ORAL HISTORY 2 TRANSCRIPT

RUSSELL L. SCHWEICKART
INTERVIEWED BY REBECCA WRIGHT
HOUSTON, TEXAS – 8 MARCH 2000

WRIGHT: Today is March 8, 2000. This oral history is being conducted at the Johnson Space Center in Houston, Texas, with Russell L. Schweickart, known as Rusty to his friends and colleagues. Interviewer is Rebecca Wright with the Johnson Space Center Oral History Project. This is part two of Mr. Schweickart's oral history. The first part was conducted on October 19, 1999, and focused on his days with the Apollo program. Today's session reflects his efforts with Skylab and his additional roles with America's space program.

Thank you again for taking time to visit with us today. You mentioned at the close of your first session that after Apollo 9 you were involved with studies concerning motion sickness and then you were assigned as the commander of the back-up crew for the first Skylab mission. Would you begin today by sharing with us your responsibilities with our country's first space station?

SCHWEICKART: Well, the back-up crew is really there to become the prime crew if they can somehow get rid of the prime crew, one or more of them. So your duties are actually identical, for the most part. There may be some things that are slightly different, but in some sense you're really doing two different things. One is you're being a crew person, in which case you're becoming familiar, going through all the specific training, etc., on all of the experiments and the flying tasks and that sort of thing. Then generally there's another set of assignments that you have which is not directly crew-related necessarily but may be a

specialty area. In my case, I was doing all of the development of the EVA [extravehicular activity] work and preparations that were done on the Skylab. Skylab did many space walks, or EVAs, primarily to recover film, at least that's what it was supposed to be, and I developed all of the procedures and helped in the development of the specific mechanisms and devices that were used and that sort of thing.

Before that, I also had an assignment for a short period of time, which was looking at the crew interface, the human interface, with the Apollo telescope mount (ATM) solar experiments, so the ATM was also something that I had a minor role in. But the principal role that I had was doing all of the preparation and development of the EVA work, primarily out of my experience on Apollo 9, of course.

WRIGHT: Of course, you were working with the spacecraft that was the latest state-of-the-art technology. Skylab was partially new, partially it wasn't. Can you tell us if there were any difficulties or concerns going through that transition that you had to get adjusted to?

SCHWEICKART: Well, I don't know about difficulties, but there were certainly major differences between Apollo and Skylab. Now, of course, the command and service module were used to get up to and back down from the Skylab, so let's let that go. That was identical. But in the laboratory itself, we were dealing with totally new systems and, to some extent, a very different philosophy in design and operation of the spacecraft.

In the Apollo, there was no attempt at all of enabling the ground to control the spacecraft. They actually did have control in the command module of certain tape recorders and data selections and things of that kind, but nothing that the crew had anything to do with.

The crew really ran the spacecraft totally. On Skylab, the philosophical concept shifted to maximizing the time of the astronauts available for the scientific experiments, principally the solar observations but not only. I mean, there were Earth observations, and there were a lot of other onboard medical and other experiments as well, and the concept of Skylab, from the design point of view, was to structure in such a way that the crew was really relieved of a lot of the basic running of the spacecraft.

Now that from time to time became ludicrous, because there were a lot of automatic systems where something would go wrong, a thruster would jam or a fuel valve would close inadvertently or something of that kind, and the spacecraft would start—when I say going out of control, I mean very slowly drifting or something like that, and the automated systems would detect that and then start going through a whole set of automatic procedures eliminating one or another possibility until it finally got to a decision point, a logical decision point which said that, "Ah, it's that valve," or something of that kind. And then it would finally take care of it.

Well, the irony and the part about it that was ridiculous was as soon as the spacecraft started drifting, if that were the symptom, you, of course, couldn't do the work you were supposed to be doing. You were no longer pointing at the sun, or you were no longer pointing correctly at the Earth or whatever, so you were free anyway, and of course you could look up, and you would immediately say, "Oh, well, that valve closed," and you're ready to open it. But this automatic system in the thing was going around doing one logical thing after another, and it would take forever to figure out that that valve was closed. So you'd be standing there twiddling your thumbs, and if you interrupted the automated system

to manually take over and open the valve and get things back again, sometimes it would screw up the automatic system to the point where it would take forever to recover.

So a lot of the time—and, of course, in simulation we discovered a lot of this—you would literally be wasting hours while the system was sitting there trying to figure out what was going on, and of course you knew it and the people on the ground knew it, but here's this automated wonder trying to do the job. So we did a lot of compromises by the time we got the flight where, in fact, we made it a kind of hybrid system. It took care of most things, some of them automatically, some the ground could take care of, and, of course, some of the astronauts were still very heavily involved in the mechanics and operation of the spacecraft as well. But it was a very different design philosophy.

I'll give you another interesting example. When I first came onto Skylab, which was very early in the program, it was before there was really any real hardware built, one of the things that, because of my experience on Apollo with the guidance and navigation systems, I took a look at was the onboard computer system. Well, this was now an IBM [International Business Machines] system, and of course they're going to throw in their latest and greatest and all the stuff, and here's a much more capable system than we had on—a much more—when I say capable, it was a much bigger system. It had more memory, it had a faster processor, and all of that kind of thing, but it had a standard keyboard, a QWERTY-type keyboard, instead of a very specialized keyboard for the astronaut interface, and so now we had to type things in. And of all the weird things, because it was efficient, we were dealing with octal on it. So if you wanted to put in 210 degrees, God forbid, because you had to figure out what 210 was in octal instead of decimal, and there was no conversion. I mean, they literally built the system with the assumption that because octal is more efficient, that

the astronauts can learn it or something, or else they won't have to put numbers in. I don't know what they were thinking. But, you know, one of the first things we looked at and said, "Out," was this octal input-output system that they had. So, you know, you find things like that.

It was really a different era in terms of spacecraft. Instead of being sort of the old fighter-pilot cliché of "you put it on," this you got into, and it existed and you learned to operate it rather than it was built around you as your spacecraft. So it was a good bit different.

WRIGHT: Speaking of that, Skylab also had an opportunity now for more scientist astronauts to have a real position in the space program. And as one of the first scientist astronauts that were part of the program, you had come through all those years and watched these developments. What were your thoughts when you saw that more scientist astronauts were being involved in Skylab, in the program as a whole?

SCHWEICKART: Well, it was a gradual transition. I was actually not a science astronaut, or scientist astronaut. If you sort of look at a Y, just before the program—there was only one kind of astronaut at first and then we went into pilot astronauts and scientist astronauts, and in the third selection I was sitting right at that junction where I was partly scientist from my background but I was also, you know, a jet pilot and had a lot of high-performance experience. So that third group of astronauts, of which I was a member, was sitting right at that junction, and after that it broke into the scientist astronauts and the pilot astronauts.

But for me that was a great transition because Skylab was really a laboratory. We had to get up into space to operate it, but it was really a laboratory for science. So having the science astronauts available and running things up there was the way it should have been.

WRIGHT: Prior to the launch, there was a lot of work between [the Marshall Space Flight Center] in Huntsville [Alabama] and [the Johnson Space Center] in Houston [Texas]. Those teams were together. You were involved greatly with that. Could you share some of those experiences of training here for some things and then going down to Huntsville for others?

SCHWEICKART: Well, I probably spent more time at Huntsville, at least up until that time, than any of the astronauts because the EVA development work that I did was done in the neutral buoyancy tank, and at that time the only neutral buoyancy tank of any size was, in fact, in Huntsville. It was a very large tank. I think, if I remember, it was seventy-five feet in diameter and fifty feet deep or something like that, and essentially the whole laboratory, the whole Skylab and Apollo telescope mount were immersed in the water, and that's where I did all the EVA development work. So I spent a great deal of time over there in "Huntspatch" [Marshall Space Flight Center, Huntsville, Alabama].

It was a different environment from Johnson Space Center, and, of course, at that time Wernher von Braun, I think, was still running it, if I remember correctly. He may have just moved to [NASA] headquarters [Washington, DC], but I can't remember, it was right in that same era, and there was a great deal of awareness of Huntsville versus Houston. The Marshall Space Flight Center was viewed here at the Johnson Space Center almost as if it were trying to crowd in on manned space, and they weren't welcome. I mean, there was real

intercenter rivalry, and it was palpable. I felt it perhaps more than many others because of my role with the EVA development. I spent, I don't know, a third of my time or something like that over in Huntsville and a heck of a lot of that under water. [Laughter] I may still have moss between my toes from all that time under water, most of it in a space suit, but a lot of it in scuba equipment so that you didn't have to go through all the rigmarole with the space suit. But I spent hundreds and hundreds and hundreds of hours under water over there.

WRIGHT: Well, from what the history books have said, the first crew did go up, the back-up crew was not able to replace on Skylab, so you weren't able to accomplish that.

SCHWEICKART: [Laughter] Couldn't break [Charles C.] "Pete" Conrad's legs, so he got to fly.

WRIGHT: He got to fly, and the Skylab launched on May 14, 1973, but sixty-three seconds through the flight, the shield accidentally deployed and tore loose from the station, taking one of the Skylab's two solar panels with it, and then the piece of the shield wrapped around the other panel, preventing it from deploying. When did you become aware that this had happened? Were you there to hear that relay in? Tell us about that time period.

SCHWEICKART: Well, I don't recall it specifically, but there's certainly no question I was down at the Cape [Cape Canaveral, Florida] for the launch of the laboratory. The crew was going to be going up, I think, four days later, so I think I was at the Cape. I doubt seriously that I was here or in Huntsville.

We learned about it immediately. I mean, as soon as it happened, the telemetry indicated that there was a serious problem. At sixty-three seconds there were glitches that were evident, and then as it entered into orbit and the deployment of the solar arrays was to have taken place, it became pretty evident that there was some really bad damage that had been done. It made it into orbit. Certain things worked, but other things didn't. I can remember there was no indication at all of power from the one solar array on the workshop. The other one had this sort of trickle of electricity which was varying slightly, and finally when we got to see that that solar array was actually partially deployed but held there by this piece of debris, you could see that there was sunlight occasionally getting into the still folded arrays but enough to generate a trickle of voltage.

So we were aware immediately that there was a serious problem. We were aware quite early that the thermal shield was gone or seriously damaged because the temperatures inside the laboratory were going up quite rapidly. The solar array took a little longer to figure out what was happening there, and until we actually got up there in flight, we didn't know for certain, but there were some very high-power photographs that the military was able to take which seemed to indicate that the one array was partially opened but that there was still an array there.

So we had an idea, and I think all of that was well within twenty-four hours, but the thing which, within a matter of a few hours, because evident was that we were going to have to do something to try and shield the laboratory from direct solar radiation which was raising the temperatures very high. And I don't remember how rapidly, but I would say within six to eight hours, a basic decision was made that we would—in fact, I would—basically lead an effort at Huntsville, at the Marshall Space Flight Center, to come up with an EVA

mechanism or means of shading the workshop, and in the meanwhile, guys back here at JSC were already starting to think about ways in which they could shade the workshop from the direct rays of the sun. So there was very rapidly this bifurcation of effort, two totally different ways of shielding the workshop and making it habitable.

WRIGHT: And what were your first thoughts on your team? Were you able to gather the people that you needed? Were you given the resources of the center to be able to get this accomplished? How did you manage to even start this major undertaking?

SCHWEICKART: Well, that is a history which really needs to be written, and it may have been, for all I know. I haven't read them all, and maybe I should write one. I don't know a great deal about what was done here at JSC. I certainly know the end result. In the workshop we had two different, very small airlocks. These were scientific airlocks, and basically they were two holes in the side of the spacecraft about eight, ten inches across, relatively square. One of them was directly on the side that pointed toward the sun; the other one was the anti-solar airlock looking opposite the direction of the sun. So with that airlock, which was designed for scientific experiments, it became pretty obvious that if we could, if you will, stick an umbrella out that side, out that airlock, and open it up and then pull the umbrella back against the side of the workshop, we would have a good shade. So the guys here at JSC set about designing that umbrella, or parasol, as it was called, that would use the scientific airlock from inside to get this parasol out and shield the workshop.

My work at Huntsville is one, of course, I'm very familiar with in detail. There we would go outside through the crew airlock, go outside and erect a big shade over the outside

of the workshop, which would shield it, and that would be done by the astronauts going through this erector-set process of putting this thing out. But, of course, at that time we had to conceive it and design it and see what we could do. I mean, you clearly had to get to places on the outside of the Skylab, which we had absolutely no intention of getting to, nor were there any handholds or foot restraints or even, let me say, well-designed or safely-designed protuberances and things. I mean, wherever the astronauts are going to go, everything gets well rounded and sanded and smoothed off so that there are no sharp edges, but in places where we had to go to do this work, there was no such preparation, and so there was a lot of question about could we really do this and what kind of care and caution had to be taken. So I headed right to Huntsville. I think I probably hit Huntsville that evening of the launch, of the workshop, and I think I probably got a little bit of sleep in the next four days, but most of the team who worked with me at Huntsville never slept for four days. I mean, literally people stayed awake twenty-four hours a day for three and four days at a time. It was total round the clock, and it was not just the resources of the center, as you asked; it was all of the resources of the whole aerospace industry. I mean, anything that we wanted. You simply called somebody and they turned inside out. Three different suppliers would manufacture some material, some thermal material or some device or something overnight. They would work on it twenty-four hours themselves. It would be there on the company's private Learjet the next morning. I mean, it was unbelievable how hard people worked.

The reason for that was that, if my recollection is proper, we had launch windows for the crew every four days, and we were going to be going up the day after the launch of the workshop, as I recall. Well, we clearly weren't going to make that, but it appeared as though five days later we had to be ready to launch because beyond that time it was not clear that the

workshop would be at all habitable. The temperatures were going up. It was using a great deal of fuel because the ground control had to take the spacecraft out of its normal attitude in order to keep the temperature from just screaming out of sight and ruining all of the food and film and everything else.

The result of taking it off the attitude so that the sunlight didn't impinge directly on it but rather at an angle was that you had to use fuel to stay at that angle. So there was this terrible coffin corner where you either got the temperatures too high or you used too much fuel. So after five days it wasn't clear that we were going to have a vehicle that could do anything. So we had to get everything ready in five days, and in five days we went into the water tank, I spent half of every day in the water tank. We first came up with a concept of what it was that we would do, which we ended up calling the twin pole sail of the spinnaker, and it was very much like erecting a sail, but we had to design and build and the astronauts had to erect a mast, actually two masts, before we could put the sail up on them, and then that sail would be put up against the side of the workshop to shade it.

But I can remember the very first night I was at Huntsville. Actually, Joe [Joseph P.] Kerwin went with me from the prime crew. We called ahead and had them get the water tank all ready. We had to answer certain very, very basic questions of could we get physically around to where we had to be? Could we see certain things? You know, these were questions which you couldn't answer just looking at drawings. We really had to get into the water tank, get on the real vehicle, and see whether certain things could be done, whether we could reach things, etc. Those questions had to be answered before we could do anything. So Joe and I planned immediately to get in the water tank. The guys had

everything ready, and we flew our T-38s over, we landed, we got—you know, blah, blah, blah.

I remember we were literally partway in the water up to our waists and the telephone rang on the console at the water tank, and it was [Donald K.] "Deke" Slayton. He said, "What are they doing?"

The guys told him, "Well, they're halfway in the water. Schweickart's in up to his waist, and Kerwin's about to get in," or whatever it was.

Deke said, "Tell them to get out."

So the guys hung up the phone, came over, and said, "Slayton says to get out of the water."

I said, "I don't care what he says. I'm not getting out of the water. We've got to answer these questions. He doesn't understand. Let's go."

So whether Deke called back or whether somebody called him, I don't know. We just kept going. I was then up to here in the water, getting weighted down and various things, and he called back and said, "Get out. Get out of the water."

I said, "Give me the phone." So I came out to my chest so I could hold the telephone, took the helmet off. I took the telephone, and we had this long conversation, and the problem was somehow related to the fact that the television networks had gotten word that we were doing this over at Huntsville. Of course, everybody was starved for what was going on, who was doing what. You know, they wanted news, naturally. So somebody had heard about it, and there was somebody who confirmed that, yes, there were a couple of astronauts getting in the water tank or something like that. So apparently they were coming running out there with all their microphones and television cameras, and they were going to record this stuff,

and somehow either Deke didn't like it or headquarters didn't want that to happen or something, but anyway, the word came down, "Get out of the water tank. We don't want you there. We don't want the press to get this."

I said, "Deke, we've got to get answers. We've got four days to build this whole thing." I said, "We've got to get answers. We didn't have this conversation. Bye." And I handed the guys the phone. We hung up the phone, we went on, we got the answers and got out of the water tank, and the media never did show up. [Laughter] I don't know whether they kept them off at the gate or what, but in any case, it never got there and Deke never said a word and headquarters never said a word. But I mean, that was the kind of craziness that was happening.

So we got out of the water tank. I can remember that it was probably ten o'clock at night. Somewhere I've got a photograph of this. We got up in the briefing quarters afterward. Everybody was there from, I guess, the deputy center director at Huntsville, all the guys that did all the development work, the mechanical stuff, the crew systems people, etc., etc. Everybody was there in the debriefing room.

Basically I stood up at this white board. There wasn't anybody else who could do it. I mean, nobody appointed me to do it, but somebody had to do it, and most of the things were heavily crew-labor oriented, so there was no question it had to be, really, one of us or somebody who represented us. There was nobody there. So I stood up at the white board and we just started organizing it. "We can do this. We can't do this. We can see this. We can't see that. Here are several options. It looks like we could try this, we could try this, we could try this. What do you guys think?"

We had a big discussion, and one by one we eliminated things, and by about midnight, I'd say, after something like two hours of this discussion, we basically had the outlines of what we were going to do. We started making assignments of who was going to do what, and that started that process. As I say, within four days we had these sails, the mast, if you will, these rods that were probably a meter or a yard long each, and there were probably sixteen or twenty of those that had to be screwed together and pulleys on the end and ropes.

We had this multilayered thermal sail that then had to be erected and tied off and all that, and tested in the water to make sure it could all work and a mounting plate at the bottom which had to be designed and built and hooked on, and all the procedures of how to get it out there and space-qualify it and vacuum-test it. All of those things. I mean, just on and on and on. And there were materials that were flying from Seattle, from San Diego, from Boston. I mean, things were coming from all over the country to support that effort.

Finally, on the fourth day we had everything together and we were doing it, I was doing it, and then the next thing we had to do was get the crew over there to train the crew in about six hours because they were going to launch the next day.

Well, as it turned out, we got right up to the point where we had the crew ready to train, and headquarters and everybody had decided that we really needed to have more than one way to do this, and the Johnson Space Center parasol wasn't ready. It looked as though they might be able to go another four days without running out of fuel, so they had things a little bit better under control. So the best guess at that point was to postpone for another four days, make sure that we had the parasol ready to go out, and, in fact, by that time the logic

said we would do that first, and the twin pole sail developed at Huntsville would be the second system that would be used, the back-up system, as it were.

The reason for that, although there was a lot of intercenter stuff that went on, the one that was invented here at the JSC was the one that was going to go out, you know, so there was that, but really, the logic which supported that was that the crew didn't have to go EVA in order to get the parasol out and try to protect the lab that way, whereas to use the one we developed at Huntsville, you had a whole separate thing of going EVA, which added a level of complexity right at the very beginning of the mission, which was seen to be undesirable. So the priority became the parasol first, the twin pole sail second. And because the parasol wasn't quite ready and they could control the temperatures, it went another four days. So we could finally—I could tell everyone to go home and sleep. [Laughter] And we had a little extra time to do the crew training and that sort of thing.

In the end, it turned out that the parasol did go out after the crew got up there, it worked but barely. It worked well enough for the first mission, and at the end of the first mission it was thermally degrading and the temperatures were starting to go back up again, and it never had deployed quite right. It was sort of cattywampus when it went out. So at the beginning of SL3 [Skylab 3], the second manned mission, Al [Alan L.] Bean and Jack [R.] Lousma and Owen [K.] Garriott put the twin pole sail out, and it went down over the JSC parasol, and it protected the lab for the remainder of the Skylab mission.

WRIGHT: Were you instrumental in training that second crew as well on how to use the twin pole sail?

SCHWEICKART: Yes. I guess the primary crew, the first crew, did train on it, come to think of it. Sure, they did, but then it was the second crew that, of course, actually deployed it. Yes, we went through the training with them in a much more leisurely way than we did with the first crew. [Laughter] I sat next to Cap Com [Capsule Communicator] and basically played Cap Com during the deployment of the sail.

But, of course, before that, there was a whole other adventure, which was erecting the workshop solar array that was hooked down, and there was only one way to do that, and that was EVA. We actually tried to do something before. When the first crew first got up there, we looked at trying to hook the—basically taking a gaff hook, almost, and hook under the end of the solar array and actually pull it up. What we had to do on that was, there was a damper. When the array was normally supposed to go up, some latches would release on the bottom, and it was spring-loaded to spring out to ninety degrees, and after it got out ninety degrees, then the solar arrays would sort of come down like window shades, almost, alongside the spacecraft. Well, they were folded up into the wing, and the wing was down for launch.

What kept the wing under normal conditions from just going "Bang!" out there was a damping system, a little fluid damping cylinder, that would just keep it from going out too fast. Well, because it went part way out and then stopped, what happened was, that damping cylinder with a liquid in it like a hydraulic fluid froze because it wasn't designed to stay liquid under space conditions for a long period of time. So after a couple of days that liquid fill in that damping pot froze, and of course then you wouldn't be able to get it out, you wouldn't let it go out at all.

So we knew that once we had this little debris strap cut, that we would then have to lift out on it and break the little rod on that damping system, and it was thin, it was never meant to be that strong. It didn't need to be that strong. So we knew that we could break that and we would have to break that, and then it would go all the way up and latch, which it actually ended up doing.

But when we first got up there, before we did the final—the EVA mechanism for doing it, the crew went up and they tried to hook the end of it on a stand-up EVA out the hatch and pull up on it, but of course, as soon as—I don't know, I think it was Paul [J.] Weitz, either Paul or Joe [Kerwin], but I guess it was Paul Weitz—got the gaff hook and tried to hook under the end of the beam to pull it up, of course the spacecraft would move around. You know, you're in two moving spacecraft, and as soon as he would apply any force it would move the spacecraft, and he could never get enough leverage to actually get the force necessary to break it.

So they went ahead and docked, and then after the mission got under way and the parasol was deployed, then we started running low on electrical energy to do the experiments and things, so we had to get that array up. Once we developed the deployment, the twin sail deployment mechanism, that was sort of put aside on the back burner because it was there and it would not be used after the parasol went out.

Then I had to go back under water and develop this whole EVA technique for the guys going outside, cutting that strap and getting the array up, and again, the only way to do that was EVA. So again it fell to me and the Huntsville guys in the neutral buoyancy tank, and we ended up with a whole procedure which is very complex, but in the end, Joe Kerwin and Pete Conrad were outside, and Pete was able to cut the strap using the technique that we

developed and eventually got the array to come open, and half of the electrical power then came back—didn't come back, came into being. From that point on, we were more or less in a nominal Skylab mission, but it was sort of miraculous getting all that work done in that short length of time.

WRIGHT: The night before they did that procedure, you briefed them on how to do that.

SCHWEICKART: Yes.

WRIGHT: What was the level of confidence? Could you feel what the crew was feeling as you were explaining this? Did they feel like they were going to be able to continue their mission and feel like they could do this procedure? It was complex, but—

SCHWEICKART: Well, it was not only complex, but you also have to recognize that unlike the twin pole sail where we had four days—and it turned out eight days—to develop that down here and the crew could train on it, in the case of the solar wing deployment, that procedure was developed after the crew was up there, and as a result, the only tools and equipment and devices that we could use were things that were already in the spacecraft ostensibly for some other purpose. So we had to cobble things together to get the procedure that would enable the crew to do this work. And that was a very interesting challenge.

It turned out that this aluminum strap, which was probably an inch wide, that was slapped up when the debris was left from the thermal shield ripping off the outside of the workshop, just left a strap and flapped it up over the edge of the solar array, and it just

stopped it from going up, well, that strap, one-inch or so piece of aluminum, maybe sixteenth to an eighth of an inch thick, we cut through that. You couldn't bend it off. It obviously had sharp edges and all sorts of things. So we really didn't want the crew trying to manhandle it and just rip it off and cut holes in their gloves or something.

So we had in the medical kit a bone saw for emergency medical purposes only, of course, but a bone saw is a cute little thing. It's basically two steel rings, almost like merry-go-round rings, and between them is like a very thin—it's a wire, a high-strength steel wire, but with teeth wrapped around it, so it's like a toothed wire and fairly flexible. In fact, when you store it, you just wrap it up in a circle and it collapses to almost nothing. But you take it out, and it ends up being, you know, a foot and a half or so with this flexible wire between it, and you put that around the bone normally, and you go back and forth and saw your way literally through a bone if you have to amputate somebody's leg or something.

Well, obviously that was a low probability occurrence, to have to cut somebody's arm or leg or finger off or whatever, but, nevertheless, the bone saw was up there. So we tested it, and sure enough, that little sucker was plenty sharp enough to cut through aluminum. So we had several other things that we tried first, but they didn't work, frankly. So in the end, the bone saw was there, I had the most confidence in that anyway because it was the most mechanical, the most straightforward. Everything else was a cluge.

So sure enough, Pete ended up with the bone saw, got it around the aluminum thing, and just went back and forth a few times and cut right through the aluminum, and that was the end of the strap. Then he had to erect it, and there we had a rope with some hooks on it that we had for EVA, and we hooked those things into a piece of the array, and then Pete had to stand up and leverage using that rope, leverage the array up and break that little rod.

Well, the problem was that Pete didn't tie the rope the way I anticipated, the way that I planned that he would and the way I thought he would naturally do it because Pete's a sailor, and I assumed he would tighten that rope up and then tie it off. Well, instead, he started tightening from the end, he started wrapping from the end, rather than pulling it around and wrapping that way. So when he wrapped from the end, as he got as much as he could, he still had some slack in the rope. It wasn't taut. So when he stood up to lift up that rope, Pete being a fairly short fellow, got the rope up and there's like no tension in it. So there was no force being applied to the wing.

Well, he obviously realized—he didn't realize why. He thought it was a bad procedure that I had developed, and, of course, I didn't know what he had done, so I didn't know why there was a slack in the rope either. We were both a little bit in the dark. But they figured it out, because all they did was they got Joe Kerwin there, and then Pete climbed up Joe's back and then lifted it up, and, of course, the beam suddenly popped up, and Pete went flipping off into space but still holding onto the rope. So they burst out laughing, and the whole thing turned into a big laughfest. But the arm came up and the arrays went down, and we had power. So it was great.

But that, of course, was very interesting because the whole procedure was developed while the crew was up there. It was developed on the ground over at Huntsville in the water tank, and we then had to write that out in a way that was understandable that they could cluge everything together, and it was a lot of cooperation and a lot of confidence, my confidence in them, their confidence in me in terms of developing a procedure like that, and it worked well. And because of it, we ended up with a great Skylab mission after that.

WRIGHT: Yes, those first two weeks were a little busy.

SCHWEICKART: Just a little. [Laughter] It was certainly a lot of unplanned manual labor in EVA, and I'll tell you, out of that we developed a tremendous amount of confidence in the EVA capability of humans in space. Before that, you know, there was still the legacy of problems with EVA during Gemini. Apollo, of course, made a big difference, but that was running around—except for my mission on Apollo, that was sort of running around on the surface in gravity again. So here was EVA of a massive scale in weightlessness that we never anticipated, did it with flying colors, everything worked just fine, never had a problem, and saved the mission. So there was a lot of confidence in the astronauts' ability from that point on to do things during EVA. And thank heaven, because the [International] Space Station's going to need a lot of it. [Laughter]

WRIGHT: I know we were talking previously about, of course, the problems of the batteries going down and why the solar arrays were so important, and you mentioned some other techniques that Mr. Conrad used, I believe, by trying to get a battery started in his own way. Would you like to share that story with us?

SCHWEICKART: Well, in spite of the fact that we had the solar arrays out now, as time went on, after the second or third week, I guess it was somewhere in the second week, we started seeing some of the many batteries were no longer charging and building up their proper charge. As a result, we were beginning to run short. At first it didn't bother people, but then more and more of them started this. I think we ended up with three or four batteries where

they were not charging. This was because of, clearly, a problem, although not so clear what it was in detail. Nevertheless, it was relatively clear that it was a problem with the battery, a thing called the battery charger regulator module, if I remember right.

This module which did the battery charging had a lot of relays and all kinds of stuff in it. One way or another we got a lot of them working, but I remember that there was one in particular which was not working. The guys did a lot of analysis, and they finally figured out, they really limited it down to one thing, which was in one relay, in a particular place physically in that box, which was about like that, there had to be a solder ball that was a piece of debris left over during the manufacturing that was keeping two relay contacts from closing. And the only way to get that solder ball out of there—and they did a tremendous analytical job to figure that out, that that was the only possible thing that could give all the characteristics that they were measuring—the only way to get that solder ball out of there was to physically jar it out.

Well, the only way to physically jar it out was somehow to hit this thing, this battery module, but, of course, it's on the outside of the spacecraft.

So on the next EVA, Pete Conrad went out, and I drew this battery regulator module that he would see and we'd have to tell him, because this is not something you were normally going to do. So we had to tell him where it was, where to look for the thing, and which one of these modules was the right one, and then on the little teleprinter I made this little diagram of the thing and I put an X on this picture of the thing where he was to hit it with a hammer. And Pete said, “Hit it with a hammer?” I mean, you don't dare do something like that with space equipment.

We said, “Yeah, hit it with a hammer.”

He said, “Well, how hard do I hit it?”

We said, “Firmly.”

So he said, “Okay.” So he went out there, and he's got the hammer, and he finally figures out where it is. He says, “Okay. I'm ready. You're sure you want me to hit this thing?”

We said, “Yeah. Hit it, Pete.”

He said, “Okay. Three, two, one, ugh.” You could hear him, you know.

We looked down at the EECOM [electrical, environmental and communications officer] guy, the electrical guy in the control center, and he's not smiling or giving us any sign. So he looks back up at Cap Com, and he says, “Tell him to hit it again harder.”

So we said, “Hit it again harder, Pete.”

He said, “Really?” [Laughter] This was like pure joy, right?

“Sure. Hit it harder.”

“Okay. Three, two, one.” Bam! He hit it harder. We looked down at EECOM. Still nothing.

He said, “Hit it harder.”

We said, “Okay, Pete. If you've got any more, hit it harder yet. Hit it as hard as you can.”

He says, “No kidding? Okay. Here we go.” And he really whacked it.

EECOM went “Yea!” [Laughter]

So Pete could never believe that. It was just so much fun just to hit something on the spacecraft with a hammer as hard as you could.

So there are little things like that, you know, that made all of the work enjoyable and fun, and, of course, it's great when there's that whole combination all the way from the detection of a problem through pouring over blueprints and figuring it out and all the analytic stuff, and figuring out what happened and which relay, and then having this kind of a solution and a crewman going up there and hitting things with a hammer and it makes it work. I mean, everybody, everybody felt wonderful, if you can imagine, and the press, of course, loved it as well.

WRIGHT: I'm sure there was a great amount of relaxation after all the tension from the first two weeks and the rest of the mission went smoothly. Was that the same on ground as it was up in the station, that everybody felt a little more relaxed, as relaxed as you could get?

SCHWEICKART: Well, relaxed I'm not so sure. Everybody felt proud of having essentially gone from a derelict whatever it was, five-, ten-billion-dollar spacecraft up there and a total disaster on our hands, to a mission which was now working. And from everything we could see once we got the regulators going, the solar array up, and the thermal shield out, even though on the next mission we put the other one out, we could now see our way going to the end of the Skylab mission as planned. We had enough electrical power, even though we missed one solar array. If things didn't fail too badly, it looked like we were going to be able to go for the whole thing. So people were very proud.

But there was still a tremendous amount of work because every day was jampacked and we were basically two weeks behind on the scientific experiments. So there wasn't a great deal of relaxation, but there was sure a lot of pride and teamwork, and everybody felt

really good about it. And, of course, by the end of the Skylab mission, we not only got done everything that had been planned, but I think somewhere around 130 percent of overall science that had been planned got done. So it was terrific and it was a wonderful experience.

WRIGHT: Now, were you busy with the Skylab 3 crew during the last part of the Skylab 2 mission, trying to get them ready for the procedures on the EVA?

SCHWEICKART: Right.

WRIGHT: And what else were you doing at that time, or did that take up most of your time?

SCHWEICKART: Well, once the Skylab 3 was trained on the EVA, then I fell back into more or less routine support type of activities. I think during Skylab 4, for example, I don't recall having any real contribution to that. All of the real unusual demand—I mean, my normal job would have been over essentially once the first crew launched and was up there because ours was the back-up crew for that first mission, and then there was another back-up crew for the next two missions.

So actually, instead of relaxing immediately after the launch, we had all of this work to do, and that basically lasted through the launch of the second manned mission, but once that was done, then finally basically all of my special efforts were behind us at that point. So I could watch it.

WRIGHT: And somewhat relax, I guess, then. You mentioned, too, that you had worked with the Cap Com. Was that just for the first manned mission, or were you also on hand for the second and third manned missions as well with the Cap Coms during Skylab?

SCHWEICKART: Well, principally during the twin pole sail deployment on the second manned mission, but once that was done, then I no longer worked with the Cap Com. I worked with Cap Com principally because of the procedures that I had developed in the tank over at Huntsville. I was also there, I think, during at least the first of the EVAs for recovery of the film and, you know, the normal EVA work that we expected to do. But the crews were very well trained on that, and there wasn't a great deal.

So I don't know whether I was there during the third manned mission EVAs or not. I can't even remember. I was probably on call, but I don't think I even sat there during those EVAs.

WRIGHT: Where did your roles take you next after Skylab? Your involvement with Skylab was very much a vital one for all those EVA procedures plus more, and then, of course, you were still with NASA. So tell us where you moved on to next.

SCHWEICKART: Well, at that point I was looking at what options that I have, and one of the options, of course, was at that point to go over to the Space Shuttle development work which was under way, quite well under way, actually. A lot of the guys coming off Apollo went on to the Shuttle work. So that was more or less the normal path. But, frankly, by that time, I had, you know, done a lot of work on Gemini in a support role, and then, of course,

everything on Apollo, and now all of this on Skylab, and to go cycle back into the very beginning of the Space Shuttle, which was not going to fly for, at that point, something like six years and best guess of anybody in the business was maybe eight years, I figured, you know, another eight years of basically going to the same kinds of meetings, making the same kinds of decisions, going to the same places.

You know, I mean, it was like "been there, done that," and I was more interested in developing management skills, having some idea what managing an operation was like, budgeting, testimony before Congress, all those things which were necessary to have anything happen in NASA but which the astronauts were normally not connected with at all.

So I opted to go up to [NASA] headquarters. Originally it was going to be for a couple of years to gain some management experience up there and then return to the astronaut office. So I retained my astronaut status but sort of assigned to headquarters for three years or so to work there. I worked in the Office of Applications under Chuck [Charles W.] Mathews, who had formerly been the head of the Gemini program here in Johnson Space Center, and Chuck and I knew each other fairly well.

I was one of Chuck's directors and basically became the liaison between NASA's applications technologies and the outside world for which they were being developed. For example, right at that point, what became LANDSAT was at that time called ERTS, which was a rather difficult name, ERTS, Earth Resources Technology Satellite. But the Earth satellite was about to go up, the first one, and of course it had all these multispectral cameras on it which were going to be taking Earth resources photographs of the whole surface of the planet. We had taken the first multispectral images of the Earth from Apollo 9, so there was some affinity there, and I think Chuck was aware of that somehow.

In any event, as director of user affairs, my job was to prepare the Department of Agriculture, the farmers of America, water resources managers, city planners, etc., etc., etc., for these images which were going to be coming down from space which were to aid them in doing their jobs, whether that was assessing the health of crops, or even identifying what crops were, or how much snow there was in the snow pack so that they could manage the dams and rivers better, or a multitude of things that could be done with this imagery from space.

The job I had was to work with the users on the outside world, whether in government or outside of government in the civil world, to prepare them for these technologies, these application technologies. ERTS, of course was the most active, but there was also CSAT and there were a variety of direct-broadcast satellite technologies which we were developing at that time. So in communications and in Earth-sensing of various kinds, I was basically the guy who directed the interface between NASA and that outside world.

It was to be a two-way street. I was to bring requirements from the outside world to NASA so that NASA could understand how better to design its technologies, and conversely, then, I was to take these new technologies and represent them to the outside world to help people understand that they could use them to do things more cheaply or better or faster than they could do them using their conventional systems.

That was a difficult and, to some extent, a thankless position, I found out. The outside world, as far as they were concerned, didn't need NASA's technology. The bulk of people who were doing things in the ways in which they had been doing them for years were happy with the way they were doing them. There are all kinds of people who work there. They're all going to have to learn a whole new thing. “Is it reliable? Who's going to make

sure that we have this data when we need it? NASA really isn't in the business of generating data; it's in the business of flying things into space. So I don't want to rely on it." It was a very hard sell to get a lot of this technology to be seen by people in the world as something which would, in fact, benefit them.

As far as some of them were concerned, and some of them were right, NASA was trying to force it on them, and, you know, it was like putting a square peg in a round hole to some extent. In some cases, it appeared to be a square peg in a round hole and actually there was a fit, and that was a sell job, but in other cases it was, and they were right, and we were trying to force things out there which nobody wanted and couldn't use. Conversely, when I would try to take things that they needed back into NASA to try to shape the technologies that NASA was developing, frankly, NASA wasn't really very interested. NASA wanted to invent its own toys, not the toys that these guys out here want to see invented. So in both directions that was a pretty hard sell.

Finally I ended up leaving that program and NASA, eventually, because it was clear that NASA didn't care what the outside—I mean, there were individuals within NASA, but NASA as a whole fundamentally wanted to invent what it wanted to invent, not be essentially a servant for that outside world who needed devices or whatever. Plus the outside world didn't think in terms of space devices either. But when they did, when somebody worked at it, then NASA wasn't really very interested, and that bothered me a lot. And I fought a lot of internal battles on that and decided, you know, nobody's going to listen to me. They don't care what the outside world wants. So why should I bat my head against the wall and just get bloody?

So then I had a unique opportunity to come out to California and work with [Governor Edmund G.] Jerry Brown, and that looked like a lot more fun and interesting. So I ended up leaving NASA headquarters, although I did another job for about four or five months there. Eventually I headed out to California to work with Jerry Brown.

WRIGHT: And that was part of the California Energy Commission, that work?

SCHWEICKART: Well, no. When I first went out to California, it was while I was still doing this user affairs thing and I was speaking to agriculture and other people in state government in California, and I gave a lecture out there in the governor's office for various California agencies, Department of Water Resources, and land-use planning people, and that sort of thing, with all the slides and whatnot, and met a lot of interesting people including the governor and spent some extra time there because of some mutual friends that we had. Stuart Brand [phonetic] was at that time working part time for the governor, and he and I had been friends for several years at that point.

So I spent several weekends out there in California almost full time with the governor, who really knew very little about space, became quite fascinated with it. I mean, it was something like sports or athletics and astronauts were athletes, you know, they're interesting to watch on the tube when you've got nothing else to do but there's nothing much there. Well, what he found out as we started talking and meeting and having a lot of conversations is that there's a lot there, it's very interesting, young people are totally fascinated by it, it's turned the world on and there's good reason, and that people who are

involved in it, like this guy Schweickart, seems to be a fairly bright fellow, you know, and I didn't expect that.

So there was a sort of awakening in this thing, the end of which was that Jerry Brown became a great space enthusiast to the point where he would offend all kinds of people because he was more of an advocate than they were. Whether that was the President or whether it was the administrator of NASA or the head of JPL [Jet Propulsion Laboratory; Pasadena, California] or whoever it was, Jerry Brown was always pushing them because he wanted to see more done and more imaginative things, you know, and more aggressive stuff.

So after a while, it was like why did I turn this guy on, you know? [Laughter] What I was challenged by was trying to hold him down so that he wouldn't just bend everybody out of shape and that they would see him as serious and not just, you know, a rabble-rouser. He was very bright, but he was also fairly impatient, especially with bureaucracy. So he would basically give me a nod and say, "Yeah, yeah, I hear you," and then he would go hit them again. But he turned into a genuine space exploration devotee.

So in the beginnings of that, before I went out there, I could see that he was interested, he was very interested in a lot of the applications things. He was fascinated by the Earth resources things. He got right away the power of these direct broadcast communications satellites which could communicate into very small portable antennas, and that could be used by state agencies in fighting forest fires, which cost billions of dollars every year in California, and all sorts of emergency situations. So he loved the idea of taking some initiative. He couldn't seem to move NASA very fast, so he decided that it would be interesting to take some initiative there.

So as we got talking about it, basically the two of us invented a job for me in the governor's Office, and I then switched from NASA headquarters to the State of California under the Intergovernmental Personnel Act, IPA. So I was still actually technically a NASA employee, but I was assigned now to California as an intergovernmental exchange person, and I worked as Jerry Brown's advisor for science and technology directly out of the governor's office.

That was very, very interesting, very, very different from my federal national experience, which was stodgy, slow, ossified, heavily procedural-bound, you know, all the testimony before Congress and every piece of testimony had to be vetted through six different committees and everything before you even got to give it. Somebody would ask you a very logical question, and unless it was already cleared at NASA headquarters you couldn't answer it honestly, you had to give the company answer. You know, it was very, very heavy, controlled sort of stuff.

On the other hand, state government, especially under Jerry Brown, it was freewheeling. It was, "You want to do something? Great. I'll sign off on it. You're in charge of it. Go do it." And two days later, "Is it done yet? Why not? Can I help you? What do you need?" A week later, "Did you get it done yet?" Well, if you're doing something big, you're talking years, even under the best of circumstances. Well, everything was just go, go, go. It was, "You're in charge. Make it happen." And that was a very, very exciting environment, and it's the way Jerry Brown operated.

Now, on the other hand, he couldn't manage anything or anybody. He was a very, very poor administrator, but he was a good leader in that sense. If you wanted to do something and you convinced him, then it was, "Go do it," and it was a very exciting. And

that was going on in environmental issues, in energy issues, in space. In our case, we ended up with a California satellite, and that went along for a long way, and it was going to be a very exciting program, and there were a whole bunch of other state and federal agencies involved in it at first, and one at a time they all dropped away, leaving only California as the user of this satellite, and it was a cooperative three-way deal between NASA and Hughes [Aircraft] with their new flat spinner and us with the payload to go on it.

It was a good deal, but in the end it got axed because of the infamous Prop [Proposition] 13 in California just as we were coming up to the final votes in the state legislature, and there was a lot of joking around. It was, on the one hand, taken seriously by a lot of people, and other people who treated it like it was a joke, you know, Jerry Brown's space program. It wasn't at all. It was a really imaginative state use of space resources, space capability, but because of the nature of Jerry Brown and the fact that I was there, to some extent, there was a potential for making a joke out of it, so there were people trying to capitalize on it. So there was a lot of back and forth. But we would have pulled that funding off in the legislature that was required to go through with it, but Prop 13 suddenly got all this momentum of relieving property tax in California, and Howard Jarvis and all of the rest of it.

I can remember one night late in the legislative session it was clear that Jerry Brown was going to have to give up some of his favorite programs in order to get anything passed at all in the legislature, and the question is, what is he going to give up? I mean, the legislative process is like sausage. You know, maybe you want to eat it at the end, but don't ever watch it being made. I mean, that's just exactly what it's like.

So I can remember late one night Jerry and I were talking on the phone, and he said, "Well, what do you think? I think we can get it through, but it's going to be a real fight, and

I'm probably going to have to give up this, that, and the other thing." And when I looked at this, that, and the other thing versus the satellite, this, that, and the other thing were people in one way or another. I don't remember anymore what they were, but they were direct people programs. And while the satellite was high profile and it would have saved a lot of money and forests and everything else in the state, it wasn't directly people. I said, "Jerry, I hate to say it, but let's give up the satellite and keep those other programs. I don't think that's a tradeoff that we ought to make." It was reluctance on both of our parts. That's what happened. We gave it up. Those programs went through. Prop 13 went through. But that was the end of the California satellite.

WRIGHT: You kept moving along with all of your space-related adventures. In '85 you formed the Association of Space Explorers. Give some background on why was that important to you and who your members are.

SCHWEICKART: Well, I was, as we just left it, up until about August of 1979, the science and technology advisor to the governor. Around August or somewhere in that ballpark, August or September of '79, the second oil crisis hit, and Jerry asked me to take over the state energy commission. So I became chairman of the California Energy Commission, setting all the energy policy in California from late in '79 through '84, when a new Republican administration came in and the chairmanship went to someone else, but I was still an energy commissioner until the middle of 1985.

So that was my work at that point. I was now into energy regulation and energy policy. But, at the same time, I, as you said, was still very interested, obviously—and by the

way, when I took over the energy commission, I became a state officer. To become a state officer, I had to no longer work for the federal government. So my NASA career actually ended two years after I got to California, when I left NASA in '79 and became a state employee and then an officer of the state.

Nevertheless, I was still very interested in astronaut activities and in the space exploration stuff and in the development of applications, for that matter, in the whole space program. A number of friends in California were involved in the early days of what was called "citizen diplomacy" where, as private organizations, they were developing relationships, people-to-people relationships, with Russians or, at that time, with the Soviet Union, with people in the Soviet Union. Some of it was on medical things and some of it was on history or philosophy. There were all kinds of exchanges that going on at a relatively low level, but nevertheless basically individual initiative on the U.S. side. On the Soviet side, of course, everything always had to be approved, but nevertheless there were these exchanges going on.

Several of my friends were involved in that, in particular at the Esalen Institute, which had developed a Soviet-American exchange program. One evening—I think it was probably in the middle of 1981 or early in '81—I was invited to a cocktail party where my friends were getting together privately and had a small contingent of Russians who were visiting as part of this exchange program, and they were going to be at a cocktail party, and they thought that I might like to meet them. They knew that I had met a few cosmonauts.

So it turned out that, in fact, one of the Russians who was there knew Georgy [Mikhailovich] Grechko quite well, one of the cosmonauts, and asked me whether I had met Grechko, which I had not at that time. The group there asked if I were to do something with

the cosmonauts, what would I like to do, what would be fun to do, would there be something interesting to do? They were thinking of some kind of little meeting or something like that.

I had always been interested in the concept of people who had flown in space getting together, which, from time to time, we did but almost always in either a technical conference, you know, the annual meeting of the IAF [International Astronautical Federation] or the AAAS [American Association for the Advancement of Science] would have something, you know, there'd be some kind of a conference of something going on for a week somewhere, and a cosmonaut would be there and an astronaut would be there and they'd meet and they'd go apart. It would be that fast, click, click with the flashbulbs, and then go. Or it would be a cocktail party, hail-fellow-well-met kind of thing, and again, end of cocktail party, end of game.

That never was very satisfying, because you never had a chance to really talk with people, to get to know what their experience was, what they felt about things, what their impression was of space flight. Anything that you wanted to talk about was not available. You didn't have the capability, the time, or anything else, the opportunity to do it.

So I said, well, I'd like to get the astronauts and cosmonauts together to really enable them—not everybody else, but just them—to enable them to talk together the way we've never been able to about our experiences of flying in space. Everybody loved the idea, and the original thought in my mind was we would have a kind of one-time meeting of astronauts and cosmonauts, civil-sponsored, not government-sponsored, but sponsored by individuals, or privately sponsored.

Well, when I got thinking about it more and I got to know Russians a little bit more, Soviets a little bit more, I came quickly to the realization that anything which was a one-time

thing was probably not a good idea because it would be too tempting for the Soviets to take advantage of it and just propagandize the daylights out of it. I mean, there was no cost to them to do that. So I realized that the only way to have anything serious happen where that would not be the case would be to have something that was ongoing, and then when we first got together they, recognizing the long-term benefit of having astronauts and cosmonauts together, wouldn't start trying to capitalize on it right away. I mean, I knew that they would, but they wouldn't immediately, you know, turn it into a fiasco.

So my determination from the beginning and actually the people who were around me was to try and do this in such a way that it was going to be nonpolitical, or as nonpolitical as it could possibly be, which is not easy.

Well, to make a long story short, what we ended up with is coming up with the idea of an organization of people who'd flown in space, which, after a number of choices, became the Association of Space Explorers, of which now 90 percent of everybody who's flown in space is a member, but in those days it was anathema. I mean, that initiative of mine to form that organization—and we can talk a little more about the way in which I did it—but basically, that initiative to form that organization was seen by many people as Schweickart being a commie pinko, you know, turncoat. The word “traitor” occasionally even came into use in some people who didn't know what they were talking about.

It was in the days when [President] Ronald Reagan was making his Florida speech about the evil empire, and anybody who had anything to do with the Russians, and especially when it was not sanctioned or controlled by the government, was highly suspect, and I came right into that assumption, and a lot of the astronauts reacted that way, but I talked with a number of them ahead of time before I even went over to Russia for the first time to explore

this possibility, and as long as I was just going to explore it and I wasn't really representing them and didn't make any commitments, people were curious about how would the idea be received.

So I went very, very carefully, a step at a time, and I always had a couple of the other astronauts with me. Between us we had a lot of respect, but, you know, it was easy, because of my political beliefs and the rest of it, to shove me off into the pinko commie corner over there. But then when Mike [Michael] Collins went over with me, people had to think a little more seriously about it, because Mike was hardly a pinko commie.

So gradually I got a few more people involved in it until finally, years later, after we formed the organization and had a number of Congresses and had members from thirty different countries, finally it gained acceptance. The Reagan administration was over. Things change. Now, of course, we're doing all kinds of cooperative things, and we started relatively soon with the Apollo-Soyuz [Test] program and things like that.

So the organization is now a going organization and very well accepted. [Richard H.] Dick Truly joined when he was administrator of NASA, or I guess right after he finished his administration of NASA he joined, but he went to one of the meetings even as he was administrator. So it made a big turn, but I was persona non grata at NASA by the NASA administrator, and it was a very difficult time for me. That bias and that prejudice, because of me taking that initiative, was not subtle. It was a very, very personal and hardball blackballing by NASA. It was very interesting.

WRIGHT: And especially, as you mentioned, we're doing so much of a partnership with them now that it's like a time—you were before your time.

SCHWEICKART: Well, you know, while it hurt in very real ways, including economic, inside I knew sooner or later we were going to all be getting together, you know, and working together again. Those things cycle. So I was basically willing to take the heat. Gradually the environment changed, and then, of course, the membership expanded and it became quite acceptable. But to imagine that we're living in this historic time when people first looked back on the Earth from the vantage point of space and to have this very limited number of people who have that privilege and that opportunity and the responsibility to bring that experience to the rest of the people of the world, and to imagine those people not being able to get together to talk about that experience among themselves was ridiculous. It was stupid. It may have been politically right or whatever, but it was stupid in the historic context. I tend to operate that way, on the big picture, in spite of my own self-interest. [Laughter]

So we formed the Association of Space Explorers in 1985. I mean, we worked at it for three years before we finally got it going, and now it's a going organization with about 300-and-some astronauts and cosmonauts from thirty-some countries, an annual congress, and a lot of exchange of communication and things. I'm delighted that I stuck with it and worked it through, and I'll tell you, it was not easy, a lot of hard times. But, you know, a lot of good people helped and we got the job done.

WRIGHT: Talking about your travels, understanding you've traveled to the end of the Earth, would you like to talk to us about the time that you were with the Antarctic Safety Review Panel and what your duties were with that?

SCHWEICKART: Well, in 1977 I moved back to Washington, D.C. from California because my significant other was back there, now my wife, and I moved back there basically to be with her and ultimately to drag her back to California. So while I was there, I went back into federal service and ended up with a job for the National Science Foundation [NSF], which actually emerged, in a strange way, out of the space program. The National Science Foundation happens to be responsible—it is the U.S. government agency that is responsible for all U.S. activities in Antarctica, and while people participate in that from universities and private corporations and other government agencies, nevertheless, the running of the program, the operation, the funding of it, all the rest of the whole operation is done by the National Science Foundation Office of Polar Programs.

Director Block [phonetic] at the time, Eric Block, who was the director of the National Science Foundation, looked across at its sister agency NASA, who had just experienced the *Challenger* [51-L] accident and the investigation that was going on and the culpability that the NASA management had, in essence, allowing the conditions to develop which ended up in that Challenger accident, and the way in which, of course, that culpability played back into the administrator of NASA and into the management of NASA and into NASA's reputation, and Eric Block was pretty bright and could see that while basically every year we would lose one or two people in Antarctica down a chasm or a crevasse or through some industrial accident or something, that in fact, with the number of people down there, that there was the potential for major disaster, and he didn't want to have to go through the same thing that his buddy the NASA administrator was going through after the *Challenger* and be called up before Congress and have the special investigating committee, etc.

So he decided to hire his own astronaut to conduct a safety review of everything that was happening in Antarctica. So I happened along at the same time that NSF needed somebody to lead this blue ribbon panel to do an independent and wall-to-wall assessment of safety in Antarctica. So I headed up the panel and got to pick a bunch of people from outside of government and a couple from inside and form this blue-ribbon panel, and we went down to Antarctica several times, visited all the facilities there, looked at everything from soup to nuts in terms of safety and risk to human life, and, as it turned out, to the environment as well.

So we broadened the charter a bit into some of the obvious and more egregious environmental problems that were going on which, in the end, could have safety implication in themselves, but basically we broadened the charter a bit.

So in [19]'77 and '78, in the winter season there, or summer down in Antarctica, I took several trips down there with this panel, spent probably a total of two weeks in Antarctica scattered among the different stations, and ended up writing quite a thick report, which, surprisingly, unlike a lot of reports like that, didn't just end up on a shelf but actually ended up changing a number of policies. There was a restructuring of the management down there. There were whole new responsibilities outlined and major changes in the way in which we handled the Antarctic operations. And it's still a risky environment, but hopefully a bit safer, and certainly from the environmental point of view, a lot cleaner now.

Interestingly, I had the opportunity, because of that experience, to participate again in 1996 in another panel that was set up by the National Science Foundation and the Office of Science and Technology Policy, this time to look at replacement of the aging South Pole station, the Scott Amundson Station right at the South Pole. The question was, you know,

should we be putting the money into this? It's going to cost several hundred million dollars. Is it worthwhile? What should it be if we do do something down there? How big should it be? Should the whole structure be changed to an international one? Blah, blah, blah, blah.

So this additional panel got set up under Norm Augustine, who was chairman of Lockheed [Corporation] at that time, and I was one of many members on that panel. In fact, I think in 1994 I was part of another short-term panel. At any rate, I also have an identity in that one with the underside of the world down there.

It's totally fascinating because—I can say it in a very short and concise way—but Antarctica, in fact, is the premier example of responsible governance of non-sovereign territory. Space is another, but space is nowhere near as far along in terms of governance that Antarctica is, and Antarctica is not owned by anybody, it's owned by everybody, and the Antarctic treaty system is the system of governance among nations which controls and operates things in Antarctica and sets the policies. It's the only operation of that kind in a specifically non-sovereign environment that's kept that way and yet used for scientific purposes in a very energetic way, and we're learning a tremendous amount.

So for me it was an opportunity to look at a metaphor for the eventual emergence and development of the governance of space and operations in space. Now, whether we follow that pattern or not is not at all well known or understood. Nevertheless, Antarctica is in that way it's a metaphor for space. Also, at South Pole, for example, you're dealing with an environment which is as isolated as the surface of Mars. So finally NASA is now working with the NSF, which is wasn't back when I started this stuff, and I didn't have a lot to do with that, but still I encouraged it, but finally NASA is now working quite actively with the National Science Foundation in the analog of Antarctica and operations in Antarctica for

operations on the surface of Mars or other places of that kind, and there's a lot to be learned. It's a very interesting place.

WRIGHT: Since you mentioned Mars, do you have thoughts of how NASA will pursue its exploration into the future? What are your thoughts on what—looking past over these many, many years, and you certainly have had a unique perspective of seeing all the ends of the Earth from all different angles—

SCHWEICKART: Yes, I almost got to the North Pole, but—I got to the north tip of Alaska. That's as close as I got with my blue-ribbon panel.

WRIGHT: It's certainly complete from looking down and looking above.

SCHWEICKART: Well, interestingly, or maybe not interestingly, my involvement in the debate about how to get to Mars, whether you go to the Moon first or set up a base, blah, blah, blah, all of the issues of getting humans to Mars is something which I have not gotten terribly involved in, and while in an academic way I'm interested in it and it's certainly going to happen and I have great confidence in that, I'm really less interested in that specific operation than I am in other, let's say, longer-term, larger, more philosophic issues of space. So I have not really gotten very much involved, and I don't have a feeling even worth expressing in terms of what I think the best way to go about this is.

What I am interested in, and working today in developing, is trying to bring to people and in particular young people, the tremendous excitement of discovery that's going on now of the extent and origins of life, and by origins I mean both here on this planet and other places even in our own solar system where life may have originated. The extent would include not just the broader extent of life here on the Earth that we understand today in thermal events, in volcanic events, in undersea environments, beneath 11,000, 12,000 feet of ice in Antarctica, I mean life is in places we never imagined it being and in varieties and in conditions which we never understood life could exist before. And, of course, all of that has a direct bearing on our understanding of the robustness of life and the diversity of life, which then can also exist in environments in space which we don't normally think of as being life-supporting.

So that whole issue of how did life originate, where did it originate, where today might it be is no longer just a matter of conjecture or speculation. We now, today, in the last five years, have discovered hard evidence of planets around other stars for the first time. We're finding more and more all the time. NASA is now committed to missions in space which are going to put up instruments which will allow us better resolution, better sensors. We're going to be able to see not just large planets, Jupiter-size planets, around other stars, or not see them but deduce that they're there, know that they're there, but also smaller and smaller planets until we will know for certain that in fact our solar system is not unique, that there are many, many solar systems.

And if there are many, if there's more than one, it's hard to stop before you reach something very close to infinity. I mean, there's so many stars and so many galaxies that

once you go beyond totally unique through some freak accident, then you're right there with millions of other solar systems, and certainly all of the other elements necessary for the formation of life, probably of intelligence, and even probably of consciousness. We're gradually beginning to see how these things, through nonlinear systems dynamics—I'm talking about chaos theory, self-organization in nature, things of that kind, we're learning so much right now which seems to indicate that life, intelligence, and consciousness, probably in diminishing percentages, is built into the fundamental structure of the universe.

This explosion of knowledge is going on today and is very exciting, and it has so many dimensions that whether you're interested in biology or mathematics or physics or space flight or almost any kind of a science bears on that great period of discovery which I believe we're going into. So I'm totally fascinated with that and hope to communicate some of that excitement and opportunity to young people.

WRIGHT: You sound like you have many plans ahead of you that might not be filled anytime soon, that many days will be busy—

SCHWEICKART: I hope not too many of them. When you have too many plans, you never get anything done. No, I'm hoping to focus a little bit, but we'll see.

WRIGHT: Well, you've been able to accomplish so much in your life. As we move toward the end of this session, do you reflect back sometimes and can possibly center on one major accomplishment that you're the most proud of?

SCHWEICKART: Not any particular accomplishment. I guess my tendency is not to—there's almost no accomplishment in human history that is really creditable to one person. Once in a while something happens. Generally what happens is everybody adds a little piece, and I'm happy to have added a bunch of little pieces here, there, and the other place.

There's certainly no question about that, but I think, in reflection, I would say that what has made my life the most interesting, although perhaps not the most lucrative or the most publicly rewarding or acknowledged or whatever, but nevertheless I would recommend it, notwithstanding the down sides associated with it, I've basically gone my way. If I think something is right, I'll go for it. I'll do it. It's just the way I'm built. This whole issue of fitting within a bigger structure, one has to do that. It's not a matter of black or white; it's a matter of degree. Everybody has to fit to some extent within a structure or else you can't get anything done. On the other hand, if you fit too well and comfortably in it, you also don't get anything done.

So there is a balance between being a bit of a radical or a renegade and working with the system. I guess I've leaned a little more than a lot of my astronaut compatriots in the sense of going with the individual initiative and doing it my way. My path through life has not been straight. It's been a series of moving in one direction and then another, always following something that was interesting and in my sense of values worthwhile, worth doing. I certainly recommend that to any young person who's scratching his or her head over how do you live life. But, as I say, it gets uncomfortable from time to time, but, you know, it's also fun.

WRIGHT: I guess you've taken many paths. I believe you described yourself once as a farm boy from New Jersey?

SCHWEICKART: Yes.

WRIGHT: And certainly have seen a lot and have done so much, and I guess thinking back on those days, did you have plans when you were a young boy on what you wanted to do, and did you accomplish those, or did you just take all those different paths that led you where you are today?

SCHWEICKART: More the latter than the former. I'm always amazed when I meet the occasional ten-, eleven-, fourteen-year-old that knows what he or she wants to do. I never did. I think most kids never do. I knew I was interested in engineering and science, but beyond that, it was more what looks interesting for the next period of my life, what looks like an opportunity, and move in that direction, rather than have a long-term plan and work it out a step at a time. You can do it either way. In some ways it's more comfortable if you have a plan. If you have that kind of thing and you're good at that, great. Go for it.

WRIGHT: We certainly thank you for your time with us today. Is there anything else that you would like to add, or is there a possibility we might have skipped over something you'd like to go back to at this point?

SCHWEICKART: No. Just different stories here and there and the other place, one thing or another, but, you know, we can go on and on with too many stories.

WRIGHT: Well, we're always glad to hear from you, and we certainly thank you for the time that you gave to us today.

SCHWEICKART: Thank you.

WRIGHT: Thank you. [Tape recorder turned off.]

How did you meet the Russians as part of your Association of Space Explorers?

SCHWEICKART: Well, from time to time I had met Russians at a technical meeting. For example, at the Paris Air Show after our Apollo 9 flight, two of the cosmonauts were there as part of the Russian space exhibit at the Paris Air Show, and we had a very interesting time where right from the outset we knew that they were going to be there, [Vladimir Alexandrovich] Shatalov and [Alexei Stanislavovich] Yeliseyev, and we said, "We want to meet them. We want to get together with them." And everybody said, "Great. That's wonderful. Yes, we'll arrange it." Day after day, we would ask, "When are we getting together with the Russians?"

"We're trying to get it set up." And that went on for about three days or something.

Then Jim [James A. McDivitt] and Dave [David R. Scott] and I at one point were sitting in our little room at the U.S. display, and we had just asked and we got the same answer, so the three of us kind of looked at one another, and I don't even know if we said

anything, but we just got up and we walked out the front of the U.S. display, and we walked down the outside, down the fairway or whatever, to the Russian exhibit, and we walked in the front door of the Russian exhibit. We got about halfway there, and our U.S. handlers back here were saying, "Where are they going? Where are they going?" The next thing we had these guys running after us, you know, trying to talk us into not going in there. So we walked right in the front of the Russian exhibit.

Of course, we're there with this big crowd of ordinary people looking at the exhibits, and, of course, sooner or later, within fifteen seconds, somebody recognized us, and the word started going out, "The American astronauts are here. The astronauts are here." And this wave kind of—you could almost look and see it, this wave of information going back down the Russian exhibit to the back, you know, and within five minutes the head of the Russian exhibit was scurrying up through the crowd to shake our hands and welcome us to the Soviet display.

After that, the next day, the cosmonauts came to visit with us. Then the day after that, we went out onto the ramp and had a great time in one of their static display aircraft, a small YAK-26 sitting on the ramp. A different story. A lot of vodka. But ways such as that.

Then probably one of the most interesting, because I had met, Vitaly Sevastyanov, somewhere, I think it was at a technical meeting. Yes. In fact, it was at the International Astronautical Federation, the IAF. The two of us, I think, chaired a session. So I had met Vitali at a technical session.

Then when I was on Skylab, and it must have been in 1973, I think, at some point, and I'm not sure when, it turned out that Sevastyanov and Shatalov were coming to the U.S., and I think the IAA was acting as host, the Institute of Aeronautics and Astronautics, and

[Edwin E.] Buzz Aldrin [Jr.] was going to act as their host. He was meeting them in New York, and they were going to see a few things there, and then they were going to come down through Huntsville and through Houston and, I don't know, out to California or something. But for some reason, I don't even remember why, because I knew Sevastyanov and I'd met Shatalov, I'd met both of them, as a matter of fact, before, so I called Buzz, and I was going to be at Huntsville, as a matter of fact, when they came through Huntsville.

I had been doing all of the underwater EVA development, procedures development stuff, and this was very much toward the end of all that, so it was very much comfortable and everything was pretty much cut and dried. I called Buzz, and I said, "Buzz, we're going to have a private conversation here if you can tell me that it's, in fact, with no question, private."

He said, "Yes."

I said, "Okay. When you guys come down to Huntsville, I'll happen to be there, and I will have just finished some EVA stuff, underwater, doing Skylab training stuff, and I'd like to invite the cosmonauts to go underwater in our neutral buoyancy facility in a U.S. space suit."

He said, "Wow. That's a great idea."

I said, "Okay. Look, you're going to"… and we talked about where they were going to be, and I was going to be showing them. I knew that they were coming, and the guys at Huntsville knew that they were coming, so we'd already talked a little bit about what we were going to show them and that sort of thing. I said, "You're going to be on a catwalk and blah, blah, blah, and we'll get all the way down to the end of this catwalk, halfway up on the outside of the water tank and looking into a porthole on the side of it, and I'll be showing them things, I'll be pointing out things, and there's not room for too many people there, so

you're going to be there, Shatalov's going to be there, Sevastyanov and myself, and probably one or two dignitaries are going to be there, and that's all that can really be within earshot. You can't get any more people there."

He said, "Okay."

I said, "At that point, I'm going to say, 'Oh, I'm going to go in tomorrow morning. Would one of you guys like to go in with me?' And I'd like to know if I were to do that, are they going to say yes or no. You never heard about this, but call me back."

So Buzz called me back, and he said, "One of them is going to say nyet, and the other is going to say da."

I said, "Sevastyanov's saying da, right?"

He said, "Yes."

I said, "Okay. You never heard this."

So then I made one call, and I think even today I won't say who it was. [Laughter] I made one call to a very close personal friend at high level at NASA headquarters, and I said, "This is what I'm going to do. If you're going to tell me not to do it, fine, otherwise just hang up, and we never talked." And the phone went "click." Okay.

So sure enough, he brings them down, they come down with Buzz Aldrin, a big entourage, and we're showing them the water tank and all this stuff. We get down to this catwalk, and just as I thought it would happen, you know, there was one or two high-level guys, one from NASA headquarters, in fact, that I didn't expect to be there, and one very high-level guy right under the director of Marshall Space Flight Center, and then the cosmonauts and Buzz and me. I'm showing them all this stuff.

Then just spur of the moment, I said, "Oh, by the way, I'm going to go in tomorrow morning for just a quick check, maybe an hour or something like that. Would one of you like to go in with me?"

"Nyet."

"Da."

Just like that. [Laughter] And all of a sudden, the eyes just got so big on these NASA officials. It was like, "Oh, my God, he just invited them into the water and they said yes." They couldn't go back on it, and we immediately started jabbering about how we were—you know, check out the space suit and whatnot.

So sure enough, it happened. That night I was briefing Vitali on all this stuff that I could brief him on, and the next morning we got him in the suit room and got him all checked out on how the suit worked and how it functioned and the backpack, and they had never done this at that time. And Vitali went under water with me. We got him all weighted out and neutrally buoyant, and I sort of stuck him in the airlock and had him hand film canisters out. I was out changing film on the end of the Apollo telescope mount.

So we went through this thing, an hour under water, and came back out. Everything worked fine, and it was just, you know, a great experience. And it would never have happened if I ever asked permission.

But it was very interesting and also it revealed something very interesting about the Soviets and the way they ran their program. Because I remember on the airplane, they were flying on the Gulf Stream around, NASA's Gulf Stream, and I flew back to Houston with Buzz and the two cosmonauts and some other dignitaries. And on the way back to Houston, Vitali, along with a translator, got me off to the side and said, "Rusty, how did I do?"

I kind of looked at him a little strangely and just sort of clapped him on the shoulder and said, “Great. Great.”

He grabbed my arm, and he said, “No, no. I want to know. How did I perform? Was it okay? Did I do all right?” He was so serious. And Vitali's a joker from the get-go, so for Vitali to be this serious, it was very interesting. He really wanted me to grade his performance.

Then after we were here in Houston, again at a party later that evening, he did the same thing. He got me aside, and he wanted to know how well he did. It was indicative of that process, that they are evaluated and graded and marked, and they take tests before they fly. It was very different treatment. Our whole program operated on the basis that if you were selected as an astronaut, you were a responsible human being for your own life and for other people's lives. But somehow the cosmonaut program, in those days at least, and I think even to today, still operates in this way where there's a very hierarchical structure, and you pass or fail, you take tests. It was quite revealing of the program.

Then, of course, later, several years later, they then put in their own water tank, and they realized it was a great way to do EVA simulations, you know, weightlessness simulations, and so they got a great big water tank at Star City [Russia] which I saw many years later. But it was a very interesting little initiative that I took on that.

WRIGHT: I'm glad you shared that first international partnership underwater with us so that we can mark that.

SCHWEICKART: First cosmonaut ever in a U.S. space suit. It was fun.

WRIGHT: That's great. Thanks.

[End of interview]