ORAL HISTORY: Walter Ewanus

About Walter Ewanus

Walter Ewanus was born in Scranton, Pennsylvania but raised in rural Long Island. Fixing radios as a teenager, Ewanus was always interested in technology. Serving two years in the Navy, he participated in an electronic technician program, and after discharge attended the University of Colorado, Boulder to receive a degree in electrical engineering. He was employed by Westinghouse directly from school, and although originally in Pittsburgh, he soon came to Baltimore. Ewanus also attended Westinghouse Design School and later received Masters from the University of Maryland and George Washington University. During his career at Westinghouse, Ewanus worked on many projects including Bomarc, satellite communications, B1B, F-117 and transcontinental communications. He retired from Westinghouse in January of 1991.

In this interview, Ewanus talks about the many projects and technologies he was involved with at Westinghouse. Many projects he cannot discuss because they are classified – a topic covered in the interview – but he shares stories about his work with NASA and various colleagues at Westinghouse such as Paul Pan and Harry Smith. Ewanus also talks about changes in technology he observed over his career, one which saw the shift from vacuum tubes to transistors and analog to digital. Finally, Ewanus discusses his career as a working engineer, largely resisting the push into management or administrative positions.

About the Interview

WALTER EWANUS: An Interview Conducted by Sheldon Hochheiser, IEEE History Center, 22 July, 2009

Interview #514 for the National Electronics Museum and IEEE History Center, The Institute of Electrical and Electronic Engineers Inc.

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It is recommended that this oral history be cited as follows:

Walter Ewanus, an oral history conducted in 2009 by Sheldon Hochheiser, IEEE History Center, New Brunswick, NJ, USA at the National Electronics Museum, Linthicum, MD, USA

Interview

Interview: Walter **Ewanus**

Interviewer: Sheldon Hochheiser

Date: 22 July 2009

Location: National Electronics Museum, Baltimore MD

Background and Education

Hochheiser:

It's the 22nd of July, 2009. I am Sheldon Hochheiser, from the IEEE History Center. I am here at the National Electronics Museum in Maryland with Walter Ewanus. Did I pronounce your name correctly?

Ewanus:

That is correct.

Hochheiser:

Very good. To do an oral history with him, to discuss his life, his career, and the Westinghouse Defense Electronics Division. Good afternoon.

Ewanus:

Good afternoon.

Hochheiser:

If we could start with a little background, where were you born and raised?

Ewanus:

Well, I was born in Scranton, Pennsylvania, but I was raised on Long Island. Farm Country, out in the middle, not a city type.

Hochheiser:

What did your parents do?

Ewanus:

Restaurateur. I'm first generation. They are immigrants.

Hochheiser:

Were you interested in technology, in science, growing up?

Ewanus:

Yes, just about all my life. That's true. My dad always said I wanted to be an engineer, and he was right.

Hochheiser:

[Laughter]

Ewanus:

And he would help make it so, and he did.

Hochheiser:

How did he do that?

Ewanus:

Well, I was essentially the community geek, I'll put it that way. I fixed all the radios, built them [Laughter] repaired them. At that day in age.

Hochheiser:

This is back when you were growing up?

Ewanus:

Yes. As a teenager.

Hochheiser:

Yes?

Ewanus:

But right out of high school, I started immediately my freshman year at Stevens Institute of Technology. I commuted then, from the middle of Long Island to New Jersey. But I got my freshman year in before I was entered into the service. I spent two years in the service, in the Navy which was very instructive and part of my education. I was a graduate of the electronic technician program in the Navy, which probably never taught in any school in the country at that time, but it was very, very appropriate to my career.

Hochheiser:

What did they teach you there?

Ewanus:

Electronics. Communications, jamming, radar, you name it. It was very basic and it was about 9-10 months worth of intense training and education. Classes, 10 hours a day. The remainder of my service was shipboard until being discharged.

Hochheiser:

Right.

Ewanus:

To continue my education, I considered returning to Stevens Institute of Technology. But, commuting again was not an option. As a youngster, it was not too bad; however, I was not going to do that again.

Hochheiser:

Right.

Ewanus:

So I decided on going far enough away from home that I could not commute. University of Colorado in Boulder fit that description.

Hochheiser:

Yes, that would be kind of hard to do from Long Island. How did you choose that particular school?

Ewanus:

Hard to say. It was compare this and compare that, and I said, "Hey, this sounds pretty good." And there I was.

Hochheiser:

Mm-hmm. So you went there as an EE—as an EE major?

Ewanus:

That's correct.

Hochheiser:

Yeah. And what was the curriculum like there?

Ewanus:

Well, just about like any electrical engineering course. Lots of math, physics, chemistry, you name it. We covered the waterfront. It was a well thought out program. And Westinghouse hired me right out of school there, at graduation, and I've never had another job since.

Starting at Westinghouse

Hochheiser:

How did you get matched up with Westinghouse?

Ewanus:

They came and interviewed on the campus.

Hochheiser:

As I assume did other companies.

Ewanus:

Yes, other companies did, but Westinghouse made me an offer, I thought it was very good, I liked the company, and well, there I was.

Hochheiser:

And did you start immediately here in Baltimore?—

Ewanus:

Yes.

Hochheiser:

Yes, you came right to Baltimore.

Ewanus:

Well, it was Pittsburgh originally.

Hochheiser:

You started first in Pittsburgh.

Ewanus:

Which allowed you to take a few orientation courses and travel and have assignments in the various divisions to learn what Westinghouse is all about. And also to help you make a decision where you wanted to work. And I had various assignments for about over a year, about six to 12 weeks in length each.

Hochheiser:

And at the end of that you came to Baltimore.

Ewanus:

Yes, I pretty much had decided on that.

Hochheiser:

What was it about this facility that attracted you?

Ewanus:

Electronics. Well you know, going way back to my early youth, particularly the Navy program and working on radar systems, ship board, I always wondered how they were designed and built. Well, I said, "I'm going to go to school and find out," so that is probably where it really started. Now I know.

Hochheiser:

[Laughter] I guess so.

Bomarc Program and Design School

So what was the first project you worked on when you came to Baltimore?

Ewanus:

The Bomarc program. Bomarc A, which is the pulse version, not the pulse Doppler. The DPN-53 was the outgrowth of that on Pulse Doppler.

Hochheiser:

Right. And what was your role in this project?

Ewanus:

I did all of the synchronization timing, ranging, testing, and helped prepare the documentation and deliver it to the customer.

Hochheiser:

Who are the main people you worked with?

Ewanus:

Well, believe it or not, Harry Smith was sort of a latecomer in that program, but he and I were first working together on the Bomarc program, so I have known him since then, since he was hired.

Hochheiser:

[Laughter]

Ewanus:

So I played project engineer, I suspect, is what you want to call it.

Hochheiser:

Okay. And about how long did you work on Bomarc?

Ewanus:

Oh, guessing maybe two years. I had an interruption. I also was called back to Pittsburgh. I was invited to go to their design school. So I went to the Westinghouse Design School for, I forgot how long, about six months before I came here permanently.

Hochheiser:

And what did you study in the design school?

Ewanus:

Electrical equipment. Electrical design. Mathematics. Servo mechanisms, they covered the waterfront. Physics.

Hochheiser:

To what extent were the things you studied there new to you and different from what you had studied in Colorado?

Ewanus:

It was advanced and more specifically oriented to real products, but an extension of my math, mathematics education and it was graduate school material, and graduates of the Westinghouse Design School were eligible for 12 hours of graduate credits at the University of Pittsburgh. So that was half of a Master's Degree right there, but unfortunately, I didn't stay in Pittsburgh, I was here.

Hochheiser:

But you did eventually get a Master's Degree here?

Ewanus:

Working here full-time going to evening school, so I went to University of Maryland, and got a Master's Degree and Westinghouse paid for it. And then later I decided to go ahead and go to Graduate School again at the George Washington University, and got another Master's Degree, and Westinghouse paid for that. So I was pretty satisfied.

Hochheiser:

Mm-hmm. Mm-hmm. So you worked on the Bomarc project for about two years?

Ewanus:

About that. Yes, and the DPN—it wasn't designated DPN.

Hochheiser:

Only on the first Bomarc.

Ewanus:

First, right.

Hochheiser:

Not the Doppler.

Ewanus:

Not the Doppler version.

Hochheiser:

Only the original version.

Ewanus:

So when I left the Bomarc program we started working on Pulse Doppler, so that is what became one [of] the basics for building the DPN-53, so I was working on the original developmental models of the Pulse Doppler system, called the breadboards and the developmental models, and test models. And I was on that, well, over a half a dozen years, working on the Pulse Doppler systems.

R&D and Satellite Communications

Hochheiser:

Okay, but not just for Bomarc?

Ewanus:

No, no, this was…

Hochheiser:

Was this more basic?

Ewanus:

More basic.

Hochheiser:

More towards the—R…

Ewanus:

R&D.

Hochheiser:

More towards the R&D end and further away from the production end.

Ewanus:

Yes. Away from the production entirely.

Hochheiser:

Was that your choice or someone suggest this?

Ewanus:

I think I sort of gravitated that way, it is what I enjoyed the most, and working with people like Harry Smith, who was a… well, is he a genius or isn't he, I don't know. But he had lots of ideas and trying to implement them was a challenge, and this is where the systems evolved and it was fun, doing new things, pushing technology, and the people I worked with were super.

Hochheiser:

And can you talk a bit about some of the people?

Ewanus:

Yes. The one I guess key individual is Dave Mooney, who unfortunately has passed away now, but he and I worked very closely as a team with Harry. Bill Dempsey was another person who we worked with very closely. And he has passed away unfortunately now, but unfortunately so has Harry Smith. And here I am. I am ruining the averages.

Hochheiser:

So you were working for about six years in R&D on Pulse Doppler.

Ewanus:

It takes me into the latter part of the 60s, I think. Then I started a new career, courtesy of Mr. Smith. He wanted to get started into communications. Now, Westinghouse had a communications department, but this was ground equipment. He wanted to get us into the aerospace and space business. So I started dabbling in that, and I think I was probably in the communications arena for well over 10 years.

Hochheiser:

That's a fair change from radar, then.

Ewanus:

Yes, it was. But we broke a lot of ground and did a whole lot of new developments and research in areas which had never been done before, under contract and studies.

Hochheiser:

And what areas?

Ewanus:

Satellite communications, really wide-band stuff, like 1.5 gigabit data rates for not only sending wide-bandwidths of data, but also for another reason, and that was spread spectrum, which is, well, that is an interesting arena. It was privacy… Anti-jam…. multiplexing of different signals, which a good example is code division multiple access, as known today. Well, we did a lot of experimentation with NASA, proving that theory. Another one was also a forerunner of GPS. We did ranging a range rate to a satellite, back before the concept of GPS was even evolved, and we demonstrated it at a NASA tracking site.

Hochheiser:

About when was this?

Ewanus:

Mid-60s.

Hochheiser:

Okay. Were there contracts from NASA to support this?

Ewanus:

Yes, yes we did that.

Hochheiser:

To support this work.

Ewanus:

Reported—and we did this as research for NASA, Goddard.

Hochheiser:

Right. Right, so you had GPS work?

Ewanus:

No, but the work we did was the predecessor for setting specifications and the concept.

Aircraft Arena and UV Infrared

Hochheiser:

And did this lead anywhere back in the 60s, or did it stay concept for a long time?

Ewanus:

Well, other companies took it over. QUALCOMM is a good example, who sells the rights to code division multiple access today. And they have made it a success. Westinghouse chose not to do that. They were not in that kind of communications business, but satellites, yes, and we tried to get into the airborne, aircraft business. And I applied spread spectrum to that arena. At that time, the Air Force had a piece of equipment called ARC-50 that is an airborne transceiver, which had spread spectrum for anti-jamming and privacy. And my idea was to take the standard receiver, in every aircraft, usually at the UHF region, called the ARC34. I proposed that I could build a box, attach it to the ARC34, and make it do everything the ARC50 would do, at such a fraction of the cost, and modify the whole inventory with these boxes. The Air Force funded me, I built it, we tested it, designed it, and it worked.

Hochheiser:

And then did that get adopted by the Air Force, did it go into production?

Ewanus:

I don't know, because it belongs to the Air Force, obviously. I don't know what they did.

Hochheiser:

So you lost track of it.

Ewanus:

Right. But I did the R&D and that is alright, it pleased me. It also applied to another area in that arena, the emergency transceivers for downed pilots. It had another application, that if we could adapt the emergency transceivers for the downed pilot application, by applying spread spectrum to it, we could quiet the zone down to where he could be picked up by the enemy to something like 1/100th of the area of which he is down, so

the enemy couldn't detect him. It would only be detected by other aircraft or other personnel, and it worked. We delivered some of those, testing for the Air Force.

Hochheiser:

But then again, the Air Force took this and did whatever they wanted to.

Ewanus:

Right. That is correct.

Hochheiser:

So it was not something closely tied to what eventually became a production product for the division—

Ewanus:

Not for Westinghouse at that time. Because we weren't in that business. Business wise. Just to relate something. Westinghouse is very good at building large things low volume high cost. Other people could build high volume at low cost, which we couldn't. So there you are.

Hochheiser:

But on research, Westinghouse had the capability.

Ewanus:

Yes, that is correct.

Hochheiser:

Now, did Westinghouse pursue research contracts in this area, or was it a matter of the customers coming to Westinghouse and saying, "Could you do this research?"

Ewanus:

No, the technology applies even to radar systems. You know, just like B1B, there is pulse compression circuitry. And that is spread spectrum, essentially. It is pseudo-noise, coded pulses. So basically the technology is transferrable between the two, and it is also part of the privacy and security involved, spread spectrum is one way of doing it. So it's an interesting arena.

Hochheiser:

And you said you did this again for about 10-12 years?

Ewanus:

We did it for about 10 years, right.

Hochheiser:

And any particular reason why the program ended, or did you just move to something else?

Ewanus:

No, I think it ended. I think the division manager at that time decided it was not a business that we should be in, so he shut it down.

Hochheiser:

And who was that?

Ewanus:

John Stuntz at that time.

Hochheiser:

Yes. So when he shut it down, I guess you had to move to something else?

Ewanus:

Yes.

Hochheiser:

Which was?

Ewanus:

Well, believe it or not, it was a strange area, almost unrelated to the other two, but it was in the optical UV and infrared region. So we were flight testing, building simulated programs for satellite reconnaissance and flying an aircraft to simulate the system and setting the specifications so that the government could procure recon satellites and sensors for it. And I did that for golly, it must have been over 12 years in that arena.

Hochheiser:

So about what time period are we talking about?

Ewanus:

The 70s and some of the 80s.

Hochheiser:

What agency of the government was funding this research?

Ewanus:

I'll say Air Force. But it related to other places of course, which I am not free to talk about.

Hochheiser:

I understand that even after many years, there are a lot of projects that went on in the division that are still…

Ewanus:

But Westinghouse is involved in building sensors in that arena, too, so it was—they were very interested in performing these tests for the government. Which included other manufacturers, too, by the way. So it was a pretty broad program.

Hochheiser:

And how closely did you work with other manufacturers, with other defense contractors on this?

Ewanus:

Very little. No, we were always working with them hands off. Testing their equipment, so of course it became very sensitive. So we were obligated to keep it separate, totally separate. So essentially everybody benefitted.

B1B Program and Inverse SAR

But then I came back, out of that, and went back into the radar business, believe it or not, with Bill Jones, on the B1B program. So I was involved in that. But in its latter stages, not at the beginnings.

Hochheiser:

What did you do for the B1 program?

Ewanus:

At the time, I did several studies with Boeing on future technology and applying it to the B1B. As a for instance, one of the missions in the study was: The Soviets at that time had

all of their intercontinental missiles—not all, but most of them were deployed on vehicles, and moved every day. From night to night, they would have a different location. The B1B mission was to find them, at that time, and at lower level, and destroy. So this was one of the things that I worked on, how to evolve the B1B and give it the capability to locate and destroy these Soviet missiles. That was an interesting project. And we came up with some viable solutions. And we also looked into other modes of application that we were dabbling in, one is called Inverse SAR. Inverse SAR—is… I will try to explain, Synthetic Aperture Radar.

Hochheiser:

Right.

Ewanus:

Which is a mapping mode.

Hochheiser:

Right.

Ewanus:

Inverse SAR—well, in a mapping mode, you use the Doppler component of frequency to map the ground in high resolution. Now, this says you could be able to see what is on a terrain, but you can't—usually the resolution is not enough to be able to identify, unless it is fairly large, with oh, say, 10 feet of resolution, which is relatively crude. But Inverse SAR used a different concept. It uses a Doppler component of the target itself that you can map the outline and come up with the target characteristics, like a ship. Inverse SAR actually paints you a picture of the ship, and we built and demonstrated that with B1B radar, it can be done. Now, we weren't big in that arena. Texas Instruments was the leader in ISAR. And it was more of a software program than a hardware program. Really, anybody could do it. And so we said, "Okay, if the customer is interested in this, we will show them that we can do it, too." And we did. So we had several pictures of several carriers here, and I think those pictures are unclassified, they are available. Interesting. Pushing the frontiers of the science, believe me. There was quite a few things that we did, under contract with Boeing, who was looking into the future of the course of the airplane and the radar system, which would help their cause, too, and business aspects. That was my main mission there.

Hochheiser:

And did you spend much time out in Seattle on this?

Ewanus:

No, they came here, believe it or not.

Hochheiser:

As you know, I was just talking to Bill Jones, and he was talking about the amount of time he spent out in Seattle.

Ewanus:

Oh, I know, but the people I worked with were all here, so we couldn't move as a team there very easily, so Boeing sent their engineers here, and we would have a monthly get together and review our study efforts. It was sort of an open contract to go ahead and do these things, and it worked out very well.

Hochheiser:

So then this fed back into improvements in the B1.

Ewanus:

Exactly. Just like these radars now, there is not just a single mode.

Hochheiser:

Right.

Ewanus:

Because some have 20 different kinds of modes, and each one of them has a breakdown, a very complex system these days.

Hochheiser:

Well, the advance of technology allows you to just do so much more.

Ewanus:

That is correct.

Hochheiser:

I mean, You started, when everything was still analog.

Ewanus:

That's…

Hochheiser:

Not in the B1B, but your career.

Ewanus:

That is true, because I saw the transition from vacuum tubes to transistors. As a matter of fact, as a note, in Bomarc A, I was the first one to use a transistor approved by the customer. Everything else was vacuum tubes. So I actually added a transistor to circuit board.

Hochheiser:

Was there something specific, some specific goal that led you to add that transistor?

Ewanus:

Yes, miniaturization, reliability, heat dissipation, just about everything you could think of. You know, the future was in solid state.

Hochheiser:

Yes.

Ewanus:

And we knew it, so I was involved in trying to evolve solid state applications in radar and communications. Pushing the frontiers of technology, isn't that wonderful?

Hochheiser:

It is.

Ewanus:

It is challenging. I hope the young people today feel the same way.

Hochheiser:

I certainly know some who do.

Ewanus:

Good, wonderful.

Hochheiser:

Of course, what were the frontiers when you were a young man and what is the frontier to a young man today are…

Ewanus:

But there are always new frontiers out there.

Hochheiser:

But there are always new frontiers.

Ewanus:

Wonderful.

Returning to Radar

Hochheiser:

And then what came next in your career?

Ewanus:

Believe it or not, I went back to the flight test program of testing sensors. I believe at that time we were working with the infrared spectrum, for a short period of time, but I always felt that I was sort of out of place. The program had evolved into other aspects, other people were doing a good job and I think they really did not need me. So I came back to the radar arena, and advanced development.

Hochheiser:

And through all of this you are a working engineer.

Ewanus:

Yes, absolutely.

Hochheiser:

Unlike some of the other people I've spoken to who eventually pretty much entirely became managers and administrators.

Ewanus:

No, I refused to be a manager or even involved in that chain. Project engineering, that's fine, but beyond that…

Hochheiser:

It just wasn't your cup of tea.

Ewanus:

No. I like my programs, I evolved them, I'll develop them, but I don't want to manage people. Technically, yes, the people reported to me technically, and they were good people.

Hochheiser:

Mm-hmm.

Ewanus:

But I didn't cotton up to management.

Defense Electronics Division Environment

Hochheiser:

Who were some of the key people you worked with over the years?

Ewanus:

Well, I'd say Harry Smith, Dave Mooney, Bill Skillman, Bill Jones. Bill Dempsey. Good gosh, I have a list like that long. Just about everybody, in almost every field. Gene Strull, Paul Pan. Just about everybody, I think. I don't think I missed any.

Hochheiser:

What was the Defense Electronics Division like as a place to work in terms of colleagues, in terms of social life, camaraderie?

Ewanus:

We were very, very close. Particularly those, at least the ones I am aware of and been closely associated with, like Harry Smith and John Stuntz in advanced development, it seems like we all took care of each other. We were all from out of town.

Hochheiser:

Yes.

Ewanus:

Apparently, the majority of us. We all took care of each other. The women would also take care of the other women who were pregnant and saw to their welfare and we each

took care of each other, and it sort of evolved as a real team, not only work ethics, but socially too. And we still see a lot of each other, we still socialize and we still get together at least once a year.

Hochheiser:

What other projects did you do?

Ewanus:

Oh boy, so many.

Hochheiser:

Well, I'm ready to listen to you talk about any or all of them.

F-117 and Transcontinental Communications

Ewanus:

You're here. Okay. Well, there was another interesting one. It was an Air Force program, and I won't be able to tell you a whole lot about it, but it was the F-117. Are you familiar with that?

Hochheiser:

No.

Ewanus:

That is the Stealth aircraft.

Hochheiser:

Okay.

Ewanus:

Still in service, still operational. We were under contract by the Air Force to study the feasibility of using a radar sensor in the F-117 and make it all-weather. The F-117 used an optical system for detection and guidance, which of course is not all-weather, but radar would be, so we looked at the feasibility of doing that. And after a year's worth of study and design work, we said it could be done. So the Air Force gave us a contract to go ahead and put a radar into an F-117 and demonstrate the feasibility of doing this. And it worked on the first flight. That is about as much as I can tell you.

Hochheiser:

Sounds like you spent a good chunk of your career in things that still many years later are still classified.

Ewanus:

Yes. That is the only way I can describe it.

Hochheiser:

Other projects?

Ewanus:

Other projects. Well… it seems like there are so many, I don't know which ones to address.

Hochheiser:

Well, since I don't even have a list of them, I can't ask you "tell me about this project."

Ewanus:

Well, in communications we had an interesting experiment, funded by Westinghouse R&D funds. We were looking at transcontinental communications at that time. This is prior to satellites and things like that, so one of the things we looked at was using the moon as a reflector to reflect the signal from coast to coast. Believe it or not, we built a terminal here in Baltimore and started to build a second terminal in California, so we could bounce signals off the moon and use it for intercontinental communications. Well, we never got to complete the system at the other end, but we were able to go round trip here in Baltimore, so we successfully tracked the moon. We had a 12-foot antenna mounted in the back parking lot, and we would track the moon and bounce signals off it, and believe it or not, we used the APG-55 radar transmitter. Which is the pulsed doppler C-band version of the first model that we built. We used that transmitter as the transmitter to do the job, and it worked. We had to build a receiver of course, a low noise receiver to do that, and we did that, too. But we never got to complete that job. Number one, business wise there is not a whole lot of you might say profitable endeavors in bouncing signals off the moon. It is mostly a research program for universities and it wasn't our cup of tea. But we had fun,

Hochheiser:

Was this in the 19—in the late 50s?

Ewanus:

In the 60s. I would say mid-60s.

Hochheiser:

So this was after AT&Ts Telstar Satellite? That was '62.

Ewanus:

Time period is about the same, I don’t know. Before or after, I can't say.

Hochheiser:

Yes.

Ewanus:

I would say after, but I am not sure.

Hochheiser:

I am not sure, but sending signals off satellites is something that was well-known and well-publicized.

Ewanus:

Oh, well, at that time, they did put in orbit the balloon.

Hochheiser:

Right.

Ewanus:

The coated balloon as a reflector.

Hochheiser:

Right, that is Echo in 1960.

Ewanus:

That is Echo. That is about the same time period. We said, "Well, if you use the moon, you can go further." In other words, you've got your reflectors 220,000 miles away, instead of 150 miles.

Hochheiser:

Right.

Ewanus:

So it could be literally intercontinental.

Hochheiser:

I see.

Further NASA Work

Other projects?

Ewanus:

We did a lot of work with NASA.A lot of study programs that we did with particularly satellite, application technology satellite number five, ATS5, as it is known. We did a lot of pseudo-noise signaling through ATS5, which was again the forerunner to the GPS concept. And we were demonstrated quite successful. We were measuring accuracy to less than one foot, and we have data supporting it. It was paid for by NASA. They supported it as a contract.

Hochheiser:

Is this also in the 60s?

Ewanus:

Yes. Now, it had another application, and like I say, it was the code division multiple access, which is now used in several of the—as Qualcomm is one of the biggest operators of CDMA, but NASA's concept was to use a satellite to address ground sensors all over the world. Environmental, temperature, weather, you name it. Water. Farming. All over the world, if you use code division multiple access, you could address all these sensors all over the world through a satellite and then relay to a common station, and that was a concept that NASA was trying to develop. What else?

Hochheiser:

So was CDMA first devised here at Westinghouse?

Ewanus:

Oh, I don't think it was first devised here. No, it was a known concept at the time, but mostly on paper.

Hochheiser:

Oh.

Ewanus:

It was known that if you use spread spectrum, many users can use the same frequency band, because they use different codes. So that is where the code division multiple access comes from.

Hochheiser:

Right.

Ewanus:

So if you use it for communications purposes, you could send individual messages to somebody who was tuned into the same code. Which is also true of the anti-jamming aspects, because spreading the signal out and then correlating it, you reject all other signals and only receive that one.

Hochheiser:

Other projects?

Ewanus:

You're pushing me, I'm trying to remember. So many were classified like: Longbow, WMP (Westinghouse Matrix Program), DCRP (Data Collection and Reduction Program), F-117 Program.

Hochheiser:

Well, I know, but since I don't know what projects you worked on, it is kind of hard for me to prompt you.

Working on Technology

Ewanus:

I know. But most of my career was not projects, it was working on technology.

Hochheiser:

Okay, so maybe other technologies. Maybe in using "projects," I am using the wrong word.

Ewanus:

I think I was the first one to develop rapid acquisition of Doppler frequencies. The problem is that acquiring these things takes time. So I worked on my own theories in

this aspect, and as a R&D program at Westinghouse. I built a concept which greatly increased the speed for acquisition of a specific target, so it didn't take time to do that, and in the process, I developed a paper and gave it at the IEEE convention. It was well received. Interesting.

Hochheiser:

Mm-hmm. Did you have many opportunities to give papers?

Ewanus:

Always had opportunities but the classification always puts a damper on it.

Hochheiser:

I guess what I mean by opportunities is just that. If you are doing classified work, then it becomes rather difficult to share it.

Ewanus:

Yes, but there is a lot of outgrowth from these things. There are applications like the flight testing that I did was not simply flight testing the data, but we had to acquire it.

Hochheiser:

Right.

Ewanus:

And it was pretty broadband data, just recording that data was a problem. So we were recording really wideband data for continued periods of time and able to reproduce that data, using a lot of computer processing, but it had to be developed and proven and we did accomplish that. And provided the customer with real simulated data.

Hochheiser:

How did you record the data?

Ewanus:

It was a tape recorder, but it was a special tape recorder. We basically broke up a multi-channel recorder, 12 channels, which was high speed at that time.

Hochheiser:

Right.

Ewanus:

But the data was spread across 12 channels, so you essentially were recording 12 times the data on one track and then reassembling it and reconstructing the data. And that was a challenge at that time. Then we had to build all the interface equipment from the sensor to the recorder, there was a lot of stuff in between. And we did a lot of carving of the airplane, too, cutting holes in it and things like that.

Hochheiser:

To get your equipment in?

Ewanus:

Actually, a lot of the flight testing was done with an aircraft called the NRA 3B. There were only three like it in the country, and we had one here. It is a Naval reconnaissance aircraft and it has a pressurized bomb bay, which was a natural for putting equipment in it. And it was a pretty nice aircraft for that purpose. So in that, you'll say flight test engineering had a challenge, too, as did the pilot.

Hochheiser:

[Laughter]

Ewanus:

They really performed. They required pinpoint accuracy, precision flying, and they did it. They lasted something like 15 years, so the customer was pretty happy.

Hochheiser:

That is a long time for a project to last, isn't it?

Ewanus:

Yes. I think so.

Advanced Development, Paul Pan and Harry Smith

Anything else?

Hochheiser:

Well, let's see. So we've talked about things well into the 80s now.

Ewanus:

Well, I retired at the end of the 80s, so I was working on proposals and things like that in Advanced Development at the latter stage of the game.

Hochheiser:

Any proposals in general or specific?

Ewanus:

And I was also managing the R&D programs from Advanced Development, too.

Hochheiser:

Does that mean they finally got you to manage people?

Ewanus:

Well, technically managed.

Hochheiser:

I guess I don't know what you mean by technically managed. Can you explain?

Ewanus:

The research and development, Advanced Development, as we called it, was broken up. Each year we would submit, groups or people would submit their desires to research or study. And we would sift and sort through about 15 or 20 of these projects and fund each one with Westinghouse funds. Now, the advantage is that this R&D or Advanced Development is also funded by the government. They will return a certain amount of your research back to you, if you report all this to the government, which we did. And I coordinated and technically put together the R&D program for Advanced Development in this arena, and you say I managed, I was the only one who was running it. To begin with, they would allocate the funds so I would give the people all their allotments and require that they report monthly and I would put all those reports back together again, report it to Paul Pan, who was the chief scientist at that time.

Hochheiser:

Right.

Ewanus:

And we would submit those to the government and get reimbursed for maybe 50 or 60 percent of what we spent. And it was very successful. So I had fun, involved with many facets of technology this way, too. It kept me on board.

Hochheiser:

Sure. What can you tell me about Dr. Pan?

Ewanus:

Well, what would you like to know about him?

Hochheiser:

Well…

Ewanus:

As a matter of fact, I worked for him, specifically, for a period of time.

Hochheiser:

He is certainly one of the names that has come up a number of times, so I don't know what you can tell me about him.

Ewanus:

Oh, well…

Hochheiser:

What was he like as a manager, as a person, as a scientist.

Ewanus:

Well, technically I reported to him. He was my supervisor, obviously, but we reported to him also and Dr. Pan was a pure scientist, good, pure scientist, and he loved technology, and he was in the right place to do that. So he surrounded himself with a lot of talent, a lot of PhDs who are doing a lot of research and the engineering which he was involved with, with us, and supported, and I said, I worked for him for about a year or a year and a half and enjoyed every minute. Super fellow. I got to know him quite well.

Hochheiser:

And similarly, what more can you tell me about Harry Smith? You have mentioned him several times already.

Ewanus:

[Laughter] Well, a very complex man, but very interesting. One of his virtues was he understood people. Not only was he technically competent, but he knew people. So he

could put things together and make them work. And he did. Everybody liked Harry. Everybody knew him by his first name, not only in engineering, but in the shop or anywhere, people called him Harry. The painter, the plumber, the carpenter, would all call him Harry. And he walked daily through the shop, just to say hello to those people, and everybody, of course, admired him. He knew people. He could get results. So people worked that much harder, just because they knew they were doing it for Harry. But he was great to work for, even in the early stages. He didn't want to be a manager, by the way. He was a fellow engineer when he was hired and he wanted to stay in the technology, just like I wanted to, but they forced him into management, and when they did, he was organizing his resignation party. He was going to quit, he really was. So we had a resignation party. But he didn't. He took the job.

Hochheiser:

[Laughter]

Ewanus:

He became supervisor and manager and of course a great one. One of the funny stories.

Hochheiser:

Please. Go ahead.

Ewanus:

More? You want another funny story?

Hochheiser:

Sure.

Ewanus:

Okay. We can always delete it from tape later.

Hochheiser:

Absolutely.

Ewanus:

While we were developing the Pulse Doppler radar, I did the design and development work on the pulsed portions of it, not the transmitter, not the receiver, but the range track, the synchronizer, and those pieces, which pulled it all together. The range tracking required a very specific type of circuitry, called an integrator, which means, as you lose

signal, you still want to track the target and anticipate where it is going to be. So the integrator became a very important criteria in determining that capability. It was incorporated in the other radars, the pulse radars of Westinghouse, like APQ35 and 41, they all had that capability but the technology for integrating; mathematically of course it was a perfect concept, but to do it electronically, it was difficult. And doing it with tubes, which was made solid state later, but this technology evolved over time, and there were two people at Westinghouse who really did a wonderful job in that arena, Doctor Clarence Glover, I don't know if he is one of your interviewees, and Dan Healy. Two wonderful engineers. They developed chopper stabilized integrators, and later did it in solid state. This is sort of building up my story. Now, remember we were building this pulse Doppler at the time on a shoestring. And looking at this super technology, Harry couldn't afford it. So he wouldn't let me go into exotic circuitry. He said let's show feasibility and stop there and worry about it later. Well, it was not the way to do things, I didn't think. So under the table, I was able to get a couple of these integrators from Dr. Glover and Dan Healy. I put them in the circuitry and of course it worked gangbusters. But Harry insisted I do the old way, which required tweaking, rebalancing continually. He said, "Don't worry about it, I will come up to that penthouse every morning and tweak it and make it right." So what I did, and I didn't tell him this, but Dave Mooney knew it, I provided a potentiometer on the front that Harry would come and use it to tweak and make it right, every morning. Well, there was no wires on that potentiometer. He did this for a month. Went up there and tweaked that system every day, until I showed him and said, "Harry," I thought he'd fire me on the spot, but no, he broke out laughing. So did everybody else. And by the way, I still hear that story from other people, they feed it back to me, they think that was great.

Hochheiser:

That is an excellent story.

Ewanus:

So that tells you a little bit about me.

Hochheiser:

And a little bit about Harry.

Ewanus:

And a little bit about Harry. Speaking of, there was another story which was not really a comedy but a serious one. Dave Mooney and I were working on the original X BAND

Pulse Doppler radar, and at that time, we had only two gridded klystrons in the world for the transmitter. Only two. A gridded [Klystron|klystron]], by the way, is one of the secrets into Pulse Doppler radar, because it was able—it had the ability to create very short pulses at high rate. Well, over the years, we were working on a system, the transmitter would degrade in power, so the one was in there, working at a fraction of the power that it had when it was new, but there was a brand new one in the crate. Dave Mooney and I decided to go ahead and get the new klystron and install it in the transmitter. And we went and got the crate, got it up into the penthouse and disassembled the crate, took out the old klystron and put it on the bench. And the klystron, by the way, has a huge magnet. Just like a magnetron.

Hochheiser:

Right.

Ewanus:

So we took the klystron out of the crate, and put it on the bench. Can you imagine what happened? Two klystrons collided and broke the stem on the new one. Well, if you would have seen two engineers working together, Dave Mooney and I, "We are certainly going to be fired." And we both went down to tell Harry what we had done. He broke out laughing. And never mentioned it again, although it was a funny story. But that happened to us. But it is another experience.

Hochheiser:

Yes.

Ewanus:

You said I could tell you these things.

Hochheiser:

No, please, well, this is part of what really makes the place come alive.

Ewanus:

Yes, I hope.

Hochheiser:

Beyond just, "Here I worked on this." Well, these stories, I think, really give character to the place.

Ewanus:

Well, I hope so.

Hochheiser:

I think they are good.

Ewanus:

About the same time, we were also working around the clock, 24 hours a day, because we had a demonstration for the Air Force coming up for the X-BAND Pulse Doppler, which they were funding, and they were coming en masse to go see this. So we were working around the clock to go ahead and prepare it for this demonstration. And while working around the clock, it was hot summer days, and it was very hot out in the penthouse which wasn't air conditioned. And it was pretty sweaty work. So we worked at night. At that time and age, we all wore ties, shirts and ties, but of course not midnight shift. So the midnight shift, let's see, how was it. I can't remember now. Johnny Pearson and somebody else were working the midnight shift. Well, the security guards come around once an hour. They [were] able to check security and also for fire and what have you. And they would go out and check every place including the penthouse. Well, at that time, that evening, the two engineers working on it decided to wear shorts under their trousers and strip down to shorts when they were working in the hot evening hours. There is nobody else where, so it was all right. Well, the guard got all excited about this and he wrote it up as he said he found two engineers in the penthouse with their pants off.

Hochheiser:

[Laughter]

Ewanus:

And that was disseminated. [Laughter] Needless to say, it broke up the whole place.

Hochheiser:

But did they continue to wear shorts on hot midnight shifts?

Ewanus:

No, they didn't. They didn't want that story to get out again. It was kind of embarrassing to them. But they did wear a shirt and tie, of course. Oh my what can I say?

Hochheiser:

I don't know if you have more…

Ewanus:

Made you laugh.

Hochheiser:

Yes, it did.

Ewanus:

That's good.

Hochheiser:

If you have other stories, I am certainly happy to hear them.

Ewanus:

Well, I am kind of running dry.

Hochheiser:

Well, in that case, have we covered your career?

Ewanus:

Well, you sure did.

Hochheiser:

Okay.

Customers and Retirement

Ewanus:

I don't know of any other highlight. There are of course a lot of material and projects that I worked on, but they are all related to radar, pushing technology. You name it, I think I worked on it. A lot of proposals, a lot of studies. Friendly customers.

Hochheiser:

Did you work closely with your customers over the years?

Ewanus:

Absolutely. Like at NASA, we worked with the director of communication systems, down in Goddard. We would have evening sessions with him in his office to try to come up with systems we wanted to test. And we would go on from there. And he would fund us. Likewise with Wright Patterson Air Force Base and the Air Force and Radar and Communications departments, they were always friendly with us and helpful and supportive. They picked up the Pulse Doppler radar and got us started. And by the way, I have a copy of the last report, the only one in existence that was classified, I left it with Alice [Donahue] to put in the library.

Hochheiser:

Good.

Ewanus:

It was classified at the time, it is a final report on Pulse Doppler radar, X and C Bands. And before I retired, I worked with security to get approval from the Air Force to declassify it. All copies were destroyed but this one. I spent a month declassifying every page of that report, and I have the last copy, and I gave it to Alice to put into the library today.

Hochheiser:

That is great.

Ewanus:

And in the flyleaf, there is a list of all the names of all the people, three columns worth of names, who worked on Pulse Doppler radar at that time, and the report's data I think is 1959. It would be interesting to look at.

Hochheiser:

Yes. So, let's see, we have covered your projects. When did you retire?

Ewanus:

As of January '91.

Hochheiser:

What led you to retire at this point?

Ewanus:

Age. I had turned 65, it was time to retire.

Hochheiser:

So you hit the retirement age.

Ewanus:

It was time.

Hochheiser:

Can you think of anything that we have left out that you would like to add about your career?

Ewanus:

No, I think you covered the waterfront.

Hochheiser:

Well, in that case, I think we are done.

Ewanus:

Wonderful. Unless you have anything specific.

Hochheiser:

No, I don't have anything else.

Ewanus:

Good.