

An Interview with

H. DICK CLOVER

OH 113

Conducted by Arthur L. Norberg

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Abstract

After briefly discussing his early life and education, Clover focuses on his work with Engineering Research Associates (ERA). Topics include: the work of C. B. Tompkins; Clover's association with Communication Supplementary Activities-Washington (CSAW); the relationship between CSAW and ERA; the formation of ERA; the roles of Howard Engstrom, Ralph Meader, John Parker, and John Howard in ERA; research on magnetic drums and disks; the relationship between Northwestern Aeronautical Corporation and ERA; and Clover's administrative work with the Navy contracts at ERA. Clover concludes the interview with a brief description of ERA under Remington Rand and Sperry Rand.

H. DICK CLOVER INTERVIEW

DATE: 5 June 1986

INTERVIEWER: Arthur L. Norberg

LOCATION: Bloomington, MN

NORBERG: Dick, can we start by my asking you something about your background, your family? Where you were born; what your father did and mother did for a living; and where you obtained your early education.

CLOVER: Well, I was born in Millboro, South Dakota, in 1921. And my father was a farmer at that time. My mother had been a school teacher. In 1926 we moved to Council Bluffs, Iowa, and I grew up in Council Bluffs and went to school there. Graduated from Thomas Jefferson High School in 1939.

NORBERG: What was the reason for moving to Council Bluffs?

CLOVER: The farm economy was worse then than it is now. And we, my father had homesteaded in South Dakota and farmed it for, oh, seven or eight years. At that time, he just, we just... The farm economy was so bad we just abandoned the farm and left it. Didn't owe a dime, my mother says, but just had no income and couldn't see any way to continue.

NORBERG: Now did he take up farming again in Council Bluffs or do something else?

CLOVER: No. He worked for the Street Railway Company, Omaha-Council Bluffs Street Railway Company I believe it was called. And then, well, I joined... Well, after high school I...

NORBERG: Let's not move quite so fast, Dick.

CLOVER: Okay.

NORBERG: What about your mother? What did she do in the '30s, after moving to Council Bluffs? Did she go back to teaching school?

CLOVER: No, she did not teach school. She just raised the family. She was very active in P.T.A. and I think she said she was in P.T.A. for something like 25 years.

NORBERG: Tell me a little about Thomas Jefferson High School. What sort of program did they have there? First of all, I guess I should ask how large was it?

CLOVER: There were two high schools in the town of Council Bluffs, 42,000 people; Abraham Lincoln and Thomas Jefferson and they were both about the same size. My recollection is there were around 400 in our graduating class, so there were probably, and it was a four year high school, so there were probably between 1600 and 2000 students.

NORBERG: Substantial for the late '30s.

CLOVER: Yes. It was a big high school.

NORBERG: That suggests the program was fairly wide-spread then. You could take physics and chemistry and mathematics and so on.

CLOVER: You could take most anything you wanted, yes.

NORBERG: What sorts of things did you take?

CLOVER: Well, I took what was called a commercial course designed to prepare you for business administration as opposed to any technical or also... I don't know exactly what I mean to say, but as opposed to any of the...

NORBERG: Say the scientific fields, where you would be going on to that sort of research. I understand the difference. It still existed when I was in high school in the '50s. Okay. So you took the commercial program, what sorts of things were in the commercial program?

CLOVER: Oh, that's a long time ago.

NORBERG: Things like accounting...

CLOVER: Oh, yes. There was accounting and statistics, algebra, none of the advanced math was in it but elementary math if you want to call it that. Business... Well, all of the various things associated with business, economics, etc.

NORBERG: Did you participate in extra-curricular activities?

CLOVER: Yes. I was on a high school wrestling team. I was probably the... I weighed, I wrestled in the 85 pound class and never had to take anything off, never had to have any problem with getting down to the weight - I was right there. I was very small. When I graduated from high school, I was about five-two and weighed around 92, 93 pounds. In the next couple of years, I grew to about 5'9" or 5'9-1/2" and put on up to about 125, and then in the next few years just added a little more stature, whatever.

NORBERG: Other things besides wrestling?

CLOVER: No, I was too small for any other sport, other than just... We played golf and we horsed around with football and softball or kittenball as we called it and all that stuff. But not any of the intramural activities.

NORBERG: How about working? Did you have any jobs during high school?

CLOVER: I carried papers for the Omaha Bee News, which went out of business.

NORBERG: Then or later?

CLOVER: No, it was in that period of time. It folded about, oh, probably about 1935. I carried papers for the Omaha World Herald and the Council Bluffs Nonoparial. And then did a fair amount of just odd helping out jobs, helping the family as well as the neighbors, etc.

NORBERG: How about hobbies during this period?

CLOVER: I have two primary hobbies: one is golf and the other is fishing.

NORBERG: Then?

CLOVER: Yes. Even then. I did quite a bit of fishing. My father was an avid fisherman and we spent a lot of time together fishing, my dad and myself. My brother sometimes went with us but most of the time it was just my dad and me. Golf, myself, my brother, and a couple of my best friends and a couple of others, we got permission from the park board to build a small golf course on waterworks property. It was not far from home and we had a little nine hole course laid out that I would guess would probably have gone somewhere near 3 or 4,000, 3,000 maybe 3200 yards. We buried some tin cans for the holes and the waterworks property, or the waterworks decided that they would not only let us do it, but they would encourage us because they mowed very closely where we had our greens and whatever. And we had a great time.

NORBERG: Did anybody else use it besides the four of you?

CLOVER: Well, there were about six or eight of us that were involved in this. And, well yes, there were some others that would play sometimes. We had old fishing parts of old cane poles marking the holes and it was just, we had a great time.

NORBERG: Coming up on 1939 what did you think you were going to do when you finished high school?

CLOVER: Well, I had been, in my senior year in - oh, I can't think of what they called it - it was the study of the current events. It was not, I don't remember if it was part of American History or what it was, but anyway, it was current events. For the year you had to prepare, pick a subject and then prepare something, monitor the papers and then come up with a conclusion. And I had chosen the world situation and I had followed very closely the Japanese involvement with China in their Indochina war, I guess it was called.

NORBERG: Yes. '36.

CLOVER: And I'd followed that and then I'd followed the German situation of their Czechoslovakia and Sudetenland and all that. And I don't know whether... I was not too happy with the grade I got in the final on my paper, because I had predicted that there would be a World War II, or a world war, I didn't call it II, but I was convinced that it was not far away. As it turned out, it began in the first of September that year with the Germans marching into Belgium, I believe.

NORBERG: Poland.

CLOVER: Poland, okay Poland. And then Belgium. But it wasn't a bad grade, but I considered it to A or A+ and I got I think a B+ on it.

NORBERG: I remember a few of those, too.

CLOVER: I thought I'd done a fantastic job and I thought I'd picked a good subject and I thought I'd made a very studied prediction. And so I was disappointed in my B+ grade.

NORBERG: Now, what's the relationship between that and what you thought you were going to be doing in 1939 after you left high school? If there was a war, did you expect to be called?

CLOVER: Oh, I expected to be in the war without any question. So my judgment that there was only a matter of time until there would be and I was just the right age to be involved. In fact, my cousin, who was my age living in South Dakota, joined the National Guard at age 18, because if he was in the guard he'd be called up whereas otherwise he'd have to wait until he was 21 because his father was a World War I veteran and wouldn't give permission for him to join. And he was that convinced that it was going to happen.

NORBERG: Did you do something of the same kind? Did you join the National Guard or...

CLOVER: No, no. I enlisted in the Navy in, well, just a few days after my 21st birthday.

NORBERG: Okay. What did you do between 18 and 21?

CLOVER: Well, I worked in Baltimore for the Bureau of Old Age and Survivor's Insurance, or the Social Security. Worked with punched card equipment. That was my initiation into the computer, in a fashion. My supervisor, I can't think of his first name, but he was Greenwall. I can't think of his first name, but his last name was Greenwall. But anyway, he knew that I was, well, of course, when the war started in December of '41, he knew that I would be eligible to be drafted or even more so that I wanted to volunteer. I didn't want to be in the Army. So I decided that I would join the Navy and he asked, took me aside and asked me if I would go talk with a friend of his, who turned out to be Dr. Charles Brown Tompkins. I don't know if you've heard of him!

NORBERG: Oh, yes!

CLOVER: But he wanted me to go talk with him because he felt that I would be, well, that I could contribute to the war there as much as anywhere, and that was my introduction into Naval intelligence.

NORBERG: We'll come back to that. Let me go back to the beginning of your tale. How did you get to Baltimore?
It's a long way from Council Bluffs, Iowa.

CLOVER: Well, I took the Civil Service examination and I went there - I don't remember when it was - sometime in 1940.

NORBERG: Now had they called you or did you look at a list?

CLOVER: No, they called me.

NORBERG: Now tell me a little about the punched card equipment? What was it? Was it IBM equipment or Remington-Rand?

CLOVER: Oh, it was all IBM equipment. It was collators and tabulators. They had a section that would punch in the wage information as reported to the Social Security offices and then that would be... Well, they would take, you know, it was just like a bank as far as making sure that the figures balanced with what was reported by the company and the number of people involved and everything else. And I don't know what else to say about it. That's it.

NORBERG: Do you remember any of the serial numbers by any chance?

CLOVER: What serial numbers?

NORBERG: Of those machines? The IBM 602 calculating punch and that sort of thing. That's an off-the-wall question, I realize it's a long time ago.

CLOVER: I don't remember.

NORBERG: Okay. Getting back then to Tompkins. This would be what, 1941, early '42?

CLOVER: When I first went over to talk to Dr. Tompkins was in, oh, it was in the late May, early June time frame. I think late May would be better.

NORBERG: '42?

CLOVER: Of '42.

NORBERG: Were you already in the military at the time?

CLOVER: No.

NORBERG: You were not. Were you ever in the military?

CLOVER: Oh yes.

NORBERG: You were. Okay. So how did that occur?

CLOVER: Well, I went over and talked to Dr. Tompkins. And I guess partially because of the recommendation I got from Mr. Greenwall and partly from the interview I had with him, I was called back again and went over for the second time and talked with Dr. Tompkins. And then after the second interview, he asked me to go to the Navy recruiting office in Baltimore and take my physical and everything and do everything except be sworn in and tell them I wanted to wait until I was 21 and that I wanted to take that short interim of time and go home and visit my family before I joined the Navy. So I did that.

NORBERG: That's interesting. Do you have any idea what his purpose was in making those suggestions?

CLOVER: Well, the purpose was I think clear when I actually did join, when I actually went to... Well, after I had completed that, I contacted him and told him that I had passed my physicals and I was ready to be sworn in and that I was going to go home. Well, I know two things happened. I know that I had a background check for security, and that may have been done before my second visit with him, I'm not sure. I suspect it was, because the second time it was pretty clear cut. Just go ahead, do this and that and the other thing. And I went down and was sworn in. They had already sent orders for me to go to Washington in a "draft of one". So here I am in a draft. I've got the papers for a draft, but I go all by myself. I go to the what's now the Naval Gun Factory. I can't remember what it was called at that time, Anacostia Naval Air Station, I think.

NORBERG: Sounds right.

CLOVER: But it's now the Naval Gun Factory in Anacostia. I went down there and reported as I was instructed in the papers. I think there were some smarty remarks by the guy, "Well, another one of those people." Then I was told to go over to the Navy and report to Dr. Tompkins, and I did. I was immediately put into this work of working with the IBM equipment. I think probably the only one that I know of anyway, my official Navy I.D. was in civilian clothes. And I'm the only one that I know of that had a Navy I.D. card that was taken in civilian clothes. And I had been in the Navy, oh, maybe six weeks before I ever got an uniform, even though it was war-time and you're supposed to wear an uniform at all times.

NORBERG: Who else did you find in the office when you arrived there besides Tompkins?

CLOVER: I don't remember any other names of any consequence.

NORBERG: Okay. What sort of tasks were you put to on the IBM calculating machinery?

CLOVER: Well, it was dealing with intercepted code, intercepted Japanese traffic.

NORBERG: Decoding messages essentially?

CLOVER: Well, it was an analytical process of taking intercepted traffic and analyzing them to determine where they started.

NORBERG: Where they started in terms of geographic location?

CLOVER: No, no. The Japanese intercepted traffic. Assume it was a series of maybe, well let's say to pick a number 100 5-letter code groups. The first one was not to start. It would start somewhere in the middle of... All I remember is the Japanese were ? ? and that was the beginning. We analyzed intercept traffic to determine where the real start of the dispatch was.

NORBERG: Of a given message, now I understand. Did you work close to Tompkins in doing all of this?

CLOVER: Well, I wouldn't say close, but I worked under him with some other, a number of other enlisted men.

NORBERG: I would think that mechanical equipment would no be very useful for this analytic task, just on the face of what you said? Is that a correct interpretation or not?

CLOVER: It was better than hand.

NORBERG: It is.

CLOVER: It was better than hand, because you can take through sorters and whatever you can, you know, sorters or collators or whatever, and you can take these messages and move them all like this.

NORBERG: I see, yes. Did you continue to do this sort of work in that office for the rest of the war?

CLOVER: No. I went overseas.

NORBERG: Oh, you did. I didn't realize that. Where did you go?

CLOVER: Well, I was based in the Fleet Radio Unit the Pacific. Our headquarters were on Mokalopa crater. Well, before that we were down in the basic Navy yard inside the compound and then shortly after that we were moved up - well, shortly was maybe a year later - we were moved up into new office buildings at Mokalopa crater.

TAPE 1/SIDE 2

NORBERG: In this task though, you were doing work other than intelligence work?

CLOVER: No.

NORBERG: No, same thing?

CLOVER: Yes. That was the Fleet Radio Unit Pacific, which was the Pacific... There was an Atlantic and a Pacific and then the headquarters in Washington, D.C. of the Naval Intelligence.

NORBERG: So you would still be reporting up a chain to Tompkins or maybe directly to Tompkins?

CLOVER: Oh, no, no, no. I was totally removed from that chain when I went overseas. I reported to Commander Samuel Bertolet. And he reported to Captain William Jasper Holmes, who wrote some fantastic World War I submarine stories - in case you're interested, I read a couple. And I was in the office next door to Captain Holmes and

got to know him quite well. At that time... Well, I started out in the tabulating equipment room. From there I moved into the group that analyzed traffic for purposes of actually assigning the decoded values to the traffic so it could be read. Then from there I moved into the cryptography room where we took the decoded traffic that we wanted to have sent out. Then we would encode it on the enigma machines, I believe they were called, if I remember correctly. In other words, they were encoding machines, a series of wheels that were changeable and would give an electrical pattern depending on which key was punched and they would then give an output which could be reversed onto a decoder and then decode them. And did that for a period of time.

When they decided that that could only be done by officer personnel, and I got moved into working in what we called the G.I. section of combat intelligence. G.I. was for - I can't even think of the name what it was - but it was General Intelligence was... And we had files established of all of the Japanese forces as well as our own, maintained logs, if you will, of where everything was going on and kept a running daily, twice a day we'd put out new documents of the history of what was going on, what was going where and whatever. So we were in the group that dealt with all of the decoded traffic. And this was the information that was used to plan where the next island hopping strategy would be, where they would be. And when these events took place, there were people who would prepare from some of the miserable HO charts we had, which were probably about World War I time frame. No more updated ones were available.

NORBERG: An HO chart? What is that?

CLOVER: Hydrographic Office. And that was one of the reasons that Tarawa was such a bloody battle. The site was picked for where they would go ashore based upon the old maps they had. In the meantime, the coral had grown so that the landing ships could not clear it and they had to go over and wade chest deep in water, maybe a thousand yards to the beach head. And the Japanese would just strafe the water and the bullets would just go like yey and... There were a lot of happy sailors, because the sailors were getting prepared for the next assault if the Marines didn't land on the second or third wave, I don't remember which it was, but it was bloody. And it was because of poor charts. I think one of the results, I guess, or happenings of that particular campaign was that because the charts were

so outdated, there was a fair amount of submarine reconnaissance to determine whether or not the charts were any good or whether the landings that were being planned would run into that kind of a problem again. It was a terrible, terrible situation.

NORBERG: Did you have any part in the planning process at all?

CLOVER: I helped put the planning together. By that I mean all of the intelligence we could gather and we could get from all kinds of sources. There was the - I wish I could think of the right name for them - there was a group of, most of them were either Australian or Dutch or whatever, plantation owners and they ran a coast watch. And there was a coastal watch. And they would send traffic to the Americans and to the Australians of the Japanese movements. That was one source, and strength and whatever. There was a lot of the coast watches. And then we had information from, of course, HO charts. The intercepted traffic, visual aerial reconnaissance, photos, Naval submarine sightings, and, I don't know what else to call them, but just from submarine sightings and their reconnaissance of the areas to what the strengths were, gun emplacements, all of that. And then the campaign would be put together primarily by CINCPAC, which was about a nine iron shot from our headquarters, not very far away.

NORBERG: How long did this go on then, Dick? '45?

CLOVER: I was three years, five months, and seven days with that.

NORBERG: In the Pacific?

CLOVER: No. Well, in the Pacific I was there thirty-three months and twenty-nine days. The three years, five months and seven days total were all in the service.

NORBERG: So that would have gotten you out somewhere in early '46.

CLOVER: December of '45.

NORBERG: December of '45, okay. And what did you plan to do at that point? Had you done any post-war planning?

CLOVER: At that point in time? Well, I was discharged and then I went back to work for the Naval Security Station in Washington, C.S.A.W. or whatever they called it, on Nebraska Avenue.

NORBERG: Who was still there when you arrived?

CLOVER: Well, I worked for Howard, Captain Howard Engstrom, and Norris worked for him. He was a commander, William C. Norris. Ralph I. Meader was with the Naval Computing Machine Laboratory in Dayton, Ohio, and he would come in periodically, and I knew him. This was about the time of the incorporation of ERA. No, close. I had decided that that was what I wanted to do, was to get involved with ERA.

NORBERG: How did you first hear about ERA?

CLOVER: Well, I was working for Captain Engstrom and at that point in time, I knew everything that was going on in the office. People may or may not realize how closely the formation of ERA was - I can't think of the word I want, but how closely they worked with the Navy in setting up the ERA. Actual approval was at the Forrestal level, who was Secretary of the Navy at that time.

NORBERG: How did this all happen and how do you know about it? Were there discussions around the office about, that is, between people who were obviously going to leave the Navy to run this company and Navy people who were obviously going to stay behind? Was that a clear cut set of groups?

CLOVER: No. Most of the ones that I knew were people that were going to come to work for the company. There

was a matter of, you know, tying up loose ends or making an orderly conclusion, I guess, to the individual people's activities during the war. I think that the matter of shutting down of a person's military career is very dependent on what they were doing. The dough-boy or the soldier, all he has to do is leave. Someone engaged in intelligence tries to make an orderly conclusion and button it down, and wind it down gracefully I guess is what I want to say.

NORBERG: All right. Let me clear up one point here. Were you actually discharged from the Navy before you went to work at C.S.A.W.?

CLOVER: Well...

NORBERG: Or were you still a...

CLOVER: I had been in... When I came back from overseas, I was stationed at C.S.A.W.

NORBERG: Okay. So in this period we're talking about, in early '46, were you still in the Navy?

CLOVER: No. I was discharged from the Navy in December of '45.

NORBERG: All right. So you're a civilian employee of C.S.A.W.

CLOVER: A civilian employee.

NORBERG: Right. Now you mentioned about the Forrestal level. Were you aware at the time that discussions were going on that high up?

CLOVER: You're asking me to put an exact time frame on something. I knew that they were... I knew that that was approved at the Forrestal level before the company was even incorporated.

NORBERG: But did you know it at the time? What I'm trying to do is distinguish between what you might have known then and what you learned later. And I don't care how later, whether it's two years or twenty years.

CLOVER: I was not aware of the meetings with Forrestal at the time they were held. I was aware of them shortly after.

NORBERG: Shortly after. So that you realized when you were deciding to go to ERA that this had full Navy approval then, that this new company had full Navy approval?

CLOVER: Yes.

NORBERG: I'd like to ask a couple of questions about Engstrom and Tompkins. How closely had you worked with Tompkins in the early part of the war, '42, and how closely after the war, but before you joined ERA?

CLOVER: When I enlisted in the Navy and reported to Washington, I reported to Tompkins. I had interviews with Tompkins before I joined. I joined as a Second Class Petty Officer, skipped over, I never went to boot camp, I never did any of that stuff. I knew Tompkins, oh, you know, more than just a nodding acquaintance; I felt that I knew him fairly well as a result of my discussions with him and working in a section under him.

NORBERG: Can you tell me a little about Tompkins then? Obviously I never met Tompkins. What sort of fellow was he? What sort of background did he have? What sort of work did he do?

CLOVER: My recollection of Tompkins is that he was a math major. I believe that he taught in a university or college, and I'm not sure where. I think it was Brown, but that would be just a wild guess. My memory, or Boston College, one or the other. But I knew that he was a very learned man and was tremendously skilled in mathematics.

NORBERG: How did he work with people? What was his style?

CLOVER: Well, I guess my observations would be that he was never really what I'd call that he never really worked closely with anybody. He was more of a loner, if you know what I mean. That he liked to pursue things on his own.

NORBERG: So the amount of interaction between you and Tompkins would be relatively small except in the direct line of duty.

CLOVER: Yes.

NORBERG: What about the others? Did you work with Engstrom at all when you returned to Washington?

CLOVER: Yes.

NORBERG: Can you make a comparison between Engstrom and Tompkins?

CLOVER: Well, there was a night and day comparison in personality. Engstrom was very congenial; he liked people. He had tremendous trust in people and people seemed to, I think, take advantage of him because of that. I know of some cases, but I won't discuss them. But Howard Engstrom was what I'd call a real gentleman and a real scholar.

NORBERG: Would you say that this group was very close when you first observed it?

CLOVER: Yes.

NORBERG: How did this, what sort of evidence would you cite to confirm that they were close?

CLOVER: I don't know if I can cite any evidence. It was just my observation that the people had tremendous respect for each other and were very interested in getting a job done and continuing to do the kind of effort that really was

needed to bring about or to preserve, I think is what I want to say, to preserve the tremendous resource that was assembled during the war in the intelligence community.

NORBERG: Well, let me ask the question a slightly different way and then maybe something else will occur to you. How many people were in the office, in the C.S.A.W. office at the time you came back in early '46?

CLOVER: Oh, I don't know. There were several thousand.

NORBERG: Well, I guess I didn't expect that sort of an answer. Several thousand is too much. Among the group like Norris and Meader - of course Meader was in Dayton - Norris, and Tompkins, and Engstrom and that group, how many were associated with the same sort of work?

CLOVER: Well, you take Meader and he was associated with the Naval Computing Machine Laboratory in Dayton, Ohio, that they actually built computing equipment, mechanical devices to assist in analyzing interceptor traffic. It was computing equipment, but we would call it very, very crude compared to things that happened within the next few years. My recollection of the assignment of Norris, he was primarily, well, electronics was his background, or electrical engineering when he went to the University of Nebraska. And he was primarily in the radio communications part of the total picture. Both of them reported to Engstrom and they were all associated with a group that was dealing with the intercepted traffic, the sorting of it and manipulation of it and so forth. Then we move from that into the section that I spent most of my time in the Navy in and that was in the section that dealt with the actual decoded traffic. That was what I dealt with almost my entire Naval career. In fact, I knew for three days before the actual surrender the exact time and place.

NORBERG: But that was still in the Pacific, though.

CLOVER: No, I was back here then. I came back in June of '45.

NORBERG: All right. Then you were at Washington, Nebraska Avenue from June.

CLOVER: Yes.

NORBERG: I kept saying early '46 and I wasn't corrected, I assumed that was right.

CLOVER: Well, that early '46 was when I went back to as a civilian.

NORBERG: Yes. Now I understand it clearly, Dick, but that leads me to some other questions. What I was leading toward, in my questions about Norris and Engstrom and that group in asking you how many there were in the section and so on, was to try and explore the issue of why this group, why did this group turn out to be the ones - or the one - that established something like ERA? Why couldn't it be somebody in the other 6,990 people in the lab?

CLOVER: I thought I had said that in the Engstrom group, which included Norris, they were dealing primarily with the intercepted traffic and how to manipulate it and work with it for purposes of preparing it for frequency counts and things like that, where you get repeats of certain information, certain kinds of data, so that you can then deal with the actual assigning of final values to the code groups so that you can deal with them and decide what they really mean.

TAPE 2/SIDE 1

NORBERG: Dick, I'd like to continue with that thought for a moment on the Engstrom group, because I'm still a little unclear as to why this group and not some other. And let me ask you a slightly different question. Was this the only segment of the C.S.A.W. operation that was dealing with the uses of equipment for these decoding activities? That is, developing new equipment to do the decoding?

CLOVER: You've got to understand that was a big organization. It required various levels of security clearances. There was no need for people in one group to know what the other group did, except that they processed work that

they got. So the amount of knowledge that any one person had about the various activities of the others was relatively limited. Because of the fact that I was in the final intelligence stage, I knew where a number of groups were, but I didn't necessarily know who was involved in them and what they actually did, now. To take a group, you would have a group of people that would deal with radio, because they were the ones that got the intercepted traffic. That same group would deal with a radio that would try to monitor the out-going traffic so that it was, that it didn't indicate panic on our part. In other words, we had various priorities assigned to messages, so many urgent, so many priority and priority QPE and routine and deferred and whatever. And we tried to maintain a relatively constant pattern so that if you sent out, in other words, you didn't want to give away any activity by the fact that all of a sudden you would send out a whole bunch of urgent messages. I know that we would take, when we had a bunch of urgent messages to send out and not enough pigeon holes, if you will, to send that many, we were exceeding the number we'd have, we would take one of the messages and code it to send out to our own forces. A date and time would be assigned to it and then they would send one of one or more of our own people to a Naval radio station. They would be escorted by Marine guards and we would get there and say now, I don't care what these are, these go first even though they're priority or routine or deferred. And the people in our associated stations, Fleet Radio Pacific and S.S. in Washington, Fremel, Melbourne, Australia. Anyway, they knew that if they got a dispatch that was relatively short period of time in between, that it was probably much higher priority.

NORBERG: I see.

CLOVER: So by that method we could get more urgent traffic into the hands of a relatively small number of people in the United States Navy that dealt with the movements of the enemy.

NORBERG: Without betraying this because of any overall change in the pattern.

CLOVER: In fact, we had a number of, oh, I've sat in on I don't know how many meetings with the person who was in charge of subpac, a Pacific Submarine Fleet, Commander Bogey. And he would come twice a day to get the reports that the section I worked in put out of the traffic or whatever was going on, the movements and so forth, and they

were all segregated into various groups in the Pacific, various groups of islands and whatever, starting with fleet headquarters in Japan and Tokyo and Kobe and all of those down and everyone of these had their own little sections of traffic that was originated by those who would be in those sections. And these were twice a day picked up by Commander Bogey and then he would take two copies, one to Nimitz at CINCPAC headquarters and he had one and that was to... Nimitz' was used to inform all of the task force admirals, Halsey and so forth... I'm getting vague on the names anymore, but...

NORBERG: That's all right. The idea is clear. There's no problem there. Okay, so this was your task and now we have two different things that have been described but as far as you're concerned you didn't know what else was going on then in CSAW.

CLOVER: Well, I knew vaguely what was going on, I mean I knew what various assigned groups were supposed to do. There was a group called TI, which was Traffic Intelligence. All they would do would be to, they would make judgments just on the sheer amount of traffic originated by a certain individual, whether it was at an outlying outpost, whether it was the first fleet, or whether it was headquarters in Tokyo or whatever. And they would make judgments based on who he would contact as to what was going on, whether something was imminent, or whether it was routine or just to keep in touch, or patting them on the back or whatever. Anyway, this was a group of people that did nothing other than to analyze the traffic flow generated by all elements of the opposition, not only the Navy, but the Army, Air Force or whatever.

And as I said, there was a group that I worked with Tompkins, and Tompkins was assigned to the manipulation of traffic. By manipulation, I mean comparing it so they got various kinds of counts, of frequencies or whatever. Various ones. Like you may have seen years ago, it used to be a common practice when the people in the newspapers were using the typesetting machines. Every once in a while, it [a sequence] would appear in the paper. And it was ETAOINSHRDLU. That's the ten most common [letters]. Those typeset, why they felt they would continue, just go ahead, everything was working fine, they still had the various slugs they needed to run a typesetting machine. Well, this was the kind of thing that is done by another group who was looking at frequency

count. And this was using mechanical means to do it. And this was where the use of computers started. First with tabulating equipment, key-punch equipment, and then with the rather very specific kinds of computers that would do very limited amounts of things but extremely fast.

NORBERG: We'll come to those in a moment. Still pursuing this same question about this group, do you recall when you might have first heard or seen anything about this new idea called ERA? Did you ever see a document that described a thing called the National Electronics Laboratory?

CLOVER: I don't remember that document, no. The first that I remember of ERA was talking with Howard Engstrom, Dr. Engstrom. And because he spent so much time and at that point in time I was serving as his chief yeoman. I was a civilian, but that's what I was serving as. As such, I knew, well, everything practically that went on in the office I was privy to because of the fact that I was his right-hand man, if you will.

NORBERG: So you learned about ERA through that connection. Were there discussions about what ERA was going to do?

CLOVER: Yes. Most of the discussions about what ERA would do were ones that I was not privy to the actual discussions.

NORBERG: When did you actually join ERA?

CLOVER: Well, I joined ERA at, I think the first or second of November in 1946 was the day I reported. And my reporting time was tied to Howard Engstrom's discharge and reporting, because he wanted me to come out there. That was the mechanism by which I came out. I had expressed an interest and he wanted me to come out and work for him out here.

NORBERG: I do recall that he was serving in the Navy for a considerable period after ERA was actually incorporated.

CLOVER: And so did Norris, but not quite as long as Engstrom.

NORBERG: Yes. Now when you were still in Washington before this November date, you were still associated with C.S.A.W.

CLOVER: Yes.

NORBERG: You were not with any Washington office of ERA?

CLOVER: No.

NORBERG: And I assume that up until that date in November that you were continuing to do the same sort of work on intelligence materials that you just described to me.

CLOVER: No. In the last, well, the place was pretty well winding down from its World War II peak and I was working strictly for Howard Engstrom as his chief yeoman at that time.

NORBERG: What were Howard's responsibilities at that time? Still continuing with the same things that he was doing before?

CLOVER: As I tried to say at one time I think that one of the tasks of an intelligence organization is to put it to bed in a very orderly fashion as opposed to just shutting it off. And there was a fair amount of, a big effort to really try to, well, let's see, to try to make a history, if you will, of what had been done, what had gone on, how things had been wound down and tried to put it to bed and hide it for the next twenty years or whatever.

NORBERG: I would have thought with the intelligence business, though, that that would need to continue even after

the war?

CLOVER: Oh, yes, but a person who is there has to be discharged. He was a reservist, and he's to be discharged, you don't just say today's the war's over, and just let him go.

NORBERG: Yes. That I realize, but I would think that they would also be taking steps to develop some sort of a steady state operation that would continue on indefinitely, as it turned out to be the case until NSA was established and so on. We still maintain a substantial intelligence network. So I would think there would be some sort of transition going on there at least for a time.

CLOVER: Well, when I said an orderly thing, part of that is historical documentation for purposes of transition. There's an awful lot of information that was in the heads of people that had to be recorded in the peace time environment as opposed to the hectic war-time environment.

NORBERG: In November of '46 then, did you move to St. Paul?

CLOVER: Yes.

NORBERG: What sort of operation did you find when you arrived?

CLOVER: Well, when I arrived our ERA was a subcontractor to Northwestern Aeronautical Corporation. Northwestern Aeronautical Corporation, owned primarily by John E. Parker, was a, I'll say, legitimate concern but that's not what I mean, was a going concern. And from the standpoint of giving a contract of that size to an unknown corporation, they had to have a business environment that they needed business people as well as the scientists and whatever and this was the way to accomplish that was to move it in Northwestern Aeronautical Corporation was in the process of winding down from its World War II activities at the time ERA was building up and it was a perfect match from that standpoint. So what next?

NORBERG: Well...

CLOVER: I found a going concern. There were a number of people that I had either known or known of in the Navy or working for Engstrom after I became a civilian, that either I knew them or knew of them and they were here. They were engineers working on tasks under this contract. The contract was actually awarded by the Bureau of Ships, and the Bureau of Ships continued to be the principal contracting agency, I guess probably for reasons that they wanted to maintain some kind of a separation between the intelligence agency and any company and they did that by having another entity of the Navy actually do the contracting. It still is a practice that the intelligence agencies not only NSA but the FBI and whatever, they've got some squirrely set-ups.

NORBERG: Yes. Mechanism for doing it so that it's not them that's doing the contracting.

CLOVER: Yes. It's to maintain a lower profile. They don't like the high profile.

NORBERG: In this November of 1946 when you arrived, what is it Engstrom had told you he wanted you to do for the company?

CLOVER: Engstrom wanted me to... Well, I came here and reported to him and then I set up what was called a correspondence center. I was manager of correspondence. And I was responsible for all communications between the company and the Naval Computing Machine Laboratory and then on to the Bureau of Ships. And this function became a natural for contract administration. That's what I basically did.

NORBERG: And this went on for some time.

CLOVER: Yes.

NORBERG: Who else did you come in close contact with then besides Engstrom, at the company now?

CLOVER: John E. Parker; John Howard, who was director of development at one time or another; John Coombs; Ralph Meader; Norris, of course...

NORBERG: Why do you say of course?

CLOVER: Well, because I thought I'd started out by saying I've worked with Norris longer than anybody I've worked with. I've worked for him longer than anybody that worked for Control Data. I worked closely with the people at the Naval Computing Machine Laboratory. They actually moved from Dayton to St. Paul. And there was Commander Svendson and Captain Hawk...

NORBERG: Dick, what sort of working relationship did you have with Ralph Meader?

CLOVER: Well, I don't know how you want me to answer that because...

NORBERG: Straightforwardly and at length!

CLOVER: Well, I knew him quite well. I spent a lot of time talking not only business but just shooting the bull with him.

NORBERG: What sort of fellow was he? I haven't met anyone so far who was that close to him, that's why I'm asking you.

CLOVER: Well, he was what I'd call an opportunist, a shaker and a mover, whatever you want to call it, but primarily an opportunist. I don't know if you remember the Western Union telegrams. They used to come out on little strips and then they had a little thing that they would put the messages on a telegram. Okay?

NORBERG: Yes. They used to stick them right on a piece of paper. I remember those.

CLOVER: Meader invented the device that did that.

NORBERG: Oh, I didn't know that.

CLOVER: And he got a fair amount of...

NORBERG: Royalties?

CLOVER: Royalties, for a period of time from that. He did several other things. He discovered that in the Works Progress Administration, the WAP or whatever, that the sand for concrete that was being used in Georgia and Florida and whatever was all coming from up in either Pennsylvania or some state up in there, I don't remember what, but anyway, he discovered that and got an option on a sand, big sand...

NORBERG: Quarry?

CLOVER: Quarry of some kind, somewhere in I believe it was Georgia. And every time a truck went out there was a quarter he whacked up, he was telling me. And every time a truck went out, and there were just gobs of them, it was 25 cents. And somebody fairly high up in the F.D.R. administration talked to him and said there's a lot of business going your way, you know, there ought to be a little bit of money coming my way. I think I knew who it was but I'm not going to say. But Meader said I told them, hey, that's the only one anywhere down there and there's no way I feel that I should give up anything. And he said, within two weeks, the trucks stopped coming. He said, I never had another load out of that quarry.

NORBERG: That's remarkable.

CLOVER: I'll tell you another little thing that Howard Engstrom told me, that Meader had...

TAPE 2/SIDE 2

CLOVER: Howard Engstrom told me that Meader had suggested to Howard that he could carry on his duties in Dayton better if he had the rank of Captain, because he said he was running into all the full colonels and the lieutenant colonels, or the bird colonels, and they were just eating him alive in Dayton and he wondered if there was a spot promotion. And Howard Engstrom said that he prepared a recommendation and Howard gave it to his superior. The letter was addressed to Bupers from Engstrom via his superior, who was Admiral Wenger, and Wenger approved it, but as a courtesy he sent it to Admiral Redman. Well, Admiral Redman had been high up in Western Union before the war. And Redman sent it back with a little note and said he thought he'd better sit on it. Well, then Wenger gave it back to Engstrom and then next time he said that Meader came to Washington he asked Howard what was coming on with that spot promotion. And he said well, here it is and he reached out and took it out of his desk and showed it to him and Meader looked at it and it was all signed off except that this little paper clipped note said that it was premature. And Meader said, he said, you know he'd love to have that for his memoirs. And Howard told me he said, sure I gave it to him. So Meader hot footed it to Bupers with a letter and said I know it's a little irregular but I'm headed back for Dayton tomorrow morning and I'm hand carrying this document. And they opened it up and he got on the train the next morning as a full captain. So I said...

NORBERG: Poor Engstrom.

CLOVER: So I say he is an opportunist.

NORBERG: Demonstrates the point, all right. But now around the office was he equally opportunistic?

CLOVER: Well, I would say not. I had quite a bit of admiration and respect for the guy.

NORBERG: What sort of direction did he give the company?

CLOVER: Well, I would classify him as being the super salesman, if you will, in other words, the one who administers things from the standpoint of getting the customer's acceptance and the continuation of the programs and so forth. More of the broad brush publicity, public relations kind of a person.

NORBERG: So he would have been working directly with the Computing Machine Lab, in personnel in St. Paul, and in Washington?

CLOVER: Well, he didn't work with the Computing Machine Lab in St. Paul at all.

NORBERG: No, work with their personnel. Is that the liaison he's doing?

CLOVER: No, no. He worked primarily with the technical people who were making presentations to the Bureau of Ships or to CSAW or whoever.

NORBERG: I see, okay. And who would have been making those presentations?

CLOVER: The technical people.

NORBERG: Rubens, Cohen...

CLOVER: Oh, Rubens, Cohen, Hugh Duncan, Dave Noble, John Coombs, John Howard.

NORBERG: Good. A good listing. Do you think he was effective in working with these people and then that group working with the Navy? I guess I should ask that a little differently. How would you judge his effectiveness?

CLOVER: I liked it the other way better.

NORBERG: Okay. All right. Was he effective?

CLOVER: To a certain extent I would say yes. Probably he was more effective with the customer, relations with them, then he was with his own people. He used to travel a lot between St. Paul and offices that ERA had in Arlington. The standing joke was that he must be on a train if they couldn't get a hold of them.

NORBERG: We'll pursue that a little bit more. Did you ever witness him interacting with John Parker?

CLOVER: I would say only in very minor situations, nothing of any consequence.

NORBERG: All right. One other person that I'm interested in talking about, because it's the same sort of situation as Meader - I've not met anyone who was close to this person. How about John Howard? Did you have much interaction with John Howard?

CLOVER: Yes.

NORBERG: What sort of fellow was he?

CLOVER: I guess I'd classify him as being an intense person. He really believed in things. He was a good administrator. He believed very much in what ERA was doing. I can remember a situation where he had called all the people in, or at least he was there, whether he called them in or not I don't remember that for sure and I want to correct that, but anyway it was about the time that ERA was putting together it's patent claim for electronic storage, or storage on a disk...

NORBERG: Magnetic drum.

CLOVER: Magnetic drum or disk. And one of the uses that came up in this brainstorming session is basically what you'd know today as the word processor. That was one of the ideas that was discussed at that meeting was to take information and store it electronically so that you can manipulate it and use it to type out and rearrange and do everything on an electric typewriter. I guess at that time they were Justawriter, Justawriter division of IBM.

NORBERG: Were you at that meeting?

CLOVER: I was at the meeting.

NORBERG: You were at the meeting, too.

CLOVER: But he was very intense and believed, belief in the fact that there was a market there for that stuff in the commercial world. Unfortunately, he got out of line at one point in time.

NORBERG: I realize that and I've also talked to John Parker about it from Parker's side of it. But you've introduced something that's a bit of a surprise to me and that is that there was discussion as early as, and if I remember correctly that meeting was in '48 if it's the same meeting, that's why I asked you if you were present because I have a list of names who were present at the meeting that I'm thinking of, I'm not sure they're the same, but there was a discussion of applications of this magnetic drum and...

CLOVER: There were... this was... I thought it was later than '48, but...

NORBERG: Well, you could be right. What I recall is not the date so much as the fact that all the, I believe it was technical people, it could have been more than that, all the technical people were asked in advanced to submit ideas, submit their ideas, and I'd seen a half dozen submissions from various people prior to the meeting and then the

meeting was held and there's a summary of the meeting, as well. Then after that you begin to see the actual attempts at patenting for various claims. I thought it was late '48, but it could certainly have been '49. And the reason that I am so insistent about that, I think, is that in my mind it's before the IBM contract even came up. So there was a good deal of internal discussion about the applications of this machine. Now what you've just introduced that I hadn't been aware of is the idea that this could be commercially exploited, that any of these ideas could be commercially exploited. Was Howard a proponent, a strong proponent of commercialization at this time and was he the only one?

CLOVER: All I really recall about that is in the meeting that I attended where they were talking about applications for the magnetic drum storage or the magnetic disk storage, and we had both, it was one of the applications that was brought up and was discussed in this meeting was the taking... well, if you recall, let me go back. The Justawriter had a punch paper tape that if you typed you could also punch paper tape. And that you could take that punched paper tape and feed it through a reader and it would run the typewriter and it would permit you to stop it and alter it and do everything, okay? Now one of the discussions in this meeting was that this could be used as a substitute for that paper tape reader. In other words, to do it electronically and store it on a drum and make it a, when I say a word processor, that's basically what word processors are these days, is just to record and manipulate and move data around and whatever. And this could all be done electronically. And this was one of the [ideas] mentioned in this meeting, uses of that equipment. Whether that ever appeared in any of the actual submissions to the patent office, I don't really know.

NORBERG: Okay. But I can check that. What I was interested in, really, is in tone. That is, what sort of tone was going on here? Were people beginning to think seriously about a commercial market that was beyond the Naval customer?

CLOVER: Oh yes, because at that time we were, if I recall correctly, that's about the time that we were doing work on what we call the 1101.

NORBERG: Well, that's later then.

CLOVER: And because that was the 1101, I can't remember when that was delivered, but I'd guess it was in 1950, maybe '49.

NORBERG: The 1101? No. In '51. Delivered.

CLOVER: Okay.

NORBERG: So we are talking about a slightly later period and then there's no question about commercialization once they begin to shift the Atlas to a commercial machine.

CLOVER: Well, yes, but moving it to a commercial machine that was quite a bit of time in between one and another...

NORBERG: One and another, one what?

CLOVER: One being the actual delivery in '51 and the time they were talking about building these machines. My recollection would be that it would be the '49 time frame when we were talking about the actual building of the machines for a commercial market.

NORBERG: All right. Good. I can check some of that by the documents for the period. Okay. Let... I see we've been running almost two hours, Dick, I don't know what your feelings are about this, but we're clearly going to need another session, I'm not going to cover all that I wanted to cover this afternoon and so we can either decide to stop at the end of this tape and make another appointment or we can keep going and make another appointment anyway or whatever your pleasure is.

CLOVER: Well, we're going to go somewhere this weekend and then we get back on Sunday and I'm leaving on Monday to go on a three-day salmon fishing trip in Michigan so...

NORBERG: So the end of next week could be possible when you come back?

CLOVER: Well, I won't be back until Friday night.

NORBERG: Oh, okay. Well, let me go a little bit longer than today, if you don't mind.

CLOVER: No.

NORBERG: I want to go back to your tasks now and leave off people for a moment. What was involved in setting up a correspondence office within ERA when you arrived there?

CLOVER: Well, it was much of what you'd expect in any office where you have communication with the customer, where you have monthly progress reports a number of which are classified. I was responsible for setting up that plus the classified aspect of it. I was responsible for all classified material by the company, including, you know, the technical specifications of the hardware. I kept those in a file under lock and key and well, actually in a safe, and would make them available to the people when they needed to work on them. It then came about that I was doing an awful lot of the ghostwriting for a lot of the people that were in contact and signed, you know, Parker would sign something, I would actually do the, write the letters and write the correspondence and generate it. Then I got so that I could write a letter for Norris that he was happy with without being, without changing. That took some doing.

NORBERG: Yes. And how long... How many people were required to run this office in the beginning? Just you?

CLOVER: Well, it was me and a secretary and then I had another person for a period of time.

NORBERG: How did your duties change over time in the late 1940s?

CLOVER: I guess they just kind of like Topsy, they grew, they evolved. As we became more involved with more tasks that we were working on, more projects, more contracts, it became necessary to have a person who was responsible for signing letters to make sure that the things that we said were right, that they were answers to the right questions. If there were questions that we answered the questions. That we were... Well, just, in general, a responsibility to conduct the interrelationships or intercourse or whatever you want to call it between our company and our customer.

NORBERG: Does that mean that the office ultimately became essentially a contract office? That is, overseeing the contracts.

CLOVER: It became that. The correspondence center as it was it became strictly a stenographic pool as other things were siphoned away from it. It then became strictly a steno pool, a correspondence center. But as it was originally established it was to be the nerve center, if you will, between the company and particularly at that time the Naval Computing Machine Laboratory, because at that time Northwestern Aeronautical Corporation was really the contracting party. And when I first started out, it was to set up something so that we, ERA, interfaced with Northwestern Aeronautical and with the Naval Computing Machine Laboratory and that the interface between the Northwestern Aeronautical and the Bureau of Ships was a step removed from us at that point in time, because by contract we were not, we were not a party to the contract itself, except as a subcontractor.

NORBERG: To one contract. But didn't ERA have another contract of their own at that same time?

CLOVER: Well, yes. We had several others at that same time, but the biggest one, the primary one was that.

NORBERG: Does that suggest then, Dick, that people who work for ERA were not necessarily Northwestern Aeronautical employees?

CLOVER: Well, they were... I'm trying to think. They were not Northwestern Aeronautical Corporation; they were

employees of ERA. There were people in Northwestern Aeronautical Corporation that had counterparts in ERA and would oversee what ERA was doing. For instance, in accounting. We would have sitting in one area was an ERA accounting and you'd see how they'd work together or whatever. Joe Walsh was controller for ERA and then he left because George Plufka, who was the treasurer, was a young man, you know, and he didn't see any room for, he didn't see any room to go.

NORBERG: No.

CLOVER: Then George Plufka had a heart attack and died shortly after Joe Walsh left.

NORBERG: I asked that question to see what sort of legal separation there might have been between the two companies. Do you know, in the contracts that you handled in ERA, were any of those for the airline side of the business, the development of various kinds of equipment for the airlines on the contract?

CLOVER: Well, by the time this came about we had three or four people working in contracts. Bill Winget, myself, Merlen ? and... I'm drawing a blank on another name.

NORBERG: Just to set the right context for me, what other offices were there in ERA at the time? I'm speaking of the late '40s now from the time you arrived through the sale. There was either the correspondence center or the contract office depending on the time we're talking about. There is certainly a research function, research and development function going on that's broken down into various parts, and there's Parker's office, the office of the president. What other things were there? Was there a public relations office besides?

CLOVER: Well, I don't know that there was any public relations office at that time. We were a relatively small corporation. Public relations I think have grown tremendously in their impact or importance or whatever you want to call it over the last twenty-five years. We're talking about nearly 40 years ago and there wasn't that much emphasis placed on public relations. I think it was done primarily at that time by the officers of the corporation as opposed to

having someone, you know, just assigned as a public relations officer.

NORBERG: So there's no one doing that sort of thing outside of the usual group. Okay, but are there other offices that would be labelled in a similar fashion?

CLOVER: Well, ERA had a purchasing office. They had a development laboratory. They had their own manufacturing activity. I'd say... And to a certain extent, well, they had personnel and whatever, but they had all of the functions you think of a corporation as having. And as Northwestern Aeronautical Corporation was wound down so that there was no, because they were in a wind-down process when we started there, as these people more or less completed their functions they would move into the same kind of a function with ERA. Purchasing became ERA purchasing as opposed to Northwestern Aeronautical Corporation. And I wanted to ask you, you have this secretary called, her name is LaVonne Molde?

NORBERG: Yes, no relation, I've asked about it.

CLOVER: No relation to Al Molde?

NORBERG: No. I asked her that.

CLOVER: I just wondered.

NORBERG: Well, I asked that question to try to understand how ERA evolved into what we would now recognize as a corporation. For the most part, its contracts were with the Federal government and so you would have to satisfy Navy regulations for various sorts of activities like accounting and reporting and so on. So you would obviously establish those offices and I would say they would look like the Navy offices, they wouldn't be a lot different. And when does this transition come about? Is it pushed by Parker, who, of course, was always in the financial world himself? Does it come from the necessity of other sorts of activities that were going on within ERA? Is it something

that you thought was a better idea to have a different kind of office within the company? Let me change the tape before we...

TAPE 3/SIDE 1

NORBERG: Dick, do you want to take a shot at answering that? How did ERA move from a military contractee to a real company in the business sense?

CLOVER: Well, I guess I never looked at it as being a military organization. Maybe that's a little strange...

NORBERG: Maybe it wasn't. Maybe I have a different view.

CLOVER: ...but my feeling is that it was a commercial endeavor. By that I mean it was run like a commercial company as opposed to a Naval or government activity. That it lived within the government regulations, but it was run as a commercial entity. I just didn't foresee your question, because I didn't see anything that would say it was run like a military organization.

NORBERG: All right. Now, let me get to the other side of the coin then. I have seen quite a large number of documents associated with ERA. There are many of them to everyone's, including mine, surprise that still exist because they were maintained in various ways because of legal cases that Sperry and other companies were involved in. Now I have seen in those documents quite a substantial series of minutes of meetings of a management committee. Do you remember the management committee? It started in November of 1946. In the management committee as I recall the names now, were the top four or five who were Meader and Parker and Norris and Engstrom, not Tompkins, but Engstrom, somebody else, but I forget who the last person was. Do you remember the...

CLOVER: Coombs?

NORBERG: No, I don't think so. I think Engstrom covered that portion of it. There was one other person, I can't remember.

CLOVER: Plufka?

NORBERG: Possibly, yes. Possibly him. Do you remember those meetings? Did you ever attend any of those meetings?

CLOVER: I never attended any of those meetings. I...

NORBERG: Did you supply information for those meetings, because many of the things that were discussed had to do with either personnel policies or contract policies? That is, what are we going to do with regard to the Navy on matter x, then they would discuss it. Or if a contract was being proposed with someone other than the Navy, they would be a review, of the terms, the prices and so on. Did you ever get in on any of that sort of discussion at the company?

CLOVER: If I got in... I never got involved in those discussions, but there is no question in my mind that I provided some input to people that were involved. And I would say primarily it would have been to John Howard, who he would give I don't know, or to John Coombs, who took over and did some of the work that Howard had done for a period of time. But I never participated in any of the... I knew of the committee, but that's all.

NORBERG: Now there are a large number of other committees, too. Many of them are later on. Did you participate in any contract discussions either inside the company or with the customer?

CLOVER: Yes.

NORBERG: Which ones?

CLOVER: Both.

NORBERG: Can you give me an example of a contract that you were heavily involved with?

CLOVER: I was heavily involved with the Bureau of Ships contract.

NORBERG: Let me tell you my problem.

CLOVER: Nobsr42791 or something like that?

NORBERG: Let me tell you my problem. I have uncovered a large series of reports of various contracts written by any number of people all across the board, from Orion in the middle of '46 period before you came, through Atlas II and the Demon and Goldberg and all those. What I didn't find was contracts. I didn't find any basic statement of what Task Order One is, or was. I didn't find anything on the Bureau of Ships contracts, the National Bureau of Standards contracts in '48, anything like that. Now I then contacted an acquaintance of mine in the Navy, at the Naval Security Group, who is an historian and also knows something about the records there and I asked him. He says that he has never seen any copies of contracts. There are no files such as N6onr28657, whatever it is. He hasn't come across any of that sort of thing, doesn't even know where to look for that. Therefore, I don't have access to those original contracts. Can you tell me anything about the substance of those contracts, so that I can somehow make comparisons between what you can tell me and what I can learn about other Navy contracts let at the same time? Some of the clauses must be standard and others would be specific for ERA. How can I distinguish those?

CLOVER: Well, if you're talking about the structure of a contract, the Navy regulations have their own, this is what must be in a cost type contract. Here are the mandatory clauses; here are the clauses to be used as appropriate; and then here are clauses that are desired and the Navy will try to get them in and the contractor will try to keep them out.

NORBERG: Why what do those entail?

CLOVER: So the contracts would be those required by law. All the clauses required by law were in there. They had to be.

NORBERG: So if I looked at any major Navy contract for the period, I should be able to separate out those clauses. Those required by law.

CLOVER: The clauses required by law. They're all there. And there would be no, the ones required by law, we had to take the ones required because of the contract type. The clauses required in a cost plus contract, or fixed price incentive contract, or fixed price contract or whatever. They're all a little different, but there is a basic set required by law and then there's a subset required by the type of contract it is. I don't mean that they're that way, but there it is.

NORBERG: I can...

CLOVER: The primary difference in the contract with the Bureau of Ships was it was a task type contract. And the contract would be, a certain task was to be performed under the contract and they were essentially individual little, individual CPFF contracts, cost plus fixed fee. Now because this one is this big and this one and this one and this one and you put them all together in a pot, if you have terribly missed one price, you're going to be working for no fee on that task if you badly underestimate it. Because it has its own goals and prices and fees. Now the contract is funded, overall, not by these individual tasks. It's overall so much funded and it can be done incrementally as funds are needed and required, because it was a multi-year on-going kind of a contract and it would be funded as time went on.

NORBERG: I've seen two different designations within these documents. One is the contract number and then Task Order I. And then we have all the famous tasks, Task 9, Task 13, Task 23, Task 29 and so on. Now are those, shall we say, pieces of the Contract Task Order I, or is Task Order I really Task 1?

CLOVER: As I recall, there was no... The only one that had separate ones under it was like, I think it was Task 3, which was personal services. And that one would have like 3A, 3B, 3C, or 3D or 3-1, -2, -3, I don't recall. It might have been 3-100, 3-101 or whatever. Now that one was one that had, it was for personal services. It was where the government wanted to get the expertise or the capability of the technical person involved in developing and working on the task order itself. In other words, a person could be tasked with working on that job and helping the Navy in developing the exact specifications of the hardware, to actually set up the kind of characteristics that the equipment would have, to develop all this stuff. Then after that was massaged by the Navy, it would come out as Task 21, or 22, or 23.

NORBERG: I see. Essentially precontract payment.

CLOVER: Essentially. What it really was was taking advantage of the technical expertise that was the basis or the justification for forming ERA.

NORBERG: All right. So we have then, Task Order I is really no more important than Task 1.

CLOVER: No.

NORBERG: So there would be then these series of tasks that would be added over time.

CLOVER: Yes.

NORBERG: Okay. I'm glad to get that cleared up. I'm grateful to you for that because it really is not clear from the documents themselves. All right, we started this part of the discussion then by talking about the various clauses that would be in the contracts themselves and that came about because I asked you if you had ever negotiated any of the contracts. You began to answer that question for me by citing a particular example, which we didn't get to

because then I started asking you about the contracts themselves. So could you cite an example of a contract that you were personally involved with in whatever capacity?

CLOVER: Well... I was involved in a number of contracts and negotiations of some of the task orders under the contract, under the basic contract. The negotiation of one... I think... I don't remember the name, but the government wanted another computer and I think it was... Anyway, they wanted us to build one on a fixed price basis. And I participated in the negotiation of that, actually was the one responsible for the negotiation of it. We finally ended up with a fixed price redeterminable contract. In other words, after 50% completion, we were supposed to redetermine the price. The 50% was in the judgment of the Naval Computing Machine Laboratory. As it turned out, I had to tell them when it was 50% done. And at that point in time we went through the agonies of the estimates of the cost to completion; we had to go through the expenditures, the commitments, the work in process, the estimates of the cost to complete. Now it turns out that, if my memory serves me correctly, that to go beyond 50% on a cost type contract then it becomes illegal because it's a cost plus a percentage of the cost. So that's why if you're going to have a fixed price redeterminable, it has to be redetermined at the 50% mark or less depending on whatever's agreed upon. Because if you go to the... go down to the 80% level and then redetermine it, then it's cost plus a percentage of cost because you've been reimbursed for everything all the way up there without any question whatsoever and the more you spend the more you make. The fee or the amount negotiated for the fee doesn't change in the redetermination unless you... Well, if you can... You can negotiate a higher fee based upon the fact that you have "underrun" what you originally bid so that you can... If you're fee was originally say 8%, which they thought was a good fee at that time, if you had an 8% fee and say as an example it's \$800,000 and it's 8%, you know, you get \$6400. Maybe you can get more than that if you go through the redetermination process and have underrun what you estimate, and you can get a higher fee. But it does become, they get very nervous when you start talking about cost plus percentage of cost.

NORBERG: Well, what were the steps in negotiating one of these contracts? You talked a few minutes ago about using Task 3 to massage the specifications so that whoever writes the final contract...

CLOVER: No, I'm saying that Task 3 was used to prepare and, oh, personal services that may not and may have been personal services, it may not or may have been personal services of a person on something totally foreign to the job.

NORBERG: Yes, that I understand as well.

CLOVER: And they may have been wanted to be consultants for the development or the refinement of specifications for a job or for a new machine that we would bid on. And it would come out as another task under there, it would not be negotiation of a new contract. There would be negotiation of the task itself and justification of... Each little task became kind of a little contract, in a way, because what you had to do was to take the estimates and justify what your engineering people said it was going to take, your manufacturing and purchasing and whatever. So you had to go through all, what you didn't have to do on a task type contract was to negotiate the contract terms and conditions. All you had to do on that was negotiate a price which is, I think, the most important part of any contract itself.

NORBERG: But let me go back to my question and rephrase it. Taking a situation in which you now have the specifications, either the Navy supplied them or you develop them yourself, I don't care. You have these specifications. You want to negotiate a contract with the Navy. What are the steps? What did you have to do, both inside and outside the company?

CLOVER: Well, let's take it from the fact that first you get it as a request for a proposal. And in the request for proposal they will include the terms and conditions. It will include all of the contract terms, all of the statement of work. Then when they finally get through all of what they really want and they've got all these standard terms and boiler plate conditions that may or may not be attached. They'll be a reference and you'll look up the FPR or the ASPR, Armed Services Procurement Regulations, you'll will look at those and you'll know the ones that are referenced there are effective such and such a date and you look and make sure all those clauses are acceptable. And having done that, a proposal is generated and submitted. It goes through a number of steps including input from the contract people as to what they feel should be done. Because having negotiated a number of contracts, the contract people develop a feel for what is arguable and what will be accepted without question in the way of what

kinds of rates. For instance, you can't say, well, we're going to do this entire job with engineers and they'll going to do all the soldering and everything, okay. So you've go to have various kinds of people. So you have to do that.

Now the contracts who're responsible for negotiating on contracts, they develop a feel from experience and so forth as to what will fly without too much trouble. It's kind of like preparing your income tax, you know. You know that certain things if they fall within certain guidelines and they may not challenge you. But they might and you've got to be prepared. And that's kind of what you do. You then prepare your proposal, you submit it, and they call you in. Now you have the right anytime you make a proposal to take exception to any terms or conditions or to cite specifically how you will accept this term and condition. You say I accept this with the specific understanding that and whatever. Now the contract person is in charge of making sure that that wording is included in the contract, because if you don't say what the specific understandings are in the contract, all that goes out the window and then you've got to argue with them about the failure of the meeting of the minds at the time of the contract, if you're trying to rely on what exceptions you took and whatever. You say, well we took those exceptions and there was no argument with the Navy or the government about that so that we counter proposed and they accepted our counter proposal. And you can win them. It's tough, but you can win them.

NORBERG: Dick, how did you develop this feel? We haven't talked about any of your background being associated with this sort of contract development and negotiation? How did you develop the feel?

CLOVER: I don't know I just... I really don't know what to say.

NORBERG: Well, it didn't come out of the air. It either evolved because you... It came up in small steps. There were some early things that were done that you didn't have any part of and you just repeated those, and over time began to understand you could negotiate this, you could push on that a little bit harder and so on. Would that just simply come with experience or am I leading the witness now?

CLOVER: I think you're leading. I think this comes from... I think that that is something that a person has the ability

to do that and they may learn something from the outside that will facilitate actually using it. But I think that's something a person either has or they don't have and that you can't necessarily train them to do it. I feel very strongly about that part of it.

NORBERG: Now, would a fair analogy be with those people who can't do their income tax and those who can't? Because there are many people who simply...

CLOVER: I think that's more... I can go out to my car and open up the hood and I can find the engine and a few other things. I would be a basket case trying to work on them, because I'm not mechanically inclined.

NORBERG: I get the point all right. Were you involved in the IBM contract?

CLOVER: Well, I was involved only in the administration of it. I didn't have anything to do with any of the negotiations, the terms or conditions, or anything. The only things that I got involved in with IBM was on technical information interchange.

NORBERG: In what sense?

CLOVER: Well, this was when Remington-Rand and IBM had their court case and they finally settled out of court and they had a swap of information. I did sit in on a number of meetings with IBM Justawriter people and ERA people that we built a joint project where we built the computer and IBM built the front end or Justawriter, built the front end of it.

NORBERG: Yes, I was thinking of the 1949 contract, which apparently raised quite a number of eyebrows around the company in terms of not understanding why so much in the way of technical information transfer to IBM from ERA was allowed.

CLOVER: No, I was not involved in that other than just I knew of it.

NORBERG: So you don't see it as a very significant develop as far as you're concerned within ERA?

CLOVER: No. As far as I was concerned, no.

NORBERG: How did the company change over time in terms of its atmosphere? Did it get... Well, it obviously got bigger. Did that mean there were other changes: you knew less people, there was less camaraderie or any sort of characteristics like that that you can recall?

CLOVER: Well, I don't know. I think that there were quite... That there were really no significant changes until there was a fairly substantial cutback in the size of the prime contract, as we called it, where there was less money available. I think that was the first time when a few people left, Hugh Duncan left. Dave Noble, Cliff Olafson, several others that went to Remington-Rand and then found out later on that they were all back in one happy family again. But that was the first little blip on what I'd call any kind of a... Up until that time it had been all positive and all uphill and that first little blip...

TAPE 3/SIDE 2

CLOVER: When that first little blip came, there was a slight change in some of the attitudes. I don't think in any of the people particularly, but the morale went from straight up almost to level off and maybe a slight falling at that point in time, because it was a fairly drastic change in the direction and that required some fairly quick recovery, and new activity, new areas to be conquered if you will. And I think that went, I'd say in recovered, that we required very well. The biggest problem that ERA had was that the base years we had for determining excess profits tax was the first two or three years of our existence. We essentially didn't make a profit [in those years] and the government said well, anything you made is an excess profit.

NORBERG: They certainly didn't get away with that.

CLOVER: Well, certainly. Yes, they did. That's the law. That was the prime reason that they company was sold.

NORBERG: Well, then tell me what all that means, because I'm not clear what it means to say that every profit you make is an excess profit.

CLOVER: Okay. Well, you should become familiar with the Excess Profits Act of World War II and that the base years... This was right after World War II, okay? And the base years were '46 and '47 and I think '48, but I'm not positive but I think those are the three base years. Well, '46 we barely had our feet off the ground, and '47 we were just starting, and '48 we were better. Totally overall I think we had almost no profit, because what profits we did make on contracts we, you know, used up in things that are not reimbursable under a cost type contract. So we basically had no profit. Now when you get to the point where we are making money, then anything that we make over and above what we had made in those base years is an excess profit. And that's taxed at a terribly high rate.

NORBERG: And there's no recourse. You can't go back and reorganize the...

CLOVER: No.

NORBERG: When did that go out of existence, or did it? Now we hear about windfall profits, is that essentially the same idea?

CLOVER: No, no. This was legislation after World War II and I don't know when it went out of existence. I would just guess probably in '53, '54 time frame, somewhere in there.

NORBERG: Now if you're taxed at a very high rate, what you suggested before, that this is at least one of the reasons why the company was sold to Remington-Rand, does that mean that, that is the high tax rate, does that mean that

there is simply not enough money to be put back into the company as working capital?

CLOVER: Yes, that's right.

NORBERG: It is? So that when it came time to develop inventories to build more machines and so on there simply wasn't enough...

CLOVER: There was no working capital because the taxes gobbled it up.

NORBERG: Would it be...

CLOVER: It would be just like if you're, if you were to say well now your base years for your income tax are 1953 and '54 and '55, and anything that you make over that is taxed at 90%.

NORBERG: Yes, I get the point all right.

CLOVER: You understand what..

NORBERG: Yes. Now how long does that go on? Did the excess profits tax go on for every year after the first three?

CLOVER: Yes.

NORBERG: And on into the future?

CLOVER: Well, it eventually died and I don't remember when, but it went on.

NORBERG: Yes, but when you people were facing it in say 1951, it was going to go on into the future as far as you

knew?

CLOVER: That's right.

NORBERG: Why not go out and borrow money then? If you borrow money, paying it back, you're taking that out of excess profits and you can get working capital at least.

CLOVER: But you still... No, in order to pay it back, it's a profit to pay it back. To pay back the principal it's a profit. You've got to have profit to pay the principal. And then any profit that you have goes essentially down the tube with that excess profits act.

NORBERG: Okay.

CLOVER: You could justify interest costs, but not payment on the principal because that would be a profit.

NORBERG: Okay, got it. Then do you recall any conversations about what was going to happen to the company in say late '51, early '52? Were you a party to such discussions?

CLOVER: I knew that some had been made but I was not a party to them and I never really got any kind of a direct input in all of the rumor, but...

NORBERG: Did you see any documents analyzing the companies capabilities, its worth, and so on done at the time?

CLOVER: I don't recall seeing any.

NORBERG: Parker had one done and he showed it to me. He had a copy of it and I have it now back at the office, in which he had such an evaluation made. But I couldn't tell from the document whether it was done internally or

someone was brought in from the outside. You don't remember anything of that kind so you can't help me decide?

Okay, fine. When was the first time you heard about the sale of the company?

CLOVER: Oh, well, I heard about it before it was officially announced. I also had heard... Well, I knew that Meader got in a little bit of trouble and the fact that he was fired by Parker and because it was an association he had to sell his stock and he stuck it to Parker he thought at the time. But he didn't. And I think John Howard was in that same activity trying to sell to IBM.

NORBERG: Meader was trying to sell his to IBM?

CLOVER: That's my understanding. I know Howard was and I think they were both working the same side of the street. And anyway, they sold their stock. Parker bought Meader's stock...

NORBERG: He also bought Howards.

CLOVER: ...and I know that he paid Meader more than the book price for it. How much more or not, I don't know, but quite a bit more as I understand, but nothing like 70 to 1 which is what, which is my recollection of what we got out of it at the time of sale. Have we strayed far enough away from that subject or...

NORBERG: Well, no. I don't think we quite answered the question yet. You said that you heard about it before the sale was actually announced. But what did you hear and how soon did you hear it? Did you know negotiations were going on?

CLOVER: I did not know negotiations were going on. I knew... I heard that we had been sold before it was actually formally announced, and how long or not I don't remember. It was a relatively short period before it was announced to the "Associates".

NORBERG: What was your reaction to the sale?

CLOVER: Well, I know that there were a number of people at the time that were violently opposed to it. They wanted to establish a new company. Let's just go. And Norris was the one who said that what has been sold is the people and he thought that the people had a moral obligation to at least try to make it work. And he is the one who, to the best of my knowledge, put that revolt down almost singlehandedly. And it was pretty strong. I don't know what else you want.

NORBERG: Well, but you haven't told me about your reaction, you told me about other people. Were you on the side of the revolvers to go with the new company or were you on the other side?

CLOVER: I was on the side saying we've gone through a period of trying to do something, which is very tough to do, and that's starting in a corporation. We started it, it was prospering. The laws, particularly excess profit, was eating us alive and we couldn't accumulate any capital. Here was a chance as a division of Remington-Rand to essentially save for our expansion all the profit we made, because Remington-Rand could stand the excess profits. And I thought that we should continue with it from that stand point. Why start out again when we don't know where we're going to go again?

NORBERG: How did things change after you became a division of Remington-Rand?

CLOVER: Well, I guess what I'd say is the old guard, the old guard of Remington-Rand, the tabulating equipment people, now all of a sudden they've got this upstart with the computers and they said, hey, we've got to get control again. We've got to get this away from them. And they realized that the company was no longer being run by them and they really pulled back on the reins and snapped everybody's head to get back into the Remington-Rand mold of doing business and it wasn't necessarily to be a leader. I remember a conversation... Oh boy, I can't recall his last name, George... vice president for marketing... I was in New York and he wanted me to move to New York and I told him I didn't want to come. He wanted to know, well, what was wrong with the people in St. Paul that didn't want to

come up here. I said, well, people that have lived out here don't like to live in New York. And he said, well, you've got to have a price. And I said, well, I would have to make enough in a few years to retire, because I would only stay here a few years. So I don't even want to talk about it because it would be just enough to retire on in a matter of three of four years. So we dropped that subject.

That was about the time that ERA had made an all solid state machine, computer, all solid state. The first one was running and they had parts on hand to build about five or six more. They were successors to the 1103A. And that was about the time that IBM came out with the 709. They had the 704 and the 705 and they came out with the 709. And the 709 was an all tube machine. And Remington-Rand old guard decided that if vacuum tubes were good enough for IBM, they were good enough for ERA and they killed that project. And we scrapped the parts for six machines, I think it was six, it was five or six. We scrapped the parts and continued with the electronic tube version of it. I guess it was the 1103A. I think that's one it was. But anyway, that I think was the thing that convinced some of the technical people that had stayed on at Norris' insistence that all ERA had to sell was the people, and the ones that he convinced, I think not only the ones then, but maybe even Norris himself decided he'd had it up to here and basically left and formed Control Data.

NORBERG: That suggests that the period you're talking about is after Sperry acquired Remington-Rand.

CLOVER: Well, Sperry and Remington-Rand merged.

NORBERG: In '55.

CLOVER: Whatever, yes. And this was probably... It was close to that time, '56 would be my guess as to when that happened. I don't believe I recall.

NORBERG: Were you involved in the founding of Control Data?

CLOVER: No. I was not party to the founding. I joined about a year after they... When they needed someone for contracts, why they called me.

NORBERG: So you were still working at Remington Rand at the time. Just one or two more questions, Dick, and I'll stop badgering you today. Did you have an association with John Parker after he left for New York?

CLOVER: After he left? Well...

NORBERG: When he set up the sales office in New York for Remington-Rand?

CLOVER: Well, not... Very little directly with him. At about this time, I worked in what was called UNIVAC scientific sales. I worked in that office and that office reported to Parker in New York, although it was based in St. Paul. Wayne Amoth and Ted Hellwig and myself. And I was the contracts person and they were the sales people. I'm a little fuzzy on how much I saw John Parker after he left. I know I saw him some, but not much.

NORBERG: Did you have any interaction with Philadelphia and/or Norwalk?

CLOVER: Not any of any significance.

NORBERG: What did UNIVAC sales do then? Did they just deal with the 1100 series?

CLOVER: Well, the UNIVAC scientific was the 1103, 1103A, 1105, that machine. And the UNIVAC basically there they wanted to change it. They wanted to change the ERA 1103 to a new name which rhymed with VAC. And there were a lot of smart remarks and smart acronyms that rhymed with it, but finally they settled with the UNIVAC Scientific, because the one built by Philadelphia was primarily commercial, for the commercial environment, and the 1103A and 5 all dealt primarily in the scientific environment.

NORBERG: So you were primarily dealing with the UNIVAC scientific out of the UNIVAC sales office.

CLOVER: Yes.

NORBERG: Okay back to the question about interaction of the other two. Apparently you didn't have very much at all if any.

CLOVER: With them? No. Not any direct activity. I got involved a number of times where our people were trying to compete with Norwalk or with Philadelphia to get funding from them. J. Presper Eckert was always one who when he talked about building machines, he was always talking about the, he was costing out the 50th or the 100th one, never dealing with the first few. And I remember one time Noel Stone talking to me and Russ Headley and he wanted us to do something, and I don't recall what it was but it was a cost type of an idea. He wanted us to do a justification. And we asked him, well, what do you want to prove. And Noel, being a hardware man very technically oriented, said, what difference does that make, he says, because whatever comes out will come out. And we said what do you want really to prove, because we can get the figures to show what you want to show.

NORBERG: This is to Presper Eckert?

CLOVER: No, this was then to give to the Remington-Rand old guard so the funds could come and it was in competition with J. Presper.

NORBERG: I see.

CLOVER: And it was kind of to challenge Pres' positions. And we said, well, you know, you tell us what you want and we'll get you the figures to prove it, you know, within reason. I think that can be done almost any time in the environment of a development or projections or whatever, if you know what you want you can find figures that will

help you. God knows we've got that problem with our government when they're talking about taxes. They can figure out anything that will prove anything.

NORBERG: One last question, Dick, on this subject. And that is, who were the principal sales people for UNIVAC Scientific? Who was out in the field selling them?

CLOVER: The principal people that I know are, were at that time anyway, Wayne Amoth, Ted Hellwig, Jim Miles to some degree, but he also worked on other types of things like the inventory control computer - I can't think of what that's called.

NORBERG: File?

CLOVER: File computer. And so he participated in quite a bit of that and I know that he also did a fair amount of work in the scientific computer. I'd classify Jim Miles as probably the best person I've ever met for a cold call.

NORBERG: Was Tomash involved at that time or had he already left for Telemeter Magnetics?

CLOVER: I believe he'd already left at that time or certainly very close to that time. I don't recall exactly when he left, but I believe that he had left at the time.

NORBERG: So he was working on earlier machines in trying to sell them on the West Coast.

CLOVER: Yes.

NORBERG: Well, good. This has been very helpful, especially about the contracts and the activities around ERA in that period from a perspective which is quite different from the technical people that I've spent most of my time talking to. Thank you very much.

CLOVER: Okay.

END OF INTERVIEW