

ERA¹ Oral History Project, St. Paul, MN – An RCHS² Initiative

August 13, 2024

Lowell A. Benson – Interviewee via ZOOM

Barbara W. Sommer and Carson Tomony – Co-Interviewers



Laptop screenshot – *sorry for the face sag, I had a Bell's Palsy bout.*

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Post transcription editing and formatting for the VIP Club Legacy Anthology,
posted by Lowell A. Benson, BEE, U of MN 1966.

¹ Engineering Research Associates

² Ramsey County Historical Society

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Name of interviewee: Lowell Benson **LB**

Name of interviewers: Barb Sommer **BWS** and Carson Tomony **CT**

Prologue

BWS: **Thank** you for doing this tonight, this afternoon. Do you have any questions? We are recording right now, so we want to get you started right away. Do you have any questions about this project, or any other questions before we get started?

LB: I do not. When we are done, I would like to get some information as to whom else is going to be interviewed. And let me apologize if I slur a little bit. Two weeks ago, I thought I was having a stroke. It turns out that I have something called Bell’s Palsy, which is a partial paralysis of the face. So, I’m going to try to avoid slurring my words too much.

BWS: Is that something that eventually disappears again?

LB: **Hopefully** in another month or two, I will be back to normal.

BWS: **Yeah**, funny how these things happen. Unfortunate how these things happen. Okay, I’m going to hit the record button. We’re going to be talking about today, just so you know, there have been so many interviews, quite a few about the ERA and about Minnesota and its work with the computer science industry and development of it. But we’re going to be looking a little bit more at the legacy and that, you know, there are allusions to that in a lot of the interviews, you know, saying, “Well, we were here, we think this was so important,” but I haven’t had heard too many people talk about what they really thought about that side of things.

And I know you have a great deal of background on that, or your background is, you have a deep background on understanding Minnesota and the computer science industry. So, what we're going to be doing today is really talking a little bit more about some of the legacy or the impacts of the ERA and of computer science. I have an introduction I'm going to read, and if you have any changes or anything, just let me know after I'm done.

Introduction, beginning of interview:

BWS: Today, we are interviewing Lowell Benson, a retired Univac and Sperry engineer for the Ramsey County Historical Society ERA Oral History Project. Benson began working at Univac in 1960 after his service in the United States Army, and while at Univac, earned an engineering degree from the University of Minnesota. He worked at Univac until 1994 when he joined the Center for Transportation Studies at the University of Minnesota. He retired in 2001 and has been very active in the Univac VIP Club, which was established in 1980.

So, thank you for meeting with us today. As I mentioned, through this project, we are interested in documenting the impact of Minnesota's early computer industry in the state. And so, would you give us a little bit of background about your interest in the history of technology and science? We have information in some of the other interviews, detailed information about your work, but can you just sort of summarize that for us and what your interest is?

Drawing Control Clerk

LB: I can. And let me start with two dates. July 1960, I got out of the Army, and I paid an employment agency \$150 to find me a job. Univac hired me to be a drawing control clerk in their somewhat obscure automatic antenna coupler department; my duty was paperwork in support of design engineers. Just 22 years old, and my weekly paycheck was a bit more than my Army pay. Quite frankly, I had no idea what the computer industry was at that point in time, nor could I imagine that they would be my employer for almost 34 years. [phone ringing in background]

BWS: Did you have any sense at all of what the computer industry is?

VIP Club's Legacy Committee

LB: At that time, I did not. I knew what punch cards were because I had used those in the Army, and I knew what comparative equipment was, but I did not know anything about computers. A second date I would like to point out is October 2005. The Sperry Retirees Club formed a legacy committee. Harvey Taipale at that time wrote, "the committee quickly realized that the history of Engineering Research Associates (ERA) continued to the present, was a remarkable story of technological innovations and contributions to computer industry in general and specifically Minnesota. The story, particularly the early years, has never really been completely told. For example, the Athena computer launched over 300 missiles at the beginning of the space age with never a launch abort caused by the computer system."

The committee — well, at that time, there had been a few things written, but nobody had really told the entire story. So, we scheduled a meeting with Dr. Arthur Norberg at the University of Minnesota's Charles Babbage Institute (CBI) to ask for some advice. He told us that if we could gather 200 career summaries, we'd have the story.

And that led us to today, as my start there and the legacy committee start. And with that, I'm pretty much open to specific questions. Go ahead. {editor's note: Dick Lundgren documented that meeting, see Our Stories, www.vipclubmn.org/Articles/FirstVisitToCBI.pdf.}

BWS: I think that's a good background. Carson, did you have a question?

CT: No, go ahead.

BWS: So, when you started at Univac, Lowell, I'd like to know a little bit about where and how people saw Univac as a business. Was it a leading business in this area? Was it innovative? Were people saying, "My gosh, the computer industry has arrived," you know? Or how did it kind of fit into the business community of St. Paul when you first started in 1960? And then I have another question to follow that.

LB: As I said, I really didn't know what the computer industry was then. However, as we started with the committee, Dr. Norberg left University, Dr. Tom [Thomas] Misa became the second CBI director at the University, and he was our committee's advisor for 11 years. Now during that time, he wrote the book *Digital State: The Story of Minnesota's Computer Industry*. So, he covered the entire spectrum, not only of ERA to Univac to Sperry to Unisys, but he included Control Data Corporation, Cray Industries, Honeywell, IBM, Ceridian, as well as the activities that went on at the University of Minnesota, like their early start with the Internet. They called it Gopher Way. Those were some very interesting things. Now we use the term Univac, and it's rather loosely. It's sort of like an umbrella like the United States, covers a whole bunch of things, bunch of areas. Univac, because Remington Rand had purchased ERA, and a couple years before, they had purchased Eckert-Mauchly Computer Corporation out in Pennsylvania, and they sort of threw these companies together, but they were more like an A and a B squad on a basketball team. They were competing with each other. They were not cooperating.

Then Remington Rand in '52 defined or separated out a group, they called it the *military division*, to handle specific contracts dealing with the Navy, Army, and the classified programs. And then in '61 they actually separated out, Remington Rand Univac, they divided into two financial groups, the commercial operations and the Defense Systems Division. And part of the reason they did that is with defense contracts, the government allows you to make a specified profit. They allow you to add a couple of percent onto any given contract for research and development, whereas the commercial sales, they could charge whatever they thought they could get away with. So, it was a separation, and even within the Twin Cities, then, the defense system division was operating like a separate entity from the commercial in Roseville.

The commercial operations in Roseville were tightly coupled with Blue Bell and all the commercial operations and so it was almost like two different companies. Now the two, the Roseville operations and the defense operations, did have annual technology exchange meetings. We used to go up to Breezy Point, i.e. Cragun's Resort, and there were different presentations made this way and that way. Now, I was up at a couple making presentations, but the main reason was government contract accounting. I think they avoided some certain auditing requirements, and the defense systems had government auditors in the plant almost all the time, and not only inspecting the construction and manufacture and testing of equipment, but also watching the books, if you will.

And I think I became aware, really, more of the computer industry in about '63 when the department I was in, the antenna coupler department, folded up and they were shifting that technology out east, somewhere. And somehow, I got a job working as a computer operator, working nights. I enrolled in the University [of Minnesota] day school. So, for three years, I worked nights operating computers and working with programmers. And after three years, I got that piece of paper that said I had a Bachelor of Electrical Engineering, and so then I was assigned to a design team. But during that time, I became aware of the commercial computers that were next door to our military computer center, and started learning a little bit about, oh, there's a Control Data over there somewhere, because people talked about having purchased stock over there.

BWS: That's what they were talking about, purchasing stock? So, you were still in the military side or the defense side, at this point when all that was going on?

LB: Yes. My entire career was in the defense side.

Computer Operator

BWS: Before we get to Control Data, and I do want to ask you about that, what kind of training were you given? You said you became a programmer. And that to me, sounds like you'd need some pretty good training, or specific training, in addition to your studies with electrical engineering.

LB: Well, I was a computer operator, and we were supporting programmers that would bring their projects in, and we'd compile them and test them and so forth. And we needed some support services, so I wrote programs for the computers we're using to read the punch cards, put them onto a magnetic tape, to do printouts. So, I did some programming like that, mostly in machine code or low-level code, and one of our machines, the 1004, had a plug board. So, you had to change the plugs, depending upon where we wanted to sort or print.

BWS: I've heard about those, yeah. And that was at the back of the computer, the plug board. Is that right? Or something that was in the back?

LB: On the side. It was accessible.

BWS: Okay, accessible.

LB: In the computer center, we had a machine, it was called a Solid State 80, it had transistors, but it had big vacuum tubes in it for the printer heads. And that had a unique drum memory, which a different type of programming than a random access of core memory. And we learned how to operate that.

BWS: Who taught you how to operate that? Was this some of the defense, some of the people who had worked in the defense?

LB: Well, there were a couple of other operators there. That center operated around the clock, and they had a couple of guys during the day, and they had a couple of maintenance guys there, and it's sort of, "Oh, here's how you do this," and just sort of picked it up, if you will.

BWS: So, they didn't have a formal class for you, and said, "Come on, sit down, here's your workbook," or something. Nothing like that.

LB: No. Yeah, here's how many jobs we have to do tonight. Put them on.- And I think the term came up, *batch processing*.

But the nice thing was, if you put a job on that took an hour and a half, I could open up my textbook from the university and do some studying while I was getting paid.

BWS: While you were watching it work, right?

LB: Watching the tape reel spin, and, you know, when the printer ran out of paper, you had to change paper and so forth, stacking it up, labeling them with the programmer's name on it, so they could pick them up the next morning. So, sort of a service operation.

BWS: Did you know what you were working on? The defense industry, there are all these stories about secrecy. That's why I'm asking.

LB: There were various programs, projects, some of them I knew were working on Naval Tactical Data Systems, doing programing. One fellow, Jorgen Anderson, was a support programmer, and he was generating a Fortran system for some Navy computers. And as it turns out, I was taking a Fortran class at the University, which was being run on Control Data 1604, but Jorgen knew that his Fortran compiler was probably working when he got the same results from my program as I'd gotten over at the university. And it was a rather simple program. I kept track of every time I put gas in my car. So, I had, you know, this log. We put each entry onto a punch card. So, the program simply read each punch card, and it calculated the average gas mileage and printed it out at the end but got the same results from at the university out of Control Data 1604 computer as we did in our military computer center, on a 1206 30-bit computer. So, the guy who was developing the compiler, the Fortran compiler, thought, well, if you get the same results, then it must be functional. So, that's sort of how you learn on the job.

BWS: When people are working on stuff like that, did you say, "Oh my gosh, this is innovative, this is way out?" Or was it fun?

LB: It was always fun. I've always enjoyed work. And you know, there's a philosophy that if you enjoy what you're doing, you'll never work another day in your life. But there were some guys that were working on support programs. One was a PERT, or program evaluation review techniques, where they were doing business management type software, some planning software the guys were developing. There were some others developing something that was a Moonbeam project, which is a logistic software set for the Navy that they ended up having on many of their ships. And there were, like I say, I sort of knew a little bit about the departments these guys were working in, but I really didn't know at that time what was going to be happening.

Engineering degree, ASW systems & NTDS

And when I got my degree, they put me to work doing testing of computers. And then I worked at a design group. And the design group, if you go back historically, some people may remember the Cuban [Missile] crisis. What the Navy describes as the Cuban crisis was that their submarine hunting methods could not keep up with the Soviet submarines that were "run silent, run deep," if you will. So, they started a program, they called it ANEW, like a new program, to where they—

BWS: Excuse me, what did they call it?

LB: ANEW, A-N-E-W, for a new program. They couldn't come up with any special acronym. So, anyway, we developed a new computer, they put it aboard the Lockheed P-3C aircraft, which would then fly over the ocean. It used something called magnetic anomaly detectors. So, as they flew over the ocean, this probe on the back of the plane could detect ships on the surface, and if there's nothing on the surface, it could also detect magnetic lumps under the ocean. So, they would drop sonar buoys, which are separate little sonar detectors which then would radio back up to the plane. And so, then they could track these underwater submarines. If you ever read the book *Hunt for Red October*, or see the movie, you see this four-engine prop plane flying over the ocean and tracking the Red October submarine. And so, I was part of the design team developing a computer that was used for that. I flew on that plane once. So, anyway, like I say, during the Cuban conflict, when the Navy couldn't keep track of submarines, they started the program to have digitized or computerized the aircraft detection systems. And that computer, we delivered the first one in 1967. Rather amazing. In 2012, a program manager told me that there was still about 40 of those computers flying in the Japanese fleet. The Japanese were using the same plane with that computer for sort of a search and rescue operation. There are not many people that can say they were part of a computer development that was still operating 45 years later. I still think about that. That was a great thing.



BWS: That's amazing. And I have heard that there were connections with the Japanese. They were interested in technology. And so, that was part of this process, then, I take it, where you were selling materials to the Japanese.

LB: Yes, selling, and they bought some of the designs, and they did, tried to do some manufacturing themselves. But they also set up, we had software support centers in various places in the Twin Cities. And so, the Japanese, as they were developing their various software, did it initially in the Twin Cities. And some of those aircraft and the computers also were flown by the Dutch, by the Norwegians, by the Australians. So, there were—over a 25-year manufacturing run, there were 499 of those computers, you know, manufactured, but they ended up being worldwide. And with various software updates, they eventually did a replacement of that computer in the '90s using embedded microprocessors. But the missions—and the missions sort of changed over the years.

BWS: Were these all still defense? This was still on defense. This was not commercial.

LB: This was in the defense. This was not commercial. Another technology that came about is during the Korean War. And some of you may be too young for that, but during the Korean War, the jet aircraft flying about, both friend and enemy, were so fast that they couldn't keep track of them with their traditional methods, which, you saw World War II movies in the ships, they had a command-and-control center, and they'd have a big glass chart and they'd be doing grease pencils. They decided to digitize that, and so they created displays, and were able to then track and they came up with something called IFF, Identification Friend or Foe. Each aircraft would have a little transponder in it with the aircraft's serial number and type and so forth. And the radars on a ship would sort of ping them, ping, and you'd get this beep back, and in the beep coming back, you would see, okay, that's an F4 or F86 fighter planes, serial number so on and so on. And so, if there were several planes that they weren't getting beeps back, they were probably not American.

So, that was a rather unique capability, you know, special radars to do that and feed the computer and the captain and control room, they could see, here's all the various aircraft, and these are ours, and those are somebody else's. And the neat thing is, as they're developing it, they call it the **Naval Tactical Data System**. And of course, they're going to Congress. They need money to do this. Congress says, "Is there a civilian application?" Well, somebody came up with the fact that at all of our airports, we have planes flying around, so they use this ping and transponder to identify commercial flights back to the airports. So, when an airport had its radar scan going on like they can get a message, oh, that's flight 265, this one is here. They could actually put the flight number on the screen, and they could say, "Slow down, get in behind this plane." They can control it. So, the Naval Tactical Data System, IFF, became a key part of the FAA's automated radar terminal system (ARTS). And, of course, the computer, the software, was done out of St. Paul here. And they did—you know, they had an Air Traffic Control ARTS I and II and III. Anyway, the III ended up with a 30-bit computer that started in, I think the first installation was in 1971, and 40 years later, the last of those computers was retired. There's another electronic system that was developed. And it just kept working, working, and working. Like I say, a 40-year service site. How many people today take their phone then a year and a half later say, "Oh, I need a new one, it's obsolete?" And that came out of the military division because of the interactions with the military computers. And so, even though that was a government, or civil problem, my computer says restart. Hold on, now. So, there was a Navy technology that ended up getting civilian use.

BWS: When you were working on some of this, was it classified, originally, do you think?

LB: I was not exposed to the classified aspects of some of the software. I knew that it was happening, and that's one of the reasons, I think, that they hired me, is because I had security clearances before, in the Army. So, that was a plus from a credential standpoint. But yeah, we had guys would come in and, "Yeah, here's the name and the program I'm on, but I can't tell you anything about it." And there were quite a few of those going on at various times.

Speech Laboratory, Special projects

In the mid-70s, I was asked to participate in a program down in the basement behind closed doors, that they were doing something, it was called a speech laboratory. And out of that came the invention of voicemail, to where they could take electronic wave speech, turn it into a digital stream, save it in the computer, and then they could turn around and play that back through a speaker. And this was in the early to mid-70s. And lo and behold, then eventually, they generated an automatic telephone operating answering service, and you could start leaving messages.

But that came out of the voice recognition laboratory down in the basement. And now, although that was in the mid-70s, they not only could recognize and break apart English sentences, but they could also do German and Russian. And that's where I came in, because I spoke both of those languages. We're always working on technologies that have different applications. That was fun. But it was down in the basement behind closed doors, and it wasn't until maybe 2005 or so that something started showing up in Wikipedia.

BWS: But you started seeing some of the, or maybe you started seeing, I guess I'll have to ask you if you did, started being able to sense or see the commercial applications, the fact that this was reaching out beyond the defense industry boundaries, as it were, is that right? When you were there?

LB: Yes, because in our plant one facility, which was right across the river from Fort Snelling, we had a military computer center, and next room across the hall was a commercial computer center, where they had the 1107 computer. And so, we were doing both military work and commercial work in the same building. And then, eventually, that commercial operations moved to some new buildings up in Rosedale. So, that was more of a physical separation in the '70s.

BWS: That's when that started becoming a little bit more obvious, maybe, a little more—you were able to see it a little bit better, or sense it a little bit better?

LB: I could sense it, because I knew one of the operators in the commercial center. His name is Harry Walz. He and I had worked together in the antenna coupler group.

BWS: When you were working at Univac, was there discussion about the Engineering Research Associates at all, ERA? Did that come up at all? The good old days, or anything like that?

LB: Yeah, the good old days, not necessarily always the good old days. But there was not a whole lot of talk about the past history, because we were always working on the next program, the next project, going forward. How can we take this technology that we have and solve another problem? Because I like to say that my career was helping customers solve problems, and sometimes the customers were adjacent departments. But you're always working on problems. One example that came up is the when the SR-71 was being developed, they discovered that when they were testing and that flew up at 70,000 feet, air was so thin up there that if they started to turn, just the nose would block enough air off, say, one engine, it would be starved, and so the outer engine would push too much, and it would start to oscillate. So, they put a computer on board to anticipate that the plane was going to be starved on one side, and they would bleed off some of the air on the other side so they could make smooth turns. But they had a computer on board to control that.

BWS: All this was coming out of St. Paul. Was most of that coming out of [St. Paul]?

LB: The computer to do that control came out of St. Paul. That was the military nomenclature was AN/UYK-23 and it was dealing with Lockheed that was doing some of the work on that. And one of the things that was unique is that the skin of the aircraft is primarily titanium. Well, most computers and cables had connectors on them. They were cadmium plated. Well, if you happen to have cadmium touching titanium, and you there was a little bit of moisture, you'll get titanium embrittlement. Therefore, we changed all the connectors in that computer and the cables to be nickel-plated in order to avoid titanium embrittlement. So, that was, you know, something else we did. We did that in the '80s.

BWS: Did you feel at Univac that this was cutting edge, that this was moving fast, anything like that? It sounds like there were an awful lot of, when you think about the end of World War II and where things stood, these are major advances, and they were coming along pretty quickly.

LB: They did. It seemed like every time you turned around, the memories kept shrinking, getting smaller and smaller and smaller, and so you could do more in a smaller space. And there was a point in time when we had a program in the basement that was doing the computers for the B-2 airplane. They came out of Eagan, if you will.

Unisys formed

BWS: Eagan. Oh, yeah, those facilities.

LB: Eagan. See, that's where the defense systems ended up being, and it eventually, you know, after—well, after Burroughs bought Sperry to form Unisys, then at that time, that was about '86, combined, Burroughs and Sperry and all the divisions had about 120,000 employees worldwide.

BWS: Worldwide, okay.

LB: And Sperry, or Unisys, Burroughs, Mr. Blumenthal, bless his soul, started selling off divisions. Because not only the computer industry, but I think every other industry, you've always got your board of directors that is trying to maximize profits for the stockholders. And therefore, if you've got this division, it's only 20,000 people, but their profit is only two percent and we want to get six, so let's sell them off. So, you know, the '80s and '90s, we had mergers and divestitures. And so, yeah, that was true—

BWS: What was the impact of that? What was the impact of that on the company or on the employees?

LB: Well, there used to be a time when you had employee loyalty to the company and company loyalty to the employees. Well, that loyalty sort of disappeared. It was bottom line profit, and that's it. And we had people that left the company. Well, you didn't get a contract or you did that contract. And we usually had what you would call a going out of business curve. If you got a production line, and you know that it's going to last another four years, and maybe you'll get some added units for five years, and you got to have new ones, you could always see out so many years, you can see the going out of business curve. And you kept projecting that. And so, you say, "Well, gee, three years from now, we're only going to need 20 people, not 30." So, you have to go through an evaluation of your employees to decide, okay, who are the best people going forward? And you evaluate the people and say, okay, these are ones we're better off taking going forward. And so, we'll have to drop a few people.

BWS: And that's where the loyalty changed, I take it.

LB: The loyalty changed. They would do a reorganization. They would create new departments. The image of the new department might be 98 percent like an old department, but because it was new, had a new name, then the person put in charge would sort of pick his people, and drop another one, and suddenly, it was in the '90s that defense engineers became expendable.

BWS: Was that a result of cuts in funding, defense funding? That would go right up the chain, I would think.

LB: It was sort of a reaction to glasnost and perestroika. Glasnost is openness, perestroika is reconstruction. And so, as [Nikita] Khrushchev opened the Soviet Union, then the defense dollars went down, and therefore fewer contracts, you needed fewer people. I describe it as you know, my wife and I were planning a trip to Hawaii, and I said, "By the way," when, we're in Hawaii. I said, "There's going to be another layoff, because about every six months they would cut a few people." She said, "Well, shouldn't you stay here, defend yourself?" I said, "No." She said, "Well, how do you know you're on the line?"

I laughed, I said, “Well, for the last three years, I participated in evaluating people. And this past fall, when I wasn’t asked to help evaluate people, I guessed that I was on the other side of the line.” So, when we got back from Hawaii, I went into work, and they gave me papers, saying, “Well, we no longer need your services.” So, anyway, so you could say I was laid off or—

BWS: That’s the way the industry was transitioning?

LB: Yeah. Or they gave me the opportunity to find something else to do. As it turns out, I had an interview scheduled before I got my walking papers.

BWS: There must have been a lot of demand for technology work, even with this sort of cutthroat approach or this different approach. It’s a growing industry and as you said, you were able to move into the Center for Transportation Studies, as I understand at that point.

LB: Yes.

BWS: And so, there must have still been enough demand for workers, is that right?

LB: Well, there was. And about a year before that, or shortly before that, we had some internal projects looking at, are there any technical fields that we could do a defense to commercial transition, apply defense technologies to some other place? And one of the things we did was to investigate the Departments of Transportation, we put together a demonstration for MNDOT.

BWS: So, there you go.

LB: And in looking at that, and what it did is, you know, we made presentations to management then and said, “If we invest this much over a three-year period, then in five years, we could start to turn a profit,” and so forth. And management said, “We aren’t going to wait that long.” But it gave me contacts to get me to the next job. So, we were evaluating new business places to see what we could do. It was not directly the technologies that we were applying. It was the management and innovation skills of the people. It was the people, not directly the past projects.

U of MN

BWS: And it’s being described as a pipeline between the University of Minnesota Computer Science and Engineering Department and Univac specifically. Was there something like that? Was that still going on?

LB: Well, if you look at it, the university’s first digital computer was a Univac computer, 1103 delivered in 1958 and a fellow named Dr. Marvin Stein came in to start their electronics department. And he also wrote a Fortran book that I had to take in class. When he became director, then of the computer science department, running that computer center was a guy named Dr. Peter Patton, who happened to be an ex-Univac employee also, but we were doing a particular study that we needed some simulation. So, we went to the university through Dr. Patton and Dr. Bill Franta, and they did some simulation for us, and here were some techniques that we wanted to try. And in effect, then, we were using university with study contracts.

BWS: So, there was a working relationship there.

LB: So, there were working relationships. We had people that were adjunct professors. They might teach a class at university, but they were also working during the day or evenings at the company. And there were several of those. So, there was a continuing interaction. And we also, in the spring and fall, we would go to university when they had career days, and set up a booth, where we would talk to young people to see if they would be interested in coming to work for us.

BWS: Did you see Minnesota, or St. Paul and Minneapolis, specifically the Twin Cities, benefiting? How would you describe the benefit of having all of this computerized and computer science activity, some of it secret, what do you think, what benefit did it bring to our area do you think?

Minuteman computer

LB: Well, there were applications of some of the technologies that were classified, and what they were going to do with it. However, some of those technologies that did not have the app with it could be used in other places, and so, let's see if I can come up with an example of that. We developed something that was called the Minuteman Launch computer. Now we used to have Minuteman silos all over the place, but they had computers that were sitting here running 24 hours a day, seven days a week, just testing and retesting, and testing and retesting, to make sure they were ready if it came time to launch a missile.

BWS: During the Cold War.

LB: The Cold War, yeah. And then we used something called plated wire memory for that, because the plated wire memory was not susceptible to radiation if there were a nearby nuclear event. Well, that technology ended up going into some commercial computers, the 9300 series, because they came up with a way of making it cheaply. But those computers, they call them Minuteman silo computers, those ran, like I say, 24 hours a day, many of them without a failure, for over 5,000 hours. They were in a benign environment. So, very, very reliable. But that was a technology that was used for specific purposes, but also then, because it could be made cheaply, ended up in commercial computers. That came out of Pennsylvania.

BWS: But I'm thinking too, of things like Silicon Valley, which sort of exploded, and, oh, it's a computer center, but we have a computer center here that sounds fascinating and very, very innovative. And how do we kind of talk about that?

LB: As we were doing components and trying to make sure that the components were all tested that they wouldn't fail, we set up a component clearinghouse in testing, and we worked with manufacturers. But we also created our own semiconductor division. And we did research into generating silicon wafers and so forth. And we had a program that we developed a 32-bit microprocessor chip the size of my thumbnail, a 32-bit computer on a thumbnail. It was classified at that time because the target applications were some of those satellites would fly over the sky. But we did development, and we had first-pass silicon.

Well, when Burroughs bought Sperry, Burroughs had a manufacturing facility in Rancho Bernardo, California. Here's this brand-new place in St. Paul that they just bought. Well, if they closed the semiconductor facility in St. Paul, they could write it off. They could write off 50 million dollars as part of the acquisition process. And so, we were also doing some special stuff with the Air Force and the Navy there. But management decision, we can write it off, close it! And the projects that were using that facility had to find replacements for a while.

A couple of engineers and I visited 16 different semiconductor factories, or sand factories, you know, including Intel, Raytheon, and Texas Instrument, and so forth. We visited them to see who had the capability to manufacture this 32-bit chip that we had created. And after visiting 16, we sent out requests for quotes to six of them, and three responded, and we picked one and sent them a design, electronic design, and they made wafers, and we had first pass wafer operation, but that's because of, you know, extensive simulation and a couple of really good design engineers. But I say this was new technology, but the business decision was to close it, and it went downhill. I happened to have my fingers in that because I was a program manager.

BWS: But that changed. Carson, did you have anything before I keep going? Any other questions?

CT: Sure. Yeah, it seems that the state of the US, and in particular the military, influences where computer engineers are needed. And obviously, we know—

Wrapup

CT: So, it seems that the State of the United States, and in particular the military kind of influenced where the need for computer engineers is. And obviously the ERA started with World War II ending and codebreakers being available, and then you just described a situation where, at the end of the Cold War, you know, suddenly, the defense engineers were no longer needed at the company. And so, my question is, you obviously went to the University of Minnesota, the Center for Transportation, and I'm wondering where did other engineers go as the company went into decline in the '90s, if you will?

LB: There were some that went into the medical industry, that went over and applied some of their creative skills to, I know some went to Medtronic, various other places. Some went to small startup companies that, you know, I think that the memory technology that went from Control Data to Ceridian, and in turn to Seagate, people with skills in certain areas then sort of went to wherever the company was.

BWS: But you're starting to see these companies, or an industry, sort of grow up, like the medical device industry, just suddenly, is large here and active. And the companies are huge worldwide. Are they coming out of some of—you know, here we are, we have this Center for Computer Technology, and we see some of this other stuff. Can we connect the dots, as it were, connect the dots there, at all?

LB: Some tightly, some loosely. What's his last name now, Manny something or other, I forget his last name.

BWS: Villafana.

CT: Villafana.

LB: Villafana, yeah. Now, he was in the medical industry, and he needed to automate something, and so I think he went first to Control Data to get, you know, a small, embedded computer system set up. But in effect, it's the people that had the skills to put together electronics and then the software sequencing to do the app. But that's one example that I became aware of just last year.

BWS: There was some transfer.

LB: There was some transfer of technological creation ability. It may not have been the direct, exact, you know, hardware. It wasn't, oh, I've got this one computer chip, and I'm going to use it for A, B, C, or D. It was, rather, we can do something similar. I used to have sort of a philosophy; there's something called paint by number. Somebody created a diagram and laid out some colors, and everybody else then could sort of replicate that. But when you're replicating it, maybe you change a color here, there, or you change two or three lines, so paint by number, and you could say, oh, they call it state of the art, well, I call it state of the science, because somebody created the scientific solution, and other people took and did some modifications of that solution to apply to a new problem. So, it's sort of the ability to think and see similarities between issues and situations to decide, how am I going to solve that problem?

BWS: One of the things that that we've noticed in reading about this history is that there was a great deal of documentation, originally from the East Coast and from the West Coast, but Minnesota was kind of a well-kept secret. Was that correct? What was the excitement of what was going on here?

LB: I think that—I don't know if you have watched the TPT documentary, *Digital State*. One of the persons there, they asked Dick Erdrich, he had a sort of crew cut blonde hair, asked Dick, "Well, how come this has never been written down?" He said, "Nobody ever asked us." Nobody asked us.

BWS: Really.

LB: Like I say, yeah, I know that because Dick and I are friends. I talked to him two weeks ago, but I used to sign his timecard at one time. We were doing additions, or apps, or hardware apps for a certain series of computers. And I used to go as a marketing team when I talked to a customer and said, well, here's how we can solve this. And Dick said, "Yes, you bag them, I'll skin them." He had vernaculars. I mean, I think there was a lot of human interaction, and people respecting the skillsets of other people to put together a team. So, in the engineering world, I think that's true, just like it is on the Viking field. It takes people in different positions with certain skillsets. How do you determine somebody who's the all pro? He's a guard. When he's got his block done then he sort of does a sidestep and helps the guy next to him. Now, it's teamwork. It was the same thing in computer and systems development, that the team of people really gets it put together, and you have strengths in some people, you have weaknesses. You never ask your weakest player to attack the toughest job. I think that that's true. You know, not only in the computer industry, commercial, defense, even in transportation industry, I observed that at the University of Minnesota when I was in the Center for Transportation Studies. It was interaction between contractors and university researchers and department of transportation employees, a lot of interaction. I have a term; it's called *life is a time space continuum of human interactions*. And, you know, it's not just the computer industry from my observations.

BWS: It worked in the computer industry. It worked.

LB: I think it did. I think it did. We had some very interesting problems that we helped to solve. I like to use the term we more than I.

Teamwork

BWS: Yeah, that's teamwork. If you were thinking back, as you look back over everything you've done, what was the impact, do you think, do you think in your own mind, of the ERA, and the impact of Univac, on the industry, or on computer development, or on the development that we all live with now? The impact of each one.

LB: Now, Sperry put out an ERA 40th anniversary booklet, and in that booklet, they have one page where they have a listing of all of the spin-off companies that went and did this, did that, and so forth. And the spin-off for smaller companies was first mentioned in a 1971 press release. Like, even before that '71 that would have been 15 years, they realized that people could go and take their skills, just like, in general, most people think that Bill [William] Norris, one of the creators of Control Data; they think that was his first computer company, but it was his second. So, anyway, you've got people that just keep going and going and apply to different fields. We did some investigation into where we could transition, and that introduced me to the highway industry. Did not see anything immediate that would be a new product.

We also had some people, out at Eagan, who developed a control system for a drone that ended up being sold. It's called Desert Hawk, sold to the British Army. Some of the control software for that was done between the engineers in Eagan and a professor at the university. They had a contract to do some of this guidance analysis. Someday out at the Lawshe Museum [Dakota County Historical Society], we're going to get a copy of that drone hanging up there. We've got it in storage.

BWS: That's historical significance, yeah.

LB: That was done. So, what happened? Well, as they were cutting back in the Twin Cities, some of the engineers that had worked on that drone, they went off and they formed a company that does drone work. Mostly, they fly over fields and can track, detect weeds etc. So, they're working in the agriculture industry. I think Centra is the name of the company that was really started by a couple of guys that came out of Lockheed Martin, they'd been developing this drone, so they just did some agricultural applications of it. And that company's doing very well.

BWS: It was a time of innovation.

LB: Yes. The CEO of Sentera is a guy named Eric Taipale. I mentioned his father, Harvey, in my opening remarks. But we've had things, we've had two, and in some cases, three generations of people that have worked in the company, or the sequence of company names. You know, one example, I was on a golf team with a guy named Paul Welshinger. He retired after 35 years. He said, "I kept every pay stub I ever had. I had the same clock number for 35 years. There were nine different names on the paychecks." So, even though the company structures kept changing and growing, and what have you, you had the people that spanned several decades of name changes. There's still about four or five people alive who, at one time, received a paycheck from ERA. [William] "Curt" Nelson, Harold Grandprey, talked to a lady last year, I forget her name—

BWS: Could you say the second name? Curt Nelson and then what?

LB: Curt Nelson, Harold Grandprey is another one. These are nonagenarians. And there was a lady that I talked to. I had put an article into our newsletter that somebody who had passed away, and I said, "He's the last of the ERA people."

And I got feedback that he was not the last of the ERA people. So, there's so many people that, you know, it was almost like family. Almost like family. Because some people, we used to have golf leagues, people would golf together. They had a photography club for many, many, many years. They had bowling teams, lots of things that, especially when they were young and single, people did things together. They didn't just go home and hide under a bushel basket. Pardon me, that's an old, old statement.

Name dropping

BWS: Yeah, interesting. That's very interesting. We've been going for about an hour. This was absolutely wonderful. Have we missed anything, anything that you'd like to add?

LB: Well, let's see now. I would like to put in a plug of appreciation for a guy named Chad Roberts (former director of the Dakota County Historical Society). In 2011 when Lockheed Martin announced they were closing the plant out in Eagan, that was the defense systems group. We had a couple of people that were in our retirees' club that were also volunteers on the Dakota County Historical Society board. They brought Chad into that plant, and we showed him what we had been collecting, hardware wise, and he in turn, convinced the Dakota County Board to set up a permanent exhibit at the Lawshe Memorial Museum. Well, of course, we know—and Chad's eventual replacement there now, Matt Carter, continues to support it, but we like to believe that we have more—I think we have more defense computer industry artifacts there than any other museum in the world. At least, we like to think that.

BWS: Well, I've seen that exhibit. It's amazing, and it's huge.

LB: And it's not complete.

BWS: I gathered that from when I was there.

LB: But yeah, and they're doing some remodeling right now, but on the second floor, they've got a room that has been dedicated to our volunteers to come in to continue cataloging and archiving. And we keep on collecting stories here, there, and what have you. And most of that, if you go to the website, vipclubmn.org, you'll see a tab that says, "Legacy Anthology." I believe we've had over 600 people contribute to that. And when we first started that, said, "Why don't we do Wikipedia?" Well, we felt that we wanted to, before we put something on, we wanted to make sure it related it to the rest of it, to try to encapsulate the entire story.

BWS: Good.

LB: The other thing that we did when we started our legacy committee is we knew that there was Control Data, we knew there was Cray, we knew there was Honeywell, we knew these other industry companies were there, but we decided to focus on what we were a part of first, because as volunteers, we just didn't have the time to dig deeply into those others. I'm thankful for Tom Misa, for putting those other pieces together. Tom is a really a nice guy.

BWS: We talked to him. We did not interview him. He didn't want to be interviewed, but I talked with him for 45 minutes on the phone. He gave us background, or quite a while on the phone. Gave us some good—yeah, he was very helpful in structuring this project. Very helpful.

LB: Yeah, both he and his predecessor, Dr. Norberg, bless his soul, held the Engineering Research Associates Land Grant Chair for the History of Technology. They both held that position, and it is now controlled by the College of Science and Engineering. The current director Dr. Jeffrey Yost does not hold that title.

BWS: Why is that?

LB: Because it wasn't granted to him or given to him as an appointment. The Babbage Institute, at least, in my opinion, under Dr. Yost, is leaning a little bit more toward the social human side than the technological aspects of history.

BWS: We interview him for this project. And he gave us a good interview, a very solid, helpful interview.

LB: And his archivist, Amanda Wick, does a nice job.

BWS: Yeah, she's helped when we've gone up to do research in preparation for these interviews. She was very helpful. We had boxes and boxes of materials on carts that she pulled out for us.

LB: Yeah, that's a fun place to tour.

BWS: Yeah, interesting.

LB: I hope I haven't bored you with too much name dropping.

BWS: No, that's fine. That's okay.

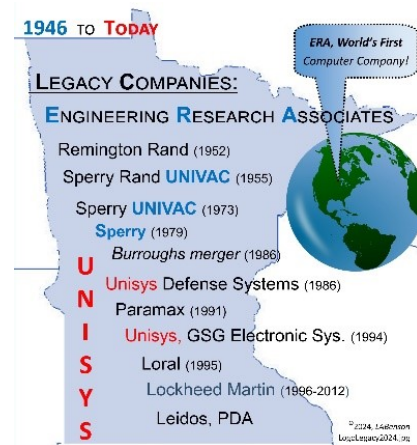
LB: I've been fortunate to have worked with, both during my career as well as during our legacy work, a whole lot of wonderful, wonderful people that you can count on. You've got a problem, you call them and ask them, "Hey, could you do this?"

BWS: Well, what you've helped us with is just understanding that the impact of the work that was done and just how it started, but then its influence continued into voicemail. Who knew? Or into some of these others, into airport transportation, or any other field. And that's just absolutely fascinating. And we've read some of that, but you've given us a very concise, very focused statement. I appreciate that a lot.

LB: There's a couple of things. On our website, we have an icon, the State of Minnesota that lists the sequence. We sort of put the dates on there, and down the left side is the word Unisys, because they ran in parallel with the Defense Group. That's why it's structured like that.

BWS: So, it illustrates, yeah.

LB: Now next year, as Unisys transitions, will be transitioning from Eagan into Woodbury. One of the things that we have done is in 2017 when they moved from Roseville down to Eagan, they had a series of we call shadowboxes, a box four foot by six foot, and it's got pieces of the technologies of different computer models, over about a 25-year span. We moved those, and retiree volunteers helped move them down to Eagan. Well, as Eagan has decided we're going to close, I talked with them, and I said, "Before you move to Eagan, I talked to Chad [Roberts, currently the director of the Ramsey County Historical Society], and I'd like to introduce you to Chad, because I think that the Ramsey County Historical Society is a good place for those." They had a meeting, and they were going to sign an agreement.



I don't know if they've done that yet or not, but we're going to make that happen. At least, that's my feeling. Because I think that the first little shadowboxes had some vacuum chassis from the 1103 computer that was the first computer to university. That's meaningful.

BWS: That's meaningful, yeah. And that's important. It's important to be able to just know that it's there, see it, look at it, look at how it's structured, made.

LB: Anyway, if you pick some topic, I could, you know, rattle on ad nauseam.

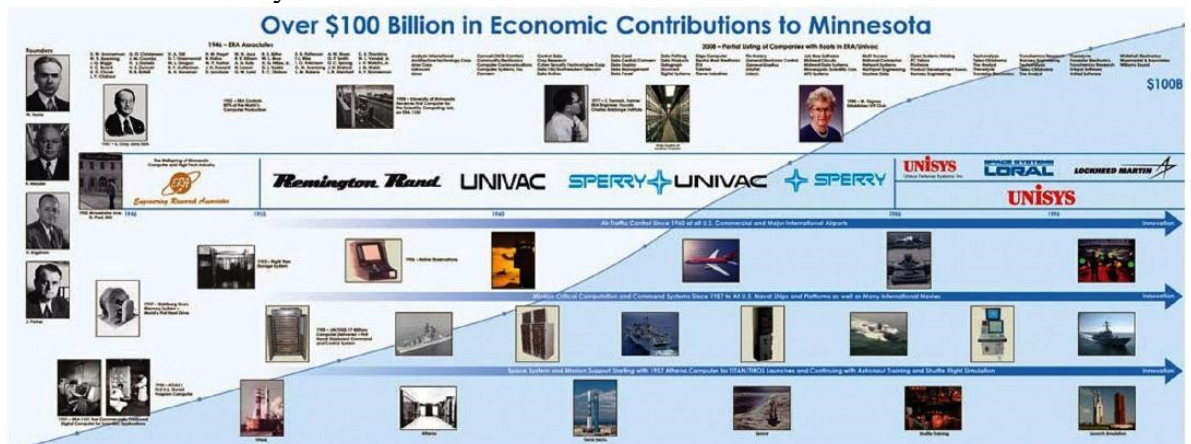
BWS: Well, we should stop now, because it's been an hour and over an hour, but I'll send you your transcript, and you can look it over. And we want to make sure that we get all the names spelled right, and we catch all the names. But then I'll go ahead and ask you, we can see if there's something, as you read through it, that you'd like to add, and then we can set up another Zoom, if you want to do that.

Illustrating

LB: Some of the things, I believe, are some illustrations. Like I said, we have our legacy State of Minnesota with all the companies listed. We also happen to have a diagram that we did for the Minnesota Sesquicentennial.

BWS: That's right.

LB: I don't know if you've seen that or not, but it has the founders at the beginning, and it's, I forget the number, but one of our guys did some calculations, and it was so many billion dollars impact to the State of Minnesota. I will attach a JPEG of that to an email to you. You look at that. You may have seen it.



BWS: That would be wonderful. I'd appreciate that. Anything like that that we can kind of continue to document what happened here and what its impact was. And there's been a lot of good information. You've given us some excellent information tonight about what happened here. But always, I'm trying to understand the gift of the original, the first company, as the industries continue to grow here. If you could call it a gift, or whatever you want to call it.

LB: Yeah, we had any given number of people that went from Univac to Control Data, and a few that came back, and so forth. I don't know if they are retired from both companies or not, but—

BWS: You never know. **LB:** Well, thank you, Barbara.

BWS: Thank you so much.