

An Interview with  
WILLIAM CHARLES NORRIS

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Conducted by Arthur L. Norberg

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Abstract

Norris was a founding vice president of Engineering Research Associates (ERA). He later became head of the Univac Division of the Remington Rand before founding and becoming president and chief executive officer of Control Data Corporation (CDC) in 1957. Norris begins by describing his employment before World War II, his civilian career with the Navy, and his commission in the Naval Reserve. He then discusses his work with Communications Supplementary Activities-Washington. Norris' description of the formation and operations of ERA comprise over half of the interview. Topics include: the roles of Howard Engstrom, John E. Parker, C. B. Tompkins, and Northwestern Aeronautical in the formation of ERA; the influence of the Whirlwind project; government contracts held by ERA; magnetic drums; and contract negotiations with James Birkenstock of International Business Machines. In the second half of the interview Norris discusses the ERA 1101, ERA 1102, and ERA 1103 computers, the acquisition of ERA by Remington Rand, the Univac File computer, his work as head of the Univac Division, and the formation of CDC.

WILLIAM C. NORRIS INTERVIEW

DATE: 28 July 1986

INTERVIEWER: Arthur L. Norberg

LOCATION: Offices of William C. Norris (Minneapolis, MN)

NORBERG: Let me start by asking you how you became associated with Westinghouse before you even entered military service.

NORRIS: Well, I graduated from the University of Nebraska in 1932, that was right at the bottom of the Great Depression. No one in our class was able to get an engineering job. In fact, the person who was the top performer in the class, just in order to survive, enlisted in the Marine Corps. Interestingly, I ran into him years later, when I took a job in the Navy department as an engineer in the Bureau of Ordnance. I was born and raised on a farm -- about a month before I graduated my father died. So I had to go home to help my mother run the farm and that kept me occupied. I got some part time work with the CCC. That was Roosevelt's big program for helping farmers. I worked at that and the farm for two years. Then I was offered two positions with Westinghouse. One was an engineer part time for \$80 a month, and the other one was a sales job, full time, for about twice that much. Well, I really wanted the engineering job, but on the other hand, I had to eat, because things were still tough. So I took the job in marketing. I did quite well and was promoted and was about ready to become a district manager, and the war came along. I really always wanted to go into engineering, and this offered me the avenue to make a change gracefully. In fact, Westinghouse had an agreement with the Navy that made it easy for you to leave your job and then if you wanted to come back you could. So I took a job in the Bureau of Ordnance in 1940.

NORBERG: What sorts of things were you selling for Westinghouse?

NORRIS: Primarily x-ray equipment for medical and industrial use.

NORBERG: Over how large an area?

NORRIS: Oh, it was the Middle West. I was attached to the Chicago office and I had accounts in Illinois, Iowa, Nebraska principally.

NORBERG: Did this require a lot of traveling?

NORRIS: Yes, constant. One of my better accounts was International Harvester, which is now in bad shape. The company was going strong then. Large hospitals. It was an interesting job. I enjoyed it.

NORBERG: Now in 1940 when you said you took the job with the Navy, was that as a civilian?

NORRIS: Yes, a civil servant.

NORBERG: Doing what?

NORRIS: In the Bureau of Ordnance working on fire control. My first job was working on interconnections for the Bofors gun mount. The Navy was buying anti-aircraft guns for ships from the Swedes. These had to be adapted to the ship's wiring and all that sort of thing. Well, I found that damn 'uninteresting' work. That wasn't my concept of engineering. That was a little bit more than what you might call drafting. I worked in a bull pen along with 100 other engineers. I felt I was obliged to do it for a while, but then it became apparent to me that one could get a commission in the Naval Reserve. That was far more appealing to me and there were opportunities in connection with radar development with the British. The British were ahead of the United States in the field of radar and the United States was anxious to get access to that technology. So I applied for a commission and I got it. But I didn't go to England but to Nebraska Avenue in Washington, DC -- I'll never know how that happened -- at the so-called CSAW, the Communications Supplementary Activities, which was the Navy's cryptologic agency that performed very important work in cryptography and in cryptanalysis.

NORBERG: When did you get your commission, do you recall?

NORRIS: It was a few weeks after Pearl Harbor.

NORBERG: Okay, so let's say the end of '41.

NORRIS: Yes.

NORBERG: And it was then at the beginning of '42 that you went to Nebraska Avenue, say?

NORRIS: Yes.

NORBERG: Around that time, you and others filed a series of patent applications under Navy regulations on things like radio position fixers and automatic communications systems, time division, de-multiplexer for teletype and so on. What sort of work were you doing at Nebraska Avenue?

NORRIS: At first in the communications area, the radio intercept area. You've got to get the stuff before you can decode it and it's not always easy to intercept. Also when I went in, the situation in the Atlantic was very, very serious. The submarine warfare was going against the United States. I don't think this is classified information that...

NORBERG: No, not now.

NORRIS: The Navy had a direction finder network, which was fairly useful. It could locate a submarine within a 500 mile area or maybe less if atmospheric conditions were not too unfavorable. Well, there was always the desire to enhance the knowledge of the position, in other words, get it closer, get it closer. And so at first I was working on ways to do that, which were classified, and in the process, also worked on some other projects just to get information faster. That's where the time division multiplexing came in. The fact that we were using electronic technology to replace mechanical devices, as you know, teletype is mostly mechanical but too slow in some respects, so we were

looking at that. And that's the genesis of those patents.

NORBERG: So you were in the communications area. Did you have anything to do with any of the other sections at Nebraska Avenue?

NORRIS: Yes, I began to, as time went on, because there was the connection between identifying sources of messages and so forth. I was never involved in actual cryptanalytical work. I'm not a cryptanalyst, but I worked on the fringes of it and worked on the machinery to facilitate the process of deciphering.

NORBERG: When you first arrived there in 1942, who did you work for?

NORRIS: Commander Welker. He was a regular Navy commander. And he had under his command the direction finder networks. I worked for him, I don't know, I suppose a year, and he was transferred and then there was a reorganization. There were frequent reorganizations and I wound up associated with Howard Engstrom, who had come on active duty a year earlier in cryptanalytical work and had just been put in charge of research. I was transferred to his department.

NORBERG: Do you recall, roughly, when that would have been?

NORRIS: I think about '43.

NORBERG: Now if he was in charge of research, did that mean all sorts of research? Communications, encryption, decryption and so on?

NORRIS: Yes, right.

NORBERG: Who else...

NORRIS: And research was broadly defined. It wasn't ivory tower research, and in order to benefit from the research, you often put it into use at the same time that you were developing the technology, because of the enormous urgency.

NORBERG: One or two questions for context. Do you recall how big the Nebraska Avenue facility was at the time in terms of people?

NORRIS: Oh, I would say 1,000.

NORBERG: 1,000. And of this 1,000 how many were you closely associated with, let's say '43 when you were in this research group?

NORRIS: You're talking professional people?

NORBERG: That's correct, yes.

NORRIS: 200.

NORBERG: What was the context of research? What sort of equipment was around? What sorts of things were you using?

NORRIS: Well, they had a number of computer like devices. Some of them were mechanical in nature and as the war progressed electro-mechanical was too slow. They were being replaced by electronics. And by the time the war drew to a close, there were very large installations of both electro-mechanical and electronic equipment for use in cryptanalytical communication work.

NORBERG: Was this standard equipment or was it constructed there?

NORRIS: No. It was all special purpose equipment. Most of it was built elsewhere by the National Cash Register Company, Bell Laboratories, Eastman-Kodak, and IBM.

NORBERG: Do you have any idea which of these pieces has since been declassified so you can talk about them?

NORRIS: Oh, I don't think any of them have.

NORBERG: Okay. I don't want to embarrass you by asking questions you can't answer. All right. You indicated, though, that much of this by the end of the war was electronic in nature. Now, some of the things that have since been released by, let's say, Division 17 and Division 7, Division 6 of NDRC, indicated that most of the devices that National Cash Register and Bell Labs were building, specifically -- I don't know about the other two -- but most of the devices were, in fact, some sort of electronic counters and being used for comparative purposes so you could pass the information through and see what sort of patterns you could get.

NORRIS: Right, pattern recognition.

NORBERG: Now, the Bell Labs equipment has since been advertised all over the place by Bell Labs as their claim to the beginnings of the electronic computing area. And those devices were largely electro-mechanical in nature as opposed to electronic. What sorts of electronic equipment were being used? Do you recall... This is going to be...

NORRIS: Essentially, replicas of the electro-mechanical only they operated faster. In other words, the relay was replaced with the flip-flop.

NORBERG: I see. Were...



NORRIS: And there was electrostatic vacuum tube memory.

NORBERG: Yes. What sorts of input and output? Were they punched-cards or paper tape or something like that?

NORRIS: Yes. That didn't really change and was about the same at the beginning of the war as at the end.

NORBERG: Now getting back to you in this context. Did you work specifically on any of this equipment or did you stay in the communications area throughout the war?

NORRIS: I stayed primarily in communications equipment. I worked on a few individual pieces of equipment. I was never involved in the actual operation of one of the large centers.

NORBERG: And who else did you work closely with besides Howard Engstrom?

NORRIS: Tommy Tompkins, C.B. Tompkins. A man by the name of John Howard. A mathematician by the name of Howard Campaigne, Don Menzel, who was an astronomer from Harvard, and, of course, Howard Engstrom.

NORBERG: Yes, you mentioned him. Now as the war was coming to an end, what sort of discussions went on among these people and yourself about post-war plans?

NORRIS: Well, it was brought up one day. I think Howard Engstrom mentioned that we should start thinking about what we're each going to do. He said, "I for one don't want to go back to Yale, so I'd like to think in terms of something else." And I said, "Well, while I liked Westinghouse all right, I didn't necessarily have to go back." So out of this we talked about alternatives. It was very clear that we had a very unique agglomeration of talent and the Navy was concerned about that being dispersed so that just kind of naturally led us to the point, well, we could set up in a government laboratory. But that didn't appeal to anybody. Or we could set up a private company and perhaps do work for the Navy on a contract basis. That was more appealing to both Howard and myself. And we

gravitated in that direction.

NORBERG: Who was leading that discussion? Do you recall?

NORRIS: Primarily Howard Engstrom and myself.

NORBERG: Where do the others fit into this picture, people like Daniels... not Daniels, Howard?

NORRIS: Howard came in later after we had pretty well in mind what we were going to do. The other person who was somewhat involved, because he was an important, would be an important part of the effort was Tompkins. John Howard was another very able guy. So you know, it wasn't something that Howard Engstrom and I could do by ourselves. It was very important to have other people have some enthusiasm about this and yet we couldn't go too far, because we didn't really know whether we could do it. But we had enough conversations to come to the conclusion that if we could get financing for a company, that many of the people would be very much interested in it.

NORBERG: Do you recall when the first documents were prepared summarizing what you thought you could do?

NORRIS: Yes, I ran into it going through that material.

NORBERG: This would be the one on the National Electronics Laboratory?

NORRIS: Yes, right.

NORBERG: The first date I know of for that is February of '45.

NORRIS: Yes, well, that would be about it. I couldn't find a date on it, though.

NORBERG: No, there was a letter in that same folder which said we have this attachment dated February 12, 1945.

NORRIS: I recognize my printing. It was never very good.

NORBERG: Which? That "National" was printed by you?

NORRIS: Right.

NORBERG: That's a good key then.

NORRIS: So I know I was involved in this document.

NORBERG: Do you think you wrote it?

NORRIS: I don't know whether I did or not. Ordinarily the way these came into being was either Howard or myself would write it and then we'd get together and mark it up. And since I marked it up, it might have been that he wrote it. But, again, that does not necessarily follow.

NORBERG: Where did Wakelin fit into this picture?

NORRIS: Jim came in later. By the time we could begin to see that this thing could happen, could come about, Engstrom knew Wakelin and said that he had had some cocktail discussion with him and Jim was very much interested and so he'd like to bring him into the discussions.

NORBERG: When you say later, how much later do you mean? If you take this February '45 document as our starting point here.

NORRIS: Oh, I think it would have been at least a year later. Maybe a little more than that.

NORBERG: February '46?

NORRIS: Yes.

NORBERG: Well, but in fact, Wakelin is writing letters about this in June of '45.

NORRIS: Oh, was he? Well, I was wrong then.

NORBERG: It's a key point for me.

NORRIS: I don't associate Jim that much with the formation of it. And again, I did not have too much contact with him.

NORBERG: That may answer the question, but I'll ask it for completeness. Do you know what he was doing at the time, in the spring of '45?

NORRIS: No, I can't recall that.

NORBERG: Remember the list of companies that were in that document as possible people to be approached?

NORRIS: Yes.

NORBERG: Where did that list come from?

NORRIS: Well, those were the companies that were approached. There was a guy -- you probably saw the

correspondence -- Russ McGregor, who was an officer at CSAW. He came from industry -- Unexcelled Manufacturing -- I always smile when I think of such a modest name for a company. Howard knew him. He was in some affiliated group that Howard worked with. I didn't know him very well until he got involved with this. Howard said that Russ was very interested and wanted to help us and so we would meet with him occasionally and talk about companies that might have an interest in sponsoring, investing, or whatever in this organization.

NORBERG: How did you see this investment taking place?

NORRIS: Well, the original concept was that the technical people would own half, the investors the other half and that ideally, if we could find investors whose businesses would profit from the technology that was developed, this would be preferable. That's the reason why you see many of the companies... American Airlines interested in a reservation system, and Submarine Signal very interested in the type of technology that we're talking about -- Western Union, Hazeltine, and so forth.

NORBERG: So that suggests that you had a fairly, let's say, sophisticated notion of what sort of products you were going to develop.

NORRIS: Yes. We could easily visualize the potential of this electronic digital circuitry.

NORBERG: Easily? How easily?

NORRIS: What did you say?

NORBERG: How easily?

NORRIS: Well, at that time, we were thinking in terms of a reservation system and air traffic control. In fact, when we talked to these people, they said, "Well what sort of things are you talking about?" And we would use the airline

reservations as something easily understandable, as well air traffic control and aircraft simulation. You remember the old Link Trainer? That was electro-mechanical. Well, I remember being some place and I saw one. It was very obvious to me that this could be computerized, so to speak, that is, using an electronic digital approach as opposed to the analog it would be a lot more flexible. I used that as an example. Then, of course, there was the matter of air intercept and guided missiles. They were beginning to think in terms of that when we were talking about possible applications of the technology.

NORBERG: This seems a very sophisticated thinking to me, based on what I know about the technology in 1945. How did you people come to these ideas?

NORRIS: Well, these were the cream of the crop, so to speak. Not necessarily myself, but...

NORBERG: I'll grant you that right from the beginning. I'm not trying to suggest that.

NORRIS: No.

NORBERG: I just don't want to read too much back into the list of potential products. And rather what I'm trying to get you to tell me is how this list of products came about in the first place.

NORRIS: Well, because we had to stretch our minds in order to sell the idea.

NORBERG: Well, okay, but where did the idea come from in the first place?

Who was thinking of a reservation system at the time? Did the Navy feel they needed something like this?

NORRIS: No, no, no. This was our brainstorming. I mentioned earlier C. B. Tompkins. This is somebody that I want to be sure is recognized to a much greater extent than he was during his lifetime. I mentioned earlier that he was one of the persons that I worked most closely with. He was a mathematician, but at the same time, he had a good

understanding of the science and engineering underlying electronic digital circuitry. You could sit and brainstorm with Tommy and if I couldn't think of, you know, how to clear an obstacle, he could. And I remember we had a meeting once at Aeronautical Radio. We laid out an air traffic control system we both got a certificate for our presentation, but I lost the damn thing. And that was done during the time that we were thinking about the formation of this company.

NORBERG: 1945.

NORRIS: Yes, yes, in '45.

NORBERG: What convinced you people that digital technology would do this for you? What sort of equipment had you developed that would allow that sort of conclusion to be drawn?

NORRIS: Well, when you see the results that were obtained in cryptanalysis, and the way that you could speed up communication and so forth it wasn't hard to take the next step. I mean in your thinking. And the step from a relay computer to a digital computer isn't all that great. And there were relay computers around then, you know, Aiken and so forth.

NORBERG: What sort of projects did you know about in '44 and '45? This is before the company is formed now. What sort of projects did you know were going on? You mentioned Aiken's so that's obviously one.

NORRIS: Well, the most advanced work was going on in England. The Colossus, you read about it. And, of course, John von Neumann, we had access to him. Turing in England was part of this group. I knew him, but not well. I didn't interface with him, but Engstrom and Tompkins did.

NORBERG: During this period? '44 and '45?

NORRIS: Yes, yes.

NORBERG: Did von Neumann ever come to the office?

NORRIS: Oh yes, yes. He came several times.

NORBERG: Do you recall what he was consulted about?

NORRIS: Oh, it was in connection with the greatly expanded programs in cryptanalysis.

NORBERG: So you knew about those two projects, did you know about what was going on at the University of Pennsylvania at the time?

NORRIS: Yes. As a matter of fact... You mean at the Moore School?

NORBERG: Yes.

NORRIS: Yes. As a matter of fact, Howard Engstrom and I got together with Pres Eckert to explain to him that we had heard that he was thinking of starting a company, we were thinking of starting a company, it's going to be damn tough, maybe if we pooled our resources, our thoughts, that would be useful. Well, he didn't want to do that. So he went his way and we went our way and then we met later in Remington Rand.

NORBERG: Do you recall what his reasons were for not wanting to join with this group?

NORRIS: Just simply that he wanted to do it himself. He just didn't want others involved. That he had a program in mind and he didn't need us, period.



NORBERG: Do you recall when that conversation occurred?

NORRIS: It would have been about October of '45.

NORBERG: '45, okay. McGregor seems to have played a fairly large role in getting some of these company people to pay attention to the idea at least. Do you have any reason, any knowledge about why he wasn't successful in convincing them to become associated?

NORRIS: Well, Russ McGregor is a person who knows quite a few people as opposed to knowing any one particular person well enough to have any great amount of influence. I think his knowledge of what we were planning was very limited. He was not in technical work, so he couldn't really articulate it. All he could do is say, "Well, I think you will find this interesting, something that you ought to know about or that you might want to invest in." And that's a pretty big handicap.

NORBERG: Yes. What sorts of reactions did you get from some of these people?

NORRIS: They were fascinated. In several cases, there was serious interest. However, one of the factors that was working against us is that every company was sort of reorganizing, rethinking its plans, getting back to what it had been doing and so forth and it was very difficult for them to stretch their mind a little bit to something that they really hadn't envisioned. I think that was the real big handicap. Now we came very close to having a commitment from Kuhn, Loeb.

NORBERG: From whom?

NORRIS: Kuhn, Loeb.

NORBERG: Kuhn, who?

NORRIS: Kuhn, Loeb from Strauss. Louis Strauss?

NORBERG: No.

NORRIS: I believe that Admiral Redman, who was head of Naval communications...

TAPE 1/SIDE 2

NORRIS: ... and who had oversight of CSAW put us in touch with Admiral Strauss in Forrestal's office. Admiral Redman said that Strauss was very knowledgeable in technical matters, and that he would understand what we were talking about. He was in the investment banking business, so why didn't we see him. So we met with Louis Strauss several times and he was very intrigued. That was where I learned first hand that the old adage about, "You have a handshake with somebody on Wall Street, you've got a deal." We had a handshake and thought we had a deal. At the last minute, he said, "Well, some of my partners don't understand this. I don't really care whether they do or not. If they don't want to do it I want to do it. But in deference to them, I want a young man here in my office by the name of Dick Paget, Commander Paget, to look at it. We're going to finance his business as soon as he gets off of active duty." He didn't mention the type of business. So we spent quite a bit of time with Dick Paget. Well, Paget came back with the report that it was interesting and important, but he didn't think it was a viable business. Well, Strauss backed out. Years later, a man came into my office who was partner in Cresset, McCormick, and Paget and wanted to do business with Control Data -- Jim Worthy, as a matter of fact. And I said, "Well, Mr. Worthy I'll have to tell you a little bit about some earlier dealings I had with Mr. Paget." And so I told him about it. He was terribly embarrassed and I said I'm not going to let that be a road block. Well, to make a long story short, Jim did do work for us and he was later a professor at Northwestern. Jim is a very high type, very versatile, talented person and he was a director for many years of Control Data, still is. So, the point is that we thought we had a deal, but we didn't and we were getting a little desperate and then we heard about Northwestern Aeronautical and John Parker.

NORBERG: How did you come to hear about them?

NORRIS: Well, the third person in this planning to a very limited extent was Ralph Meader. And the reason that we included Ralph is because he was in the Bureau of Ships. He'd been the contracting representative for much of this special purpose equipment that was acquired from National Cash. In fact, he was stationed at National Cash. Well, it was important to have him involved because when he heard about it, he wanted to be a part of it, so there was nothing to do but to include him. He was also trying to find leads for financing and somebody suggested that Nelson Talbot, who was a brother of Harold Talbot. At one time, Harold Talbot was the Secretary of the Navy -- might be interested. That he would understand this type of business. This happened at a cocktail party. So Ralph called Bud Talbot, that was his nickname, and Bud Talbot said that he wasn't interested, but he knew a man by the name of John Parker at Northwestern Aeronautical that might be interested. And so then we got in touch with John Parker.

NORBERG: And all that occurred somewhere around Christmas time, I guess.

NORRIS: That's right.

NORBERG: Why was it important to have Meader? Not necessarily on the team, but at least have his sort of consent for the project?

NORRIS: First of all, the National Cash Register Company had a very large contract with the Bureau of Ships representing CSAW for this special purpose equipment. There was always the possibility that National Cash might want to continue in the business and we'd wind up as a laboratory in the National Cash Register Company, which wasn't too appealing. If the Bureau of Ships were opposed to this, and, you know, if Ralph was not a part of it and was unhappy about it, he could poison the well in the Bureau of Ships. So we just felt it was being smart to include him, particularly when he said he wanted to be included. And he was helpful then in explaining it to the Bureau of Ships. There was always concern about having a relationship that wasn't proper. And on the other hand, the

decision was not made by the Bureau of Ships. The decision was made by the Chief of Naval Operations upon the recommendation of Admiral Redman, who, at that time, was chief of Naval communications. Had somebody over in the Bureau of Ships raised a red flag, it could have made it very, very difficult.

NORBERG: This suggests that the Navy was very interested in helping this group to get started. What was in it for the Navy?

NORRIS: This group had been critically important. The Navy could never have broken the codes without this group of people. And it represented an enormous reservoir of knowledge that had been built up during the war. These people came from different walks of life. They were not from the Navy; they were not civil servants; and they were going to evaporate. And this was a great concern. So when it was proposed to Captain Wenger by Engstrom, well, this is one way to keep this knowledge together, he had to be interested. And also Wenger was a broad thinking person. He really was. The average person in the government, whether in the military or civil service would have immediately looked at all the problems with such an arrangement. But he saw the advantages immediately and said, "Well, there will be problems, but we should be able to work them out."

NORBERG: How did the Navy express its interest in this sort of idea?

NORRIS: Well, Wenger said the next thing for you to do is to go see Redman, Admiral Redman. We talked to Redman about it, and, again, Redman was a broad gauged person, and he said, "Well, yeah, it makes sense to me." He said, "You realize there will be opposition. You'll be accused of double dealing and all that sort of thing, but on the other hand it makes sense and there must be a way." And he said, "The next step is for you to go to the Secretary's office." I was not at that meeting, Wenger and Engstrom attended it. They met with Forrestal. And he said that it sounded reasonable to him, but to put it on a piece of paper and run it up through the channels. And in the process, then, Wenger talked to I think at that time that was a Captain Hull, who was in charge of the electronics part of the Bureau of Ships, and he blessed it, and the Navy supported it.

NORBERG: When were all these negotiations going on?

NORRIS: Mostly after Parker said that he wanted to go ahead -- that was late in '45. We had to get busy and put a contract on the table. So that was when it really began to shape up.

NORBERG: So before this the only Navy people who might have been involved were Wenger and, well, you mentioned Strauss having considered whether or not...

NORRIS: Well, Strauss was not in the approval channel. Strauss was only involved insofar as he personally might finance it or his company might finance it. The Secretary did not look to him for advice as to whether or not it should be supported by the Navy, thank god.

NORBERG: All right. So the approval chain was only necessary after you had a financial backer. And the rest prior to that had all been sort of informal.

NORRIS: Yes, that it's a good idea and if you can put it together, we'll support it.

NORBERG: I recall seeing an early statement about what the conditions of employment would be for the professional group. My recollection is it was dated somewhere around in the end of September 1945. Do you recall developing such criteria?

NORRIS: Yes.

NORBERG: And why would it have been developed so early?

NORRIS: Well, because people were thinking about what they were going to do. The war was ending and...

NORBERG: The war was over by that time, certainly.

NORRIS: Right.

NORBERG: All right, but you had nobody to back it yet, so these...

NORRIS: Right, so we had to get busy and, you know, put a little pie in the sky out there for them to look at.

NORBERG: Do you remember who developed those contract terms?

NORRIS: Oh, I think Engstrom and I did. I think I probably did. I don't think this was something that he would have done.

NORBERG: When did you first meet Parker?

NORRIS: Well, it would have been in the fall, late fall of '45.

NORBERG: That early?

NORRIS: Yes.

NORBERG: Well, let me try to get some sort of dates straight then, Bill. When did Paget suggest to Strauss that it's probably not a viable business?

NORRIS: I can't tell you exactly. It was fairly late in the game, it would have been the fall of '45.

NORBERG: Because I don't recall seeing Parker's name until the end of the year. And then the first letter from Parker

is in January of '46.

NORRIS: Well, there were meetings before January, because by January people were getting ready to move to St. Paul. I think Bob Gutterman moved to St. Paul at the end of January. And in the fall, late fall, I think one or two people visited St. Paul. I didn't.

NORBERG: Well, but the company wasn't incorporated until January 8, 1946 according to documents here in this state.

NORRIS: That's right.

NORBERG: But are you suggesting that there was a company going before?

NORRIS: Well, there was Northwestern Aeronautical.

NORBERG: True.

NORRIS: Was in business. And it was always the idea that it would take the contract so that... discussions with Parker would have had to have been started in the late fall. Otherwise, we never could have put it together.

NORBERG: When did the office in Washington open then?

NORRIS: Oh, I think that was probably not until mid-summer of '46. There's a letter in here that I noticed, or a memo that Engstrom wrote, saying that Captain Wenger had asked him to stay on until June and that he really was a little put out about that, but on the other hand felt that he would have to comply with the request. So it was probably then, although on the other hand, I don't know when Jim Wakelin came to work. I think it might have been a little later.

NORBERG: Yes, I think that's right. He did come later than that and came for... What was it, either SQUID or BOOM. I've forgotten which one, but it was one of those two contracts.

NORRIS: BOOM.

NORBERG: All right. That has me a little confused at the moment then about when the office in Washington opened, because I assumed that the Washington office opened first and then people began moving to St. Paul.

NORRIS: No.

NORBERG: So people would have been coming back here...

NORRIS: In fact, I interviewed people like Howard Daniels, but I don't think there was a Washington office.

NORBERG: What were people coming back to do? Regardless of when they were coming back here prior to the summer of 1946, what were they coming back here to do?

NORRIS: You mean coming to St. Paul?

NORBERG: Correct.

NORRIS: To go to work.

NORBERG: To do what?

NORRIS: On the Navy contracts.



NORBERG: But the Navy contracts weren't let until the middle of '46?

NORRIS: It was very likely a contract would be signed and they were put on the payroll of Northwestern Aeronautical. If I remember right, Bob Gutterman came in January of '46 and then C.B. Tompkins soon after that. It's hard to remember exactly.

NORBERG: All right. Let me try and get at it a different way and that is to ask about, how the contract terms were arrived at that would have been incorporated into those contracts in the middle of '46.

NORRIS: Well, Parker did the negotiating, if I remember right. Met with the Bureau of Ships contracting officer and negotiated the contract.

NORBERG: Well the contract had to have some tasks to perform, so Parker could not have developed those for himself.

NORRIS: No, but the tasks had been written up by Engstrom and myself and he had a sheet of paper. The tasks were never detailed because of classification. For example, Task 1 was to set up additional tasks. And then Task 2 and Task 3, were specific things, but they were in code names. So there was never anything very specific in the contract. And the contract was cost plus and it was administered on the basis of here's a million dollars for 1946 or '47, that's the amount of money you get plus a fee for doing Task 1, Task 2, and Task 3, in accordance with specific instructions from the contracting officer.

NORBERG: Now that seems quite far removed from the early potential products that were being floated to the companies in 1945 as sweeteners to get them to finance the company.

NORRIS: We always made it clear that we'd have to start with government R&D. We didn't have any money and

that we'd have to start out with the government financed R&D, and as a matter of fact, that the technology needed further development. In the case of the simulator, we looked into that, and yes, it was true that you could substitute the electronic digital circuitry for the analog mechanisms in the Link Trainer, still, the cost would be much higher. Even though it would have much greater performance, it still wasn't economically viable. The same thing was true of the reservations system. You could build a reservation system, but it would be too costly; the point being that with further development cost would come down and it would be a viable product. That was always made clear. As a matter of fact, as far as our own personal outlook was concerned, it was always clear that if the company couldn't do any better, then just do work for the military; the company would do well. And that turned out to be the case.

NORBERG: So does that suggest that even in those early months of '46, let's say all through '46 for that matter, that you had in mind that somehow you were going to develop this technology to do more significant things?

NORRIS: To do other things.

NORBERG: To do other things, not... You don't like my more significant?

NORRIS: Right.

NORBERG: Why not?

NORRIS: Oh, what's more significant than cryptanalytical work?

NORBERG: Well, doing a survey is not equivalent to building some sort of a new system.

NORRIS: We were building new systems, right out of the gate. Those tasks actually specified new pieces of hardware that had higher performance than anything that had been built.

NORBERG: In the contracts of '46?

NORRIS: Yes.

NORBERG: I would have guessed middle of '47.

NORRIS: No, no. Right away there was a desire to get going on these different devices.

NORBERG: How did this happen, then, within the company? For example, you didn't come actually into the company until late '46. Isn't that right?

NORRIS: Yes.

NORBERG: Somewhere around August or September or something like that.

NORRIS: Yes, right.

NORBERG: Well, what were you doing in the eight months from January through the time you came? For the company now, first of all, and then we'll get back to the Navy.

NORRIS: Yes. Well, just planning. In my odd hours, I was interviewing people: Gutterman, Howard Daniels, Sid Rubens, quite a number of people, talking to others.

NORBERG: Others? For what purpose?

NORRIS: To convince them that they ought to join the company. About 40 people, somewhere between 35 and 40 people, transferred to St. Paul, mostly from Washington, although there were two or three of them that came from

Dayton and I think one or two of them came from Poughkeepsie, New York.

NORBERG: During this period what were you doing for the Navy?

NORRIS: Continuing to develop devices, bringing the projects to a close... [unreadable] ... and that sort of thing.

NORBERG: When you came aboard, then, full time for ERA, what were your responsibilities?

NORRIS: I was in charge of engineering in St. Paul. Engstrom was in charge of research; Meader was in charge of manufacturing.

NORBERG: And what specific tasks did you perform as head of engineering?

NORRIS: Putting together the organization. Getting people started in jobs. There were only two employees, Tompkins and Gutterman, and they'd been working with the old Northwestern Aeronautical crew in getting laboratories built, space rearranged and to expand employment to vastly step up the rate at which the work was being done on these Navy contracts.

NORBERG: How did you people distinguish between research and engineering at this time, say, September '46?

NORRIS: Well, if it was research it was a study, if it was engineering you were going to build it. For example, Tompkins reported to Engstrom at first being part of research and later on he reported to me.

NORBERG: I'm still not clear what sort of projects, though, you would have been doing in engineering in November '46. I would think there wouldn't be very many, because there's still some studies to be done and some ideas to develop and so on.

NORRIS: You've got to remember these guys hit the ground running, because this work was the same type of work that had been done during the war.

NORBERG: All right.

NORRIS: So they had the background, and, of course, that was the beauty of the whole thing. We didn't have to spend a lot of time in training or getting oriented.

NORBERG: All right. I've read a number of reports of ORION before it changed its name into Goldberg, and so on. And in reading those reports, they have a tremendous research flavor -- new things being tried, prototypes being constructed to see whether or not you could transfer information back and forth across some sort of boundary like a photoelectric boundary or the magnetic boundary and so on. That there's a lot of this going on, but not a lot of building going on outside of that.

NORRIS: That was what was going on. It was building. I think that to say it was research is somewhat of a misnomer.

NORBERG: Okay.

NORRIS: I think that the emphasis in ERA was always on solving problems and you used the state of the art to do it. You didn't advance the state of the art unless you had to. There was an enormous reliance on technology in other places, like Whirlwind at MIT. ERA engineers used Whirlwind reports like the Bible. They brought with them the state of the art, so they were able to get started to build equipment and meet a delivery deadline. If they could make it better, that's what they did, i.e. improved performance. But above all, they wanted to deliver something that solved the problem that worked reliably.

NORBERG: You described earlier the interaction with people like Engstrom on developing the idea for ERA and then

getting the early financing and so on. How did your association with Engstrom continue after you came to St. Paul in 1946?

NORRIS: Oh, it was always very close. We got along fine. We had no problems at all.

NORBERG: Okay.

NORRIS: But he maintained a very close relationship there, which was extremely important for both parties, because there was a lot of knowledge as to what could be done and on the other side was what needed to be done. And there was always, "Well, can we do it better?"

NORBERG: Did the two of you ever sit down to discuss these Whirlwind and other reports?

NORRIS: No. He was never that closely involved in the actual building of hardware.

NORBERG: But how about the design of hardware?

NORRIS: No, not the specific design. He was mostly just involved in broad concepts. Tompkins got more involved in the specific design than Howard Engstrom.

NORBERG: Did you work closely with Tompkins on these specific designs?

NORRIS: No. I worked closely with Tompkins on conceptual designs. Earlier I mentioned air traffic control; he worked with individuals, engineers, on specific designs.

NORBERG: I guess what I was leading to was to try to see whether or not you felt that in 1946 and '47 that you were now doing the engineering that you had wanted to do ten years before.

NORRIS: No. I was not doing engineering work. I was an executive. I gave up the idea of engineering in the Navy. As a matter of fact, I did technical work when I first went to CSAW. However, I soon discovered that that really wasn't the greatest need; what they needed most was management. Many people were available with technical capability, but what they didn't have was the management for putting it together so I started putting it together.

NORBERG: Now this is in the Navy, too?

NORRIS: This was in the Navy, right.

NORBERG: But yet you were under Engstrom...

NORRIS: I was putting it together for him. He didn't have that capability. He was not an executive. He was a mathematics professor and his interest was in broad concepts as I said earlier.

NORBERG: I'm looking here, and I'll be happy to show it to you, I'm not trying to hide it, on an organization chart, which was developed in November of 1946. And it was developed for NAC, obviously, which said that "the plan attempted to envision the future growth of ERA and provide the necessary flexibility to conform to needs in the highly specialized operations of the company." And then it goes on to list a board of directors, which includes you, and the usual list. Parker is president, Engstrom as executive vice president, and then Meader at manufacturing, Norris at engineering and research was the title. And Plufka as treasurer, Rutchick as secretary. What was your relationship with Parker? You had not worked with Parker before, after all. What sort of thing developed here?

TAPE 2/SIDE 1

NORBERG: What was your association with Parker?

NORRIS: Parker lived in Washington; he commuted. When he was in St. Paul I met with him. We had relatively long meetings at times, discussing different issues. We had a good relationship. John did not have a grasp of the technical aspects of the business, which was a handicap to him.

NORBERG: It suggests, if he were living in Washington, then, and not around St. Paul all that much, that in effect, that left you in a very strong position -- you and the others I might add.

NORRIS: Yes.

NORBERG: You and the others in a very strong position to really direct the company on a day-to-day basis.

NORRIS: Yes, we did. And that of course also led to the problem with Ralph Meader. Since Parker wasn't there much of the time, Ralph had his ideas, which were not in consonance with mine and that led to some problems between me and Ralph. And meanwhile, the company needed business and in order to keep the thing going, and not have it fall apart because of dissension, Parker asked me if I'd move to Washington and be responsible for getting more business for the company. And I said sure, I'd be glad to do that, but at the same time, I pointed out to him that Meader was not a competent replacement. Well, John said he didn't know that. And I said, "No, I know you don't know that. But that's the way it is and I can understand your position. I want to see the company successful, so yes, I'll move to Washington." I did, the business got into a horrible mess and Parker asked me to come back. It was at that time that Parker bought Meader's stock and I was placed in charge of operations.

NORBERG: How long did you stay in Washington?

NORRIS: Oh, about a year.

NORBERG: And that would be roughly when?



NORRIS: '49-'50, I guess.

NORBERG: So it's relatively late, then.

NORRIS: Yes. Let's see, Meader left in late '49, I think. I think I saw something in here to that effect, so he would have been on his way out by the time I came back. I suspect I came back sometime during '49.

NORBERG: So you were gone, let's say, the year of '49, just for discussion purposes. All right, prior to the...

NORRIS: No, I'd say half of '48 and half of '49.

NORBERG: Okay, fine. That's a very significant period, it seems to me, in the history of ERA. But I'll come back to that, I still want to confine our discussion for the moment to the first couple of years. By the end of 1946, it's my impression that the company has begun to shake down rather nicely. That a group of people has been hired and brought to St. Paul to develop some new, some really new concepts. In some ways they're based on the Whirlwind reports, that's true, which were being circulated, but there's also been the suggestion that the interaction with the Navy proved very beneficial. Were the specifications for equipment developed largely inside ERA somehow in conjunction with the two, or largely by the Navy?

NORRIS: They were developed jointly. The Navy didn't have the expertise to do that by itself. They were always good people in the U.S. Naval Computing Machine Laboratory. The standards, specifications, performance criteria, acceptance criteria were worked out jointly. And it was a good arrangement. The people that represented the Navy were realistic. On the other hand, they insisted on good equipment, top performance, so there was no room for sloppiness and it worked very well.

NORBERG: What sort of role did you play in this, let me call it negotiation, with the Navy?

NORRIS: Well, I was always a great believer in delegating and normally I wasn't involved. We operated on a project basis. The Navy was interested in getting equipment in the shortest possible time. The most efficient way to do that is to set up on a project basis. The project engineer (i.e. project head) would meet periodically with the Captain of the Naval Computing Machine Laboratory. If the project leader ran into trouble, he always could come to me. But I don't remember more than once or twice of having to get involved. It was a very, very good relationship. There was trust on both sides and the Navy took great pride in what was being delivered. In fact, whenever we'd ship a new machine, it was a victory for them as well as for ERA.

NORBERG: There must have been earlier negotiations associated with the project development before it even became a project.

NORRIS: Not really. Again, I go back to the task-type contract. The negotiation for the specifications, in other words, for the performance, what that equipment was to do, was specified only in very gross terms. In other words, to spew out data at a certain rate or to do this at a certain rate. And how you did it was a subject of negotiation between ERA and the Naval Computing Machine Laboratory.

NORBERG: And that would be done with the project people. Okay. I guess I have that pretty clear in my mind now. During the course of these first few years, what sort of projects - not projects - problems developed for the company?

NORRIS: Well, the biggest problem was Parker's expense account.

NORBERG: Tell me about Parker's expense account.

NORRIS: Well, he had an old Cessna airplane that was a great prestige item with him and he used to fly that thing back and forth between St. Paul and Washington. And of course he wanted to charge it into overhead. And the Navy objected strenuously to that. Also he put on a party now and then and that was customer entertainment. Well,

the Navy took the position, hell, we don't need to be entertained, you've got the business.

NORBERG: That's funny, John never told me those stories.

NORRIS: This really got to be acrimonious at times. I will always remember we had a consultant by the name of Admiral Hooper, retired Admiral. And at one point, Johnny was saying, "Well, by god, I'm going down there to the Bureau and tell those bastards where to get off." And the Admiral said, "Johnny, let me tell you something. You don't ever tell the Navy where to get off or they'll tell you, 'Fine, be my guest'." So they just kind of wore out that problem. They compromised on it. That really was the major one until about 1950. When I came back to St. Paul ERA was in serious trouble on two projects; they couldn't make the god damn equipment work.

NORBERG: Which two projects were they?

NORRIS: I've forgotten the name of them, Warsaw, or Warlock. Do you remember that name?

NORBERG: I know the name.

NORRIS: Yes, it was Warlock was one and the second one I can't recall. Warlock was by far the most important. But that project absolutely stuck and I guess it presented the most puzzling problem that I ever had. I would get the people together and there was bad feelings among the engineers and technicians on the projects. Finally one day I told the Warlock group that I thought they were lying down on the job, that they weren't getting in there and working as hard as they could. Sometimes I said, you just have to beat hell out of a problem in order to get on top of it and I don't think you guys are doing that. Well, there was one fellow, George Hanson, who blew his stack. So I thought, wait a minute, here's a guy that can straighten out this project. I met with him later and said, "George, you have very strong feelings. You're the only one that really spoke up." And he said, "God damn it, I know what needs to be done." At that point I put him in charge. He said he'd straighten it out. I said fine. The Navy was very worried because they viewed the failure as part of their fault for letting the problems develop and not being sure that the right

people were on the project. Cressor, the captain, would come to me and say gee he was worried and that he might catch hell for it and so forth. So the Navy was really relieved when we got that one straightened out and so was I.

NORBERG: Who was in charge of that project before Hanson took it over?

NORRIS: The person was Art Engstrom.

NORBERG: How about problems earlier? For example, John Howard was bought out in late '48 as well, essentially asked to leave, I guess.

NORRIS: That was more of an emotional thing. John was ill.

NORBERG: John Howard was ill.

NORRIS: Yes. I mean in the sense that he had terrible, terrible problems of coming to grips with the situation and so forth. That's characteristic of people are emotionally distressed.

NORBERG: I see.

NORRIS: He died fairly young.

NORBERG: I didn't realize he had that sort of problem. Okay. Now on this same site...

NORRIS: It wasn't as clear right at that time what the problem was, it became clear later. That is characteristic of those situations, you just can't figure out what the hell is going on and then later, as it develops, you can see that it was an emotional problem.

NORBERG: Well what sort of symptoms were there?

NORRIS: He couldn't make a decision. Everybody was against him. Other people making decisions that were wrong and so forth.

NORBERG: Make any challenges to take over or suggest that someone ought to be pushed out or...

NORRIS: I don't recall any of that.

NORBERG: On this same site, there were quite a large number of Navy personnel as well in the Naval Computing Machine Laboratory. What was their role in all of this, as an organization now? I guess what I'm asking, what's the association between NCML and ERA?

NORRIS: Well, first to maintain security, first and foremost. Second to be the inspector, the Naval inspector, as a representative of the Bureau of Ships. But as I mentioned earlier, it was much broader than that in a different relationship than a Naval inspector would ever have. They were actually working with us in determining what is reasonable performance and so forth. I guess that was essentially it.

NORBERG: How did it work physically? Were these people just as if they were employees of ERA or did they have a separate place?

NORRIS: Oh, they had a separate place, kind of set apart.

NORBERG: Were they likely to come wandering through the ERA buildings?

NORRIS: Oh yes, all the time. And they'd actually, sometimes actually work on the projects. There was a Commander Svendsen who was technically oriented, and he often worked with the project engineers.

NORBERG: And so these people would have been quite familiar with the ERA types that were working there as well.

NORRIS: Yes.

NORBERG: One of the things that I noticed you did not mention in the course of our discussions about ERA, especially when the overhead issue with Parker and his airplane came up, there were a number of other contracts, were there not, that ERA was pursuing? Or at least Northwestern Aeronautical Corporation was pursuing in the period up to at least the middle of '47. Various other aviation company projects.

NORRIS: Well, there was one, two or three with Wright Field. One was a cargo container that you could throw out of an airplane and it would survive the fall. I don't recall. I think there was one or two others, they were small projects, but at some point, they were transferred from Northwestern Aeronautical to Control Data.

NORBERG: To ERA.

NORRIS: I mean to ERA.

NORBERG: Okay. Those, I take it, were not real money-makers at all, so they couldn't provide any sort of cash flow.

NORRIS: Right.

NORBERG: Later on there was one thing developed, the antennae coupler, which apparently turned out to be very beneficial for Remington-Rand.

NORRIS: It was very profitable.

NORBERG: But it was too early for ERA to profit from. Okay. The period... This leads me right into the question of profit to begin with. The period from October '46 to October '47 was profitable. If you look at the annual report for the company, it was profitable. To what do you attribute this?

NORRIS: Well, we had a cost-plus-fixed-fee contract and we weren't spending hardly any money on marketing or R&D, so we hung onto it.

NORBERG: Well, but later on that didn't turn out to be the case.

NORRIS: Well, later on the company was trying to expand. That meant more money for marketing, a small amount of money for R&D, at least for proposal writing and that's what reduced the profit.

NORBERG: Was there very much debt in the company in its early years?

NORRIS: Well, that's about all there was.

NORBERG: Let me ask the question differently on that, Bill. Who did you owe money to?

NORRIS: First National Bank of St. Paul. The loan was guaranteed by Parker. Paid-in capital was very small -- 10 cents a share. I don't think it was over \$25,000, I've forgotten, but it was ridiculously small...

NORBERG: Well, when you say guaranteed by Parker, what did that mean?

NORRIS: That he personally had some liability for it. I guess I never knew exactly the extent to which he had liability. There was really not very much in the way of assets. The bank was somewhat uneasy about the loan.

NORBERG: Who owned the building?

NORRIS: The government.

NORBERG: The government owned the building, so in effect you really had very little capital in as you just said, except for the very little amount of money that had come from the sale of the stock. I'm trying to match this with Parker's comments about the money that he had to put up front and it seems to me that there wasn't a hell of a lot of money to be put up front.

NORRIS: That's right.

NORBERG: I'll have to check on that. Over time, the company increased it's work force and increased the amount of money that it was taking in, obviously, from the Federal government. Was there ever any period in those early years of the company that you were concerned that there wouldn't be sufficient money coming in from the Federal government in contracts to cover the payroll and so on?

NORRIS: No, we always managed to have enough working capital and contracts in hand so that there was never a time that there was a mad scramble to get another contract.

NORBERG: Did you feel that there was any competition out there for ERA?

NORRIS: No, not as such, not like there is today for Control Data. The main problem was gaining understanding of the potential for the technology. There were very few companies that had the technical resources in digital electronics at that period of time that ERA did. Our main selling job was to convince the government that digital electronics, indeed, was the best solution.

NORBERG: Now, what was the best solution?



NORRIS: ERA's knowledge, applying ERA's knowledge in digital electronic circuitry. We started to branch out. We got a contract from the Office of Naval Research for the Logistics Computer. We began to seek business from the Bureau of Ordnance, from the Bureau of Standards, and to get into the Air Force ballistic missile program.

NORBERG: These were all in the late 1940s now?

NORRIS: Oh, no. I've moved ahead.

NORBERG: Because all the first ones you mentioned until you get to the missiles were all late 1940s. The NBS contract was the middle of '48; there was an Air Force contract in the same year; there was the Army, oh what was it, a development center of some kind and so on. There were quite a number of those in '48 and '49 and then the ballistic missile things come in the early 1950s when that program gets going.

NORRIS: Just the ballistic missile program was later.

NORBERG: All right. Now, how was this business sought? Did they come to you? You meaning ERA?

NORRIS: No, we called on different agency. We had one or two people in so-called marketing. I made quite a few calls myself when I was in Washington and I maintained the relationship after I came back to Minnesota.

NORBERG: How about contacts with other companies in this same period, I'm thinking in the late '40s still?

NORRIS: Not many.

NORBERG: No attempt to sell other companies...

NORRIS: Just one, Automatic Electric. We tried to sell them a reservation system. Gee, I spent, oh, two weeks in

Miami talking to Mr. Adams, who was then the chief executive officer of Automatic Electric. He was getting older and lived there instead of Chicago, which was the headquarters of Automatic Electric. He wanted to proceed, but it was a pretty stodgy organization and they just couldn't see the potential. So we spent an awful lot of time and never got anything out of it.

NORBERG: Why did you choose them, Bill?

NORRIS: Because they needed to modernize. They'd been manufacturing cross-bar switching systems for many years. We warned them that cross-bar switching would soon be challenged by the new electronic technology. They agreed and that they were going to have to put a lot of money into development. We proposed that an airline reservation system would be a less expensive and less complex application than a telephone switching system -- hence, a good place to start with the new technology. Mr. Adams agreed, but we just couldn't get it accepted by other executives.

NORBERG: I'm still not quite clear on why you would settle on them. Had you looked at a range of companies and thought there's a good prospect for us?

NORRIS: No, I can't recall why we settled on them other than it was a company that obviously needed new technology and did not have a strong research capability, like Bell Labs of AT&T.

NORBERG: Yes, but that raises the question of things like Western Union, I guess.

NORRIS: We talked to Western Union. In fact, as I mentioned, we knew Admiral Redman, who had been head of Naval Communications. After the war he went to work as a vice president in Western Union. As a matter of fact, Engstrom met with him several times. But Western Union was another stodgy company.

NORBERG: Of course they had Bell behind them and so it made... By that time, they had Bell behind them. By 1950,

the company is beginning to look at places like Automatic Electric and other potential companies. I know of times when you went to describe the drum storage system and what it would do for various companies if they would purchase it. Do you recall when the first ideas about commercialization of ERA's products came about and how it came about?

NORRIS: Oh it was, I would say, during that period. Taking the magnetic drum, for example, it was obvious that there would be many uses for it. I called on Burroughs and two or three other companies suggesting uses for magnetic drums. This was natural. Everybody was interested in seeing the company expand its products. And of course, the John Plain [Company] was an obvious application, keeping track of inventory -- not a complex application. So it was just a natural evolution of thinking.

NORBERG: All right, but when you were going to places like Burroughs and so on, you were trying to sell them something that they would then incorporate into a larger system and sell the larger system.

NORRIS: Yes.

NORBERG: All right. Now that's a little different than some of the other proposals that were floating around the company at the same time for, say, the reservation system that you were also out trying to sell. There you were selling a system of your own.

NORRIS: That's right.

NORBERG: Okay. How were these distinctions made? Do you remember discussions about this?

NORRIS: Oh, nothing very profound. It was just to sell what you could sell. And, of course, I think this is the evolution that any new company takes. You can sell a component or you can sell a total system. Now, ordinarily, a total system requires a much larger investment and this was the reason we went to Automatic Electric. We had to

contract with them; we couldn't afford to put together a reservation system, but they could. On the other hand, in the case of the magnetic drum, we could deliver to Burroughs or anybody else a component for a system that was ready to go.

NORBERG: How does IBM fit into this picture? '49 now.

NORRIS: Yes. Well, somebody talked to IBM about using our magnetic drum storage and they were interested. IBM placed a contract with ERA. I didn't have anything to do with it. Parker met with Jim Birkenstock of IBM and Birkenstock offered him a contract. Parker showed it to me. It was an insult to our intelligence because of patent terms much more favorable to IBM than ERA. Hell, I said, "John, he's taking advantage of you." Well, we never did get contract properly structured. We were able to modify the terms to some extent, but IBM had rights that they should never have had. They should never have asked for them in the first place. But again, that was evidence of Parker's lack of real understanding of the business. To him the fact that IBM would contract with us for anything on any basis was a great coup, because he didn't have the perception of what a proper technical relationship ought to be. But we performed the work and the outcome was advantageous to ERA. We learned some things. IBM interjected some technical perspectives new to us. And I think the contract produced useful for IBM.

NORBERG: Is it possible that the IBM contract, and the negotiations surrounding it, were the things that set off thinking about commercialization?

NORRIS: No.

NORBERG: You don't think so. Why not?

NORRIS: It was just another place to sell something. That would have been no more likely than with Burroughs.

NORBERG: Do you think you would have had to enter into a similar sort of contract with Burroughs? Not

necessarily transferring all the technical know-how, but a similar sort of contract where you'd be transferring more than just the product?

NORRIS: Well, that wasn't what I had in mind. What I had in mind was selling a product. But as I recall, it was quite some time later before we actually sold Burroughs a drum. By that time, it was a drop in the bucket of a much larger business.

NORBERG: Can we go back to your reaction to at least the draft, because it went through several drafts, the contract with IBM. You said you commented to Parker that this is terrible. What did you do about it?

NORRIS: Well, it was his contract. He was the one that had been talking with Jim Birkenstock, who was a senior IBM vice president. I had had nothing to do with it. So it was his responsibility to get it straightened out.

NORBERG: And you don't think he did?

NORRIS: No. It was improved, but much more could have been done had the person doing it really understood what needed to be done.

NORBERG: Well, why couldn't you be more forceful about the matter?

NORRIS: Well, you have to pick the circumstances where you want to fight with your boss and that wasn't one of them.

NORBERG: Why not? That seemed very serious.

NORRIS: Pardon?

NORBERG: That contract seemed very serious.

NORRIS: Not that serious.

TAPE 2/SIDE 2

NORBERG: Now I don't understand that, financing Control Data.

NORRIS: I'm sorry, I keep referring to Control Data.

NORBERG: Oh, so you mean financing ERA.

NORRIS: ERA, right.

NORBERG: And by that time, you really did have a problem, then, is that what you're suggesting?

NORRIS: Oh, we had a problem from day one. It was a terrible handicap to have to grow without any capital base, but that's the way it was and we made the best of it. You could see the opportunity expanding for the company but no inclination on the part of Parker to really look seriously at providing adequate financing. And that was the area that I argued with him on as opposed to a particular contract. And in point of fact, it got to the point where he didn't even want to talk to me about it, because he didn't want to finance the company. So that in any discussion with me it always put him in an awkward position, because he didn't really have in mind finding a solution, other than to sell the company.

NORBERG: Now when you say he didn't want to finance it, you mean he didn't want to finance it himself, or he didn't want it to grow beyond this so he didn't look for financing elsewhere either?

NORRIS: Either one. Because any additional financing and a considerable expansion would involve risk obviously, and he just preferred to cash in his chips.

NORBERG: Well, he certainly could have done that without selling the company off in the way he did. Don't you think?

NORRIS: No, I'm not sure. I don't know that it was that obvious at that point in time -- the future of ERA.

NORBERG: That's obviously a conclusion being drawn from the witness. Let me go back to some facts in that period, though. Parker commissioned a study to be done, analyzing both the financial condition of ERA and also its potential. And that study seems to me, at least in hindsight, to be fairly thorough. That it was pretty clear that most of the money, if not all the money was coming from the Federal government. It also seemed that it was going to be a few more years before technical development would be at a stage where you could expect to sell products on the open market. The 1101 was still not a functioning system at the time. And thirdly, that it would require an inventory and therefore further financing as you just suggested. Now, was that report circulated around the company?

NORRIS: I never saw it to the best of my recollection. It had obviously incomplete conclusions. There's still the government market, the military market, that could have been addressed, which was the one that we were in, and had the potential to be big in just that narrow field. Again it was very clear to me that Parker didn't really want to finance the company, because frequently he had somebody proving, so he thought, that this would be a bad idea. He had some guy visit St. Paul from Auchincloss, Parker, and Redpath, and he talked for about an hour on the risks of a small company and how it should seek the shelter of a larger organization and that by seeking the shelter of a large organization it would make it possible for all these geniuses in the company to realize their ambitions and so forth -- again, further evidence that Parker didn't really have in mind anything other than to sell the company and cash in.

NORBERG: Do you remember when these visits were occurring? That is, the man from Auchincloss, Parker, and Redpath?

NORRIS: Not exactly, no.

NORBERG: Do you remember other, that is, representatives from other companies coming to look at ERA?

NORRIS: No one else ever looked at the company to my knowledge. If somebody looked, I didn't know it.

NORBERG: You didn't know that's what they were looking for.

NORRIS: Right, right.

NORBERG: Do you remember interactions with other companies, though, specifically in this area in which there would be discussions about what sort of mutual benefit there would be if the two companies worked together?

NORRIS: I don't recall any.

NORBERG: Arnold Cohen has mentioned to me a couple of such instances, one from Honeywell, specifically, that he remembers, because he was the lead technical person involved in late '50, early '51. He couldn't remember exactly the date, but he did know that because he had some notes in his files about some projects at that time, and there was a mention of the Honeywell people coming through. He claims, in hindsight, that those people were probably looking over the potential of ERA. But you don't remember any of these sorts of visits at all?

NORRIS: I really doubt that, anyway.

NORBERG: You doubt it.

NORRIS: Yes, I don't think Honeywell had that perception then, but who knows?



NORBERG: Well, as I said, Arnold didn't know either, he was just guessing on that one. When it came time, then, to sell the company to Remington-Rand, your comments all suggest that you had no knowledge of this before the event. Is that true?

NORRIS: Yes, until it was pretty well advanced and Parker told me about it. And I said, "Well, Johnny if you want to sell the company, hell, I'm not going to get into a fight with you, but you know my position on it, I think you're making a hell of a big mistake." Well, he said, "You know, you'd have all these advantages of being in a large company." And I said, "Johnny, listen, I worked for a large company. I worked for Westinghouse. God damn it, if I want to work for a large company, I'll go get a job with a large company, so don't give me that as an argument." Well, he said, "You want to, you know, want to be open minded about this thing. Hell, sometimes these little companies are acquired by big companies and the guys wind up on top." Well, that was quite a prophetic statement, because about a year later, Johnny wound up working for me. I guess it was two years later.

NORBERG: All right. But you didn't much care for this idea of selling...

NORRIS: Didn't much care for it, I was absolutely opposed to it. It was the wrong thing to do.

NORBERG: Did you consider buying him out?

NORRIS: Well, I had no money, I couldn't buy him out.

NORBERG: Couldn't even... You didn't even think it was possible.

NORRIS: Well, there wasn't a venture capital industry then. It was still very difficult to raise money. So there really weren't any other options.

NORBERG: There weren't. But there were five years later.

NORRIS: Yes, but there was dramatic change in the environment. And as a matter of fact, Control Data helped change it. We were the ones that really opened the era of the dollar stock, which gave the venture capital a hell of a boost.

NORBERG: What transpired, then, when the company was sold? That is, when did you have your first contact with the people from Remington-Rand?

NORRIS: Oh, it was just a few days after the deal was closed. I was notified that Hugh Duncan, an ex-ERA employee, who had been hired by Remington-Rand, was coming to visit us. That word went through the plant. It was stupid having one of us come back and look at us. I called the liaison guy, I think his name was Beverly Bond, and I said, "Listen, you get this guy back on the god damn airplane or you're going to lose about half your technical staff." And he said, "Well, christ, the old man sent him out." And I said, "Well, tell the old man to pull him back. Get him on the god damn airplane or you're going to lose half of what you bought." In about an hour, Duncan said he'd just gotten a call to go back to Norwalk. As a result there was a conversation about just how this sort of thing should be handled which led to a more formal arrangement. They didn't want to work through Parker; they wanted Parker to report to them. They also wanted me to report to them. So I worked out an arrangement where they'd come out, we'd make a presentation as to what we're doing, and then we'd decide then on monthly reports. And if they wanted to assign somebody as liaison that would be fine. They never did.

NORBERG: Now who's the they you're talking about?

NORRIS: The executive committee of Remington-Rand.

NORBERG: So it would be people like James Rand and his closest group of executives.

NORRIS: Well, it would be the guys on the executive committee. There was Beverly Bond, B. F. Anderson, Art Rumbles, and two or three others.

NORBERG: So this is all going on then in that period from, say middle '51 when the sale was agreed to through to when Remington-Rand officially took over.

NORRIS: And I had a good working relation. In fact, we needed more space. We were still in an old building. Space was one of my priorities. I had told Parker, "Listen, I don't like this, but if somebody buys the business, I'll stay at least two years. I think I owe that to the buyer. But from then on, though, you make it clear that I'm free to do what I want to do." He did that. One of the first things I said that they should do if they really were serious about expanding the business was to provide us with decent quarters. Well, we got a new plant located at the confluence of the Mississippi and the Minnesota Rivers. ERA was making money and Remington-Rand was very proud of that, because their Eckert-Mauchly division was losing money. So I had a reasonable relationship for a couple of years.

NORBERG: Was there any talk of combining the three operations in the electronic computer business?

NORRIS: No. That happened after Sperry came into the picture.

NORBERG: None whatsoever?

NORRIS: None whatsoever.

NORBERG: Didn't you find that a little odd?

NORRIS: Yes.

NORBERG: Was the...

NORRIS: It wasn't odd under the circumstances, though. Odd in the traditional sense.

NORBERG: Because there are obvious strengths that one can achieve if one combines operations, if we listen to the Burroughs-Sperry line these days.

NORRIS: That's right.

NORBERG: But what sort of contact did you have with either Sperry or Norwalk? You just suggested that you wanted to get Hugh Duncan the hell back in the airplane.

NORRIS: You mean Philadelphia, not Sperry.

NORBERG: I'm sorry, Philadelphia, yes. With Philadelphia and Norwalk?

NORRIS: Very little. Pres Eckert took the view that what ERA was doing was not state of the art. Therefore, he didn't want to waste his time with us. Norwalk was less involved in electronics. They were still in the tabulator era. So that was about the way it was viewed. And also that ERA was doing work for the government, well, oh, fine you just go ahead and do it and have fun.

NORBERG: That seems like a pretty sloppy way to run the business to me.

NORRIS: Oh, it was terrible.

NORBERG: And it doesn't lead to any great development within the companies themselves.

NORRIS: That's right.

NORBERG: Parker moved off to New York.

NORRIS: He was assigned to sell the products of ERA and UNIVAC. Parker was the unifier from a market point of view, and product point of view to some extent.

NORBERG: Was there any interaction between you and Parker after that?

NORRIS: Oh, yes. But since there was not too much to sell from ERA -- we were in the process of developing and manufacturing the 1101, but we didn't really have any marketing plan. Thus, Parker's main focus was UNIVAC for Eckert-Mauchly.

NORBERG: Did he take any of your people to help him with the marketing?

NORRIS: Yes, I think he hired one or two. I can remember a younger person, Graham Smith from ERA who went to work for Parker. I don't remember anyone else.

NORBERG: He didn't borrow any of your staff that you recall?

NORRIS: No.

NORBERG: How about Erwin Tomash?

NORRIS: Yes, that's true. Erwin did work in New York, didn't he?

NORBERG: Yes. For a while, anyway.

NORRIS: For a while.

NORBERG: He decided he preferred to stay in Los Angeles. All right. Now, did the new association with Remington-Rand make your management job easier in St. Paul?

NORRIS: Yes, because I had more funding.

NORBERG: Is that the only reason? More funding?

NORRIS: Yes. And it was really easier to operate with Remington-Rand than Parker, because they never came near the place.

NORBERG: That has both its good and its bad side. Well, how did you get the greater funding? If nobody came near the place, you didn't just send memos back and say I need another \$100,000 and they'd send the check.

NORRIS: Well, I regularly went to Mecca, to Norwalk, and that was one of the high points in my life. I'd go there about every two weeks. Remington Rand headquarters was located in the Fairless mansion in Norwalk -- beautiful grounds, beautiful building. All of the top executives had offices there. I'd go there every two weeks on Thursday. The reason I picked Thursday was because General MacArthur was there on that day. I could see the old man (Jim Rand), my liaison Art Rumbles or Bev Bond or whomever the hell he was and any point. I had three or four right in quick succession. After meetings in the morning we'd have lunch and MacArthur would reminisce for three or four hours and then I'd ride back to New York with him.

NORBERG: Were there ever any meetings among the various divisions in which distribution of resources would be under discussion and therefore, you'd have to compete with, say, Eckert-Mauchly division for resources?

NORRIS: Not in Norwalk, no. I never attended any.

NORBERG: So there was really no interaction with, say, Pres Eckert?

NORRIS: None. None.

NORBERG: Well, there are some memos, Bill, they tend to be later, '54 and '55 in which there is some interaction back and forth and there is considerable criticism of what's going on in St. Paul by Eckert. Secondly, there is some infighting after Thornton Frye comes aboard in the company and so on.

NORRIS: Oh, yes. In '55, I became general manager of the UNIVAC division. And I had under me both Eckert and St. Paul. And then there was a hell of a lot of discussion.

NORBERG: But none before that.

NORRIS: Not very much.

NORBERG: I don't find very much of it either...

NORRIS: Well, there wasn't very much.

NORBERG: ...in the records, and I'm trying to confirm whether or not there was or was not.

NORRIS: No. No, from '52 to '55, there was very, very little, not much of a relationship between ERA and Eckert-Mauchly.

NORBERG: Now there are a couple of machines, though, that are delivered in that period. The UNIVAC II gets under development, the 1103 is under development at this same time; and then there's some problem with the UNIVAC

being delivered in Louisville. Do you remember anything about those?

NORRIS: Yes. There were hellish problems with UNIVAC I. The initial contracts were for \$250 or \$300,000 and they cost over \$1,000,000 each. They were delivered late. Parker was located in New York at the time if the serious problems with UNIVAC. But there wasn't any relationship with ERA. ERA was not involved in any way.

NORBERG: But Drake was sent down to Louisville to get that thing into operation.

NORRIS: No, not really. Drake isn't an engineer.

NORBERG: That's what Drake told me.

NORRIS: What?

NORBERG: That's what Drake told me.

NORRIS: Oh, he went there to hold hands and to get the people to work together and so forth. He was what you'd call a contract representative.

NORBERG: But why send Drake? Why didn't somebody from Eckert-Mauchly go?

NORRIS: They probably told Parker to go to hell. I don't know.

NORBERG: All right. What I'm trying to get at here is that your responsibility isn't to make sure that their machines run as well as your own.

NORRIS: I had no responsibility and no one else in ERA had any responsibility for Univac systems. Whatever Bill



Drake did, he did for Johnny Parker.

NORBERG: Do I understand, then, that what you said a few minutes ago is that you found it better to work under Remington-Rand than it had been to work under Parker.

NORRIS: Yes, yes.

NORBERG: And it wasn't until after Sperry took over the company that things began to develop that sort of made it a little more difficult.

NORRIS: Well, the basic problem wasn't Remington-Rand, it was Harry Vickers and Sperry. It was after the merger of Sperry and Remington.

NORBERG: How so?

NORRIS: Well, he told me that he wanted to be number one. And I said, "Well, we're making money in ERA, we're losing money in UNIVAC, and if you want to be number one, you've got to invest a lot more money, which means that the whole UNIVAC division is going to operate at a loss. And he said, "I don't care. The difference between a few hundred thousand dollars or two or three million dollars in loss is not relevant. I want to be the leader." I said, "Fine." Well, I was a damn fool for ever believing him, but after all, he was the boss. So I embarked on a more ambitious research and development program. Well, as soon as the losses started to show up then everybody started to bitch and bellow. I reminded him of the fact that I was doing what I was told. There was another problem with tabulating machinery inventory that should have been written off ten years earlier. Sperry inherited the inventory -- something like \$75 million dollars at book value -- a real slug. They wanted me, as head of the UNIVAC division, to attest to the fact that it was good inventory. When I said, "I can't do that," we got into a big ring-tang-too. So it was just one problem after another, and fundamentally, Harry Vickers didn't understand what it was that he bought. He thought he bought into the computer business. What he bought was a chance to get into the computer

business by investing a hell of a lot more in R&D. And he wasn't prepared to spend the money.

NORBERG: Would you say that the Remington-Rand people back in '51 and '52 felt that they were doing the same thing? Buying into the computer business?

NORRIS: The old man did, yes.

NORBERG: And so they ran into the same sort of problem that...

NORRIS: Yes. They didn't have a computer business. They had a computer R&D enterprise.

NORBERG: How did you people go about assessing the competition, then at the time. IBM, Sylvania, which was now...

NORRIS: No, there really wasn't any competition. IBM was still focusing on tabulating machinery. And the problem was convincing people that this new technology had merit when there was the alternative, a much slower, much less flexible tabulating machinery. In fact, that was one of the handicaps in Remington-Rand. They had that big investment in tabulating equipment, which they weren't anxious to obsolete.

NORBERG: But yet there must have been something along the grapevine that there were going to be new machines coming out of places like IBM very soon.

NORRIS: Well, yes, there was. And that's what aggravated the problem. That's what obsoleted the inventory. But they didn't write it off until after they made their deal.

NORBERG: Was there sufficient interest in building enough, say 1103s at that period, '55 or not? I mean, you talked about the research and development side, but how about the inventory side? How about developing more machines

to get them out there for sale?

NORRIS: Well, that was no problem.

NORBERG: That was no problem.

NORRIS: No.

NORBERG: That strikes me as a good stopping point, Bill, for today.

DATE: October 1, 1986

TAPE 3/SIDE 1

NORBERG: Bill, I'd like to return to a subject we explored only lightly in the last session and that is machine development. First I'd like to ask about task designations. When tasks such as 1 through 3 were contracted for with ERA, it seems that the Navy had a number of projects in mind that could be done under any one of those task numbers, depending upon what the task was designed to do like consulting or training or whatever. Was this always true? For example, was Task 13 devoted only to the development of one machine, the Atlas?

NORRIS: Oh, yes. Where there was a specific objective like a machine that was normally a task.

NORBERG: Who was responsible for producing the Atlas? That is, who did you designate within the St. Paul operations to accomplish Task 13.

NORRIS: We were operating mainly on a project basis. I think it was Arnie Cohen.

NORBERG: All the way through?

NORRIS: Oh, I think so.

NORBERG: Because if you remember, Mullaney was the one to publish a paper on the subject in 1951, describing in that case, the 1101.

NORRIS: Have you talked to Frank? What did he say? He would know.

NORBERG: Well, there are several levels of responsibility that are obvious.

NORRIS: Yes. Well, Cohen was in charge of the logic of Atlas.

NORBERG: Right. And then Frank in terms of the execution of that logic into some sort of specific circuit design.

NORRIS: But I kind of remember Cohen as being in charge of Task 13, but...

NORBERG: Okay, that's fine, thinking about it from your perspective. How did the shift from Task 13 or Atlas to 1101 come about?

NORRIS: Engstrom was vice president for research. He wanted to get on with a commercial version. It was his initiative.

NORBERG: And how was this worked out with you and perhaps Parker and others?

NORRIS: Oh, just whatever Howard wanted, we did.

NORBERG: It was that simple?

NORRIS: Yes.

NORBERG: I mean here's a case where some decisions have to be made about moving into a different kind of market, don't they?

NORRIS: No. That was different only in the fact that it was going more toward a commercial project which we all wanted to do. So it was just a question of, well, this is where we all wanted to go, now let's get with it.

NORBERG: When you say this is what we all wanted to do, what does that mean?

NORRIS: To commercialize the technology.

NORBERG: Based on what sort of model, just desire to sell to anyone who would come along?

NORRIS: Well, yes commensurate with, depending on what we had. Everyone was very confident that we could build a commercial version of Atlas. So the decision was easy.

NORBERG: Were any sales calls made at the time?

NORRIS: Yes. And again, I think Howard Engstrom spent some time making sales calls, so to speak -- Georgia Tech, for example.

NORBERG: Why do you mention Georgia Tech? Because it's listed there or because you remember it specifically?

NORRIS: Oh, I remember specifically as Georgia Tech was the recipient of the first 1101.

NORBERG: The first commercial 1101.

NORRIS: Yes.

NORBERG: Well, let me ask that question a little differently. Somewhere along the line there was at least a consideration if not a decision made that one of the 1101s would be placed in the Arlington facility.

NORRIS: That was never really a decision. That would have been a nice thing to do, and Engstrom wanted one, but we couldn't afford it.

NORBERG: I see, so it was based on economics that it never got there.

NORRIS: Right.

NORBERG: So it went to Georgia Tech instead, that is, that first machine went to Georgia Tech?

NORRIS: I really think it was always intended to go there.

NORBERG: Why was it always intended? How did the Georgia Tech contract come about?

NORRIS: Well, again Howard Engstrom behind it might provide the best environment for a new machine. Beyond that I don't recall. Georgia Tech has always been in the forefront in a number of technical fields, and I think Howard had some connection with that institution during the war.

NORBERG: That one's a bit of a puzzle to me, because I think in those days Georgia Tech's reputation was not what it is now, certainly, even relatively speaking.

NORRIS: I think they were stirring. And it was the beginning of what you see now. It certainly took some imagination to acquire an I101 at that point in time.

NORBERG: But why?

NORRIS: Why?

NORBERG: Yes.

NORRIS: Well, it's the first really commercial scientific computer.

NORBERG: Let's see. It went to Georgia Tech in 1954, which means that somehow the contract would, say, be two years before, just for the sake of discussion here, so it would be about 1952. At that time did it still take imagination?

NORRIS: Yes. Keep in mind that a number of the early machines didn't work very well.

NORBERG: There certainly weren't very many around when you consider the UNIVAC machines and a couple of others.

NORRIS: Right.

NORBERG: But I guess what I'm having difficulty foreseeing here is why Georgia Tech? Why not some of the bigger places? Harvard had a machine, MIT had at least the stirrings of a machine.

NORRIS: Well, they had Whirlwind.

NORBERG: Yes.

NORRIS: And they took a pretty dim view of anybody else as far as being in the forefront is concerned. They respected ERA, because what we had built, worked. But, it wasn't necessarily of interest to MIT just because it worked.

NORBERG: Yes. Now there were a number of companies in the New York City vicinity that were interested by that time in machines. Were they not even approached?

NORRIS: Not in a scientific machine.

NORBERG: Okay. That would be strictly business machines and you people weren't even looking for that market.

NORRIS: Right.

NORBERG: You and Engstrom paid a visit to MIT, specifically on August 21, 1951, and in fact, there was quite a lot of toing and froing between MIT people and ERA people. I take it this was to sell them a drum?

NORRIS: Yes

NORBERG: Or somehow use a drum with their Whirlwind machine.

NORRIS: Right.

NORBERG: Was there any other transfer contemplated? Were you talking with them about technical developments of any kind other than that?

NORRIS: No.



NORBERG: There were three 1102s and as far as I can tell, they were all for Air Force contracts.

NORRIS: That's right.

NORBERG: Is that your recollection, too?

NORRIS: Right.

NORBERG: How was the 1102 related to the 1101?

NORRIS: Oh...

NORBERG: I'm not thinking of specific circuitry or any of that kind, I can look that up, but in terms of why it even had a new designator. Why didn't the Air Force buy 1101s?

NORRIS: I can't answer that.

NORBERG: Now, when the 1101 or the Atlas was contracted for, you were still in St. Paul were you not?

NORRIS: Oh yes.

NORBERG: It would have been in the middle of '47.

NORRIS: Yes.

NORBERG: So you were still in St. Paul. How about the 1103, the two prototypes that became the 1103? Were you

still in St. Paul then when that contract was let, Task 2-... I want to say 29 but it could have been 23.

NORRIS: That was quite a bit later. Yes, I was still there.

NORBERG: So you were involved...

NORRIS: Wait a minute. I was only in Washington for a year and then I came back to St. Paul. So I was there at that time.

NORBERG: Okay, but do you remember the negotiations about the 1103, Atlas II?

NORRIS: Yes.

NORBERG: I don't find anything about those. There's a good deal about Atlas I and people seem to remember Atlas I but not Atlas II. Another thing which is related to this and why I wonder about both the Atlas I and the Atlas II is something Svendsen said to me and that is a concern on the part of the Navy that some of the early machines that had been contracted for, built, and delivered, by the time they were delivered -- and this was no criticism of the way the work had been done on his part -- by the time they had been delivered, the single purpose for which they had been designed was no longer necessary. Therefore, the Navy thought, Eachus and Pendergrass and so on, that they should shift to a more general purpose machine. Now there it seems to me 1101 or Atlas I would serve quite well those purposes. Why go to an 1103?

NORRIS: Oh, well, it was a more advanced machine.

NORBERG: In what sense?

NORRIS: It had additional features. I don't recall. We learned quite a bit by the time the 1103 came along.

NORBERG: Such as?

NORRIS: Oh, I just don't remember other than that the 1103 represented a considerable advancement over the 1101.

NORBERG: I think that's true as well. The 1103 was a quite successful machine in terms of the number of machines that were sold over the next several years. Do you recall the thinking about the commercial possibilities for 1103 around 1952 say?

NORRIS: Not really other than that there was a market. As far as making any survey or market study we didn't. It's very difficult to study a market that doesn't yet exist.

NORBERG: Yes. Because I ask that because if you look at the list of sales, they're all to military contractors or, I'm sorry, to the military or to military contractors in every case right up through the time you left Sperry and then even after some of those orders would have been in hand. And that makes me ask again, were any approaches made to other organizations? There were two sold to Johns Hopkins University, two laboratories which were doing government sponsored work. And there was one sale to the University of North Carolina, which I don't understand. I'm not exactly sure why they wanted one. It certainly wasn't for military contracts because they didn't have any military contracts to my knowledge. So all of the scientific machines were being sold to the military and military contractors. Any attempt in those years, '52-'57 to try and sell 1103s to others?

NORRIS: I don't think so. I doubt that they had the funding at that time. Universities really didn't get funding for computers until quite a bit later unless they had a military contract that required them.

NORBERG: What do you mean by quite a bit later?

NORRIS: Oh, somewhere in the '60s.

NORBERG: I see, so it is that late. It's a decade later.

NORRIS: Right, damn near.

NORBERG: Yes, so it's not possible to sell to them. Okay. By this time then, in post '52, it would be... let me ask you rather than concluding it, do you think it was the policy of Remington Rand and then Sperry Rand to keep the business activities within UNIVAC machines and scientific applications within the 1103 machines, so that there was a separation between Philadelphia and St. Paul naturally on the basis of these two machines?

NORRIS: Yes, that was the policy willy nilly.

NORBERG: When you say willy nilly, what do you mean?

NORRIS: It wouldn't have been possible for it to have been otherwise.

NORBERG: Why?

NORRIS: Well, there was an enormous difference between architecture of the UNIVAC and the 1103. Also, the disparity in the objectives of the two organizations. Pres Eckert was only interested in human applications. ERA was interested in scientific and engineering, because we didn't have the resources to go beyond those fields. And there was always the belief that there was a substantial market there; thus we focused on the scientific and engineering segment.

NORBERG: But yet didn't you tell me last time that people at St. Paul felt that the Eckert-Mauchly division certainly had some interesting designs in their machines?

NORRIS: Yes, but not applicable to the architecture that ERA was using.

NORBERG: I have one remaining question about the... I'm sorry, I didn't follow up on that quite completely, was this division between business and scientific acceptable to the ERA staff?

NORRIS: Yes.

NORBERG: It was. So there was no conflict in their mind about what they were not being allowed to do?

NORRIS: Right.

NORBERG: I have one remaining question about...

NORRIS: As far as the 1103, as far as the large computer is concerned.

NORBERG: Okay. In what sense was it not acceptable?

NORRIS: You've heard of the File computer that came along later as an outgrowth of the John Plain machine. ERA saw a market for smaller machines, a commercial type market, not seeking the same market as UNIVAC, but still a market with considerable potential, which the File computer was the addressed.

NORBERG: I'll return to that in a moment with another question. I have one remaining question about the sale period, that is, '51, '52. We have found annual reports for ERA up to the end of fiscal year 1950. That is, October 31st, 1950. As a private company, we know it didn't have any responsibility to circulate reports except to the Associates, but they did print these up to October 1950. Was there a report for fiscal year 1951 -- 1 November 1950 to 31 October 1951?

NORRIS: Oh, I'm sure there was. Yet it was probably just another monthly accounting report.

NORBERG: Rather than the printed form that had occurred in the previous years.

NORRIS: Yes.

NORBERG: Because I've not found one and I've looked everywhere.

NORRIS: Yes, right. As a matter of fact, I don't recall. I only recall seeing one so-called annual report, which you have in your file.

NORBERG: The first one came out in '47 and then went through 1950.

NORRIS: Right.

NORBERG: All right. When was the agreement made between Remington Rand and ERA to be acquired?

NORRIS: It was '52.

NORBERG: Well, it was in May '52 that the actual transfer took place.

NORRIS: Well, it would have been December, I think.

NORBERG: Okay, so that's after the end of that fiscal year?

NORRIS: Yes, which again suggests that there wasn't a hell of a lot of interest in an annual report, just a normal accounting report.

NORBERG: I'll have to look for accounting reports, then, to see whether or not I can fill in that gap, because there's no indication of what happened during that fiscal year of '51 in comparison to the previous years and so on. And then, in fiscal year '52, of course, that would show up in the Remington-Rand report that's not broken out, so there's no way to know that except through sales reports. All right. Now I want to come back to this other question that I said I would return to. A major reorganization of what was called the operations division, occurred in Remington-Rand in the spring of 1953. I don't have the organizational chart, but it apparently did involve quite a number of changes in the organization. And you were listed as an assistant vice president and you had certain executive assistants and sales promotion and so on with Knight Prior and Bill Drake. Do you recall this as a major reorganization period at all?

NORRIS: No.

NORBERG: How about 1954?

NORRIS: No.

NORBERG: January '54 it was even bigger and I can show you that one because it struck me so much that I copied down a good amount of what was going on under you here in St. Paul. And you can see that it's divided up into design, support and also some of the contracting services and so on. And that one, the January 1954 one, suggests the shift to an arrangement to separate design and manufacturing and services in St. Paul. Does any of this come back to you when you see that?

NORRIS: No, none of it. Organizations, you know, come and go. This sort of thing was going on continuously. So I don't have any recollection. Why is it important?

NORBERG: Well, I'll show you another document. I have three more. I'm really investigating the reasons why you

left and coming to a better understanding of some of the things that occurred. What I have here is now after the Sperry/Remington merger in 1956 and I was trying to lead up to these to show what sort of model was being done. In the fall of 1956, a suggested division of effort among Norwalk, Philadelphia, and St. Paul was at least proposed by Robert Sorensen, who at that time, as you remember, was head of Norwalk. And he wrote a suggested plan of product planning, development, and design that he submitted to Thornton Fry in July of 1956. I've not seen that document, but I have seen Fry's responses to it and Fry like the idea. Then there were a flurry of memoranda back and forth which ended up in this rough draft of a suggested division of effort.

NORRIS: Let's see, at that time, Thornton Fry was reporting to Marcel Rand?

NORBERG: Yes, that's correct.

NORRIS: All right.

NORBERG: Now this, I think, was not out of Fry's office. I think Bill Butler developed this. It's attached to a document that he produced and sent to you. Do you remember this? I don't mean the particular document; I'm just curious about the issue.

NORRIS: I don't even remember the exercise.

NORBERG: Do you remember this sort of product planning design scheme?

NORRIS: No. I don't really think it was anything significant.

NORBERG: Well, all right.

NORRIS: Keep trying!



NORBERG: Let's go to the next phase. I think it is relevant, at least I'm trying to decide that it's relevant, because in February of 1957, this begins to stir up again. Nothing seems to be done at the end of '56. But there were many memos passed between Stutzman, Kalb, Butler, and you about organizational changes. Principles of organization in the operations division and also some clarifications of responsibility. And one of those documents that tries to clarify responsibilities done by Butler to Stutzman with a copy to you and it makes reference to a number of these previous documents that I just talked about that were floating around at that time.

NORRIS: Well, this was all part of the goddamn turmoil.

NORBERG: All right, but the turmoil seems to involve you, because on February 11th, just before this document was prepared, you wrote a memorandum entitled, "Recommendations of the Vice President and General Manager of the UNIVAC Division for Product Planning, Large-scale Computers," and it's that document that I'm most interested in. What sort of response did you get from New York on that document?

NORRIS: Probably none.

NORBERG: Probably none.

NORRIS: Right. I never got any response out of Marcel Rand.

NORBERG: How about out of Fry?

NORRIS: Essentially the same thing. Two things about Fry: Fry was a double-crosser, and secondly, he didn't really understand the business. He came out of Bell Labs, a bright guy, intellectual, but he didn't really understand much about organization.

NORBERG: Well, was there some other sort of ferment about organization going on at the time? In the spring of '57, *this* was promulgated around the company: a statement of policy about the nature of the UNIVAC division.

NORRIS: I think by this time they had decided that they were going to separate engineering and manufacturing.

NORBERG: Can you enlighten me as to what the meaning of this might have been in 1957 when it was promulgated?

NORRIS: Yes, it was just goddamn ignorance on the part of the top management of Sperry Rand. There was a guy there by the name of B.F. Anderson, who was a good alley fighter was in charge of manufacturing. But he never could get control of manufacturing in the UNIVAC division, because his perception of manufacturing was to take it all over, have the engineer throw the design over the fence, thank you, and we'll go make it. Well, that wasn't my perception. So we tried very hard to work with him, because after all, anybody has a certain contribution to make. But it was very, very hard, because every time you turned around they were trying to take over the whole thing. For example, one manifestation of this was in connection with a union -- which was a stupid thing to let happen, but Parker let the union in Northwestern Aeronautical organize the manufacturing personnel in ERA. Jim Rand didn't like the pay scale. And he told me to reduce. I said, fine, I'll do what I can. When we got into negotiation the union balked. So B.I. Anderson came out to meet with the union. He said the old man wants you to make a deal, which in the old man's approach was to give the union leader money so he'd agree to lower wage rates for the other members. I said I can't do that. If you want to, you go out behind the barn and do any goddamn thing you want to, but it's your responsibility. He did. So you can easily imagine how my relationship deteriorated with the old man after that, and B.F. Anderson, as well.

NORBERG: Well, now, that would only affect new hires, wouldn't it?

NORRIS: No, no, no. This was a union contract.

NORBERG: Actually cutting the wage rates of the people who were already working for the company?

NORRIS: Yes, changing classifications in some manner and winding up with a lower pay scale through reclassification. Establish a new classification and a lower rate and suddenly you find that you can do a lot of your work with people in that grade scale.

NORBERG: I see. Can you tell me the differences between what Anderson would be proposing with Fry in this document, versus what sort of manufacturing was going on in the ERA division? How was that...

NORRIS: Oh, he wanted direct control over the manufacturing. That was very simple.

NORBERG: All right, but what sort of manufacturing was going on here in St. Paul?

NORRIS: Making 1103s and antenna couplers.

NORBERG: I see. And the 1103s were not very extensive in terms of manufacturing, so why would he care about that?

NORRIS: Well, there were people doing manufacturing and that's his responsibility. A stupid overall management sees that as very logical.

NORBERG: How many antenna couplers might be coming off the line every month?

NORRIS: Oh, maybe 20, 30, 50. I've forgotten. It was a pretty nice business.

NORBERG: It's a nice small number, though, not thousands.

NORRIS: No, no.

NORBERG: This doesn't seem like the sort of thing one should fight over, which I guess is your conclusion back in 1957?

NORRIS: Yes, right. It's too stupid to fight about. And beyond that, of course, was the far more serious problem was the unwillingness to support the required level of research and development.

NORBERG: That's something I'm also going to come back to from last time. But let me just pursue this a little bit further.

NORRIS: Oh, one other thing. We had terribly poor plant space in St. Paul. You saw pictures of the building at 1902 West Minnehaha. By 1952, we were getting large R&D contracts from the Air Force. I well remember when Air Force General Shrever, who later joined Control Data's board, visited ERA St. Paul and castigated us for not having better facilities. He always jokes with me about this.

TAPE 3/SIDE 2

NORRIS: ... General in the Air Force. Yes, I told him that although ERA doesn't have the greatest facilities in the world, don't let that blind you to the fact that we've got the best talent. He said okay, but if I give you the contract, for Christ's sake, will you do something about improving the facility? I said yes, as soon as it's possible. When we became part of Remington-Rand I told the old man that we desperately needed better space, particularly for military contracts. He could understand that. So he said, fine, B.F. Anderson, who was in charge of building and would come out, and so forth. Well, I said, I'll work with him and we can get some help from the community. We got a choice area overlooking the confluence of the Minnesota and Mississippi River. B.F. Anderson, unknown to me, went to the community and exacted additional concessions in my name. He never told me about it. And, in fact, I didn't know about it until two years later after the goddamn plant had been built, until one of the bankers came out and wanted some business. And I said, hell, you haven't done anything to earn it. "What the hell do you mean," he

said. "I gave B.F. Anderson \$20,000 as part of the pool that the community kicked in in order to help finance your building." Well, that sort of thing, you know, makes me want to throw up. And so it was those types of events that sickened me to the point where I wanted to do something else.

NORBERG: Well, where did that \$20,000 go?

NORRIS: Into the lower cost of the land. In other words, the community helped buy the land. I didn't mean it as a...

NORBERG: I understand. No, no, that's what I was trying to make clear that we weren't making any accusations against Anderson.

NORRIS: No. I was the one that got the community to agree to give us a choice location and we made a deal and then Anderson went back and pulled that trick.

NORBERG: Are you telling me then, Bill, that this document, this statement of policy, the only implication for St. Paul was in manufacturing.

NORRIS: Yes.

NORBERG: That Anderson would have had control over manufacturing. It wouldn't necessarily have moved out of St. Paul.

NORRIS: No, no. Well, he would have moved it out if it would have made sense, but it didn't make sense in this instance.

NORBERG: All right. Now, at the same time as this document is being prepared...

NORRIS: But he did move it out of Philadelphia to Elmira and, in the process, they lost the know-how to make memories, their circulating mercury memories. They had a hell of a time gaining it back, which again is why I say this sort of thing is really stupid.

NORBERG: Yes. Now when did he move the Philadelphia manufacturing of memories.

NORRIS: Oh, it would have been even earlier than that... I think it occurred very soon after I became general manager of the UNIVAC division. There was a terrible problem in Elmira trying to get the computers to function properly.

NORBERG: Mid '56.

NORRIS: Yes.

NORBERG: I see. Did you people take any responsibility then for getting those memories to work later on?

NORRIS: Oh, yes. Well, only to the extent of sending engineers that could recall the various little twists and turns to make them work. At that time there was kind of as much art as science.

NORBERG: These would have been people from Philadelphia I take it.

NORRIS: Yes.

NORBERG: That you would have had direct responsibility for. Around the same time as the statement of policy came out, two other documents came out. One of them being a memorandum from Marcel Rand to company employees dated 18 April 1957 in which he stresses the point that the importance of the military operations and the need to strengthen the management of the military systems group required some realignment of the company's activities.

NORRIS: We had already tangled and he was laying the ground work for my leaving.

NORBERG: How did you tangle?

NORRIS: Pardon?

NORBERG: How did you tangle?

NORRIS: Over things like that.

NORBERG: Over things like this statement of policy about the UNIVAC division.

NORRIS: Yes, and cutting back the R&D and, as I think I mentioned, he's a nut. I don't know whether he's still alive or not. I called him a nut in an interview. Berg saw and he said, gees, you'll get sued, Bill. And I said, well, but a nut's a nut. So Berg left and he came back the next day and he said, say, that's okay. Call him a nut whenever you want to and if you get sued I'll swear you're senile.

NORBERG: Well, that's consistent with the statement of three days before in which the reorganization then put Thornton Fry in as head of the UNIVAC division.

NORRIS: Yes. Thornton Fry talked to me and said that this is what Marcel Rand wanted to do. And at that point in time, I said, well, hell, Thornton, just don't count on me. And so I made them fire me. I didn't resign, I just... But he got the message and that's the reason they started to move then and make this change.

NORBERG: Well, but you were not fired.

NORRIS: What did you say?

NORBERG: You were not fired.

NORRIS: Well, not really, but they wanted me out, let me put it that way, and I wanted out. And it was kind of a mutual agreement sort of thing. And I got paid for a while after I left and so forth, so... You can do better, you know, if they want you out.

NORBERG: ...I was trying to catch my thoughts, because I had a couple things in mind. I still want to pursue this leaving before we end it. It's been attributed to you, and I'm speaking now specifically of Jim Worthy's introduction to your book on *New Frontiers on Leadership*. It's been attributed to you that "you urged Sperry Rand to take the substantial resources it had assembled and use them to become the world's principle supplier of computers." That's a quotation.

NORRIS: Yes.

NORBERG: I'm interested in what arguments you made and how they were received. Are they the things we've just been talking about?

NORRIS: Yes. Well, I think in the earlier interview I mentioned the conversation I had with Harry Vickers when I was placed in charge of the UNIVAC division. And he just wanted to... He said he had the resources and desire to be number one. And I was damn fool enough to believe him. I think in a naive way he had that desire, but he didn't really understand what was required to get there.

NORBERG: Further on in that same paragraph by Professor Worthy he says that the way was still clear as late as the mid 1950s for UNIVAC to become what IBM in fact became. Sperry Rand let it's chance slip by, hesitant to make the investments and take the risks Norris knew were necessary. In the early 1980s I assume these statements came, you



were quoted as saying that, "We sat there with a tremendous technological and sales lead and watched IBM pass us as if we were standing still." I'd like to take these issues one at a time. If we assume that you've already listed the various arguments that you made for effective use of these resources by both Remington Rand and Sperry Rand and some of that does appear in the records of the period, what evidence would you site that confirms that the way was clear in the mid 1950s? How did you know this was going to be a major economic sector, or could be, I'll rephrase that.

NORRIS: Well, at Metropolitan Life replacement of two floors of tabulating equipment with the UNIVAC sends a hell of a message.

NORBERG: But was the productivity any better?

NORRIS: What?

NORBERG: Was the productivity any better?

NORRIS: Well, yes. Well, it wasn't so much the productivity. It was the doing things that you couldn't possibly, you couldn't even dream of with a tabulating installation.

NORBERG: Such as?

NORRIS: Well, all kinds of statistical reports, getting the reports out much faster, the whole tempo of the thing changes. The installation at Appliance Park [GE] is a whole other dimension to what you can do in inventory control and production control and so forth with tabulating machinery.

NORBERG: How long did it take companies to appreciate this difference? This ability to work?

NORRIS: Four or five years.

NORBERG: So somewhere between '55 and '60 then, we'll say.

NORRIS: Yes. But IBM certainly understood it, because as soon as, you know, they were hanging on to their gold mines, their oil wells, the enormous cash that they were getting out of this old tabulating machinery. But when we replaced the Metropolitan Life tabulating system, boy, I'll tell you, things changed in a hurry. And also things started to change as they saw some of these large military contractors buying 1103s. And, of course, in that same era now, in 1957, comes Control Data, and, well, it was goddamn clear to me what the opportunity was just in the scientific area.

NORBERG: Can you be a little bit more explanatory about that?

NORRIS: Well, yes, on the basis of the demand that there was in the military for the 1103 and the fact that as the cost came down this was obviously would open up to non-military uses in scientific and engineering. Of course, that led to the Control Data machine.

NORBERG: It's difficult for me, Bill, to understand the use of the word demand here, because when we think of demand for computers today, there's several ways in which the term is used. Obviously the demand for microcomputers is very, very much greater than the demand for supercomputers.

NORRIS: But the demand for supercomputers is pretty strong.

NORBERG: Well, that's what I'm hoping you'll explain to me. How does one interpret your use of the word demand for 1957.

NORRIS: Knowledge of the need.

NORBERG: So this knowledge is spreading.

NORRIS: Yes. If you had that product and if you had it at a little lower cost, you obviously could see that the market would be there.

NORBERG: How did one go about assessing what the appropriate costs, or available costs to be met by these organizations would be done?

NORRIS: You couldn't. You just did the best you could. And you knew at some point in time you were going to hit crossover.

NORBERG: You knew or you hoped?

NORRIS: Well, I would say that it was more accurate to say you knew. The same thing is true when you see computer based education. People always said, hell, it's just a dream, but goddamn it it wasn't a dream. It was knowledge of the fact that at some point, there had to be an enormous market there. Well, you can just begin to see that market now exploding. Just begin to see it.

NORBERG: Just as an incidental aside, that's something else that Worthy says in that introduction and that is that you knew, even back in ERA days, that the computer could be used for training purposes.

NORRIS: Yes. Well, that didn't take any great clairvoyance. They had Link trainers back during World War II for training airplane pilots. And hell, you just take one look at that and you could see that if you could replace the analog with digital circuitry, and have a much more flexible machine. And in fact, at the time we started ERA we took a look at that as a possible market, but the cost was too great.

NORBERG: Was there discussion about it?

NORRIS: In ERA?

NORBERG: Yes.

NORRIS: Oh, yes. And the thing that we went into, we started working on, although working on maybe is a little exaggeration, it was mostly paper work, was an airline reservation system and an airline traffic control system.

NORBERG: Yes, I've seen reports for both of those, so they did survive.

NORRIS: Yes.

NORBERG: Okay, so it's not an idle comment by Worthy then that we're talking about. That there were serious comments to back this up.

NORRIS: We had a discussion on it. We had a discussion on it.

NORBERG: Returning to this question of demand and projections and so on, when I think of the demand and the possible projections that could be made from that perception of demand, I think of a relatively small number of machines, say less than 50, that are possible to be sold in 1955 or so. And, therefore, if that's the case, and we all know that IBM had no way of even guessing how many 650s were going to be sold -- that really turned into a market that expanded without anything being done by them -- I would think that given that sort of projection that an analysis of the Sperry Rand policy statements and so on, of changing manufacturing, and changing the nature of the UNIVAC division and so on, doesn't necessarily say that those were inappropriate moves. That if Sperry could have settled down in that period and just got on with the job, that it's possible that they could have done the task. Therefore, my question to you is, what is...

NORRIS: I don't agree with that, but go ahead.

NORBERG: Oh, you don't?

NORRIS: Well, no, because there had to be a very close relationship between engineering and manufacturing and as soon as you move the manufacturing -- well, I gave you one example, they lost the knowledge on how to make the damn thing. And it wasn't until quite a few years later... And IBM could reach that point sooner than UNIVAC could, because they had some, were still using peripherals from the tabulating machine industry. Of course, the 650 ballooned unexpectedly somewhat. So they were in a position where they could make a 650 most anyplace. But you can't do that when you've got very large, complex machines. Now Remington Rand had round hole punched-card machinery. It wasn't worth a hell of a lot, they could make that anyplace. It wouldn't be any worse at Elmira than in Philadelphia. But it was the complexity of the Univac computer system that negated separating manufacturing and engineering.

NORBERG: Right. Do I conclude correctly from that then that what you're saying is that the past experience of Sperry, or Remington Rand for that matter, could not be carried over to the new situation. The people simply were not foresighted enough to understand that there was a difference. Whereas, companies like IBM did understand there was a difference and as a result, were able to capitalize on that.

NORRIS: Yes, correct.

NORBERG: So it's not just services and field engineers and lack of resources. There is also a critical lack of foresight that you're suggesting.

NORRIS: Yes.

NORBERG: I'm going to try to approach it just a little differently still to see whether I can elicit anything else from you. Looking at the sales up to the end of 1956, and I think we can make a reasonable comparison between IBM because of the 650 and 700 machines, that the IBM sales were approximately the same in number into '56 as the UNIVAC and ERA sales, in terms of the machines that were available. I don't see a lead there for IBM at that point and so it could still go either way in one sense. It is still possible in '56 for Sperry Rand to maintain something. On the other hand, one could say that they had already lost the race, because they were not thinking in terms of competition with IBM. Was there ever any discussion of competition that you recall?

NORRIS: Oh, yes. They understood that they were going to get competition from IBM. There was a constant awareness of, well, for example, when you saw Metropolitan Life, IBM was there with their paper machine saying we're going to have it. So they were always in evidence.

NORBERG: When you say their paper machine...

NORRIS: The design.

NORBERG: The design of which, the 650?

NORRIS: No, the 700 is a follow-on machine, a larger one.

NORBERG: All right. So they were doing the same thing that you claimed later on they were doing against Control Data.

NORRIS: Oh, yes.

NORBERG: So this was a talent.

NORRIS: Yes, they were very expert at that.

NORBERG: I want to ask just one more question about this and then I'll let it go. How can we now judge the plans and policies of '56 and '57 that we've been talking about, so as not to use our hindsight knowledge to indict a company for what it did not achieve? Is there any value in these statements of policy and the attempt to separate design, manufacturing, sales so on? Was there any value in that at all by the Sperry Rand people?

NORRIS: Well, the separation of the sales and service was a less serious move than separating the engineering and the manufacturing. However, because of limited resources, not just dollars but talent, people who understood, having the manufacturing, marketing, engineering services in a division, for example, was a more powerful and more resource efficient approach, but it could have worked with the marketing separated. That would have been less of a handicap than separating the engineering and the manufacturing. But that wasn't the reason that UNIVAC lost the race. You put your finger on that: it was lack of vision and commitment. And had there been vision and commitment, these other things wouldn't have happened, probably.

NORBERG: I wish you could remember more about those three different design phases for Norwalk, Philadelphia, and St. Paul, because there is a consistency with what you just said about the differences between engineering/manufacturing on one hand, and sales and service on the other, and the attempt by people in St. Paul, you and Kalb, and Butler, and Stutzman to attempt to convince Fry and his people in New York that, in fact, what needed to be done is to consider a decentralized situation, to develop a scheme for what sorts of product development would be done in given localities, but then decentralize the process so that everything could be done in one place, if that was appropriate, and combinations if that was appropriate in other circumstances. But apparently that was not listened to or at least that didn't show up on the final documents.

NORRIS: No, because they had been using the other approach. They had a laboratory in Norwalk where they did development work on accounting machines and tabulating machines. And the factory was in Elmira and some other place. But accounting machines and tabulating machines, and they weren't very good at best, it was a different ball

game at that point in time of electronic digital computer. And they just couldn't differentiate.

NORBERG: Do you recall IBM's manufacturing facilities at that time?

NORRIS: No, I don't.

NORBERG: So we can't make a similar comparison there.

NORRIS: No.

NORBERG: I'll look that up though, because that is a valid comparison. I had an interesting time reading your testimony in the U.S. versus IBM anti-trust suit. And I was very interested in the type of cross examination that was done by the attorney for IBM. It seemed to me that what Mr. Barr was trying to do was to get you to describe a certain meaning, or at least agree to, a certain meaning of the word competition -- what it meant to be in competition in the computer industry at various periods and he centered on two, namely the 1950s and the 1960s. I'd like to discuss with you for a few moments the meaning of that term competition in that decade of the 1950s, because at one point, you wrote a memorandum, in I think it was 1954, having to do with the number of possible companies infringing Remington-Rand, i.e., ERA, patents, having to do with the drum, the magnetic drum. And the list was quite remarkable. I'm wondering if anything was ever done about it. Burroughs, Computer Research Corporation, Hogan Laboratories, Underwood, Teleregister, Consolidated Engineering, Electrodata, Librascope, Colesman Instrument, Bendix, and Ferranti. This was 23 December 1954 Norris to A. M. Ross.

NORRIS: To who?

NORBERG: A. M. Ross. He was an attorney. R-O-S-S.

NORRIS: Oh yes, well, hell. I was just responding to a patent attorney who had a job to do. It doesn't have any



relevance to how significant I thought that might really be.

NORBERG: Well, true, but let me quote from your memorandum. "Listed below are firms that have made definite commercial offerings of a magnetic drum system which infringe our patents of which we have concrete evidence."

NORRIS: Right.

NORBERG: Okay. Now that's my definition of competition. Here are firms, that list of firms, offering machines similar to yours, and I mean similar in design now. They all use magnetic drums for storage. I had the feeling in reading the testimony that what the IBM attorney was trying to get you to say was that any time you enter a business, in this case the computing business, with a machine regardless of whether it's the same as someone else's, regardless of whether it approaches the same need as someone else's, that that's competition. And you seemed to be backing away from that. You were not willing to say that if you, Control Data in this case, put out a machine like the 1604 for which there was no equivalent in the IBM line, then you were not competing with IBM.

NORRIS: Oh, no. That's not true.

NORBERG: Which is not true? That the 1604 didn't have competition or that you were not competing with IBM?

NORRIS: I never said that we weren't competing with IBM, because we always were. And even though IBM didn't have the equivalent of the 1604 they tried to stop the sale of the 1604 and that was what the law suit was about. They didn't have a machine that was an equivalent. So they had to pull out a paper design and present it as not only better, but less costly. It just didn't happen to be available right now, but be patient and it will be.

NORBERG: So your definition of competition then is going to be the same as that attorney's and that is that as soon as you enter the business, you're in competition, regardless of whether they're equivalent machines or if you're addressing the same market or not.

NORRIS: Yes.

NORBERG: So every company in the computer business is in competition with every other company.

NORRIS: Sure.

NORBERG: Without question?

NORRIS: Yes. But I don't see the fine point that you're getting at.

NORBERG: Well, I'm not sure that I understood the problem because I would think... Well, let me see if I can think of another example from a different line of business. I'm sorry I can't at the moment, it doesn't come quickly anyway.

NORRIS: Well, you're thinking of performing a function with a different type of equipment?

NORBERG: Yes. A microcomputer isn't going to do the same job as a supercomputer, not by any means.

NORRIS: Right, but if you had another...

NORBERG: By any stretch of the imagination.

NORRIS: Right.

NORBERG: Even if you had a million micros it's not going to do the job for you. Therefore, Cray Research or Control Data, with their high end machines, are not in competition with Apple, I would say.

NORRIS: Yes, that's right. That's right. But IBM had something that was a hell of a lot closer than an Apple to the 1604.

NORBERG: All right, it's the time period then that turns out to be relevant when I look at the '50s or the '60s and so on. Since people are putting a similar kind of machine on the market, they're all in competition.

NORRIS: Yes.

NORBERG: All right. It just puzzled me as to why that attorney would go on for two days on that one issue. And anyway...

TAPE 4/SIDE 1

NORBERG: Still referring to that same court case but now just bringing this to a close, your reasons for leaving Sperry in the court case were listed as two. One of them was the demotion and the perception that you could not reestablish, as you said, "my former level of position, and even if I could there were other aspects that were not to my liking." What were these other aspects?

NORRIS: Well, what we've been talking about.

NORBERG: This turmoil.

NORRIS: Yes.

NORBERG: Which was point number two, the turmoil being made up of "confusion, indecision, conflict of orders, organization line breeches, constant organizational change, fighting, and unbridled competition between divisions" which is what the lawyer said to you which you then agreed to.

NORRIS: Right.

NORBERG: And you've offered me a number of those examples. How was your decision made to leave Sperry then? You sort of hedged around that a few minutes ago by saying that they fired you, but in fact, I claim they didn't fire you.

NORRIS: Well, you're right. But they sure as hell wanted me to leave and in order to get me to leave they made a real good settlement. So I think the fact that they made a good settlement, because these guys are thugs, you know, that we're dealing with so...

NORBERG: But when you say a settlement, when I think of a settlement I think of saying, Mr. Norris you're finished here and here's the package we're going to give you if you'll leave quietly. Was that the sort of thing that was baldly done?

NORRIS: No, no. It was just that I wanted to leave.

NORBERG: And you told them that.

NORRIS: Yes. And that under the circumstances, I think you've treated me very unfairly. I had this conversation with Thornton Fry. I said Fry, you know you bastard, you double crossed me and I haven't thought a lot about what I might do, but I sure as hell don't want to stay here and so what I need is a reasonable length of time to work out something else and they gave it to me.

NORBERG: I see. Do you recall how long they gave you?

NORRIS: Oh, I think it was five months or something like that.

NORBERG: I see. Now had you already talked to Arnold Ryden and Bill Drake and others about CDC?

NORRIS: Well, hell, there was always conversation about starting another company. You talk to Arnie Ryden and Arnie will tell you that, you know, he's the guy that started Control Data. It was a pretty obvious solution, wasn't it? And I had people for two years coming to me and saying, Bill, why don't you get the hell out of here and do something else. Start a company, I'll go with you.

NORBERG: Who were these people?

NORRIS: Frank Mullaney. I think Bob Kisch, Carl Swanson. I don't remember all of them.

NORBERG: That's all right.

NORRIS: Because I didn't really pursue it with them. I didn't want to be in a position of doing that. These people all worked for me and there's one thing I've been very, very careful of and that's fraternization of any type. So I just shrugged it off as sort of a passing thought. But I always knew that if that was something that I decided to do that it wouldn't be any problem. As a matter of fact, Arnie Ryden wanted to start a company, but he couldn't do it. And that's the reason he came to me.

NORBERG: When you say he couldn't do it, why couldn't he do it?

NORRIS: Well, they wouldn't have... He couldn't get the good engineers to go into an organization with him. And had that been possible, I never would have been part of Control Data. But that just wasn't something that he could do.

NORBERG: Why wouldn't they have gone in with him?

NORRIS: Didn't have any respect for his leadership.

NORBERG: Technical leadership or management leadership or both?

NORRIS: Probably both.

NORBERG: Probably both, okay. All right. So when did you get serious, then, about CDC?

NORRIS: Well, I began talking to my wife about it and kids I suppose oh January or February about something, you know, this isn't going to go on, it doesn't make sense and life's too short. And I told the kids that one option might be to start a company and if we did that there was going to a lot of risk but we still had our farm in Nebraska and if it didn't work out, we'd go to the farm. The kids liked that.

NORBERG: Oh, I'll bet they did.

NORRIS: So, you know, I just kept thinking about it. I don't remember really talking to anybody in the company, except Bob Sorensen. I guess I'd known Bob and he had gone to Norwalk. He was caught up in this thing and because he'd been, well, he was identified with me, he got singled out for snide remarks and all that sort of thing. I think maybe he was the first one that I talked to about the possibility. But he didn't want to leave that part of the country for some reason, I've forgotten.

NORBERG: Who else among the Sperry staff was committed to leave at this time? You mentioned that a number of these people came up and talked to you over the previous two years, but when you got serious about aligning yourself with the CDC group had others already agreed to join Ryden and Drake and so on if they could pull it off?

NORRIS: No, they had not agreed. Some of them said that if I would be involved, they would consider it. Oh, I've

forgotten, I think Frank Mullaney might have mentioned that Ryden had talked to him or Bill Drake, and his note said -- I think it was maybe even a little handwritten note -- just saying that Bill, I'm not really seriously considering leaving but if you leave, I would consider. I don't know the sequence of time on that, I just remember the note, which I appreciated. And then of course, when I made the decision then that I was going to leave and I would start a company, since this number of people had said they were interested, they started calling me. And so I decided that hell the best thing to do is just anybody that wants to talk, I'll talk to them all together. And so I invited them out to the house. And I was absolutely flabbergasted at the number of people that came. The neighbors thought there was a funeral. And one of the young guys that came there I didn't know, Seymour Cray. I'd heard about...

NORBERG: You didn't know him?

NORRIS: No. I'd heard that Seymour was a very astute engineer and one of the real comers, but I never really... Well, I might have shaken hands with him, but I couldn't have said that's Seymour and picked him out of a group of people.

NORBERG: Did you advise anyone to stay behind to complete projects or tasks?

NORRIS: Yes, I did Seymour. I was talking to Ed Svendsen about this...

NORBERG: Oh, that's too bad. I was looking for independent confirmation of it.

NORRIS: Oh. Oh, he... Did you talk to him? He remembered it, didn't he?

NORBERG: Yes, he did. He was the one that told me. I didn't know that before. He told me. And he told me that's one of the reasons why he liked you very much, because you had not interfered with something going on that the Navy considered important.

NORRIS: Yes. He brought that up.

NORBERG: So you don't have any independent recollection of that?

NORRIS: Of what?

NORBERG: Of having suggested to Seymour that he not come.

NORRIS: Oh, yes, yes.

NORBERG: You do.

NORRIS: Oh, it's very clear because... And Seymour agreed to stay there. Well, it was about a six month job and after about two months, he called me, Seymour, and said that he was resigning and were we ready to put him on the payroll. And I said, "Goddamn, Seymour, what about the Navy?" He said, "I don't care about the Navy. This job's far enough along they can do it and I want to come to work next week." And I said, "Well, Goddamn, you really posed a problem." And he said, "Well, do you want me or not?" I said, "Well, hell, yes, Seymour." "All right," he said, "I'm coming to work." So I got a hold of Hank Forrest to talk with Ed Svendsen and tell him for Christ's sake just exactly what happened. He knew Seymour real well, and so it was all very plausible and he never questioned it.

NORBERG: What demands did you make of the fledgling organization or of the planners of the organization for your participation?

NORRIS: When I started? Well, hell, I was part of it. It wasn't a question of somebody else planning it. They didn't have any plan. They had, Arnie Ryden had one sheet of paper.

NORBERG: The reason I ask that question is another reference to Worthy's comments that you insisted that no one



have a controlling interest in the new company so that it couldn't be sold out from underneath the participants without somebody...

NORRIS: Well, that was part of the plan.

NORBERG: Okay.

NORRIS: Which I was part of.

NORBERG: All right. How did this planning go then, because you left in what, July of 1957.

NORRIS: Yes.

NORBERG: Seymour left in September of '57. Now how did this plan develop in that period if he came to work in, say, the first of October in 1957?

NORRIS: Well, we opened the doors to the company, as I remember, the 15th of July. Hell, I put in \$25,000, enough to get the thing started and we raised the money as we were going along. Once you decide to do something, do it.

NORBERG: Do these early documents still exist? That is, the plan that was developed for the company?

NORRIS: The only thing that represents that is the prospectus.

NORBERG: Which would have had to have been filed.

NORRIS: Yes. And that was very general, because well, you didn't want to get hung later saying you were going to do something when you didn't do it. And it was a very innocuous piece of paper, which you... Well, as a matter of

fact, I had a real good friend who was a medical doctor and he made quite a bit of money in investments. We used to room together and he always said, "Gees, if you ever run into something and you know what you're going to do, I'd be glad to invest in it." So I sent him a copy of the prospectus and he said, "I can't figure out what it is you're going to do. I'm interested, but can I come up?" And I said, well, sure, and the thought occurred to me, that I'd take him to the St. Paul plant and show him a couple of UNIVACs. So I did. It was on a Sunday and I shouldn't have done this, but I knew the guards wouldn't know whether I'd left or not, and they didn't. They were glad to see me. And so I showed him a number of the big machines that were being manufactured. And he said my God, is this what you're talking about? And I said, "Ultimately." Fine. And he invested \$25,000. So we had \$100,000 just like that. And after that, the offering was oversubscribed.

NORBERG: Well now, the original capitalization was something in the neighborhood of \$600,000 as I recall.

NORRIS: Right.

NORBERG: 600,000 shares. Was that the only capital necessary to get this company off the ground?

NORRIS: Yes.

NORBERG: How did the research and development go on with that small an amount?

NORRIS: Well, we committed a good piece of it to the 1604 and hoped that we could get contracts and that we could get additional financing, which we did. Allstate, and then we had a public financing and we just kept going.

NORBERG: Okay, so there is more than that \$600,000 that comes in.

NORRIS: Oh, yes. That didn't last very long.

NORBERG: In that early period, that's what I was suggesting that it wouldn't have lasted very long.

NORRIS: Right.

NORBERG: Now when the Allstate people came in that would have caused a chunk of the company to go over to Allstate would it not?

NORRIS: Yes, but not a real large piece of it. I've forgotten the percentage.

NORBERG: It's relatively small as I recall, something like 7% if I remember the documents well enough.

NORRIS: Right. Right.

NORBERG: I'm not really prepared to talk about the CDC terms today, so I'll have to look at some more of those documents. But just to close the period up to 1957 so we don't come back to that again, is there anything in this questioning that I have missed, Bill, that seems obvious to you that is something that we should have talked about?

NORRIS: Well, I don't think so, but what are you going to do with all this?

NORBERG: Well, what I'm hoping to be able to do...

END OF INTERVIEW