

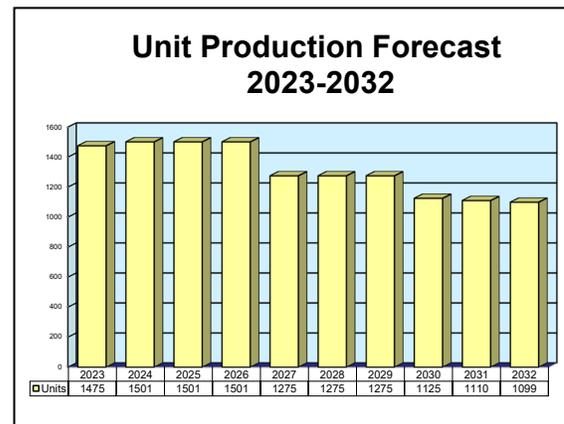
# ARCHIVED REPORT

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## BLU-109/B Series Hard Target Penetrators

### Outlook

- Serial production ongoing for U.S. Air Force as-needed procurement and export sales
- USAF is now focused on the advanced BLU-137/A2K variant of the BLU-109/B
- Forecast reflects U.S. Air Force procurement and export through the FMS program



### Orientation

**Description.** An air-delivered hard-target munition.

**Sponsor.** The U.S. Air Force sponsors the development and U.S. procurement of the BLU-109/B.

**Status.** Development through serial production.

**Total Produced.** Through 2022, we estimate that the contractors produced 75,443 BLU-109/B series munitions and 5,565 BLU-109/B HAVE VOID munitions.

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

**Price Range.** According to U.S. Air Force budget request documentation, the basic BLU-109/B bomb carried an FY21 unit price of \$34,000.

The BLU-109C/B carried an FY21 unit price of \$35,000.

The BLU-137/A2K carries an FY24 unit price of \$58,404.

### Contractors

#### Prime

|                               |   |
|-------------------------------|---|
| <b>Ellwood National Forge</b> | <a href="http://www.ellwoodgroup.com">http://www.ellwoodgroup.com</a> , One Front St, Irvine, PA 16329 United States, Tel: + 1 (814) 563-7522, Fax: + 1 (814) 563-7529, Email: <a href="mailto:enfsales@elwd.com">enfsales@elwd.com</a> , Prime |
| <b>Lockheed Martin Corp</b>   | <a href="http://www.lockheedmartin.com">http://www.lockheedmartin.com</a> , 6801 Rockledge Dr, Bethesda, MD 20817 United States, Tel: + 1 (301) 897-6000, Fax: + 1 (301) 897-6704, Second Prime   |

## BLU-109/B Series Hard Target Penetrators

### Subcontractor

|  |   |
|--|---|
| <b>McAlester Army Ammunition Plant</b> | <a href="http://www.mcaap.army.mil/">http://www.mcaap.army.mil/</a> , 1 C Tree Rd, McAlester, OK 74501-9002 United States, Tel: + 1 (918) 420-6591, Email: <a href="mailto:usarmy.mcalester.usamc.mbx.pa@mail.mil">usarmy.mcalester.usamc.mbx.pa@mail.mil</a> (BLU-109/B Load, Assemble & Pack) |
| <b>Teledyne Brown Engineering Inc</b>  | <a href="http://www.tbe.com">http://www.tbe.com</a> , 300 Sparkman Dr, PO Box 070007, Huntsville, AL 35807-7007 United States, Tel: + 1 (256) 726-1000, Fax: + 1 (256) 726-5556, Email: <a href="mailto:publicrelations1@tbe.com">publicrelations1@tbe.com</a> (Integration Kit)                |

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

## Technical Data

**Launch/Carrier Platforms.** All tactical aircraft capable of carrying 864.59-kilogram (1,902.1-lb) "2,000-pound" Mk 84 bombs or Paveway laser-guided bombs can carry the BLU-109/B.

**Dimensions.** The following data pertain to the basic unguided BLU-109/B bomb.

|                   | <u>SI Units</u> | <u>U.S. Units</u> |
|-------------------|-----------------|-------------------|
| Munition length   | 2.503 m         | 8.21 ft           |
| Munition diameter | 36.83 cm        | 14.5 in           |
| Munition weight   | 875.23 kg       | 1,925.5 lb        |



BLU-109/B in GBU-15 Configuration

Source: U.S. Air Force

## BLU-109/B Series Hard Target Penetrators

### Variants/Upgrades

**Variants.** While the basic BLU-109/B bomb casing can accept a variety of guidance packages, the primary variants of the basic BLU-109/B bomb are the BLU-118/B thermobaric munition and the BLU-137/B Advanced 2,000lb Penetrator (A2K).

#### *A New Kind of 'Deep' Attack*

Operation Enduring Freedom in Afghanistan (2001-2021) clearly revealed the need for a specialized munition to defeat targets in caves. Most of these so-called hard or deeply buried targets (tunnels in rock) are so deep that conventional high explosive (HE) munitions cannot penetrate to sufficient depths through tunnel adits (portals) or exterior doors to destroy critical assets located deep within.

To this end, the U.S. Department of Defense initiated the Thermobaric Weapon Demonstration Program in October 2001 as a high-pace effort to develop weapons based on a new class of solid fuel-air explosive thermobarics.

The program developed the BLU-118/B thermobaric bomb in only 67 days.

The BLU-118/B is the BLU-109/B penetrating warhead casing containing a PBXIH-135 insensitive polymer-bonded thermobaric explosive filling. Upon detonation, this filling generates high-sustained blast pressures in confined spaces such as tunnels and underground facilities. The BLU-118/B munition features an FMU-143J/B fuze modified with a new booster and a 120-millisecond delay. The BLU-118/B is compatible with the same guidance packages as the basic BLU-109/B bomb, including:

- A Paveway laser guidance package
- A GBU-15 modular glide bomb
- An AGM-130 missile

On March 3, 2002, the U.S. Air Force used a single BLU-118/B thermobaric bomb against an al-Qaeda and Taliban cave complex in the Gardez region of Afghanistan. This action marked the combat debut of the BLU-118/B.

The BLU-137/B A2K is used against bunkers, aircraft shelters, and reinforced concrete structures and is compatible with the Joint Direct Attack Munition (JDAM) guidance tail kit.

The BLU-137/B design is an advanced and modernized BLU-109 warhead with increased reliability and survivability. A2K will replace the legacy BLU-109. Procurement started in FY18 at Eglin AFB (AFLCMC/EBD), and reportedly transitioned to Hill AFB (AFLCMC/EBH) in FY20.

**Modernization and Retrofit Overview.** The Defense Threat Reduction Agency is seeking commercial technology solutions to address U.S. DoD requirements for advanced energetics and novel explosives that yield more explosive energy and greater lethality than conventional high explosives. The agency's Hard Target Defeat Program Office is developing schedules, budget estimates, trade studies, test plans, and engineering evaluations for new weapons and the related technology development programs.

### 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 would be likely 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-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 had deemed the situation serious enough to implement a crash program to get a new penetrating bomb in service at the earliest possible

opportunity. Although the French Durandal (as the BLU-107/B) was already in service with the U.S. Air Force, this runway attack munition lacked sufficient kinetic/chemical energy for attacking hard targets.

#### *The HAVE VOID Program*

In 1984, the U.S. Air Force tasked the Armament Division of the Air Force Systems Command with the development, on urgent priority, of a new penetrating munition. This program – designated HAVE VOID – would also integrate an off-the-shelf guidance system with the penetrating bomb, resulting in a precision hard-target munition. Lockheed Martin assisted in development. In 1985, Lockheed Martin secured a production contract for the new munition.

## BLU-109/B Series Hard Target Penetrators

**Description.** The HAVE VOID (subsequently designated BLU-109/B) featured a high-strength 4340 steel alloy bomb casing containing an explosive filler of Tritonal and PBXN-109.

### *Enhanced Performance*

To meet the precision guidance requirements, the BLU-109/B integrates the laser guidance element of the GBU-10 Paveway laser-guided bomb. To eliminate the fuzing problem of the Mk 84 against hard targets, the BLU-109/B features the FMU-124A/B fuze from the GBU-15(V) glide bomb.

Although actual performance details remain sensitive, reports suggest that in the initial series of tests, the new bomb literally "ripped out" the side of a granite mountain. In other tests, the bomb reportedly penetrated 3.048 meters (10 ft) of steel-reinforced concrete before detonating.

National Forge Company originally acted as a subcontractor to Lockheed Martin, producing the bomb casings. Throughout the late 1980s and early 1990s, the subcontractor assumed an increasingly larger role in the BLU-109/B program. Ellwood National Forge is now the prime contractor for the BLU-109/B production program.

### *Rapid Development & Production*

Lockheed Martin was able to place the BLU-109/B into production less than a year after the U.S. Air Force issued the original HAVE VOID requirement. Throughout its service life, the BLU-109/B has been known by a number of names, including:

- HAVE VOID – the original program name
- Improved 2000 (I-2000) – initial product name
- The Mole – informal nickname
- BLU-109/B – official designation
- Model 110 – U.S. Air Force version of the penetrator warhead assembly
- Model 150 – U.S. Navy version of the penetrator warhead assembly

Because the HAVE VOID effort was a U.S. Air Force "quick-reaction capability" program, HAVE VOID procurement was originally limited to 1,300 operational bombs in the FY85 and FY86 budget requests. However, because the basic BLU-109/B munition was well into its production phase and the GBU-10 guidance components were readily available, the USAF extended procurement of the BLU-109/B beyond the interim phase. The Air Force first requested procurement of the GBU-24 version of the BLU-109/B in the FY87 budget. In 1988, Lockheed Martin secured a contract worth \$15.7 million for serial production of 2,000 bombs; other contracts followed.

The overall U.S. Air Force procurement objective for the BLU-109/B was originally 64,000 bombs. However, the dramatic changes in the threat scenario since the end of the Cold War have greatly reduced the figure. By the late 1990s, the procurement objective had dropped to 13,500 bombs. Following the events of 2001, production briefly surged to meet increased near-term requirements. The Forecast International Weapons Group now expects Air Force procurement of the BLU-109/B to continue through the next decade.

## Funding

The following table reflects U.S. Air Force FY24 budget request documentation (March 2023) for procurement of the BLU-109/B series 2,000-pound hard target penetrators. All amounts are in millions of U.S. dollars.

| U.S. FUNDING          |       |      |       |      |      |      |
|-----------------------|-------|------|-------|------|------|------|
|                       | FY20  | FY20 | FY21  | FY21 | FY22 | FY22 |
|                       | QTY   | AMT  | QTY   | AMT  | QTY  | AMT  |
| <b>Procurement</b>    |       |      |       |      |      |      |
| <b>U.S. Air Force</b> |       |      |       |      |      |      |
| <b>BLU-137/A2K</b>    | 1,040 | 85.0 | 1,040 | 64.0 | -    | 1.5  |
|                       | 1,040 | 85.0 | 1,040 | 64.0 | -    | 1.5  |
|                       |       |      |       |      |      |      |
|                       | FY23  | FY23 | FY24  | FY24 | FY25 | FY25 |
|                       | QTY   | AMT  | QTY   | AMT  | QTY  | AMT  |
| <b>Procurement</b>    |       |      |       |      |      |      |
| <b>U.S. Air Force</b> |       |      |       |      |      |      |
| <b>BLU-137/A2K</b>    | 105   | 6.0  | -     | -    | -    | NL   |
|                       | 105   | 6.0  | -     | -    | -    | NL   |

### BLU-109/B Series Hard Target Penetrators

|                       | FY26<br><u>QTY</u> | FY26<br><u>AMT</u> | FY27<br><u>QTY</u> | FY27<br><u>AMT</u> | FY28<br><u>QTY</u> | FY28<br><u>AMT</u> |
|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>Procurement</b>    |                    |                    |                    |                    |                    |                    |
| <u>U.S. Air Force</u> |                    |                    |                    |                    |                    |                    |
| BLU-137/A2K           | -                  | NL                 | -                  | NL                 | -                  | NL                 |
|                       | -                  | NL                 | -                  | NL                 | -                  | NL                 |

NL = Not Listed

## Worldwide Distribution/Inventories

**Export Potential.** Although the U.S. Department of Defense places strict export controls on the BLU-109/B, the bomb has attracted a moderate level of export interest, mainly in relation to Paveway and JDAM guidance technology. Israel acquired an unknown number of BLU-109/B munitions, and at least six other nations have purchased the BLU-109/B. Finally, at least two unspecified Middle East nations have expressed interest in the munition.

In addition, a French contractor reportedly secured a production license for the BLU-109/B. The many nations that cannot purchase American-made BLU-109/B bombs may be able to acquire this munition from France.

**Countries.** Bahrain, Denmark, France, Germany, Greece, Iraq, Israel, Morocco, the Netherlands, the Republic of Korea, Singapore, Turkey, the United Arab Emirates, the United States, and possibly others.

## Forecast Rationale

Serial production of the BLU-109/B series hard target penetrators continues for U.S. as needed operational requirements and export. The BLU-109/B series is still attracting export orders.

### *Export Sales Continue*

In June 2015, the United Arab Emirates requested 500 BLU-109/B bombs as part of a \$130 million proposal for precision-guided munitions.

In November 2015, Turkey requested 200 BLU-109/B Hard Target Penetrator warheads as part of an overall request worth an estimated \$70 million for Joint Direct Attack Munitions (JDAMs).

In July 2016, the U.S. State Department approved a UAE request for 500 BLU-109/B bombs as part of an overall request for JDAMs worth \$785 million.

In May 2018, the U.S. State Department approved a request from Bahrain for 500 BLU-109/B bombs as part

of an overall request for aerial munitions worth \$45 million

In April 2019, the U.S. Army awarded a contract worth \$125 million for an unspecified quantity of Mk 80 and BLU-109/B bombs intended for FMS transfers to Iraq, Bahrain and Singapore.

### *Still a Vital Asset*

The U.S. Air Force procurement objective for the BLU-109/B was originally 64,000 bombs. By the late 1990s, the procurement objective had dropped to 13,500 bombs. U.S. Air Force FY24 budget request documentation (March 2023) indicates BLU-137/A2K procurement only through 2023.

The Forecast International Weapons Group expects that USAF procurement will resume. Export of the BLU-109/B series will support an average annual production rate of at least 1,100 munitions.

**BLU-109/B Series Hard Target Penetrators**

**Ten-Year Outlook**

| <b>ESTIMATED CALENDAR YEAR UNIT PRODUCTION</b> |                  |                        |             |             |             |                        |             |             |                    |             |             |              |
|--|------------------|------------------------|-------------|-------------|-------------|------------------------|-------------|-------------|--------------------|-------------|-------------|--------------|
| <b>Designation or Program</b>                  |                  | <b>High Confidence</b> |             |             |             | <b>Good Confidence</b> |             |             | <b>Speculative</b> |             |             |              |
|  | <b>Thru 2022</b> | <b>2023</b>            | <b>2024</b> | <b>2025</b> | <b>2026</b> | <b>2027</b>            | <b>2028</b> | <b>2029</b> | <b>2030</b>        | <b>2031</b> | <b>2032</b> | <b>Total</b> |
| <b>Ellwood National Forge</b>                  |                  |                        |             |             |             |                        |             |             |                    |             |             |              |
| <b>BLU-109/B</b>                               |                  |                        |             |             |             |                        |             |             |                    |             |             |              |
|  | 63,111           | 1475                   | 1501        | 1501        | 1501        | 1275                   | 1275        | 1275        | 1125               | 1110        | 1099        | 13,137       |
| <b>Total</b>                                   | 63,111           | 1475                   | 1501        | 1501        | 1501        | 1275                   | 1275        | 1275        | 1125               | 1110        | 1099        | 13,137       |