

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT

MANFRED H. "DUTCH" VON EHRENFRIED
INTERVIEWED BY REBECCA WRIGHT
LAGO VISTA, TEXAS – MARCH, 25, 2009

WRIGHT: Today is March 25th, 2009. This oral history interview with Manfred "Dutch" von Ehrenfried is being conducted for the Johnson Space Center Oral History Project in Lago Vista, Texas. The interviewer is Rebecca Wright, assisted by Sandra Johnson. We thank you so much for taking time this afternoon to sit down and visit with us for this project.

VON EHRENFRIED: Well, this ought to be fun.

WRIGHT: We're looking forward to it. We would like to start today by you sharing with us how you first became involved with NASA.

VON EHRENFRIED: Okay. I was going down to Langley [Air Force Base], [Hampton] Virginia to join the Air Force, and I was teaching school, and I was applying for jobs at the national laboratories, having just gotten a degree in physics. I thought I would be a physicist. But they would send me back little terse letters like, "Well, when you get your PhD, give us a call." In the meantime I realized that I wasn't going to go to a national lab. But I was interested in flying. So I went down to Langley, took my physical, flunked it—because I checked item 12, had asthma as a child, or something like that. Flunked me on the spot. I walked out the door with my head between my tail and just was really depressed. I saw a sign that said NASA [Langley Research Center]. I said, "Well, I've heard of them." Knocked on the door, so to speak, interviewed with

Chris [C.] Critzos, who showed me around, and met Gene [Eugene F.] Kranz and John [D.] Hodge and a few others. Sort of hired me on the spot, like, "You're just what we needed."

I said, "Well, I'm teaching school. I'm almost finished. But I could be here by June." This was May 4th, 1961, the day before Al [Alan B.] Shepard got launched. I didn't know what they were talking about. They said, "We need flight controllers." Well, from a flying standpoint, to me flight control was ailerons and rudders and things. I didn't even know what flight control was. So I went back to teaching, had the radio on for Al Shepard's launch. Everybody was excited about it. I couldn't wait to get there. Came back in June. Actually didn't make any calls or anything. I just assumed, well, I was hired. So I packed up the U-Haul and the car and the wife and at that time one child. Came back and knocked on the door and said, "Here I am."

They said, "Well, who are you?" They said, "We don't have any record of hiring you." I said, "Well, yeah, there was a guy named Chris Critzos." So they got it all straightened out. "Oh, yeah, oh, hi, how are you?" Here I am. I said, "I've got my wife and U-Haul out there, and it's awfully hot. It's time to get out of the sun." That's how it started. It was just a fluke. I just walked off the street. So I think there's a little divine providence there.

WRIGHT: Tell us some of the first jobs and responsibilities that you had and how they evolved.

VON EHRENFRIED: Well, I go into this thing called Flight Control Branch, and there's Gene Kranz, a fighter pilot, a classic character right out of the movies almost at the time, and just gung ho as can be. There's probably eight people. Arnie [Arnold D.] Aldrich was one, and a few others and there was a whole bunch of Philco guys, and they were all in a separate room. They

weren't NASA, they were contractors. So it was a very small group. John Hodge, I think he was the branch chief at the time. Jerry Brewer [phonetic] was another guy that was there. He stayed at Langley. He didn't come down with everybody else.

[Christopher C.] Kraft, I don't even think he was the division chief yet. So it was just like "What do I do? Where do I sit?" It was that green. This was just between Al Shepard and Gus [Virgil I.] Grissom's flights. So all I did was to help Gene. I was just working on mission rules. I didn't even know what mission rules were. I soon found out after I spent seven years writing mission rules. But at the time, it was just a very small group, and everybody was in training. So we all had to learn what a spacecraft was and what a launch vehicle was. Certainly there weren't any courses in school for any of this.

So most of it was training and just administrative, just helping people do things while I was just learning. So after Grissom's near disaster, the big thing was to get ready for [John H.] Glenn's flight. In that interim I got sent up to [NASA] Goddard [Space Flight Center, Greenbelt, Maryland] to learn communications. So there were a few unmanned flights in between there. So I went up and went with the Goddard voice communications people and learned voice and teletype, which was the basic thing, because without satellites you communicated to the remote tracking station by voice and teletype. So I learned that part of it while I was waiting to get clearances and to get trained and to get ready for Glenn's flight.

WRIGHT: Can you explain a little more about teletype and voice communications and how that worked?

VON EHRENFRIED: Here again the tracking stations were just set up. They were all over the world. I forgot how many there were. A dozen at least. As the launch vehicle left the Cape [Canaveral, Florida] it would fly over Bermuda and Eleuthera and go over to the Canary Islands and down over Africa to Nigeria and Zanzibar and a few tracking ships like the *Coastal Sentry Quebec* all the way to Australia, all the way around. So those tracking stations had to be communicated with.

At the time down in the Atlantic there was an Atlantic Missile Range, which was for all the ballistic stuff. So there were contractors, not NASA people, but contractors, for the range that we had to communicate with. Out of the Control Center you communicated then with high frequency and UHF. It was almost like ham radio. That's how primitive it was. It could take a half an hour just to set up a link to one of these remote places. It wasn't so bad to go to Bermuda or Antigua or down the range. But once you got across to Africa, you had to go through some circuits that were preestablished and were monitored specially for NASA for these flights. So operations procedures, which was what Gene was at the time, I was learning that position. So most of it that he gave to me was to communicate with the remote sites and to keep them up to speed. That was quite an effort. I had to learn almost like ham radio kinds of techniques.

So I was really trained by a guy named John [W.] Hatcher, who was a systems support guy in Mercury. He was very helpful to a lot of people when they first got to the Control Center. This is the old Mercury Control Center now. He would help them know how the systems worked. He taught me quite a lot about the range and so forth. Also in the old Mercury Control Center was a guy named Robbie Robertson, who was the teletype guy. All the messages we sent to the remote sites were literally low-speed teletype. So I would draft up a message for Kraft or Gene in a very terse teletype kind of a format, run into this teletype room, and there was this guy

with all these banks of clanking machines. He would send them out to the tracking stations. Well, this later turned to be very important for Glenn's flight, because as Glenn got his problems with the heat shield, the old Segment 51 you probably have heard of, where the sensor—there's a false instrumentation loop that indicated that the heat shield was deploying. Well, that didn't go too good in orbit, because we're going to need that for reentry. But it really frightened everybody. So there were a lot of messages that were drafted by Kraft and Kranz and the McDonnell people that were in the support room as to what really is going on, what are you seeing.

So we had to get these messages out through teletype. Once the spacecraft got [to a tracking station], you could talk to some people about it through these very difficult voice channels, through what they called the Goddard Conference Loop, which was the loop all around these tracking stations. So that's how primitive things were. Glenn's flight was quite short, but there were very few people in this little support staff room. I would say six people at most from McDonnell and [NASA] Headquarters that were handling this problem and trying to understand what really was happening and get that back to the flight controllers in the front room.

There were people there that really thought that that was the end of manned spaceflight, that if Glenn really did die in orbit or in reentry, that that would just about kill the program. But as it turned out it was false instrumentation and everything came out fine. Glenn didn't even know quite what was going on at the time. He was pretty upset about that. But anyway, that was my first mission in the old Mercury Control. It was called Mercury Control then.

There were many, many scrubs on Glenn's flight. We must have been down there for months. Everything would get ready for launch, and something would happen. But that gave us time to relax in between the scrubs. We did have fun at times playing volleyball and stuff like

that. But it was grueling, because it wears on you after a while. It's hard to be that intense for that long a period of time.

WRIGHT: Years before, you had been a schoolteacher, and now you were traveling at this intense schedule.

VON EHRENFRIED: I'm 25 years old. Now I look at a 25-year-old person, and it just doesn't compute. I don't see how people at that age got that kind of responsibility. I think the average age was not much more than that, maybe 27 or 28. Let's say everybody in Mercury Control for Glenn's flight had to be in their 20s. Kraft was an old man of maybe 32, 33. There were some other people there, like there would always be a general or an admiral that sat behind me. They were there for recovery or for the Air Force support or whatever, so they were older guys. But as far as the flight control team goes, the guys like Arnie Aldrich and Kraft and Kranz and Glynn [S.] Lunney and Tec Roberts. Tec Roberts was an older guy. He must have been 32, 33, or 34 as well. He was the [Welsh] flight dynamics officer. So they were our leaders if you will, because they were older and wiser. They didn't even have gray hair yet.

WRIGHT: I'm sure the space program helped them get a few.

VON EHRENFRIED: Oh, for sure. But my first real flight in the Control Center was that exciting.

WRIGHT: The lessons that you learned from that flight, did that help start making up more of the mission rules and the procedures that you worked on?

VON EHRENFRIED: Well, after every simulation, which went on for months—I don't know how many there were. These are worldwide simulations. Every tracking station up, everybody monitoring on Goddard conference. Go through a simulation would be—I don't know, an hour or two or three. Data flow tests. Sending messages back and forth. We would then go underneath the VIP room of the old Mercury Control Center. Underneath there was a little room. We'd all go back in there. Sometimes the crews, if they were just in the simulators or whatever, they would join us. Then we'd sit there, and every systems guy, every position, would debrief. We would debrief worldwide. That would go on for hours.

All of those notes we would take, and then we'd have to consolidate all those inputs. Some of them were difficult in that some people wanted their actions or their procedures to be such-and-such a way. But that would conflict with so-and-so. All those had to be resolved. Then we would literally type them up. We [would copy] those on mimeograph machines. We'd go back to Langley, or we'd have somebody there. We'd rewrite them all, republish them, hand them out, argue about them again, have more simulations. On and on and on. I guess they do the same thing today. I'm not sure. I haven't been back to hear a mission at all to know how they do it now. But [we would capture] all of those lessons learned.

Those [rules] were integrated, too, with the Cape's launch vehicle people, as well as the tracking station people. So the test conductors and so forth, they would have certain times where they would be waiting for an input from the Control Center to proceed. Since we took charge of the mission after we cleared the tower, those handoffs had to be coordinated. All the radar instrumentation people, all the range safety people, all those had inputs. I got a copy of some of those just to show you. Fascinating when you look back on them after 50 years or so.

WRIGHT: For a physicist and a mathematician, you certainly came into the writing and documentation business, didn't you?

VON EHRENFRIED: Oh yes. Which later put me in good stead for a lot of things. I've written hundreds of documents. Now, I don't write them totally, but responsible for them, integrating them, arguing about them, getting hit over the head about them. A lot of emotion goes into these things. A lot of screaming and hollering.

WRIGHT: At what point did you become the ultimate say on the documentation? Or did that always pass to someone else?

VON EHRENFRIED: Well, my name would be on them—well, Gene's would be on them first. Then he would hand that off to me later. Then I would put them all together, sign off on them after they were all coordinated with everybody, and then the three big guys, Walt [Walter C.] Williams, Chris Kraft, and Gene Kranz, would sign off on them. Walt Williams being the old X-15 guy who sat in back of me. He wasn't that much interested in the details of that, so much as the total mission and how it was proceeding and who was doing what and where the problems were.

WRIGHT: How did you get the updated materials to the places around the world?

VON EHRENFRIED: Teletype.

WRIGHT: Goodness, that's a lot of teletype.

VON EHRENFRIED: Well, I sat next to Gene many days 16 hours straight taking direction from all of those people, coming through Gene, who was coordinating the effort from an ops [operations] and procedures standpoint, and actually implementing, getting it done so to speak. Many times I was ready to fall over, wishing he would fall over first. I've actually seen guys fall over. I've seen one guy who sat in the chair next to me through a long simulation of days fall asleep. The chair and him went down the steps. Luckily I think it was only two steps. But that's how exhausted people got. So it was amazing when you look back on it.

WRIGHT: Those were long days, weren't they?

VON EHRENFRIED: Oh yes. Then sometimes we'd be interrupted by the press, which would really tick some people off. Jules Bergman, do you remember him? He would come in insisting that he be interviewing these people, and wanting to get pictures of the Control Center and the layouts and this and that. He was really obnoxious about it. He would bring in these camera crews who you'd know they were up drinking all night. They would come in in their T-shirts and beards, and we'd be there still with white shirts and skinny ties and crew cuts. We just didn't get together at all. I've seen Gene literally turn totally red just in anger and frustration with these guys.

WRIGHT: The cameras in the early '60s weren't portable units either.

VON EHRENFRIED: And everything's loud, and the lights are loud.

WRIGHT: It's very invasive, isn't it?

VON EHRENFRIED: One time we're trying to work. This is after a simulation. Not too many people left in the Control Center. Gene and I are still writing and doing this and that. Somebody gets up out of the console, and Bergman says, "Cut. Who cast a shadow on such-and-such?" Like it was his stage, and he was the director. That's when Gene just almost—he could have punched him out.

WRIGHT: Did the grueling hours or the long hours and the schedules have a lot of impact on the people and did you have turnover? Or did people that started out with you stay with you and work through?

VON EHRENFRIED: Well, the move from Langley to Houston was not received too well by some people. Some people were old Virginia people, and the thought of moving to Texas in [19]'61 or 62—Texas was someplace out west that they saw in a movie with Gene Autry. That was the vision of Texas, let alone going to move there. A couple people backed out. Jerry Brewer was one. He stayed at Langley. Jack Koslosky was another ops and procedures guy. He came down for one mission, I think, but then I don't think his family wanted to move from their family. So there were some family problems there.

We had some flights that flew flight controllers and astronauts down to [Houston to] look around. It was kind of shocking. South Houston at the time, this was when there was no NASA [Road 1, now NASA Parkway] strip. There was a road there and there were cows. To think that they were going to build a center there, why was that? We thought we were moving to Tampa [Florida] or someplace close to the Cape. What do we do about the data lines from the launch vehicle? Why would you get communication all the way to Texas when you could be in Tampa Bay or some nice place?

Then we found out that it was because Lady Bird Johnson said, "That's where we're going to go," and she owned some land around there, and Rice University [Houston, Texas] had that little spot there, that beautiful thing that became the Lunar Science Institute I guess they call it. It was hard on some people. Plus the time that you're away from family caused a lot of grief. I've seen six, seven people on our street get divorced.

WRIGHT: I read that one of your early assignments from Gene regarding the move was to come down and try to go down to Houston and find a place. I think it became flight controller alley, because there was so many of you [lived there].

VON EHRENFRIED: Well, I think we all made one trip, and then we would go back [to the Cape] for a launch, go back to Langley, and somewhere in between there, he said, "You got to go back down and see what we can get." I don't know what else I was doing at the time. So I saw this blank field, and it had two or three concrete slabs on it, but you could buy a brand-new house for \$16,000, \$250 down. So I borrowed \$250. I was a GS-7 [General Schedule, pay scale] or [GS-]9 at the time. I was making \$6,000 a year. Which is another story I'll tell you.

So I went down and I said, "Okay, I'll put \$250 down on this corner lot." So I got a nice corner lot. We went back to the Cape. It wasn't maybe one mission at the Cape, back to Langley, that house was done. Just huge labor forces went in. They built a couple streets in Sun Valley, it was called. It's still there. I went back to see it. It was like a time warp. I just could not believe that was my house. All the trees that I had planted like this were now 40, 50 feet tall. I couldn't even recognize hardly anything because all the side streets were built up with restaurants and gas stations and everything. I know it's in here somewhere. It really is a time warp to go back and see something 50 years later. It's a shock.

WRIGHT: Was that where NASA first established its offices?

VON EHRENFRIED: We were there on the Gulf Freeway [Interstate Highway 45]. We were in Oshman's Sporting Goods building. The Petroleum Center was next door. There was another building where all the big guys were. Farnsworth[-Chambers Building] or something like that. So we were there for '62 and '63 because I remember when [President John F.] Kennedy came down to see us all, and he came by there, that was the day before he was killed. So even in '63 we were in those temporary buildings while the [Manned Spacecraft] Center was being built.

WRIGHT: Were you part of the visit? Did he come to your area?

VON EHRENFRIED: He spoke at NASA. I forgot where that was. Then he drove by our building. Everybody was standing out in front of the Gulf Freeway there while the entourage goes by.

WRIGHT: Part of the other task that you had about moving when the Center moved is that you were very instrumental in putting the new Control Center together. Can you talk about that move?

VON EHRENFRIED: You got to go back almost to the old Mercury Control Center and how primitive it was. So when I got there, first saw it in early '62, maybe late '61, even the consoles were quite not done. They were there but they were still—the displays and everything were still primitive. It wasn't what people wanted. Even the group displays were basic. That classic scene you see where the little round lights go over the tracking stations and all that, and a clock or two at the top. As we evolved through that, we started to add some more displays on the side for timing situations. Some people's consoles were changed slightly. Because in Mercury there weren't too many telemetry signals. I think there was like 90 or something like that. So a lot of people had just some very basic instrumentation.

So we knew that that wasn't what we needed in the new Control Center. So there was a period from, let's say maybe from the early Gemini flights, the unmanned ones, 1 and 2, and then even Grissom's flight, people started to realize that now we're going from this launch vehicle to a Titan, and we've gone from this spacecraft to this spacecraft, and so we needed entirely different displays. So we started to just write down what people wanted, and eventually that became a real big effort with Philco. I think Hodge coordinated that for the Flight Control Division. We would document "The Flight Control Requirements for the Integrated Mission Control Center," what it was going to be called. I don't think anybody ever used that term though. But I think that's what the documents said.

So there was a big effort as to what each console was, what did the intercom panels look like, what were the intercom loops, who talked to who, why were you talking to who, how did you get messages around, what displays you needed. Because we had big cathode ray tubes then. That was a big thing. We didn't have gauges anymore. How were those displays generated, and what if you wanted to add one or take one away, or what if you wanted to modify this or that. All of the interfaces to the tracking stations started to change as well. The remote sites and those interfaces got better defined procedurally. All that got documented to these giant books that every group had a contributory role to say.

So the flight control people had one, the flight support people had one, the display people had one. All that was put into the design. That's the first picture over there [pointing to a photo] of the first flight control team in the new Gemini Control Center. There were I think three teams, three flight control teams. That was Gene's team, and Kraft and Hodge each had a team. Those were the first three teams in the new Control Center.

That's me in the center there with Gene. There on the left you'll see two guys named Neil [A.] Armstrong and Buzz Aldrin, who were CapComs [capsule communicators]. Some of those people are now gone. Several people in that front row have already passed away.

WRIGHT: Other than the obvious, what were some of the lessons that you learned from the Mercury Control Center that you wanted to make sure were applied in this new integrated Control Center?

VON EHRENFRIED: Well, I think most of it had to do—my particular standpoint was mission rules and interface to the tracking stations. Also other things that became a requirement, like

how do you integrate with the launch vehicle countdowns. So we knew we needed to be integrated better with those distinctly different organizations. So we would write an integrated countdown. That countdown, as you see these people sitting at their consoles looking at books going down a list, all those inputs from these different organizations are a line item. If the test conductor does this, he's waiting for you to do that, or you're waiting for a radar to come up or a computer to come up, all those things are integrated into this countdown procedure. So that was something that became much bigger. The mission rules, I think they just became a little bit more sophisticated from the standpoint of how they were documented better. The inputs were gathered more efficiently. More people had their say as to their roles because there were more roles. For example, when the rendezvous came, you had two launch vehicles and two spacecraft, and everything became much more integrated.

So you knew that you had to be more efficient in the operational procedures and the integration of those from different people. You can see that in the documentation, how it evolved. Those are things that are necessary evils, but they're not glamorous, if you know what I mean. They're grunt force kinds of efforts that are just in the background.

WRIGHT: Gemini 4 was the first mission where you used the new Control Center. Is that correct?

VON EHRENFRIED: I think we had them both up for 4, and 5 I think it had full authority, for 5.

WRIGHT: Well, tell us about 4 and what worked and what didn't, in parallel with the Cape.

VON EHRENFRIED: Let's see now. I got to get my numbers right. Gemini 4 is Ed [Edward H.] White [II]. You got to go back a little bit before that now. This was [19]'65, June [3-7] of '65 [pointing to a photo on the wall]. Before that was [Russian Cosmonaut Aleksei Arkhipovich] Leonov flying just a few weeks earlier [March 18, 1965]. So when they realized that they really wanted to do a space walk, that was the first time I ever saw a secret meeting. I'm sure there were more secret meetings. First time I was ever involved in a secret meeting with a guard outside, sitting with the crew and the flight crew support people and the technicians with the spacesuit and a few flight controllers trying to write the mission rules for this thing that they may or may not do.

So that was a neat effort. Then I don't know if they realized how difficult a time Leonov had, but he almost died. I think had he not been able to get back in he certainly would have. But for him to have to depressurize his suit, which was quite dangerous, to get back in the spacecraft, I don't know if they knew that at the time. But they knew that they had one-upped the United States, and that we should try this thing that they had prepared for but were still a little reluctant to do. Because they had the umbilicals, they had the little space gun, they had that kind of stuff already manufactured and tested, so they pulled it out a very short time afterwards. It was very successful. In fact, I was standing next to Kraft when he was getting very apprehensive about Ed White not coming back in and telling the CapCom to tell him to "Get back in now."

But he was just having too much fun out there. But we were about to lose communications with him. So I think it was time for him to get back in. Enough was enough. He proved the space walk capability for us anyway. That was neat.

WRIGHT: That must have been quite amazing in your still young career to witness that.

VON EHRENFRIED: Yes. He was a hell of a nice guy too. He was the guy who really got the astronaut gym going. He was really a fitness kind of a guy. I liked him. He was pretty nice.

WRIGHT: Talk a little more about Gemini and what all that you were involved in in the missions, because that was such a stepping-stone for the next part of the program.

VON EHRENFRIED: In fact, this thing [referring to an old document] with all the 50 years of mold on this, here's a whole bunch. These are all Gemini mission rules. Not all of them, but quite a lot of them. You can see how primitive hand-typed mimeographed, and look at that. That's a ditto machine. I remember Gene and I and a few others in Langley in a giant vault trying to run off some mission rules, and us all starting to get woozy with the smell, and we had to keep the vault door open. We would collate these things in a daisy chain. We'd all go around a big table, everybody'd pick up a page and collate it. That's 1961 and '62.

WRIGHT: Technology.

VON EHRENFRIED: Right. Then these things would get coordinated, and the three big guys would sign off on them. So they're almost falling apart now. But this is how primitive it was, and they're hand-typed, and sometimes somebody would come in with a chart, and we'd throw that in too.

WRIGHT: You mentioned some of the discussions that you had trying to get things integrated. Do you remember any discussion more than others of people wanting to have things done their way that stands out in your memory that made an impact on a mission?

VON EHRENFRIED: Well, these are very high-strung people. They're all in their 20s but very demanding and arrogant. Not arrogant from the standpoint—that's the wrong word. Not arrogant. Self-assured I guess would be a better term. So each group would say, "This is what we want, and don't change that." Well, by the time I got it maybe over to the crew or to some other support person or whatever, "Well, that can't be," because of such-and-such. I remember sitting on the beach with Wally [Walter M.] Schirra [Jr.] in a lounge chair with sunglasses and a beer, just the two of us, going over mission rules, and him telling me what he wasn't going to do. That this was not—"tell so-and-so that this is"—and then we would go drive down the beach in his Maserati and go have lunch.

Can you imagine that happening today? Never happen. But that's how loosey-goosey it was as far as coordination goes. Sometimes it was just one or two guys would decide what to do. Then somebody else would have to go either clean up after them or go coordinate it or change it, whatever. Then after a simulation, the same thing would happen. The crews would get very adamant about the simulation was not realistic. "This is never going to happen."

Well, then we learned that everything happens that you never thought of. That was a big lesson learned.

WRIGHT: I guess that was a mission rule, wasn't it?

VON EHRENFRIED: That was a big lesson that you just cannot think of all the possible horrible things that can go wrong in your wildest dreams and in the wildest dreams of some of these simulation guys who were very creative. They did a marvelous job of making the whole flight control teams and the crews become a little bit more humble.

WRIGHT: Did you have an opportunity to input sometimes for what simulations should include?

VON EHRENFRIED: No, those were snuck in on all of us. I think there was some vindictiveness going on there. "We'll show so-and-so."

WRIGHT: Any practical jokes as well with simulations, or were they pretty serious?

VON EHRENFRIED: No, they're deadly serious as I recall. There might have been some jokes afterwards or in between, but there are many many times that the crews would be very very vocal about, "We just wasted an hour with that stupid simulation," which wasn't all that stupid after all. Apollo 13 is a good example, of course. Well, look at all of them. Who would have thought that Wally Schirra's shutdown on the pad—the mission rule was if you get a pad shutdown, you abort. Well, nobody wanted to pull the abort button, ejection seat of whatever vehicle you were on in the tower, if it really wasn't a shutdown. Well, he sensed the shutdown, but he did not sense a liftoff.

So that's seat-of-the-pants stuff. How do you, sitting on a rocket, verify that it hadn't moved two inches off the ground, which is when the umbilical starts to pull out the bottom or whatever? So he saved the launch vehicle, and he got a lot of razz for that. But there were so

many times where unforeseen, unthought-of, unsimulated events would happen that you just became more and more humble as well as more and more cautious as to you don't know it all. You just can't conceive of all the things that could happen. There's millions of parts on these things.

WRIGHT: The Gemini missions progressively added more and more objectives with the flights. For instance, on the rendezvous there was so much.

VON EHRENFRIED: Well, rendezvous, that's a different story now. When you get to rendezvous, now you got—well, you had the one launch came out of sequence too, the one shutdown, then the other one had to go first. But now you have two launches a very short time apart. The rendezvous techniques were developed based upon how soon you could launch to catch up with the next one, which is another story about Buzz Aldrin. So at the time we thought, well, we can't get these things off whenever we want to. We've had so many slips and so many delays on all these launch vehicles. How can you launch one at a certain time? We never thought you could do that. Well, they do it all the time now.

But that was a big thing, to actually launch when you wanted to, within a few seconds or whatever. Then I don't recall that the procedures for any one of them was that much different, in that the mission rules applied to each launch and to each vehicle. But to make it happen was a nice flight dynamics and guidance thing that had to prove the concept of going to the Moon with the lunar rendezvous technique was based upon this whole concept of being able to do this, coming back off the Moon and rendezvousing with the Command Module, which was the path selected much earlier for Apollo. So it had to be proven. So that was a big thing. In fact, I think

that lower picture [pointing to a photograph on the wall] is the celebration in the Control Center of the rendezvous. Lower left in that black-and-white. Everybody jammed in there to witness that. That was a big thing.

WRIGHT: Soon after that, or around that time, you had the title of assistant flight director. How did your job change with that title?

VON EHRENFRIED: That was a natural progression. Gene did the same thing. He went from operations and procedures to assistant flight director, then to flight director. I was following that same path. That would be like mid-Gemini or something like that. Those roles are not that much different, except now you're really watching the flight director's back so to speak, getting him anything and everything he wants, and being sure that he's going down the countdowns and following the mission rules and getting support from the back if needed. So it's more of a coordination job. Some people didn't like that role. It was [sort of] a necessary step to be flight director, which I never became, which was a disappointment to me. But then by the time Gemini was done, I had left temporarily. I went to Martin [Marietta Corporation] for like six months and came back as a guidance officer for Apollo, because Gemini was pretty well defined by Gemini 8 I think, which was Neil Armstrong's fiasco.

That was a near tragedy too. Those guys were really good to pull that one out. That was what some psychiatrist I guess would call cognitive dissonance, whereby you're trained or your mind is set. If you're docked to the Agena and if the Agena has any problems at all, get away from it. Well, they were docked to the Agena. Problems occurred. It wasn't the Agena. It was the Gemini. But the rule was get away from it. So the mindset was get away from it. Well, by

the time you get away from it, and you got now the stuck thruster on the Gemini, you've just lost the mass of the Agena, which was dampening the roll oscillations. You might have been better staying there and figuring it out better with slower rotations, slower gyrations, than had it separated. Then he spun up like a little gyroscope. One or two revolutions a second or some horrible—and then while you're spinning around trying to find the right switch somewhere that cut out the thruster problem and bring in the other reaction control system. Well, of course he was an X-15 pilot too. He was also a glider pilot. They did a marvelous job.

But there's another case where nobody simulated that either. Nobody trained for that either. "Let's spin you up in the centrifuge and see if you can throw the right switch." Let's try that for training.

WRIGHT: I'm sure the astronauts would have had some input on that one as well, right?

VON EHRENFRIED: Yes. Well, this would never happen.

WRIGHT: Well, as you mentioned, in '66 you joined the Flight Dynamics Branch. Was that something that was offered to you? Or was that a course you pursued?

VON EHRENFRIED: No, see, I begged to come back, see. I made a big career mistake. Martin offered me a 50 percent raise to go up to Denver [Colorado] and work on their Apollo experiments with some great people, another side story. But I realized that I'd made a mistake, and asked to come back. Well, luckily I came back fast enough that I still had my civil servant thing going. So at that time, they needed to staff up for Apollo. So I went in Lunney's branch

under Charles [B.] Parker on the guidance section and started training for Apollo 1, which was where I got into this other thing that you asked about. About what's a guidance officer, and what about all this astronomy and inertial guidance, what's that?

So when the crew started working on Apollo, it was like well, now this is a different ball of wax entirely. We got to train to go to the Moon. Well, how do you do that from a guidance standpoint, because now it's really complicated? You got a computer—as primitive as it was—and you got to do celestial navigation to figure out where you are going to the Moon. You got to send commands to the spacecraft that goes to the computer. You got a new Control Center with new displays. What kind of displays? What decisions do you make? Who makes them? So that was the time where they took the—most of them were like the second astronaut crews. They went to MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts]. We all went to MIT to get trained by Dr. [Charles Stark] Draper and his crew up there, which was really mostly on inertial guidance.

Now where do you go get inertial guidance training? Well, there's no courses in college on inertial guidance. This is now '66. So they were the only ones that really had anything going. It was called the Lincoln Lab [Laboratory]. So we would sit there, and Dr. Draper would just come in, he would just do an introductory thing and hand it off to some PhD candidate who would go into all the equations. Well, see, that's where Buzz Aldrin was getting his doctorate in all that. We used to call him Dr. Rendezvous. We used to tease him. He would have his Phi Beta Kappa key on his tie, and he'd be at the blackboard, and he'd be talking about rendezvous and whatever that was. Who knows what rendezvous is? We thought it was something you did with a girlfriend in a motel or something.

So rendezvous was quite new. Buzz knew it all. He was the guy. So that's how we got trained in the concepts of rendezvous and what the math part of it was. There were only maybe four of us, maybe four astronauts and four flight controllers. I can't even remember now. But it was a small group of people. Then we went to the [Griffith Observatory] in LA [Los Angeles, California]. Then we would study stars that would be used by the onboard computer, where you actually mark on a star and you do that at different times, certain key stars, and that would go in the computer, and that would figure out where you were inertially in space, and therefore help you compute the angle to the Moon. That would go down on a telemetry link. We had to define what that telemetry was. So the computer word that had this data in it was something that the guidance officers developed, and the displays for that. Somebody in IBM I think with MIT, I think those were the two, that would then do the software in the big RTC downstairs, the real-time computing complex downstairs, which would be driving our displays. So that was all new.

That's what we would train to. What decisions do we need to make? What kind of telemetry do we need? Therefore somebody needs to make the computer word come down with all that right data and be formatted properly on the screens. We'd develop our own display screens as well. Then we'd test those in simulations and so forth. So that was what the guidance officer's role was. We would have little models, too, for the spacecraft, to figure out what the orientation was in certain parts of the orbit and therefore what should the astronauts be seeing. I remember sitting in the Command Service Module simulator at the Cape with Wally Schirra and Donn [F.] Eisele, and some guys in the sim [simulation] room put in the model of the [Starship] Enterprise [from *Star Trek* television show]. So we were sitting there. What the guys were seeing was rendezvousing with the Enterprise instead of with the Lunar Module. The heat of the lamps in the simulator started to melt the model. Anyway, I got a kick out of that one.

WRIGHT: That's a new effort, wasn't it? To try to rendezvous with a melting object?

VON EHRENFRIED: It would be almost like a warp drive kind of thing. Laser gun had melted the Enterprise. But that's the kind of training that we would get. We were really getting the best training in the world.

WRIGHT: Of course you brought a unique background, as you had helped develop the Control Center.

VON EHRENFRIED: Well, just pieces of it. It was really our consoles. I think we did the flight director's console and the assistant flight director's console and the ops procedures console, and then we'd do some group displays. Then we'd document a lot of this and that, the guidance officer's console. But I was getting pretty well into knowing control centers, displays, and tracking stations by that time, which is only about [five] years from '61 to '66. So in five years in that kind of intense operational environment you learn a lot pretty fast.

WRIGHT: Becoming a guidance officer, did you find your mathematics and physics background now becoming useful?

VON EHRENFRIED: I think that was the toughest mental position for me in the Control Center. Of course the FIDO, flight dynamics officer position, really pretty tough too. But any of those trench jobs were pretty much into math and understanding trajectories and onboard computers.

The onboard computer was primitive. Your watch has got more power in it. It's hard to believe. 64K memory, I think that was all there was. The Apollo computer was verb-noun-driven. You had a verb, you'd have a number for that verb, like do this. So you'd have verb 34 noun 50. That's what the navigator would punch in to do something, like go point at a star. It was that primitive. So when you think about going back to the Moon now, or to Mars, with the technology we have now, it's just unbelievable. We have not ten times, not 100 times, not even 1,000, we have tens of thousands of times more computing power and abilities to display things and multitask things.

Each position was very focused in one or two things. Maybe in Mercury, like a systems guy, he would be looking at 20 or 30 meters. That was it. Now you see all these screens and all the data. Infinite, backed up, pages on top of pages, depth everywhere.

WRIGHT: Well, in development of that system, did you find yourself going back to MIT to the labs working with that crew?

VON EHRENFRIED: They came to the Control Center. They were in the Support Staff Rooms, which is another problem. We had a problem on Apollo 7. One of the experiments, well, there were a couple. Although Apollo 7, which I spent two years on, was probably—was the first manned spaceflight [in Apollo], very successful, did like 105 percent of the test objectives, something like that, did everything plus. But there were still some problems. One of them was shooting the horizon. Well, the horizon for the onboard computer to compute something, well, there are many horizons there. There's at least probably three.

When you mark on a horizon, it would compute something. Well, if you were below the horizon, it started to divide by zero and the thing would fault. The computer with all the warning lights would come on, and Schirra would go ballistic and yell down at the ground, "Who came up with this idea?" Well, it was the MIT guys in the back room. We had to go back and find them and figure out what had happened. So they were always there to support the team. But the operations people always had the final say. Some things were changed for that reason.

WRIGHT: Did you work on the unmanned flights as well prior to [Apollo] 7? All of those?

VON EHRENFRIED: Well, all those Gemini flights, and some of those—all from a mission rule and remote site standpoint. Between—I guess we forgot this one, out of timeline. But between Mercury and Gemini I went to Australia for a month, and there was a brand-new tracking station at Carnarvon, and it had to be tested and checked out and approved to be part of the Gemini tracking system. There were new consoles, new displays, everything. So we wrote the "Remote Site Flight Controller's Handbook" out there, went through every meter, every button, every test, every overflight we could think of in a month. Then that permeated throughout the new Gemini network as far as what flight controllers do at the remote sites.

WRIGHT: What were the living conditions like for that month out there?

VON EHRENFRIED: Well, our hotel was the Gascoyne Hotel. We're right on the Tropic of Cancer, right on the Indian Ocean. The hotel was corrugated sheet metal. My bed was a metal cot. One bathroom down the hall for everybody. But I think there were three bars downstairs.

There was the general bar, a women's bar, and a couples' bar. The general bar was the same vision you put in your mind as *Crocodile Dundee's* scene bar. You got that picture? I'm sitting at the bar having my schooner—schooner, not a glass—a schooner of beer. In walks this guy and sits next to me. General conversation. He's got his beer. He gets out a needle and thread, puts it next to his glass, drinks his beer, bites off the rim of the glass, chews the glass, gets me to thread the needle with thread for him, sews up his mouth, his lips, and walks out the door. I said, "Who the hell is that?" The bartender says, "Oh, he comes in here every year and does that." He was a rancher, had a million acres of land. Didn't know how many sheep he had. But once a year he would rent a helicopter and he'd fly all over the place and try to figure out what he had. Come in for get drunk and go back to the "station" they call them, they don't call them ranches. He was just an eccentric guy who lived out in the boonies.

We're talking about a town of a few hundred with a constable who was 21 years old, maybe two other bars in town, a couple buildings. We'd go out on hunts at night looking for kangaroos and emus, go down to the cliffs of Shark Bay with 400 or 500-foot cliffs, climb down to the beach, watch the sunset, build a fire, go into Shark Bay with a pillowcase, get lobsters like this [demonstrates size], cook them on the grill of the Land Rover, camp out all night, come back, go back to work. Those were the conditions.

WRIGHT: That was an adventure, wasn't it?

VON EHRENFRIED: I had a great time. I got a lot done. Because we worked harder than they did. One day I was calling to get everybody together for a test, and started calling in the back for the M&Os, the maintenance and operations people in the back that support the little control center in

the front. I'm calling on a loop saying, "M&O, CapCom." We're simulating different positions, doing all kinds of—writing down things. Well, there was nobody there. "M&O CapCom, ready for the test." Nothing. Take my headset off and go in the back room. They broke for tea. I said, "Well, hey, you guys, we're up for the tests." They said, "Well, it's teatime. Sit down, bloke, have a tea." The double-A types up front and the Australians in the back. You've got to learn to give a little bit.

WRIGHT: You learned to work with all types of people, didn't you?

VON EHRENFRIED: You got to back off a little bit.

WRIGHT: Was that the only remote site that you went to, or did you have other adventures?

VON EHRENFRIED: I went to the *Coastal Sentry Quebec* when it was in port, where we did the same kind of thing. We just verified that they were up and ready to support. I don't know if that ship was—yes, it was a new modification for Gemini. Those were the only two.

WRIGHT: Quite a different change from that then moving into Apollo. At what point when you were in working with the Gemini program, were you involved at all with the stuff that was coming up for Apollo?

VON EHRENFRIED: Only as a guidance officer. See, I left from Gemini, went to Apollo 1. Apollo 1 was over shortly. That's when Kraft and everybody had that two-year hiatus to fall

back and regroup [after the Apollo 1 fire]. North American had to rebuild the spacecraft. So we went off and became mission staff engineers in ASPO [Apollo Spacecraft Program Office], which was a brand-new position too. Kraft wanted somebody with operations background to be sure that the program office with the new spacecraft was coming up with new test objectives, was doing all the right things. So that's when the mission staff engineer position got created. A few of us went over there. I was on Apollo 7. I was on 7 backup to John [G.] Zarcaro, who had the lead on 8. A couple guys had the launch vehicles of the unmanned Saturn Vs. I think Jim [James L.] Tomberlin was one of those. Ron [Ronald W.] Kubicki I think was another one. We all really were there. Although we were in the Apollo program office, we were still representatives to flight operations. So we worked with those crews for two years. That's that upper picture there [referring to photo on wall]. That was a tough two years, because everybody was so concerned about the Apollo fire. Wally went on a big crusade to be sure this next spacecraft was going to be right. Donn [F.] Eisele, since I was a GUIDO [Guidance Officer (flight control)], I worked with him closely; and with Walt [Walter] Cunningham, who was really in all of the meetings as far as test objectives goes. So I worked with them for two years.

WRIGHT: You were on console when Apollo 1 test happened.

VON EHRENFRIED: Yes, I was there during Apollo 1. That was quite a shock, yes. It was one of those things where in fact I've got something you might work in here. I wrote an article after that for *Reader's Digest*, which NASA wouldn't let me publish. I think now after 45 years—but I really went through it. [[View the article here](#)] [The article] describes really what was

happening, and what I felt about it. I read it again, and I think it's very apropos as far as what flight operations really is and what teamwork is all about.

WRIGHT: That's one of the topics I wanted you to discuss a little bit, was the teamwork in the trench and how close that part of that team worked, and then how close all the controllers worked.

VON EHRENFRIED: It's hard even today for me to realize how different each position was from a personality standpoint. You got John [S.] Llewellyn as a retrofire officer, you got like Jerry [C.] Bostick or Glynn Lunney—no, Glynn Lunney was already out to the flight director. You got Jerry Bostick as a flight dynamics officer, and me and let's say Gran [Granville E.] Paules as a guidance officer. Three distinctly different people. Totally different backgrounds. I went to see if there was any discussions of guidance officers. I didn't see one guidance officer in the whole history chronology, not one. Of which there was—of that era of Apollo, say. Gran Paules, Will [Willard S.] Presley, who died a tragic death, Will [William E.] Fenner, who died, I think [Kenneth W.] Russell and [John Gary] Renick [and Charlie Parker], I think they were the ones. But anyway, all entirely different people. Those positions, they're dovetailed, they have to be dovetailed, that's why they're all sitting there together in a row. But [kind of] competitive, but very much the team.

They still have that trench mentality. If you were in the trenches with one another, you were like on the beaches of Normandy [France] kind of a thing, friends forever kind of a thing. Because you suffered so much together.

WRIGHT: Well, [Apollo] 7 was such a monumental part of the Apollo program.

VON EHRENFRIED: Yes, it proved it. It proved it all as far as—well, it proved not the Saturn V, but the S-I, the S-IVB, and it proved the spacecraft, which was the big worry after the fire, that the spacecraft was changed that much. A lot of that had to do with the guys who were on that team, like Frank Borman I think headed that up the investigation of the fire.

But all the changes that came out of that were now in this new spacecraft. Although Wally was pretty testy, he was that emotionally involved in it to be sure that it was right, but he did step on a lot of toes as a result. He just died last year.

WRIGHT: Were you pretty confident based on what you knew that the spacecraft was ready to go?

VON EHRENFRIED: Oh yes, yes, yes, yes, I just knew just about everything there was about what was going to go on with that one. Because I worked so hard with Walt Cunningham, who was a tough guy to work for. He was a Marine pilot, a go-getter, a double-type-A. But he knew what needed to be done, and he was really the action guy for that crew as far as down at that level, the working level, goes. And Eisele and I worked [together] with primarily from just the guidance standpoint; what his experience would be as far as testing the checkout of the navigation systems, the inertial guidance system. But when you go down and look at all the test objectives, there were quite a lot. I worked very closely with George [M.] Low at the time, and General [Samuel C.] Phillips, who I later worked with on Space Station much later at Headquarters.

So yes, there were some great people. It's just hard to believe how great those people were. Just how did they all get together? At the right time and the right place.

WRIGHT: When we look back at what all was going on, and as you mentioned the different personalities, different talents, different—they're all maybe on the same goals, but at the same time approaching them different ways. The fact that you were all able to come together.

VON EHRENFRIED: Yes, well, there was some screaming and hollering for sure.

WRIGHT: I'm sure simulations, as you mentioned earlier for Apollo, also must have been—

VON EHRENFRIED: Oh yes, oh, worse than that.

WRIGHT: Any you'd like to share with us?

VON EHRENFRIED: I would, but I don't know.

WRIGHT: We'll have to see if you can think about them later.

VON EHRENFRIED: Well, I'll tell you one on me. I'll tell you one of my mistakes, which never sat well. This had to be in Mercury. Worldwide simulation. I forgot what flight it was. It probably was Mercury 7 or 8. Worldwide simulation. Everybody's tired. Going around the world. Comes back to the Control Center. Hours go by. Everybody's talking, arguing,

whatever. I'm saying something. It was my turn to talk, and Kraft says, "Well, that was a stupid answer." I said on Goddard conference worldwide, "Well, that was a stupid question." Suddenly the entire world was silent. Very quiet. Kranz is standing next to me. Kraft is on my right. Kranz is on my left. Kranz's ears turn red. I could just see it today. Kraft got his look. Have you ever seen his look?

WRIGHT: Not in person, no.

VON EHRENFRIED: Well, you remember the movie *The Day the Earth Stood Still*? The robot is standing there and the eyes, the shield of his eyes rises up and then the lasers come out. Well, that's what I got, right in the middle of the forehead. I got the laser, the Kraft lasers. Well, it goes on. It finally ends. I know I'm in deep kimchi. See, I'm now 27 years old. I'm really smart now. So I'm standing at the end of the Control Center, right at the end of the steps, and I'm waiting for it. I said, "I'm sorry, Chris, I just got excited there." Still he says, "That's okay, just don't ever let it happen again." Then we go back to the dungeon underneath the VIP room and start work. But I'm sure he never forgot it. I never forgot it. That's for sure. I've seen the lasers many times, is my problem. But I thought he was very gracious to me in his book.

WRIGHT: Maybe he's forgiven you.

VON EHRENFRIED: Maybe.

WRIGHT: Maybe. You mentioned Gemini 4, when you were starting to work on that, that was the first time you were involved in a secret meeting. How about Apollo 8? When did you learn that they had made the decision to go around the Moon?

VON EHRENFRIED: That was in a big meeting in the program—that was a meeting from all over. I was just a shadow on that mission. I just helped Zarcaro a little bit with the test objectives. So I wasn't prime on that flight. But I sat in on all those meetings. I flew down to see the crew with him and sat and went over test objectives and so forth. But that was Frank Borman, I think, was instrumental, as well as a few higher than him, to make the decision to really go for it.

WRIGHT: You had been involved in so many of the firsts that had happened in the space program, and now this was a really big first. What were your thoughts when you heard that they were going to take that step?

VON EHRENFRIED: Well, you know when Kennedy said, before we'd ever gone into orbit, he said, "We're going to go to the Moon," everybody thought this guy is crazy, we've never even launched anything that flew yet? It was that same feeling like I don't know if we're ready for this yet, what's wrong with Apollo 11 or somewhere out there. So it was pretty gutsy. I forgot now the impetus behind it, because the year was what, '68. No, see, now there's a year that I totally lost societalwise. I'm in the Control Center day and night or working on something day and night. People would say, "Hey, you hear about the riots?" Or "You hear about Martin Luther King?" Or "You hear about this?" Or "You hear about that?" I said, "No, what's going

on?" So the world is spasming out there. Vietnam and all the other stuff and pickets and lines. Everybody's working so hard, we just don't know what's going on.

WRIGHT: Didn't have time.

VON EHRENFRIED: Didn't have time for that. Yes, but so those meetings with the big guys, we would just be sitting. We wouldn't even be at the big table. We'd be sitting on the wall.

WRIGHT: You were busy during that time period, but yet you found time to serve as Apollo pressure suit test subject.

VON EHRENFRIED: Yes, see, from the period of '67, that's that shot up there [referring to photo on wall], from '67 to about '70 or thereabouts maybe, I was just doing that. I had already gotten my pilot's license. This is before I got to that program, but I already got that. I was trying to get as much experience as possible. I thought well, if I didn't make flight director, maybe I can be a mission specialist on the Space Station, which I thought was going to be in the '70s. Which was 20 years later or so, a quarter century later. So I was trying to get as much experience.

So that's why I went to that test program, which was just every once in a while they would need somebody. I was in great shape. Judo was my big thing at the time. That's another story, about Kranz and I and judo, which is kind of funny. But so I was doing so well with that. I did the centrifuge, the zero-G aircraft, I did all those switch tests, memory tests and sequencing tests. I did the chamber runs, all that kind of stuff. So I was doing just about everything that the crews were doing. Plus I knew operations. So I thought well, I might be a good candidate.

So I talked to Deke [Donald K.] Slayton about it. So in '69 I applied. But by that time, see, the writing on the wall was there's not going to be an Apollo [18], and there might be a Skylab, and after that who knows. People were cutting the programs down. So by '70, '71, I knew that that was sort of the end, as far as I was concerned. I could try something else. I was getting some good job offers. So I went to the aircraft program in, I want to say, '68ish. That was kind of fun, because I got to do things that mission specialists would do. I got to do all the sensor operations stuff. Got more pressure suit time and more flight time. By that time I had my own Apollo suit. They made that for me. A \$500,000 suit with not Dutch on it, but my name on it. So the first A7LB suit was mine. So I did a lot of testing in that. Then that made me a natural for the B-57. So I did 46 missions in that. They did train some astronauts in the RB-57F. Because it's good experience to do those kinds of sensor things. Flight ops things.

WRIGHT: When you were testing for the suits, how long did those tests last?

VON EHRENFRIED: Well, you see on the left there [referring to photo] I'm having to prebreathe for a couple hours, because the chamber altitude on that one, which was Neil Armstrong's suit I tested, was 440,000 feet. So it's very dangerous. So they check you out pretty good. There's plenty of people around, doctors all around the chamber and technicians and so forth. So what we were doing there, I did the lithium hydroxide test. How long can you walk on the Moon with a backpack pumping all that CO₂ into the system? How long will that last? So I did that one and some other CO₂ absorption tests and things like that.

They would last long enough for me to get up to a certain BTU level, like 2,500 BTUs an hour, which is a full sweat. You're exercising a simulation of moonwalking, doing all kinds of

geology stuff, whatever. Then you're just testing the capabilities of the suit to withstand all that and process all that. I did things like the first drinking thing where you can get a sip of water. Even on the high altitude aircraft program, we could get some nourishment through the helmet and still be able to keep pressurized.

WRIGHT: Were all these done at MSC [Manned Spacecraft Center, now Johnson Space Center, Houston, Texas] at the time?

VON EHRENFRIED: Yes, all the aircraft stuff was out at [Ellington Air Force Base]. Of course we would fly to different places to base out of. That was a tough year, because I was gone like 180 days that year. My wife did not appreciate that at all. I remember even we would have a baby, and I would leave like the next day or the next two days later. I would have to be at the Cape for such-and-such. She didn't appreciate that at all.

WRIGHT: How long were you gone at a time?

VON EHRENFRIED: On the aircraft program, maybe a couple weeks, I think, at most. I think Australia was my longest full-out trip. Although I've been at the Cape for a month at a time. But I would bring my wife and my kids down with me. So would a lot of guys. We'd rent a little place, and that way the kids could—family gets a vacation too. But then we'd be gone all the time. They'd be at the beach or at the hotel pool. We would call and say, "Well, won't be home until ten."

WRIGHT: Can you share with some of the missions or some of the memorable times that you were working as part of that program?

VON EHRENFRIED: The aircraft program? Tell you the time we hit a car. This plane is huge, it's like a big U-2, only it's bigger. It would carry ten times the payload of a U-2. It was an interim plane. There were only 19 or 20 built. It was between the U-2 and the SR-71. NASA had about four aircraft. This was a high altitude one. The concept was that you'd have people on the ground with sensors, you'd have people at different stages of the atmosphere, then you'd have a spacecraft like Skylab. So these sensors could be all coordinated to what they called a ground truth. Here is what you're really looking at from here.

So the concept was to take all these sensors, some of which were Skylab prototypes, like an infrared spectrometer or an infrared scanner, let alone special films and different cameras. There're two flying today. You ought to go down and see them, they're neat. There's only two left, they're 50 years old and still flying. It's a very unique plane that's tremendous altitude capability. Seventy thousand feet is the highest I've ever been. I don't know of anybody other than astronauts and a few others that have been much higher.

So we would base these—here again the concept was Earth resources for Skylab and the program, which was an international program. So this data is being shared internationally. But we flew out of one base out of Wurtsmith Air Force Base, which is no longer there, in Alpena, Michigan. So we were flying northern targets. The pilot cannot see the wingtips. The wings are so long. When you fuel the wings, they go down to your knees. So that plane comes out of the hangar like this [demonstrates]. There's wing walkers on either side. The pilot is sitting up there, I'm in the back, as the sensor operator. We've got full pressure suits on too, plus even

when you turn, you can hardly see anything. So we're coming out of the hangar—and I wasn't on this one. I was in the hangar. Another crew was flying. I see him coming out, and I said, "Oh, that car is sitting over there to the side. If he doesn't turn now he's going to hit it." Well, he doesn't turn. The plane comes out, and the wing walker doesn't see it, or he thinks he's got it cleared. This wingtip hits this Buick. Everybody's going [demonstrates yelling] and you can't yell. Those engines are so loud. So the plane stops. Turns out it's the base commander's wife's car.

WRIGHT: Well, if you're going to pick one—

VON EHRENFRIED: If you're going to pick one. So the base commander grounded the guy, sent him home, sent him back to—he was flying out of Kirtland [Air Force Base] in Albuquerque [New Mexico]. Sent him back. He's got his ass chewed there, he's got his ass chewed back at Albuquerque. It wasn't his fault. The wing walker should have caught it, or the Buick shouldn't have been parked that close to the apron.

So that was just one side note. But I flew one comet mission that was a failure. I'll give you an article on that. The idea was that this—I think it was called the Sato-Kosaka comet of 1970—was coming. A scientist at Goddard was desperate to get some information on it. He didn't know how bright it was going to be. Knew roughly where it was coming from. But all of our sensors are "downlookers," and we don't have any "uplookers." It turned out Los Alamos got some. So he said, "Well, take these cameras handheld and go up and see if you can't get it."

I think we were trying to do it in different spectral bands as well. So we take the payload off, which was like 4,500 pounds or something, just to get the altitude. We got up as high as we

could at night. That was the one at 70,000 feet. I knew from my astronomy roughly where this thing was coming from. I see a little fuzzy spot, and I said, "Well, can't be it." I thought I was going to see a comet. I start taking some pictures and stuff. Now you've got vibration of the plane, the canopy, and the camera and the pressure suit, and so I didn't get anything. I got blurs.

That's all we got out of it. But good example of you just can't adapt one payload to another or do something real fast. So the Goddard scientist was disappointed. But we proved we couldn't do that.

WRIGHT: Had you worked with the photography equipment before you became involved with these missions?

VON EHRENFRIED: No. See, the payload is all [referring to a photograph]—although I knew exactly what was in there, and I got to see it assembled and checked out and so forth—that's another story—I didn't have to worry about that because the Earth scientist types would define exactly what we were going to be looking for. What I would do as the navigator and the sensor operator, I would plan the mission to fly over these exact sites that they wanted. So I would lay out the entire mission on charts, then I'd brief the pilot. Then I would get the pilot to take me here, and I would take it from there. But one of the payloads was this infrared scanner that Texas Instruments, I think, had provided either the sensor or maybe the filters or some components to it.

So we're taking this thing up, and we're just doing some check flights. We're not getting anything. I'm supposed to be looking at it in the back and I'm just getting squirrely data. Sometimes it's nothing, little wiggly lines. I go back and complain. They drop the whole

payload down and they check out the whole thing. Our NASA guy would say, "Well, looks like it's working fine." Lo and behold, the Texas Instruments guy would not tell us that he put in the wrong filter, because it was a classified sensor. So we wasted all this time flying around boring holes trying to check out this sensor. Finally we had to get somebody to tell his boss to tell us to give us the right filter.

That was a classic thing, because NASA is unclassified programs, and yet we're flying some of these quasi-intelligence kind of sensors. Here we are supposed to be cooperating together for Skylab and for the Earth Resources Program, but there were some things there that we weren't getting the right data for. But turns out that when you're looking from above, looking down through all these layers of things, you need to have the right water absorption filter or this filter or that in order to cut through to get to what you're looking at. But it's amazing what you can see from that altitude in those days. This is before digital stuff. Now these new intelligence satellites, you'd be surprised what you can see. Just amazing.

WRIGHT: Did you undergo extensive training before you got into the planes to do your missions?

VON EHRENFRIED: Well, I'd already had the pressure suit experience. I had to go down to Tyndall Air Force Base [Panama City, Florida] and get seat ejection training. I was already a pilot, but I wasn't an Air Force pilot, and I had to get their chamber certification, which is just really rapid decompression stuff. So those are pretty simple tests. But there's nothing to them. You sit in an ejection seat and they just want to be sure you're going to pull the handle. So they

say, "Eject." Then you pull the handle. Then it fires you up a sled. But they want to be sure that you got the cojones to do it.

WRIGHT: Did you have any close calls while you were working those missions?

VON EHRENFRIED: There was only one, and I didn't realize the full extent of it. When you're at that altitude on that particular plane, they have what they call a "Mach Tuck" problem. You can't get the nose down too far because you don't recover. So the thing will go over on its back, then the wings come off. So we did get an indication that the elevator trim was either stuck or not operating right. So the pilot said, "Well, we can't continue because we're pushing the envelope now as far as this Mach Tuck problem goes." So we landed I think it was at [Washington] Dulles [International Airport, Chantilly, Virginia]. So there I am at Dulles Airport with my flight suit on, and all these passengers walking by saying, "What's he doing here?" Forced landing.

WRIGHT: Guess you stood out in the crowd.

VON EHRENFRIED: Oh, I was in an orange jumpsuit at the time. That does stand out.

WRIGHT: It does. Did you leave that program and then become the chief of the science requirements?

VON EHRENFRIED: I think they were close to—I think there might have been some overlap there, or was the overlap on—let's see. It was only a year that I did the science requirements for ALSEP. That would be '70, '71. So I think I might have flown a mission or two in parallel there. I've forgotten now. I'd have to look at the dates. So that job was really pulling together all the procedures and test objectives and documentation for the lunar experiments and some for the Command Module. You had that bay where you had some other experiments in it for what the gravity variation is around the Moon. That was a lot of people involved with that. There was about five contractors providing all that equipment. They would all have input as to what that was. All that would go then to the crews for training. How to deploy the ALSEP experiments, and how to turn them on and turn them off and get data. There were a lot of them. They worked for a long time. Matter of fact, I think some of them still work, like this laser reflector. But I think most of them worked for four or five years, and I think they were designed for a year or six months or something. A lot of science there. All kinds.

WRIGHT: I think you wrote yet one more handbook when you were there.

VON EHRENFRIED: Yes, there was another document or two for sure.

WRIGHT: Resources Application User's Handbook.

VON EHRENFRIED: Oh yes, I forgot about that one, yes, that was for Skylab. That was taking all the aircraft stuff, and anything that applied to Skylab from a sensor standpoint, coordinating that with those who were scientists. That was an international, too, thing at Goddard. They had

people from all over the country coming. What they wanted to do, and what payloads they wanted access to, what data they wanted access to. So I worked with scientists and engineers on those.

WRIGHT: So you found yourself in yet a wider array of personalities and skills and talents to pull information from.

VON EHRENFRIED: Yes. Even when I left, I worked with scientists and engineers.

WRIGHT: You left in 1971.

VON EHRENFRIED: Yes. There again I got an offer and couldn't refuse it. I knew the end was near here. So I went to work for a contractor at Goddard on ERTS [Earth Resources Technology Satellite], which became Landsat. Same thing. It was all that payload stuff for Landsat, which was all imagery and the data processing laboratory that processed it all. So ERTS, Earth Resources Technology Satellite, became Landsat. That contractor was having problems at Goddard, and I don't think they got any follow-on. So I left there. Another NASA flight controller was there. Dick [Richard L.] Holt, who was a network controller in Mercury and Gemini.

WRIGHT: Then you went to work later to help support Space Station Program Office.

VON EHRENFRIED: Yes. My wife and I started a company called TADCORPS in Washington in '82. We worked with the first Space Station task force they called it. John [D.] Hodge headed that up. I haven't heard from him in years. I hope he's okay. He's getting up there. He's probably 80 by now. A real gentleman. A few other guys that were flight controllers too, or flight support people, or mission support people, were there. Then that grew very fast. By '83 or '84 it got to be a full office type of thing. We just did the administrative support for them. Although later through our company, we hired some experts, like General Phillips for example, and people who would support their big—big—meetings that would just go on for days it seemed.

That was a tough period to get Space Station started. There were a lot of documents coming out of that. Some neat ones too. Tom [Thomas P.] Stafford had a lot to do with those, and George [W. S.] Abbey did too. There was some beautiful documents on Mars that came out of that. We even hired—oh, who's the guy, the great artist that did all that stuff in the Space Center?

WRIGHT: Bob [Robert T.] McCall?

VON EHRENFRIED: McCall, yes. Through his daughter, who coordinates the stuff for him. A lot of different diverse people came in. We did some Viking lessons learned, submarine lessons learned. That was interesting. We had the whole Viking team there, what was left of them, give their—that went on for days. Did stuff at Woods Hole [Research Center, Massachusetts], scientists, lessons learned there. I thought sure that that thing would have been flown years ago. It's still not done.

But I remember one chart I had, and I showed it to the public affairs guy and said, "Well, I project that this costs now—this thing is going to cost \$25 billion from what I've been able to put all these pieces." He said, "Don't show that to anybody." Well, now it's over \$100 billion. Well, that's nothing compared to a stimulus plan, right? That's chicken feed now. Below that like you wouldn't believe, right? But yes, that was a big deal. It would only cost \$9 billion. Oh yes, promise Congress it's only going to cost \$9 billion. Well, what happened there was we made this big deal with the Russians to come on board. That terminated our contract like that, because then Boeing came in as a sole source contractor, no competition, take over everything. So they cut out all the small business stuff and took it all over.

WRIGHT: So were you officially out of the space program at that point?

VON EHRENFRIED: Yes, except that we still had some contracts with the education and training people. Frank Hoban. Do you remember him at all? He's more of a Headquarters guy. Bob Freitag. All those guys are dead.

WRIGHT: Must have been interesting for you to hire Sam Phillips to work as part of your operation after you had worked under him.

VON EHRENFRIED: A small side note. He was easy to work with, and I got to know him. But he was still a four-star general. Even in a business suit, he's a four-star general. Well, he was coming into our office to get signed up for this task, and I greeted him at the elevator and said,

"Hi, Sam, how you doing?" He [shrugged my hand off his shoulder.] It's just, you just don't put your hand around a four-star general and say, "Hi, how the hell are you?"

WRIGHT: Not ever.

VON EHRENFRIED: Not ever, right. But he was very nice. He was another gentleman.

WRIGHT: I remember when we first started the conversation, we talked about you being 25 and you were working with these pioneers. You talked about Chris Kraft, and you mentioned George Low. I know, as you said, you weren't in those high-powered meetings, but you certainly were there. Can you give us some impressions of some of these?

VON EHRENFRIED: George Low, he was an aristocrat. He had that air about him. I think he was Austrian, so he was a very commanding person, a very forthright person. You could talk to him. You could tell him whatever you felt like telling him. In fact he gave me one of my grades [promotions]. So he was okay to work with, but he was another, quote, four-star general, but not a general. But you know what I mean. He was more a control person from the standpoint of a big project. He took over from—what was the guy that had to leave after Apollo 1?

WRIGHT: Joe [Joseph F.] Shea.

VON EHRENFRIED: Joe Shea. Joe Shea was supposed to be in that [Apollo 1] spacecraft that morning. Did you know that?

WRIGHT: No I didn't.

VON EHRENFRIED: From what I heard. I don't know if this is true or not. I think it's true. It was a plugs-out test or something. I forgot what they called it. So I think he always wanted to see what goes on, so I think he was going to sit down in the navigator's [station] down below there and just watch things happen. Then for some reasons somebody said, "No, it's just—they're going to be in full suits, it's an all-up test, there's just no room." So he never did go in there.

WRIGHT: Many have talked about how Apollo 1 literally changed the course. Do you agree with that?

VON EHRENFRIED: Definitely. Oh yes, yes. Mentally, physically, hardwarewise, oh yes. We had been close before of hurting somebody. I always thought that—look at the pad shutdowns we had. Before I got to Glenn's flight, there were a couple aborts off the pad just that previous four or five months. I'd witnessed several explosions. We used to go to the beach and watch them. When you see one off the pad—I forgot which one I saw. I think one to the Moon. Ranger or something. Atlas lifts off, goes up maybe that high [gestures], and kaboom, particles of aluminum fall for 30 minutes or more. The big engines fall down. Fireball. But all this other stuff is now shrapnel. It's almost like—the Atlas was only as thin as a dime, it's almost like tinfoil. This stuff would be floating in the fireball. It would just sit there. You can just watch it. Eventually it would fall down. Horrendous explosions.

So we thought well, this is a dangerous business, somebody's bound to get hurt. Look at all the flight tests of aircraft, like the F-100, which I think Gene might have flown the F-100. But it killed over 100 pilots. The F-104 killed people all the time. Well, this was just flight tests. People are going to die. So we went a long time, and after a while you think you've got everything under control. But here again things happen, and they're catastrophic.

WRIGHT: You talked some, but I'm hoping you can give us a few more details, about being a guidance officer, since you were one of the first and helped develop that position. Why it's so crucial to have, and maybe what were some of the characteristics of the guidance officers that were so crucial in making sure that the flights were carried out the way they needed to be.

VON EHRENFRIED: Well, you should interview Gran Paules, who was there for a long time.

WRIGHT: We actually did.

VON EHRENFRIED: Okay. Gran would have a much more in-depth perspective there. Will Presley has died, so you can't get anything from him. Will Fenner is gone. For me it was the opportunity to define what that job is. What do you do? How do you do it? When do you do it?

Then once you figure that out, your checkout procedures have to be in front of you. So you've got to write all that down. In frustration I threw away my logbook. I shouldn't have done it after the fire, but it had everything in it, all the detail; detailed stuff that you got to know. So defining that from the standpoint of what are you looking at, where are you trying to get to. You're trying to get a spacecraft to the Moon, but that's a long way from here to there. So what

are all the maneuvers that have to take place or possibly can take place. Then how does the navigator on board determine his position, and how do you verify that on the ground with the radars around the world and the deep space tracking stations, depending on how far out you are. Therefore how that rolls into the Control Center and to you, as to how you configure the commands to the onboard computer as to inertially where you are and where you want to be after the FIDO [Flight Dynamics Officer] gives you some burns and the propulsion guys figure out what to do.

So then you do that again. I forgot how many maneuvers there possibly are to get to the Moon and get around the Moon and get home again. But all those displays and procedures have to be documented, and we got to know them. When the crews tell you something, "Hey, I'm seeing this," or "I'm seeing that," you've got to spatially feel that. Where are you and what's the background? What are they looking at? What time of year is it? Therefore the stars are different. The position, the orientation of the spacecraft is different. So all that gets figured in there. So it's a neat job. But Gran would be the best.

WRIGHT: You talked about the stars. You briefly talked about going to LA [Los Angeles, California] to the observatory there. Was that just a one-time trip or did you go often?

VON EHRENFRIED: No, for me I think it was just one time. I think they went many times. Or at least Donn Eisele might have. I don't know if that entire crew went or not. I remember the entire crew at one of them. I think they all went.

WRIGHT: Looking back over your career with NASA, what do you consider to be probably the most challenging time that you had?

VON EHRENFRIED: Well, when you walk in cold, that's a pretty big challenge. You sit next to Kranz, it's a big challenge to be able to take his direction and go for it. So from a human standpoint that's one. No matter what you're doing, and then getting to know these people. When you're that green, even sitting next to an astronaut is a pretty big thing. Well, after a while it's no big thing. You go from that one extreme to another, where I used to sit there between simulations, and Neil Armstrong would be sitting on the stairs, and we'd be talking about soaring, or he wanted to invest in Campbell Chibougamau Mines. We're going from that to okay, now he's back to being a CapCom, now we're getting serious again, to chitchat. So you go from awe and wonder to just everyday work, get the job done, very mission-oriented. After a while, being very comfortable in the whole environment with people and with the technical aspects and operational aspects. So that happens very quickly, two years maybe from walking off the street to being comfortable knowing what you're doing.

WRIGHT: You were involved in so many of the firsts. Do you have one aspect that you feel is your biggest contribution?

VON EHRENFRIED: Well, I spent the most time on Apollo 7. In fact, I'll give you something too. Remind me to give you this thing. Kranz asked me the same thing, what are the most important things? This I'll just give you [referring to document]. This was my feelings after Apollo 1. Kranz asked me, "What mission in each program was your favorite?" Well, John Glenn because

it was my first in the Mercury Control Center for sure, and it was so exciting, and it was over in three orbits. It went from—oh, it's over. Gemini '76 first rendezvous. Apollo 7. I busted my buns on Apollo 7. Skylab, I only worked on it for a short time, but I enjoyed it.

From the standpoint of five events that you remember most, Glenn, '76, the Apollo 1 fire, Apollo 8, from the standpoint of the first humans to leave a planet. That's pretty far out. Of course the lunar landing, which I was not on as a flight controller. I was still flying and suit testing. But at least I did my contribution to the suit world on that one. So in fact, I should give you this too. I'll go make a copy of this.

WRIGHT: Speaking of Gene Kranz, when I was reading through some things, I noted in his book that it talks about the first time that he put on his white vest, and you were sitting next to him. I got so tickled that he describes you as gently rolling your eyes, I think.

VON EHRENFRIED: Didn't I say something like—I said something on the loop like—okay, what was that? It was in one of those books. Like "I think we need to get the white jacket guys in here" or something like that. The other white jacket guys in here.

WRIGHT: I don't think he shared that in his book.

VON EHRENFRIED: Well, I know him like a brother.

WRIGHT: He mentioned how you sat next to him many a days.

VON EHRENFRIED: I love the whole family. The whole family is just wonderful. They lived down the street from us. I used to go to Gene's house and I said, "Gene, what are you doing?" He said, "Oh, I'm giving the kids a bath." I go in there. He's got them all lined up like soldiers, ready to get into the tub. Each one. You know that's what he would do, right? "All right. Next. Come here. You're out of here. Next."

WRIGHT: Well, with five I guess he had to have some system.

VON EHRENFRIED: Six, isn't it?

WRIGHT: Six I think, yes.

VON EHRENFRIED: One of them was conceived in my house. Did you know that?

WRIGHT: I read that in the book, yes. It was a little bit more than I wanted to know.

VON EHRENFRIED: TMI [too much information] there?

WRIGHT: Did you live down the street from him in Dickinson, [Texas] or when you all were still in Houston?

VON EHRENFRIED: No, before then, it was in Sun Valley.

WRIGHT: In Sun Valley.

VON EHRENFRIED: Yes, it was one of those houses that we all picked out together.

WRIGHT: You ended up in Florida for a little while. Were you working down there?

VON EHRENFRIED: Well, that's much after. Well, you're talking about during Mercury, you mean? Or much after?

WRIGHT: No, after you left the space program.

VON EHRENFRIED: Oh yes, yes, 15 years.

WRIGHT: One of the other things I thought was interesting that you were talking about was you were in such good shape because you were into judo. Talk about that, because I know there's several of you that were doing that.

VON EHRENFRIED: Well, I was in judo at Langley. This is 1961 now. So John Llewellyn, being a marine from Korea with a 19-inch neck and built like an ox. Of course then that's a long time ago. You can imagine how big and strong he was. But I was in judo before him, but of course he was in real combat long before me. So he and Glynn Lunney and I are over at the—what's that Army base there? Fort Monroe. We're using their gym and I'm like "Hey, I'm in this judo thing, John, why don't you come down here?" "Oh, I know all about that. I was in jujitsu and

this and that." So we're getting it on. There's two stories. I'm sure you've heard some of the Llewellyn stories, haven't you?

JOHNSON: Some.

VON EHRENFRIED: Well, these are new ones for you. So I'm in good shape, but John is so strong. So we're getting at it. He's getting meaner. He's getting to be a marine. I'm sort of in sport Olympic judo, and he's sort of in combat. We're getting it on and we're starting to—and Lunney says, "If you guys don't stop it, I'm leaving." Lunney was going to start taking it with us. Well, that ruined it for Lunney right there, because this was getting a little bit too—

WRIGHT: Intense.

VON EHRENFRIED: Intense. Well, now let's fast forward about to Apollo 1. So we're still playing judo, but now we have the NASA judo club. We're written up in the little paper there and everything. A lot of the guys were joining. Bill [William J.] Moon was there, and Kranz came, and Llewellyn came, and before you knew it we had oh, 20, 30 of us working out and staying in shape. But at the same time we're trying to really get serious about it and get our ranks and so forth. Llewellyn and I were getting it on again. Llewellyn was trying this throw called Ippon Seoi Nage, which is a one-arm shoulder throw, very basic. You've seen it probably in many kung fu movies, and John can't throw me. He's getting more frustrated. I said, "John, you're not doing that right. The technique, you got to do this and that." He's trying it again. I said, "No, John, you got—" Well, you don't want to tell a combat Marine quite how to do this.

So he comes back again. This is the throw where you come up underneath an arm and you throw them down like that. He came in so hard my shoulder popped right out of my socket and came up to my ear. Went back, fell down to my waist. This arm just—this arm is totally out. I turn white and I fall down on the mat. I'm just out with pain.

So I never let him forget this. He's so apologetic and everything. I'm sitting at the console on Apollo 1. I'm still in a sling. Luckily it was my left arm, so I could write with my right. But yes, he just pulled my arm right out of my socket.

So John and I are still good friends. There's a classic case. I used to call him a schizophrenic. He's a genius on the one hand. But given a certain word, you press the button, and he'll rip the chandeliers right out of the ceiling, which I've seen him do as well. But he's a great guy really, but he's got a little combat fatigue there.

WRIGHT: You mentioned when you were down in the Cape and you were working, you would have volleyball and do things. Did you have all your family socialize as well.

VON EHRENFRIED: Yes. Oh, we used to party all the time, yes. We were all very close, yes. We would always throw parties.

WRIGHT: Having a good close neighborhood.

VON EHRENFRIED: Well, it was too close. When I moved to Nassau Bay—this is a true story. You don't have to put this in there either. I saw six couples swap couples. Marriagewise as well. This guy would marry this guy, this wife would marry this guy, this guy would marry that

wife, this guy would marry that one, that one. That was all on three streets. Can you imagine that?

WRIGHT: No.

VON EHRENFRIED: Well, that's how tense some of these jobs were. People were just—the families would just get broken up. It was terrible. Very hard on families.

WRIGHT: The other thing that you mentioned earlier was that when you first started, you were making \$6,000 a year.

VON EHRENFRIED: Oh, no, no, no, this is a funny story. This goes back to Chris Critzos. I walk in. I'm making \$3,600 a year teaching school. Which at the time was—you could—and I had a child. So when I rented a house at Langley first year, \$60 a month, a house. So \$3,600 was okay, but I'd like to make more. So I go to Langley and I talk to Chris Critzos, he hires me off the street. He says, "Okay, now let's see. Got a degree in physics. Got one year experience. Okay, you're going to be a GS-7." I say, "What's that?" He says, "That's \$6,345 a year." I say, "Oh, I don't need that much." I kid you not. I told you I was green. Didn't I tell you I was green?

WRIGHT: But he certainly did not—

VON EHRENFRIED: No, he said, "No, you got one year, and you got this, and you got GS-7."
That was it. That was it.

WRIGHT: So you said, "Okay."

VON EHRENFRIED: I couldn't believe that somebody would pay me that kind of money. I just could not believe it.

WRIGHT: That should have been a clue how much you were going to make an hour.

VON EHRENFRIED: Yes, I had no idea. I couldn't conceive of that. Well, now that's '61. Now it's 1962. I'm buying this house in Sun Valley. \$250 down. I borrowed the \$250 from my wife's aunt. That was a lot of money. The bank says, "Well, you need to make \$7,500." I said, "Well, I'm up for GS-9 here soon." So I go back to Gene. I said, "Gene, when am I going to get my 9?" He says, "Well, when you deserve it," or something like that. I say, "Well, I need a letter that says I'm going to be a GS-9 someday." So he writes me a letter. So I give that letter to the bank and I get a new house. I'm making I think it was like \$8,000. I can get a new house and a car, all this stuff for the house. Life was good.

WRIGHT: Amazing. It was amazing times for all. Is there anything else that you'd like to?

VON EHRENFRIED: Read that stuff I gave you.

WRIGHT: I will.

VON EHRENFRIED: I think there's some good stuff in that article. I think that really encapsulates the spirit of flight control.

WRIGHT: Okay. Well, we'll do that. So we thank you for giving us your afternoon.

VON EHRENFRIED: My pleasure. My pleasure.

[End of interview]