

Tactical Tomahawk Missile

Tomahawk is a long-range cruise missile designed to be launched from submarines and surface ships against land targets. Engagement planning, missile initialization, and launch control functions are performed aboard the launch platform by a Combat Control System (submarines) or Tomahawk Weapon Control System (TWCS) (surface ships). Targeting, mission planning, and distribution of Tomahawk tactical data are supported by the Tomahawk Command and Control System (TC2S). There are two versions of Tomahawk: Tomahawk Baseline III, and Tactical Tomahawk Baseline IV.

Tomahawk Baseline III

Three primary variants of Tomahawk Baseline III are currently operational: RGM-109A Tomahawk Land Attack Nuclear (TLAM-N) (not deployed); RGM-109C Tomahawk Land Attack Missile-conventional (TLAM-C); and RGM-109D Tomahawk Land Attack Missile-conventional submunition (TLAM-D). The fielded Baseline III Tomahawk Weapon System continues to receive incremental upgrades. The principal improvements are in the Advanced Tomahawk Weapon Control System (ATWCS) fire-control system, and the TC2S software. Test and Evaluation Master Plan (TEMP) 251 Revision A governs test and evaluation of the Baseline III missile and ATWCS. TEMP 1007-1 Revision B, Change 1, approved by DOT&E in 2001, governs the Tomahawk TC2S testing.

Tactical Tomahawk Baseline IV

The RGM-109E Tactical Tomahawk (Tomahawk Baseline IV) program began in FY98 as a restructure of the earlier (FY94-FY98) Tomahawk Baseline Improvement Program. Tactical Tomahawk represents a considerable leap forward in technology. Designated C3 nodes will be able to communicate with the missile in-flight and direct it to pre-planned alternate targets or change its mission plan to attack new targets. While in flight, the Tactical Tomahawk missile will be able to transmit its health, status, and limited imagery to the C3 nodes. The fire control system is also being upgraded and is called the Tactical Tomahawk Weapon Control System (TTWCS).

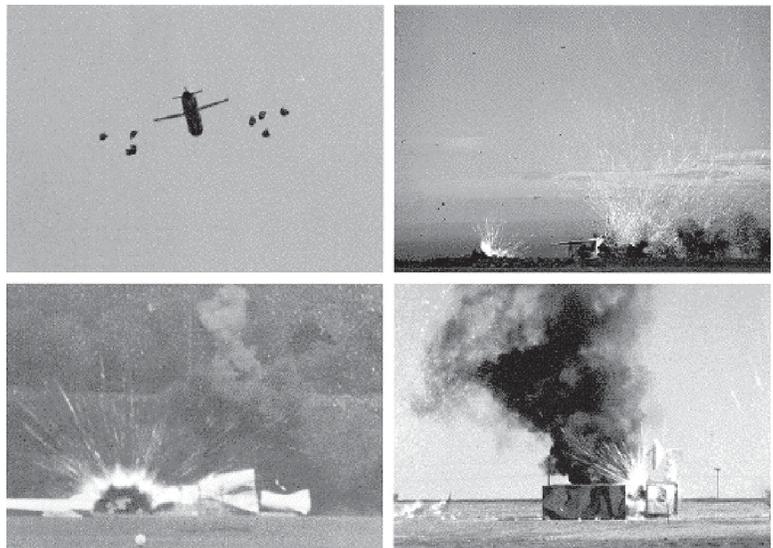
The Tactical Tomahawk missile retains the same WDU-36/B warhead as the Tomahawk Block III. Differences between Tomahawk Block III missile and the Tactical Tomahawk Baseline IV missile include significant structural modifications to the missile airframe and engine as well as modified terminal engagement parameters that could significantly affect system lethality. Therefore, live fire testing is required. Tactical Tomahawk TEMP 251-4 governing test and evaluation of Baseline IV systems was approved in FY02.

TEST & EVALUATION ACTIVITY

Tomahawk Baseline III

The lead operational test agency, the Operational Test and Evaluation Force (OPTEVFOR), completed two operational tests (OT) in FY03. TC2S software release 3.3 for the Theater Mission Planning Center/Afloat Planning System (TMPC/APS) was tested during OT-IIIIG. TMPC/APS software version 3.3 rehosted the Mission Distribution System to personal computer hardware (PC-MDS). The move to PC-MDS simplifies hardware updates, decouples software updates from hardware updates, and makes commercial network communications solutions available to the TC2S.

OPTEVFOR began OT-IIIZ, evaluating ATWCS software release 1.7.2.1, in FY03 but their test activities have not yet been



Operational Test-IIC (Tactical Tomahawk Baseline IV OPEVAL) is currently underway in preparation for a June 2004 full-rate production decision.

NAVY PROGRAMS

completed. This software is an evolutionary improvement on software release 1.7.1, evaluated in FY02. The improvements are designed to reduce mission response time and increase system throughput; to incorporate strike planning and coordination functionality and ensure compatibility with existing and future Naval and Joint C3I systems; to improve human computer interface technologies to reduce operator workload; and to provide on-line embedded training that incorporates simulations and instruction for individuals, functional groups, ship teams, and C2 teams/staffs.

Tactical Tomahawk Baseline IV

OT-IIA, an operational assessment of Tactical Tomahawk, was completed by OPTEVFOR in FY03. Key test events included a Functional Ground Test, completed on May 17, 2002. The Functional Ground Test exercised most facets of missile operation while the missile was confined to a test stand. The operational assessment also used data derived from the first two missile developmental test (DT) flights (DT-0 and DT-1). Both were launched from fixed sites with the prime contractor assuming primary responsibility for test conduct. The Program Office completed DT-0 in August 2002, and DT-1 in November 2002. OPTEVFOR also used data from DT of TTWCS and TC2S for their operational assessment.

OT-IIB was conducted by OPTEVFOR in FY03. This test evaluated the backward compatibility between Tomahawk Baseline IV's TTWCS and the Tomahawk Block III All-Up Round (AUR). Test events included two 48-hour at-sea battle group scenarios in which TTWCS will receive tasking and intelligence inputs; perform mission planning, engagement planning, and C3 functions; and launch simulated missiles, including salvo launches. Also included were two Block III AUR test flights, a maintenance demonstration, and supplementary battle force simulation exercises at Naval Surface Warfare Center – Dahlgren Division.

Naval Air Warfare Center – China Lake completed two live warhead sled tests and two live warhead flight tests against realistic targets in FY03.

TEST & EVALUATION ASSESSMENT

Tomahawk Baseline III

OT-IIIG testing resulted in OPTEVFOR rating TC2S TMPC/APS software version 3.3 operationally effective and operationally suitable. OPTEVFOR resolved all Critical Operational Issues as satisfactory and recommended fleet introduction of TC2S software version TMPC/APS 3.3.

Tactical Tomahawk Baseline IV

OT-IIA resulted in OPTEVFOR rating Tactical Tomahawk potentially operationally effective and potentially operationally suitable. They rated the Training Critical Operational Issues Red, noting serious risk to a satisfactory resolution in future testing. The current embedded training architecture does not support Tomahawk Strike Network (TSN) two-way satellite-enabled communication between the Tactical Tomahawk AUR and C3 nodes when TTWCS is in training mode. TSN messages include in-flight updates to the mission plan, AUR health and status, and battle damage assessment imagery. Currently, fleet personnel are limited to the training they can derive from simulations contained within their own shipboard computers. The valuable learning implicit in live training exercise communications among ships, shore nodes, and simulated in-flight missiles is not currently available.

In the near term, Fleet personnel will be able to receive some of the needed training in shore-based training facilities, limited by the availability of training schedule time. The Navy's plan to incorporate live TSN communication with TTWCS in training mode is called the Integrated Training Architecture. According to current program plans, the Integrated Training Architecture will reach the Fleet in FY06. This is after the planned TTWS initial operational capabilities in FY04, but approximately concurrent with the arrival of significant numbers of Tactical Tomahawk AURs in the Fleet. DOT&E expects future testing to provide better understanding of this issue and the effectiveness of the Navy's proposed solutions.

NAVY PROGRAMS

Despite initial problems, OPTEVFOR has completed OT-IIB (TTWCS backward compatibility with Baseline III missiles and TC2S). Analysis and reporting is in progress. DT-IIC (Baseline IV Tactical Tomahawk technical evaluation), in preparation for Baseline IV Tactical Tomahawk OPEVAL, is also under way.

Results from four LFT&E test events completed in FY03 are still undergoing analysis. Quick look analyses suggest that LFT&E test objectives were met in the tests, and results were generally consistent with the pretest predictions. Data from the tests should support a limited demonstration of Tactical Tomahawk lethality in both functional modes (Precision Warhead Detonation and Vertical Dive Attack), and a similarly limited comparison of Block III and Tactical Tomahawk lethality.

The Program Executive Officer's (PEO) proposed test configuration for the IOT&E supporting the initial operational capability and beyond low-rate initial production decisions is inadequate. The PEO has proposed limited live communications with the TSN (one flight AUR plus three hardware-in-the loop AUR simulators), to be supplemented with more extensive scenario work in a laboratory, where all communications paths and the AURs would be simulated. The laboratory does not adequately replicate the operational environments aboard the launch platforms and other participating C2 nodes (battle group staff and higher commands). OPTEVFOR and the Program Office are discussing options for satisfying these concerns.

