

## Small Diameter Bomb (SDB) II

### Executive Summary

- The Air Force Operational Test and Evaluation Center and the Navy's Commander, Operational Test and Evaluation Force, completed the Small Diameter Bomb (SDB) II Operational Assessment in February 2015.
- DOT&E published an Operational Assessment report in May 2015 to support a Milestone C (MS C) decision and entry into low-rate initial production.
- The Milestone Decision Authority approved the SDB II MS C in May 2015. Subsequently, the Program Office awarded the Lot 1 production option.
- The SDB II program test team is completing developmental flight testing. The program has accomplished 12 of the 16 Normal Attack (NA) mode Guided Test Vehicle (GTV) shots and 3 of the 6 NA Live Fire (LF) shots required to enter Government Confidence Testing (GCT). SDB II is on track to begin GCT in early 2016.
- The weapon is progressing well towards demonstrating its requirements in the NA mode. It has demonstrated in-flight target updates with both Ultra High Frequency and Link 16 networks.

### System

- The SDB II is a 250-pound, air-launched, precision-glide weapon that uses deployable wings to achieve stand-off range. F-15E aircraft employ SDB IIs from the BRU-61/A four-weapon carriage assembly.
- SDB II combines Millimeter-Wave radar, imaging infrared, and laser-guidance sensors in a terminal seeker, in addition to a GPS and an Inertial Navigation System to achieve precise guidance accuracy in adverse weather.
- The SDB II incorporates a multi-function (blast, fragmentation, and shaped charged jet) warhead, designed to defeat non-armored and armored targets. The weapon can be set to initiate on impact, at a preset height above the intended target, or in a delayed mode.
- SDB II provides increased weapons load per aircraft compared to legacy air-to-ground munitions used against offensive



counter-air, strategic attack, interdiction, and close air support targets in adverse weather.

- SDB II provides reduced collateral damage while achieving kills across a broad range of target sets by precise accuracy, small warhead design, and focused warhead effects.
- There are three principal attack modes: NA, Laser Illuminated Attack (LIA), and Coordinate Attack (CA). SDB II can be used against moving or stationary targets using its NA (radar/infrared sensors) or LIA modes, and fixed targets with its CA mode.

### Mission

- Combatant Commanders will use units equipped with SDB II to attack stationary and moving targets in degraded weather conditions at stand-off ranges.
- An SDB II-equipped unit or Joint Terminal Attack Controller will engage targets in dynamic situations and use a weapon datalink network to provide in-flight target updates, in-flight retargeting, weapon in-flight tracking, and, if required, weapon abort.

### Major Contractor

Raytheon Missile Systems – Tucson, Arizona

### Activity

- The Air Force Operational Test and Evaluation Center and the Navy's Commander, Operational Test and Evaluation Force, completed the SDB II Operational Assessment in February 2015.
- DOT&E published an Operational Assessment report in May 2015 to support a Milestone C (MS C) decision and entry into low-rate initial production.
- The Milestone Decision Authority approved the SDB II MS C in May 2015; the SDB II Program Office awarded the Lot 1 production option for 144 Air Force weapons in June 2015.
- DOT&E approved the updated Test and Evaluation Master Plan in April 2015; the SDB II Program Office is preparing for IOT&E.

# FY15 AIR FORCE PROGRAMS

- As of 2015, the Air Force has successfully completed 12 GTV and 3 LF developmental tests against moving and stationary targets. Three of the GTV and one LF test were conducted with Ultra High Frequency updates while nine GTV and two LF test shots were conducted with Link 16 updates. All tests were conducted in the NA mode, which is the primary employment method for SDB II. LIA and CA will be tested in 2QFY16.
- The Program Office completed 12 rounds of seeker CFTs, resulting in over 1,833 target runs in a wide variety of terrain and environmental conditions providing terabytes of seeker performance data and over 439 hours of seeker operation without a single failure.
- The program has augmented and refined the Integrated Flight System (IFS) model by incorporating the results of over 1,833 CFT runs as well as weapon flight tests. IFS model verification and validation is expected to be complete by the end of calendar year 2015, and the Air Force Operational Test and Evaluation Center is expected to accredit it prior to the start of operational testing.
- The Program Office completed over 2,000 hours of ground reliability testing and nearly 200 hours of inflight reliability testing.
- The program is scheduled to begin a 28-shot NA mode GCT program in January 2016, which will test the weapon in more operationally realistic environments with operationally representative hardware and software. GCT will test the weapon versus maritime targets, countermeasures, and GPS-degraded environments.
- The SDB II program met the MS C criteria. The SDB II Program Office is preparing for IOT&E with an adequately resourced test program and no unresolved major programmatic testing problems. IOT&E is scheduled to begin in 2QFY17.
- Two GTVs and one LF mission required additional attempts and were successfully repeated after completion of the failure investigation and implementation of corrective actions. All corrective actions to date have been successful in preventing repeats of the observed failure modes, with the exception of LF-5. LF-5, which was conducted on September 14, 2015, did not detonate and is currently under investigation. The test will be repeated after the investigation to adequately assess the lethality of the SDB II against the specific target.
- The weapon failed one environmental test related to the shipboard environment, but the program implemented a fix and completed design verification testing giving the Program Office confidence that the corrective actions will be successful.
- Preliminary comparisons of the IFS model pre- and post-flight predictions indicate the model is adequate for the kinematics flown in flight test to date. Raytheon Missile Systems will continue to develop and update the IFS model, which will be essential to the assessment of the results of live fire and operational testing. IFS, in combination with lethality data, will produce single shot kill probability values needed to assess end-to-end weapon effectiveness against a range of operationally relevant targets.
- The weapon is progressing towards demonstrating the required reliability. Further testing in GCT and CFT should provide increased confidence in weapon reliability.
- The weapon is on track to proceed to GCT.

## Assessment

- The operational assessment showed the SDB II progressing well towards meeting its effectiveness, reliability, and lethality requirements in the NA mode, which is the primary employment method for SDB II. SDB II successfully engaged both moving and stationary targets, in which there were no free flight reliability failures. The program has implemented corrective actions and fixes for all failure modes discovered in test.

## Recommendations

- Status of Previous Recommendations. The Air Force completed all previous recommendations.
- FY15 Recommendation.
  1. The Air Force should use the results of GCT to further refine the IOT&E test plan.