SENSOR FUZED WEAPON (SFW)

Air Force ACAT IC Program

Total Number of Systems:	4,920
Total Program Cost (TY$):	$1920.9M
Average Unit Cost (TY$):	$.4M
Full-rate production:	3QFY96
SFW P3I:	4QFY01/02

Prime Contractor

SFW: Textron Systems Corporation
WCMD: Lockheed Martin

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The CBU-97/B Sensor Fuzed Weapon (SFW) is a 1000 pound class, unpowered, air-delivered, wide area cluster munition designed to provide multiple kills per pass against armored and support vehicle combat formations. Fighter and bomber aircraft can employ SFW. The primary components of SFW are the SUU-66/B tactical munitions dispenser (TMD), 10 BLU-108/B submunitions, and 40 "hockey puck" shaped infrared sensing skeet projectiles. After release, TMD opens and dispenses the ten submunitions, which are parachute stabilized. At a preset altitude sensed by a radar altimeter, a rocket motor fires to spin the submunition and initiate an ascent. The submunition then releases its four projectiles, which are lofted over the target area. After the projectile's sensor detects a vehicle's infrared signature, an explosively formed penetrator fires at the heat source. SFW is currently planned to be retrofitted with the Wind Corrected Munitions Dispenser (WCMD) Tailkit in the year 2000. The SFW

BLU-108/B submunition will also be a payload in the Joint Standoff Weapon AGM-154B (1st LRIP Buy in FY99). SFW supports the ***precision engagement*** component of ***Joint Vision 2010***.

BACKGROUND INFORMATION

The SFW program entered full-scale development in 1985. After a DAB program review, USD(A&T) authorized LRIP in March 1992. In November 1994, USD(A&T) delegated the full-rate production decision to the Assistant Secretary of the Air Force for Acquisition. The Air Force Milestone III Acquisition Decision Memorandum was signed in June 1996.

The BLRIP report submitted in May 1996 determined that SFW has only been proven operationally effective when employed at low altitudes using level or shallow angle dive deliveries. Due to the effect of launch transients, ballistic errors, and unknown winds on TMD performance from medium to high altitudes, the current SFW weapon configuration provides the user a limited range of tactical employment options.

The Wind Corrected Munitions Dispenser and Sensor Fuzed Weapon P3I programs are intended to address current performance shortfalls in SFW. WCMD is an inertial guidance tail kit that replaces the existing tail section of current inventory area attack weapons, including the SFW, to improve delivery accuracy when released from medium to high altitude. The Sensor Fuzed Weapon with the Wind Corrected Munitions Dispenser is designated as a CBU-105. The P3I program involves three major improvements: (1) improving performance against countermeasures; (2) altering the warhead design to improve performance against softer targets without degrading the current target-set performance; and (3) raising the radar altimeter height of function to increase area coverage. The current sensor will be upgraded from passive-only to a dual-mode active passive type. This upgrade will enhance the sensor's performance against cooler targets and improve weapon aimpoint. The SFW P3I submunition is designated a BLU-108B/B.

Two Producibility Enhancement Program (PEP) hardware upgrades were initiated for SFW to reduce costs and improve producibility through design improvements. The first, PEP-1, involves electronic and mechanical changes to the projectile. The second, PEP-2, involves redesign of the sequencer and altimeter into one integrated submunition electronics unit.

The Sensor Fuzed Weapon TEMP is in the process of being updated to reflect changes in the test program. FOT&E 1 was completed in 1998. All objectives were met and testing results indicated that PEP-1 changes have not degraded the performance of the Sensor Fuzed Weapon. However, the PEP-2 program, and subsequently FOT&E 2, were cancelled due to technical problems. Critical technology elements from the PEP-2 program are being integrated into the P3I program.

Program delays for SFW P3I led to the development of an interim configuration (BLU-108C/B) for SFW, incorporating only the insensitive munitions fill—PBXW-11. This submunition is planned for incorporation in the initial production configuration of JSOW AGM-154B.

The CBUs experienced premature high altitude dispenses in Sensor Fuzed Weapon lot acceptance testing and WCMD Developmental Testing. An Air Force Red Team determined the most probable cause of failure to be the proximity fuse. Analysis showed that occurrence of early opening events fell within stated reliability of the FZU-39 fuse.

Developmental/Operational testing of the Wind Corrected Munitions Dispenser tail kit showed uncommanded fin movement during a supersonic release. To minimize program delay, the Air Force split the combined WCMD DT/OT and IOT&E programs into two phases. Phase I testing was intended to verify the high altitude, supersonic performance of the weapon needed to achieve early capability on the B-52. Phase I testing was successfully completed in August 1998. The Wind Corrected Munitions Dispenser received a favorable decision in August 1998 to enter LRIP following the successful completion of Phase I testing. Phase II testing will use production representative hardware, including the new fin lock mechanism, to verify all unresolved WCMD issues. Phase II combined DT/OT and IOT&E testing was scheduled for 2QFY99.

The DOT&E-approved LFT&E strategy for SFW P3I will be completed in two phases. *Phase I* will include: (1) collection of sensor data against a representative target set; (2) warhead performance data against armor plate targets; and (3) three test shots that repeat shotlines from the original SFW testing in 1990. An optional *Phase II* test will consist of a maximum of seven additional tower shots determined after the results of Phase I have been reviewed.

TEST & EVALUATION ACTIVITY

The SFW P3I underwent ongoing developmental testing during FY99. The system demonstrated adequate progress during this testing for proceeding to Sensor Fuzed Weapon P3I DT/FOT&E on schedule in FY00.

Technical testing of the initial proposed fin lock mechanism fix for WCMD resulted in a performance failure. Two new designs and a third backup design were developed and underwent technical testing, including high subsonic and supersonic releases. This testing has been successful and a favorable LRIP 2 decision was made for WCMD in July 1999. However, resulting program delays have postponed WCMD Phase II IOT&E to FY00.

Technical testing of proposed fixes to FZU-39 is ongoing. The test results do not definitively indicate whether the FZU-39 fix is successful.

Testing conducted at the end of FY98 and the beginning of FY99 indicated that the use of manufacturing tooling at the Load Assemble and Pack facility, to press the qualified explosive fill (PBXW-11) into the warhead, resulted in unacceptable performance variations. A failure/sensitivity analysis, followed by more contractor developmental testing (CDT) occupied almost all of FY99. CDT was recently successfully completed and the design finalized. Government Warhead Qualification Testing is scheduled for September 1999. The three phases of captive flight testing have been completed, although data have not been released for review. The Test and Analysis Plan will require updating to support Warhead Qualification Testing.

TEST & EVALUATION ASSESSMENT

Our current assessment remains the same as outlined in the May 1996 B-LRIP report. The SFW has only been proven operationally effective when employed at low altitudes using level or shallow angle dive deliveries. This provides the user a limited range of tactical employment options.

Overall, the Sensor Fuzed Weapon P3I program continues to fall behind schedule. Further delays in the P3I or warhead development could threaten the planned cut-in date for P3I into both SFW

and Joint Standoff Weapon (JSOW) and result in the procurement of fewer, more capable P3I versions of these weapons. SFW program delays have already caused the JSOW AGM-154B program to plan initial production with the BLU-108C/B submunition, which lacks P3I improvements.

Preliminary testing in support of P3I LFT&E indicated that the newly designed multiple Explosively Formed Penetrator warhead has the potential to achieve its intended effectiveness. DOT&E continues to monitor the WCMD and SFW programs due to interrelated issues.

CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED

A lesson learned this year is the risk inherent in basing design decisions on hardware assembled using non-representative manufacturing processes. This is particularly critical for systems or devices that will be manufactured using high-volume processes, and even more so when the particular device is known to be quite sensitive to manufacturing tolerances (such as an Explosively Formed Penetrator).

The incorporation of a fin-lock mechanism on WCMD caused a year delay in the program. Some of the delay was the result of proceeding quickly with the initial, unsuccessful, fin-lock design. The subsequent success of testing several proposed designs demonstrates the value of scrutinizing corrective action plans/designs before proceeding and value added of initial cost up-front for multiple-design, risk reducing corrective action plans.

Dependent subsystem programs require close coordination to ensure adequate OT of the various system configurations prior to full-rate production. Since the same System Program Office conducts SFW and WCMD, there have been significant savings in test, integration, and management. One example was discovery of an early dispense problem and development of a cooperative engineering fix for all versions of WCMD CEM, GATOR, and SFW. Additionally, JSOW funded an SFW-conducted independent development of a BLU-108 warhead with an Insensitive Munition fill to meet Navy shipboard requirements while continuing to meet U.S. Air Force requirements. Based on the delays in SFW P3I, the synergy of having all programs collocated resulted in a successful risk reduction effort. The SFW P3I, WCMD, and JSOW test programs have taken advantage of coordinated test planning and shared test data on common components to eliminate duplicate testing.