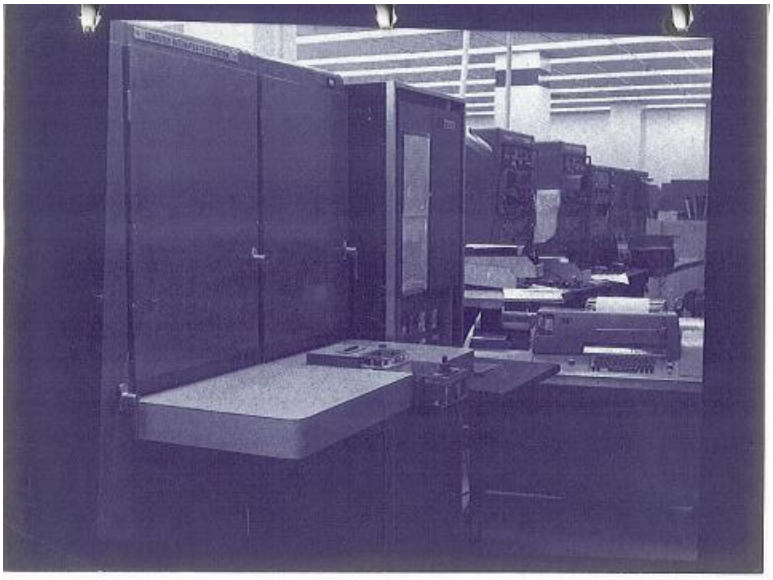

The First Computer Assisted Test Station [CATS] at Martin Marietta Orlando Aerospace.

Russell E. Theisen

1967

The First Computer Assisted Test Station [CATS] at Martin Marietta Orlando Aerospace.

By Russell E. Theisen Life Senior Member IEEE

Before I went to work at Martin Marietta Orlando Aerospace in 1966, I spent two years working at the North Street in Endicott, New York International Business Machine {IBM} in 1963 to 1965. We built the IBM-360-20 which was the first Solid State Computer System that IBM manufactured. I was also involved in developing the IBM computer that was used in the Moon Lunar Lander that was built in IBM Owego, New York Government Division. I used the IBM 1401 Transistor Logic Technology as a test equipment controller used to build the [SLT] Solid Logic Technology IBM 360-20.

Russ Theisen Military Story

Russell E. Theisen and Mary Ann (Asbury) Theisen

Military History of Russell E. Theisen

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http://trees.ancestry.com/view/Military.aspx?pid=1184653499&tid=20375746&vid=fffe41ce-4e66-42e0-b792-a6df5b80df57&pv=1

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We had only been married for a few years and my wife; Ann was from the South and did not like the severe weather that was typical of Endicott, New York. Nor did she like the clannish unfriendly people of that New York State area.

That year in 1965 we had a snow accumulation of over 200 inches in our front yard.
We had our first child born in Endicott, Ann told me that she would not spend another winter in New York and she was going south and wanted me to come with her.

After I received my Professional Engineering License through my work at Binghamton, New York University, I asked for a better assignment at IBM. This did not seem to make any difference to the IBM management. They said that the plant only needed one Professional Engineer at the plant and they already had one.

I tried to get transferred to an IBM plant in a more acceptable climate, but my managers all the way up three levels refused to approve the transfer. They claimed that my work was indispensible doing what I was then doing. It would take at least three more people to get the skills that I was providing to IBM.

Their recommended solution was for me to get a new wife and stay working in Endicott. I felt that I had tried three times to find a workable solution at IBM, I pitched three balls and IBM struck out three times. There was not an acceptable IBM management reply. THEREFORE; I was forced to choose between my wife and my job so, that summer, I look around for a better solution.

When my vacation came around, I had set up some ten plus interviews across the country, from Cherryhill, NJ; Philadelphia, PA; Baltimore, MD; New Port News, Virginia; Norfolk, Virginia; Raleigh, NC; Savanna, GA; Orlando, Florida; Huntsville, AL; Dallas, TX; SanDiego, CA and a few other places. When my wife saw Orlando, FL she said that "this was the place that she wanted to live". Good weather and friendly people. She voted for Martin Marietta in Orlando, FL.

We arrived at the Harley hotel in down town Orlando about 2A.M. in the morning. I was scheduled to interview at Martin at 8:00 A.M. I only got about 3 hours of sleep that night.

When I first interviewed at Martin, I was originally asked to interview with a single manager, in the Test Equipment Department; but before the day was through, I had eight interviews scheduled for me that day. When my last interview was completed around 7:30 P.M., I returned to the Human Resources Department for an Exit interview. But everyone had gone home. I was told "If there was any interest I would get a letter offer". So I left and returned to my wife and son and we traveled to Huntsville, AL to interview at a company called Teledyne Brown. When we were in Huntsville, AL My wife's comments were "they don't even have a McDonalds in Huntsville".

I realized that the only place that would allow peace in the family was back in Orlando, FL.

The following week I received eight separate form letters from Martin Marietta Orlando Aerospace that were very confusing. Three were the "**sorry you are overqualified for the positions that we had openings**", and five others were that "**You were great and we wanted to offer you a position with a Substantial Offer**". All the letters were standard form type and were from the same HR at Martin with the same date, with the same signatures all with contradicting messages. I called Martin Marietta and asked for clarification, since I was not experienced with this type of confusing letters. The head of the HR Office said did you get a letter with an Offer attached or Not. I said yes in fact there were five different offers involved. He said, "**than why in the hell are you talking to me, just accept one and come join us**".

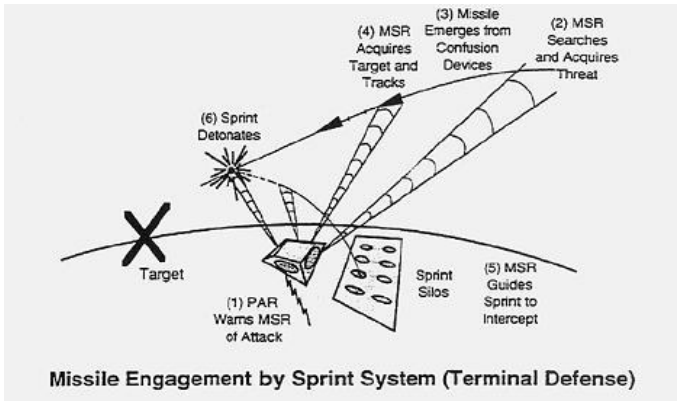
I finally ended up accepting a Reliability Engineering job with a former Airplane company that was now trying to get into the Defense Missile Business in Orlando, Florida. My Engineering experience was not in Reliability Engineering, but that is what they wanted, and they had made the best offer, so I became a Reliability Engineer doing Safety Margin Testing. I returned to IBM and I submitted my resignation and with my wife and young son, left for warmer climate.

Martin, a former Airplane builder moved from Baltimore, MD where they built Airplanes and Joined a Building materials company in Marietta Georgia, to form an Aerospace Air Craft building Culture trying to build missiles in Orlando, Florida, since it was close to the cape Canaveral where they could be launched.

VHAT WAS THEN, AND STILL IS, the entrance to the lobby of the Main 'lant. Other than the Martin-Orlando logo, there is little change in this portion f the building.

Russ Theisen worked on a program related to the Safe Guard Missile Defense system being developed for the US Government. It was an interesting cultural change from a manufacturing culture of IBM making computers to Martin Marietta Orlando Aerospace a company trying to make missiles.

Martin management did not seem to know what a computer was back then, or what it could do for them. They asked if it had something to do with the payroll.



Missile Engagement by Sprint System (Terminal Defense)

Part of my job was to review the documentation and drawings to make sure that there were no dangerous drawing mistakes that would cause un-safe design and development of the missile components. I reviewed all the electronic and manual Test Equipment designs to make sure that they would not damage the missile components during the testing phase.

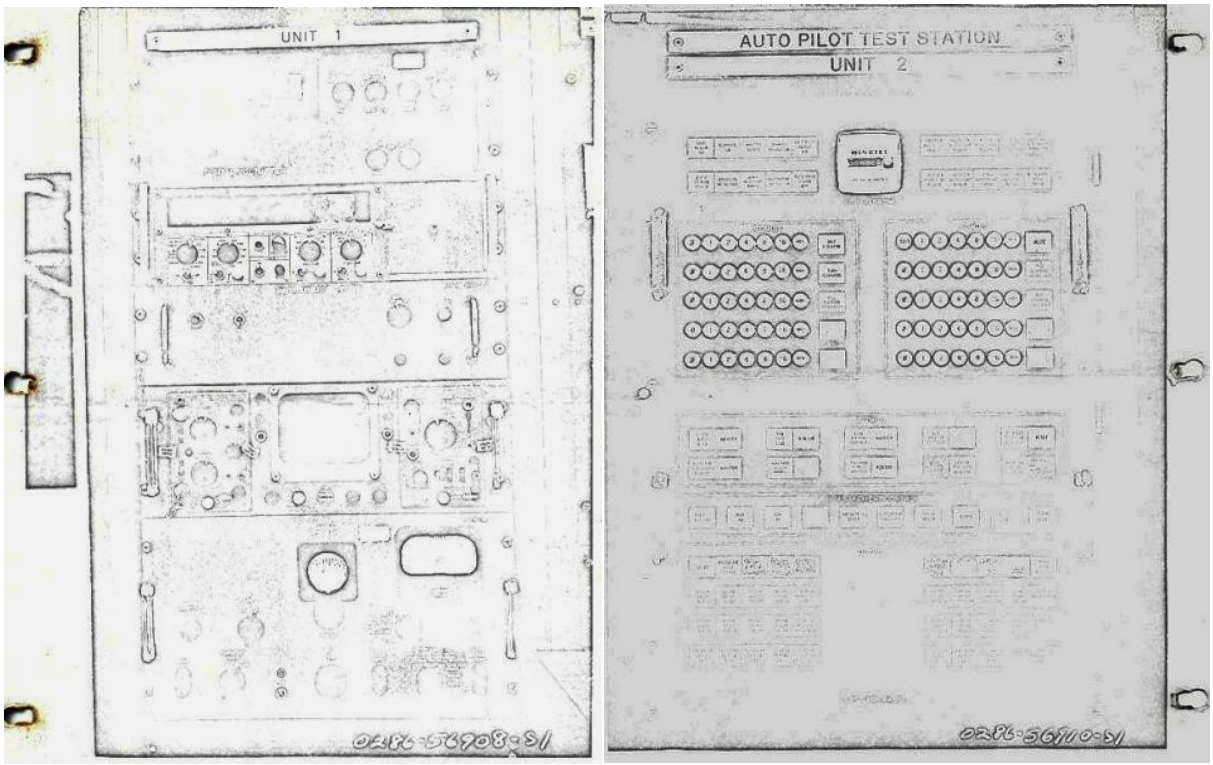
My unique experience in test equipment design, calibration and utilization through my accumulated experience with 10 years of Radio, Television and Communications equipment repair business and the 14 years service in the US Marine Corps Avionics, where I had taken over 10,000 hours, (5 years) of electronics schooling, plus the years of Engineering Education in Mechanical Engineering, Civil Engineering that I had gathered from Virginia Polytechnic Institute and Old Dominion University to get my EE Degree.

I did not realize that young engineers were so sensitive about constructive criticism. They did not like being told that their designs had a possible flaw in their designs that would probable cause damage to missile components.

One test equipment design engineer got so upset that he resigned from the Test Equipment Department and went to work at the US Naval Test Equipment Center in Orlando, Florida.

His manager called me into his office and asked why I had critized his design. I showed him that he was using a common monitor bus, that was utilizing “make before break” mercury whetted relays. This could put a short from a 28 volt signal to ground for over 500 milliseconds that could very well damage the missile components that were in the [UUT] Unit Under Test.

The test department Manager said “could you do any better?” I said sure I can, by changing the type of relays being used to break before make. And making several changes to the interface controls. The Test Equipment Manager said “that is great, you have just been transferred in to my Department to do the design, since my designer has left the company”. (This manager is also the managers that interviewed me and made an offer for me to take a job in the test equipment design department during my original interview at a much lower salary). I was now doing designs of electronic test equipment. I asked my Reliability Manager what he thought about the events and he said you are only loaned to the Test Department, but you still work for me. That was hard to believe, since all of my time charges were to the Test Department.



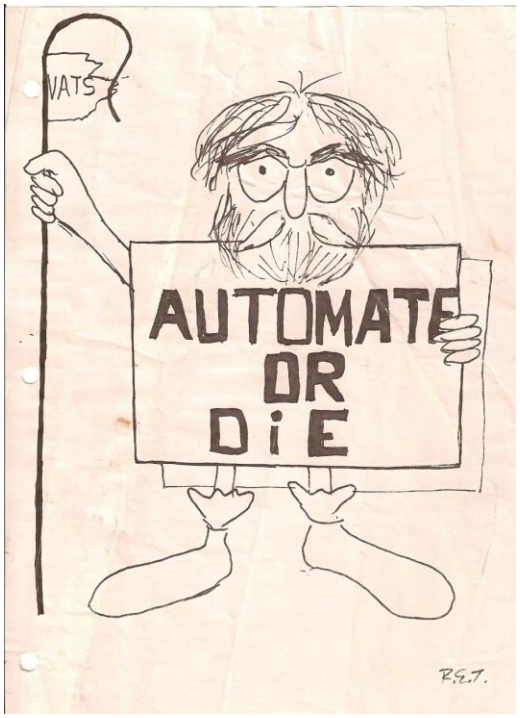
We built the Auto Pilot Test Station for the SAFEGUARD SPRINT Autopilot

Russ Theisen continued to do test equipment design and upgrades for several years. We put over 350 Engineering Change Notices in this Test Equipment that was trying to perform three different test function configurations with the same documents. The documentation was getting to complex to maintain a single set of documentations. One for the Engineering Evaluation test set, one for the Manufacturing Test Set and one for the Reliability Test Set. I finally forced the issue when I generated a weird change notice and submitted it. It went all the way to Corporate Headquarters before it bounced back.

The change notice called for a" Was", and "Now" document plus an "IS" and "Should be" document. My manager told me that they could not afford to create different documentation. I was called to my manager's office to explain. I said that the configuration of the three machines were all different even though the documentation did not show this. I generated the **Was** and **Now** to correct the documentation and the new **IS** and **Should be** document for the technician to show what it **IS** going to look like when you open it up and the **Should Be** is what it should look like when you complete the change. I understand that the Martin Management all got a laugh with my documentation however, I got my three sets of documentation to show the three different configurations.

I continued trying to introduce Martin Marietta management to the benefits of using computer controls in test equipment design but the concept seemed to always fall on deaf-ears. I thought that I would never get away from this test equipment for Sprint. Since no one else seemed to understand its complexity.

I continued to try to promote Automatic Test Equipment whenever I could.

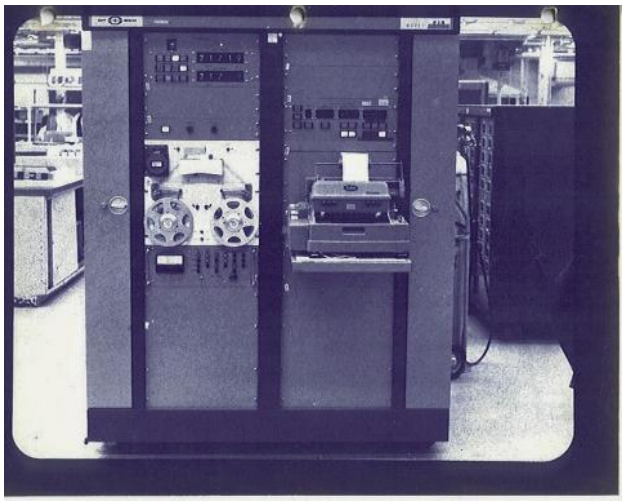


[VATS] Versatile Automatic Test Set

I tried many times to try to convince management of the advantages of time savings and improved quality through computer controlled testing. Three hours or three days of test time; Which is cheaper?

Finally, my message got our Army customer curious and with his help, I was able to order a numerical controlled cable tester to test the Army missile cabling. This was my first proof of principle demonstration.

After I had written a purchase request and the Army customer for the Sprint Missile, asked that it be approved. In 1966 when the customer, the US Army saw what I had done they said that they wanted this test technology for their new test equipment development. Now that the customer wanted it my management was more agreeable to try it.



ATE-Ditmco1966

This was the [DITMCO] Drive In Theater Movie Company cable tester that Russ Theisen was able to get for the Safe Guard Cable testing. It was a paper tape numeric controlled test set with a Freeden printer.

Yes, this system was used to test the Speaker in a Drive-in Movie Theater. Russ thought that the missile building business could use the technology as well. It saved hundreds of hours of cable testing and sold some management on Numerical Control Testing. This was a first step in the right direction.

Walleye Missile (AGM-62) Contract

One of my next test equipment developments was for a Navy program that used the Walleye TV guidance bomb system to guide the missile to impact. It was used in the Korean conflict. We were to be providing Depot Maintenance and build to Navy Prints. Martin did not yet know about Manufacturing time constraints and test time limitations related to manufacturing on a large scale. But I had experience in this area, that Martin management seemed not to have, nor did they even consider or want to listen to.

We were about to learn the reality of Manufacturing and Depot Testing costs.

It was about this time, a young engineer that joined the company, Lyle Finn, he had just earned his Master's Degree in Electrical Engineering and he wanted to try building a sampling digital volt meter. We were able to get our test department management to spend some $30,000 of engineering study money for an obsolete 12 bit SCC-650 computer (That we planned to build the (ATS) Automatic Test System around).

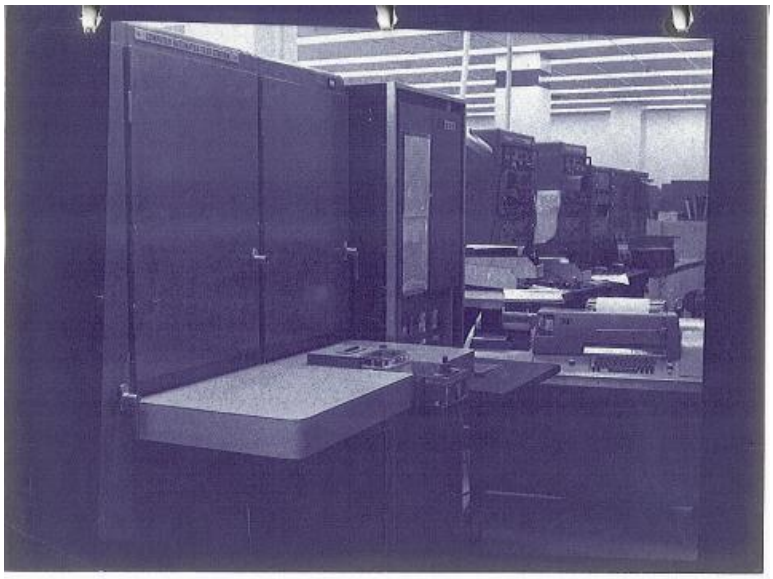
This computer was similar to the PDP-8, It was a single-address, 12-bit-word computer of the second generation. It is designed for task environments with minimum arithmetic computing and small Mp requirements. For example, it can be used to control laboratory devices, such as gas chromotographs or sampling oscilloscopes. Together with special T's, it is programmed to be a laboratory instrument, such as a pulse height analyzer or a spectrum analyzer. These applications are typical of the laboratory and process control requirements for which the machine was designed. As another example, it can serve as a message concentrator by controlling telephone lines to which typewriters and Teletypes are attached. The computer occasionally stands alone as a small-scale general-purpose computer.

However, there was no money for engineering development manpower. So, Lyle Finn and I agreed to build this first Automatic Test Station on an unpaid overtime basis. We worked evenings and weekends designing, building this first of a kind computer assisted test system. We could not use the Martin Marietta support functions of normal test equipment design, because we did not have support money for these functions.

We had much interest from management ,and engineering getting this system designed, developed, programmed. We had one engineer, Ken Smith come up to me and ask "Can I play with the computer? I want to see how it works". When I told him that there was no money for him to charge his time to, he said heck I would pay you to let me play with it. It was a 12 bit octal assembly language program. It had only 4 k of memory; it was a 4 pass paper tape assembler that took some 4 hours to assemble a paper tape that the computer could use.

We worked for the better part of a year to build this first Automatic Test system. The console was made of plywood, with plastic test adapter interface; It had a KSR-35 teletype input, printer, paper tape reader and punch. Lyle Finn built the printed circuit cards, Russ Theisen built the interface, cabling, test adapters, wrote the test programs and we gave the Job of writing callable Assembly Macros to Ken Smith. We completed the engineering bread board test programs. When Martin Marietta Management wanted to show it off, the comment was "I can't see it do anything so I wrote a demo program the make light flash paper tape read, punch and print out messages and the light to flash in a pattern. Then I wrote a program that would allow you to type a message on the teletype and the printer would print it out in 10 inch high characters on the teletype pages. A great management play toy. Before I was through with this program, I had spent more than a man-year of unpaid overtime to get this program going.

It used the new design sampling digital voltmeter to analyze the video signals of the unit under Test



ATE for Walleye TV Guided Missile System 1967

This Automatic Test Equipment [ATE] was the first computer controlled Test Equipment that was used in Martin Marietta Orlando Aerospace [MMOA]. Russ Theisen, Lyle Finn, and Ken Smith donated over a man year each to design, develop, build, program and demonstrate that Automatic Test Equipment had a future in Test Technology. We never did get compensation for the time spent developing this first ATE system. However, without our dedication and foresight, [MMOA] would probably never have an understanding of the importance of ATE.

Walleye AGM-62 TV Guided Missile

Russ Theisen helped develop the first Automatic Test Equipment to be built at Martin Marietta Orlando Aerospace to test the Guidance and Sensor electronics for this missile.
Russ Theisen, Lyle Finn, Ken Smith donated over one man year each of unpaid overtime to

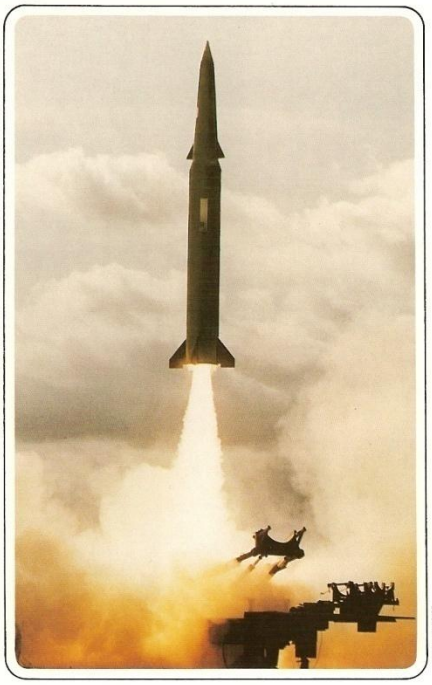
design and develop the first Automatic Test Equipment for Martin Marietta.
This was the [UUT] unit under test.
Up to this time, I feel that Martin Management would not consider using a computer in test equipment since they had never been exposed to it. Martin Marietta had a problem with the Navy customer since we contended the documentation provided to us would not make a viable missile component since it was different from the actual missile as built. Martin Offered to correct the documentation for the Navy but the Navy claimed the documentation was correct as supplied. Actually the documentation was an afterthought by the Navy, but they did not want to admit that the missile could not be built to the documentation supplied to Martin. The Navy cancelled the contract that they had signed with Martin. Since the test equipment was not part of the Navy contract we kept working on it for other uses.

Pershing Missile System

The Army saw the Walleye Automatic Test Set demonstration and they decided that they wanted one for the Pershing Missile Development.

We said that was fine but, we would like to get a more logical computer a 16 bit Hex machine like the one from Hewlett Packard, but Army customer said that they only buy proven machines and the Walleye ATS was proven. I tried to convince them that the computer was obsolete and was no longer being manufactured, but that did not have any effect on the contract they awarded to Martin Marietta for a machine for the Pershing missile. We made a Rube Goldberg that converted the SCC 650 12 bits to a 16 bit by programming t-bar relays to get the 16 bit that we needed. It was slow but that's what the customer ordered. The Scientific Control Corporation that made the SCC 650 had to reopen a production line to make this obsolete machine for us They asked why in the world would we want such an obsolete machine? We said that what our customer ordered. I made many tools to make it faster to develop a proper paper tape program but that was the only way to save time in the normal 4 pass assembler process.

Time was money made or lost.



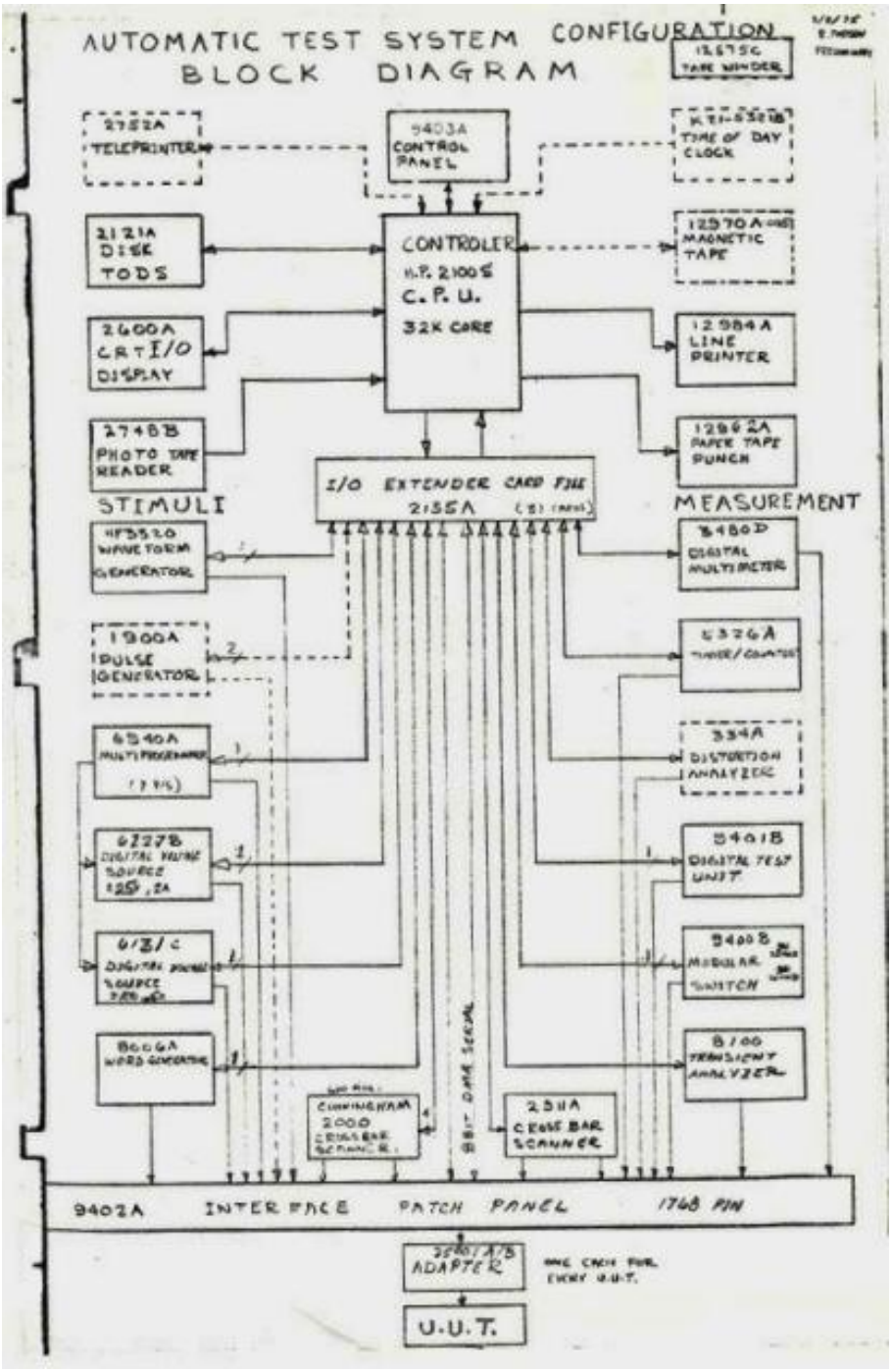
PERSHING II

The U.S. Army's Pershing II is a mobile, surface-to-surface tactical nuclear missile being deployed with NATO forces in Europe. Pershing II has twice the range and ten times the accuracy of its predecessor, the Pershing Ia, which has been deployed in Europe since the 1960s. The improved accuracy is provided by a terminal guidance system that compares radar imagery of the target area to a prestored reference image and sends guidance commands to the missile controls. The basic Pershing II fire unit consists of the two-stage missile, a transporter/launcher, and associated launch control and support equipment. The Pershing II program is unusual in that production began before system development was complete. This accelerated schedule reduced program cost and allowed deployment to Europe on schedule in December 1983.

FACTS MARTIN MARIETTA

U.S. Army troops train with the system at Fort Sill, Oklahoma. The first Pershing II units are now deployed in Europe with U.S. NATO forces.

Pershing Missile was the one that worried the Soviet Union more than any other during the cold was in Europe since it only had flight time of less than an hour after launch.

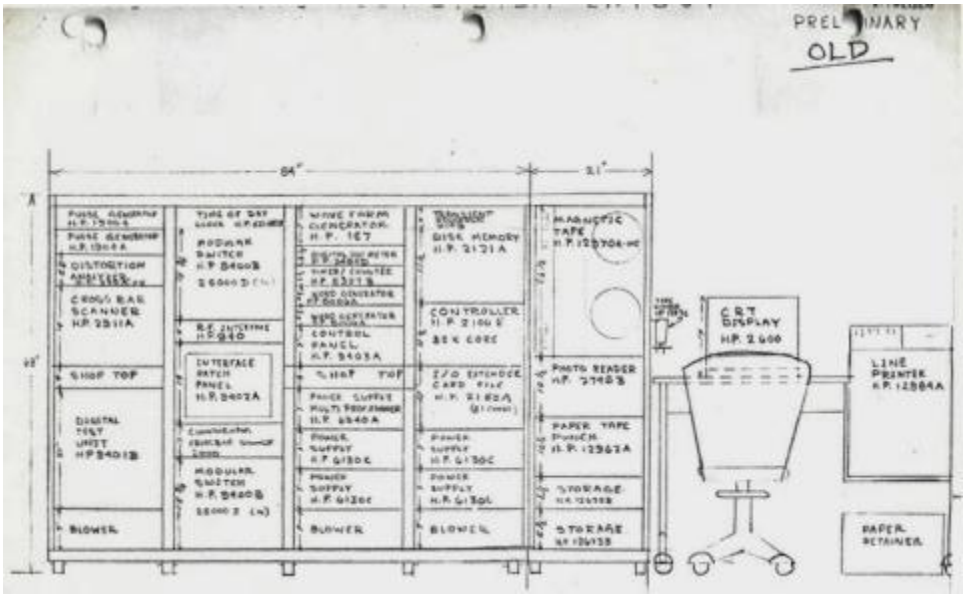


The Proposed ATE Configuration.

We developed the Computer Automated Test System (CATS) that was used on the SAVEGUARD Ground equipment. I proposed using a compiled version of BASIC, But management thought otherwise. We then developed the (LSEQ) Launch Sequence Test Language to test the Sprint Ground Launch sequence because it must respond in the millisecond time periods. And most test languages were thought to be to slow for this purpose.

Modular Automatic Test Equipment (MATE)

The next evolution was the MATE that was used for the Army and Air force Testing.



The Proposed configuration above finally evolved into the following.

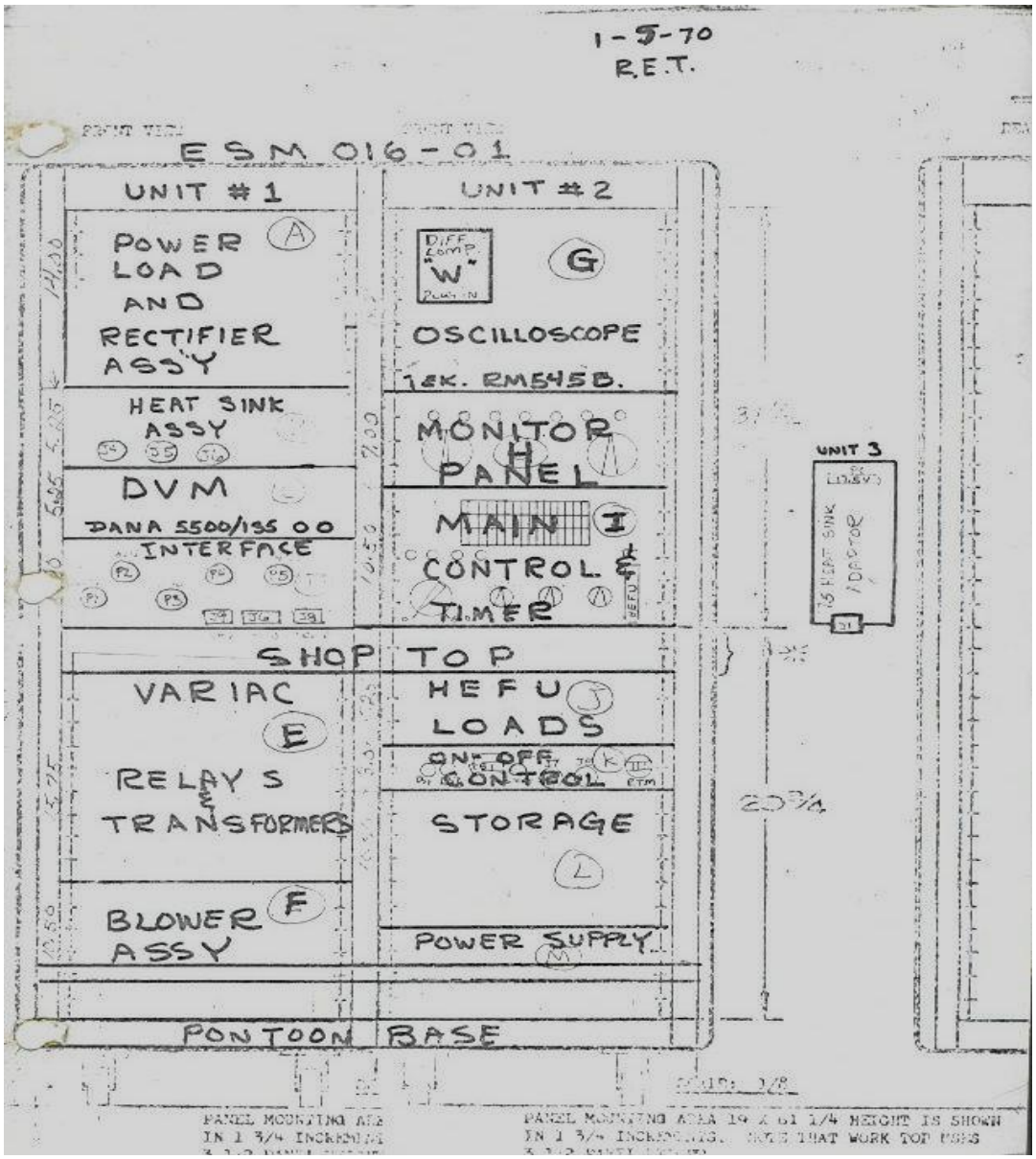
[MATE] Modular Automatic Test Equipment

Russ Theisen was among the design and development team that developed the MATE Test System for Martin Marietta Aerospace.

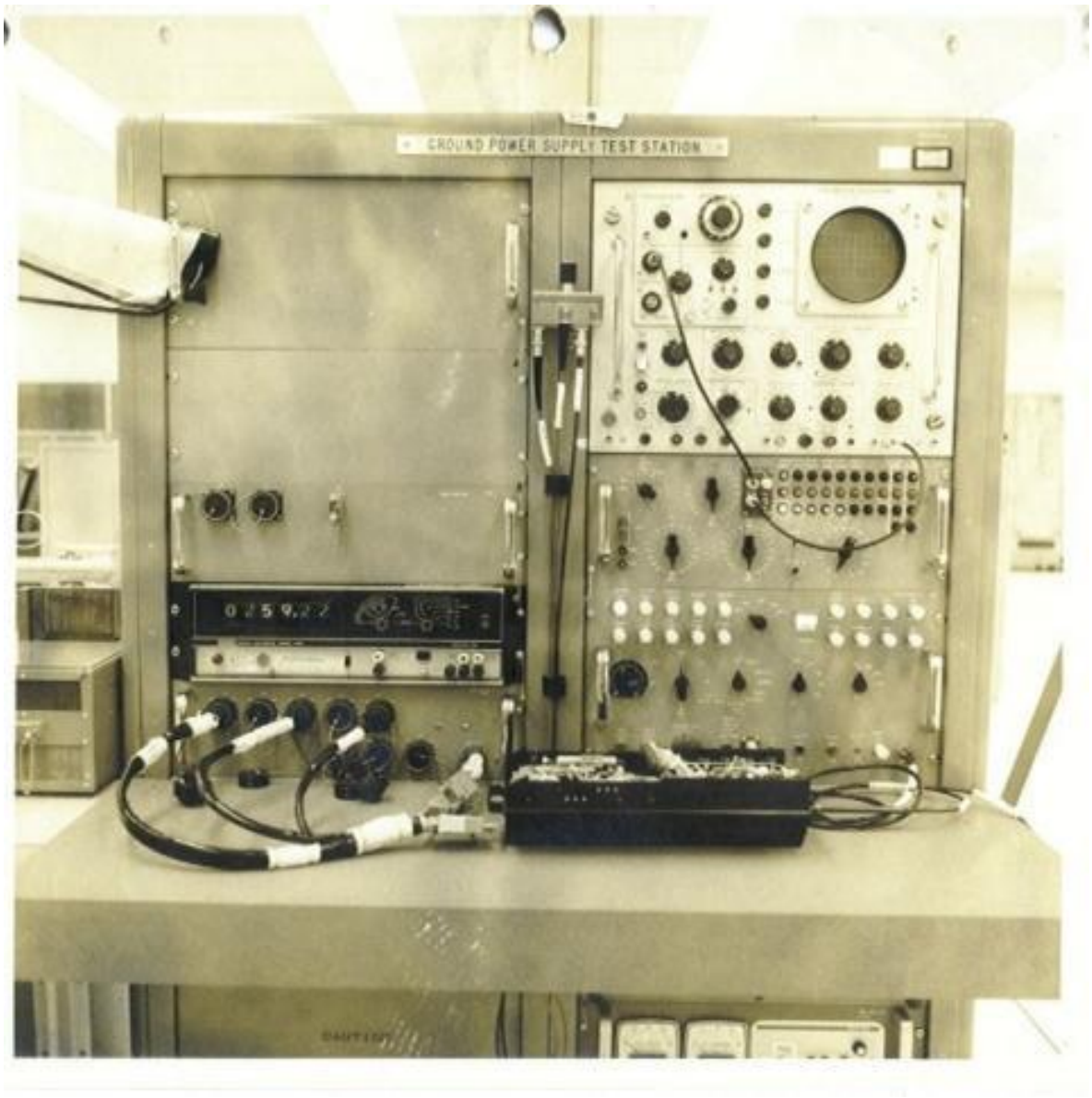
Design Review Process

All systems developed held a Design Review for most of the Engineering Team Members and Russ Theisen was invited to attend one the day before the Christmas plant shut down in 1969.

On December 23,1969 Russ Theisen was attending the standard Product Design Review and he asked "How will you test this Power Supply, since the requirements are quite strict and difficult". The answer is "we had not thought of that. But you can tell us how the first week of January, since you are now assigned to make the Test Equipment Design". I asked is the Schedule correct, that you are scheduled to start testing in 3 months? I said "the lead time on ordering parts is at least 4 months and usually 6 months". My manager said "you can tell us how you plan to make that in the presentation you will give us in the first week of January 1970. Well I thought that the only way to meet this schedule is to use existing parts, so I grabbed a box and made a trip to all of the parts cribs that I could think of. To make a long story short, I delivered the test station on time with a warning. I hope you never have to make another one because 75% of the parts are obsolete and no longer in production, Well, I make the Test Schedule with the following unit and guess what The Army customer ordered 10 more just like it.



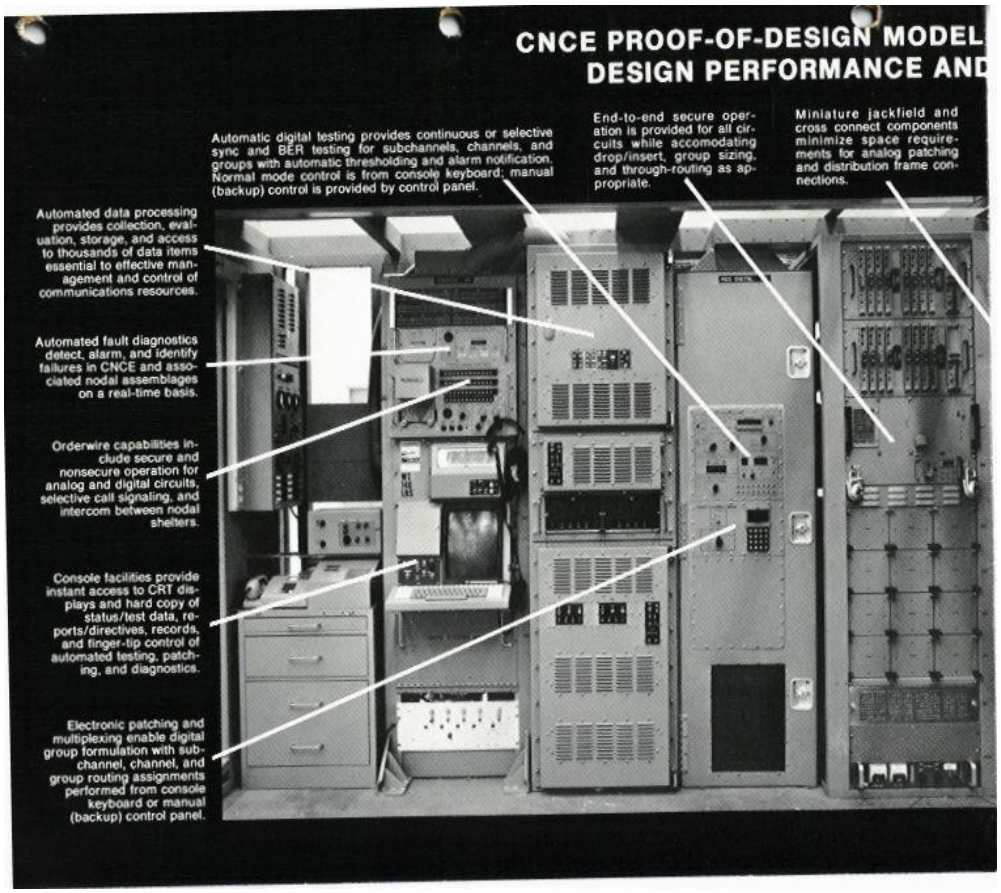
Test configuration for the Engineering Study Method -016 - 01 for Sprint Ground Power supply Test Set



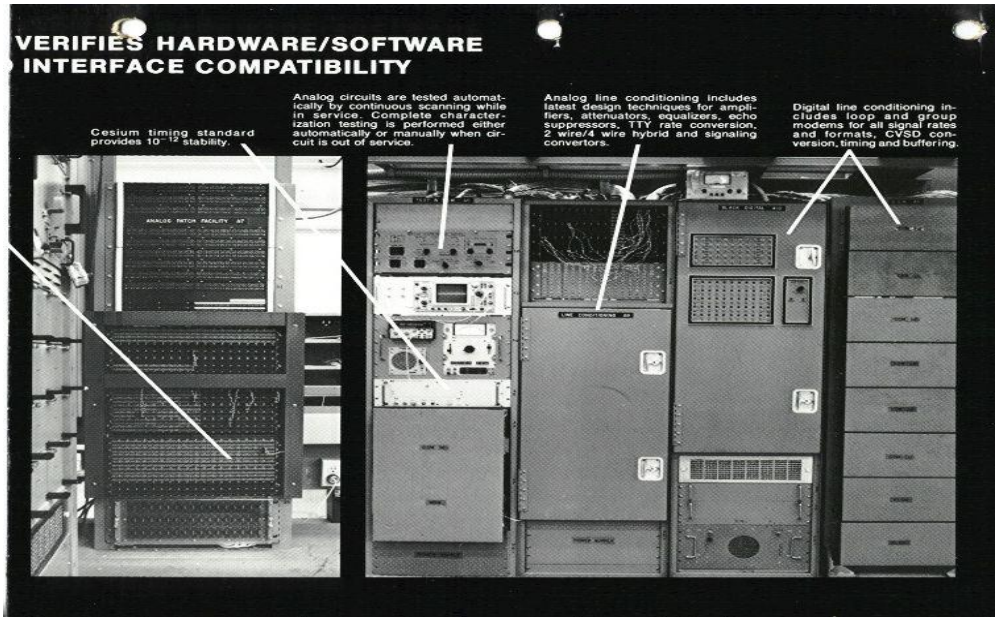
The Ground Power Supply test station as built.

(Many of the follow on programs were of the classified nature and we cannot discuss them). But there were over 7 different test systems.

Tritac Tactical Control Communications Facility (TCCF) component Communication Nodal Control Element CNCE
Tri Services Command and Control for Air Force, Army, Marine Corps



Part –A of the TRITAC Communications' Network Control Element



Part –B of the TRITAC Communications Network Control Element

The ADATS Air Defense Anti Tank System

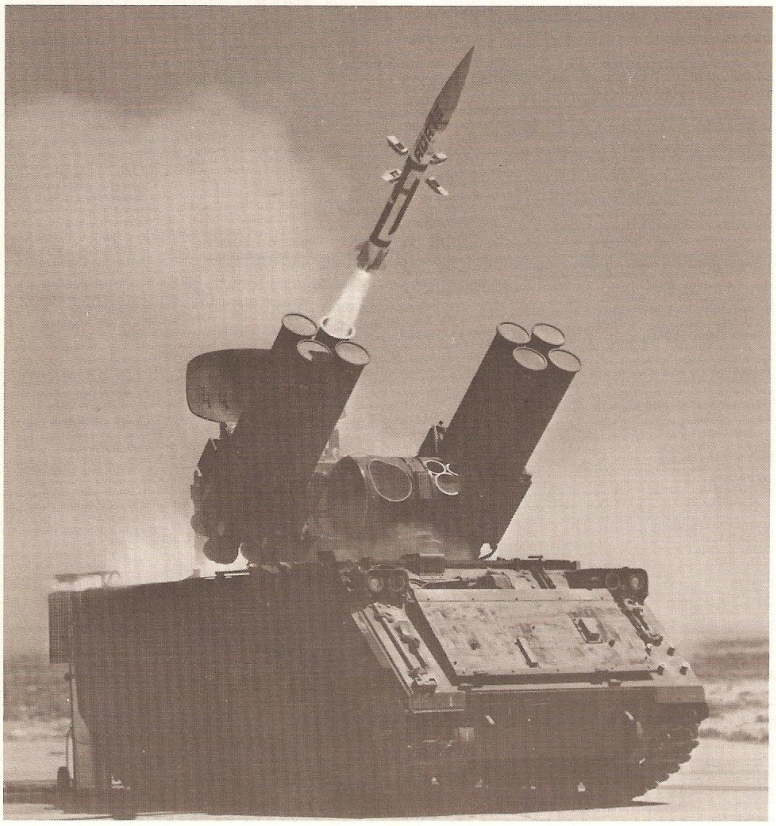
Olerkohn Burleigh of Switzerland had given Martin Marietta a contract to build a Defensive Missile System that could be used against any known Tank or any low-flying Aircraft with a single missile round. That could not be jammed or defeated by any known counter measures equipment. This program was a pleasure to work on, since it did not have the typical US Government constraints that limited the cost of the hardware to only 20% of the actual cost of the program.

The US Government programs spent most of the money (80%) just in documentation and management review cost. There was only 20% left to put into the actual product.

We worked with small team that spent 95% of the funding just on building a great system. And only 5% for the dog and pony shows.

This contract did require the President of the United States to sign the contract to make sure the Swiss would get delivery of the system they paid for.

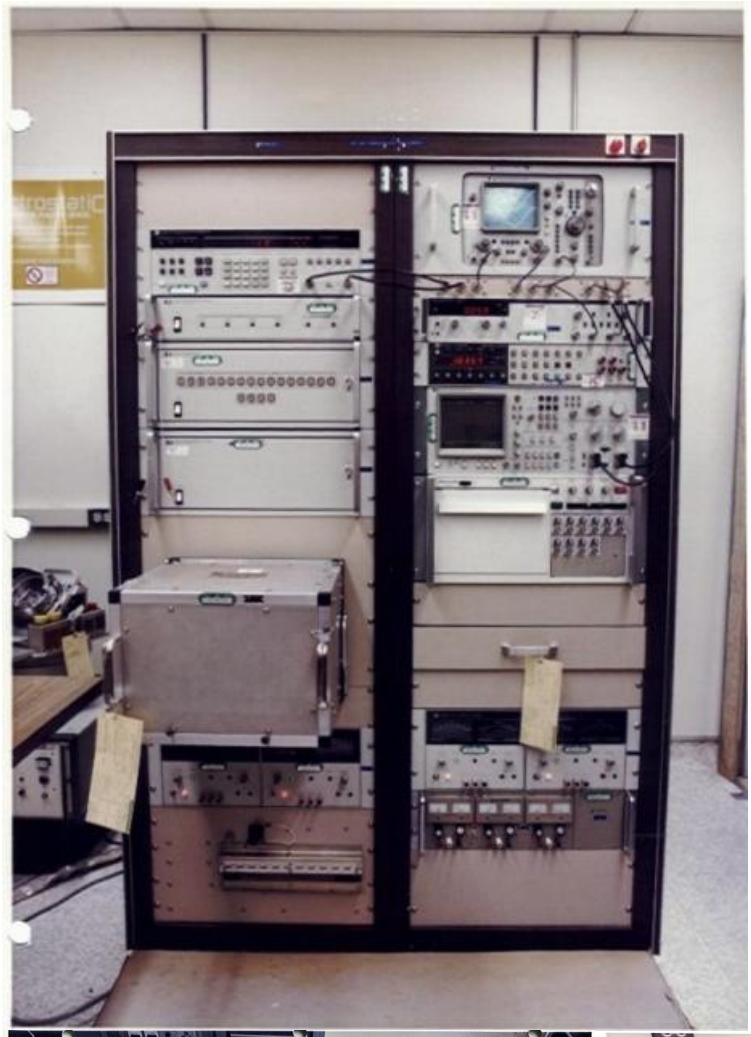
What they asked for was simple, but they left the details up to the experts.

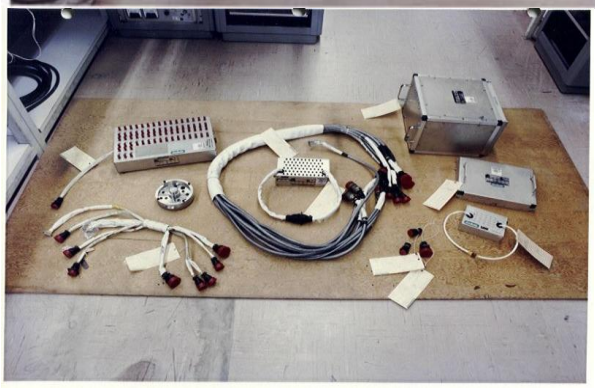


READY, AIM, ADATS – Orlando's Air Defense Antitank System missile (ADATS) rockets from its launch tube during a recent test at White Sands Missile Range. The missile has successfully completed a 59-month full-scale engineering development program. Thirty-nine missiles were fired during the program.

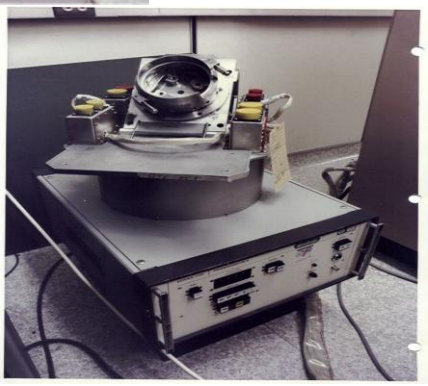
Guidance section under test with HP controller, Video Monitor Printer, Floppy disk softrware , breakout box, Ionizer and test cabling.

How we did it was also simple, when we were allowed to design, and develop the product without customer interference.



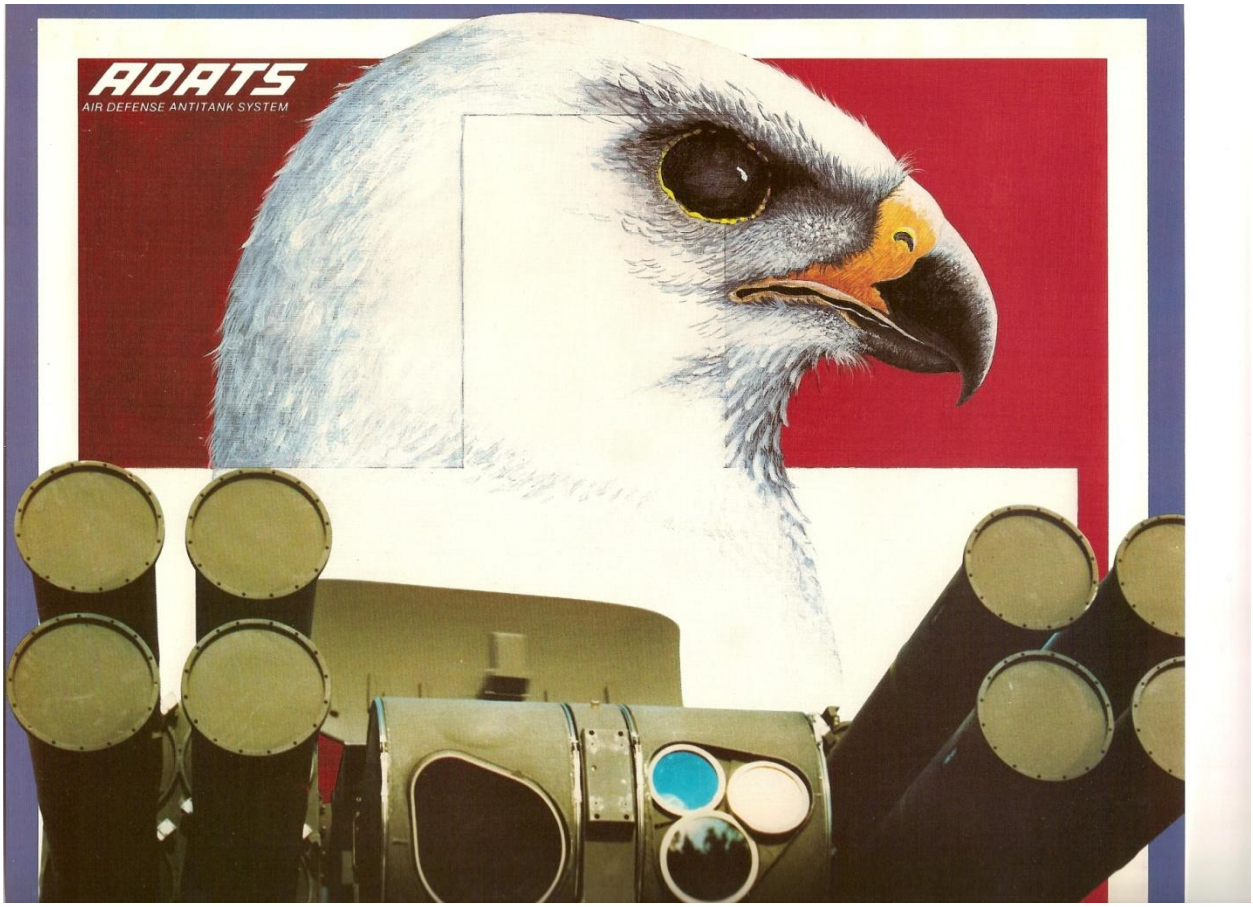


Cables, breakout boxes and test Interface, tests Adapter Box, Calibration box,



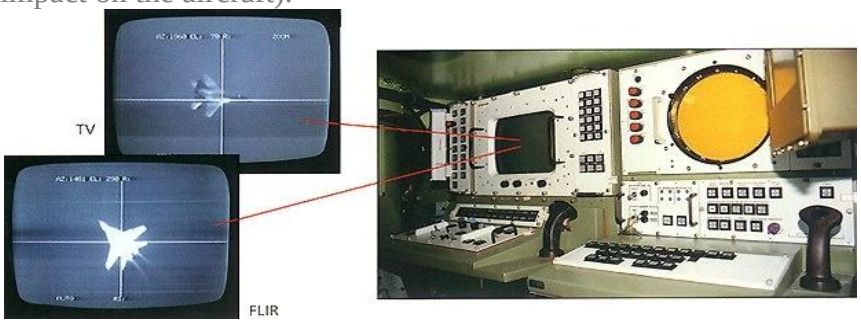
Rate Gyro Test Table for autopilot gyro

Here was a Automatic Test Set developed for the [ADATS] Air Defense Anti Tank Missile Test System



As a side line, this contract had one of the most “successful test failures” to ever face Martin Marietta. It was during the Field Test at White Sands New Mexico. There were over 200 spectators invited to watch the field test of the **ADATS**. The test consisted of firing two missiles from the launch vehicle. One was a ground shot at a tank some 5 miles down range and a second telemetry shot without a warhead at a remote control airplane F-86 frown by the Air Force.

Each half of the test was to prove the dual mode of the missile by killing a tank and then by killing an aircraft by flying with-in 10 feet of the air craft, which would show by telemetry that it would kill an Air Craft. There were two Missiles loaded in Launch (tube 1)(A Tank round with a crush switch that would detonate the warhead on impact) and (tube 2) (An Air Craft telemetry round that did not have a warhead, but a telemetry electronics that would show the simulated impact on the aircraft).



Control console of the ADATS showing the TV and IR Monitors

There was also an assortment of video cameras to record the whole test from launch to impact. Since the Tank was some 5 miles down range, Management asked that several barrels of gasoline and oil be placed in the tank so the spectators could see an actual explosion when the tank was hit. When getting for the test firing the Martin Management wanted to make sure the test procedure was working flawlessly, so they had the test crews rehearse the test firings several time before the actual test firing. (It is very unnerving to have a dozen people looking over your shoulder while you are trying to follow a written test procedure).
When the actual test was performed everything went exactly as rehearsed and the missile was launched at the tank, however, the missile in launch (tube 2) with the Air Craft Telemetry unit was launched instead of launch (tube 1) with the actual missile warhead that was supposed to blow up the tank. What do you do now we had just launched a missile with no warhead at the tank and that missile did not have a crush switch but a proximity detector that was to signal when the missile came with-in 10 feet of the remote controlled F-86 aircraft?

Well the missile streaked down the range and reached the tank 5 miles away in about 15 seconds. No one except the launch crew knew that the wrong missile was launched. Everyone was amazed when they saw the big black smoke of the Tank explosion and raved at what a great shot that was. (Apparently the missile kinetic energy was sufficient to blow a hole in the tank and ignite the gasoline and oil mixture in side).

Now was the time for the Air Craft shot, but the only missile left had a crush switch that would only detonate when it hit the target.
The launch order was given and the missile in launch (tube 1) was launched at the aircraft about 5, 000 feet in altitude we saw the missile make a impressive target tracking shot for the Remote controlled F-86 air Craft the Air Force was providing to us for our “non destructive telemetry test”,
Now the image switched to the television camera mounted on the vertical stabilizer of the F-86 drone. We watched as the missile approached at 3 times the speed of sound and flew straight in to the jet intake of the air craft.
The video went blank as the warhead vaporized the video camera on the vertical stabilized.

From the ground the crowd roared when the air craft blew into a thousand pieces. Everyone was happy at such a successful test firing. I am not sure, when the Martin Management explained to the customer and the Air Force how we were able to kill a tank without a warhead and a airplane without a proximity detector trigger. I think, the customer was so happy that they paid for the air plane since, they had the video tape of how the shot succeeded. We had the most successful test failure ever admitted at Martin Marietta Orlando Aerospace. Everyone except the Air Force was joyous.

We tried to sell this ADATS defensive concept to the US Government, but they were more interested in offensive weapons and not in defensive systems. Now only our allies have this capability.

Apache Helicopter AH-64 development

TADS/PNVS provides the U.S. Army's AH-64 Apache with sophisticated day/night navigation and targeting capabilities.

TADS/PNVS

Martin Marietta's TADS/PNVS provides day/night and limited adverse-weather targeting and night navigation capabilities for the U.S. Army's AH-64 Apache attack helicopter.

TADS/PNVS consists of two independent systems — the Target Acquisition Designation Sight (TADS) and the Pilot Night Vision Sensor (PNVS). The TADS provides the copilot/gunner with capabilities for target search, detection, recognition, and laser designation by means of direct-view optics, television, and forward-looking infrared sensors that may be used singly or in combination depending on tactical or weather/visibility conditions.

The PNVS provides thermal imaging capabilities that enable nap-of-the-earth flight to, from, and within the battle area at night, at altitudes low enough to avoid detection by the enemy.

TADS/PNVS sensors and laser designator provide effective standoff target attack capabilities as demonstrated in autonomous Hellfire missile launchings by TADS/PNVS-equipped AH-64s. Successes have been scored during the day, using the TV sensor for target acquisition, and at night, using the FLIR.

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Electronic Systems

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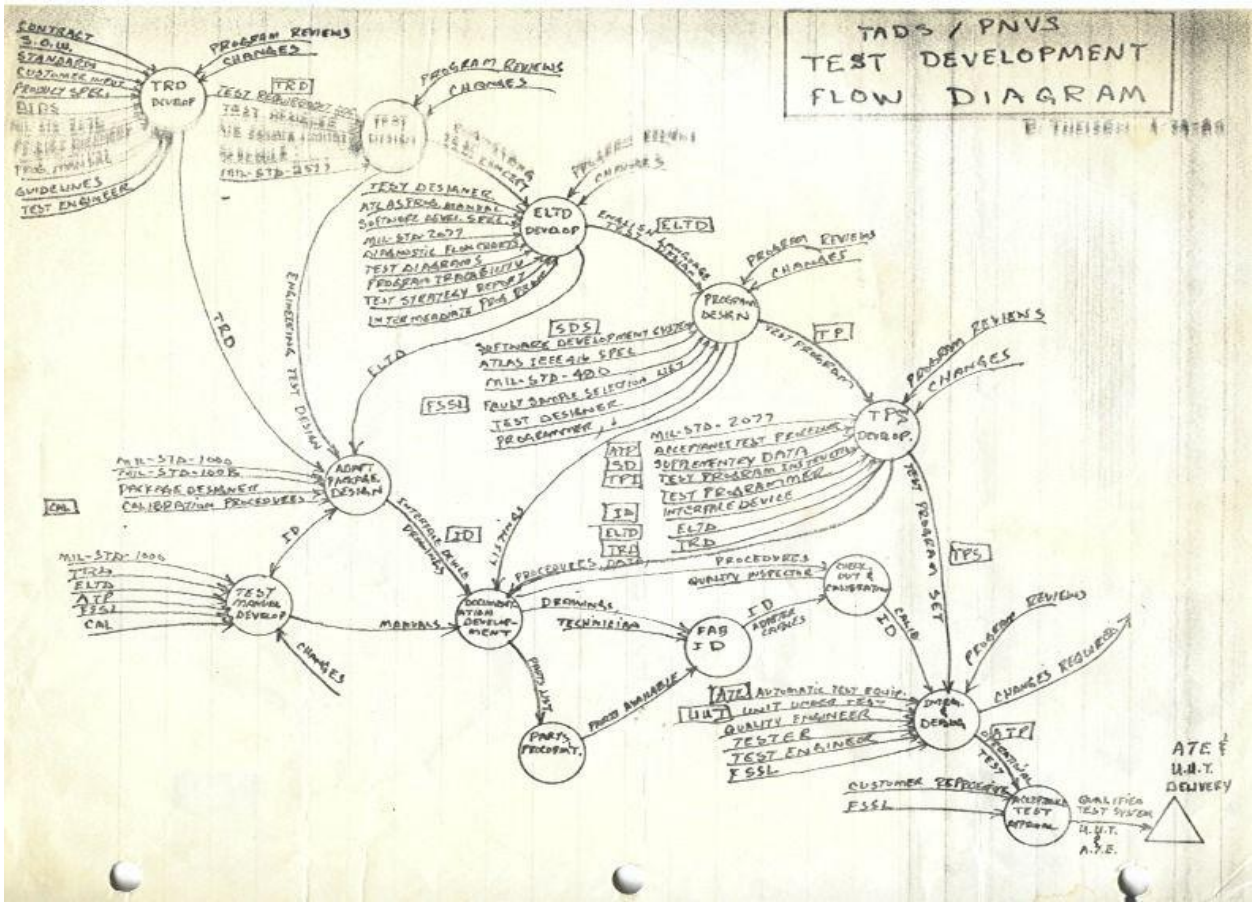
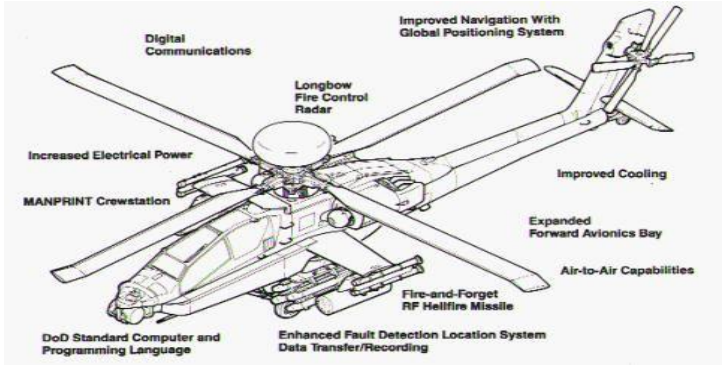
Apache EQUATE Test Set Development flow diagram



This is a test flow diagram that Russ Theisen used to try to show Martin Management why all things could not be performed at the same time.


Night
Side
Day
Side


AH-64D
APACHE
LONGBOW
TEAM

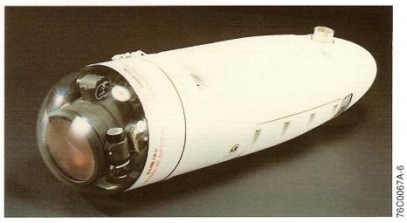

Digital
Communications
Improved Navigation With
Global Positioning System
Longbow
Fire Control
Radar
Increased Electrical Power
Improved Cooling
MANPRINT Crewstation
Expanded
Forward Avionics Bay
Air-to-Air Capabilities
Fire-and-Forget
RF Hellfire Missile
DoD Standard Computer and
Programming Language
Enhanced Fault Detection Location System
Data Transfer/Recording

Russ Developed an expansion to the Guidance Development Laboratory used including a Software development Lab using the PDP-11/45 to develop the MIL –STD-1553 bus, and the PAVEPENNY Electro Optic sensor for the A-10 Wart Hog

Software programmers hard at work.

80C0078E-1

Pave Penny is adaptable to a variety of existing and future aircraft. It is currently in service on the A-10, A-4, A-7, and F-16, and can be adapted to other attack aircraft such as the F-4, F-5, Alphajet, or Mirage V.



76C0067A-6

Pave Penny

AN/AAS-35(V)

The U.S. Air Force's Pave Penny is an advanced, miniaturized, day/night laser-target identification set developed and produced by Martin Marietta. It searches for, acquires, and tracks laser energy reflected from targets designated by airborne or ground-based lasers. The set can be integrated with aircraft avionics to display target position to the pilot, cue other weapons for early lock-on, and provide precise target location data to weapon delivery computers. The result is improved accuracy in delivery of either conventional or guided weapons.

The standard Pave Penny pod can be used on any aircraft. This wide flexibility of application is provided by the external-mount design plus aircraft-unique interface adapter units.

The system consists of a target detector, a control panel, and an aircraft adapter. The detector is a gimbaled telescope/detector with data processor and unique circuitry that provides long-range detection, discrimination, and tracking capabilities. Precise target line-of-sight angles are supplied to the pilot's display and aircraft avionics.

To permit automatic fault isolation, built-in test equipment and modularized subsystems are incorporated into the system.

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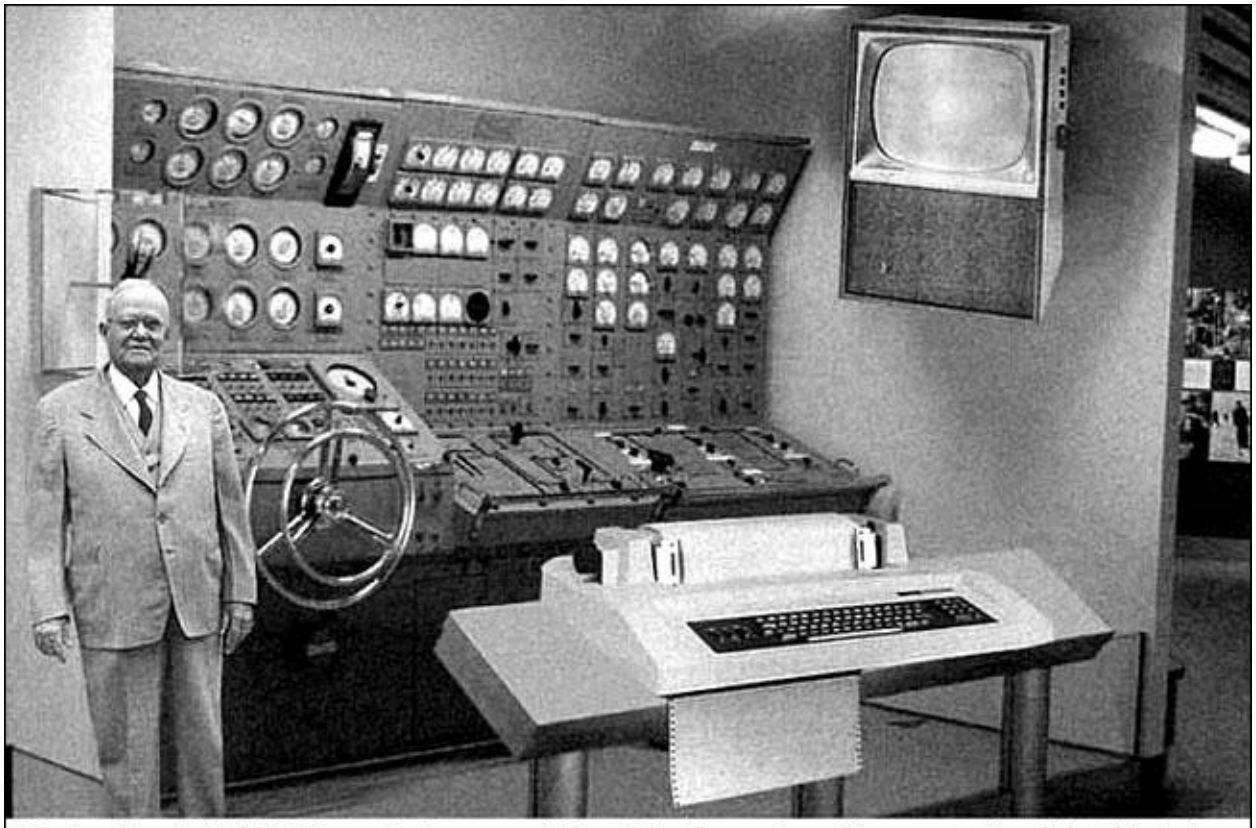
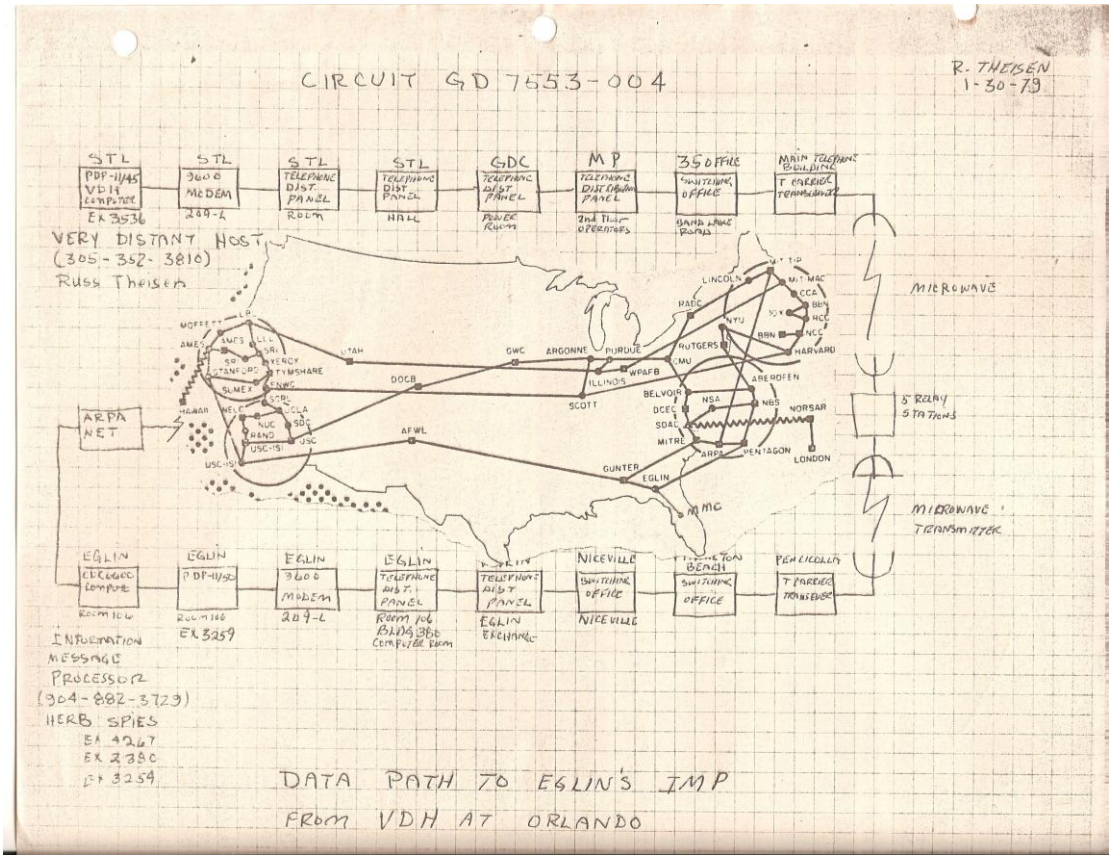
Electronic Systems

MARTIN MARIETTA

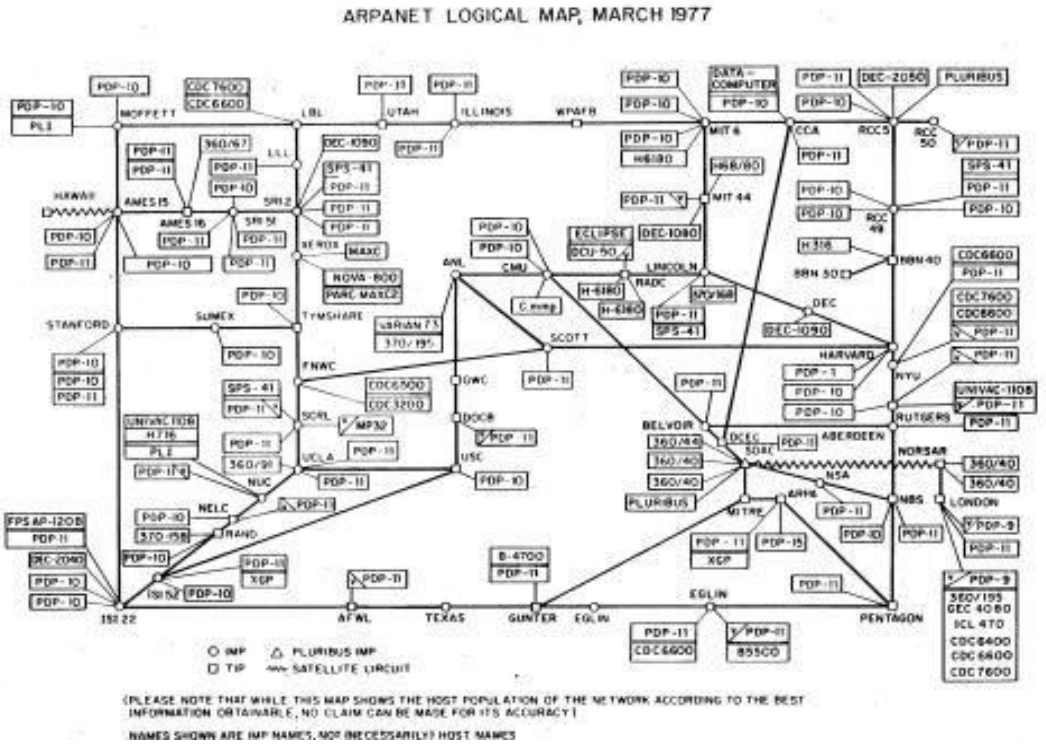
Around this time Remington Rand gave their version of the home computer as it would appear in fifty years in the future in the year 2004.

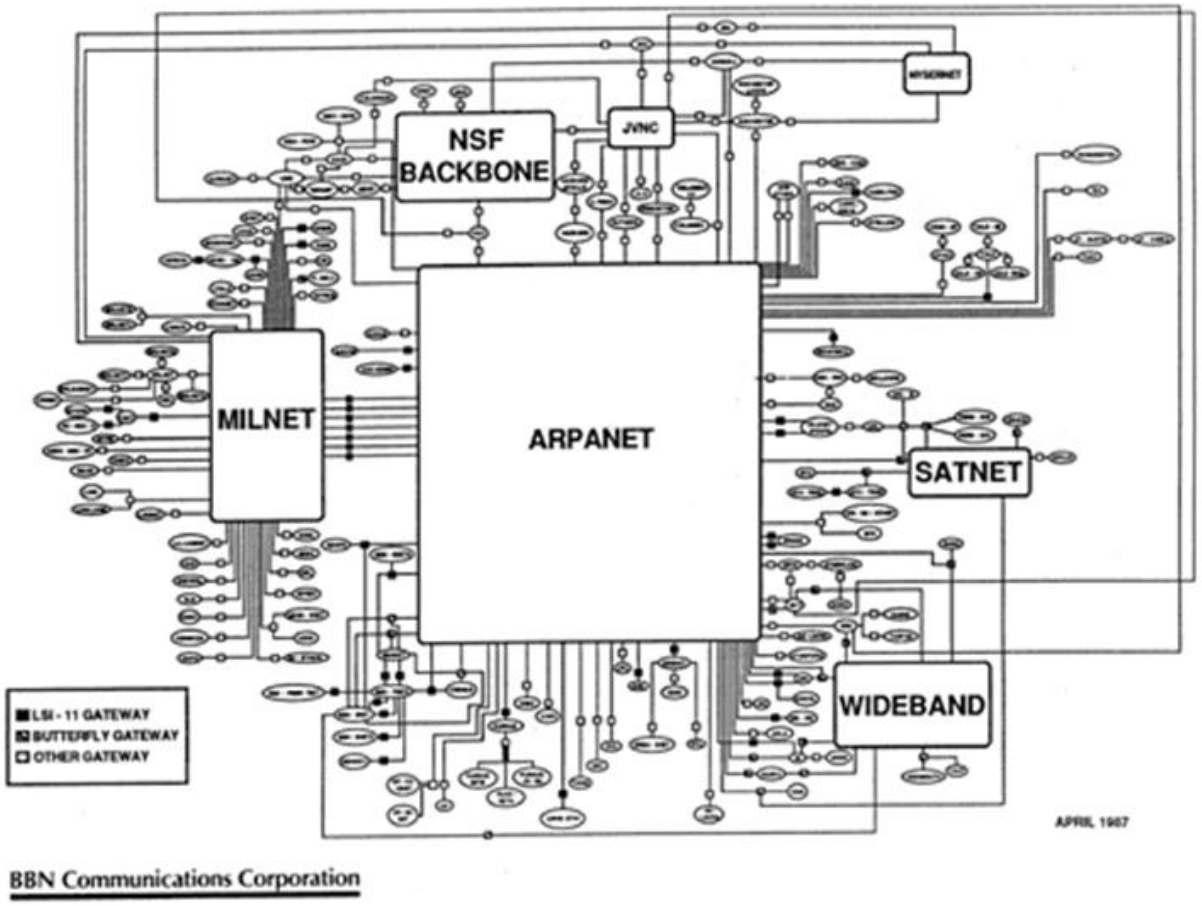


Scientists from the RAND Corporation have created this model to illustrate how a "home computer" could look like in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.



Russ helped develop the ARPANET and provided the plan to take it to Orlando Aerospace and to Cape Kennedy in Florida.





ARPANET when it was released as the World Wide Internet in 1992

MAN OF THE YEAR

RUSSELL E. THEISEN

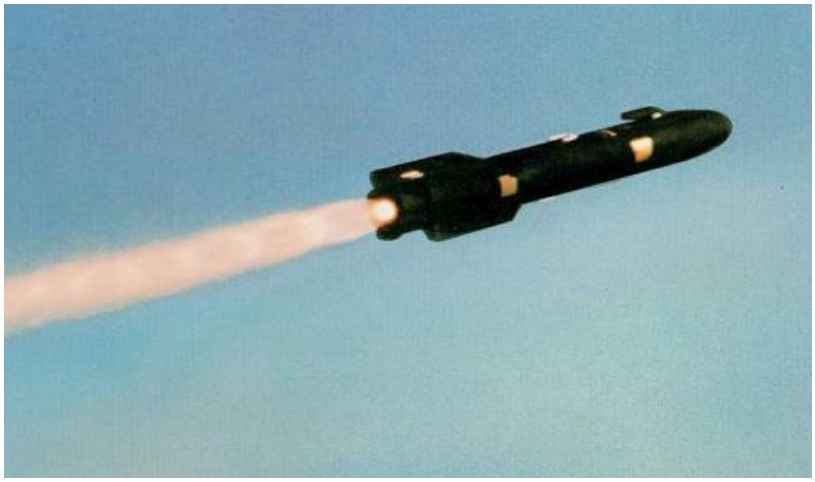
Russ is a system software staff engineer at Martin Marietta Aerospace, where he is developmenting the Tactical Communications Control Facility (TCCF), an advanced military communications system. His experience also includes the development of the prototype to the army standard test system MATE, and the Versatile Automatic Test System (VATS), a test system for satellite communications equipment.

He has been deeply involved in the IEEE at the chapter, section, regional, and national levels of the computer society. He has served as chapter chairman, area 3 chairman, and is at present a member of the governing board of the IEEE Computer Society at the national level. He is the chairman, or an active member, of eleven national professional committees of the computer society, and the American Federation of Information Processing Societies (AFIPS).

He has served the IEEE Orlando Section by his participation in many committees. At present he is vice-president of the section.

Russ has also been active in local community affairs - Director of the Winter Park Pines Community Association, YMCA Activities, and Orange County Library Services Advisory Board. For his seven years' work on the library board, he was recently recognized with a Distinguished Service Award by the Orange County Commission.

Russ is scheduled to present the tutorial "Specifications in Software Development" at the COMPCON Fall 1977 conference in Washington, DC this month. There he will receive the Distinguished Services Award of the IEEE Computer Society.



Hellfire Optimized Missile System (HOMS)

This is the Hellfire missile that is presently being used by the Apache Longbow and the Predator drone Aircraft.

LANTIRN on F-15D stearing the Laser Guided bomb to its target.

(LANTIRN) Low Altitude Navigation Targeting Infra Red for Night

(No Sanctuary in the Darkness)

Following these

Russ Theisen was assigned to get Martin Marietta to a CMM Level 3 so he spent his time developing documentation and procedures to reach a Computer Maturity Model Level 3 and then to a Level 4. In 1992 he was a casualty of the [RIF] Reduction in Force, so he selected early retirement.