

# Lockheed Martin Develops Unique Missile Tracking Antenna System For U.S. Navy

PRNewswire-FirstCall  
SUNNYVALE, Calif.

Lockheed Martin has developed an innovative and cost-effective antenna system for tracking test flights of the U.S. Navy's Trident II D5 Fleet Ballistic Missile.

The system, called S-Band Mobile Array Telemetry (SMART), was developed, tested and deployed under a series of successive contracts with U.S. Navy Strategic Systems Programs (SSP) to develop the affordable, mobile telemetry data acquisition system. SMART can be deployed aboard any one of five test range support ships-of-opportunity, thus minimizing the need to use telemetry aircraft which have been the primary means for flight data acquisition during the Navy's on-going operational evaluation tests of the Trident II D5 Submarine Launched Ballistic Missile strategic weapon system.

The SMART system was successfully field-tested in the South Atlantic Ocean during two separate Trident II D5 test flight operations in 2002 and has been turned over to the U.S. Navy for operational use. The system, which can also be adapted to meet other missile testing telemetry needs, is projected to save the Navy more than \$2 million annually in telemetry aircraft operation and support costs.

"This innovative antenna system solution represents the best in the way of commercial off-the-shelf technology, augmented with unique, cutting-edge Lockheed Martin developments," said Bob Ghani, project manager for the SMART antenna system at Lockheed Martin Space Systems. "The antenna's architecture and our breakthroughs in phased array miniaturization and modular design allowed it to go from concept to reality in half the cycle time of a typical antenna development effort."

The SMART antenna system was developed by a team led by Lockheed Martin Space Systems, Sunnyvale, Calif. and included engineering experts from the company's Advanced Technology Center in Palo Alto, Calif., and sister company Lockheed Martin Maritime Systems & Sensors (MS2)-Perry Technologies in Syracuse, NY. The team was formed to engineer a shipboard antenna system to acquire, receive and record telemetry data from the Trident II D5 missile during test flights and after completing a six-month initial concept evaluation, a phased array telemetry system was selected to meet the large field-of-view requirement and to avoid the need to compensate for ship motion (roll and pitch).

The SMART antenna system employs a large aperture, highly integrated, active, phased array S-band telemetry antenna; operates over the range 2200 MHz to 2400MHz; is capable of seeing out 1100 nautical miles; and generates sufficient beams to track eight independent targets. The system has no moving parts.

It is electronically steered over a field-of-view of 120 degrees in azimuth and 80 degrees in elevation in order to overcome the ship's motion and eliminate the need for a gyro stabilization system. It can search the entire volume (field-of-view) in less than one second. The highly integrated sub-array design, which uses multi-layer microwave boards, reduces total cable and connector counts by 70% over a typical antenna system. The benefits of this design are higher reliability, lighter weight, and more compactness. Additionally, because the system is based on COTS components, low-cost PC board manufacturing and Surface Mount Technology (SMT), it has an extremely low production cost-per-square-foot relative to all other active phased array antenna system (lower by a factor of 5).

The SMART antenna system receiving, recording and control equipment is housed in a standard 8 x 20-foot International Organization for Standardization (ISO) van. This equipment is all COTS instrumentation, and is configured in a modular architecture to allow for easy maintenance and technology refreshment.

The entire SMART antenna system can be installed aboard the test range support ship and be up and running in under two hours. The SMART Antenna is also the largest self-calibrating highly integrated electronically scanned S-band active phased array antenna system in the world.

Headquartered in Bethesda, Maryland, Lockheed Martin employs about 125,000 people worldwide and is a global enterprise principally engaged in the research, design, development, manufacture and integration of advanced technology systems, products, and services. The Corporation reported 2002 sales of \$26.6 billion.

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