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## W76-0/Mk4

The W76/Mk4 reentry body assembly (RBA) on Trident I (C4) and Trident II (D5) strategic weapon systems are a key component of the Nation's strategic deterrent force designed and produced between 1972 and 1987. Meeting this mission will require that the W76/Mk4 RBA be deployed well beyond its original service life of 20 years. W76 refurbishment, scheduled to begin in FY'07, will include re-qualifying the pit, replacing the primary high-explosive, secondary refurbishment, a new arming, fuzing and firing (AF&F) system, and a new gas transfer system.

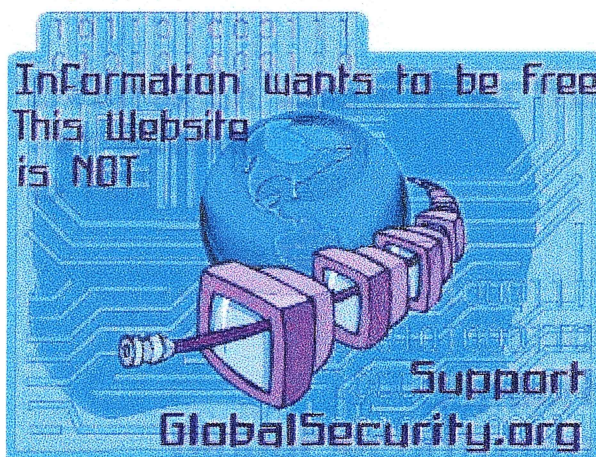
The Nuclear Weapons Council (NWC) approved the Block 1 refurbishment plan for the W76 in March 2000. The Block 1 refurbishment of the warhead (about one quarter of all W76 warheads) will focus on the high explosive, detonators, organic materials, cables and addition of a new Acorn gas transfer system. The Block 1 refurbishment will also add a new arming firing and fusing (AF&F) system. The FPU of Block 1 will be available by the end of FY 2007, and Block 1 production is planned for completion in FY 2012. During the Block 1 production, a decision will be made to either continue Block 1 retrofits on the entire W76 stockpile, change to a Block 2 retrofit that could include other options, or stop the retrofit altogether. The Block 2 effort, if approved by the NWC, would continue from FY 2012 to FY 2022 to refurbish the remaining W76 warheads.

The first W76 Enhanced Fidelity Instrumented-A (EFI-A) Reentry Body (RB) and Type 2G High Fidelity Flight Test Unit were successfully flown in February 1999. Sandia was the project integrator for development, building, and qualification of the flight test units. The EFI-A experiment provided valuable data using a newly designed, state-of-the-art telemetry system. The data has increased our understanding of the missile/RB interactions, internal RB shock/vibration environments, and RB dynamic behavior. The EFI-A was the first W76 flight test body to collect first-stage ignition data.

A life extension study was conducted during 1999 for the W76/Mk4 Reentry Body Assembly by Sandia, Los Alamos, DOE, Navy Strategic Systems Programs, US Strategic Command, Lockheed Martin Missiles and Space, and ITT Industries. The



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'block upgrade'  
- 1 in 5 yr  
segments





component with radiation hardness requirements to be qualified without underground testing.

The US Navy W76-0/Mk4 Joint Test Assembly (JTA) redesign achieved First Production Unit status in August 2001, following a successful development flight test in February 2000. The redesign replaced sunset technology components in the existing 20-year-old JTA, which is used to test the continued conformance of a denuclearized version of the War Reserve (WR) warhead. The new JTA collects significantly more state-of-health and critical performance data from onboard the Reentry Body (RB), as part of the core surveillance program. Aging concerns, the non-availability of replacement components used in original designs, and a desire to modernize nuclear safety features requires a refurbishment of the W76/Mk4 RBA for it to meet the extended service life. This should be accomplished in a planned, methodological manner to prevent possible weapon downtime and the total consumption of the National Nuclear Security Agency (NNSA) nuclear weapons complex capacity that could occur if a critical problem were identified. The US Navy Strategic Systems Programs (SSP) requested and the Nuclear Weapons Council Standing and Safety Committee (NWCSSC) approved a joint Department of Defense (DOD)/DOE Phase 6.2/6.2A Study, which was initiated on 19 October 1998. The study was conducted under the W76/Mk4 Project Officers Group (POG). The results of the study were briefed by the W76/Mk4 POG to the NWCSSC on 8 December 1999 and to the Nuclear Weapons Council (NWC) on 13 March 2000.

Study ground rules included the following:

- Modernize nuclear detonation safety features (to Mk5-like interface)
- Consider W76/Mk4 on Trident II (D5) only
- Current W76/Mk4 Military Characteristics (MCs) and Stockpile-To-Sequence (STS) were baseline
- Plan for a one-time refurbishment process (DOD and NNSA)
- Plan for total stockpile quantities reflected in the current Long Range Planning Assessment (LRPA)
- Production duration goal of 10 years or less
- Goal for a post-refurbishment life extension of 30 years

Emphasis was placed on meeting performance requirements over the extended life and minimizing the cost of necessary refurbishment.

The drivers for refurbishment are fourfold:

1. The W76/Mk4 is the most critical element of our nation's strategic deterrent and cannot be allowed to be degraded by a serious aging problem;
2. The W76/Mk4 Dual Revalidation Program has shown that even though components are aging gracefully, there are some negative changes;
3. The Stockpile Surveillance Program cannot predict failures; rather, it only detects them when they appear and when it may be too late to prevent degradation; and
4. The Navy has expressed the desire to retain an average system age of no more than 30 years, compatible with life extension of the Trident Weapon system.

The POG-recommended refurbishment option meets the life extension requirements for the W76/Mk4, while enhancing surety and providing increased targeting flexibility and effectiveness. Careful examination of technical, certification, and compatibility issues have identified no unacceptable program risks. DOD and NNSA costs have been identified to the degree appropriate for this phase of the program. Based on these factors, the POG recommended refurbishment of the W76/Mk4 beginning on 1 April 2000.

In 2002 the W76-1/Mk4A Life Extension Program successfully completed its second year of development engineering, achieving several significant milestones:

- Numerous reviews, including the Customer Requirements Review, and the Arming, Fuzing, and Firing Subsystem and Joint Test Assembly Conceptual Design Reviews.
- Completion of two reentry body Model Validation Tests and our first Joint Ground Test in support of structural and thermal model validation and environmental specification.
- Delivery of our first flight test bodies in support of the Demonstration and Shakedown Operation Navy flight test in FY03.

The MC4380A Neutron Generator was designed and qualified for the W76-0/Mk4 Trident warheads to provide additional margin in radiation environments. This intensive two-year project successfully supported the stockpile needs without the benefit of underground tests. The effort began in August 2000 and was completed in April 2002, followed by completion of the first production unit in May 2002 and delivery of the first units to the Navy and the UK in the summer of 2002.

The W76-1 Arming and Fuzing Subsystem (AFS) integrates radar, flight computer, and diagnostics in a single compact assembly. The design met aggressive cost goals through use of commercial off-the-