BERTHA M. RYAN
NASA ORAL HISTORY

INTERVIEWED BY SANDRA JOHNSON AND REBECCA WRIGHT
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JOHNSON: Today is June 13, 2001. This interview with Bertha M. Ryan is being conducted as part of the NASA Headquarters History Office "Herstory" Project. The interview is being conducted in Ridgecrest, California, by Sandra Johnson and Rebecca Wright.

Good morning, Ms. Ryan. Thank you again for taking the time to meet and discuss with us your experiences while employed with the NASA Flight Research Center in California. We'd like to begin by gathering some background information from you. Where are you from originally?

RYAN: Just outside of Boston, Massachusetts. A town called Newton.

JOHNSON: You grew up there. Did you go to school there? Go to high school, all the way through high school there?

RYAN: I went to all the Newton schools. Grammar, junior high, and high.

JOHNSON: Where did you go to college?

RYAN: Emmanuel College [Boston, Massachusetts], and then MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts] for graduate work.

JOHNSON: Was this something that you'd always planned to do, or was there some reason you went to Emmanuel College?

RYAN: I started liking airplanes at an early age, and so my aim was to do something in aviation. I had heard that you should know math, so I went to Emmanuel to study math, and then to get closer to aviation, I went to MIT first in math, and then switching to aeronautical engineering, as they called it in those days.

JOHNSON: So you started out with a math degree as an undergraduate, and switched to that. Where did you begin work?

RYAN: Professional work?

JOHNSON: Did you do some other work during college?

RYAN: Yes. I had to. I worked in a grocery store. In high school I worked in a so-called war plant, packing and inspecting tubes—Raytheon [Company], actually. In college, I worked at the school and I worked in a grocery store. At MIT, I mostly worked full time and went part-time. Worked first in the math department and then the Aeroelastic and Structures Research Lab at MIT.

JOHNSON: And after graduation?

RYAN: Went to Douglas [Aircraft Company] in Santa Monica, which no longer exists. It's now Boeing and it's not in Santa Monica. And then I went to FRC [NASA Flight Research Center]—Dryden, now. And then the Navy here at China Lake [California], and I worked for a contractor my last year to sort of phase out. I'm retired now.

JOHNSON: At Douglas, how long were you at Douglas?

RYAN: Four years, I guess. Went there in early '55 and I left in late '59. I went in early '56 and late—and I worked in the aerodynamics research group.

JOHNSON: How did you learn about Dryden, or did they recruit you?

RYAN: When I originally looked for a job at MIT, I wanted to go to Dryden. I'd heard about their flight test work and all those snazzy airplanes they worked on and this sort of thing, and the recruiter that was there at NACA [National Advisory Committee for Aeronautics] at the time was from Langley [NASA Langley Research Center, Langley, Virginia] and he said, "You don't want to go to Edwards [Air Force Base, Edwards, California]. That's way out in the desert. Come work for Langley." Well, I didn't want to work in Virginia, so I went to Douglas.

JOHNSON: So all along you had that in mind then? You wanted to work for NACA, to come out in this area?

RYAN: Yes.

JOHNSON: While you were in college, is that correct, or right after college, you built a glider?

RYAN: When I left back East to come to the West, which would have—let me see if I can get it right this time—it would have been December 1955 or January 1956. I ordered a sailplane kit [Schweizer SGS 1-26A] to be delivered in California, and then I built it out here, and flew it that summer.

JOHNSON: Where did you learn to fly?

RYAN: Framingham, Massachusetts, is where I soloed, and Norwood, Massachusetts, is where I got my private license.

JOHNSON: That was in a regular, normal airplane with an engine?

RYAN: I soloed in a Taylorcraft [airplane] and I got my private [license] in a Piper J-3 Cub, and I didn't get introduced to sailplanes until 1950 at MIT. It was high school when I started flying.

JOHNSON: So this is something you've grown up wanting to do all your life?

RYAN: Yes.

JOHNSON: What got you interested in flying?

RYAN: I think back in those days, there was more interest in it because of the things that people were doing. Of course, [Charles] Lindbergh was a bit before my time, but Amelia Earhart, I guess, would have been a big influence. It just seemed like flying was what I wanted to do. I had my first flight in 1945, when it was still wartime, and so they couldn't give joy rides. They had to give instruction, and the whole intent of it was to scare me to death so I'd get my foolishness over with. But it didn't work. I loved it even more.

JOHNSON: So do you feel like you were being discouraged, maybe, because you were female,

or just because of your age?

RYAN: No. It was my mother that was discouraging me. I didn't find any discouragement anyplace else. In fact, I sort of started in a fly-by-night outfit, but when I got into a formal one a couple of years later, she wouldn't sign for me, and that's why the first place I started with was sort of a fly-by-night outfit. They didn't mind that they didn't have the signature, but this more formal place did. The instructor came and spoke to her and said that it would be a good thing for her to do and so forth, and talked her into it.

JOHNSON: And she agreed sort of willingly?

RYAN: Well, she agreed. I think it scared her. She was born in 1884, which was a whole different world. So it was a strange thing for her to have her daughter do. She had three boys older than I am, but she didn't think this was the thing for her daughter to do.

[I probably learned to fly and became an engineer partly because of my mother and the example she gave me. She did not want me to do those things but she did not stop me. She was a very special woman, having been widowed with four children ages three to thirteen and then sending her three sons off to fight in World War II. There are two very special things she stressed: 1) You can do anything you want if you work hard enough, and 2) don't be afraid to be different.]

JOHNSON: But you persisted and you got your license. You began your work with NACA—

RYAN: NASA by the time I joined. I went to work on December 31, 1959, which is a bad day to go to work for the government. By that time, it was NASA.

JOHNSON: What were you doing when you first began?

RYAN: Sonic boom studies. And then after about a year, I got on to the lifting body project, which was really a fascinating thing.

JOHNSON: Can you give us a little bit of information about the sonic boom studies?

RYAN: There was some thought they could be used as a weapon by focusing them, so that they would hit in one place. We actually did some experiments and broke a few windows or something like that. Just minor stuff. I guess they eventually decided it wouldn't work. But at the same time there was a comic strip that was doing this. Made it sort of funny.

To study the sonic boom, you have to go into flowfield studies and so forth. And of course, they would be concerned, too, because of disturbing people with the sonic boom. There was some talk at the time also about a supersonic transport and if you're flying across the country supersonically, you're making noise all the way across the country, and they didn't know if this would be acceptable. So that was the reason it was important to study sonic booms.

JOHNSON: You did that, you said, for about a year?

RYAN: I think it was about a year, yes, and then I got into the lifting body project. When [Robert] Dale Reed started it, I think the way he started it is interesting and typical of NASA in those days.

I know it's a “herstory”, but if you have a chance to talk to him, you might find it interesting. He had seen these shapes. They had been tested in wind tunnels, mainly at [NASA] Ames [Research Center, Moffett Field, California], but some at Langley also, and

got the idea that it would be a good kind of a shape to return from space in. But nobody thought they could be landed, and so he thought it would be a good project to build one and see if he could land it. And so he built a model of one and he built a model tow plane, and he started flying them in the halls of NASA.

The director at the time was Paul [F.] Bikle, who was a glider pilot also, and saw this thing going on of a model tow plane towing a lifting body, and thought it would be a good idea, too, and it grew from there. And then they actually built one. It was a lightweight one, the M2-F1, and flew it, and then they built heavyweight ones, M2-F2 and the HL-10, and dropped them from a B-52, and proved you could land it.

JOHNSON: How did you get involved in the project?

RYAN: Actually, I was the second person assigned to it, although until they started building the M2-F1, it didn't have that much visibility, but I was just trying to gather data and so forth. That was about a year after I went to work there.

JOHNSON: That's what you did, you gathered data for them?

RYAN: And tried to figure out what the data meant, and then as time went on, we had wind tunnel tests and simulations, as it grew to a bigger project. And then we compared flight test with wind tunnel with calculations, which is a very satisfying thing to do, to find out if your calculations are real.

JOHNSON: Who else was involved in this project, besides you and Dale Reed?

RYAN: Very soon after, when they started the construction of the M2-F1, they involved

[Richard] Dick Eldredge. He's no longer here. The crew chief was [Orion] Bill Billeter and the pilot was Milt [Milton O.] Thompson. You're stretching my memory.

JOHNSON: Was Harriet [DeVries] Smith involved?

RYAN: Harriet Smith got involved soon after that, and did a lot of the simulation work. I have a report where she reports upon some of the simulation work that was done. And then she got very much involved with the heavyweight one. I've never been good at names.

JOHNSON: That's okay. I identify with you.

RYAN: I can see the people. Oh, Ken [Kenneth W.] Iliff got very much involved. I'm trying to think of the other people. I could go get the report and look up their names.

JOHNSON: From some of the research we've done, I read that a gentleman by the name of Gus Briegleb was the one that was contracted to build the original body out of wood.

RYAN: Yes. Gus had a glider operation nearby at El Mirage, California. He's still alive, but he's in a nursing home, and his sons are still involved in aviation. He got the contract to build the shell of the M2-F1. The inside structure, chrome-moly steel tubing, was built at NASA. And of course, the design was at NASA, with the practical input from Gus Briegleb and the construction from Gus.

JOHNSON: Did you know him?

RYAN: Oh, very well. I did my flying there, and completed the sailplane there. I was

working on it in a friend's garage in Santa Monica [California], and then I brought it up to El Mirage for its final construction and first flight. Flew there a lot for several years, and so did Paul Bikle, the director at the time, so we knew Gus and his capabilities. He had designed and built sailplanes, a whole series of them.

JOHNSON: His own designs?

RYAN: Yes.

JOHNSON: So he was the expert?

RYAN: Very definitely, very definitely, yes.

JOHNSON: Going back to when you first got here, can you tell us a little bit about your first impressions?

RYAN: Well, like I said, it was December 31 [1959]. That's a bad day to go to work for the government, but my impression improved in the following month. That's probably a bad day to go to work anyplace. [Laughter]

JOHNSON: The climate was quite a difference from where you grew up.

RYAN: I'd been spending weekends in the desert, and wanted to live in the desert.

JOHNSON: Did you?

RYAN: Also it's a dry heat, and when I first moved West, I didn't think I'd like the heat because I hated it in Boston. If it got above eighty degrees, I was miserable. And so I thought, "Gee, I don't know how I'm going to like the desert," and then I discovered I loved it.

JOHNSON: Where did you live when you first worked for NASA?

RYAN: Lancaster [California].

JOHNSON: So you lived in Lancaster.

RYAN: I had an apartment and then I bought a house, and my mother came out to live with me the last two years of her life there. It was a big change for her. She had moved from just outside of Boston to Manhattan [New York], with my brother, and she came directly to the desert.

JOHNSON: There's quite a change.

RYAN: She was probably seventy-six at the time. Big change for her. But she was adaptable.

JOHNSON: You had your own car? Did you drive back and forth?

RYAN: There was a bus. Sometimes I'd drive, but there was a bus that would go back and forth, so you'd get on the bus early in the morning and go to sleep and then an hour later you'd be there, and then you'd go home by bus. The only problem with that, which was such a joy when I came here, was that you had to leave exactly at that time, and you'd be in a meeting,

and the meeting would break up because everybody had to catch the bus. So that was a disadvantage. It was a big joy here when I am just a few minutes from work and come and go as I please. Don't have to stick to that bus schedule. But it was nice sleeping on the bus, too.

JOHNSON: Have that extra hour. What were the conditions like when you went to work, where you worked? Like the buildings you worked in.

RYAN: Well, it was that main building that's there now that has the airplane out in front of it, so it was that same building, and the conditions were fine.

JOHNSON: They were? Everything was—

RYAN: Yes. There was a cafeteria and everything was fine. The people before me might have something different to say, I'm sure, because conditions were—

JOHNSON: Had improved?

RYAN: I would imagine. I didn't realize that, but apparently, just before I got there, there had been a big improvement in all sorts of things, so I just took it for granted it had always been that way.

JOHNSON: Were there very many women engineers beside yourself?

RYAN: Well, I honestly wasn't that conscious of women versus men, but I believe Harriet [DeVries Smith] may have been the only one. Now, Betty [Scott] Love will be able to

answer that, but I think Harriet Smith might have been the only one. Mary Little [Kuhl] had a very strong responsibility for the computational group, but you'd have to check with Betty Love to know that, or Sheryll [Goecke Powers]. I think the work she's done on the book might answer that question for you.

JOHNSON: So it really wasn't an issue, even in that time?

RYAN: It wasn't to me, but I'd been working for quite a few years as an engineer by that time, so I didn't think it was an issue, at least not to me. Maybe it was to someone else, but I just wasn't aware of it being an issue, particularly. It was when I went to Langley on travel one time.

JOHNSON: Was it?

RYAN: Yes. But other places, it didn't seem to be an issue at all.

JOHNSON: Was it something you want to share with us, what happened?

RYAN: I had gotten into the habit—I'd been going to the wind tunnel tests, and I'd gotten into the habit of going back in the evenings to see if there was anything else new or to look at the data and be prepared for the next day. The first statement I got when I got to Langley was, "No female works at night." And also, the previous people that had gone there on travel had been put into the area where the engineers were, and I was put into the area where the computers were, and I guess you've gotten the definition of the—

JOHNSON: Yes.

RYAN: And while that was nice because they were lovely women, they weren't people that I could share work discussions with, and so I finally called back to Edwards and Dale Reed got on the phone and called them and then things were okay. I guess they just did things differently at Langley. But I've been there since lots of times and there's no situation like that now.

JOHNSON: What other projects did you work on when you were at NASA? Did you work on the X-15?

RYAN: No, I didn't. I was interested in what was going on. Naturally, we all were, but I didn't work on it. I was full time on the lifting body.

JOHNSON: Did you work on that the whole time you were there?

RYAN: After the sonic booms, I worked on it all through all of them up to what we called the SV-5 that became the X-24. It didn't fly until after I left. The M2-F3 didn't fly until after I left. The M2-F2 cracked up shortly after I came here, and they called me and let me know about that, and then from that they built the M2-F3.

JOHNSON: Was there a lot of enthusiasm on that project, on the M2-F1, when you were working on that?

RYAN: Oh, a tremendous amount. I mean, it was fun. It was great. Oh, yes, there was a tremendous amount of—and it was sufficiently informal that even though I wasn't part of the flight test team, I was on the analysis side. I could go out on the lake when they were doing

the tests, and in fact, I even took pictures, which you probably couldn't now, but you could then.

A film that I took was actually the only one available for a few days and they wanted to be showing other people what they had done with the first few flights, and so I was delighted that they were able to use my film until they very quickly got a NASA photographer out there and took some professional ones. But I was pleased that that got to be used for a while. Well, I've still got it.

JOHNSON: Was there a vision with this project of what they eventually wanted it to accomplish?

RYAN: Oh, definitely. Yes, definitely. It was to come back from space. And some of the designs now are lifting body shapes. In fact, one of my last projects with the Navy, believe it or not, was working on the X-30, which was to be a horizontal takeoff, single stage to orbit and horizontal landing aircraft, and it had a lifting body shape. That was the model of it you may have seen on the way in. There's both an M2-F2 and the X-30 on my entry table.

JOHNSON: I'll have to take a look at that.

RYAN: So it was sort of fun to go full circle, except that was too complicated so it didn't fly.

JOHNSON: There was an interesting towing vehicle on the M2-F1.

RYAN: The Pontiac, yes.

JOHNSON: Can you tell us anything about that?

RYAN: A Pontiac Catalina convertible with a rollover bar. You would want a convertible so you could see what was going on with the lifting body, and you want the rollover bar in case you have to turn suddenly. A fellow named [Walter W.] Whiteside, Whitey Whiteside, who you've probably heard of—I think he passed away not too long ago, maybe a year ago or something—arranged to get this car. I guess he was into racing.

But there's the story that went around that you had to get an okay for this through Congress to buy a car and how do you tell them that you want a Pontiac Catalina convertible. So they called it a lifting body power plant, and they got it. I had a note from Betty Love with something that I'm going to have to ask her about when she's back in town that I find very distressing. It was apparently on eBay [Internet-based auction], for sale on eBay, and I don't know how it ever got to eBay in the first place—this is what I want to ask Betty—without wheels and without the engine.

But I would have thought NASA would have kept that and preserved it as a piece of history. But apparently they didn't have any pictures of it either. I took some pictures and apparently some other people did, too, that they've since obtained. But they didn't take any pictures because I guess there was some sensitivity about the lifting body power plant. And so when they [reconditioned] the M2-F1, they asked me if they could have that picture that I took, and so they used it there and I guess it's in their gallery.

But it's a shame that that wasn't kept and preserved by NASA. I'm going to have to ask Betty how it got on eBay. I don't know if she knows. Maybe they wanted to hide it and got rid of it quickly and sold it for surplus. [Laughter]

JOHNSON: Milt Thompson was the pilot?

RYAN: Yes. Great guy.

JOHNSON: Did he have anything to do as far as input on the design?

RYAN: Oh, definitely, definitely. All the pilots at NASA really know their airplanes, and they're better engineers than the engineers, I think. Well, they should be because they're going to be the one flying it. And actually, that got me in trouble up here one time because I went to see one of our Navy pilots and assumed he was as good as a NASA pilot, and started asking him questions, and I guess I embarrassed him. But no, Milt Thompson was an especially good pilot in flying new and different things. Especially good that way.

JOHNSON: So you worked on those projects, and then you went to work for the Naval Weapons Center at China Lake?

RYAN: Yes.

JOHNSON: Can you give us some information about that job and what you did there?

RYAN: Well, I wanted to get back to more analytical work. I had trained in viscous fluid flow and boundary-layer transition, and I wanted to get back into doing more of that, so I transferred up here into the aerothermodynamics branch, which allowed me to do heat transfer work, which comes from heating of the flowfield around shapes. We worked on projects about half-time and on exploratory development projects the other half, so we'd be learning all the latest techniques and developing them, and then we could apply them to projects.

So it was a good combination of the practical and the semi-practical, I guess you'd call it. So that was lots of fun, too. Worked on all the various weapons, hoping that because we

had good weapons, we wouldn't have to use them. And I guess we did stay out of World War III, even though we've been involved in other wars, at least not World War III.

JOHNSON: You were involved at NASA and then with the Navy during a rather turbulent time in our country, as far as the Vietnam War and the protests. Some of the people we've interviewed from Johnson Space Center during that time have said that they were so focused on what they were doing, the rest of the world really didn't enter into what they were doing, and they weren't aware. Do you feel like you had the same focus?

RYAN: Especially here, especially here. I came here in 1967, and a lot of our practical effort then was involved in supporting the people in Vietnam, and we'd get into strange things that weren't exactly our field, but you felt like you were maybe doing some good, like how do you help the guy that gets wet boots and has to slog through the swamps. So we'd get into some practical things.

But no, we were very much supporting the war effort here, probably even more than they were. I frankly didn't understand what was going on, and I wasn't that conscious of it because we were so involved here in trying to get the thing over with, so people wouldn't have to continue dying. Over with, hopefully winning.

That was a very sad experience for the people who fought it, compared with World War II, where it was a 100 percent effort, and it just seems a shame that people didn't support the service people, no matter how they felt about the war. But they were very much supported here, and so that was a good feeling that we could help them out.

JOHNSON: During your time at Dryden, there were changes, I'm sure, that took place. Were there any that you were aware of, as far as the facilities or the way it was funded, or any of those issues that you were aware of?

RYAN: Well, the funding was different from here, which, in a sense, made it easier there, because here we had to account for our time. The project paid for our time, also, and not just what we made, but overhead, and our time. So funding was different between the two places. I don't know if that changed down there or not. I wasn't that aware of the funding. I've never paid as much attention to that, I guess, as I should.

Plus, the lifting body project was, at least, started out in a way to spend the least that you could. It was a very low-cost project. They did start to build—they call it the calibration hangar, that one next door. They started to build that, I guess, about the time I was there. One difference I noticed, and it may have just been time, and not place. The engineers wanted to do their own programming for the computer, and that wasn't allowed at NASA. It was a closed shop, so to speak. And when I came here, of course, we could do that, and it's good to be involved in that kind of thing, at least in those days when computer programs were smaller, because you understand the intricacies of it, and the ins and outs and what the assumptions are, and this sort of thing.

NASA would just give them the equations and they'd program it and that isn't a satisfactory way to do things. They didn't do that here, and whether it was time or location, I don't know. It's quite possible that engineers got more involved at NASA, also. In fact, I'm sure that they did. I'm sure they must have because it's the best way to do things.

JOHNSON: Were there any opportunities at NASA for advancement in your field, or did you look for that?

RYAN: Well, I took courses and advanced the usual way, like everybody else does. I wasn't interested in management at all, and I haven't been here, either.

JOHNSON: We've heard some other people, in some of the research we've done, describe the atmosphere at NASA during that time period, and the teamwork and the feeling of cohesiveness.

RYAN: Especially the lifting body project, I think, although I'm sure it was true on the X-15 also, but I think the lifting body group especially felt that. It was really enjoyable to have the whole gamut, from analytical to wind tunnel and simulation and flight test, and as I think I said before, to be able to check your computations with the real world.

JOHNSON: Do you think the size, as far as the number of people that were working there being smaller, attributed to some of that teamwork feeling?

RYAN: Perhaps so. Everybody knew everybody, and perhaps it did. Although, once again, if it had been a big place, I'm sure we would have the same with the lifting body project.

JOHNSON: While you were there, what do feel like might have been your most challenging part of your job at NASA?

RYAN: I don't know. The whole thing, I guess.

JOHNSON: Anything in particular, or just every aspect?

RYAN: Well, flight test was new to me. Being a pilot, although I was not the same kind of pilot, I think helped a lot, in a place like that in particular, so it was very good in that there was always something new to learn, and there was an opportunity to learn, and so that was very satisfying.

JOHNSON: Was there ever anything discouraging or frustrating about your job, or did you ever feel like there was anything that you couldn't go through the proper channels and correct?

RYAN: Well, there were sometimes some tough battles, which you'll get most anyplace, but we eventually got them through. There was one sort of interesting thing that I sort of got a kick out of it. It probably is just a blip that nobody ever noticed, but one piece of flight test data came back in which there was an indication that the pilot had pushed the rudder in one direction while he said he pushed it in the other direction, and everybody decided the pilot was wrong, and I couldn't believe that.

And so I went to see the instrumentation people and they were very helpful and they looked at all the instruments and so forth and they found one, the one that tells which way he had pushed the rudder, that they had borrowed from the Air Force. They took it apart, they were very helpful. It was great to work with them because they were so helpful. And it had been hooked up backwards. The pilot was right. So that was sort of satisfying.

JOHNSON: Were there technical reports published during that time that you were involved with or did you—

RYAN: Yes. I think Sheryll [Goecke Powers] has them in the book [Women in Flight Research at NASA Dryden Flight Research Center from 1946 to 1995]. I think there was one, and then there were some very informal ones. Mostly I was working on the informal ones to get the information out, and I did leave one report in final form when I left, but there was no one there to push it, so it didn't get published. I wish I'd kept a copy of it, but it was more difficult to make copies in those days. I'd have to look that up to get the—I do have the

information here. I can look it up. We can do that later, maybe.

JOHNSON: So you left NASA, and you went to the Navy, and all this time you were flying on your own. Were you involved in any groups that were flying, or was this something you just did on your own? Did you belong to any organizations?

RYAN: I did belong and still belong to the Soaring Society of America, and I'm active in that. I belong to other aviation groups that I'm not as active in, but I just belong. I rented airplanes at the time and flew my sailplane, and then when I came up here, we lived on base, and living was so cheap that in three years I'd saved enough to buy an airplane, which I still have, Piper Cherokee. I brought my glider with me and I eventually sold it and bought a higher-performance sailplane, which I still have.

My sailplane is being restored in Florida, and the fellow wants to restore it to its original condition, so every once in a while, he'll contact me by e-mail and say, "What color white paint was it?" He'll send me samples of white paint, and I don't remember. I didn't have any money when I was building that, so it was probably the cheapest paint available. So I picked one out and sent it back to him.

JOHNSON: You made him happy.

RYAN: But it's been sort of fun. He's been sending me pictures of it, the progress that he's made in restoring it. It had, I think, two owners between us, and one of them left it out at a [gliderport]—I think it was Crystalaire [Llano, California]—and it was attacked by a dog, and so it needs restoration. And so he's been doing that and it's been fun keeping in touch with him.

JOHNSON: What about honors and memberships in anything? I think I found that you were a member of the American Institute of Aeronautics and Astronautics?

RYAN: It was originally IAS [Institute of Aeronautical Sciences] and ARS [American Rocket Society], and then they combined to form the AIAA, which is what you just said, and I am an associate fellow of that.

JOHNSON: What do you do as far as your involvement?

RYAN: I just go to local meetings now. I used to go to the conferences, and I did for a time after I retired, too, but I just go to the local meetings now and get their magazine to keep up on things. [I held offices in the local China Lake chapter and was chapter chairman in 1973. I also was a member of the General Aviation Systems Technical Committee in the mid-1970s.]

JOHNSON: At any point in your career were you ever—or before you chose your career, were you ever discouraged from going into engineering, being female?

RYAN: By my mother.

JOHNSON: Again.

RYAN: I said, "I want to do aviation research." She was a brilliant person in every other aspect. She said, "There's no research in aviation." She didn't mind when I went into math, but engineering, she didn't think that was the thing I should do. And the airplanes scared her, so she didn't ever fly with me, for which I was very sorry.

JOHNSON: So when you were going to school, though, as far as college is concerned, or choosing that as a career, you don't feel like there was anyone that told you being female would be an issue?

RYAN: No. I was always encouraged, I think, actually.

JOHNSON: Were there other women in the program?

RYAN: At MIT while I was there, I think I was the only one in aeronautical engineering. It was hard to tell, since I was working full time and taking a course or two at a time. But I had been preceded by two very talented women, who actually went to work in the group at Douglas that I eventually went to work for, and probably because they were so talented, it made the path easier for me.

JOHNSON: At NASA, was there any one person that you felt like was very encouraging or a mentor, or anyone that you feel—

RYAN: Well, Dale Reed was always a great inspiration, and Hal [J.] Walker. [Thomas V.] Cooney, the first person I worked for. Very nice branch head. Cooney. I can't remember his first name. Gee, I should have looked all these things up before you came.

JOHNSON: We can fill those in later.

RYAN: In fact, no, I thought they were always very encouraging.

JOHNSON: So you worked for the Navy until you retired, is that correct?

RYAN: Yes, I retired and then I worked for a contractor for a year, half-time, to sort of phase out. That turned out to be a good thing to do because it's—I mean, I loved my job so much that I wouldn't have wanted to have cut it off suddenly, but it was time to. I felt like it was time, so things worked out right, and to work half-time was just perfect. Also I think it helped the Navy because by that time they knew I was leaving so they made the transition, you know, retaining the information they needed to and so forth. I think that made it easier. So I think it's a good way to do it.

JOHNSON: What year was that?

RYAN: I think I chose April 1, April Fool's Day, 1991, and then I think, I'm not real sure, I think it was '91, and then I worked for about a year for DCS Corporation, which is based in, I believe, Alexandria, Virginia, but they had a small office here and I brought my funding with me and worked through them, doing essentially the same thing with a slightly different name.

JOHNSON: Have you continued working anywhere else since then?

RYAN: No. I've been offered positions but I didn't want to. I have chosen to do different things. I've been writing articles for magazines, which is sort of fun. I wrote one on the lifting body, in which that picture of the Pontiac was first published before [NASA] had it.

JOHNSON: So that's what you've been doing with your time mainly, is writing articles?

RYAN: Well, traveling and writing articles, trying to throw things out and flying, and this sort of thing. You collect too many things, so I keep trying to throw them out and they pile up

faster than I can throw them out.

JOHNSON: Some of your awards and citations—would you like to talk about any of those, that you've received? The Soaring Society of America, you were on the board of directors in 1960, is that correct?

RYAN: Yes. Boy, how did you get all that information? I think it was about that. Paul Bikle was president and I was the treasurer then on the board of directors. And they elected me to their hall of fame in something like 1972 and a couple of other minor awards, and then in 1996, I was very pleased to receive the Warren E. Eaton Award, which is an annual award, the highest one the Soaring Society gives. And then I was really very extremely pleased to receive the [Fédération Aéronautique Internationale Gliding Commission] Pelagia Majewska Medal. I received it in 1997 for 1996 and I was the first person from this country to receive it, and so far the only American to have received it, so I'm very proud of that one.

JOHNSON: What was the criteria for receiving that award?

RYAN: Well, in both cases, I think the criteria are very similar. You either have done something magnificent in flying that year, which I didn't do, or you have given long service to the [sport,] science and art of soaring. I've lasted a long time.

JOHNSON: You've been involved with the Women's Soaring Pilots Association [WSPA], is that correct?

RYAN: Yes, to some extent. We had a thing called the Smirnoff Derby where Smirnoff wanted to advertise how light they were, so they figured they'd sponsor a sailplane cross

country, from Los Angeles to Washington, or the West Coast to the East Coast. I did the scoring for it and went along, flying my airplane. They had five of them and I went along on two or three and did the others by phone.

But it kept coming up, how come there are so few women flying sailplanes? And I was trying to figure it out, because it's a great sport. How come there are so few doing it? So I started a newsletter to ask why. I still haven't figured it out, incidentally, but we started calling that *Hangar Soaring*, and then about ten years after that, they formed the WSPA. So while I haven't been directly involved in the WSPA except as a member, they do still use the newsletter that I started, and they've much improved upon it. It comes out now, I guess, about four times a year, and it's still called *Hangar Soaring*.

JOHNSON: Is it?

RYAN: How did you learn all these things?

JOHNSON: Oh, research. You mentioned you went to Langley on travel one time.

RYAN: Several times. I don't know if I went more than once for NASA, but I went for the Navy.

JOHNSON: Did you do any other traveling for NASA?

RYAN: I went to [NASA] Ames [Research Center] a lot for the wind-tunnel tests. In fact, that was a very helpful thing. No one wanted to spend that much time up there. They all had families and so forth, so I said, "I'll go." I had a wonderful time, and it got me started doing more and more with the project, so it was a good thing to do. Plus it was very interesting to

be at Ames.

JOHNSON: I was going to ask Rebecca and see if she has any questions that she'd like to—

WRIGHT: If you could share with us a few more details. I made a note when you were talking about your analysis and the comparison, when you were doing your lifting body projects. You had a team of so many different types of experts, sitting together. Could you share with us on how you were able to take your information and watch it be compiled with others' information to have results that would help your project as whole? How were you all able to take all this data and make it into something that truly would benefit that project?

RYAN: Well, we'd gather the information from the wind tunnel and get the aerodynamic coefficients from it, and we'd also try to predict what we would expect those would be, and then put them into a simulation, and, of course, people would work together on the simulation, and try to set it up so that the pilots could fly it. Then they would do the flight tests and get the data from the flight tests.

The people would gather that data and we'd take it and put it into a form where we could compare with what we had predicted. The pilots would also tell us if the simulation was like the flight. Neil Armstrong used to always say that the flying part is always easiest in the simulation. There was one simulation that we did that was really sort of fun. Also, have you bumped into the name Larry [Lawrence W.] Taylor [,Jr.]?

WRIGHT: Yes.

RYAN: He was in simulation work and, at the time, was not a pilot. I think he's since learned to fly, but we thought it might be useful to set up a simulation of the lifting body on tow

behind an airplane. This isn't something that had been done before, and especially the characteristics between the lifting body and the tow plane.

So we decided to do it with something that we knew, so we used the 1-26, my sailplane, to guess what those aerodynamic coefficients would be, and put them into a simulation. While that was a single-place glider, there was a two-place also that had similarities, so we made up this simulation of the 1-26 on tow.

And then Larry Taylor and I went up to Tehachapi and flew. Like I say, he didn't fly at the time, but I would allow him to handle the controls, and when he'd get into trouble, I'd take over, and so he called me a "reset button." And so that's how we checked out to see if it was realistic, and then we could put the same ideas into the M2-F1's flight simulation on tow.

And I think he's since learned to fly. He was at Langley. I saw his son at Langley. I think he had passed away, but I saw his son when I went there on travel for the Navy. His son is working for a contractor, not for NASA, but he was at Langley.

WRIGHT: It sounds as if that, once you became involved in the day-to-day operations, it was more of a day-to-day discovery. You were constantly learning more information that you could apply to what you were looking for.

RYAN: Well, I certainly was. Not only learning more information but learning how to do things, and so that made life very interesting.

WRIGHT: When you arrived at the Flight Research Center, changes were beginning because it was growing there, compared to, of course, where it started out as, but there was an atmosphere of a small, tight-knit family. Do you feel like you were treated as an outsider or did you feel like you were accepted?

RYAN: Oh, I felt accepted immediately. No, like I say, I think most of those big changes must have come before I got there, and apparently just before, from recent discussions with Betty Love, because, to me, it just seemed like a great place. I went there and enjoyed myself and hopefully got some useful work done and found the people great to work with.

WRIGHT: Sounds like your days were full.

RYAN: Yes.

WRIGHT: And then you filled the rest of your days with flying. It was almost as if your hobby became part of your work and your work became part of your hobby.

RYAN: That's what was so much fun, really, that the two seemed to be intertwined. Maybe that's one reason I left. I was feeling guilty about having too much fun, but then I continued to have fun up here, too.

JOHNSON: It's unique to be able to enjoy your work that much.

RYAN: I think it's very important to enjoy your work. It's a big part of your life and if you enjoy it, I think you do it better. I feel for people that dread going to work.

JOHNSON: What about the social aspect when you were at NASA? Did you socialize with the same people you worked with, after hours, or fly with them?

RYAN: Well, some of them I flew with, but mostly I was involved with the flying people. I'm not an awfully sociable person. I don't know if I'm insulting myself or what.

JOHNSON: Well, you knew what you enjoyed, and you pursued that.

WRIGHT: You mentioned, too, that you started flying when you were in high school. That was close to the end of World War II. There were programs, the civilian pilot training. Were you able at all to become part of that?

RYAN: No, and I've just been reading a book. During World War II, there were women pilots called WASPs, and they've just written a book of the stories of 694 of them. There were 1,074 or something and they wrote them all and they sent back and said how they got started and what they did and what they've been doing since. It's been a fascinating book.

So many of them started with this CPT, civilian pilot training. As I understand it, 10 percent of them could be women, but then as the war came, they wouldn't let women in anymore, because the purpose of it was to train pilots that would fly during World War II. But a lot of the women that joined the WASPs did seem to get their initial training with the CPT, but that was long gone by the time I was old enough.

My brother took some ground courses in that and gave me a book from it, which I still have, on aeronautics, but that was as close as I got to that.

WRIGHT: And you worked part-time jobs in order to pay for your flying lessons, or were your flying lessons given to you? Tell us about you managed to do all that.

RYAN: My flying lessons were not given to me.

WRIGHT: Nothing was given to you, was it? [Laughter]

RYAN: I got this job at Raytheon, testing and inspecting tubes, while the war was still on, at fifty cents an hour. I worked there part-time while I was in school and then that summer, which would have been the last summer of the war, 1945, I worked full time, so I was making—for forty-eight hours of work—I was making twenty-four dollars. The cost of flying at that time in a Taylorcraft was $10.50 solo and $12.50 dual.

So I would take a bus every weekend to Framingham Airport [Framingham, Massachusetts] and take something like a half an hour flying, whatever money I had, and I finally soloed in October that year. Of course, by that time, everybody had been laid off from their wartime jobs, but I had still saved every cent of it. I used to walk to work and everything, but I did have to take the bus to the airport. And I soloed in October in 1945 and the next day they closed the airport and built a prison. [Laughter]

JOHNSON: Hopefully that wasn't related in any way.

RYAN: So I had to find a different airport to fly from and I flew from several for a while, and had various adventures until I finally went to Norwood [Memorial Airport, Norwood, Massachusetts] and they had a specific course all set up. Also I had certain advantages there. Well, I spoke about the instructor that had arranged for me to fly, but also they had a GI Bill, where the people returning from World War II could fly for free, so they'd always pad their time a little bit and give it to me. Not much, just a little, so that helped a little, too.

WRIGHT: And you haven't stopped since.

JOHNSON: Did any of your brothers fly? You mentioned your one brother.

RYAN: The three brothers, all of whom were in the service during World War II, and the

middle one, Fred, who has since passed away, was an Air Force pilot. He's the one that gave me the book from the CPT, and he went into the Air Force. He's also the one that was supposed to arrange to take me out to the airport that day and scare me so I'd get over the foolishness.

He knew very well that—he had been flying B-24s. He was a bomber pilot. And he knew very well he couldn't take me up in the T-craft [Taylorcraft airplane], so I knew he knew what was going on, so he went out and got me a ride on it. I had off from school because President Roosevelt had died, so I got my first flight, which was my first lesson, and it was even better than I thought it was going to be.

WRIGHT: And which plane was that?

RYAN: It was the Taylorcraft.

JOHNSON: So it was everything you expected and more?

RYAN: It was more. It was more. But I wouldn't have wanted to have been a professional pilot. I preferred to have been an engineer and do the flying on the side, but be associated with aviation.

WRIGHT: You certainly have made an impact on many planes. Is there some project that you worked on in the Navy that you can share with us? I know sometimes some projects still are not to be discussed.

RYAN: For the projects, I did heat transfer work. Mainly the heating from aerodynamic heating. We would make computer models of the particular system that we were trying to

analyze and then apply the flight conditions to it to see if it would get too hot for the electronics to work or something like that, or too hot for the structure. So it was just all kinds of Navy weapons—Condor [missile], Walleye [precision-surface, antisurface guided glide bomb], Sidewinder [missile]—just about all of them at one time or another. Tomahawk [cruise missile]—just about all of them I worked on.

And then, as I said, we had exploratory development programs about half time. Oh, there would be interference heating between the wing and the body and how you analyze that, or there would be the effect of boundary layer transition and where it occurs, and that was one of the—what I was working on with the X-30, NASP, National Aerospace Plane, was what the interference heating was between the body and the sort of a wing control, which I can show you on the model.

But we needed to know where boundary layer transition happens, where the flow goes from being laminar or smooth to being turbulent, and right at that point, it can be very hot and so you need to know where that is. They started trying to figure that out in something like 1911, and they haven't figured it out yet.

So that was probably one of the things in my part of the X-30 study, which was the exterior of the airplane, that would have delayed it from flying. The main problem, I think, though, would probably be the power, the engines, but from a practical viewpoint, I think it was because they were designing by committee, which you can sort of see by someone in the Navy working on this project.

They had something like seven main contractors, and they wouldn't down-select. They decided not to down-select. NASA and the Air Force and some of the Navy—I sort of talked myself into working on it because I knew it would be interesting, so I persuaded them that we ought to work on it, but you don't design airplanes by committee, and so I think that might have been the biggest problem.

But it was a good thing to do because the people who had worked on hypersonic flow

with the X-15, for example, the NASA people, were getting where they would be retiring and moving on, and the younger people hadn't worked on hypersonic flow, so it got those two groups together—the people with the background knowledge and experience, and the newer people coming in. So I think it was a good program to do just from that viewpoint.

But I was glad it turned out to be a lifting body shape, even though they didn't fly it. Someday they'll do that with some of the newer ones they're working on now.

JOHNSON: How did you feel the first time you saw the Shuttle fly, or knew that it was flying, knowing that you had something to do—?

RYAN: Well, I didn't. They didn't take a lifting body shape. They took one with the wings.

JOHNSON: Some of the research, though. Some of the research came from—

RYAN: I'm sure a lot of the techniques and so forth did, yes, and I was extremely pleased to see it, and I did have the opportunity to see it land a couple of times, and I saw one of the night landings, which was very interesting, too. It was fun to go down there. I'd occasionally go down and watch from outside of Edwards, too, so it was very satisfying to see it, and to know some of the people involved was very pleasing also, to have contact with the people that have made history.

JOHNSON: Speaking of some of those people that have made history while you were there, there were other test pilots. Milt Thompson, you've talked about. Were there any others—or how was the atmosphere? Being a pilot yourself, did you have more in common with them?

RYAN: I felt that being a pilot helped in my contacts with them. Maybe it was my

imagination, but I felt that that made a difference, although I was, of course, a very different type of pilot. But I very much admired and respected them all very much. I thought they were just outstanding. [William H.] Bill Dana just came up and spoke to our AIAA group a couple of weeks ago and it was very nice to see him again. And Bruce Peterson and [Joseph A.] Joe Walker, of course. It was a very sad day when Joe Walker had his accident.

WRIGHT: How did the changing of technology affect your job and what you were trying to achieve?

RYAN: I was so proud down at NASA because I had a 20-inch slide rule I could do my calculations on. And of course, then they got the computer which we couldn't be directly involved with, but I was more directly involved here, and worked up through working on a Cray [computer] here, and working the ARPANET [Advanced Research Projects Agency Network] in 1980, which eventually became the Internet.

There have been some tremendous changes. I think these changes have increased productivity tremendously. I mean, calculations that would have taken six months, if we could do them, you could maybe do in a couple of minutes. We could go into the analysis of a vehicle after several years here, and I'm sure they did it down there now, too, of course, that we couldn't even conceive of when I was first starting.

Yes, there have been some big changes. It's been fun to see them. The first computer I saw at MIT took up a whole building, and the output was a CRT [cathode ray tube], where you took a Polaroid picture of it, and it was a whole building, and now you can hold something in the palm of your hand that can do even more. So it's sort of fun.

There's a computer museum in Boston that's fun to go to, although you go to it and you see it's already behind, because things are happening so fast. I have a little antique computer here, the first one I owned. I keep it in here with the other antiques. [Laughter] I

don't know how anybody ever used it. You have to boot it up each time you use it. It's terrible. It's probably fifteen years old, so it's not all that old, in a sense.

JOHNSON: It doesn't take much to make a computer antique anymore, the way technology changes.

RYAN: Yes, what is it? Moore's Law or somebody's law says something about capability doubles every so many months [18 to 24 months], something like that, and price goes down. Which is why productivity has gone up and one reason we've done so well in the last few years in our country.

WRIGHT: Have you been back to visit MIT?

RYAN: Yes. I was back a couple years ago for AMITA, the Association of MIT Alumnae, and I was back there. I was back to see Emmanuel [College] for something they had, and then there was something going on at the same time at MIT, so I went to see them both. And I was back last year to the fiftieth reunion at Emmanuel, but I didn't go to MIT at the time. I guess it would have been the forty-fifth there.

WRIGHT: Aviation research at MIT, when you were first just working on some of your jobs and research there, it certainly has gone into different areas that I'm sure they never even dreamed of, just like you.

RYAN: Yes. Of course, more computerization and so forth. Our contacts there were fabulous, the people that would come through there that we'd have contacts with, and I remember, we'd have seminars and so forth and I remember hearing the tape of [Charles E.]

Chuck Yeager's flight when he broke the speed of sound, and so that was another thing that made me want to wind up at Edwards for a while.

JOHNSON: So nowadays, would you encourage other women to go into your field, still?

RYAN: Oh, definitely. I probably had the best of it, I think. The most exciting time, from what I was interested in. But there are tremendously exciting things coming up, with the exploration of space. Oh, I think it's still a fabulous field, and there's a lot of interesting low-speed stuff going on, too, that you see with the gliders.

There's been a tremendous change in the design of the—aerodynamic design of the gliders, where they went into composite structures, and they really took a step increase in capabilities, aerodynamic performance in the gliders, when they did go to that new type of structure.

Now they're putting computers into the gliders, which will compute for them where they are, what speed they would need to fly to get to where they want to go, and they're doing tremendous things from the computerization, instrumentation in the sailplanes now, too. So there's a lot to be done low speed and a lot to be done exploring the universe.

JOHNSON: Have you ever been involved in any competitions, as far as gliding or soaring?

RYAN: To some extent, but that hasn't been my interest. I used to do the scoring for the contests. I had a lot of fun doing that.

JOHNSON: How often do you get to fly now?

RYAN: I try to fly my airplane a couple of times a week. The sailplane, I haven't been flying

quite as much as I had been, but I'm still trying to fly sailplanes, too.

JOHNSON: Have you ever been in involved in teaching other people how to fly?

RYAN: I had a glider instructor rating for a while. Every once in a while I bump into someone who said they flew with me, and got started. Well, it's so nice to know they got started and continued on with flying sailplanes.

WRIGHT: I found that was an interesting description that you gave a while ago about the art, science, and sport of flying.

RYAN: Of soaring.

WRIGHT: Of soaring. Of those three elements together.

RYAN: Well, I think that's why so many engineers are attracted to soaring, and maybe this is why there don't seem to be so many women in soaring because there aren't that many women engineers, although I guess there are a lot more now. But yes, you really need to understand all about your sailplane, you need to know the structure of it so that you're confident of its strength. You definitely need to know the aerodynamics of it, so you know what it can do in a performance, because you're trying to utilize the power from the air.

And you need to know and understand the weather, somewhat on a large scale, but especially on a small scale, and you need to combine all those things and decide what's the best to do. A champion sailplane pilot once said that if you're not making a decision every minute, you're not working hard enough, and so I think this is why engineers are attracted to soaring because of the thought process and all the things that are involved.

WRIGHT: And when you're flying your planes, what's going through your mind? Is it a time for you to be free, or is it a time for, as you mentioned, making decisions every moment? Tell us about those times when you're getting to take your plane up.

RYAN: I'm a little different from most glider pilots, in that I like to go up and see the power that you get from the air and enjoy the scenery and the beauty of the countryside. So I don't work as hard at the decision-making process as the true competition pilot would, which is probably why I'm not that much attracted to competition. But a lot of people do use it as a means of relaxation. They very often have stressful jobs and so they take up soaring as a way to find another way to be stressed, I guess, in a more pleasurable manner.

WRIGHT: Are you flying close by your home, or do you go different places each time?

RYAN: With the soaring, I do some flying here [Inyokern] and California City and Tehachapi and occasionally it's nice to go further afield and fly some different sailplanes or something like that. But we're very fortunate in that we have good flying and soaring weather, which is one reason I live here.

WRIGHT: Now, your mom never flew with you before she passed away. Did she ever fully understand what brought you to have that desire to be in the space industry?

RYAN: One day, not too long before she died, she said she wanted to make something for the sailplane, so she knew that it needed a rudder chock, which I had, but she took cloth and covered it for that. And also, there was a fellow at NASA that used to make jewelry out of the catalyst for the X-15. I wish I could remember his name, too, because he was a great guy.

He was going to make me a pin in the form of a sailplane with a sort of a circle around it, like it was spiraling, and she said, "I want to give you that." So she finally realized that it was a losing battle.

JOHNSON: After so many years, she couldn't convince you otherwise.

RYAN: She finally accepted it.

WRIGHT: Well, that's good.

RYAN: Yes, it is.

WRIGHT: Well, that was pretty much all I have for now. Is there anything that you would like to add before we close? Some areas that we might not have talked about, or some other aspects of your life and your career that we could think about?

RYAN: I have been writing these articles, which has been sort of fun, that they've been accepted.

JOHNSON: What magazine?

RYAN: Well, four, but mainly one called *Woman Pilot* magazine. It's on the Internet, actually—womanpilot.com. And they've been very receptive and I wrote about the lifting body and I wrote about Sierra [Mountains] wave conditions. The wind crossing the mountains gives a particular kind of meteorological condition, which glider pilots utilize but power pilots need to be aware of.

And I've written about various well-known women pilots. Hanna Reitsch, I had the privilege of meeting her. Oh, that's something I should tell you. She was a famous German pilot and she was the first person to fly a helicopter indoors, which she did in Berlin [Germany] during World War II, as a demonstration. She is one of I think only two women who received the Iron Cross [medal]. She came to this country to attend some functions here, and I guess it was 1961 or [196]2.

Paul Bikle, being the director of NASA and a glider pilot, arranged for her to stay with me while she was in this area so that she could do some flying here. One day when we were walking out the door to meet him and go have dinner or something like that, she started a conversation, saying, "People said I was [Adolph] Hitler's girlfriend, but I really wasn't." My mouth fell open and all I could do was sit there and listen, or stand there and listen to the most fascinating story I've ever heard in my life, which I wrote up for this magazine, was how she flew into Berlin during the last days with—[Colonel-General Robert Ritter] von Greim was the person who took over the Air Force from [Reich Marshal Hermann] Goering—and they flew into Berlin while it was under attack in Fieseler Storch [airplane] I believe it was, and landed on one of the streets of Berlin and went into the bunker. And she was there the last few days of the bunker and finally, Hitler talked her into leaving to go tell [Heinrich] Himler off or something like that.

I could have the airplane wrong. They flew one in and a different one out, so don't go by my details, but you don't often meet somebody like that. And so that was a remarkable experience, but Paul Bikle was showing her around the hangar at Edwards, and I was standing off to the side, and there was an Air Force officer standing beside me, and I thought he might be interested in knowing who this person is. She was a very small person, and I said, "You know, she flew the V-1," [surface-to-surface pilotless flying bomb] and he looked at me with the strangest look and then he walked away. But she did. She was very small, and they put a cockpit on the V-1 because they were having some problems with it, and she

flew on it. So that was an interesting experience to meet her.

WRIGHT: Well, we're going to stop for just a second so I can change the tape out, okay? Then we'll pick right back up again.

RYAN: These were just data that we gathered. [Referring to Technical Reports] These are the people that were on the project. What's the date on this one? This was the M2-F2.

JOHNSON: April 14, 1965.

RYAN: Yes, we started getting more formal later on. We weren't all that formal in the beginning. These are other people that worked on it. Oh, after I left NASA, there was an invited paper of the International Congress of Subsonic Aeronautics, which John McTigue gave and I helped him write. The Navy actually sent me back to go to the conference, which I thought was nice, considering it was a NASA project. This may be the one that didn't get published. [Summary of Aerodynamics of the Manned M2-F2 Lifting Entry Vehicle] April [19]60. Well, I don't know, that's the year before, so maybe it did. These are just rough drafts of them, I guess.

WRIGHT: During the time you were in NASA, a lot of the NASA budget was going toward the human space flight goals. Did you feel any effect of what was going on in the other parts of the [NASA] Centers, of trying to reach that goal that President [John F.] Kennedy had set forth?

RYAN: No. Of going to the moon, you mean?

WRIGHT: To the moon.

RYAN: No, I didn't. That would have been right during that time period, wouldn't it? But no, I didn't. But I'm glad they went. I think they should keep going.

JOHNSON: As far as producing these types of reports during the time you were there, it was pretty labor-intensive, wasn't it, to get it written and get it typed and get it edited?

RYAN: Well, it's certainly easier to write things now, and rewrite them. Things take a lot of rewriting, and it wasn't that easy back then.

JOHNSON: Were there times you had to modify them and try to keep from making the changes domino? You know, if you modified something at the beginning and knowing that it would affect—

RYAN: There were always several iterations, as I remember, on things.

WRIGHT: Quite a group.

RYAN: Yes, they were a good group.

WRIGHT: At least now when you're writing, it's a little more free. You sit and then you're able to control the whole aspect of it. You're a one-team member on your writing projects now.

JOHNSON: Is there anything else, any other maybe anecdotes or stories?

RYAN: Well, see, this is why I was taking notes for that little gal from MIT because you're supposed to give me those ideas. [Laughter]

JOHNSON: Any anecdotes about any of the other pilots that you met? You told us the one.

RYAN: Oh, well, there were always good stories about them.

JOHNSON: Any that you want on record?

RYAN: They might not. I remember when they first—the early days there, they used to give bananas to the pilots. You know, some of the first space passengers were monkeys, so they'd give bananas to the pilots. And then there was the time when the U-2 [spy plane] flew, and it got caught over in Russia, and for a little while—this was very shortly after I got there, too—for a little while there was—it was supposedly a NASA research project and the press had been coming up anyway to talk to Joe Walker about the X-15, and we were told not to go look out the windows, which, of course, we did, because they had pulled a U-2 down from North Base, with the paint saying "NASA" still dripping, and the press were interviewing Joe about the X-15, with this in the background.

Of course, they started asking him about the U-2 and so here he had to tell him all about his flying in the U-2 while he was trying to get a look at it himself, and all of us were in the windows trying to see what a U-2 looked like also, so that was sort of fun for a couple of days.

Then Milt Thompson had a flap stick or brake or something and he was going around like this in an F-104 [Starfighter], so he punched out, and the F-104 made a big hole in the ground, so someone took a picture of it and put a sign on it and said, "Cleared for a straight-

in."

And then on the lifting body program, there was a pilot named [Jerauld] Gentry from the Air Force who flew the M2-F1 and got a little out of control on the tow and released and landed and hurt the landing gear a bit, but things were okay. Well, then when he went to fly the heavyweight one, somebody put a sign on it saying, "This side up." So they have a good sense of humor, the pilots.

JOHNSON: They took it well?

RYAN: Well, they have to.

WRIGHT: Were flight tests going on all the time or were those times few and far between during your research?

RYAN: I don't remember particularly. It seemed like you'd have to do some planning for the next one all the time. The car tows with the Pontiac, we seemed to get a lot of those off for a while. They had a center fin on the M2-F1, and the pilot, when he was first flying it, it was a new aircraft, so it was a little unstable. It appeared unstable, but it was just because he didn't know the aircraft. He had to learn to fly the aircraft. But they thought it might have been the center fin, which isn't what you'd expect, so they took it off, but later on, on other designs, they put it back on. It was just simply that he was learning to fly it because it was a very new and different thing than anybody had ever flown before.

WRIGHT: When I'm visualizing you out on the Center with all these men, working, are you dressed in a skirt and blouse and heels, or were you able to wear comfortable clothes to go out to the flight test?

RYAN: I honestly don't remember, so it must have been comparatively comfortable. I don't think I ever wore high heels very much anyway, but I don't remember one way or the other, frankly.

WRIGHT: So much of that social climate was changing during the sixties, where things were becoming a little more comfortable, and not so formal between the genders.

RYAN: I must admit, I just never noticed it. I was working as an engineer, or when I was on weekends I was playing as a pilot.

WRIGHT: Just a human being, enjoying the day. That works out.

JOHNSON: You were there during a time when some test pilots came through that eventually became pretty famous.

RYAN: Oh, Neil Armstrong.

JOHNSON: Did you have the opportunity to meet him, or any of the others?

RYAN: We took a heat transfer course together from USC [University of Southern California] that was offered there and he put it to practical use, of course. I'd be stuck on some problems or something and he'd tell me how to do them. He was a smart guy, was a good choice for the job he had.

WRIGHT: That must have been a little sense of pride, knowing that your former classmate—

RYAN: I had spoken of my mom having been born in 1884, and then she winds up in Lancaster with me and the people that she might meet or see became people that would go out into space, and what a transition in her lifetime. Fred [Wallace] Haise [Jr.] was there, the one that flew in Apollo 13. He was involved in a fascinating project, doing flutter on the tail of a Piper aircraft. I don't know if you know much about flutter, but it's not a nice thing, and so I thought that was courageous, I guess. Joe [Henry] Engle was there flying the X-15 and he of course has gone on to lots of things with the astronauts.

WRIGHT: He's still very involved with [Thomas P.] Tom Stafford, working for NASA.

RYAN: One of our people up here—in fact, I just wrote her up a couple of issues ago—a gal named B.J. Holden, who was both a power pilot and a glider pilot and a Ph.D. in EE [Electrical Engineering], applied for astronaut training, and was one of the final 200, but didn't make the last cut. But during that process, I got a phone call from John [W.] Young, as her reference, so that was sort of fun.

WRIGHT: Yes, he's still very active. Just never know who's going to call you on the phone, do you?

RYAN: Well, I was sorry, I guess I could have done better on the recommendation, but B.J. would have been the type of person that wouldn't have liked the publicity that went along with being one of the first women mission specialists, so she probably had mixed feelings about the whole thing.

JOHNSON: Why did you leave NASA and go to the Navy?

RYAN: Well, I really felt like I should get more into the work that I had trained for. I had been interested in boundary-layer transition and viscous flow and this kind of thing, and that's what my thesis had been about. My work at Douglas had been more theoretical aerodynamics and my work at MIT, which was both aeroelasticity and flutter, but also the fluid flow, I just wanted to get back into that more. I considered going back to school. I got accepted at Stanford [University, Stanford, California] and got a job at Moffett Field, but I decided it was better to come here and I think it was a wise choice.

JOHNSON: No regrets.

RYAN: No. I think I had the best time working here, too. It hasn't been so pleasant since the nineties. They had more contract monitoring and concern with funding and so forth and those were the things I didn't want to be involved in, so it turned out I had good timing every place I went.

WRIGHT: Yes, you did. Well, we thank you for your time this morning and have learned so much.

RYAN: Well, I hope it's been what you wanted.

JOHNSON: Oh, yes. It definitely has.

WRIGHT: Absolutely. And once we send you the materials, you'll have a chance to think if there's some other things that you want to add, and we can do that.

RYAN: Well, if you think of anything else, too, that you should have asked me, I don't think

of those things until somebody brings them up, I guess. And I've forgotten an awful lot, too. Should have been writing things down.

WRIGHT: It sounds like you were very busy.

JOHNSON: It sounds like you had your hands full, both at work and not at work. Well, thank you again.

[End of interview]