PROFILES OF SWE PIONEERS

ORAL HISTORY PROJECT

Elizabeth Plunkett Interview

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Elizabeth Plunkett

Elizabeth "Pete" Plunkett was a successful engineer in the aviation and aeronautical fields. She attended the University of Washington beginning in 1943 and began working for The Boeing Company several years later. She left the university before completing a degree, but stayed at Boeing her entire 37-year career, beginning as a draftsman and working her way up to engineering technical laboratory manager, where she oversaw two laboratories that provided experimental test facilities for all commercial airplanes. For several years she worked as a research analyst and test director for aeroelastic models of hypersonic orbital and space flight systems during the very beginning of the U.S. space program. Plunkett was an officer and Fellow of the Society of Women Engineers, and was active in the American Institute of Aeronautics and Astronautics.

In her 2002 Profiles of SWE Pioneers Oral History Project interview, Plunkett discussed her background and education; her career at Boeing; and her involvement in the SWE.

- July 2016

INTERVIEW WITH ELIZABETH (PETE) PLUNKETT BY LAUREN KATA, MARCH 3,2002

[Tape 1]

LAUREN KATA: This is an interview with Elizabeth (Pete) Plunkett, a longtime member of the Society of Women Engineers, a Fellow of the Society of Women Engineers. And this interview is taking place by Lauren Kata, Society of Women Engineers archivist, at the Ramada Inn in downtown Seattle.

LK: Pete, can you begin by telling me when you were born and describing your family background?

ELIZABETH PLUNKETT: I was born on October 10th, 1927, the youngest of three children in the family. All three of us were girls. My father was a Protestant minister, and my mother wanted to be an opera singer. She went to the University of Louisiana and studied voice, and my father graduated from divinity school. He was the first member of his family to go to college. And his first job was down in Texas, where he met my mother.

My mother had been born and raised a Catholic. And she just fell in love. She had been thinking about the differences she saw in her own religious community, between the Protestant Church and the Catholic Church, and was feeling very uncomfortable about it. And so she and my dad hit it off very well. My mother left the Catholic Church, and her mother was very, very angry about this. Mother was one of twelve children, the first to leave the Church.

But at any rate, my oldest sister is eighty-nine. And she's not very well. She's in a nursing home. My other sister is just seventeen months older than I. So my mother and father came to the West Coast when my dad got a position in Sumner, Washington. They were here for a year, and my mother didn't like it. She wanted to go back to Texas or Louisiana. They went back, and she didn't like that, so they came back to Washington, where my sister Theresa and I were both born, a long time ago. Anything else that's important?

LK: Well, what was it like growing up?

EP: It was great. I seemed to have a natural bent for mechanical things. My father didn't have a lot of time to do the things around the house. He was always concerned with helping other people and administering to people in his church. So I was the one who would fix the leaking faucets, and that sort of thing seemed to come natural to me.

LK: Was your mother a mechanical person?

EP: My dad was not a mechanical person, but I was.

LK: What about your mother?

EP: No, Mother wasn't a mechanical person either. But she was an excellent homemaker and an excellent cook. And one of the things I remember about my experiences growing up was, we had a car. I don't remember the kind of car it was, but it had small hubcaps with the name of the car imprinted on the hubcaps. And they really weren't hubcaps. They were only about maybe three or

four inches in diameter. But it said -- I think it said "Overland." One day I noticed that they were all out of order. That is to say, that some were pointing straight up and some were pointing horizontally, and some were at an angle, and so forth. So I went around and I took those little caps off the wheel, and I arranged them so that the name was horizontal on both sides. So then, my dad took the car out for a drive. When he came back, they were all unorganized again. And I asked him what he did. (Laughs) And he couldn't tell me how that happened. He said he just knew that it was all right, not to worry about it. But he couldn't explain to me what had happened. It was a long time before I learned about differentials and how that sort of thing could come to be. So I just thought at the time that he was a poor driver.

LK: In school, when you were young, did you have early experiences with math, science, or technology?

EP: When I went to high school I did. We had chemistry and physics in high school. We thought those were very interesting courses. We had a very excellent math teacher. But I don't think I was paying very good attention in my math classes. I probably could have done a lot better than I did. But I enjoyed the science -- the chemistry and the physics classes. I particularly enjoyed the experiments that we did. I thought that was great -- good stuff to be able to get to the lab classes.

LK: Where did you attend high school?

EP: I went to Edmunds High School, in just a little city north of here.

LK: North of Seattle?

EP: North of Seattle, yeah. I graduated from there in 1943. A lot of my classmates had already left to go to war. So the girls were left, and all of us girls, and some of the boys, but not many. So graduation was a pretty solemn exercise, simply because of the war.

Then I started at the university that summer, but I was really much too young for the university experience. I would have benefited from a community college experience, but there weren't any community colleges to go to in those days. I started out in economics and business, simply because I was not brave enough to say I wanted to be an engineer, and although I knew that's what I wanted to do. As I said yesterday, my two uncles were engineers in the sugar cane industry, and they only worked six months of the year—and I thought that was good. But that first quarter, summer quarter at the U was the beginning of a lot of negative experiences in college.

LK: University of Washington?

EP: University of Washington. When I came home with my report card at the end of that [first] quarter and was disappointed in what was happening, my mother said, "Why don't you do what you really want to do?" And so I changed to general engineering studies.

LK: How old were you when you started at the University of Washington?

EP: Fifteen and a half. And that's not because I was smart, it's just the calendar, well, the calendar being what it is, and my birthday being in October, for some reason or other, I skipped kindergarten. I never had a kindergarten experience--I always felt kind of cheated after I found out what kindergarten was all about. (Laughs)

At any rate, I was really much too young, both in terms of the calendar and socially. So when I got on campus that next fall, in the department of engineering, it was worse than I had ever imagined. And I really didn't know what was happening to me. But the rejection was awful. The B-12 and B-6 programs were on campus—they were Navy programs. The boys would march to and from class. There was no interaction with any other of the students in the class, and there were no women in the classes.

LK: You were the only woman.

EP: Yeah. And the professors didn't want me there, and they made no bones about it. So it was really a negative experience.

But I called my whole university experience "the most successful disaster I've ever been through," because it caused me to leave school a little earlier than I should have. I then got into a position at Boeing Company, at the beginning of the new technology in flutter and vibrations and dynamic analysis. I couldn't have gotten that experience even by going to school, if I

had been able to even just go to school and take some of the university courses. It just wasn't really available. And financially, it wasn't in the cards. So while I intended to go back to the university, I did not, simply because I was being so successful and felt so comfortable in learning this new technology, and was so well received on the job.

LK: So you began at Boeing in 1944?

EP: No, 1947. I struggled through more than three-- well, about three and a half years. So we're talking about -- including the summers, we're talking about -- I think it was 1948.

LK: Did you work summers for Boeing?

EP: Yeah.

LK: So before you left the university, you were working for Boeing in the summer?

EP: Yes. I was doing a drafting job, really. The specifics were to update all of the drawings, the airplane drawings, the B-29, and make all the corrections for the changes that had been made over a period of time, so that the drawings would be completely up to date. It was an incredibly wonderful experience. I didn't know it at the time, but I learned very important vocabulary, so when I got on the job full time, I knew the parts of the airplane, and I knew how the wings were constructed, and how the fuselage was constructed. So when somebody said, "We have to have the characteristics of this particular section of the airplane," I knew what they were talking about, and in fact, I

knew where to go to get it. Not in a form that was usable to us, but it was a starting place.

LK: Were there many women that worked in the drafting department at Boeing during that time?

EP: There was one other woman in my particular group. Now, we didn't associate with each other -- that is, outside the group. We finally had a group at that time of -- it was a structures group, and probably fifteen people; two of us were women. And we associated, kind of, in that group. I could see other women walking around in the engineering building, but I never -- it took a long time for me to find out what they were doing. Some were secretaries, who are very, very important people. And some were clerks, some were librarians, and some were other technical people, but the real extent of their technical work was not known to me then, and it is not known to me now. I don't think any of them were engineers.

LK: So what made you make the decision, finally, to leave the University of Washington?

EP: The B-12 and B-6 programs -- well, I started the university on the quarter system. The B-12 and the B-6 programs were on semesters, so [during World War II] the university changed from quarters to semesters. Then in 1946, I believe, late '46, the B-12 and B-6 programs ended, and so the university went back to quarters. And as a result, I could not get the courses that I needed to finish until the next year. When I tried to negotiate

substitutes, I got no place. My instructors would not support it. The dean of the school would not support it. And I really didn't know how to negotiate a situation like that very effectively. Later I learned that in the agreement between the Navy and the university on this whole program, one of the criteria was that substituting courses would have been permissible. I didn't know that. Nobody told me that. I'm not sure the people in the engineering department knew that. But by that time it didn't make a lot of difference, because I was, you know, being successful in my full-time job at Boeing, and the courses that I lacked weren't apropos to what I was doing.

LK: Were you recruited for the full-time job at Boeing?

EP: No.

LK: You had to apply?

EP: When I decided I would have to work for more than just a summer waiting to get back to the U, I went to one of the personnel managers that I knew. And I said, "I really want to come back to Boeing full time," I can't remember which year it is now. "But I want a job this time that uses more mathematics." And I said that because I didn't want to stay in drafting all my life. I wasn't quite sure what I was saying, but it was the right thing. And I learned from that another experience, that is, if you want to make a change, you need to be clear about the kind of change you want to make, and how that change can be effected, as far as you are concerned. You don't go up and say, "Look, I don't

like what I'm doing, I want to do something else." You say, "I want to have a job where I use more mathematics," even if you don't really know what that means at the moment.

LK: Were you hired as an engineer?

EP: No. I think there was some sort of a transfer, paperwork -- a transfer that labeled me as a draftsman when I went to my full-time job. But that was then changed to junior engineer. And that probably took six or eight or nine months, something like that, for that to happen.

LK: How long was junior engineer your title at Boeing?

EP: Oh, my goodness, I don't remember.

LK: Do you remember?

EP: I don't remember. I really don't. There were several grades of junior engineer. And then the company went through a process that was related to the Seattle Professional Engineering Employees Association, which was intended to be a union. And they negotiated some new titles. I don't remember exactly when that took place. But we were all punching the clock at that time, even the supervisors. The next thing we know, the supervisors didn't have to punch the clock. And maybe five or six years after I started, engineers, at least those who were no longer the really low junior engineers, got off the clock. And that was a major milestone.

LK: What year was that, do you recall?

EP: I don't recall.

LK: Was it the ‘40s, or was this in the ‘50s at this time?

EP: I’m sure it was in the early ‘50s. Now those things seem trivial. But at the time, you know --

LK: It was a big deal.

EP: It was a big deal.

LK: Were you a member of the Seattle Union?

EP: No. No, I never felt the need to join the union, although they didn’t want to be known as a union. They wanted to be known as a professional organization. Their objective was wages and working conditions. Well, I was doing pretty well, and not feeling any reason to ever want their services. The money that was involved was not very great, but I didn’t like the idea of the union. And a professional organization to which you paid dues seemed to me to be more union than anything like that. Particularly when they were negotiating wages and salaries -- I mean, wages and working conditions. So you know, things were going good for me. I didn’t feel the need to be involved.

LK: Do you feel that at that time, there would have been some office or some department inside the company that you could have gone to on a one-to-one basis to negotiate your own conditions?

EP: No -- well, there was. We had the office of women --

LK: Office of women?

EP: Yeah. Now, this is professional women. There was one woman who was an old-timer at Boeing, who came up through

manufacturing, a great lady, who was in charge of all the women's affairs.

LK: Interesting.

EP: Uh-huh. I became very well acquainted with her. But her services were not used by me, because I never felt it necessary to go to her. The bosses that I had were, I thought, very fair in handing out the raises, and doing the -- in those days we didn't do personnel evaluations. But no, I didn't feel any need to use her services at that time. Later, I called upon her to help me with a particular employee who needed some outside help, an engineer who needed some pretty serious outside help, and was causing some problems within the group. She helped me with that.

LK: Can you describe the type of work that you did in your early career at Boeing?

EP: Yes. The Boeing Company formed this new group to understand and evaluate flutter characteristics of swept-wing aircraft. They hired a Ph.D. mathematician from the University of Chicago to lead the group. And the group had formed probably four or five months before I got into it. Our job was to describe the characteristics, the dynamic characteristics of an airplane numerically, so that we could analyze the structure.

And our computing capability was nonexistent. A lot of us -- in fact, I'd say eighty percent of the group was using a Marshant calculator every day, all day. Two of us would work the same

problem, and we'd compare our data at the end of the day to make certain that one of us hadn't made a mistake. And if there was a mistake, then you had to go back and find it. But it would be disaster to find it at the end of a three-month period when you were supposed to have the bottom line. So I became very, very adept at the calculator.

And then we got to the point where the calculator simply couldn't do the job, we couldn't do it fast enough. And so we were given the opportunity to use the accounting department's computers, IBM 360, I think it was. And so we worked a six-day week, some of us worked a five-day week on occasion, but we had to work Saturday and Sunday, when those computers were not in use. The rest of the time we had to work at night. So we had some very different schedules on a week-to-week basis.

LK: Were you able to take the regular work days off, or--

EP: Oh, yes.

LK: -- were you working seven days a week?

EP: No. We were working mostly a five-day week. But if you got one of the weekend schedules, you were working a six-day week. And we just organized the group so that we had somebody there from our group who was using the computer three shifts on a Saturday and three shifts on a Sunday.

LK: What kind of training on the computer did you receive, or did you receive any training?

EP: We didn't receive any, except on how to read a punch card. We didn't do the keypunching ourselves. But we had to be able to check and make certain.

LK: Okay. So someone else actually did the punch card--

EP: Someone else actually operated the machines. But we would take the cards over. We would negotiate schedules with them. And they were already on a three-shift, seven-day-a-week schedule, so we were interrupting their normal routine and asking them to do some new things. But they delivered.

And then we graduated to an analog computer.

LK: Within the engineering division? Finally the engineering division received a computer?

EP: No, our analog computer, a roomful of radio tubes, a terrible machine. We'd come to work in the morning, and we'd power it up and calibrate it. And sometimes we couldn't get it to work for all day. But if we did get it to work, we didn't even stop for lunch, didn't dare turn it off. Some were more adept at this device than others. And by this time, I had a lead position, so I did very little work, after a couple of years, on this analog computer. I didn't find it to be a very friendly device. But I learned a lot about radio tubes, and I learned an awful lot about oscillation in electronics. It wasn't apropos to solving our problem, but apropos for keeping the machine going.

LK: Do you remember how you felt about this new technology?

EP: I loved it. I thought it was interesting. I was really glad for the opportunity I had. And I was able to, a little bit at that time, after a couple of years with this analog machine, to kind of pick the things that I really enjoyed most, and assign those that I didn't to others.

LK: So were you a supervisor -- you had the responsible to assign work?

EP: As a lead engineer, I did. I got my first job as a supervisor in 1965. I ran across that letter the other day, that letter of appointment. And in that envelope was my first parking pass, as I said yesterday, my very own parking pass.

LK: So how many other women were lead engineers at the time that you were--

EP: I can't possibly tell you. I think there might have been two at the wind tunnel, but I really don't know how the other parts [of the company] were structured. You know, the kind of -- the things that interest some people, and knowing how many are like you, and how many aren't, and how many supervisors, and you're not one yet, you know, that sort of thing never did bother me at all. I was just there to do my job and to learn, and to bring others along with me, whether they were men or women.

LK: Their interests mattered more to you than anything?

EP: Yes.

LK: Do you remember the makeup of the group that you worked with when you first started; for example, when you were working on the early computer?

EP: I think we were probably --

LK: I'm thinking in terms of age--

EP: Oh, age.

LK: -- as well as male, female.

EP: Well, we talked about the male/female thing, I think. But I think we were half mathematicians and half engineers.

LK: Oh, interesting.

EP: And I think they were probably very early graduate engineers, and very early graduate mathematicians. As I said earlier, you could not get the technology that was needed out in industry yet, and there were only two universities that had training programs, and it just wasn't available very easily at all. So if you had the right interview, and this job was described, and you said, "Yes, I'd like to do that," well, generally, you were hired. But as far as experience working, we were pretty green. And that probably helped, because we didn't have any preconceived notions about how organizations worked at that time. We just followed the leader, and kind of developed our own way of doing things, our own way of working outside our own group, which we had to do a lot, and working -- you know, getting library data, getting historical data from other companies if we could, getting data from the structural designers, and getting the

data from the stress analysis, and going to the aeronautics, getting their input, all that sort of thing. So it was a very, very interesting and valuable experience to me.

LK: Would you describe that as interdisciplinary?

EP: Yes, very much so.

LK: Was that word used at the time?

EP: No. No, it was just "go over to the aero group and see what data they've got" -- no, that word wasn't in my vocabulary.

LK: So you were promoted to lead engineer?

EP: Uh-huh.

LK: At any time was it ever an issue that you didn't have an engineering degree?

EP: No. No, that was -- I was so close to getting it. And the courses that I didn't have, I think it was thermodynamics and some other fluid dynamics course. I can't remember now. But these weren't germane to what I was doing. They were germane to the mechanical engineering degree, but that was never a problem.

LK: I think we can shift gears now and talk a little bit about the Society of Women Engineers.

EP: Okay.

LK: At the time that you were at the University of Washington and working summers at Boeing, was there any type of network or organization of women engineers -- I know there wasn't a national one yet -- that you can recall, that you remember in your area?

EP: No, I don't recall any. It was very difficult to make any connections with other women, let alone other technical women. And the reason for that was, you know, well, you've got to study hard. And I was not a terrific student, I worked really hard. I'd ride the bus to and from school. And you know, there's a kind of isolation. There wasn't any way to get any information. There were no newsletters that I recall, no attempts by anyone that I ran into in the faculty office. A couple of women there, you know, they just thought -- I think they probably thought I was a little strange. (Laughs) But at any rate, there was nothing that I was aware of.

LK: Were you aware of other student chapters of professional societies?

EP: Yes.

LK: Did you become --

EP: There was an ASME [American Society of Mechanical Engineers] group.

LK: Did you become involved in any of those groups?

EP: No. The groups were not active during the war, so they just kind of disappeared, because all the guys were gone, mostly. And if you weren't gone, you were in a Navy program, where you couldn't participate in that sort of thing.

LK: So when did you first hear about the Society of Women Engineers, do you remember?

EP: Well, I know I was at Boeing full time. There was a gal that lived in Seattle by the name of Jo Troxel, who was a civil engineer. Her husband was also an engineer. His specialty was underwater demolition. And she and her husband worked together a lot. And Jo found out, I think -- I'm not positive about this, but let me go ahead anyway -- I think she found out about a group in Colorado that was forming, of women engineers. And she brought back that information to this area, and began to try to find out from the university which women had graduated from the university, and from there, to get information from the Boeing Company, information from Monsanto -- they had a big plant here -- information from Pacific Car and Foundry, places like that. And I think she just contacted us all, and said, "You know, it would be nice if we could get together." I think we thought it would be nice to get together too. I can't exactly remember the specific way in which the section was formed.

LK: The Pacific Northwest Section?

EP: The Pacific Northwest Section, yeah. But it came into being, and I know this was before 1956. The reason I know that is because in 1956, I was asked by the engineering recruiting group at the Boeing Company to go to the [SWE] Detroit convention as a recruiter. Now, they didn't say that that way.

LK: The Society of Women Engineers convention?

EP: Uh-huh. They didn't say "recruiting." They said, "We're going to give you all this information about the company,

and would you be willing to distribute it and talk to women engineers, and have them get in touch with us if they are interested in joining the company?"

LK: And did you go?

EP: Oh, yes. That was my first airplane ride, and I thought the airplane was coming apart. We took off from Seattle, and going into Portland, it can frequently get very rough. I was holding onto the seat arms, and the airplane went down, and I went up, and I took the seat arms with me. (Laughs)

LK: But yet you'd been working on airplanes -- the design of the airplanes for a decade at that point.

EP: Yeah. Never had a ride on one. Anyway, it was an interesting experience. Everybody had to get off the airplane in Portland while they cleaned it up. It was a pretty rough ride.

LK: So what was it like when you got to the Detroit convention?

EP: I was very, very warmly received by those people back there. In fact, I think they thought I was really somebody. I'm not sure they had ever had somebody sent from Boeing with this kind of mission. And so it was easy for me to meet people and to do my job, and to take in the convention at the same time.

LK: Do you remember some of the people that you met?

EP: I remember their faces, I can't remember their names, except there's one you and I have talked about --

LK: Ann Fletcher?

EP: Yes, Ann Fletcher. She was a very warm, very wonderful person. I enjoyed meeting both Ann and her husband.

LK: Do you remember Hazel Quick?

EP: Hazel Quick, yes. And I remember Emma Barth.

LK: From the Pittsburgh Section?

EP: Yes. And I'm sure there are others -- generally, everybody at SWE impressed me. There are so many people to meet. You know, I don't remember how big this convention was, but I think it was less than 100. Even so, that's a lot to take in one three-day event.

LK: Do you remember what types of events they had?

EP: No. I do remember the banquet. And I know we went on field trips. I think we went to the Ford Motor Company. We might have gone to GM also. But you know, I'm not a very good historian. I didn't know you were going to ask me these questions in 2002.

LK: (Laughs) Well, that's okay.

EP: Good.

LK: But do you remember how you felt when you came back to Seattle after that first convention?

EP: I felt very good and very important. I was very appreciative of the opportunity. You know, to fly on the airplane, to have a free ticket, to have all my expenses paid. It was my first encounter with per diem. But it worked out just fine. And I think it was relatively successful. I don't know

that they actually hired anybody, but they did get some responses. I think they probably got about six responses. But it was company-wide, you know. And at that time we had a commercial airplane division, and a space division, so they were interested more, I think, at that time, in people for the space division than they were for the airplane division.

LK: You were in the airplane division?

EP: Yeah.

LK: Right. Throughout your career and your career at Boeing and your career in SWE, can you talk a little bit about the connections that you made?

EP: I'm not sure I understand your question.

LK: The professional and personal relationships that came from your involvement in SWE.

EP: Well, I have, you know, both personal and professional relationships. And I attempted to be a strong promoter of SWE, as soon as I got back from that convention. I think as a result of that, we were brave enough to bid for the 1960 convention, which was a really big deal for us. You know, we're in Seattle, when you're talking about the center of the earth being east of Mississippi. Will they come?

LK: And they did.

EP: And they did. We had more than 100, I think, registration, which was the biggest convention, ever, for SWE. And we worked pretty hard. But we had some really good heads. Jo

Troxel was still with us, and Irene Peden. And I think we had the former Governor Dixie Lee Ray as one of our key speakers. I think I remember Pat Brown from that convention. And Lydia, of course, was involved in the convention, Lydia Pickup. And she had a friend from Hartford, whose name I can't recall. But I made some good, strong, I think, professional connections, at that time. And even if I hadn't met them at the convention, just having the roster, and knowing -- learning about people and what they did, there were times when I felt very comfortable in reaching for the telephone and calling them up and saying, "Have you ever run across this situation?" or "Do you know anything about such and such?" or "What references do you have to such and in such?" And it could have been a woman's issue or a SWE issue, and it could have been a technical issue. A very important connection, I thought.

LK: Did you belong to any other organizations during your career other than SWE?

EP: Yes. AIAA, American Institute of Aeronautics and Astronautics, and Puget Sound Engineering Council, and I think those are about the -- I can't think of any others that I've belonged to.

LK: Why was it important to join these types of organizations?

EP: To broaden your outlook, to network broader, to learn about what others are doing and what help they can be to you or

what help you can be to them. And in terms of AIAA, that is a professional organization for aeronautics and astronautics, with a wealth of information available, good publications, a very strong section in Seattle. I got a lot of benefit out of that.

Let's see, I was section treasurer one year --, or two years for AIAA. And for Puget Sound Engineering Council, I was president for two years. And I think during my first term we put on the first Puget Sound Engineering Council Engineering Day at the Seattle Center.

LK: Oh, wow.

EP: We invited all the businesses to participate, show and tell, and recruit if they wanted to.

LK: Does that still happen?

EP: Yes. Well, it's much better now. They're doing a much better job. Izzy [Isabelle] French has been involved in that, and they're really doing a professional job. I look back at what we did the first time, and it's -- it needed a lot of work and improvement. But we were pretty proud of what had happened.

LK: Sure. What was it like working for Boeing in the aircraft industry during the time of the evolving space program in the United States -- I mean, personally, for you? Do you have any comments about that?

EP: We were only on the edge of the space program. It was Space Divisions, you know. I can remember one time being shanghaied -- do you know what that term means? It's a term that

I first heard years and years ago around here, where it had to do with the Chinese being kidnapped, if you will, and put on ships to help bring the ships over, or to bring them over to populate areas in the West Coast. When you were shanghaied, you didn't have any choice in the matter, you weren't even told to go, you were just all of a sudden taken.

Well, the first time I was ever shanghaied was for a job with the aerospace group. It had to do with the dynamic stability during blast off, a problem that all of the big boosters were experiencing. So they needed a little help. But fortunately, I didn't have to stay too long.

LK: So you related to the Space Division [at Boeing] in terms of the types of jobs that you were assigned to?

EP: Yes. We didn't really know a whole lot about the specifics of what Boeing was doing in the space program, just bits and pieces [that] happened along the way. We did get involved in another one called Dinosaur. It's a vehicle that looks much like the space shuttle now. It would be shot up to space and come back, and land in the water. Boeing didn't have any data on what happens when you drop a vehicle of that size at that velocity into the water, so they wanted to get some model data. And we built a geometrically similar model. It wasn't dynamically similar, but...

So we got the biggest water tank we could find around here, put it up at North Boeing Field, filled it full of water, and

dropped this thing from a beam overhead at various heights. And we instrumented it, and tried to -- we took nice big photos so we could look at the splash. And the word was if we could do a good job on this project, we'd win a shuttle contract. Only it wasn't a shuttle contract in those days, it was like the first capsules, you know. Well, we thought we did a good job, but -- we didn't get the contract. But we had a lot of fun.

LK: Do you feel that you've been a role model in anyone's life?

EP: Perhaps. I never tried to be, I just tried to be myself, and I tried to bring others along. I wound up doing a lot of counseling over the years, which was gratifying in a way. I never felt really competent to do that, but it was gratifying to be called on to help people with problems they were having on the job.

I can remember one guy, he actually was from -- he was working on a government contract. And he called up one day and he said, "Pete, I need to talk to you." And I said, "Okay. Well, we can have lunch in my office or we can go out to lunch." He says, "Let's have lunch in your office." So he came over and he said, "Look, I've been doing this work for years and years and years. I'm going no place." And I happened to know the work that he was doing pretty well. So I said, "Well, you have to look at the objectives of the program you're on right now. First of all, Boeing has said, 'We don't need that data.' They said that to the

Air Force, 'We don't need that data. We have analyzed that, and we have enough proof that we don't need any more data.' But the Air Force said, 'You got do it. We have to have that. It's part of your contract. If you don't do it,'" -- you know...

And so this guy was doing a job that nobody wanted, except the Air Force, so it wasn't buying him anything within his organization or within the Boeing Company. Now, he kept on doing it anyway. And the reason had nothing to do with the job he was doing, but he had status in the company that allowed him to take off six weeks and three months to go mountain climbing.

LK: Wow.

EP: I pointed out to him that, you know, he has to look at himself to see how serious he is about his engineering career if he wants to move up. So he didn't make any changes. He knew what he preferred to do, and he was willing to sacrifice, I guess this boring job he had so that he could do these other things outside. Choices.

LK: What about within SWE? Do you feel that you're a role model within SWE?

EP: Again, I don't know. Some people have told me that, and I'm grateful that they think that, but I have never actually tried to be a role model deliberately.

LK: Let me rephrase the question: Have you participated in mentoring?

EP: Again, indirectly. There are certain people I think that you always run across that you can give a little guidance to, show them a little better way to handle themselves or handle what they're doing, or you know, to make a change that would benefit both their employers as well as themselves. And if I could see those things, I'd do it. On the other hand, you have to be careful that you're not just being a busy body. We talk a lot about needing role models, and I'm sure that's true. I think they happen without being designed. I don't think you set out to find a role model -- at least I don't think you do. And I don't think that those who eventually become role models set out to be role models. I kind of think there's a synergy that just happens, which is the best of all worlds. I've never had anybody come to me and say, "Will you be my mother? Will you be my role model?" I don't think it happens.

LK: Did you have any role models when you were younger?

EP: Yes, I think I did. I think Jo Troxel was a role model, for the way she handled herself professionally. She didn't know tiddly-doo about what I did, nor did I know a lot about what she did.

LK: On the job, you mean?

EP: On the job. But it was the way that she comported herself on and off the job, and the way that she understood the importance of bringing women into the engineering profession and helping them move along. I never had a chance to just talk with

Jo about role models or mentoring or anything like that. Again, I think that's just one of the things that happened.

(INTERRUPTION IN RECORDING-end of Tape 1)

[Tape 2]

LK: This is tape two for our interview with Elizabeth Plunkett. I was wondering if you could talk a little bit about how, as a full-time professional engineer, you managed to balance your personal life with your everyday working life, and maybe some of the things you were interested in outside of the job.

EP: I've never been married, so I have not had those kinds of opportunities, you know, or sometimes I think of them as constraints to career development. But my job was very demanding in that we were doing all these new things, learning at the same time, and wanting to be successful. The work that we were doing also was quite public, because we used wind tunnels outside the Boeing Company, and were involved with NASA -- not the space program, but the basic NASA, the original NASA. And we had to go outside to companies for the development of new materials to support the model manufacturing that we were doing.

So what I'm getting at is, that required a lot of travel. And the travel got extremely burdensome. There wasn't time to come back to the office and kind of conceptualize what you have done, and where you needed to do more, or didn't get what you wanted at all. I mean, it was just bing, bing, bing, one right after the other.

I can remember during this period, on this Dinosaur program -- and this was classified, it was a secret program -- we were doing the first panel flutter testing that had ever been done in the United States. We were using the NASA Langley Supersonic Tunnel. And we had five panels, all different characteristics. We had to work nights, because we needed a lot of power to run the wind tunnel. And we were working twenty-hour days, and we had to get this done. We had a deadline, which had been compromised already by factors beyond our control, including tunnel availability. And we had a particular panel that was of great interest to the Boeing Company, its subcontractors, and NASA. And they wanted that back from Seattle for one of the meetings that we were having with all parties concerned.

So, I just signed it -- I packaged the panel up, got the pilot to sign for it -- this was classified – and flew to Seattle. We had one stop along the way, but we didn't change pilots, fortunately, otherwise I would have had to get another signature. I got to Seattle, retrieved the carton -- a wooden box, really, from the pilot who signed for it...and I couldn't even recognize my own signature. I was just absolutely so tired, I was just out of it. Fortunately, one of the guys from the plant had met me with a truck to pick up this package. So you know, I felt, "Okay, I'm safe. Now I'm home."

But those kinds of experiences are not comfortable, because you don't know what you haven't done, if you've made any mistakes,

you know, if you did the job right. You just lose it completely. So those kinds of impacts in your professional life really, I think, should be avoided at all costs. That, and traveling so much. I'd be gone for three weeks, I'd come home for a weekend. You'd have to go into the office and get updated on what was going on, what we want to do about it, and then go. And that got to be incredibly difficult. If I had had a family, it would have been absolutely impossible. But as I mentioned yesterday, my family thought I was really overdoing it. They didn't understand what I was doing, and I couldn't always explain it to them.

When we got back to strictly working on the airplanes, we would do what's called the ground vibration test on the very first completed airplane. We'd always have to do this in the factory. And the airplane was never quite finished. There was always something that needed to be done. Fortunately, it wouldn't affect the experiment we were running, but we would put three teams together or two teams together, ten-hour days each, for eighteen, nineteen days, and run this ground vibration test always over the Christmas/New Year's holidays, because everybody else wanted to be on vacation. And my family really objected to that. They didn't think that was necessary.

LK: Were they in the Seattle area at that time?

EP: Uh-huh.

LK: And it was your parents and your sisters?

EP: Yeah. They thought I was just going overboard. But eventually I was able to show them really what was going on. They weren't very comfortable about it. My sister still brings it up. She says, "I can't tell you how many Christmases you missed." And that meant a lot to my family. I'm grateful for their love and affection and their caring about I was doing, but eventually I was able to explain it to them, and they understood. And they understand now, of course, more than they did even then. So the impact of professional life on family is really very, very important.

And one has to think about that, how much are you going to devote to this technical job that you're on in contrast to devoting the same amount of time, or an equivalent amount of time, let's say, to your family? You can understand that a lot of women couldn't take this on. But at the same time, we have to realize that the guys are doing it, and their problems with their family are the same.

I can remember we had one fellow on our team that I really liked. He was an instrumentation engineer. And he really always wanted to come on our team. But invariably we'd get back to Langley or Cleveland or San Diego, and his wife would call. And it would always be an emergency. His son fell and broke his arm, something like that. And she was simply incapable of handling those events by herself. So the guys had it too. He got to the point where he made arrangements in advance to have some extra

support for her when he would leave, not that it always worked, but at least I think both of them felt more comfortable about him being away. So travel is hard for anybody, not just women, but also for the guys.

LK: Sure.

EP: And I think bosses and supervisors and program planners have to be sensitive to that. It's not everybody can have the same level of expertise to handle some of these things, so you can't always pick and choose. But one thing you can do that I found out was: send the wife too. We didn't always do this, but when I perceived that this might affect the guy's performance on the job, then I would go to a great effort to make arrangements to at least have the wife back there for a weekend, or to have them back there for full time. And sometimes this would be as much as three weeks. Now, it's interesting, I'd only have to do that once, and they would say, "That's a pretty boring three weeks for my wife. A weekend is good enough." So you have to think about those things.

And the guys would appreciate it. They'd be more willing to go next time and give their all. Hours were long, conditions were not great, the food -- you're eating in restaurants all the time. And even the people from Wright-Patterson who were with us a time or two would say, "I don't know how you do this." And I'd say, "Well, sometimes we don't know how we do it either."

LK: So you were making decisions about who would travel, as a supervisor?

EP: Yes.

LK: How many people were you supervising at one time?

EP: I think the most was forty, and that's too many. You know -- but I had lead engineers to help. But forty is much, much too many.

LK: There are other considerations, in terms of family or of personal responsibilities, including things like housework, and just the every day. I mean, how was that for you?

EP: Well, I lived at home until -- I think it was maybe 1959, maybe '58, something like that, with my mother and father. And the reason I lived at home was, I had my shop at home. I couldn't put my shop in an apartment house. So it's not that they needed me so much, but you know, the things that I would do in my free time were there.

And then we had the Society of Women Engineers Tea that was organized by Jo Troxel. She thought we ought to have a little (Laughs) -- well, I can't remember the word she used, but she wanted us to be like ladies.

LK: Okay. (Laughs)

EP: She thought we ought to have a tea, and we ought to honor someone who had really done something unusual and important. We had a woman here who was a graduate of the University of Texas, who had been chosen as the Amelia Earhart Scholarship

winner. She worked at the wind tunnel. Her name was Shirley Holmgreen.

So it was my job to invite Shirley, write the invitation, you know, and make certain she had all the information, and get her there, and that sort of thing. And I did, and she didn't answer. And I thought, "Boy," -- So I got up my courage, and I went down to the wind tunnel one day to meet her. And she says, "Well, I wasn't sure about this group. I'm not really familiar with it, and I just don't know what you do." So you know, we dropped the ball in trying to explain what was going on. We thought as an engineer, I guess automatically that she should know. And so she came. And we had hats, and we had white gloves, and we had tea, silver service. I mean, it was lovely. And we listened to Shirley talk. So I forgot the question now. Where are we?

LK: Well, we were talking about how you lived with your family, and then you began to talk about this meeting, and meeting Shirley Holmgreen.

EP: Yeah. I can't talk anymore about that, for reasons that you may know. Shirley died about three and a half years ago. A very close friend. We lived together and did a lot of interesting things together, but it's very difficult for me to talk about her.

LK: Did you want to take a break?

EP: Yeah.

(INTERRUPTION IN RECORDING)

[resume tape 2]

LK: Pete, what do you think are your most important contributions to the field of engineering?

EP: Well, you know, you asked that question yesterday. I'm not sure that I -- there are some things that stand out, some firsts, as I think most women have. And some of the firsts are related to my job. Some of the firsts, I think I constructed for myself, one of which was a series. I think there were eight sessions [in the series] that I had for professional women about getting from where you are to where you want to be, and that was done for engineering, women in the engineering field. We did videotaping at that. And I'm talking about 1973 or '75. I hired a videographer. We had the women tell us a little bit about their organization with a speech. Then the next time they came to class, they had to give the speech. They had three minutes. It was videotaped. And then the group -- we'd play the videotapes back, and the group criticized the videotape -- critiqued it, not criticized it.And then the participant was handed the videotape.

One of the people in that class was Laurie Baker. Laurie was working at the Boeing Company at that time in the structures group. And I'm not sure how I met Laurie, probably through SWE. She was a graduate of the University of Florida, but I just don't remember all the details. She worked in a group that was all men, and she was having a difficult time getting the opportunities that she thought she should have.

And she was struggling, wanting to, you know, decide whether she should stay, or what else she should do. And through the Puget Sound Engineering Council I happened to meet one of the general managers -- well, I guess he was in charge of engineering -- at Kenworth's Truck Factory. And he called me up one day and he said, "Pete, I need a woman engineer who knows about structures or acoustics." Well, there's not a lot of difference between the two technologies. And I said, "I think I have the woman you want." So I called Laurie. She called him back.

They made a lunch date, and they had a reasonably good outcome, except she called me back and she said, "Well, they won't pay me enough." And I said, "Well, make them a counter offer." Now, if somebody had told me that early on, I would have said, "You're nuts. I can't make a counter offer to anybody like that," you know. "I don't have that kind of chutzpah, or whatever it is." And she said, "Well, what if they say no?" And I said, "Okay," you know, "You still can take it or leave it, take what they offer you." She said, "Well, okay, I will." So she did, and they met her offer, and they hired her.

LK: Fantastic.

EP: And she became chief engineer of that plant. She has been sent over to Foden Truck Company in England when Pacific Car and Foundry bought that, and she had a big technical job there. And she's in SWE, she's still in SWE. She is still with Pacific Car and Foundry. She is now, I think, the vice president of Human

Relations, a job which I told her she shouldn't stay in too long.

Laurie seems to think that I was instrumental in getting that job for her. I wasn't. She did it on her own. I just had a name for her. But as these things really work, you do things yourself. Nobody can get the job for you. And she has really been successful. She's very deserving. So I think that's one other thing that I did.

And there's another good thing, and I've got to be careful about this. I was on the board of SWE for several years. We had a meeting in Texas. I can't remember when this was, the council meeting, you know, the board of directors, it was. And at that time, the magazine -- the newsletter was terrible. It was really awful. It was an embarrassment to me, at least. And we were talking about it around the table. And I suggested that they ought to have an editorial board. And one of the reactions was, "Well, we don't want to have to pass all of the stuff in the newsletter through somebody and have them critique it." And I said, "No, that's not what I mean. What I mean is, you ought to have an editorial board under which you have organized groups of people to handle each month's issue," because the newsletter was always late, and there was always an apology. And I got tired reading about these apologies and seeing them in print. It was not a publication that I would have been proud to take outside, as a representative of SWE.

So if I remember the story correctly, I think it was a good thing that we had that discussion, and that SWE is now doing that, because it has been very effective. And the magazine is terrific. They do an excellent job. I'm really proud of it. I don't know what the costs are for the magazine, but I think it does an excellent job of representing SWE at every level, from the top of our government on down. I think we need to have as good publications as AIAA or ASME, or any of the professional organizations. And we are there, thanks to some of the people I've met here.

LK: Do you have any further experiences you'd like to share about engineering or anything else?

EP: I've so many experiences, but you know, I don't know whether they're all that interesting or not. I can't think of anything offhand that would be any different or any more important than what we've already talked about.

LK: Okay. What do you find most satisfying about being an engineer, the work as an engineer?

EP: To design or analyze something or see it built successfully. A lot of people, you know, never get that opportunity. They have a small part in designing something -- and even people at Boeing have a small part in designing something, and they never get to see the end of it. They never know, well, did it fly? Is it working okay? How did it work? You know, that

sort of thing. But I always seemed to be in a position where I always knew whether it was any good or not, and it was satisfying.

I can remember one time we were having some elevator damping problems. And that was an embarrassment, because we'd had them before, and just to think that we didn't know how to handle the problem. And then one of my bosses said, "Well, you know, what about a damper. Maybe if we just put a damper on it." And I said, "Gosh, thinking of a hydraulic damper, all of the systems that are required and all this other stuff." And he said, "No, a mechanical damper. Can't you people design a mechanical damper to take care of this problem?" And one of the guys said, "Hey, my little kid's got a tin can with a whole bunch of shot in it." He said, "Maybe something like that would work." And this guy who said we needed a damper, he says, "Hey, let's try it." So we got a tin. It looked -- the first ones looked like half of a snuff can, you know, a round can?

LK: Uh-huh.

EP: And we put shot in it, and sealed it up, and then epoxied it to the surface and fluid, and it worked.

LK: (Laughs) Wow.

EP: So we proceeded to refine that idea. And they're called penny pie dampers. But subsequent to that, we finally resolved the problem analytically, and they're not flying penny pie dampers anymore. But that was an interesting experience, and something you can see from beginning to end.

And you have to have an open mind. You don't blow off a boss who says, "Can't you design a mechanical damper?" You have to keep listening. And fortunately, my friend at the time that was with me had kids who knew about these toys, and so it's kind of interesting to adapt something that simple and make it work.

LK: Well, thank you very much.

EP: Thank you. It's good to meet you.

LK: You, too.

EP: It's been great.

*****

[End of tape 2]

End of Interview