

## JOINT STANDOFF WEAPON (JSOW)



### Navy-led ACAT ID Program

|                            |                      |
|----------------------------|----------------------|
| Total Number of Systems:   | 19,114               |
| 154A:                      | 8,800 Navy; 3,000 AF |
| 154B:                      | 1,200 Navy; 3,114 AF |
| 154C:                      | 3,000 Navy           |
| Total Program Cost (TY\$): | \$5,999.6M           |
| Average Unit Cost (TY\$):  |                      |
| 154A:                      | \$.219M              |
| 154B:                      | \$.361M              |
| 154C:                      | \$.291M              |
| Full-rate production:      |                      |
| 154A:                      | 1QFY99               |
| 154B:                      | 1QFY02               |
| 154C:                      | 1QFY04               |

### Prime Contractor

Raytheon, Tucson, AZ

### SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Joint Standoff Weapon (JSOW) is a family of kinematically efficient (~12:1 glide ratio) 1000-lb class, air-to-surface glide weapons that provide for low observability, multiple kills per pass, preplanned missions, standoff *precision engagement*, and launch and leave capability against a wide range of targets during day/night, all weather conditions. All three JSOW variants employ a tightly

coupled Global Positioning System/Inertial Navigation System (GPS/INS). JSOW is employed as a force multiplier in a joint warfare environment for interdiction of soft/medium fixed, re-locatable and mobile light and heavy armored targets, massed mobile armored targets, anti-personnel, and air-to-surface threats. JSOW primarily functions in a preplanned mission mode where the system can store up to eight (8) targets; however, the system will allow pilot manual inputs as well as third party targeting as long as the targeting system can meet JSOW's targeting requirements. The weapon will be both land and carrier based.

Mission planning will be accomplished using the Navy's Tactical Automated Mission Planning System (TAMPS) and the Air Force Mission Support System (AFMSS). Integration of operations with the Joint Mission Planning System (JMPS) is planned. JSOW will be employed on the following aircraft: F/A-18C/D, and E/F; F-16C/D (Blocks 50, 40, 30); F-15E; JSF; B-1B; B-2A; and B-52H. The weapon comes in three operational variants.

- AGM-154A (JSOW Baseline) – USAF and Navy: The payload of the AGM-154A consists of 145 BLU-97/B submunitions. The BLU-97/B is a combined effects munition. The bomblets have a shaped charge for an armor defeat capability, a fragmenting case for material destruction, and a zirconium ring for incendiary effects. JSOW Baseline is designed to conduct pre-planned attacks on stationary soft targets such as: air defense sites, parked aircraft, components of airfields and port facilities, command and control antennas, stationary light vehicles, trucks and artillery, and refinery components.
- AGM-154B – (JSOW BLU-108) - USAF and Navy: The payload for the AGM-154B is the BLU-108 submunition from the Air Force Sensor Fuzed Weapon (SFW). JSOW will carry six BLU-108s, each of which dispenses four warheads or skeets. The skeets carry an infrared or dual mode sensor, and upon detecting a target, detonate to create an explosively formed penetrator that impacts the target. This system is an interdiction weapon with a target set identical to the Sensor Fuzed Weapon (SFW), which consists of mixed units of tanks, infantry fighting vehicles/armored personnel carriers and trucks in a tactical road march formation.
- AGM-154C (Unitary Variant) – Navy only: The AGM-154C, in addition to the common INS/GPS guidance, will use an autonomous Imaging Infrared seeker for target acquisition and terminal guidance. The AGM-154C will carry the BAE multiple warhead system (Broach), and is designed to attack point targets such as industrial facilities, logistical systems, and shipping locations.

## **BACKGROUND INFORMATION**

The JSOW program is incorporating a new Low Cost Control Section (LCCS) and Low Cost Guidance Electronics Unit (LCGEU) into all variants. This change is planned prior to final operational test and full-rate production decisions of AGM-154B and AGM-154C variants, but will be cut into the full-rate production of AGM-154A. In addition, JSOW is integrating the new GPS Selective Availability Anti-Spoofing Module (SAASM) security architecture into the LCGEU for delivery in fielded units in late FY03.

### **AGM-154A, Baseline Variant**

Milestone III for the AGM-154A was October 1998. DOT&E observed Navy OPEVAL and Air Force IOT&E in FY97-98. During FY98, DOT&E performed an independent LFT&E assessment on the lethality of AGM-154A JSOW/BLU-97 based on data obtained from the BLU-97 Insensitive Munitions (IM) warhead characterization test, DT-IIC and OT-IIA live missile drops and OPEVAL live drops. The results of the assessment were included in the combined AGM-154A Operational and Live Fire Test & Evaluation Report to Congress.

In April 2000, material defects were discovered in the payload rails and were identified as safety of flight critical to the BLU-97 payload assembly of the JSOW AGM-154A (baseline) variant. The program office removed the AGM-154A JSOW from flight status. Subsequently, AGM-154A JSOW was released for restricted combat operations. The problem was identified and the corrective action to go to a new rail supplier was implemented and new rails began delivery in Jul 00.

### **AGM-154B, BLU-108 Variant**

LRIP for the AGM-154B was granted 1QFY99. The AGM-154B Milestone III decision is currently scheduled for 4QFY01.

AGM-154B LFT&E is based upon live fire testing conducted for the Sensor Fuzed Weapon program. Due to delays in the SFW Preplanned Product Improvement (P<sup>3</sup>I) program, the JSOW Joint Program Office funded the SFW program to develop a baseline BLU-108 warhead modified to incorporate an IM fill (PBXW-11 explosive). The PBXW-11 IM fill performance was equal/greater than the previous OCTOL fill BLU-108 warheads. The LRIP I buy of AGM-154Bs will use this interim risk reduction warhead until the P<sup>3</sup>I warhead becomes available. The LRIP II (deliveries start in Aug 02) and subsequent FRP AGM-154Bs will incorporate the P<sup>3</sup>I BLU-108. The P<sup>3</sup>I warheads will also have the IM PBXW-11 fill.

### **AGM-154C, Unitary Variant**

The AGM-154C LRIP is scheduled for 4QFY02; MS III is scheduled for 4QFY03.

DOT&E did not initially require LFT&E for the AGM-154C variant because the program office originally planned to use the BLU-111/B, a proven warhead. In September 2000, USD/AT&L approved incorporation of the developmental Broach warhead. Due to incorporation of the new warhead, LFT&E including system-level realistic lethality testing of the AGM-154C against threat representative targets is now required.

## **TEST & EVALUATION ACTIVITY**

### **AGM-154A, Baseline Variant**

Aircraft integration continues for weapons incorporating the new LCCS and LCGEU. In Aug 00, AGM-154A conducted end-to-end testing which included captive avionics integration missions and live launches from a F/A-18C/D, F-16 Block 50, and B-2A. The F/A-18C/D testing consisted of side-by-side launches of two AGM-154A weapons, one weapon configured with old control section and GEU, and one LCCS and LCGEU production verification test (PVT) weapon. During CY00, the B-2 launched four

JSOWs in a Force Deployment Evaluation (FDE) to certify their OFP and verify B-2 training and tactics. Three LRIP AGM-154As were launched. One FRP AGM-154A with the LCCS and LCGEU was successfully launched in September 2000. The last B-2 FDE shot demonstrated the B-2's ability to rapidly re-target the JSOW weapon just prior to launch.

GPS jamming testing was completed this summer with the F/A-18C/D.

AGM-154A weapons were successfully tested, aircrews trained and deployed with the 20 Fighter Wing (FW) to meet a Quick Reaction Capability (QRC) direction from CSAF.

### **AGM-154B, BLU-108 Variant**

AGM-154B (BLU-108 submunitions) received approval from the Joint Safety Review Board (JSRB) for MOT&E and shipboard use. Validation of equivalent performance of the BLU-108 warhead with PBWX-11 IM fill vice the old OCTAL fill was completed using the baseline warhead configuration to support MOT&E. The validation testing for the complete P<sup>3</sup>I BLU-108 design including a new warhead started in September 2000.

MOT&E environmental qualification for the AGM-154B began in March 2000. Operational flight testing was originally scheduled to begin in Dec 00, but is being delayed, probably until mid-2001.

During PVT-B testing on the F-16, LCCS BIT (motor fault) failures were reported when moderate aerodynamic buffet was encountered during several high speed, low altitude test points. All BIT failure indications cleared when the aircraft reached flight conditions where buffet subsided indicating no permanent weapon failure. However, the fault indications are within the performance specification limits for the JSOW in the F-16 launch and captive regions and are an operational issue. During investigation of the LCCS BIT failures, significant wear was noted on control fin pin locks and inserts.

Also, in an F-16 launch of an AGM-154B in September 2000 all control section moveable fins fully deflected just prior to release. After release, the weapon departed controlled flight and crashed.

Together, the LCCS BIT failures, control fin pin lock and insert wear, and the fin deflection problem are delaying the start of MOT&E and the final B-52 launch. An investigation is in progress.

### **AGM-154C, Unitary Variant**

AGM-154C is scheduled to begin developmental testing in 3QFY01 with an operational assessment in 3QFY02 and initial operational testing starting in 2QFY03.

## **TEST & EVALUATION ASSESSMENT**

### **AGM-154A, Baseline Variant**

The results of Navy OPEVAL and Air Force IOT&E confirmed that JSOW Baseline, AGM-154A, is operationally effective and suitable. Additionally, JSOW Baseline meets accuracy and lethality requirements when employed against fixed, soft, pre-planned targets. However, future operational testing must address end-to-end interoperability with targeting aircraft/joint forces using third party and self-

targeting modes of operation. Self-targeting and third party targeting will be evaluated when launch platform-targeting systems and third party data source interfaces become mature. Third party timing will be assessed during operational testing of JSOW AGM-154B.

Fixes to the payload assembly rails material defects of the JSOW AGM-154A variant were identified and are being incorporated into all weapons. Combat restrictions are removed for all systems that have had their rails replaced.

Production Verification Testing (PVT) with an AGM-154A (PVT-A) and AGM-154B (PVT-B) was delayed due to software development for the LCGEU, and resolution of material defects with the dispenser rails. Results from F-18 launched PVT-A side-by-side and additional PVT weapon launches are being used to evaluate any effects on the performance of AGM-154A due to the new LCCS and LCGEU. A recent F/A-18C/D side-by-side launch of a AGM-154A with the older control section and an AGM-154A with the LCCS (and LCGEU) showed no discernable difference in performance between the two configurations. Terminal end-game maneuvering and weapon accuracy of the new Low Cost Guidance Electronic Unit (LCGEU) and Low Cost Control Section (LCCS) was demonstrated to be similar to the previous LRIP weapons during the dual launch from the F/A-18C/D. The AGM-154A Production Verification Tests also demonstrated performance within GPS jamming environments.

### **AGM-154B, BLU-108 Variant**

Delays in the P3I submunition development affected the planned cut-in date for P3I into both Sensor Fuzed Weapon and Joint Standoff Weapon, and will result in the procurement of fewer P3I versions of these weapons. The delays led the JSOW AGM-154B program to plan initial production with the BLU-108C/B IM filled submunition, which lacks P3I improvements. Follow-on operational testing of the AGM-154B will be accomplished when the BLU-108 P3I warhead completes SFW P3I LFT&E and FOT&E and is available from production. The SFW risk reduction testing of the interim BLU-108 with the insensitive munitions (PBXW-11) fill has been completed. Awaiting analysis and reporting of test results.

During investigation of LCCS BIT failures on the F-16, testing on an F/A-18C/D under similar flight conditions indicated satisfactory performance of the weapons during captive carry. The contractor has reproduced this BIT false alarm indication with a LCCS in the vibration laboratory and is working corrective action.

The AGM-154B flight test failure on launch from the F-16 is also currently under investigation. Although the failure is a JSOW air vehicle failure and is not specifically related to the type of payload that it was carrying (BLU-108s in this case), this is a significant event because it affects all variants. Failure analysis is in progress. The F-16 launch failure was preceded by successful AGM-154A launches from F/A-18C/D and B-2 aircraft. These weapons were configured with the same LCGEU, LCCS, and 8.1.4 guidance software.

The LCCS Fin Motor BIT fail indications and control fin pin lock and insert wear observed during F-16 captive carriage and F-16 launch failure have impacted the start of AGM-154B MOT&E, now to be determined pending the outcome of the investigation.

### **Operational Use**

As of September 2000, 66 AGM-154A weapons have been employed against fixed and relocatable targets in combat operations in Operation Southern Watch and Operation Allied Force.

Battle damage accuracy assessment estimates exceed requirements for the weapon dispensing over the planned target area.

### **LESSONS LEARNED**

JSOW production issues have occurred, and the JSOW Program Office demonstrated a capability to rapidly address and resolve these issues. A BLU-97 payload rail-manufacturing defect was detected during the manufacturing process, which had safety of flight implications. A new rail supplier was rapidly qualified and a rail retrofit program was implemented with minimal impact to operational capability. No JSOW weapon had experienced a failure of this component during flight test or operational use.