# Sperry Utah

Sergeant Missile Program by Ed Bower

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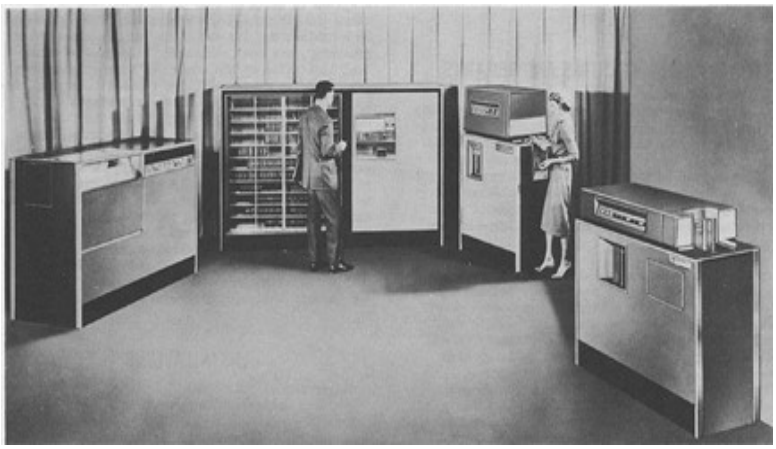
### This Must be the Place (1961-1964)

My family and I enjoyed the Denver, Colorado area. I also liked my job at the Martin Company, later known as Lockheed Martin, doing scientific programming on the IBM 704, but a friend pointed out that a company from Salt Lake City was holding interviews downtown for engineers. My interview went well; the company was called Sperry Utah, which was building the Army's Sergeant missile. They offered me a nice raise and a chance to broaden my programming experience. It sounded like a good thing to do at the time.

The broadening happened as I developed some business programs for Sperry Utah. One project was to build a database of parts we called a generation breakdown.

My experience broadening also extended to using several computers that were new to me. We first used the Solid State 90 (referring to the use of semiconductors as opposed to vacuum tubes) and then the Real Time 490. The implication in the name was that the computer could perform solutions to situations as they occurred, which of course it never did, programmers had to write the code.

Sperry Utah was my introduction to the Univac computer family.



The Solid State 90 used a drum for the main memory, which complicated the programming a little; since the instructions and data had to be placed on the drum locations such that the operation of the program would be somewhat optimized. This is the machine I put the missile database on.

## My Job

I worked at Sperry Utah from 1961 through 1964. My role was not in the design of the rocket technology, but to help automate the manufacturing process. After doing strictly scientific programming the first several years of my working career, I had to learn about generation breakdowns and parts cribs. It wasn't rocket science. I was happy to get the varied experience in programming though.

A generation breakdown is what is sometimes called a "gozinta" process. A 2/3-inch bolt gozinta a ¼ inch steel plate and so on. It is kind of like the song taken from Ezekiel, "the toe bone connects to the ankle bone, the ankle bone connects to the leg bone, now hear the word of the Lord." Only the generation breakdown is more like a tree with a lot of branches. It starts with the entire missile, which is composed of a plethora of subassemblies, which in turn are composed of other subassemblies down to the nuts and bolts.

When I arrived, there was a department of people, each of whom took charge of one or more subassemblies. Each clerk had a file box with all the generation breakdown data on each part or subassembly under their cognizance. It was my task to put this information on a computer and run whatever information they needed from the data base. The programming was done on the Univac Solid State 90.

Generalized database programs were not available then; so, I had to write my own. The software I wrote made the department of people unnecessary. I felt a little bad about that, but I think they were given the chance to move to another department.

We used an assembler program and generated all the subroutines ourselves. The way programmers do business is to program sets of algorithms that occur over and over, one time and then copy them in whenever needed. These programs used over and over are called subroutines. An example might be one for the cosine of x. Then whenever there is cos x in an equation you insert the routine.

The SS90 used a drum memory for the main memory as opposed to current computers using random access memory which is where the current data and program operations are held. This posed unique programming challenges to optimize the operation. We did what we called "minimum latency" programming.

{Editor's Notes: "The SS-80 and SS-90 were basically the same machine except that the SS-80 processed 80 column cards with Hollerith code while the 90 used '90 column' cards, i.e. the same size but with two rows of 45 circular holes versus rectangular for the 80 column cards. The function code had an operation, the address of the operand, and the address of the next instruction. Optimization was so that the next instruction would be under the read heads as soon as the current operation was completed - unlike the sequential addressing of most of the 16, 18, 24, 30, 32 and 36-bit machines."}

## Missile Development

After the Second World War, several German missile scientists (the most notable was Wehrner von Braun) were given amnesty for any role they played against the allies with their V2 rocket development. They were brought to the US help develop missiles. One of the first missiles developed was the Corporal under the government auspices of the Jet Propulsion Laboratories (JPL). JPL eventually came under NASA and has been responsible for overseeing and in some cases actual design and development of quite a few space and space related programs.

The Corporal was an army ground to ground missile capable of carrying a fission type nuclear warhead with 20 kiloton explosive capacity (similar to the bomb dropped on Nagasaki). It was a liquid rocket that was over 45 feet long, weighing about 11,000 pounds. There were limitations that were soon remedied in the successor Sergeant Missile.

Sperry Utah got the grant to pull the program together and manufacture the missile. Thiokol, another Utah company eventually got the contract to develop and manufacture the solid propulsion system. One of the improvements was the guidance of the missile. Sperry Gyroscope, a sister company of Sperry Utah, designed and built the inertial guidance system. The missile had a warhead with 10 times the destructive power of the Corporal.

### Sperry Utah Sergeant Missile

Here are some facts on the missile from a search.

The Sperry Utah Sergeant Missile that was built while I worked there is a surface to surface missile that used “inertial” guidance. This means that the path to the target was programmed in and gyroscopes were used to keep it on its correct path. One of the reasons, I would guess, that Sperry got the contract was that Sperry Gyroscope was a sister company of Sperry Utah. The predecessor missile, the Corporal, did not have this kind of advanced guidance.

Here is some data on inertial guidance.

"Inertial guidance is the guidance of a missile, an aircraft or spacecraft in which gyroscopic and accelerometer data are used by a computer to maintain a predetermined course. It is also called inertial navigation. An accelerometer is a transducer that converts any acceleration into an electrical signal that can be used in an electrical circuit to represent the actual acceleration."

Here is some more on-line information on the Sergeant.

"The Sergeant was the first solid-fuel surface-to-surface missile deployed by the U.S. Army, and replaced the *MGM-5 Corporal* as the Army's medium-range tactical ballistic missile."

"This was a core-burning solid-fueled rocket engine, in which the surface area of the burning fuel remained constant. Therefore, this engine type combined the advantages of the earlier end-burning (constant thrust) and core-burning (light-weight structure, because fuel acted as insulator) rocket designs".

"The first experimental Sergeant missile was launched in 1956, and the Sperry Utah Company was chosen as primary subcontractor for missile production. In 1960, Sperry became prime contractor for the Sergeant, and in July 1962 the Sergeant was operationally deployed for the first time."

In July of 1962 we had a big celebration out in the parking lot because it was a milestone in the status of the missile. The sergeant was operationally deployed. We probably even had a piece of free cake in the cafeteria that day. From that day on, we were doing real manufacturing for our customer, not just preliminary stuff.

## On to the Next Challenge

My family and I were happy, and we loved Salt Lake City.

But it was a time of competition with Russia and technical people were in some demand. Companies competed for our services. When Bunker Ramo advertised for interviews on an exciting project down in Arizona, I wanted to check it out. By now at Sperry Utah I was responsible for a group of programmers in the technical management for the manufacturing application. I was now also doing some system analysis to define how to better do manufacturing reporting to upper management. So, anything I looked at as a change had to be very inviting.

Bunker-Ramo invited me to go to Sierra Vista, Arizona to talk to the team of programmers developing a fire control system for the Army Artillery called TACFIRE at the Army's Fort Huachuca. I was hooked when I visited there, took the job, and worked there for as long as Bunker Ramo had the contract with the Army.

*Then to Sperry in St. Paul in 1966.* See http://vipclubmn.org/People1.html, section 3.15.