An Interview with

EDWARD C. SVENDSEN

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Conducted by Arthur L. Norberg

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Edward C. Svendsen Interview
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Abstract

Svendsen begins with a description of his early life and education and a discussion of his work in the Navy during World War II. The bulk of the interview concerns the relationship between Engineering Research Associates and the Navy. Topics include: John Parker and the management of ERA; the work of Howard Engstrom, William Norris, Ralph Meader, John Howard, and Sid Rubens at ERA; and ERA's projects for the Navy.

DATE: September 16, 1986   INTERVIEWER: Arthur L. Norberg

LOCATION: Charles Babbage Institute (Minneapolis, MN)

NORBERG: Captain Svendsen, would you tell me something about where you were born and what your parents did?

SVENDSEN: I was born in Minneapolis, Minnesota. My dad was a University of Minnesota graduate, electrical engineer. He had a company called Balsted Electrical Company which is still in existence.

NORBERG: How's that...

SVENDSEN: We got on the mailing list of several of the projects like Whirlwind... I went one year to the University of Minnesota, took engineering and then went to the Naval Academy.

NORBERG: Can we back up just a minute? What did Balsted produce, if anything?

SVENDSEN: Balsted is a motor, generator repair and also switch-board repair and design. They perhaps have been one of the few companies in that business throughout the years that actually had engineers on their staff and did engineering work, like they could pick up a 440 generator and convert it to some other voltage or this sort of thing. They did quite a bit of work, I think, for Northern Ordnance during World War II. But in general, they're an engineering company - sales, service, repair of motors, generators, switch-boards and they're kind of a distributor in the Northwest for a lot of the basic electrical pieces.

NORBERG: What was your father's last position with the company?

SVENDSEN: Well, he started out with a guy named Balsted, fresh out of the University of Minnesota, early in the game. Balsted was the guy that put the money into the thing and was the entrepreneur, the manager. My dad was the technical guy. The two of them started the business and then Balsted eventually sold out to my dad. He was

Balsted until he died here ten years ago.

NORBERG: Did you ever work for the company?

SVENDSEN: No, I never did work for the company.

NORBERG: That's interesting.

SVENDSEN: My hobbies were model airplanes, ham radio, you name it, electronics. An interesting thing, my two brothers were athletes. They played with Bernie Beirman on the famous Golden Gophers. I was supposed to go along and follow their path but I didn't. I was the old man's son and started out in engineering. I went one year to the University of Minnesota.

NORBERG: Did you select the university with the intention of staying here or was that...

SVENDSEN: Yes, that was my intention and the Naval Academy thing came along just completely...

NORBERG: I see. How did it come about?

SVENDSEN: There was a guy named Browning, who was a Naval Academy graduate, and some of his relatives had been high ranking Naval officers and he went to the Naval Academy. The family had a business called Browning Paper Pulley Belt Company in Maysville, Kentucky. One of the big things in a rural farm area like this is the belts and the pulleys for the farm machinery and dad was one of the distributors, the Northwest distributor for Browning. Browning used to come and call on dad. My old man was a real conservative type. When the salesmen came he didn't go out to dinner with them; he invited them out to the house. And here was this family of kids. Two of the boys were in college, at the university and I was just about to go to college the next year. And so Lawrence Browning told me, "I think you ought to go to the Naval Academy." And I said well, I want to be an engineer. And

he said, "You can be an engineer in the Navy. You can go to post-graduate school, get an advanced degree. So then he took off after that and contacted us and told us that if I was interested, if I got, let's see, I had to get B or better. There are two ways to get in: the entrance exam or you could go to an accredited college and in a certain subject B or better. And that's what I did to get in, the University of Minnesota engineering. You also had to pass the physicals. So I went to the Naval Academy.

NORBERG: What year did you enter the Naval Academy?

SVENDSEN: The summer of '37.

NORBERG: The summer of '37. So that puts you in the class of '40?

SVENDSEN: The class of '41. I graduated in '41. Actually I graduated in February of '41 rather than June, because the war was already being accelerated. You know we were helping the British to convoy ships in the Atlantic and the Navy was already participating in that. You know, the U.S. gave Britain 50 destroyers. The U.S. was partially at war in that time.

NORBERG: So even though you had spent one year at the University of Minnesota, you still needed to spend approximately four years at the Academy.

SVENDSEN: Everybody had to do the same thing. You ended up with a so-called B.S. degree, but with a minimal... Well, it's marginal engineering type. Well, I think you got as many credits as a normal engineering student would get, but you had a hell of a lot more thrown at you, other things that you would not normally get at the University of Minnesota.

NORBERG: So you came out in February of '41. What was your first duty?

SVENDSEN: Then I was assigned to a ship in the Pacific, the U.S.S. Mississippi and that was in Hawaii. I got there in April. In May, no in early June, the Mississippi and two other battleships, several cruisers, and several destroyers went out on kind of a battle exercise. They ended up at the Panama Canal and came to the Atlantic. And that was just at the time when the Germans were and the British were getting very active. The British had sunk the...

NORBERG: Bismarck.

SVENDSEN: Bismarck, yes. The Germans sunk the Hood and then the British sunk the Bismarck. And this big hunk of the U.S. fleet was moved to the Atlantic to back up the Allies.

NORBERG: I see. What was your task aboard ship?

SVENDSEN: Well, when I first came aboard ship I was assigned as the assistant navigator. All the junior officers were assigned to different things around. This was a very interesting job, I didn't have to do all the routine quarters and all that. When we were under way all we did was we did the sights and the working out of the star sights. Every noon you take the sun line. Then when you were going in and out of port, you were under the navigator and the assistant navigator. You had a bunch of very sharp enlisted men who were the quartermasters. They were the guys that kind of kept things going up on the bridge and that was my duty.

Just a month before we went to the Atlantic, they put out a call for officers to go to a special school called the Electrical Engineering School. My background was Naval Academy and then I had this little ham radio and went to the university one year, I guess that helped. I got selected for the school. When we went through the canal and got around to Norfolk, I was detached and sent up to Bowdoin College in Brunswick, Maine, which is the first officers preradar course. We stayed there for two-and-a-half months. The whole staff of that school was made of engineers and scientists who had been in the Naval Reserve and had been hauled in, you know, and put on active duty. So the whole faculty were Naval Reserve officers who had just been activated. Very interesting group.

NORBERG: And approximately where did they come from? Did they come from schools in which, say, electrical engineering...

SVENDSEN: The preradar school didn't have anything to do with radar. All it was was to get us up on microwaves, transmission lines. Some of the things... Oh, high-powered microwave vacuum tubes. Some of the things that we haven't got as standard things in the engineering schools.

NORBERG: Do you remember who some of the faculty were by any chance? Any name at all?

SVENDSEN: God, I can remember some of the warrant officers down at the N.R.L. (Naval Research Laboratory) there, but...

NORBERG: That's all right.

SVENDSEN: There was a guy from GE I should remember. I can supply you with that if you're interested in that. It was a very interesting group. They stayed there for a while, then they moved on to other jobs in radar associated jobs. One guy was from Bell Labs. It was actually a telephone company guy who was an engineering graduate, wasn't a real scientist. They had a pretty good little course. Little review course on transmission lines, microwave transmission, microwave tubes. Just a little refresher. Things that were the basics for radar.

Then we went down to NRL and we were there for about two and a half months and that's where we got the first look at some of the early radars. They had a search radar, the CXAM, the predecessor to that. Of course, NRL had kind of developed some of the early radar. They already had in production a fire control radar from Western Electric. The FA I think was the name of it. By the time I got to the ship it was the FC. The antennas were mounted actually on the directors, the gun directors, and they were very high frequency compared to the search radars. Search radars were about 200 megacycles, the fire controls were, some of them were 1,000 some of them were, they got up to 3-400 megacycles. Radar was just starting to come out. GE had big contracts for a search radar. They had some airborne radar that was already being installed, and fire control radars. And then as soon as the war started they really

installed those. From there I went back to my ship.

NORBERG: Same ship, different one?

SVENDSEN: Same ship. The ship was in Iceland. We were in Iceland for about a month and a half and then when the war started we came right back to Norfolk. Installed several radars, search radar, fire control radar, a whole bunch of new guns and aircraft radar.

NORBERG: If I remember my naming right, the Mississippi would be a battle ship. Is that correct?

SVENDSEN: Yes, it was a battleship, right. Well, then we as soon as we had a very short quick overhaul, we had some of the guys from NRL down helping to check out the radar. They had some real top guys down there. And then we went around to the Pacific and I was in the Pacific until the last year of the war.

NORBERG: Okay.

SVENDSEN: I was a radar and a CIC through that whole period.

NORBERG: CIC?

SVENDSEN: Well, that's a Combat Information Center. That's the place where they bring all the stuff together and have the plotting boards and all that. In those days, that was brand new. We designed our own CICs. Every time we took a ship in for an overhaul, we'd scurry around and get the right kind of stuff to make plotting boards. We signed up our own automatic pots and anything you could do to make things work better. So that was all three years in the war, in the Pacific, in the southwest Pacific going in and out of Pearl and the Aleutians. Mostly part of amphibious forces. But we had guys that could, some of my people actually were intercept controllers. We'd take control of aircraft either from the beach or from the carriers and had controllers.

NORBERG: Had you been rising in rank during that time?

SVENDSEN: Oh yes. Well, rising in rank was automatic. I was an Ensign in '41, February of '41, June of '42 I was a junior grade and then later on I was lieutenant and finally lieutenant commander by the end of the war. But the promotions were almost automatic. They were taking in this huge number of people and so everybody just went up very fast.

NORBERG: And then what happened after the war?

SVENDSEN: Well, now right at the end of the war, I got orders back to the post-graduate school. So I went to the post-graduate school. The post-graduate school was at Annapolis still, before they moved it out to Monterey. And I had three years in they called engineering electronics but it was electrical engineering, specializing in electronics. I got a Master's from that. And then in '47 I graduated from there and guess where?

NORBERG: Middle of '47 say? June?

SVENDSEN: Yes, June of '47 I was on my way to... As soon as I graduated, I was on my way to... I got there in July of '47.

NORBERG: Okay. Got where? Here?

SVENDSEN: To St. Paul.

NORBERG: To do what?

SVENDSEN: I was the... Oh, incidentally, at the time I got my Master's I put in for engineering duty only they call it.

They used to call them the EDOs, Engineering Duty Officers. The BuShips, I was part of the BuShips family, EDO. Before that I was just a general line officer who had specialized in the radar thing during the war. So then I put in for engineering duty officer, which meant that my duty would all be associated with the technical part of the Navy. And so at the time I graduated I also became an EDO. BuShips had just reached this agreement, or they had just moved in the NCML from Dayton, Ohio, up to St. Paul. Most of the officers in the old NCML - after you stripped them of the good reserves like, you know, Bill Norris and all those people - there were some real good people in Dayton - they were mostly warrant officers. And what they wanted to do, knowing what this thing was coming up, they wanted to get some more technically trained people. They made an ED billet and I was called the technical officer. And they sent me up to fill that billet that had just been established.

NORBERG: Okay.

SVENDSEN: They had it...

NORBERG: Two questions before you go on to what they had at NCML at the time. We started that discussion when I asked you about changes in rank after the war. You mentioned that you had been ordered back to the post-graduate school. Did your rank shrink back down again as a result of war-time changes?

SVENDSEN: No, no, no, never did.

NORBERG: Never did, okay. And...

SVENDSEN: I was a lieutenant commander when I was going to post-graduate school and then I made commander while I was actually physically at St. Paul in the Computing Machine Lab. The last year, I think I was here '47 to '51. But there was no, I went along right with the rest of the guys.

NORBERG: Okay, second question. What sort of studies went on at the post-graduate school that you were

involved in?

SVENDSEN: They had some of the standard math courses up through vector analysis. In the first year they gave us essentially, since we'd all been out for the war, some of the courses would have been repeats on an engineering degree. But we got several math courses, electrical engineering, strength of materials, you know, that end of the whole business of materials.

NORBERG: To be used in things like vacuum tubes and so on?

SVENDSEN: Well, this was just general.

NORBERG: General.

SVENDSEN: General, yes.

NORBERG: Okay.

SVENDSEN: We had some special courses. We had some special courses in specifically radar. Not all of the people in the school had had radar experience during the war like I had and some of the others, so they had some specific courses in radar and commu nications, math, pretty heavily dominated by math and... One of the most interesting courses... God, I can't even think of the name of it now.

NORBERG: Mathematics or engineering?

SVENDSEN: Mathematics. Well, Fourier series, related to Fourier series, there's a whole book, a whole...

NORBERG: Harmonic analysis?

SVENDSEN: No.

NORBERG: Potential theory?

SVENDSEN: No. Well, it was...

NORBERG: Can you reflect for a minute about the differences between that course of studies and what you had been through before the war in similar kinds of subjects at the Academy?

SVENDSEN: Well, we got most of the stuff. We got standard math. We got trig and calculus. In PG school, we got vector and tensor analysis. I think that's probably one of the areas that we didn't get in the undergraduate thing before the war. We had some pretty interesting lab stuff that involved doing experiments and then trying to formulate the mathematics behind the experiments. I remember myself and a lab partner built a grounded-grid amplifier, which was something fairly new. Then we tried to actually make the mathematical model for the thing, which was very difficult. This was the kind of thing that we did.

NORBERG: It was things like the grounded-grid amplifier that I was looking for as differences between the two types of programs, that is, how much new material was being inserted.

SVENDSEN: Yes. And then we got a look at, of course, all the techniques that are involved in all the radars that had either been developed during World War II or were in development about that time, which was the end of the war. Well we didn't have anything like an FM radar, which, I remember, the principals of FM radar are different. You know, pulse radar you measure the time between the pulses and in FM radar you have a continuous signal and you measure the difference in the phase of the signal coming back. On paper I designed what I called a station keeper that would have made me the hero of all the officers of the deck who had to stand there with, you know, the statsmeter that used to measure the distance between a ship they were keeping a guide on and that sort of thing. But we had an

opportunity to do a lot of things like that. And we were very busy, very busy people for almost three years.

NORBERG: Were most of the people in the class with you of similar rank?

SVENDSEN: Yes, within a couple or three years most of them were the same rank.

NORBERG: One last question that I neglected to ask. The year of your birth?

SVENDSEN: 1917.

NORBERG: All right. Returning to St. Paul. You arrived in St. Paul at NCML and you were about to say what was going on at NCML I assume from your question, when you started to say they had there.

SVENDSEN: Well, they had moved many carloads, freight trains full of equipment up from Dayton, Ohio. I assume you've gotten some briefing on what went on.

NORBERG: No, I have not. Not about at NCML.

SVENDSEN: Well, I can't give you anything more than what I heard from people that had come up from there.

NORBERG: Well, if you would tell me I'd appreciate it then I can check it with other sources if you can...

SVENDSEN: Well, Dayton NCML had the job of building some pieces of hardware that were used by the, you know, the people back at Nebraska Avenue - I guess you'd call them CSAWs. The Navy had gone to National Cash (Register) and said here, we desperately need this. Now, we'd like you to set up this thing here and we'd like you to provide the manufacturing and purchasing support to this activity. And so that's how National Cash got involved with it. But then they set up a huge thing and, as I understand, Commander Meader, Ralph Meader, had a whole

bunch of literally hundreds of waves, but they also had a bunch of engineers there. So they were doing, I would guess you'd say they were doing production engineering there. The people back on Nebraska Avenue were telling them... It was not too unlike the arrangement that you know ERA and NCML had, only NCML was a big doer then in Dayton because they did all the assembly of these things, rotors and all that stuff. The assembly of this stuff was kept under very close security and done by Navy personnel and a whole bunch of waves they had doing some of that. So it was different from the St. Paul one in that they had a big productive group there which worked with National Cash. National Cash did the manufacturing necessary to produce the pieces and then the NCML people did all the wiring of them, putting together and checking them out and that sort of thing. They had a big operation and not all that was moved. Only a small group of people were moved to St. Paul. The big productive outfit was chopped down.

NORBERG: I assume dismantled all together. They were not producing further machines.

SVENDSEN: I'm not quite sure. Some of that type of work, I think, actually continued to be done back in Washington that needed to be done. But they didn't have the tremendous pressure and the volume of equipment that needed to be produced during the war.

NORBERG: Well, if they cut back on the production facility after the war, what was the large freight train load of equipment that would have been shifted to St. Paul?

SVENDSEN: Well, there was a tremendous number of... There was a lot of stuff back there. They had some really good stuff at the end of the war when you couldn't get your hands on things. We filled a big hunk of the old ERA factory. The first year I was here a lot of the people were engaged full time in sifting and sorting and cataloging this stuff. They had a whole bunch of telephone stuff, like stepping switches, relays; they had some electronics equipment, just everything you could imagine. And this was a tremendous source of experimental parts. We kept track of it, but the engineers had free access to this stuff. It didn't cost projects any money or anything. And it was used. But it was just a big reservoir of parts. And there were several, there were several...

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SVENDSEN: They were just starting to get to the vacuum tube stuff in Dayton, so most of the stuff was, you know, the electro-mechanical type of stuff. But a lot of that stuff was needed in the first machines we built, anyway.

NORBERG: What was the structure of NCML when you arrived here?

SVENDSEN: Well, we had a captain, Captain Creasor and... When I arrived it was about the same as when it was a little later. They had a Captain and then he had some administrative types. There was one of the Warrant Officers who was tagged as kind of the technical officer, and he left shortly after I got here. But I was the Technical Officer. We did have an Executive Officer. I can give you the structures: Captain, and then an Executive Officer, and then a Technical Officer, and then a little office administration where there was a Chief Petty Officer, and then there were several ward officers and some young reserve j.g.'s, Ensigns and j.g.'s were ordered in, and they were kind of assistant project officers to me. My job was to look at the technical work. And I had these young guys, who were fully cleared, and were also engineers, and who knew the problem having worked with the people back on Nebraska Avenue. In other words, they were able to communicate with the project people; they knew the actual problems that we were working on. Very few people did that, you know, even in the company. So that was myself and these project types. In general, one of the warrants ran the whole storeroom, and the other warrants we had, worried about such things as, you know, acceptance testing and lining up all that sort of thing. One guy worried about working with the company on arranging transportation. We had to ship these things back by armed guard and they worried about that kind of thing. But in general there was a technical group and then the commander and the exec worried mostly about the company, its financial problems and all that, which were substantial, as you probably already know. In fact, that was the one that worried people more than anything, I think.

NORBERG: Why? What really was the problem there?

SVENDSEN: Well...

NORBERG: Let me ask the question a little differently. Why would the Navy worry about the financial viability of ERA, when, in fact, the principal contractor was the Navy?

SVENDSEN: Well, okay. This was brought to a head by the second CO there, Captain Hawk.

NORBERG: How is that spelled?

SVENDSEN: Earl Hawk. H-A-W-K, just like hawk. The execs spent a lot of time worrying about, you know, the overhead of the company. Now see 90% of the business of the company for a long time was, or a very high percentage, was Navy business. So every 90 cents out of every overheard dollar the Navy was also paying. And that was where the Navy felt that they were concerned with what the company did on the overhead thing.

NORBERG: I see.

SVENDSEN: And that's what created some problems. I don't think we ever had any real technical, real problems with the, you know, the John Howards, and the John Coombs, and the, you know, the development. I think we were pretty much on the same wavelength most of the time. But there was some concern about, you know, how Parker was running the damn thing, very frankly.

NORBERG: That's been told to me before, that's not the first time.

SVENDSEN: Yes. I mean, he was a high flyer. This is just a typical thing: he used to tell Captain Creasor that, didn't you know this, you guys? He used to use Northern Ordnance over here, which was another kind of a captive Navy contractor, Northern Ordnance.

NORBERG: Used them for what purpose?

SVENDSEN: He knew Hollie, the head man over there. That company was a known thing; it had been going for years. And he used to quote Hollie as saying, "Well, now you know Northern Ordnance does it this way and Mr. Hollie doesn't have to play games about this cost and all this." So John used to try to... Well, I think he did talk Captain Creasor into the fact that, you know, it was not too much of our business. Then Earl Hawk came along and he had had a tour of duty up at in one of these R&D inspector Naval materials up in the Boston area and he had dealt with research and development firms and he knew what was good, what was allowed, what was not allowed, so he really just put the old clamp on. He didn't take any crap from John Parker. Finally ended up in a conflict where the chief of the Bureau of Ships came out here and had a confrontation with Parker.

NORBERG: Do you remember over what?

SVENDSEN: Well, I wasn't completely involved in it. It was mainly just the... It had to do with some overhead charges.

NORBERG: What might have been considered legitimate overhead at the time?

SVENDSEN: Well, advertising, well, you know, trying to get new business. That's legitimate overhead. The Navy all along encouraged ERA to get new business. In fact, we bent over backwards trying to help them. Some of the officers, Parker being the principal, well, he was travelling all over the country and he was living very high on the hog for a company that wasn't in all that good financial shape. So that was one of the areas.

NORBERG: So things like advertising that you mentioned, also let's say, new project development costs, would they have been covered by the Navy as well? Suppose I want to design a piece of equipment for the University of Minnesota as a possible device and I might sell a number of them.

SVENDSEN: Well, some part of the development would have been covered. We went further than that, we established a special task called Task 23 which had the deliberate purpose of financing a little research project. Sid Rubens and those guys can tell you about that.

NORBERG: I take in from your perspective that those projects would not have had a hell of a lot to do with Navy requirements.

SVENDSEN: Well, yes they would. Well, I mean across the board. I mean, here we're entering the digital age, transistors came about. ERA, through us, got one of the first batches of transistors from Bell Labs. When they first announced, everybody wanted to get their hands on them and so they set up a central point and then they dished out transistors to the different military research and development groups. And as I understand it, ERA got the first batch that was allocated to the Navy. And having worked with the big umpteen kilowatt computers and all that, what to do with all that power in the vacuum tubes, boy, those transistors looked awfully good and awfully quick and we supported that. We had it on one of our Task 23 things to start developing circuits for digital circuits for computers. I can't give you a complete story, because as I told you, I was primarily worried about all the tasks, you know, the technical projects, although, you know, I was in the office and I knew the guys and I had heard what was going on, especially the exec there who got pretty deeply involved. We all knew what each other was doing, but I wasn't directly involved in this so-called harassment of the company on the overhead.

NORBERG: Okay.

SVENDSEN: It ended up all the way to the chief of the Bureau of Ships making a trip out here and making the parallel between a ship builder, a ship builder that gets a cost-plus fixed fee contract. He said, by God every damn penny of his overhead is of interest to the Navy. We make it a point of interest, because every cent you spend we have to pay you not only the cost of it but the...

NORBERG: Fixed fee on top of it.

SVENDSEN: Yes, fixed fee, and part of the cost is a share of the overhead. When the share gets to be 90% or you know a high percentage, then you get damn interested in it.

NORBERG: Let's return to the technical projects. You said something a few moments ago which caught my attention because I hadn't heard it expressed in quite that way before. It was the following: talking about the people who were working for you in this technical oversight, knowing everything, knowing a complete project from the Navy's point of view...

SVENDSEN: Knowing what the problem was.

NORBERG: All right, knowing what the problem was, which even the ERA people would not have known. Now was that because of the tremendous segmentation within the company required by classification, or were you talking about something else?

SVENDSEN: Well, yes. Very few of the company and the people really had a knowledge of the problem. The problem was processing a lot of data, but I mean going back to what is the problem we're trying to solve, the real classified thing back there, which is, you know, right now you can say it to break a code. Well, there are all kinds of different types and there are experts in the different types. To minimize the amount of our guys travelling to Washington, or the ERA going to Washington and the Washington types coming out here, which they did a lot of, but we had some guys that had worked back there long enough so that they had a feel for how the end product, the machine was going to be used when it gets back there and for what. So this was to minimize some of these. Now there were only a very few people that could actually talk at that level too, but - this was later on in the game - we had some goods ones, Roy Howard... We had some good young people who later went out and got jobs in the computer industry.

But they were a little different from the warrants. Warrants were basically from the part of the business which had to

do with the intercept of data. They had these intercept stations all over. These guys were mainly expert in that part of the business. Because this part was new, this computer business was a new way to attack the old problem, the same problem. So we had some really top notch young engineers. They were hauled in to the Naval Reserve, and then we had these warrant officers, and then we had some administrative people like yeomen and myself, and the exec and then the captain.

NORBERG: How did the technical group become familiar with the problem? Had they been at Nebraska Avenue?

SVENDSEN: Oh yes. They had either been there or they actually spent time there.

NORBERG: And so they brought the information back to St. Paul once some set of specifications had been developed, I take it.

SVENDSEN: They didn't specifically bring them back. What they did, when we got some of these new projects for which the time scale was very short and a lot of effort had to go into it, they would send these people out just to augment our staff, and we actually assigned them to these really high priority jobs. So they actually spent a good part of their time working with the company project people. So they knew what the company was doing and they also were in a position to know when the company was missing information on the real problem. It came both ways, initiate either somebody from Washington coming out and getting the problem solved, or the project engineers going back to Washington.

NORBERG: Project engineer meaning ERA project engineers.

SVENDSEN: Yes, ERA. Now there had to be a lot of sequestering of the information, but most of the top level engineers in ERA either knew, had worked on the problem when they were at NCML. In other words, they had been in the business, or they were given the access to the information.

NORBERG: What was your role in all of this? You mentioned your people actually working in the company. Where did that place you in all this?

SVENDSEN: Well, we were all working on the project. Actually, some of those guys didn't come until later. One very mundane thing I had to do, which was time consuming but it, I guess, was supposed to be useful, because this was a cost-plus-fixed-fee, expenditures over a certain amount of money had to be approved by our office. So my boss said, you give approval. So about every day Al Molde or Russ Ragon most of the time... You have heard of Russ Ragon?

NORBERG: Yes, I've met Russ.

SVENDSEN: Well, Russ was an outstanding guy. And he'd trot over with a stack of purchase orders - I forget what the dollar value on it was, but anything over a certain amount. Also, they were supposed to, if at all possible, get competitive bidding on certain things, and they had to explain to me why they weren't. We didn't have too many problems that way. If the purchase got over, and I forget the dollars because it would seem so insignificant now but it was a lot of money in those days. I think over a certain number of dollars that we had to send it back to Washington or some damn thing, because of this cost-plus-fixed-fee. That was one of the things. Then it was up to me just to keep on top of all the projects through my people. I used to just roam the damn place. I knew every one of the project engineers, and in general, we were on pretty good terms.

NORBERG: What sort of assessment did you have of these people? Specifically, people who were here in St. Paul such as Engstrom and Norris? Let's start with the top of the company first.

SVENDSEN: Engstrom was outstanding. He didn't spend too much time here, but he had the confidence of everybody. All the engineers and the people really liked him, and, you know, they looked up to him.

NORBERG: Was he here when you came in '47?

SVENDSEN: Oh yes. See he was one of the original...

NORBERG: Yes, but was he here in St. Paul?

SVENDSEN: Well, he spent a lot of time here. And of course, Bill Norris was outstanding. I'll tell you something about him later, after he went to Control Data. Outstanding. Ralph Meader was...

NORBERG: Outstanding in what sense? It's a kind word to say, but what criteria do you use to make that judgment?

SVENDSEN: Bill was working hard on the marketing business, but you always knew that you could always talk to Bill Norris. And you always had the feeling you knew what you were talking about and who you were talking to.

NORBERG: As compared to whom?

SVENDSEN: Well, Ralph Meader was a, just a bull in the china shop and he was no damn good for the company and it's good he left. He just didn't do things. I guess he was instrumental in getting the whole thing started, but... If I wanted a problem solved I tried to avoid Ralph Meader really. I used to deal with John Howard, director of development I think they called him, and then John Coombs took over later, I forget what they called him. Director of development I think was what they called him.

NORBERG: In 1947 John Howard was director of laboratories.

SVENDSEN: Well, he was actually director of development.

NORBERG: And then Norris was acting director of engineering.

SVENDSEN: Yes, okay.

NORBERG: With Tompkins being director of research, according to an organization chart which survives.

SVENDSEN: John Howard I don't remember as director of laboratories, because he didn't stay very long.

NORBERG: What was Howard like? What sort of an engineer and executive was he?

SVENDSEN: Well, John was a pretty straightforward guy. I didn't have any problem with him, but I understand he used to blow his stack, you know, and get upset with the engineers. My assessment of him was that he was a pretty straight person to deal with. You could talk to him directly and he wasn't pulling my leg, I don't think. He didn't have control of himself like Bill Norris. Bill Norris was just as solid as a rock. And, of course, John didn't last very long. I don't even remember that director of laboratories. Who told you that?

NORBERG: That's out of an organization chart which survives from that period. It didn't necessarily have to be very long, of course.

SVENDSEN: Yes. I don't remember that director of laboratories.

NORBERG: So we've covered Engstrom, Norris, Meader, and Howard. John Coombs was in there at the time, too.

SVENDSEN: John Coombs was there. Yes, John Coombs was there and he was very highly regarded as an engineer. I got to working with the level below that in most cases.

NORBERG: And who was that group?

SVENDSEN: Well, Jack Hill, Hugh Duncan, our friend from Dataproducts, Erv Tomash, of course, although he was

kind of in and out of our project work. Cliff Helms was a really outstanding guy. I think he went to work for Erv when he got out. There was a whole bunch of other guys now. Well, Arnold Cohen, of course, and...

NORBERG: All right.

SVENDSEN: Sid Rubens, of course, we had a lot to do with him because the magnetic thing was going all the way along. And also he was active in some of the R&D in Task 23 stuff the Navy sponsored. We set up that Task 23 in a way to cover just this kind of thing [R&D]. The company had to have it. ERA just didn't have the money, or they couldn't get the money set aside, to do that kind of thing. And so we went along with this idea. We, including the ERA people, talked the Nebraska Avenue people, Joe Eachus and that outfit, over to this idea. I think it came to a head when the transistors came out. And here we have to work on these. Another problem we had concerned the input device. The best input-output device we had was a paper tape reader. Running these damn machines at ultra high speeds and still inputting with a paper tape. Everybody that was concerned with the problem felt that something had to be done in those areas, so that's when Task 23 came to light. Now the company should have been doing more of that. See, that's one of the criticisms I think that I have to lay on John Parker for thinking too much about making a big buck and not really enough about the company growing. Dumping too much of that responsibility on the Navy to get the company moving.

NORBERG: There are several questions running through my mind at the same time and I'll try to sort them out. Let me take the Navy's role in all of this first. We talked a little bit about the specification development, or the problem understanding on the part of your technical staff. It's my impression that a good deal of information of a general kind was passed to the ERA people from the Navy.

SVENDSEN: Yes.

NORBERG: Reports of other projects, for example.

SVENDSEN: Oh yes. We got Whirlwind. They had good access to all kinds of classified information, good technical information. The only thing that the access was limited to on was this very high security stuff to do with the code breaking which was incomplete.

NORBERG: Do you know anything about the Navy's procedures in distributing those reports and other information from other projects?

SVENDSEN: In this area the procedure has been don't distribute.

NORBERG: In which area now?

SVENDSEN: In the, you know, the NSA type work.

NORBERG: Yes.

SVENDSEN: The policy has been don't distribute. That's where you're going to have problems of digging up information because except for things that have been specifically declassified, you're going to run across a blank wall.

NORBERG: That I understand. But in fact, apparently, the Navy, as a result of all the sponsorship that they were undertaking at the time in the digital field, there was a lot of information coming to Washington as a result of that. Everybody after all had to submit their reports.

SVENDSEN: Yes.

NORBERG: Now what did that mean - and I think best turn this over - what did that mean in terms of distribution from Washington? That is, did everything come to you people automatically about the digital equipment field?

SVENDSEN: No.

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NORBERG: I'm sorry, you started to say no to that question.

SVENDSEN: No. Things were not automatically sent out because the whole community of digital computers had not

gotten to the point where it got much later. We would hear of projects and reports. The engineers in ERA would

hear about them. And then we would go and get on the mailing list of Project Whirlwind. And we were on the

mailing list of several of those projects that had distributed periodic progress reports. But at that time, we had to go

after them. Now we had people back in Washington looking out for us, too. For example, ERA was not the only

company in the business doing this kind of work. IBM was doing this work, a lot of it. Not in the electronic

computer yet, but they were big in the... And there were several other companies who were actually doing work in

this area. So we got the progress reports on all those contracts. We had a BuShips office right out on Nebraska

Avenue, which dealt on a daily basis with the Nebraska Avenue people and they also did contracting for other

contractors besides, other than ERA. They had a whole bunch of them. So they would put us on the distribution of

those projects which they thought were pertinent to the project. And we had in the basement of the little Navy office

here a vault that could handle anything.

NORBERG: This was here in St. Paul?

SVENDSEN: In St. Paul.

NORBERG: All right. So we still have this problem then of trying to decide which things you thought were

appropriate to pass on to ERA, you meaning U.S. Navy?

SVENDSEN: Yes. Except, in general, we got the things for them. You know, we got them and they got their hands on Whirlwind reports for example. So there wasn't any problem. The problem was finding out where the information was. But once we found out where it was, then we had no problem getting it to the right people.

NORBERG: Do you recall any time discussing a range of techniques with ERA people and trying to help them or participating in coming to a decision about which technique would be best? Let me give you just one example that occurs to me. This would be too early, perhaps, for you, but it's the one that is uppermost in my mind at the moment, and that is the decision between using some sort of photographic film for the processing of information, high-speed processing of information, versus a magnetic drum. Those two possibilities for the storage and processing of information were being studied at the same time by ERA and a decision was finally made that the photographic film is not really going to work for this purpose. For a variety of reasons, we're going to go with the drum. Do you remember any similar such things while you were there? Where you would have participated or your people?

SVENDSEN: There's some very, very mundane engineering problems that we got involved in, but...

NORBERG: Can you describe a couple of those and then let me decide whether I would call them mundane or not?

SVENDSEN: Well, we started drawing this huge 7,000 tube special purpose computer, we started making drawings of them and the drawings ended up being 40-60 feet long. So actually we had to kind of make special rollers that you could fit over a drafting table. Well, it was obvious to both us and the ERA types that we couldn't spend all our time making those huge drawings like that, so we went to the symbolic method of, you know, the symbolic method of laying out the circuits. There was a standard AM nomenclature for color codes, well we ran out of color codes so we invented some new color codes. Well, I worked with the guys who were... We just couldn't have a solid color and one stripe, it got so we had to have solid colors and two stripes. These are little things, but we were part of the process of doing that. Some cases, we added to it.

Another one, which I think Jack Hill gets most of the credit for, but we participated in this, too, and that's the

business of the reliability of the vacuum tubes. We had some problems that it took so long to do when we used vacuum tubes and flip-flops. The flip-flop would stop flipping if the emission of the tube got below some threshold. So some of the mathematicians figured out we could never solve this problem because if you took the number of tubes and the random, you know, distribution of [them], then there would be a random failure of the tubes. There was going to be a failure before you solve the problem with all the tubes in the machine. Somebody said "crash". I'm not sure who came up with the idea exactly, but I know we implemented, in fact, I was right in the middle of it by, you know, encouraging it. We got some huge big filament transformers and had taps on them so you could arbitrarily reduce the voltage on all the filaments in the whole cabinet and that would just drop the emission down below this threshold. So before you'd start operating the machine on the shift, you'd weed out a few tubes that would probably fail during that time. That was implemented on several machines and it was necessary because the damn problem was so long that you couldn't have a failure. You had to try to minimize or eliminate the failures during this period of time. The other thing that I, again, I think I contributed to was during World War II at Columbia University. Some mathematicians from Columbia University generated all these [techniques for] testing of the probability of failure type things to test electronic equipment. If you wanted a certain level of confidence, then you had to test so often. And they generated huge tables and it was very good. All the electronic manufacturers used those tests to make sure the quality was up to that whatever the specified level was. Well, when you apply this to the computers, hell, you don't want any failures. You can't accept this idea of maybe 1 out of 100. We found that if you had a failure of a single component and it got into a card, you know, a plug-in card, then... Okay, you find the failure when you're testing the card. Then you've got to go in and refix the card. And fixing the card was a hell of a lot more costly then trying to make sure you don't get any bad ones. So we essentially threw out this sampling testing and said 100%. And resistors and all these things. We got so the manufacturers would deliver them to us in ribbons and the ERA types put together an automatic tester that you would run these things through, not too fast, but it was, you know, stepping fast. And then they had a typewriter on it so you'd run this whole row of resistors through and out would come a report with the actual value of each resister and a red mark on each one that was out of tolerance. Not only did that prevent the bad stuff from getting into the manufacturing process, but it also was a tremendous lever on going back to your vendor and saying, hey, buddy, look here. You said you were going to provide this level of quality and you didn't. Here's our report. No argument, they'd send you a whole new batch. We were confident that

they took that old batch and delivered it to some company that wasn't doing that. Now we got involved in that, and, as I say, I'm not sure who gets most of the credit for that, but it was just one of the things we worked on. Cooling and everything. That level of thing I think our office did contribute to the thing.

NORBERG: If we ran a contrast between what was going on at Eckert and Mauchly Company in terms of the design and construction of computers and then we look at ERA in the same period, the late 1940s now, rather than '47, '48 but '49 and '50, if we look at the differences, the machines are not the same kind of machine in terms of the basic componentry in the machinery itself. And that has been attributed by a number of ERA people that I've talked to, and it's implied, at least, in the documents, it's not specifically stated, that the Navy had some rather special requirements because of the use of the equipment. Now, in fact, if we...

SVENDSEN: No. Oh, okay go ahead.

NORBERG: Go ahead, that's fine. Challenge me right now because the next statement would go beyond that. When you say no, why do you say no?

SVENDSEN: Well, no. The Navy electronics organization got to be a very highly developed thing during World War II, and it was mostly not regular officers but this influx of all these engineers who came in during the war and the Navy requirements for reliability were quite high and so they developed a whole set of specs, mil specs for electronics, which had been through the mill and had been extremely useful and necessary in order to provide really good equipment. And they covered such things as modularity and, you know, maintenance philosophy, plug-in versus fix it, and so that body of specs... When we moved in, we were going to build this equipment for BuShips - it's actually for NSA, but it's for BuShips. But we were given on the grounds authority to waive any of those specs. But what we did, we applied all the specs that had to do with the good parts and good maintenance practices. We obviously didn't require them to build something that had to pass the shake rattle and roll thing that you have on moving ships and that the Marines have, and that the Army has going over through the rough terrain. But all of the basic component and basic specs and philosophy of really well engineered equipment, we applied it to ERA. We had

the authority to waive the things locally, so that made it work. Otherwise that would have been an impossible thing if they had to go back to Washington to get all that crap waived.

NORBERG: Yes. Do you remember any discussions about this being too onerous for the designs in question?

SVENDSEN: Yes, I do. In fact, if my memory holds, we didn't hear much after a certain time. There were a lot of people that thought we were spending... Well, there wasn't too much objection on the part of the ERA engineers in actually using it for the Navy projects. But then, they said, well now, hey, we've got to get this commercial business and we obviously can't spend all that money, you know, on, some would say, the gold-plating of the product. We've got to get the price down. And so the first real commercial computer that they built... it wasn't the 1101, it was something called, was it the File computer?

NORBERG: No, that's 1955. That's later.

SVENDSEN: Even then. I'm trying to think of what... One of the machines they built, and it was the first one they built completely...

NORBERG: For commercial purposes?

SVENDSEN: Yes, commercial purposes.

NORBERG: That's the File, all right.

SVENDSEN: And then they produced it and the feedback we got, from my friend Don Ream and those guys back in Nebraska Avenue, was that ERA had a hell of a lot of problems with the File computer. They just had pure old maintenance problems. I'm not sure how true that is, and how that opinion was twisted by the fact that, you know, we were pretty proud of what they had done for us in the Navy work.

NORBERG: But that's later, too, that really is a different problem

SVENDSEN: Yes, that's later, too.

NORBERG: All right. So it's your contention, then, that the specifications that were required were really not onerous because they had to do with reliability and quality of componentry and so on.

SVENDSEN: We waived all the other... In fact, the basic electronics specification at that time was Mil 16E400 or something like that and it then refers to a whole bunch of specs for components, you name it, maintenance philosophy, everything. I rewrote that spec leaving out all the crap about salt water, you know, and shake, rattle and roll, and all the things that had nothing to do with shore based things and just left the basic reliability. I don't think that ever got published, but it represented what we were trying to do right in St. Paul. And I think that's pretty much what we did. We made them buy good parts. I read in that book where somebody said something about the people were having trouble getting waivers. Did you in the...

NORBERG: You mean in that Sperry history of ERA?

SVENDSEN: In the history.

NORBERG: Yes, I noted that, but I don't have any explanation for it.

SVENDSEN: I'm trying to think of when that happened, because we didn't have a formal waiver process.

NORBERG: But you were describing earlier that you were the person who would be doing the waiving.

SVENDSEN: I would have done it. Now, this might have happened after... See, about the time I left, things were

starting to stir around and Rem-Rand got in there right after that and I'm not sure what happened to the... In fact, they disestablished Navy Computing Machine Lab, made it a BuShips Inspection Office, BSTR I guess. No, I guess it's BuShips Tactical Representative for a while. But they disestablished the NCML, which I thought was a grave mistake, but I was gone.

NORBERG: I want to go back and still pick up two more points here. One of them has to do with your interaction with the people on Nebraska Avenue. Who were you interacting with, and if you could tell me, on what subject?

SVENDSEN: Well, BuShips had an office in a code back there who we actually worked directly for. In other words, the contract ERA was out of that BuShips office. We were essentially administering the contract for them. They had offices right in Nebraska Avenue. And there were several people there. This was primarily contract administration. They in turn for requirements dealt with people like Dr. Joe Eachus, I'm sure you've heard of him. Well, Don Ream, whom you met, worked for Dr. Joe while the machines were being built out here, while I was out here, Don would frequently be the guy that would come out here to lead the NSAs, not NSA then but the predecessor. He would lead the acceptance team. They'd accept the thing here. ERA would run the machine and show them it was working and they'd go through all the acceptance tests. Don would be the guy that represented Washington and then we'd have a guy on our staff who would work with them then. So Don was out here accepting most of the machines that were being built. And then he went to work for BuShips later, but that was much later. He worked in that office on Nebraska Avenue. He's typical of the kind of people that they have at Nebraska Avenue. Nebraska was part of the CNO organization, but they had extremely talented people like Dr. Joe Eachus and a bunch of math... well, Howie Campaign's another guy that you met. And then they had at the engineering level like Don Ream and here these guys had to know how the machines functioned so they could actually maintain it and, well, accept it and maintain it and run it back there. And then a bunch of technicians that actually did the running of the machines and the repair. We had a very close relationship with them, of course.

NORBERG: In what sense? How would you describe the details of the relationship?

SVENDSEN: Frequent contact. They'd make trips out here.

NORBERG: Do you remember any of those trips?

SVENDSEN: Oh, there were so many of them, so many of them. The only really big one where the BuShips came out here that made a big fuss was when the chief of the Bureau of Ships came with that other thing.

NORBERG: Overhead issue.

SVENDSEN: Overhead issue. That was a big to-do. See, back there [Washington] they had people assigned to the specific individual projects who were kind of sponsoring the individual machines and who would have to live with them when they got back there. And so frequently those guys would make trips out here to see how the machine was coming so there was a pretty steady flow back and forth between Washington and here.

NORBERG: But the machines fall into a very few categories, do they not? When I think of machines like Goldberg and some of the subsidiary ones who's names escape me at the moment, that would be one class where data was being stored and somehow processed looking for various kinds of associations among the data. Then there was a second group of machines where the Atlas leads the class, the general purpose machine, which then 1101, 1102, 1102A and so on fit into the same group. Now, in addition to that, there's a third group of material which are the lower level things, power supplies and whatever other auxiliary equipment might be needed which was also being designed in some ways and built here at ERA. The first two classes, it seems to me, really are the important classes that the Nay would have been concerned about. And that very quickly the general purpose machine supersedes the Goldberg type of machine. Now, that's my reading from the outside and what I know about the machinery. My question for you is do you have any recollection, did you at the time have any knowledge is really the question, I guess, about when that general purpose idea would seem to be the answer to a number of Navy issues, maybe questions?

SVENDSEN: Well, I think this was Dr. Joe Eachus and it's hard to put a date on it. I can tell you when I know that everybody thought that would be a good idea. If that coincides with when they started the thing, but we had one real crash project here that we were supposed to complete in a very short time. Before we finished the project, the problem had disappeared. In other words, the requirement disappeared, because, you know it's like when the President announced that traffic into the Libyan embassy in Germany gave him the news on the bombing of those, you know, all those kids and that thing. Well, you know that particular system is going to disappear. We'll never see that one again, probably. Maybe, I don't know.

NORBERG: It's good speculation.

SVENDSEN: That's the kind of a thing. For these guys that work in this business that's the real facts of life.

NORBERG: But how did this apply to ERA in the example that you started out to tell?

SVENDSEN: Well, as I say one of the machines that they built, the need for it disappeared overnight.

NORBERG: All right. So that's...

SVENDSEN: So the people that are working back there see, now Goddamn it, we can't be spending all this millions of dollars, thousands of millions of dollars working on these machines and then our friendly enemies change their mind about how they're going to communicate. So then, smart people like Joe Eachus decides that, hey, it's time we did something better here. He's the man. But I don't know just when that happened.

NORBERG: Okay. How did he convey the information to you and your people here?

SVENDSEN: Of course, they started discussing the original Atlas, the original Atlas thing which became the 1101, was the drum, the GP computer using a drum, that started fairly early in the business. At that time, within the

community, it was pretty common knowledge that that was the reason. Here's the storage, let's do the stored program, let's try the stored program because maybe that's the solution.

NORBERG: Did this mean any change in the way you people were doing business here in overseeing ERA?

SVENDSEN: No.

NORBERG: Did you have to learn anything new particularly?

SVENDSEN: Well, we were pretty knowledgeable. You know, von Neumann and Goldstine and those guys wrote that paper which pretty well describes the stored program computer. Joe Eachus was the first guy to implement that kind of a thing. Joe knew what was going on in the whole computing world.

NORBERG: How often did you meet with him?

SVENDSEN: Well, Joe would make a trip out here periodically. I would say he was out here a couple of times a year, at least, as a minimum. And then if there was some specific machine, he would be out here sooner. I don't really remember.

NORBERG: And how often would you visit Washington?

SVENDSEN: Not too often. Once a year, maybe. One year twice a year.

NORBERG: My second question in this same period has to do with this Naval Reserve unit that we heard about the other day and the possibility that someone who had worked on the construction of a machine might then turn around and put on his reserve uniform and spend a couple of weeks on active duty as a reserve officer, enlisted man, and actually run the acceptance test? Did that story ring true with you when you heard it the other day?

SVENDSEN: It wouldn't bother me because most of the acceptance tests were run by a fairly large group of people. I mean they were accepted not on the ability to solve that problem that they wanted, but, you know, acceptance of the fact that the damn machine worked the way it was supposed to aside from solving that particular piece of paper problem that ran into it. The fact that it was doing all the things it was supposed to, unless you got, you know, one of the very top notch guys here to deliberately mess up the acceptance test, I don't...

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SVENDSEN: Other than that, I really didn't know too much about that reserve unit.

NORBERG: But, in fact, you described to me, in some length a few minutes ago, that acceptance tests were done here with Navy personnel on site before it was even shipped.

SVENDSEN: There was a set of acceptance tests that were done here and usually somebody from the customer, you know, Nebraska Avenue, would be here going through the test with them. Don Ream was frequently that guy; there were others besides him. So that the thing actually ran through a set of tests here and final acceptance course was back in Washington.

NORBERG: Do you recall any of the interactions that the ERA people were having with other companies at the time we're talking about, 1947 through the time you left about '51?

SVENDSEN: Well, of course, they were new in the... You mean other companies involved in the computer business?

NORBERG: Yes, I do.

SVENDSEN: Well, I wasn't aware of too much. I guess the only one I really became aware of, one contact was with

IBM.

NORBERG: Which contact with IBM? What can you tell me about it?

SVENDSEN: The Navy had a hand in this one. The Navy had a problem. They needed the capability of the drum, which ERA had developed. In fact, it was being put into Demon or Goldberg, I forgot which one, both maybe. And they had a problem. As I told you, IBM had been doing this kind of stuff in a fairly large scale way but theirs was all electro-mechanical and, you know, all kinds of card handling equipment, sorters and all that stuff. Electro-mechanical primarily. And they had a very special problem that they felt only could be solved by a combination of the IBM equipment, the electro-mechanical equipment which IBM was most proficient in and then this new drum with all the associated electronics. So Navy arranged a meeting between IBM and ERA and they exchanged information on it and then the Navy gave two companies a spec and they worked out a spec for the electro-mechanical stuff and then a spec for the drum. That was all worked out and then they did produce a piece of equipment like that.

NORBERG: This is for Nebraska Avenue?

SVENDSEN: For Nebraska Avenue, yes.

NORBERG: Which I take it is a classified piece of equipment.

SVENDSEN: Yes, this was a classified piece. In the process, though, IBM learned quite a bit about ERA. ERA was new and they were just starting to get known for, you know, the drum I guess got some publicity. So IBM entered into an arrangement with ERA to purchase a drum. And not only did they purchase the drum, they purchased basically the design disclosure of the drum, I guess, I don't know whether it was specifically the patent, but anyway it was the... And they, not in the contract, but they dangled the prospect, they had made a market survey of what later became the 650 drum system and they dangled some fairly large numbers, like 50 or 100. I forget the number, but it was a sizable number for ERA who's striving for some commercial work. They signed this contract and came the

delivery of the equipment to IBM and IBM said goodbye, thank you. And so they just snuckered ERA out of the drum thing. And then, Christ, they sold I don't know, thousands of 650s. That's one specific case. There were other companies and other projects, you know, that would get clearance to come and visit ERA and we'd run them through. There was a lot of that, you know, like Whirlwind types came out here. We even had, you know, Bell Labs, Bardeen, Brattain, and...

NORBERG: Shockley?

SVENDSEN: Shockley. We had one of them, Bardeen or Bradley came out here and talked to the people and actually, you know, swapped lies on how the transistor could be used. There were a lot of people coming through here all the time. That was later when ERA started to get a little reputation. In the parts procurement they had wide contact with a lot of companies, of course, because they were buying a lot of parts from a lot of the companies and they developed a first class procurement activity. Well, Russ Ragon, when at the time they went to work with Rem-Rand, he set up his own distributing company and he just retired recently, but it's, you know, a pretty big distributor of all kinds of electronics parts. They developed a first class association with a lot of companies at the component level. Interesting, I got into a lot of these procurement problems because I was the guy that had to sign off on them, if they had any problems they'd tell me about them. General Electric and Westinghouse, the big companies, were interested in big motor generator sets. Early computers needed motor generator sets because of the power involved, and big DC machines. They weren't interested in making machines, you know, if you only needed one or two of them. And we had a hell of a time getting - ERA and I worked with them - getting good DC motor generators. We finally ended up getting some from a little company down near Kato, Kato Engineering in Mankato, Minnesota. I'm not sure whether they're still in business, but for a while that was the only place in a hurry get a custom made machine. So, like any other company, they had contacts with component suppliers all over. And they got involved in the electro-static storage tube, that was the first fast storage on the Atlas II. So you know, their guys were out looking all the time for information and they got it and whenever they ran across a problem with classification or anything like that, they'd trot over to us and we'd try to help them out. If we couldn't do it directly we'd go back to Washington and have them open the door for information. So they had pretty free access, I think. I may be wrong,

but I think they had pretty good access to whatever was known to be around. It wasn't a systematic method of distributing digital computer information in those days, of course, because no one had that in their library thing yet.

NORBERG: When exactly did you leave St. Paul?

SVENDSEN: Summer of '51.

NORBERG: Summer of '51.

SVENDSEN: That was just before the start of the Rem-Rand thing.

NORBERG: Can you remember any view, any changing view particularly, of ERA over those years from '47 to '51? Did you look at them differently in '51 as you were coming up for transfer than you had when you arrived, say that first year? Had the company changed?

SVENDSEN: Well, I don't think so, really. I think I had a very high regard for the engineers, you know, the engineering level. And at the engineering management level I think I had high regard for those guys all the way through. We always thought the top management of the company was somewhat suspect. We always felt there was a disconnect between the top management and the middle management. That may be because we worked so Goddamn close with these guys that we felt the way they felt, because at times we worked pretty close with them.

NORBERG: Well, what did you feel you wanted management to do that they weren't doing?

SVENDSEN: See, the engineers were some top notch guys there. They recognized they really had something here that nobody else had. And they felt, I think, that they had this mixed feeling about the Navy, you know, that we're happy that you guys are giving us all this work but we all, you know, they would have liked to have seen ERA prosper in their own commercial business. That's what they really, I think, wanted to see and they weren't seeing

that. I was closer to the project engineer level and all those, you know, that level. So perhaps, my feelings reflect a little what they felt. You know, they were openly critical of things that the management did. In fact, we had one group rhubarb that, you know, I don't think I should even be talking about this.

NORBERG: Come on. Come on.

SVENDSEN: No. No. But I think there was this feeling that they really had something, but, you know, when are we really going to stand up to be a big company like we can be.

NORBERG: This was really a sensitive feeling at the time, you think?

SVENDSEN: That was throughout much of the year, it didn't change too much. I wasn't here when they sold to Rem-Rand but I can guess what the feelings of the people were. Of course, the Rem-Rand sale was really in a sense, the initial sale was a very bad one because Rand, I saw some of this, Jimmy Rand I guess was running it. And it appeared to me and a lot of the other people - see these talks were going on about the time I left there or no, this was later I guess. Yes, this had to be later after Rem-Rand had taken them over - see I got involved with Sperry quite heavily in a thing called a Navy Tactical Data System. When we started working with Rem-Rand then, there was much unhappiness with the top Rem-Rand management.

NORBERG: I don't want to move that far ahead quite yet. What I was sort of pushing you on a little bit is, there was that feeling certainly among the engineering staff of Engineering Research Associates that somehow they seemed to have something that management was not taking advantage of. But nobody has been able to tell me what management, what they thought at the time, and I'm not asking them to make predictions, of course, of what happened later, but what they expected management to do. Now Parker will answer that quite straightforwardly as to what he thought he was about at the time and Bill Norris has answered it quite...

SVENDSEN: He didn't have money.

NORBERG: Exactly. The capital was not there. And nor was the business there. When we go back we can't use the IBM 650 case which happened 5 years later, and say, well, ERA should have known that and capitalized on it, that's not fair.

SVENDSEN: Yes, okay. Well, you're right that the business wasn't quite there yet and wasn't there right for the grabbing but it took time for it to develop.

NORBERG: Now, last question on that point and I won't press you any further about it, but did the Navy have any views about what ERA's future ought to be like, in 1950 say?

SVENDSEN: No I don't think so. I had some views, but they didn't get very well accepted. There had been this stirring around. I mentioned the chief of the Bureau of Ships had to come out here and have a confrontation with Parker and Captain Hawk. The people in OpNav, you know, the CNO Op side of the family, the operational people who really are directly over the Nebraska Avenue types, I think there was some unhappiness with what was going on at that time. And not liking to have this Goddamn adverse publicity or whatever was going on about ERA and the Navy work. One thing the Navy does, the whole Nebraska Avenue type work, one thing that they do is to break their butts to keep things quiet. And they can't afford to have any kind of a squabble, any kind of a public squabble, because of just the nature of their business. It's not the idea of attempting to, you know, to cover up something bad, but they just cannot afford to have any kind of publicity to any of these kinds of projects. And so there was some unhappiness, I'm quite sure. Again, this is speculation, except it's based on talking with some of the people that I knew back there. There's really was some unhappiness with this kind of thing. I do believe there was the idea that - and I hate to even say this - but I have a distinct feeling that at one time there was a push to get me and several others moved out of here.

NORBERG: By the ERA management?

SVENDSEN: Well, I can only guess that that's where it came. And the only part of management that would attempt anything like that was John Parker, who was known to, well, hell he used to play with Harry Truman's press secretary so, had a way of getting around the circuit.

NORBERG: So what was the problem? Why would they be trying to push you people out?

SVENDSEN: Well, I'm not sure. There's one incident I know of, and I don't think I really ought to talk about it. I'm not sure enough about it to know that this was the case that they tried to move some of us. It was over an incident that happened with the company. I think it was a sense of frustration. If Parker did do that, it was his frustration at first having been slapped on the wrist by the chief of the Bureau of Ships and another incident which I was involved in. The first one I wasn't so much involved in that, because the overhead stuff was more, you know, Captain Hawk's and Commander Holland's doing. But this other was a thing that really, it came close enough after the big flail of the chief of the Bureau of Ships thing that it might have caused him to do what I think he did.

NORBERG: But was it a technical question? Were you people forcing certain technical issues or...

SVENDSEN: Well, no. I'll tell you, this is one I would probably... (tape machine turned off)

NORBERG: In 1951 when you left ERA, NCML, what was you next duty station?

SVENDSEN: I went to the San Francisco Naval Ship yard and I spent two years on the waterfront as assistant repair superintendent for electronics, installing electronics on ships that were in there for overhaul. For one year I was the electronics officer which had under it all the electronics engineers in the yard. They did all the inspection on the ships when they came in and the final acceptance of the works of the shop. Then I was a radiological defense officer and we decontaminated one of the Bikini ships. Well, that was the standard industrial tour that all the engineering officers get assigned to a shipyard because that's their big business.

NORBERG: Was going to San Francisco related to the action in Korea?

SVENDSEN: No. No. Actually, when Korea started, they held me on at St. Paul. My normal tour there would have been three years, but they held me on another tour because they just didn't want to change things. And Korea started while we were at that time.

NORBERG: While you were still here?

NORBERG: Yes. Okay. So it would be, what, June of '50, right? I had the idea it was October of '50, but the dates are a little off. After the radiological activity, where did you go from there?

SVENDSEN: Well, then I went back to BuShips. And my job was the special applications officer that had computers, cryptoanalytic, cryptographic, infrared, special applications, RADIAC. Under me I had the office that controlled the work at ERA when I was out here. So I got right back into that kind of business. I was there one year when the whole NTDS type thing came up and then I later became the NTDS project officer and worked on that for, you know, almost the rest of my career. And during that period, of course, I had a lot to do with Sperry. For a short time I was on the Op Con center and I had to do with Control Data. There were, you know, Hughes and Collins and a bunch of other contractors involved, that was a really big operation. But we always had a feeling of confidence in its hardcore gang at Sperry, former ERA guys.

NORBERG: And how about Control Data? Would you say the same thing about them, too?

SVENDSEN: Oh yes. I wanted to tell you about Bill. Our NTDS project had gone along to the point where all three contractors were busily building the R&D hardware and it was to be put together at the Navy Electronics Lab in San Diego. We had gotten to the point where we needed coordination meetings between the contractors and the lab and then us and Washington, and so we would shift around. We'd scheduled a meeting here in St. Paul in '57. This was a big meeting. It was the first time the CNO people, a couple of admirals, were coming out and they were all going to

come out and get the latest hot dope on NTDS. I arrived here and Bill Norris asked me if I could please see him before the meeting started. So I got over there and he announced that he's going to form Control Data. Here I am... Sperry by far the principal [contractor], not only did they have the computer development, but they had the basic system programming and they were our system design implementor. Actually the Navy did the overall basic system design on this thing, believe it or not. They were our key contractor, no question about it. And Bill Norris announces that, you know, Frank Mullaney and Seymour Cray and Jim Thornton... You know a whole big list of people and, of course, I'm sick. And then later he said he wanted me to know that he wanted to do anything he could not to - I don't know how he said - not to hurt our programs. So I'm going to leave Seymour and Jim Thornton on the project until they deliver the computer and he did.

NORBERG: That's why they didn't leave right away?

SVENDSEN: That's right.

NORBERG: Because I saw that they didn't leave until September and Norris and some of the others had gone by July.

SVENDSEN: Oh, Seymour was longer than that, I think.

NORBERG: Longer?

SVENDSEN: Yes.

NORBERG: Yes, I can check to see when it was. I see, so this redounds to Norris' credit as far as you're concerned with not interfering with a project which was rapidly coming to some sort of running stage.

SVENDSEN: Yes, Seymour was the guy, you know, he had actually put together the design of our so-called unit

computer. And Jim Thornton was, you know, running all the rest of the things outside the computer. He was kind of the overall project manager.

NORBERG: Okay. I've just arrived at the place where I'll be talking about NTDS with Jim Thornton and with Bill Norris.

SVENDSEN: Okay.

NORBERG: And so I'd like to reserve that until I'm a little bit more knowledgeable about the whole thing, which I'm not because I've been talking about the earlier period mostly with others. I want to thank you very much for this. This has been quite helpful.

END OF INTERVIEW