

B-1B CONVENTIONAL MISSION UPGRADE PROGRAM (CMUP)



The B-1B Lancer is a swing-wing, heavy bomber, with a takeoff weight of 477,000 pounds and a crew of four. The aircraft has four F-101-GE-102 turbofan engines with afterburners. With air refueling, the B-1B can deliver approximately 50,000 pounds of bombs or near-precision guided weapons to targets anywhere in the world. The aircraft is capable of penetration speeds up to Mach 1.2.

IOT&E of the B-1B was conducted from 1984 through 1989, and it achieved IOC as a nuclear bomber in FY87. With the transition of the B-1B from a nuclear to a conventional role in 1993, the Conventional Mission Upgrade Program (CMUP) was begun. Initially, for a conventional mission, the bomber could carry only Mk-82 500-pound general-purpose bombs. To date, block changes carried out under the CMUP have upgraded the aircraft's capabilities as follows:

- Software upgrades to offensive and defensive systems (Block B).
- Capability to deliver CBU-87/89/97 cluster bombs (Block C).
- Communications system upgrades, addition of Global Positioning System (GPS) navigation, and capability to deliver GBU-31 Joint Direct Attack Munition (JDAM) (Block D).

Remaining blocks of CMUP will accomplish the following:

- Upgrade the computers for increased weapon flexibility and better supportability, and integrate Wind Corrected Munition Dispenser (WCMD), Joint Stand-Off Weapon (JSOW), and the Joint Air-to-Surface Standoff Missile (JASSM) weapons (Block E).
- Upgrade the defensive avionics suite by removing most of the existing AN/ALQ-161 and replacing it with an AN/ALR-56M radar warning receiver and portions of the Navy's AN/ALQ-214 Integrated Defensive Electronic Countermeasures (IDECM) system with a fiber-optic towed decoy (Block F).

CMUP changes to the B-1B enhance conventional weapons delivery capabilities, provide increased situational awareness, increase survivability, and improve supportability. These improvements will equip the B-1B to provide precision strike, attacking strategic and tactical targets at all stages of conflict.

BACKGROUND INFORMATION

Development of Blocks E and F was initiated in FY96. When begun, Block E was expected to be ready for full-rate production (FRP) in FY01 and Block F in FY02. Problems with development of flight software have delayed both Blocks. Block E and F's FRP dates are now in FY03 and FY04, respectively.

Block E adopted a three-phase approach to minimize impacts of software development delays. The first phase (Phase A) has been delivered and tested. This phase supports basic aircraft flight functions of navigation, terrain following, and radar operation. Phase B software will support gravity weapon delivery and Phase C will support guided weapon delivery.

In addition to late flight software, Block F was also impacted by development problems in the Navy's IDECM program resulting in the late delivery of IDECM hardware and software to the B-1B program. Block F FRP is currently projected to occur in March 2004.

Both blocks were re-baselined for cost and schedule in FY99. However, further delays have occurred since that time due to the February 2000 Seattle earthquake and limited test infrastructure to support defensive testing. Because of changes and schedule delays in the programs, the Block E TEMP Annex was approved September 2001 and the Block F TEMP Annex is being updated.

Live Fire Test & Evaluation (LFT&E) of Block D consisted of a series of LFT ballistic tests conducted on large assemblies cut from production aircraft #1. All ballistic testing was completed to support Block D MS III. An LFT&E report was submitted to Congress in January 1999. LFT&E will be evaluated by analysis for Block E and Block F.

TEST & EVALUATION ACTIVITY

DT&E flight testing of Block E began in December 2000 at Edwards AFB, California. Testing to date has concentrated on Phase A (basic aircraft software) and Phase B (capabilities to deliver gravity weapons). As of September 2001, more than 60 Phase A, B, and C flight test sorties have been flown, accumulating more than 250 flight hours on the test aircraft. DT&E flight testing of Phase C functions related to delivery of precision guided munitions started in September 2001 and is planned to be completed by April 2002. Of nearly 1,300 planned test points, more than 56 percent have been completed. Dedicated IOT&E is planned for June 2002 through September 2002.

DT&E testing of the Block F defensive system has included hardware-in-the-loop (HITL) testing at the Nevada Test and Training Range (NTTR), system integration laboratory testing at the Integrated Facility for Avionics Systems Testing (IFAST), and aircraft installed systems testing at the Benefield Anechoic Facility (BAF) at Edwards AFB, California. Block F DT&E flight testing began in August 2001 and is expected to last until December 2002. Early testing will evaluate aerodynamic aspects of deploying the IDECM fiber-optic towed decoy from the aircraft; tests to evaluate situational awareness and jamming effectiveness will follow. Dedicated Block F IOT&E is currently planned for February 2003 to September 2003.

AFOTEC Detachment 5 at Edwards AFB, California, is currently conducting Operational Assessments of Block E and Block F. Aeronautical Systems Center at Wright-Patterson AFB, Ohio, is

currently conducting analyses to support LFT&E of Block E and Block F, leveraging on the previously conducted LFT&E on Block D.

TEST & EVALUATION ASSESSMENT

BLOCK E

Block E DT flight testing of Phase A software has progressed satisfactorily to date. Tests of computer and software functions for basic aircraft flight conditions have revealed relatively few anomalies, and the software appears to be stable.

Testing of Phase B software (gravity weapon delivery functions) is in early stages. To date, the most serious findings have been associated with WCMD releases. WCMDs released from all bays have experienced violent pitch downs and inconsistent tail fin deployments. Test results indicate an inconsistent capability for WCMD to reach the desired target. Store separation testing halted in Phase B. Issues included uncertainties with weapon specific hardware and system aerodynamic effects on weapon release. This could lead to some restrictions on the WCMD delivery envelope. Stores separations are not necessarily dependent on the software build so they can be accomplished in Phase C.

Additionally, as reported last year, there is a high level of risk associated with planned Block E IOT&E in the adequacy of the design of cockpit controls and displays to support weapon delivery from the aircraft. Concerns about the Block E design were based on crew assessments in simulations. Simulator study results and crew subjective opinions indicate that the planned display of Launch Acceptability Regions (LAR) may not provide adequate steering cues to enable flying the aircraft to the correct weapon release zone when the aircraft is not on the planned route or when operators experience heavy workload. Until testing of Phase C software is complete (functions for guided munition weapon delivery), the seriousness of this problem remains unknown. The System Program Office and Air Combat Command are currently working near and far term situational awareness upgrades to address this problem in additional efforts.

Air Combat Command's agreement to furnish a production-representative kitproof aircraft to participate in the planned IOT&E mitigated concern about the adequacy and availability of flight test aircraft.

At least four regression testing sorties are planned at the end of IOT&E to mitigate the risk associated with late delivery of the production version SP-103A aircraft computer and ensure no degradation with the final producible design.

BLOCK F

The Block F development schedule continued to experience delays, in part because of delays in the Navy's IDECM program, but also because of delays in Block E avionics software development. The IDECM fiber-optic towed decoy, towline, and deployment design are high-risk issues for the B-1B, even though the B-1B's environment may be somewhat less stressful than the F/A-18s. Availability of IDECM is on the critical path to Block F flight testing.

BOTH BLOCKS (E AND F)

Flight testing of both Blocks E and F depends on access to the NTTR. Because of competition from other programs and unexpected delays in the availability of key range emitters, the B-1B may have difficulty getting the required number of range sorties in the planned timeframe. Although some sorties can be flown at other test ranges (i.e., China Lake), there remains a risk that range availability could lead to an extension of B-1B flight testing for both upgrades.

Both Blocks E and F of the B-1B CMUP have several moderate to high-risk problems, outlined above, that could prevent or delay meeting operational effectiveness and suitability requirements. Although the risks are diminishing as DT&E is progressing, continued management attention will be necessary to solve technical problems, correct deficiencies, and conduct thorough testing of CMUP functions.

Updated OT&E plans for B-1B Blocks E and F are in work to reflect schedule changes. However, the previously approved test approaches are not expected to change significantly.