

## B-1B CONVENTIONAL MISSION UPGRADE PROGRAM (CMUP)



### Air Force ACAT IC Program

Total Number of Systems:	93
Total Program Cost (TY\$):	\$3,049M
Average Unit Cost (TY\$):	\$32.8M
Full-rate production:	2QFY03
SEP Production	3QFY03

### Prime Contractor

Boeing North American Aviation

### SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The B-1B *Lancer* is a long-range, supersonic bomber, capable of flying intercontinental missions. With air refueling, it can attack targets anywhere in the world and return to bases in the U.S. The B-1B's design features a swing-wing, four F-101-GE-102 afterburning turbofan engines, and a defensive avionics system comprising primarily the AN/ALQ-161A radio frequency surveillance and ECM system (i.e., a self-protection jammer), and a tail warning system coupled to a flare/chaff dispenser. The offensive avionics system provides precise navigation and supports delivery of weapons. B-1Bs are based at Dyess AFB, TX; Ellsworth AFB, SD; McConnell AFB, KS; Robins AFB, GA; and Mountain Home AFB, ID. Initial operational capability was achieved in September 1986, with the last aircraft delivered in April 1988.

The B-1B Conventional Mission Upgrade Program (CMUP) began in 1993. Changes being carried out in the CMUP are intended to enhance conventional weapons delivery capabilities, provide

increased situational awareness, increase survivability, and improve supportability. These improvements will equip the B-1B to provide *precision engagement* by attacking strategic and tactical targets at all stages of conflict. CMUP will also improve the B-1B's *full-dimensional protection* capabilities.

CMUP Block C modifications in 1996 made the B-1B capable of delivering Cluster Bomb Units (CBUs) in addition to the Mk-82 500-pound bombs that the bomber could already deliver. The Block D upgrade adds capabilities for employment of near-precision Joint Direct Attack Munitions (JDAM), Global Positioning System (GPS) and new radios needed for conventional warfare, and provisions for the ALE-50 Towed Decoy System (TDS). Upon incorporation of Block D changes, the B-1B would require re-configuration to be capable of delivering nuclear weapons.

Remaining phases of CMUP consist of two principal "blocks":

- Block E: Upgrades computers for increased weapon flexibility to be able to employ a different weapon type in each of the three weapon bays and for better supportability. Integrates Wind Corrected Munition Dispenser (WCMD) weapons for more accurate delivery of cluster bomb munitions. Enables integration of the Joint Stand Off Weapon (JSOW) and the Joint Air-to-Surface Standoff Missile (JASSM).
- Block F, Defensive System Upgrade Program (DSUP): Upgrades the defensive avionics suite by integrating a radar warning receiver, a radio frequency countermeasures system, and a fiber-optic towed decoy.

## **BACKGROUND INFORMATION:**

OT&E of the B-1B began in July 1984 with the delivery of the first production aircraft. FOT&E on the Block B software upgrade was completed in February 1995, and FOT&E of Block C (CBU Upgrade) was completed in April 1996. Block D IOT&E was completed in September 1998 and production began in January 1999 (Milestone III). Block D upgrades are still in production, with approximately two-thirds of the aircraft fleet modified. Block D production will be completed in March 2002. The ALE-50 Towed Decoy System completed IOT&E in October 1997, followed by a Milestone III decision in January 1998. Approximately one-fourth of the fleet has been modified, with production planned to end in FY04.

Test planning for the B-1B CMUP is covered by a Capstone TEMP and annexes for each major upgrade. DOT&E initially approved the CMUP Capstone TEMP and the Block D annex on January 6, 1995. Subsequently, the following TEMP documents have been approved by DOT&E on the dates shown:

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|---|--------------------|
| • Block F (DSUP) TEMP annex               | March 20, 1997     |
| • Revised B-1B CMUP Capstone TEMP         | September 11, 1997 |
| • Block E (Computers and WCMD) TEMP annex | September 11, 1997 |

During late FY99, Blocks E and F were restructured by the Air Force because of schedule changes and cost growth in both programs. Both Blocks E and F have undergone further slips because of problems in developing Avionics Flight Software (AFS) and in part due to a Boeing engineer's strike. As a result, a Block E Acquisition Program Baseline change request was submitted and approved August 10, 2000, with the proposed Block E Milestone III date slipped to January 2003, and the Block F

Milestone III date has slipped 18 months. The future of the Block F DSUP is uncertain as a result of the Air Force's decision not to fund production of DSUP in the FY02 Budget Estimate Submission. Restoration of production funding will be reconsidered in the planning for the FY04 budget. As a result, TEMP revisions for both Block E and F have been initiated.

The B-1B CMUP was placed on the Annual T&E Oversight List for LFT&E in December 1993. A waiver from full-up, system-level Live Fire Testing was approved in January 1995, together with an Alternative Plan for meeting the LFT&E objectives. All testing has been completed. A DOT&E independent evaluation for Block D was completed, and a classified report was sent to Congress in January 1999. The Live Fire evaluation will be updated to reflect the changes implemented in Block E and Block F, and an updated report will be submitted prior to Milestone III for each Block. The update reports will account for effects of the Block upgrades (if any) on LFT&E findings.

## **TEST & EVALUATION ACTIVITY**

OT&E activity during FY00 was limited to Force Development Evaluation (FDE) of the aircraft, FDE of Mission Planning Equipment, and Operational Assessments (OAs) of Blocks E and F.

Fiscal Year 2000 FDE was conducted on Block D aircraft to identify remaining deficiencies, evaluate the operational impact of changes, assist in developing tactics, and re-evaluate the B-1B against changing operational needs. FDE is conducted continuously but is funded and tasked in fiscal-year increments. FDE activities included operational testing of fixes to the B-1B Block D's radios. Upon integration of the ARC-210 radio during Block D modifications, UHF reception and transmission became weak, scratchy and unreliable. The causes of these problems were identified, engineering changes and fixes were determined, and installations are underway or planned. Mission planning FDE was also conducted in March and April 2000 to assess the most recent upgrades.

Block E is currently in EMD, with DT&E flight testing scheduled to begin in early FY01. Block F is also currently in EMD, with DT&E flight testing scheduled to begin in late FY01. Ongoing OAs for Blocks E and F intend to identify and assess major impacts affecting the potential effectiveness and suitability of the Block upgrades. The Block E and F OAs began in FY98, and will continue through approximately mid-FY02.

## **TEST & EVALUATION ASSESSMENT**

### **Force Development Evaluation**

Final design modifications to correct Block D radio problems were completed in June 2000 and began FDE testing in September 2000. Upon completion of testing, depot-level installations of engineering changes will begin and plan to be completed by March 2002.

FDE of Mission Planning Equipment version 1.2 resulted in an overall "satisfactory" rating, although several significant usability issues remain that increase planning time and lead to risk of errors. There is also an open suitability concern because the hardware for preparing data transfer cartridges is a single-point-of-failure item and units are not provided with spares. Failure of this item would prevent a deployed unit from fulfilling their wartime mission. Thirteen new deficiencies were identified during test of Version 1.2 (none of these were high priority), in addition to 32 uncorrected deficiencies from earlier releases. Version 1.2 was a significant improvement over the earlier version in route planning and

functions related to JDAM planning. The previous B-1B release (version 1.1) had not been recommended for operational use by the OT&E test team; however, Air Combat Command certified it for operational use during Operation Allied Force.

## **Block E**

Block E weapon system upgrades are progressing with moderate to high risk that requirements may not be met upon completion of IOT&E, even in light of re-baselining of the program. Operational Assessment of the Block E program identified several areas of risk that may impact the effectiveness of the upgrades and/or the adequacy of the OT&E test program.

The highest risk associated with Block E is whether the design of cockpit controls and displays will be adequate to support weapon delivery from the aircraft. In order for guided weapons to reach their targets, the B-1B must release them within a Launch Acceptability Region (LAR). The current design provides a simple display to assist the Weapon Systems Officer but no display for the pilot. The display does not provide adequate dynamic steering and timing cues to help the crew arrive in the LAR for weapon release, especially in cases where the aircraft has had to maneuver off its planned flight path. Assessments by operational testers and studies by the contractor indicate that unless displays are improved, as many as 25 percent of smart weapons may not be employed. Alternate designs have been identified, but no direction or funding to implement a change has been provided.

A moderate risk is associated with test aircraft adequacy. At the current time, the Air Force plans to conduct Block E IOT&E with a single test aircraft. The test aircraft does not have the ALE-50 TDS installed. Configuration differences between the test aircraft and a fleet-representative aircraft could provide misleading test results. The single test aircraft may not be fully production-representative and an additional first production aircraft should be provided. This would increase the fidelity of flight tests and help reduce schedule risk. Plans are being revised to provide a production representative aircraft for IOT&E.

A second moderate risk concern is that the production configuration aircraft computer will not be available for IOT&E. Because of diminishing manufacturing sources, the version of computer hardware in the test aircraft (SP-103 Enhanced) cannot be produced in quantity. A later version (SP-103A) that will be produced does not become available until after testing. Risk will be mitigated by regression testing of the SP-103A after IOT&E but before all computers are produced. However, the planned approach will require retrofit of the SP-103A computer to early production aircraft via a Time Compliance Technical Order change.

DOT&E concurs with AFOTEC's current assessment that Block E development is progressing under the burden of an unexpectedly large number of software development problems. Additional potential problems were identified in the OA, and there remains a potential for unexpected IOT&E flight test problems due to the immaturity of Block E software and hardware. There is moderate to high risk that Block E may not fully meet operational effectiveness and suitability requirements.

## **Block F**

A major contributor to schedule slippages and cost growth in Block F has been delays in the Navy's Integrated Defensive Electromagnetic Countermeasures (IDECM) program. From the B-1B perspective, IDECM components are provided as Government Furnished Equipment to the B-1B. The T&E assessments for IDECM Blocks II and III relate to B-1B DSUP.

Since the re-baselining of DSUP in July 1999, the program had been “on track” to meet planned performance goals, however, the ongoing OA on Block F by AFOTEC identified several risk areas. These are moderate risk areas and include concern whether operationally representative threat data files will be available for IOT&E.

Previous OT&E of the current ALQ-161A system and the ALE-50 TDS showed that these systems are not effective against all the threshold threats identified in the current Operational Requirements Document. While the systems have some effectiveness against specific threats, the current systems cannot meet Reduction in Lethality requirements for all. Therefore, if a decision is made not to complete development and production of Block F defensive system upgrades, it would leave the B-1B unable to meet survivability requirements. This could seriously diminish the contribution of the B-1B in future conflicts. The B-1B may be limited to a stand-off role or use only after the air defense threat is suppressed.

