

SHERYLL GOECKE POWERS

NASA ORAL HISTORY

INTERVIEWED BY REBECCA WRIGHT AND SANDRA JOHNSON
NASA DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CA – JUNE 13, 2001

WRIGHT: Today is June 13, 2001. This interview with Sheryll Goecke Powers is being conducted as part of the NASA Headquarters History Office Herstory Project. The interview is being conducted at the [NASA] Dryden Flight Research Center by Rebecca Wright and Sandra Johnson.

Thank you again for taking the time to meet with us to discuss your experiences while employed with the NASA Flight Research Center in California, and we'd like to begin today by gathering some background information about you. Can you share with us where you're originally from?

POWERS: Iowa. I was born and raised in Iowa, the central part of Iowa.

WRIGHT: And how did your travels bring you here?

POWERS: I went to college at the Iowa State University and they had a co-op program at that time with Dryden. Well, it wasn't Dryden at that time, but they had a co-op program with what is now Dryden, and I signed up for that. Eight of us came out that first year.

WRIGHT: And were you all females, or were some males and females?

POWERS: Two of us were females. Emma and I roomed together. Emma Jaycox and I roomed together. The guys, some of them roomed together. I'm not sure how they split up, but they had

friends that they stayed with, too. At the time, I was at the end of the freshman year and there were three of us who started out in aerospace engineering at Iowa State, and Emma and I were the ones that came out here. The other girl, and I don't remember her name at all, dropped out of the aerospace program the first year and Emma dropped out after we went back.

They always told you, when you had your freshman orientation—I don't know if you had that or not in yours—but in the freshman orientation for engineering, we're all sitting there, we're all wide-eyed, and they say, "Okay, now look to your left and look to your right," and we're sort of bobbing our heads back and forth, and they say, "Now, when you graduate, only one of you is going to be in the class," and that was about right. So there was about one-third of the people who started in the freshman year graduated.

WRIGHT: When you came as part of your co-op program, what year was that?

POWERS: 1963.

WRIGHT: At that time, aerospace engineering, was that a relatively new field?

POWERS: Yes, it was more the aeronautical, but Iowa State had gone for the aerospace engineering.

WRIGHT: What made you interested in that field?

POWERS: I couldn't really decide what I wanted to do, and there was an article in the *Des Moines Register* Sunday paper about a woman who'd gone into engineering, and it sounded interesting and I liked planes. I thought that would be fun to do, and so that was why I focused on aerospace

engineering.

WRIGHT: Was this your first time away from Iowa to come to some place as exciting as the NASA Flight Research Center?

POWERS: Oh, yes. Yes, it was the first time. Three of us flew out together, literally, in a small—it was Piper Tri-Pacer. Emma knew a guy who was willing to fly us out, basically for the cost of the gas. So it was myself and Emma and Jim, whose name escapes me right at the minute. Anyhow, we all flew out together, and we left from Marshalltown is little airport and he flew in there.

Not realizing the size of the airplanes, I'd already packed my bags. I knew they were somewhat weight-restricted, but I figured, well, I weigh less than they do, so I can pack more than they do. But there isn't that much room in a Piper Tri-Pacer, so my mother shipped it out to me on a Greyhound bus.

Jim Cooper was the guy I came out with. He and I were in the back seat because it was Emma's friend, so she got to ride in the front seat. We flew into Oklahoma, Oklahoma City Airport. The significance of that is, I was doing great until that time, so we got off and I wasn't feeling really good, so I just had 7-Up. I remember that I had 7-Up to drink. The rest of the flight wasn't pleasant for anybody else, me included. I didn't feel good, but luckily he had a coffee can. Poor Jim, he sat in the back seat with me. I'm busy barfing away in my coffee can, and they're sitting in the front seat. It wasn't a very pleasant trip for them, either.

WRIGHT: But you got there.

POWERS: I got there. Of course, my mother, she was—and my father was there, too. There were

tears in their eyes as they watched me take off, especially in this little tiny airplane. I don't know if you've ever seen a Piper Tri-Pacer, but they aren't very big.

WRIGHT: Were your parents involved in engineering in any way?

POWERS: No.

WRIGHT: So this was a new field for them as well.

POWERS: Yes. My brother had gone to college. He majored in probably something to do with zoology because he worked for the Conservation Commission. But no, my mother had gone to college, actually, which was rare for her age. She was born in 1905. I was the youngest by a lot in the family. She went to college. She actually went to Iowa State, only it was Iowa State College at that time, I think, is what it was called at that time. She only went for two years. She and her sister went, but her sister didn't want to continue, and my mother didn't want to go on by herself, and she didn't want to teach. So then she went to a business college.

My dad didn't graduate from high school. They were farmers and his father said, "I need you on the field. I don't need you in school," so he never graduated from high school, even.

WRIGHT: I can understand why they had tears in their eyes then, as you fly off in a plane and then off to a land of California.

POWERS: Oh, yes, because it was the desert. It was going to be warm and really nice. So I didn't bring any heavy coats. I came out in the end of May. I started right after Memorial Day. And of course, as you know, from being here in the desert, it gets pretty hot in the summer, but the

nights get really cool, or they can get really cool, and I wasn't expecting that. And then the winters get cold as well.

I didn't go back. I was out here for six months at that time, so I went back in, oh, it would have been right around Christmas. November. It must have been around November. Yes, it was right around Thanksgiving.

WRIGHT: You didn't go back the same way you came, though, right?

POWERS: Oh, no. Well, the first time on the co-op program, the first and last time, you have to pay for your own transportation. The other advantage of going out with Emma and with Jim was that there was a group of us, and it turned out we lucked out with the guy because none of us were old enough to rent a car, so he was able to rent a car and we got a place to stay before he flew back. We never even thought about that, but you can't rent a car at nineteen.

WRIGHT: No. I think even till today you can't do that.

POWERS: That's right. I think you have to be—

WRIGHT: I think it's twenty-five.

POWERS: I think so. I think somebody else was talking about that.

WRIGHT: Did you land close by?

POWERS: Oh, yes. We landed at Fox Field [General William J. Fox Airfield]. You'll see a sign

for it when you go back to Lancaster [California].

WRIGHT: You kind of had a bird's-eye view of where you were going to be.

POWERS: Yes, we stayed in Las Vegas [Nevada]. We made it to Las Vegas the first day. By the time I got there I was really hungry, and the guy was really worried because I was eating a lot. I'd lost, kind of barfed everything out on the plane. And then we flew into Lancaster. It was dark when we flew in, naturally. It was quite a trip. I think actually it was worse for the other people. I mean, I was sick, but they had to listen and watch me, so they had a much worse time of it than I did.

WRIGHT: Everybody made it, and your roommate stayed with you.

POWERS: Yes. We roomed together that year.

WRIGHT: Were you in town in Lancaster, or were you out here on—

POWERS: No, we were in town. Earlier, they did have places for people to stay on the base, but by the time, by 1963, they didn't really have any places on the base that people could stay long term, so Emma and I stayed in a trailer court. We had our own trailer. We lucked out. We were right across from the restroom. They had a restroom area there. Because the woman told us when we rented the trailer, "Don't flush the stool in your trailer. It's slow-flushing." Oh, okay. So we never did that.

WRIGHT: What a summer.

POWERS: But we were close to where they had the restroom in the trailer court, so we could just run over there, so that worked out really good.

WRIGHT: And how did you get back and forth to the Center?

POWERS: Well, some of the other guys had a car. Actually, probably a couple of them had cars, so we carpooled with them. There was also a bus, but the bus didn't go by our street, so we were in the carpool.

WRIGHT: Give us your first impressions of the Center as you came here those first days.

POWERS: I don't really remember much about that. I think everything was just so new. The trip and everything had just been so new that—obviously, it was considerably different than Iowa, as far as the green went, as far as the humidity went. It was quite a bit different.

The first group I worked with—at that time, the groups were more in just rooms. We didn't have the individual cubicles. So I went in this first group and all the desks are really close together because that's how they got so many people in there. So your desk would face somebody else's. It was just a lot of different people to meet. It was a fun time.

They were adding on to the building at that time. The '63 addition everybody refers to, and of course, they had this sign up, "Keep Out" so we all checked it out to see what was going on in the building. But it was a good group of people I worked with then.

WRIGHT: Were a lot of them co-ops or were a lot of them other?

POWERS: No. I was the only co-op in our group most of the time. Well, there were actually two co-ops. He wasn't really in the co-op program. He was in a different program, so there were two students in there. He was an older student, actually, too. How many people were there in there? Well, Al Covington was my immediate supervisor. Then there was Lovic Thomas and Jack [L] Ehernberger, Dean Webb, Harold Washington, Bob Barron, Gene Matranga, and Don [R.] Bellman. I think that was most of them. And then Frank Beverly was the other guy.

So the first year I was here the group was working a lot on what they called LLRV, the Lunar Landing Research Vehicle. Don Bellman was one of the big drivers of that. He was pushing that, and they didn't have a current model of it, so they gave me a pile of sticks—they had little wooden dowels—and the drawing, and you just cut the little dowels out and you made a model of it.

So I made a model of the LLRV. You may have seen it on your tour. I don't know if you did or not. They call it the flying bedstead. It's a very unusual shape. Don had made the little engine shapes. I don't think he made the actual engine himself. He may have had somebody else do it. But he made the little jet rocket things that we glued on there. It was interesting. I had never built a model before in my life and here I am getting a pile of sticks and a knife and a bunch of glue and you put something together.

WRIGHT: And that was something that would basically go down as a training vehicle for a monumental time in history.

POWERS: That's right. And they had a big box. It was a good-sized model. They had a big box built for it and they hauled it around to show to people. They'd actually pull it out and say, "This is how it's going to work," and the engine would gimbal like it was supposed to gimbal, and making sure where all the little rockets were. So that was different. Like I said, I had never built

anything like that before. Never built a model.

WRIGHT: Is that model around still somewhere?

POWERS: I don't know what happened to it. I don't know. It was big. It had a big box. It was probably about two, at least two feet, maybe three feet long, and at least a foot wide, maybe eighteen inches wide. The model itself stood up—how high would that be? About eighteen inches. So it was a good-sized model. It was too big to really keep under your desk, and I don't know what happened to it. Nobody can figure out what happened.

Somebody gave me an earlier version, an earlier model, that was built. It was much smaller. I don't know where it was, but they found it, and they knew I'd built one so they brought it to me and I kept it for a while and I finally gave it to Dill [Hunley – Dryden Flight Research Center Historian] when they started collecting their historical models. But mine was bigger. I don't know. I've asked everybody who was involved with it and they have never been able to figure out what happened to the model.

WRIGHT: Was that the primary focus then of the group that you were in for the first stage?

POWERS: Yes. That's what I remember most about them working on. They also did a lot of the airspeed work. Terry Larson was also in that group. They did a lot of the airspeed work and he did a lot of plotting. Most people don't do the plotting anymore. We'd have dreams about these little points after a while, we did so much plotting of them. It was very tedious work, very time-consuming, very meticulous.

Basically, you'd take a sheet of paper and it had many little columns on it, many rows, and we'd fill it all up with numbers and we'd plot all those numbers on a piece of paper. So you got

really familiar with your data.

WRIGHT: Was it many days of your time during those weeks?

POWERS: Yes. That and building the model, yes.

WRIGHT: Did you have any expectations of what you would be doing during your co-op term, or were these something totally different than what you expected? Well, I suppose the model, because you'd never done that.

POWERS: I don't think I knew what I was going to be doing. I was kind of naive in that respect. I didn't really have any expectations. I just was coming out here to work, and I didn't know what was going to be involved with it. We had only had the first of—you hadn't even gotten into your aerospace engineering courses the first year, it's just your general curriculum, where they weed out most of the people. And then you get into the second year where you start getting into the courses, so I didn't really have a feel for what was going to be involved.

WRIGHT: It sounded like you were ready for any surprises that came your way then.

POWERS: Yes. Well, Jim Cooper worked here, but we were the only two co-ops that came back after college to work at Dryden, of the original eight that started. The others all went elsewhere.

WRIGHT: Was that the first time that Dryden had had a co-op program as well?

POWERS: No.

WRIGHT: It just happened to be your group?

POWERS: It happened to be my group. I think it was the first one with Iowa State. There were other people out here who had been to Iowa State, and graduated from Iowa State, but I think it was the first co-op program at Iowa State. It continued for a few years, but then the co-op program at Iowa State was canceled because they didn't think that Iowa State had enough minorities in their school.

WRIGHT: I'm glad you got here when you did. You were here for six months, was that your term, that you said?

POWERS: Yes. There were three, six months, and then the last one you had to go back for your full senior year of school, so it was only like three months. I should say, Iowa State dropped out of the co-op program, too, because they kept cutting down how many they could send, and pretty soon it got to where the numbers were so small that they couldn't justify rearranging their schedule for them. But the main reason Iowa State got out was because NASA didn't feel they had enough minority students.

WRIGHT: That's too bad. When you went back that November, did you have any thoughts of staying back in Iowa, or were you looking forward to coming back here?

POWERS: No, I got into the program, so I was looking forward to coming back. I expected to come back and I was looking forward to it. I'd made friends out here.

WRIGHT: When you returned, did your duties change?

POWERS: The overall duties remained the same. The projects would change. But basically, we didn't have the computers yet so you were doing just a lot of hand labor. Used the slide rules. Not the calculators, mechanical calculators so much. Of course, when the hand calculators came in, the hand computers came in, that was a big deal. Everybody had to have one of those. You could use those a lot, but you still were transcribing everything on paper because you didn't have anything.

Then when they started getting the printed ones, ones you could actually print stuff out, that really changed. They started getting to the mainframes, the big computers. A lot of it, for a long time, until the personal computers really started to get on the individual's desk, you still did a lot of hand work. You don't do much of that anymore. Everybody has their own programs that they run instead.

WRIGHT: What were some of the first projects that you worked on, other than that?

POWERS: X-15. I worked on that. The LLRV continued on for quite a while, and then I worked on the B-70, XB-70 and the X-15 were the first ones.

WRIGHT: The LLRV, the first summer, and you built the model and that was your group, and then when you returned, were you able to watch the progression of this vehicle, and could you share some of the evolution of that process?

POWERS: Well, the next time I came back, they'd gotten to where they were actually—I think they had some of it built already so now you had to have your configuration control and your

drawings to keep everybody updated on that, and I was involved with that at that time. I can't remember when they started flying it. They may have flown it when I was back at school the first time. I don't remember that. I don't remember being involved with the flights on that.

WRIGHT: So you didn't get to see it fly?

POWERS: I don't remember seeing it fly. I remember seeing it on the videotape, but I don't remember seeing it fly. The X-15, obviously—well, you may not be familiar with that, but they were starting their control rooms at that time. I'm not sure when they actually started the control rooms, but you could go up and they'd have a few strip charts they could watch for the X-15 flights. But then when it landed, everybody would go out either on the roof or on the lake bed so you see it come in, and that was always fun.

WRIGHT: What was your part of the X-15? You mentioned that you had worked on that.

POWERS: I worked on the base drag area. I wrote a report about the base drag on the X-15.

WRIGHT: Could you give us some details of how you collected that data, and how long it took? Kind of the process of how that came about.

POWERS: You'd identify—well, actually, you didn't identify points, you just took whatever points you could get on that one, but the data was all recorded on film, so you needed to decide what kind of range you needed for your [pressure measurement instrument] so they could calibrate it so you'd get the best spread in your data. [What you wanted to see was the change in your data with changing flight conditions. For example, you were expecting a pressure change in the range

of 0-2 psi. If the range of the instrument measuring the pressure was too large, say 0-10 psi, than your data line on the film would be insensitive to small changes in pressure, the resulting data line would be almost constant and you could only determine gross changes. However, if the range of your pressure instrument was too small, say 0-1 psi, than you would lose all the data over 1 psi. The data line would disappear off the edge of the film when the pressure was greater than 1 and not reappear until the pressure was again less than 1. The same loss of data would occur for pressures less than zero if you had assumed the pressures were positive and they actually included negative as well as positive values. The chances of negative pressure values were very likely because the pressures for most experiments were usually a differential pressure from a reference pressure. In other words, the difference between the pressure at the chosen location of your experiment compared to another pressure (referred to as a reference pressure). Maintaining and measuring a reference pressure also required skill and expertise. Using a reference pressure meant that you also needed to have a feel for how this pressure varied during the flight so you could estimate how the differential pressure would vary from the reference pressure during the flight. You could usually determine a good estimate for the required range in differential pressure. The first flight of your experiment showed how good your estimate was.] So you'd do that and then they would fly the airplane and it would be recorded on the film.

They'd get the film back and they'd develop it and then you'd—you could either have them read all the traces off, or you could read the traces off, but before they would give it to you, they'd indicate where the traces were and they'd start the time for you, so you knew what the time was. So then you could look at the film and you could read the deflection from your reference line.

Then you go to your calibration sheet, which showed you what that was in terms of

pressure, and then you'd put that value in, so that would give you the deflection from your reference, and you know what your reference pressure was, so you could add that on there so then you could come up with pressure, the information, you had the base then.

And then you kept track of the times, because when they came out with their final charts—this is where the airspeed group came in—they would do a master chart that would plot the altitude, the mach number, the dynamic pressure. I think they had the angle of attack on there, probably the angle of sideslip as well.

So then you would take your time, go to the plots, and get the values from there for your mach number and they had velocity on there as well, or your dynamic pressure, to use in your calculations to calculate your base pressure. It was fairly time-consuming. And you got to look at a lot of little tiny lines, but you got pretty good at estimating where it was within a square because you could work with your—I don't even know what they call it anymore [we called it plotting paper, but I suspect that wasn't the name on the box]—but the ones that had the English units on it [main gridlines each half inch, with 10 lighter gridlines in each half inch, or in other words, 10 by 10 per half inch] because they had bigger squares on it. You went into metrics [main gridlines each centimeter with 10 lighter gridlines in each centimeter, or in other words, 10 by 10 per centimeter] and they had smaller squares.

So depending on how long your plot was, you could either go to the one that had big squares you could see pretty easy or go into little squares and you could get longer scales on those. And then you always could go to the eleven by seventeen sheets of paper in case you couldn't get it on the eight-and-a-half by ten sheets.

But the plots you were working with for the airspeed were not the original ones, obviously. They would make what they called ozalid copies of those, and depending on how good the machine was, sometimes you had to kind of draw your little scales in because they didn't always reproduce that well. The ozalid ones are blue and white. You could make ozalid of

copies of the ones you'd made too.

If you wanted to do that, then it was best if you put this orange paper behind it, so then when you made your lines and your symbols, you'd have little orange stuff on the back of your paper, then that made a better copy than when you ran it through the ozalid machine.

So usually you wound up making more than one plot because the first plot was usually more just looking at the data, making sure it was good, making sure there wasn't a problem with your sensors. Then you could come up with your more formal plot, which had the points on it you wanted that you thought were good points and that you wanted to do, and then you'd make your orange stuff on the back of it.

You had your little symbol-makers you could make your symbols with. Some people got really excited about the size of symbols that you use because that's supposed to indicate how sure you were about your data points. If they were little symbols, obviously, you were positive that was where it was. If they were bigger then it might mean, well, somewhere within that little circle.

The co-ops got tired of making your symbols. They looked like they were kind of—how would you put it? —the little dots weren't in the center of the circle. The little circles would be together like the guy was looking cross-eyed or something.

WRIGHT: Entertainment value.

POWERS: The person who wanted the plot, he didn't think that was very funny because that wasn't what he wanted. It looked kind of funny on the plot.

WRIGHT: Was there a lot of pressure to get this done in a specific amount of time?

POWERS: It depended on what group you were in. No. Obviously, the airspeed group was under a lot of pressure because everybody was dependent on their plots to finish their data, calculate their data, so they had a lot of pressure on them. On something like the base pressure, there wasn't near that kind of emphasis on getting it out because it wasn't as important to continuing anything.

So if it was the first flight of anything, then there was usually a lot of pressure to get something out because you wanted to see what the airplane was doing. But after a few flights, then it was more just filling in the points that you didn't have, and making sure that your trends were still the same. Especially if you had some points that were a little funny-looking, you wanted to make sure that you got repeatable data.

WRIGHT: The technical report that you mentioned, the information that was contained in it, was it released before you actually published the report, or is the report more of a formalized release of your information?

POWERS: The report was a formalized releasing of the information. Anything that went out before, well, certainly under a lot of pressure, would have "preliminary" on it. Usually nothing went out of the Center that didn't have a report attached to it, or it was given as a paper somewhere. That was usually the only way the data went out of the Center.

WRIGHT: How about among the working members of the team, were you able to pass information informally to inform the other team members?

POWERS: Oh, yes. There's a lot of discussion. Yes. Your supervisor would always check to see what was going on, but you'd keep him informed. But yes, there would be a lot of discussion

among the people.

WRIGHT: Were you part of the discussion groups early on with your career here, or was there a certain level that you became more and more involved in that aspect?

POWERS: Well, it depended on importance, how big the question was. The supervisor would usually do a lot of the discussions. If the project team got together, it would depend on what level we wanted to present it at. If it was going to be just an overview, then often the supervisor would give it. If they wanted to get down into more detail, then the people who were actually working on it would often get the information.

So it varied. Kind of like it is now. If you've got somebody coming in from headquarters, usually it's a supervisor that's going to give it. If you've got the team getting together to talk about what they're doing, then it's usually the individuals that give it. It hasn't changed that much.

WRIGHT: The technical report that you mentioned, is that the first one that you had published, or when was the first one that you had done?

POWERS: It was XB-70, I believe, was the first one.

WRIGHT: Were you the primary author?

POWERS: No, I was second. The supervisor was the first author on that.

WRIGHT: But you've had several that you've published?

POWERS: Yes. Yes, I have.

WRIGHT: And some as the primary author on?

POWERS: A lot of them were as the primary author.

WRIGHT: Do you like that aspect of compiling information and releasing it?

POWERS: Yes, it's kind of a closure. You've thought about the experiment, you've decided what you want to do, you get the information, you compile it all together, and you report on it. It makes a nice closure of what you're doing. Although the report writing itself can be kind of miserable. It's a case of everybody has ideas about how words should be written down, and if you happen to kind of go along the same path as the people who are reviewing it, then it's okay. If you get somebody who doesn't quite think the same way you do, then you wind up doing a lot of rewriting.

WRIGHT: You've had both experiences?

POWERS: Yes. I've been fairly lucky most of the time. I haven't had to do that much rewriting. Some people, have had more problems with that. They just don't happen to think the way somebody else does, and sometimes you get the controversial reports and they kind of toss it back and forth. "Well, we don't really want to say this" and the next guy, "Oh, yes. We do want to talk about this." And so the poor author gets kind of stuck in the middle about who's going to do what. But most of the time it goes fairly smooth.

WRIGHT: Has that process changed much since your first days here, to where you are now?

POWERS: It's changed in the way you think about writing. Back in the days of the typewriter, you did handwriting on it. You did a lot of handwriting, because most of us couldn't type that well. So you were more conscious about your words. You did a lot of literally cutting and pasting of the words because you just got tired of rewriting it, and then you'd give it to somebody else to type, and then they would have to try and decipher what you'd written, so they could type it.

But then because they just had the plain—as you know, when you first started out, you just had the plain manual typewriter. I remember one of the senior guys telling me, "Well, we want to make sure we change these words that it comes out to the same number of words on this page, so they don't have to retype the pages after that." It was that kind of thing.

Actually, when you got the report down close to the final stages, that's the thing you started think about, because if you had like, you know, even a ten-page report, if you changed something on the first page, the reports people were very concerned about how it looked, that it should look a certain way. So if you took out a paragraph on the first page, then you'd have to retype the whole report because it would look really funny to have this—it wouldn't matter if it was the second page, but the first page would be more significant, because now you're looking at retyping all the pages. Whereas if it's the last page, you're just retyping the last page.

And so the senior guy's saying, "Okay, we've got to be sure you get the same number of words in here so you don't have to retype the rest of it." And then one of them, he was saying, "You've got to be careful when you think of the titles. Minimize the words so they don't have to type so many of these words." It was a different way of thinking then, because it was just a lot of—it was labor-intensive to do this, whereas now, when you type on a computer, you just type whatever you want and then you just drag it all over the place, and you change your sentences,

you change your spelling, whatever.

So it's changed the way you think. People don't think as hard about how they're going to write stuff now because you don't have to. The same way with programming. With a mainframe, you have your box of cards, so you run down there and you leave off your box of cards. Well, you might get, if you were lucky, two or three runs a day because there were other people coming down with their box of cards to have a run-through as well.

So when you had an error on your program, you'd come back and you'd fix that one, but then you'd go through the whole program to see if there were any mistakes in there because you knew you were only going to get probably maybe one, and if you were lucky, two more runs that day, so you did a lot more analyzing at your desk of your program. Whereas now, you just make the change and run it again. Okay, if there's another mistake, I'll make another change.

It's a different way of thinking. It's not necessarily better or worse, it's just a different way of thinking. And that's the same way with the writing. Everything was so labor-intensive when you were doing it manually that you thought differently about how you did it.

WRIGHT: How else has technology changed your job since you first came here?

POWERS: More travel. As you know, we have all these ways of communicating with people, but there's more travel now. I remember, trips used to be a big deal. If somebody went on a trip, there was a lot of planning that went into it. You didn't see them go very often and so when they'd come back, especially if they went, well, overseas one in particular, but when they went anywhere, there was a lot of effort that went into the trip, and now you just kind of, "I'm going on a trip," and in two weeks you're gone. So it's just a lot more travel.

Telephones. You used to have like one or two numbers for the whole office. Now everybody has their phone. That's changed. People didn't spend much time on the phone

because you had everybody else looking at you, because somebody might be trying to get in touch with them and somebody might be trying to get in touch with the boss because they were sitting all close together there, so you didn't spend much time on the phone. So that's changed. Now everybody has their own telephone and there's not that worry about it.

Copy machines. Of course, you have to be careful what you copy in your copy machine, but you'd go down and you'd hand them the sheet. This was just to make copies. This wasn't doing anything special, but you had to hand it to somebody to make the copy. And sometimes you'd get, you know, if you really knew the guys, they'd let you in and you could run your own copies. You didn't have to wait for them. But as was then and is now, people tended to copy things that weren't necessarily—I mean, you probably really didn't need to copy.

But they wouldn't let you do it, and if they caught you then they'd run you out of the room and they wouldn't let you back in for a while. But you didn't just go down the hallway and copy anything. When the Xerox machines came out, that was a big deal. Still you'd hand it to them and they'd copy it for you, and they'd hand it back to you.

WRIGHT: How about your actual data processing that you had to do, or your plotting, the technology that affected some of those tasks?

POWERS: Well, the film was what you would call an analog system because it was continuous, so you have to look at the data, you could look at your line on the film, and you'd have a feel for what's increasing here, what's decreasing there. You had a really good feel for it. If you'd see a blip on there, you look and see, well, everything's got a blip here, it's probably just some weird thing on the plane. We'll just ignore those points.

But then when you went to the computers and the digital systems, you had so much more data. It was physically not impossible but close to it to look at it. So then you started putting in

the filtering programs. Well, if the point exceeds this by so and so, we won't consider that and we'll just skip those. So you got away from your data. You got more data and you got it at a higher speed, but you weren't as close to it because there was just too much there. So it was kind of a mixed field there.

In some respects, you've got more data now than you could ever think of. I mean, some horrendous amounts of data that you couldn't possibly look at, but on the other hand, you don't really have a feel for what's happening as well. You aren't as close to it. Whatever number comes out of the computer.

And this is the problem with if you aren't familiar with what's supposed to happen, how the data is supposed to be looking. It's coming out of the computer and my program, I know, is working right. There's a tendency to think that, well, it's got to be right. Well, maybe it is and maybe it isn't, but you don't have as good a feel for it, especially the younger people.

The older people, a lot of them would still run a few hand calculations to make sure that everything was okay. And of course, a lot of them, they just had a feel for it. They'd look at and they could say, "Oh, that's squirrely. That's not right. We've got to back and check that out." So in some respects we know a lot more, but we don't really know as much either.

WRIGHT: Did you have a situation or were you part of a situation where that happened, where some computer data came out and you just knew there was something squirrely with it and felt like something needed to be checked again?

POWERS: Any time I saw points that didn't agree with what I thought or what I was expecting, yes, I would go back and check them out. And sometimes it would turn out to be just an electrical blip in a plane or while the plane was flying, there was just a blip, yes. So I always checked those out.

The other thing is, people do averaging of the numbers. And again, it's about all you can do when you've got so much data, but it's really easy to average in values that really aren't the ones you want there. It makes it more difficult to analyze what you've got, because there's just so much data out there.

The X-15 flight would last maybe ten minutes at the most, so yes, you had a lot of points to plot out, but you're only looking at ten minutes and you could read it—I can't remember how close you can read it. Probably a tenth [of a second]. I don't know. Well, the lines, they weren't that far apart, but you had to find that number of points you could look at. Whereas with the digital stuff, you've got a lot of stuff there and you just have to be more careful with it.

WRIGHT: From what you're saying, it seems like there's such an emphasis on each person making sure that their work was done so exact because it affected so many other parts of the project. Well, the X-15, like you mentioned, was somewhat of an exciting project for you to work on as well. Were you on that project a while?

POWERS: A while, yes. It was fun to work on that. Again, I hadn't even heard of an X-15, and then I got here—well, I think I may have heard of it, but then I discovered there were three of them. I didn't realize. A lot of the stuff, I really didn't know that much about. I hadn't followed the aviation like some of the people had. I don't know if any of our group were that really involved with aviation. We were just kind of a general interest at that time.

WRIGHT: I know that you mentioned you were one of few females that arrived here as part of your co-op program. Were there very many females that were on the Center, working at the Center, when you arrived, in an engineering or professional capacity?

POWERS: No. Bertha [M.] Ryan was here, and Harriet [J. DeVries Stephenson Smith], and Elsie [B.] McGowan would have been here. Connie [Eaton Harney], I think, came a little after the—I don't think she was here when I first came. Elsie was within a few months, within a year or so of when I came. Connie was a little bit later than that, so she wasn't here when I first came.

Beverly [Strickland] Klein was here at that time, I think. No, I don't think she was. I think she came later, too. But for sure, when I came it was Bertha and Harriet and Roxanah [Yancey] and Mary Little [Kuhl] and Katherine, Katherine [H.] Armistead.

WRIGHT: Now, Roxanah had a group of people who worked as computers, but that was not going to be your role. Did people sometimes confuse that?

POWERS: No, the computers were off in their own room. By the time I came, they were all in one room, so there really wasn't any confusion in that respect. Not really. Co-ops always complain about getting all the tedious work, but that's about all you can give to them and they expected that.

WRIGHT: Your co-op program lasted several years, but then, of course, you came on as full time. Did your role change, and how did it change once you took the full-time employment?

POWERS: That one you had to be a little bit careful of, and it was the same way for the boys as the girls, the men and women in the program, because people tended to remember what you had been, so it was a little bit of a transition there. Not real hard, but you just had to be aware of it, that people still remembered you as the co-op, and I can understand that. As I get older, the years, they go by pretty fast. It's hard to keep these people straight and equal.

So that was a concern, but everybody had that problem who was a co-op. You just had to

remember that you were no longer the co-op, you were actually the engineer now.

WRIGHT: Did you work with co-ops then that were part of your group?

POWERS: Yes. Yes, I did.

WRIGHT: I'm sure they were somewhat grateful to know that you understood what they were going through. Sometimes that helps.

POWERS: Yes, it does. Yes, it does help.

WRIGHT: When you got here, even as a co-op, and for sure as a full-time person, did you find someone that kind of helped you learn more about the Center, someone that maybe might have served as your mentor, or just someone that you could talk with sometimes when you had questions?

POWERS: They were more just friends. I wouldn't say they were really mentors. They were more just friends I did things with.

WRIGHT: The atmosphere of Dryden, from what we read, it was more of family, close-knit.

POWERS: Yes, it was.

WRIGHT: Especially those early days. Did you find that when you arrived as well?

POWERS: Yes, everybody knew everybody. They had a picnic. Most of the people would go and they all knew each other. They knew their families, they knew their kids. I noticed that. You'd say, "I'm working for so and so," and they'd say, "Oh, yes. I know them" or "We did this together" or something. So yes, it was still that way at that time.

WRIGHT: Other social activities. You mentioned that you lived in Lancaster and worked out here. Did people socialize as well after work, other than organized activities?

POWERS: Yes, they did some socializing. They had their softball teams and there would be quite a few of—the NASA people would be on it. They also had the basketball teams. That's about the main things. And they had people who hiked together and they fished together. So there was some of that.

Hiking was a big thing for the group I was in. The particular people I was around, they really liked the hiking so they were always talking about their hiking trips and they'd go on their long hiking trips and they'd go fishing and they'd do things like that. That was about all they did.

Bike-riding wasn't really a big thing then. You didn't have the ten-speeds yet so that wasn't as big a thing. Some of them had motorcycles, but usually they rode by themselves. They didn't really have those groups yet. There were some activities but you were pretty much on your own. You made your own friends and did your own things. It wasn't a formal activity type thing.

WRIGHT: How often did your projects change? You mentioned you were on the X-15 for a while. Did you get other ones as you were on the X-15, or were you finished with one and they moved you to another?

POWERS: You tended to finish a project at that time and gradually, maybe you would be phasing

in as the other was phasing out, but you tended to be more one project, unless you were in like the airspeed group because then they would do the airspeed for all the projects, so if you were in a group that was a discipline function, then you would likely be on more than one. But there were enough people in the group that usually you just wound up working on one. They might be working on something different, but you would usually be working on the one project, primarily.

WRIGHT: And what group were you—

POWERS: I was in the vehicle aerodynamics group. That was its name at one time. Like now, the names keep changing but that was the name for a while.

WRIGHT: And after the X-15, where did you move to?

POWERS: Let's see, where did I go to then? That would have been the SR-71. I worked on that. That was fun.

WRIGHT: Tell us about that. Why was that one fun?

POWERS: Well, it was a relatively new airplane at that time, and of course it was secret. This got everybody all excited. We've got a secret project. So everybody always enjoyed that. And it's just a nice-looking airplane. It's a really slick—I don't know what expression I want to use, but it's a very exciting airplane to look at. It looks like it can go fast, and it could, so that was—it was exciting to work on something like that. It was new, relatively new. It was called the YF-12 at that time, because it was a prototype. So that's what made it exciting.

The XB-70 was interesting, but it was kind of a big lumbering-looking airplane. It wasn't

nearly as trim and sleek-looking as the SR-71s are. Well, you've probably seen an SR-71. They're a pretty slick-looking airplane. And YF-12s looked just like them, basically.

WRIGHT: Did your duties and responsibilities while you were on that project stay the same, or did they change?

POWERS: They stayed somewhat the same. You had more responsibility or worked more independently. The supervisor knew that you could handle it so they didn't follow you as close. It was more just checking up to see how things were going than what you actually were doing, so that worked out pretty good.

WRIGHT: Was it more and more of a one-on-one tag-up with your supervisors?

POWERS: Yes.

WRIGHT: Did they have team meetings of everyone within your group to trade information, or did you need to know what other people in your group were doing?

POWERS: Not usually. They were usually on a different project, so you didn't really need to know. If anything came up you thought was important that everybody should know about, then you'd share that, but most of the time you didn't. Some of the groups, I didn't wind up in one of those, you'd actually be the whole project. They had a YF-12 project office, but the people in our group didn't actually sit in that office. We were more of the piggy-back experiments, and so we didn't sit in with them. They were more the primary experiments. The piggy-back experiment, you didn't have to come up with as much money because, after all, I'm going along for the ride,

so I don't have to pay for as much. And so our office tended to do more of that at that time.

WRIGHT: Where were you located physically on the Center, what building?

POWERS: 4800. 4800 was the only building. Well, no, they had the heat facility. What is it called now? Something else. Structures Thermal Lab or something or other now. They'd call it the heat facility and everybody referred to it as heat facility. Of course, I thought, being from Iowa, that it was the building that generated all the heat that was sent around. It took me a while to figure out that that wasn't really what they meant by the heat facility. But that was my first—when they said "heat," I thought, "Oh, yeah, I know what a heat facility is. We've got one of those up at school."

So there were the two primary buildings then, the heat facility and 4800, with the hangars on each side. The hangars were there. All the other stuff came. We had the '63 addition. They even built the ISF [Integrated Support Facility]. They've added a lot of buildings on since then.

WRIGHT: When you were working on the X-15 and the SR-71, did you have any idea what—because you mentioned that it was secret, so did you have any idea what other people were working on? I mean, did you know about the other projects that were going on at the Center at the time?

POWERS: If they weren't secret, you would know what they were working on. If they were secret, you'd have speculation about what they were working on. You might not know exactly what they were doing, but you could figure out, oh, they're working on that. Usually you had an idea at least what the plane was. You may not know what they were doing but you would try to figure out. You'd listen closely to see what they said. Same way it is now. If somebody knows

something you don't know, you try and figure out what they're doing.

WRIGHT: Well, it was kind of a unique time for the country, because it was the Cold War time, but yet we were starting to get so much involved with the human space flight area, and the projects seemed to be somewhat diverse.

POWERS: I should add that even though you wanted to know what everybody else was working on, you didn't really care to know too much because then you didn't have to worry about slipping and letting it out. We weren't involved with the space stuff as much. The lifting bodies came along, but that was—I wasn't involved with those very much at all. Other people worked on those.

The first one was, a lot of it was an in-house effort. It was about that time that—the lifting bodies were going is about the time that Bertha [M. Ryan] left, and part of the reason—Paul [F.] Bickle was the Center director at that time, but he didn't—you know, women were okay, but you couldn't really trust them. I shouldn't really say he said that but he didn't give them positions of authority, and his secretary didn't have much authority, like the secretaries you would expect for a Center director's secretary to have.

She didn't have that kind of authority. She kept his schedule, she answered his phones, and relayed the messages. Whereas a lot of the secretaries now, you know, they have a little more authority than that. So he wasn't really sure he wanted women in these positions that required authority and responsibility. [His attitude about women in positions of authority began changing when his daughter entered the workforce. That was a year or two before he retired.]

WRIGHT: Did you see that change through the years since you've been here?

POWERS: Yes. Yes, it's changed. It's more now that for the women, you know, true equality, I read it somewhere and I don't know who I read it from, but true equality is when the people of equal ability get to have the same chance for the job. And for women and I suspect for a lot of minorities, it's not equal ability. You have to be vastly superior before you can be considered for the job, and there's still a lot of that. It's not equal ability, so you have to be more capable than your competition. If you're equally capable, then chances are you're not going to get it.

WRIGHT: Have you had opportunities for advancement since you've been here. Surely, hopefully, they don't still see you as the co-op?

POWERS: No, they don't see me as the co-op. Yes, I've had some opportunities. Most of the women that have advanced, it helps if you're more aggressive. You don't have to be but it helps a lot.

WRIGHT: It's still mainly men at Dryden, or are the numbers starting to shift to where there are more women?

POWERS: It's still mainly men. There's a few women, but it's still primarily men. The women who are at the, what would be considered more the senior management level, are definitely more aggressive than a lot of women are. It's not to say there's anything bad about it, their personalities are just much more aggressive than most of the other women are.

WRIGHT: How about the engineering field? Do you have more colleagues that are females now than you've had before, or do you see that number increasing?

POWERS: There's more. I haven't worked in that area for a while. Right now I'm in the—well, you probably don't know I'm in the management systems support office. I've been helping the Center get certified for ISO [International Organization for Standardization], so I've been a little out of the engineering field as such. But there are more women. I see more of them. I see some of them leaving as well. They're quicker to leave, I think, than they used to be, or maybe they're leaving about the same rate. I'm not sure.

They look at it and they see what's happening and they say, "Well, it's not the best place for me to be here. Maybe I might as well move on to another spot." And I expect to see some more of them leaving, the younger ones, because a lot of the people in the branch-level management now are getting to be—well, they're younger. Like younger, they're probably in their forties.

But they're at the age where, if you're coming up, you're looking at these people and you realize, they're going to be here a long time, and if I want to advance in any of these positions, I need to do some serious thinking because it's not likely these people are going to change. So I expect to see some of the women leaving.

WRIGHT: Well, you've been here long enough to know that the turnover route is such—does the turnover affect the projects, because of the way that the teams work together, or is it sometimes good to have new people coming in?

POWERS: Certainly with new people coming in you have the new ideas, the fresh perspectives. That's always good. You're losing some of the memories, some of the corporate memories, and what was done. I think all of NASA right now is in a state of turmoil as to what's going to be happening, and it's reflected here in Dryden now. There's a lot of unease.

We're unsure what is really going to be happening, what kind of projects are going to be

worked on, and what's going happen. We don't really have a flying project as such right now, so the people who are interested in working on airplanes, they're looking at this and they realize that if you actually want to work on an airplane that's flying, you have to do some hard thinking because it's not clear what's going to be happening here, which way we're going to go.

And that's just part of—that's all of NASA right now. NASA's having a big problem right now about what they're going to do with getting the funds for the [International] Space Station, what's going to be cut, what isn't going to be cut. I know Kennedy [Space Center] and JSC [Johnson Space Center] have been going through more turmoil, I think, than Dryden even. The flight programs are getting few and far between because the money is going towards the space side, and so if the people want to be involved with a flight program, they've got to think about it.

WRIGHT: How valuable is a corporate memory when you're working on flight testing and flight analysis? You know, the years that you've been here and you mentioned that long ago, that some of the people that have been here know what to look for, and if you could share some of the information or share just your feelings on how valuable it is to have that memory to build on and to share.

POWERS: It goes both ways. Certainly when you have the corporate memory, people who are really good at it can look at a shape or at a particular design and say, "This is what I expect is going to happen. This is what we have to worry about." The down side to the corporate memory is that, this is the way we've always done it and it's worked in the past and that's the way we're going to do it now.

So you have the younger people coming in, and I've heard some of them talking about it, and they're all fired up. They've got all these new ideas they want to try, these new ways they want to approach it, and they run into the people who've been here a while and they say, "We're

not going to do it that way. This is the way we've always done it. This is the way we're going to do it."

And it's very hard on them, because their ideas aren't bad. In fact, a lot of them should be accepted and used, but it's not going to happen, not while you have some of the corporate memory here. I know one of the younger guys. It's been a few years ago. Basically, that's what it was. He had this way he wanted to do something, and it had to do with computers, but the person he was working with at that time, and the guy has since retired, wouldn't let him do it. He was getting very frustrated, because he wanted to try these new things, he wanted to do these new things, but you simply can't do it. So the down side of the corporate memory is that you don't get the new ideas in, so the trick is somehow to get the two to merge, and that's hard.

I don't know the best way to do that. Somehow, the people with the corporate memory have to be open to letting them try new ideas, and maybe even making a few mistakes along the way, so they can see why you want to do it a particular way, or what you have to consider when you do something like this.

WRIGHT: Have you had experience in some of the projects that you worked on where you were able to see this merging, that made a great breakthrough that resulted in something that benefited the project?

POWERS: That's usually not the way we do it here. Like most places, somebody says they're going to retire and then they retire and then they decide, well, son of a gun, they did retire. Now we've got to get somebody in that job. There's a tendency to do that, but there's enough work going on that you don't want to double up on this one particular area in essentially a teacher-student type mode, and so you wind up with the person leaving and then the next guy that comes in picks it up.

WRIGHT: Well, tell us about other projects that you've worked on. You mentioned the SR-71. Did something follow that was as exciting as that one?

POWERS: I worked on the F-111 Mission Adaptive Wing [MAW]. That was fun. It was a big project. That was a lot of fun. It was another one to do on the F-111. It wasn't the MAW at that time, but it was more base drag, more looking at ways to alleviate base drag. So it was interesting.

The MAW was—it was a pretty big project, and I wound up being the technical chairman of the committee of the last presentation they had for the MAW, and that was interesting, working with all the different people.

WRIGHT: Was that the first time you had done something like that?

POWERS: Yes. It involved getting them all to get their papers written. A lot of nagging.

WRIGHT: Mother hen type of thing.

POWERS: Yes. That's what the technical chairman winds up doing a lot of, because you have to get the papers all together, you have to get the presentations all together. They all have to come around at the same time. And it's checking up, "How are you doing on this? Do you need any help? What are the problems you're having?"

WRIGHT: Did you have a time period that you had to have all that done?

POWERS: Oh, yes. We had a time period, so you mapped it all out. This is when the symposium is going to be held. Okay, so this is when everything has to be done, and this is what has to be done, and you just set up dates by when you need to meet these certain deadlines, otherwise you aren't going to make it at the end. We made it.

WRIGHT: Did you have to travel and do presentations about some of the work that you were working on?

POWERS: Not as much. There wasn't as much traveling as there is now. I did do some presentations at groups, but not as much as happens now. Probably about the last five years or so, it seems like they've been traveling a lot. I think that's going to end, too, because the travel money is getting tighter. NASA, to me, appears to be in—we're in another change, and what's going to be happening after the change, nobody's really quite sure, and it's really traumatic because the old ways, the old days, are gone and we aren't sure what the new days are going to be like.

WRIGHT: Thinking about those older days, is there a project or a time period that you reflect on as being one of your favorites since you've been here?

POWERS: Probably the SR-71. That was a lot of fun. You had to go down to this separate hangar because you had to keep it in a secret hangar, so you had to have all the badges to get in there. That was fun.

WRIGHT: Were you able to witness the flight testing of that as well?

POWERS: Oh, yes. You sat in the control room and you'd see what was going on. Strip charts were really advancing by then so you had a lot of strip charts you could look at.

WRIGHT: Were a lot of people in the control rooms at the time?

POWERS: Yes. Actually, there were quite a few. It's people on the project, so I don't know how many would have been in there. I don't know, ten, twelve, fifteen. I don't know. There was quite a few in there.

WRIGHT: Were you able to see what they were doing or were you so focused on what you were doing?

POWERS: Usually you were focused on what you were doing, because your purpose at the strip chart was to see, how is your data? Are they getting the data you need? Are they getting the point you want? Is your instrumentation working okay? That was your purpose of being in there, so you could check to see when your point was taken. And because the flights were so long, you kept track of when your points and they only processed certain parts of the tape. They didn't process the whole, I think they were like three-hour flights. They didn't process the whole flight then because you didn't need it. Nothing was there that you were interested in.

WRIGHT: Was there a time that you thought maybe this wasn't a good decision for you to be here, some time frustrating that you just maybe wished that you could move on some place?

POWERS: Yes. I think everybody runs into that. But I didn't move on at that time. It might have been better, it might not have. Most of the people that move on—a lot of the people that move

on, move on within about the first, probably about the first five or six years, because they're starting to get enough experience, they're starting to move up in whatever they want to do, and then it becomes clear at that point whether the path they want to take is going to be open. And so if it's not, then that's when they decide whether they're going to stay and take the ultimate path or whether they're going to move on and try and find another path.

WRIGHT: Tell me about your silver Snoopy.

POWERS: I did work on the Space Shuttle. It was the first one. Was it the Enterprise?

WRIGHT: The Enterprise.

POWERS: My mind's going here. So it was just basically the drop test, and I worked on the airspeed part of that, so that was interesting, too. I enjoyed that.

WRIGHT: That was something completely different.

POWERS: Yes, it was.

WRIGHT: What were your first thoughts when you were assigned to that project and learned what you were going to be doing in this totally different aircraft?

POWERS: Well, naturally, since you have the old naysayers here, there was a lot of discussion about, they can't do it, they'll never be able to land it on a given spot, can't do it. And obviously, they did do it. It was pretty exciting because you weren't sure what was going to happen, whether

it really was going to do it or not.

So it was exciting, to see that happening. You weren't sure when it went off the plane if the whole thing wasn't going to crash into the tail and knock both planes out of the sky. You can do all your studies, but when they finally actually do something, that's when you find out whether your studies are right or not. So it was exciting.

WRIGHT: How long were you working on those studies before they actually tried it?

POWERS: I'm not sure. I probably spent, I don't know, maybe two years on that total.

WRIGHT: Were you able to watch the testing as well?

POWERS: Yes, I was up in the control room.

WRIGHT: That must have been so exciting.

POWERS: Yes, it was. We got some data off the first flight, so the Space Shuttle was coming back to see if it was agreeing, so it was a lot of fun.

WRIGHT: Have you seen it land here as well?

POWERS: Yes.

WRIGHT: From an actual flight?

POWERS: Yes. Almost saw it take off. My husband actually got the trip for that. He worked on the Shuttle as well. But they aborted that flight, so he didn't get to see it launch.

WRIGHT: Maybe one day soon.

POWERS: Maybe one day. I did see an Apollo launch, though.

WRIGHT: Were you working here at the time?

POWERS: Yes. The director at that time had connections at Kennedy, so a number of us planned a big trip back to Kennedy to see the Apollo launch.

WRIGHT: Of course, I didn't see Saturn [rocket], but I understand watching a Saturn V launch was pretty impressive.

POWERS: I almost didn't go either. They kept delaying it and delaying it and we kept staying and staying, and finally it went off, so it was fun.

WRIGHT: Do you remember which one it was?

POWERS: No, I don't. [Apollo 17]

WRIGHT: It was a few years back. That's understandable.

POWERS: I can't remember which one it was now. It was one of the night launches, though. I've

got some nice pictures of it launching.

WRIGHT: Did you keep up with the LLRV from where it left here? I know that that was about the time that you were finishing school.

POWERS: No, I didn't really keep up with it after that. I'm not sure anybody really did much keeping up with it. Once it leaves here it's hard to be involved with it anymore.

WRIGHT: You mentioned the Space Shuttle and also I believe you worked on the X-29. Is that correct?

POWERS: Yes. Not as much, but I did work on it, yes. I did a parameter estimation study on that.

WRIGHT: How was it different, or was it different, from the other projects that you worked on?

POWERS: This was actually more a paper study. I didn't have an actual experiment on the plane, so that was different. Usually I had an experiment on the plane, but this one I didn't. Some of these things just kind of run together in your mind, actually.

WRIGHT: I was going to ask Sandra. You have any—

JOHNSON: Just thinking back, the time you were here and just what was going on in the country and the dress code the women followed more so then than they do now. Have you noticed a lot of changes as far as how you're allowed to dress, or was there an actual dress code at that time?

POWERS: Not a written dress code, but, yes, there was a dress code. You wore skirts to work, dresses. You didn't wear slacks. You just didn't wear slacks.

JOHNSON: Did that make it hard to do your job sometimes? I mean, if you're having to go out and check out planes.

POWERS: Most of the time you didn't have to climb on the plane. When I started working on the XB-70, I did have to climb on the plane, so I had coveralls that I changed into whenever I went out to check my experiment on the airplane. And probably—well, it would have been probably in the seventies is when they finally started changing the dress code and women started wearing slacks to work.

But prior to that time, like I said, it wasn't written down but you just didn't do it. You wore hose and skirts and dresses. You didn't wear slacks, you didn't wear shorts, and that's what all the women wore.

But when the seventies started, then the dress code changed a lot. The women working now and even the women who started working in the seventies, they don't really understand that. They never went through it and that's just the way it is, and that's all they remember and they never really understood that. You were a lot more restricted in what you did. They worried more about what you did after hours than they did now, because of your security clearance, so they followed what you did after hours, too.

JOHNSON: Did they follow the men the same way?

POWERS: Probably not. I don't really know. But I know that a woman got talked to about after-

hours activities. They actually did. They were—you were much more watched about what you did, much more concerned about what you did. So when the women started coming in the seventies, they didn't understand that. They had never been through that. I don't know if they ever will understand that. It was just a different way of doing stuff. They had a lot more freedom to do whatever they wanted to do. That was a big change, it really was.

The men's clothing didn't change as much, because it was a point of pride or honor among a lot of the engineers out here that they wore more the casual clothes. They didn't always come in the shirt and tie. Besides that, they worked down on the airplanes and they were doing stuff, so they didn't—so that was a big point with a lot of the men, but the women were expected to be dressed up.

JOHNSON: No matter what.

POWERS: No matter what.

JOHNSON: Do you feel like you were ever discouraged, as far as when you were in school or when you first started out in your career? Engineering, even at that time, wasn't a normal field for women to go into. Do you ever feel like you were discouraged at all?

POWERS: My mother didn't want me to go into engineering because she knew how hard it was going to be. She felt, you know, there's easier things out there to take than that. Why don't you consider those? I never noticed it in the instructors as such. The problem was that I was the only engineering student in my—aerospace engineering student. There was one in architecture in the dorm. So you wound up working by yourself.

A lot of the guys, either in the fraternities or even in the dormitories, had files from

previous classes on the engineering work, so they would go into their files to check out what was going on. In that respect, it made it harder for the women because you didn't have the files. They didn't even have files of some of the tests. [The fraternities and men's dormitories had copies of previous tests.]

I don't know how long [how many years of tests]—but you hear them talk about it occasionally, so in that respect, yes, it was—it wasn't that they would discourage you from doing it, but you weren't playing quite from the same field that they were playing, so that did make it more of a challenge. And the instructors I had were pretty good. Most of them, it didn't make any difference to them. If it did, they never showed it.

My advisor was, he wasn't quite sure how—he was relatively young. I thought he was old, naturally, but he was relatively young, and I think he wound up with all three of the girls, and he wasn't quite sure what to do with all these—he would have been much more at ease with the boys than with the girls. He didn't discourage you but he wasn't as at ease with the women as he was with the men.

But no, nobody really discouraged. You never heard any voices coming out and saying, "What are you doing in it?" One thing though, when I graduated, there was a company in my hometown that had engineers, and my mother said, "Oh, why don't you apply for that?" So I went in and talked to them and it turned out they weren't interested in hiring me at all. They just wanted to talk to a woman engineer.

JOHNSON: Because they'd never talked to one?

POWERS: That's about it, yes. So you did run into that. The government couldn't do that, and most of the people here, you didn't have that impression that they felt that way. They may have but they didn't show it. Like I said, Paul Bickle, I haven't ever heard him say anything about

women. Women just didn't get promoted to any positions of responsibility.

JOHNSON: So there was more of an undercurrent?

POWERS: That's right.

JOHNSON: It's wasn't overt. That's about all I have.

WRIGHT: Before we close, I would like to talk about your monograph that you did, and I think Sandra's letting me know that we might want to stop and take a break for just a second and change the tape out, but after that.

POWERS: [Referring to behavior and working attitude at Dryden]—things that have changed, and I don't know if it's just because I'm older and I don't see it anymore. When I started here, the people were more spontaneous, they seemed to do more things, they seemed young at heart, and the people now don't seem to be as young at heart.

I know the one guy, this Terry Larson, a real character, they were talking about when they were younger engineers, they'd go on top of the hangar and they'd make their paper airplanes, and then they'd throw them off the roof. Naturally, most of them would go back in the hangar. Well, they got chastised for doing that because all these paper airplanes were coming in the hangar.

Poor Terry, he was one of these guys, he was very good at taking a joke, but they were always pulling practical jokes on each other, and I don't know, the younger people, they seem much more solemn now. They don't seem to pull these practical jokes on people anymore. It's interesting. It's like the place is kind of old and stodgy, compared to what it was when I came there.

There was a lot of energy. They'd come back from their hikes and some of them would be burned almost beyond recognition, but they were out doing things. And they'd talk about their flight parties and all the problems they had getting home and all the drinking. It was just a different atmosphere. I'm not saying that drinking is good, but they did a lot of those things and you don't hear those stories.

It's like, there was an article in some magazine, I can't remember which one it was now, but one of the women engineers, and I'm pretty sure who it was, made the quote, referring to the fact that they had seemed to be doing more fun things, did more fun things. Now you see the pilot going down the street. On the back of his car he has this bumper sticker that says, "My student is an honor student at such and such a school."

It's just a completely different atmosphere in that respect. It's much more solemn. They don't laugh very much. I don't know if you've noticed that where you work or not, but it's a different type of spirit. Maybe times are more solemn now. Certainly you're more safe with seatbelts and all this other stuff they have, but the spirit of adventure, it's just not there like it used to be.

You say it's good to have all this stuff and it is, but we've lost something, too. It's just, the excitement is not the same. It's a different group. Of course, some of the stuff, I did, too. But I remember, just recently, this younger woman with her kid. She was talking about, we were at this place, and there was more than one car, and my husband took off in the car and he took the childcare seat. Well, we couldn't go anywhere then because we didn't have a childcare seat to put the baby in. I was sitting there, "Yes, that's true. That probably is true," but I remember some of the things we did, and we wouldn't have worried about any childcare seat. It's a different mentality.

WRIGHT: It's interesting, especially in our field, talking with people about how they were able to

adapt to whatever situation. Well, we might have thought it would have been extremely challenging. They just said, "That's what we just did, and that's what we had to do and go on." They didn't find all the reasons that they couldn't do it. They just found the reasons that they needed to do it.

And that was one of the things that we wanted to come back and talk to you about, is the information that you put together about a group of women that did that. You put together a publication you called "Women in Flight Research at NASA-Dryden Flight Research Center from 1946 to 1995." Tell me why you decided to put this effort into this publication.

POWERS: Well, it started out, I think I even mentioned in there that the Society of Women Engineers was having a meeting, and a bunch of us said, "Hey, it would be kind of fun to go to that," and so I thought, "Well, what could I write about?" I could write about the Society of Women Engineers, I could write about the history of women at Dryden, and I did that, and then the paper just kind of expanded from that, because one of my colleagues said, "You should put in about the film recorders" and all this other stuff, and it was a good idea, and I did put it in there.

Looking back, I was lucky in the time I wrote it because the people that I knew who had worked on these things were still here, so I'd just go down and ask them, "What did you do on this?" and they could tell me, and most of those people are retired now. It would be really hard to get that. The men. The women were already retired.

I have a lot of respect for what the women did then. They went through a lot. They were really pioneers, but you never hear anything about them. They were a significant part. They were a substantial part of the group, but they weren't really acknowledged as that. They were just the workers. They just did the work. And I guess part of it was, too—like with my mother, they did a lot of things. They deserved to be recognized for what they did, and that's part of the reason I did it.

WRIGHT: When you talked with them, did they realize the contribution that they had made to the history of Dryden or did you feel they just felt they were doing their job?

POWERS: They did their job, and that was the response I got from some of them was, "Well, I just did my job. I don't see why you want to write about this." And in fact, one of the people out here who was in a supervisory position said, "Well, I don't see why you're writing about history. We don't write about history at Dryden." And of course, he went on to write histories of some of his work.

There wasn't a lot of support for it, there really wasn't. The Center director, Ken [Kenneth J.] Szalai, supported me in it, but the support in between was kind of spotty. Sometimes you'd get support, sometimes you wouldn't, but he did support the activity.

WRIGHT: Did you have difficulties finding the information that you were trying to document to put in here?

POWERS: Not really, because a lot of the men, in particular, were still here. I knew them, I'd worked with them, they had no problem talking to me about it, especially with the film recorder stuff. They were proud of their work that they had done at that time and they were more than happy to talk to me about how it was done.

I knew the people to talk to. Somebody else coming in wouldn't have known the people to talk to. I knew the people to talk to and they knew me, and so they were more than willing to talk to me about it. I got a lot from Terry Larson, I got a lot from Dean Webb. Dean Webb encouraged me a lot, in writing this. In fact, he's the one that wanted me to expand it to include about how the data was actually reduced. That was a good idea, and I did.

But it would be difficult, even for me now, to get that kind of information because the people aren't here anymore. They were eligible to retire when I was talking to them, and they have since retired.

WRIGHT: Have you thought about other information or have you found other information since the publication's been released that you would have liked to put in here? Like if you could do an addendum, is there information that you've thought of that would go nicely in here?

POWERS: Not as much. I was so happy to get it out [laughter]. I have found out more about the first expresses that were published. I could add that in there. I haven't really thought that much about it. Like I said, it took me a long time to get it out.

WRIGHT: How long? Estimate the time.

POWERS: Probably about three years. And I got down to where I was almost ready to go. I was trying to make an SP [Special Publication] because it didn't fit in any other categories, so I thought it would be a special publication, and I couldn't get approval from a supervisor that I needed to get approval to have it as an SP, as it was. So I sent it off to headquarters. I saw an article about the history office back there, so I just sent it off to the headquarters history guy.

WRIGHT: And it worked.

POWERS: And it worked.

WRIGHT: What kind of feedback are you getting back?

POWERS: Positive. I got a lot of positive feedback on that one. One of the best-selling ones I've ever written. [Laughter] People actually say they read it and they like it. One of the engineers who I talked to a lot about it says he—he hasn't told me, he's told a friend of mine, who then told me, that he thinks it's a really great paper, he really enjoys all the stuff in it, and he uses it a lot.

So I've got a lot of feedback from it. The Embry-Riddle [Aeronautical University] used it for one of their courses. I have no idea what they used it for but they used it for one of their courses. I think it probably would have been for the data reduction section that had the film recorders, and it's been referenced by a guy who wrote about film recorders. He was writing about that. It's been very pleasant. I've been very pleased with the reaction I got from people. I've got a lot of positive comments from people about it.

WRIGHT: Well, we've certainly learned a lot from it. Some of the women that you've talked about, when we talked to them about it, were very pleased that that information has gotten out. Do you have another project in the works, or are you planning another writing project?

POWERS: I don't know. I haven't thought of another one. Like I said, if I hadn't sent it to headquarters, it would not have been published, because the supervisor that needed to sign it simply was not going to sign off to get it published.

WRIGHT: Well, at least you have an avenue now to go with if you have another idea.

POWERS: Maybe it's my only inspiration. I haven't come up with anything since then to write about. The women now, certainly there's been some changes going on. Maybe because I know them too well. They don't seem nearly as exciting. They're okay. I'm not saying that. They're

nice enough people.

The times don't seem as exciting now. You don't have the stories like with Lita Holleman talking about she didn't go on her trip because it wouldn't have been accepted for her to do that, even though there would have been a chaperone along. It just wouldn't have been looked upon as well. Somehow, the women now—I don't know. They don't seem to have the struggles.

Like I said before, they don't realize the struggles that everybody has gone through to get them where they are. I don't think they understand the struggles their mothers went through, either. Some of them, you can tell, when they talk about their mother, "They didn't really do it like they should have." Well, you know, they had different times. They did what they could. And like I said, I don't know. If I think of anything, I will, but at that time, it was a struggle to get it out.

WRIGHT: When you talked to the women that you feature in your publication, did they remember a lot of the details? Sometimes they say it's the same thing, day in and day out, so were they able to provide lots of information for you, or did you have to piece a lot of it together?

POWERS: It's one of those situations where the people I worked with talked a lot about how things used to be, what they used to have to do, and I came in at a time when I still could see what they had to do. I didn't do the airspeed, I never really worked much in that area. But from working with film, I knew what kind of effort they'd gone through. From fairing curves by hand, I know what kind of effort was involved. I'd heard about it.

It was like the stories you hear when you're growing up. The tales were all there, and so when I would talk to the women, they would certainly fill in areas that I didn't know about, but I was able to more ask them specific questions because I had a good feel for what they had actually worked at and what they had actually done.

WRIGHT: And it seemed like you certainly had a sensitivity since you were the second or the next generation of women that came to Dryden to do yet another field of work.

POWERS: It wasn't a cold call in that I didn't know what they had been through. I didn't know a lot of the people but I knew people that they knew. It's like Mary Little. I knew Mary Little. I never worked with her on anything but I knew who she was, and she knew who I was. We just worked in different areas. Roxanah—again, I knew her. I never worked with her, but I knew her. Katherine Armistead, Kay, I worked in the same general area, so I knew more about her, and then Harriet, I never worked with, either. We were small enough that I knew all these people.

It would have been difficult for me just to call up some of the women like [Mary] Tut Hedgepeth and Beverly [Swanson] Cothren if I hadn't been so immersed in what had gone on here. But everybody that I talked to knew these people, or knew of them. It was one of these continuous things that they knew them. I don't know if that answers your question or not, but it was more that I was here and it was kind of, you know, like the tales you hear, it was a matter of sorting them out and getting the actual facts from the people.

WRIGHT: I'm sure it was a bit of a comfort to them to know that someone who understood what they did was trying to now put it down on paper for somebody else, so they didn't have to go back through all the stages of explanation, that you could certainly appreciate that. Well, we certainly have appreciated the information, and the opportunity to sit and talk with you as the—like I said—

POWERS: It was nice.

WRIGHT: —the group that you're involved with. Are there any other areas that you can think of that—or projects, any anecdotes of being at Dryden? How many years have you been here?

POWERS: Thirty-eight. No, I can't really think of anything in particular. We had the old cafeteria. The old cafeteria was in 4800. It was a big shock to people when they had to walk outside the building to the cafeteria. It was bad news as far as they were concerned. A lot of grumbling about that.

WRIGHT: Really?

POWERS: Oh, yes. Before, you didn't have to go outside. You'd just go down to the cafeteria and get your ice cream cones and they would scoop out the ice cream for you.

WRIGHT: Was that kind of a time at lunch, too, that everybody saw everybody else, when the cafeteria was there?

POWERS: Yes. You could see everybody there. A lot of people brought their lunches. A lot of people would take breaks in the cafeteria, so you would see a lot of different people in the cafeteria. Now, a lot of the people I don't know anymore. A lot of new people. It's hard to know when you look back, whether people were really that much closer, or were they just imagined that way? But I think they were. I think there was a—proximity-wise, you were just much closer. I don't know.

The numbering of the building. We renumbered it many times, and you never could figure out what the new numbers were so you just, you know, who are you going to see? That's where they are. A lot of changing of names. Different directors. When Paul Bickle left—in my

mind, the reason he left was because the times were changing and he didn't want to change, and that's not a bad reason to leave.

But it left us kind of vulnerable because he hadn't been keeping up with the changes. He hadn't been making the inputs for Dryden, so when the next group came in, they were at a disadvantage. There were kind of funny ones there for a while. We had a lot of scandal.

The director that came in, Dave [David R.] Scott, one of the women that worked as a contractor on the YF-12 was a very attractive woman. Dave Scott liked attractive women. He got her in as his secretary. That had a lot of the women upset because she was an attractive woman and she dressed like she was proud of her shape, and so she had these tight-fitting clothes, short skirts and high heels, fancy hairdos.

The woman who was the secretary didn't care because he put her with the lawyer, but she was interested in being a paralegal anyway, so that didn't make any difference to her. And then just to make sure that all the areas were covered, he had another woman come in who did get along with the sexy chick, to do the actual work. So he had everybody up in the air. All the women, anyway. The guys, I don't know, they had different, probably, reactions. Some of the women were really upset about that.

WRIGHT: Quite a change.

POWERS: Quite a change. But then he left and the next guy came in. An outsider has a hard time coming into this place, they really do. It's getting better because we aren't as small as we used to be, we aren't as much of a family as we used to be, so the people coming in have an easier time. But back then, it was really hard for anybody to come in.

We had some outside Center directors, and it was very difficult for them. And Dave, I don't think, he didn't worry about. He had his job so he was happy. But the first black guy that

came here as the Center director [Isaac “Ike” Gillam], he always felt it was because of his race. It may have been some of that but we were just a really tight, closed Center, and he was the outsider.

So no matter what his ideas were, if they didn't agree with what the inside group wanted, there was this united front to try and not agree with whatever he wanted, so he had a really hard time. It was just, we were a very small Center, and if you've ever lived in a small town, that's what we were.

WRIGHT: How did the pilots fit in to all the team efforts and workings of the people that were here? Were they part of those teams or were they leaders of the teams, or just pilots?

POWERS: Gods is probably too high a term to use for them, but it was kind of like that. The pilots were basically the last word on anything. If they didn't like something on the plane. And there's a lot of justification for that. After all, they're the ones going out and risking their life, so they had a lot of influence, a lot of concessions, I guess you would say, for the pilots. One of my supervisors one time was all upset about what was happening with one of his planes, because they were just taking it out and using it for pilot proficiency. He never made any progress on that one because, well, so what—your problem is.

WRIGHT: Did you work closely with them, with your work?

POWERS: No. They'd be in the tech briefs, they'd be in the pre- and post-flight briefs. But no, you didn't work that closely. Most of the people didn't work that closely with the pilots. The crew was obviously the ones that worked really close with the pilots, they worked really close with. They knew who you were, you could talk to them, they were friendly enough, but I didn't

work that closely and most of the engineers didn't work that closely with them.

If you were involved with a simulator, then you would have worked closely with the pilots because they would have come down to run the simulator so then you would have gotten to know them better, but I didn't work with the simulators. Otherwise, you just wouldn't have a chance to be with them. But that's why it's been really hard for the Center because a lot of the flight projects have gone away. The pilots are really dismal because there's not that much—compared to what there used to be to fly, there's not that much to fly anymore, so it's been hard.

WRIGHT: Well, we certainly hope for your sake, on a personal basis and professional basis, that before you decide to end your career at Dryden that it'll swing again and allow some more excitement for your work on some projects that you really will enjoy doing before you decide not to do this anymore.

POWERS: Yes, that would be nice, but I suspect I'll retire before then.

WRIGHT: Then you'll have opportunity to write more books.

POWERS: That's right. I can spend more time writing books and researching. I did enjoy doing that one. It was interesting, once I got into it. It's always hard for me to get started, get the words down and get started in those thoughts.

WRIGHT: Well, it was definitely different than any of the rest of the reports that you had done.

POWERS: It's a different way of writing. The reports used to be quite structured in how they wanted them written, even down to the tense you were supposed to use. And so you got used to

that because they changed it all, so you might as well start out with that. It was a change to go to a different way of writing. It was a completely different style.

WRIGHT: Well, we wish you luck on the next one and look forward to reading it, whatever it may be.

POWERS: Are you going to write one?

WRIGHT: We'd like to. We are finishing a book that we worked with the author on the Shuttle-Mir project, so we've had our hands at helping to write and organize and do whatever. But our main job right now is just to gather the history before it's gone, or before people don't want to talk about it, so we're hoping to stay with our project as long as we can.

POWERS: Yes, the numbers are dwindling rapidly, as far as talking to the ones here in the fifties, the forties. They're starting to disappear, so time is not on your side.

WRIGHT: And that may be something you can help pick up with. But we wish you luck in the future, and thank you again for talking with us today.

POWERS: Thanks.

[End of interview]