ORAL HISTORY: Naomi McAfee

About Naomi McAfee

Naomi McAfee was born in Hart County, Kentucky in 1934 and grew up on a farm on the Larne/Hardin county line. She majored in physics at Western Kentucky State College and received her degree in 1956. After graduating, McAfee began her thirty-eight year career at Westinghouse with her first position as Associate Mathematician in reliability engineering. McAfee was later promoted to engineer, became the first female supervisory engineer at Westinghouse in 1966, and Section Manager in 1968. Over the years, maintainability engineering and quality engineering were added to her reliability group, and through this group she worked on various projects such as airborne radar, APQ 120, AWACS, lunar camera and CAALS. She retired from Westinghouse in 1994 and worked for a time with a consulting firm. Throughout her career, McAfee was also involved in organizations such as the American Society for Quality Control (ASQC) and IEEE. In the ASQC, McAfee served as chairman of the Electronics Division and in the larger society was executive secretary and regional director. In the IEEE, McAfee was very active in the Reliability Society and was elected society president in the 1980s, making her more involved in the Institute at large on committees such as TAB. McAfee is also the recipient of awards such as the ASQC Edwards Medal in 1980 and Reliability Society Engineer of the Year in 1995.

In this interview, McAfee discusses her long career at Westinghouse and the various projects and groups she worked with. The issue of women engineers is covered, such as the sparseness of female engineers at Westinghouse until the late 1960s and the challenges she faced as a female supervisor. The progression of McAfee's responsibilities – with maintainability and integrity added to her original reliability engineering – is also talked about, as well as her management style. McAfee also discusses the atmosphere at Westinghouse Baltimore, where she spent her long career apart from a short stint at Westinghouse Pittsburgh, as well as changes at Westinghouse over the years.

Note: A short addendum from McAfee is added at the end of the interview in which she notes a few of the topics not covered during the interview.

Naomi McAfee has also been interviewed by the Society of Women Engineers, of which she was president from 1972-1974. You can find the transcript of that oral history here.

About the Interview

NAOMI McAfee: An Interview Conducted by Sheldon Hochheiser, IEEE History Center, 18 February 2010

Interview #531 for the National Electronic Museum and IEEE History Center, The Institute of Electrical and Electronic Engineers Inc.

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Interview

Interview: Naomi McAfee

Interviewer: Sheldon Hochheiser

Date: 18 February 2010

Location: The National Electronics Museum Baltimore, Maryland

Background and Education

Hochheiser:

This is Sheldon Hochheiser. It's February 18th, 2010. I'm with the IEEE History Center. I'm here at the National Electronics Museum in Baltimore, Maryland with Naomi McAfee. Did I pronounce your name correctly?

McAfee:

Yes you did.

Hochheiser:

If you don't mind I'd like to start with a little bit of background. Where and when were you born?

McAfee:

Well I was born in 1934 on a farm in Hart County, Kentucky. When I was one year old my father decided that he would keep that farm but he bought another farm and we moved to Larue County on a farm, which had property in Larue County and Hardin County. In fact the county line ran down through the middle of the farm. So depending on what was going on and what was to people's advantage we were either Hardin Countians or Larue Countians. I spent my first 16 years there before I left Glendale High School and went off to college at Western Kentucky State College.

Hochheiser:

Were you interested in technology and science growing up?

McAfee:

Oh yes. The biggest fear my mother had was that she would leave home and come back and find everything taken apart. I loved to see how things worked. So at the time I went to college I was thinking about majoring in chemistry but once I got there I found that physics was of more interest. So I switched majors. But interestingly enough when I went to talk to the head of the department about whether I could major in physics, after we chatted for a while he told me "I don't think a girl can do it, but I'm willing to let you try." And after that he was my greatest supporter. So when I graduated in '56 with a Bachelor's Degree in Physics, I didn't find out until years later that he would not let a recruiter on campus unless they talked to me first. So when people talked about having trouble getting jobs as a woman at that point in time, I didn't have any trouble with interviews.

Coming to Westinghouse Baltimore, Security Clearance

And I had job offers. And the best one was here with Westinghouse in Baltimore.

Hochheiser:

What made that seem to be the most attractive offer?

McAfee:

Well when I came to Baltimore most of the companies I interviewed, when you talked to them, it was sort of like what can you do for us, ABCD. Not only were they interested in what I could do for them, but they were very good about telling me what they could do for me. The people were friendly. They made sure I was able to see the town, the area. The atmosphere was different plus the fact it was the best money offer that I got.

Hochheiser:

That certainly helped. What was your first position here?

McAfee:

Well I came in as an Associate Mathematician because I had [a] degree in physics, not engineering. And the job was to do things like statistical analysis of parts that were failing, look at trends of various activities and so forth. However, because I did not have a security clearance, the first thing they did was assign me [a] report to analyze some activity on a program. I wrote the report. They brought it over and said now you need to sign this. And then they classified it secret and I couldn't see it.

Hochheiser:

[Chuckling]

McAfee:

I found out later that that program was Bomarc. And a lot of people did things like that and it wasn't an unusual story that they brought you in, they gave you a bunch of "unrelated information" you put it together and when you got through it was classified either secret or top secret.

Hochheiser:

And what part of the organization were you in at first?

McAfee:

I was in reliability engineering which was part of the components and materials organization

Hochheiser:

So you started off in reliability engineering.

McAfee:

Yes.

Hochheiser:

Okay. I assume eventually you got the security clearance?

McAfee:

Well they didn't fire me so, yes. It took about six months at that point in time to get.

Hochheiser:

It was a matter of how long the paperwork takes?

McAfee:

Oh yes. And so after six months I had the security clearance and after that went onto a lot of other things. But the Bomarc job was very interesting from the viewpoint that you could talk to all of these people, they gave you all this information, you had no idea what [it] was about.

Reliability Engineering, Airborne Radar and Typhon

Of course other programs that I worked on like the Aero 13 and the APQ-20, no. Aero 13 and well it was something 21.

Hochheiser:

Well I can cheat. I can look at what you wrote down - the Aero 21B.

McAfee:

Yes, it was the Aero 21B. Did a lot of analysis, looking at parts that were failing. We did shop follow to try to determine what were the trends on some of the items that they were building, especially ones that were having high failure rates and what we could do to determine what the cause was and how we could prevent that. Of course back at that point in time reliability engineering was "a new field". And the reason was that during World War II, they had a lot of equipment that was very unreliable and especially when

they got into the electronics area that things failed pretty often. In fact, there was a statement that everything had a 5-hour mean time between failure and electronic equipment would always have a 5-hour mean time between failures. So what we were trying to do was to look at ways that we could improve that. We didn't do the design or the development. But we did analyze the activities and what was going on and tried to determine how one could reduce the probability of failure.

Hochheiser:

So then did the other groups in Westinghouse call you in because your group was reliability, the people who knew about this sort of thing?

McAfee:

Yes. We were a service organization which was on call to the other organizations. And not always liked, especially when you went in and told somebody that 'gee I've looked at this circuit and you're overstressing all of your parts in that circuit.' And it was sort of like, 'what do you know about that?' But that was fun. Nobody ever threw me out.

Hochheiser:

[Chuckling]

McAfee:

But I'm sure there were times when they would have liked to. But it was an interesting time. We moved on to other programs. I first started in the Air Arm Division where we had airborne radars and so forth. So everything was very, well, comparatively small at that point in time.

Hochheiser:

You're going to stick something in an airplane; you've got real size and weight issues.

McAfee:

Yes. You had to have - you've got the size, you've got the weight and you have the power constraint. Then I moved from that activity to the Electronics Division working on a program called Typhon. Typhon was a ship borne radar that had klystrons that were taller than I am. And they had a lot of them. So when we ran our first reliability analysis on that system, it was one of the things where you added up probabilities of failures to determine how long the system would work before it failed, the probability that that system would fail was greater than 1. So we extrapolated those results and said the system will fail 22 minutes before you get it together. Well that of course wasn't the

situation but the idea was it was a very complicated system that used a lot of high-powered parts. Of course this led us to look at what could be done to get the failure rate down. So we came up with a concept called reliability with repair. They had strings of klystrons so if you had one fail you could move that one off line and put another one in before the system went down. That was not a total set of redundancy, but one of the first steps towards putting redundancy in the systems.

Promotion to Engineer, Quality Control

Hochheiser:

After a couple of years you went from being associate mathematician to being an engineer?

McAfee:

Yes. That really was more of a way you progressed. You could start out as an associate engineer or an associate mathematician. The next step was engineer. But actually at the point when I was promoted to an engineer I was doing more engineering than I was mathematical analysis. I was basically using a little bit more of my physics than I was at the very beginning.

Hochheiser:

But still in the reliability area.

McAfee:

Yes. I spent almost all, well the largest part of my career, in the reliability engineering business. And it was fun because we were pioneers. People hadn't done what we did before. And of course you'd come up with an idea and everybody would say it would never work. Can't do that. But eventually we would persevere and prove that it could. Things like, stress analysis, worst-case analysis, failure analysis, failure mode analysis. And initially everybody said those things are meaningless but when we started to look at them we found that yes, well yes, there are some of those that are meaningless but there are a lot of them that are very, very meaningful and you need to address the root cause of what's going on.

Hochheiser:

Did you draw at all on the pioneering work of people like [Walter] Shewhart and [Joseph] Juran and [W. Edwards] Deming?

McAfee:

Of course. In fact I knew Shewhart and Juran and Deming. And in fact in 1980 I was awarded the Edwards Medal by the American Society for Quality Control.

Hochheiser:

Right.

McAfee:

So anyway it was really fun because at the time that we were doing this everybody was talking about how poor Japanese quality was and that they weren't doing anything to improve it. And Deming and Shewhart went to Japan and introduced quality concepts to them and when they got through the Japanese believed what they were saying about statistical analysis and so forth. They adapted the techniques and you know what happened to the quality there.

Hochheiser:

Right.

McAfee:

It wasn't very long before they were surpassing what we were doing here.

Hochheiser:

Right. And we were sending people over to Japan to figure out -

McAfee:

What we should have already known.

Hochheiser:

Because it started out here -

McAfee:

Here - right. Right.

Matrix Management and Customer Interactions

Hochheiser:

How did you work with the product groups on, say, the Typhon project? How did you interact and work with the people responsible for the project itself?

McAfee:

Well there was a group that was assigned to the Typhon project to do reliability and quality -

Hochheiser:

Okay. You were part of a group doing this -

McAfee:

We were part - actually the way Westinghouse was organized was a matrix management. So you had a program management staff but then they drew on engineering for engineers, manufacturing for manufacturing personnel, and various support groups for other disciplines as needed to support the programs. So yes, you were part of a program but you belonged to a matrix type organization. The advantage to that was that when programs ran out, you had a home to go to rather than somebody saying 'well tough luck, you're out of work today.' There were disadvantages too because program managers complained that they didn't have control over people. And sometimes that was good and sometimes that wasn't good but for the most part everybody tried to work together as a team. And you had a common goal. It was to develop a product that worked, that made the customer happy and then when you shipped it out, the end user would find it was something that was useful and did something well for them.

Hochheiser:

And this role say on Typhon or other projects - did you interact with the customer as well with the other Westinghouse people?

McAfee:

Oh yes. We quite often talked to the customer [about] the design of the units that were being built. We called them line replaceable units, LRUs. And this LRU has a 100 hours mean time between failure or a 90 % probability that it will work for 10 hours or whatever or .999 probability of success for 10 hours, which you could then convert into mean time between failures. And we tried to identify the ones that were lowest on the totem pole as far as reliability was concerned and what could be done to improve them. So ours was a kind of a detective's job. And sometimes detectives aren't very popular.

Hochheiser:

Yes. You're telling someone that the item they designed is not -

McAfee:

Well it's not up to snuff. Not that it's bad but it's not up to snuff. But we were very fortunate. We had a bunch of very creative people very, very bright people. And very friendly people. It was more like a big family.

Hochheiser:

Who were some of the key people you worked with in your early years?

McAfee:

Well I was hired by a guy named John Harris who ran the Components and Materials group. My immediate supervisor was a fellow named Bob Briggs. Later on as I moved up the management chain I worked for people like Ben Vester, John Stuntz, Johnny Pearson, and eventually toward the end of my career I was working for Aris Melissaratos, Noel Longuemare and Wally Hoff. It was quite an interesting and smart group of people.

Women Engineers at Westinghouse

Hochheiser:

Now I know you've covered some of this in your SWE interview, but I gather when you joined Westinghouse women professionals were, shall we put it mildly, extremely rare?

McAfee:

I think I was the third woman that had been hired in the Baltimore complex. It was somewhat interesting. One gal was from MIT and the summers here were too warm, even the winters were too warm so she went back to Massachusetts. Another one was from Florida and the summers were too humid and it was really too cold in the winter, so she went back to Florida. I was the only one who lasted. For a period of time I was the only - well no, there were two. There was one in the west building or the Electronics Division at that point in time and myself. And I was there for three or four years before I met her. It wasn't because people were trying to keep us apart. It was because of the differences in work that the two divisions did. We just didn't cross that divide. That was in 1956. By 1964 they were starting to hire more women engineers and then in 1967 there was a rather large influx of women engineers. But it was a good time. The people somewhat treated me like a little sister, but also very nice. In fact, when I first came up, there used to be a couple of guys who would come by and look at my feet. And I finally asked, 'what are you doing'? Well I'm from Kentucky. They were trying to find out if I

was wearing shoes. Or at least that was the excuse. I finally told them I put gravel in them to compensate.

Hochheiser:

[Laughing]

McAfee:

And they didn't bother me anymore. [Chuckling]

AWG 10, APQ 120

Hochheiser:

How long would you work on a particular project in reliability? It looks like you were working on Typhon for a fair number of years, is that correct?

McAfee:

Well I worked on the Typhon program about three years. And then it was obviously on its downswing. They were only going to build a couple of them. There were going to be sea tests and so forth on it but basically the engineering work was pretty much finished on it, except for the follow-ons that everyone did. So at that time I transferred back into Air Arm Division - I think it was still called Air Arm at that point in time - to work on the AWG 10 program.

Hochheiser:

What was the AWG 10?

McAfee:

The AWG 10 was airborne radar that was, I guess, the follow-on to the APQ 72 and the Aero 13B. It was a pulse Doppler missile control system where you were looking out the nose of the airplane, to detect targets in the distance, determine if you had friends or enemies out there and what to do.

Hochheiser:

Now was this for a particular aircraft model?

McAfee:

Yes. It was for the F4. The APQ 72 was for the F4 and the AWG 10 was the follow-on basically to that. So I went from this huge ship borne area where you could walk around

and get lost - back to something where it was a comparatively small box that you put into the nose of an airplane. And basically that was a lot more fun to work on than the big systems.

Hochheiser:

Why was it more fun?

McAfee:

It was a bigger challenge. You had less space to do something. You had a lot of functions you needed to do. The big question was, how could you put more and more into a smaller and smaller place?

Hochheiser:

And I guess in some sense that must have made the reliability questions more complex.

McAfee:

It did because what did you do with the heat that you had to get away from the parts to keep them from failing? How could you miniaturize the parts to get them down to this point? And if you look at technology today versus what we had back then, what we were putting into something that was the size of your Coke bottle, today is about the size of a pinhead.

Hochheiser:

Right.

McAfee:

We've come a long way in that.

Hochheiser:

Do you recall any particular reliability problems that you needed to solve on the AWG 10?

McAfee:

Well the AWG 10 was one of those technology transfers where we were going from tubes to semiconductors. And so it was a question of how did you analyze that technology and so forth. The other problem that we had with the AWG 10, well not a problem but a challenge, was that they had a built-in test situation where they were trying to isolate failures in flight so you could do almost instantaneous repairs when the

plane landed. The question was do you use a relay tree which everybody knew would work or did you use the new LED technology that was coming in. Well we had information on failure rates on the relay system; we didn't have any information on the LEDs. So we opted for the relays. We had 248 relays in that tree, almost but not quite, in series to do all this testing which later proved to not be anywhere near as reliable as the LED's. It just proved that when new technology comes up, take a hard look at it and probably use it because it may be a whole lot better and more reliable than the old technology. But when we made the decision we didn't know. Of course one of my friends later told me he would never forgive me for making that decision [Chuckling] because of the problems with the relays being intermittent and so forth.

Hochheiser:

Was the next project the APQ 120?

McAfee:

Well the APQ 120 was really the big brother of the APQ 72. It was a different version of it which included far more functions, more modes of operations, and had a higher reliability requirement by a considerable amount. And in fact I think the APQ 72 had a mean time between failure of about 5 hours. We had a goal of something like 38 hours MTBF on the AWG 10 and 20 hours MTBF on the APQ 120. Well that seemed not too bad. People said 'well gee, you know basically it's only an increase of 4 or 5 times the old requirements.' But if you analyzed it there was something like 7 times as many parts, 6 times as many functions to do, 3 or 4 more modes of operation so it ended up with about a 23 to 1 increase in the reliability requirement. So that was pushing it just a little bit.

Hochheiser:

But were you able to reach those targets?

McAfee:

Eventually. It took a while. The initial analysis showed us meeting 13 hours MTBF, on the AWG 10which was the minimum requirement with the goal being 38 hours. We started out about there and it grew over the period of time as we found new ways of doing things and found problems that existed in the system and eliminated those and simplified the system in some ways. Ultimately we met the 38 hour MTBF requirement, but it was a struggle. It was always interesting in how things could go. We would run various tests. One test would work, the next one wouldn't. And then you would say,

'what happened?' And sometimes trouble shooting those things was not easy. And since they never happened the same way twice, it made it even more interesting to come up with something that was coherent to try to eliminate some of those problems. So it was always a challenge. And the other thing was that whenever you solved a problem, there were always at least two more that cropped up. And sometimes the problem you thought you solved, the solution caused the new problems. It could be a double-edged sword. But a lot of fun.

Westinghouse Baltimore in 50s and 60s

Hochheiser:

How did you find Baltimore, Westinghouse Baltimore as a place to work in the 50s and 60s? Camaraderie social life, spirit?

McAfee:

Well, when I came to work I was working with a group [of] four people. So we were a family. There just wasn't any question about it. We went to movies together. We had picnics, you name it. But that changed as the size of the group grew. Now the first few years it was still a big family. It just got bigger and bigger and bigger. But then there was a point in time like in any extended family you start to lose touch with people that you're working with. And when the area got big enough you would have people in the section that would be off working in other parts of the plant that you might not see for months. There was a social life but it wasn't the one where you would think that 'gee every day I'm going to a party with the same people' or I'm going to lunch with them. It varied. But for the most part camaraderie was great, even under the greatest times of stress when we were trying to meet shipping dates.

Hochheiser:

I imagine those times of stress also led to some rather long hours.

McAfee:

Yes, there were a couple of times that my husband and I talked about it. We were working on programs with tight deadlines; one was AWACS, when we were trying to get the first shipments out. I can remember that there were something like 31 consecutive days that I got home after he had gone to bed and I left before he got up in the morning. Now he's an engineer, and had some of the same deadlines, so he understood what was happening there. But when the first AWACS was shipped he laughed and told me that I slept for 36 hours when it was done.

Hochheiser:

[Laughing] I bet. Now was he also with Westinghouse?

McAfee:

Oh yeah. That's where I met him. So Westinghouse was good to me in a lot of ways.

Becoming a Supervisor, Space Programs

Hochheiser:

Now in '66 you became a supervisor?

McAfee:

Yes. I was the first female supervisory engineer in the corporation.

Hochheiser:

Not just Baltimore, the entire corporation -

McAfee:

Yes, not just Baltimore, the entire corporation. And it was an interesting time because a lot of people said ‘gee, you know, men shouldn't work for women’ and so forth. Occasionally I got some things like that.

Hochheiser:

Sure.

McAfee:

One day a guy came over and told me that this was all wrong. Well I - here's my group sitting around me and this guy's telling me that -

Hochheiser:

So this is some guy from elsewhere in the company.

McAfee:

Yes. And he said men shouldn't work for women. And I remember looking at him and saying you don't understand, men have always worked for women. This is just a slightly different perspective.

Hochheiser:

[Laughing]

McAfee:

[Chuckling] And my group gave me a cheer. [Chuckling] And then he left of course. He did, but he complained to my boss that I was being insubordinate. And my boss came out and asked me 'what did you say to John Doe?' And I told him and I thought he was going to lie down on the floor and laugh. So there were some times like that, but for the most part people understood that you had a job to do and they let you do it.

[Laughter]

Hochheiser:

So when you became a supervisor, how many people did you have working for you?

McAfee:

Well, initially I think there were 12. And my job was reliability engineering for all the space programs. So I had people who worked the lunar camera, who worked the DSMP program or Block 5 as they called it. One of the first jobs I worked on in space was a radar altimeter which was to be put on a missile for people in Huntsville. And it was also one of the first company trips I took.

Hochheiser:

Down to Huntsville?

McAfee:

To Huntsville, yes. And the program manager and the engineering manager for that activity went along on that trip. And so when we walked into the meeting with the people from NASA one guy said to Johnny Pearson, who was a section manager at that time, they said 'oh I see you brought your secretary along.' And Johnny said 'well yeah but you might be amazed.' And that's all he said. Then when I made my presentation and when I got through the guy said 'I'd like to have a secretary like that.' And he and I became very good friends after that. But it was interesting. They had never seen a woman come in to make a technical presentation and it was an education for them and for me. They gave me a chance and that was really what mattered.

Hochheiser:

And when they saw the presentation and saw that you knew what you were doing.

McAfee:

Yes, when they asked questions and I could defend all the things being presented they accepted me. I remember one of the questions was ‘have you had any disagreements with’ - no it was ‘how do you get along with the engineers when you've got a question or a problem?’ And I said ‘well there have been differences of opinion.’ And that kind of brought the room down as they laughed. It was a good time. A lot of interesting things on the space programs. We ran into some really strange, unusual, technical problems.

Hochheiser:

Such as?

McAfee:

Well, how do things react in weightlessness? How do you make sure that you have gotten every single particle or sliver of anything that could short something out that will float in space? And we had some interesting events occur - I won't call them failures but unforeseen results. One time when we were working on a program, we turned the unit upside down and vibrated it to be sure we got all the loose particles out. And then rather than removing the system, they turned it back up the other way and put all the particles back in it. So [Chuckling] you go through a few things like that. And you stop and think how on earth could anybody have done something like that? But it's human nature. You don't think of everything.

Hochheiser:

No you don't. Any particular issues that you had to deal with with the Apollo lunar camera?

McAfee:

Well on the lunar camera the thing that we were looking at was, can we make it reliable so it will do what they want it to do? And so it was such things as how do you seal it to make sure there is no out-gassing when you get it into the capsule and how do you screen the parts to make sure that they will work for the period of time that you want? A lot of those types of things. Of course that camera was on a very tight schedule. And a lot of very smart people worked it and they worked very, very hard to get it done. And when it worked it was sort of like a big whew from everybody who was there. I think everybody who worked on the program, the night that Neal Armstrong stepped off on the moon, was watching that TV program.

Hochheiser:

As well as most of us who had nothing to do with the project. [Laughing]

McAfee:

[Laughing] But you didn't say whew when it worked. [Chuckling]

Hochheiser:

No. No because I obviously knew nothing about all of the work that went into it

McAfee:

But those programs were challenging because they used quote “new technology.” You had to develop new techniques. You had to develop new methods for screening of parts. You had to devise new ways to predict what was going to happen on those things. So those things were all fun, a lot of fun to do. A little stressful at times when you were really working under a lot of pressure to get some things done. But it was a great time.

Hochheiser:

I assume you and your team were working the reliability angles as part of a matrix team with the engineering groups that are actually developing the product itself.

McAfee:

Right. Stan Lebar was the program manager for the lunar camera. Stan was quite often at my desk saying, ‘you know, you guys aren't doing A, you aren't doing B, you aren't doing C,’ and it was sort of like when did that come up? But no, it was that type of thing. We were matrixed to that program and worked with them.

Hochheiser:

It just must have been enormously satisfying when those pictures came back from the moon.

McAfee:

Yes. It was enormously satisfying when the pictures came back from the moon but on the DMSP program it was enormously satisfying when we saw gee, the pictures of the weather fronts that were coming across the -

Hochheiser:

DMSP?

McAfee:

Deep Meteorological Space Program.

Hochheiser:

Is this before or after the lunar camera or at the same time or -

McAfee:

Well basically this started in 1965, the camera was developed in '68. So it was, you know, the same type of time. Block 5 - what we call the DMSP now - was an Air Force program with the idea that they needed to do tracking of weather fronts to find out how you best deploy your troops, what's happening at sea, any number of things. Of course I'm sure there was other stuff that they picked up besides just weather fronts too from that. But all of that were challenges because nobody had ever done anything like that before. And so anytime you had a small success you went out and celebrated.

Hochheiser:

What were those celebrations like?

McAfee:

Well if we delivered a system we would have a party and it might not be anything more than going to the G and M's and having crab cakes or whatever. Or it might be going to Timbuktu which is one of the other restaurants in the area. But those were the types of celebrations where you went out and got together and had a drink and then went home.

Hochheiser:

So were DMSP and the lunar camera the two main space projects you worked on in this period?

McAfee:

In that period yes. There were others later on but those were the two big ones at that point in time.

Section Manager and Maintainability

Hochheiser:

So in '68 you became a Section Manager.

McAfee:

Right.

Hochheiser:

So what did that mean?

McAfee:

Well it meant that I picked up another function. I not only had the entire reliability engineering group which was for all of the systems in the aerospace division but I picked up the maintainability engineering activity also.

Hochheiser:

Which was?

McAfee:

Well, reliability is you build systems to try to make sure that they work. But they don't always work so you have to fix them. And that's where maintainability comes in. So our goal was to have a big R and a little M. If reliability was very high and systems worked very long then you didn't have to do a lot of maintenance and so forth. On the other hand you wanted to be able, when something went wrong, to detect that it went wrong and be able to fix it quickly. So they complemented each other.

Hochheiser:

It sounded like two functions that would complement each other. How large was the team under you at this point?

McAfee:

I think at that point in time we had about 35 people. So it was small enough that you knew everybody but large enough that it was beginning to outgrow the family-type concept.

Hochheiser:

And I suppose as you had more and more people under you, your job became more managerial and less engineering?

McAfee:

Yes. Well, the additional responsibility of trying to plan schedules and making things happen and so forth, that was not bad. But to get away from the technological end of it you lost something, once in a while it was just nice to go down and look at something,

pick it up and say 'what is this and what can we do with it?' So yes, as one went up on the administrative chain you tried to keep your knowledge of the technology up but being able to apply it was a little bit different.

Hochheiser:

How did you manage a group of 35 people?

McAfee:

Well I had, what, three or four supervisory engineers reporting to me. They each had a number of people reporting to them, so you start and you break it down into manageable groups. I think there was one time when I was a supervisory engineer I had something like 23 people working for me for the simple reason that one of the other supervisory engineers had become very ill. Instead of going out and getting a replacement you double up and figure out how to handle the situation until he gets back on his feet. I never want[ed] to do that again because people were scattered all over. Just trying to keep up with what they were doing and where they were going and so forth, was a lot. And while doing that, you don't have anything to do with the technology. And technology was where the fun was.

Hochheiser:

So how do you manage to keep having fun as you have more and more managerial responsibilities?

McAfee:

Well, as the managerial responsibilities went up I tried to get very good technical people working with me and keeping me apprised of what they were doing. I didn't quite have people come in every day for an hour to tell me what this technology is, but we got together at least once a week to go around with - okay, what's new in this area, how are you applying it, what are the new analytical techniques, what are we doing from a prediction viewpoint, how do we minimize failure rates, that type of thing. So you have to allocate but it's not the hands-on type of thing where if you really like to know how things work, you like to take them apart and you like to put them back together.

Hochheiser:

If you didn't like that you probably wouldn't be an engineer.

McAfee:

That's true. [Chuckling] It seems like one goes with the other.

Hochheiser:

It certainly does. So around '68, you're a section manager.

AWACS, Quality Engineering

Now you're getting involved with the large AWACS project.

McAfee:

Well yes. The AWACS project started as something called the Overland Radar Program. I had one person that was assigned to that study. And it was one of those things where people kept questioning whether this technology would ever work or not. Of course people there were very, very smart so they made sure that it did. Then the Overland Radar program - they were looking at how you could do a 360 degree scan. First of all they hung pods on an airplane to do this. Then finally the concept of putting that huge structure on top of that Boeing 707 came up. That was one of the things where people say you can never get something like to fly. Well bumblebees fly but theoretically they can't. So it was a matter of Boeing being very smart about how they did that. The antenna though was huge; what, 32 feet in diameter, 6 feet deep at the center post? And revolved at something like 16 revolutions per, no it had to be more than that, per minute. But, gee, that was a fantastic problem. The other problem was how do you get enough power to the antenna to keep it going? The cable run from the transmitter to the antenna was I think about 90 feet long. You don't run high voltage like that through that length of cable without a lot of power loss. Plus we had to have a rotary joint that would allow that power to be transmitted to the antenna. So there were tremendous numbers of technical problems there. And yet the people did everything there, it seemed like they invented on schedule if that was what was required to be done.

Hochheiser:

Now did you and your team work directly with the Boeing folks?

McAfee:

Well we did not have anybody at Boeing, even though I made trips to Boeing to talk about it. I had people who were assigned to the program. We would talk to the Boeing people that were in Baltimore, then talk to the people who were at Boeing in Seattle and work together to look at analyses of the test results; identify problems, that type of thing. And when it came to going out and talking to Boeing about it or when Boeing came in to talk to us about system reliability, my people were there, I was there. So yes on all of those programs we had interfaces with the customer. And I think for the most

part we had very good interfaces with the customers. We had very good customers. They were very bright, very demanding and sometimes hard to get along with, but the relationships were very good because they had one goal in mind and so did we. And that was to deliver a good product.

Hochheiser:

Now let's see, in '72, was another promotion from section manager to simply manager. Or was that just a re-title?

McAfee:

Just a re-title. I added another group to my activity; the quality engineering activity, so yes it was a promotion. And now instead of just looking at the engineering side of the house which was reliability and maintainability, we now looked at the manufacturing side of the house to see what was happening and tried to combine the groups in such a way that we started at the beginning of a program and followed through all the way to the end on the program. It was an interesting kind of education and a different world to go out and find out what was happening on the shop floor.

Hochheiser:

Had there been a quality function on the shop floor before?

McAfee:

Yes. This was a Harry Smith idea that we should put the engineering and the manufacturing operations together so they could understand each other's problems and work them continuously across the board. The quality engineering people basically interfaced with the resident customer group that monitored us all the time which was NAVPRO at that time. In 1974 or 1975 it changed to AFPRO because we were doing more work for the Air Force than the Navy at that time. We did a lot of work with them to make sure that the procedures and documentation they wanted was done correctly and efficiently. So it was interesting. Now, there were times when there were disagreements between those groups. And one of my jobs was to try to act as a referee between the two parties. There were times you wished you could go home and get away from it all, but for the most part people were pretty good. However, depending on your perspective, a problem can either be a problem or a non-problem. So it was a question of how you sort the perspectives out so that when they agree that there really is a problem you figure out how to solve it. And if it's a non-problem it goes away. I had a lot of fun doing that type of thing.

Hochheiser:

You mentioned Harry Smith. What can you tell me about him? Unfortunately we started this project just a little bit too late to ask him himself.

McAfee:

Well, Harry Smith was one of the most brilliant people that I have known. He was inventing until the day he died. An engineer's engineer. Harry was very creative. He could take things that people had already done and look at them and come up with new ways to use them. He could devise new techniques for doing things, create new products. And he was a good manager. He was one of those people that you called him Harry; you didn't call him Mr. Smith. And he would come down to wherever you were working - sit down and talk with you about what was going on. Just like you and I are talking right now. You would mention things to him and then a few days later you might find out that a problem you thought you were having that you had told Harry about, all of a sudden it was being solved because he had listened and gone off and dropped the right words at the right spots or he might come back and tell you that 'gee, we're doing such and such and maybe you ought to think about doing something about that.' He was a great guy to work with and for.

F16, WMP and Pittsburgh

Hochheiser:

The next project I see your group working on was the F16.

McAfee:

Well, of course the F16 was one of the most successful radar systems. It was an outgrowth of a system called the WX 200; after we lost the F15 radar we were practically out of the radar business. At the time the F16 really began to come in, I was on my way to Pittsburgh. The initial portions of it I missed but later on when we were trying to get the production runs going and everything moving very fast there I was back from Pittsburgh in time to do a lot of work, a lot of the interfacing between the AFPRO and the program on that.

Hochheiser:

So I guess we're now at the point where you go to Pittsburgh for a while, unless I've left anything out.

McAfee:

Well I guess the one area that was missed was the WMP program. That was a space program. It was very challenging from the viewpoint of not only delivery schedule but what we had to do. We were really getting into integrated circuits at that point in time and finding out all the problems that happen with integrated circuits. I can remember doing things like chasing quote "mobile ions." Now mobile ions were such that if you had a step function, a step on a surface in the integrated circuit, if they were not properly treated or if the silicon was not properly treated, after a period of time the ions would migrate. And you would have discontinuities. Now nobody had ever seen anything like that before. And when we brought up the idea of mobile ions, we nearly got laughed out of the place. It took a while but we finally proved that those things existed and we finally came up with a way to solve that problem by basically doing a heat treat on them. But that program, because it was really the first major introduction into integrated circuits, created a whole new vista for everybody to go out and work. We found a new set of problems to be addressed and a new set of things to be laughed about. Engineers would say 'you found what?' [Chuckling] But it was very interesting as we were working on the cutting edge of technology. The fun of working here in Baltimore was that we were always on the cutting edge of new technology. And almost every case where we developed new technology, the reliability of the systems improved. So that, from my viewpoint, that was a great thing.

Hochheiser:

Sure, since you were in charge of reliability.

McAfee:

Yep. [Chuckling] Well, I couldn't really always claim the success, but it was one of those things where when we looked at the new technology and the development of it primarily that was the reason for the increase in reliability. There were some downsides to that. When we had the big old tube systems you could take a huge swing in voltage, increases in temperature and so forth and the systems would still not have any problems. Now the semiconductors wouldn't tolerate that. But we could devise techniques for making sure that didn't happen too. So I worked the WMP program and then I went off to Pittsburgh.

Hochheiser:

Okay. How did that come about?

McAfee:

Well it was one of those things where people were looking at what I needed to do to advance my career.

Hochheiser:

So you had mentors.

McAfee:

Oh yes. John Stuntz, Harry Smith, Ben Vester, Johnny Pearson all of those people were mentors. Anyway, the vice president of engineering had a group called Directors of Strategic Resources. And these people were to evaluate the technology that was being developed at the R&D labs and see if we could take it out and put it into some of the old line divisions.

Hochheiser:

The R&D labs are in Pittsburgh.

McAfee:

They are in Pittsburgh, right. We also did things like look at strategic planning and the plans that were developed by the various divisions to see if there was anything that other divisions were coming up with that might help and so forth. So it really was a transfer of technology when you came down to it. The idea was that if I went to Pittsburgh I would not only see what the rest of the corporation was doing, but I would also get some indoctrination into what financial accounting and the business side of the company was, As a section manager, yeah, I had targets I had to meet but I really wasn't responsible for profit or anything of that type. So I went there for that and with the idea that it would be exposure at the corporate level generally. Now I had 15 business units to cover, one of which was the Baltimore divisions, which was nice because that could provide me an excuse for being home on weekends. But they varied. They varied from the heavy motors division in Buffalo to the gas turbine division in Pittsburgh, to the elevator divisions. So it was a completely different experience.

Hochheiser:

A lot of things far away from defense work!

McAfee:

Oh it was mind-boggling. Here we were working on putting stuff into smaller and smaller packages and so forth. There, you would go into a place and you would have a generator that was bigger than this room.

It's a whole different world of technology. It took a little while to grasp part of that. And you never catch all of it because it's just too varied. But the one problem that was really difficult was when you were dealing with the customers for those products, for example, the utility companies would come in and they would tell you, look I don't want anything new, I want exactly what you gave me last year because I know that works. Well that's fine, but often those parts were no longer available because technology had changed and they no longer made parts for that type of stuff. So convincing them that you could not give them what you had before and that what you had now was better was very difficult because they didn't want to take any risk. To me it was very frustrating because the technology that they were using we had used ten years ago here in Baltimore. Simple things like the elevator division getting integrated circuits and transistors put into the control units on the elevators. It wasn't hard to convince the engineering manager at the elevator divisions that this was a move forward; after all at that point in time he was a guy from Baltimore. But convincing his customers that this was something that should be done was – 'oh too expensive, we don't know if it will be reliable, what's the liability involved?' On and on and on and on. So it was a completely different world. When they decided they were going to reduce staff at headquarters and eliminated both the positions of vice president for engineering and vice president for manufacturing - just cut their staffs entirely - I was very fortunate because at that point in time I was ready to leave and they were ready for me to come back here.

Hochheiser:

Now when you went there was the plan for this to be a relatively short-term assignment and then you'd come to Baltimore or was that kind of open?

McAfee:

Well, I was told a year is probably a little bit short, 2 years is too long. And so we were looking at something like 15 to 18 months. And always in my mind and I think here too, the plan was basically to come back here. There was some thought that I would end up at the R&D Center, which would have been okay in a way but really research was not my strong point. And I couldn't imagine trying to impose discipline on a bunch of scientists. That would have been like trying to herd grasshoppers.

Hochheiser:

I suspect there also would have been the additional problem - at least the research labs that I know of tended to start off with assumptions about people who did not have the PhD, whether they were [Chuckling] valid or not.

McAfee:

Oh yes. They're tremendous. Well, wherever you go you have a certain amount of Not Invented Here.

But in places like that if you don't have all those letters after your name, then it's really, really hard. Fortunately Mechlin, who was the head of the research labs at that point in time, was looking at the thing from a viewpoint of we have to do something to be able to get this technology taken out into the other divisions. He was talking to me about how could we set that up and make that happen. But when I looked at that it was sort of like 'that's like herding grasshoppers.'

Returning to Baltimore and Product Integrity

Anyway, there was an opening here and I came back to work for Johnny Stuntz as, I think, the exact title was Assistant to the General Manager for Product Integrity. And I hated the title.

Hochheiser:

Well what did it mean?

McAfee:

Well, the idea was that all of the equipment that we had here we needed to make sure that it was reliable, maintainable, that it carried the integrity of Westinghouse behind it. So what could you do to put all of those things in place? We were working on AWACS at that point in time. AWACS was a huge system. And we had a customer who insisted more on having paperwork right rather than having equipment right. And so at that point in time, my major job was how do I interface with those people to teach them that gee, get this system right, get the equipment right, make the paperwork match it. And if you have a choice of which one is wrong, it's the paperwork. Well that was a tremendous task. And the program people, they were at loggerheads with the AFPRO. My job was to figure out how I could talk the AFPRO Colonel into becoming more reasonable. He wasn't really the problem. The problem was his staff who had dug in and said this is the way it's going to be and we're not going to back off. I found myself on many occasions talking to him about what's reasonable, what's not reasonable. I remember once when we were talking about a system that had never had a failure. It had been built up, everything went together, and yet when they got ready to ship it, some of the paperwork didn't agree with what people thought it should. And so we spent a night tearing that system down, going back and making sure that the paperwork

agreed with the actual system configuration. I told the Colonel, I think there comes a point in time when you have to look at things a little different. As an example, I told him about an experience I had with my '65 Lincoln Continental. I tuned that car myself. And at one point in time I got it to the point where it would get 15 miles to the gallon. And I thought well if I tweak it a little more, I'd get 17. And I never got more than 12 after that.

Hochheiser:

[Chuckling]

McAfee:

And it was sort of like, you know, there comes a point in time when you leave things that are working alone, and he understood that, and things eased down a little bit after that. But quite often I was in the mode of trying to figure out how I can come up with an analogy that will go along with all this high tech stuff that we're doing. That was one of the jobs I had there. The other thing was to convince program managers that you don't cut every corner that you can. You cut what you can as long as it works. And then when you get to the point where it's not working you don't just put back the last part back you took out in type of thing. How do you convince people that we should pay a lot of money for screening parts? We did that on the space programs. A lot of the other programs didn't. I can remember one program that we were working on where I was on a space program - I think it was the environmental measurements experiment. We were screening all of our parts. And the guy sitting across the desk from me was working on an electronic warfare project and he asked me who was a good supplier for potentiometers? And I said well, I'd buy from this manufacturer. Well he did. It turned out he got the rejects from my program because they weren't doing any screening. So he told me later, I'm never going to listen to you again. I understood that but then we found that companies like the toy manufacturers - Atari and so forth who made PacMan - were screening their parts long before anybody else was screening parts because kids just did not tolerate stuff that failed.

Hochheiser:

They were less tolerant than the military?

McAfee:

From a commercial point, yeah. Children just say, 'if this doesn't work I'm not buying any more of that stuff.' It was interesting that those people learned that you need to make

sure that you have things that really work, much earlier than we did, at least outside of the space program.

Hochheiser:

Now in this position as Assistant for Product Integrity or whatever the inadequate title -

McAfee:

Well the problem wasn't the title, it was just too long. How do you put that on a business card? No, I think people understood that product integrity was something that was very important. When you say Assistant to the General Manager for -

Hochheiser:

As opposed to something like "Director of Product Integrity" - that fits nicely and describes the job.

McAfee:

Right. But John Stuntz's idea was he wanted people to understand that I worked for him, and just wasn't out there in the typical manufacturing world wandering around. And that was good but that title, that title, oh well.

Hochheiser:

Now did you have a group of people working under you at this title or was this staff?

McAfee:

No, this was a staff position. I was working with all of the divisions. I was working with every program within the whole complex including Oceanic and Sunnyvale and the ones here, Hunt Valley. So it was across the board. And my job was to try to stay on top of the techniques that were coming up, be knowledgeable about new requirements that the Air Force and the Navy were putting out and get those requirements infused back into the culture here so that when we were doing things we knew that we were up to date with what they were doing. And it was an interesting job because it put you in touch with so many different people. At that point in time, we must have been building 400 different products here. If you went to Oceanic it was one thing, if you went to Sunnyvale that was something else. If you were at Hunt Valley, which was the logistics group, it was entirely different. It made life interesting and I got to know a lot of people, got to learn a lot of things. And that was both in the customer community and in the community here.

Line Management and Design Assurance

Hochheiser:

And after doing that for a couple of years?

McAfee:

I moved back into a line management job. At that point in time I'd been on staff for three years, three and a half years. There comes a point in time when you either love staff work or you don't.

Hochheiser:

And you concluded?

McAfee:

I'd had enough. And fortunately Johnny Pearson decided that for the engineering activity, we needed to really put an emphasis on design assurance. And design assurance was, if you start with a design you want to make sure that it's right at the beginning. You do the analysis; you do the checks and so forth. It was really a higher level of reliability engineering than I had done before. So again with the design assurance, I picked up maintainability engineering and I was back into the nitty-gritty, day to day type of operation, which after being on staff for a while was very, very nice. It was looking at programs from the very beginning. Starting with the proposals for new programs. We got more involved in this like electronic warfare, especially in the upfront proposal stage and the initial up front systems requirements allocations in the engineering stage. So it was administrative activity again but with a bunch of very competent technical people that we really worked [with] across the board on all programs.

Hochheiser:

So how large of a group did you have under you?

McAfee:

I think at that time we only had about 30 people. People were assigned to product areas of responsibility, one was airborne radar, one was electronic warfare, one was space, and then there would be subdivisions within that. Again, we were looking at new things. How do you do the tradeoffs to make sure that you get the best product for the least money? How can you make sure that you get the reliability you want without putting

too much weight into a system because one of the common ways of doing things was to add redundancy? Well, okay that's fine. But when you do that you double the weight, you also double the possibilities of things going wrong. At least at that point you can do some checking to make sure that you've got something that is working and you can switch it out. Eventually the Design Assurance group was comprised of not only reliability and maintainability engineering, but components engineering, the model shop, engineering labs and flight test.

CAALS

From there I went into another staff job, mainly because of reorganizations that went on. And one of the things that came up was the CAALS activity. And CAALS was Computer Aided Acquisition and Logistics Systems.

Hochheiser:

Yes.

McAfee:

The idea was that we would start getting rid of paper across the entire system. We'd set up a system where starting with the design, everything would be done on the computer. We would eliminate all the paper. We'd do simulations and so forth and then when we handed it off to the manufacturing activity, no paper there. They would have electronic diagrams and so forth for how to build stuff. Well, it never worked. Well, I say it never worked. The problem was that it was set up to be - it was too ambitious. On programs that were in existence at that point in time, if you were doing a new design, it made sense to do your new designs paperlessly but it didn't make any sense to go back and throw all your old drawings away and so forth. So you had this mis-mash of things. The other thing that tended to happen was that there would be a mix of paper and paperless systems set up and instead of letting the two systems work simultaneously until you were sure that the new one worked, one would get cut off and you'd find, good grief, that something wasn't transferred, things accidentally eliminated so that the program wouldn't work. So we had that type of problem. Really, it wasn't a lot of trouble convincing people that they should do their designs on the computer and so forth because you could do so much more so much quicker. The problem was doing that and coming up with realistic checks to make sure that you had thought of all the variables, that everything had been tested thoroughly and been put into quote "a bread board" to make sure that it worked. Now initially the thought was we'd never have that bread boarding type of thing. But that didn't work because one of the first design reviews that

I sat in, they were talking about detection probabilities for an antenna and I immediately ended up adding up the probabilities of detection derived and came up with the probability of detection greater than 1. Kind of hard to.

Hochheiser:

This is not good. [Chuckling]

McAfee:

Well, it'd be great if you could do that every time. But obviously no one had really put the system together and checked it out as a real piece of hardware. So there was a fear, and rightly so, that there was too much reliance on simulations and not enough real testing to prove everything was right. That was the beginning and I'm sure right now that there is a whole lot more that has [to be] done to put all of the designs and manufacturing instructions on the computer and eliminate paper documentation completely. One of the ways that we were going to implement that program was through something called concurrent engineering. Concurrent engineering was a very simple concept. You take an item that you're going to design, say it's a transmitter. You get all the design people together as a group, you bring in the manufacturing people up front so they can talk about what materials you're using and how you're doing that. Everybody is talking together from the beginning so that you don't have this huge glitch of something being thrown over the wall from engineering to manufacturing with no conversation having been had. It took a little while for people to give up their fiefdoms or share their fiefdoms and understand that yes, we can do things a whole lot smoother if we do them that way. So that was a technique that was begun. I felt like one of these traveling ministers. He goes out and he pitches his tent and he preaches his sermon. Everybody comes in and says 'oh boy I'm going to do this, this is great,' and they are all converted to the concept of concurrent engineering. He leaves, and comes back six months later only to find that everybody's back doing what they did before. So it was a constant educational battle. But once people saw that it did work, they tended to do it. Now, there was always this group of people who took the stand that 'we've never done it that way, I'm not going to do it that way.' They either had to be moved aside or retire or whatever. But when I retired in '94 there were a lot of people who had looked at that concept and decided that it was something that should be workable. It was efficient, let's do it.

Retiring from Westinghouse, Hitachi

When I left Westinghouse in '94 I felt that I'd spent a pretty good 38 years there and I was ready to go do something else. [Chuckling] So I joined a consulting firm.

Hochheiser:

So it was your decision that it was time to move on to something else?

McAfee:

Well, my husband had been retired for five and a half years. When we got married, it was one of the things that when he hit retirement, I would be close enough to retirement that we probably both could go. Well, he decided to retire earlier than that. And at the point in time when I retired in 1994, I was not quite 60. But they came up with a great incentive plan. And it didn't pay me, didn't make any economic sense for me to work another three months or four months to hit my birthday and get out. I was better off retiring. So everything just kind of fell together at the same time. And yes, I was looking at what I was doing and saying this is great. I spent a lot of time here but the atmosphere is changing because of the change of people at headquarters. It was just time to go.

Hochheiser:

Right.

McAfee:

Now. The one thing that I had done as part of the CAALS concurrent engineering effort was to introduce Dick Linder to the CEO of Northrop Grumman. And well, we know what happened after that. I don't want to claim responsibility for the ensuing events.

There were only six of us in the consulting group, each with a different area of expertise. It was one of those things that if something came in from a customer that you were working with that was within the other person's bailiwick you just turned it over. After a few years of that, the travel on that got to be too much. There were advantages. One is that in the consulting business you can plan things so if you're traveling you can take your spouse with you. And we did a lot of that. But when I was doing the consulting, I was just basically still doing reliability engineering.

Hochheiser:

Well sure, that's where your expertise is.

McAfee:

Yes. We had a lot of interesting customers. We worked with the Australian DOD. I worked with a paper plant in Finland who insisted I still can't tell you who they are. I worked with automobile companies. So it was a very, very diverse type of activity. And again I saw a whole lot of things that I never would have seen before and how things work. But it was a great life. I was working as a consultant - we were dealing with the Japanese and thinking back in 1982, I think it was, I had just gotten back from headquarters and was basically in the design assurance field when Tom Murrin said we're dealing with Hitachi, I want you to take a team to Japan and find out why Hitachi is building computers that are more reliable than what IBM is building. So I got together a group, a team, and we went to Japan to talk to Hitachi. And the day that we arrived in Tokyo a bunch of the Hitachi executives were indicted for, I don't know, monopoly or something here in the States. [Chuckling] So our timing was awful —

Hochheiser:

Okay.

[Laughter]

McAfee:

But it was interesting; Hitachi was doing techniques then with computers that we weren't doing. They were putting designs on computers, integrating the peripherals in such a way that when they set systems up they worked immediately. They put in a system here. All of our experience with big computer systems was that once they were put in place, it took months to get them to do work like they should. Well, Hitachi was installing a computer system here and the completion date was over the Christmas holidays. And of course, as one of the quote “design assurance managers,” I had the job of going in to see how things were going. I think it was Christmas Eve. The guy finished up. He turned around and he said well, I am done. He picked up his coat and he started to walk out. And I said where are you going? He said home. He threw the switch and everything worked. And there were a bunch of Westinghouse people there with their jaws hanging [Chuckling] because nobody believed that that was going to happen. And what we found was that Hitachi did things like hooking all systems and the peripherals together. They made sure they worked before they shipped them. And so they had checked everything out. So it was just a matter of assembling the units and making sure that you had assembled them correctly. But that was mind-boggling; we hadn't seen anybody do something like that. And that guy was just totally competent. So with that Mr. Murrin decided we needed to go to Japan to find out how Hitachi did that. But of course a one-week trip isn't going to do that for you but it was a good learning

experience though. We found that a lot of the things they talked about - the Taguchi methods that they used - they actually did do what they were saying they would do. And we brought some of those back to use here. So anyway, that's about, well let's see from '56 to 2003, that's what, how many years? Well, not quite.

Hochheiser:

Almost 50.

McAfee:

- almost 50.

Hochheiser:

It's 50, 47 years.

McAfee:

But it was [a] great, great ride, great roller coaster, very enjoyable. And if I had it to do over again, I'd do it.

Hochheiser:

In what ways did the operations in Baltimore evolve or change over the course of your 38 years here?

McAfee:

Well, when I first started here I think we had something like about 2,000 people. And, of course, as it got bigger the bureaucracy became greater. And as long as it was managed by - not only here because here was managed pretty much by engineers. But as long as Pittsburgh was run by engineers things worked reasonably well. Now, Baltimore was never a big cog in the Pittsburgh Westinghouse way of thinking of things, except for the fact that Baltimore did provide a nice cash flow into the corporation. And plus the company felt that they should have a presence in defense and to show: one, that they were good citizens and two, that we were very smart. But when the money managers moved into Pittsburgh, it was like, well, we're putting out a huge amount of expenses for research and development and what is that doing for us? So the emphasis became more on the financial side of the house than it did on the product creativity. The "you can be sure it's Westinghouse" thing kind of started to slip aside. And then when it moved into Michael Jordan, who was the president, well I don't know, I guess he was a general manager or president of Frito Lay before he became president of Westinghouse, had no understanding of the manufacturing side of the house at all. It was sort of like 'well,

what can we do to create cash flow, to add value for the stockholder?' and so forth. And let's eliminate things like research and development and so forth. And so obviously with the merger with CBS, then the merger with Viacom, the idea was to get rid of the manufacturing organization. So unfortunately a great [many] companies disappeared.

IEEE Reliability Society

Hochheiser:

Can I switch question areas a little bit? You know I'm from the IEEE.

McAfee:

Yes.

Hochheiser:

So I'd like to ask you about the history of your involvement with the IEEE. Do you know around when you joined?

McAfee:

I think I joined in 1958 or '59.

Hochheiser:

So not long after you came here and started to become an engineer?

McAfee:

Right. I joined because one of the guys in the section I worked with was saying this is a great way to stay technically on top of what's going on and to meet people in the field and so forth. So it made sense. And when I joined I guess at that point in time it was the IRE.

Hochheiser:

Right. It was still before the merger with the power guys.

McAfee:

And then when it became the IEEE they had things like the Reliability Society which was my field so I joined that and eventually became president of the IEEE Reliability Society.

Hochheiser:

How did you become active and get to the point where you worked your way up to being president of one of the IEEE societies?

McAfee:

Well that probably is serendipity. In early 1958 the IEEE, well the IRE, and ASQC decided that they needed to get together and do something about developing a textbook for reliability engineering. The request came into the Baltimore divisions to have somebody assigned to that and I guess I was [the] low person on the totem pole so they sent me off to work on that. And I met people like Cliff Ryerson, Stan Zwerling and Frank Gryna and we put together a book. It was called The Reliability Training Text. It's the first book on reliability engineering. And basically what we did was get about 12 or 13 people together to write about various aspects of reliability engineering, and then we edited that into a training text. I don't know how many copies of that thing sold. No royalties to any of the people who worked on it. But it was "the text" for several years.

Hochheiser:

When did it come out?

McAfee:

It came out in 1959.

Hochheiser:

I wasn't clear whether '58 was when it started or when it finished.

McAfee:

Well actually we started in '58 and it was published in mid '59.

Hochheiser:

That's quick.

McAfee:

Well, I think everybody that we worked for said you either get this done or you're going to be off of this. But when it came out it was so well accepted. At that point in time I met all of these people that I later worked with in the Reliability Society. At that time they said 'we're doing these things why don't you work with the Baltimore group?' and I did that. And finally I became a region director or one of them. I'm not sure what the titles are. They changed them so much. As a result of the work on the Training Text I was asked to run for executive committee of the Reliability Society and was elected. And

then after serving there for several years, I guess it was just routine moving up the chain. Then in '84, I was elected president of the society. One of those years they gave me their annual reliability award. And I can't remember what year that was.

Hochheiser:

I probably can look it up.

McAfee:

Well I've got it someplace too. I could go look at the plaque I guess. That would tell me. The year was 1995.

Hochheiser:

What did you do as society president?

McAfee:

Well, as society president, one of the things that we were trying to do was to work with other societies to figure out how we could get reliability implemented across - well basically we wanted reliability engineering to become a household word. So we were developing and setting up educational programs. We had training programs. We had symposia. There was the reliability magazine that was issued six times a year or something like that. It still is, probably. So the idea was primarily to educate people about reliability, get them interested in it, see what new techniques we could get developed. How could you spread the word about those things? And, of course, to make money. We did that by running symposia, running training programs and so forth. One of the symposiums that we were a member of was the Annual Reliability and Maintainability Symposium which in 2004 had its 50th anniversary. I chaired that in 1997. After retiring in 2003 I've stayed in touch with the people but I really haven't been doing anything in the society. It's time to let the younger people move in.

Hochheiser:

Have you maintained your membership?

McAfee:

Of course. I am a life member. But, yes I think it's well worthwhile. The magazines are fun; the literature you can get and the fact that they now have so much stuff online. You can go in and find information on almost any topic you want. So, so yes. I have maintained my membership. I've also maintained contacts with the people that I worked with.

Larger IEEE and ASQC

Hochheiser:

Another IEEE question: you were president of the society; that put you on the Technical Activities Board with the other professional society members?

McAfee:

Well actually I guess I was on that board for two years. One as vice president and one as president because it was sort of like, okay we keep the thing, you just don't drop off and hand it off to somebody new.

Hochheiser:

For two years.

So you had a bit of exposure to the overall IEEE?

McAfee:

Yes.

Hochheiser:

Do you have any recollections of what TAB meetings or board series were like?

McAfee:

Not really. It was a long time ago. And I don’t remember getting bored enough to go to sleep or any confrontation or anything that came up that was really a hot issue for discussion. I remember going to meetings, but I just don't remember much about them.

Hochheiser:

Were you also active in ASQC?

McAfee:

Yes, I joined ASQC before I joined IRE. And when I joined ASQC I guess it was because a local section was having a revolt against the national group. They decided that they needed a woman in the local set of officers and elected me Chairman. I've always been convinced that Atchison Duncan and all those people were really telling the national organization we're going to stick it in your eye. I also joined the Electronics Division of ASQC and eventually was elected Chairman. Obviously I must have done that well enough because I was elected executive secretary of the society, and I went on to serve

as regional director for several years. But again as I got more active in IEEE, I got less active in ASQC because there's only so much you can do.

Hochheiser:

Okay. Well we've gone through your career. I've asked you about IEEE. I'm out of questions but if you have anything you'd like to add, anything that I neglected to ask you about I'd certainly be happy to hear.

McAfee:

Well we've covered a lot of territory here in this short period of time and I really can't think of anything else to add. It's been fun. Thank you very much.

Hochheiser:

Well thank you for being willing to come here and tell us about your career.

McAfee:

Well I'm happy to do so, but thank you.

Addendum: Some things that weren't covered in this interview were my service on the Army Science Board. I was appointed by the Secretary of the Army to three two-year terms on the Board. President Reagan also appointed me to serve a three-year term on the President's Commission on the National Medal of Science.