MAX HOPPER
ORAL HISTORY

COMPUTERWORLD HONORS PROGRAM
INTERNATIONAL ARCHIVES

Edited Transcript of a Video History Interview with
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Max D. Hopper Associates Inc.

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With no objections being heard, it's my great pleasure to begin this interview, Max, by thanking you for coming and asking you to start at the beginning. Tell us when and where you were born and something about your parents.

MH: Dan, thank you for allowing me to be here. It's indeed an honor and a real privilege. From what I've been told, I was born November 4, 1934. I was born in a little log house north of a town called Lufkin, Texas on land that my grandfather had bought and established a second family somewhere around the start of the 20th Century.

He was, I think, in his fifties or so. He married my grandmother, who was at that time considered to be an old maid in her thirties. They had a family of four living children: two sons and two daughters. My dad was the second son when he was born. His name was Irving Washington Hopper. He was born in 1910.

A little about my grandfather that I do know: I believe he was born in Mississippi. At a very early age, he served on the riverboats as what they called a butcher boy, carrying papers. They came to Texas to try to escape the Civil War—or his dad did—and was unsuccessful. My grandfather did some early trail rides to St. Joseph, Missouri from Texas and they had various Indian encounters and a host of other things that became the folklore of the family.

On my mother's side, all of my family settled in this area around Lufkin, Texas, somewhere around the end of the 19th/early 20th Century. They all came from the South, from the Tennessee, Mississippi area after the Civil War. Times were very hard and they came to Texas to find cheap land and hopefully, a place to live.

As to my immediate family, my dad was born in 1910; my mother was born in 1913. They lived probably ten to fifteen miles apart growing up, but I don't think ever really knew one another until a year or two before I was born. They were married, I think—I'm not sure of the exact date—a year or so before I was born.

It was during the depths of the Depression. In those days, people didn't always finish school or have school. The high school that my Dad was in, I don't even know if it went to the 12th grade. He went to the 10th grade. Of the three other children, his sister, the youngest, went to Lufkin for her last couple of years, so she could finish high school.

DSM: Lufkin was about how far?

MH: About six miles, but that was a great distance in those days, although my grandfather did have a Model T for a while. As for my mother, her greatest achievement in life she told me many times—and she's unfortunately very seriously ill now, approaching her 87th year—was graduating from high school. It was quite a remarkable thing in those days to do so, at least in that part of the country.

It was still very much almost 19th Century life. The things I can remember, because we lived so close to my grandmother and lived with her for many years, I can still remember her doing things like making soap, taking corn and creating hominy. I don't know if anyone would know how to do those types of things today. She was a great quilter and did a lot of that type of work.

I remember sewing frames that she had in her little house that was built three or four years after I was born. They tore the old log house and built another little three-room house that she lived in. My grandfather died about that time and she helped earn spending money with her quilt frames. I remember the wooden sewing spools that were great toys for someone at my age and playing under the quilt frames. Those are things that I recall growing up. It was a world that was vastly different. The new house that they built had electricity. The old house did not.

DSM: When was this?

MH: This would have been 1938, 1939.

DSM: It was part of the Roosevelt era?

MH: Right. My grandfather died--that was a very traumatic thing to me. It was one of the first memories I have of that kind of situation. I think I was about four years old when he passed on and I remember them taking me to the funeral and almost forcing me to look in the grave, which I didn't want to do. That was one of the negatives, I recall, as a youth.

DSM: Lufkin is in east Texas, isn't it?

MH: It is in east Texas.

DSM: In the piney woods?

MH: In the so-called Piney Woods. In fact, there are national forests around it today. It was very much a logging town. There was a big paper mill that was built around those times and there were some foundries or forges that built oil field equipment in those days. It was semi-industrial as well, but all the area around it was rural and settled by essentially small family farmers. My grandfather had about 20 acres that he ultimately divided among the four kids.

DSM: Was the family pretty close?

MH: It was fairly close. My grandfather, in the later years--and I don't really know what his earlier occupation was, other than farmer--became what was called a singing teacher. In those days, Gospel singing was a very much traditional thing that folks did. He became a teacher, a singing teacher. They had singing schools and he would teach the schools and he would lead the singings.

The four kids formed a quartet and they all sang different part. My dad was the bass; until the day he died, he still loved to go to so-called singings. He wrote some Gospel songs and music and that was kind of one of his avocations through his life.

DSM: Did you ever capture them on tape?

MH: Unfortunately, no.

DSM: So, yours was a churchgoing family.

MH: Very much. My grandfather donated land across the road from the house for a church that my grandmother attended. It was a Pentecostal Church in those days, one of those that was very close to the Bible, but encouraged music. We lived off and on with my grandmother. I don't recall living there, but I was born in that house, and with them. I moved to a few other houses.

I've been shown pictures of where we lived. I know when I was about four or five, maybe five, we moved back there and my dad and my grandfather—my mother's dad—built a house on our part of the land that was given us. Between our house and my grandmother's house was this church that my grandfather had donated land for. As a youth, as a very young kid, I would go with my grandmother to church and Sunday School and know all of her friends. I had a tremendous, if you want to think of it, support group of her friends, who were a lot of the quilters. Those were very joyful times that I recall.

DSM: Did you sing in the choir?

MH: I was too young to sing in the choir in those days. I don't recall they had a choir, but they did love gospel music and sign those songs.

DSM: Your mom, what did she do?

MH: It was an interesting thing, thinking back on it. My mom lived about six or eight miles away. Her life was a bit different. She came from a family of four living children as well. But her mother died of the flu epidemic in the 1917-18 time frame, when she was three or four. My grandfather did a despicable thing. He married a grass widow. Now my grandfather and my mother grew up in the religion called the Church of Christ, which was very rigid. I think that is best way to describe it in terms of their belief.

You could not marry someone who--a divorce was not accepted in those days. My mother remembered that woman. In fact, she became her mother, if you want to think of it, for a period of years. Unfortunately, she decided to go back to her first husband, so everything was right in the world in one sense, but was wrong in another.

DSM: I know what you mean. I had a grandfather who was a Quaker and married a Presbyterian.

MH: It's interesting how in those days, tolerance was not really there, not compared to what we accept today. But I think, to some degree, that forms your thinking patterns. Are you going to accept tolerance or not accept it? Looking back, I can think of it having a place in my own view of the world.

My grandfather, I always thought, was a little bit rigid. He had mules and he farmed and was a carpenter. Those were the two occupations that he practiced. He and my mother's brother—who was, to some degree, mentally impaired. He just never fully developed his mind, and always lived at home. I can remember them plowing with mules and planting the ground and I can remember one year when they raised cotton, and helping them try to pick cotton. I can remember falling off a wagon full of logs that were being hauled in to heat the house during the winter and having the wagon roll over me at about four and managed to survive that. Fortunately, it was sandy soil and I think my little body just melted in the sand, so to speak.

But those are things I remember that way. The one thing I do recall from my parents, grandparents, grandmother, was they always worked. I guess when I think back on things that did push me, they were active. They were always active. I remember my grandfather (my mother's Dad), even after he quit farming and so forth, he still tried to find things to do. Occasionally, he would spruce himself up, so to speak, and go sit on the front porch and watch the world go by. But that was not often. When I think of things that maybe formed my, to what degree I do things, I think those were some of the things that have driven me.

DSM: I see you playing with spools under the loom. Were there any stories they used to tell about you as a little kid that gave you any inkling of your mechanical aptitude or where you were going to be later on?

No, I'm not sure I had any mechanical aptitude. It's interesting—the things that did drive me that I do recall—particularly with my grandmother. I remember I wanted a wagon. In those days, of course, there wasn't money to buy much of anything. I think it was probably for my fifth or sixth birthday, I got one of these wagons from a Sears catalog. It was a wooden bed wagon with the red paint on it and it had the tongue. I remember that my grandmother always, for many years, had her own garden and I remember earning my first dollar by pulling stuff up for her out of the garden.

DSM: What about school? When did you start school? Did you go into Lufkin?

MH: No, I went to the little school that my dad had attended. It was called Central Consolidated School. It was about ten miles, maybe eight to ten miles north of Lufkin, about two or three miles north of where we lived. I rode a school bus. When I started I was almost seven, because you had to be six by September 1 or Labor Day, whenever it was, to start. There was no kindergarten, so you didn't start to school until you had passed the age of getting there.

It was a fairly small school, at least when I started. I don't think there was maybe one room per grade, no more. The heating was wood stoves and they had huge woodpiles that were stacked up. As kids in the first and second grades we'd make paths through the woodpiles and build forts and those kinds of things.

The playground, to the degree it was one, had a few swings. It had no grass or anything else. It was rough gravel and the early pictures of me in the first and second grade always had a skinned nose from falling and skinning my face on the stones in the playground.

DSM: Did you learn to read when you were in school or before?

MH: As I recall, it was in school. I don't recall learning to read, other than I do remember my mother encouraging me to do various things. I remember the one thing she did before I started to school, was buy some early edition of some encyclopedias from some traveling salesman. Again, she was very much into education. I don't recall really having any books or anything that I could read before I started school.

DSM: I didn't ask you about brothers and sisters. Who did you play with?

MH: Primarily, I had a brother that was two years younger than I am, named Dan, and he and I had some of the best fights growing up that you can imagine. He and I had very different personalities. He was always getting into mischief, and just seemed to want to and I was always trying to be the good guy. I had a sister that passed on when I was about seven. She was a little over a year-and-a-half old, as I recall. I had another sister that was born about a month before that or maybe two or three weeks before that. Growing up, there was primarily my brother.

I had a couple of cousins, one that was a couple of years younger than I was, and a boy that essentially lived right down the road. My aunt had property and they built a house, so they lived not far from us. At the time I was about eight or nine years old. My dad's brother lived another five miles or so away. He sold his property and lived in property that his wife had gotten from her folks. He had a couple of girls, one that was slightly older than I was and one that was almost a year younger than I was, but started school at the same time that I did.

DSM: You were all together?

MH: We were together at Christmas and those kinds of things. We were always together in those kinds of situations. Another unfortunate incident that I recall, they had a brother that was slightly younger than my brother and my cousin, and we were going across the road one time to my aunt's house. He ran in front of a pickup truck and was killed. That was not too long after my grandfather died, within a year or two. Those were the two tragedies that I remember and then, my sister died. Those three things and I can still have that feeling. I don't know what it did, but it ties in with some other things that my mother did. She would send me across the road to buy candy and cold drinks and those kinds of things. There was always a sense of independence, risk taking, of fate, maybe. As I think back, as I have gone forward, I am more of a risk taker than a lot of folks. Not necessarily "unregarded" risk, but at least I've been willing to do things.

DSM: You're starting school in 1941, 1942?

MH: 1941, right.

DSM: Your family seems to fall into that group in which all the kids were too young to be directly touched by the War.

MH: Right.

DSM: And you parents were probably a little too old. Did the War touch you?

MH: Yes, in a couple of different ways. One, my sister died the day Pearl Harbor was bombed, and that was something it obviously always touches off. My uncle decided to go into the service, although he had enough kids and everything to keep him out, but...

DSM: Volunteered?

MH: Volunteered for the draft, I think, for some of the economic consequences of what it might offer. To that degree, to this day he claimed that he encountered some heart problems and so forth. It seems to be a farfetched story, but unfortunately, it did, He did die relatively early and had that tied to it, at least so he said. What it did for my family, I think, was it ultimately offered jobs that took us to a little town called Texas City, which was on Galveston Bay, just north of Galveston and south of Houston. My dad went to work there and then, ultimately, we moved there. My dad had worked on WPA during the Depression for a while and tried to do part time farming and small farming. Like I say, there was just limited work and with his limited education, there was not much that he could do, other than those kinds of things.

DSM: Do you remember any of your teachers in grammar school?

MH: My first grade teacher—I was trying to remember her name and I don't. She had taught school for many, many, many years and, in fact, may have taught my dad. Well known.

I did something a little bit unique. Because I started so late, they moved me up to the second grade at the last half of my first year. I do remember that teacher's name was Miss Modisett and the reason I do was because it was the maiden name of my cousins, or my aunt—my uncle's wife. She was a Modisett. My cousin was so distraught that they moved her with me.

DSM: It was a time people can't imagine now.

MH: They can't. I can remember my grandfather getting electricity put in, and then later, getting running water put in. When we built our new house we had electricity, but my grandfather still did not and I can remember him getting wired for electricity. It would have been another maybe six or eight years before we had running water put in the house, and up until then, there were either wells or cisterns. I don't know if you remember those kinds of contrivances. Before the electricity, I can remember that the way to keep food cool and particularly milk and milk products, was we would lower them down in the well to keep them cool. Now, their timeframe was certainly much less than you would ever have with refrigeration, but my grandmother, when they rebuilt her house she had an ice box, as it was called. She had a refrigerator.

DSM: The refrigerator was one of the first appliances?

MH: Yes, it was one of the first appliances and it was an old GE that had the humming motor on top—a little round thing and little box underneath. Later in her life, very late in her life, she had a washing machine, but those were the only two appliances that I ever remember her having.

DSM: The move to Texas City was a major change.

MH: It was. I was about nine years old. I had also completed two grades of school in my second year. I went through four grades of school in the first two years and then, right after I started fifth grade, I remember we moved to Texas City. As I recall, there was a lot of debate in that school system about whether or not I should be put back. They decided, and for good reason. From a personal point of view, I could handle the educational type of thing, but I was certainly much younger than my peers. They didn't put me back and that continued all the way through high school. I think I was one of the youngest to graduate from high school when I graduated. I was sixteen.

DSM: Where did you graduate from high school?

MH: In Texas City.

DSM: Tell me about Texas City and how it was different.

MH: Texas City in those days was a bit of an industrial city. There were a lot of oil refineries and chemical plants and they were building a lot more. This was at the time of the War. I can remember that we were on the coast during the War. We practiced blackouts at night.

There would be blackout curtains and/or you'd turn the lights out because there were German submarines in the Gulf, and there were concerns that they would either come into Galveston Bay. In fact, at Galveston, they had the batteries—the gun batteries—all along the various beachfront areas and I remember, as a youth, going down and seeing them. They were to protect us against the subs and so on.

The school was larger. As I recall, it was more advanced than where I had come from. I can recall enjoying Texas City. Living there, I had a lot of friends. We bought a house, sold our place up near Lufkin and bought a house in Texas City. I guess just kind of growing up with a lot of neighborhood kids and myself.

DSM: What sort of things did you do?

MH: Oh, we played; we did things most kids did. We played softball. We didn't have necessarily the batting cages and the fields, but we made up our places. It was semi-rural, if you want to think of it. It wasn't certainly, an advanced neighborhood. There were a lot of vacant lots and open land and so on. There were some little ponds that were semi-stock ponds around and we'd go surreptitiously swimming. It was even more dangerous. Almost lost my brother once. Managed to rescue him. I can also remember, we would have--what kind of hair oil did we have? Very oily stuff in those days..

DSM: Slicked back?

MH: Slick stuff. We'd keep one of the little bottles there so when we went swimming, we could dry our hair and put it on, and my mother would never know. We did those crazy things. And we had bikes for the first time. I can remember getting my first bike and that was a big deal.

DSM: Did the town have a theater so you could go and see movies?

MH: On Saturday afternoon—now, that was a big deal. Or, you could go Saturday morning as well and for nine-cents, you could go to theaters and you'd see all kinds of serials. Then you'd have the western main feature, and sometimes a double feature. For a nickel, you could buy popcorn and for another nickel, you could have a cold drink. That was high living.

DSM: I have to ask you, given your later career, what's the first airplane you remember?

MH: I probably was four or five years old. I do remember old biplanes, when I was six or seven years old, after the War started. I don't know where they were doing the training from, but they were still using biplanes. They would pass over and drop flour bombs occasionally and we would, as kids, try to track them and follow them.

The other thing I remember about the early part of the war was people coming in and collecting any bit of scrap metal that you had. I remember my grandfather had a lot of farm implements and those kinds of things that he "donated" to the War effort, just because they were old and weren't being used and people wanted every bit of scrap metal.

It's an interesting kind of thing.

DSM: Do you remember rationing?

MH: Rationing, yes. When we were growing up, you had the red and blue tokens and you had stamps, as well. Some of it was for meat. One thing I do remember my dad had and I don't know how he worked this out, but he had some deal where Hershey Bars. He could get around rationing. Those were prizes, and every once in a while, he'd get a box or something of Hershey Bars, which were a real, real treat.

DSM: In Texas, you can learn to drive and get your drivers license pretty early now, but when did you learn to drive?

MH: I learned to drive at roughly fourteen and had a learner's permit. Then, on my sixteenth birthday, I went and took the test. I drove myself to the examiner.

DSM: What was your first car?

MH: I didn't get my first car for probably--I think I was probably nineteen. I had gone to work; I had gone to school for a couple of years. I couldn't afford a car until I went to work, but my first car was, as I recall, a 1949 Ford. It was a green one and I kept it for, I think four or five years, six years.

DSM: You graduated from high school when?

MH: I graduated in 1951.

DSM: What did you like, what did you not like about high school?

MH: I had a great group of high school teachers. There are several. My algebra teacher and I do remember her name, Mrs. Blockert, in ninth and tenth grade. My good subjects were in math. I was always great in math. When I got to Texas City, they had this little deal that the bank sponsored at two or three elementary schools. The student with the highest average in math got a $25 prize or $50 prize, when you finished sixth grade. There was one for math and one for English. Interestingly enough, I do remember being told to go to the high school graduation. They called me up for one; they were surprised and called me back for the second, so I won both prizes in the sixth grade. In the ninth grade, you got another prize and I remember winning the math prize in junior high.

DSM: Math is such a problem many young people today. Do you think it's aptitude or good teaching or something else that makes a difference?

MH: I think it is both. I can remember doing sequences. I didn't know what those were in those days, trying to do calendar dates and so on, when I was six or seven, eight years old. You could see the logical sequence over time, trying to figure out when days would occur or how many years were in between and so on. Math was something I always had an affinity for.

My dad and his brother always loved to play dominoes or pinochle or hearts. Those were the kinds of games we could play, and so I learned math to some degree in a practical sense, from trying to learn to try to play those games and be as good as my dad and my uncle were.

DSM: You start school as one war is breaking out and you finish high school in 1951?

MH: Right, the Korean War.

DSM: Right in the middle of the Korean War. Did you have some decisions to make?

MH: I'm sixteen when I finish high school. Again, my mother had pushed very strongly for education. There wasn't any question that I wanted to go to college. It was a question of could I afford to go to college in those days.

My dad had moved from a couple of jobs. He was, at this time, a union official. I guess some of the union situations in those days were not totally honorable. He felt very strongly about some things and they kicked him out of the union because he wouldn't go along with some of the top guys. So he lost that job. There was then a question of what he was going to do the rest of his life, and he did various things. For the last twenty years, he was a roofing contractor, but in between, there were issues. That was about the time I was starting school or right after college.

DSM: Not an easy time?

MH: Not an easy time. Other than high school, my mother had no formal education, either. She went to work when I was in high school at a hospital, helping out there. During at least my first couple of years in school, she supported me. I borrowed some money. The Kiwanis Club in Texas City had some scholarships that you could borrow money from and then ultimately repay. That helped out. I had worked the last few years I was in high school in various jobs and had saved some money. But it was not an easy time.

DSM: How did you choose the University of Houston?

MH: I didn't choose the University of Houston. It's interesting, for a couple of reasons. One, the Navy had a scholarship, an NROTC scholarship, and I thought I was eligible for it. I took the test and did very well on the test. They had a group at Rice, which was in Houston. Rice was very good school and had its own scholarship if you got in. I thought maybe I could get into Rice. I went up to apply for that. The problem was, you had to be seventeen and I was not. I was still sixteen. My parents were not very sophisticated and there was no one else really to look after me. I don't know if there was other rules that could have been applied which would have delayed it a year or whatever. As far as I was concerned, a rule was a rule and I didn't qualify. I then decided to go to the University of Texas in Austin—it was a state school. The other big state school was A&M, which was, in those days, very much a military school. The cost would have been greater than going to Texas; Texas appeared to be the best approach.

At that time, especially if you grew up in Texas City, the ambiance of what people looked at is—an advanced approach was—if you were an engineer, that was a big deal. And mathematics, you got steered in that direction. If you're good in math, then this is what you ought to: study. I liked science, as well. I'd done well in chemistry and physics and so on. So I decided—a chemical engineer. Texas City is chemistry and if you could, you always look at home and see if you can do well. I decided I was going to Texas and study chemical engineering. That's where I headed. You were asking about teachers. I had great teachers in a whole host of subjects. English, I'd always loved English. We had a great government teacher. The teachers I had in high school, I can't recall all their names, but I can see them.

One teacher I do recall. I didn't have her for my early math, but she came in later to teach math. We did number sense the last year I was in school. It was mental arithmetic on a timed basis, so you had ten minutes and 100 problems to test yourself. There were also district and regional and state competitions. The last year I was in high school, I did that type of thing and I at least got to state. I finished first in the district, second in regional, but well down in the state. It was my first time to do it, and the ones that I ran up against had been doing it for lot of years. It was still a lot of fun. I can still remember doing that.

DSM: Mental arithmetic, no clue about calculators?

MH: No, no, no, no, no. Calculators were verboten. There was another thing I remember about high school. I'd always liked music and had stayed involved in music and had done some singing, of course in church and those kinds of things growing up. My dad insisted I learn music. They had started a band program, when I was in the seventh grade. I started off playing trumpet in the band, and then, played trombone and did reasonably well with it. I always enjoyed music. I dropped it unfortunately, although at the University of Houston, interestingly enough, the band director offered me a scholarship to go in music.

I had a great time during my high school years. I did the one rebellious act of my life when I was in high school. One of my buddies down the street—I must have been about fourteen at the time—had a Whizzer motorbike. I don't know if you've ever run into those. It was a heavy frame bicycle with what you'd almost think of as a lawn mower motor on it, but it was enough of a motor. It was belt driven. It was actually driven by chain. You could get up to 55, 60 miles an hour with it. It was that heavy and fast. I was fourteen and I approached my mother and dad. They said, "No." I had money in the bank. I had saved my money from my awards and other kinds of things and from gifts. I had about $200 in the bank. I went down and I drew money out of the bank and we went up to a little town, probably 20-25 miles north of Texas City, and there was this used bike for sale. I had never really had much instruction on this, much less on any other. I can remember arriving home, riding down at what was in those days a two lane highway, but it was a highway, passing trucks, and doing 50 miles an hour. No one had heard of helmets. I'm lucky that I survived that day, much less the next several months. I don't remember if I wrecked it or if my brother wrecked it because he used it constantly. But, we eventually wrecked it and sort of saved myself—other than skinned knees and those kinds of things—from sliding it in the gravel.

DSM: Tell me about the transition when you went to the University of Texas in Austin.

MH: I went to the University of Texas in Austin and studied chemical engineering—working, trying to find a place. Started at sixteen and quite honestly, up until the last few months in high school, I did no dating. I was just socially way behind my classmates; I was much younger. That's a pretty devastating thing. Not long after I got to Texas, I met a young lady who ultimately became my first wife and we dated for long time. I was usually working one or two jobs, that kind of thing. I didn't go to a dorm, which I should have done. I initially occupied a room with a friend of mine from high school, which wasn't a good idea.

DSM: Can I ask you about that?

MH: His uncle or someone owned this house that he'd broken up into rooms that he let for students. We were right across the street from the campus. It was very close. It was unsupervised and in mid semester, he joined a fraternity and he started drinking a lot of beer. While I was never quite into it, you couldn't totally escape. I didn't have a stellar career. The other thing about me, if I liked my classes and I enjoyed them, I could usually either do great or I could pass without a lot of work, depending on how much effort I wanted to put into them. If I didn't like them, in those days, I really didn't care.

DSM: And there was a lot else going on.

MH: Right, and there was a lot of else going on.

DSM: You were seventeen years old?

MH: Sixteen or seventeen years old. It was, I guess, conducive in growing up in a different way, but it wasn't necessarily conducive for being the best student in those days. To make a long story short, I got through in roughly two years. Ran out of money in the last half of my second year because my mother had gotten pregnant and had my younger brother, who's now in his 40s. But he was seventeen years younger than I was, named Ricky. She was no longer working. She did find a way to get me enough money, borrowing money, for me to finish that semester. When I got through with school, they had just moved to Houston. In fact, they'd moved to Houston after my first year at school.

DSM: We're talking 1952?

MH: This would be 1952, right. I had worked again at summer jobs in Houston in 1952. In 1953 when I finished school, or at least my second year, I was trying to decide, "okay, how do I go back to school" and those kinds of things. I still don't recall how I ended up applying for work at Shell Oil, but I did. They had a job open for a lab technician at their research lab. They used some short IQ test that had a lot of mental arithmetic on it. I aced it and scored, they said, one of the highest grades they'd ever seen.

The other good thing was that they had just hired a couple of young PhDs in the chemistry portion of the research lab. One happened to come from the University of Texas and he was willing and I had taken chemistry there. At least he knew--I don't recall if he was my lab instructor—at least he knew the one that was or something along those lines. The combination of that little bit of luck, or those two little bits of lucks I guess, enabled me to get a job at Shell's research lab as a research technician.

DSM: Great company, great business.

MH: Yes. The irony of this was that I was the first one of my family on almost either side, immediate family, to go to college. My mother had a couple of aunts that had gone to college, to go as teachers, but on my dad's side, other than my cousin who started to follow me, I don't think any had.

There were the males in the family—my dad, who was not necessarily a strong supporter of me going to school, and my mother's sister's husband. He, in effect, was in charge of maintenance at one of the larger hospitals in Houston, but had no formal education beyond high school. They were obviously thinking that all this going to college wasn't worth it, except that the salary that I got as a lab technician at Shell after two years was essentially the same salary my uncle had working his way up and was not far from what my dad was earning as an individual.

DSM: This is when?

MH: This is 1953.

DSM: Were you getting paid by the hour?

MH: I was paid by the month. I earned $330 a month. I can remember it to this day, and I got a $13 raise before I went to work because they got a general increase of whatever it was. That was an unheard of amount. The entire amount that I probably used in college in my first two years was no more than maybe $500-$600 a year, if that. So, this was prosperity.

DSM: You're now working as a lab tech?

MH: Lab technician.

DSM: Shell Oil labs?

MH: Right, the research labs.

DSM: You're seventeen?

MH: I'm eighteen.

DSM: How long did you stay in this job?

MH: This was 1953. As I said, I was still courting; I spent the next year probably going to Austin, where my girlfriend was, almost every weekend. I bought my first car. I married at nineteen, and she had just turned twenty. Within a year, we set up housekeeping and those kinds of things.

DSM: Your first car was what, a 1949 Ford. Boy, that was a great car.

MH: It was a great car. Quite a transition from 1948 to 1949.

DSM: I always thought that was such a cool car. That was a real vehicle. How long were you with Shell?

MH: All together, including my time when I was in the service, about thirteen years.

DSM: And when did you leave?

MH: It would be 1967.

DSM: Tells us about your military service.

MH: I was among the group that enlisted when the government was going to stop the VA bill for college. I was among the group in January 1955 that went into the service to ensure that I got the educational bill.

DSM: What branch of the service?

MH: I joined the Army. It had the shortest enlistment time. There were several attributes around that. First of all, Shell had a military policy that if you went in the service, they would pay you up 1/2 of your salary to bridge the gap between your military pay and your total pay. From an economic point of view, whatever pay I got in the military got made up to almost a full amount, or at least by the time I was getting through. Second, it appeared to me that the only opportunity that I had to go back to school—and I wasn't sure if I wanted full time or part time or how to do it—would be to have the ability of the GI bill.

DSM: Was Shell doing that because they knew their guys were going to have to go into the Army and they wanted to make sure they kept them?

MH: This was a policy that had been in place prior to the Korean War and it was still in place as of this time. I don't know if they've continued it forever or if they ever stopped it or not, but I went down and talked to a recruiter. One of the first things they do is give you some kind of a test. I've forgotten what it was. I scored very well on the test and they talked to me about this secret branch of the Army called the Army Security Agency.

My brother, who was two years younger than I was, decided that he was going to go in as well. He did all right on the test and we both were selected to go into the Army Security Agency. This was January 1955. They put us on this cold train out to Fort Bliss and El Paso. Houston was a very warm climate. We didn't have cold clothes and we went out to Fort Bliss. There were so many people that went in the military that month, they were unable to handle it; they hadn't anticipated this. They were not processing people, so we spent a couple of weeks there in transitional things. I know there were several days before they could even get us clothes. We were wandering around what were some temporary barracks, and they were trying to feed us and trying to keep us occupied. Then they gave us these flu shots. One of the worst things they ever did.

Anyway, long story short, they send us off to Fort Ord, outside of Monterey, CA for basic training. Again, there were very old barracks because they were not prepared. Didn't have very good enlisted men. The people that we had that were our cadre, I think we called them, were pretty much folks that were getting out of the military and weren't going to stay in and certainly were not very interested in training a bunch of new recruits. So basic training to me was not a great time, for many reasons. I quickly determined I was a little too independent for the standard military life anyway. I had been married only six months and I was homesick for my wife and a host of other things.

DSM: She was back in Texas?

MH: Yes. On top of it, the climate at that time of year—February in California—is not the best. It was one of the cold winters. We even had snow down in the Salinas Valley. The weather was such that you'd be freezing cold in the morning, so you'd dress for that and then it would get very warm in the day and then you'd undress. By late evening, the fog would roll in and you'd get cold again. Everybody was sick. I caught pneumonia and what they call an upper respiratory infection. They sent me to the hospital for three days and then said, "You've got two choices. You can recycle for two weeks or you can get out of the hospital." I was coughing up blood for months. I mean, just gross, but it was unfortunate. I just wanted to get through. Basic training was not fun. I went home. Then I was sent to Fort Devans, Massachusetts for training. The MO they selected for me at that time was a Morse intercept operator, so I learned to take Morse code, listen to it, from a whole host of things. It was a fun school. It was about six months.

DSM: Can you still take Morse code?

MH: Yes, I think so. I finished first in my class, so I got a choice of assignments. My wife had come up to join me in Massachusetts. She drove my old Ford up and stacked it with all her worldly possessions. I still can't imagine her doing it, driving from Texas to Massachusetts in those days...

DSM: No interstate highways.

MH: No interstate highways. It was foolish to do, but you're young and foolish and you do things.

DSM: How long did it take her to get there?

MH: I think two or three days, and she had guts enough to do it and I still respect her for it. That was a tremendous thing. The old Ford had a shimmy in the front and if you ever hit a rut! They could never fix it. It was a fun time going up. We really enjoyed the summer up there in Massachusetts. Had a choice of going to a lot of spots—from Turkey to Korea to Panama— and she didn't want to leave the States. I came to a little place south of Washington, called Vent Hill Farm—that's down near Warrenton—for my military career. It's a big antenna base. My brother followed me and then later, about the last year, he went on down to North Carolina somewhere for another thing.

DSM: This was during the Cold War. What sorts of things were you listening to? [

MH: At Vent Hill, we had coverage of a lot of areas. Depending on the time, it was Allies as well as foreign situations. We did a lot of listening to the French particularly. This was dealing with the Viet Nam circumstances and their side.

During this time, we had the Suez Canal crisis and we did a lot of listening to British and French naval traffic. We listened to a lot of Israeli diplomatic stuff; we listened to a lot of Cuban and Venezuelan military. There were some Venezuelan rebels that were active. We listened to them, as much of the Russian and other traffic we could copy. A lot of that traffic had moved away from Morse by then or at least from hand sent Morse to other kinds of things. We had other kinds of gathering tools as well. You could set up your receivers and I used to be able to handle three or four.

DSM: I've heard Morse code operators talk about being able to recognize other operators.

MH: Sure, yes. By their fist, oh yes. If you worked one segment for a reasonable time frame and they used standard operators, you could tell. You could tune them in by the sound of the transmitter and certainly then, by their own signatures and their way of using keys.

DSM: Is there anything you intercepted that particularly stands out?

MH: Of course, we'd never know what we intercepted, because it found its way into the National Security Agency for processing. The last several months though—I guess this would have been 1957 in the August-September time frame—I was selected to come up and work at Arlington Hall. There were five of us that had access to a little room and we told we'd be killed if we ever revealed anything. You might think of what the Russians shot up about that time. It was Sputnik. They had at least found the frequency that it was transmitting on and we were capturing the telemetry. We had a whole different set of tools and so forth, but I can remember the day when they came and said, "we broke it." It was a pretty big deal. I hope they can't put me in jail now. Yes, I had gone thorough all of this. A lot of communications stuff, obviously, that I learned or worked on during those time frames had parallels to computers, even though we didn't know about computers in those days. We had access, at least, to some of the materials in those days.

You could read about it. I remember a book, *The American Black Chamber* and then one on the French and then, of course, the—what was the machine that the British developed? I've forgotten what it was. It did the code breaking. I had a couple of guys that remembered World War II in the Pacific Theater. They were still around, and they remembered the Indians using their codes, or their language as a code.

DSM: Code Talkers, yes.

MH: Right.

DSM: How long did you serve?

MH: Three years.

DSM: And what were you when you got out?

MH: I had gone to sergeant pretty quick, in eighteen to twenty-one months and that was as high as you could go without going to be a lifer. They tried to get me a couple of times to go to OCS. The problem was that it would have lengthened the time and economically, it wouldn't have done anything. In fact, there was a question at the time, if you got out of the military, which you'd have to resign as an enlisted man and then go in as an officer, they'd cut short your GI benefits because now you have shortened the time. They never would answer that for me. But I never pursued it to really find out because it didn't matter. I've never again had the sophistication of knowing what serving as an officer might have meant. I can look back and say, "Gosh, it would have been a great leadership experience to have been able to do that, but…"

DSM: You also had the guys at Shell that had made an investment I you.

MH: That's true and that's why I wasn't looking to change anything.

DSM: You got out when?

MH: I got out in January 1958. My wife and I had a son by that time, who was a little over a year old. He was born at Fort Belvoir while we were in service here. We'd lived over in Falls Church. A great little guy. We went back to Texas and back to Shell. While I was in the service, the Army would let you go to school part time, or at least where I was here. The University of Virginia had an extension in Arlington that had a lot of the basic first two year courses. I'd had most of the math and the English and those kinds of courses, but they had a lot of business courses. I started going and taking business courses, accounting, cost accounting, business law and economics and things like that. I got a totally different perspective of the world. In fact, my accounting professor was at the CIA and he wanted me to go to work for them. He offered me a job when I got out of the service. The NSA offered me a job when I got out of the service, to stay in and go into their program. They had an educational program. Obviously, f you had the clearance, they'd invested that money in you, and wanted to keep you. We had at that time, what was called Q clearance, which was above Top Secret.

DSM: That must have been fascinating.

MH: All that kind of stuff. They both were. But for some reason it just didn't take, so I went back to Texas and went back to Shell. That was when I decided to go part time to the University of Houston. Since I had been going part time in the service, I'd kind of set that pattern and it seemed to work okay, so I went back to the University of Houston. I was trying to decide what to do now with chemical engineering, now business courses. Where do you put it? I had enjoyed business. I enjoyed the problems of business as well as the technical problems of the other.

DSM: You had a foot in chemistry, one on mathematics and then, the business courses?

MH: Right. It looked like industrial engineering at that time, operations research that was tied into industrial engineering at the University of Houston at the graduate level. It tied in with business problem solving and mathematics. I embarked on an undergraduate approach in industrial engineering and then found that it was a shorter path to get a degree in mathematics and then go for an advance degree in OR—operations research. I took a lot of math courses, which were a great precursor in terms of the operations research courses. And graduated in 1960. I was twenty-six at the time.

DSM: What did you get your undergraduate degree in?

MH: Mathematics.

DSM: And then, you'd go on to get your...?

MH: I went to get, to study, operations research. Just a short story. I took about four years to get all my course work done and most of my thesis work done. Shell wanted to transfer me to New York. My advisor left academia to go to work in Cleveland, Ohio and I never did finish my thesis work.

DSM: What was your topic?

MH: It was inventory management and automated inventory management. You look back on your life and you say, "Well, I didn't get the piece of paper." On the other hand, I felt I'd done all the work to understand what I needed to understand, and from my point of view, I'd solved my problem. I've learned over the years that that's a frequent problem of programmers.

DSM: Well, I think anyone would be proud to do some of this research. The article you wrote, "Rattling Sabers"?

MH: Oh, that. Yes, many years later.

DSM: It's required reading still at Georgetown.

MH: Oh, it is? In any event, that's about the time that a lot of fortuitous things happened at Shell. That was the advent of larger computers coming into play. At the research lab, they had established a group that was working with some computers in the late 1950s, but we in the chemistry department weren't allowed to use them that much. They were for a different group of folks working on computer problems.

DSM: Your first encounter with computers was in the Shell business environment, not in the university?

MH: No, it was not. The University didn't have any computers in those days. Now they did as I was getting into graduate school, but not in the undergraduate side. They didn't have a computer at all.

DSM: Do you remember the first computing machine you ever worked on?

MH: I remember the first one I ever worked on. It was a Burroughs Elecom 101, which was a punchboard type of computer. I don't know if you ever saw one of those. It was not dissimilar to some of the IBM computers that had the--what was it, 407? I've forgotten what the calculating computer was, 403's or something along those lines. It had very simple instructional steps that you could make. You programmed them by essentially plugs. The IBM had wires that you had to push in so they wouldn't melt. The Elecom was very portable--you could move them. It was very simple. I started playing and that was really a play toy.

It was a group totally outside of Shell and totally outside of the university that another friend of mine and I wandered into. Somebody was trying to create a little business and they were going to use that as a business. I was entrepreneurial even in those days and took a little course. I thought it was quite interesting.

We were talking about calculators earlier. At Shell, we had the huge old Marchants and other calculators for all the lab work. You had huge experiments and stuff that required enormous calculations. I started trying—I've forgotten what the model was. I think it was a Univac model. It was probably one of the very early 90-card machines; I do remember that. We were trying to use it simply as a calculator for some of our early lab calculations. And this was before I finished my degree. When I finished my degree, interestingly enough, they had a couple of jobs open at the research lab, but they didn't want to really consider me. It was the first time I learned about intellectual snobbery. Rice, of course, was a good school. But the University of Houston, part-time versus full-time students? It was frowned on in terms of some of the senior folks at the lab. They all knew me and most of them respected me, but I was just not ready to move into their caste, at least for a few of them. We had an E&P area—an exploration and production area—and the guy down there had just committed to IBM to bring on an IBM 7070. They already had an old IBM 650 and they were going to get an IBM 7070, which was moving to the first solid-state machine—from the 650 being a tube machine. He was looking for a few folks. I went to work for him and within a month or so, after I got my degree as a programmer, I learned first to program on the 650 because that's what we had.

The 7070 was coming in a little later in the year. The role he assigned to me was to go back out to the lab and sell myself to the engineers and the people at the lab, to help fill up the use of the machine.

DSM: You're selling computer time?

MH: I'm selling computer time from almost day one. In those days, there were no charge backs, particularly in a technology group like Shell. Houston was a real ferment and a lot of the folks were at University of Houston as well as in Shell. The refinery was just getting started with some computing stuff and they were starting to do some linear programs and running them on 7090s and you got involved with that.

We started geophysical work for the first time, using some outside computers. We started on the 650, then 7070, then to 7090s. I remember the first mini-computers, the SDS 930s. We built a separate lab for that kind of stuff. This was very early computing and we were really almost empowered to solve any problem we could solve. I was solving reservoir-engineering problems, a host of things like that. It was just the first time they were done. Nobody had done these kinds of things.

DSM: Nobody to ask?

MH: No, no. I'd go out and work with the engineer and we'd figure out how to solve them. I was plotting—we were doing geophysical plots and the well plots on big old printers. We'd take Mylar sheets and you could have the wells plotted, but we didn't have anything that enabled it. But by doing that kind of a thing, it just enabled you to grow. To do all the things I was doing, I ended up with a little staff of three or four people supporting me, including the first female programmer, which was unheard of at the time.

DSM: Where was she from?

MH: I don't remember. They brought her in to work for me. I hired her and up until then, IT was—to the degree we called it that—a male profession.

DSM: This is a long way from Piney Woods.

MH: Oh, a long way.

DSM: But you're still in your mid-20s.

MH: Oh, yes.

DSM: Was this intimidating, or were you so into it you didn't think about it?

MH: I didn't even think about it. This was so much fun. It really was. By the time my daughter Laurie was born and things were good. Another thing at Shell that I got involved in was a project they asked me to take on at a corporate level because we had done so well at a local level in designing a system for what we'd call today capital budgeting. This was the first time that we used various kinds of risk analysis, discounted cash flow approaches and those kinds of things to determine what economic approaches to take. An engineer from New Orleans and I worked on this system including the programs. It was a program system that not only enabled the company (in fact, a couple of generations of it) but also the planning group. We came up with a coding scheme that categorized any investment. You could have an oil field investment—like drilling an exploratory well or producing well, or building a refinery, or building a producing plant, all kinds of things—and they could then look at them in a three-year cycle. You could have the engineers and project leaders define what they thought they could do. You'd looked at what they said they could do the year before. We ran a three-year cycle on them, so you could get some history of how good these guys were.

DSM: Tell me more about the importance of having some business problem perspective as well as technical problem perspective.

MH: During this time, even while I was working, I was still going to school working on my master's in operations research. The combination of looking at the business problems being technical problems and vice versa, given the other background, was always intriguing. It was taking this corporate budgeting system and applying the technology to it. One of the things we were able to do was to do a make-buy analysis. We were able to look at what price we should pay for producing properties and using it in a reverse sense. This was part of the model. I remember the first time we applied it, we saved many millions of dollars more than we'd ever spent trying to develop the thing.

Another thing I remember working on and doing was a gasoline plant. A gasoline plant is where you collect all types of liquids—wet gas and other kinds of stuff coming into one place. You'd process it and send out dry gas plus various kinds of compounds. It's probably one of the most complex cost accounting systems you can ever devise. It's based on pressure, content of gas, and those kinds of things that constantly change. It's a very dynamic system we had to build. These were fun things that we did in those days in addition to the technical stuff.

Shell at that time was based in New York, and they asked me to join their computer-planning group that they were setting up. They wanted me to come up and work on that. I moved to New York with my family in 1964. I settled in a little town out in northern New Jersey and commuted into the big city. It was for me an interesting experience. We weren't paid that well, so you had to live fairly frugally, but again, it was a little bit of the American dream that you were going up. The projects in those days were just fantastic. If you remember back, 1964 was the year that SABRE came out, so we studied SABRE.

It was also the year of Project Mac at MIT—time-sharing. I worked on a number of projects for the company. We were starting out to try to develop some standard systems for various things and I remember working on some of the first plotters or graphic devices and so on.

The big project that I remember working on in that plan was what system Shell should use for their technical computing platform. As I said, Project Mac and SABRE had come out, and we worked on a joint basis with Bell Labs and MIT to try to discern which vendor would ultimately survive. The GE645 came out of that, as did the IBM67. In addition to what I thought I was working on—liking in the business side of it—I had been the chief technical programmer to the degree that there were software programmers, which we didn't have. For example, on the 7070 I could work it from the inside as well as I could the outside. It was one of those things where you learned everything; it was just total absorption.

DSM: Those Bell Labs guys?

MH: Yes, Dave Vikshotski at Bell Lab and I've forgotten the guys at IBM. Do you remember the black out in probably 1965 or 1966 in New York?

DSM: Yes.

MH: We were up at IBM's place across the river from Kingston at their corporate facility going through the details of the 67 in those days. This was when the power grid in New York went out and the entire East Coast went blackout. We were driving back in those days. I was working on all those kinds of projects. I went on in Shell. Then they had a huge New York data center and they asked me to take over a piece of that. In early 1967, EDS came along and tried to persuade me to join them in New York.

DSM: Who did you meet at EDS?

MH: I'm trying to think of the man's name.

DSM: They came after you?

MH: They came after me in New York, went through the interview process, and turned them down. Then Shell talked about moving me to The Hague. In those days, the headquarters of the Royal Dutch was there. My wife really didn't want to go overseas and I could understand it. I wasn't particularly interested myself in going over seas.

DSM: Well you're cooking; you're in New York.

MH: Right. Later in the summer I got a call from Ross Perot. He invited me to come down to Dallas to meet with him and some of his key guys. To this day I don't think that he was aware that they had tried to recruit me in New York and I'd turned them down. I don't know how that all happened. I flew down to Dallas on a Saturday and checked into the hotel. Ross would have somebody to pick me up and we'd go over. I can still recall he and a couple of his lieutenants having lunch at a Mexican restaurant.

DSM: This is great; he's one of your fellow honorees.

MH: Really? That's great.

DSM: What did he say?

MH: I was anxious to get back to Texas and did not want necessary to go to The Hague. I had been thirteen years with Shell. As I've looked back in career times, I've discovered that's a fairly common time frame when people get a little antsy looking from one company to another. Long story short, I met with Perot and Mitch Hart, who then became the President, and Tom Walter, who was a senior vice president or one of Rose's senior guys. For that day and that night they tried to persuade me again to join them in Texas; they painted a good story. I go into Dallas, my wife agreed, and we'd headed out to Dallas.

DSM: So this is 1967?

MH: This is 1967. It was not great pay but reasonable pay, and it was a chance to work in a new concept.

DSM: What did you do with EDS?

MH: I thought I was big stuff and then I found at EDS we were all what Ross called "system engineers" which was fine because I didn't object to competing on any level. I was a big competitor. They had a couple things—they had a real tight time deadline to build their first health care system. They wanted to do a real time system. I worked a little bit on the design of that and I did some ancillary type things. Then because I had had more management responsibility than most of the folks that they brought in, they asked me to take responsibility for the Texas Blue Cross. They were going to be the first user of the system and run the existing one—handle the customer, do the processing or the things that had to be done, and then handle the conversion.

DSM: That's a huge customer.

MH: Yes, it was their biggest and they didn't have many. They had Frito Lay. But Texas Blue Cross was their largest customer. I did that and between Christmas and New Year we did some of the craziest work I've ever done. We had cots and we worked around the clock. You just didn't have any way of doing things. I think our tape files were something like sixty or seventy reels because it was the old, lightly formatted. kind. We got through it; I came out somewhat shell shocked. Mort Myerson had the responsibility for that piece of it and he kind of challenged me and said, "You can either come with us or…." He kind of put it that way. EDS had some insurance work and had this. I wasn't sure that that was exotic enough. Another EDS vice president had contact with United Airlines and they were looking at doing some work on inventory control using Univac 1108s. It happened at Shell that we had used 1108s. I had background in inventory control in my operations research days, so it was fairly easy to get selected on that to start working on airline situations.

DSM: You started working for United.

MH: We started. There was a team of three or four of us from EDS that were chosen to go out to United's maintenance base in San Francisco. A couple of them I helped recruit; we were constantly recruiting in those days. When I joined EDS there were, I think, 150 people. It was a very little company. It was still private; it wasn't public at all. Ross still remembered every kid's birthday and those kinds of things. It was very much a paternalistic type scenario. He really tried to make everyone feel...

DSM: Very hands on.

MH: Very hands on. The law. Jack Hight was the EDS vice president. Over the years I got to know Jack very well. He had joined Ross in creating EDS Federal. They both worked together at IBM in the Dallas office. Jack had gone on from there to teach in IBM school and then become IBM's first lobbyist. He had been the number two guy with Lyndon Johnson on his Senate staff. Later, he was one of the pallbearers at LBJ's funeral. He had that kind of political tie. One of Jack's buddies was the chief legal guy out at United and that's how we had that connection. United had various consultants in trying to create a sort of a supercomputer. It was the first one that I had seen—a total system for the airline. It was all going to run on this one set of computers. It was a reservations system, it was an operational system, it was maintenance systems--everything connected with the operation of the airline was going to run on one bank of computers.

Our initial assignment was to look at the maintenance and engineering, the operational systems. They approached maintenance from a point of view of parts and spare parts, and called it a material control—MCS, material control system. The idea was you could track the spare parts—whether they're on the airplane, or being repaired, or in an inventory system—since there's a huge chunk of those parts that are repairable, reusable, and so forth. You have time frames and you have bills of materials. That was key to running that part of the airline. Then we built all of the operational systems—whether it was the overhaul approach, or the engine plant, or various things—from an overall logistics framework.

DSM: You're going to go apply some of these same principles in different capacities later on.

MH: Yes. We'll get into how that transformed itself. Interestingly enough, some United people had created this task force and we had other consultants. My assignment was the repairable parts, rotable parts we called them, to create that kind of a system that tracked all of those. We had other sub systems so I was participating in the overall. I had United people working for me and I had other consultants working for me designing, while we were going through the design framework of the systems. At the time, we thought we were going to do that work in San Francisco. About a year into the project, United had the reservation work being done in Chicago and a lot of the air operations work being done in Chicago.

DSM: They had all the pieces separate.

MH: Yes, so they said, "We're going to do it all in Chicago." We finished a lot of the design concepts, so it was a lot of development to be done. We went back to Chicago and there they were starting to run into some major problems with the reservation piece. Their initial test wouldn't support the throughput. Plus, they had major problems in managing the project in terms of keeping things straight. They asked us to take a look at that. We had a couple of guys in Dallas that worked with me on the real time system and worked on SABRE. We started consulting. This would have been about 1968, maybe 1969, that time frame.

We did an early report for them on what they should do to get their reservation system squared away and gave it to the management, then went back to work on our piece of the project. Within six or eight months they threw up their hands and said come back and take a look; it isn't working. This would have been late 1969. I led a joint task force of my team and some United people, and we ultimately recommended that they throw out the 1108 approach for the reservation system, even though they had implemented some good pieces of what we had suggested a year or so earlier. We'd kept on top of that, but the hardware wasn't supporting it.

It's interesting, the history of computers. This was to be a four-processor 1108 to support it. When it was sold, the mathematics that was used was that one processor does one work and the four-processors do four-work. This was multiplied by the number of processors. But you know that you end up in a multiprocessor environment with huge conflicts in memory and communications. At best, they were getting between two and three times the power. They tried various other solutions—putting front-end communications computers on it and other things—but it just was never going to handle the volume the way they had designed the application.

I remember on New Years day in 1970, presenting to the then CEO and chairman of United, that they had to go to the IBM approach at that time, which was the only other viable solution that was running in the industry. They asked us if we would work with them in bringing it live. I still have somewhere a copy of a letter of intent that would have let EDS run their reservation system. We did go out and select a site in Denver, worked on getting a site created, worked on laying out the plans, and a whole host of things. We then entered negotiations with United to actually do the running. They offered us a cost plus deal.

Now Ross was on an airplane trying to deliver Christmas packages to prisoners in Vietnam— you may recall that—and was totally out of touch. Mort and Jack Hight went in to do the final negotiations with Curtis Barkus, who was the chief financial officer at United, and had been given the ball for doing this. They had, in effect, had to fire the guy on the computer side of things, and some other folks, because it had been a pretty rough place around there. Mitch Hart and I were waiting to see how they were going and coming out. I remember them saying, "We're at this point; United wants a cost plus deal." A lot of us thought that that was pretty good.

Mitch ended up being the decision-maker. EDS had just gone public within the last year. They had done nothing but fixed price deals. That was their mantra, "we'll do it", so Mitch called the guy that had taken us public—a guy named Ken Langone—and they counseled and they couldn't get ahold of Ross. They decided, we better not take that deal and Curtis shut them down.

DSM: Because Ross Perot was on a plane.

MH: He was on a plane.

DSM: History changes.

MH: Yes. Ross came back and met with me. In the meantime, we had people that were going to Denver; we had people in Chicago because we were building up to go do this thing. EDS didn't mess around. I then had a decision to make because Curtis came to me. I was guiding him privately with regard to 1108's. He said, "Can we make some use of them?" They had several systems that had been designed and were being built to operate from the operational side, including the rotable tracking system that I had led the efforts on. I told him that I saw no reason we couldn't do that. We had a network in place, terminals in place. He settled with Univac for pennies on a dollar. Of course, it solved a lot of problems for Univac since they had projected the four times kind of thing. He asked then when this failed if I would take over that aspect for United.

We had an agreement at EDS; you couldn't go to work for a customer. That was verboten. Ross came up and he wanted a little debriefing on what had happened. We went to lunch and he said, "You guys had it down the half yard line"—he loves sport metaphors—"and we blew it. Didn't get across the goal line." He allowed me to go because, although we were working on it and had American and TWA almost in the same posture. That's another little story that I'll tell. But he allowed me to go to work for United. I was the first guy that he allowed to get out of the contract. He told me I always had a job coming back. I was the first one that he ever offered to do those kinds of things.

DSM: He just figured he owed you?

MH: I don't know. I think he felt that I had done what he thought was good work and I continued to do good work, so he was willing to allow that to occur. During that time frame though, Jack and I had tried to talk to both American and TWA. They were going through some of the same throes. American was trying to decide how they were going to get out of their old computer, which was 7090-based and then in conjunction with a 360 base--reservation system to the new model. TWA had attempted to follow United and they had attempted to go with Burroughs to create an independent reservation system. They had these two development efforts going on and parallel in the late 1960's.

They asked us to take a look at the TWA thing. Interestingly enough, what led up to that was that Jack Hight and I called on the president at the time and the CFO at TWA. They told us they were getting ready to dismiss their computer guy. This was January 1970. I think it was a fellow named Jim Smith, as I recall. They had this young man who was the treasurer, but had had some limited data processing experience back at Hallmark Cards. They were going to put him in charge of their data processing.

DSM: The accounting guys always have the first computer training.

MH: Yes. That guy's name happened to be Bob Crandall.

DSM: Are you kidding?

MH: I'm serious. I've often told Bob I knew he was going to get the job before he did. The second half of that story is that by that time the thing had transpired and I had gone to work for United. I still was in very close touch with Ross and trying to help them get the TWA thing, or it was right in that same time frame. I don't recall all the timings. Ross had been shut out at United and had given it up; if they'd taken the deal at United, TWA would have fallen in their lap. They wouldn't have an excuse. But now it became Ross versus Bob Crandall at the board level of TWA. Guess who won? It wasn't Ross. Ultimately the solution TWA and United took was to take the Eastern version of the PARS reservation system and install independently—as opposed to having some third party do it for them—create one of the early utility approaches and doing it in an outsourced way. They retained their own approach to it.

I was at United and we did a lot of good work. We brought a lot of those systems on line. I think there were probably a half dozen of them in a year and a half, EDS still had a few guys that had been helping them out in Denver to build the place, and got that going and so on. United brought their system up. There was a change in management at United. Keck had been the president and CEO. Because of all their problems with computers-they at the time merged with a hotel company from Seattle, Weston—the board threw George out. They brought in the person who was the CEO at Weston—I don't remember the guy's name—and he replaced Curtis. I was pretty exposed. I had been responsible for a lot of bad things with a lot of executives at United. American was looking for somebody to do the SABRE thing. United was not anxious to keep me around because they had the other fellow who was going to consolidate things and we had three independent groups. Curtis was going to let me run all three groups, but he left, so I'm out in the middle.

DSM: This is a good time to look for alternatives.

MH: It was a distressing time because I really didn't want to leave Chicago and I had a couple of alternatives to stick around Chicago. For whatever reason, I'd become enamored with the airline business and American wanted somebody who could migrate SABRE from the old system to the new.

They had gone with the Eastern approach as well and quite honestly had done a lot of joint work with Eastern, such as ticketing and a lot of other projects. They got the rights, the code, and they changed it so that it looked like the original American system.

I had done a lot of knife-edge cutovers again at United on some of the systems. Interestingly enough, United had one system that did flight following—an independent system that we cut over to, the Univac system. American didn't have a good one and that's how I got tied in with American. That was one of my introductions to American—selling them a service. That's how I got acquainted generally with them. Anyway, we figured out how to do a knife-edge conversion of the new SABRE.

One story I will tell is that American was in a little bit in a political upheaval at the time. George Spaner, who was the CEO, was a very weak CEO. He'd come from the legal department after C.R. Smith had left in 1968 to become Secretary of Commerce right at the end of the Johnson administration. American had a lot of senior executives during that time frame, but the one that was going to succeed turned up with cancer. They ended up with Spaner as CEO. I don't know if he was convicted or not, but during the Nixon re-election campaign there was money traced to American supposedly to help influence a route transfer. It was a United lobbyist that got it, so we never were quite sure how he collected the money—how it all tied in. George just didn't oversee a strong camp and the house was divided. The marketing people at American at the time, at least some—the computers had been built, the SABRE system, under the finance department—had never totally accepted that. There was a division when I joined American, which I didn't know until I got there, about how we were going to make it happen.

I can remember going to New York on one of my first meetings and the head guy in the marketing department that was supposed to be the interface to the computer group asked me to an afternoon staff meeting of his folks at a round table with him and his subordinates. There were about eight of them in various groups. There was an empty seat. On that seat was sort of lifesaver from a boat. He assured me that I would need that by the end of the meeting because he was going to tell me how it was going to be done.

DSM: Welcome to...

MH: Welcome. The gentleman's name was Rod King. He was probably about six two with a totally baldhead. He was an imposing guy, in a way very bright. He had had some of his own funding to do some R&D into some computer stuff, which I'll bring up in a little bit. He called SABRE "big mother" and he was not in any way believing that big computers were the way to do things. In that sense he had some visionary strengths, but he was not a computer guy. He didn't really understand them. Mr. King and I had an interesting debate for about two hours, where I obviously did not back down. We arrived at a situation within a couple months where in order to effect the cutover, I requested that they do a volume test, because there was no way we could generate sufficient volumes from our other testing scenarios. In any real time environment you really want to put it through those last things to see what will happen under volume. It was a big risk. Mr. King decided—and this was known at all senior levels—that that wasn't necessary. He was willing to take the risk.

I warned him that I had been through it; I didn't want to take the risk. But all the other plans were put in place. We worked out an arrangement where we had a communications processor in front of the new SABRE system so that we could switch the communication lines between boxes very easily, which was sort of a first. Then we did a tape capture starting about midnight, put them on a private jet, flew them down to Tulsa, and loaded them in the system. Then because we had typewriter-like terminals, the agents could re-enter what few reservations that happened between about midnight and maybe nine in the morning. We did it on a Sunday so there would be very limited volume.

DSM: About what date is this?

MH: This was sometime in either March or April 1970; I forgot. It was probably April by that time. Things chugged along from about 9:00 until about 2:00 and then we noticed. Without going into a lot of detail, it looked like we were losing some records in the way that system was working. By about 5:00 or 6:00 we couldn't track it down, so we flipped the switch back. Mr. King then had the enviable task of taking all that day's records and re-entering them on overtime, which he was unwilling to spend.

DSM: King was on the financial side.

MH: No, but it was his agents where he would have had to spend the money—the marketing department. We got two tests before we went live again and it worked great. The travails of Rod aren't there though. We had developed this ticketing code to billing the tickets—to price tickets—from Eastern, because we'd jointly developed it and they had it. He wasn't going to let us put it in the computer. We put it in the computer anyway and his people used it. That galled him, but he was working on the outside doing two projects over the years. These are just fun stories, I think. One was a computer that he had for gate check in. He actually installed it in Chicago and a couple other places, but they couldn't keep it operating. This was very early...

DSM: He was ahead of everyone.

MH: Yes, five, ten years ahead of what other folks had. That's why I say he was a visionary. You couldn't argue with the desires of solving the problem' it's how the solutions went at it. We ended up inheriting those and ultimately disposing of them, because we couldn't keep them working. They weren't tied in; they were independent. Then he came up with another little device somewhere in Pennsylvania for travel agents. We were going to automate travel agents with a very simple reservation device. There had been a couple of attempts to automate the industry even when I was at United, and others that had failed for various reasons.

DSM: But this is an idea with potential.

MH: It was another idea with potential, except the device wasn't worth a damn. It was like a portable PC that was ten years well ahead of any PC situation. The other insufferable thing that Rod did was, the guy that had really built the SABRE system in the first place or was responsible for it, had gone onto Avis and built their system. But he had contracted with IBM. This was before the advent of generalized display devices for some special purpose devices that would at least work. He had contracted for 1,000 of them. But when I came to American, they were sitting in the basement of the new computer center. Rod wouldn't let us put them in. He wouldn't fund putting them in, so they were sitting there. All of this is an interesting story. About a year after I joined American, the guy that's the chief financial officer moves over to become head of the maintenance organization or one of the operations organizations. They decide they're going to recruit someone to come in, and whom do they recruit? Bob Crandall. Bob had left TWA because he didn't get the senior VP of finance job there and had gone to work for one of the clothing stores—one of the big ones. He spent a year there in retail and then came to American as a chief financial officer. I brought him down to Tulsa the first time and showed him those terminals. It wasn't long before we were installing them—it wasn't long before Rod retired. That was kind of the history of that.

That gets us into the time when Bob came in. He replaced my boss with an old friend of his from TWA named Jim O'Neil. I had known Jim when I was at United, so we worked together reasonably well. By that time I had been given responsibility for essentially all of the data processing in American other than the financial type computers, which were up at Lake Success, N.Y.

DSM: When does Bob arrive?

MH: It would be 1973.

DSM: That's for everyone that just assumes the image of SABRE is that it's always been there and travel agents had always had it. He arrives into an environment that has made a transition that is basically monitoring seat inventories.

MH: The original SABRE system was the first system to tie passenger names to seats and those kinds of things.

DSM: That was the source of the financial guys versus marketing guys?

MH: Yes, but in terms of the history of computing, that becomes the base that IBM built on to build the PAR systems that Eastern later used, and like I said the other airlines used. Then American worked with Eastern on some extensions to it and modified it back to use.

DSM: It had grown from that to generate flight plans?

MH: No, that's a parallel story. Again, this was slightly before Bob, so this would be late 1972/early 1973 when I did take responsibility for some of the other systems. American had disparate systems for flight following. I just mentioned they were using United's old system for flight planning, for maintenance and engineering, a lot of the things, their rotable control system and so forth. We were faced the decision of what technology to use.

I opted to use the same base technology that we used for reservations, not because it was necessarily the best solution set, particularly for generating flight plans and those kinds of things. But because we had a network that would have had to be replicated, that were out in the airports and operational areas that were used to for reservations. Because the back and forth need of reservation systems for helping to generate the base information for flight plans and a lot of other types of aircraft operational stuff, it just seemed to me that if we could tie those together. Again, I took a page out of the Univac story at United, which they had planned to do and were unable to do because of the capacity needs. Then we had divergent system. I just felt that that was a much more unified approach even though it might not be the best technology solution for that particular problem set. In a broad general sense, it was the best technology solution for the airline.

DSM: Given the benefit of solving the business problems, the trade off.

MH: Exactly, and that's always been an issue or an area where even then technologists, and particularly a lot of my operations research compatriots, are very good problem solvers on a particular set of problems. They always want to use the best tools for that set of problems and don't see it in the perspective of a broader framework.

DSM: That's an interesting question about problem solving and innovation. Do you think this an art?

MH: I don't know; I guess it's a combination. It's certainly not totally right brain or left brain. I don't know where it comes from. I guess if there's anything where maybe I've been able to stand a little apart from some others, it' the ability to see a little further or a little broader into what can happen and what impacts of things. Maybe more variables or that kind of thing, evaluate more variables, than maybe others do.

DSM: Just think about your music and your math background, and the training you got solving problems in your head. This is not really a difficult question to ask and answer but, do solutions to problems sort of pop into your mind or do you see them in some way?

MH: I can see things. I can see how things tie together and I don't know why. I can't describe it other than I can see how things tie together. I do see systems as opposed to individual problem solutions.

DSM: It's almost intuitive at this...

MH: Yes, and it's multi-varied. I don't know. Like I say, it's a gift.

DSM: There's a certain beauty and aesthetic in that.

MH: Yes, it becomes art.

DSM: Don't you get the same sort of visceral pleasure out of a problem's solution?

MH: Sure, very much. I'd love to create a great painting, but my skill at doing that is so limited. But having that visual feel for what can be, to me, has a lot of those same attributes of creativity and accomplishment. The interesting thing is, having the visual capability and getting it done—or having it done—sometimes they are just miles apart. I've seen a lot of things that ought to be done and a lot of them never happened for many reasons.

DSM: Let me get back to—Rob had this idea about automating travel agencies.

MH: Yes, about this time Bob came in, Jim came in, and we moved all the computing out of New York to Tulsa. I was busy there. I was busy getting the operational site up and creating the applications. Again, American had really stopped spending money on technology back in the late 1960's under Spaner.

Just before Bob came in, the year before he came in—about the time I got there—they started being willing to spend money again and recognized they were starting to slip behind their rivals, so they allowed us to spend it. I started on a lot of these things. Within a year or two—after the operational things started going—we started on some of the airport operation things like printing tickets. Simple things like that. Even three of four years later the boarding pass things came along, but right in that time frame. It would be the 1973/1974 timeframe—not too long after Bob came in. Bob only spent a year in the finance job, and then he went into marketing. He wanted to go into broader responsibility. Bob always retained a lot of control over everything anyway. I wasn't sure if I ever was working for Bob or working for the CFO, or whomever, because Bob was always so hands on.

There were these guys that came around that said, "We think that we'll come in and do it for you." There had been all these attempts at providing automation for travel agents. They were a little outfit called Greenwich Data Systems, who had been a consultant to British Airways and a number of others. Most of the people had come from either building the I-PARS system or some of the PARS systems; some of them had worked on SABRE originally. The guy leading them had been at Fed Ex; he led some of the early efforts there. We all knew one another and those kinds of things.

The earlier efforts had failed—some were technical, some were philosophical, some were political. The CAB had to get into it because of multiple airlines wanting to solve a common problem, and all the anti-trust rules and everything else in their control. I think Greenwich Data Systems had just been acquired by CDC. They were willing to put up the money for this in between system. There were a couple of others that also had approached us on doing some of the same things, even from wilder places.

I got to looking at it and this was where I ran into Bob Crandall on a street corner on the way to lunch. I think he had come back from a club. It was 41st and 3rd, or 40th and 3rd I guess it was, somewhere there. I said to Bob, "How up-to-date are you on this? Do you want to have someone come between us and one of our principle distribution channels?" At that time travel agents were doing about 40 percent of our business—handling it up to 40 percent. He said no, so we sat down and he got involved. He called United, called ASTA, and went to Brazil and presented to ASTA. We got the CAB. This became the so-called JICRS study, the Joint Industry Computerized Reservation System study. It got approval in late 1974. It was to be jointly funded by all the airlines that wanted to participate and then various others.

Bob pushed me to run the study since I had initiated the action and probably knew as much as anyone about doing it. So I led a study; we headquartered it in Chicago. It took six hard months. We had participants from a number of airlines; others contributed cash. We brought in a few consultants and others, and asked them to participate in it. We came out with conclusions in about June of 1975. United didn't like our conclusions, so we had to tone them down a bit.

DSM: Everybody's going through really hard times.

MH: These were hard times and it was just prior to deregulation. This was the advent of the Carter administration and they were fairly sure that deregulation was going to occur. It was a matter of when, not if, by that time.

DSM: Deregulation and then you had the rise in gas prices.

MH: That's right, you had the fuel prices, so it was not a good time. It was one of those times where from essentially July through close to the end of the year—really through the end of the year—I was trying to find people to help support it. TWA and American were all for it. United was opposed to it because they thought it would level the playing field and they had spent a lot of money improving their system. They thought they would lose those advantages and various others because of deregulation coming and those kinds of things. Didn't want to spend the money; didn't believe it or pretended not to believe it.

The time just wasn't right for an industry solution. There were a couple of things that did happen that I think might be worth telling. One was that Ross indicated some interest in taking this idea and running with it. He had some people that worked for him that were interested, but he was unwilling to put forth the risk capital that was necessarily.

I think EDS again missed another opportunity. But United started to install their system into some test locations, not necessarily in travel agents but corporate locations. Bob said to me, "You better plan for what we're going to do in case the Industry System can't be sold." I asked the company for about 20 million dollars. You can imagine the airlines—as we just talked about short of cash, deregulation—that would have paid for four or five airplanes. There's nobody that's going to support it much other than Bob, and fortunately we had a chairman, a CEO at the time.

DSM: What was the business plan" Do you still have copies?

MH: I don't have them, but I think there may be some around. The reason they were around was that later we were sued on anti-trust grounds and we had to generate all of that stuff. I'm sure they're around in some archives.

I hired one individual in December. Then we had that fateful meeting in January where all the participants came back together. That was when JICRS "got dissolved." United was put under the gun by ASTA. We had people who were keeping us informed of what was going on, because we were friends of the court. It wasn't any surprise to us when United rolled out its own system of travel agents in late January of 1976. They made a few promises. One was, "We're going to give you our system, and it's the best in the industry. Although it's an airline system, it's got enough other things that will solve a majority of your problems. You'll be happy with it. It's first come first serve. you've got to just sign up with your United Airline agent. By the way, we'll start installing sometime early in the fall—September or so." We announced the next day. We said, "No, the system you're going to get from American, we won't tell you everything it's going to have upfront because we're going to add to it as quickly as we can--and you're not going to get the American system, you're going to get the system that was promised by JICRS." We had that model, so it wasn't going to be an airline system; it was going to be a travel system that included various kinds of accounting, ticket printers and those kinds of things, which they needed for their operation. "And by the way, you're not going to have to wait until September, we'll start installing in the spring. By the way, it's not going to be first come first serve, we're going to have to choose who gets it." We didn't say all of those things but that was our approach. I hired a special sales force. They had been sales people in the airline, but it had usually prior reservation experience for the most part.

DSM: Who ran your sales?

MH: Fred Green was my first guy. Fred was not an airlines guy. He was a sales guy and worked for American Express, I think. Within six months—or at least a year—it became overwhelming for Fred. It was just one of those things that just hit like a ton of bricks and trying to get everything together was just a very tough thing.

DSM: Do you remember who made the first sale?

MH: Yes, the first travel agent. ASTA had a chairman of their automation committee that had worked with us, a fellow by the name of Don Soln. In fact, Don's going to be at the dinner. Don taught at Harvard business school, Dr. Soln. He decided to create one of the first commercial travel agencies where he could cater to corporate clients. Then he was one of the first to start trying to automate his agents. SABRE had been installed in very limited quantities from the late 1960's, but never in an environment that was an online environment. He became the first that got installed in a real online environment. Don certainly worked with us on JICRS because he was helping us in some of the concepts again. He was one of the more forward thinkers. He became the first one to install.

DSM: This not only transforms the airline business but the travel agencies, as well.

MH: The travel business as a whole.

DSM: They were doing approximately forty percent of the reservations when you started?

MH: Like I say, travel agents did about forty percent of the general airlines. The international airlines, they did a much higher percentage.

DSM: But that jumped.

MH: Probably three years ago it peaked, before the advent of the Internet, at probably eighty percent. So they doubled their market share in that intervening let's say twenty years. Most of the hotels and cars were done independently, and by different transactions. We gave them the ability to integrate a host of transactions. Moved it all over to the leisure area; brought in cruises. Today what are looking at in the Internet world, we're calling them exchanges, where there are multiple buyers and sellers being brought together in one space or a marketplace. You can think SABRE. Because we forced the other so-called CRS's—United and TWA and others that followed us without going into all the history—into roughly adopting our model. Then it became that.

I think maybe in terms of leaping forward a little bit, there were a couple of key things that happened. One, there was a lot of competition. A lot of the airlines tried to offer independent solutions—US Air, Delta, various others along the way—over two or three years. We recognized that we couldn't compete with United in a geographic way. We still believed very much in trying to have others join with us. So we created a plan—we called it Cohost—whereby the other airlines could sponsor agents in their geographic territories. We also figured out a joint financial benefit where we could start getting them to pay fees and getting that going. Then in exchange, we gave some display preference.

DSM: That was one of the big terrors about SABRE, that screen preference. That didn't work out.

MH: There were those that thought it was worth a lot more than I ever did. I thought it gave you some advantage if you had good marketing advantage going with it. If American was first on the screen and you mentioned that to a customer and you had all these other good things, I think you would likely have bought American. If you mentioned Value Jet first and then American second, I'm not sure you still wouldn't have picked American. I guess that was some of the feelings we had. But there were those that thought this was the Holy Grail. Then in the early 1980's, the CAB—at that time I guess it was the DOT— ruled that to be unfair; it required neutral displays. That became deregulated through the EEC and Canada, and any place where they now have rules regarding the computer reservation systems that call for totally neutral displays as opposed to that. There was another thing they gave us though, because there were a lot of airlines that didn't choose to participate and/or, pay fees. They said, "If you're going to participate you have to pay fees— if you're going to participate in any of these. That created the industry on a little greater total.

I don't know where that leaves us. I had created the system, had done the co-hosting thing. About then Bob took on a new job; he became president of the airline. Jim O'Neil and I had left the data processing environment just to head this travel agent thing. Jim O'Neil had left the company to head up Sky Chef's. I was chosen to go back and head up all the IT activity again, working for Bob. A couple years later I had the opportunity to go to Bank of America.

DSM: I really want to hear you talk about Bank of America, just because it juxtapositions your life, with Morse's telegraph and your telegraph experience. Some people say that Bank of America produced the first CIO.

MH: Ziff, Al Ziff.

DSM: Ziff. James McKinney and Barrons say you were probably the first modern CIO. Were you together at Bank of America at all?

MH: No. I know Al and I'll go into how I know him. But Al, I would agree, he probably was maybe--I guess if you were looking back classically--was definitely one of the first CIO's.

Al was a very smart guy. He went down to UCLA. I don't think he had a formal education, but he went there, did some studies and finished in a very short time frame. This is at least the apocryphal story that's been told to me. He helped design some of the first modems. The first Bank of American system and SABRE have always been about the same time frame of being the first real time computer systems with a lot of terminals tied into a central computer. He did this for retail banking. The other thing that Al has taken a lot of credit for, or I think they've given him a lot of credit, was the design of the micro-code. It's on checks today for check processing and so forth. Bank of America essentially was the big pusher of getting the industry standard for that.

Al was involved in those times and doing those kinds of things. As I understand it, he tried to take on more of an operational and leadership role in the bank and ran into some political foils. I think he probably retired maybe five or ten years before I got there.

DSM: How did you get there?

MH: Sam Armacost had come in as CEO and believed very strongly that the future of banking was going to lie in the use of technology. He believed that after Al had left, their leadership—which is a little bit like American if you think of it in some senses—had declined. He wanted to make this a part of his new administration in going forward. I, in effect, was recruited for the job. American tried to get me to stay. If they had let me tie together the computer group with my travel agency thing, I might have stayed; but they wouldn't do it because I was running a business, and I had gone from running a business to running another internal thing. I made a lot of people. When I left, it raised all the salaries in here a lot. The airline was such a good player that they figured if the bank was willing to pay—I got a lot of Kudos from it.

DSM: So you went to Bank of America.

MH: I went to Bank to America.

DSM: This was 1982?

MH: Yes. I always said this was like a one-eyed man in the house of the blind. I was amazed at how poor it was in terms of what I thought was just standard ways of doing things. An airline had to be so cost conscious; they had to do things so quickly. You make decisions very quickly. You don't waste time and effort because you can't. Just the nature of it is much more fast-paced than I found banking to be.

On the other hand, the broad systems—the flows of information and so forth—are very similar, whether you're taking deposits, or whether you're accepting order entry, or whether you're generating cash, or you're generating tickets. Or keeping track of things and a whole host of other situations, there's just a tremendous number of similarities in terms of the broad systems. Different terminology, that was the biggest hurdle I think.

DSM: Where were you living when you were with Bank of America?

MH: I lived on the Peninsula, right on the boarder of Burlingame and Millbrae. I loved it there. It still overlooked the airport so we could still see airplanes.

DSM: You could see the United operations.

MH: Yes. Getting back to Al Ziff, I used to have lunch with Al probably every two or three months. Al I think by then had Parkinson's, so he was not always aware. But he was still very much aware of what was going on in the bank. He would give me counsel and guidance. Like I say, I give him great credit for having done the broad initial banking systems that most other banks eventually emerged from.

DSM: How long were you at Bank of America?

MH: 1982 to 1985. Bob becomes CEO and Chairman in the spring of that year or very early in the year, and approached me. If I'll come back to American, he'll give me not only the combination of the two, but also wanted me to build other new businesses. He wanted to extend American's approach into the business side. Sam was willing to put me in a total non-technology role. I went back and forth for a long time on whether to leave. But the Texas ties finally brought me back. I came back to American and worked on trying to create, not take on the business. I took over SABRE again and we expanded it around the world. It is one of the things we did. We tried to create a number of other businesses and different approaches, and then tried to keep the airline growing as well in technology. And yes, by 1995, it's right at a billion dollars in terms of revenue by that time.

DSM: Globally.

MH: Right. The other aspects were we had sold SABRE. Today they have something they call an application system provider. I sold SABRE and other reservation services to folks like Southwest. We had about seventy customers. In total revenue we were well over a billion dollars. If you considered then the outsourced portion of American Airlines, which became part of the SABRE group when we did it all, when I retired it was a billion-and-a-half or something like that.

DSM: Having led one revolution, now you're in the middle of another one. What do you think is the limitation of this Internet technology from the very system you built?

MH: I think there are two great things about the Internet. One is the ubiquity of the network. With SABRE and most of the other systems I worked with over the years, going back to the banking system, you had to have private networks or special purpose networks and they inhibited the ability to do things. The other thing that's happened is, with the Internet there's been so much investment in the tools that you can find tools to do almost anything you want. It's like having a complete hardware store or a tool shop. You go pick one from here and one from here, and put them together. There's very little in terms of development these days—unique development—that has to be done to solve business problems.

DSM: The tools are there, what you need is...

MH: …are people that can tie it together and run it. You mentioned a little earlier I wrote a piece in the Harvard Business Review ten years or so ago, and one of the things suggested was that we would have computer utilities. I think that's exactly what's happening now.

There are very few companies that are going to run their own internal DP, whether we have ASP's, whether it's applications. I'm on the board of a number of companies now and many of them are Internet or Internet related. We're trying to create in some cases market systems or exchanges, like SABRE in different worlds. I'm also on the board of one called Exodus, which is the largest host outsourcer of web computers. We run other people's computers, build data centers and networks to tie them all together and make them operate. Again, it's very much along what's happening.

I can't envision too many years when companies will run anything of their own. It will be outsourced to specialists that have the scale and scope to do it, and do it a lot better than they can afford to do it for themselves. So the Internet to me is: we are on the first step of just a long ladder of totally transforming the way we do business or do things in the world. Not that I haven't been trying to do it. I can think of the errors that we went through. In the 1960's when we first had the big computers, we were able to bring in things. I remember in those days in the oil patch, where we had little offices scattered all over the countryside, and they were doing things by hand. We were able to centralize those into big centers and do processing, and have monthly statements and so on.

I think the next major thing that happened was the advent of the PC. We had things going along the mini-computer and all those that started to distribute things and allow work to be done closer, and in smaller chunks and so forth. But we got the ubiquity with things where everybody could access to whatever they needed to do when they wanted to do it.

I think now we have the ubiquity of the net. All the tools—and we're building more tools every day—that just enable us to do things more simply, more securely. We still haven't solved all the problems—either political ones like privacy, or sometimes some of the security hackers—but we will. If you think of where we are today in a brief five to seven years from where we started with the initial uses of the net in any kind of commercial type setting, it's just been an amazing saga. Like I say, we're just getting started. I'm having an awful lot of fun trying to be more or less a mentor, I guess, in some ways. Whatever experience I can bring from the past into some of the success of some of these other little guys.

DSM: You're still teaching?

MH: No, I really don't teach. Like I say, I'm on seven public boards and I probably work with maybe as many as ten of what I'll call pre-IPO type companies. Many of them are a year or two old; they are just getting started in the market place.

DSM: Speaking of companies getting started, what do you think are the implications of the imminent break up Microsoft?

MH: I think that's a drastic solution. I don't think that's going to really benefit most of us, if they do it that way. I lived through the era, and I've known Bill, and I think he was a little heavy-handed in some of the approaches that he took to some of the smaller competitors from time to time, and even some of the larger competitors. I can understand the pressure that he brought to bear that might result in people finding him perhaps in a monopolistic scenario. I went through a trial, an anti-trust trial Northwest Airlines brought against us. I spent months in a combination of depositions and listening to it, and testifying. I have maybe a little bit more appreciation than someone that hasn't had it. I can understand why some of the legal theories that were applied to us have maybe been applied to him. There's always gray areas. Did he go over the bounds or not--if he was pushing them? But I just can't agree that breaking up Microsoft is a proper solution.

There have been reported instances where Microsoft was perhaps a little heavy handed with one or more either not then competitors or things they built in and so on, that extended the reach of their product. But I know from when I was building SABRE, we extended the product constantly. I don't recall us ever trying to push anybody else out of business. There have been reports that they were maybe a little heavy-handed occasionally. But I just don't see that there's going to be a great benefit to the industry, to the world, by splitting them in two.

DSM: I've got about three more questions I want to ask you about. I want to talk a little bit about the future and in particular the future of the IT revolution. What excites you most about the future, and where do you think we're going?

MH: I think there may be three or four broad things that excite me an awful lot about the future. One is, obviously I think we're "flying" technology—as we have for the last thirty or forty years but more and more broadly. In other words, we're not only extending it in terms of moving it toward much more real time for almost all kinds of things, but broadly in terms of the context that we use it in. That is, I think, the one. Not in all things, but we will if we choose to use it, we will have tools that I think simplify our approaches to doing the transactional things in life—whatever they are. Encompassing with that, I think are some ease of use scenarios that will be coming. One is: I think you will be able to talk to it, as opposed to having to work in an alpha numeric kind of a inter-connectivity world.

The other, coming back the other way, is that I think we will view things in much more of a visual form—things that we might call full motion video, natural kinds of scenario. I think we're going to see essentially a total merging of what we think of as the TV, the net, and maybe even music and movies—this whole approach of dealing with things that are somewhat independent, but are still our connectivity to cultural, or business, or a host of things. I think you'll see a total convergence in that whole realm.

DSM: How smart are the machines?

MH: They will be smarter than we are. Now that doesn't mean that they will be smarter than we are in every type of situation. But in terms of making choices that are based on available information, they'll be able to have much more information to make choices. To the degree that we can instruct them within acceptable bounds, they can do it faster and perhaps better than we can. I don't think you'll ask a machine necessarily to find your next soul mate. You may want to have it select ten for you, that then you can make a choice. But there's a lot of things in this life that I don't want machines to interfere with.

One of the other things that are happening though, is the collection of more and more data. The extendibility and the ability to collect things. We make in the world an awful lot of decisions on poor data or averages, or things like this. We'll be able to collect data that is total, complete. You'll be able to process it, you'll be able to make decisions on it, instead of having to collapse it and do it on pieces. So I think that's one of the other trends.

We're just touching the capabilities. We're still dealing with bits and we're going to be able to deal with terabytes. That's where the technology is taking us, and we're learning how to utilize it for those kinds of things. In translating that up to business processes, we'll be able to make business decisions—we're making them today. If you think of the way the model of the business is done on the accounting systems, they don't make sense. We do things; we measure physical assets. That's not what the world is about in terms of valuing companies today. They're valuing intellectual assets, or customers, or those kinds of things. The balance sheets are totally out of whack. We designed them for the industrial revolution. We do reporting on a quarterly basis or an annual basis. What company will run things on a quarterly, and annual, or even a monthly basis? People need to know where they are every minute—whether it's in terms of cash flow, whether it's in terms of inventory, or customer service, or what have you.

We're changing the way we do everything around the world. I think one of the other things is, we will change the organizational aspects of the way the world works. You're already seeing that. Why were corporations created in the first place? Why were institutions created? To bring people together to do things normally in one place, working on some common set of things. With the net, you don't need to bring people together. You may want to for social reasons, for other kinds of things. But to work on problems, to work on other kinds of things, you could work independently. I think corporations will shrink to very core competencies. They'll bring people on in terms of project needs, as they need them.

I think people will want to be far more independent. They'll be constantly learning. If we go back to the beginning of time when mankind was first getting established, this individual did things his or her way and this one did another. They met and they bartered, and I think barter will come back in a big way. Not that it doesn't exist today, but the way we monetize things, we've created difficulties for sometimes in exchanging goods and services.

Barter is very simple. You like what you've got and I like what you have. As long as there's some way of finding some liquidity for some party, fine, but that liquidity may be in something other than what we call a financial product. I just think that there's a host of both social and business, and we haven't even talked about the tools your going to have— your automobiles, the tools in your home, the toaster that talks.

DSM: What do you see as the biggest obstacle in the way of this? Is it technical or is it social?

MH: It's always social. The technology runs way ahead of social; it's people willing to adapt. Even today in some things I just talked about, how are governments going to tax on the Internet? We still don't know what. When you're dealing with something that's produced in one part of the world that's sold in another and you bring them all together— we really haven't defined where the responsible party lies for that.

But that's just one example. Governments lag social acceptance in general. They don't lead. It's just natural that they lag. So some of the things we were talking about—for example, Microsoft, we can go back to them. They were hit by the IRS who said that all their part-time employees had to be treated essentially as full-timers. Now that's an old model; that's an industrial model. That's forcing everybody almost into a bureaucratic idea, as opposed to having the freedom of working independently and coming together. That's just a simple model that I think has to be done. I mentioned the issue of accounting, and our whole SEC, and our quarterly reports and so forth, which isn't measuring real value. The industrial companies, your market cap may be between one and two times book value. In the new economy you're hundreds or thousands of times. So those things we've done institutionally we haven't caught up with yet.

DSM: Like the models quantifying things like customer loyalty, which just don't exist?

MH: Right.

DSM: You've been in the business of using this technology to do many things. What do you think is going to be the effect of all this on the public marketplace? You're not going to be from east Texas going to Carolina anymore. You're going to be part of groups all over the world. Do you see things like nationalism eroding?

MH: Yes, it has to. There are good things about nationalism and destructive things about nationalism. One of my favorite places to go is Scotland. The Scots, they're great. They still have some nationalistic fervor and they're still wrestling with the British, but I don't think it's totally out of hand. Around the world, you certainly can have the ability to have cultural issues and those kinds of things that are very worthwhile, and still recognize that the business side of things needs to be pursued on a more global basis. I think that's the way that you'll see things happening.

The other thing, you are talking about a small boy from East Texas. I didn't know what the world was. I didn't know that my dad had ever gone out of state even, until well after I married and he came to visit me in places. I've traveled around the world and things like that. I'm amazed at what's happened in my lifetime and the way my own eyes have been opened, and I can accept things and so on. Yet, I know that my grandchildren will experience even more. They're going to Florida here, and they'll be up here in a month and are going to attend a dinner that's black tie. I had never heard of a black tie. It's that kind of just a huge social upheaval in matter of a few years. The TV is one of the great levelers and our communication systems are just so phenomenal that it's hard not to believe that you're going to have a global sense of working with one another on business problems, because they are going to be more global. The elements of them are not local anymore. The airlines are an example of this with their alliances. Who's to not say that they shouldn't be more than loose alliances? Economic facts would suggest that certainly in fifty years they'd be independent companies, joined companies. So it's hard for me not to believe that the world will continue to shrink in terms of working, problem solving, and economic solutions. There will be global solutions and hopefully still cultural uniqueness that make us enjoy people for what they are and having different approaches to life.

DSM: You have had an extraordinary career and have inspired many people. Who has inspired you?

MH: That one is tough. There are a lot of folks that I have great admiration for. One you probably haven't heard of but who is going to come our dinner, is Naomi Seligman, who was in charge of the research board for about twenty-five years and just retired. A very insightful lady and knows technology and the people that run it. She has, I think, great insights into the way the world works and has probably assisted more CIO's, in creating the CIO, and creating what CIO's have done. She has been friends with folks like Grace [Hopper] and others.

Another one I would recall is Grace. I was thinking back again among the pioneers that I think did more to help bring computers to use. I think Grace probably did as much as anyone in terms of taking on that role. Some of her pioneer friends down at the University of Pennsylvania—Eric Mockley and Eckhert—I think you've got to give them tremendous credit, too. I had the pleasure of meeting Elise Press one time. Those are people that I look up to because they created stuff out of nothing. They had the insight; they had the vision; they had the ability to really make things happen.

Thomas Watson, Jr. Again you have to give him great credit for taking the computing to the enterprise and making it what it was. I'm not sure we would be where we are without that.

Ken Olsen at Digital. He brought democracy in a broad sense to computers. The folks out at Apple—Steve Jobs. These are folks that I look at and say, they did something; they really made things happen. Steve would be fun. I've known Bill Gates and I don't know if you could get him to open up. Another fun guy is Michael Dell. We're talking about the revolution today as opposed to the revolution of the past, so to speak. They'd be fun people.

It would be fun to me to have someone who is not only from the technology side, but also from the social side of things, to help moderate that. I'm not sure I could point to one individual that I could pick. To me, I think the real issues that we have facing us going forward are far more social in some respects than technological. I would want somebody who had faced that or at least recognized it and was willing to address it.

I don't see our politicians yet addressing or even necessarily recognizing the issues to a degree. I think they only see tips of the iceberg and maybe in some cases I'm not even sure they see the tips well. Then fortunately a lot of our politicians are sometimes more subservient than they are really, or they're so conscious of what the public wants as opposed to taking leadership or unique positions.

DSM: The last question is a thought about your own role in this revolution. Three hundred years from now, how would you like to be remembered?

MH: Personally, I guess I'd like to be remembered as someone who liked other people and other people liked me—my family, my kids, my grand kids, my wives. That would be to me a great legacy if you could have that.

In terms of maybe accomplishments, I guess I'd like to be remembered for having some insight as to how technology could be applied, and at least willing to take the risk to try to apply it once or twice. We'll let people judge whether it was successful or whatever. Again, I've always liked—we can go way back—solving business problems and having maybe a willingness to take risks in trying to get some of them solved. It's been a fun and very fortunate time for me. Whatever capabilities I had seemed to fit in and I've been allowed to work with a lot of people in a lot of scenarios that allowed me to do things, and I feel very fortunate that that was the case.

DSM: I think you'll also be remembered as somebody who had contagious enthusiasm. It was a great pleasure to record this interview with you.

MH: Well thanks again for having me, it's been fun.