Oral History of John T. (Jack) Gilmore Jr.

Interviewed by:
Gardner Hendrie

Recorded: February 13, 2007
Mashpee, Massachusetts

CHM Reference number: X3925.2007

Gardner Hendrie: Today is February 13, 2007 and we have Jack Gilmore who has graciously agreed to do an oral history interview for the Computer History Museum, thank you very much Jack.

John T. (Jack) Gilmore Jr.: My pleasure.

Hendrie: I'd like to start out maybe asking you to tell us a little bit, about when you were growing up, just get some background about sort of where you came from.

Gilmore: Okay, I lived in Dorchester, Massachusetts where I was born. My father was a steam fitter, a contracting steam fitter if you will, he went from one place to another and in his own way, he was running his own business. I had two older sisters, 10 and 12 years older, so I was the nurtured spoiled brat <laughs>and it was a very pleasant home life. Listening to some other people's family problems, I realized how lucky I was to have a happy home life.

Hendrie: You had a stay at home mother too.

Gilmore: Yes, it was very good. I went to grammar school, Mather School in Dorchester, was there while they celebrated their 300th anniversary in 1939 and went onto English High School, which in those days was the public prep school for MIT, Latin High School was the prep school for Harvard and it was my goal to go to MIT if I could because by that time I had found a love for mathematics..

Hendrie: Tell me a little bit about your early years; what were your first thoughts about what you might want do when you grow up.

Gilmore: I think from the time I was in maybe the 7th or 8th grade, my ambition was to be in engineering and get a degree at MIT. I am glad you asked. All of us have great teachers that we can look back at and I certainly had one, Miss Schultz made the multiplication tables so exciting that I learned to love mathematics. A Miss Murphy and a Miss Churchill saw that I liked mathematics and encouraged it. And it was Miss Murphy who sought to get permission for me to go to English High. You did not go to English High unless you were allowed to by virtue of the teachers in the local schools. The only people that went to English High without that were the people that lived in the district where English High was. So it was an interesting mesh of students, a bunch of us were there hopefully all seeking to get to MIT before we were through. English High had 3600 students, 600 were in my class.

Hendrie: Now where is English High located?

Gilmore: It was in the South End of Boston on Montgomery Street. Boston Latin and English High shared the same building for many years. But then Latin got their own building and so we had the entire building on our own. My memories at English High were being a skinny guy, so ashamed of being so skinny that I didn't even like going to gymnasium. One day they discovered I could run and the instructor insisted that I go out for the track team and I finally became a high jumper at English High School. I had a

great mathematics teacher in Dr. Goathwaite and Mr. Ford taught me to be a physicist in high school, got me a job after hours at the State House working as a laboratory technician. I won that by virtue of getting top physics grades and life was great and I was certain that I was going to go to MIT with one exception, it was too expensive. So the next choice was Boston College but the problem there was that it was 1946 and the returning veterans from World War II were coming home and Boston College, like all the other colleges, forewarned all us non-veteran candidates that veterans have top choice and that we had to really score very high in order to get admission. I was not very confident that that was going to happen but I still went and took the exams at Boston College and because of English High's technique of having us constantly take an entrance exam every Friday from January all the way to May when the exams took place. When I walked into the library at Boston College, they gave us a chemistry test and a math test and three hours to do both exams. I opened up the chemistry and I had just finished the same test a week before, so it took me about 15 minutes to get 100, so that gave me several hours almost to get another 100 in the math and I think those two scores were enough to get me into Boston College. The other little hurdle I had was that my father being a union steam fitter had already arranged for a union position for me as an apprentice and with great reluctance said "I will pay for one year of Boston College and then you will become a steam fitter." And I said, "Fine, I'll at least do the one year and see what happens".

Hendrie: So he did not have an ambition for you to get a college education, did your mother encourage that?

Gilmore: No, I think my sister's, they were 10 and 12 years older and they obviously felt that I ought to do that but I merely said, "Well let's, you know, take one thing at a time." The thing that turned everything around and the reason why I mentioned the track business was that I went out for track at Boston College and became a high jumper there as I was at English High School. The first track meet, the freshman class from Boston College track team took on the prep school in Andover, Phillips Andover Academy and I broke the high jump record there at 6'1½" and that evening we went to the Knights of Columbus track meet as spectators and Jack Ryder the track coach for BC said, "How did you guys do?" And the assistant track coach said "Gilmore broke the record there" and he said, "Why didn't you ask for a scholarship?" And I said, "I didn't know that just <laughs> high jumping would do it" and he said", It is now." So interestingly enough with a scholarship I was able to stay at Boston College and majored in physics there and had a great time.

Hendrie: Now why did you major in physics there?

Gilmore: Because I had found my love of the subject at English High School.

Hendrie: That you'd had a great teacher there and all went well with that.

Gilmore: I had a great mathematics teacher and a great physics teacher at Boston College and interestingly enough this happened in the junior year. I was in a laboratory working with a graduate student who was an instructor and he asked me to see my notes on something that we were doing and I opened up the notes and he said, "My god you've practically written the text book all over again". And so

he called a Jesuit professor over, it was Father Ring that knew me quite well, and he said, “Is this the way you study?” And I said “Yes”, he said, “Has anyone ever told you that you’re dyslectic?” And I didn’t even know what <laughs>dyslexia was and he said, “Tell me what your program is during the day and how much time do you spend at night on your work”. I commuted to BC and I had a track situation so that was at least 2½ hours for track, I was doing 22 hours in the physics program and then I commuted and then when I got home I spent at least four, five hours on homework. The way I studied was I would write it down and I found out later that with my learning disability, which I had, all these years, I just thought everyone had to study as hard as I did to get it. So that had some interesting aspects to it in the future because after finishing Boston College I still was determined to go to MIT and so I put in an application to get an aeronautical engineering degree at MIT and was accepted into the class of 1953. They took me in as somewhere between a sophomore and a junior in that class.

Hendrie: So you didn’t have enough credits to undergraduate, you needed to sort of repeat?

Gilmore: I went in specifically to get another undergraduate degree and the reason for that is worth mentioning. Amherst College had a program in those days that I thought was fantastic. Amherst College had a situation where at the end of their junior year, if they elected to go to MIT for two more years that they would have both a degree from Amherst College as well as one from MIT. Well that was obviously an expensive situation I couldn’t do, but I decided to do it myself. So after having a scholarship at BC, I at least had enough money to do the freshman year at MIT and so I applied for admission as an undergraduate at MIT and became somewhere between a sophomore and a junior, but they established me as being part of the class of 1953. My graduate year was 1950 for Boston College, so in 3 years I was going to basically get a 4-year degree with aeronautical engineering. Flying was something that I always loved because Squantum [Naval Air Station] was right near where I lived. My home was very near the big tank alongside of Malibu Beach that everyone sees on route 93. I felt aeronautical engineering was what I ought to do.

Hendrie: Why didn’t you stay in physics, what led you to choose besides the love of flying or what other things did you think about?

Gilmore: I just felt that aeronautical engineering would be a combination of the two and it would give me a chance to get involved in flying someway or another.

Hendrie: Somehow, some way.

Gilmore: First of all, I needed work in order to survive there, so I got a job through the Tech Christian Association, which was a volunteer outfit at MIT that helps students find work at MIT and elsewhere. I got a job at Project Whirlwind, I interviewed with Charlie Adams who was just becoming in charge of their mathematics group and programming and he interviewed me as a candidate to learn how to program the Whirlwind computer and within a month or two, I had discovered my destiny, programming just melted me to the core.

Hendrie: You just loved it.

Gilmore: I walked into that console, which was a room in itself and it was my *Star Wars*, if you will. So after a semester of aeronautical engineering and working as a programmer part time I went to MIT and asked them if I could change my degree to computer science and they said that's three or four years away, they didn't have a program like that. Professor Forrester who was in charge of the Whirlwind Project, heard what I was trying to do and he said, "You already have a degree in physics, we'll bring you on board as a staff member" then and there.

Hendrie: So you don't need a degree from MIT then to have this job.

Gilmore: At 22, I was a research engineer in love with programming and for the next two years working for Charlie I wrote the assembler program and several other things and that was that.

Hendrie: Tell us something about, what you first did when you got the job with Charlie Adams or some stories about the first things you worked on when you were working on Whirlwind.

Gilmore: Well there were about eight of us**.**

Hendrie: In that math group?

Gilmore: In the math group.

Hendrie: Okay at that time.

Gilmore: John Frankovitch, who was in that film that you saw a little while ago, was in the audience. He and I had gone through English High together, then he went to MIT, and so there I was meeting John again in Charlie's group. He went on to be an employee of MIT for the rest of his life and his task with Charlie was to write the floating-point conversion program. Charlie decided that I was to be the one to write his assembler, the concept of assembling everything together. I had the pleasure of meeting Wilkes, Wheeler, and Gill, they had come over from the EDSAC, and so as a youngster, I was rubbing elbows with some pretty heavyweights there.

Hendrie: They'd come over to visit?

Gilmore: Yes and so Charlie gave me a running head start and said this is what you have to do and I proceeded to figure out how to write the assembly program and in the process we discovered that we could not only do mnemonic assemblies but take symbolic addressing as well which is a key for programming.

Hendrie: Now how were they programming before you wrote this, how did they do that?

Gilmore: They figured out what the instructions were and then they had to break it down into four pod sexidecimal characters and then they were keyed in as hexadecimal characters on a Flexowriter and so the ideal situation was to actually have the flex writer be used as a typewriter to type the programs and then my assembly program was going to interpret the mnemonic letters and the addressing and then I would generate the binary conversion and crank out a binary tape.

Hendrie: Okay so they had not gotten to that stage yet.

Gilmore: That's right.

Hendrie: Okay they were still doing with a coding in octal or some sort of binary on coding sheets and just punching it in.

Gilmore: By the way, there was sexadecimal in those days.

Hendrie: Not hexadecimal.

Gilmore: I think some purist decided to change it to hexadecimal but what they had rigged up was a hexadecimal assembler. There were two lovely graduates from Emmanuel College that actually took people's programs and broke them into the hexadecimal characters. Then they typed those in a flex writer and then there was a simple hexadecimal connector that created the binary tapes and so forth using Whirlwind.

Hendrie: So you would write it out on a coding sheet, now did you write.

Gilmore: They did.

Hendrie: So before the assembler you'd write, do you still use mnemonics?

Gilmore: I had to do that in order to get my stuff in.

Hendrie: Well you had to write your assembler, you had to do that and so the girls really were the assemblers.

Gilmore: That's right, they were.

Hendrie: It was manual assembly of the code.

Gilmore: Two lovely girls.

Hendrie: Two lovely girls, now when you got there, how far had the Whirlwind advanced, was the electrostatic memory, were there 256 words of memory or was it still the toggle switches and flip-flop registers?

Gilmore: It was just the toggle switches and that was it.

Hendrie: And the four flip flop registers?

Gilmore: Right, the displays were all in position and it was probably maybe two or three months after I got there that they started to actually get the 256 words of cathode ray tube memory working and that was the only way I was going to be able to run.

Hendrie: You could not write an assembler in the toggle switches.

Gilmore: Right, what they did prior to that was they again used the Flexowriters and had a technique for keying in the flexi tapes and getting it into the toggle switch memory using just the tapes with hexadecimal characters. But the fun part of Whirlwind was it was almost like being in space wars, in fact it was almost make believe it was so exciting to be in something as brand new as Whirlwind. The programming for that assembly program was difficult and yet time seemed to melt, one didn't think about it. I had just about finished the assembly program by the time my first semester at MIT was completing and I got the assembler working. I went to Charlie and said, "I really want to change my program from aeronautical engineering to computers. It turned out that it didn't exist and so I was betwixt and between as to what to do because I had found my love. Jay Forrester heard about my concern and went to Charlie and said hire him as a full time staff member, he's already got a degree in physics from Boston College, and so at the age of 22 I was a MIT staff member.

Hendrie: So what did you do next when you had the assembler done and running?

Gilmore: Well once we had the assembler--- by the way a comment on the assembler, I mentioned it before and we had 256 words of memory and the assembler, which was ambitious, decimal as well octal numbers and mnemonics. We put it all together and I found myself staring at 257 words and consonants and it took me about two or three weeks to figure out how to squeeze those 257 into 256 locations in memory and the way I did it was I discovered that I could come down a particular routine and literally walk through about 10 or 11 places where we had consonants and I interpreted the consonants as instructions and found out that by making a few changes in less significant bits that they could appear to be instructions that did nothing and so I managed to get the program working in 256 words of memory and we had octal and decimal numbers and mnemonic codes for the instruction set and it worked very well. After that Charlie said, "Well since you've written the assembler, I'm going to put you in charge of worrying about getting all the programs put together for not only the military programmers but also the MIT graduate students that were going to have a crack at it". So I became in charge of computer

operations for non-military activities on Whirlwind and also responsible for all the assembly and subroutine that took place. So next task was to start putting subroutines together. To assist the students and also the military people that were going to start working on the other aspect of what Whirlwind was there for.

Hendrie: Before we get into what you did in terms of building up the subroutine libraries and linking them and some of those things, what were the military activities or applications that people were using Whirlwind for, at that time?

Gilmore: By that time it was pretty much determined that a new defense system was required and Whirlwind had gotten the nod from the Air Force to put together the beginnings of the development of a real time machine that would serve as the brain for an Air Defense System.

Hendrie: Okay, they used Whirlwind as a flight simulator; by the time you got there had that gone away?

Gilmore: Yes that's true, there were some aspects of it afterwards but the main thing was to focus on having Whirlwind serve as the prototype for a computer that would be larger and stronger. That would take on the job of running an Air Defense System. One of the things that was interesting is that when that decision was made, they realized that they had to have a fair number of programmers. They were concerned as to how the computer was going to be operated and I made a suggestion to Charlie Adams who was my boss, that I thought I could train two high school students to run the computer. Charlie thought it was very good idea, there were several other people between him and Jay Forrester that did not think it was a good idea. But Charlie bought it up to Bob Everett and to Jay Forrester and both of them said let's give it a go. So I was given the task of finding two high school graduates that couldn't afford college but were college material and I found one in English High School and another one at Mechanic Arts, which I think was later called Boston Tech. Their names were Joe Thompson and Billy Kyle.

Hendrie: You just went to the schools and talked to the people there?

Gilmore: I went to the vocational guidance people.

Hendrie: They would then identify the students.

Gilmore: What I told them was I wanted bright kids that couldn't afford to get to college and that was it.

Hendrie: Easy spec.

Gilmore: And Joe Thompson and Billy Kyle were the two candidates and they both did very well. Joe Thompson stayed longer than Billy, Billy was drafted, Korea was going on at the time, and so Billy stayed

with us maybe a year and a half or something like that and then went into the service. Joe was an orphan and lived with his aunt and so he had a deferment so he was clear of the military and so he stayed on and became the operator that did an awful lot of the work. I felt that he was so good that we should try and get him into MIT's night school as well, which I did. He went the two years, but we worked him so hard for the first year that his C's were because of the amount of time he was working as both a computer operator as well as a student in the evenings. I got permission to have him repeat the second year over again, so he actually got three years of MIT nights. Went onto become a staff member of Lincoln Laboratory, had a great career.

Hendrie: That is a wonderful story.

Gilmore: And he turned out to be the mannequin in the computer museum for the Whirlwind site.

Hendrie: Very good, okay. Talk some more, I interrupted you when you were talking about the follow on work for the assembler, maybe you could tell some of the utility programs or some of the work on subroutines or some of that work.

Gilmore: The big break came not too long after my assembler was running. The difficulty was that in the process of putting a subroutine together, we didn't have floating addresses at the time. It was a little difficult to write and so the goal was we needed to figure out somehow to get a symbolic address in there so that it could be used no matter where the consonants were in memory. I discovered that I had written an assembler for converting the thing and I discovered that if I ran the thing twice through the reader, that the assembler could remember the addresses and the second time around, could fill them in, in the areas where the addresses were above where the original position for the address was, if that makes sense? So the floating address became a reality and with that, we were able to really get cracking as far as developing subroutine libraries, because everything was written in relative addressing and symbolic addressing. And because of that, Charlie then said "Well I'm going to put you in charge of the subroutine library to make sure that it works out all right" and at the same time he asked me to be in charge of all non-military computer operation as well. So that is what I did.

Hendrie: So then, you were doing programming and doing operations work sort of setting up how the schedules were arranged and figuring all of that sort of thing out.

Gilmore: Now there's a portion of this time that I really have to take a moment and talk about. Charlie Adams was a very interesting guy, he was very shy, very humble, and very smart and he never intimidated you and what we would do is in the evenings we would go down into the basement of the Batter building and he would teach us programming. On a weekly basis, one of us had to get up and describe the software that we were developing. I can't remember how many were there. Some of those were military programmers by the way. But the way we learned was very interesting because we had to get up on a blackboard and write our programs on the blackboard and then we had seven or 8 guys that said "Why did you do this, why did you do that", so you really had to defend your software in a classy way. And it became a game, When you got up to show what programs you were writing, if they found a way to make it shorter. you were one upped <laughter> and so it would behoove each one of us to

double check our work so that we weren't embarrassed by finding out that someone else had an idea of where we could save instructions and so we were always constantly worried about that for the simple reason, we didn't have much room.

Hendrie: Didn't have much memory.

Gilmore: Much memory but that was a beautiful way to learn and of course, Charlie was hovering in the background all the time, asking us "Why didn't we do this or do that". I think I got a PhD in programming unofficially.

Hendrie: Right, a computer science degree on the job.

Gilmore: You had better believe it, it was a great time. Then interestingly enough that went on for two years and then because by not continuing to be a student, the draft board had access to me and I finally was called to the draft. One of the graduate students was a former navy pilot in World War II and he suggested to me that the Naval Air Cadet Program was taking on candidates at Squantum Navy Base in Boston. So I went down there, passed the mental and physical, beat the draft board to the punch, and became a Naval Air Cadet instead and that was it.

<Crew talk> <End of tape>

Gilmore: Well, just one little comment on Joe Thompson. When I called the Mechanic Arts High School they had already been searching for a college oriented talent that couldn't go to college because of money and the vocational guidance teacher at what later became Boston Tech said, "I've got a candidate" but he said, "he's black." And I said, "I don't care whether he's blue as long as he's bright" and that stuck and he too did a great job and he became I think the first black in the computing industry, in the software industry anyway, did a great job. And he was later honored by, the Boston Tech Museum.

Hendrie: Yes, Boston Computer Museum.

Gilmore: They honored him later on as being the first black in the computing industry and he certainly did it with great honor. Years later he and Charlie Zraket, who was a very famous guy who had been president of MITRE, and I were honored as computer pioneers at a Whirlwind meeting—

Hendrie: Alumni.

Gilmore: Excuse me, at the museum get-together was where they honored us.

Hendrie: Are there any other stories that come to mind of your time with Whirlwind before we move on to the next phase of your career?

Gilmore: There was one Jay Forrester was invited by Edward R. Murrow to be on his *See It Now* television program. Charlie and I had just come back from a trip to Washington, D.C., at a very early ACM conference and found out that we had to put on some sort of a show for the program. So Charlie had already figured out a couple of things to do. What he wanted was the use of a display to be on there as well. So one of the military programmers, Ron Meyer, and I were assigned to put together a demonstration of a Viking rocket's trajectory being displayed on the computer as part of its show for *See It Now* with Edward R. Murrow. And that was a very exciting time and we had everything working.

Hendrie: How long did you have to do this?

Gilmore: Charlie and I arrived from Washington on a Friday afternoon. We found out about it that afternoon and Ron Meyer and I had to work around the clock Saturday-- all night Saturday and into Sunday morning. The program was scheduled for I think 2 o'clock on Sunday afternoon. At 11 o'clock we still had one bug left. He had written the mathematics to it and I had written the display and trajectory part of it and just before they were going to cancel that because we couldn't find the stupid bug, I turned to Ron and I said, "Let's just talk it out, what you do and what I'm doing," and in the process of doing that we found out that I had assumed that I had to divide something by two and he had already done it and that was the clincher. And we were able to put on a great show and the display of the rocket was a hit and it was just a lot of fun.

Hendrie: That's really something to write a program—

Gilmore: That is in the museum at—

Hendrie: The actual television broadcast—

Gilmore: Yes, the television program is at the museum on the west now. (Computer History Museum). .

Hendrie: That's a good story. You've decided not get drafted and so you had heard about a naval aviation program.

Gilmore: Yeah. The NAVCAD program-- Most of them went in after they finished their sophomore year, I went in as a senior in that I had four years of college and three years at Whirlwind. I went in as a naval air cadet and those four years were fantastic.

Hendrie: What did you do as a naval air cadet?

Gilmore: I became a navy carrier pilot.

Hendrie: Did you know how to fly at all?

Gilmore: No.

Hendrie: Maybe you could run through a little bit of how that all went, that story. You said there was something going through preflight that you wanted to talk about.

<crew talk>

Gilmore: There was something that was kind of cute at the time. One of my classmates was F. Lee Bailey, who became a big, famous crime lawyer, and he and I became competitors. He was determined that he was going to outscore me in preflight and one day we went to navigation class and he stood up and bet everyone that he would get 100 and took on about eight people. And so every Friday he was collecting about eight or nine bucks from these guys who were betting that he wouldn't get 100 and he did every time. I had enough math and science that I was doing the same thing but I wasn't taking any bets.

Hendrie: You weren't making bets or collecting money.

Gilmore: At the end of the preflight session, the final was a little tricky in that they took us out of the northern hemisphere and we had to come back in and when we came back the ship had gone into the southern hemisphere and Lee had neglected to figure that out and so he got a zero on the stupid test and he lost a lot of money that day. And that also caused me to out beat him as far as cumulative. He was just livid that I had beaten him, but we went on and became good friends from that time on. He was a great guy.

Hendrie: Then you soloed in—

Gilmore: SNJ trainers. The instructor I had was one that was called back after flying for the navy and the marines in World War II and as a result of being called back he lost his farm so he was a very bitter man. He caused a lot of anxiety with the cadets. One day I was flying along and he had a technique of taking the stick and whacking your knees if you weren't doing what you were supposed to do. He was in the back seat and he started whacking my knees because I was getting too close as far as formation flying was concerned and I got livid when he started playing that game and so I grabbed the stick and locked it. We were headed for England and I didn't say a thing for about an hour and neither did he and finally he said, "You must be holding the stick and we're going to run out of gas so we've got to get rid of this argument back at the base." And so with that I reluctantly released the stick and we went back and he said, "I'm going to beat the hell out of you when we get out of this airplane for what you did." He got out first and then I got out and I was determined that if I was going to get out of the navy it was after I would beat the hell out of this guy. Instead he said, "Come with me," and so we went into the main hangar area

and he asked for my log book. There were tons of other people around the counter. He said, “And bring the stamp ‘Unsafe for Solo’ as well, which was the kiss of death. That meant you were out The navy fellow was reluctant to hand it to him and he insisted on doing it so he reached out to get the ‘Unsafe for Solo’ stamp and was about to stamp it on my book when a non-com came and grabbed him and just about broke his wrist. It was my other instructor who said, “What in the hell are you doing?” “This is one of our best pilots.” And the first instructor said, “Well, he took over my airplane during instruction and I’m going to punish him” and said the non-com said, “He probably did it for a reason and we will find that out. And after we find that out we’ll see which one is going to be reprimanded.” And it turned out that when the non-com found out the entire story that the guy was in bad shape.

Hendrie: That was a close call.

Gilmore: That was a close call and my career as a navy pilot was just wonderful. I enjoyed it immensely.

Hendrie: What did you end up flying after you learned to fly?

Gilmore: After basic, I went on to dive bombers, AD-1 dive bombers, and that’s what I did the advanced training in. I almost became part of a beach. <laughs> We were dive bombing from 10,000 feet and we had both bombs and rockets and we did the bombs first and then went back up and did the rockets after that. On the first dive from 10,000 feet as you went through 3500 you were to press the button to release either the bomb or the rocket but I had forgotten that we were on bombs now instead of rockets. And so the time it took me to move my thumb from the rocket button to the bomb button I went through about 6,000 feet and I let it go and as I was coming up I was looking at surf on Padre Island and I looked at the altimeter and it said 200 feet and I said, “My God. Thank God,” and just then the instructor, who was hovering down below, said, “Remember on a 10,000-foot dive there’s a 200-foot error.” I had missed being part of Padre Island by about 25 feet and so that made me realize that one of the things about being a navy aviator was you made sure that you had enough time to do things.

Hendrie: Did you learn—

Gilmore: Yeah. The choice was to either go multiengine or single engine and carrier and I elected to go carrier and loved every minute of it. I served on six carriers.

Hendrie: Six different carriers?

Gilmore: Yes. I went with an ASW squadron and so we spent about three or four months on a carrier and then we would come back and do retraining for new people and then go back again. So over the period of about 2½ years there were about five or six carriers.

Hendrie: Were these fleet carriers—

Gilmore: Yes.

Hendrie: --as opposed to smaller antisubmarine carriers?

Gilmore: Well, I actually I night crawled on the smallest carrier called the CBNA which was actually a converted cruiser. On that one we had a 500-foot deck.

Hendrie: That was one of the derivatives of that class of Princeton that they converted light cruisers to carriers.

Gilmore: My first carrier landing was on the Monterey, which was also the carrier that President Ford served on. I thoroughly enjoyed it, immensely, and I became a night carrier pilot. I think I had about 156 carrier landings altogether and about maybe 26 or so of those were night carrier landings.

Hendrie: When your enlistment—

Gilmore: Oh, okay. Yes. The interesting thing is toward the end I really had fallen in love with the Navy and was seriously thinking about staying in and then I got a call from Bob Everett who was the second in command at Whirlwind and he said that they had moved to Lincoln Laboratory and wondered whether or not I was interested in coming back. And I said, “I’m trying to make up my mind what to do” and he said, “Well, we’ve just put together an advanced research group and we’d like you to come and be part of that to program a brand new computer which is called the TX-0, the first transistorized computer” That was enough for me and so “bingo,” I went back to MIT and worked on the TX-0 and then the TX-2 and had a good time.

Hendrie: He basically recruited you back.

Gilmore: Yes.

Hendrie: Otherwise If you hadn’t heard from him you might have stayed in the navy do you think?

Gilmore: Good question, yes.

Hendrie: Not sure. Were you married at this time or not?

Gilmore: No.

Hendrie: You were single then.

Gilmore: That's one of the reasons why my navy career was one that didn't get me into too much trouble. The married guys had a problem. Their wives were forever writing them letters saying "Be careful, be careful," And ironically enough you had to have a lot of piss and vinegar in you to do what we were doing and the last thing you needed was someone to tell you to be careful and to make you worry about what you were doing because flying at night on a carrier was tricky stuff I had a lot of girlfriends but I didn't get serious until after I left. I met the love of my life at Lincoln Laboratory.

Hendrie: After you came back. Let's continue with the story. You decided to get out when your enlistment was up.

Gilmore: Yes. It was four years altogether.

Hendrie: Four years altogether and you went back to Lincoln. What was going on at Lincoln when you got there?

Gilmore: Well, I specifically had been asked to join the TX-0 crew and, lo and behold, John Frankovich, who had been with me at Whirlwind, was at the desk next to the one that they said, "This is where you're going to work." So John and I went another three years working side by side again and he stayed on at Lincoln Laboratory and actually finished his professional career there. It was a great career. Wes Clark, who had been at Whirlwind when I was there, by that time had become the logical designer for the TX-0 and Ken Olsen was the manager for building the thing and they were in the process of putting together the TX-2 when I showed up. The TX-0 was basically—

Hendrie: The TX-0 was up and running when you showed up?

Gilmore: Yes. They had some minor routines as far as getting in and out but the first thing that Wes Clark asked me to do when I got there was, "We need your assembly program talents again and we need an operating system for this program." So I wrote the TX-0 direct input, output utility program, which today would be—

Hendrie: Viewed as an operating system.

Gilmore: Would be called an assembler.

Hendrie: Would be called an assembler. I see. Okay.

Gilmore: And excuse me. Not an assembler. It was the precursor to an operating system like Windows—

Hendrie: But it was the precursor because it provided all the utilities for getting in and out so the programmers didn't have to write those over and over again—

Gilmore: Absolutely right.

Hendrie: --or put in subroutines and attach them to their program of all of that.

Gilmore: Wes had written a program called Hark that was a magnificent symbolic assembler program and his added nuance was variable length symbolic adjusters and that was really a lot of fun because when I sat down to write the operating system for the TX-0 I wrote it using the Hark language. Then Wes said, "We need to be able to do input, output for programs and instructions online and so part of that utility system that I put together was to enable a programmer to sit at the console and key his program in on the keyboard right at the console. And so that was a love of life that was fantastic. The TX-0 was also being used for many other things at the same time and one of them was speech analysis.

There was another group from the electronics department at MIT that was working on brain wave analysis, and they brought in an analog to digital converter and hooked it up to the TX-0, and I wrote a program to bring that data in and actually plot the brain waves, the EEG curves, on the screen of the TX-0. A team, which was made up of Wes Clark and Belmont Farley and some others from the electronics lab were trying to develop an algorithm to recognize the sleeping spindle of a brain wave. It appeared when a patient was asleep. So we had recordings of brain wave data of sleeping patients. The trick was to try and recognize the sleeping spindle, so I provided the graphic capabilities and essentially put together a moving window, oscilloscope display so that they could run up and down the data and see whether or not their algorithm was working. The technique was, if they thought they were in a sleeping spindle they put a dart in a particular place and they kept putting a dart indicating that they still thought they were in the spindle and I was plotting it out as well so that they could see when the algorithm actually lost track of the spindle. They would in effect go back to the software and figure out why they lost the signal. It was a wonderful time because we were constantly changing the code. I was adding things and what I did in the process of doing that is I provided a whole series of online routines. This utility system that I put together would enable people to make changes in symbolic language and so forth right on the spot.

Hendrie: They could actually change instructions in memory.

Gilmore: And then one other thing that came along in that same utility program, by that time we had 65K of memory and that was what was needed to contain all the brain wave data as well. I decided that we had enough room so that we could actually put some utility programs in there to monitor the programs better. I came up with a technique whereby the programmer made out his flow chart and I had them lay it out so that it would fit across the face of this little eight-inch screen. Then what I did was I rigged up a technique where I would display the boxes that they had shown me as far as their diagrams were concerned. They could see their flow chart on the face of the screen and we had an acetate copy of that on the face of the screen as well. And I rigged up a technique so that they could run their program using the scope and the switches. By turning the toggle switches on and off they could see where the program

was going and what it was doing and when it came to their stop. It was an excellent debugging agent and it was certainly the first of that kind of thing. That was an awful lot of fun.

Hendrie: This was a machine unlike most that actually there was enough time, at times, to use it online rather than in classic batch systems.

Gilmore: There was the input/output utility system, which was fundamentally an online operating system, and then there was the brain wave activity. Then Wes Clark came to me and said, "We need a scientific terminal for the TX-0- and the TX-2" and he said, "We don't have any way of inputting technical characters into that system."

Hendrie: Or displaying them—

Gilmore: Right. So he said, "What I'd like you to concentrate now on is figuring out how to provide a utility that would enable us to have such a system . I decided to see if I couldn't draw something on the screen that would duplicate a scientific character. So I threw all ones on the screen and because we had a light pen I could figure out a way to draw, as I moved the light pen across this screen that had all dots on it, I could in effect freehand a technical character. And then where I made a mistake, I flipped the points so the zeros and ones became ones and zeros and that enabled me to correct the drawing . I was able to carve out the technical character that we wanted. Once we had the technical character, I had all the scientists come in to agree that that's what—

Hendrie: That that's what they wanted?

Gilmore: --that's what they wanted for a symbol. I merely reduced the symbol in size and before I was through I had a complete list of alpha numeric scientific characters that could be applied to a display. In the process of doing that, I developed a thing called the Scope Writer. That was very interesting for the simple reason that once I found out that I could draw characters and I discovered I could draw diagrams using the same technique . I started generating printed circuits and that became a piece of work that was an earlier version of online computer graphics.

Hendrie: Was there any sort of editing facility for a program or was that all done off line—

Gilmore: Well, part of my online utility system was an online editor. I essentially did another assembly program online and that was part of the utility system that I put together. The utility system had printouts and we had debugging techniques as far as finding things that were wrong. It was a nice utility system and it enabled computer programmers to sit at a console and literally make changes in their software using an online typewriter and a light pen. Between the two, they could figure out what was wrong with their programs because I was providing debugging aids as well. The debugging aid that I did for the brain wave thing turned out to be a big savior as far as providing assistance to the other programmers.

Hendrie: Help me with a little bit more detail of how the debugging aid would work. What would you see and what could you look at and how could you change it?

Gilmore: Okay. Well, one of the things that we did because of the ability to put the flow chart on the screen, that became a debugging aid in itself because now the programmer could actually set switches online by merely throwing a toggle switch to close or open a switch in the flow chart. So it was an online flow chart and they could actually see the flow chart come alive and they would iterate and then go to another one and then "bingo," they'd get an alarm. I provided online debugging aids so that they could go to the online typewriter and check their program and make changes right there on the spot and then go and do it.

Hendrie: Would it print out the program in binary or—

Gilmore: No. They could do it all in mnemonic symbols and addresses.

Hendrie: It would look at the—

Gilmore: It was an online utility program.

Hendrie: But it would look at the binary and translate it back into symbolic form? Is that how it worked? It looked at the actual memory locations?

Gilmore: The way it worked was that they could bring up a copy of their instruction set and see that on the screen, okay, and they could make changes on the screen. They could literally key in the instructions. So I in effect had an online assembler as part of my utility.

Hendrie: Then you'd tell it, "Go reassemble."

Gilmore: And that's basically the same thing as Windows.

Hendrie: Yeah. Go reassemble and then execute.

Gilmore: Right. It was an online assembler.

Hendrie: You had mentioned I think before somewhere-- Maybe it was in a conversation we had about being able to edit the programs and actually cut and paste or at least remove characters. Is that this program?

Gilmore: Yeah. You could do everything. A programmer could go in, once he had gone through the batching, if you will, of having his complete program typed up and so forth, after that it was online in real time and we encouraged the programmers to get an hour or two and sit in front of the TX-0, which was outstanding from the standpoint that no one else had that kind of luxury. And that enabled me, by the way, to be able to enhance my utility system because I did it the same way. The people that were doing the brain wave analysis for example, once they saw--if you remember--once they realized that the algorithm was losing the sleeping spindle they didn't have to go back and cut code. They actually switched to my utility program, made the changes, and then tried doing it again. So it was an online technique.

Hendrie: Yeah. It was a real online application.

Gilmore: Yeah. It was great fun.

Hendrie: Tell me the story about when you first started using the delete function with the light pen.

Gilmore: Yes. It turned out that I wanted to be able to have an online editor and so I wanted to be able to produce a system that had 200 keys. We're picking up from after I had the design of all the alpha numeric characters and so forth. Then we worked with IBM as a matter of fact for them to literally crank out some characters and put them on an online typewriter that IBM had just recently developed and so I worked with them as far as getting that scientific character set established for IBM.

Hendrie: So that you could get hard copy output as opposed to photographing the oscilloscope.

Gilmore: Right, but now the ideal thing was to have the operator be able to sit at the console and literally work with keying in not only straight alpha numeric but also formulas. In the process of doing that I created a technique for providing an online typewriter, on the face of the computer and I had 200 dots in the lower portion and I applied conventional characters and technical characters. We had an overlay so that once we had designed what the characters were we placed them over the dots and now this programmer had an online typewriter. The upper half of the screen was where he could literally key in not only his code but also his equations, etc., and also could in fact draw a diagram because I realized that besides producing characters and so forth we could draw lines.

<End of tape>

Hendrie: Now tell me the story about your first implementation; you will have to give me the correct term, whether that was the Lincoln Writer or the predecessor of the Lincoln Writer.

Gilmore: The Scope Writer.

Gilmore: The transition from it just being a typewriter to actually drawing the characters.

Hendrie: Yes, you drew the characters and than you also had the editor and the story about the delete button.

Gilmore: We found ourselves certainly checking out to make sure that we could provide the tasks that were set forth initially for a scientific online workstation, ready to go on the TX-2.

Hendrie: Right.

Gilmore: Okay and we accomplished that. But in the process I had this beast <laughs> that I was using everyday and I started playing with it and I discovered that I could do some fancy drawing, because what I had was - remember those things that were out a long time ago in a sketch - echo - what was it?

Hendrie: Etch -

Gilmore: Etch-a-Sketch.

Hendrie: Etch - yes.

Gilmore: I had an Etch-a-Sketch. For putting together a diagram, I would use the same technique of flooding the screen with ones, all white dots, and than having the individual handwrite. Well it didn't take much to start arranging it so that they could pull the line straight. Then we realized that we had the beginning of a diagrammatic capability. The plan was to push in that direction on the TX-2 and then of course there was an interest on the part of many people to do that. But in the process - just about that time, I was married for a year, and Charlie Adams came back from making money in South America, said he enough money to start the company, a consulting firm of his own, and I wanted to make more money than I was making and it seemed that that was a pretty good idea.

Hendrie: Okay.

Gilmore: The original plan, for what its worth, was he was going to pick up six people, and I was one of them. Each one of which was going to have something like 14% and he was going to have the 50% or whatever. No one bet on the thing except me and my biggest mistake was instead of saying, since I'm the only one that's coming in, I would like more percentage. So - like I was very naïve in those days and so it was an 85/15 kind of percentage.

Hendrie: Kind of deal, yes.

Gilmore: But I didn't care because I felt that he had the money and I didn't. You have to realize that I was also dealing with my former hero. I worshipped the ground that he walked on for two years while he was teaching me how to be a programmer.

Hendrie: Yes.

Gilmore: The thing that I'm most happy about is being recognized by the science and technology yearbook or whatever you call them, was not for my work on _Rowen._???____ It was for my work in Lincoln Laboratory, that was the stuff that I did from scratch. But I still owe the training from Charlie for making me the kind of programmer that he was.

Hendrie: Yes. Now what did Charlie do? Charlie had, while you were in the Navy Charlie left also, and went to South America?

Gilmore: No. He stayed on and worked with Alex Vandenburg and others, because there were some fascinating things going on in the commercial non-military side of the fence. A guy by the name of Don Belick, for example, was working on television patterns. One of our own people whose name was Jack Porter, from day one had the oil companies coming in and working with him and his expertise using partial differential equations. He was able to work with the oil companies to figure out at what point do they go in after the smaller tributaries in an oil mine and pull out those smaller pockets of oil. There's an economic give and take there, how long do you spend the expense of drilling to get you know a certain amount? So he was doing the mathematics for them to figure that out. That was just one example of some of the commercial things that were going on Charlie went down to South America to work for Exxon basically to just get them started in computers and he did a very good job of that, made a lot of money and than came back and was able to start a consulting firm with that money.

Hendrie: Okay, so that's what he was doing when he -

Gilmore: In October of 1959, I did everything ahead of time and by the time he showed up I had an office in Bedford, had everything set up, even had the secretaries hired, and in he walks and I said, here's your business.

Hendrie: Okay, good for you.

Gilmore: Yes, it was great.

Hendrie: All right. Well we're going to go and talk about the evolution of that business in a minute, but I think we skipped a whole bunch of things in the things you did -

Gilmore: The TX-2

Hendrie: TX-0 to TX-2 transition.

Gilmore: Well one of them which you know I'd like to mention sometime or other.

Hendrie: Yes, well mention it right now.

<The camera pans out to show Gilmore unfolding a large computer printout>

<The camera now pans in to show the printout is really a flowchart>

Gilmore: The idea of having some form of a graphic tool that could draw circuits and various other kinds of drawings was great. There was also the business of handling programming and the TX-2 still is one of the best machines on the market <laughs>as far as I'm concerned in the design of the instruction set. Very elaborate but the thing that's very nice about what's happened in the computing business is that the challenge out there responded to the needs and we were able to find extremely talented people that could come and write worthwhile programs.

Hendrie: Yes.

<Gilmore holds the flowchart again>

Gilmore: This is the way I set it up and several of my colleagues started doing it as well and I have to tell you that - I think I mentioned already that I was dyslexic, right?

Hendrie: Yes.

<during the following , Gilmore referred to the flowchart>

Gilmore: Well one of the things that dyslexic's have is a love affair with two dimensions rather than one. So instead of thinking of coding as a string of text, the dyslectic programmer wants to think of it in terms of a diagram. This is what I did and this is how I wrote my programs, and the beautiful part about it is I could see all the connections. It was much easier to do that than to have it all in your head that you could only see the serial part…

Hendrie: Yes.

Gilmore: So this was to me the - God's way of programming.

Hendrie: Okay, it worked for you.

Gilmore: Yes.

Hendrie: Very good.

Gilmore: The difficulty was that in those days a 12" screen was pretty jazzy so the ability to have a screen big enough to scan on something like this was out of the question, but ironically enough I feel today, with the massive displays that we have now for football game watching, a programmer could start programming <laughs>in the two dimensional way that I think people ought to do.

Hendrie: Okay, good.

Gilmore: Particularly since there's an awful lot of extra information about things and in recognition of Wes Clark's first assembler that allowed the variable length addressing and comments, this would work in even more so, and I still write in that fashion. I try to document in my symbolic addresses.

Hendrie: Okay, oh that's good.

Gilmore: So this is a challenge for the future. I'd like to see programmers working on a screen this big <he points the flowchart> and get back to a drafting board kind of environment so they can see a major portion of their algorithm on one shot and I think it would help them immensely.

Hendrie: Good.

Gilmore: For what's it worth, <Gilmore folds the flow chart up> Wes in one of our conversations pointed out that one of the things that he asked me to start, was creating a symbolic language that would lead to logical design and this was an attempt to take a simple computer and write in it as though it were a program. <Gilmore unfolds another chart showing a block diagram of a computer system>

But essentially instead of programming the computer per se you were programming the design of a computer, okay. So I'm going to turn this over to your computer museum and maybe -

Hendrie: Oh cool.

Gilmore: this will cause some - one of your attendees to do something about it.

Hendrie: Get inspired right, good.

Gilmore: Okay, so have we -

Hendrie: Let's see you did -

Gilmore: Anything more on Lincoln Lab that you want to talk about?

Hendrie: Well yes, you just mentioned the things that you did work on. You told me you also did the operating system and that you did some work on the assembler for the TX-2, or Wes Clark had written

Gilmore: No, I did the full assembler for the TX-2.

Hendrie: Oh, all right, yes okay.

Gilmore: I have that report somewhere and I can't find it at the moment, but I'll give it to you.

Hendrie: Okay.

Gilmore: And I wouldn't be surprised if Alex Vandenberg might have a copy of it, and you've got to meet Alex Vandenberg before you're through.

Hendrie: Okay good.

Gilmore: I think there's a half a dozen people that are on my must list for you.

Hendrie: Okay good. Well we will take note of them and see whether we can dig them up.

Gilmore: Let's see - oh wait a minute, voice - we did some voice work as well.

Hendrie: One thing, you had mentioned you wanted to point out how the light gun evolved to the light pen and who did that work.

Gilmore: At Whirlwind, when they were considering air defense. Tying in the radar of incoming aircraft, it dawned on them that they had to point to a spot and tell the computer that they were looking at this one particular spot and wanted to get information about it. And tell the computer this is the one that we're interested in. So fundamentally, what they were trying to teach this monster behind the console was how to communicate. This whole business of man and machine communication is what all this was all about when you get right down to it. And Bob Everett, being the genius that he is, and the genius is only as

good as the technical stuff he knows. I mean its fine to have a beautiful brain and if all you know is the human language, than all you can do is write nice text in a series and that's it. But he knew his electronics inside out and so he figured out how to use the scope and a light gun by having a photocell be activated when it was pointing over a certain spot, and if it saw light than it sent the signal back to the computer saying I'm seeing something. When the program agrees that's what it is, then you've got man and machine saying, okay now we've got the spot what do you want to do with it? One of the things you can do with it is track the movement of the gun or you can just use it as a pointer. So there are two things that were needed and pointing was the first one that had to be done for the air defense system. Than later grabbing onto something and moving it over was certainly the next move which is where I came in as far as drawing on the TX-0.

Hendrie: Okay.

Gilmore: I saw…

Hendrie: Now the original light gun was a really sort of Cumbersome thing

Gilmore: I have picture of it right here. We can put it up against the screen.

<Gilmore stands up and places the picture close to the camera. The picture has two images on the top is a portion of the Whirlwind computer back panel with two men in the foreground. The bottom portion has an image of the light gun. Gilmore is pointing at the light gun>

Hendrie: Yes it.

Gilmore: This is Bob -

Hendrie: Yes.

Gilmore: This is Bob here and this is the light gun and it was over 10" long and it had a photocell and it had the circuitry so that when it saw light it sent word to the computer, “I'm seeing light”. The computer also knew the coordinates of what he was pointing at, and so now the computer says I have a spot at XY.

Hendrie: Yes.

Gilmore: And bingo.

Hendrie: Good.

Gilmore: Communications was established.

Hendrie: Now the light gun, however, was relatively big and clumsy. How did the light pen evolve?

Gilmore: Transistors.

Hendrie: Was that a much smaller -

Gilmore: The birth of the transistor - what Gurley did -

Hendrie: Who designed it?

Gilmore: Ben Gurley.

Hendrie: Who?

Gilmore: Ben Gurley.

Hendrie: Ben Gurley designed the light pen, okay.

<Gilmore is moving through the materials he has by his side trying to find a picture of Ben Gurley. There follows a dialogue between Gilmore and Hendrie concerning his inability to find the picture.>

Gilmore: Ben took upon it himself to try and produce a smaller light gun and obviously to use a transistor, and you remember, that the TX-0 was the first transistor computer. So the guys that could put the TX-0 together knew their transistors.

Hendrie: Yes.

Gilmore: So Gurley, who was involved in the development of the TX-0 also took on the development of the light pen and he is the inventor of the light pen.

Hendrie: Okay.

Gilmore: Ironically enough -

Hendrie: Yes.

Gilmore: As much as [Douglas] Engelbart was the inventor of the mouse and that certainly was a beautiful thing, and still is, but now we have tablets and you don't use a mouse on a tablet, you use this -

Hendrie: Stylus!!!

Gilmore: I wanted to say Scarlet but it isn't. A pen is enough, you have a pointer, okay, and the light gun is going to come back - it is already back in the fact that that's what they've got for tablet work, okay?

Hendrie: Okay.

Gilmore: So he, in effect, provided what both the mouse and the pointer can do.

Hendrie: Good.

Gilmore: And I wrote the first tracking thing for that -

Hendrie: Okay.

Gilmore: --which wasn't the best one. I had put together a whole series of spots in the form of a circle. What I was doing was waiting for the pointer to move in a certain direction and I'd catch it at any one of the boundary points and then I would reposition the circle.

Hendrie: Yes.

Gilmore: Someone at Bolt, Beranek and Newman [BBN] -- and we should probably make sure we've found out who that is because that's very important-- came out with the tracking cross. The tracking cross is the way to do it because the logic as far as the pen is concerned is it's always looking for the center point, so if you move it, it finds itself down one of the lines and so it goes back to find the center again, and in the process of doing that, it's tracking - it's catching the movement, okay?

Hendrie: Yes.

Gilmore: I could do the same thing but my software was not as efficient and so as soon as I could I think in the EDM we finally went to a tracking cross.

Hendrie: The electronic drafting machine?

Gilmore: One of the greatest sins when you're in research is to stick with your idea. If the next guy's idea is better, you've got to use his idea and give him credit.

Hendrie: Yes, okay.

Gilmore: We have a saying at Lincoln Laboratory that a guy could steal your money, he could steal your girlfriend, but if you stole an idea you were dead.

Hendrie: Okay, all right.

Gilmore: All right, so we're just about ready to leave Lincoln Laboratory I think, right?

Hendrie: Yes. Now has the electronic drafting machine arrived yet? Okay, we're going to go to Adams Associates.

Gilmore: Right.

Hendrie: You had talked about how that got founded.

Gilmore: Right, and basically Charlie came back and was looking for close to a half a dozen people to join him and I having worked with him for two years knew exactly what his style was, it was really worthwhile because we were fond of one another as well. We're both Aquarians, by the way -

Hendrie: Okay.

Gilmore: And several other planet signs are similar too, very similar. Anyway, I was delighted to join him and became a stockholder and as I told you earlier I should have asked for more stock. That was just a question of a young kid from Dorchester not realizing it. We had a grand time. Earl Pugh, the one who was in the film, had gone on and found work with a bank in New York. We let all of our peers know what we were doing and it was Earl Pugh who called up and said, 'I'd like to have you come in and cut some utility programs for a new computer that we've just bought and we need some utility software. So Charlie and I went there and fundamentally I said, hey I'll just put the TX-0, input/output utility program on this machine as well.

Hendrie: Okay.

Gilmore: And so I did.

Hendrie: What was that machine? Do you remember?

Gilmore: No I can't remember. I can find that out for you later.

Hendrie: Yes, that's fine. Okay, so that was the first job you guys got?

Gilmore: And in so doing, I was elected <laughs>to go to New York and live there during this time, and so we found a family that was departing from a small penthouse on Central Park West and so my pregnant wife and I and our young daughter went to New York and had a grand time living on Central Park West while I was working in a big bank in New York.

Hendrie: Okay.

Gilmore: It was great.

Hendrie: Good.

Gilmore: I learned a lot in those days doing that sort of thing– One thing that was born at the same time that you wanted to bring up, Charlie was thinking of some handout that might be worthwhile as far as letting people know about our consulting software firm. His idea was to provide it with a perpetual calendar that one could use year after year. I came up with the idea of a list of the computers that were available and their characteristics. We called it a computer characteristics shot and the nice thing about Charlie was that if the other guys idea is better than his idea, he had no qualms about using your idea. So that's what we did. We worked well as a team from that point of view. We did that a lot.

Hendrie: Okay, good. So that's where that publication came from?

Gilmore: Yes, that's where the publication came from and it really did help as far as finding clients because people wanted to know what the various differences were.

Hendrie: Okay.

Gilmore: And in fact it even got us business from some of the manufacturers. We did some work for RCA and others along the same line as we did for the bank.

Hendrie: Okay.

Gilmore: Okay, so that took me the better part of three or four months to get that squared away at the bank, and we came back home and there was a period of some very small jobs, but things were not moving as well as we liked and we were getting antsy that we just hadn't hit the right kind of thing, and I went to a computer conference and who do I bump into but Norm Taylor from Roman <?> days and Lincoln Lab days, and I said where are you now, and he said I'm with Itek Corporation and I said, I'd like to show you one of the things that I did on the TX-0 because I don't think you saw it at that time. Anyway, to make a long story short, he saw what we did with the Scope Writer on the TX-0. I wouldn't be surprised if I took him actually over to the TX-0 and showed it to him in person. He convinced Itek to take on the task of building an electronic drafting machine.

Hendrie: Okay.

Gilmore: For the next two, two and a half years, something like that my team was devoted to that completely. Charlie participated in it as well until it was obvious that one of us should be also looking for other business and he elected to do that. But he definitely contributed, especially in the construct end of the things as far as the macros that we also added to the keyboard and so on. All right, that takes us into…

Hendrie: And this is fundamentally based on this -

Gilmore: Scope Writer.

Hendrie: On the Script Writer, yes.

Jack Gilmore: Scope.

Gardner Hendrie: Scope Writer, sorry.

Jack Gilmore: Yes.

Gardner Hendrie: Yes.

Gilmore: Charlie also spent a lot of time with Earl Pugh and Don Taylor in perfecting the flicker free display because Charlie was also a damn good circuit guy as well as everything else. He was a very talented person. So his contribution in the electronic drafting machine was making sure that we had a scope that was behaving properly.

Hendrie: Yes, okay.

Gilmore: Let's see, what are some of the things that happened as far as finding the first customer. We certainly showed it to a lot of people, but it was the aircraft industry that really perked it up.

Hendrie: Now this was based on a PDP-1, is that correct?

Gilmore: Yes.

Hendrie: Yes, what was the machine? The machine behind it was a PDP-1?

Gilmore: Right, before Charlie came up to join me in the consulting, Ben Gurley who had left Lincoln Lab to join Ken Olsen -

Hendrie: Yes.

Gilmore: Gurley had been assigned to build Digital's next computer and God love him, Ken Olsen was the kind of guy who delegated, and he delegated well and he gave Ben Gurley free reign and Gurley did a fantastic job. That PDP-1 was a very nice machine. I had the honor of being asked by Ben to work with him on the instruction set.

Hendrie: Oh really? Yes.

Gilmore: My first consulting check was $175.00 per day consulting for Digital.

Hendrie: And helping them go -

Gilmore: As Jack Gilmore not as Adams Associates, it was very interesting.

Hendrie: Oh really? Do you remember any of the suggestions you made?

Gilmore: Oh yes, the add1 was mine. Where you automatically index something and tested it at the same time for - whether or not to go and so on.

Hendrie: Okay.

Gilmore: Sort of a way of you know loop - you not only decided to go but it clicked it over as well.

Hendrie: Okay.

Gilmore: The other - quite frankly there wasn't that much to do for me because Gurley was no slouch and so, if anything, I verified 90% of the instruction set - and maybe through in a suggestion or two, it was a only a couple of instructions that I came up with, but it was still an honor to work with him. We were good friends.

Hendrie: Good.

Gilmore: So now where are we? We've got the drafting machine and we're trying to get it to be used by various people.

Hendrie: Right, you're presumably out trying to sell it -

Gilmore: Right, yes.

Hendrie: --and demonstrate it and things like that.

Gilmore: And some of it was promotional work, getting Time Magazine to do that bit -

Hendrie: Yes.

Gilmore: It was interesting, once we got the machine working we had to learn how to become electronic draftsman and one of the things I did for us, I drew <laughs>the plans of my house.

Hendrie: Really?

Gilmore: Yes. In the meantime I had purchased a small bungalow for my wife and first child and just for the heck of it I decided to see if I couldn't draw the plans of the house using the EDM, which I did. It worked out great, and in the process of doing it, you know came up with several other discussions The other thing we did which didn't amount to much, but we did add some mathematical capabilities as well. The draftsman we felt might want to do some mathematics and so - and Bob Welly's still at the drafting board and so he could do that as well. I mean that's almost standard in the drawing machine now is that you can switch over and jump to the telekineter (sp?) quickly as well.

Hendrie: Yes, okay.

Gilmore: I'm trying to think about what else as far as the drafting machine. Suddenly going to Lawrence Livermore Laboratories and showing them what we could do and that talk got us some business from there, and then computer - Data Corporation -

Hendrie: Control Data?

Gilmore: Control Data was still in the wings and so we wound up negotiating with them to convert the instruction set over to their computer and than making sure that ran on it as well.

Hendrie: Yes, now what machine was that that you converted it too?

Gilmore: The Control Data -

Hendrie: Was it the 3200?

Gilmore: Yes, that's the one, thank you, yep -

Hendrie: Okay.

Gilmore: --the 3200, right.

Hendrie: Good.

<Gilmore pauses trying to recollect other happenings at Adams Associates>

Hendrie: Well now did you have to - did you support you know Control Data? You know after they bought the rights did you get a contract to work with them?

Gilmore: Yes, we had reasonably small contract. I think a couple of my people did spend time making sure that all the software was transferred over correctly and improved upon.

Hendrie: Okay. Now did you mention at one point that Control Data actually wanted to hire you -

Gilmore: Gurley.

Hendrie: --and Ben Gurley -

Gilmore: Yes.

Hendrie: Maybe you could just tell that little story.

Gilmore: Including his demise?

Hendrie: Well yes I think -

Gilmore: I think you have to if you're going to get into it.

Hendrie: Yes, all right, well then let's get into it.

Gilmore: Okay, well I'm going to flash back to Lincoln Laboratory just long enough to point out that there were two technicians that babysat the TX-0 and made sure that it was in running order everyday. I had the machine starting around 5:00 or 6:00 in the afternoon and going into whatever length of time I did on the third shift, and one of them would show up at 5:00 in the morning and take over. One of them - the one that didn't show one particular morning had been shot by the other one, although we didn't know it was by the other one at that time and it was a case of severe jealousy between the two. One had been promoted and happened to be - what did you say? Was it psychologically -

Hendrie: Yes, had psychological problems. Yes, he was a schizophrenic.

Gilmore: Yes, right.

Hendrie: Yes, we're going to go to Ben Gurley and you being offered jobs . We're going to end up than with Ben Gurley's death.

Gilmore: I wanted to point out that had happened long before either Gurley or I had left, and than Ben left before I did and joined Ken Olsen at Digital and Bloomfeld apparently left Lincoln and went with RCA and than from RCA over to Digital.

Hendrie: Yes.

Gilmore: He wound up being Gurley's assistant. Gurley got involved in the electronic drafting machine because it was his machine that was -

Hendrie: His computer, yes.

Gilmore: - we had number two if I remember correctly, and so he was over there constantly making sure that everything was right and so forth and most interested in the flicker free display mechanism. In the process of talking with Control Data, Control Data saw two things. They saw me as the father of the software and Gurley as the father of the hardware, and said why not invite both of those guys to join the company, and so they offered work to both of us. Gurley had left Digital by that time, and had formed a company of his own with Ed Fredkin, and Ken Olsen had allowed Gurley's stock options to continue because there was not going to be any competition between that firm and Digital Equipment. The difficulty was that the agreement did not hold as far Control Data and so it meant Gurley giving up all his beautiful stock that he had with Digital in order to go to work for Control Data. I had a meeting with him at his home where I in effect said, we either go as a team or we don't go, and he said, I don't think I can go because of my obligation to my family for the stock, and so I agreed and I decided to stay with Charlie because of that reason.

<End of tape>

[Continuity with previous tape missing]

Hendrie: We're on.

Gilmore: Harlan Anderson and I had a very good relationship and more often than not, it was he that I met with as far as coordinating using first the PDP-4 and then the PDP-6. But when the PDP-6 developed a problem and finally the board decided to dump it, I fought it as much as I could, but when that happened, there was a great falling out between Harlan and Ken. Harlan decided to leave rather than put up with Ken's antics. The sad thing about it was, a mistake on the part of Gordon Bell's design and Gordon found it but too late to mend that riff. Ken couldn't understand why we just didn't wait until it was fixed, because he was sure it was going get fixed. But that's why--

Hendrie: That's why Harlan--

Gilmore: When Harlan decided to leave, that's when Digital went public because Harlan demanded that so he could get cash on the barrel.

Hendrie: You had told me earlier just what the problem was with your PDP-6. Maybe you could just go over that. I think that's a really interesting little historical footnote. We'll get there eventually on Keydata, but let's keep talking about it.

Gilmore: Well, did I discuss the Transitron stock situation?

Hendrie: No. You did not.

Gilmore: Well, I have to do that. After the drafting machine was moving along pretty well, we were still looking for something else to do and not making a hell of a lot of good sales as far as getting contracts when lo and behold this guy comes out of the blue from the law firm Helendor[sp?] in Boston and somehow or other they heard about us and it turns out to be the Transitron brothers, who founded Transitron [Electronic] Corporation.

Hendrie: Yep, there were two brothers, right.

Gilmore: They had been public for about five years and the stock had gone very, very well; in fact they were the two richest men in Massachusetts at the time, which is saying a lot, and then one of the insurance companies that had bought Transitron somehow or other did an investigation on the syllabus and found that one of the patents that the Bakala brothers claimed was protected was not. It was not a lie; it was a problem in that the Bakala brothers didn't know that it was protected.

Hendrie: There was some prior art. It was not a solid patent. That's what you're trying to say.

Gilmore: Yes. So this outfit decided that they should sue Transitron and so they took it to court and the district court took the job and since it wasn't an act of evil on the part of the Bakala brothers, there was no severe penalty, but what they did do is they said, okay, take five million bucks out of your pocket, out of your treasury at Transitron, and distribute it to those stockholders who lost money during this recession, which they claimed was because of this loss of protection, which it wasn't. I mean, they were just taking advantage of a weak market and they were going to get some money back one way or the other. The insurance company was leading that pack, right? So it wasn't a clean thing. Anyway, to make a long story short, no one had ever done it before. So they came to us. They said we have this problem. We have a ton of people who have been buying and selling our stock and now we've got to rectify their losses and spread this $5 million, as much as we can, over those losses, and figure out what's fair so all of these people that suffered those losses would get an amount proportional to what they lost. And we agreed to take on the task. What had to happen was we had to get mail certified from the customers as to when they bought and when they sold and how much they lost. And so we wound up having five or six mail bags of stuff every day coming in from stockholders; it was heavy duty stuff.

What Charlie did was very, very interesting. Digital had this policy, cash on the barrel, nothing else. No part-time buying or anything; you buy our computer, you pay cash, and that was it. We went to them and said we want a PDP-4; we haven't got any money.<laughs> And so because we were all out of the same woodwork at the Lincoln Laboratory, they agreed to let us rent it, which was against their policy altogether, but they did. So we rented a PDP-4. The PDP-4 by itself was not that rich a machine to write the kind of stuff that we had to put together. Charlie comes to the front, and says, "I'll write an interpreter." So he wrote an interpreter of a more powerful machine that had the algorithms and so forth to do what was necessary to calculate the losses. It would have been more difficult to do without Charlie's interpretative program. It could have been done in machine code, but it would have been achier. So Charlie sat down and wrote an interpretative program for all these algorithms to be in this pseudo interpretative-program computer. And I was the programmer who wrote in that new language. And again, getting back, he liked to write interpreters; I liked to write programs.

Hendrie: So you had a new language to write in.

Gilmore: So we wrote a bunch of programs to figure out how to determine what every one of these people that had sent mail in should get. We had to come up with the ratio, not what they should get, but the ratio and then the law firm, after taking their chunk out for legal fees and so forth, and expenses, including us, then said, "Here's the rest, Judge," and he in effect bowed and say, "okay, pay them." Then we had to go back and pay them with the same computer-

Hendrie: And print all the checks.

Gilmore: So we did all the checks. So we were in the midst of this-

Hendrie: This was a big data processing job.

Gilmore: Yeah, it was. And we had half a dozen secretaries, full time, working on stuff; we had a pretty good staff. It was on Congress Street in Boston, we had the second floor area.

Hendrie: And you put the computer there?

Gilmore: Yeah, we had the PDP-4 there, right. And we did such a great job that this investment firm, who I cannot remember the name, I'm sorry, that can be found by any one of your legal people who knows how to go back and look at how corporations were founded. They came back and they said, "We're aware of what you did with the Transitron thing. We think you ought to go into business as a time sharing device." That was the other thing. One of the first, I hate to say "the first," because you can get shot doing that. We rigged six, I think it was six, maybe eight, but six I'm comfortable with, six teletype tied writers to the PDP-4 in a miniature time sharing situation. And how did we know that, because we had done time sharing consulting for MIT and Adams Associates. I have a whole stack of pictures with their profiles of people at Adams Associates, and one of them was a guy named John Avery, who worked on some work for the MIT computer department in helping them to derive their time sharing in their computing system. So we rigged up the same kind of thing in Charlie's pseudo machine and as a result we had a little miniature interpretative time sharing system with six customers, six teletype machines.

Hendrie: Who were all right there.

Gilmore: All in the same room and all these kids did for eight hours a day was crank in stuff from the mailbags.

Hendrie: Did you have mass storage on this PDP-4?

Gilmore: Yes.

Hendrie: Okay, you had a drum? Or tape? Did you use drum or tape? Do you remember?

Gilmore: Can't remember. I would be surprised if it was tape. But on the other hand, I think it might have had a small secondary drive; I can't recall.

Hendrie: It probably-- it may have had a drum. Because Foxboro insisted that they wouldn't use the PDP-4 unless it had a drum, and so they added a drum to it.

Gilmore: Drums were very popular in those days. Okay, so now we've got someone saying, why don't you build something with more than six terminals and go into the business of providing capabilities in a time shared way. And Charlie and I agreed that that was probably worthwhile. Particularly since we didn't like being dependent on always finding a client for work. The two of us did not like the consulting business because it was feast or famine, you know, you either had too many guys on the hook. It was a pain in the neck. It's a tough business. So this was a way of getting a steady flow of work and people that weren't going to come and go, so that's what we did. Now, it was I who convinced Charlie to go with the PDP-6. I think he wanted to go with one of the commercial houses. He always had a bent for the commercial rather than the scientific, even though he was a fantastic mathematician and a good circuit guy in his own right. He liked commercial stuff. And that was, I think, the experience he had when he was in South America, setting up their oil business. So we proceed to put the PDP-6 together, and because that took a lot of our time.

Hendrie: Is this a relatively early PDP-6?

Gilmore: It was number 5 or 6.

Hendrie: Okay, relatively early.

Gilmore: Yeah. I think one of the colleges had one. We were the first PDP-6 to have three banks of independent memory. Most people either went one or two and if the two went, it was interlaced, okay? The 6 had one mistake, it was a mistake of choice and that was not putting in a parity check. By that time there was a great feeling that the memories were reliable enough that you didn't have to waste time with parity checking. And Ken went along with that. That was okay as long as you were in a batch situation. We didn't add one and one and get two; we didn't realize we needed that in a time sharing environment. We did, for the simple reason that after making all the software changes and programs and so forth to get a better time sharing system, we just had this little miniature thing from the PDP.

Hendrie: Yes, I'm fine.

Gilmore: So that's why we went with the 6 because it was fast. The other reason we went with the 6 is because it had memory protect. That was key so that we could put a scientific type on to do debugging on our-- the only version of online Fortran was ours, we were ahead of the game, we beat IBM in literally providing an online version of Fortran. That was neither Charlie nor me, it was one of our own people, and he was terrific. If you want that name I can probably figure it out before we're through. So now we've got an online Fortran and we got Charlie's experience as far as commercial stuff that he was just aching to get back into anyway, so we went into the business of providing inventory control and payroll, not payroll, but payables and receivables. And lo and behold, we get up on the air and we've got customers and so forth and dingo, the damn thing freezes like a rock with no explanation, and it just won't work, and then all of a sudden, 15 or 20 minutes or a half hour later, it seems to mend itself and we can run it again. Which is just out of this world. Jack Shields, who I talked with just recently this spring, it's been last year, I guess, now, was the technician.

Hendrie: He was the technician? <laughs>

Gilmore: He was the technician.

Hendrie: That they sent? To try to fix it.

Gilmore: Right. Jack Shields, lead technician. <laughter>

Hendrie: That's pretty funny.

Gilmore: And I took him aside at this affair for Ken Olsen at Groton College that took place about six months ago. I said "I want to make sure this story is correct". I said, "was it correct that because we had three independent banks of memory, if we did not keep all of them hot, any one of them that stopped getting signals from the main computer for some period of time, microseconds, a voltage level would drop. Then when a request for storage came in the first request went zippo for the simple reason that the voltage level wasn't up again". And he said, "absolutely correct". Now, that is something that a logical designer like Gordon Bell probably wasn't even in his design.

Hendrie: Yeah, this is in analog world.

Gilmore: That's right.

Hendrie: Not logic world.

Gilmore: Because of that, the board and Charlie felt that we couldn't wait--

Hendrie: And at this time, they had no idea what was going wrong. This was found out later?

Gilmore: That was the problem, we had a dark hole as far as when the damn thing was workable and we had customers who were calling us saying, "Right in the middle of cutting an invoice, you cut us out, is this time sharing?" It was a difficult time. So it was a lot of pressure on us, okay? And Shields was over there all the time trying to figure it out, every time they threw a circuit broad-

<microphone static –Gilmore adjusts microphone>

Gilmore: Anyway, I was on the side of the fence that said, you know, by the time we screw around recoding and everything else, they'll find it. I had a fair amount of confidence with the people that founded Digital, whereas Charlie didn't; Charlie didn't know those people. And as a matter of fact, he wasn't that fond of Ken. The personalities clashed. Charlie was a drinker and Ken was a teetotaler and they didn't like one another. And finally the sad decision was made to send the PDP-6 back and that caused a riff between Harlan Anderson and Ken Olsen and that prompted them to seek going public so that Harlan could cash out and depart the scene. It was that bad a riff, at least in my interpretation of things. I hope I'm not being too simple in explaining that. So now we've got only a commercial application instead of both a scientific and a commercial application.

Hendrie: Why is that?

Gilmore: Because with the departure of PDP-6, we had to go to a Univac 494 and that didn't have memory protect. So the online Fortran went zippo. The programmer that was involved in that left and took his online Fortran with him, with our blessings and he became a millionaire. His name was Goldstein or something like that. Young, bright kid, and he made a lot of money. He didn't stay in the business that long either; I guess he made his money and got the heck out and that was it. That's another story. So what that did was it created a situation where the break even instead of being a year and a half turned out to be three years or two and a half years, whatever. In the process of doing that and supporting a large computer like the Univac 494, plus a sales staff. We had to keep going back to the bar to get money from our backers, which were Allstate and Pitcairn. In those days and each time they did that they got paid in preferred stock. Okay? So slowly but surely the measure of who owned what--

Hendrie: The control of the company.

Gilmore: The control of the company was getting stronger on the side of the board rather than us. Okay, I think covers that situation. Now, I have in my notes here six things to talk about as far as Adams Associates and Keydata. The first one is the development of the EDM.

Hendrie: Now, we spent a fair amount of time on that. We talked a little about that and its sale to-

Gilmore: The second one was the automation of the oil refinery.

Hendrie: Why don't you talk a little bit about that? We don't have that on tape.

Gilmore: Okay. It's a wonderful story. When Charlie and I formed the company, our shtick, as you would call it, was online and real time applications. That led us to process control work, and we wrote the first process control program for Oreo Cookies, in Chicago, which was really a very fascinating thing.

Hendrie: And this was with Foxboro?

Gilmore: No, no, this was Adams Associates doing it for Oreo Cookies.

Hendrie: For Nabisco?

Gilmore: Right. No middle man in the situation, we had the job with Nabisco. And I had a programmer by the name of Alan Russo, who later became one of our VPs, he was that good. He was an excellent programmer and between Charlie and me, we always trusted someone who had proven himself, and so we sent this young man out and said go do it, and he went and did it. And Charlie and I had "this much"<two fingers close together> to do with the whole damn job, he did a nice job. We have several success stories like that. We trusted our people, because they were so good. And then that turned out to be a fair amount of business for us before we were through. We were getting other process control work, including

[Gilmore refers to a paper]

Foxboro. I'm trying to pick up to how we got in touch with Aruba. One of my programmers, who by the way was an older guy, he was 42 <laughs>

Hendrie: He was 42?

Gilmore: I don't think he was even a programmer when he first joined us, I don't know what he did. But we trained him and he wound up being involved in the process control teams that went out to various companies. I think he did do some coding before he was through. Anyway, he knew what we were doing with the drafting machine. We haven't talked much about this, but after the drafting machine was alive and well, we got a contract from the government, the Air Force. The Air Force bought one for $125,000, that was the first. So we got a hundred and twenty-five thousand bucks for the second drafting machine.

[again referring to his list of topics]

Oh, the reason why I wanted to do that is because it tied into how we were able to deal with this refinery. Because we were over there working on that one and adding some additional software that they needed

and so on, and John Hermiston was his name, called me up and said the guy in charge of computing and so forth down here in Aruba, has an ambition to automate the refinery and said, you know, "It's going to take CIts [ph?] and all that sort of thing and I told him what we were doing as far as drafting machines up in your place," and I said, tell him to come up and we'll show him what he's interested in. I asked John to give me a little bit of an idea of what this guy was looking for, and he in effect said, he wants to automatically have a centralized group be able to decide to move oil from the ships into the tanks, the tanks into the refinery, and then the refined stuff back to holding tanks or directly back to the ships.

Hendrie: Right.

Gilmore: So I told the guy to give me three weeks and when he came up, I had a mock of that on the Air Force's computer, with their permission. And so when he walked in, I said, is this what you're looking for, and I took the light pen and I pointed to his ship, and then we indicated the-

Hendrie: The route, the pipes, yeah-

Gilmore: The line became bolder, and then going to a tank and then I said, you know, then we want to take it from there to the refinery and so forth, and the guy melted in front of the screen, he said, "This is what I want." <laughs>

Hendrie: Good.

Gilmore: And that all happened, this is interesting, he showed up around 11 o'clock, we spent from there until almost three or four and then he said, "I'm going back to my hotel, and then come to dinner." I think I told you this story about dinner. Do you want me to do that, too?

Hendrie: Oh, sure. It's a good story.

Gilmore: So, I said "why do you want me to come to dinner"? He said, well, I want to talk about certain things to expect and whether or not you should be the prime. I want you to come to dinner. So just before we started eating, we ordered drinks, and he waited until I ordered a drink, to see what I was going to do, and once I ordered a drink, he said, "Now I'm going to tell you why you're here." And I said, what, and he said, "I don't do business with people that don't drink." And I said, why not? He said, "I just don't trust them." And I said, well, I think that's kind of a silly thing; he said, "I know it is, but that's my ilk and I've had a couple of bad experiences and I just won't do it again." He said, "I want to see how much you can drink, I'll be delighted to have you get drunk as a hoot owl, but I'd like to see how much you can hold, too, because I have a lot of respect for people who can hold their liquor." Anyway, I put him to bed and then went home. He didn't know he was talking to a Navy pilot. <laughter>That next day he showed up at the office and he said, "You're going to be the prime," which was unheard of. We were a miniscule of a software house and he said, "Pick your computer manufacturer, pick your peripherals, it's your job."

And one of the things that I want you to make sure you cover in this is the following: the guy who was not at this meeting that you saw in the film, he wasn't there for the simple reason that he was geographically across the country. This was not that big an audience, it was strictly an in-house digital thing and I managed to find at least some of the team to come to the party. So David Weisberg was not ignored, we just didn't consider it that big a deal at the time. If I'd known the impact of what this little film clip has done for us since then, I would have made sure, but in those days, I don't think Digital would have paid to bring one of them in. Okay. David was the guy in charge of the programming. He was the coordinator, who did what and so forth. And I wrote the program, the sketch programming and the tracking and all that sort of thing. I was his programmer when I did that. I made a point of-- because I love to do this, that was my baby, that was the part I wanted to do anyway, so I did it, but I didn't do it as a vice president, I did it as a programmer. David was after me for, "When are you going to have this done." just like he was with everyone else, right? I'm glad we're putting that on tape because he'll get a lot of kick out of that, knowing he'll recognize that.

[Gilmore refers to his list again]

Gilmore: So-- oh, we're in the refinery thing.

Hendrie: Yes.

Gilmore: Okay. So I decided that David, because he knew so much about the drafting machine, and was reasonably flexible as far as traveling and so forth, but more that he knew how to manage. David was a civil engineering grad from MIT, which was by the way and I think we should get this on tape as well; the civil engineering department at MIT was light years ahead of the electronic—

Hendrie: Electrical engineering-

Gilmore: -- department of MIT as far as computers. The draftsmen in the early 1950s, not the draftsman, the civil engineers, were computer oriented long before the electronic guys were, and I had about three or four of them. Eighty percent of my programming staff at one time was out of MIT. That's almost unheard of. That was great. Okay, so we've got—[referring to his list again]

Hendrie: So that job went through-

Gilmore: So David goes down to Aruba and periodically he calls me and tells me how things are going and how many more people he needs and so forth, and we had a fixed price contract. He hired GE to provide us with 4020s, which was a beautiful real time machine. The computer display was a neat little company that had a great display scope at the time and I can't remember the names of the people that provided the analog to digital conversion, but I suspect our friends over on the other side of MIT gave us the names of the outfits to use, probably. But we were the prime. And David was the boss of the whole thing and did a great job.

Hendrie: That's a great story.

Gilmore: And it took about three years altogether.

Hendrie: Do you remember about what time this was?

Gilmore: Sure, it was 1963, 1964 and 1965.

Hendrie: Okay, very good.

Gilmore: You can check on it, when you see David-- he's written a book on this, too. Yes, he's got one on Aruba and one on the drafting machine. Okay. Let's see, anything more on the Aruba thing? I don't think so. [referring to the list]

Hendrie: All right. Now, you covered sort of the original founding of Keydata.

Gilmore: Yeah, the work with Citibank. I didn't mention Citibank, but it was the Citibank computer.

Hendrie: It was Citibank, okay. Good. And you mentioned something about Instinet; can you tell me about that application?

Gilmore: One of the programmers, not programmers, one of the staff at Whirlwind was a, I like to call them girls, I'm still an old man from that point of view-- Phyllis Fox was on the staff at Whirlwind as a graduate student and she had already had two degrees, one from Wellesley and the other one was from the University of Colorado and she was in the process of going after her Ph.D. in mathematics. Bright lady. And in the development of the assembler at Whirlwind, Charlie wanted to make sure that the conversion of the octal and the decimal numbers was done correctly, so she was given the task of making sure that what I was doing was going to balance. That's why her initials are on the-- besides mine; Charlie's is there, certainly as the brain trust, what to have done, and Phyllis because she made sure the meat and the potatoes, namely the numerals, the numbers, were correct. I mean, can you imagine converting incorrectly? So we had to have someone that was smart and we certainly did in Phyllis. So why am I talking about Phyllis?

Hendrie: We're heading toward Instanet.

Gilmore: That's right. She married a guy by the name of George Sternly , who came from experience in the retail stores and so forth, but I don't know what undergraduate work he did, but he was a very bright guy and had wound up going to the Harvard Business School. And I think while he was going to the Harvard Business School, he met Phyllis and they eventually married. So when Keydata got on the air,

George, who is-- I have a picture of the board of directors, by the way, that you're going to take with you-- George is there along with two of the people from the first investment house. George married Phyllis, all right? Some of George's friends were in the stock market business and they wanted to automate the buying and selling of stocks, and so Sternly came to Charlie and said, "I've got this team of guys who would like to use Keydata to be their computer for selling stocks."

Hendrie: Okay. We're going to have to pause just a second to change tapes.

Gilmore: Okay.

<End of tape>

[audio begins abruptly]

Gilmore: --came and said this is what we'd like to do, and it required some programming on the Keydata that we didn't have done and so forth, and Charlie raised his hand and said, you know, "You raised your hand for the drafting machine, I'm raising my hand for the Instinet, and I want to get involved in this," and so he did. So he worked with those people and had a few programmers making changes to the Keydata support system so that it worked, but before we were through, they were on the teletypes as well and they were cutting stocks, using Keydata. And as far as I know, Instinet, it's probably not got its own-- they still don't have the same name, but I think it folded into-- the capability was put on another machine later on, but that was still there when I left.

Hendrie: Is that right? Okay. There were still people using the service?

Gilmore: When I was president of Keydata, the owner, the head guy of the group, whose name I can't remember right away, he and I were on excellent terms and I was always friendly to what they were accomplishing or trying to accomplish, which they did, but then there was something that they were having trouble with and I got involved. But for the life of me I can't remember exactly what the hell I recommended, but they thought it was brilliant and they used it. <laughs> I should have asked for some sort of acknowledgement but didn't bother. It was one of those things where they all had a mental block on something and I didn't, and it was a way of double checking the stocks or making sure the deal went through correctly; I can't remember. Anyway, that's the end of that. But that was one that was basically Charlie's. By the way, I think when the board went after his fanny, he brought the Instinet to the Adams Associates side of the fence and continued that relationship that way.

Hendrie: Rather than the Keydata?

Gilmore: He still used the Keydata computer but anything that they wanted on it was done on Charlie's side of the program, which was fine with me. Charlie and I were not enemies at that point.

Hendrie: And the board was a Keydata board; they didn't own Charlie's—

Gilmore: Oh, no, Adams Associates and Keydata were part of the same company. It's just that they were two different activities and two different corporations owned by the same holding company, and that was it.

<Pause in recording>

Gilmore: Okay, we're going to talk about the PAR system and it's one of my favorite stories. I had great difficulty and impatience with the accounting side of the fence for the simple reason that they never had the information that I wanted, when I wanted it. I always got it three weeks later than I really wanted it, and I think that's probably the story of every executive officer that I know. Maybe now with better computing, they're giving it to them faster, but in the old days it wasn't the case. I got so frustrated that I decided to see what Keydata itself could do as far as helping me. So I went to my programming staff and I said, "this is what I want". I said" I want to take the charter accounts and I want to create a set of whatever I designate as part of the charter accounts and I want that to be considered that an entity unto its own. And then I want to do several of these and then, I want to be able to tie two or three of those to still another. So in effect I want to create my own independent hierarchical connections to the charter account that can suit my curiosity as far as what's happening with our money. Okay"? I think that was pretty good if I say so myself. Anyway, they did it. They did it beautifully. I had some great programmers, I tell you. Ben Kelsky, Pat Sweeney, two of the best; they could do anything. And they knew that Keydata interpretative code better than anyone else. Anyway the bottom line was I said "in order for you to do this the way I really want it, I want you to emulate the complete accounting structure that Keydata has in my accounting department, so that there will be no challenging one system over the other as far as accuracy. Every quarter, or every month, whenever we do it, I want both systems to be matched to the penny; otherwise I'm dead in the water as far as that's concerned". And they did it. Now, what did I get from that? At the time I had a very fast computer terminal at home in Weston; <laughs> So I had it rigged to set the computer up right there in Keydata, and as soon as the end of the month, as soon as our stuff was ground up, they'd call me and let me know and I'd get up at four or five or whatever time it was, and I'd sit at my desk in my study in Weston and start using the PAR system, is what I called it, "planning, analysis and reporting." So the entities that I had already created, I merely would go to those and I would see their finances and what their expenses were and whether they were on target as far as budget and so forth; no sweat. If I wanted to add another, I didn't have to do anything more than to create another entity and describe what they connected to and then hit a button, and then bingo, they'd be connected so that I could do a "what if," and so forth. All right? I had a precursor to the spreadsheet.

Hendrie: You could do “what if’s” once you had one of these. You could change the revenue and make the revenue go higher--

Gilmore: I could do projections.

Hendrie: Yes, cool.

Gilmore: And so the fun was packing up my stuff and going in and meeting my financial VP and he would run through the usual stuff and then I’d say, “How’s Chicago doing?” and he’d say, “Well, uh.. I’ll have a schedule for that next week,” or whenever. And I say, “You don’t have to, I already have it,” and he’d say, “What’re you talking about?” and I’d say, “Chicago’s off their budget by three percent.” And he would just about goff, or whatever the expression is. Then I’d say, “New York on the other hand is doing well, Canada is all right, too.” And he said, “Where the hell are you getting all this?” I said, “You were the one who cooperated with me as far as putting that little package together called PAR, I’m getting it with my PAR system.” He said, “How?” I said I can get charter accounts through PAR and I can put together any kind of schedule or situation in 15 minutes and run it and find out what it is. He never once asked if he could use it or try it.

Hendrie: That’s exactly what I was saying. “Embarrassed once but not twice,” I would have said. “Show me how to use this. You’re not going to do this to me again.”

Gilmore: It was tantamount to having scales taken off my eyes because the accounting thing was always a bore to me, always a bore. No longer, I had control over it. It was not as though I had to peek in through the back window and look at someone else’s additions and subtractions. I could get at whatever I wanted to in the charter accounts. I could see anything that was happening because the entire charter of accounts was open for sale, if you will. And it was a fun, fun situation. On my own I did an analysis of all the various activities that we were charging for and did a profit/loss on each one, all by myself. And I found out that the communications charges for the concentrators, you know, we had a whole flock-- by this time we had GE terminals instead of teletype writers, by the way. When I left Keydata we had about 350 terminals and there were only one or two customers and we were in 25 states and three provinces of Canada. Primarily on inventory control and billing and accounts payable and stuff like that. Anyway, I found out that all of our profit was coming from our interface, the communications interface charges, and that the activity for storing, we were renting time on the drum, we were renting paying for number of transactions per hour, and all that was breaking even. Ironically enough we had nothing that was losing, that was a loss, which I found fascinating, but everything was paying its way, but nothing more.

Hendrie: It was like priced at cost.

Gilmore: Right. And I think that appealed to the vendors that we were dealing with because there was a fixed price for the communications and then if they cut an invoice they knew they paid for it. If they didn't cut an invoice, they knew they weren't paying for something they weren't doing. They liked the idea of only paying for what they did. What we should have done-- if I'd had that earlier, we probably would have met our profit situation sooner. But as you'll see; I'm giving you all the quarterly reports were nothing but up. It was doing well; its growth as far as I was concerned was all right. I wasn't in that much of a hurry. The problem was my board was in a hurry. They'd come originally thinking that Keydata was going to be a reasonably easy or early investment-

Hendrie: A rocket ship.

Gilmore: And the rocket was going to take off very soon, and it turned out that it was a damn good business, but it was not one that was going to skyrocket. And then with the introduction of the smaller computers and the PCs and so forth that were coming, there was a question as to what role we were going to play and how were we going to play it. And interestingly enough, looking back I can see Keydata probably would have been on a flat level for sometime until people realized that they still would like something that was on the net as opposed to in their computer, for one reason or another. Now, it's different; today people are enjoying a remote computer service and Keydata would have been right up there, ready to go as well. But our board, particularly one of the newer board members, made a commitment to a private family that wanted to invest in Keydata and he promised, without board permission or my permission, a price in stock that was ridiculously out of the realm of reality. And then because of the recession, we weren't moving even as fast as we had anticipated, he panicked and in effect said, there's a way to change all this, and he got the rest of the board to agree on it, and that was to reduce the programming staff and the sales staff.

Hendrie: Reduce costs.

Gilmore: But reducing costs can be taken two ways. One is trimming back and another one is destroying. And what they were talking about were 80 percent cuts, not 8 percent cuts, and--

Hendrie: Let's milk this, get the stock up and leave.

Gilmore: Right. I said what analyst on Wall Street is not going to see through this maneuver? And they almost said it'll be too late. They would have gotten what they wanted. Now, whether or not they wanted to just push it up to a decent amount and then get the hell out themselves is a good question. We'll never know that.

Hendrie: We'll never know the facts about that. We'll be pretty sure though.

Gilmore: Anyway, so with a great disappointment, as far as walking away from something that I'd help build, I did something very interesting. Instead of starting to look for a job, I went to the MIT bookstore, which I always loved to go to whenever I was there, and I just went through that section of books as far as "how to," and "what to" and so forth. And I didn't even know what I was looking for. And I ran across a book that said, forget the resume, this is what you ought to do to get your next job. And fundamentally what they said was instead of walking in and asking for a new job, tell them that you are looking for the next opportunity that you want to get into and whether or not that company was a good candidate--

Hendrie: Whether they had that opportunity.

Gilmore: That's exactly right, and that's what I did. And I spent the next three or four weeks ringing on a few company's doors and getting some information and then I called up Ken Olsen and said I wanted to meet with him. And we were good friends, so I went in to meet with him, and I said. "I'm making a move and I thought you'd be a good one to advise me on where to start looking." And he said, "You should start looking here." And I said, "Why?" and he said, "There's a thing called word processing that's coming out of the woodwork and we don't know what the hell we're doing in here. We do have a newspaper editing capability, but I need a new profit and loss manager and I want you to be it." Bingo. So he went to his brother, Stan, and I had to meet with a few of the other senior people and we all agreed that the best way to do this would be for me to come in for the first year as a consultant to see whether or not the word processing thing and me could get along. Now, the reason why he thought of me was the MIT Lincoln programming and what I had done there, which was a natural extension of what I did. And I fell in love with it and I had another passion. And 19 years later, I left the job. I enjoyed every minute of it; it was very good.

Hendrie: Tell me what you did at Digital? What was the state of word processing; what you were responsible for?

Gilmore: I went to Stan Olsen and I said, "How do you want to operate," and he said-- and this is Stan all over, he said, "How do you want to operate?" I swear to God, he went to a Jesuit college because that's the first thing the Jesuits teach you to do. But he didn't. But at any rate, I said, "This is how I want to operate. I want to operate as though it's my own business and I want to report to you when I need to get advice and I want to report to you at the end of every financial period and tell you why I was ahead or why I was behind." And he said, "You've got a deal," and that was it. It was fun. I hired the way I would have if it were my own company, and I had some real winners. The name Dan Bricklin is not forgotten. Dan Bricklin was one of the key programmers, but not the only programmer; I had some whiz kids that were great. If anything I knew how to hire programmers from all the Adams Associates and Keydata experience.

And I got to tell you this one story that's great. Stan and Ken both liked woods meetings, get away from the company, go off to a shack or a cabin somewhere and spend an afternoon or a day or two, if necessary, until the job had worked out a solid approach and so forth about what was bothering them. n I got some of the programmers together and we were trying to determine just exactly how we should build this software. I decided to have a word processing woods meeting. But I belonged to the Weston Golf Club in Weston, so I arranged to use one of the rooms upstairs which are not only for dinner but also for dinner meetings. And I reserved it for the whole day and so Dan Bricklin and one of these other guys, I'm embarrassed I can't remember his second name, but they were hippies. Dan Bricklin had a hairdo that was at least 24 inches long in the back, and he had the cutest pair of dungarees and plaid shirt or whatever, and these kids started walking towards the front door of the Weston Golf Club and two of the guards casually came over and said, "What are you two doing here; get the hell out of here." And my son, who was one of the tennis caddies, I don't know I must have had some inkling that that might have been the case, I said, "Keep an eye out for some guys that look like hippies and if they have any question as to where I might be, let them know." So my son actually saved the day and told the guard not to get excited. So Bricklin showed up and my other programmer showed up, as well as Stan, and we spent the better part of a day and when we were through we had a set of plans to build an interactive word processing system.

That from the beginning was different in that I insisted that what we were going to do was tie it into the data processing capabilities. Even though they would start it as a stand alone, it was going to be a hybrid as far as data processing and word processing. None of the existing competitors had that at all. The other thing I pointed out was that we have to do it in such a way that it's going to be capable of being tied into the VMS system as well. And the technique as far as how to put it together and so forth, was reasonably easy, and the reason why it was reasonably easy was because I was able to get some of the programmers from the product line that was handling newspapers and generating some of their things using text editing for newspapers, so I wound up with some key people who knew what text editing was all about and one of them was a fellow by the name of Bob Travis, who has had a great computing career and wound up being a major player in one of the search engine companies, not Google, but one of the others. Within a year we were on the air.

Hendrie: What was the first product called?

Gilmore: WP-78. Something like that. the first thing we did, Digital was selling a mini computer and I said, I want to be on that as an adjunct and so we immediately put the stuff on that as well.

Hendrie: This was a small, desk like thing. Was this on the back stations or was this an LSI-11?

Gilmore: No, he had a 310, it was Irwin Jacobs commercial product line.

Hendrie: Okay. I remember the 310.

Gilmore: He was selling a 310. I sold a 310-W. The interesting thing was the 310-W was also capable of being a 310, so that data processing, word processing was there from the beginning.

Hendrie: It was 310 plus W.

Gilmore: Right. And then we went to single terminal devices and my pride and joy was the WS 200 that had eight CRTs on it and had magnificent speed, a centralized facility and could also be a data processing system as well. Jay Forrester had a WS-200 in his office at MIT. The WS-200 was the matching point as far as beating Wang out. They were a tough competitor, but I could meet them as far as eight terminals and a WS-200, knock them dead. And quite frankly, and this is not anything off the record, as far as I'm concerned. My humble opinion was that the problem with Wang was that there were two major groups within Wang; one was data processing; the other was word processing. And the people that were running those two operations had no intention of ever merging. They gave lip service to it, but they were just hoping the other guy was going to die and that's why Wang failed. And that's why our stuff was merged and went on to get on the VMS system, became part of All-in-One, and it was terrific. And then when the PCs started coming down the pike, we dragged our feet purposely for the simple reason that the profit on unintelligent terminals tied to a VMS was still coming in. They weren't as technically intriguing as the stand alone and so forth, but there was one thing that was very important: the guy in charge of the VMS system had control of all those terminals. There was no such thing as any secondary storage that could be stolen out or anything else. And they didn't cost much. So on a cost per basis it was very competitive.

Hendrie: Very good.

Gilmore: I guess we've got to slip from there into what happened next inside Digital.

Hendrie: Okay. Yes, let's do that.

Gilmore: This is a little sensitive but it's common knowledge, at least to most of the Digital people. They don't know why it happened and I'm going to tell you why. On one of our long-range planning meetings, which was always doing a five-year plan, we went through the regular procedures and there were some guidelines as to what to use as far as what we thought-- by the way, by this time there was I think 18 profit/loss centers, and I was one of them, and I was the smallest of all of them, okay? Simply because I was only, what, at that time, maybe three, four years old, something like that. At the time the word processing group was doing about $60 million and we went through the normal guidelines to project out

what we would be doing in five years and it came out to $250 million. And everyone thought that was very great and they got up and it was one of those all day meetings and I said, “You’re not going anywhere.” And they said, “What are you talking about? We’re through.” And I said, “No, we’re coming back tomorrow and we’re going to start all over again.” And they said, “For what reason?” and I said, “Not for what reason, because we’re not going to apply to any of the guidelines we applied to this time. Tomorrow I want you to come in with a fresh head, no holds barred, and we’re going to figure out what we could do without being told what we can’t do.” And they said, “Wow.” I said, “It’s only a day and we can throw it away but at least see what we can do.” What it was, we were 18 product lines and each one of them had their own sales force, okay? And each one of them had all their various supports and each one of them had to buy salesmen from the sales department, this was matrix management stuff.

Hendrie: Right. I understand that.

Gilmore: Okay. I got those direct reports of mine together and I said, “Anyone got any ideas,” and so forth. And they said, “You know, we can only do so much with the number of word processing people we have,” and I said, “Well, what would you do instead?” and one said, “You know, the guys that are selling for these other product lines could sell our stuff as well if they wanted to because they’ve got a concept we’re not even in.” So I said, “Okay, number one, we merge our sales force or what? Do we throw our sales force out?” Well, the first thing was maybe we keep our own sales force but we give a commission or something to the other product lines if they sell, and we went through that and said that’s awkward, and finally I said, “I think what you guys are telling me is I should stop being a product line and start being a marketing department.’ And they all looked up and said, “You’re right. We’ll do the software, we’ll make sure that it’s the right product and so forth and then we will give it to the other 17 product lines and they will sell it as part of their situation.” I walked into my boss and said, “How does $500 million sound to you instead of $250?” He didn’t buy it.

Hendrie: He didn’t buy it?

Gilmore: Nope. Didn’t want it.

Hendrie: Why? You knew I had to ask that question.

Gilmore: Oh yeah. He was terribly fond of what we were doing in word processing and he was convinced we could be a super product line in our own right and I felt just the opposite. And you know, ironically enough, so did Irwin Jacobs, because he was involved in the initial offering and they were already sharing with us as far as word processing anyway, because I was using the very same equipment and all I had to do was shove my software to him and so, we were almost doing it with his shop anyway. But organizationally wise, it was not part of the game plan of my boss. He wanted his own organization

and he felt that $250 million over the $60 million he already had was great and his other product lines were going to do as well, and so from that point of view, he was content. And so he said, “Just park it away,” and I said, “No.” And he said, “What?” and I said, “You forget that I was a CEO for seven years before I came here.” I said, “I’m used to thinking in terms of what the corporation needs and not what one individual department needs,” and I said I cannot in good faith continue in that direction and he said, “Well, what do you want to do? And I said, “Well, I think I want to go back to engineering, I want to get back into-- there’s some things in word processing and office automation that I’m intrigued with,” and I said, “It’s time for you and I to split,” and so we split..

<Pause in recording>

Gilmore: Okay, so you want to know how I came about doing something like asking for that extra day?

Hendrie: Yeah.

Gilmore: Okay. I didn’t get an MBA, I got something better than that, I had an electrical division in my squadron that I was commanding officer of besides being a Navy carrier pilot, and most of us either had electronics or electrical duties. And each one of these groups supported our squadron one way or the other, and as officers, besides flying, we also administered. I went down, when I first got on board on the Antietam, I picked them up while they were on the Antietam and was informed that I was also going to be the electrical division officer as well. Okay? So one or two of the other guys said you’re going to like that chief of yours, he’s a pretty mean son of a so and so. You know what a chief is?

Hendrie: Yeah, he’s the guy that does all the work.

Gilmore: Right, does all the work. So I went down to that area off the second deck and sat down with him and he said, “Well, where would you like to start, lieutenant?” and I said that’s not the right question, and he said, “What’s the right question?” and I said, “I’m going to ask it. How would you like me to run you? How do you want to operate?” He said, “Are you kidding?” and I said, “No, I’m not kidding.” He said, “No one’s ever asked me that question before.” I said, “You’re the one that knows this division, not me. How do you want to run it? You tell me how you want to run it and if I think it’s right, then that’s the way it’s going to be run and I’ll be the commanding officer and you’ll be the executive officer of this operation and it’s your baby, and I’ll back you up on anything as long as you let me know ahead of time” “Yes sir.” Well, that was the beginning of a beautiful relationship for two and a half years. He did a great job.

Hendrie: He did know what to do?

Gilmore: Oh, he was first rate, and also he had some great first, second and third petty officers. I'll give you one example. We had an admiral's inspection while we were at sea and we had about six weeks to prepare for it, which meant preparing the syllabuses for training courses for every item in the division's bailiwick. And my peers started bellyaching because they were going to have to do so much homework besides flying, and I said, what do you mean. And they said, "Well, you know, I'm an expert in electronics and I've got to help put some of these things together." And I said, "Why aren't you letting the people that really know how to do it." And they said, "No, no, no, I know better than they do what they should do." I went down to the chief and I said you tell me who the smartest kid is on this particular subject and I don't care what his rank is. And he said, oh this, third classman, he's the best. And I said he's the one that's going to write the syllabus on that course. And I said do it that way. And so we had, you know, an intermediate meeting and some of the guys said, "I'm 30 percent through," and "I'm 40 percent through," and the lieutenant commander turned to me and he said, "Lieutenant?" and I said, "I'm all through." He said, "What do you mean?" I said, "It's all done." He said, "How did you possibly do it?" And I said, "Because I didn't do any of it myself," and they were all done better than what I would have been able to do, even though I have a physics degree and two years as a staff member at MIT, I still couldn't write a syllabus on the gyroscope and what it needs and how it should be done and so forth.

That's what it was all about. I'm rambling here, but I think it's worthwhile to tell you. We had inspections, including lining up all the fellows in their blues to make sure they looked like real Navy sailors and so forth, and the first time it happened, I had a dress rehearsal and they looked great and then they went back to the barracks and they went out that night, some of them. So the inspection was the following day and the shiny shoes I saw the day before and the pants that were pressed were not pressed as well the day of the inspection. So guess what happened at the next inspection? I had a dress rehearsal in the hanger again and then they took all their clothes off down to their skivvies and they put them in lockers in the hanger room and the following morning they came down in their overalls and then they got into their sailor suits and I walked into inspection in a situation where people just dropped their eyeballs. We were sharp as can be. And I won every inspection thereafter.

Hendrie: I love it. All right. We've got to change the tape.

<End of tape>

Hendrie: Tell me about what you did after Digital, you know, a little bit about your motivations, your philosophy, what was going on then.

Gilmore: Okay, well to tell you the story correctly, I have to take you back into the last few years of Digital. I was in the office engineering group at the time as a senior technical manager. I was very concerned as far as the competitive situation at Digital. Digital was, for the first time, failing competition. It was a company that did not have any competition almost the entire life of it, until the very end. They

were reacting very badly at seeing competition that really was getting tough. I had the pleasure of at least doing three different studies for Ken to find out who the competition was, or what we were doing wrong. He wanted to know more about Wang and what we should be thinking ahead as to what their next move was. I said to myself, "The only way I'm going to find that out is to talk to people who are in Wang or used to be in Wang. I had worked with a consulting firm I'd worked with before, so I went back to her and I said, "Have you get any Wang alumni on your staff?" She said, "Yes." I said, "I want to do a study, a competitive analysis on Wang and I want those three people assigned to me so that I can get some idea of what to expect as far as competition," and she said, "Fine." Net result was that I found out from them what was happening inside of Wang. I think I mentioned it before, briefly to you, but what was happening was that there was a political fight going on between the two major groups: data processing and word processing. And the leaders of both those shops, one of them was their son and he had the word processing, the other one was a manager who was not related, but definitely was strong. They kept promising that there was going to be a word processing/data processing hybrid, but these three people were absolutely convinced that the company was going to come apart before then, because neither one of those was going to give in to the other one. I looked into that more and presented that story to Ken and a roomful of his direct reports. Halfway through, he got up and said, "Thank you very much. That's enough." He walked me to the door and he said, "I'm disappointed," and I said, "In what?" He said, "I wanted to know how to combat Wang and you didn't do that. You just told me forget about Wang and that was it." And I said, "That's right." He said, "Who am I supposed to worry about?" I said, "There's a small shop called Microsoft and that's your problem." He said, "Well that's another day. We'll talk about it." I said, "Okay." That was the situation.

Then another thing that I was doing, I was determining how good the functionality was in some of our products. I developed a comparative analysis technique so that I could do the same for the competition. The information was publicly known, so it was just a question of putting it alongside and equating it, and then putting weights of importance on what was really important and what was trivial. I was writing up these scores and presenting them, but I was presenting them using statistical techniques. I was using normal curves and statistical planning procedures. I was getting dull, uninterested blank stares from the senior management. They couldn't appreciate what I was saying, for the simple reason that it was just a series of words. And there were many times when I would come out of these meetings and say, "What the hell am I doing this for?" I'd work like a son of a gun and lay it out. I could see it plain as can be that we ought to be strengthening this and not worrying about this, and yet I could strangle these guys. I called Bob Everett, who was Director on the Board of MITRE [Corporation], and I went to his office in MITRE and sat down and I told him exactly what I just told you and I showed him some of my results. There was one technique that I was sort of using mental curves. I could show them, even though the strength of the VMS timesharing system was not that strong in many situations where our customers had these needs; it was actually better than a whole bunch of PC's. And he said, "Your information is correct, but the tools you're using to show it to the managers is not." He said, "They're not schooled in statistics or graphics that you're showing them. You've got to come up with some visual arrangement that will show them what the real situation is". And he said, "I'm not telling you what that is," but he said, "That's what you've got to come up with."

I wasn't to the car in my parking lot when I came up with intelligent vectors. I almost ran to my desk when I got back to the shop and I started sketching things. An intelligent vector is one that if you click on the thing, it tells you what it is, and what qualities it has, and what directions it's going and all these other things. So just for the heck of it, I went back to the same stuff I had done and I applied intelligent vector technology to it, and I came up with what I call vector strings. Think of a product that has a whole bunch of features, each one of them can be categorized into nodes. At the top of the description of your functionality, you've got maybe six things that describe the product. Each one of those has a vector assigned to it. It then explodes down level by level, and each one of the things that is dropping down becomes a vector and so forth, so that they can be walked down until we can see everything about that particular functionality. The trick is to get the expert opinion as far as how good that capability is, and also, to get some idea from either customers, or market watchers as to what features are hot and which ones aren't. Then you apply rates of importance to those vectors. Now the question is how to do that, because if something is important it would that have a dividend for being important, and if its not important it should have a debit.

I came up with a technique. I think I invented this. I came up with the idea of a square vector. A square vector is one whose components are exactly equal, the X and Y are equal. If you think of a feature being the flight of an airplane, and then you think of the importance being the wind, then the wind is going to push the plane off course. If it pushes it off course, it's also going to affect the speed of the plane. So depending on whether the wind is friendly or unfriendly, you've got a problem. So I took the technique of applying that to a vector that was representing a feature with a particular score. And if it were important, depending on how important it was, you extend that feature from, say, a 4 to a 4.8. But at the same time, I pushed the .8 to be a vertical, as well as a horizontal. So now, instead of having a line that has gone from 5 to 5.8, I have an angle that's going up with a horizontal that's going 5.8, that also has a vertical 5.8. And so the angle is showing visually that this is an important feature that has been rewarded because it's above the horizontal. And depending on how much it's been rewarded, is going to be reflected in the size of its angle. So then if you take, say, the top six things in the description of a product, however you get the features on the way-- which is another story-- once you get that information, you apply that rating and you have vectors that are bent either down or up. If one is of no use to anybody, it's pointing straight down, because it has no forward thrust at all. So if you want to shut off certain features, all you've got to do is give it a weight of zero and bingo, you've taken it out of the situation. So now I've got a technique for showing in one vector string how strong something is. And then if you sort the vectors from least important to most important, the ones that are least important are coming down, and then in the middle, they're even. And then the winners are on the right hand side and they're longer and stronger. That is my vector string. I have a patent on it, believe it or not. <laughs>

Hendrie: Okay, cool!

Gilmore: And so if I'm evaluating four products, I take the four vector strings and put them over one another. And I can do as many as practical. And in one glance, let's say we're looking at a dozen

contenders or rivals. In one glance at the top vector chart, you can see immediately who the winner is: who's the guy who has the longest horizontal thrust. Interestingly enough, if the arrowhead is above the horizon all of it is weightless, that means the thing is improved all the way around. If it has suffered in the back dramatically, and then come out with a few winners, the arrowhead will be below the horizon. From there, you see a weakness or strength, and all you do is click on it and the computer shows you that vector's entire picture down below, which is another complete set of vector strings for that particular item. So for example, if it were cost, you come down and you see the eight major portions of the cost and how they shape up and so forth. If you're interested in this particular cost, you click on it and boom, you've got it. See the thing that meets Bob Everett's requirement to get to the knowledge of the observer is that a guy can click the hell out of the damned thing and spend as long as he wants to, but when he's through, he can walk in just like I did with Wang and he can say that particular product has a weak computer down here. <laugh>

Hendrie: Yeah, right.

Gilmore: That's going to be an important situation, and we should make sure that ours is stronger than this guy's. So that's what I do and I've been doing it ever since 1992. And up until just three years ago, I only had a small number of clients, but they were companies that had big decisions to make. They thought nothing of spending $30,000 or $40,000 for a complete analysis of what they had to do. One of them was to decide which computer vendor to line up with for the next five years, a pretty strong impression. Another one was whether or not to switch from one operating system to another operating system. I did an analysis of MT against Novell in 1995. That was the sweetest thing you ever saw in your life and I didn't evaluate one feature. All I did was play master of ceremonies. I had an inside group of 26 experts. I had three outside groups, one that was a specialist in operating systems in general, and the other two were specialists in what the two rivals were good at. We wanted to make sure that we were scoring fairly to both vendors. I have tried vendor's alternatives and so forth. I now, just in the last year or two, I now call them rivals. My vector strings are hurdlers. I have grid lines that separate the vectors so that it's easier to read. Each one of those grids represents a criteria hurdle. So when you look at something, you can see up until this point, they're neck-and-neck, and then all of a sudden, this guy is pulling away from this guy. So if you use the concept of a race, it's easy to do. So that's been my passion ever since I walked away from Bob Everett's office in 1989. Ask my wife and she'll say no.

Hendrie: Did you leave Digital then or no?

Gilmore: The ending, as far as Digital, is simply this. The VP in charge of software at that time took a look at what I had done and immediately gave me an award for excellence in coming up with something, and then they turned and said let's make it a product. Pretty good, huh?

Hendrie: Yeah. Who was the VP of software then?

Gilmore: Unfortunately, he died of cancer, and he died like six months after that situation. Keating got into the act. Do you know him? Anyway, he's a real good guy. He picked it up where the other one left off. I'm sorry I can't remember his name. But anyway, Keating said this is terrific and we'll make it a product, and so I got transferred down to a group he felt could handle it better.

Hendrie: What year is this?

Gilmore: 1991. From 1989 to 1991, I was doing it myself, showing people how it worked and so forth and giving papers. I gave a paper on the management science conference on this in 1990 or 1991. I tried looking for the book, but I'll get it to you before I'm through, because there's an interesting story about that letter. <laugh> But anyway, he came to me in the latter part of 1991 and said, "Everything is imploding. We have to cut back, and cut back and cut back." And he said, "I have to tell you that I'm taking a package next year myself." And so like a ton of other people, in 1992, we left.

Hendrie: Has Ken gone yet?

Gilmore: Ken had not gone yet. I don't think he left, no.

Hendrie: But things were not good.

Gilmore: It was sad. It was sad. The thing that was even sadder was-- and you're seeing it in Microsoft now-- the talent is leaving. Programmers were leaving. The last guy to lock the door is the human resources guy, you know.

Hendrie: Yes, exactly.

Gilmore: I didn't have a human resource division in any company I ran, never. As a matter of fact, any side service, as far as I'm concerned, should be an outside vendor. Stanford University was explicit in that every man in an organization structure should have complete authority from that leg down. That was their rule. They hired and fired at that level, and everything else. That was it. Now, Ken did the same thing until the boys from--

Hendrie: Till Gordon Bell.

Gilmore: No, no, not Gordon Bell, Data General.

Hendrie: Oh, till Data General.

Gilmore: Did you ever study at Data General

Hendrie: No.

Gilmore: Three computers were challenging for the next computer for Ken back in those days. He decided he would be a Machiavelli and he asked for three challengers to the next product. They were all good teams. The team that came in second, was the team that ultimately got so upset in not being the winning team, as far as their computer was rejected, they walked out the door with the plans, and they started their own company with the plans and they built that computer. Ken never went after them, never. He could have, but he didn't.

Hendrie: Really?

Gilmore: Absolutely correct.

Hendrie: And they built that computer.

Gilmore: Right on the button. They had a running head start. The first Data General computer was the one that they wanted to build inside of Digital. Then Ken took the other one.

Hendrie: What was the other one?

Gilmore: <laugh> I've forgotten.

Hendrie: That's okay.

Gilmore: It had to do with the theory of management. He said, "it was my own fault. I should have had some detective situation, and the fact that I didn't, I'm not going to penalize them. Even though ethically, they shouldn't have done it, there was no rule except the rule of ethics, so now I'll do something to make it not an attractive thing to do". So he went and asked the administrative VP to go find a consulting firm to recommend how to be organized to prevent that from ever happening again". Boston Capital got into the act and they introduced Ken Olsen to Matrix Management. Need I say more? That was the kiss of death.

Hendrie: So that's where Matrix Management came from.

Gilmore: Right. When they got through with the rules and regulations, a product manager was fighting four or five different forces as far as what he could do. I'll give you an example. When I was a product manager, the sales department called up and said, "We've got a situation that we want to talk to you about," and I said, "What is it?" They said, "We have three candidates for sales, and we think they're ideal for selling your product, word processing, but we have a budget of so much money per salesman that we bring on, as far as training and so forth." And he said, "In order for us to go after these three guys, we need $100,000 over the next year to cover the overhead and expenses and all that crap that's built into, again, the Matrix Management thing. Everyone's getting a piece of the pie. I went to my financial guy and I said, "How are we fixed for money?" and he said, "Our reserves are in great shape." I said, "Do we have $100,000 I can play with?" and he said, "Sure." So within 15 minutes, I called back and I said, "You've got it. He said, "My God." He said, "How did you do that?" I said, "I just did it." "What are you talking about?" I had run another company for seven years and I could do that and I just did it. Three days later, the financial VP of digital-- and its best we leave the names out-- he called me. He started the conversation by saying, "What the hell are you doing taking $100,000 of my money?" I said, "It's not your money." He said, "It sure is. You just think it's yours." And I said, "Well I'll tell you what, I spent it," and I hung up on him and I got my three guys, but that was it. You stayed within your financial rigid situation and that was it. And as long as you were a few points one way or the other, you were a good guy, if you screwed up, you were a bad guy. But any innovative thinking was crap, and that's because they come in and they lock in and they create meetings because they've got to be in on things. There are meetings, and so they must be busy, they must be worthwhile, so they must have great salaries, blah, blah, blah. Anyway, that's the experience I had. But I've got to tell you, Sam was the kind of guy that backed me up on things like that very nicely. I went to him and I told him what I did and he said, "Tough. Do it yourself." And as it turned out, the three guys turned out to be fine.

Hendrie: They were good people.

Gilmore: Yeah, yeah.

Hendrie: Sales had not been pulling your leg. These were good candidates.

Gilmore: Yeah. I think we need to talk about what I did after 1992.

Hendrie: Yes, good. Why don't you do that?

Gilmore: It's really not terribly big stuff. I decided I was going to be content being my own consultant, but instead of just going in and saying do you want some expert advice or whatever, I sought out people that could use my software. I was a consultant with a bag of software and I tried to push the use of that on the side of master of ceremonies and so forth. I learned that at Digital, because this one particular company heard about me from a consultant at Patty [Patricia] Seybold Consulting, another data consulting firm. Patty and I are good friends. One of her contemporaries heard about what I was doing somehow, and I showed it to him and in the process of talking with this client, he in effect told the client about what I did. So I started working as a technical client for Digital with this company. And when I retired, I continued to do it with this company. I enlisted them at least eight or nine different jobs for them over the next five to seven or eight years. It was a nice setup. And fundamentally, each time I did a job, I always found at least half a dozen features that ought to be in there. I kept fine-tuning it and fine-tuning it. Then two other guys got involved. The first guy that was using me went over to EMC, and the guy that replaced him started using me. <laughs> And then the one that came in again, he used me. And then they all went, and so now I had three disciples. I wasn't making a tremendous amount of money, but I wasn't doing too bad. I was having fun. I got up every Monday morning and could hardly wait to do what I wanted to do. And that was my father's advice to me a long time ago, when I was still trying to figure out what to do. He said, "You go find a job that when you get out of bed on Monday morning, you're going to look forward to it. If you don't have a job like that, then you're in trouble."

Hendrie: That's good advice.

Gilmore: Yeah, it sure was. He was a pretty good guy. And so I continued to do mostly big jobs, mostly RFP's, but very interesting ones. And then I wound up doing one for Microsoft that did not require a team of experts, but rather required a team of analysts that were measuring performance. It was an analysis of AOL, MSN and Yahoo. And what they had was timings, as far as how long it would take someone to do it using MSN versus each of them, and how long did it take to learn, and who was first, who was second and third and so forth. I changed and modified the service of the software to meet that situation. The good news, for what it's worth, was that Microsoft was ahead of those other two, based on that analysis. That was right up to the night before I had double-knee surgery. I had two or three months of recovery. I came to the conclusion that after at least ten years before I had modified or upgraded the thing and so forth, so I decided to completely analyze my 40,000 lines of code and build up the interface and throw in some things that I wanted. And so for the last few years, that's what I'm doing. I am this far away <holds up hand with fingers slightly apart> from starting to solicit and starting out again. I'm going to go back to work.

Hendrie: Cool! Good for you! Sitting around playing golf--

Gilmore: You know I love to play golf and I love to enjoy myself once in a while. This business of being a full-time golfer is not for me.

Hendrie: Well unless you have the talent to play in competition--

Gilmore: I think I could be a low 90's golfer, if I wanted to. I was consistently 102 playing four or five times a month. People say, "How can you sit in that room of yours upstairs"? We see the light on at 2:00 in the morning sometimes. What the hell are you doing up there?" <laugh> In fact, I was at dinner just a few nights ago. My wife has been away for two weeks, and its right before she's coming back. And so they're taking pity on me, they invited me to dinner. And I said, "When I get in front of that screen and I'm trying to change an algorithm, I'm in never-never land. I'm just gone." And talk about thrills of getting a hole-in-one, to put together a loop of logic and have it finally, after you've found all errors, and all of a sudden, you see it go through and it's going through, and now all of a sudden, it's running properly, there's no better thrill as far as a programmer is concerned.

Hendrie: You found your love-- <laughter>

Gilmore: Oh yeah.

Hendrie: -- for aeronautical engineering and you haven't fallen out of love.

Gilmore: Well not only that, but it has to do with the dyslexia. I think you read the poem that I sent to Gorman, right?

Hendrie: Yes.

Gilmore: Here's the situation, which is very interesting. I recognized this when I was even writing the very first program for Charlie, and one of the reasons why I got turned on. I take longer to learn something because of dyslexia. I've got to go home and really work at it. I'm not one that has a photographic memory. I have damned good talent, but it takes me a long time. One thing, I've got the discipline of not just trying to do it as quickly as possible, I think it out The other thing is the dyslectic has a gift as well as a handicap. He's got multidimensional vision. A dyslexic programmer can be thinking about all these other routines and it's not bothering him. Once he's learned that and he's got it, he knows that he's got to worry about this, he's got to worry about, and now he's working on this.

Hendrie: You see all the interactions in your head.

Gilmore: That's right. And I think the gift is with the deficit. I really do. It sometimes irritates my wife, because in bridge, being dyslexic, it takes me so long to figure out how many points I've got. <laugh> Isn't that silly? I mean some people can go boom, I'll bid three. <laugh> And ask me to spell a word that you've just spelled for me, take an 8-letter word and spell it to me and have me try and repeat that, I can't do it. I can't do it.

<End of tape>

Hendrie: You had mentioned you had some thoughts for younger people about following their destiny. Could you elaborate on that, Jack?

Gilmore: Yeah. I'd like to pass something on. I'll be 78 in two more days. Looking back on my life, it's been extremely pleasant, good childhood, some very, very interesting things to do and so forth. But one of the things that I found was pretty early in my game; I knew what really turned me on as far as intellectual activities. It was primarily because I had some good teachers that almost pulled it out of me. Looking back, I think the best one was my physics teacher in English High School. I thought physics was just going to be one more course. I found myself loving the stuff. And putting a typical dyslectic technique, I wrote my own manual on the physics thing that was that year. But at any rate, as you move along in your life, you definitely know where your strengths and weaknesses are. Sometimes, however, as far as your career is concerned, you ignore those, if in fact the financing gets in the way, or your better half is not interested in moving to a particular place or whatever. You've got to be careful of that, because you have a destiny. I'm convinced everyone has a destiny, and the sooner you sense what your destiny is, the better off you are. I just knew that I had to be in the software world, and on the making of it, not just the using of it or selling of it, but in the creation of it.

The seven years I was a CEO, I think I did a very good job and I think the quarterly reports will show that. And when I stopped being one, I was pretty unhappy, because that wasn't my decision to leave. A year or two after that, I realized that I was on the right track, even though I hadn't chosen it. And I really have very strong feelings about the logical designer upstairs in effect saying, "I think this guy should be doing this sort of thing a bit." So destiny is a God-given thing and not something that you pick yourself. I just wanted to pass that on as best I could. When I was in the Navy, flying off the carrier and so forth, someone later on in my life who knew much about it said that the naval aviator has an interesting job, because he has to be very careful, because one false move and he's dead. In my career, I had at least almost a dozen of those. I was a dive bomber in advanced training making a run on Padre Island when it was a training facility, <laugh> instead of a bunch of condos now. It took me a moment to move my thumb over to the rocket button to the bomb's button, because I had forgotten that this one was for bombs. I went through 10,000 feet in that process, and so when I finally let go and was pulling out, I was looking at surf, which mean that I was less than 200 feet off the beach. I didn't think a bit about it at the time. I said, "Oh that was lucky." About ten years later reviewing it, I said, "My God, I was so close to death, it wasn't even funny." I kept saying to myself, "Why was I spared? I could have been _____ into the sand." Another time I was being taken from one field to another. I had to take another plane back. The only seat in the plane was to sit in the tail wheel, way down at the base of the plane. We lost an engine and we had to crash wheels up. The first thing to hit the ground was my tail wheel. And a periscope that was between my legs-- it was a torpedo bomber-- the periscope hit my knees and both feet went up. And just then, we encountered a set of railroad tracks perpendicular to our path, and it acted like a knife and it cut the chair right in half out from under me. Then equipment was coming all over me and so forth, and I was buried in sand and equipment in the plane, sitting in 2 ½ inches of gasoline. And they're trying to open the door to what was left of the plane, and they're trying to do it without causing

a spark; otherwise, I would be a pretty toasted. <laughs> I couldn't walk, because it appeared that every bone in my leg was busted. The pilot who was in the front cockpit had broken his back in eight places. My electrician that was on the trip with me was in the middle cockpit up above and he came out beautifully, thank God. So I, for the most part, said I've got probably a rehab of a year or two to fix everything. The doctors came back to me and they said, "We don't know what's wrong with you. And I said, "What are you talking about?" And they said, "You don't have anything broken in your leg. You're entire nervous system is asleep. We think the thing that hit you so shocked the nervous system of your leg that it completely shut off everything and that's why nothing is working." He said, "If we're right, you're going to get pins and needles first, and in an hour-and-a-half, you're going to walk out of here." I couldn't believe it. I did. Walked down to my ready room and my fellow pilot said, "I just come back and wondered what kind of a double amputee I was going to be." And then I walk into the room and they said, "How did this happen?" And again, I casually threw it off and I was flying the following Tuesday and didn't think nothing of it. After I left the service, I looked back and I said, "My gosh, why did this happen to me? Why aren't I a piece of sand or a piece of this and that and so forth?" Anyway, I guess my parting words are keep your eye on what's happening. If something dramatic happens, it might be that you're destined to do something that you didn't think you were going to do, but somebody wants you to do it. Ronald Reagan said it the best way after he was shot, when he survived that assassination attempt. He looked up and he said, I guess He wants me to do something else before I die," so that's how I look at it.

Hendrie: That's it. Thank you.

Gilmore: You're welcome.

Hendrie: Well thank you very much for doing this interview for the Computer History Museum. Thank you, Jack.

END OF INTERVIEW

