

# ARCHIVED REPORT

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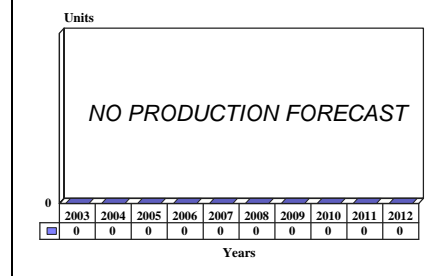
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## CBU-87/B and CBU-103/B Combined Effects Munition and SUU-65/B Tactical Munitions Dispenser and BLU-97/B Submunition - Archived 11/2004

### Outlook

- Production concluded
- No further orders from the U.S. Air Force or export clients are anticipated
- Integration with the Wind Corrected Munitions Dispenser and insensitive munitions technology ongoing

10 Year Unit Production Forecast  
2003 - 2012



### Orientation

**Description.** An air-deployed submunition dispensing system.

**Sponsor.** The development of the CBU-87/B has been sponsored by the U.S. Department of Defense through the U.S. Air Force, Air Force Materiel Command, Air Force Aeronautical Systems Center, Eglin Air Force Base, Florida. The weapon has been procured through the Aeronautical Systems Center, Ogden Air Logistics Center at Hill Air Force Base, Utah, and the U.S. Army's Rock Island Arsenal, Rock Island, Illinois.

**Contractors.** This weapon was developed by the U.S. Air Force Aeronautical Systems Center, a unit of the U.S. Air Force Materiel Command located at Wright-Patterson AFB, Ohio. The United States Army Armament, Munitions and Chemical Command is the executive agent issuing the procurement contracts. Until 1994, Aerojet Ordnance Company (a component of the GenCorp organization), located in Tustin, California, manufactured the BLU-97/B submunition and acted as the prime contractor for the complete CBU-87/B weapon. In early 1994, Primex Technologies (formerly Olin Ordnance), headquartered in St. Petersburg,

Florida, purchased Aerojet Ordnance. In 2000, Primex was purchased by General Dynamics.

For the CBU-87/B application, the Tactical Munitions Dispenser SUU-65/B was manufactured by Alliant Techsystems, Edina, Minnesota, with Kaiser Marquardt as the second source. In 1985, Alliant Techsystems was selected as the second source for the complete CBU-87/B weapon. Day & Zimmermann has acted as a subcontractor, assembling and packing the weapon at the U.S. Army's Kansas Army Ammunition Plant located in Parsons, Kansas.

**Licenseses.** None

**Status.** The serial production of the CBU-87/B weapon is dormant following the completion of the latest order; the weapon is in service with the U.S. Air Force and in at least two other nations. This weapon was procured in a competitive procurement manner, with (then) Primex Technologies winning the major share of the latest Fiscal 1994 procurement.

**Total Produced.** As of January 1, 2003, a total of 158,520 CBU-87/B weapons, along with the appropriate

number of submunitions for that dispenser application, had been manufactured.

**Application.** The destruction of tanks and other armored vehicles and materiel.

**Price Range.** Based on a 5,828-unit buy, the Fiscal 1995 documents listed the unit price of an all-up CBU-87/B at \$12,010. A more recent figure is \$14,320 for a slightly smaller buy.

## Technical Data

**Launch/Carrier Vehicle.** All United States and NATO tactical aircraft.

**Submunitions per Dispenser.** 202

**Dimensions.** The following data are for the production-standard CBU-87/B weapon.

	<u>SI units</u>	<u>U.S. units</u>
Length (SUU-65/B):	1.83 meters	6.0 feet
Length (BLU-97/B):	32 centimeters	12.59 inches
Diameter (SUU-65/B):	39.62 centimeters	15.61 inches
Diameter (maximum - BLU-97/B):	13 centimeters	5.12 inches
Weight (SUU-65/B - empty):	97.73 kilograms	215 pounds
Weight (SUU-65/B - full):	454.55 kilograms	1,000 pounds

**Control & Guidance.** The SUU-65/B Tactical Munitions Dispenser is spun at a preset rate for stability and to eject the submunitions; four spring-loaded fins at the rear of the dispenser impart the spin and stabilize the system. The spin rate is selected in 500-revolution-

per-minute increments up to 2,500 revolutions per minute. An optional FZU-30/B Doppler radar proximity fuze can arm and dispense the munitions at a preselected time.

## Variants/Upgrades

**Variants.** As the U.S. Navy has had a long-standing requirement to field munitions filled with insensitive propellants and high explosives, some years ago contractors developed a version of the BLU-97/B filled with insensitive PBX-type high explosive. There is no degradation of the lethal performance of the munition filled with this explosive.

**Modernization and Retrofit Overview.** There is one major retrofit program for the CBU-87/B, an accuracy enhancement program. The U.S. Air Force has developed an accuracy enhancement for the SUU-64/B and SUU-65/B Tactical Munitions Dispensers, including the SUU-65/B as used in the CBU-87/B Combined Effects Munition. The enhancement, called the Wind Corrected Munitions Dispenser, is in the form of a kit that is retrofitted to existing dispensers. The components of the kit enable the dispenser to correct itself for wind changes and ballistic errors during flight.

Among the equipment involved in the enhancement is an inertial guidance system – pop-out, movable tailfins with an associated actuation system and a central processor to accept targeting data from the launch aircraft before release. Some ballast is also required in the forward portion of the dispenser in order to maintain the correct center of gravity. In January 1995, in a downselection process, Alliant Techsystems and Lockheed Martin were awarded competitive development contracts for the Wind Corrected

Munitions Dispenser kit; a year later, the Lockheed Martin entrant was selected. On August 3, 1998, the U.S. Air Force approved the low-rate initial production of the Wind Corrected Munitions Dispenser. The dispenser had an originally projected unit price of between \$30,000 and \$35,000, and a total of around 40,000 are being procured. As detailed below, these kits are being fitted as needed to portions of the CBU-87/B, CBU-89/B and CBU-97/B weapon inventories.

The version of the Wind Corrected Munitions Dispenser that was ordered into production featured a fin-locking mechanism that was recently integrated with the weapon to keep it from spinning. The modification to the original Block 1A design was incorporated after it was found that the fin mechanism could move prematurely after release from the aircraft. Spinning and other inappropriate aerodynamic movements resulted, causing the weapon's inertial measurement unit to become saturated and making the weapon uncontrollable.

The weapon's contractor, Lockheed Martin, developed a fix that essentially consists of two squibs that lock the fin in place until the appropriate time in the flight path when the squibs are fired, releasing the fin for proper guidance.

The Air Force had planned to have the Wind Corrected Munitions Dispenser kit in service by December 1998, some five months ahead of schedule, but this was slipped around nine months. The new weapon has a contracted unit price averaging \$11,200 over the 40,000-unit production run. These kits are being fitted as needed to portions of the CBU-87/B (30,000 kits),

CBU-89/B (5,000 kits) and CBU-97/B (5,000 kits) weapons. The initial platforms for the new munition are the F-16 and B-52. The B-1B, F-15E and F-117 will be integrated in the near future.

When fitted with the Wind Corrected Munitions Dispenser kit, the CBU-87/B is designated CBU-103/B.

## Program Review

**Background.** The growing disparity in armored vehicles between NATO and the Warsaw Pact began to alarm military planners in the United States in the 1970s. In response, several new air-delivered munitions programs were started by the Defense Advanced Research Projects Agency (the Assault Breaker program) and the U.S. Air Force (the Wide Area Anti-Armor Munitions program). Several of the technologies investigated were combined into one air-delivered system that could attack armored vehicles, materiel and personnel at one time. These technologies were further developed and integrated into a new weapon by the Air Force Systems Command, Armament Division, and several contractors noted at the beginning of this report.

The new Combined Effects Munition submunition received the military designation BLU-97/B in 1981. It was integrated with the spun version of the new Tactical Munitions Dispenser, the SUU-65/B, to result in the CBU-87/B Combined Effects Munition weapon system. The first service delivery was made in December 1983. The total development cost was put at \$21 million, and the production program represented one of the largest munitions acquisition programs of its type to that time. The U.S. Air Force originally planned to procure approximately 160,000 CBU-87/B systems, but this figure was later reduced in response to changes in the threat scenario and reduced defense budgets.

**SUU-65/B.** The delivery vehicle for the BLU-97/B submunition is the SUU-65/B Tactical Munitions Dispenser. This dispenser was developed to replace the obsolete SUU-30/B, which was limited to subsonic carriage and deployment at higher altitudes of around 304.8 meters (1,000 feet). The Tactical Munitions Dispenser, produced in the spun SUU-65/B and non-spun SUU-64/B versions, can be carried at supersonic speeds and delivered at altitudes as low as 60.96 meters (200 feet). The Tactical Munitions Dispenser was designed for the BLU-97/B, as well as the BLU-108/B, BLU-91/92, BLU-106/B, HB876, BLU-77, and BLU-63, among others.

The SUU-64/B and SUU-65/B are the same except for the fins of the SUU-65/B, which impart a spin. Both versions are fabricated from aluminum skin which is rolled into a cylindrical shape, then welded. The forward bulkhead, also of aluminum construction, is

welded to the cylinder. This forms the main structure to which the remaining components, such as fins and the strongback, are attached.

The strongback is a single piece of aluminum containing two steel inserts placed 35.56 centimeters (14 inches) apart for the suspension lugs. The strongback is attached to the inside of the aluminum cylinder and provides the strength and rigidity necessary for suspension and carriage.

There are two electrical harnesses attached to the body – the fuze harness and the body harness. The fuze harness connects the fuze to the proximity sensor and to the body harness. The body harness runs the full length of the body and allows the fuze to control the explosive bolt in the SUU-65/B fin cant mechanism.

The cutting network consists of a manifold and lead, three longitudinal strands of aluminum linear-shaped charges (each with a booster at the aft end), and a circumferential strand of the linear-shaped charge at the aft bulkhead. Its function is to cut the dispenser body into three pieces, to dispense the submunitions, and to separate the tail section when the fuze functions.

The aft bulkhead provides the primary structural support for the aft end of the body and acts as a seal for the cargo section.

The lanyard system consists of three sheathed lanyards in two aluminum conduits and three lanyard extractors. The lanyard system is mounted on top of the body and is used to release the fins, initiate fuze arming, and select the fuzing mode. The forward conduit carries the fuze arming and fuze option lanyards, and the rear conduit carries the fin release lanyard. Each lanyard is tied off at one end and connected to its particular function at the other end. The use of lanyard extractors with break links allows the lanyards to be retained by the body after release.

Each extractor has two break links – an upper and a lower one. The lower break link is attached to the conduit and will break with a pull of 24.54 to 35.9 kilograms (54 to 79 pounds). It is used to assure that the extractor will be pulled free of the solenoid jaws without pulling the lanyard when the arming solenoid is not energized. The upper break link breaks under a pull

of 44.09 to 63.63 kilograms (108 to 140 pounds). When the dispenser is released with the arming solenoid energized, the extractor becomes taut and breaks the lower break link. This allows the extractor to pull the lanyard until it engages its stop and the upper link breaks. The lanyard and extractor remain with the dispenser and only the loop remains attached to the ejector rack. Fuze option is determined by arming solenoid selection. The tail solenoid is used to pull the fuze arming lanyard, and the nose solenoid is used to pull the fuze option lanyard. The fin release lanyard extractor is tied off on the ejector rack sway brace and is always pulled regardless of arming solenoid selection.

The electronics assembly contains the necessary circuitry to: 1) charge the capacitors, which fire the piston actuator in the safe and arm mechanism, the detonator, and the fin cant mechanism explosive bolt; 2) sense the selected spin rate; 3) select the proper function mode; 4) interface with the proximity sensor; and 5) interface with the safe and arm mechanism.

The thermal battery is used to power the electronics section and a target proximity sensor, and to charge the three firing capacitors of the electronics assembly. The thermal battery is initiated by a firing pin when the arming lanyard is pulled, and has an approximate life of 3.5 minutes with the proximity sensor, and five minutes without it.

BLU-97/B. The BLU-97/B submunitions are packed 202 to each SUU-65/B dispenser. The BLU-97/B is cylindrical in shape with a "sleeve" or solid plastic parachute to stabilize its descent. The BLU-97/B is

composed of a fragmentation case for anti-personnel/anti-materiel use, a conical-shaped charge to penetrate armored vehicles and aircraft, and zirconium, a highly flammable material used for its incendiary effect.

Operation. A typical deployment for the CBU-87/B is four dispensers under the wings of an F-16, or up to 14 dispensers under the wings and fuselage of an F-15. The SUU-65/B can be released at between 60.96 and 12,192 meters (200 and 40,000 feet) altitude. After release, the canted fins impart a spin to the dispenser. After dropping to a predetermined height, the dispenser is split explosively and the BLU-97/B submunitions are flung out over a wide area. The submunitions explode on impact.

Second Source. In 1984, the Air Force opened the bidding for second source production of the CBU-87/B. Brunswick, Alliant Techsystems, Magnavox and Marquardt were bidding. Alliant Techsystems was selected, in 1985, to produce the complete CBU-87/B system, while Marquardt was selected as the second source for the SUU-65/B Tactical Munitions Dispenser.

Have Mail. The Have Mail program was aimed at increasing the versatility of the Tactical Munitions Dispenser. Efforts were directed at developing the CBU-98/B Direct Airfield Attack Combined Munition, a program that has subsequently been terminated.

Joint Stand-Off Weapon. The BLU-97/B has been selected to be the submunition for the U.S. Navy's version (the AGM-154A) of the Joint Stand-Off Weapon. This program is detailed in the pertinent report in this tab.

## Funding

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The CBU-87/B program is one of the major success stories in the U.S. military procurement effort. As a result of the competitive procurement process, the unit price of the system dropped more than \$10,000 from that originally projected. The funding below is the latest for the CBU-87/B, as no funding requests have been made since Fiscal 1996. Procurement funding for the Wind Corrected Munitions Dispenser was initially allocated in Fiscal 1998, when 280 kits were procured for \$11.8 million. The Fiscal 1999 procurement of the Wind Corrected Munitions Dispenser totaled \$14.9 million for 676 kits, while \$48.4 million for 2,990 kits was funded in Fiscal 2000. Fiscal 2001 funding totaled \$100.3 million for 5,918 kits, and Fiscal 2002 funding totaled \$111.4 million for 6,917 kits. The Fiscal 2003 request is \$71.2 million for 4,959 kits.

**Note:** This weapon was developed under several research and development program elements, including Program Element 64602F - Armament/Ordnance Development, Project 2586, Dispenser Munitions, which supported the Have Mail improvement program for the Tactical Munitions Dispenser. Also contributing to the development program was Program Element 62602F - Conventional Munitions, Project 2502, Ordnance Technology.

Replenishing the Inventory. Following the Second Gulf War, the Air Force announced that it would procure 20,000 additional CBU-87/B weapons. This procurement was completed in the mid-1990s.

## Recent Contracts

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The following were contracts issued by the U.S. government; Alliant Techsystems has also concluded at least one contract (with Turkey) on a private basis.

On September 30, 1991, Aerojet Ordnance was awarded a \$95,065,717 contract for the procurement of the CBU-87/B. The contract, number F08635-87C-0028, covered the procurement of 7,775 complete weapons and 650,400 BLU-97/B submunitions.

On October 1, 1991, Alliant Techsystems was awarded a \$39,741,813 contract for the procurement of the CBU-87/B. The contract, number F08635-87C-0029, covered the procurement of 2,875 complete weapons and 20 CBU-87/B training munitions.

On September 29, 1992, Alliant Techsystems was awarded a \$66,822,194 contract for the procurement of the CBU-87/B. The contract, number F08635-87C-0029, covered the procurement of 9,598 complete weapons and 104 CBU-87/B training munitions.

In June 1994, Alliant Techsystems announced that it had signed a contract with the government of Turkey for the procurement of 493 CBU-87/B weapons.

On August 31, 1994, Alliant Techsystems was awarded a \$71,878,006 contract for the procurement of the CBU-87/B. The contract, number DAAA09-94C-0554, covered the procurement of 5,796 CBU-87/B weapons and 10 CBU-87(D2)/B training munitions.

In October 1994, Primex Technologies (then Olin Ordnance) was awarded a contract for the procurement of 7,682 CBU-87B/B weapons, 300 CBU-87C/B weapons, and 284 CBU-87(T-1)/B weapons. The contract value was \$94.4 million.

## Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Mid	1970s	Development begun
	1978-1982	Development and testing
August	1983	Low-rate production
December	1983	First production deliveries
June	1994	First direct export sale announced
	2002-2003	Production dormant; integration with Wind Corrected Munitions Dispenser ongoing

## Worldwide Distribution

**Export Potential.** Several NATO and other countries have expressed an interest in acquiring this technology. In 1991, Egypt became the first known export customer of the CBU-87/B when it was announced that the country would receive 160 weapons. This sale was made through the United States government. The first direct commercial sale was made in June 1994, when Turkey ordered 493 weapons. While the Netherlands has announced its intention to procure the CBU-87/B to replace its Mk 20 Rockeye cluster bombs, none have been procured yet. Our research indicates that at least three other nations (Israel, Kuwait, and one unidentified Asian nation) have expressed an interest in procuring the CBU-87/B Combined Effects Munition. However, for the reasons outlined in the **Forecast Rationale**, these procurements are not forecast to move ahead.

**Countries.** **Egypt** (160), **Turkey** (493), **United States**

## Forecast Rationale

No new orders for the CBU-87/B Combined Effects Munition have been placed. Sales of the CBU-87/B were severely impacted by the Ottawa Convention of late 1997, which bans anti-personnel land mines. Therefore, no additional procurement of the CBU-87/B by the U.S. Air Force or any other client is anticipated.

The figures in our forecast charts are for all-up CBU-87 weapons, *not* the SUU-65/B or the SUU-64/B. A total of 202 BLU-97/B submunitions are contained in each SUU-65/B for the CBU-87/B application.

Any other application for the BLU-97/B is covered in the pertinent report, such as that on the AGM-154 Joint Stand-Off Weapon (JSOW) program in this tab.

# Ten-Year Outlook

## ESTIMATED CALENDAR YEAR PRODUCTION

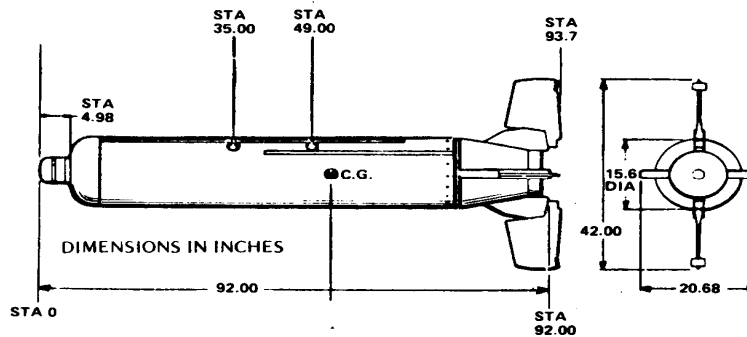
Munition	through 02	High Confidence Level			Good Confidence Level			Speculative			Total 03-12	
		03	04	05	06	07	08	09	10	11		12
G.D./ALLIANT/U.S. GOVERNMENT												
CBU-87/B (a)	158820	0	0	0	0	0	0	0	0	0	0	0
Total Production	158820	0	0	0	0	0	0	0	0	0	0	0

(a) Production through 2000 includes 65 developmental systems; the forecast application is for the CBU-97/B weapon using the SUU-65/B version of the Tactical Munitions Dispenser only with each SUU-65/B dispenser holding 202 BLU-97/B submunitions.

## ESTIMATED CALENDAR YEAR PRODUCTION

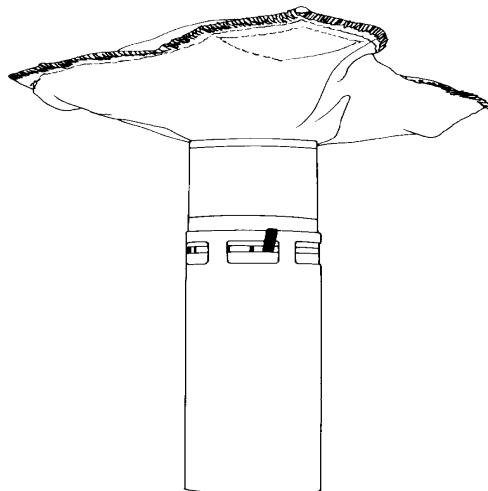
Munition	through 02	High Confidence Level			Good Confidence Level			Speculative			Total 03-12	
		03	04	05	06	07	08	09	10	11		12
GENERAL DYNAMICS/ALLIANT/U.S. GOVERNMENT												
BLU-97/B (a)	32021040	0	0	0	0	0	0	0	0	0	0	0
Total Production	32021040	0	0	0	0	0	0	0	0	0	0	0

(a) Production through 2002 includes approximately 13,130 developmental and contractor/operational test munitions for integration with the SUU-65/B dispenser. Production shown is for the CBU-87/B application only, with 202 submunitions per dispenser.



**SUU-65B**

Source: U.S. Air Force



**BLU-97/B COMBINED EFFECTS MUNITION**

Source: Forecast International