

## DDG 1000 – Zumwalt Class Destroyer

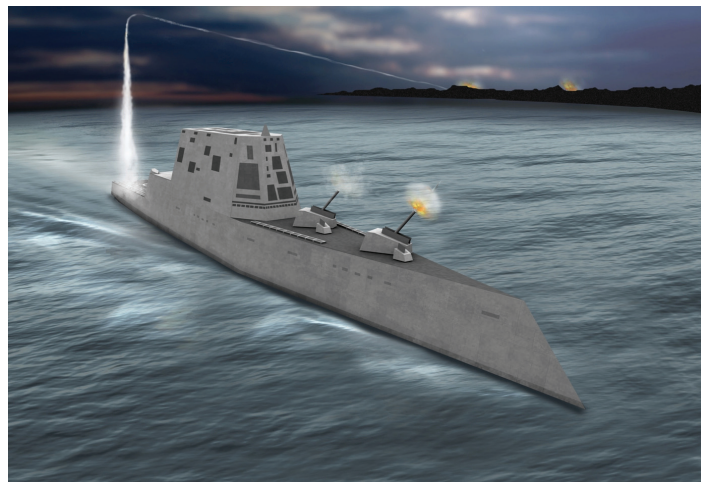
### Executive Summary

- The first ship in the DDG 1000 class was launched on October 28, 2013, with fabrication over 85 percent complete. The Navy initiated lead ship pre-delivery testing in FY13 and will continue in FY14.
- The Navy conducted live fire tactical guided flight and lethality testing of the Long-Range Land Attack Projectile (LRLAP) in FY13. Analysis of test results is ongoing.
- The Navy successfully completed initial integration and compatibility testing of the ship's Engineering Control System at the DDG 1000 Integrated Power System (IPS) Land-Based Test Site (LBTS).

### System

DDG 1000 is a new combatant ship with a wave piercing hull form designed both for endurance and to be difficult to detect on radar. It is equipped with the following:

- Total Ship Computing Environment Infrastructure that hosts all ship functions on an integrated, distributed computing plant
- Two 155 mm Advanced Gun Systems that fire LRLAPs
- AN/SPY-3 Multi-Function (X-band) Radar modified to include a volume search capability (the Navy removed the Volume Search Radar (S-band) from the ship baseline design for cost reduction per an Acquisition Decision Memorandum of June 1, 2010)
- Eighty vertical launch cells that can hold a mix of Tomahawk Land Attack Missiles, Standard Missiles, Vertical Launch Anti-Submarine Rockets, and Evolved Sea Sparrow Missiles
- Integrated Undersea Warfare system with a dual frequency bow-mounted sonar and multi-function towed array sonar to detect submarines and assist in avoiding mines
- An ability to embark and maintain MH-60R helicopters and vertical take-off unmanned aerial vehicles



### Mission

- The Joint Force Maritime Component Commander can employ DDG 1000 to provide:
  - Joint Strike
  - Joint Fire Support
  - Anti-Surface Warfare
  - Anti-Air Warfare
  - Anti-Submarine Warfare
- DDG 1000 is intended to operate independently or in conjunction with an Expeditionary or Carrier Strike Group, as well as with other joint or coalition partners in a Combined Expeditionary Force environment.

### Major Contractors

- General Dynamics Marine Systems Bath Iron Works – Bath, Maine
- Huntington Ingalls Industries – Pascagoula, Mississippi
- BAE Systems – Minneapolis, Minnesota
- Raytheon – Waltham, Massachusetts

### Activity

- The Navy continues to revise the Test and Evaluation Master Plan (TEMP). The most significant issues being addressed in the TEMP revision are:
  - Removal of Volume Search Radar
  - Replacement of an integrated Mk 110 57 mm close-in gun system with non-integrated Mk 46 30 mm guns
  - Changes in hardware and software delivery schedule, including the delivery of Anti-Submarine Warfare, mine avoidance, Tomahawk Land Attack Missile, and Advanced Gun System counterbattery capability during Post-Shakedown Availability
- The last annual report of DDG 1000 class ships was in FY09. Since that time, the Navy:
  - Successfully completed initial integration and compatibility testing of the ship's Engineering Control System with the ship's major IPS hardware at the DDG 1000 IPS LBTS in March 2012.
  - Continued guided flight testing and lethality testing of LRLAP at the Army Test and Evaluation Command's White Sands Missile Range. Lethality testing was conducted in accordance with DOT&E-approved test plans and is now complete. The Navy's Lethality Assessment

# NAVY PROGRAMS

Report is expected in FY14. One remaining guided flight test is scheduled to occur in FY14.

- Commenced development of the DDG 1000 Probability of Raid Annihilation (PRA) test bed, modeling and simulation that will be used to assess DDG 1000 capability against threat anti-ship cruise missiles and threat aircrafts.
- Is developing and validating ship models to assess the vulnerability of DDG 1000 to above-water and below-water threats. These models will support Damage Scenario Based Engineering Analyses and the Total Ship Survivability Trials. The Navy's Final Vulnerability Assessment Report is expected in FY16.
- In January 2013, DOT&E sent a memorandum to the Assistant Secretary of the Navy (Research, Development, and Acquisition) outlining the need for a threat torpedo surrogate to support operational testing.

## Assessment

- Analysis of the LRLAP lethality test data is ongoing. However, the preliminary assessment is that the LRLAP is lethal against expected realistic targets.
- Integration and compatibility testing at the LBTS provided early identification and correction of deficiencies within the ship's power distribution system and should reduce cost of post-installation deficiency correction.
- A component shock qualification program is required for assessing ship vulnerability to below-water threats and is necessary for accurate damage simulations. However, the shock qualification program remains unfunded.
- Two LRLAP failures in the first 20 guided flight tests were the result of accelerometer failure. The Navy incorporated

additional quality screening requirements for its accelerometer and has seen no issues in the successive 14 flight tests. Recent performance indicates that the probability of accelerometer failure may have been reduced; however, the limited number of firings prior to operational test will not validate the effectiveness of these actions.

## Recommendations

- Status of Previous Recommendations. The Navy should address the following open recommendations from FY09 or earlier:
  - Develop tactics and training that optimize employment of the Mk 46 gun systems against surface threats.
  - Fund and schedule component shock qualification to support the DDG 1000 class requirement to maintain all mission essential functions when exposed to underwater explosive shock loading.
- FY13 Recommendations. The Navy should:
  1. Determine a development and test strategy that mitigates the risk of delivering substantial mission capability during Post-Shakedown Availability.
  2. Complete the revision to the TEMP that accounts for DDG 1000 baseline changes and system delivery schedule.
  3. Develop a strategy to validate reliability of the accelerometers used in LRLAP prior to shipboard operational test.
  4. Develop and execute an accreditation plan that validates the acceptability of the PRA test bed to support operational test.
  5. Identify and/or develop a threat torpedo surrogate to support operational test in FY16.