

ARCHIVED REPORT

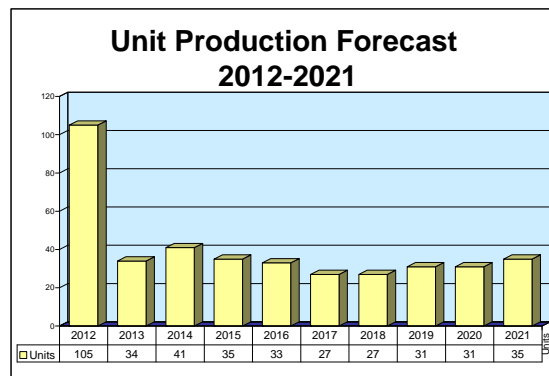
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BLU-116/B

Outlook

- Serial production reportedly ongoing for U.S. DoD; development continues
- U.S. DoD procurement through 2021 may total 2,850 units, augmenting existing BLU-109/Bs and BLU-118/Bs in service
- Production forecast reflects our estimate of U.S. DoD procurement only



Orientation

Description. An air-delivered hard-target munition.

Sponsor. The U.S. Air Force has sponsored the development of the BLU-116/B. The U.S. Navy has also participated in development of the BLU-116/B.

Licensees. None

Status. Development through serial production.

Total Produced. Through 2011, we estimate the contractor produced 2,466 complete BLU-116/B munitions.

Application. An air-delivered munition, optimized for the destruction of hard targets and buried installations.

Tactical aircraft can employ the BLU-116/B munition as a basic "dumb" bomb or as a "smart" munition, integrated with various guidance packages.

Price Range. The U.S. Air Force has not yet listed the procurement of the BLU-116/B in annual budget request documentation.

Based on data for the BLU-109/B and other research, the Forecast International Weapons Group estimates the basic BLU-116/B bomb (without guidance packages) carries a unit price of \$20,000.

Contractors

Prime

Ellwood National Forge	http://www.elwoodgroup.com , One Front St, Irvine, PA 16329 United States, Tel: + 1 (814) 563-7522, Fax: + 1 (814) 563-7529, Email: enfsales@elwd.com , Prime
Lockheed Martin Corp	http://www.lockheedmartin.com , 6801 Rockledge Dr, Bethesda, MD 20817 United States, Tel: + 1 (301) 897-6000, Fax: + 1 (301) 897-6704, Second Prime
Naval Air Warfare Center Weapons Division (NAVAIR WD)	http://www.navair.navy.mil/nawc wd/ , 1 Administration Circle, China Lake, CA 93555-6100 United States, Tel: + 1 (760) 939-3511, Email: CHLK-WDSiteContent@navy.mil , Second Prime

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Subcontractor

ATK Defense, Defense Electronic Systems	http://www.atk.com, 21301 Burbank Blvd, Suite 100, Woodland Hills, CA 91367 United States, Tel: + 1 (818) 887-0844, Fax: + 1 (818) 887-1447, Email: advanced.weapons@atk.com (FMU-159A/B Hard Target Smart Fuze)
Raytheon Systems Ltd	http://www.raytheon.co.uk, Harman House, 1 George St, Uxbridge, UB8 1QQ Middlesex, United Kingdom, Tel: + 44 1895 816200, Fax: + 44 1896 814829, Email: corporatecommunications@raytheon.co.uk (FMU-157 Hard Target Smart Fuze)
Teledyne Brown Engineering Inc	http://www.tbe.com, 300 Sparkman Dr, PO Box 070007, Huntsville, AL 35807-7007 United States, Tel: + 1 (256) 726-5555, Fax: + 1 (256) 726-5556, Email: publicrelations1@tbe.com (Integration Kit)

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Launch/Carrier Platforms. All tactical aircraft capable of carrying 864.59-kilogram (1,902.1-lb) Mk 84 bombs or Paveway laser-guided bombs can carry the BLU-116/B.

Dimensions. Our research indicates the munition is similar in dimensions to the BLU-109/B, as follows: munition weight includes 109 kilograms (239.8 lb) of PBXN explosive filler.

	<u>SI Units</u>	<u>U.S. Units</u>
Munition length	2.4 m	7.87 ft
Munition diameter	37 cm	14.6 in
Munition weight	874 kg	1,922.8 lb

Performance. Open-source reporting suggests the BLU-116/B is at least twice as effective as the BLU-109/B in perforating concrete.



BLU-116/B Advanced Unitary Penetrator

Source: www.military.com

Variants/Upgrades

Variants. The contractor has integrated the BLU-116/B with laser-based Paveway precision-guidance technology, yielding the following variants:

- GBU-24C/B (U.S. Air Force)
- GBU-24D/B or GBU-24G/B (U.S. Navy)

The BLU-116/B could also accommodate the GBU-series Joint Direct Attack Munition (JDAM) or the Conventional Air-Launched Cruise Missile (CALCM).

In the late 1990s, Lockheed Martin began developing a 454.5-kilogram (1,000-lb) version of the BLU-116/B for the unitary penetrator warhead option of its new Joint Air-to-Surface Stand-off Missile (JASSM).

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Research indicates that the contractor may integrate a thermobaric filling with the BLU-116/B in the future; this munition would carry a new BLU designation.

Modernization and Retrofit Overview. Not generally applicable. Upgraded versions of munitions normally carry new designations.

Program Review

Background. In the early 1980s, the U.S. Air Force became concerned over the growing number of hard targets (command and control facilities, underground storage facilities, and certain weapon sites) that were likely to be encountered in a European war scenario. The standard high-capacity bomb in service, the Mk 84 general-purpose bomb, was suspect in its performance against such targets. The 864.59-kilogram (1,902.1-lb) Mk 84 was a design from the mid-1950s. With a thin mild steel casing, the Mk 84 was prone to poor target penetration and had a tendency to ricochet, even at steep impact angles.

By 1984, the U.S. Air Force deemed the situation serious enough to implement a crash program to get a new penetrating bomb in service at the earliest opportunity. This effort – the HAVE VOID program – resulted in the current standard penetrating bomb, the BLU-109/B. (For a more complete discussion of this munition, see the "BLU-109/B and BLU-118/B" report in this tab.)

Beyond the BLU-109/B Series

While the BLU-109/B earned a proven combat record during Operation Desert Storm (1991), bomb damage assessments indicated the need for a munition capable of penetrating deeper and harder targets. As an immediate response to this requirement, the U.S. Air Force developed a new 2,272.7-kilogram (5,000-lb) penetrating bomb, the BLU-113/B, and rushed it to the theater of operations.

Shortly after Operation Desert Storm, the U.S. Air Force initiated the study of a number of proposals on how to best address this mission requirement, including:

- The Boosted Penetrator Bomb concept
- The Velocity Augmented Munition (a boosted munition)
- The Multiple Independently Targetable Submunition (a precision-guided submunition)
- The Small Smart Bomb (a 113.6-kg/250-lb bomb with the same penetration performance as the BLU-109/B)
- The BROACH (a boosted bomb with a tandem shaped-charge warhead by RO Defence)

- Various missile options with advanced unitary warheads and/or penetrating submunitions, including the B61-11 penetrating nuclear warhead

In October 1995, the U.S. Air Force initiated the Hard and/or Deeply Buried Target Defeat Capability program under the Advanced Concept Technology Demonstration effort.

Advanced Unitary Penetrator

In September 1996, the Wright Laboratory of the U.S. Air Force Aeronautical Systems Center (the lead agency for development of the BLU-116/B) awarded Lockheed Martin a three-year, \$5.5 million contract for the design, fabrication, and dynamic (sled and air drop) testing of the (then) Dense Metal Case Penetrating Warhead (DMCPW). The U.S. Navy's Naval Air Warfare Center Weapons Division (China Lake, California) was also heavily involved in the BLU-116/B development program. The DMCPW munition also picked up the name Advanced Unitary Penetrator before receiving its official designation as the BLU-116/B in 1998.

Ellwood National Forge originally acted as a subcontractor to Lockheed Martin on the BLU-109/B program. It now acts as the prime contractor for the BLU-116/B program, as well as for the BLU-109/B and BLU-118/B programs.

Description. While the technical details of the BLU-116/B remain sensitive, research indicates that the BLU-116/B is similar in shape to the BLU-109/B, being longer and thinner than conventional aerial bombs; some descriptions characterize it as a dart. The bomb case consists of a nickel-cobalt alloy (Air Force 1410), possibly with a depleted uranium component. In sled tests, the bomb perforated 3.35 meters (11 ft) of reinforced concrete, equivalent to more than 30.48 meters (100 ft) of soil.

'Elevator Bomb' Concept

Key to the performance of the BLU-116/B is its reliance on the "elevator bomb" concept, featuring a smart programmable fuze that senses various levels as it passes through the target and detonates at the desired level. On August 11, 1998, Alliant Techsystems, in cooperation with Raytheon Systems Ltd (London, England), won the contract for engineering and production of the FMU-157 Hard Target Smart Fuze. In

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addition to the initial three-year, \$16 million developmental contract, production options could bring the total value of the contract to \$54 million. The U.S. Air Force Precision Strike System Program Office (Eglin Air Force Base, Florida) manages the Hard Target Smart Fuze program.

A Joint Service Effort

After a successful series of dynamic tests, the U.S. Air Force and Defense Special Weapons Agency accelerated BLU-116/B serial production into FY99. On December 2, 1999, Boeing selected a version of the BLU-116/B over the competing BROACH warhead for retrofit to at least 50 Conventional Air-Launched Cruise Missiles (CALCMs) – formerly nuclear-armed AGM-66 missiles.

The Defense Special Weapons Agency is reportedly the lead agency for BLU-116/B procurement, with the

support of the Ogden Air Logistics Center (Hill Air Force Base, Utah) and the Naval Air Warfare Center Weapons Division (China Lake, California).

The U.S. Air Force originally stated an initial procurement objective of 1,500 BLU-116/B munitions. The U.S. Navy is acting as its own prime contractor for the first 370 BLU-116/B bombs, with final assembly at the NAVAIR WD China Lake facility. In total, the U.S. Air Force, Navy, and Marine Corps could eventually procure at least 2,800 BLU-116/B munitions.

Still Under Wraps?

In August 1999, the BLU-116/B reportedly underwent operational tests in combat in the Balkans. Unconfirmed reports also suggest the BLU-116/B may have seen use in Afghanistan. The U.S. Department of Defense has not released any information regarding these alleged operational tests.

Related News

Democrats Eye New Round of U.S. Defense Cuts – The U.S. Democratic Party is calling for further defense spending cuts in its 2012 policy platform. These new reductions would be in addition to the \$500 billion in automatic Pentagon budget cuts that are part of the existing \$1.2 trillion deficit-reduction package. These automatic cuts will take effect on January 2. The new cuts could hit the U.S. nuclear weapons inventory, as well as eliminate certain weapons systems. The Democrats say the Pentagon does not need outdated Cold War-era systems. (*Defense News*, 9/12)

U.S. Air Force Projects Sustained Growth for Procurement Budget – The U.S. Air Force's base budget declined by 4.7 percent in FY13, but the service is now projecting moderate budget growth through FY17, according to the DoD's National Defense Budget Estimates for FY13, known as the Green Book. According to the latest estimates, the Air Force budget will increase to \$147.0 billion in FY14, \$149.3 billion in FY15, \$154.6 billion in FY16, and \$158.2 billion in FY17, not including war funding. The plan would reflect real growth of 3.7 percent in FY14, 0.1 percent in FY15, 2.0 percent in FY16, and 0.6 percent in FY17.

Although the Air Force has already been hit by the DoD's efforts to cut nearly half a trillion dollars over the next 10 years, service leaders are still attempting to safeguard valuable procurement dollars. The Green Book shows the Air Force procurement account increasing by an average of 6.3 percent per year, totaling \$37.7 billion in FY14, \$39.0 billion in FY15, \$42.8 billion in FY16, and \$43.9 billion in FY17. (FI, 3/11)

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Funding

Data not available. The U.S. Department of Defense has not yet published procurement funding data for the BLU-116/B.

Contracts/Orders & Options

Since the announcement of the September 5, 1996, award of a \$5.5 million contract to Lockheed Martin for the design, fabrication, development, and initial production of the BLU-116/B, the U.S. Department of Defense has not published any procurement contracts related to the BLU-116/B. However, research indicates Ellwood National Forge won three BLU-116/B procurement contracts since 2000, as follows:

Date	Amount	Description
FY00	unknown	31 BLU-116/B bomb casings
FY01	unknown	3 BLU-116/B bomb casings
FY02	unknown	148 BLU-116/B bomb casings

Timetable

Month	Year	Major Development
Sep	1996	Lockheed Martin wins Dense Metal Case Penetrating Warhead contract
	1987-1998	Development of BLU-116/B continues
May	1998	Lockheed Martin teams with National Forge to produce BLU-116/B
Mar-Jun	1999	Unconfirmed reports of operational combat testing in Balkans
Dec	1999	Boeing selects BLU-116/B for retrofit to CALCM
	2012	Development and integration continue; production ongoing

Worldwide Distribution/Inventories

Export Potential. The BLU-109/B has garnered a moderate level of export sales, mainly in relation to Paveway guidance technology. We expect the BLU-116/B will attract the interest of the existing BLU-109/B customer base, which includes Denmark, France, Germany, Greece, Israel, the Netherlands, and the United Arab Emirates.

Country. United States.

Forecast Rationale

Serial production of the BLU-116/B is reportedly ongoing for the U.S. DoD. The U.S. Air Force originally stated an initial procurement objective of 1,500 munitions. In total, the U.S. Air Force, Navy, and Marine Corps could eventually procure at least 2,800 BLU-116/B munitions through 2021.

The Hush-a-Bomb

In August 1999, the BLU-116/B reportedly underwent operational tests in combat in the Balkans. Unconfirmed

reports also suggest the BLU-116/B may have been used in Afghanistan. The Department of Defense has not released any information regarding these alleged operational tests.

The U.S. Air Force has yet to acknowledge employment of the BLU-116/B during either Operation Enduring Freedom (2001-present) or Operation Iraqi Freedom / Operation New Dawn (2003-2011).

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence					Good Confidence			Speculative			Total
	Thru 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Ellwood National Forge												
BLU-116/B <> United States												
	2,466	105	34	41	35	33	27	27	31	31	35	399
Total	2,466	105	34	41	35	33	27	27	31	31	35	399