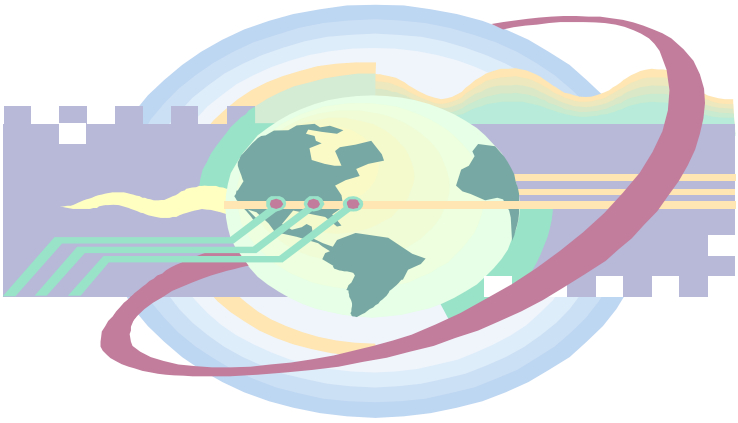
Boeing Missile Group Chooses Acroamatics for LEAP Program

US Navy's Light Exo-Atmospheric Projectile Telemetry(LEAP) Consoles for the STANDARD Missile Program



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Background of the Standard Missile Program

The STANDARD Missile (SM) is the U.S. Navy's premiere surface-to-air missile system. Today, the SM is used aboard missile cruisers, destroyers and frigates in the US Navy and in 13 foreign navies. STANDARD Missiles have been produced, in some version since the mid-sixties. Beginning with the SM-1 in 1967 and then progressing to the SM-2 and now the SM-3, these missile systems form the basis of the US Navy Missile Defense capabilities. The latest missile system developed, the SM-3 is a theater wide missile intended to intercept medium and long range ballistic missiles.

The US Navy contracted with then Hughes Missile Systems Group, subsequently sold to Raytheon, to develop systems that could destroy target missiles. The system was called the SM-3 LEAP (Light Exo-Atmospheric Projectile) Kinetic Warhead. Raytheon teamed with Boeing to create a third generation LEAP warhead for the SM-3 missiles.

On January 25, 2002, the US Navy completed a successful test of this missile system in Hawaii that has been covered worldwide by news organizations and industry representatives.

Acroamatics products and personnel were used extensively during these tests both by Boeing as part of the delivery of our LEAP consoles and at PMRF as part of the US Navy telemetry systems.

The SM-3 Missile System

Based upon the Standard Missile systems developed over the last thirty years, Raytheon was contracted to create a new generation of Standard Missile called the SM-3. The SM-3 Lightweight Exo-Atmospheric Projectile (LEAP) Kinetic Warhead (KW) was designed to intercept an incoming ballistic missile outside the earths atmosphere and destroy it completely during mid-flight. Intended for use on the Aegis class cruisers and destroyers, this missile system is the most advanced anti-ballistic missile defense in the world.

The KW is a very advanced, highly compact warhead intended for use in space. The KW system was developed by both Boeing and Raytheon and is launched on an SM-3 missile.

The KW includes the ability to view the target during the flight using infrared seekers and incorporates sophisticated guidance and control systems to insure accuracy. The design was validated on January 25, 2002 off the shores of Hawaii when it successfully hit a target missile hundreds of miles away in the atmosphere over the Pacific Ocean. Acroamatics LEAP consoles were the sole telemetry systems used by operators during the test in order to capture the data in real-time.

The LEAP Contract

In late 1997, Hughes Missile Systems Group, now Boeing, in conjunction with Raytheon, chose Acroamatics, on a sole source basis to provide fourteen telemetry stations to track the KW. The project involved integration, customization, development and test of a complete telemetry system in various packages all delivered in a very short time frame.

The LEAP consoles process simulated and flight test telemetry data. They also condition and process high and low power RF input signals directly from antennas, vehicles, or an RF Simulator, switching RF paths as programmed.

The systems are required to perform down conversion, bit-synchronization, decryption, de-commutation, and manipulation of data to provide real-time display of an embedded video channel on both rack-mounted monitors and remote data displays.

The delivered systems include eleven rack-mounted systems, two portable systems and one airborne system. These consoles consist of three varieties: a *Captive Carry* system for airborne use; a *Portable* system for shipboard and field use; and eleven *Rack-Mounted* consoles in fixed locations. Total value of the contract was several millions of dollar

Elements of the Acroamatics Solution

The contract specified that Acroamatics perform the following functions:

- Project Management
- Third Party Product Procurement
- Software Design
- Hardware Design
- Decommutation
- Integration
- Test
- Implementation

As part of the solution, Acroamatics used existing products from several vendors including the Acroamatics Telemetry Data Processing Model 2225V systems. Information on these systems can be found at www.acroamatics.com.

Project Management

The Acroamatics Project Management team devised an overall plan to complete at least one system each month until project completion. A project manager was assigned to handle all aspects of the program both internally and externally. Due to the short time frame allowed for delivery, scheduling and workflow was managed using a PERT system of control. Acroamatics teams in the Procurement, Software, Engineering, Test and Manufacturing departments worked closely with the Project Manager to complete the program on time and according to requirements.

The Project Management department provided oversight and coordination between all responsibilities, and interfaced with the customer to reconcile the continually evolving requirements as the project changed dynamically. All these scheduling, procurement, and functionality changes were successfully handled to the customer’s full satisfaction. The final result is that the LEAP consoles were delivered on time, under budget, and fully meeting all specifications.

Third Party Product Procurement

The Procurement department devised a just-in-time delivery schedule that delivered all third party products at the time needed. One area of special concern was the RF Simulator, a unique, single card design built and designed for this project. Close cooperation with the vendor resulted in the timely completion of a product that met all specifications. Out-sourced products included customized rack systems, RF switches, RF attenuators, RF power meters, PC's, VLDSB recorders to MIL-SPEC, power control panels, scan converters, digital tape playback systems, NTSC monitors, and VGA monitors.

Software Design

In addition to using the Acroamatics COTS Telemetry Data Processing software in the Model 2225V System, special software was written in order to use real time data external to the Model 2225V system. This involved writing code to interface Reflective Memory inside the system. This software had to write the data from the Current Value Table into RM and send an interrupt on the RM bus. The software engineering department wrote drivers and interfaces for the various third party products used in the consoles such as recorders, digital mux, RF simulator, RF receivers etc.

Hardware Design

Acroamatics was tasked with designing an RF Matrix Switch to route the incoming antenna, vehicle, or simulator RF signals along various attenuation and conditioning paths. The RF matrix switch was not available off the shelf and was designed especially for the LEAP console systems. . Acroamatics designed the RF matrix switch to route RF from a simulator or antenna or the KW itself to the power meter or RF receiver. The RF mux is part of the model 3400 data routing chassis. Acroamatics also designed the digital mux card installed in the 2225V chassis. The digital mux allows the telemetry console to route the clock and data signals to the other parts of the decommutator. This allows the customer to choose whether the recorder records black (encrypted) data or red (unencrypted) data. Or it lets the user playback black or red data from the recorder. If the data is black, then it steers the clock and data signals through the KGR-68 decryptor. The leap program uses a single PCM telemetry data stream. The 2225V has one Bit Sync and Frame Sync. But each device has four separate inputs. The Digital mux lets the users take advantage of each of the four inputs.

Decommutation

The Acroamatics 2225 Telemetry Data Processing system is based upon existing technology used in missile test systems throughout the world. Housed in a 12.5" VME chassis and including a flat panel display with fold out keyboard, the system is a complete telemetry solution. The LEAP console requirements were easily met with a combination of processing cards available as options.

The particular configuration of the Model 2225 included a VME processor to manage the system, several frame synchronizers, time code generators, D to A converters, and other telemetry system cards.

In addition to the Model 2225, each console required bit synchronization for each PCM data stream. Using our Model 2340 Dual Bit Synchronizer products, we were able to provide clean signals to the 2225 for each PCM stream.

Integration

The task of integrating the various components of the LEAP consoles into the three separate packages involved extensive engineering by our hardware integration team. Elevations showing the locations of each component in the racks and portable containers were created in consultation with the customer. Wiring diagrams, cabling issues, video display installations and all the various elements of designing a user friendly, efficient configuration were all provided by Acroamatics. Specifications for the portable systems included the requirement to have it be moved easily by two people and reassembled in the field with minimum effort. All unnecessary cabling was eliminated in the portable systems. In the case of the airborne systems, lack of space on the aircraft meant that these systems had to take up the smallest amount of space possible while still performing critical functions.

Test

The test department provided the Acroamatics 2225V Telemetry Data Processor units containing the decommutator, timing, signal distribution, algorithmic manipulation, and bit synchronization functions, and insured that all previously shipped consoles were upgraded to the same levels as improvements were incorporated into later consoles. All systems were factory assembled, tested and delivered for staging at the customer premises.

Each Telemetry console underwent acceptance testing at Acroamatics per an ATP procedure written by Acroamatics and approved by Boeing. The ATP verified that all the requirements asked for in the SOW were met. As well as demonstrating that each piece of hardware functioned properly and all the interface connectors had the proper signals. The ATP had to pass before Acroamatics could deliver the console to be paid. Boeing is very pleased with the performance and patience of Acroamatics.

Implementation

Acroamatics also provided on-site technical assistance, training and support throughout the deployment of the systems. The units have been in operation in several locations during tests of the SM-3 missiles for over four years.

The Field Portable systems took part in the January, 2002 intercept mission of an Aries target missile near Hawaii. The systems functioned flawlessly, delivering real-time data from launch to destruct. The video channel displayed in-flight data of the closing moments of the intercept, including the final frame that showed the center of the Aries target vehicle perfectly aligned in the crosshairs of the interceptor.

Acroamatics

Acroamatics has been working closely with missile test ranges for over 30 years. Our line of telemetry products includes bit synchronizers, decommutators and various telemetry systems that enable our customers to act in real time during field tests. Our capabilities as

an integrator of complex systems has been proven over and over again at facilities such as AFWTF Roosevelt Roads in Puerto Rico, Jervis Bay, PMTC at Pt. Mugu, PMRF at Barking Sands, Vandenberg AFB and many other ranges.