Aegis

Executive Summary

- Aegis successfully conducted two intercept tests against unitary and separating short-range targets.
- Long-range surveillance and track capabilities against Intercontinental Ballistic Missile (ICBM)-class targets were demonstrated during two Air Force tests of our strategic missiles.
- Aegis Ballistic Missile Defense (BMD) demonstrated enhanced discrimination algorithms during recent flight tests that will contribute to the strategic defense of the U.S. territory and limited theater defense.
- The Missile Defense Agency (MDA) made good progress in adding realism to the Aegis BMD test program. Aegis flight tests are conducted as part of a test campaign where other ship operations are exercised while conducting missile defense. Demonstrating capability under challenging operational conditions remains an objective for future tests.

System

- Aegis BMD is a highly mobile sea-based missile defense system that employs the multi-mission shipboard Aegis Weapon System, with new radar and missile capabilities, to engage ballistic missile threats.
  - AN/SPY-1 radar computer program modifications allow long-range surveillance and tracking of long-range ballistic missiles.
  - New Standard Missile (SM-3) design delivers a maneuverable kinetic kill vehicle to an intercept point in the upper atmosphere or in space.
  - The modified Aegis vertical launcher systems store and fire the new, larger SM-3 missiles.
- Aegis BMD is capable of autonomous missile defense operations, but can also accept external cues and tracks over tactical data links.

Mission

The Navy will employ Aegis BMD for two missions:

- Provide forward-deployed radar capabilities to enhance defense against long-range ballistic missile threats
- Provide all short-, intermediate-, and long-range ballistic missile threat data to the Command, Control, Battle Management and Communications system for dissemination to U.S. Strategic Command and U.S. Pacific Command to ensure situational awareness
- Defend deployed forces and allies from short- and intermediate-range theater ballistic missiles

Aegis BMD ships are designed to conduct all aspects of theater ballistic missile defense engagements.

Activity

- In FY05, Aegis BMD continued testing to assess engagement of short-range ballistic missiles, as well as long-range surveillance and track capabilities.
- Two successful intercept flight tests were completed.
  - Intercept flight test against a unitary ballistic missile in February 2005
  - Intercept flight test against a separating ballistic missile in November 2005
- In concert with the flight test missions, at-sea demonstrations of Aegis BMD capability were conducted using simulated engagements in a multi-warfare environment.
- Aegis BMD participated in tracking exercises of theater and ICBM-class targets.
  - Sea trials and tracking exercise of Aegis Readiness Assessment Vehicle-A in February 2005
  - Medium-range target tracking exercise in April 2005
  - Critical measurements and countermeasures tests in August and November 2005
  - Tracked two United States Space Command missile tests: Safety Enhanced Reentry Vehicle in August 2005, and Glory Trip-189 in September 2005
  - Sea trials and tracking exercise in November 2005
- Ground tests of upgraded SM-3 missile Block components were conducted.

Assessment

- Aegis BMD demonstrated a capability to engage short- to medium-range ballistic missiles. In five out of six attempts to date, Aegis BMD successfully intercepted a short-range, unitary ballistic missile target. Test events were conducted under increasingly operationally realistic conditions with the involvement of the Navy Operational Test Agency.
- The Aegis ships modified for BMD are currently limited to ballistic missile defense missions; ship cruise missile defense is not possible with the current software. Future versions of the system will include both capabilities.
- Testing to date of Aegis BMD tracking performance has been primarily focused on short- and medium-range targets. Aegis BMD recently collected data on an ICBM-class target with the Limited Defensive Operations configuration. Data from these tests are currently under analysis to assess Aegis BMD long-range surveillance and track capability to support the Ground-Based Midcourse Defense mission.
- Flight tests have demonstrated good Aegis BMD performance for the engagement space tested to date. However, some issues remain open. Recent ground tests of the SM-3 third-stage rocket motor surfaced problems with thrust performance for certain fly-out scenarios. Also during ground tests of the redesigned kinetic warhead maneuvering system, the highest pulsed thrust mode failed to consistently perform to specification. This maneuvering system was redesigned in FY05 in an attempt to address past problems with thrust response. These thrust anomalies could lead to additional design changes.
- The Navy is making good progress toward incorporating operational realism into their flight tests. Operational crews execute the intercept flight missions without advanced notice of launch time. In early testing, ship position with respect to the target trajectory is still controlled to increase the probability of intercept. Other testing constraints such as sea states, time of day, weather, and target dynamics are necessary for safety, and to baseline system performance and concept of operations. The influence of these operational parameters must be accounted for in models and simulations used to extrapolate flight test performance to expected mission performance.

Recommendations

1. Finalize design and flight test configurations of the third-stage rocket motor and the kinetic warhead divert system.
   - Future flight tests should exercise the various multi-pulse modes of the third-stage rocket motor and the kinetic warhead divert system against separating targets.
2. Increase operational realism for the long-range surveillance and tracking exercises of ICBM-class targets. Specific examples include:
   - Use Aegis BMD as a real-time contributor to Ground-Based Midcourse Defense weapon task plan development during an Integrated Flight Test.
   - Use ship positions and search sectors developed by the Aegis BMD tactical Mission Planner versus pre-scripted locations and search sectors.