

DDG 1000 *Zumwalt*-Class Destroyer



As part of the ongoing IOT&E that commenced in FY22, the Navy commenced modeling and simulation (M&S) testbed runs in FY23 that will inform DDG 1000 *Zumwalt*-class anti-air warfare capability against threat anti-ship cruise missiles (ASCMs). Insufficient data are available to change the assessment provided in DOT&E's classified early fielding report of November 2022. The Navy also completed evaluation of *Zumwalt*-class survivability to cyberattack which will be included in a classified report upon completion of IOT&E, currently expected in FY24.

SYSTEM DESCRIPTION

Zumwalt-class ships are long range, low observable, destroyers. They are equipped with: 1) a modified AN/SPY-3 Multi-Function (X-band) radar that adds a volume search capability; 2) 80 vertical

launch cells to employ Tomahawk Land Attack Missiles, Standard Missiles (SM-2/SM-6), Vertical Launch Anti-Submarine Rockets, and Evolved Sea Sparrow Missiles; 3) an integrated undersea warfare system with a mid-frequency bow-mounted sonar; and 4) two Mk 46 30mm close-in gun systems.

MISSION

The joint force maritime component commander can employ *Zumwalt*-class destroyers primarily for forward-deployed offensive surface strike missions, with a secondary mission of surface warfare dominance. As

designed, the *Zumwalt* class included undersea warfare capabilities, but the Navy now does not intend to use the ship in this role. The *Zumwalt* class is designed for independent operations but can be integrated into Carrier or Expeditionary Strike Group operations.

Between 1QFY24 and 2QFY28, the Navy will install Conventional Prompt Strike (CPS) modules on each ship of the class. These modules will provide the *Zumwalt* class additional strike warfare capability.

PROGRAM

The *Zumwalt* class is an Acquisition Category IC program. The President's Budget in 2011 truncated the class to three ships. The Navy commissioned USS *Zumwalt* (DDG 1000) in 2016 and USS *Michael Monsoor* (DDG 1001) in 2019 and expects the delivery of *Lyndon B. Johnson* (DDG 1002) in FY27 after CPS install.

The Navy continues to update the *Zumwalt*-class Test and Evaluation Master Plan (TEMP) due to significant modifications to the operational requirements and warfighting concept of operations. In 2019, the Navy changed the *Zumwalt* class's primary mission to open-ocean surface strike, removed all requirements related to mine avoidance capability, and codified additional changes in a June 2021 revision to the Operational Requirements Document, to include the addition of CPS. The Navy also intends to remove requirements to test

undersea warfare capabilities of the ship in the next revision of the TEMP based on revised employment of the class. The *Zumwalt*-class IOT&E started in October 2021 and will continue into FY24. DOT&E will require testing not completed during IOT&E to be addressed in FOT&E as part of the TEMP revision.

» MAJOR CONTRACTORS

- Bath Iron Works, a subsidiary of General Dynamics Corporation – Bath, Maine
- HII (formerly Huntington Ingalls Industries) – Pascagoula, Mississippi
- Raytheon, a subsidiary of RTX (formerly Raytheon Technologies) – Arlington, Virginia

TEST ADEQUACY

Zumwalt-class testing to date was conducted in accordance with the DOT&E-approved test plans and observed by DOT&E. The Navy began modeling and simulation (M&S) Probability of Raid Annihilation testbed runs in July FY23 and expects to complete in FY24. These runs will evaluate the *Zumwalt* class's probability of defeating inbound anti-ship cruise missiles (ASCMs) as part of *Zumwalt* class's anti-air warfare mission. Additional live fire testing against ASCM surrogates is scheduled aboard DDG 1001 in December 2023, however there is currently no

plan to rerun M&S with updated data from the live fire testing.

The Navy completed a cyber cooperative vulnerability and penetration assessment and an adversarial assessment between November 2022 and March 2023. Testing encompassed Internet Protocol (IP) networks aboard the ship along with industrial control systems associated with its hull, mechanical, and electrical systems. These tests were adequate to assess cyber survivability of the class, in accordance with the DOT&E-approved test plan, and observed by DOT&E.

As noted in the FY22 Annual Report, the Navy has not yet funded or planned an adequate ship survivability assessment against underwater threat weapons, to include a demonstration of residual mission capability after such engagements, through a full ship shock trial. The Navy is currently evaluating options for completion of the equipment shock qualification program and conduct of an alternative to shock trial that would sufficiently assess the risk to the warfighter from associated weapon events.

The Navy has not yet updated vulnerability and recoverability M&S meant to support the LFT&E survivability assessment of the *Zumwalt* class to reflect the ship as built. In the FY22 Annual Report, DOT&E recommended that the Navy work to develop an updated M&S strategy that would include survivability model updates, but currently the Navy does not intend

to update, validate, or accredit LFT&E survivability assessments prior to completing their LFT&E program in FY24, previously expected to be completed in FY23. DOT&E will not be able to provide an assessment of the *Zumwalt* class's vulnerability to threat weapons without the results from validated survivability M&S that models the ship design as built.

PERFORMANCE

» EFFECTIVENESS

Not enough data are yet available to determine *Zumwalt*-class operational effectiveness. Simulation runs for AAW remain in progress and no update in the determination of AAW performance can be made from the preliminary assessment provided in DOT&E's classified early fielding report of November 2022. Similarly, torpedo defense testing conducted with DDG 1000 in October 2021 provided data on the class's ability to evade torpedoes, but the postponement and proposed cancellation of other undersea warfare test events prevents further assessment of the class's effectiveness against undersea threats. Final assessment of *Zumwalt*-class offensive surface strike effectiveness will be reported in a classified report following the completion of the live missile events in FY27.

» SUITABILITY

Not enough data are yet available to provide an assessment of *Zumwalt*-class operational

suitability. DOT&E will report operational suitability after changes to hardware and software baselines associated with the install of CPS and the technological refresh of the class's Command, Control, Communication, Computer, Cyber and Intelligence (C5I) systems.

» SURVIVABILITY

Due to vulnerability and recoverability M&S not yet being validated or reflecting the ship as built, data are insufficient to assess *Zumwalt*-class survivability against threat weapons. DOT&E will require that the survivability M&S be updated and validated as part of the upcoming TEMP revision.

Failure and recoverability mode testing aboard DDG 1001 conducted in 2022 provided insight into the recoverability of the class after damage. However, testing was not sufficient to resolve associated LFT&E critical issues due to limitations on the systems under test. DOT&E will address the strategy for completing the LFT&E assessment of the *Zumwalt* class's mission system recoverability as part of the upcoming TEMP revision.

Results from cyber survivability testing aboard DDG 1000 conducted between November 2022 and March 2023 will be included in a classified report upon completion of IOT&E, currently expected in FY24.

RECOMMENDATIONS

The Navy should:

1. Complete remaining IOT&E events in accordance with the DOT&E-approved test plans.
2. Complete revision of the TEMP that includes completion of existing IOT&E requirements and an adequate test strategy for the as-delivered mission capabilities after installation of CPS.
3. Complete development and validation of the combat system M&S testbed, to include debris, missile, radar, and electronic warfare models.
4. As noted in the FY22 Annual Report, document the risk to the warfighter associated with incomplete component shock qualification and lack of full-ship shock trial prior to deployment.
5. Update the LFT&E strategy to include evaluation of the as-built survivability of the *Zumwalt* class and submit it for DOT&E approval with the TEMP update.
6. Plan and resource within the TEMP update a full ship shock trial of the first available *Zumwalt*-class ship with CPS installation.
7. As recommended in the FY22 Annual Report, sufficiently fund modernization and sustainment of the DDG 1000 class to include improvements determined from Failure and Recoverability Mode testing, which will be documented in the final survivability assessment report.