Small Diameter Bomb Increment II (SDB II)

In February 2024, DOT&E published an early fielding report on Small Diameter Bomb Increment II (SDB II) as integrated on F/A-18E/F aircraft. In FY24, the SDB II program continued integration testing on the F-35B/C and F/A-18E/F. The program made significant progress resolving cryptographic information delivery limitations. However, military test range availability, weapon mission planning, and weapon and aircraft Operational Flight Program (OFP) compatibility issues continued to delay test progress. This resulted in zero successful F-35B/C operational tests and two successful F/A-18E/F operational tests in FY24, delaying completion of the quick reaction assessment (QRA) until FY25. The program office now anticipates SDB II initial operational capability (IOC) on F/A-18E/F in FY25 and on F-35B/C in FY26.

SYSTEM DESCRIPTION

SDB II, also known as the GBU-53/B Stormbreaker, is the second increment of a 250-pound air-to-ground glide bomb. It is a network-enabled weapon (NEW) equipped with an encrypted weapon data link (WDL) radio that allows it to destroy moving targets in adverse weather at standoff ranges. When launched, SDB II guides to a designated target cue using a GPS-aided inertial navigation unit. In normal attack mode, the attacking aircraft or a third party updates the target location with inflight target updates sent via the WDL. Finally, the weapon uses a multi-mode seeker to precisely locate, identify, and terminally guide to the target. SDB II also has laser illuminated attack and coordinate attack modes to engage laser-illuminated targets or GPS coordinates.

MISSION

Combatant commanders will use SDB II to attack stationary and moving ground and littoral targets at standoff ranges in a variety of conditions including adverse weather.

PROGRAM

SDB II is a joint interest Air Force and Navy Acquisition Category IC program intended to deliver expanded capability deferred from SDB I. DOT&E approved the SDB II Milestone C (MS C) TEMP in April 2015. The MS C TEMP outlines a two-phase Multi-Service Operational Test and Evaluation (MOT&E). Phase I achieved SDB II fielding on the F-15E in FY20 with IOC declared in September 2022. Phase II intends to achieve early fielding with limited capability on the F-35B/C in FY25, followed by IOC in FY26. In FY20, the Navy initiated a QRA to integrate SDB II onto the F/A-18E/F. DOT&E approved a six-event QRA test plan. Despite significant delays executing the test plan, the Navy declared early fielding on the F/A-18E/F in October 2023, prior to completing the QRA. DOT&E published an early fielding report in February 2024. DOT&E will publish a QRA report in FY25 to support the Navy's IOC decision.

The program office is drafting a full-rate production (FRP) TEMP and anticipates an FRP decision in 3QFY25, following completion of the F-35B/C testing and the publication of DOT&E's report.

» MAJOR CONTRACTOR

- Raytheon, a subsidiary of RTX – Tucson, Arizona

TEST ADEQUACY

During FY24, the Navy conducted two of the remaining four live-fly operational tests for F/A-18E/F integration. DOT&E observed these events, which the Navy executed in accordance with a DOT&E-approved test plan and test plan change. Due to overland range safety limitations, the maximum employment range was limited below the program's threshold requirement. Other range safety restrictions continue to impose significant limitations on SDB II employment envelopes and F-35 self-lasing. These restrictions prevent testing SDB II's full operational capabilities.

The Navy attempted seven times to accomplish the remaining two test events at Point Mugu Sea Range to complete the F/A-18E/F QRA, with the following outcomes:

- One attempt was canceled in November 2023 due to a bomb rack unit issue resulting in a hung weapon.
- One mission in December 2023 and two missions in May 2024 were unsuccessful due to weather on the designated test range.
- Unsuccessful loading of the correct cryptographic keys into the weapon in February 2024 led to canceling two attempts. One of these attempts would have been canceled because the Federal Aviation Administration did not provide clearance to operate the weapon on the Link 16 network, which is a recurring issue affecting NEW testing across the DoD.
- The August 2024 attempt was unsuccessful due to a malfunction on one weapon and a combination of weather on the designated test range and incompatible Link 16 networks between the F/A-18E/F aircraft and the P-8 aircraft for the second weapon.

Due to these unsuccessful attempts, the last two test events are scheduled for 1QFY25. Moreover, delays in the F-35 30R08 OFP development and integration issues with SDB II prevented the program from conducting any operational tests on the F-35 in FY24.

MOT&E Phase I cyber survivability testing, conducted by the Air Force in FY19, was inadequate to support DOT&E survivability evaluation. The test asset was not production representative and testing lacked adequate documentation and engineering support to determine the emulated cyber threat's level of sophistication. The program office is working with DOT&E to rectify these shortfalls prior to the FRP decision. Cyber survivability testing is planned for FY25 as part of MOT&E Phase II.

PERFORMANCE

» EFFECTIVENESS

MOT&E Phase I verified SDB II's operational effectiveness on the F-15E. The program has not yet demonstrated operational effectiveness on the F/A-18E/F or the F-35B/C. As discussed in the FY23 Annual Report, operational users had difficulty employing full SDB II NEW functionality on the F/A-18E/F. Many of these challenges were resolved prior to the two FY24 operational tests, during which the SDB II performed as expected in normal mode against one static and one moving land-based target. Recent laboratory testing also revealed the potential cause of extended Link 16 network entry times. The Navy will verify the proposed fix on the remaining two QRA test events in FY25.

FY22 reporting highlighted a hardware issue affecting F/A-18E/F SDB II employment during bomb rack ejection. While formal analysis is ongoing, initial results indicate the materiel solution implemented in FY24 will reduce the likelihood of degraded weapon performance.

A developmental test in 2QFY24 on SDB II revealed a targeting software anomaly, which will be resolved in the SDB II OFP and verified in FY25 during F-35 MOT&E Phase II.

» LETHALITY

MOT&E Phase I verified SDB II's lethality against a variety of static and moving targets including main battle tanks, infantry fighting vehicles, anti-aircraft guns, surface-to-air missile target erector-launchers, and small patrol boats. Additional modeling and simulation would be necessary to verify SDB II lethality against small patrol boats and fast attack craft, if included in the SDB II target set.

» SUITABILITY

Current data available are insufficient to provide a preliminary assessment of SDB II suitability. MOT&E Phase I, completed in FY20, first highlighted concerns with cryptographic key loading and SDB II mission planning for the SDB II as employed by the F-15E. The process for synchronizing cryptographic keys across the weapon, the mission planning environment, and the key filler devices remains cumbersome and error prone. However, the program office has made significant progress. Operational squadrons are now consistently able to load the correct keys into the weapon and achieve NEW functionality in FY24. The program has not yet demonstrated interoperability with the F/A-18E/F or the F-35B/C.

» SURVIVABILITY

The cyber shortfalls from MOT&E Phase I have not yet been addressed during MOT&E Phase II. The Navy's Operational Test and Evaluation Force is working with the program office to submit an updated cyber survivability test plan to DOT&E before conducting a cyber survivability evaluation.

RECOMMENDATIONS

As stated in the FY23 Annual Report, the DoD should:

1. Continue to streamline cryptographic material delivery, management, training, loading, and verification processes.
2. Continue to work with military test ranges to mitigate F-35 self-lasing restrictions and allow operationally representative SDB II employment by all platforms.
3. Work with the Federal Aviation Administration to develop a timely approval process and

reasonable safety measures that will allow the DoD to test NEWs in restricted airspace.

As stated in the FY23 Annual Report, the Navy should:

1. Continue to develop and fund an adequate MOT&E Phase II cyber survivability T&E.

As stated in the FY23 Annual Report, the SDB II Program Office should:

1. Update the FRP TEMP to reflect the updated MOT&E Phase II cyber survivability strategy and submit for DOT&E approval.
2. Continue efforts to improve the mission planning process across all platforms, particularly regarding cryptographic data entry.