# **Imsai History**

By Stan Veit

**A**lthough the MITS Altair 8800 was the first practical personal microcomputer and started the industry, credit for spreading the personal computer revolution must go to another company – IMS Associates and its product, the Imsai 8080 computer. While it was not strictly a clone of the Altair, this machine adopted the bus structure of the Altair and used interchangeable plug-in circuit boards. This commonality and the availability of the Imsai assured the dominance of the Altair (S-100) Bus.

IMS Associates was started by William Millard as a computer consulting company, whose most important consulting project was the development of a computer system for an automobile dealer. In an effort to reduce costs, Millard became interested in the new microprocessor chips being manufactured by Intel, and the possibility of networking many of them into a powerful computer system he called Hypercube.

When the Altair article broke in ***Popular Electronics***, Millard and his associates tried to order some Altairs to try out this idea. They immediately ran into two problems. First, MITS wanted payment in advance, and second, they couldn't promise to deliver the order for at least 90 days. IMS Associates couldn't get the money unless they could show their customer that they had a solution to the problem, and they couldn't wait 90 days. Millard did manage to borrow an Altair to examine, and he and his associates became convinced that such a microcomputer represented the best solution to their problem, and the Altair 8800 was not a commercial piece of equipment by any criteria. Since the only other choice they had was a much more expensive minicomputer, with an even longer delivery time, they decided to build a copy of the Altair. Having made the decision to build their own 8080 computer, IMS Associates decided to correct the obvious defects of the Altair and build a rugged commercial grade machine.

The most glaring defect of the Altair was the location of the expansion motherboards. MITS used a standard Optima case to house the computer, and its shape dictated the mounting position of the motherboards. This in turn caused the board mounting connectors to face the side of the cabinet. As a result, the connections from the front panel to the motherboard required a large cable. In addition to making the computer kit harder to build, this cable was a potential source of trouble over the life of the computer. IMS Associates designed their own cabinet and made it much deeper than wide. This allowed the Imsai to be made with the motherboard perpendicular to the front panel so that the front panel itself could be plugged into the first connector on the motherboard. This eliminated the large connecting cable.

The front panel of the Altair used small toggle switches to program the computer in binary machine language (ones and zeros were represented by switches "on" or "off".) The Imsai used the same arrangement but replaced the Altair's toggle switches with heavy commercial-grade "paddle" switches. The plastic switch "paddles" were colored red or blue. Mounted above the paddle switches was a colorful plastic panel with the indicator lights showing through. The name *IMSAI 8080* was displayed in the upper right-hand corner of the panel. To emphasize that this indeed was a commercial-grade computer, the heavy aluminum cover was painted what was then called "IBM Blue." In all, the Imsai design was very impressive and professional.

Once the Imsai cover was removed, you could see that the obvious and most impressive difference between the Altair and the Imsai was the power supply. The Altair used a power supply rated at 8-amps and constructed of radio grade components. This was thought to be more than adequate for the original design of the computer, but not for an expanded system. (MITS later had to upgrade the power supply to allow for growth.) The Imsai power supply, on the other hand, came equipped with a massive transformer and very large computer-grade capacitors. The standard model was rated at 20 amps, and for a small upgrade fee you could get a huge 30-amp supply. This big power supply could deliver 30 amps at 5 volts and 3 amps at + - 16 volts. Having a large power supply was an advantage because all the S-100 Bus computers used un-regulated power supplies with power regulators located on each individual circuit board. One of the most common causes of failure in S-100 computers was failure of the on-board power regulators. The use of massive transformers and capacitors provided less electrical fluctuation and longer life for the power regulators. In addition, larger power supplies provide a reserve for later expansion.

For the computer owner, selection of motherboards for the Imsai was very important. The standard kit or assembled unit only came with a 6-slot motherboard (2 more than the Altair), but only two connectors. To expand the system, additional connectors and 4-slot motherboards had to be added to the computer. Every time you added a connector, you had to carefully solder 100 connector pins to the board. Whenever a motherboard section was added, 100 wires had to be added. This required making 200 solder connections, and every solder connection was a potential source of trouble. The Altair connectors were made with a different pin spacing than the standard 0.125-inch Texas Instruments connectors used by Imsai. You could plug the same circuit board into either type of connector, but the pins that went into the motherboard were spaced differently. The Imsai connectors cost from $7 to $10 while the Altair connectors cost $15 each and were harder to get.

Imsai offered a 22-slot motherboard as a $52 option, when you ordered it with the computer. This was the solution to the motherboard problem. If you installed with at least 10 connectors, additional soldering seldom had to be done. Word got around very fast, and almost everybody ordered the Imsai with 22-slot motherboards and 10 connectors.

Like the Altair, the Imsai kit only came with the front panel board and the CPU board. No memory or input/output board was provided. However, by the time the Imsai was being shipped, there were several choices of memory boards available. Imsai made an excellent 4K Static RAM board for $139 in kit form. Processor Technology had both 4K and 8K Static Ram boards available, and even MITS had 8K Ram boards and a new 4K Ram board that worked.

You really needed about 16K of memory to load BASIC and generate programs with usable data. You also had to have a working Input/Output (I/O) board to get things in or out of the computer. I/O boards came in either serial or parallel form, or both. One of the most popular I/O boards was the 3P+S from Processor Technology, which had both forms of I/O on one board. Imsai advertised that they were developing a super I/O board called the Multiple I/O (MIO) Board, but it never seemed to come out and was referred to as the "Missing I/O Board."

One most important thing that MITS had over Imsai was the BASIC written by Bill Gates of Microsoft, which was very important because lack of a good BASIC made operation very difficult.

Imsai had little software capability. The only software they supplied Imsai was a modified version of the Software #1 package, written for Processor Technology and placed in the public domain. This was delivered on a paper tape and required 8K of memory. The software consisted of a executive program, including a text editor and an assembler program for assembly language. To use it, you had to have a teletype tape reader. The procedure was not simple. First, you used the computer's front panel switches to load in a bootstrap loader program, one byte at a time.

Once the loader was in memory, you could start the tape reader and load the executive program from the tape. Now, you could use the keyboard on the teletype to write an assembly program, and the executive program could assemble it. If that worked, the result was object code for your program, and it could be stored in RAM memory. If you had enough memory, you could run your program. Then if everything ran okay, you could store your program using the punch on the teletype to make a new paper tape. The next time you wanted to run the program, all you had to do was load the object code paper tape back into memory and there you were. Simple! This was not exactly what we today call "user friendly," and this is why having a higher level language like BASIC was so important.

Imsai advertised both 4K and 8K BASIC but noted that this was under development and would be available "real soon now." Imsai owners did not wait; they got Altair (Microsoft) BASIC by hook or by crook (mostly by buying it as a group and sharing it among themselves.) Altair BASIC soon became the standard language for personal computers even before Microsoft got out of its restrictive agreement with Altair.

In spite of its usefulness, the Teletype as an I/O device, printer, and mass storage device was too expensive, too hard to get, and too hard to use. The audio cassette interface was a much better choice. Tape recorders were low in cost and easy to use. The problem was that there was no standard interface, and tapes made with one interface could not be read by another. The industry held a meeting in Kansas City to develop a cassette tape standard, but few adhered to it. Finally, because it worked the best, the Tarbell Cassette Interface became a *de facto* standard for S-100 computers, except for notable exceptions like MITS and Processor Technology's SOL. Cassette tape took over I/O functions from the paper tape punch and reader until floppy disks became commonplace. Video terminals and low cost printers also became available for microcomputers.

IBM had developed the floppy disk to load software, and Altair, Imsai, and other companies were working to adapt it for use on microcomputers. The development of floppy disks and disk operating systems, plus cheap RAM memory, opened up the industry for really useful software, and completed the transition from hobbyist's toys to really useful computer systems.

Because of component board interchangeability, almost no one ran a complete Imsai Computer System. The computer itself might be an Imsai with its 8080 CPU, but even that was likely to be a Z80 CPU from TDL, or Cromemco. The memory could come from any of two dozen manufacturers. Seals Memory were popular 8K boards as were Vector Graphic, IMS (not related to Imsai), and Processor Technology. In 16K memory boards, Cromemco and Processor Technology were well thought of, as were TDL, Seals, IMS, and a few others. The I/O board was most likely to be a 3P+S from Processor Technology although George Morrow made a popular one and some people liked the Vector Graphic. The computer terminal was likely to be a Adam 3A or a Hazeltine 1500. Many users saved money, and in place of a separate video terminal, installed a Processor Technology Video Display Module (VDM) and a keyboard. With this combination, they used the computer itself as a terminal.

For data and program storage, they often used the Tarbell Cassette Interface before the advent of the floppy disk drive. Imsai's first attempt at a "smart" floppy disk drive was a total failure. Later, various disk drives from MITS, Pertec Persi, North Star, George Morrow, Micromation, and Cromemco were installed in Imsai computers. Imsai finally did manage to come out with their own working floppy disk unit. At first, all the floppy disks were 8-inch units and were very expensive. When the 5 1/4-inch floppy disk drives came out, many computer owners who had not been able to afford disk drives purchased them from Pertec, North Star, and other companies.

One very important thing that Imsai did to advance the use of floppy disks was to license the best disk operating system, later to be known as CP/M. In fact, it was money from the Imsai license that encouraged Gary Killdal to form Digital Research Incorporated and to get into the CP/M operating system business.

While Imsai never became a successful systems house as did Cromemco and others, the Imsai 8080 with its massive power supply and 22-slot chassis was a foundation for almost any 8080 or Z-80 system you could think of. Even Alpha Micro Systems used the Imsai for its first 16-bit multi-user systems.

## From IMS Associates to IMSAI Incorporated

The company that developed the Imsai was very different from the company which invented the MITS Altair. Ed Roberts of MITS was a technical person who was propelled into the leadership of a rapidly expanding computer company. Bill Millard, on the other hand, was an entrepreneur who envisioned the growth of his company into a vast computer utility. He was a believer in the self-improvement techniques developed by Werner Erhard, called "EST," which he attempted to apply to all situations. EST convinced him that once he had made up his mind to do something it was as good as done. He surrounded himself with people who had "taken the training," and this was a big factor in the accomplishment of bringing the Imsai to market in record time. It was also a factor in the failure to test equipment before releasing it to the market, and the inability to see changes in the market as the technology advanced. Fortunately for Imsai, in addition to Millard and his "ESTheads" the company also had the services of some of the best sales and marketing executives in the industry, includingEd Faber, who built both Imsai and Computerland, and Seymour Rubenstein, who founded MicroPro the owner of WordStar software.

It was said that MITS was an engineering company who did not know how to build and market their products. Imsai, on the other hand, was a marketing company who developed one brilliant product and overexploited it. From the Imsai 8080 on, they never knew the difference between a prototype and a production model, and never really had another successful computer.

## The Life and Death of Imsai

When the Imsai 8080 was in development at IMS Associates, it looked like the company would run out of money before the computer was completed. As a last resort, Millard placed an ad in Popular Electronics Magazine, describing the computer and offering it for sale as a kit. The ploy worked beyond their wildest dreams. The computer hunger, fed by the Altair articles and the inability of MITS to deliver, impelled people to send in checks for the Imsai 8080 merely from the description in the small ads. Millard used some of the money to prepare a professional ad campaign and place ads in Byte and all the other computer magazines now appearing. The stream of checks grew to a flood and people startedto inquire about becoming dealers**.**

As owner of the Computer Mart of New York, which was about to open, I was one of the first people to contact IMS Associates. They were very interested in selling in volume to dealers, but they had priced the kits at $439, a price too low to provide for dealer discounts. Quickly they raised the price to $499 and allowed a discount of only 15% for orders of 10 or more computers. This was still not enough margin to allow a dealer to make a profit after paying his overhead, considering the small quantity we could sell. Then Ed Faber came up with a scheme that benefited both the company and the dealers. He proposed that if we dealers could pay for the computers in advance, we could get another 5% and IMS would pay the shipping cost. For me that was the clincher; I sent off my check and prayed that IMS Associates would make delivery on time. Little did I know that I would get priority because Millard and Faber wanted their computers on sale in New York where theywere trying to raise capital.

Back in San Leandro, the people in IMS Associates went to work to build their first 50 kits to make the initial shipments. By December **1975,** they had shipped the first lot and were at work on the second batch of 250 kits. Ten of these were mine**,** and never had I sweated out anything more than the arrival of those computers. I had exactly one complete computer, one partial kit for the Sphere computer, ten video monitors, one teletype, a lot of books, assorted parts, chips, and connectors to open a computer store with. We hoped to open March 1, 1976, but in the middle of January five of my Imsais arrived and we couldn't wait to open. Not convinced that we would ever make it, I had been looking for work and had contracted to write a manual for the Warner Communications Timesharing Service. We actually opened on New York's Fifth Avenue in back of Polk's Hobby Department Store in February 1976 and started immediately selling Imsais.

Ed Faber quickly saw the potential of the computer stores and took IMS Associates (now called Imsai ) out of the direct sales business. Instead, he developed a plan where a dealer had to commit to only 25 computers a year and put up a deposit of $2,500. The discount was put at 25%, and Imsai would ship on a C.O.D. basis rather than requiring cash in advance. For us established dealers, it was a great help. However, under this plan dealers sprouted all over the place, in garages, lofts, and hardware stores. In addition, the mail order discount dealers appeared, and people started to bring in kits they had bought by mail but couldn't put together.

At the first big computer show held in Atlantic City, New Jersey, on the weekend of August 27, 1976, Imsai was not an exhibitor although MITS and every other company was showing their products. However Ed Faber walked through the show like a king. The truth was that there more Imsai computers than any other make. Every retailer had Imsais, as well as people selling boards and peripherals. In addition there were heaps of Imsais piled up and marked with bargain prices for sale at the show. Although MITS was the biggest exhibitor at the show and they introduced the new Altair B model, Imsai got the greatest attention

However, I was one of the few dealers not showing Imsai computers. Instead I had a brand new computer made on a single board. It did not need a teletype because it had its own video output to a TV set. It had a very fast cassette interface for data storage, and it had its own version of BASIC that came with the computer. It was called The Apple and it was being shown in my booth by two young men from California, Steve Jobs and Steve Wozniak. The Apple proved to be one of the hits of the show. In addition to the Apple, the show introduced the new Processor Technology SOL, the new Cromemco, and the TDL Z-80 CPU board for the S-100 Bus.

Although we did not realize it at this show, the handwriting was on the wall for the Imsai 8080 as well as the Altair. The new generation of computers was already here, and within a year the SOL became my biggest seller, followed by the Apple II a year later.

Imsai as a company tried to introduce several new products as an upgrade to the 8080. One was the "smart disk drive mentioned previously. It was a single sided 8-inch floppy disk drive originally set for introduction in 1976. The unit was released and shipped before it was completely tested, and it proved to have all kinds of design problems. When it did work for any length of time, it grew very hot and generated heat to distort the diskettes. It quickly became known as "The Imsai Pizza Oven" and was quickly withdrawn from the market. The next version took over a year to complete, although it was offered in the Imsai catalog.

Another product launched with an intensive advertising campaign was the Imsai 8048 Control Computer. This was a single board computer designed to control all kinds of electrical devices. The 8048 computer worked, but priced at $200 to $400 it found no market. Other devices such as the Commodore KIM-1 were much more versatile and cost only half as much.

In addition to the declining market for Imsai 8080 computers, and the lack of follow-on products, there were other problems in the Imsai Corporation. Bill Millard had decided that his future was to be in selling computers rather than manufacturing them. A man named John Martin had brought him the idea of setting up a franchise computer business to be called Computer Shack. Martin had actually copied the idea from Paul Terral's Byte Shops, but had added some ideas from his experience in the franchise muffler business. Millard incorporated The Computer Shack franchise business, put Ed Faber in charge, and started to sell franchises.

The new business caught the crest of the wave of interest in computer stores and quickly became a major force in the industry. The only setback was caused by Radio Shack, which caused a name change to Computerland. The Computerland stores carried Imsai computers but they also sold Apple, North Star, and Cromemco. In fact, the Imsai 8080 became one of the less popular computers in the stores.

Determined to dominate both the retail franchise and manufacturing ends of the computer business, Millard forced his Imsai division to produce a desk top business computer called the VDP-80. This was an all-in-one machine with the video monitor, keyboard, disk drives, and computer, all in one cabinet. Millard had the cabinet built in Europe with an eye to exterior design and no consideration given to the requirements for the internal components. The new machine was plagued with problems and in addition had an unproven dual floppy disk drive made by Persci. This drive was almost impossible to keep in alignment under the most favorable conditions. In the furnace inside the VDP-80, it refused to run properly. Although intensive advertising sold this computer, Imsai could not afford to keep up their warranty. There was a quick re-design installing 5 1/4-inch drives to replace the 8-inch Perscis and changing the name to VDP-40. However, the damage had been done. The Computer Mart of New York refused to sell the VDP-80 and gave up the Imsai dealership, which had become unimportant anyway.

Millard had stripped Imsai of all its resources and put them into Computerland. Bankruptcy quickly followed for Imsai. While Computerland went on to become the most important retailer of Apple and IBM PCs, the foundation crumbled and Imsai disappeared. Many of the assets of Imsai, including the rights to the name, were bought by Fisher-Fitas, a former sub-contractor to Imsai. They continued the manufacture of the original rugged 8080 machines until the parts ran out and then the Imsai 8080 became history.

Computerland stores prospered as the primary retailer of IBM computers but, when IBM abandoned the ISA bus and the clone business started, they fell on hard times. The franchisers joined in a bitter legal battle with Millard and became independent of his control.