

**NASA HEADQUARTERS NACA ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT**

AMERICO "MOE" FORESTIERI
INTERVIEWED BY SANDRA JOHNSON
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JOHNSON: Today is June 6, 2014. This oral history session is being conducted with Moe Forestieri at NASA's Glenn Research Center in Cleveland, Ohio, as part of the NACA [National Advisory Committee for Aeronautics] Oral History Project, sponsored by the NASA Headquarters History Office. Interviewer is Sandra Johnson, assisted by Rebecca Wright. I want to thank you again for coming today and taking some time out to talk to us. I know it's been a busy week for you. I'd like to start today by asking you how you first heard about the NACA, and when you first started to work here, and a little bit about your background.

FORESTIERI: I first heard about it when I graduated from Case Institute of Technology [Cleveland, Ohio], at that time, now called Case Western Reserve [University]. I had heard about it before, but it was one of the places that I had interviewed with to get a job. I guess another place was in New York somewhere, but this was the place that I really wanted to come to because I was from Cleveland, my family was here, and I heard a good reputation from this organization. That's how I came here, and I came directly from college, actually.

JOHNSON: What was your major in college?

FORESTIERI: Electrical engineering.

JOHNSON: What did you think you were going to be doing, or what did you know about the NACA when you first started?

FORESTIERI: I knew that they worked on airplanes, primarily, and flight propulsion, primarily. That's what it was called, the Flight Propulsions Laboratory. When I was hired, I was hired to operate a cyclotron, which is an atom-smasher; that is another name for it. I was hired to operate the cyclotron, but it was in the process of being built. It had not been completed yet, so when I got here, of course, I learned about the cyclotron but they needed to keep me busy on other things, and so they moved me into different projects. I actually never got to operate the cyclotron. Because of one thing or another, I got moved from one project to another, and then they decided I was better at something else, rather than operating a cyclotron. It took some time to get that cyclotron operating. They had some difficulties, and so it was delayed for several years, and in the meantime, I got to work on other things.

One of the first jobs I was transferred to was working on a system for a nuclear-powered aircraft, which nowadays sounds pretty scary, but in those days—this was 1951—we did not know all that much about radioactivity. We knew that it was dangerous, but we didn't know the things that we know today about radioactivity. They were interested in developing a power system for an aircraft that would be nuclear-powered. Of course, nuclear power meant it could stay aloft many, many hours or days or whatever. I worked on that for several years, actually, and then I got moved to working on several other projects.

They found that I was talented in bringing projects together and building them from scratch. If somebody who had an idea of doing a particular project, then they needed some equipment, I did that. I was good at that. As soon as it got built and operating, they moved me

to something else. It took me a long time to actually operate systems and get the data, but back to that nuclear-powered aircraft, I did write a couple of papers on systems for that aircraft. They were corrosion properties. It had nothing to do with the actual flight system, but part of the reactor system, I guess it would be called.

I worked on a laser system, I worked on a field ion microscope. One of the interesting things that happened to me when I first started, I thought I would bring this up, is I was here probably three or four months, and the Director of the laboratory decided to have a picnic for the overall staff. It's my recollection, I think that was the first picnic they had for the overall staff. One of the people that I knew that worked at NACA was a fraternity brother of mine—he had graduated a number of years before me, but he knew me—and he recommended me to plan that picnic, to organize that picnic. I didn't know hardly anyone here, but it was kind of interesting. I'll tell you why it's interesting later on, but it was interesting, and I organized that picnic. It was fortunate for me because I got to meet an awful lot of people that I never would have met, but I got to meet them very early on. The picnic was a success, and I just wanted to mention that.

The reason I mention that is that later in life, that's basically what I'm doing. I'm now a meeting planner. I organize conferences, a particular conference on solar energy, on solar cells, but I do a lot of organizing of big groups. I did that a number of different times through my career, and I never put it all together. I started thinking about it, that's what I was doing all these years. It was interesting, anyhow. Let's go back to NACA. What was the last project I worked on at NACA before it became NASA?

JOHNSON: While you're thinking, if you want to go back and talk about that nuclear-powered aircraft, you said that you wrote some papers about the corrosion properties. Can you just talk

about that project a little bit, maybe some of the other groups that you worked with and the testing that was going on, and what happened?

FORESTIERI: As much as I can remember, yes. One of the things that they wanted to do for this nuclear-powered aircraft is to take the heat from the nuclear reactor and bring it in to an engine. To do that, they needed a fluid to carry the heat from the reactor to the engine. The material they chose was sodium hydroxide, and the reason they chose that, in my recollection, is that it had a low-capture cross-section, and that meant that it did not get radioactive just by going through a reactor. It did not get very radioactive, so it wouldn't make the rest of the system radioactive by doing that. The test was to see if we could use this fluid because it was highly corrosive, if there was a way we could use this fluid and not ruin the equipment.

One of the laboratory division chiefs, I guess, had developed this system which was called a toroidal transfer system. They had learned that pure nickel was a good material for containing this sodium hydroxide, and what he did was he created basically a hula-hoop, a round hoop of nickel. It was filled with sodium hydroxide, and he set it on a table that does exactly what a hula-hoop does—it did this [rotates]. By doing this, it was a molten fluid. We heated it up so it was molten. The fluid would go around the circle—you didn't need a pump, you didn't need any extra equipment to make it go around. Just sitting on this table, going around like this, just like a hula-hoop, exactly what it was.

We found that in spite of it not being hurt by the sodium hydroxide, the sodium hydroxide slowly dissolved some of that nickel in the hotter section, and it deposited it in the colder section. We had a section that was cooled and a section that was hot, so after a bit of time, the cold section would become clogged up, so that didn't work. We tried a number of

different additives to the sodium hydroxide, and then we did a number of tests with nickel and the sodium hydroxide and other additives. In fact, I even put an aspirin tablet in one of the things, just try to get rid of that headache. That didn't work, but I wrote a paper on the corrosion properties and what we tried, and the various different materials we tried. I think I wrote one or two papers on that, I can't remember. That's basically what that was.

JOHNSON: Like you said, you didn't know as much then about the danger, but working with nuclear-type material, what kind of safety measures were in place?

FORESTIERI: I didn't actually work with nuclear, at that time. It was a side project that would work with nuclear. We did not use a reactor to heat up the sodium hydroxide. We used electric heaters to do that, so I didn't get involved with nuclear until later. Then, I had a different project which I didn't recall before but I do now. We were looking at what the effect of compression—high compression—on material was, and we wanted to know how it affected the material strength, and how it changed the material. What we did there was we had pure silver, little slugs of pure silver. They were about a quarter of an inch in diameter, to my recollection, about an inch long, and I plated one surface with radioactive silver and put another one on top of it. Then, we squeezed it with an instrument called an instron, that's well controlled; I could compress things that we know at the correct rate. Then, after that test, we did it with the various temperatures. After that test, we would cut that slug of silver and then look at the surface, where we cut, with polished. I think we took photographs of it—not photographs, but laid a film on it—and of course, it got developed by the radioactivity. We could tell by the darkness of the film where the radioactivity went.

I did that for a year or two, I guess, and there was some danger to it because it was radioactive. The safety thing I did was in all my systems, I had lead bricks surrounding everything that was nuclear. This was in my child-producing years, and I wanted to be sure there was nothing wrong. I was well protected. It was interesting that one of the people working in that area at that time was not as neat as I was, and actually, he contaminated his home with radioactivity. I don't remember what the results of that was, but I remember that that happened.

JOHNSON: It must have been, I would think, in your mind a lot just because the war wasn't that long ago, and we know what happened.

FORESTIERI: We knew it was dangerous, but we didn't know how dangerous. I didn't think it was a very good thing for him to do, but he did that. I think that got resolved—they actually went in and cleaned up the home. Radioactivity is dangerous, but you can find it because of Geiger counters, you know where it is. They did take care of that, but that was something that stood back in my mind. What time period is this? Probably 1956, because I got married in '56, so it would be about that—'56, '57.

JOHNSON: When you first started out there, we've heard that they had classes and training programs, sometimes, that they would send people around to learn different things. Did you have any kind of training when you first started, since you were fresh out of college?

FORESTIERI: I don't remember that. I did a lot of training, but I don't remember any training when I was with NACA. With NASA, I remember quite a bit of training, but I don't remember

any with NACA. I don't remember going to any classes, although I did get a master's degree while I was with NACA. They gave us time off from work to go to school, and then I did that and night school, and so on. I got a master's in 1954. I had a bachelor's in 1951, but I got a master's in 1954.

JOHNSON: Where were you located on site?

FORESTIERI: M&S building, it was called, and I don't even know the number of it anymore. It was called the M&S building, Materials and Structures building. For a while, we were in a room that we called the DP room. They called it dislocated persons, or something like that, where they put the people that had not gotten clearance because you had to go through a major clearance to get into that building because that's where the cyclotron was. Eventually, I got that clearance, and so I was in that building someplace.

JOHNSON: What did it entail to get that clearance?

FORESTIERI: FBI [Federal Bureau of Investigation] checking you, checking your family, and so on. I remember my family saying, "Did you know that somebody called here?" or "Somebody visited us," or something like that. That's all I recall on that. I know you're going to eventually get into 1958, but do you have any other questions before that time period?

JOHNSON: We were talking about some of those earlier projects. You said that you went to a laser system—was that still within NACA?

FORESTIERI: That was still with NACA, yes, and we were interested in lasers. At that time, we didn't know exactly what they could do, like we know today, but we wanted to know what the effect of different things was on lasers. I had done some experiments with, it was called a ruby laser at that time, and boy, I can hardly remember. Different temperatures, different reactions on a ruby laser and what it did to that. I think I even wrote a paper on that, but I don't remember that very well. This was a long time ago, you know?

JOHNSON: Yes, I know. We're asking you to stretch that memory a little, aren't we? Let's talk about some of those early years, and as you mentioned, you got to organize a picnic, and the feeling at the site at that time, when people were first working here in the NACA, we've heard people describe it as a campus, or very congenial.

FORESTIERI: It was. It was very congenial. It was very campus-like, very unstructured, in the sense that nobody watching you every minute of the day, or anything like that. A lot of freedom, but everybody was interested in working. That was an interesting time period; everybody was interested in what they were doing. I don't remember anybody talking about any goof-offs at that time. It was kind of interesting. That's not the same as it was with NASA. NASA was a little bit different.

Let me go one more step forward because after it became NASA, the new Director, then, I think it was Abe [Abraham] Silverstein, said he wanted to have a lab-wide social activities committee, and he formed that. A friend of mine became the head of that—that was Robert Miller—and he became the head of what's called the Lewis Social Activities Committee, and we

had a logo that said “LESAC,” and then they had a Frenchman with a beret on his head as a logo for it. I meant to bring that book with me and I forgot it. There’s a booklet I have that was presented by the Director, but it had a bunch of photographs. It had a whole bunch of photographs of all the different picnics and parties we had.

We had two functions a month, at that time. This was ’63 on up to ’67; I don’t remember how long it lasted, but ’63. I was on that committee, by the way, another organizing committee. I was actually the treasurer of that group. That was another function I had and carried on through my life, is treasurer. I seem to be treasurer of every organization I belonged to.

JOHNSON: At least you know they trusted you.

FORESTIERI: I guess so. If you want to go on to that, we will, but if you want to go back to NACA, we can do that.

JOHNSON: We can talk about NACA for a while. You mentioned the events and everything. I was thinking about the open houses, and when people would actually come here to Lewis, famous people or dignitaries.

FORESTIERI: Yes. I sort of remember [President Dwight D.] Eisenhower being here at one time. I don’t know when that was, but I sort of remember that. We did have open houses. I wasn’t so much involved in those except that we were all asked to do something at an open house. Whoever came around looked at everything. It was kind of interesting. Then, you had to spruce

everything up and get everything working properly. That's basically what I remember about that.

JOHNSON: The projects you were working on, were they assigned? You said you were good at organizing and you tended to set things up and then get it going, and then go to the next thing. Were those assignments that came down, or did you have the freedom to see that something needed to be done?

FORESTIERI: No, these were all assignments, at that time. Somebody had an idea and they wanted to create something or make a test on something, and they were all assigned projects. It didn't get until later on where at least for me, where I had the opportunity to modify what was going on, some ideas I had to see if they really worked, but I had the freedom to do that, but that was later on.

JOHNSON: When setting those things up, did you actually have anything to do with setting up, like, testing rigs?

FORESTIERI: Exactly, exactly.

JOHNSON: Talk about working with the technical services groups and maybe photographers or whoever you worked with on some of that.

FORESTIERI: Actually, I worked with just about everybody at the laboratory. I had an excellent experience with technical services. We had what we called mechanics in our building that we worked in. They were all part of technical services, but they were assigned to different buildings. They were all excellent. They were excellent teachers to me. For some reason or other, they helped me. I guess they liked me. They showed me how to operate all the machines. I was able to operate a lathe, a milling machine, a grinding machine, all those machines that the mechanics use. They showed me how to operate so I could do that, which helped me in the future, so that when I needed to draw a plan for something to be built, I knew how to design it so that it could be built. They didn't have to come back to me and say, "I can't do it that way; you have to do it this way." I knew that ahead of time because of the teaching that they did. I was very fortunate to have that.

I met with technical services. When I wrote papers, I had to meet with the people who, at that time, were the typists who typed the papers out. It's so different now, with computers, I just can't imagine. Every time you made an error, you had to sort of retype it. They didn't have copy machines, even, then. That's hard to remember, that they didn't have copy machines. If you made an error, you had to do it over again. I worked with the photographers many times. Just about everybody at the laboratory, yes.

JOHNSON: It's interesting that the photography had so much to do with what people got out of these tests.

FORESTIERI: Absolutely.

JOHNSON: If you don't mind, just for a moment, if you can recall working with the types of photography that may have helped with some of the work that you were doing?

FORESTIERI: I think most of the work I did with the photographers was to take photographs of the equipment, and of the equipment I was working on. Now that you mention it, it was kind of interesting, I did mention lasers. Somebody sent me just recently an article or a link to something that's on a NASA website, a series of photographs, and on the cover page of that photograph is me with a laser. If I had brought my cell phone with me, I could have showed you that, but I think if you look up "NASA photos," it's a relatively new document. It's just photographs from way back when.

Basically, my work with them was primarily taking photos of the equipment that I built. I'm trying to recall if there was any project that I worked with them where I needed them to help me solve a problem. There probably was, but right now, I can't think of anything.

JOHNSON: Talking about those open houses, in '57, there was an open house, but also Sputnik [Russian satellite] happened in '57.

FORESTIERI: Yes. We all remembered that very well. It was a surprise to a lot of people, and a surprise to us, too. I don't know if anyone mentioned that they were working on rockets here, even at that time. It was not a big project, but they had a rocket laboratory here. My recollection is that we would not have the Apollo Program if it hadn't been for the Lewis Research Center developing the hydrogen-propelled rocket system, which was used on Apollo. That's my recollection. I could be wrong, so you can check me on that. Dr. Silverstein, at the time, I think,

was a Director, insisted that we had the technology to develop a hydrogen-powered rocket. He was given permission, I guess, by Headquarters, to go ahead and do that. It took a while, but they did do that. We were all quite proud of that. Even though we were not a flight research center, we had a lot to do with the flights in that sense.

JOHNSON: As far as spaceflight, yes.

FORESTIERI: Yes, space flights.

JOHNSON: Talk about that transition between NACA to NASA.

FORESTIERI: That happened in 1958, in October '58. We were all quite interested and happy about that, but there was some dissension, and I'll tell you why. There were a number of people here who were well-qualified to do anything. At that time, they hired in a bunch of new people because we expanded, obviously, to become NASA. They hired in a bunch of people to be project managers, etc., and they hired them at a higher grade rate than the people that were working here. There were a lot of people who were quite annoyed at that.

I don't think it changed the quality of the work at all, but there were a lot of people that were annoyed that they could have done that job if they had been told to do that, but they were not asked. They brought in new people at a higher rate, and there was a lot of problems with that.

What else happened? I think everybody took on the new tasks that were assigned and recognized that we had a race on our hands, basically, to do what we could. Everybody just buckled down and did what they were supposed to do.

JOHNSON: You mentioned earlier that you don't recall the training so much in NACA, but you do in NASA. Was it at that time that you started different training?

FORESTIERI: No, it was actually later, when I got in to training.

JOHNSON: What were you working on after the transition?

FORESTIERI: Shortly after, I think it was about 1963, I transferred from a research area of the laboratory to the project area of the laboratory. That person, Robert Miller, that I mentioned, I joined his organization. I was always interested in solar cells, and solar cells was one of the things that they used in space to generate electricity. That was in his division, it was the power systems division, headed by Dr. [Bernard] Lubarsky, I believe. In that division is where they had the project work. They had solar cell research work in the old division that I worked in, but the actual project work was in this new division. I came to that division in 1963, is my recollection. I'm not positive of that. I'll tell you about what I did in '63, but in '66, I got into the solar cell area and I was selected as a section head in a solar cell project area, and I can't even remember the name of the section, exactly.

When I first came to that power division, I again was working on something called SNAP-8, which was Solar Nuclear Auxiliary Power. It was a power system, again, I think it was

for rockets this time. Again, a nuclear-powered system, and they had tests again, checking to see if they can transfer the heat from a reactor to the engine, eventually. I worked on some aspect of that for a while. I was mostly working in electrical engineering stuff and trying to measure things. There was a lot of new electronics that came into fore at that time, and I remember developing a system where we could detect if something failed without having to dismantle the whole system. That one worked very well, but that was a long time ago, my goodness. I can't remember many details of what happened at that time.

JOHNSON: That's fine. That's why you have the technical reports and the memorandums and the papers. You said you could tell us what you did in '63?

FORESTIERI: That's what I did, and then I mentioned the LESAC in '63, got involved in that. That LESAC took quite a bit of time, but the Director wanted us to do that. He thought it was good for the laboratory to get together and party together. I think the idea was if you partied together, you could work together better. As I said, we had two functions a month. One was a function which was lab-wide but involved wives, you could bring your wife into the party, picnic, whatever, dance, it was. The other one was solely for a mixer for the people at the laboratory. They happened on the weekends; they did not happen during work time, but they happened on a Saturday, usually. That kept you pretty busy.

We didn't take work time off—we did it after work, so it was Friday afternoons or in the evenings, or so on. It was interesting. We did a lot of it. We had a lot of fun, actually, the people had a lot of fun. It was a big, big group of friendly people, actually, as I recall it, and they

all looked forward to these parties. They were well attended. We were young then, actually. It was interesting.

JOHNSON: That is something because I know in this Center and a lot of Centers, so many people were young, and it was a very exciting, young, vibrant time.

FORESTIERI: It was, it really was. Everybody was excited about the work we were doing. In spite of that downside, that thing that I mentioned before, that didn't seem to alter the working system, it was really good.

JOHNSON: The spirit of it.

FORESTIERI: The spirit was excellent, yes.

JOHNSON: In the early years with NACA and when you first started working there, it seemed like a lot of the work that they were doing was in partnerships or helped to benefit industry and other things like that. Then, once it became NASA the goal changed.

FORESTIERI: There was very little of that because there weren't very many people working on space systems at that time. Now, because once they got developed, of course, now there's a lot of technology transfer going on, but at that time, there was very little. It was all done by NASA at that time, and the NASA people. In fact, I think we had very few outside contractors at the

time, and that was kind of interesting, too. That was a new environment that we had to get used to, the outside contractors.

JOHNSON: Did that happen pretty quickly after it switched to NASA?

FORESTIERI: I don't remember when it happened, but I know little by little, more and more outside contractors came in. I'm going to say we had, like, 5,000 people at one time, and I don't remember how many were civil servants and how many were outside contractors. The only difference between the two is that they got paid from somebody else rather than from NASA. I don't remember anything that said, "Oh, Jerry, you're just an outside contractor." I don't think there was any difference there. They were treated the same as a NASA employee.

JOHNSON: Even with the social events, did they participate?

FORESTIERI: Yes, I think they were invited to the social events. I can't swear to that, but I think they were, because they had badges, they came into the laboratory.

JOHNSON: On the notes you gave me, right before you said that you'd been an active member of the Institute of Electrical and Electronic Engineers since 1966, and you've served as chairman on numerous committees, and internationally recognized photovoltaic expert?

FORESTIERI: Yes.

JOHNSON: You want to talk about that for a minute?

FORESTIERI: Solar cells—photovoltaics is a fancy word for solar cells—was basically my career. That's what I did. I worked on developing power systems. Part of that overall area was that, and I mentioned it in the notes that I was on a Space Station task force, that went to [NASA] Headquarters for a year with a group of NASA people from all the Centers, and we essentially developed the Space Station Program.

JOHNSON: What year was that?

FORESTIERI: In 1984; '83, '84 is when I went to Headquarters, but in 1984, January, it was my recollection, President [Ronald] Reagan announced the Space Station Program. We were part of that task team, and that was an interesting time of life. I had moved to Washington [DC] for a year, and the system allowed us to come home once a month, which I did. My wife traveled to Washington to visit me once a month, so I got to see her every couple of weeks. Back to organizing things again, they had a party for this task force, and guess who organized it? I don't know how it happened—I don't know if they were looking at history, or what.

JOHNSON: Your reputation preceded you, I guess.

FORESTIERI: Perhaps, perhaps, but I organized that party for the Space Station task force, as a matter of fact. That went also very well. That was a good time period, too. That was very exciting. It was a good group of people. They were all interested in getting the job done. In

fact, they did do the job, they did have a Space Station Program. There were people from all the Centers, which was quite helpful, got to meet a lot of different people. Interestingly enough, they're pretty much the same, regardless of where you came from.

That was a different kind of environment. You didn't work in the laboratory, you didn't do any tests, it was all head work and organizing and creating and designing and just matching things together and seeing what's the best here and what's the worst here, and so on. That was a good group. That was very interesting. I enjoyed it a lot. I can't tell you much more about it except I can't give you any details. We had a lot of meetings and a lot of interaction.

JOHNSON: And your wife got to come to Washington?

FORESTIERI: She came once a month. She came once a month and I went home once a month, so I got to see her for two weeks. When she came up to Washington, she would bring some friends of ours, and we would party that weekend. It was kind of fun.

JOHNSON: A nice opportunity.

FORESTIERI: It was. Then, of course, there's very many things to see in Washington, which you don't normally—unless you get there. We got to see a lot of things that we would not have.

JOHNSON: Right, on just a vacation or something, yes. Quite different if you live there.

FORESTIERI: My kids were in college at the time, or just graduating from college, so they were busy creating their careers. I guess my two sons did come to see me in Washington, and that was kind of interesting, too. It was a fun time.

JOHNSON: What did you do when you came back here?

FORESTIERI: When I came back here, I think I became a deputy division chief of an organization on advanced development, is what I recall. It was primarily for the Space Station, worked on advanced development systems, actually. I'm trying to remember the projects we worked on. Why is that part a blank?

JOHNSON: I don't know, I could probably try to guess, but maybe they weren't as exciting as maybe some of the others?

FORESTIERI: No, they were—they were exciting, but I don't know why. I'd have to think about that.

JOHNSON: That's okay, and you can always add it later. That's not a problem.

WRIGHT: The [Space] Shuttle Program had started, too.

JOHNSON: Yes, during that time period.

FORESTIERI: Yes, but we didn't have anything to do with the Shuttle. Before I went to Headquarters, I was co-principal investigator of something called LDEF, Long-Duration Exposure Facility. We had a project done, not of LDEF in total, but we had a panel on LDEF, which turned out to be a significant experiment. It was primarily solar cells, but we were looking for the degradation of solar cells in space, and we had to know where the Sun was coming from and what the intensity was, and so on.

You remember that LDEF was there a number of years rather than six months, as it was supposed to be. In all that time, our experiment was working and they were getting data from it. Because we knew what the experiment was and where the Sun angle was, from our data, everybody else on LDEF could determine what kind of exposure they were getting from the Sun, or what their position was. It was a very valuable experiment, and we didn't realize that when we set the experiment up. We were there for six months, and that's what we thought we were going to get, but it turned out to be very valuable.

When LDEF came back, I was no longer in that area. I had already been to Headquarters and came back, so I didn't do any of the analysis of the data and so on, but I still was interested in it. I do remember that. That was a good, critical experiment; it was a good, interesting time period, too. Again, it was on solar cells. I do remember that a lot—that was quite good.

JOHNSON: Do you have any memories of maybe any of the accidents, like the Apollo 1, or of [Space Shuttle] *Challenger*?

FORESTIERI: I remember *Challenger* very well. We were in a meeting with the Director of the laboratory. I don't remember where the meeting was, but let's see, what year was that?

JOHNSON: It was 1986.

FORESTIERI: I had just become, I believe, the Director of External Affairs. Was I director by then? The accident was in January, right? I was not quite the director, then—I think I became the director in March. We were in a meeting someplace, and I don't recall what the purpose of the meeting was. It was one of these training sessions, and I don't remember what the purpose was, but I do remember the director being there. Andy [Andrew J.] Stofan was there. I remember that we were interrupted because of the accident, and that everybody was trying to, you know, "What does this do to us?" Everybody didn't know what they were doing, I guess. I remember that time period exactly.

Shortly after that, I became the Director of External Affairs, and because of that position, I think I spent the first year discussing the *Challenger* accident. From what caused it, how we could have prevented it, and so on and so forth. Had a number of local TV interviews, and tried to explain it. I did have an advantage that some of the other people didn't have, that were External Affairs, is I was an engineer. Most people in External Affairs were not engineers—they were people that were interested in public affairs, visitor center, things like that—but I had a background of engineering. I was able to explain things, I think, a little better with an engineering background, and they said I did a good job. I don't know whether I did or not, but they said I did a good job. I spent a lot of time that first year discussing the *Challenger* accident. External Affairs was an interesting organization.

JOHNSON: As you said, you were an engineer, and then you became Director of External Affairs. How did that happen?

FORESTIERI: I applied for it, and apparently, the panel that looked at the applications liked it. In my career, I had done a lot of explaining of things and discussing things with different organizations, when we had photographers come in or people come in. I would always talk to them about stuff. I guess they liked it, and that's how I became the Director. It was good, it was an interesting job, it was an interesting transition from just engineering work to public affairs and technology transfer, education; that was all part of the organization. There was an interesting transition, and I enjoyed that. I enjoyed that a lot, actually, but it was different. You had to think differently, actually. Engineers think differently than most people.

JOHNSON: Speaking of engineers thinking differently, you worked under different [Center] Directors, starting with [Edward R.] Sharp, who wasn't an engineer, and then Abe Silverstein, and through your years here, more than one Director. Can you just talk about that for a minute? Maybe the differences between them, as you observed?

FORESTIERI: I can't talk about too much because I didn't interact with that office very much until I got into the Ad [Administration] building when I was Director of External Affairs. At that time, it was Andy Stofan, and then I got to be meeting with the upper staff, at that time. Prior to that, I had very little reaction with them. You had a lot of reaction with the division chiefs, but the division chiefs at that time, that I worked with, were all engineers. I can't relate very much to the different Directors. Everybody had comments about the Directors when they came in,

whether they were going to be good or not good and what their backgrounds were. I think everybody recognized there was politics, always, in the directorships, how they were selected.

My recollection, there wasn't very much politics early on, NACA. Sharp must have come from someplace; I don't know where he came from, actually, maybe that was political, I don't know. Silverstein was just a sharp man, that's all. He was just terrific. He was a tough guy, but he was really good. Everybody liked him. They hated him, but they liked him, if you know what I mean by that. He was a task master and he wanted things done and he wanted it done his way. He was good.

JOHNSON: Then, you moved into another position as Acting Director of the External Programs Directorate?

FORESTIERI: That was right before I retired. They decided to make the External Affairs office into an External Programs Directorate. It was basically the same people. They added some additional responsibilities, and they brought in somebody from the outside to be the Director. I was the Associate Director or Assistant Director. At that time, in my mind, the office became involved in a lot of political things, and it wasn't to my liking. I had been here for 41 years, so it was time to retire, so I retired. Then, that's a whole new life.

JOHNSON: Looking back over NACA and maybe those first early years in NASA, which project, or what do you think you did that would be your most significant contribution to the program at that time?

FORESTIERI: You mean other than the parties?

JOHNSON: Yes, other than the parties.

FORESTIERI: I think a significant thing was the LDEF experiment that I mentioned. I don't know if there was anything outstanding. I did co-invent, and I'm not sure anything came of it, something called solar cell shingles. They were solar cells that you could put on the roof of a house, but they were really antiquated compared to what they're doing now. We had a technique for making flexible solar cells, they were in flexible systems, and we actually made some shingles that you could put on the roof of the house and connect them together. I have a patent on that, but nothing came of that patent.

This was the days before they have the system that they have now, where you created a patent, it was NASA's patent, and you couldn't get anything from it. Nowadays, if you have a patent, you can collect royalties from it. I couldn't do that, and I don't think anybody would want that patent, anyhow. It was the beginning of solar cell shingles, anyhow. I'm not sure anybody else developed the shingle for the roof of a house before then, but that's what we did.

JOHNSON: That's very interesting.

FORESTIERI: It was interesting, yes. When I look back at it, I wouldn't take that patent and try to build something like that. It was a precursor of some of the later ones, yes.

JOHNSON: That seems NACA did that a lot, that they led other research being done in the industry.

FORESTIERI: They did a significant amount that way, yes, they did that.

JOHNSON: Is there any other memories of things that you worked on that we haven't talked about?

FORESTIERI: Nothing comes to mind right now, but probably when I go home, I'll say.

JOHNSON: That's fine, and you can certainly do that. I was going to ask Rebecca if she had any questions, if you don't mind?

WRIGHT: I've just got a couple. One is you mentioned so much about the reports—what are your thoughts, or what were you told when you first got here about the importance of documenting your work and doing reports?

FORESTIERI: I knew that reports were important. They were not the same as they are today, where what's the word, I guess, that they use about having it written down? People in academia have a—

JOHNSON: Like they publish or die, that sort of thing?

WRIGHT: Publish or perish?

FORESTIERI: Yes, publish or perish. That wasn't the mantra, then. It was important to document your work, and you wanted to get that accurate. The people who helped you write reports were quite helpful, quite interesting, but when I look back, it's such an antiquated system as compared to what you can do today with computers.

It was a lot of work to create a report because they had to type it out and you had to look at it, and then you made corrections, and then they had to re-type it. It was a lot of work. You tried to do it right the first time, but you never did. I don't remember anyone that ever did a write-up that was right the first time. Then, you had to get photographs and try to augment the report with things. It was interesting, but it wasn't so important. You had to document it, that was important, but it wasn't the thing that you were working to. You were not working to write a report; you were working to develop something, do something, and that's what my impression was.

WRIGHT: The report was the means to share that knowledge?

FORESTIERI: That's right. That's what the report was. It let everybody else know what you did.

WRIGHT: Do you know of other areas in the NACA Centers, or even the NASA Centers, that were working on solar energy when you were?

FORESTIERI: Yes, there were other Centers working on it. I'll tell you that in a second. Goddard Space Flight Center [Greenbelt, Maryland] had a solar cell group. Marshall Space Flight Center [Huntsville, Alabama] had a group working on solar cells. JPL [Jet Propulsion Laboratory, Pasadena, California] had a group working on solar cells. I don't recall anything at Johnson [Space Center, Houston, Texas].

WRIGHT: Ames [Research Center, Moffett Field, California], anything with the Ames Center?

FORESTIERI: Ames, I don't recall that they did anything on solar cells.

WRIGHT: Did you share information back and forth?

FORESTIERI: Yes, absolutely, we did. We always shared our information back and forth. There was a little bit of competition there, always. "We can do it better than they can," that type of stuff.

About 1974, they had that oil crisis, and interestingly enough, with that oil crisis, they started working on terrestrial systems here at Lewis. In fact, the other Centers did, also. I think we had a meeting in New Jersey, I'll think of that later, where it was at in New Jersey, and we brought the Centers together, looking at ways we could use the technology we had developed for space, and using it for terrestrial applications. Not only did we look at solar cells, but we looked at wind turbines because we had the technology for propellers.

There was a group working here on wind turbines, and we had a group working on terrestrial solar cells. We did quite a bit of work on that. I was involved in that. We had

experiments where we were looking at the effect of different locations on solar cell panels, and we had panels. I set one up in Colorado. I know we had some in most parts of the United States. We had them in Africa. We had a system set up in Africa, we powered a village in Africa, as I recall, with solar cells. And Indian villages in Arizona, we had solar-powered systems. That was an interesting aside—we brought in electricity to these villages, and the purpose, one of the things they did with the electricity was power a refrigerator. The purpose of the refrigerator was to keep medications in, but we found a lot of the refrigerators had beer in them, instead. You do what you do. You find something that's useful, you use it.

We did quite a bit of work on terrestrial applications for a while. I don't know how long that went on—I can't remember how long that went on—but it was a couple of years, at least. It started with that business in '74. In my mind, it was a very famous meeting in New Jersey, in Cherry Hill, New Jersey, and I think it's in the literature. You can find out about it.

Also worked with Interagency Advanced Power Group [IAPG], which was exactly that, it was an interagency group that met and I think it worked with outside contractors who did all of the reporting and getting the meetings together. I think they were located in Philadelphia, Pennsylvania, and I can't remember their names right off the top of my head. They brought this IAPG group together, and we met regularly. I was chairman of one of those groups at one time, and we met with people from all the Centers to share our knowledge. That was space and terrestrial, whatever we did was shared. What else? We're covering a long span of time, aren't we, 41 years?

WRIGHT: I'm going to ask you to bridge it. Where do you think the work that you did on the solar cells while you were here, how has that work impacted what people are looking at today to try to find alternative methods of energy? Do you feel like your work has been used?

FORESTIERI: When I look at that, things have changed so much in that time period, from then to now, that I'm not sure that there was any impact in what we did then. It's a progression, little by little, step by step, but it's one of the steps in the series. If we took what we did here away, I don't know that it would have made any difference. Somebody else would have done it because there was a lot of interaction and a lot of people doing the same kinds of things, so I don't know that because we were here, this happened. I could say that about the hydrogen-powered rockets, I could say that about that, if we weren't here, it wouldn't have happened, but I can't say anything about the solar cells. I don't think there was any significant thing that we did that's an, "A-ha, that's why we have what we have today." Being honest, it is what it is.

WRIGHT: I know alternative energy methods have always been looked at, but so few have progressed to common-day use, so I was just curious.

FORESTIERI: I think that what they did in wind turbines might have had some impact, but again, we were experts in propellers, but there are a lot of experts in that area, now. I don't know that there was any significant thing in that area.

JOHNSON: It is interesting that in the early days, NACA, it was such a power-draw that a lot of the testing had to be done in the middle of the night to get the electricity, so it wouldn't affect the

rest of the community, and then you're working on giving power back to communities. It's kind of an interesting progression.

FORESTIERI: That was one of the things I did, way back. What time period was this? I don't remember the date exactly, but I did order the largest batch of solar cells that this company ever made. It was a company that first started, it was called Solarex, and we were looking at building a solar array. I don't know if it still exists or not, but it was in the back area. I think I ordered something like two kilowatts of solar cells, 2,000 watts of solar cells, and they built them up into panels that were facing the Sun, and they actually got power from them. It was connected to a system, and we could take that power and put it back into the grid. It was protected. It was all done properly. I remember that one particular day, because solar cells are more efficient when they're cold and when you have bright sunlight, I remember a day, I think it was in January and I don't remember the year, and it was 15 degrees below zero and bright, sunny day, and that power system was just spinning like crazy.

JOHNSON: It was clicking along, wasn't it?

FORESTIERI: It was really clicking along, yes, and it was interesting because we've never seen that kind of power out of the thing again. It was just that particular day. It was kind of interesting. I did build that system, or I didn't personally build it; I was in the organization that had it built, so it came out of my organization. I don't even remember the time period of that. I don't remember.

WRIGHT: The other question I had, because I think I heard you say something when you first came in, something about the glee club. Was there a glee club here?

FORESTIERI: There was. That was before I came here, actually. One of the women who was in that glee club was a friend of our family, and she's since passed away, but she went to my wife's church and I knew her. When she passed away, her children found this information, knew it had come from NACA, knew I'd worked here, and gave it to me, and so I brought it to Bob, yes. That's how it got here. I figured if it was history, and you'd think that—you guys know this better than I do—"Just because it's history, it doesn't make any difference." You get that attitude, but I saw that it might be important someplace and brought it here.

JOHNSON: It says a lot about the community you were talking about, and the atmosphere, and the feeling that people recreated here. They didn't go off or do other things; they stayed here with their friends, which is a lot different than people do today.

FORESTIERI: Yes, you had a lot of clubs here at NACA and NASA. Skiing clubs, all kinds of clubs, to get people together. That's what they did. It was a big family, basically, is what it was.

JOHNSON: Do you remember any women engineers working in your area at any time, or were they mostly the women secretaries or mathematicians?

FORESTIERI: We had women engineers working in our area from day one, when I got here. I always thought the women were excellent. Not that they were anything special, but I thought

they had a slightly different attitude toward work than the guys did. I don't know how to describe that, but they were really interested in doing what they did, and I think they did a darn good job. I had a lot of women working for me in my time period that I was here, and I always thought that 90 percent of them were top-notch, they did an excellent, excellent job. I would never hesitate, hiring a qualified woman to do something—never. They were good. They were talented, they were dedicated, they were good.

JOHNSON: Is there anything we haven't talked about that you'd like to bring up?

FORESTIERI: Do you want to talk about after NASA?

JOHNSON: Sure, tell me what you did after that.

FORESTIERI: That's interesting, too. Organizing. When I retired, I mentioned that I did some teaching work, I got involved with the Photovoltaic Specialists Conference [PVSC]. In 1976, I was chairman of that conference, but I have been associated with that conference since 1967. I'm still associated with it. If I can hang in another two years, I'll be associated with it for 50 years, which is kind of a long time.

After I retired, one of the men that worked for me became chairman of that conference, and became inundated with work, trying to do his work here, and to organize a conference which was going to be an international conference, the first time it was going to be international, in this sense, and asked me to help because he knew that I had been chairman of the conference. I agreed to help him, and it was going to be held in Hawaii. My first question was, do I get to go

to Hawaii? He said, "Of course," so I decided to help him. The conference was a great success, and the next chairman of the conference saw what I did and said, "I'm going to need your help, also," so I said, "Okay."

Then, all of a sudden, one thing led to another, so I've been now associated, as the title is, PVSC Administration, I'm the administrator of the conference. I have been since '94 till now, and I still am. As a matter of fact, I was supposed to leave tomorrow for the next conference, which is the 40th conference, which is being held in Denver [Colorado]. I had to cancel that trip because of my wife, but I'm still doing it. Part of the responsibilities is to organize—you remember, that's what I did? Now I organize committee dinners and I organize conference dinners, and it's just a lot of getting a lot of date together, not meeting, but calling restaurants from afar.

One we had in Vienna, Austria, and I was able to do this all by telephone and by email, to get a restaurant and organize a dinner for a group. It all works. If you want it to work, it'll work. I continued to do that, and it's interesting for me. I don't know why it is. I do most of the work from home. I do some traveling, but I've cut down on traveling, now. I used to do the site visits, too, which was going looking for locations, but now it's getting so big. The conference that started out as being 120 people is now 1,500 to 2,000 people. The last time they wanted to do site visits, these younger people decided to do five different cities in a week. I said, "Okay, I'll pass, I'll get somebody else to do that." That's being handled by other people, but I still do what I do, and they still want me, so I'm still having fun.

JOHNSON: That is exciting. You worked with the Baldwin Wallace [University, Berea, Ohio] Institute of Learning, in retirement?

FORESTIERI: Yes, Baldwin Wallace, that's one of the things I did when I first retired. My wife didn't want me around the house, so she said, "Baldwin Wallace has this new Institute for Learning in Retirement [ILR], made up of retired people who get together and chat, have courses, and do different things." At that time, though, the group was 25 people. It's now, I think the last count was 1,400. It's grown fantastically, but they had one course a year on something or other, and now they have 20 different courses. They're taught by retirees and some retired professors, and whoever has something to say, they can do that.

It's very well organized, and so, I went to the first couple of sessions of that. I think I took a course there, the first course, and got interested in it, and joined their organizing committee. Then, they selected me as the finance chair for that committee, and I did that for about 10 years. Then, I stopped doing that but I continued on as their ad-hoc chair for a scholarship committee. What they did with some of the funds that they collected was they gave out scholarships to people in advanced learning or continuing education programs. I did that for about 10 years. I think I just stopped doing that about two years ago. That was interesting and I enjoyed that aspect of life, too, but I think I'm keeping busy.

JOHNSON: Sounds like it.

WRIGHT: And having a good time.

FORESTIERI: Having a good time, absolutely.

WRIGHT: It's like you're still learning.

FORESTIERI: I am still learning. I'm enjoying everything I'm doing. My wife and I have had a good life.

JOHNSON: That's wonderful. We thank you for taking time away from her to come see us today and talk.

FORESTIERI: I didn't take time away from her; I took time away from planting because she's got a schedule of my planting.

WRIGHT: We better let you get back, then.

[End of interview]