An Interview with

CARL HAMMER

OH 56

Conducted by James Ross

on

15 April 1983

Washington, DC

Charles Babbage Institute
The Center for the History of Information Processing
University of Minnesota, Minneapolis

Carl Hammer Interview
15 April 1983

Abstract

Hammer reviews his career in the computing industry, including his work for RCA, Sperry, and Sylvania. He begins with his entry into data processing at the Columbia University T. J. Watson Scientific Computing Laboratory and his work under Paul Lazarsfeld as a research associate at the Bureau of Applied Social Research. He turns next to his employment beginning in l950 at the Franklin Institute. He discusses the industrial applications of computers, and collaborations between the Franklin Institute and the government. From 1955 through 1957 Hammer headed the European Univac Computing Center. He discusses interactions with U.S. computer professionals, the peculiarities of installing computers in Europe, and the differing effect of computers on institutions in Europe and the U.S. He reviews Sperry's merger with Remington Rand and the changes in marketing and other operations after the merger. He cites these changes as his reason for leaving Sperry to work for Sylvania on his return from Europe in 1957. Sylvania's MOBIDIC computer and the ballistic missile early warning system are described in detail. In 1959 Hammer joined the Surface Communication Division of RCA. He discusses the in-fighting at RCA after John L. Hammer became president in 1960, the resulting demise of RCA's computer operations, and his own return to Univac in l962.

CARL HAMMER INTERVIEW

DATE: 15 April 1983 INTERVIEWER: James Ross

LOCATION: Cosmos Club (Washington, DC)

ROSS: Carl Hammer once formulated his "second law." Do you remember what that was?

HAMMER: I sure do--"Unless it's documented it doesn't count." Hammer's first law is: "Too many people ignore Hammer's second law."

ROSS: Tell me a little bit about your holdings.

HAMMER: My holdings?

ROSS: Your personal papers.

HAMMER: I did submit to the Institute a listing, so I have to do this out of memory now.

ROSS: Rather than run down such a listing, can you characterize it in general terms?

HAMMER: In general terms I would characterize them as personal holdings. They relate more to me as a person than to the computer industry as a whole, except where the two of us have jointly trod the same paths. My holdings reflect what I did in, for, and sometimes against the computer industry, or in or for some particular job--government or industry.

ROSS: Rather than documenting those industries' concerns?

HAMMER: Rather than documenting the industry's concerns, it's my own experiences. It's a personal history. It

includes, for example, all the programs, hardcopy, at which I have ever spoken. There must be thousands of those. They are organized by years, and, in some instances, include special folders for those programs for which there is a major address I gave and some correspondence. I had to weed out some of the correspondence. I'm not even sorry about that. Since it's personal, I don't think that either the industry or historians would derive any benefit from the personal correspondence. There was nothing in it to hide, in the first place, but it's not anything that the historian could make anything out of.

ROSS: Any further characterization, as an introduction, which you'd care to lend?

HAMMER: Well, I'll let you ask the questions, but not that I can think of. It's several filing cabinets full of material of that sort.

ROSS: For example, if we wanted to document changes in organizational structure, you would suggest we look in your holdings, or elsewhere?

HAMMER: Elsewhere. You may have to look into my head, because...

ROSS: We're about to do that.

HAMMER: Yes. Careful, of course. The change in organizational structure, worldwide and particularly in the United States, for industrial and post- industrial societies is something I've been watching very carefully, of course, and the impact of the comp uter as an instrument and as a source of power for management has been one of my major concerns, and of course that has to do with the changes in management structure. However, it is my considered opinion that that change hasn't even begun yet, notwithstanding what my good friend John Diebold and people of that ilk say. I think the structure of American industry, and for that matter of government, will ultimately have to adapt to electronic systems. At the present time we are using a Procrustean approach--we fit the customer to the machine. That's really wrong. The customer will really have to adapt to the machine. We've forced the customer to

accept the systems as we designed them, but the customer, at the present time, doesn't realize that if he changed his methodologies, if he changed his structure, if he changed his management style, he could use the machines to much greater advantage. So it's Procrustean in a dual sense.

ROSS: And that's been an enduring approach. Really it began in the late '40s...

HAMMER: Yes. My idea along those lines is that there's a lag...I'm trying to think of the guy at Teacher's College, the famous man with whom I worked during the '40s, very famous...Edward Lee Thorndike.

ROSS: "Social Lag?"

HAMMER: ...there's a lag of fifty years between an event in education and the time it is seen in academia. So at "TC" we used to say that you invent something new, then fifty years later you see it actually in the schools. I have a feeling that management, in general, and industry and government are as conservative and as resistant to change, not only here but in all countries. It's a threatening event when you tell them that they have to change the government of the United States or change the structure of a corporation, and that threatens them fundamentally, and for that reason they don't want to do that. In my opinion it's going to happen.

ROSS: How did you prepare yourself, if you did, or how did you find yourself entering the world of data processing?

HAMMER: I've thought about this, and it is my opinion that much of it was an accident. When I went to school in Germany one of the exercises through which we had to go, I took astronomy in the '30s, was astronomical calculations, and the training to do hand calculations was a very rigorous training, and I found it interesting--I never had any objection to it and also it was very helpful to my career, later on, because I was one of the few people who had some real training in numerical calculations. And so when the time came, and I discovered computers were on various horizons, not too far from me for that matter, I was immediately intrigued. And so the accident by which I

entered the computer industry was almost by my own promotion. I forced myself into that direction. I remember one year I commuted every day from New York to Philadelphia where I had a job at the Franklin Institute as a consultant, and I was spending eighteen hour days, five days a week and my wife said: "Why do you do this?" And I said: "I have a long-range plan, this is going to be helpful to me, this is going to by my career." It turned out later that I was right.

ROSS: Who hired you at the Franklin Institute?

HAMMER: A fellow by the name of Lewis P. Tabor. He was an electrical engineer and director of the electrical engineering department. He needed somebody to do some work in analogue computers. There was a whole team of analogue computer experts there, and I brought with me some expertise that they needed, like the mathematical depth. We analyzed, in the late '40s I guess, around '49 or '50, a large number of dive-and-toss-bomb computers which were all analogue computers. And we did, essentially, an analysis of the fundamental mathematics of those machines and we wrote a very interesting report about them.

ROSS: Was this a task oriented project or was this something that the Institute picked up on its own?

HAMMER: Well it was government funded--Air Force funded, and the Air Force didn't have any expertise whatsoever to do this kind of work and they wanted a report which would indicate to them in what direction analogue computers would likely go, particularly in regard to dive-and-toss-bombing. During the Second World War and at the end of the war the only devices we had, like Norden Bomb sights and others at Sperry were analogue computers, whereby the bombardier would simply take over the control of the aircraft, over the pilot for that matter--the pilot was his subsidiary for that brief run, and the bombardier would set the controls on this instrument and then release the bomb. The mathematics that went into those devices was remarkable. I remember one that was built by Saab in Sweden; it had a solid nickel-steel cam with a three dimensional surface, about six inches long, like a cylinder, carved out on the side, of course, and about four inches in diameter. It must have weighed about twenty or thirty pounds. It rotated, and there were some gliders riding on that thing that would calculate the trajectory of the bomb in advance

from all the inputs. It was a beautiful device--just incredible, done in Sweden. And then the Germans had done something like that--it was called the ZAR, and of course the Germans in their incredible fashion had polished the sides of all the wheels--totally useless. I could see some German general saying: "The wheels will be polished on the sides!" And of course: "Yes, Sir!" And they'd polish the wheels. It was the dumbest thing they ever did. Fortunately that machine never went operational--we had a prototype, and it was a very good machine.

ROSS: The government came looking for you--for the Franklin Institute, rather than the Franklin Institute proposing such an experiment?

HAMMER: Well, not quite, not quite. The Franklin Institute had accepted this contract and they had heard of me in New York and they approached me: "Would I like to spend a year as a consultant and possibly later on move to the Franklin Institute," which I did then.

ROSS: Yes, I'm sorry. My question was a little ambiguous. Did the government solicit the Franklin Institute, or was it a bid-contract?

HAMMER: Well, yes, it was a bid-contract, but the Franklin Institute was the only one that could have possibly done it. They had a marvelous staff of mathematicians, engineers, general scientists--they had a fine reputation. They're the ones that designed the atomic artillery, on one side, and they are famous for the invention of Teflon...what was the guy's name? Ed Thelen, he did some work with DuPont, I just cannot think at the moment what it was.

ROSS: What other projects were you involved with during your tenure at the Franklin Institute?

HAMMER: Well, one of the earliest, of course, was the analysis of digital machines. We did work on the ERA 1101, which was the earliest machine, and I had to check some of the subroutines on that machine, and then the 1103--same thing there, the scientific subroutines. And we found an unknown error. Of course this is a famous problem--the

undetected error. And they had been using that sine and cosine routines for God knows how long on the ERA 1103, and I discovered an error in the subroutine. I wonder, sometimes, what consequences that might have had. It was a small error, but it was fundamental--I mean the results were totally incorrect.

ROSS: You mean a logical error?

HAMMER: A logical error in the design of the subroutine. But obviously the frequency with which it occurred was not very great, so it was not much of a problem.

ROSS: Had you documented anything relating to that, or was it totally internal?

HAMMER: I'm sure I documented that, but that's all internal, and I wouldn't even know where that is now.

ROSS: Maybe in the UNIVAC papers?

HAMMER: No. I would say it's more likely in the Franklin Institute papers. That work was done for the Air Force. Let me tell you what...

ROSS: Who was the contractor there?

HAMMER: The Air Force--Eglin Air Force Base in Florida. They had an 1103A on the ground with which they analyzed, in real-time, telemetry data, as they were doing the dive-and-toss-bombing; these were digital data, and they were reduced on the ground in real time, while the bomb was being released and while the bomb was on its way. That was one of the earliest real-time calculations I've ever seen--it was around 1949 or 1950, and very good work.

ROSS: Did you have direct contact with any of the ERA people during that time?

HAMMER: Yes. I met quite a few of them at that time, but I was trying to make up a list of names but I was not too successful later on. Walter Anderson, of course, was one of them. Walter was the only one I could really think of. We have remained friends for thirty years now.

ROSS: My question relates to whether these people were travelling around, following up their computers. For example, did anyone come on-site, or did you visit ERA?

HAMMER: Yes, to both questions. They came down to Eglin, and we went out to Minneapolis on quite a few occasions, and the rest was done by mail and by telephone.

ROSS: Who else at the Franklin Institute was working with you?

HAMMER: The two senior people were Don Houghton and Don Hay both from Princeton. They commuted forever from Princeton to Philadelphia whereas I commuted from New York for only one year and moved in '51 to Philadelphia. That's plus or minus half a year, but they continued to commute from Princeton every day on the railroad and back home to Princeton at night. Hay, since that time, has become President of a small engineering firm I believe in Princeton; Don Houghton became a vice president of Westinghouse and did some very interesting work in the Westinghouse financial network. Westinghouse of course is like all other conglomerates--a large computer dependent company in the sense that their financial transactions have to be balanced every day, and so while one component of the corporation would borrow money in the market for whatever reason, another one is depositing money; and so he built this financial network for them whereby they first balance out their own funds internally before they went to the bank. So I'd say they make net deposits and net borrowings.

ROSS: Who else, anybody you can remember?

HAMMER: Yes, Ed Thelen he was a chemist.

ROSS: How do you spell his last name?

HAMMER: T-H-E-L-E-N. Oh, Christ, C-H-R-I-S-T, obviously spelled like Christ but pronounced Crist. He became director of The Franklin Institute around 1954 or '55, in that neighborhood. I have a list of names actually...

ROSS: Oh, excellent.

HAMMER: Oh, names. I never did say this before but I have a file at home with 9000 3 x 5 cards with names and telephone numbers, and cross-indexed by affiliation. Quite a few of those I have actually came from the Franklin Institute or from anyplace else. I weeded them out. At the present time there's nobody in that file more than 10 years except some people I've kept in touch with longer. One other thing we did was with Picatinny(?) Arsenal. As a matter of fact I got a letter from the Franklin Institute the other day. Ted Hannum was the guy who did the work, and I developed a statistical method of testing, destructive testing, such as detonators, squibs and fuzes. Nobody would care about what they are but when you build certain devices like atom bombs and others you must have an assurance that when you fire it, it fires. And so I developed the whole theory for them to do this, and somebody dug this out the other day and says they are still using it at Picatinny, in the arsenal. This is after 30 some odd years. Ed Thelen, whom I mentioned earlier, did the original development work on Teflon for Dupont at the Franklin Institute. They had the research and development contract to do this. And particularly the bonding mechanisms which were like physical chemistry I guess and so the fascinating work going on in that place.

ROSS: What about Pillsbury Mills?

HAMMER: That was actually prior to computers because that was in the '42 to '44 or '45 neighborhood, and Pillsbury Mills was one of the earliest users of what later on became a very renowned category of mathematical tools called linear programming, and so I developed for them a simplified transportation algorithm which Motzkin and Dantzig both have seen and have always thought was pretty clever. And its less of a guarantee that it's a simplex solution but its close enough. And the main reason we have developed this is because Pillsbury did in those days about 20

million dollars of prepaid freight per year in the United States, and when you spend that kind of money on railroads you would like to make sure that you have the best railroad routings and so we developed it. That was done I would say in the middle '40s and I found that very fascinating.

ROSS: And from there you went to Columbia.

HAMMER: I went to Columbia yes. And of course that was the major exposure to the T. J. Watson Scientific Computing Lab in which Watson senior deposited one copy of every machine that IBM was building and so we saw the earliest 604s which was a card program calculator; we saw the early CPCs; there was a machine called the 609 which was a transistorized 604. IBM only built about 10 of those, and a concept came out of that that was not picked up until Seymour Cray thirty years later. The machine was in a door. The entire hardware of the machine was in a door, the door must have weighed a half a ton. The 609 was a transistorized version of the 604, totally redesigned, but IBM was never able to make a go of that; I think they made about 10 copies.

ROSS: And the purpose for putting it in a door was?

HAMMER: Was easy to engineer. With access to the machine for maintenance purposes so all the tubes were sticking right in the door. You just open up the door and then everything for maintenance was ready for you. But these doors of course were very solid. My recollection is that the door was four to six inches thick and it was strictly electronics. Also they had a machine up there which is totally lost. It was an electronic calculating machine. It was called the statistical sorter, the IBM 101, which was also lost in the shuffle. It was never really built by IBM but we had a copy of that one which allowed you to sort and at the same time sort by characteristics into pockets. So not only you sorted but you got frequency counts in the pockets. And we did some interesting work with Carl Holzinger, he was the inventor of factor analysis, and one of the earliest jobs we did at Columbia with Carl was a factor analysis of a 146 by 146, if I recall, which means you had 146 squared coefficients of correlation, a matrix of 146 squared and looking for factors in these 146 attributes. Before, when you did this by hand, you could do at most maybe a 10 by 10 and with the CPC we did 146 by 146. It took a couple of weeks but by hand it would have been totally impossible.

ROSS: What were you giving to IBM, or asked to give IBM, in return?

HAMMER: Nothing. Nothing. The Scientific Computing Lab in Columbia was strictly an academic enterprise in which of course our documentation was scanned by IBM which is fine, but there was no underlying concept that we owed them something.

ROSS: Oh no, I didn't mean anything, but a reciprocal interchange.

HAMMER: It was reciprocal by way of a gentleman's agreement. In those days, I might add this, separated of the patents of the hardware, the applications and even early programs were all in the public domain. That was a system of honor. The honor system worked so that everybody who had written a program that was useful gave it to his friends and they gave it to some other friends and so many programs turned up on the West Coast after they originated on the East Coast. Of course there was no guarantee they were fool proof or correct but that was long before software became proprietary. Now the hardware was a different story. So IBM gave continuously, as a matter of fact, to the Columbia Scientific Computing Lab the hardware that they produced-that IBM produced-but the applications were in the public domain and so I'm sure IBM got their money's worth out of that.

ROSS: Were you aware that they were doing this with other institutions or other companies doing it?

HAMMER: The thought had, at one time or another, crossed my mind I'm sure, but no, I do not know of any other organization in the United States that...

ROSS: Not that early.

HAMMER: That that early supported any university to that extent.

ROSS: We're talking about...

HAMMER: IBM would be the only exception.

ROSS: ...mid to late '40s.

HAMMER: We're talking about what we call them, data processing organizations, manufacturers of data processing equipment, of which there were only two until the late '40s: there were IBM and Remington Rand. Remington Rand of course had the round holes 90 column cards and IBM had the rectangular holes and 80 count cards, that was the main input, output device for those machines. And Remington Rand, being considerably smaller both in customer base and in revenue as a corporation, just couldn't afford this kind of a magnanimous gesture just endow some university with a computing laboratory, whereas IBM could. And IBM did in fact endow the Columbia University lab there initially with nothing but card processing devices, and only as they slowly entered the computing field, say with the CPC and similar devices, did they give them all to Columbia. But initially they simply gave Columbia nothing but all these card processing equipments.

ROSS: And you stayed there until 1950, is that right?

HAMMER: Right.

ROSS: And from there you went to the Franklin Institute.

HAMMER: Then I went to the Franklin Institute.

ROSS: Okay.

HAMMER: One other assignment I had at Columbia I should mention at this point was I was a research associate at

the Bureau of Applied Social Research which was headed by Paul Lazarsfeld, an old friend of mine from Germany. Paul and I had much in common. Lazarsfeld is L-A-Z-A-R-S-F-E-L-D. And one thing we had in common is we both smoked cigars; that was much to the dislike of the rest of the staff because they felt that was a bit much. There were quite a few young ladies there and they didn't like cigar smoke, but Paul and I didn't care. He was one of the earliest mathematically inclined sociologists. Kingsley Zipf was a visitor from Harvard; then there was another Kingsley, Kingsley Davis who was on the West Coast - both of them have the first name Kingsley. Davis is a very famous sociologist, and the Bureau of Applied Social Research was a bureau in which Lazarsfeld, by his design, was trying to mathematize what the soft-sciences had been doing mostly by guesswork or by intuitive modelling and quite a few interesting publications came out of there. One of them in fact dealt with the earliest application of Leontieff input-output analysis. We did in 1949 a Leontieff input-output analysis of, let me see, certain European countries where data were not that readily available and where the data were contradictory and so the project that we were doing was trying to make sense out of the contradictory data and using the tool of input-output analysis we simply said: "Well, some of these numbers were too large and others were too small." So we adjusted them. We used the Leontieff matrix as an adjustment tool for these data, and I still have the feeling that we knew much better than some of the Eastern European countries what they were actually producing by adjusting the data because we knew then, and I make no secrets over it now, that they were lying to one another internally of course and we knew that then and they are still doing that.

ROSS: When you say what they were producing, were you doing this industry wide?

HAMMER: No that was done only you might say for a national economy.

ROSS: I see, so it was totally aggregate data.

HAMMER: Aggregate data to the extent that today you might say there were...oh probably I identified several hundred components like steel and aluminum. Just a typical I/O matrix.

ROSS: At the Franklin Institute you did some digital computers as well?

HAMMER: We started with the analog systems and from there we graduated you might say to the digital world. And I never left the digital world again. That was like 1952 I guess, '51 or '52. And after we'd done the analogue computers then the Franklin Institute had the finest, if I recall right, the largest analogue system, a special purpose system, which was a huge analogue computer simulating the entire power grid of the larger Pennsylvania area. There are like 15 some odd power generating companies; they're all tied to one grid and they had a contract with those corporations or companies, utilities, to monitor that and they would run their problems on the analogue system at the Franklin Institute which was special purpose, and that was about the last I did in analogue computing, and then after that I stuck strictly to digital.

ROSS: So very early you were involved in what many computer scientists then and some today would call "mundane" in that these were industrial applications.

HAMMER: Yes and of course there were...

ROSS: It was scientific computing but...

HAMMER: ...they were mundane in a sense; they were mundane in the sense that when we look at it today, you'd say to yourself well: "What's so difficult about integrating a differential equation?" But we hadn't had any digital computers to begin with and so number one we didn't know how to do this and number two we had to learn how to do this on a digital machine and so one of the earliest papers I published I have a copy of it somewhere was in the '52 or '53 neighborhood when I used Grace Hopper's A2 compiler to integrate a differential equation and show the results of that. I published that in some place or another, and of course at the time I was trying to point out to the people that this was a twofold innovation in a sense that it was a useful application of compilers, especially the A2 compiler and secondly it solved a good industrial problem. I remember the problem. It had to do with a ball bearing, no with a roller bearing, which has a coat of oil both on the roller and on the sleeve, and of course when they roll the laws of

gravity and the laws of rotation make this a non-uniform coat of oil and the question was when will it break down.

ROSS: Yes, the viscosity.

HAMMER: Right and so I solved that problem for them.

ROSS: What kind of reaction did you get from the wider community?

HAMMER: Utter amazement.

ROSS: Disbelief, but any...?

HAMMER: Not even disbelief; they said: "That's incredible. How can you do this? I said it's very simple. I wrote twenty lines of coding for an A2 compiler to solve the whole problem, and here they'd been working for months and years sometimes on these things and I said: "But we have a computer called the Univac I." "Well, what's the Univac I?" was a question I got early on which got me off on marketing tangents trying to sell my sponsor and said: "That's a great machine," you know.

ROSS: What I was leading to was many of the people who were involved in some of those early applications, found a good deal of resistance. Did you meet that? Not just disbelief but...?

HAMMER: I just can't recall that. I am myself a gee whiz type and so I used to use that approach and say: "Gee whiz, look at the things we can do with this machine," you know. "It's a million times more productive," well that's not the right number. Univac I was about 10,000 times more productive than a human being in terms of power. What a human being can do in 10,000 minutes the machine can do in 1 minute roughly, the Univac I could do it--that's the ratio. And I tried to point out to the people that this was a remarkable thing because, you know, we could speed up industry, science, all the applications we could learn more, and all that from the power of this machine. So I

approached them from that viewpoint and it never bothered me that maybe a lot of people would have to be retrained because they had learned the wrong skills.

TAPE 1/SIDE 2

HAMMER: I was too close to both of the initial manufacturers of these machines. I had friends in IBM, I had friends in Univac, I had friends in Honeywell, and I had friends in Datamatics which became Honeywell later on. And at the same time I had enough friends in academia and in industry, and so it dawned on me that all these people have their own personal interests which usually in a capitalist society involve growth but they were unable to get all those interests together. I felt there were some of us and I felt always I was one of them, I was like a missionary going to the user and saying, "You will have to learn how to use a machine because eventually when you learn it it will do things more rapidly, more efficiently, more precisely, more accurately for you, but you the user have to learn something." At the same time I was going back to the manufacturer and said: "Now you have got to talk to the users and see what their problems are," because I could visualize myriads of problems, thousands and thousands of problems all these users had and which at best they did by punch cards in those days and at worst they did by long hand. On one of my sojourns I had stopped at MIT and I had met this guy Norbert Wiener, and he had imbued me with the folly of this. Somewhere I have this quote from him that this is inhuman. Human beings shouldn't be standing in a factory with their hands all day long turning the same screw ten thousand times or whatever they're doing--mechanical rote and drudgery. At the same time he pointed out to me, and this is the concept I took up later on, that we have the mental rote and drudgery in offices where people spend their entire lifetime behind these eyeshades on desks, shuffling papers around which is really inhuman. And I could see that the computer was going to solve that problem, and essentially not only has solved it but has made things possible that, say in 1940, when I first heard about computers or the idea of computers, seemed totally unrealistic--that mankind would never ever solve these problems. But of course today it is routine. But I felt there was an education process involved to get the producer of the machines to understand the user's needs and the user to talk to the producer.

ROSS: So to some extent the computer simplified, but it also complicated things, creating potentials that had not

existed before.

HAMMER: But it created a market.

ROSS: Yes, yes.

HAMMER: I had this typical American approach--you've got to create a market for these things, and I heard all these rumors about the whole country needs only 6 Univac I's and I thought that was funny as all get out.

ROSS: Yes: "All the computers that are needed are already in existence."

HAMMER: Right. And this has never stopped. People today are talking about: "Why do we need a Cray II? The Cray I is good enough. They don't understand the problem. The problem is that I can give them a list of interesting applications, which are strictly fundamental, which have to be solved some day and which are larger than the total computing power of the United States today.

ROSS: Give me some examples from the past. You said you were on Sojourns as a solicitor almost.

HAMMER: Yes, marketing type.

ROSS: Who did you go to and what did you discuss in the '50s?

HAMMER: Most of the time I think I talked to government people.

ROSS: Why that choice? That's a leading question.

HAMMER: It seemed to me in retrospect--looking at that--it seemed to me they were most receptive. It seemed to me

also they were less concerned with what today has become the term "cost effectiveness" and that they would be more freely supplying money and resources which then, and that of course was my interest in the whole thing, which then would be seed money for furthering the computer industry. And, of course, both Pres Eckert and John Mauchly were doing initially the same thing; you know their first few contracts were government contracts, which is where the money really was. I'm sure you recall history that they actually had sold a couple of machines to the A. C. Nielsen Co. But when Nielsen found out those machines weren't $100,000 but $2 million, he withdrew very quickly. And, of course, industry at that time had no appreciation of the magnitude of the cost of these machines nor of the cost of implementing these tasks, and I felt at the time that the government was--that's to answer your question--the government was the most logical place. Then the next logical places were the large industrial giants. Dupont, which of course did have a Univac and that was run in Wilmington, Delaware, and General Electric had one down in Louisville, and so some of the industrial giants of course saw the value of those machines and they did their own pioneering. It was my feeling at the time that the senior managers in those organizations who were in fact either buying the machines or supporting the machine purchases from Univac or IBM or whoever, they were the real pioneers because they had to fight their own management, their management didn't even know what was going on.

ROSS: Sure, it wasn't just a production problem of dedicating research and development money, but it was also a customer problem of coming up with the purchasers.

HAMMER: Oh, worse than that; you had to talk to controllers because it was also a simple money problem.

ROSS: Yes.

HAMMER: Think of 1955 or '54; you walk into a controller's office: "I want $2 million." Now today, in terms of Senator whats-his-name, a million dollars here, million dollars there, pretty soon you're talking about real money. In 1955, (actually he said: "A billion dollars.") But in 1955 a million dollars was not what it is today. Anybody can spend a million today, but in '55 that was not easily come by and so it was this...

ROSS: Especially for something so hard to understand.

HAMMER: Yes, on top of that...

ROSS: In following up what you had said already about...

HAMMER: And so you had to get to the controller and you had to convince him, and in many cases that's what I was able to do. I got frequently involved with the vice president of finance or somebody...

ROSS: Who for example? Can you remember any specific instances?

HAMMER: That's a tough one. I would have to go into my records.

ROSS: But it's possible for us to trace this through some of your...

HAMMER: Oh, yes, yes. Certainly I remember the guy at Dupont whoever he was, and...

ROSS: So now you would announce yourself through a piece of correspondence and walk in and...

HAMMER: No, the Univac people would make arrangements for me to go and visit.

ROSS: Okay, so as a consultant you were...

HAMMER: Well, I was on their staff of course. And then later on the RCA people would do the same thing. They would sort of drag me in and say we have this guy Carl Hammer, and he understands what you are talking about.

ROSS: Oh, I see, you have jumped in time a little bit here.

HAMMER: No, where I already practiced what I was preaching is as early as in the '50s, so it was the middle '50s. I was actually convinced that this thing was going to do it, that was going to make it. Now I realized of course at the time the hardships that some of these companies had you know, how many times Eckert and Mauchly asked the senior people in the Univac Division...They had to go to corporate management of Remington Rand and later of Sperry Rand and fight for another $25 million, and Univac, a division of Remington, later Sperry, was never in the black until the late '60s and they were internally as the big rat hole; they were the most hated division by the Shaver Division which was part of Remington Rand. The Remington Shavers were clearing every year like $30 million net profit, and Univac people ate it up. You can imagine, I spoke earlier about these corporate shenanigans and fights. Imagine if you are the division president of a successful division and every dollar you're making is being chewed up year-after-year by some other very non-successful division and so the image you are trying to create for a division is strictly erased year-after-year.

ROSS: You were personally aware of this as you were an employee?

HAMMER: Oh yes, that was very obvious. I forgot who was the president of the Shavers division but he visited me in Europe a couple of times. I remember some of the Sperry people in Long Island came to see me in Europe, and I saw them afterwards when I came back to the United States again, and quite frequently we were involved in it. The rivalry internally has never really ceased but that's corporate management, that is the corporate game.

ROSS: The nature of the beast. Just to clarify on tape you were the head of the European Univac Computing Center.

HAMMER: Yes, from 1955 to 1957, that is correct. In Frankfurt. And among other things, I had to put up a building for the machine and I left one wall open so we could get the machine in and I never did know how they got the machine out some 10 years later. We put the last wall of the Computing Center up when the machine had come in.

That was the opening ceremony in October '56, close up the wall.

ROSS: Tell me a little bit more about that time. How different was it to be in Europe than, say a hypothetical question, had you been part of the Univac organization in the United States.

HAMMER: It was very different. It was probably the most challenging assignment I ever had because it was four thousand miles away from anywhere and the management job per se was made difficult because nobody understood how to manage this kind of thing.

ROSS: In Europe?

HAMMER: In Europe. And I had to explain to them, you know, that you're no longer dealing with a $10,000 dollar device you're dealing with a $2 million device.

ROSS: Okay, so you're dealing with tabulating people.

HAMMER: I'm dealing with tabulating people and very successful ones. Fritz Harms, he has died since then, but he was the president of Univac, no president of Remington Rand Germany and he was actually Senator harms, he had one of those honorary titles from the German Government, Senator--Honoris Causa, H.C. And he was a brilliant man in many respects. I could admire him. He was totally bombed out during the war, which happened to many Germans, and personally he was out there clearing the rubble; I've seen pictures. The man was dedicated to the success of the company, dedicated to his job, and dedicated to his employees, he was going to rebuild this company with his own bare hands, clearing out rubble. Well he was general director of the organization, the manager, but he didn't understand--as nobody else did for that matter, computers. Furthermore, he was 4,000 miles away (from the U.S.) and it was very difficult for those people to really make a go of that.

ROSS: What was your impression about dealing with the managers at home, excuse me in the United States? Did

they understand? I mean this could be a further complication of the problem.

HAMMER: No, I dealt with Ralph Luttman, I dealt with, let's see who else, Marcel Rand and I would say Luttman was the most knowledgeable one of the whole bunch. Of course he was tabulating but he had very quickly adapted to that because he had several computers, Univac I computers, under him so he knew what he was doing.

ROSS: Where were those installations?

HAMMER: One was in 315 4th Avenue New York, the Univac I Computing Center, service center, one was in Norwalk somewhere, Electric Boat, I think it was I'd have to go back to the list. Univac built 46 Univac I's and May 1981 when I was doing the Pioneer Day thing I made a complete roster where all these machines were.

ROSS: Oh, so this is published.

HAMMER: Oh, yes.

ROSS: Oh, okay. How did Luttman, as a tabulating manager, come to have Univac's under his guise?

HAMMER: Strictly by succession in the events. He was tabulating manager for Univac, I'm sorry for Remington, and then when Remington took over Univac he automatically became manager for tabulating and computers and then later on they were managers of computers only. Tabulating took very quickly a much worse position than second fiddle. Obviously it went out. There was one machine that was built in between the Univac I and later machines it was called the Univac Computing Tabulator, UCT, and initially it was...

ROSS: Built in Philadelphia?

HAMMER: ...built in Philadelphia and initially it was built with magnetic amplifiers and was later on changed to

transistors. And even the name would indicate, if you think about this...

ROSS: The tabulator...

HAMMER: The people think of tabulators and of course they didn't understand the problem. It was much more than a tabulator, it was a computer. But it was called the Univac Computing Tabulator and of course...

ROSS: Well it was a transitional name. I mean it sounds to me like a designed thing, just as the IBM card calculators were.

HAMMER: Same kind of thing, yes. It caught on. Everybody knew what a tabulator was you know so it was called the Univac Computing Tabulator.

ROSS: Back to Europe.

HAMMER: Yes, in fact the first Univac Computer Tabulator was installed in Hamburg in the Hamburg Credit Bank while I was over there. That was one of the sales that we had negotiated from the United States to Hamburg, and it was very difficult for the Germans to adjust, as it turned out to be the United States for that matter, to the rigor required by a computer. The computing system essentially dictates a certain amount of rigor in your organization, in your procedures, in your processes, in your thinking even, in everything you do day and night and there is only a certain amount of adaptation that you can carry on. But the Germans for example have a law that says if you have a banking application, and the one in Hamburg was a bank, you must have on the customers desk a statement the next morning, every day, for any transaction.

ROSS: Oh my goodness.

HAMMER: And with the help of the German post office, they would actually do that. The German banking system

until 1968 or '69, late '60s, was still doing that. The customer would get a daily statement in the mail, on his desk, the next morning. That's a totally unbelievable thing.

ROSS: That is astounding. Now you said this was also going on in the United States to some degree.

HAMMER: Well...

ROSS: No, no, you were saying that the resistance was.

HAMMER: The resistance was.

ROSS: The resistance to the rigor.

HAMMER: But the rigor of course, the German rigor, was much stronger than the American rigor, the Americans were already fighting whether they should do their monthly statements with a cut-off date at the first of the month or whether they should have a floating date in there. I remember the battles that took place in the American Bankers Association. This went on for about ten years before they allowed the banks no longer to close their books on a fixed date. When I was in school, of course that was a totally inconceivable idea. Why: "One must close the books on the last day of the month, one must know exactly to the last penny how much one has in the till," and of course nowadays the banks, the large ones say in the multi-billion dollar category, they don't even know what they have in the till within 100 million dollars, there's no way. And they don't have to but it took them easily ten years to make this transition from that rigor to the much more fuzzy approach which is modern of course. And my feeling in Europe, to come back to your question, was that Europeans had even more rigorous systems than we had in the sense that they had spent a thousand years developing a system, whereas the United States had only spent 200 years developing it. So they were much more mortified, if you will, or ossified, in their system thinking than we were, and of course I was trying to sell them on that, that that in fact was the forte of the computer--that is what they could do with a computer. If they really insisted on this dumb thing of having daily statements, by God the computer could do that for them.

ROSS: How successful were you?

HAMMER: I thought I was fairly successful, I gave a large number of seminars all over Europe in those days. I spent at least one third of my time away from the Center. I had some very good management people there, and most of them, the ones that I'm still in contact with, are very senior people now in Europe and I ran into some of the most brilliant people all over Europe, beginning in the United Kingdom, and then Germany, France, Italy I saw most of the development work there, and it was remarkable. It was essentially influenced by the United States, there's no doubt about it. In fact, I saw Korolev, who is rather well known in the Soviet Union. He came to Namur (Belgium) in 1956, I guess it was, for the first congress of cybernetics for which I gave a paper on the Univac compilers and they were doing also worn in the Soviet Union on computers and so I met him there and he spoke fairly good English. But the Europeans, because of their different history, were much less flexible than we were in the United States and yet at the same time the computer was the ideal instrument to meet their rigorous system requirements.

ROSS: So it really was a matter of adapting this new invention to the customer's needs. How was that...how easy was that...?

HAMMER: In the early years of course, we...I almost said we lied a lot but we used a loose language a lot; we said: "The computer can do anything. We can do anything. It may take some time. It might take us a year or two to program it." Of course in those days people never understood that as a problem, and I think only the late '60s did it dawn on them that there was something wrong with these machines because you bought a machine for a million dollars and then a year later it turned productive and that didn't go over so well. But they bought it, in a sense, when I explained to them how complicated it was that they had all this time to prepare for the machine. And I think most of the time I was successful in that. Saying: "This is your time to rethink the systems, and reorganize." I was very careful, very much like John Diebold, to avoid telling them what I really thought, that they had to reorganize their companies, but that doesn't go over well, even today.

ROSS: How willing were they to take advice on exactly how to make those steps from you or from your salesforce.

HAMMER: Or from the other European scientists.

ROSS: Yes.

HAMMER: They were quite open minded. Those were the pioneering days and the computer in those days was still the gee whiz thing and had not yet gotten the bad name in terms of some minor catastrophes as when occasionally something went totally wrong and sour with one of the installations and it got publicized. In those days there were not that many computers in the whole world, so they were probably willing to forgive that and say: "Well, the Zeppelin got shot down again or something," but once you had like 100,000 computers in the field, some years later, you really couldn't afford any longer to be flippant about it. But in the early stages of the game the computer was still regarded as a minor miracle and it was being sold on the basis that it could do some of the things that had to be done, that management required to be done.

ROSS: Can you remember specific installations in which the computer actually changed traditions or organization systems --where you knew in order to sell you had to advocate a specific change and someone or other accepted that?

HAMMER: Ah, yes. The Arizona Light and Power Company had a Univac I, my guess is '57 or so, and we pointed out to them that they should be thinking about data, what today would be called data-base management systems but data management systems which were totally integrated so that all of the data that would be used by that corporation, whether they were in production or in management or in marketing or in customer billing, they really should be in one location, centralized data base. It turns out that couldn't be done, because in the Univac I you had at most ten magnetic tapes, and we had no mass memory. Of course it hadn't been invented yet. And so the processes in those days were all sequential processes, running through literally hundreds and hundreds of magnetic tapes, at fairly low densities. (The highest density we had in those days was 200 bits to the inch, vis-a-vis 3000 some

odd now). But the Arizona Light and Power Company was, I felt, quite receptive to that; they understood what today would be known as the relational data base model by Ted Codd but I think they understood that ultimately they would have to work towards that so that the data would be in some central repository and could be retrieved in whatever format was required. That's an example that I'm sure I still have in my mind correct.

ROSS: Did you find that exceptional among customers, or were the European customers that were...?

HAMMER: The Europeans didn't think about that. They were using essentially machines for the solution of specific problems rather than for augmenting their total corporate management system. The idea that a computer would be a corporate management tool didn't really emerge in Europe until the end of the '50s, where in the United States in the middle of the '50s people were already thinking about this. Of course today this whole concept of corporate data management systems is well developed, at least conceptually, not that anybody was really doing it, they wouldn't dare. In fact as a sidelight I'd like to toss in the direction that's of interest: I have observed that the Russians have an enormous interest suddenly in computer security and in the concept of how to design a secure computer system. So I asked some of my friends from the other side of the curtain (which is of course a dirty word): "Why?" They said: "Well, because there is this enormous danger. The computer suddenly makes it possible for anybody to find out anything. Because you can access it you can access a data base. As long as you have brown folders and 3 x 5 cards, you can lock them up but you cannot lock up the data base of a computer." And so the Russians are really worried about this because this is a greater threat to their internal security, which of course is based upon a totally repressive system (they have this obsession with security and leakage) and so they are really worried about this. Much of their work, I read in their own literature right now, deals with designing and developing secure data base management systems and secure computer systems. And of course for a country in which there is no crime, at least according to them, that is rather an interesting development because of this --they're really worried that the computer might be the thing that is going to topple them.

ROSS: Are they being logical about this in terms of the more centralized your data base has become the more difficult it is to be secure? In other words what's your response to something like that?

HAMMER: No, on the contrary that is independent of whether you have a distributive data base or a centralized data base. Either one essentially is a threat to their political system. And it's going to be interesting to see whether this threat materializes. But they perceive it as a threat and if they perceive it as a threat, then...

ROSS: Then they'll act on it.

HAMMER: ...then it is a threat. And so that's my guess and it is going to bear watching. Some of us Kremlinologists, you know, are watching all of these good things over there and that's one of my pastimes.

ROSS: Can you mention any names of senior European managers that worked under you? Actually I think you've given me some already...

HAMMER: Yes.

ROSS: ...but I...

HAMMER: Well, the later director of Lurgi was Karl-Heinz Buchner; Karl-Heinz with a hyphen K-A-R-L hyphen H-E-I-N-Z and Buchner is B-U-C-H-N-E-R. He was director of Lurgi which is a large German-Swiss or Swiss-German Corporation, chemicals and chemical engineering. L-U-R-G-I. And he comes to mind. Then another one of my people went to a Siemens, Dr. Heinrich Posch. P-O-U-H-L-A-U-T. He died some three or four years ago I guess. He became chief engineer of Siemens. He, in fact, engineered the Siemens S-1000 machine, to the best of my knowledge, it came out in the '60s and he was my chief engineer in Frankfurt, a brilliant guy. But you know, a typical German brilliant guy. The guy had a encyclopedic knowledge about a lot of things, like computers, about which he knew everything; anything else he knew nothing about. Strange! All compartmentalized. But as an engineer he was outstanding; I never had a better engineer.

ROSS: You mentioned off tape the diaries that are in your collection.

HAMMER: Yes, I have an unbroken set of diaries on a daily basis which in fact I keep rather lavishly; and I lost quite a few in the early section, in one of the moves they got lost, but I think the set is unbroken since 1960 or '61 back from here on up. And they are like engineering diaries; I record times, dates, places, telephone numbers, people, important calls or whatever come in, either at the office or at home, there is no difference.

ROSS: So it's a grand addition to the index card system that you've kept as well.

HAMMER: Yes; but they are fairly hard to read because my handwriting of course is not very good. So I've taken to hand printing and that even has become illegible but I can read them that's--it's almost like Leonardo DaVinci from left to right, but mine is so bad that you can't read it unless I tell you what it says. I sometimes have difficulty reading it myself. You can look at this and (handprinting) and you see that's fairly good.

ROSS: I can read that.

HAMMER: That's not too bad.

ROSS: You should see some of my students.

HAMMER: I mentioned earlier that I have a large personal data collection. I forgot to mention that I have also a copy of every single publication in which I published a paper which is about a nine foot shelf. My resume of course lists all of them--well it's not updated recently but...

ROSS: This is nine linear feet.

HAMMER: Nine linear feet. [Break]

HAMMER: No its not, its strictly a scientific observation.

ROSS: We're talking about Hammer's second law again. Scientific--why in a speech that you presented to the computer scientists did you--last month, is that correct?

HAMMER: Yes.

ROSS: You put the second law underneath the European experience you had.

HAMMER: Yes because many of the people over there didn't really see the value of documenting things and since we dealt here with a multi-million dollar machine and a multi-multi million dollar, you might say, life-cycle-cost of a system and the people involved, I felt that all the things we were doing should be documented. I had a great time getting the Germans to agree to that, you know, that they would document everything they were doing and so that we had an audit trail through all of the expenses and also a trail through all the projects and an audit trail through all the visitors, whatever we're doing, you know, I'd want to document it. Well it didn't sink in too well. Sounds maybe too much like a spy system, as if I was spying on them.

ROSS: This is the customer you're trying to convince, as well as the Remington Rand people.

HAMMER: It was Remington Rand on the one side and it was, of course, with customers I was trying to do the same thing. I was trying--they had to think--I thought earlier easily 25, 30 years ago about this cost of a machine and the concept which later on became known as the life-cycle-costing. In fact, I have a major presentation which I developed for the DOD some years ago that I give quite frequently; in it I talk about this and how in life-cycle-costing you cannot omit anything; it has to be all there, but unless it's documented you won't find it, and that's where the kangaroos are always buried, you know they were burying all these monies but in the end when you add up all these life-cycle-costs for an organization or for a project they have to add up to the same total and that's hard to...

TAPE 2/SIDE 1

ROSS: Betty Holberton in an interview with the Smithsonian Institution talks about going to England and seeing one of the ACE machines in essence spilling out of itself all over the room, wires entangled all over the place. She was thrilled with the machine but she was struck that there was a different tradition of running a machine before it was packaged in Europe. Did you find that true in your operations as well?

HAMMER: Yes.

ROSS: Certainly not with Univac.

HAMMER: No, no, no, no. Yes on two counts. You see she went to Europe when Europe was in a stage of the Univac I of 1950. Let me remind you of my favorite story of A.C. Nielsen that is the A.C. Nielsen coming to Philadelphia to look at his two computers, and there are wires and components and tubes and stuff strewn out all over the floor and he says, "Where's my computer?" and Eckert says, "That's the computer, we haven't built it yet." The Europeans had about a five year lag in terms of acquiring the manufacturing controls and expertise, there's always a lag between these countries, and it is my feeling I visited some of the London operations there. LEO, for example, I saw the factory as a matter of fact. It is my feeling that the Europeans in the middle '50s, '55 or '56, were just where we were in 1950. And so, yes, I myself have seen locations where everything was all over the floor because they had not yet learned the technique of building those machines, behind closed doors obviously. They were still working with prototypes, whereas we already were in mass production which of course was the major transition made by Eckert and Mauchly. You see before the Univac I there were already several hundred computers in existence. But each was one of a kind, and each went through that same process of design, development, engineering on the fly, engineering in real time, and making inventions all day long to make things fit, and finally getting the machine half-way to work and then retrofitting all the things that were engineered wrong. Then Eckert-Mauchly came out with the idea, "We don't want to do this. We want to have one machine and make many copies of it." That's the concept

that sold, the concept of the commercial machine vis-a-vis the one-of-a-kind machine, that was the revolution that took place in 1952, and the British in '52 were not yet quite in that neighborhood. They started to think about building LEO that way but they didn't until later, nor the ACE machines.

ROSS: What's this about wires under cement?

HAMMER: Yes. When I put up that building in Frankfurt to house the Univac I, I learned a great deal about civil engineering in Europe that is totally unbelievable to the average American. What it amounted to was that we obviously had to have outlets for power and, you know outlets, plugs, and so on. I was watching these guys and I said, "What are you doing there," as they were laying four parallel bare wires on the cement, actually driving nails through on the cement, and then they were putting plaster over these bare wires and they were putting ends on the four bare wires and two of them would go into some outlets. I said to them, well I didn't understand the whole problem of course, I said, "Well, what are you doing this for?" "Why cement and plaster are perfect insulators." I said, "You never heard of BX cables?" They never heard of BX cables. He said, "We don't need that," he said, "We just lay the wires and then we just put cement and plaster over it. And if anybody drives a nail through the plaster and breaks one of the wires you got two more."

ROSS: You're kidding?

HAMMER: I kid you not.

ROSS: Did you stop that process?

HAMMER: No.

ROSS: Or was it too far gone?

HAMMER: No, that's the local code. That is the local building code.

ROSS: Or was at least.

HAMMER: I haven't recently inquired I'm not going to find out. I'm not going to drive nails in the wall and put my finger on them to see if they carry any power, because you have to drive two nails to know where they are.

ROSS: I would think that would make you awfully uncomfortable about installing a computer on that basis.

HAMMER: No, it didn't. Because you know, the wires were not there, I mean you had no access to the power unless you drove nails into the plaster, and it's like sticking one's fingers into a box here, people do this, too, you know.

ROSS: That's true.

HAMMER: But I thought that was incredible. The building codes are a totally different process. I decided I'm not going to fight it why should I fight the building code if that's what the code says, we're going to do that.

ROSS: That's an astounding story. What about the company when Sperry joined? Sperry made the acquisition just prior to your...

HAMMER: That was prior to my joining. Of course I worked with them before then because we had a contract at the Franklin Institute with Grace Hopper and Remington Rand and we knew in fact about the acquisition coming up. I guess it was not in essence inside information; I don't think anyone had enough money to buy one share of Remington or one share of Sperry, much less two or three shares, so it wasn't a matter of doing anything with inside information. But the merger, the acquisition of Remington Rand by Sperry which then became Sperry Rand, was heralded immediately as a great step forward but there was no such thing as a step forward. This was absolute stagnation. There was for years more talk about anything that Sperry and Univac would do together jointly, but it

was all talk. I was observing this both from the inside and the outside how little cooperation, how little long-range planning for an ultimate merger of these divisions there was made. I guess it was the typical corporate rivalry. On top of that, of course, the Univac division of Remington was one of the main losers in this whole thing. The main reason I guess that Sperry acquired Remington Rand at the time was there were some divisions who were making money like Shavers, and the Sperry divisions, flight systems, Sperry Gyroscope, Long Island operation, and a few others. They were making fairly good money there was enough government money available, most of the customers were government or quasi-government like the Federal Aviation Administration, and so they were doing quite well financially. So when they acquired Remington Rand there was this one black sheep in the family sucking up all the money, and that caused a lot of internal problems.

ROSS: So you wouldn't characterize the acquisition as one made to balance military and government against commercial products. They weren't interested so much in that. They would have looked for example at the Univac division of Remington Rand, they would have looked more kindly on ERA because of its experience with the Navy and the Air Force than they would have at Philadelphia with its commercial products.

HAMMER: Yes, now since you asked this, I don't even know what their reason was for this acquisition. All I can say is, the only person I think who might know is Art Draper, he was the acquisition man in Remington; he was the guy who buys, who buys almost anything from...The worst thing he bought were ice buckets, I mean the guy was making acquisitions. That was his job.

ROSS: We need to talk to him. Everyone's mentioned his name.

HAMMER: And he's the only one who might know what really moved that thing. The indications that all of us got, and I worked very closely with some people in Long Island, with the Sperry people, their senior vice president was a good friend of mine, so I can only give you perceptions, the perception was very simple. There was no real exchange of anything between those divisions. Sperry was Sperry. The divisions, like flight systems were one group, and Remington Rand Univac was something else. In fact, on many marketing occasions I had a feeling that the Sperry

people walked in there and they were trying to market their private little computers, special purpose, they had some very good ones, especially in the...And they did some very good work in signal processing, for example, which is a very specialized kind of work, and had built a--in the '70s--had built a machine for that, but even in the '70s I can give you almost a date on that one, like '75 or '76 by a strange coincidence the Univac division found out that Sperry had a signal processor, yes, I remember that, which is doing like ten million operations per second, special purpose of course.

ROSS: Okay.

HAMMER: Why, the single processor of ten million operations per second in '76 was respectable, and we just found out by accident.

ROSS: That's amazing. Were most of your dealings then with the Remington Rand side?

HAMMER: Predominantly, yes, most. Even less than that, with the Univac side which was part of the Sperry Univac family.

ROSS: So would you characterize your association with Sperry people as almost social.

HAMMER: Oh, no, no, it was strictly business. In fact, I would say the social end of that was very minor, just occasional visits and dinners, either home or foreign locations. But the predominant activities that, I could say if I go to my diary and add up days, I would say 90% at least was done for Univac. But 10% would be in areas which had to do with Sperry, or one of the Sperry divisions. I don't want to make this sound as if Sperry wasn't talking to Univac, I would like to say Univac wasn't talking to Univac either. The Univac Military Systems Division in St. Paul which is of course the ERA offshoot in a way...

ROSS: Defense systems.

HAMMER: Defense systems, they wouldn't be talking to the Univac commercials, and especially in telecommunications and marketing. There might be two marketeers going to the same office, one trying to sell defense system, and the other one trying to sell Univac product line.

ROSS: Now off tape when we talked, you were saying that was a healthy competition.

HAMMER: Oh, yes.

ROSS: Okay. Expand on that a little bit.

HAMMER: Well because if by some decree you had only one product line or if you had only one organization driving product development, you couldn't possibly meet all the requirements of the marketplace. In fact, you wouldn't even know what the requirements of the marketplace are because you have these blinders on. And so I feel that a large corporation, and only large corporations can do that, in fact, is healthy if it internally has some competition of its own. For example IBM has their Federal Systems Division vis-a-vis their commercial side, they are reorganizing again, whatever that means, but IBM has internally the same kind of competition that Univac has. So that the Federal Systems Division of Univac sometimes doesn't even talk to the commercial branch, although they are in the same building. They rival one another, and that goes as far as the product line development, which in Univac is both at St. Paul and Blue Bell; I feel that is healthy.

ROSS: Would you say then that the loss of market share Remington Rand and later Sperry Rand almost suffered, was more a product of...?Its been characterized as doing something wrong, and you're not saying that really.

HAMMER: No I'm not saying that. But I'm also not saying that I don't realize that they lost what you might call a proportional share of the market. But they lost that because of poor marketeering, not because of poor kinds of products; they had enough products. But it's hard for a corporation that is not extremely wealthy in terms of internal

resources; even IBM at one time was also not quite as affluent as they were in other times. And there comes a time when internally some manager must make a decision and that is to bid or not to bid on a request for proposal. In Univac I have this feeling that many of these no bids were bad choices. But that's a marketing decision, perhaps a bad marketing decision. Now I'm not saying that a marketing manager ought to go out there and make a proposal on every single RFP (request for proposal) that comes out; that's again the wrong thing to do. But if the bids are successful, that shows the astuteness of the marketing manager who is likely to become the marketing vice president. That is the process, that's the important thing. I feel that the expertise in Univac simply wasn't there. Perhaps IBM couldn't care less because they have 55% of the market and so if they lose half a percent of that, so what have they lost? But if you only have 10% of the market, or even 20%, then that loss becomes very noticeable. So there is much more risk involved when you're making the wrong decisions on the no bid. And therefore, in my assessment, to your question as specifically as I can, Jim, would be that it was not specifically a product line problem ever; I have a feeling it might turn out to be in the future, but that's a different story. But in the past it was simply the lack of marketing expertise. The company was driven by accountants, was driven by business managers, against whom I have nothing personally, but they were driven by it, and by some engineers, but not by the marketeers. IBM was driven by the marketeers. Now Sperry and Univac are trying to do this but whether that's too late, I wouldn't know.

ROSS: You left the European Univac Computing Center...

HAMMER: '57.

ROSS: ...in '57. Was that a break or just another opportunity?

HAMMER: No that was my planned return to the United States, and at that point in time I looked around Univac and I was not very happy with what I saw back domestically. There were lots of internal fights, and my base was in New York at the time, and I didn't like what I saw there, so I cast my bread upon the waters and ended up in Sylvania.

ROSS: You say you didn't find what you liked and that's making a comparison.

HAMMER: Yes, yes.

ROSS: You were enjoying yourself in Europe. Is that what you're...?

HAMMER: Yes, yes. I found the domestic environment stifling, which happens by the way to many with foreign assignments. When you come back you find the domestic environment stifling. I'm not saying I had a free wheeling assignment in Europe but simply I had a very specific assignment, you know-- install a machine and make it go and then it was done. And when I came back to the United States I found there were no other assignments for me like installing a machine in Frankfurt and make it go. I had liked that; what other assignments there might have been...I recall I interviewed here and I interviewed there but they weren't to my liking. And they were also not assignments...well maybe I interviewed the wrong people, I don't know about this, but they were not assignments which I found challenging enough. By a strange coincidence I had some friends up at Sylvania and I talked to them, and they said: "Why don't you come to Sylvania and talk to us," and I had an offer in one week.

ROSS: Wow, that's...

HAMMER: Which in '57 wasn't all that bad. '57 was not a good year for getting job offers.

ROSS: Who was giving you the assignments in New York? Was John Parker still...

HAMMER: Uh, no, Parker wasn't there anymore...

ROSS: He wasn't.

HAMMER: No. Luttman and Marcel Rand, those two, and I really never got close to Marcel Rand. Well, he was not

the brightest. Luttman was all right, he was a good marketing man. But Marcel Rand, I never understood him.

ROSS: Well I have heard that his appreciation for the computing business wasn't the greatest.

HAMMER: Also he didn't have to worry about it. He had 3 million shares (of Sperry stock) or whatever. I don't know the exact number but some enormous number of shares.

ROSS: Who brought you to Sylvania? You said some friends.

HAMMER: Yes. Harris, what was his first name? Fred Harris, John Harris, no. An English name. I'll think about it. Hunter C. Harris, that's it. And Sylvania at the time was going to try to get into the computer industry. They had a contract with the Signal Corps to build a machine called the Mobidic, which obviously was a whale of a computer; from an engineering viewpoint it was exactly twice as good as any other machine, and I can prove that. The Mobidic had a 37 bit word and since it had that extra bit it was obviously twice as good as any other machine which had only 36 bit words. The mathematics here is not quite correct but that's ok. Secondly they had a contract with RCA, or were developing a contract with RCA, on the ballistic missile early warning system, for which we got the subcontract on the computer installation. It was a whole bunch of IBM 709's and 7090's. And that was to my liking, I liked that. The idea was very challenging.

ROSS: Tell me a little bit more about both those projects. You said as you got there Sylvania was just deciding that it ought to get into this side of the industry.

HAMMER: Right.

ROSS: They bought...

HAMMER: That was the military division of course.

ROSS: Yes, but they were able to not only bid but receive a contract on their human capital? No products to show in previous...

HAMMER: No they had hardware also, Sylvania...

ROSS: Oh, I'm sorry, I misunderstood you then.

HAMMER: Yes, I know, but Sylvania had a number of military contracts to begin with and probably in those days had the world's leading expertise in a fellow by the name of Richard Fidler who was the most knowledgeable radar man all over. They also had already in existence some machine called the UDOFT (Universal Digital Operational Flight Trainer) which was a very interesting machine because it had split memories. It had a memory bank for data and a memory bank for instructions. And the instructions were essentially protected. They also had a large division doing highly classified work, today it would be known as cryptographic security, with feedback amplifiers, and shift registers and all those good things. No, they had great expertise, a marvelous engineering company. Again this is an engineering company, they knew nothing of marketing. And Harris, I have to think of the first name eventually (Hunter), was a typical Harvard graduate--patches on the elbows and all that sort of thing, and I knew he was going to make it. He did, and so he invited me up there, and I liked the people. So I was put in charge of the training program for the Mobidic software and I got the training program for the ballistic missile early warning system with about 150 people all told and I ended up with over 200 by the time I think I was through with that. And that was probably one of my last 24 hours a day, 7 days a week assignments, and at that time I was already in my 40's, I guess I was getting tired, you know, working 7 days a week and that sort of thing, but it was fascinating. The Mobidic was a forty- foot van sized machine, 37 bits, maximum of 7 banks of 4000 words. It was a 7 micro second machine which wasn't bad for 1957. And one of the persons on the other side of the fence whom I'd known before that was a fellow by the name of Luebbert, L-U-E-B-B-E-R-T, first name was Bill, yes, Captain William, he was a Captain Luebbert, later to become Colonel Luebbert, later even became Dr. Luebbert. The Army Signal Corps, sent him to Stanford to get a Ph.D. He was that good, the guy was really great. And he is the guy who invented the field data code that was his

work. So when you see the field data code, that is Captain, or Dr. Luebbert. And he and I became very good friends. He was quite a good guy. So that was the Mobidic project, and I had probably 15 or 20 people doing the software. And the person in charge of that software group was Jean Sammet.

ROSS: Ah, ah.

HAMMER: Whom I hired away from Sperry. She was at Sperry, Long Island. And so she worked with me out there for about 2 years.

ROSS: What impressions was she able to give you on her past experience at Sperry?

HAMMER: They were a little more vitriolic then mine, but she is not known to be always a great diplomat.

ROSS: Okay, that's enough, I just wanted a general statement.

HAMMER: Yes, she was very, very critical. But anyhow she's a brilliant person. I don't know how much you know about her, but she's the only daughter of a pair of lawyers. Her mother was admitted to the bar and her father and mother both were highly respected lawyers. So she grew up in the environment of legal precision and she loved documentation, that's--she and I got along just fine, no problem, just excellent. And then came the ballistic missile early warning system and...Oh, I forgot one thing on the Mobidic. The reason I got the Mobidic under control was with 15 to 20 people. Luebbert and I met in Fort Monmouth at one time. If I go back in my diary I would find what day it was. And I said to him, "Bill," it wasn't John it was Bill, William Luebbert, I was wrong, Bill. I said, "Bill, what are you going to use these Mobidic's for?" He had this enormous scheme. He was going to buy hundreds of them. Every battalion is going to have a Mobidic, and Sylvania was in there laughing it up; they would like to build hundreds or thousands of such machines. I said, "Don't buy all that." I said, "What are you going to do with those machines when you get them all built?" "Oh, we're going to run programs on them." "Oh, interesting, oh, well what kind of programs?" "Well, anything." "Where are they going to come from?" "Well, programs, they have them for

these machines." I said, this is before be became a Ph.D., I said, "Bill, they don't have programs for these machines. Somebody has to write them." "Oh?" And so I gave him a 1 hour lecture on software and then I asked him (this way I ought to be able to figure out the date: The fiscal year in those days ended for the government in the end of June) so it must have been early June of a certain year, I guess it was '57, early June. That was my best guess, yes. And I said, "Bill, how much money have you got left unspent in your kitty?" I said, "You and I know what we're talking about." "Oh," he says, "I have got about $137,000 dollars." I said, "Bill, why don't I write you by tomorrow morning an unsolicited proposal for software for the Mobidic for 136,000 some odd dollars.

ROSS: They'd accept it.

HAMMER: Yes.

ROSS: Darn right he did.

HAMMER: He would have been sunk, I mean he just didn't understand this, that you had to have software for those machines. And of course years later I'm sure he realized that he did actually everybody a favor by using our team (?). So we put, I think, 12 or 15 people, some odd, for a couple years on the software. And meanwhile, Sylvania had been bidding with RCA on the ballistic missile early warning system, which turned out to be even more fascinating because there were three Northern sites--one in Scotland, at Flightingdale; one in Greenland, at Tule; and one in Nome, Alaska; and to build a radar, sole source for nobody else could do it, bigger than a football field on its side; G.E. had a sole source on that one. No matter who won the contract GE would build that radar. And the question was how are you going to process those data, and we had a team up there that, the likes of which you would not believe, and we made a very thorough study, this was like late '57 I guess, of the MIPS requirements for this job, the millions instruction per second requirements, and there was really no machine that could do it, not a single one. We looked at the M460 of Remington or Univac really. We looked at the IBM 709 which had just been announced. The 709 was what? Multi-micro seconds. So it's maybe 4, 5, 6 micro seconds. The Mobidic was 7, so it must have been better than that, maybe, a 4 micro second machine. And there was no machine around to do a million operations per

second, and we knew we needed more than that even if we had two machines in tandem and we'd analyzed the project of analyzing those missile tracks coming in from the radars. We knew what the radar would deliver to us. Dick Fidler had explained that to us. And what we had to do was sort out all these tracks and combine the right pieces of the right tracks with the right pieces of other right tracks and know this piece of the radar data belongs to this track and label it and this belongs to that track, and sort things out. It was an enormous data processing job. It doesn't have to be mathematics or science, just a sorting job. At any rate, we ended up with the 709 as an interim solution for training, and IBM speeded up the 7090, and the final selection was 7090's. I think 4 of them at each sight, an enormous project. And we had to do the software for the 7090 which we started on the 709. Let's see now, that lasted until March, '59 I guess it was. In March '59 the people in RCA with whom I'd been working as a prime contractor told me that they were going to make me an offer. They wanted me to go from Needham to RCA and I said, "Well, what's the plan?" you know. They had an operation in New York called Surface Communications, and I had never done much work in communications. And it was managed by an ex-German who was on the paper clip team his name was Guenther, Dr. Guenther, Dick, Richard Guenther. He had a speech impediment; he always talked in a high-pitched voice, very difficult to understand. The man was six feet tall. But brilliant--he's the guy who laid the Vienna to Rome to Berlin microwave link during the Second World War, in Germany, and to Austria and to Rome to connect the three governments. He is a brilliant German communications engineer who had amassed a marvelous staff of almost nothing but Ph.D.'s in this Surface Communication Division in New York. So I joined them as a consultant, and again that turned out to be a very happy choice because of several contracts. One was with the Navy on Polaris Communications which was obviously classified. Then we had another contract with IT&T and another one with AT&T on cables, now what was that? Underwater cables, yes. AT&T lays these enormous cables, they are made in Sparrows Point, near Baltimore. They are a thousand miles long and they require this special cable ship with which they are laid that on the bottom of the ocean from here to Europe. That's incredible. I went to look at it. I couldn't believe that. Coaxial cable, you know, two thousand miles long--that's one cable. But there are some echos on the signals.

TAPE 2/SIDE 2

ROSS: You were saying there were echos.

HAMMER: Yes, on these cables have repeaters and amplifiers which cause echos so there was some scientific problems involved in communications engineering of how to eliminate those echos, and I remember we were working on that. I was the one who did the mathematics, but overall this was a team effort. There were a whole bunch of us; there was a Dr. Dutka, D-U-T-K-A, his first name was Jacques. I remember that because he had a French first name. Jacques, like in French Jacques. He had just come from Columbia and his name was in TIME magazine, not too long ago, likely less than ten years ago. He had calculated the square root of 2 to a million decimals; that's his claim to fame, and so TIME magazine published that. I remember him, and I have a list of most of these people of course; at that point in time suddenly a bomb burst and the bomb was Minuteman, highly classified initially; I had done all the early work on the computers and Minutemen of course was both computers and communications, so I was put in charge of the design team by the Air Force to design the first communications network for the first wing of the Minuteman system out in the wilds of North Dakota at Great Falls. And that was another one of those assignments I just enjoyed doing incredibly, incredibly. And there were many new experiences, like security of the system which says that how do you know it is safe--can you prevent the system from launching itself, because you know there is no human launch involved. These damn things are down in some holes and everything is connected with computers. There is only one launch command, and of course there are three guys in there. Now suppose they go berserk. How can you prevent the missiles from going off--it's fascinating. And I did that for about a year some odd and then we finished the design; in fact Sylvania was the contractor to build the hardware for it. That was diphase equipment, and Sylvania built that; obviously the system has never launched itself so I guess it worked. And at that point in time RCA decided that they had to get out from the market of military computers and into commercial machines. By a strange coincidence they tapped two or three of us in this surf-com division; I was one of them, and they moved me to Washington in 1960 or '61, give or take a year, and it's not so much as a half a year anytime unless I look it up. And of course I really got involved in this great internal battle in RCA with their new President.

ROSS: Now, what's all of this? Who was he?

HAMMER: Oh, John what's his name, I just mentioned his name earlier. John Burns, John L. Burns. And he had become the president of RCA, because he had made that management study for RCA, and RCA had decided that they needed somebody who was knowledgeable in the management of computers and they made him president of RCA, which was of course the most idiotic thing to do because he didn't know anybody in the company except for the people who dealt with him making the study but he had no clout.

ROSS: What had his previous position been?

HAMMER: A consultant in McKinsey; one of the management consultants.

ROSS: So he came out of the blue.

HAMMER: Out of the blue. A good study he made, you know, and which again proves to me time and again in my entire career I said, "How do these corporations make all these dumb decisions? It takes some doing, I could never get over that. I mean they must be working on this to make all these dumb decisions and by God I think they do. And of course that's part of the game because if there were one company, James, that would consistently make nothing but the right decisions, well, they would own the world.

ROSS: So this turned into a good guys versus the bad guys?

HAMMER: Absolutely. Oh, this was a bloody battle. And with heart attacks and dying in the hotel rooms in the middle of the night in Florida, and I mean just incredible.

ROSS: What happened to some of these individuals, can you name names?

HAMMER: Yes, Rev. Mooney, he was involved in that and he was one of the guys with the white hat. They had a meeting down in Florida, the white hats, in conjunction with something else they were doing of course. His wife was

downstairs talking to everybody else and he didn't feel so good so he says: "I'm going up to the room for a moment to lie down;" and she comes upstairs later and he's keeled over dead, massive heart attack. About a half year or three months later Bob Bruce died. Then Stan Farwell, an impressive man, impeccable background, about 6 feet 4 tall ex-Navy Captain. In fact his younger brother was Captain of the Sasebo Naval base in Japan. I have met, him too, from an impeccable family. I mean very fine background. I was Stan's best man at his wedding during January of '63, and about three months later he keels over, leaves a bright young widow alone. So all the white knights were just cursed.

ROSS: Okay, white knights against the black knights. The white knights are...?

HAMMER: Well, the black knights of course were the entrenched RCA power holders who were more or less the son of bitches; they were the ones who had in fact been with RCA as a communications corporation and who took a dim view of this whole mishmash of building computers and plowing millions of dollars into some rat hole, which of course you have to do. And yet they had a marvelous machine, the RCA 501 which dates back to the late '50s. It was a very good machine, very well engineered. Out of that came the 301 which was a smaller machine, again some very fine work of engineering done on the 301. At the same time the RCA people, the so called white knights, were fighting almost for survival and...

ROSS: To hold up the new president?

HAMMER: Not only to hold up the president but also to gain a visible and respectable share of the market. And they could just never do that. Again, they made a large number of wrong decisions. I could make you a long list of them and I know who made them, but they were so bad it's not even funny.

ROSS: Well, let's hear a little.

HAMMER: Alright, Ed McCollister had been hired, pirated away from Univac, about December of '62 that's plus or

minus three months, as vice president of marketing. Maybe one half year earlier than that, maybe summer of '62. And he is an impressive guy, 6 feet tall, big, looked like a football quarterback you know, smoked cigars all the time, puff, puff. I like people who smoke cigars. And he came from Univac and knew of course all about Univac's disastrous projects. He made all the decisions how they were going to be--the RCA strategy of how to get in the computer market, that was his strategy, and one key element was to be IBM compatible. Not only that, but since they were unable to build a high speed printer they bought the high speed printers from IBM and just painted them blue. If you opened up the hood they would say IBM. That's called OEM. What would that stand for? Oh, Original Equipment Manufacturer. So IBM built the printers for RCA. Also they couldn't build a card reader, so they bought IBM card readers and painted them white or whatever. And he signed several contracts of course to make sure RCA would be known as the compatible manufacturer. And I felt that was the downfall of RCA, I told them that in the summer of '62, I said: "That won't work." And of course when the final collapse came, you know, it was really much later, it was '72. See, I left--I told him in the Fall of '62 I was going to leave, and he didn't want me to leave, but I said I couldn't stand it. It was too much. And I hadn't even made up mind where I was going to go, but in the Fall of '62 I decided RCA was not going to make it ever, and it took them ten years to find out, but in the Fall of '71 they finally got out of the business, and in '62 McCollister said to me, "Carl, I don't want you to leave." He said, "We have great plans. We are going to meet IBM head on." And I said to myself, "spattered right up the ceiling." The idea of head on is the last thing that I wanted to do. I said, "Ed, I don't want to do this." This convinced me I had to get out, so I hung out a shingle in the Fall of '62 that I was going to leave RCA and sure enough I got quite a few telephone calls and one of them came from Dr. Louis Rader who was then President of Univac. I had him known before, and he wanted me to meet with him and Ray Retterer who had come to Univac from National City Bank (which later became City Corp.,), an ex-vice president. And so the three of us meet here in Washington and plotted the thing and we decided that I should return to Univac, and so in January of '63 I returned to Univac and that's another story--that's the next ten years. But the RCA story, of course, was a bloody one. They had good products, I mean good products in the sense that they were well engineered, but no, not in my opinion at least, no real good market study. The products were conceived and designed by the engineers who in their infinite wisdom knew exactly what the market needed but they never asked the marketeers and that included the juke box that they had from NBC with those rotating platters, and they really built that thing.

ROSS: We had talked off tape about a possible origin for disk storage which was the juke box, at least by analogy,...

HAMMER: Yes.

ROSS: And that's what you're referring to.

HAMMER: Right. It was an NBC device which allowed a radio station, mostly the smaller 1500 watt radio stations to go totally unmanned for one day in a row. So the man would only go in there once each day, one half hour perhaps, and make sure that everything was rolling around. In this cage were 144 platters, 45 rpm disks (in the NBC version); the cage moved one notch and then put the next platter on the turntable, played it, turned the 45 rpm record over played it again, put it back in the cage, and then the cage would move another notch. With 144 of these platters there were enough to run the station for 24 hours. The NBC computer engineers had seen that and said, "Ah, we, the computer experts, will now build a mass memory for the computers. Instead of having 45 rpm records we will have "x" rpm magnetic disks and we're going to read those and then we're going to have random access to them.

ROSS: The cycle time was what?

HAMMER: Mean access time was 30 seconds.

ROSS: Tell me a little bit about your impressions of young Sarnoff, the literature has given him a good deal of play in this whole move to meet IBM head on, you haven't mentioned him.

HAMMER: I had carefully avoided that because I met the man only once. I was quite impressed. He was a very strong person, that's my impression. And everything else I have is hearsay, but I do have a choice morsel. On September, oh '71 is the year, on September 17, 1971, which is the famous date--it's anagrammed because 17 and 71

are reversed. I had the wrong date earlier. I'm quite sure it's something like that, 17 September 1971. He had earlier assigned this ex-IBM salesman William Donegan to become president of RCA--of the computer division of RCA, and this guy, like everybody else, had been pouring millions of dollars down this rat hole. I don't wish Mr. Donegan anything ill, but I have this story from a very good source, a very reliable source...

ROSS: Which is?

HAMMER: Which I'm not going to tell. And he was just not the caliber of someone like my friend John L. Burns, whom I knew much better, to be a president of a computer division. I mean he was an ex-IBM salesman. He was a successful salesman and there is nothing wrong with that, but that doesn't qualify a person for being a corporate president. It takes a different caliber man.

ROSS: Well, it's a different organization too.

HAMMER: What I'm trying to say now is essentially universal...

ROSS: Okay.

HAMMER: Corporate management, it will become evident when I tell you the story. Here is the meeting of the board of directors of a large corporation, and everybody goes around and makes a progress report for each division, which is what one does, and Donegan makes his, and so Sarnoff says to him, "Well now, Mr. Donegan according to the latest numbers I have here from you, you're still in the red. How much longer and how much more money will it take to get into the black?" Now this is a board of directors meeting. And in the meeting of this sort, everybody knows this is a game, it's not a charade, it's a game; you play according to very specific rules.

ROSS: He didn't say I don't know?

HAMMER: There's one answer he was not supposed to give. That's the one answer he gave, "I don't know." And Sarnoff blew his top, stalked out, and said, "There is something else you don't know I'm going to call a press conference this afternoon, and we're going out of this business.

ROSS: I didn't know that.

HAMMER: He did. I have this from a fairly reliable source who was in that meeting.

ROSS: Can you name the source?

HAMMER: No, I cannot.

ROSS: Okay, that's going to take an historian. That's a marvelous story. Let me take you back a little bit to some of the early...

HAMMER: But I've cast all these allegations on corporate management, and here is another one of those things. How can a man say that, I mean he knows--if he says 149.6 million dollars. Good answer...

ROSS: In two years.

HAMMER: ...on Monday morning his staff would do up all the...

ROSS: Necessary reports.

HAMMER: ...with flip charts...any number, any data. But I don't know", it's the one answer that is not acceptable. In fact, I made that mistake once myself in May of 1963. I remember this guy Lee Johnson, that's part of the other story, and he was my vice president here in Washington Univac. He was commonly referred to as the revolving

son-of-a-bitch, no matter which way he turned he looked like a son-of-a-bitch. He caught me in a hallway and he says, "Carl how many terminals have we got installed in Houston? 'And I said, "I don't know." He jumped right in front of me, about 4 inches away from me, and he says, "What else don't you know?" and walked away. I should have known that, the one answer...

ROSS: Even in a hallway.

HAMMER: ...even in a hallway.

ROSS: Let me take you back a little bit. I have some questions relating to the early warning system and to Mobidic. What did you and Sammet actually come up with in terms of software.

HAMMER: Oh, we did the whole software package.

ROSS: Okay, is it documented?

HAMMER: Oh, yes, yes, it's all documented. The military has all the documentation. The Mobidic no longer exists, you know, but that's all documented. I wouldn't be surprised if she in fact had it because it was unclassified, and Jean has an enormous amo unt of documentation. She's got, I don't know, half of IBM stacked up with files. She's a pack rat, I'm not. I decided to throw all the Mobidic stuff out; in fact, I don't have anything, but it was unclassified. We wrote an operating system, we wrote compilers, assemblers, sort-merge, whole bunch of utilities, you name it, we had them. And let me point out that the Signal Corps had failed in their systems design. Oh, an interesting story that she and I discovered. The Mobidic had a maximum of 7 banks of memory at 4000 words, that's 28,000 words of memory, at 37 bits, which I mentioned earlier. And of course in their infinite wisdom the Signal Corps didn't know how programmers do things. So I said to Bill Luebbert, "Bill, I've got another question for you. How are you going to get memory dumps?" Well he says, "We print out what's in the memory." "Ah, I heard that, but how are you going to print it out?" He says, "Print it out on a printer, like a teletype printer." I said, "Bill, you can't be serious. 28,000

words of memory on a teletype printer?"

ROSS: How many of them would you wear out before you...

HAMMER: So he immediately went into a high gear and assigned a special project to build a high speed printer for the Mobidic which was assigned to the Sheppard Corporation. They had marvelous experience in building high speed printers.

ROSS: In the speech you made, just to refer to the outline you had used, you had a story that I need to know about since I have not heard the speech, and that's who is Ed Veitch?

HAMMER: Oh, yes. Ed Veitch...

ROSS: Veitch.

HAMMER: Veitch, yes, that's a good story. In 1961, when I was put in charge of the design of the minuteman communications wing of one system, RCA had decided to close out their Cape Canaveral RCA service corporation contract. They laid off 4000 people because they had been told by the government that if they kept the contract with the RCA service company at Cape Canaveral then they would be unable to bid on other contracts in the government because of conflict of interest. And so RCA had weighed the thing in their infinite wisdom and decided what they'll do is fire 4000 people and that way we can bid on these other contracts. And they did. Easter, I'm sure it was Easter, because I was in Cape Canaveral at that time. I was down there on Good Friday, Good Saturday, and Good Sunday, and Good Monday whatever that means. I spent 4 days interviewing, as other people in RCA did, thousands and thousands of people. And so when I came back from there I had a sizeable number of people that I had hired directly from down there for my project. Meanwhile, RCA also found in their corporate offices some people that were not gainfully employed. There are always some people sitting around, and they wanted to put them to work. So this guy walks into my office and says, "I'm supposed to report to you here for this minuteman assignment." I said, "Yes,

fine," and so he gives me his card. I said, "Veitch? Ed Veitch, V-E-I-T-C-H?" I said, "That's a well-known name. Are you related to this guy with the Veitch diagrams?" (They are similar to Venn diagram). Well he says, "I am Ed Veitch." The Ed Veitch. His famous contribution to logic were his Veitch diagrams.

ROSS: That's astounding.

HAMMER: Yes. I didn't know what the guy looked like, how could I know? I mean I don't know everybody in the United States. But he was so modest, he didn't answer my question. He simply said, "I am Ed Veitch." I'll never forget this. I had a marvelous team there. He was just one of them. A good team.

ROSS: What others do you remember off the top of your head. I assume you have the team documented.

HAMMER: No.

ROSS: Oh, you don't.

HAMMER: I tossed all that out. That's all out.

ROSS: Give me some more names to go on.

HAMMER: John Sims.

ROSS: That's an IBMer?

HAMMER: No, well, no - he was then with Sylvania, but he had also come from Univac. While I was up in Sylvania for a couple years he worked with me. And he had been on the original univac I team, in fact I just saw him in '81 again, I believe he was also on the ENIAC team. I've never checked that out. That name comes to mind. That's

going to be a tough one. Essentially that's going to require a tape with long gaps in it because I would have to do some thinking.

ROSS: You can do that when you consider the transcript, and add them.

HAMMER: Yes. Let me give you some more numbers. I made a calculation the other day. I was also teaching in Washington, a graduate seminar in computer science, spring and fall, and sometimes summer occasionally, on Monday nights--always standard on Monday nights, a three hour seminar. And it was the final seminar which had to be taken by all Doctoral and Master Degree candidates at American University. In my 20 years of doing this I had actually produced something like 900 Masters and Ph.D.'s. I cranked them out down the basement and these guys show up all over the world, in fine and very responsible positions, as a matter of fact. Many of them send me Christmas cards and tell me what they are doing, and I tell them what I'm doing. But it's for that reason that I can keep track of them. My guess would be that, not counting public speeches, where I meet thousands of people in one year. I kept track of them when I was in Univac. It was part of my major objectives. In one year normally, I would address an aggregate of about 10,000 people in meetings--public meetings. That was my own design quota, but in addition to that I would meet on a more personal basis anywhere from 500 to a thousand people per year, an average of like 4 or 5 a day. I'd work with them for a period of time, and then we'd part again. And of those, with at least 100 a year I would stay in close contact. So I had developed this file of names which I have which has like 9000 cards in it. Now about a third of those people I can actually picture, I can recall what they look like and two thirds, I'm fuzzy on. And I would say 1000 of them--almost 1 out of 10--I would recognize immediately going down the street. Unfortunately that is not what I run into. I run into the other 8,000 and they say, "Don't you remember me?" And I say, "No, I don't remember you."

ROSS: Well, I'll tell you what, you put that on your micro and we'll put it in our data base.

HAMMER: I'll tell you what you're going to do. You're going to put it on ~~your~~ micro. Have you ever thought of entering 9,000 names, addresses, and telephone numbers. Most of which are probably no longer even valid.

ROSS: I wouldn't want to work on that mailing list. Who were some of the IBM people while you were at RCA and Sylvania that you dealt with?

HAMMER: Oh, yes, yes, yes. Glen Solomon, he's here in IBM, Gaithersburg. He worked his way up, you know. Then another fellow by the name of Fox, he was the Vice President out at Ga ithersburg. I remember those two guys. Then...

ROSS: What were their associations with you?

HAMMER: Glen Solomon was head of the IBM senior management team assigned to handle the multi-million, turned out to be multi-billion, dollar contract actually, in terms of IBM 709, 7090's, and the whole schmear for the relationship between RCA and IBM in the ballistic missile early warning system. You realize that the ballistic early warning system started originally as a billion dollar contract in 1958, and of course now it's up to about four or five billion. You know that system is still working. They have to replace the machines, like one always does over and over. But that was a good investment for IBM.

ROSS: And Fox again?

HAMMER: And Fox became president of the Federal Systems Division. Fox, what is his first name? I don't know. He's vice president of Federal Systems in Gaithersburg. Let's see who else? Stanley Winkler is one of the scientists. He was down at Fort Huachuca (Arizona) at a time when they installed their 709 for the Mobidic project. They got a 709 instead of the Mobidic, so that was in March of...I'll have to think of the date on that. It was March because they had the only snow fall on record. March '59. I was down at Fort Huachuca and they had a 4" snow fall down there and it was ridiculous. IBM, who was the vice president here who was quite active, who was in fact in charge of...? There is a man I'm trying to think of his name and when I read the transcript I'll remember who he was. Let me tell you this story because it's fascinating. He was in charge of the New York City IBM 704 Service Bureau in 1957. Bruce

Oldfield that was his name; and one of the people on my staff was Sidney Cashton. Sidney and I went to Bruce in New York and we said we needed to buy lots of his 704 computer time for a project. Now the IBM service bureau in those days was not really a money making device; so you know, he was selling 1,000 dollars here and 500 dollars there. So we wrote him a contract if I recall right for one quarter million dollars for one year because we had to write all the software for the ballistic missile early warning system and we didn't have any machines and so we...

ROSS: So you went around the country...or you just went there?

HAMMER: No, we just went right to New York. And we were told by IBM that the 709 that I ordered would be compatible with the 704 with a few minor problems but we could essentially write all of our software on the 704 and then test it on the 704 and then modify it for the 709. So here we came, gave Bruce this big windfall, and we ran into the strangest people down there. They were doing some funny work. They pulled down all the window shades in the computer center before we got on, this was another customer. They were in there only for an hour randomly and then pulled all the shades and then shredded all the paper or took it with them. They never left anything there. They cleared all the memories, I mean they really left a virgin machine when they left. One day Sidney and I looked at this and I said, "Sidney, you know there are two possibilities. Either they are from the KGB or the CIA or the NSA or something like this, or they are from the gambling syndicate" and we had guessed it.

ROSS: They were.

HAMMER: They were from the gambling syndicate. And a last story before the tape runs out, Sidney Cashton worked for me in '57 and later on became the director for data processing for the United Nations. That's where he is now.

END OF INTERVIEW