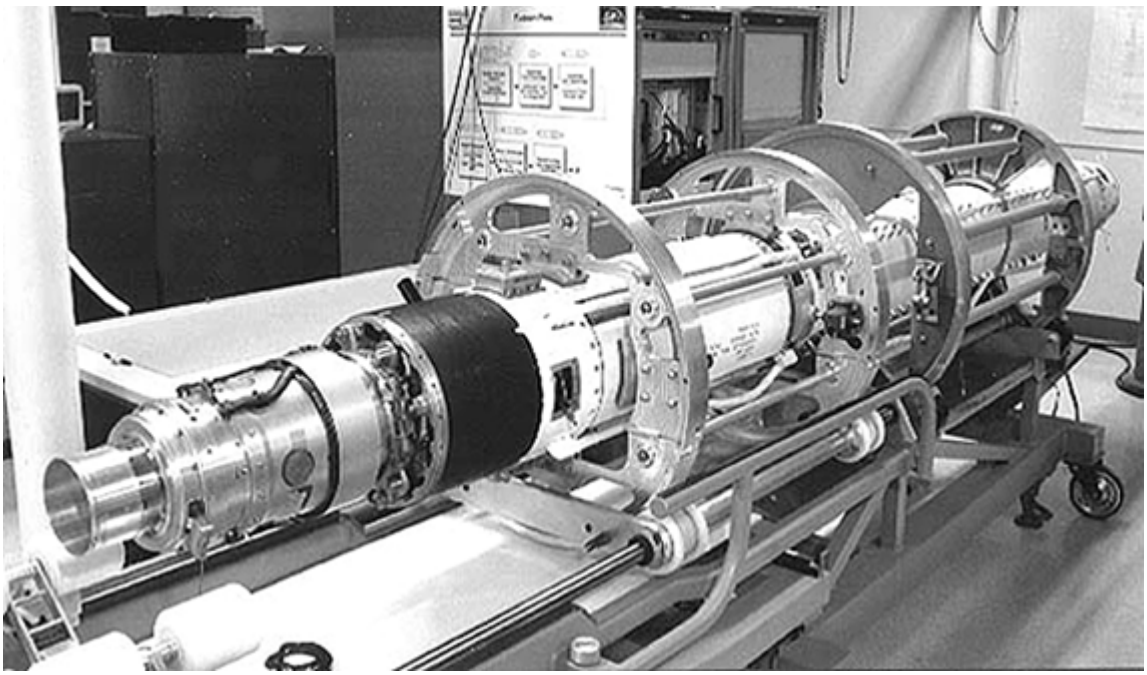
NAVY THEATER WIDE (NTW)



Navy ACAT I-D Program

Total Number of Systems:	4 Ships, 80 Missiles
Total Program Cost (TY$):	$5,493M
Average Unit Cost (TY$):	$11.275M
Milestone II:	1QFY04
Full-rate production:	3QFY07

Prime Contractor

Raytheon Missile Systems Company (missile)
Lockheed Martin Government Electronic Systems (AEGIS Ship)

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Navy Theater Wide (NTW) system is a response to the vulnerability of U.S. forces and protected populations to the ballistic missile threat. The mission of NTW is to provide upper-tier protection against longer-range threats. NTW will provide the capability to intercept missiles from exoatmospheric ascent phase through exoatmospheric descent. The NTW system contributes to three of the four ***Joint Vision 2010*** operational concepts: ***full-dimensional protection, precision engagement, and dominant maneuver***. NTW supports:

- ***Full-dimensional protection*** by defeating incoming exoatmospheric ballistic missiles to assist in controlling the airspace.
- ***Precision engagement*** by contributing to a Theater Ballistic Missile Defense (TBMD) family of systems that can locate TBMD targets, provide command and control, engage targets, and assess level of success.
- ***Dominant maneuver*** by applying information, engagement, and mobility capabilities to accomplish an upper-tier TBMD defense.

The current NTW program consists of the Standard Missile-3 (SM-3) and upgrades to the AEGIS Weapon System. The SM-3 evolves from the SM-2 Block IV booster and sustainer motor by the addition of a third stage rocket motor and fourth stage kinetic warhead with a solid divert and attitude control system guided by an infrared focal plane array seeker. The AEGIS Weapon System will be modified to enable longer-range exoatmospheric theater ballistic missile detection, tracking, discrimination, and engagement.

BACKGROUND INFORMATION

The genesis for NTW was the TERRIER Lightweight Exoatmospheric Projectile (LEAP) demonstration program, which occurred from September 1992-March 1995. The TERRIER LEAP program consisted of four modified TERRIER missile flight tests. Two flight tests occurred without targets, and two flight tests occurred against targets. The two intercept attempts failed. One of the failed intercepts was due to a software error and the other was due to battery failure. However, sufficient technical progress was made to warrant further development work in the AEGIS LEAP Intercept (ALI) program.

Milestone I occurred in spring 1999. The Program Definition and Risk Reduction (PD&RR) test program has been approved and TEMP refinements are currently in final staffing. The Program Definition and Risk Reduction phase and the revised TEMP have been approved. The Navy plans to field a Block I missile with a single color long-wave infrared seeker. The AEGIS Weapon System for the Block I missile will be upgraded to include high range resolution and a new signal processor for added radar discrimination capability against separating targets. Research is advancing for the potential development of a Block II missile with improved infrared and radar discrimination capability; however, there is currently no funding for development and acquisition of the Block II system. Plans for a Block II system feature a two-color infrared seeker, improved propulsion (axial and divert), and the integration of a high power discrimination radar into the AEGIS Weapon System. Recent developments suggest that two-color seeker technology may be available for incorporation into NTW sometime during PD&RR.

TEST & EVALUATION ACTIVITY

The Navy Theater Wide program is currently in the PD&RR phase and includes the AEGIS LEAP Intercept Program consisting of eight missile firings. The tests will be conducted from September 1999-December 2000. The first two flights will be SM-3 missiles flying on trajectories against simulated targets. The third flight test will be a seeker characterization flight against the target to be used during the intercept attempts. The remaining five firings will be target intercept attempts against the single stage ARIES target.

After the Aegis LEAP Intercept program, there will be six firings against Threat Representative Targets during FY03. These firings will be against the ARIES target as a threat surrogate. These firings, the Aegis LEAP Intercept firings, and high fidelity end-to-end hardware-in-the-loop testing against separating targets will support the Milestone II decision.

In September 1999, the Navy conducted the ALI Control Test Vehicle-1A (CTV-1A) flight test from the Pacific Missile Range Facility on Kauai, HI. All of the CTV-1A objectives were successfully

accomplished during this test with the primary objective being to demonstrate airframe stability and control of STANDARD Missile 3 through second/third stage separation.

The Navy is developing the LFT&E strategy for NTW. In late 1996, the Navy instituted a pre-Milestone II SM-3 Lethality and Analysis Program, in conjunction with the AEGIS LEAP Intercept program, to reduce risks associated with missile lethality. The lethality program includes:

- Light-gas gun testing with sub-scale replicas of the kinetic warhead.
- Target vulnerability model development.
- Direct-hit lethality sled testing.
- Hydrocode analyses.
- Other ancillary tests and analyses.

Those tests and analyses also support the development and design validation of SM-3 as well as the Validation, Verification and Accreditation of computer models used to evaluate its lethality.

In December 1998, the Navy conducted a series of six 1/4-scale light gas gun tests at Arnold Engineering Development Center in Tullahoma, TN, against a replica bulk chemical warhead target. The SM-3 kinetic warhead surrogate produced significant damage at speeds within the operational range for NTW intercepts.

In June 1999, the Navy completed a series of four developmental sled tests using a full-scale model of the projectile used in the quarter scale tests at Holloman Air Force Base, NM. In the last test, a high-speed checkout test against the same target used in the quarter scale tests, the Navy successfully demonstrated their sled testing technique and proved that the NTW kinetic energy warhead could achieve a kill on such a target. NTW tests and analyses will continue through 2003.

The Navy has made significant progress with AEGIS Y2K certification. The Navy has certified the following as Y2K compliant: the SM-3 missile, the Vertical Launcher System, and AEGIS Baseline 5 Phase III computer program. The Baseline 6 Phase III program has Y2K compliance as a contract requirement and will be tested in both developmental and operational testing as the system matures.

TEST & EVALUATION ASSESSMENT

NTW faces several technical challenges:

- Ascent phase intercept. This will be demonstrated during the second phase of PDRR flight testing.
- The single color infrared sensor's ability to discriminate the target from fuel chuffing or target plume.
- Potential obscuration of the seeker by the kill vehicle Divert and Attitude Control System propellant plume.

- AEGIS radar detection and tracking. The AEGIS radar is designed for acquisition and tracking of relatively large aircraft targets, and may have insufficient power to autonomously acquire low signature ballistic missile targets at long range. External cueing of the radar may ameliorate this challenge.

The Navy has produced a solid PD&RR program that maps out a reasonable Engineering and Manufacturing Development (EMD) program, albeit with a challenging schedule. To address DOT&E's concerns for reducing risk prior to the milestone, the Navy added six Threat Representative Target flight tests to the PD&RR phase and increased the extent of hardware-in-the-loop ground testing. PD&RR testing is structured to provide an adequate evaluation of Block I systems' potential capability. EMD testing, which now includes 20 missile firings and combines extensive hardware-in-the-loop and digital modeling and simulation, should provide an adequate assessment of the Block I system's effectiveness and suitability.

Obscuration of the seeker by the kill vehicle Divert and Attitude Control System plume is a recently identified risk area to the program. The Navy is developing an extensive ground test program to characterize these phenomena and will collect in-flight data during the Aegis LEAP Intercept and Threat Representative Target flight tests in PD&RR. To fully understand these effects, it is essential to test during periods of solar illumination of the propellant plume.

The SM-3 Lethality and Analysis Program is building a solid foundation for future LFT&E activities. The program is addressing many of the lethality issues early on and developing test techniques that can be employed in future lethality testing.

During the past year, the SM-3 Captive Carry program on the Airborne Surveillance Testbed (AST) has been a technical success story. AST has carried a SM-3 seeker assembly on several tests involving targets of opportunity, including Theater High Altitude Area Defense tests. The Captive Carry testbed has allowed the program to characterize the IR sensor and develop software to be used in flight testing. The knowledge gained thus far benefits the entire Ballistic Missile Defense community.

The development of two-color seeker technology should be accelerated. Two-color technology would significantly improve seeker discrimination over the proposed Block I capability. This technology shows promise and has the potential to be incorporated into the program during PD&RR.

RECOMMENDATIONS, CONCLUSIONS, LESSONS LEARNED

The Navy is aggressively applying lessons learned from the Welch Panel review of hit-to-kill missile defense programs. Their methodical approach for conducting pre-flight ground tests is reducing risk and inspiring confidence in success.

The need to meet a mandated capability fielding timeline within established funding levels has forced the Navy to delay development of a two-color infrared seeker for the kill vehicle. The two-color seeker is scheduled for the objective system (Block II), which is intended to address the 2010 threat. However, with its one-color seeker, the performance of the Block I system against certain classes of existing threats may be compromised. Developing and fielding the NTW Block I knowing it will only partially address the existing threat at fielding is a concern. Early fielding of Block II with its upgraded

infrared and radar discrimination capability would ameliorate many of the threat shortfalls associated with Block I.

The weapons development process should not only consider today's threat but also the reality of the reactive and evolving threat. The technology to achieve the objective system, Block II, is available and should be incorporated as soon as possible.