

NASA HEADQUARTERS NACA ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT

JOHN C. DUSTERBERRY
INTERVIEWED BY JENNIFER ROSS-NAZZAL
PALO ALTO, CALIFORNIA – 29 SEPTEMBER 2005

ROSS-NAZZAL: Today is September 29th, 2005. This oral history session is being conducted with John C. Dusterberry of Palo Alto, California, as part of the NACA [National Advisory Committee for Aeronautics] Oral History Project sponsored by the NASA [National Aeronautics and Space Administration] Headquarters History Office. The interview is being held in Palo Alto, California, during the Eleventh NACA Reunion. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright.

Thank you again for taking the time to meet with us this morning. I'd like to begin today by asking you how you began working at the NACA.

DUSTERBERRY: Well, it was in the middle of the war, May 1st, '43, I believe, and I had just graduated from Stanford [University, Palo Alto]. In fact, the last quarter of my senior year, because of the exigencies of the war, I had gone to summer school in the summer of '42. I got out a quarter earlier than I otherwise would have gotten out, and I had been recruited by NASA—by NACA, pardon me. Art [Arthur B.] Freeman, who was later an Associate Director of the Center, came out to Stanford on a recruiting trip, and then he took me on a trip through Moffett Field [California] afterwards.

I had known a little bit about [NACA] and was excited by what I saw out there. I'm an electrical engineer by training, and he didn't offer me a job as an electrical engineer. They were taking anybody who had an engineering background and they would teach them aeronautics, I

guess. I was delighted to find when I first went to work that there was an opening for a junior electrical engineering job, and I got that opening. So that's how I started working there.

ROSS-NAZZAL: I wonder if you can describe the work atmosphere out at Moffett Field when you first arrived, and then also what it was like. What did it look like when you first arrived in '43?

DUSTERBERRY: Well, the forty-by-eighty wind tunnel was under construction. The two seven-by-ten wind tunnels and the sixteen-foot wind tunnel were in operation. The Flight Research Hangar was in operation, and I believe the management offices were there, because the Administration Building, what's the present Administration Building, was under construction at the time, as I remember. There was a big Shop Building. There was a Utilities Building, where I worked, which housed the motor pool and the electrical shop. There was something else in there I can't remember. Oh, the stockroom. And that was the extent of the buildings.

I think the atmosphere I would think of as kind of frantic. Maybe it always has been frantic. [Laughs] But there was a war on, and they were trying to build a Center and trying to do research and trying to do all these things at the same time. I guess I found myself pretty bewildered. They didn't really have the chance to teach you very much. You had to kind of learn by doing.

Certainly one of the great things about it was, because of this—because everyone was so frantic, because there was so much to do—particularly in a wartime atmosphere that, although you started out with pretty trivial jobs, you really had responsibility thrust on you earlier than you did ten years later or something like that. They had to give the job to somebody, and the fact

that you didn't know how to do it and had to find out for yourself how to do it, that was just one of the rules of the game in that atmosphere. [Laughs]

ROSS-NAZZAL: What was your first assignment when you first came on board?

DUSTERBERRY: I can't really answer that specifically. There was a lot of trivial jobs which were really things that the more experienced electrical engineers had to get off of their jobs, I mean, they didn't have time to do, and they were glad to have somebody do them for them. So I didn't for a year or so consider I had any project or that I was working on any particular project or anything. Since the forty-by-eighty wind tunnel was under construction and, in some ways, they had never accounted for some of the electrical design, I got doing some of that.

I remember designing the installation of a bunch of underground duct lines for electrical cables and going out and seeing people with a shovel, having to excavate those duct lines. Made me feel either guilty or powerful, I'm not sure; some combination of guilt and power, I guess. Nobody should have to work with a shovel like that.

ROSS-NAZZAL: As you came out to work at Ames [Aeronautical Laboratory, Moffett Field, California], what division or branch were you assigned to?

DUSTERBERRY: Well, I was assigned to what was called the Electrical Branch, which had both electrical engineers and electricians in the same group under Jim [James A.] White as Branch Chief.

ROSS-NAZZAL: Your biographical data sheet indicates, and you've also indicated today, that you did some work with wind tunnels. Can you talk to us about designing wind tunnel drives and their auxiliary systems?

DUSTERBERRY: I guess the first important job I had was on the twelve-foot wind tunnel auxiliary system. I was assigned the electrical engineering job. The twelve-foot wind tunnel was pressurized. You could run it from a vacuum up to seventy-five pounds per square inch pressure, and they had about five thousand horsepower worth of air compressors to evacuate or pressurize the tunnel, together with equipment to take water out of the air and so on. I was assigned the electrical work on that job. Now, I guess it's fair to say the systems engineering had been done by the contractor, but no installation plans had really been made, and I had to make all the electrical installation plans for that. I'm not sure when that started, probably about a year after I got there.

ROSS-NAZZAL: What did that involve, making the installation plans?

DUSTERBERRY: Well, you had to make drawings of where all the underground duct lines went from the motor-starting equipment to the machinery, to these three large motors and about ten small motors, oil-circulating pumps, and things like that. You had to make up a control sequence drawing, so you press the button and certain auxiliaries start, and then you check to see, with pressure switches and things like that, that things have come up to pressure and that it's okay to start the big machines. And then a sequencing so that you didn't start all the thousand-

horsepower and larger machines, didn't start them all at the same time, but sequenced them on. That's about it, I guess.

ROSS-NAZZAL: Did you play any role in the construction then of the wind tunnels?

DUSTERBERRY: Absolutely, yes.

ROSS-NAZZAL: Can you talk about that?

DUSTERBERRY: I guess you could call it construction supervision. I was learning more from the people who were installing it than I was teaching them, I think it would be fair to say. And I must say, they were all contractors—they were not NACA personnel—and they were very helpful.

In fact, one of the things—this is getting away from your question, but one of the things I found out was that I learned an awful lot from people like head wind tunnel mechanics and chief electricians and people like that, the nonprofessionals. I really learned a lot from them. Part of the technical—I think more than that—well, how to get the nonprofessional people to do the work that you wanted them to do and not act like you knew it all. Ask them how to do it, or ask them how they would do it. Don't tell them how to do it, because they were skilled tradespeople, and they knew more than a punk engineer knew. Generally, throughout my career with NACA, I think that always happened. In a sense, they helped you grow up I think is the best way to put it.

ROSS-NAZZAL: Once the wind tunnels were finished, was there ever any sort of dedication ceremony?

DUSTERBERRY: They used to have these—what were they?—triennial inspections. In a sense, the place shut down for about three weeks, and they invited in several hundred people, academics, local chamber of commerce, for these big tours around the Center, which were very formal. There would be a explanation at each wind tunnel or flight line, what research was going on and what had been accomplished. They were big public relations deals. I remember that the forty-by-eighty wind tunnel was dedicated on one of those. But that occurred only once every three years, and that's the only dedication that I can recall.

ROSS-NAZZAL: I had another question about the impact of the war. I had read in one of the Ames books that some of the men were inducted into the Navy.

DUSTERBERRY: You bet.

ROSS-NAZZAL: Were you one of those men?

DUSTERBERRY: Yes.

ROSS-NAZZAL: Can you talk about what was going on at the Center and how people reacted to that news?

DUSTERBERRY: Well, yes. Let's see. I worked there for about a year as a civilian, and then they, whatever arrangements NACA had with the Selective Service was renegotiated, and renegotiated differently at the different Centers. At Ames, everyone who was not a journeyman tradesman or not a professional at some level—and I couldn't tell you what level; P-4 or something like that, I would guess, was the designation at the time—who was draft eligible was drafted into the Navy. You were given the opportunity to go out and apply for a commission, which I did. I had a speech defect at the time, and I didn't get a commission.

Everyone, whether he got a commission or not, went through a six-weeks boot camp there at Moffett Field, where we stayed in the Navy barracks. They gave us, oh, I don't know, maybe three hours of training every morning, and this was naval history and—what did they used to call it? “Rocks and Shoals”—[*Articles for the Government of*] *the Navy* or something. Which you were supposed to read to every enlisted man, once every six months or something like that, so you can't ever say, “Nobody ever told me I shouldn't do that.” That took about three hours of our day, and then we still had to work eight hours for NACA, so we worked through in the evening till eight o'clock or something like that. That went on for about three—well, I guess about six weeks, and then you were given some sort of rating. I was made a Chief Petty Officer; chief Specialist X was exactly what it was called. Some people got commissions. Some people got first class or lower, Petty Officer First Class or lower.

That was kind of tough for—the people who got commissions were a lot better off than those that didn't, in the sense that they could live off the base. I had recently married, and my wife and I were living in East Palo Alto, so for a while I got home every fourth night and was still maintaining a household, if you could call it that, while people who got commissions automatically—well, had the opportunity to live in the Bachelor Officer Quarters if they wanted

to, or if they didn't want to and were married, got an allowance for food and lodging, which I didn't get. There were some anomalies coming out of the fact that some people got commissions and some didn't, because in the NACA structures, there were commissioned officers working for Chief Petty Officers and things like that.

In fact, there's some story about some Admiral who came in and got a briefing from a Branch Chief who was—well, if your coat's off, it's not immediately obvious whether you're a commissioned officer or a Chief Petty Officer, and this Admiral came in and the Center Director—Engineer in Charge, he was called—took him down to talk to this Branch Chief on some problem the Navy was having. The Admiral said when he left, "What was the rank of that guy in there?"

[Dr. Smith J.] DeFrance said he was Chief Petty Officer.

He says, "Isn't that the Navy for you?" Here was the expert on the subject, who was not a commissioned officer.

ROSS-NAZZAL: You mentioned that you made it home probably every fourth night. Where were you staying?

DUSTERBERRY: We had a little house in East Palo Alto.

ROSS-NAZZAL: Were you living at Moffett Field, though, for the rest of that time?

DUSTERBERRY: Oh yes.

ROSS-NAZZAL: Were there barracks there for—

DUSTERBERRY: Oh yes, yes. You know, there are barracks for four thousand people or something like that.

ROSS-NAZZAL: Was there a cafeteria there on-site for everyone?

DUSTERBERRY: Well, there was the Navy Mess. Yes, there was a cafeteria primarily for civilians. There was the Navy Mess for enlisted personnel, and the Bachelor Officers' Quarters had some kind of feeding facilities. I don't really know what they were.

ROSS-NAZZAL: What was the reaction of most of the people who were working for NACA when they became members of the Navy? What was your reaction?

DUSTERBERRY: Well, I suppose, obviously, you wish that it hadn't happened. At the same time, there were an awful lot of your friends who were out getting shot at, and so you couldn't feel too bad about it.

ROSS-NAZZAL: And how long did you stay in the Navy?

DUSTERBERRY: Almost two years.

ROSS-NAZZAL: So you stayed until '46?

DUSTERBERRY: Yes, it was sometime in the spring of '46. I know it was just under two years because I guess in the Korean War there was talk about calling up people who hadn't served two years, and I wondered if it was going to hit me.

ROSS-NAZZAL: Right. Sure. I can imagine. Let me ask you some more questions about your work with the wind tunnels. Your biographical sheet indicated that you worked on operation of some of the wind tunnels. What did that involve?

DUSTERBERRY: Well, it depends what you mean by operation, I guess. I wouldn't have called it quite operation, in that I would say that those people who were conducting the tests were the wind tunnel operators. I never did that. I, at times, operated—well, you're certainly on-call for electrical problems on all wind tunnels, and as you achieve some rank in the organization, you were expected to walk in and find the trouble on any wind tunnel which wouldn't start or any of the auxiliary equipment that wouldn't start.

I guess the main thing that I think of myself as doing was there was a lot of installation of things like model support systems. They put the model on a couple of prods, two or three prods sticking up, and then they want to change the attitude of the model or things like that, and automatic systems to do that, and I did a lot of work on design and installation and troubleshooting on those systems.

ROSS-NAZZAL: So were you building models then?

DUSTERBERRY: No. No, I'm speaking of the kind of things that hold the models in the wind tunnel. As you probably know, the model is sitting there on some sort of support system, and that in turn is connected to a force-measuring system of some sort so you can see what forces the wind imposes on the airplane.

ROSS-NAZZAL: What were some of the challenges that you encountered while working on this type of position or job?

DUSTERBERRY: I think that there weren't many precedents for the design of such things, and that they were unique systems, and so you had to figure out how to make it work. You had to figure out a design that would make it work.

ROSS-NAZZAL: Can you give us an example of some of the groundbreaking techniques that you might have come up with?

DUSTERBERRY: Well, I guess in the forty-by-eighty wind tunnel model support system—on all those systems—there is some sort of shroud surrounding the struts that hold the model in the tunnel, and let me explain that further. You want to get the wind forces on the model, not on the struts, which are also out in the wind, so you put a shroud around the struts so those forces are not detected by the force-measuring system. So then when you move the thing, when you move the model, you've got to move both the strut and the shroud but keep the shroud away, not touching the strut, because then the forces that would be on the shroud would be transmitted to the strut and to the force-measuring system. So you need a system where one thing tracks

another, so you've got one motor moving it, moving the strut, and one motor moving the shroud, and you've got to keep them tracking each other. Those turned out to be rather difficult control problems.

ROSS-NAZZAL: How many people typically worked with you on these systems?

DUSTERBERRY: Well, there were, of course, mechanical engineers. I was doing the electrical engineering work. There were, on the building of a system like that, of course, there's a lot of people in the shop before they ever showed up to be installed, showed up in the wind tunnel to be installed. I never worked in the shop or were contracted out. And then the crew of wind tunnel mechanics had probably six people or so putting it together, and a couple of mechanical engineers and one electrical engineer, I guess, putting together a system like that.

ROSS-NAZZAL: Where was your office located at the time that you were working on these?

DUSTERBERRY: It was in what was called the Utilities Building. It's across the street from the fourteen-foot wind tunnel.

ROSS-NAZZAL: How much time did you spend in the wind tunnels while you were working on these systems?

DUSTERBERRY: Oh, maybe 25 percent of the time.

ROSS-NAZZAL: What was your average workday like? Can you give us a sense of when you might arrive, what you might do during the day, and when you might leave?

DUSTERBERRY: Actually, arriving—well, particularly when I was a civilian, arriving and leaving had to be pretty much on a schedule because of gas rationing during the war. You had to form ride groups, and that meant everybody got there about eight o'clock and everybody left about four-thirty. Now, obviously, if you had some hot job going on, you might have to stay beyond four-thirty. I hitchhiked home a lot of times.

Repeat the question, please. I got on a side track there.

ROSS-NAZZAL: Oh, sure. No, but that's great information for us to have, actually. Can you give us a sense of your workday as you're working out at Ames, what you might do during the course of the day?

DUSTERBERRY: Well, I don't really know what to say there. Most of the time the work was in the office, and probably you ended up taking at least one trouble call a day which got you out of the office for what could turn out to be two or three days, but more likely fifteen minutes to an hour and a half. Most of the work was in the office, and I really find it difficult to characterize it other than that.

ROSS-NAZZAL: What type of tools or equipment did you use to do your job?

DUSTERBERRY: Well, I guess about the only thing an electrical engineer normally kept with him was a so-called analyzer or a multimeter, which was a combination voltmeter, ohmmeter, ammeter, and you used that a lot. In fact, I can recall when, after I had been there about a year, I guess, Jim White was moved upstairs, and the new Branch Chief saw to it that every engineer got a multimeter so that he didn't have to go out someplace without an instrument and then come back to his office to get one, that he could take one with him.

That, to me, was kind of indicative of the depression. You know, in the questions or fact sheet that you sent out or whatever, it said what were the changes from the war. It seems to me you could see the depression in the organization still, that every electrical engineer didn't have a meter all the time when they should have, and if you wanted to make a phone call, you had to get—oh, god, this went on into the NASA—if you wanted to make a long-distance phone call, you had to get permission of your Division Chief or somebody or other. Those things, to me, were holdovers from the depression, from the time when they really had to squeeze every dollar, and that they were just carried on after the depression was over.

One of the guys I worked for, it seemed to be more important that you got to work promptly at eight o'clock than it was what you did after you got there. [Laughs] And I think that was a holdover from the depression. You know, during the depression there were a lot of good people who didn't have jobs, and so if you had a job, you got there at eight o'clock, or a quarter to eight, better yet. I think you could see signs of the depression even in the early forties.

ROSS-NAZZAL: Once the war ended, what was Ames like?

DUSTERBERRY: Let's see. The six-by-six-foot wind tunnel was started late in the war, and I worked on that. There came a period in the late forties where I felt that things were just kind of drifting along. The jobs weren't very interesting. I think you ought to be careful about my saying that, because I was not on the research side of the house. The people on the research side of the house may have felt, "We've finally got the equipment we need, and we're able to do the work we always really wanted to do."

Well, I had been in the business of providing new equipment for people, and when the war was over, they said, "Well, we don't need anything new for a while," and so things slowed down to, "Well, can we make this a little better? Can we make that a little better?" And there were no big construction projects.

ROSS-NAZZAL: Did you work at all on deactivating any wind tunnels or making changes to certain wind tunnels?

DUSTERBERRY: Deactivating, did you say?

ROSS-NAZZAL: Yes. Did you help out with deactivating or closing down any wind tunnels?

DUSTERBERRY: No. I don't know of any that were—well at least under NACA, I don't know any that were deactivated at that time.

ROSS-NAZZAL: What about making any changes to any wind tunnels?

DUSTERBERRY: Yes, a lot of changes.

ROSS-NAZZAL: Can you talk about some of the changes that you helped [with]?

DUSTERBERRY: Well, there were a lot of variable-frequency motor generator sets put in. The wind tunnel models used to have in them motors to drive the propellers in the model, and they had to be very small. They were water-cooled, because you want to get a lot of horsepower output in a small volume. And then you got speed control of the propellers by feeding them with electrical power that was adjustable frequency, from zero to 150 cycles in some cases, zero to 400 cycles in other cases. There was installation of that equipment in a number of wind tunnels that I worked on, forty-by-eighty and the six-by-six wind tunnel. I think that's all.

ROSS-NAZZAL: What was the impact of the use of jet engines on your position at NACA?

DUSTERBERRY: Well, little or none, I'd say, I guess, in the sense that when I was first there they kept buying more and more of these motors to put into models, and they quit buying those, although they were used to drive air compressors in models to simulate the jet in a model. But little effect on the things I did.

ROSS-NAZZAL: What about the use of supersonic aircraft? Did that have any sort of influence on your career?

DUSTERBERRY: Well, only in the sense that I was working on new kinds of wind tunnels, supersonic wind tunnels. In general, in the older wind tunnels the speed of the drive motors went through a continuous range, from zero to top speed, while in the supersonic wind tunnels, they were driven by compressors within the speed being set by an adjustable throat in the wind tunnel.

ROSS-NAZZAL: While you were working for NACA, did you frequently give presentations or write papers?

DUSTERBERRY: Under NACA, not at all.

ROSS-NAZZAL: Was that common for electrical engineers working for NACA?

DUSTERBERRY: Yes.

ROSS-NAZZAL: Did you belong to any sort of professional organizations while you were working out at the Center?

DUSTERBERRY: On the NACA, I had joined what's now IEEE [Institute of Electrical and Electronics Engineers] in college, and that organization has a nice advantage of when you reach a combination of age and length of membership reaches, I don't know, eighty or something like that, you're home free. No more dues. [Laughs]

ROSS-NAZZAL: That's excellent. Were you encouraged by your Branch Chief or anyone else at NACA to join professional organizations and to go to conferences?

DUSTERBERRY: No, no strong pressure. I think encouraged is okay; that is an okay, word, but there was no strong pressure.

ROSS-NAZZAL: Do you recall if NACA paid your dues, or did you have to pay your dues?

DUSTERBERRY: Oh, I recall they did not. [Laughter]

ROSS-NAZZAL: What impact do you think that Ames has had on the surrounding area of San Jose and some of the universities in the area?

DUSTERBERRY: Well, certainly one of the criteria in choosing Moffett Field was the fact that Stanford and UC [University of California] Berkeley [Berkeley, California] were in the vicinity. I don't have a good answer for your question. I don't think I know.

ROSS-NAZZAL: How did you get around the Laboratory once you were on-site? Did you ride a bicycle to get around the site, or did you walk?

DUSTERBERRY: Oh yes. Oh yes, the Electrical Branch had about six bicycles, which were kept under lock and key so nobody else would take them. Then somebody figured out this elaborate scheme where, when the bicycle got old—they wouldn't give you a new bicycle, but when the

bicycle got old, you could ask that it be condemned, and then you could get a new bicycle. But then somehow or other you fixed up the condemned bicycle, so you got one more that way. Yes, mainly by bicycle. When I was first there, the Electrical Branch had no transportation except bicycles.

Sometime during the war—it was before I got there—they had a barrage balloon. You know what a barrage balloon is? Well, during the war they set up these free balloons with cables dangling from them so an airplane couldn't fly low. That is to keep out enemy fighters, primarily, or any kind of enemy plane. One of them broke loose—I think it was from Mare Island—and it ended up on the Ames Substation, where it shorted out the buses, I guess. It was before I was there. I guess the engineer in charge said, "Well, look, you guys weren't really equipped to handle a big emergency like that. I'm going to get you a truck."

ROSS-NAZZAL: Do you recall when you got that pickup truck? Was that before you came or after?

DUSTERBERRY: Afterwards. Took about a year to get the truck, I would guess.

ROSS-NAZZAL: Did you belong to any organizations that were active at Ames?

DUSTERBERRY: No. Well, I guess so, in the sense that in the first ten years or so, fifteen, maybe, the Electrical Branch had a softball team, and everybody under the age of thirty played on the softball team. Everybody had to, because that was the only way you could field a team.

ROSS-NAZZAL: So did the other branches then have their own softball teams as well?

DUSTERBERRY: Yes.

ROSS-NAZZAL: Do you recall how well the Electrical Branch did in competitions?

DUSTERBERRY: Not really, no.

ROSS-NAZZAL: Were there any sort of dances or social activities that were sponsored by Ames that you attended?

DUSTERBERRY: Not very many. Now, what I'm going to tell you is hearsay, but it's probably so. At Langley [Aeronautical Laboratory, Hampton, Virginia], you know, they were kind of isolated there. There was no large cities in the vicinity, and so that there were a lot of dances and amateur theatricals. In fact, I believe they even had a symphony orchestra there. So when the hierarchy of Ames came out from Langley, they attempted to start things like that here, and my impression was that people here were used to going to San Francisco [California] for the theater and the symphony and things like that, and that they didn't need that bush-league, amateur theatricals and things like that. There were some dances, but it is my impression that the management tried to foster things like that, and they really fell kind of flat because people out here didn't feel they needed them.

ROSS-NAZZAL: Speaking of Langley, did you ever do any work with individuals who worked at Langley while you were working on projects at Ames?

DUSTERBERRY: Not under NACA, no, I did not. Under NASA, yes, but not under NACA.

ROSS-NAZZAL: Did you ever do any work with any of the universities near Ames?

DUSTERBERRY: No. I took some courses at Stanford, but nothing work-related. I mean, the courses were, of course, work-related, but only taking courses there, and I can't even remember—that's one of those places where I can't draw the NACA/NASA line.

ROSS-NAZZAL: What impact do you think that the Korean War had on NACA?

DUSTERBERRY: I didn't see any impact. Now, other people may have and that's quite possible. The only impact I saw was the threat of recalling to service or drafting of some of the people who were working for me at the time. NACA was always successfully able to defend those people against the draft and against recall, but that's the only thing I remember about the Korean War.

ROSS-NAZZAL: By that time, what position were you at NACA?

DUSTERBERRY: I was what's called Section Head of the Electrical Engineering Section. Sometime, I can't remember when, maybe 1950 or something like that, the Electrical Branch

was split into two sections, and there was a branch organization which was just the Branch Chief and, I guess, two assistants, and then there were Engineer Section and an Electrician Section, and I was head of the Engineer Section.

ROSS-NAZZAL: Do you recall why that branch was split into two?

DUSTERBERRY: No. It's not that I don't recall. I don't think I ever really [knew]. I suspect that it was some sort of political move that they could give more prestige to the organization and get better pay for everybody.

ROSS-NAZZAL: I wonder if you could talk about the transition from NACA to NASA that occurred in '58.

DUSTERBERRY: I don't recall any great transition in '58 except, I guess, Jim [James E.] Webb was coming out, and they had to get the sign. They had to be sure they had the NACA signs off of all the buildings and got NASA signs up. And, in fact, the front of the Administration Building had, cast in concrete, "Ames Aeronautical Laboratory" on it, and they had to get a jackhammer and dig that out and put "Ames Research Center" [Moffett Field] out there. That was done in a hurry because everybody thought, "Well, we'll do that in good time," but James Webb was coming out, and they wanted it done before he got there.

I don't recall any big instant transformation. Activities began to expand. There were more people. I got the opportunity to move into flight simulation, which was a great opportunity for me.

ROSS-NAZZAL: Were there any members of Ames who were not happy with the move from NACA to NASA?

DUSTERBERRY: Well, I can remember Smith J. DeFrance, who was Engineer in Charge under NACA and the Center Director under NASA, I remember him saying, "Well, I could have done the same thing and not changed the name; changed the act. We could have done all this under the old legislation." I'm sure he lost a lot of independence, and, well, I'm also sure that he'd worked there long enough so he was reluctant to make any changes. As long as he was the boss, why would you want to change anything? [Laughs]

ROSS-NAZZAL: How do you think that the work environment changed, if at all, when you started working for NASA?

DUSTERBERRY: I think, to me and to a number of other people, there were just a lot more opportunities. There was a lot of different kinds of work going on, so that if you had experience and a record of working hard and doing well, that new opportunities were presented to you.

ROSS-NAZZAL: Looking back over your work with NACA, what do you think was your most significant accomplishment?

DUSTERBERRY: I guess I can't think of any really significant accomplishments there. One thing I think I did after White left and his successor left, the new boss was physically not very well,

and I felt like that I kept the electrical end of the operation out there going. Obviously not all by myself, but I felt I was providing as much direction as anybody else to all the electrical work going on.

ROSS-NAZZAL: What do you think was your biggest challenge while working for NACA?

DUSTERBERRY: I think my biggest challenge was doing what I just told you without making it obvious to my boss. [Laughs]

ROSS-NAZZAL: What do you think has been the impact of your work with NACA on aviation research?

DUSTERBERRY: I've never done any aviation research, so I only enabled others to do aviation research.

ROSS-NAZZAL: Would you like to tell us a little bit about your work with NASA?

DUSTERBERRY: Well, I guess it was 1960. They'd been doing some flight simulation work at Ames, and they were about to put in a small centrifuge. In general, work on simulation machinery was expanding, and they wanted me to set up a separate group to handle that. I was asked to be the Branch Chief of that group, so this was a great change in formal responsibility to me and opportunity to do things more the way I wanted to do them. It expanded to more than that. You asked about writing papers. I began to write papers, which I had never done under

NACA. I began to meet with people from other NASA Centers. I began to go to international meetings. So there was a great personal change to me.

Were these changes because of the change from NACA to NASA, or were they just the way technology was expanding? That's a hard line to draw, I guess, but I never saw anybody in the kind of work I had been doing in electrical machinery, I never saw anybody at Ames do things like that under NACA, and I could do that under NASA. Maybe that was time rather than change in organization; but I think it was change in organization.

ROSS-NAZZAL: You mentioned you did work in simulations. What aspect of simulations, specifically?

DUSTERBERRY: Well, the thing that Ames was primarily good at was motion cues in flight simulation; that is, putting the forces on a pilot, giving him the physical feel of the airplane as opposed to just looking at an instrument panel. We had a lot of machinery to do that, eventually developed a lot of machinery to do that. Then they had really before that had done nothing but an instrument panel, a pilot and an instrument panel and control devices. So the expansion there was to get these motion systems in, get out-the-window visual systems and things like that.

ROSS-NAZZAL: Did you work with any aircraft companies or the military on these simulators?

DUSTERBERRY: Yes. AIAA [American Institute of Aeronautics and Astronautics] set up—there was a working group on flight simulation, which included military and NASA and airframe manufacturers, generally. We used to meet twice a year, I guess, and we'd go jumping around

the country and look at each other's facilities, and people would get up and explain what they're doing. It was a very free interchange of ideas. It was a good group.

ROSS-NAZZAL: How did simulations change over time, from 1960 until you left Ames?

DUSTERBERRY: Well, as I said, when I first got there about all they had was a pilot and a joy stick and an instrument panel. By the time I left, they had big motion-producing devices, out-the-window visual systems, and things like this, so much more realistic.

ROSS-NAZZAL: Looking back over your career with NASA, what do you think was your most significant accomplishment?

DUSTERBERRY: Well, I think I played an important role in putting together the Simulation Lab. The people who had headed it up before thought of this as a sideline to the mathematical work they were doing, which was perfectly okay; it just grew to the point where you had to put more concentration on it, and the people who headed it up before weren't interested in doing that kind of work.

ROSS-NAZZAL: What do you think was your biggest challenge while working for NASA?

DUSTERBERRY: I think it was putting together that simulation stuff.

ROSS-NAZZAL: And when did you finally leave NASA?

DUSTERBERRY: '81.

ROSS-NAZZAL: And why did you decide to leave NASA at that point?

DUSTERBERRY: Well, I worked for two or three years, four years, I guess, in the Director's Office at a staff position, and the last couple of years as a what's called a Research Assistant to the Director, which was a really good job. One thing you did was you were kind of stage manager for every Headquarters review, NASA panel that met and so on. You got to meet many of the important scientific brains and personalities in the country.

The only thing wrong with the job was that it was cyclical. The first time you did these things, nobody told you how to do them, and you kind of fumbled your way through. Then a year later the same cycle starts coming up again, and you thought, "This time I'm going to get it really right." Then the third year comes around and you think, "Oh, not that again." [Laughs] So I asked to be relieved.

As a matter of fact, Hans Mark had resigned as Director to go to work for the Air Force, and his successor, "Sy" [Clarence A.] Syvertson, who is a real nice guy, well, he was Acting Director for some time, and then when he was finally made Director, then they had to choose a Deputy Director. God, that took forever, six months or something. Those last six or nine months I was in that cycle of "god, I'm doing the same thing a third time," but I didn't really want to leave because I felt until the Director or the Deputy Director, there was somebody filling those positions, that it wasn't right for me to further detract from the organization.

I went back and worked on the reconstruction and rebuilding of the forty-by-eighty wind tunnel. I wanted to go back to being an engineer for a couple of years, which I did. I had kind of decided that when they got the wind tunnel running that I would retire at that time. I didn't see any job I wanted to do. I didn't see I was going to get any job that I might want to do, that I hadn't felt I had done the equivalent of before.

As it turned out, I didn't quite stick that out. My wife was taking radiation therapy and she needed help at home, and I actually got out of there three or four months before I planned because I'd seen somebody else to hang in there while his wife went through radiation therapy, and then when she was finished, he said, "Okay, now I'll retire." [Laughs] I didn't want to do that. And that was great luck on my part. As you may know, they had a disaster in the reconstruction of the wind tunnel, and if I'd hung in there until they had that disaster, then I would have been on the horns of a dilemma; do I want to leave now, or do I want to help put it back together? So I was lucky to have gotten out when I did.

ROSS-NAZZAL: So you've been retired since then?

DUSTERBERRY: Yes. I've done some work in the first five or six years after I retired. I did some work on contract for Ames, mainly writing instruction books on various things for the forty-by-eighty wind tunnel.

ROSS-NAZZAL: If you don't mind, I'm going to ask Rebecca if she has any questions for you.

DUSTERBERRY: Why not?

WRIGHT: I have a couple. One of them focuses on budgets. Can you share with us how you put together your budget, especially during those first years in NACA, and then how maybe the budget process changed for NASA? And then again, I know NASA had some lean years as well. But just kind of talk to us about how money impacted the work that you did, if it did at all. Did budget increases or decreases affect your projects?

DUSTERBERRY: I can remember the last simulator we built. I can't give you a good general answer. I remember the last simulator we built. We were told, "You're never going to get the amount of money you need for that. Why don't you make this compromise now, and we'll come back later and bring it up to the specifications that you really want." That's the only thing that I can really remember where we didn't get the amount of money we needed.

WRIGHT: You mentioned earlier about when Jim White took over and gave everyone the instruments that they needed—

DUSTERBERRY: Well, when he was taken over from.

WRIGHT: But you got the instruments. You had said that NACA for a while was living through a depression mentality, that you weren't exactly getting what you needed to do your job. But you saw that change where you got more instruments. When you were in charge of that branch, were you able to get your employees what they needed to do their job?

DUSTERBERRY: I think so.

WRIGHT: How big was your workforce at the biggest?

DUSTERBERRY: About ten.

WRIGHT: And you were scattered all over the Research Center?

DUSTERBERRY: No, we were all in one group, although we worked all over the Center. You just said something that—I can't remember what it was. You just said something that put a spark in my head, but—oh, I know. It seemed to me that I guess in the latter days of NASA, that engineers, the electrical engineers—it was probably true in the other branches—that they should have been hiring more clerical help and fewer engineers, that the engineers were doing things that were primarily clerical tasks that could have been passed on to other people, and some of them would have been happier.

WRIGHT: Probably. Before we started our interview today, you and I were talking about Mr. White and how we're not going to be able to interview him. Is there anything you'd like to add, before we finish our interview today with you, about working for him? Any memories or anything that you have of him that you'd like to share?

DUSTERBERRY: Well, I remember him as a very intelligent and smart person. I guess until I went to work for Hans Mark I think Jim was really the smartest person I ever met, and

remembered everything he learned and knew how to use it. He was kind of a conservative person, but I really admired his intellect.

WRIGHT: Now, he was one of the people from Langley that had come?

DUSTERBERRY: That's right.

WRIGHT: Were there others that you worked under directly that had come from Langley?

DUSTERBERRY: Well, I can remember one man who was in charge of the Drafting Room. It turned out that on one job I had, I had to spend a lot of time with a draftsman, and here I was, a young engineer who really didn't know what I was doing, and the guy who was the head of the Drafting Room was a Langley engineer, and he was one of those people who wasn't your supervisor that you learned a great deal from.

WRIGHT: When you first came to work for the NACA, most of the new hire people that you were working with, were they from this area, or did they recruit them from all over the country to come work with you?

DUSTERBERRY: I wouldn't say they were from this immediate area, although there were a number of people from Stanford and UC Berkeley. There were a lot of tradespeople. There used to be something called the San Jose Technical High School [San Jose, California], and a lot of the tradespeople apparently came directly out of that high school. Graduated from high school

just about the time Ames started, and constituted, at the time, the journeyman level in a number of the trades there; as years went on, rose to be heads of the various shops and so on.

Oh, one thing about the Navy, in addition to the people who were at Ames, the Navy sent in a lot of people. They had a lot of ensigns were who in the V-12 Program, which was a Navy program that allowed you to stay in college, and when you got out, I guess you got an ensign's commission when you got out. A lot of those people, they were really just stockpiling in universities till they needed them. They sent in a lot of people. A lot of those people that came out of the V-12 Program, they were scattered all over the Center. I think there were three of them or four of them who were electrical engineers, but they were scattered throughout the Center.

Then they also sent in a lot of tradespeople, some of them who came off aircraft carriers and things like that, who had spent enough time at sea or on the battlefield that the Navy gave them duty Stateside for a while. They must have sent in a hundred and fifty people or something like that. I'd forgotten about that.

ROSS-NAZZAL: How many people were working at Ames during World War II, do you recall?

DUSTERBERRY: My badge was number 6-0-6, and obviously, some people had left. About five hundred, I would guess. By the time I left, there were about three thousand, although, as the boss used to put it, there were three thousand people come through the gate every morning, but not all of them were NASA employees.

ROSS-NAZZAL: How do you think Ames changed from the time that you arrived until the time that you retired?

DUSTERBERRY: I think it was a much more open establishment, open in the sense that individuals had more freedom to pursue their own goals. In general, I think that's right. It's obviously much more diverse. It was not just propeller-driven airplanes, and it was not just airplanes, because it involved spacecraft materials and life sciences, so it was a much, much more diverse organization.

You read about what they did yesterday?

ROSS-NAZZAL: About Google? Yes.

DUSTERBERRY: There you go.

ROSS-NAZZAL: That's fantastic. Do you have any more questions, Rebecca?

WRIGHT: No.

ROSS-NAZZAL: Is there anything that you'd like to tell us that we might not know about that we should talk about, about NACA? I'm curious to know, did a President ever come out to NACA, [Harry S.] Truman or [Dwight D.] Eisenhower, while you were there?

DUSTERBERRY: No. Lyndon [B.] Johnson came out when he was Vice President.

ROSS-NAZZAL: Can you tell us about that?

DUSTERBERRY: Well, we did a demonstration on a moving base simulator for him, that is, motion, force-exhibiting simulator for him. And then I was just reading in a biographical note on George Cooper that George Cooper had flown Lyndon Johnson in one of the simulators. I've got a job to take one of the tour groups out to Cooper's Winery tomorrow, so I dug up some biographical information on him, and I noticed that he said, "Lyndon Johnson said he knew how to fly an airplane, but he didn't. I had to rescue him every time." [Laughter]

Pat [Thelma Catherine Ryan] Nixon came out one time, but those are the only presidential—well, neither one was president at the time.

WRIGHT: You've spent a lifetime at Ames. Did you ever think about leaving and moving somewhere else?

DUSTERBERRY: Yes. Well, about the time I got this job in flight simulation, I felt that, well, as I told you, I felt that my boss wasn't physically capable of keeping the place going, and that I was doing a great deal of it—the Electrical Branch—and that I wasn't getting credit for it or getting paid for it, and yes, I started looking around for a job. Fortunately for me, this other opportunity came up about that time.

ROSS-NAZZAL: We thank you for your time this morning.

DUSTERBERRY: Sure.

[End of interview]