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ORAL HISTORY TRANSCRIPT

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INTERVIEWED BY SANDRA JOHNSON
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JOHNSON: Today is June 13th, 2013. This oral history interview is being conducted with Harry Schenk in Greenbelt, Maryland, for the NASA Headquarters Oral History project. The interviewer is Sandra Johnson, assisted by Rebecca Wright. I want to thank you again for joining us today and agreeing to talk to us. I want to begin by talking about how you first began working for Bendix Field Engineering Corporation in support of the NASA ground stations during Gemini and Apollo. If you can talk about when you first came and any training you had and duties, and that sort of thing, right at the beginning.

SCHENK: I joined Bendix Field Engineering when I was discharged from the Air Force, and was fortunate to get on the space program in the very beginning of the space program. The training I had in the Air Force in electronics was very comparable to the type of training that was required for maintaining the NASA ground stations around the world. My first assignment there was on Kanton Island, which was one of the original [tracking] sites, NASA sites, for manned spaceflight. Kanton Island, when they told me Kanton Island, I said, "Well, where is that?" It's in the middle of the Pacific, about 2,000 miles south of Hawaii. Very little island, tip of a volcano actually sticking out, with the lagoon in the middle and a donut ring around it with a channel cut out for entry to the lagoon.

We had a very—by today's standards—basic tracking station there, and our communications were with the outside world in relaying the voice from the Gemini missions, by

HF, high frequency, which is not as dependable or clear as we're used to with satellite communications today. It was pretty primitive, but it worked, and it accomplished the job. Do you want me to just go from there?

JOHNSON: You can describe, if you don't mind, while you were on that island, how long you were there at a time and which missions you covered?

SCHENK: I was there for one year, and I covered the early Gemini missions. I believe it was Gemini 3, 4, and 5. It was the beginning.

JOHNSON: How many people were on the island with you at that ground station?

SCHENK: With Bendix, when I first got there, the FAA [Federal Aviation Administration] ran the island. They did the power, the water, had a dispensary, but they pulled out. Bendix took over the whole thing, and I would say we had about 70 or 80 people there, but on the tracking station itself was about 10 people. You need all the other people because you had to make your own water, you had to make your own electricity, chow hall, living quarters. It took seven times as many people to sustain the few that were at the tracking stations.

JOHNSON: You said the living conditions were sort of primitive. Can you describe how they worked?

SCHENK: It was actually a family assignment for the FAA, so they had housing, they had regular houses on the lagoon. It was beachfront property, but I mean it was primitive in the sense that we were isolated. We had an airplane that came once every two weeks that brought mail, brought food, brought people, and took people off. The rest of the time, you were pretty much on your own. All the water had to be made, all the electricity had to be generated, to sustain the operation there.

JOHNSON: What were your specific duties there?

SCHENK: That was a kind of interesting thing for me because when I was in the Air Force, I worked on aircraft navigation systems, and since the FAA was pulling out, they wanted NASA to sustain the navigation systems that they had on the island. Also, at the tracking station, I worked as a telemetry engineer. I had a dual job there, and as a result of that, I had my own pickup truck because I had to be on-call 24 hours a day. Besides the tracking station, I had to take care of the navigational aids and the calibration that went along with that.

JOHNSON: You were pretty young at that point, I assume.

SCHENK: I was 23.

JOHNSON: Were most of the people there working also young?

SCHENK: Most of the people at the tracking station were similar to myself, but the sustainment people, the power, the cooks, the mechanics, were primarily from Hawaii, that had families up in Hawaii, and they were called range rats. They worked on the range there and they basically sent the money to their families in Hawaii, and then took the time at every opportunity to go up there. They pretty much lived on the range.

JOHNSON: Was this also voice communications and all types of telemetry that you were tracking?

SCHENK: At that point, like I said, it was relatively primitive. We had voice communications, where we would relay Houston's [Texas, Johnson Space Center, JSC] voice through the station up to the capsule, and the voice back to Houston. The telemetry was all recorded on tapes, on magnetic tapes, and sent back after the mission.

JOHNSON: Just flown back to Houston?

SCHENK: Yes, right.

JOHNSON: There were limited times, obviously, because each tracking station only had a certain amount of time for each mission.

SCHENK: Yes, the tracking station, if you look at a map, it's usually drawn as a circle around the geographical location. That circle designates the area that you can cover for a spacecraft like

Gemini, depending on the altitude. The circle will get bigger as you go higher and smaller as you go lower. The orbit, sometimes it hits just a part of the circle, sometimes it goes through the middle, and sometimes it just hits the other edges. On our passes, there tend to be three passes, so we would get three passes in a row and then we'd have a break until the next series of three passes.

JOHNSON: What did you do after that year?

SCHENK: I went from there to [Tananarive] Madagascar, which was actually, at that time, the Madagascar station was what was known as a STADAN [Spacecraft Tracking and Data Acquisition Network] site. Kanton was a manned flight, manned spaceflight. The STADAN was a scientific satellite, but because of its location, we had a couple of trailers there that were used for manned spaceflight, and that's the reason I went over there. I supported the rest of the Gemini Program in Madagascar, and then the beginning of the Apollo Program, which was the unmanned portion of it. We sent up the capsule and re-entered it unmanned to test the heat shield. It just happened to happen over Madagascar because they climbed over the Indian Ocean and then re-entered very fast there. We got some of the very early Apollo support there.

JOHNSON: How long were you in Madagascar?

SCHENK: Madagascar was two years.

JOHNSON: That was all through the end of Gemini and the first parts of Apollo?

SCHENK: That was the end of Gemini and the start of Apollo, yes.

JOHNSON: Where did you go from there?

SCHENK: From there, I came back to Maryland, here, and went on assignment on the Apollo aircraft that were used for testing all the stations for Apollo. The Apollo aircraft were Lockheed Constellations, four-engine propeller planes that had all the equipment that resembled the Apollo spacecraft. Some of the actual Apollo units were on the aircraft, but some of it was test equipment associated with that to make the system. To a station, we looked like the Apollo spacecraft, electronically, so the signals that were sent down were the same as we'd see from the Apollo.

JOHNSON: The plane would go up and fly over the stations?

SCHENK: We'd fly over the stations, we'd run simulated passes, so to them, again, it would look like there was a spacecraft going across. Basically, it was for training, and to certify the stations that they were ready for support. As part of that certification, we also gave them problems, where they were expecting a certain mode or certain configuration and we would set up something different and see how long it would take them to figure out that the Apollo spacecraft was not doing this. We'd delay the acquisition or break the signal and see how the station reacted. It was a proficiency training prior to every mission because at that time, there weren't as many spacecraft as we have now.

Now, you don't need to learn how to track a satellite because there are a lot of satellites, but at that time, that was pretty much very specialized and one-of-a-kind. We did not only the stations, but we also did the Apollo ships—there were ships that were used during the Apollo Program. We would test them and also tested the ARIA [Advanced Range Instrumentation Aircraft], which were big aircraft that were used for tracking the Apollo. It was both land stations, ships, and airplanes, and consequently, they took me around the world because we had stations at that time in Australia, in Hawaii, Bermuda, Guam, Madrid, Canary Islands, Mexico.

JOHNSON: You flew on the airplane?

SCHENK: I was a crew member on the aircraft, yes. Along with us when we went on these trips, we took a NASA team of engineers that would go to the station and observe. They were observers, so as we put the station through their paces, they would observe how well they do and what improvements or how ready they were for the next mission.

JOHNSON: That was quite a unique opportunity, I would think.

SCHENK: It was. It was great, it was exciting, and for Apollo 11, we always got scripts from Houston because we did the voice as well. One of the people was acting as an astronaut and was actually reading scripts, the conversation that they could expect. It was pretty close on the landing. We didn't have "One small step for mankind," but everything else was pretty close. Those were interesting times, and it was really being a part of a team that went to the Moon.

JOHNSON: Right, and doing things, like you said, the training to track these things that we'd never tracked before. Were there any other anecdotes during that time period, during that training period, that you can remember? Any challenges or unusual things that happened?

SCHENK: When they took the rover to the Moon, the little vehicle, on the trip that we were going to the Pacific, we stopped in Houston and picked up a unit that was the camera. It was actually the LCRU [Lunar Communications Relay Unit], as it was called, LCRU unit that we mounted in the aircraft, and I think we had a JSC person with us as well to work it. They would remotely command the camera, and we had it mounted where the consoles were. So, you're sitting there and out of the corner of your eye, you see the camera coming around like this, and then the lens would go out and the lens would go back in, and they were doing that from Houston. They were actually remotely commanding, just like they did on the Moon with the camera.

JOHNSON: It allowed them to also practice what they were going to be doing.

SCHENK: Right, so these were like integrated sims [simulations], then, yes.

JOHNSON: That's interesting. It sounds like a part of training that not a lot of people have heard about.

SCHENK: The challenges were the stations were pretty stable with manpower, but the ships, because they would go out and then when they would come back in, there would be people that would get off the ship, and they'd be replaced by new people. That was always more of a

challenge to train them because you were starting with a little bit of a new crew. Then, the ARAI aircraft, which were manned by the Air Force, this was during the Vietnam War and they rotated the people off those airplanes to Vietnam, and they replaced them. With them, it was always a challenge to get the crews trained because you were starting with people that had never done it.

JOHNSON: Your group was responsible for that training also?

SCHENK: We were responsible for providing the training for them. The first day was always very rough, the second day got better, and the third day, it improved. Then, they were ready, and then after the next mission, we started all over again.

JOHNSON: Yes, started with a new crew. Did the training last about the same length that the mission was planned for?

SCHENK: We normally did a week at a location, so the first day was basically interface checks. We'd actually fly circles, so they would have us continually, and then we would get into the passes. No, it was not the length of the mission, but it would put them through all the phases. Whatever phase they would be supporting, we would concentrate on that.

JOHNSON: Sometimes, I imagine you would have to do it more than once, especially with those new groups coming through.

SCHENK: Right.

JOHNSON: You did that all the way through Apollo?

SCHENK: Did that all the way through Apollo, and then after the Apollo, the aircraft were decommissioned and I moved on into working at Goddard here. For missions, we had what we called a Network Support Team. There was a team back here that helped the stations getting ready for missions and during the missions, actual technical assistance there. After that, we went through ASTP, the Apollo-Soyuz [Test Project] mission, and then we got into Skylab. I was involved with that here at Goddard.

JOHNSON: Can you talk about just some of those duties that you were doing during ASTP and Skylab in a little more detail about what you did?

SCHENK: During ASTP, then, as I said, the Network Support Team was based at the Network Control Center at Goddard, and we would interface with the stations. We would set them up for testing, we would monitor their performance, and then we would assist them in technical problems, so each mission had its own timeline and we would go through simulations and countdowns and the whole gamut of things that you put a station through.

JOHNSON: Was there any interaction, with ASTP, with the Russian side as far as the network support?

SCHENK: No, we did not have it, but we monitored, during the mission, the real-time voice. We would hear the Russians as well as our crew, but no, we did not deal with them. That was, I think, done all through Houston.

JOHNSON: I believe in 1981, you became manager of the Test and Integration Group, is that correct?

SCHENK: Yes.

JOHNSON: Do you want to talk about that a little bit? Of course, Shuttle coming in at that point.

SCHENK: The Test and Integration Group consisted of the Compatibility Test Van, which were actually vans, big trailer trucks, that we would send to the manufacturers of spacecraft and test the satellites while they were in the factory, before they were launched, to ensure that they were compatible with the support that we were going to be providing, either through the ground stations or through TDRSS [Tracking and Data Relay Satellite System]. That was very interesting. It's a very technical job because essentially, you replicate the station that the spacecraft's going to see and ensure that the signals are all compatible and that there are no problems that we would experience once it was launched.

The other part of it was called the SOSC, Spacecraft Operations and Simulations Center, and we used that to actually field teams that went around and did sort of similar things I did on the airplanes but did it now with a computer at the station itself. It wasn't as dynamic, but it still provided the interaction that they would be seeing. That was the Network Testing, was made up

of those two entities there, the compatibility testing and the SOSC, the Simulation Operations Center.

JOHNSON: You mentioned TDRSS also.

SCHENK: Then, I got involved in TDRSS, in the very beginning of TDRSS. The first time I went out to White Sands [New Mexico] there, the facility was still under construction and the concept of the TDRSS, the initial concept of the TDRSS was it was going to be a commercial service and NASA was going to get the signals that they paid for, but the satellites were going to be also used for commercial support. There was a part of White Sands that was called NASA Ground Terminal, NGT, that would receive the signals from the other side, which was the commercial side, and then take those signals and distribute them within the NASA environment there. I was involved in the early testing, or the implementation of NASA Ground Terminal, and then the early testing of that and the early support of TDRSS.

JOHNSON: Which finally launched in ’83, right?

SCHENK: It did, yes. That satellite had a bad ride. The rocket that was used to propel it into the geostationary orbit had a problem and it did not get into the right orbit. It took about six months, I believe, from what I remember, to coach it into the synchronous orbit. They were using the little thrusters on the spacecraft, which were not designed to do that, and so the SOSC was involved with monitoring that data in real time and the temperatures on the thrusters so that over

time, the satellite was put in orbit. Then, it lasted forever. It was just, I think, last year that it was decommissioned. Its design life was, I believe, 10 years, and it exceeded that by quite a bit.

JOHNSON: Were you working all through that time period? Were you still in that management position, the Test and Integration Group?

SCHENK: Right. I got a little more hands-on technically with the TDRSS, but yes, I was still at the same position.

JOHNSON: Then, of course, the second TDRSS that was going to launch was on the [Space Shuttle] *Challenger* [STS-51L], and then was lost during the accident.

SCHENK: It was, and unfortunately, I was at the Cape [Canaveral, Florida] at the time for a meeting for Hubble [Space Telescope] because we had some interface meetings on the Hubble launch that was coming up later. We were at a Hubble meeting and they announced that it's, like, "45 minutes before launch, and if you want to go watch it, we'll break the meeting and reconvene after the launch." Three of us went down in front of the VAB [Vehicle Assembly] Building and there was an open field there, and I have pictures where it was so cold that I had an overcoat on. I had the collar turned up because the wind was really cool.

The launch went off and then it appeared like there was a problem, but it looked like, we were hoping, that the Shuttle would actually separate and fly off, but that was not to be. We saw the whole thing.

JOHNSON: It must have been quite an emotional day, the rest of the day, then.

SCHENK: I went back to the headquarters building where we had the meeting, and everybody was glued in front of the TV sets. You could hear a pin drop. They kept replaying and replaying the launch sequence there, so yes. After that, I had a hard time watching TV for the future launches until the separation, until those solids separated.

JOHNSON: I can understand that.

SCHENK: I just had a scar from that. It was kind of different, how I happened to be down there, because the Shuttle was supposed to launch, like, two days before that. They slipped, and then the next day, they were supposed to launch the day that I was flying to Florida, so when I landed in Florida, I said, "Did it launch?"

They said, "No."

I said, "Oh, good, I'll get to see it." What happened the second day, I think there was some handle or something they had a problem with, and so they scrubbed the launch and they fixed that. We ended up seeing it because of the slips there.

JOHNSON: After that, obviously you probably didn't just go back to your meetings. Did everything just stop?

SCHENK: It was like everybody was walking around in shock at Kennedy [Space Center, Florida]. Our meeting was at the headquarters building. No, we did not resume the meeting, but

the rest of the day was spent essentially watching the thing over and over again, and seeing if there was any more information that would come forth from that.

JOHNSON: Of course, you were meeting about Hubble and this was definitely going to put a hold on Hubble.

SCHENK: It delayed that substantially, yes.

JOHNSON: What exactly were you meeting about and did you continue working with the Hubble project?

SCHENK: The Hubble was supported by the Space Network, and also during the launch by the Ground Network. I think we were discussing three things, they were doing compatibility testing down at the Cape when the Hubble got down there, and also the support from the TDRSS and the ground stations that was going to be upcoming. It was kind of a project meeting.

JOHNSON: I know when Shuttles launched, there was a whole network of networks that carried the telemetry and the signals, starting, I believe, with MILA [Merritt Island Launch Area] was first.

SCHENK: Yes.

JOHNSON: There was a process, could you just walk us through that? Walk us through a Shuttle launch, as far as the network coverage as it launched and went into orbit?

SCHENK: Sure. You mentioned MILA. I ended up going down to MILA a couple of times there as a station manager because of vacancies that we had. I think I spent two six-month periods down there managing the MILA station during the Shuttle Program there. The MILA station was located in Merritt Island, and you could see the pad electronically, so there was a lot of testing done before the Shuttle ever launched.

The weeks before the Shuttle launched, there would be testing using MILA as the ground station. Then, during the launch itself, MILA would track off the pad for about two minutes, and at two minutes, the Shuttle was in such a position where the solids were facing—they get between the MILA and the Shuttle, and the solids have a lot of metal oxide in it, so it really degrades the signal. When that happened, we had a station up the coast there called Ponce de León [PDL], which was a smaller station that was used, but it had a different angle at it.

When we started getting dropouts with MILA, we switched over to Ponce de León, and it would cover it for about two minutes. Then, MILA would be cleared and MILA had the bigger antenna, so we'd go back to MILA. It was MILA, PDL, back to MILA, and then as you went up about seven minutes, well, there are two periods there. We had a station in Bermuda that was pretty critical for launches, but as we got TDRSS worked out and really dependable and people began having trust in using satellites to track another satellite, then we switched over to TDRSS.

In the early days of the Shuttle we had MILA, then PDL, then Bermuda, and then Wallops Island [Virginia], and then TDRSS. Then, later on, I would say about 10, 15 Shuttle missions, we started going MILA, PDL, and TDRSS. The Shuttle would do a heads-up roll to

where it would expose the antenna to TDRSS and then the rest of the mission would be flown on TDRSS until the landing. Right before the landing, they'd go back to the ground mode and MILA would pick it up as it was approaching and then cover the landing.

JOHNSON: That's an interesting process of how you had to switch. You said you managed MILA a couple of times?

SCHENK: I did. I spent about six months in there twice, when we had a senior manager and the station manager that left, and I would fill in until we found a person that was qualified that we could put down there.

JOHNSON: Of course, from the beginning, with Gemini and Apollo and the limited coverage and the numerous ground stations, then with TDRSS.

SCHENK: What a difference, what a difference.

JOHNSON: Do you want to talk about that difference?

SCHENK: In the early days, probably the longest pass you would get would be 12, 13, 14 minutes, and that would be ideal. That would be at the circle across the middle, but most of the passes were less than that because you hit the fringes. With TDRSS, it's continuous, so essentially, we went from having 10-minute spots occasionally to full-time voice communication and data communication with the crew. Yes, it changed.

JOHNSON: I imagine your job was a little busier at that point just because there wasn't as much downtime in-between.

SCHENK: On the other hand, once you establish the signal and you have the TDRSS acquisition, after that it's pretty much like a telephone call. Once you make your call, it just keeps—

JOHNSON: It keeps going.

SCHENK: Keeps going, yes.

JOHNSON: It really made a difference. I know the technology, as it changed throughout your career, has really made a difference.

SCHENK: Tremendously, yes. We used to think a high data rate for the communications, when I went up to Madagascar, we had 9.6-kilobit communication links. During the Apollo Program, the sites went to 56-kilobit lines, so they would have three 56-kilobit lines. Now, you have megabits. During Mercury and Gemini, Houston used to send people out to the stations themselves, they would have a flight surgeon at the station, they'd have a controller from Houston that would do the actual communication with the thing. With the advent of the higher communication lines and the TDRSS, they sit in Houston and talk to them continually, any time they want. Before, that had to be planned, "When's the next acquisition and when can we..." Quite a change, yes.

JOHNSON: You were a contractor all the way through your career?

SCHENK: I've been a contractor my whole career, yes.

JOHNSON: Was it in '88, AlliedSignal, did they just take over for Bendix for the contract you were working on?

SCHENK: AlliedSignal bought Bendix and essentially, Bendix was merged into it. The contract I was on, Bendix Field Engineering won that initially and kept it until two years ago. It was a long run, from '63 to '11.

JOHNSON: You became the associate program manager for NASCOM [NASA Communications System]. Can you talk a little bit about NASCOM and what that meant?

SCHENK: There were some contract changes at Goddard and there was some consolidation where all the functions, NASCOM used to be a separate contract, other pieces of it. They combined it all into one, so when we bid the consolidated contract, which was greater in scope than the previous contracts, we had NASCOM now. I was asked to manage that, and I learned all about communications, quickly.

NASCOM provides—what's called NISN [NASA Integrated Network Services] now, but it was called NASCOM, NASA Communications, at that time—provided all the circuits around the world to connect all the different stations, Centers, universities, together that NASA flows

data from or communicates with. It was a 24-hour day, seven days per week operation. NASCOM pioneered what today is packet communications there, and it was called a 4800-bit block. It was the way you send data in blocks. Today it's called packets, and computers do it all the time, but NASA was a forerunner in doing that because it didn't exist. NASA invented their own, and that was called a NASCOM 4800-bit block.

The telemetry would get put in the block set, when the blocks get accounted for, they had error correction on them so they would know if there was an error in that one because there'd be a calculation done on the content of the block. It was pretty advanced, in its day. Today, it's commercially available, but much more improved, much faster, et cetera. In its day there, I think it was pretty good.

JOHNSON: Like you said, the networks were all over the world, and everything's growing, I would imagine, exponentially, getting larger and larger.

SCHENK: With the advent of TDRSS, what that did is it basically shut down much of the Ground Network because now you had no need to have the station in Hawaii or in Dakar or in Hawaii, Mexico, et cetera, because now you had communications going all the way around. The stations became very specialized. MILA was always needed because of the preparations for the launch and the initial launch. With the gantry and everything around the spacecraft there, TDRSS would not really have a very good shot at it until it gets up a little ways there. That was the reason for using MILA and then PDL and then TDRSS when it was clear of all the obstructions and was oriented properly so that the antenna would work.

JOHNSON: To someone listening to this, it may be a little hard to understand, but I was wondering if you can just talk about the differences, because when I was reading about this and not being in your field, the Ground Networks, the Space Network, then the Ground Network then became the Near-Earth Network. Then, of course, the Deep Space Network [DSN]. We have all these different networks. Can you just kind of give us an overview of each one and what made them different and how they worked together?

SCHENK: I happen to be fortunate enough because I worked in all three of them.

JOHNSON: Right, that's why I thought you'd be the person to ask.

SCHENK: Spending a year at DSN as well. The Ground Network was the original network. At that time, there were actually two networks. I think, as I said earlier, there was a Scientific Network called STADAN, there was a Manned Spaceflight Network, MSFCN, and the manned spaceflight was primarily around the equator, equator-based, whereas the scientific was more north-south. The STADAN sites were, for instance, in Santiago in Chile, in Peru, in Ecuador, going north and south, and Madagascar was one as well. The Near-Earth Network became what was left of the ground stations from the old Manned Spaceflight Network and the STADAN network combined because those two got combined over time.

The TDRSS was a new entity and it basically replaced a lot of the ground stations because ground stations are expensive to operate, they're usually depending on being in foreign countries. We've had some problems in the past. As a matter of fact, the station I was at in Madagascar ended up being shut down by an Army intrusion over a dispute whether NASA

owed the government of Madagascar, Malagasy Republic, money for rent. There was a dispute over that and they came on the station and basically said, "Okay, everybody out and you have to be out of the country in two weeks." There was a problem in the very early days, in Mercury days, in Zanzibar, sort of a similar thing. The government changed and people were told to leave. Those kinds of dependencies, TDRSS does away with that. It's all U.S.-based, it's out in New Mexico, and you don't have the dependence on foreign agreements and changing political climates.

The Deep Space Network is an interesting thing. It's made up of three complexes, one in Goldstone, California, which is near Barstow, one in Spain, and one in Australia. If you look at the globe, there, those are about 120 degrees apart, so as the Earth rotates, one always has a sight, and for a short period, you'll have two of them. That way, you have continuous coverage. Deep space is just what it means. They deal with very weak signals, very long flights, very complex navigation.

Spacecraft landing on Mars is a pretty amazing thing, when you think about it. Those complexes tend to have bigger antennas, much more sensitive receivers because they have to deal with great distances and weaker signals. Some very impressive technology and some very, very smart people out there. Being at JPL [Jet Propulsion Laboratory, Pasadena, California] is like being on a college campus, and there's some really bright, bright people.

JOHNSON: That sounds like it would have been really interesting to do as much traveling as you've done and to meet as many different types of people.

SCHENK: I was out in DSN, I was assigned there as a director of the program, the contract that Bendix or at that time AlliedSignal had with JPL, and I was there when the Sojourner [rover] landed on Mars. That was the first time they used a balloon or a ball that bounced, and that's how it landed. That was really, really exciting.

JOHNSON: Where were you when that happened? You were at JPL?

SCHENK: I was at JPL.

JOHNSON: Yes, that is exciting.

SCHENK: Yes, so it was a fun year that I did there.

JOHNSON: Yes, it sounds like it. After that, is that when you were working on CSOC [Consolidated Space Operations Contract], after that that?

SCHENK: Then, CSOC was coming in, so when I went out to JPL, I actually was filling in because the person that was there left. I made it clear that I would do this temporarily but not for the long-term. Well, "temporarily" turned out to be a year, and there was a long commute for that year, but like I said, it was a very rewarding experience. I appreciate much more the challenges of deep space that are faced there.

JOHNSON: Yes, it's so different from manned spaceflight.

SCHENK: They're both challenging but in different ways, yes. Then, so we were getting ready for CSOC, and CSOC was a new concept that NASA was doing by consolidating—I mentioned earlier that there was consolidation at Goddard, like the NASCOM and the tracking and the flight dynamics and the spacecraft operations—the next step with CSOC was doing it across all the Centers at NASA. It took JSC, it took Kennedy, it took [NASA] Marshall [Space Flight Center, Huntsville, Alabama], Goddard, and took the similar type of work and put it under one contract. AlliedSignal bid with Lockheed and we were successful in winning that contract and then phasing it in as a consolidating contract.

While it was technically successful, it was, I don't think, perceived as being the right way to go because after five years, which was the life of the contract, it was changed back and broken up back to going back to the individual Centers. Like I said, operationally, I think it was successful, but from a business standpoint, I think there was a lot of resistance and perceived problems that basically said, "You know, we need to go back to smaller chunks."

JOHNSON: As part of your work during that, you were the customer services director. You helped implement commercial services to assist the government owned ground stations. Can you talk about that?

SCHENK: There was a new concept of how you provide services, and it was called project service level agreements, where it would be an agreement between the spacecraft project and the contract that was supporting the services, a written agreement that basically said, "We need you to provide this, this, this, this many times, at this level, at this accuracy." We pioneered that

concept of project service agreements to provide the services. That was the customer services; this was an interface between the users and the providers. I provided that interface and I had a group of people that developed the documentation and did the negotiations about what went into it with the projects. I did that for Goddard, and there was a customer service director at JSC and there was one at Kennedy and at Marshall.

At that time, working for Lockheed, I worked for Dan [Daniel C.] Brandenstein, and Dan was an astronaut, he was actually the head of the Astronaut Office before he retired from NASA. He flew all four of the Shuttle missions there, and he was the vice president in charge of customer services. I worked for Dan as well as the person at JSC and the person at Kennedy and the person at Marshall and JPL.

The commercialization came in because we had to shut down all those stations, but yes, we have TDRSS, but TDRSS does not fit all situations. There's still a need, and it's usually a need for either launches, launch and early-orbit-type supports, or in many cases, the spacecraft are not built TDRSS-compatible. The EOS [Earth Observing System] missions that we have here at Goddard, the Aqua and the Aura [satellites], those are Ground Network missions. There was still a need for ground stations, but we had shut down most of our ground stations, and the ground stations that we needed were in different locations, anyway.

A lot of these are polar missions, so now we needed polar locations. We looked for commercial providers, found that the Norwegians had a Kongsberg Satellite Services that has a station in Svalbard, Norway, which is about 700 miles from the North Pole. Ideal location for polar satellites, so we established contracts with Konigsberg to provide support to NASA on a per-pass basis, so that we pay by the pass. We don't own the station, we don't operate the station, but we buy the service.

We do the same thing with stations up in Alaska and in Chile and Hawaii and Australia. There's a U.S. company called Universal Space Network, USN, and down in Chile, it used to be University of Chile that did it, but they sold that station to the Swedish Satellite Corporation, and so we have a contract with them for the support down in Chile.

JOHNSON: That's what you've worked with since then, the commercialization manager?

SCHENK: That's what I'm actually doing, yes, that's what I'm still doing today.

JOHNSON: Let's talk a minute about some of the things that have happened while you've been the manager of that. One of them was the support of a Soyuz reentry. I believe that was in 2008? The Russians requested some help?

SCHENK: Yes, that was an interesting thing, and I sort of got involved in that in a different way. The Russians were seeing a problem with the reentry and they were not getting the data because the data was out of reach of their tracking ships and ground stations. They had requested, and I think Bill [William H.] Gerstenmaier actually is the one that—because Americans are riding on this—wanted to make sure that the data was available to make sure that nothing bad would happen. We were asked to see if we could capture the data. The Russian Soyuz is on a VHF frequency which we've stopped using, many years ago.

We came up with a way to put together a very crude system which we took to the American embassy in Athens [Greece] and mounted the antenna on the roof of the embassy and tracked the reentry from the top of the American embassy in downtown Athens and did get the

data. So, it was successful. The reason I went on it was I was involved in the planning and the testing, when we tested it at Wallops Island before.

When the people were deploying to go to Athens, they showed up at the airport with these big boxes of equipment and the airline would not take a couple of the boxes that were too big and too heavy, and they said, "No, that's got to go air freight." Then, we tried to get it air freight, but we were three days from the time that we needed it, and there was no way we were going to get it there. I ended up volunteering to break up those boxes and hand-carry some of the stuff there.

The main thing I brought were the recorders, because without the recorders, there would have been no way to store the data, and a receiver. The rest of the stuff did make it there, so I showed up a day later than the other two people that went, at the American embassy, and was met by the van and taken right to the embassy, to the roof, and got it all installed. Went and got about eight hours' sleep and then we had the reentry. That was kind of exciting and rewarding, I think.

JOHNSON: Yes, it sounds like it happened very fast.

SCHENK: It was a very short fuse on it.

JOHNSON: You mentioned also in your résumé that you gave us, the Lunar Reconnaissance Orbiter [LRO] launch?

SCHENK: Yes.

JOHNSON: The antenna system support?

SCHENK: For the LRO, we installed a new antenna out in White Sands. It was used exclusively for the LRO; we're now beginning to use it for other uses as well. It was a new antenna, new system, and there was a lot of anxiety about using something brand new and untried. I got involved in a lot of the testing prior to launch and then supported it during the launch. Went out to White Sands on the first pass, and everything worked. The other part, the reason there was anxiety, is because the LRO uses Ka band, and this was the first Ka band user that we had. The antenna is S band and also Ka band, and so, we did a lot of testing on both S band and Ka band, and when it launched, it worked. It's been working ever since.

JOHNSON: As we mentioned, you've worked as a contractor since the beginning, but having NASA as a customer, how has that changed since the beginning in the early '60s, when you were working on Gemini, to now? How has that relationship changed, or has it changed over the years?

SCHENK: I think I've always found a good relationship with my government customers. I almost became a NASA employee at one point, and that was getting ready to start when President [Ronald] Reagan got elected, and of course, his first act was to put a freeze on government hiring. The offer was retracted, and that was as close as I got to being a government employee.

Like I said, it was very close, so I could have been on either side of the thing. I've always had good relations with the people that I work with. I think NASA's a great place to

work, and I think it's an exciting place to work, and I think it draws, both on the government side and the contractor side, people that like that kind of excitement and challenges and working environment. I've always had good relations. The contractors and government complement each other. Sometimes some are stronger technically, but both sides, they usually complement each other to work together. It's a very strong team.

JOHNSON: When you first started, you were more on the technical side, hands-on, doing the work, and you've moved to management, more management, and then you were talking about going to Greece for the Soyuz.

SCHENK: See, I like to keep my hands in it.

JOHNSON: Yes, I was going to say, is that something you miss doing, being a manager, and do you take those opportunities as often as possible?

SCHENK: You can manage different ways. My management style has always been more hands-on and involved with people that I manage rather than sitting in an office. I've always felt that if I ask somebody to do something, I'd like to know that I can do it and know what it entails, doing it. I would say my management style was hands-on, working with the people, rather than more administrative.

JOHNSON: It's easier to manage if you know what they're doing, right?

SCHENK: If you understand the challenges because a lot of times, it's easy to criticize, but if you don't fully understand what it takes to do the job there, it's easy to go astray.

JOHNSON: You've had the luck or the need in your job to travel all over the world. Are there any experiences or any places that stand out in your mind as the most memorable?

SCHENK: By the way, I like to travel and I've enjoyed that aspect of the job as well because it makes it even more interesting. We were going to Madagascar with the aircraft to run some series of tests over there, and to get to Madagascar, we had to fly from Baltimore [Maryland] to Trinidad, Trinidad to Recife, Brazil, Recife, Brazil to Ascension Island, Ascension Island to Luanda, Angola. You want memorable things, so we landed in Luanda, Angola, and they parked us in the middle of the field. The American embassy had a little Volkswagen bus that pulled up to the airplane and a Portuguese soldier got out, and the embassy person, and he came onboard and he said, "Passport." So we gave him our passports and the embassy guy says, "Just give him your passports," and he says, "I'm going to take you to your hotel, and then I'll pick you up in the morning and bring you back out to the aircraft." On the way to the hotel, he's telling us now, "I don't want you going too far from the hotel because there's a lot of problems here."

There was a war going on. Next morning, he picks us up and we go back out to the airplane, and the soldier or the officer, again, he's got our passports and gives them back, and as he's leaving, he tells our captain, the aircraft commander, the pilot, "By the way, try to climb fast because they shoot at airplanes at the end of the runway." Our plane didn't climb very fast, but we didn't get shot, either. That sort of stuck in my mind. From there, we went to Johannesburg, [South Africa] and then Johannesburg to Madagascar, and then coming back the same way.

JOHNSON: That's a lot of time traveling just to get to some place out in the middle of nowhere. It sounds exciting. Again, you were working—and you mentioned it earlier—a lot of the guys on the ships or on the planes were going to Vietnam during that time period, and you were working all during that time period. A lot of times, we've talked to guys at NASA, and they mentioned that what was happening in the world in the '60s, was so out of scope to what they were concentrating on that it was almost a surprise when they'd walk away from their job for a while and they'd see the news or what's going on in the world. Was it that way for you, being on these different stations? How aware were you of what was happening?

SCHENK: It was a different time. I had gotten out of the Air Force right as Vietnam was starting up, and one of our trips to Australia—when we did the Apollo trips, we basically had two big trips. One was Atlantic [Ocean], which did MILA, did Grand Bahamas was the station, did Ascension Island was a station, Dakar, and then the Canary Islands and Madrid. That was pretty much the Atlantic trip. Then, going to the Pacific [Ocean] was the other trip, and that was basically Goldstone in California, Hawaii, Guam, Carnarvon, which was a station on the West Coast, Orroral, which was a station on the East Coast in Australia, made up that trip. On one of the trips that I was going on the Pacific, we went from Baltimore to North Dakota, North Dakota to Alaska, Alaska to Japan, and then down to heading towards Australia.

We stopped in the Philippines, at Clark Air Force Base, and that's where it kind of hit me, the Vietnam War, because we landed there. They had airplanes everywhere, and they parked us on the taxiway. When we said, "Do you have any rooms at the BOQ [Bachelor

Officers Quarters]," they just laughed and said, "No, you go downtown." The place was overrun by military aircraft and the influx of traffic that was caused by Vietnam there.

When I was in Madagascar, news was kind of hard to get, but we could get BBC on the radio, so that's how we kept in contact with the real world there. By the time we get a *Herald Trib* [*Tribune*, newspaper] from Europe, it'd be a week old, but it was still good to read a newspaper even though it was a week old.

JOHNSON: With Apollo 11, when they landed on the Moon, where were you?

SCHENK: I was here, I was here at Goddard.

JOHNSON: Were you at work or were you at home?

SCHENK: I was at home, glued in front of the TV.

JOHNSON: Knowing that you helped bring about that.

SCHENK: Listening to it, and I said, "Boy, that's just like we were training!"

JOHNSON: They had the same script you did, right?

SCHENK: The script was made up in Houston, it was basically to do with the readings of the landing itself. It sounded very similar, yes, because their readouts, they knew they were going to be getting that type of readouts.

JOHNSON: That's exciting.

SCHENK: Yes, that was pretty exciting.

JOHNSON: Looking back over your career, is there anything that you would say was the most challenging, and what would that be?

SCHENK: I don't know about most challenging, but I think that the change that has taken place over the length of my career there is pretty phenomenal. When I started at the stations there, everything was manual. You could make the connections manually, you tuned the receivers manually, you did everything manually. Over time, you transition to where it's full automation now. The commercial stations are running stations that don't have anybody there. They have somebody on call to do maintenance when something happens, but the operation, it's all set up by computers and scheduled. It was a total transition from doing everything manually to almost hands-off, where we are today.

The TDRSS is the same way. It's amazing, the amount of data that's pushed through that system, and the number of users at the same time. Whereas when you had one pass or five passes a day, you'd say, "Wow, that was a big day!" They do 10 passes consecutively. It's the

technology transition from the way it was to the way it is now. I'm sure it'll be different in 20 years as well. I think we still would be amazed.

JOHNSON: The number of things out there to track now—

SCHENK: That's the other thing, is that we used the airplanes because there was nothing else to use as a test. Then, they did launch what they call the Test and Training Satellites, but that was very crude and not very successful. Now, there are satellites up there that we routinely, if we need to check an antenna, we'll just track one of them. It went from one mission, like Apollo was a couple of missions a year, to continuous missions now, all the time. [International] Space Station, it's up there and it's being tracked every day, 24 hours a day, 7 days a week.

JOHNSON: All types of data and telemetry.

SCHENK: All kinds, yes.

JOHNSON: Video, yes, everything.

SCHENK: They send up faxes; it's just like being on Earth. The communication's very solid. When you talk on a phone now with somebody overseas, you don't know that they're overseas; they could be next door, for clarity. Technology has come a long ways. The space program, I think, has been a driver for a lot of the technology, medical technology, a lot of computers. The

chips, a lot of that stuff was designed because of the weight considerations and reliability that you need for spaceflight is migrated into things that we take for granted.

JOHNSON: Right, the telemetry in the medical field and everything else.

SCHENK: Ambulances sending the vital signs by telemetry to the hospital on the way to the hospital, I believe that's all a fallout of the space program.

JOHNSON: I also read that you received a Silver Snoopy [Award]?

SCHENK: I did.

JOHNSON: What was that for?

SCHENK: For all the support we just talked about. John [W.] Young gave it to me, and I had Dan Brandenstein there, since he was my manager at the time. I had two astronauts for the award.

JOHNSON: I bet that was exciting.

SCHENK: Yes, it was.

JOHNSON: Looking back over your career again, is there anything that you're most proud of that you had a chance to work on?

SCHENK: I think I have to go back to Apollo because that was a very high-level goal that President [John F.] Kennedy said, "In this decade, we're going to put a man on the Moon." When you think about it, that was quite a challenge, and it was very successful. When Apollo 11 landed, I said, "Man, now we've got to get back." You can simulate that very well.

I did have a friend of mine that worked for Bendix and he told me a little anecdote about the bolts, the separation bolts, the explosive bolts that were used on the Lunar Module as it took off. There were bolts that were holding it together, and they had to blow those away to lift off. He worked in quality control and he spent a lot of time out at White Sands testing ground, blowing these bolts from different lots and numbers, and he said they never had one fail. Fortunately, they never had one fail when they had them on the Moon. There was a lot of testing. That's just one part of a very complex system, but all it would have taken would be one bolt not to blow and the whole thing would have—there's a pretty amazing accomplishment.

JOHNSON: In a very short period of time.

SCHENK: In a very short period of time.

JOHNSON: I was going to ask Rebecca, and see if she had anything.

WRIGHT: I was wondering if you could share with us some of the projects you're working on now.

SCHENK: Now, I'm basically managing the commercial contracts there, so every year, we determine what spacecraft we're going to be flying and how much support we need, and then I translate that into contracts with the commercial providers. We have a weekly meeting where we literally go around the world somewhat to discuss the last week's activities and what's coming up.

I call it the Inquisition, and essentially, we go in sequence where we start off in Norway because of the time difference. When it's early in the morning here, it's late in the afternoon there, and then we go to Chile, which is pretty much on our timeframe, then we go to USN, which is the company that does the Alaska, Hawaii, and Australia, but it's controlled out of Horsham, Pennsylvania, so there's your remote, where everything was done manually. They have people sitting in Pennsylvania that basically control the station in Australia, the station in Hawaii, the stations up in Alaska. Then, we go to Alaska, which is the University of Alaska has a station up there and they participate in this, and then Wallops Island is on the eastern shore here.

We go around all those stations and basically talk about any problems that we had or anything coming up that needs their attention. That's part of my job, is just to get the services and make sure that the services are provided on time, accurately, and within affordable limits.

WRIGHT: You mentioned about having government customers. Now we have up-and-coming American launch services. Are you involved with the commercial launch services like SpaceX and Orbital Sciences [Corporation] and the new Mid-Atlantic Regional Spaceport [MARS]?

SCHENK: No, but some of our people here are because of Wallops.

WRIGHT: MARS?

SCHENK: MARS, yes. SpaceX uses TDRSS once they launch, going to the Station. No, we're not involved with them directly, but we still support SpaceX and will be supporting the Cygnus once it launches out of Wallops, there, with TDRSS.

WRIGHT: Your repertoire continues to grow, doesn't it?

SCHENK: It does, yes, but when I talk about commercialization, in my world, it's the ground stations, but there's commercialization now, as you mentioned, the SpaceX and the Orbital Sciences is moving into the launch vehicle commercialization.

WRIGHT: This sounds like a simple question, and it might be. Are a spacecraft and a satellite the same challenge in tracking, or are there different issues depending on what kind of vehicle or item has launched?

SCHENK: Basically, it's the same because you're dealing with signals but there's usually a higher complexity with the manned missions because you have more signals. You have the separate voice transmitters, you have telemetry, usually maybe a couple different telemetry transponders, but generally no, it's tracking a satellite or tracking a capsule, the tracking part is the same. It's just how much information or how you have to process that information on the ground, it gets

more complex with the manned missions and some of the higher satellites, like Hubble. Hubble is large amounts of data, so you have to deal with volume.

WRIGHT: I was just curious. Of course, you have that human factor that can fiddle with things that can make your job a little difficult. Thank you.

JOHNSON: Was there anything we haven't talked about, or any highlights, or any memorable moments that you'd like to mention?

SCHENK: No, all I can say is that it's been a very exciting career and I feel very fortunate, being part of this part of the NASA history that has changed the world a lot.

JOHNSON: You've had a 40-year career so far with it, right?

SCHENK: Yes.

JOHNSON: So far.

SCHENK: So far, and I don't know how much longer, but it's certainly been exciting. It's great to have a job where you enjoy coming to work, and this has been certainly the case, in my case.

JOHNSON: That's very nice. We really appreciate you doing this today. Thank you.

[End of interview]