A FUTURE NAVAL CAPABILITY

Missile Defense

The United States Navy and Marine Corps face a world in which both cruise and ballistic missiles are increasingly available to hostile nations and terrorist factions. Less expensive than piloted aircraft and widely proliferated, missiles threaten both ships at sea as well as forces and critical assets ashore. To project power from the sea rapidly, effectively, and securely, the Naval warfighters must be able to defend their forces and assets against *all* air threats.

Why is this Future Naval Capability important? Few adversaries will try to match and overmaster American strengths. Rather, they will attack our forces in an asymmetrical way. Modern air forces are expensive and difficult to maintain, but modern cruise and ballistic missiles are not—particularly if the enemy only wants to damage a city or a large defended area. Widely available and easy to use, land attack missiles can have a strategic and political impact far surpassing their tactical effects. In fact, the already-proliferated anti-ship cruise missile can be launched from land either at our ships operating close to shore or at land targets in a bombardment mode. In the cluttered littoral battlespace, these threats pose a confusing and difficult air defense challenge.

What's our investment strategy? In developing the Missile Defense FNC program, the Integrated Product Team (IPT) focused on gaps in current Navy and Marine Corps Theater Air and Missile Defense (TAMD) capability, selected a set of very promising technology products for transition to funded acquisition programs, and designed a systems engineering strategy to meet established joint and naval requirements.

· ***Priority.*** Our enabling capability is to perform overland missile defense. As stated in the Joint Theater Air and Missile Defense (TAMD) Mission Need Statement (MNS) and Capstone Requirements Document (CRD), this capability should provide 360° overland surveillance, overland fire control quality track, a single integrated air picture, composite combat identification, distributed weapon system control, and overland target intercept with a high probability of kill. The products of this FNC address all of these requirements.

How are we filling the gaps in this enabling capability? A set of milestones and transition opportunities address capability gaps.

Priority: Develop technology to enable baseline overland missile defense.

This is the ability to engage all air threats in the littorals where radar clutter is often severe and terrain may blind surface-based sensors. Central to our enabling capability is the operational integration of organic Naval airborne surveillance and tracking systems with battle management and surface-based missile-firing units. It also provides the basis for an overland missile defense capability for Marine Corps units engaged in Operational Maneuver From The Sea (OMFTS) and Ship-to-Objective Maneuver (STOM).

·**In FY 2002:** UHF Electronically Scanned Array (UESA) E-2C aircraft antenna fabrication and assembly, Multi-Source Integration (MSI) Phase I integration of satellite communications sources into the mission computer unit of the E-2C aircraft, Advanced Sensor Netting Technology (ASNT) integration of electronic support (ES) data into the Cooperative Engagement Capability (CEC), Composite Combat Identification (CCID) demonstration of CEC track interface to the EP-3 StoryMaker system, completion of algorithms for Distributed Weapons Coordination (DWC) functions for theater ballistic missile defense (TBMD).

· **In FY 2003:** Infrared (IR) Sensor critical component demonstrations, MSI phase I flight testing in E-2C aircraft, development of ASNT identification attribute passing and data distribution algorithms, coding and testing of DWC TBMD algorithms, Reactive Warhead static arena tests.

· **In FY 2004:** MSI phase II software development, ASNT ES integration demonstration at Distributed Engineering Plant (DEP), CCID StoryMaker-CEC interface demonstration at Joint Combat Identification Evaluation Team (JCIET) exercises, Reactive Warhead dynamic sled tests.

· **In FY 2005:** IR Sensor fabrication & aircraft integration, flight tests of UESA antenna on EC-130 testbed aircraft, lab testing of Affordable Ground Based Radar (AGBR) advanced development model (ADM), MSI phase II software testing, ASNT demonstration of ID attribute passing and data distribution at DEP, coding and testing of DWC air defense algorithms.

· **In FY 2006:** IR Sensor flight tests, field demonstration of AGBR ADM, proof-of-concept test for DWC, ASNT track and gridlock algorithms demonstration at DEP, CCID identification reasoning engine demonstration, Advanced Area Defense Interceptor (AADI) live fire demonstration.

· **In FY 2007:** IR Sensor flight test data analysis, MSI phase III software demonstration, ASNT capability demonstration in fleet units, CCID capability demonstration in Common Command and Decision (CC&D) system, full-scale testing of DWC in AEGIS and CC&D.

Transition Opportunities:

· Infrared Sensors—transition to E-2C, FY 05, FY 07.

· UHF Electronically Scanned Array (UESA) antenna—transition to E-2C Radar Modernizaton Program (RMP), FY 05.

· Affordable Ground-Based Radar—transition to USMC Multi-Role Radar System, FY 04.

"The success of US Tomahawk cruise missiles during the Persian Gulf War has heightened interest in cruise missile acquisition in many countries. The LACM market through the year 2015 has been estimated by one Western LACM manufacturer to be 6,000-7,000 missiles, not including those purchased by Russia, China, and the United States. The majority of these missiles will have the potential to perform precision-strike missions."
—Ballistic and Cruise Missile Threat, *National Air Intelligence Center NAIC-1031-0985-98*

· Multi-Source Integration—transition to E-2C Hawkeye 2000 in FY 03, and to E-2C TAMD configuration 3 in FY 05.

· Advanced Sensor Netting Technologies—transition to Cooperative Engagement Capability (CEC), FY 04 through FY 07.

· Composite Combat Identification (CCID)—transition to EP-3 (FY 04), Common Command and Decision (CC&D) system (FY 07).

· Distributed Weapons Coordination—transition to AEGIS, in FY 05, and Common C&D, in FY 07.

· Advanced Area Defense Interceptor—planning effort for Navy-Marine Corps live fire demonstration of entire Air-Directed Surface-to-Air Missile "kill chain" in support of STANDARD Missile (active) and E-2C RMP P3I, FY 06.

· Reactive Warhead—transition to STANDARD Missile P3I, FY05, and HARM, FY 05.

What's some of the sustaining discovery and invention science and technology? The Missile Defense FNC exploits numerous ONR discovery and invention programs.

Advanced mathematical techniques will permit the development of efficient algorithms to correlate real-time and non-real-time data for sensor fusion, sensor netting, combat identification, common threat evaluation, and preferred shooter recommendations.

Multicolor focal plane arrays will permit deployment of infrared sensors for long range, precision post-boost detection and tracking of theater ballistic missiles.

Solid-state radar components will enable construction of affordable, lightweight, highly mobile, and powerful new radars for air defense and other applications.

Photonics promises dramatic improvements in data transmission. Improved sensor performance and better processors will be important to target detection and identification.

Automation of decision-making will improve timely, efficient and effective battle management involving multiple sensor and firing units defending against numerous simultaneous attacking theater missiles.

Advanced warhead materials make possible use of lightweight fragments that react upon impact to inflict catastrophic damage to missile airframes, seekers, propulsion and payloads.