

ORAL HISTORY: Herb Nunnally

About Herb Nunnally



Herb Nunnally was born in Louisville, Mississippi, and from an early age had an interest in technology. In his teens, Nunnally worked as an electrician with his father, leading him to study electrical engineering at Mississippi State. Graduating in 1963, Nunnally went right to Westinghouse, starting in Pittsburgh at Westinghouse's Graduate Student Program. He soon transferred to Baltimore, where Nunnally stayed for the rest of his career, beginning in the Field Engineering and Services Department. Nunnally eventually became marketing manager of FE&S, before becoming marketing manager for the

Communications Division, working over the years with groups like the Air Force, American Mobile Satellite Corporation and National Iranian Radio and Television. He also was a part of various projects such as the Orbiting Astronomical Observatory (OAO), Communications Technology Satellite and teleconferencing. Nunnally retired in 1996.

In this interview, Nunnally discusses his long career at Westinghouse, going from engineer to manager. He talks about the projects he worked on with NASA such as OAO, and becoming a project engineer while working on Goddard contracts. Nunnally discusses being a part of management and how to effectively lead various people and groups, including multinational groups, like for the MEECN contract. Nunnally also talks about the emphasis placed in his division in later years to move from an entirely military focus to more commercial, leading to changes such as a new name for the Communications Division – Westinghouse Wireless Solutions Company – to sound more commercial. His work in finding contracts for his division is also covered. The atmosphere of Westinghouse Baltimore is discussed, as well as the sale of Westinghouse (although Nunnally's own division was not involved) to Northrop Grumman.

About the Interview

HERB NUNNALLY: An Interview Conducted by Sheldon Hochheiser, IEEE History Center, 18 February 2010

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Interview

Interview: Herb Nunnally

Interviewer: Sheldon Hochheiser

Date: 18 February 2010

Location: The National Electronics Museum, Baltimore, Maryland

Background and Education

Hochheiser:

This is Sheldon Hochheiser of the IEEE History Center. It is February 18th, 2010. I'm here at The National Electronics Museum in Baltimore, with Westinghouse retiree, Herb Nunnally. Good morning, sir.

Nunnally:

Good morning.

Hochheiser:

If we could start with just a bit of background. Where were you born and raised?

Nunnally:

I was born and raised in a little town in Mississippi called Louisville, Mississippi.

Hochheiser:

Where is Louisville, relative to some larger place that someone might be more familiar with?

Nunnally:

Well, it's closer to Meridian, Mississippi.

Hochheiser:

Okay.

Nunnally:

It's about 90 miles, 100 miles from Jackson, Mississippi.

Hochheiser:

Okay.

Nunnally:

North of Jackson, Mississippi, and so forth. So.

Hochheiser:

Good. Now I've got it fixed in my mind geographically. What did your parents do?

Nunnally:

My father was an electrician; my mother was a homemaker.

Hochheiser:

I guess if your father was an electrician, you had a lot of opportunity to be around electrical things when you were growing up.

Nunnally:

I did. And I worked in that field as a teenager with him and other people.

Hochheiser:

Yes.

Nunnally:

That's where I got my introduction into electrical work, at a very low level, I might add.

Hochheiser:

I suppose that therefore, you were interested in, in technology and things electrical as a kid.

Nunnally:

Always. From the very beginning, I had an interest and fascination. Technology was not the prominent feature in one's life those days, but it was nevertheless an intriguing thing for me.

Hochheiser:

Sure. What led you to Mississippi State for college?

Nunnally:

Well, it was a thing that I was told I was going to do without being told I was going to do it. I was just brought up, my parents did not have college educations at all, and they wanted very much for me to be the first member of the family to do that. Mississippi State was about 25 miles away in Starkville, or State College, Mississippi. So I went there often as a child, teenager, to sports events and those kinds of things. And I knew I wanted to be in engineering and that was the state school for engineering, which it still is. But nevertheless, I knew where I was going to go at a very early age and and that's where I went.

Hochheiser:

Um-hum. So did you go there specifically with the idea of electrical engineering?

Nunnally:

Indeed. That was the subject and topic from day one. I enrolled in that the first day.

Hochheiser:

And never looked back.

Nunnally:

Never looked back. No.

Hochheiser:

What was the curriculum in EE like when you were a student in the late fifties, early sixties?

Nunnally:

Well, it was primarily power oriented, with the primary employers, once you graduated, being the power companies in the south.

Hochheiser:

Yes.

Nunnally:

Mississippi Power, Alabama Power and Light, Florida Power and Light, those kinds of organizations. So the curriculum, once you got into the junior-senior years, was very heavily oriented to power. In my junior year, they offered their first computer course. And really, what that was was transistors. So that was a very early part. I took that, got interested in it, and gravitated to the extent I could, into two areas, communications and electronics.

Hochheiser:

Were there any communications courses?

Nunnally:

Yes. They were about the second tier beyond power.

Hochheiser:

Ah.

Nunnally:

Or below power, whichever way you refer to it. So there was an awful lot of communications courses, and RF communications, to say the least. And, line-a-sight microwave; those kinds of things. I took all those and so I knew I had an interest in communications, junior year, senior year of college, and that carried me all the way through my career.

IRE and Going to Westinghouse

Hochheiser:

Now, did you join Westinghouse directly upon graduation?

Nunnally:

I did.

Hochheiser:

And what led you to Westinghouse rather than some other employment opportunity?

Nunnally:

Well, my father being an electrician, being on the power side of things, he had often spoken of me joining a power company and he was very interested in that. And he had worked for a long time for Mississippi Power and Light, so he thought one of those companies were stable, you know, reliable employers, and which they are.

Hochheiser:

Yes.

Nunnally:

But I had no interest in that field of endeavor. I wanted the electronics side of things. And so I interviewed with a variety of companies in my senior year, and was fortunate to get an offer from Westinghouse, and I took it. So that's – I joined Westinghouse in 1963, even before I graduated. So it was, you know, in the summer...of 1963. I might add that you – since you make reference to the IEEE. We had an IEEE chapter, at Mississippi State, of course. And I belonged to that. And then I also belonged to an organization called IRE. I don't even remember what the acronym stood for anymore. But, there was the two, sort of, academic fraternities; even though they were fraternities, they were professional organizations.

Hochheiser:

Well, there were two – IEEE itself comes about in 1963, when IRE and AIEE merged.

Nunnally:

It was IRE.

Hochheiser:

Right. The IRE started out in radio and, and had really gotten big into electronics. And AIEE was mainly power and some wired communications.

Nunnally:

And so that's – now you've refreshed me.

Hochheiser:

Well, that's okay.

Nunnally:

That's why I was involved in the IRE.

Hochheiser:

Right. Because that was more -

Nunnally:

Radio engineering.

Hochheiser:

Along with the stuff you wanted to do.

Nunnally:

Yes. So I went to work at Westinghouse. That's where we left off.

Hochheiser:

Then did you maintain your IEEE membership through your career?

Nunnally:

For a long time. I didn't join Westinghouse here in Baltimore.

Hochheiser:

So when you joined Westinghouse, where did you start?

Nunnally:

I started in Pittsburgh. Westinghouse had a program at that time called the Graduate Student Program. I was hired under that, in that manner. I went to Pittsburgh at first, and I went through several weeks of exposure to the Westinghouse product lines that they had. And the program was excellent in the sense that you got to take a look at all these areas where Westinghouse had facilities and product lines, and to some degree you got to choose which one of these you'd like to go and have an interview with. And so after doing this, I went and came down to Baltimore and interviewed here. And the idea behind the program was, after several weeks here, a month, six weeks, then you were to go back to Pittsburgh and you have your experience discussed. And if you wanted to take another assignment in some other area, you were free to do that. I think you could take two or three of these. And then the requirement was that you make a choice.

Hochheiser:

Right.

Nunnally:

And if they wanted you and you wanted them, well then, Westinghouse had made a match; they had an opening, and so forth and so on. But I never took but one assignment, and that was here in Baltimore. I chose them, they chose me; I was lucky in that respect, so I came to work here in Baltimore.

Field Engineering and Services, OAO

Hochheiser:

What was your first assignment here in Baltimore?

Nunnally:

Well, it was with the Field Engineering and Services Department. I joined that department when I made my selection. So I came here in – best I recall it was the fall, or so, of '63 – and accepted permanent employment in the FE&S Department. Field Engineering and Services.

Hochheiser:

Um-hum. And what did you do in the Field Engineering [and] Services at the time?

Nunnally:

Well, at the beginning, of course, they give you a variety of just, exposure-type assignments.

Hochheiser:

Sure.

Nunnally:

With FE&S, you have that opportunity because of the variety of work going on, because they work on behalf of all of the other divisions in the local area. So I went to work in a place, I think it was in what was called the Aerospace Division, for a while. I worked in some computer-related work there for a while. And then I was asked to take an assignment at what was at that time Grumman Aircraft, on Long Island. Westinghouse had a contract to provide the ground support equipment for what was called the OAO, Orbiting Astronomical Observatory.

Hochheiser:

This would have been about '64 now?

Nunnally:

Well, we're in the late stages of '63. So I took that assignment and I went to Bethpage, Long Island and worked for Westinghouse as a field engineer at Grumman Aircraft. And our job there was to support the Westinghouse ground support equipment, which had been installed there at Grumman, in checking out the spacecraft and so forth. This would be later used, of course, when the spacecraft was put in orbit. So I spent time up there, the better part of, oh, six or eight months, if I recall, learning the equipment, learning the project, and then that equipment that Westinghouse was building had to be installed in the outskirts of Lima, Peru and Santiago, Chile, and Quito, Ecuador.

Hochheiser:

Were these the places where the ground stations were for the system?

Nunnally:

In addition to Rosman, North Carolina, I believe. So it was Rosman, North Carolina; Quito, Ecuador; Lima, Peru; and Santiago, Chile.

Hochheiser:

Now did you go to these various places?

Nunnally:

Yes, as part of my assignment. There was another person that was – in those days they called them engineer in charge - he was the engineer in charge; I was the young fellow working for him.

Hochheiser:

And who was he?

Nunnally:

His name was Elwood Baker.

Hochheiser:

So you and Elwood Baker went to each of these places together?

Nunnally:

We did. We went down to each one of those places and – on behalf of Westinghouse but working for NASA, who the contract was with.

Hochheiser:

So NASA had a contract with Grumman and Westinghouse had a subcontract?

Nunnally:

Let's see, now. The best I recall, our contract was with NASA.

Hochheiser:

Your contract was directly with NASA.

Nunnally:

But Grumman was the lead contractor because they were building the spacecraft. So when we went to South America, there was no Grumman presence at that time. It was all NASA tracking stations. And so they had managers at each one of those and we worked, at that time, for them.

Hochheiser:

Okay. So you worked directly then with the NASA managers at each of these ground stations.

Nunnally:

Correct. Putting that equipment in, checking it out. This is all prior to launch. There was no satellite in orbit.

Hochheiser:

Right. There's no point in launching the satellites till the ground stations are ready.
[Laughs]

Nunnally:

Right. Well, that's the general idea, for sure. [Laughter] Sometimes you don't get quite all that perfection, but nevertheless.

Hochheiser:

But that's the idea.

Nunnally:

The idea, of course.

Hochheiser:

How long did it take to get all of these things ready?

Nunnally:

Well, there were several months involved. Best I remember, we went down and spent weeks at each. And I don't think there was more than two at each place. Something like that. Because all the equipment had been delivered and installed in buildings, you know, from a physical point of view. Our job was to ensure that once it was electrically connected and properly so, then to run all kinds of tests on the equipment to ensure that it was working properly. So it was about two – best I remember – two weeks at each place.

Hochheiser:

That was a lot of travel for a young fellow.

Nunnally:

Well, it was. And quite an interesting taste of parts of the world that I had never begun to imagine.

Hochheiser:

Yes.

Nunnally:

And, in the middle of all of that - let me just back up here. I am off. I did not go down there until the fall of '64.

Hochheiser:

Okay.

Nunnally:

So I was at Grumman, from roughly the fall or early winter of '63, until the fall – it's 10 months or so, in there.

Hochheiser:

Right.

Nunnally:

Maybe close to a year. And then we went to South America. So in the middle of all that, I had gotten married, so I spent our honeymoon, as it turned out, in South America, without her.

Hochheiser:

Well, it's – what'd she think of that? [Laughter]

Nunnally:

Well, she didn't think much of it at the early point of it, but bless her heart, she adapted to it. And so I was gone for all of that.

Hochheiser:

Once you finished your rotation of the several ground stations, did that end your involvement with the project?

Nunnally:

No, we came back and then there was time spent on the same equipment down at Goddard Space Flight Center, which was going to be the mission control area for the satellite. The satellite was being managed and developed and designed out of Goddard Space Flight Center. They were the mission center there.

Hochheiser:

Right.

Nunnally:

So consequently, I was assigned there and spent a number of months. I think it was on into '65, somewhere; again, doing much the same, ensuring the equipment was working. And that time, I was all on my own. Mr. Baker went on to some other assignment and I covered the facility down at NASA, at Goddard.

Hochheiser:

And were you there through the launch of the satellite?

Nunnally:

Yes, I was. And unfortunately, the satellite went in the ocean. It got off the pad but not very far.

Hochheiser:

And was that the end of the project, or - ?

Nunnally:

Well, they had another one, and that one had problems as well. Unfortunately, it never got a spacecraft in orbit. And so, therefore, there was much consternation as to what to do and the project was basically shut down while NASA tried to think their way through this. [They] could get no money, because the NASA headquarters and the Congress would not allocate more money to this project that didn't have any semblance of succeeding. And so NASA – as other people have done as well – they changed the name after a number of years to the Hubble Space Telescope, and built other spacecraft and that was quite successful.

Hochheiser:

So did the ground equipment you worked with then eventually get used with later satellites?

Nunnally:

It was a different era. If I remember correctly, by the time this all got organized into the Hubble Space Telescope, a numbers of years had gone by.

Hochheiser:

And the state of the art had moved on?

Nunnally:

Much, much so. The computer that we had for the OAO project was made by, believe it or not, General Mills. [Laughter] And it was a very primitive device, to say the least. The only thing we had was a paper tape reader. We had to punch the paper tapes and enter them into this device now. Then the technology had certainly picked up in that period and all of that was naught. The great thing to have here in the museum was one of those General Mills computers because they only made one and that was it.

Hochheiser:

So you're down at Goddard for a while, the satellite does not successfully launch.

Nunnally:

Right.

Airborne Fire Control System Computer

Hochheiser:

So then, I assume you eventually had to move on to another project?

Nunnally:

Yeah, I did. I came back. Well, I didn't have far to come back to. I was just operating out of the plant here, down at Goddard. So I came back here and I was assigned, back again, on another project over in the aerospace division working on the first Westinghouse produced here at Baltimore, a little computer. It was going to go in an airborne fire control system for an airborne radar. That thing was hand-built and I was fortunate enough at that time to be assigned to that project. And I worked with people that were leading the project, and technical people here, for – I don't know – six, eight months, something like that.

Hochheiser:

What would this have been, about '66 then?

Nunnally:

This was somewhere in late '65. Because the spacecraft, OAO, was unsuccessful, I think, in the early or late spring of, I think, '65.

Hochheiser:

Which radar system was this for?

Nunnally:

I don't recall the airborne radar system that it was supposed to go in. It had a targeted system, but it was also a bit generic in that they were trying to develop a computer that could go in a variety of places. So probably -

Hochheiser:

Now, are you out of field engineering at this point?

Nunnally:

No, no. I'm still a part of field engineering.

Hochheiser:

Even though you're now working in Baltimore?

Nunnally:

Yes. Even though I'm in the home base, I stayed in field engineering and was assigned to this project, which was also located in Baltimore.

Hochheiser:

Who were the people you worked with on this project, do you recall?

Nunnally:

Well, yes. There was the project leader [who] was a fellow by the name of John Gregory.

Hochheiser:

Who I interviewed yesterday.

Nunnally:

Oh, you did talk to John. [Laughter] Well, thank God. I'm glad to hear he's up and well.

Hochheiser:

He's up and well.

Nunnally:

That's great. So John was the project manager and there were a number of technical people. There was a Bill Bidler; there was a Dave Sloper. There was a Jim Hudson.

Hochheiser:

So you worked on this computer for what, you said six to eight months or so?

Nunnally:

Oh, maybe six. Something like that. I don't recall exactly the timeframe. And then I was – it was to a point to where that project was getting, I won't say finished, but down to the point to where they didn't need my kind of level of participation.

Applications Technology Satellite

So I went back across the hall, in a way of speaking, and I was reassigned. That time, I was reassigned to another program out of Goddard, called the ATS, which was Applications Technology Satellite.

Hochheiser:

Right.

Nunnally:

And this was to be a communications satellite, as opposed to an earth observation satellite. And I became an engineer working on that assignment because we had much the same role, ground support equipment-wise, that we had for the OAO.

Hochheiser:

And you now had lots of experience in the ground support.

Nunnally:

Especially with NASA in that context. So I was involved in that for a while. And then I was assigned because the contract we had was with Goddard again. And this time the contract was with our department. The Field Engineering and Services Department had the contract. So there was a role for someone to work between Baltimore and Goddard, and go back and forth and back and forth, and I was assigned as the first applications technology satellite liaison engineer.

Hochheiser:

What does that mean?

Nunnally:

What that meant was that I was to carry issues back and forth, try to resolve them, understand them, present them here, present them there, on the technical level. And work a lot down there, a lot up here, so a lot of back and forth but the distance was short enough to where it didn't really matter. And you know, obviously, telephones were involved, to say the least. But I sat in meetings down there; I sat in meetings up here. Understood issues, tried to convey one side's point of view, the other side's point of view, then from a technical level, not in the management sense but the technical sense. And got answers and solutions and that kind of thing. So I was in that for maybe six months. Something like that.

Hochheiser:

And then after that six months?

Nunnally:

Well, after that six months I stayed on that project, but the department had won another contract to develop a series of data processing equipment and ground support equipment, and software, for a range of communications experiments that were going to be conducted on this satellite. Propagation experiments, line-of-site and microwave experiments. In those days the idea that RF communications was different when you're transmitting to a satellite than it was terrestrially, was a big idea. As it turned out, it wasn't. [Laughing] The laws of physics didn't change. And so consequently, the idea was to run a whole bunch of experiments on this satellite to determine the effect of broadcasting, or transmitting, you know, 22,000 miles and back, and delay times and all those kind of things. So I became heavily involved in this subset of the contract, and eventually became the project manager of those experiments.

Hochheiser:

Can you tell me a bit more? So there's this contract between NASA and Westinghouse, and the experiments, then, are one part of this overall contract?

Nunnally:

I believe it was a subset of the original contract. But I'm not sure, to be honest, if it was a stand-alone contract or a subset of the original contract. One way or another, it was managed separately, and I became – they called them project engineers in those days. Today the word is program manager. So I became a program manager of those sets of experiments.

Hochheiser:

Now as the project engineer, did that mean you now had engineers working under you?

Nunnally:

Yes. Yes. I was, you know, leading a team of engineers instead of just myself. Which was a whole new -

Hochheiser:

Are you now spending more of your time managing than actually doing?

Nunnally:

Well, not at that level. I'm still doing an awful lot of technical work, but indeed, you're involved in people issues from time to time. But more, at that stage, still very much a technical role in leading technically, as opposed to leading so much managerially.

Hochheiser:

And where did these experiments lead?

Nunnally:

Well, let me think now. They led to the development of a whole series of experiments that had to be planned. And then the idea was to - once the satellite was launched - was to run those experiments, collect the data, and then do, eventually, what was called the analysis or the processing. Well, the first satellite, ATS, it goes in the drink.

Hochheiser:

And when was this?

Nunnally:

This may have been late '66, '67, somewhere in there. And so, fortunately, though, they had a series of these. There were five of them. And the second one was basically already built. It was close to it. And its orbit, the first one was to be a polar-orbited satellite, if I remember right. And this second one was a synchronous orbit. Fortunately, that one was launched and it was quite successful. And so the work on that satellite lasted into the seventies.

Hochheiser:

So with the second satellites successfully launched, the experiments could be run.

Nunnally:

Yes. And so, we began to run those experiments. I was involved in not only the data collection, but there was a very rudimentary effort at trying to do computer analysis of the data. You can imagine the data was, by those standards, quite voluminous. Not by today's standards, but in those days [it] was. So how in the world were you going to analyze this without some assistance of - so we developed a series of programs to facilitate some of that. And I was involved in a little bit of that as well.

Hochheiser:

So you were then taking the data and analyzing it on computers down here in Baltimore?

Nunnally:

Well, at first, the data was all analyzed by the old strip-chart method where you basically just watch the RF propagation off of the strip-chart and tried to look at conditions that surrounded the time that the data was collected and make judgments about the levels and the frequency response, and all these kinds of things. And then you begin to do some ideas of, well, if we put this into some sort of analog to digital conversion, and we begin to kind of collect this data a little bit in a digital fashion, well then maybe we could figure out a way to do some of this analysis by computer programs but that was very primitive in one sense of the word. So we didn't ever really get that far on that until there was another one called ATS 3 that was launched that had more experiments of a more sophisticated nature. I believe, if I remember right, they didn't have a four. They opted to build a completely massive contract; it was called ATS-6.

Hochheiser:

Sure.

Nunnally:

And the company that had the contract to build that satellite was Fairchild – I believe they were in the Gaithersburg area at that time, or Rockville, well maybe Gaithersburg. And then I was given assignments to work on the early phases of that data collection. More importantly, the decision had been made we were really going to go after a lot of digital processing and digital data handling of all that. So I became assigned to work on the computers and the development of the software that would work down at Goddard. They were the IBM 360 Series; they were brand new. And we were to develop the software that would then be used to do this digital analysis. And so I was the project leader/program manager of that effort, and I had software people, hardware people. It took on more of a program management role.

Hochheiser:

It sounds like now you probably had more people working with you on the project.

Nunnally:

Yes, a different variety of people and, and also, I eventually assumed financial responsibility for the budgets as well as how the money was made or not made on that particular facet of the project.

Hochheiser:

And so while staying with the ATS program, it sounds like you're getting more and more managerial responsibilities and, I assume then, less and less actual time doing the engineering?

Nunnally:

Well yes, that's correct. It was still an awful lot of technical decision-making, project direction, technical direction. But you're right. The program management role, the interface with their management, the interface with Westinghouse management, grew and grew. As long as time went by. Put it that way.

Hochheiser:

Right. Who, or maybe it was several people, did you report to during these years?

Nunnally:

Well, there was a man who I reported to by the name of Chuck Sargent. I worked for him. I worked for another fellow by the name of Dave Coleman. I worked for a fellow by the name of Ira Sussman. They had different roles at different times. And I would be reporting to different ones of those as the project went, you know, went through its phases.

Hochheiser:

Yes. And were there other groups at Westinghouse, other teams at Westinghouse that you interfaced with regularly over the courses?

Nunnally:

No. For the most part the contract was held by the Field Engineering and Services Department. So all of the engineers that were working on that either migrated into the department or were the original people. We did have some people that assisted from time to time that were software people that were not a part of the department. But most were, which was very new. The department never had its own program management. The department was a Field Engineering Services Department and it normally assigned people to work for others. But in this particular case we owned the contract and were responsible for it, so we got the experience at being program managers for ourselves, for the first time. And I was fortunate to be one of those early guinea pigs.

Baltimore in the Sixties and Seventies, More ATS

Hochheiser:

How did you find Baltimore as a place to work in the sixties and seventies?

Nunnally:

Well, it was a godsend. At that period of time now - we're into the seventies - I've been around probably seven or eight, nine years, something like that. Because somewhere, let's see, about 1970, '71, I was promoted to supervisor. And so then I did have the program management responsibility, but I had a management title as well. The first level of that rung of that ladder. So Baltimore at that time was basically booming. It not only had the NASA work that we had, it had NASA work in other parts of the company. For example, the lunar TV camera was developed here. It was used on the first landing on the moon. So that NASA work was going on. And, of course, we had military work. And we also had work with, with the secure agencies, NSA, and a variety of places. So Westinghouse, here in Baltimore was growing and booming, and the opportunities were numerous. So you could almost, if you worked hard, [have] had growth about yourself; there was an awful lot of opportunities to pick and choose, types of projects, and places to work.

So it was a great place. It always was.

Hochheiser:

So you become a supervisor, still on these ATS projects.

Nunnally:

Yes.

Hochheiser:

Anything further about the ATS project as we go on?

Nunnally:

Well, I guess the thing that sort of defined all of that work for me, when it was all over, was that I had won a contract there, again as a part of ATS, to work on what was the first propagation studies from a satellite, using Ku-band and Ka-band frequencies. And no one had ever looked at these from a spacecraft transmission and reception point of view, with the intriguing part being what does rain – precipitation in general – what does it do to the propagation characteristics at Ku and Ka-band? So we had to develop a variety of experiments, collect the data, eventually process that data, do the analysis. We worked with what was the principal investigator for NASA, who was down at Goddard Space Flight Center and we worked for him. We had the contract. I was responsible for the contract, but we were responsible to him, to do the work and to help him determine what needed to be written about and characterized from these studies.

Hochheiser:

What was his name?

Nunnally:

Lou Ippolito.

Hochheiser:

And if you were working with him, did this lead to any publications or conference stuff?

Nunnally:

Yes. There was all kinds of, over the years, publications of papers. He and I would give them together. He would do one, I would do one, so there was, it was quite an interesting period there, of – once the data got to the point to where you could understand it a little bit.

Hochheiser:

[Laughter] Well of course.

Nunnally:

And had something to say. I'll put it that way.

Hochheiser:

And would – that's a nice compromise – would these have been IEEE conferences or papers?

Nunnally:

I honestly don't remember who sponsored them. And some of them were NASA sponsored because they were trying to promote the work they had done. Some were just part of other conferences, and I don't remember.

Hochheiser:

How long did the sequence of projects on this ATS program continue?

Nunnally:

Well, it was into the middle seventies.

Hochheiser:

That's a nice long run.

Nunnally:

Yes, it was. I guess I started on that phase of NASA work in the early seventies and it lasted till, best I remember, '74, '75, in that timeframe.

Communications Technology Satellite and Teleconferencing

We saw that work winding down so we began to try to launch efforts into extending our credentials in that area and work for other people. One of them was Ames Research Center, out in California. Lewis Research Center, up in Cleveland. All these were NASA

facilities And we got a contract with Lewis Research Center. That was for the next generation. It was called CTS, Communications Technology Satellite. It was the successor to the ATS. You have to change these names periodically, to get new funding. [Laughter] So with that said, I became a principal investigator. Even though we had a contract, I was defined as the principal investigator. And this required Westinghouse to spend money on its own, for the first time; in addition to the contract, we had to spend money, so it was a collaborative effort.

Hochheiser:

Right. But the money was there for the Westinghouse side to do this.

Nunnally:

Well, by making the pitches to upper management to secure the money, yes. Eventually that was secured and I had the good fortune of having upper management who would listen and people who helped fund it.

Hochheiser:

And who were these people?

Nunnally:

Well, there was a variety. One was a fellow by the name of Ray Esary. Another was a fellow by the name of Bill Pridgen. Another was a fellow by the name of Dick Hale. A variety of these folks got behind the project and contributed money. The project I was the principal investigator of was called a teleconferencing experiment. The idea was that we would set up a facility in Baltimore and we would set up a facility in Lima, Ohio because that plant in Lima, Ohio reported to Baltimore. And both [Baltimore] where I worked, and the Lima facility were responsible [to] Mr. Ray Esary. He was the general manager of the division that had that. So he was the guy, then, that sponsored, primarily, the money, so that we established this video conferencing capability in Lima, Ohio and here. We had to develop conference rooms and we even branched into an element of psychology and how do people behave before cameras; how do they perform in a meeting environment. And we had to develop all of these experiments and eventually write about them and publish the data. So I was the principal investigator of that, and NASA, whenever they had somebody they wanted to have talk about this, I was the one.

Hochheiser:

So you were using the NASA satellites for -

Nunnally:

The Communications Technology Satellite or CTS.

Hochheiser:

- the CTS satellite to run video teleconferencing experiments between Ohio and Baltimore.

Nunnally:

Yes.

Hochheiser:

Okay. I've got it.

Nunnally:

They were live, they were in color, and we set up a conference room here that had a kind of a crescent shape, one similar to that in Lima. We did automatic voice switching where when you spoke the camera automatically switched to that voice. Voice recognition. And this was very tricky and very difficult.

Hochheiser:

I bet.

Nunnally:

I learned that video is easy and audio is very difficult, relatively speaking, of course. [Laughter] We can handle the video part of things much easier. We learned that people accept all kinds of levels of video performance but they are very critical of audio performance where they can't hear it right or if it's clipped, all those things.

Hochheiser:

What were the lessons that you were able to draw from these experiments?

Nunnally:

Well, the big lesson that we published and Westinghouse got recognition for, is that we basically proved that meetings could be productively conducted over this medium of video. Now, forget it was a satellite if you will. It worked for terrestrial as well as for a satellite. But the satellite had the advantage where great distances were involved. And, of course, in those days, AT&T ruled the roost and they charged unbelievable [amounts] for these T-1 lines, or whatever they were called in those days. And the bandwidth on those were very small. We had more than enough bandwidth to where we could go color and full video, and full motion, and all those things. The idea was that later on a series of satellites would be developed commercially by somebody. NASA was trying to push that notion. Then companies would buy into this. We basically proved that it was not only feasible technically, but that was sort of understandable from the start.

Hochheiser:

Right.

Nunnally:

But it was acceptable from a management perspective in getting people to be productive in this environment. So that was a real secondary component, but [a] very critical one because if people can't be productive and don't feel like they had something – and didn't have to get on an airplane or travel distances – they're not going to use it. But we proved they could. So I guess the main contributing factor of that was teleconferencing. I think AT&T had introduced a telephone that had a video conferencing capability.

Hochheiser:

Several times.

Nunnally:

That may have been introduced in the sixties, matter of fact, at the World's Fair.

Hochheiser:

Shown at the '64 World's Fair.

Nunnally:

Yes.

Hochheiser:

Commercial introduction not successful in 1970. By some point in the eighties, AT&T was selling a conferencing setup that sounds somewhat similar to what you had been doing in the seventies.

Nunnally:

Yes. So the big factor there was not – well, it was a bandwidth restriction, because it was all copper.

Hochheiser:

Very tricky until you get to - that's why satellite seemed great – until you get to fiber optics.

Nunnally:

Oh, yes. Different story.

Hochheiser:

Well that solves the bandwidth issue.

Nunnally:

Exactly. [Laughter]

Hochheiser:

So the, so the experiments were successful.

Nunnally:

Very successful.

Hochheiser:

And you got to talk about them, and I assume, write them up as well?

Nunnally:

Oh, yes. All kinds work, in addition to the project management; indeed the writing and the publication and going to NASA. There were what was called user meetings, and they were held every couple of months, and you'd have to go and report to others that were doing things. That kind of stuff.

Hochheiser:

About how many people did you have working with you, working under you, on this project?

Nunnally:

Well, on this one, in addition to that teleconferencing component, there was probably about four or five of us on that.

Hochheiser:

Right.

Nunnally:

But then, in addition, I had a responsibility for the work that we had under CTS contract for more propagation work. And so there was a whole other component of just pure technical work.

Hochheiser:

Right.

Nunnally:

And that was probably – roughly 20, I guess. So if you add us all together, maybe it was 20, 25, something like that, who were involved in the pure technical as well as this teleconferencing component.

Hochheiser:

And both of those components then reported in to you?

Nunnally:

Yes.

Hochheiser:

And how long did this CTS program run?

Nunnally:

Oh, it went on to '76, maybe '77, maybe '78. Something like that.

Management

Hochheiser:

How did you balance this fascinating technical work, and psychological work, and all this work on the communications satellite with the needs to manage a group of 20 people?

Nunnally:

Well, it's just a learning process. [Laughter] Put it that way. I always have thought, even when I had other upper management assignments, that the first the line supervisor is just like a first sergeant. I mean you are right there where the action is. Others can think about what's going on and you have to deal with what's going on. So first line supervision is an experience everyone should have [Laughter] whether they need it or not. So that's just a complete learning process, to say the least. Because now you've got human beings that are – I don't think it's near what it is today. But still, human beings were human beings. And their abilities need to be evaluated, their assignments need to be made, changes had to be made when they were having problems and when they needed help you had to recognize this because sometimes engineers won't tell you

when they're having problems. You have to help them decide they do need help and they needed to be worked with.

Hochheiser:

And how do you do this? How do you manage a group of people like this, as a first line supervisor for a success of the project and the people?

Nunnally:

Well Sheldon, I, I can only recall that in those days – this was early, mid-seventies, late seventies.

Hochheiser:

Right.

Nunnally:

In that decade of the seventies the variety, if any, of the training programs that were available were essentially zero. The training notion – it was all what we call OJT, on job training. And so you learned from the seat of your pants, with the assistance of other management people. Of course, you had those to go and get advice from and assistance from, and all of that. The Westinghouse upper management, as well as your section managers and department managers, were always just great in that regard, so you did have a very good support system. But it was from your management, upper-line management. It wasn't from a human resource training sense of things. So you just have to learn by your mistakes, and hopefully they're not too big, and you can redo them and back up and try another path.

Hochheiser:

Right.

Nunnally:

In those days they were trying to hire people with some, what is called today, diversity. And I was told one day that I had a new engineer that had been hired and was going to be assigned to me. And I said okay, what's his degree in? And of course it was EE, majoring in computers.

Hochheiser:

Sure.

Nunnally:

And then, where's he from? And he said, well, he just graduated from the University of Puerto Rico. I said, does he speak English? And they said, very little. So then it became my responsibility to try to work with the person and help him learn. And the language being – because I spoke, essentially, no Spanish. Essentially none. And so one of the learning experiences was, I learned, after say, three, four, five months had gone by, that when I would talk to him, I'd always reserve a time, like two or three days after work, each week, to spend an extra 30 or 40 minutes with him alone, to help him. And I came to realize one night, by total accident, that he didn't understand hardly anything I was telling him.

Hochheiser:

Oh dear.

Nunnally:

And the way he was doing it was, after I left, he would try to write it in English, on a pad. He would try to take what he remembered and look at it and write it down. But being reluctant, he wouldn't come and ask me if that's what I said. And so by total accident, one night quite late, when I came through, I just happened to go by his area, I looked down on his desk and there was all these things I had somewhat said. It dawned on me that the poor guy was trying his best to take it out of his head, in Spanish, and write it in English, so it would help him do it. With that, it was just another one of these moments when you realize that what you'd been doing was not working. So that was just a unique experience that I had in working with other people. It taught me that even if you're speaking the English language, a lot of times people don't understand; they've got another tape they're playing in their heads, whatever – and miscommunication is what I'm getting at.

Hochheiser:

Yes.

Nunnally:

Well intentioned on everybody's part; they just, you just miss the message. Whether I'm doing it well or they're doing it well doesn't matter. It's just not happening right. That leads people to waste time; that leads people to go down wrong paths, spend money. And so I learned that communications between what you're saying to the group or your individuals is so vital. Just because you're a supervisor doesn't mean anything. It just means that you've got to do quite a good job of communicating. So that was one of the profound points I learned early on.

Hochheiser:

Were you able to figure out another way to help this young Puerto Rican engineer?

Nunnally:

Well, we got him into some language classes. [Laughter] You know, it was kind of an uh-oh moment. Why didn't that occur to somebody, you know.

Hochheiser:

Yes. Well, if you hire a Spanish speaking engineer that -

Nunnally:

Can't speak English.

Hochheiser:

Then you need to start by -

Nunnally:

That before they sent them into the work environment, you'd run them through some [Laughter] -

Hochheiser:

Yes.

Nunnally:

Well, the answer was no. But several months later we got on that bandwagon and things got better.

National Iranian Radio and Television

Hochheiser:

Yes. So about how long did these CTS video conferencing experiments continue?

Nunnally:

Well, again, it's fuzzy to me. But it went on into '77, '78, thereabouts. I had already started doing other things because I knew that work had a finite conclusion. And there was only one of these satellites. There wasn't going to be a second one. It was one of a kind. So there was no more work to be garnered there. And now I have responsibility for people, and you're supposed to help keep them, you know, gainfully employed. That was part of the job.

Hochheiser:

So part of your job then was to look for another project to keep your group gainfully employed?

Nunnally:

Correct.

Hochheiser:

I assume you found such a project?

Nunnally:

We did. But it was a very small thing at the frontend, so some people had to be reassigned. This probably got started in '76, it had to be '76, because I made my first trip seeking this work, I remember, in '76. But, because I knew somewhere in the next year or two or three, all of this work was going to close. And you can't wait till the last minute, so, that was the idea.

Hochheiser:

What was this next project that you found?

Nunnally:

Well, the next project was my first, beyond the work in South America, that was international. We had another component of Westinghouse here doing work in Iran. They were working with the National Iranian Radio and Television, who were in this area that I had been working in. They were, in those days, forming up the development and the building of a satellite, a communications satellite, that would service Iran and, in a broader sense, the Middle East. So I went to Iran and began the effort of trying to establish a contract to use our expertise here. It was all going to be at the higher Ku-band frequencies. And we would be able to help them develop the equipment as well. It wasn't going to be an engineering experiment. This was going to be a quasi-commercial endeavor. So they needed expertise in helping them develop the equipment that would work, both the transmission, the reception equipment, as well as what was called small ground terminals. The little video receivers. So I went to work on that. And yes, we did get a contract. But, in '79, there was a revolution and bingo, that was over.

Hochheiser:

Did you or any of your people get caught in the middle of the revolution?

Nunnally:

Not of mine. But I was scheduled to go. My last visa was, I think, gotten in August. And then between the State Department and Westinghouse it was decided nobody is going there anytime soon. And at that time, Westinghouse - again, the Field Engineering and Service Department - had a huge contract with Iran, to develop an electronics repair capability in Iran. So we had, from the FE&S, hundreds of families living in both Tehran and Shiraz, and they had to be evacuated. Now I was not a part of that; all my work was in Tehran in the headquarters of this National Iranian Radio and Television. So none of our people were there when Khomeini arrived, and all of the revolution took place.

Hochheiser:

Right. But there were other Westinghouse people who were there.

Nunnally:

They all had to be evacuated, so Westinghouse leased, from Pan-Am, jets. Flew them into Shiraz, loaded all the people on them. I don't know whether they flew into Tehran or just Shiraz. Maybe people in Tehran went down there. I don't recall how the logistics were all handled. But they evacuated.

Hochheiser:

But they got everybody out.

Nunnally:

Got everybody out.

Hochheiser:

Well, that's one way to have a project end. [Laughter]

Nunnally:

That's kind of a unique way probably in the annals of history, all of a sudden, and it was interesting, too. The head of the National Iranian Radio and Television thought so highly of his technical people that in the late summer of '79, or early fall - I don't remember the exact timeframe - he decided that these people needed some more education and he sent them all to France or to the U.S. for any course they could find. All of that being just a way of getting them out of the country. They were more than well educated at that point. And so all of these people that we worked with in the technical area, including the fellow that I worked with, he was the head of the whole thing. They all got out. He did not. And he was later killed. But he did send his people out.

Hochheiser:

Good for him.

Nunnally:

Yes. He had foresight and knowing that, if they were in France or England, or the U.S., if things calmed down and it didn't happen, they could always come back. But if it didn't, well, their lives would be, hopefully, spared. And they were.

Marketing Manager

Hochheiser:

So what did you move on to once the project in Tehran blew up?

Nunnally:

Well, it [Laughter] it's like, one morning you wake up and you have a cold dose of water in your face, even though you could see it coming. Now it's here; the water has dumped on you; you have no more work. So the group had to be disbanded and the people reassigned. Again, because of the overall strength of Baltimore, the people were reassigned. Because of my development of business as a part of this work, I was asked to take a marketing assignment. First, at FE&S, they didn't have a marketing manager.

Hochheiser:

Was this a new position that was created?

Nunnally:

It was created. I was the first person, another guinea pig. So I went into that role and I was in that role for about a year. We were in a division called the Logistic Support Division, and this fellow, Richard Hale, Dick Hale, was my department manager's boss. I was asked to come and take the marketing job at a division level from this department level. So I then went into being a division marketing manager in '81 or early '82, somewhere like that.

Hochheiser:

And you were the first person there. What did you do as a marketing manager?

Nunnally:

Well, they didn't have one at the division level. They did have one at the department level because the Logistic Support Division worked for all the other divisions, here, at the airport. It was located in Hunt Valley, Maryland. Its job was to provide the logistic support, which meant everything from field engineering to technical data work, to technical training. When they would sell equipment here, to someone, whether it was

U.S. Air Force, U.S. Army, overseas, well then the Field Engineering Department and the Logistic Support Division would take all those projects on, which were sub-projects to the delivery of the hardware and go overseas and sell it. The idea was, look, we're pretty good at this. And the U.S. Air Force, in particular, is building up a huge interest in segregating out logistics work; where it won't be a part of the hardware contract. It'll be a separate contract from the hardware development. And so my job was to tackle and try to garner some of what was called independent logistics work, and form up a group of people to tackle that.

Hochheiser:

Was the Air Force a primary group you were marketing to, then?

Nunnally:

Primarily. The Army, a little bit, but primarily the Air Force, because we had so much Air Force work here.

Hochheiser:

Right.

Nunnally:

We had credentials in that area

Hochheiser:

Right. Now you said this division was in Hunt Valley?

Nunnally:

Yes.

Hochheiser:

Now how far is that from where we're sitting now?

Nunnally:

Well, let's see. If you go up the Beltway, up Interstate 83, it's the first couple exits over there. It's probably a 30 mile, or so, journey thereabouts; 30, 35 miles, tops.

Hochheiser:

Okay. Now had you been based in Baltimore before this position?

Nunnally:

No. I was based here at the airport.

Hochheiser:

You were based here by the airport and the logistics division was up in Hunt Valley.

Nunnally:

It was in Hunt Valley, but to complicate it a little further, the job I had for the department marketing – Field Engineering and Service – was located in Columbia, Maryland. So I had been assigned from the airport to Columbia first and I worked there about a year or so. And then I continued to work there, even when I had the new marketing job for the division, because it was a place for us. But eventually, I was transferred, physically, to Hunt Valley, from Columbia. And that must have been '82, or so.

Hochheiser:

That was still a commute. And that 30 miles was still reasonable commuting.

Nunnally:

Oh, yes. Sure. It was all in easy commute distance. In those days, it was an easy commute. I don't know, probably be a nightmare today.

Hochheiser:

Traffic's worse now. [Laughter] So, how and what did you market to the Air Force, specifically? I know you were looking for stand-alone logistics contracts.

Nunnally:

Yes.

Hochheiser:

Could you describe some of those, some of that work, some of those contracts?

Nunnally:

Well, it was going to various places in the Air Force, where they were learning to try to segregate out these logistics contracts, where if there was a piece of equipment that you had, as a prime contractor, like Westinghouse, here at the airport. Well, then they would segregate that out – in some cases, early – and say, okay, now we're going to have a separate contract to develop all of the tech manuals and all the training for the hardware. They're going to be separate contracts. Now, of course, this was a very difficult transition for them. And it was a very difficult transition for the people here at the airport because they used to get all of that work as a part of the development contract. So, to say the least, between the Air Force and the prime contractors for the hardware, including my own company, they were all fighting this. Right? Because it was a terrible transition to try to segregate these outright separate procurements. They were somewhat successful in achieving this, but never in the way they wanted to. It just became too difficult. Now what was propelling all of this was the Reagan administration's buildup of the military contracting. There was plenty of money to be considered, and so I was tackling that. The customer was fighting it, in a way. They don't fight it at the upper levels; they fight it at the lower levels. This is where the work gets really done. So people at the upper level say all the right things and the lower people don't do it. Right? [Laughter] Typical. But it was broken out and we were somewhat successful in getting a few of these. But what turned the tide was they decided they would have, for the aircraft, the FB-111, a massive segregated contract for all of the ground support equipment that would be put at the home base of the FB-111, to support the aircraft.

Hochheiser:

Right.

Nunnally:

And so, along with some other people in the Logistic Support Division, we decided to focus on that contract. We would go for the grand enchilada instead of working on a

variety of much, much, much, much smaller ones. We were successful. We won that contract in '83 or '84, I don't remember when. It was obviously huge. It was the - I believe it was the largest single contract at one time that Baltimore had won. It's about \$100 million. We were successful in doing it.

Hochheiser:

Now, I assume you had a group of people working under you on this effort?

Nunnally:

Well, yes, that's true. But also there was people in other departments, with the technical side, the engineering department.

Hochheiser:

Right.

Nunnally:

We had formed up a project management – what in those days were called capture teams. I don't know what they're called today. But the idea was to pursue that work and so our division had to fund all these people and segregate them. Had to put them [in] a separate place, [and] fund all that work which was leading up to the proposal. So when the requirements for the proposal, or the RFP, came out then this group of people, including myself and others, were dedicated. So even though I was the division marketing manager, at that time I was focused singularly on that one big win.

Hochheiser:

And I assume you then had to make a variety of presentations.

Nunnally:

More than you can imagine. You had to visit the customer and have him become comfortable with you and have them understand why you should be considered, strongly, and on and on. The Air Force base was down in San Antonio, Texas so there were umpteen trips to San Antonio. Then you had to go to other places where the aircraft was being manufactured, and on and on and on. A lot of travel, but it was successful.

Hochheiser:

Now once the contract's awarded, was your job with this project done?

Nunnally:

Yes, my job was done.

Hochheiser:

Now there are lots of people in Westinghouse who now have to have the contract and have to -

Nunnally:

Have to go to work. Right. But because I was the division marketing manager and had a department that I hadn't really addressed for months, I went back to fulltime for that.

Hochheiser:

And what did that involve?

Nunnally:

Well, it was like, even though we'd won this big job, the idea was to try to now find another one or capture a series of smaller ones. And so that's what he did. We went back to looking for that and were never really that successful. In fact, the success was minimal, because it's hard to get internal support from people when they've just won a \$100 million contract; and all focus for every human being that can possibly make a contribution, is on that job.

Hochheiser:

Yes.

Nunnally:

And so now you'd like to steal some expertise to go off with you on a trip and it's tough to get that done because they're needed over here on the job. We did a lot of it in the

department ourselves. You certainly understand why they can't do this; I mean, they've got a contract; they've got to perform.

Hochheiser:

They're busy 24 hours a day on the contract, the big contract you won.

Nunnally:

Right. [Laughter]

Division Marketing

We pursued some of that. But that led, somewhere in '84 – I guess it was '84, it may have been late '84, or early '85 - I was asked to leave that job as the market manager and take responsibility for division marketing, here, for a series of divisions in what was called at that time the West Building. And that was the old surface radar. A lot of these tipsy seventies out here, that you see, so I was asked to form up a division marketing capability for this set of divisions which again, they didn't have. So now, I'm working for the guy that's division's manager.

Hochheiser:

Who was that?

Nunnally:

His name was Ed Silcott. I was his marketing manager and we were both pursuing international, domestic, and also what was called development contracts at the Rome Air Development Center, up [in] Rome, New York, who were the technology development centers for the Air Force, who would then transition their work to Hanscom Field, outside Boston. And our job was to try to win some of those early-on development contracts that would give the product people here a lead on where the technology was going. So that was kind of the thrust there, as well as international, as well as other bigger domestic product things, like the TPS-70.

Hochheiser:

What were the notable projects that you went after and were able to get?

Nunnally:

Well. What would have been some of those? There were Navy contracts we were pursuing for naval airborne, air fire control systems. Wow. I just can't specifically pick one or two that come to mind. Well, there was a large number of them, not all, by any stretch of the imagination were we successful in capturing.

Hochheiser:

Of course. You go after lots of business and you, hopefully, you get enough to keep thriving.

Nunnally:

Yes. And, too, the marketing department was a support effort to the divisions who really ran these efforts. The tradition had been that the divisions run these efforts out of themselves. And so the marketing department, when it was formed, became a support department to that effort. So we were providing assistance both internationally and domestically for those efforts. So that was a mixed bag in a lot of respects.

Hochheiser:

How long did you do that?

Nunnally:

It must have been, whatever was left of '84 and '85, and into '86. So let's say, roughly, a couple years.

Communications Division Manager

And then Ed Silcott, who was my boss, decided that they were going to form the first communications division, and I was asked to be the general manager.

Hochheiser:

Okay. So now, you've got a much broader role.

Nunnally:

Right. And in communications.

Hochheiser:

So what was the logic behind setting up this division?

Nunnally:

Well, the West Building, even though that was kind of its generic location title - its true name was Communications Command and Control, C-cubed - and then eventually the services added the letter I, so eventually became C-cubed-I. But at that time it was just C-cubed. So we had radars, we had systems development work for command and control, but we didn't have a communications division. So it was a logical extension to add a communications-focused component to this. And so I was asked to take that division.

Hochheiser:

Where did the groups come that reported to you in this new division?

Nunnally:

Well, they took various pieces of, oh, I guess, two or three groups. And there was a group of people who had been working communications work. They weren't in a division. They were integrated into these other places, and they pulled them out of there and put them in this communications division. So then, I had a group of people who had no contracts of their own, but what they did have was work that they were doing on other contracts back in the division. So it wasn't like I had a group of people and no work. I had a group of people who had work. And then, of course, they've got work and now you're trying to develop your own work and you've got to find the way to steal time from what they're already doing to assist back in the division's main area. So that was quite a transition, until you've got something to call your own.

Hochheiser:

Right. How did you manage that transition?

Nunnally:

Well, it's a beg, borrow, and steal [Laughter] operation, and to get people's attention, let the people know who they were working for, who needed them to give you enough

time of these people's so they could spend X-hours a week working on this. And so it was just doable. It was just hard work but it was doable.

Hochheiser:

Yes. Yes. And so then were you going out seeking -

Nunnally:

Air Force contracts, primarily. Some with the Army. But primarily, again, the Air Force, because the Air Force was such a huge component of the work here. When you went to present yourself, you could talk about the work you're already doing for the Air Force. Before I was named the division manager, Mr. Silcott and others, had bought a company in Cincinnati, called Xetron.

Xetron was then assigned to the communications division. It's located in Cincinnati. And they were doing work for the Air Force, and also work for NSA. And so that entity became my responsibility. And also in the course of time, they bought another company in England called Park Air. And that was assigned to the division. So I had a facility, a company, in Cincinnati and a company on the east coast of England, that I was responsible for. Plus, the pursuit of this work here. And we were successful in getting a huge contract from the Air Force, from Hanscom Field, to develop a second generation, what they call, MEECN receiver. It was dual frequency. See it was a derivative of the low-frequency work that communicated with submarines. I would penetrate, the lower frequencies would penetrate.

Hochheiser:

So this is communication between aircraft and submarines?

Nunnally:

Yes, it was in some cases. And also it was communications with other aircraft - it was ground facilities - so it was a dual frequency and I don't remember what those were anymore, but it was kind of a multipurpose - it was going to be the granddaddy of all. And we developed, in the division, that receiver, and provided it to the Air Force. Over time, of course. With great difficulty. It was a very difficult project.

Hochheiser:

But ultimately successful?

Nunnally:

Ultimately successful.

Hochheiser:

Yes. Well, it's also must have been quite a complex management task, because you've got people in Cincinnati, people in England, people here in Baltimore. How do you manage to do it? [Laughter] How do you manage to manage a group like that?

Nunnally:

Well, Sheldon, I don't know that there was any single, one attribute. It sounds trite, but it was just an awful lot of hard work. And in those days, now we're in the middle eighties, you don't have emails. So what you have are telegrams, even to some extent. You're just beginning to get fax machines into the mix. And telephones are terribly expensive to call England. So you have to ration those. Cincinnati is close by. There was a huge contract out there that we were developing – they were developing – for the Air Force, and it was in a massive trouble. Massive trouble. Because the company, Xetron, had always done low-key development. They'd never done huge production work. Never. And now this is a U.S. Air Force production contract under sub-contract to Boeing, and they had never lived under the rules that the Air Force imposes for suitability of flight, configuration management; all the things you have to pass in the critical design reviews, the preliminary design reviews. They'd never done this.

Hochheiser:

Yes.

Nunnally:

But they had one of the greatest technical expertises in the country, and that's why they were selected. But the production became a nightmare; losing money, falling behind, Boeing and the Air Force quite upset, over months and months. But we exhibited, I guess, first, the right technical abilities and second, the right intentions to satisfy the responsibilities that we had. And they never wavered, they stuck with us. Boeing did a tremendous job in assisting us even though they would spend the first two hours of the day beating you up; the next ten hours they spent helping you. So it was a tremendous

effort and we eventually solved all of that with, again, a lot of help out of Baltimore. We hired back retirees from here. They went to Cincinnati and worked and did an unbelievable job there because they were familiar with production requirements here.

Hochheiser:

Right. The guys in Cincinnati, I guess, must have been fortunate that Westinghouse bought them, because they didn't have these other types of experience and capabilities, but you had them here to call on.

Nunnally:

Correct. Right. And they had underbid the job tremendously because they didn't know you had to do all these things. [Laughter] Well, I guess they read the words that you had to do them, but it didn't mean a thing to them, see? So when you don't understand, you low bid it. And then you get into all kind of financial troubles. But we eventually made it through production and made a lot of money. But it was a trying period.

Hochheiser:

Were you still reporting to Ed Silcott?

Nunnally:

No, at that time he had moved on. Now, we're getting into the late eighties. And they had decided that they wanted to form this commercial thrust, and he had been appointed to that. And they had named a replacement for him, so I now reported to this fellow.

Hochheiser:

Who was?

Nunnally:

Milt Borkowski, so I was working for him at the time. Fortunately, he had a lot of good Air Force production experience. His expertise and experience, and all that, was most helpful. He knew when we running into these problems and he knew what the problem was all about. He didn't like the suffering of the financial part more than anybody else. But he had an understanding of what you had to fix. You know, that was very helpful.

Hochheiser:

Now you stayed in this position for a good number of years?

Nunnally:

I was in this position until about 1992, from '86 to roughly '92, still in the communications division. And because of this effort to go into more and more commercial work, communications was identified as one of those place where we ought to be pursuing this commercially, in addition to militarily.

Hochheiser:

Right.

Westinghouse Wireless Solutions Company

Nunnally:

So my division started pursuing a huge contract with a commercial entity, who was going to launch satellites, commercially, for mobile telephones. And we won that contract. Again, it was, I think, one hundred and something million. And the idea was to develop all of the software and the ground control as well as the telephones.

And that's what I brought to here [to the National Electronics Museum] for them to consider, was one of the early versions of the telephone.

Hochheiser:

And who was the customer?

Nunnally:

The customer was an organization called American Mobile Satellite Corporation. AMSC. They were located in Reston, Virginia. Their major backer was Hughes Aircraft. And so we had the contract, this commercial contract, and we were completely taken out of the military world, on the strength of this huge contract, and we're located – my goodness – over here, not far; now there's a whole series of movies and theaters, and hotels down

here. Then there was none of that. There were several buildings and we were in one of those buildings.

Hochheiser:

Right.

Nunnally:

And then the new Westinghouse facility was located up here on the hill. And then – because of this commercial orientation – I was removed from Borkowski and reported back to Silcott, who was leading all of that. [Laughter] So I have, not a new boss, but one that I was quite familiar with.

Hochheiser:

Yes. A boss who you were quite familiar with and comfortable working with.

Nunnally:

Right. So anyway, I went to work back for Ed Silcott again.

Hochheiser:

And so with this big win your group's work was then pretty much concentrated on this satellite contract.

Nunnally:

That single entity, that's correct. Now, we tried to branch out and get other contracts with people who were going to piggy-back on this satellite. One of whom was Mexico. We pursued that contract and we won that with the Mexican Telecommunications Authority. It was a government entity located in Mexico City. So we had that contract as well. Now, that came later. After the win of the big one, it came, maybe a year or two later. And so we had to provide a smaller scale, much smaller scale, because they were just piggy-backing on this. We did that. Then we changed the name because the Communications Division didn't sound commercial enough. So we renamed it, Wireless Solutions, because all of this was a wireless endeavor. And so we became the Westinghouse Wireless Solutions Company. It never was a company, we just used that word.

Hochheiser:

Right.

Nunnally:

It was a part of the facility here in every way. But we called it a company, and that gave you a little more cachet in the commercial world. It was truly a separate entity within here, working commercial communications.

Hochheiser:

Right. When still the majority of the effort here was still military.

Nunnally:

Absolutely. Very much so, even though, under Silcott, we had commercial endeavors that had been won or bought in trying to build up this commercial capability because it was a strategic decision made, in the late, late eighties, early, early nineties, to make this commercial thrust, because Reagan's defense budget was no longer there. The defense budgets were coming down.

Hochheiser:

And the Cold War was over.

Nunnally:

The [Berlin] Wall fell, and a whole variety of things. Military procurements fell out of favor to some extent. Remember, Reagan was going to have the 600 ship Navy, and all of that went away. So forth and so on. So there was an appropriate shift, not away from defense, but to develop a different component, and that was commercial.

Hochheiser:

How did the satellite communications project go?

Nunnally:

Technically, it went exceedingly well. It was very, very difficult work because fundamentally, what we put in place was a cellular network operating with a satellite. And we did this from scratch. We had to develop all of the software to control the signals, the switching – all of this so you could have people, whether it be – whoever had coverage of the satellite. That could be California, Hawaii, and it went out that far, all the way to the East Coast. It was captured between the boundaries of the U.S., into Canada. I might add Canada was a major player in this because they had a partner up there, Telesat Canada. We had customers in Canada, Reston, Virginia, Mexico City. There was a lot of work, but striving for the same thing. They were different contracts but they were for the same goal, to work with this satellite. The satellite was launched, it was successful, everything worked fine. Part of the learning process – it was so difficult for our culture here. Our culture was very oriented towards military contracting. One of the things that I think all of us learned, including, well, certainly myself, was that the technical work, even though extraordinarily challenging and very difficult, was easy compared to the contracting and the legal dimension of working commercially. You start with a clean piece of paper and you write a contract. In military procurement, you get a contract, you review the contract, you make amendments to the contract, you adjust it in certain places, but the fundamental document is given to you. And in this particular area we had to, with the customer, write a contract. And it's all steeped in legal; there's no procurement regulations to go back to like you have in the military. And the amount of time spent on legal issues was extraordinary.

Hochheiser:

And you probably needed a whole different sort of lawyer to do it.

Nunnally:

A whole different type of commercial-oriented lawyer as opposed to military procurement legal issues and so forth. Patents, who owns the patents, who doesn't own the patents. Who has [the] right to do this, who has rights – it's just on and on and on. Very, very, very business-challenging environment. And we suffered, financially, for a long time. So, you know, it was great – even though the contract was huge, we satisfied all of the requirements, we met every one of them in the end, but we never really made the money we wanted to make. And after that, that contract was over.

Hochheiser:

When was the contract over?

Nunnally:

And that was over in, well, it wasn't over, probably, until '97 –

Northrop Grumman

and in late '95, early '96, Northrop Grumman bought the facility here.

Hochheiser:

Right.

Nunnally:

And of all of the purchase, my division was the only one kept out of the sale.

Hochheiser:

Ah. As Northrop Grumman wasn't interested because it wasn't military work.

Nunnally:

Correct. And I understand, fully.

Hochheiser:

Yes. So knowing Northrop Grumman, I understand fully as well.

Nunnally:

It makes total sense.

Hochheiser:

Yes.

Nunnally:

Okay? And so then we're operating absolutely stand-alone.

Hochheiser:

Well, that must be tough because you were used to all of the availability of all the other facilities here.

Nunnally:

Of course. And, you create a tremendous anxiety with the people because they don't know whether to say good-bye to you, and get back to the mother ship, or whether to stay with this thing, and hopefully there'll be other contracts or other commercial work. And some left. My controller made the wise decision to go back here, so I stayed, and the boss I had was in Pittsburgh because there was no more bosses here. They'd all been sold. So my boss became a brand new hire, from McKinsey Consulting. And as you can imagine, there was some interesting conversations between he and I over this job because he had no background in any of this. None. He had worked for McKinsey. And he could tell others what to do, but, you know, he just wasn't oriented to being a line manager.

Hochheiser:

Yes.

Nunnally:

So the chairman of Westinghouse at that time was Michael Jordan. I was working for this guy who reported to the chairman, he was most understanding of the pickle we were in.

Hochheiser:

Yes.

Nunnally:

And he's going through – this is '95, '96, and Westinghouse has sold the operation here, to raise money. And he is holding on by a thread – by a thread – and selling other pieces of the company. So one of those pieces that he sold was Westinghouse Radio to CBS. Okay? When that happened, they took this commercial work here and assigned it to CBS. That was the operating entity that had the closest to communications work left in Westinghouse. But he was trying to do the best he could.

Hochheiser:

Right.

Nunnally:

It wasn't willy-nilly on his part. [Coughs] Michael Jordan. And I had met with him in the development of this job, when we were still owned by Westinghouse, so many times. And I thought, personally, highly of him because he was a very good listener and strategic thinker. Very good. But he was in a pickle. The company, the corporation, was dying and it eventually died. The company that I worked for, for 32 years, doesn't exist.

Hochheiser:

Right.

Nunnally:

But the right thing to do with this operation here was to sell it to a good, strong, military-based organization, Northrop Grumman. And it was a godsend for this place. Godsend. But I was not a part of it. So I never worked a day for Northrop because it was held out. I worked for Westinghouse, then assigned to CBS. And all of my retirement is through CBS [Laughter] and Viacom. But then they split Viacom into two pieces – Viacom and CBS. All of my paperwork stayed with CBS. So today I'm a retiree of CBS.

Hochheiser:

Now, what eventually happened to your commercial division?

Nunnally:

It was wound down. I retired in July of '96. It was wound down. The commercial obligations were met. The commercial viability of this company that we were doing the work for never panned out. Because this little thing called satellite – excuse me, cellular telephone – was spreading like wildfire. Everybody from Sprint to you name it, was doing this. And it became economically not viable from a competitive point of view even though it worked like a million dollars. They couldn't price it right.

Hochheiser:

It was not economically competitive with the terrestrial tower-based cellular systems.

Nunnally:

That's right. So it got overtaken by the technology as well as the commercial component of things. They went into a deep, deep financial problem. Hughes had to assign all kinds of money to help them limp through, and they went out of business somewhere in the late nineties.

Retirement

Hochheiser:

In what ways have you remained active since your retirement?

Nunnally:

Well, early on, I did a variety of things for people. I did some consulting work. And then I decided that there was so much life to lead, outside of all this. I had been blessed with a great career, and 32 years, as I've described. From a young engineer, getting out of college, all the way through these, in some cases, ground-breaking efforts. I enjoyed and was blessed with all of that from working for Westinghouse, and I just basically decided I'm going to do less and less of this.

Hochheiser:

That makes sense.

Nunnally:

And I am going to replace some of those things in my life that I had given up. And that's what I've been doing.

Hochheiser:

That sounds good. Just one more question. We briefly touched on your membership in IEEE and its presence when you were a student. Did you remain a member?

Nunnally:

Somewhere along the way, I faded out. I don't know when, but it had to be in the seventies, somewhere.

Hochheiser:

We've covered your entire career. If there is anything you'd like to add that we haven't covered, I'd be happy to have you do so.

Nunnally:

Well, I would, just in the way of summary, say, Sheldon, that I went from this young engineer to a person that was on the board of directors of companies that Westinghouse owned, to companies that we had been affiliated with, commercially. I was elected to serve on their boards. I was a member of the board of directors of AFCEA, which is the Air Force Electronics Communications Association, based out of Ft. Meade. I was on that board. Westinghouse afforded me an excellent opportunity to do a variety of things. And supported me and my endeavors, tremendously, for 32 years. So I am most proud to have worked for Westinghouse. I am sad that it doesn't exist. But I had a great run. So I'm a blessed man.

Hochheiser:

Well, I thank you very much for your time and for giving me the opportunity to learn about your career.

Nunnally:

Well, thank you for inviting me, or whoever did. [Laughter]