

# ARCHIVED REPORT

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## GBU-15(V)/B - Archived 11/98

### Outlook

- Additional production is forecast for the export market
- Due to the advent of the AGM-154 Joint Stand-Off Weapon, no additional procurement by the United States of America is forecast
- The GBU-15(V) remains in service with the United States Air force and several other nations
- Various product improvements are expected to be retrofitted to existing weapons

### Orientation

**Description.** A family of glide bombs.

**Sponsor.** The development and procurement of the GBU-15(V) has been sponsored by the United States Department of Defense through the United States Air Force. The executive agency is the Development Test Center of Air Force Materiel Command located at Eglin Air Force Base, Florida.

**Contractors.** The GBU-15(V) system was developed and is manufactured by Boeing North American (formerly Rockwell International Missile Systems Division); Duluth, Georgia, United States of America.

**Licensees.** None

**Status.** The serial production of the GBU-15(V) is ongoing; the weapon is in service with the United States of America and several other nations. The development of the infrared version, the GBU-15(V)2/ B, is complete with deliveries ongoing. The development of the GBU-15-I model is also complete.

**Total Produced.** As of January 1, 1997, a total of 4,071 GBU-15(V) weapons had been manufactured.

**Application.** The pinpoint destruction of highly defended, hard targets at a stand-off distance by tactical aircraft.

**Price Range.** The unit price of the GBU-15(V)/B was last listed in the Fiscal 1992 documents at \$272,265 in Fiscal 1992 dollars.

### Technical Data

**Launch/carrier vehicles.** F-4E, F-15E, F-16D, B-52G/H, F-111; others are possible and expected to be integrated.

**Dimensions.** The diameter and weight are when integrated with the Mark 84 bomb.

	<u>SI units</u>	<u>US units</u>
Length	3.94 meters	12.92 feet
Diameter	46 centimeters	1.51 feet
Weight	1,140 kilograms	2,508.02 pounds
Wingspan	1.50 meters	4.92 feet

The performance of the GBU-15(V)/B, especially the range, is classified, although the range is around 32.2 kilometers (17.38 nautical miles) from an unspecified (but high) release altitude. The range at unspecified lower release altitudes, the ones normally associated with operations in areas of vigorous air defense systems is approximately 9.26 kilometers (five nautical miles). In the 1994 Weapon System Evaluation Program tests, 19 out of 20 direct hits were scored by the GBU-15(V); in the 1995 tests, 11 out of 12 were direct hits.

In the another series of developmental tests which were conducted in mid-1995, the GBU-15(V)1/B scored

100% against a variety of targets in differing conditions. The mean miss distance for the six GBU-15(V) weapons that were launched was four meters (13.12 feet) for the horizontal targets and five meters (16.4 feet) for the vertical targets. In one launch, made from an altitude of 9,144 meters (30,000 feet), the GBU-15(V) flew 25.928 kilometers (14 nautical miles) and hit a vertically oriented target within two meters (6.56 feet) of the intended point of impact. The guidance technology employed in these tests was the differential assisted Global Positioning System.

## Variants/Upgrades

**Variants.** The GBU-15(V)/B is a modular system, there are no specific variants; the weapon is designed to be fitted with a variety of sensors and data links. A boosted version of the GBU-15(V)/B, designated AGM-130, has been developed and procured by the United States of America. This missile uses a solid fuel strap-on boost

rocket to give a greatly extended range. The AGM-130 program is covered in **Missile Forecast**, a companion volume to this.

**Modernization and Retrofit Overview.** This is generally not applicable to this type munition.

## Program Review

**Background.** With the phenomenal success of the first Paveway laser guided bombs, the United States Air Force wanted to explore the prospects of using electro-optic and other technologies to guide bombs to various heavily defended targets. Two programs, project Pavé Strike and the Defense Suppression Program, developed this technology starting in 1972. The Missile Systems Division of Rockwell International was selected in 1973 as the prime contractor. In December of 1996, this firm was acquired by Boeing and renamed Boeing North American.

**Description.** Both electro-optic and infrared guidance and control kits were developed for the Mark 84 909.09 kilogram (2,000 pound) bomb and the Mark 118 1,363.63 kilogram (3,000 pound) bomb to result in the original GBU-8 Pavé Strike weapon. Further developments were in the data link OA-8921/AXQ-14, the WCU-6A/B integrated control module and the distance-measuring equipment. Operational testing was conducted in Southeast Asia and resulted in a full-scale development program. In addition to other developments, this program integrated the CBU-75/B cluster munition to the Pavé Strike concept. Hughes Aircraft Company of Los Angeles, California, contributed the data link technology and development of the planar wing weapon version of the GBU-15(V)/B, while the then Munitions Division of the United States Air Force Systems Command provided integration and other assistance. Through the seventies,

the GBU-15 concept was expanded and developed into an operational reality. For some time, the program was referred to as HOBOS, for HOming BOmb System; then the Air Force called the entire system the Modular Glide Bomb System. More recently, the system has been designated the GBU-15(V), the V meaning variable configuration. For a time in the late seventies, a version using guidance based on the Precision Location Strike System was being developed. However, this weapon, designated GBU-20, was canceled due to budgetary and technical problems. The modular concept for this type of weapon is preferred by the Air Force. The illustration below will aid in the understanding of this somewhat complicated system.

The distance-measuring equipment can be used in conjunction with the electro-optic or infrared modules.

The actual kit designations are as follows:

KMU-353A/B Electro-optic, the seeker being the DSU-27A/B, now designated GBU-8.

KMU-390/B Electro-optic, the seeker being the DSU-27A/B, designated GBU-15(V)1/B.

KMU-359/B Infrared, the seeker being designated WGU-10/B, designated GBU-15(V)2/B.

Either the infrared or electro-optic systems can be integrated with the BLU-109/B bomb; the weapon is then called GBU-15-I.

Each kit consists of the following components, which are listed front to rear: the front-mounted guidance module with an FMU-23 or 24 fuse, the forward adapter, the warload, the control module containing the batteries, autopilot, displacement gyroscope, the tail assembly with four fins with control surfaces and the data-link module. A set of strakes and metal straps which integrate the various assemblies with the warhead completes the system.

System Operation. The GBU-15(V) is mounted on the launch aircraft in the same manner as any other large bomb. The guidance modules are fitted as the mission parameters require. The electro-optic version transmits a live picture to the pilot in the launch aircraft. Both direct and indirect attack using the data link are possible, the latter offering a significant stand-off capability. The infrared version functions in the same manner as the AGM-65D Maverick. The distance measuring equipment version is independent of visual conditions and needs a data link with an airborne targeting aircraft. These operational variations are depicted below.

Prior to 1992, a GBU-15(V)N/B version with combined infrared/electro-optic guidance and the SUU-64/B dispenser equipped with the smart submunitions of the CBU-98/B Direct Airfield Attack Combined Munition (the BLU-106/B and Hunting Engineering HB876) had been under development; this program is now dead. Other submunition packages, including the BLU-108/B, could also be incorporated into this system in the future. The FMU-124/B fuse and a radar altimeter are incorporated in this version which is to be a multi-mission (anti-airfield, anti-armor, defense suppression) weapon.

The development of the infrared and distance-measuring versions is now complete, although beginning in the early nineties, it proceeded at a slower pace than in the past. The infrared version uses the seeker developed for the AGM-65D Maverick air-to-surface missile. The operational testing of this model began in late 1986 and was completed in the early nineties. Other still ongoing research is aimed at enhancing the all-weather and anti-jam capability of the weapon. Such techniques as homing on jamming, LORAN, inertial guidance and other advanced technologies are being studied. A special effort is being given to the integration of fiber-optics guidance technology with the GBU-15(V)/B.

Revised Follow-On Test and Evaluation. In late September of 1985, the Air Force announced that it would more than double the GBU-15(V)2/B Follow-On Testing and Evaluation program. The first Initial Operational Test and Evaluation program, lasting one year, was already expanded and lengthened after 6 out of 11 weapons (54.5%) missed their targets. After analysis of the test data, it was found that the major problem was not with the hardware but with the operator-weapon interface — it was difficult for crewmen to use. With the electro-optically guided version, the operator has a much clearer picture of the target than with the imaging infrared version. This is due to the lower resolution of the imaging infrared sensor.

Originally, 20 launches had been planned for the test program; this was changed to 44 launches. This stretched the program and delayed production 24 months. The Air Force had originally planned to procure 300 of the imaging infrared version out of the total 635 unit procurement for Fiscal 1985. This was cut back to 60 units, all for tests. The entire Fiscal 1986 buy of 495 units was of the electro-optically guided version. The imaging infrared version is now in serial production.

It should be noted that the problems encountered in the test program were not considered serious by Air Force officials and have subsequently been put right in the Follow-On Testing and Evaluation program with the latest series of tests resulting in a 100% success rate. The weapon was used successfully in the Second Gulf War.

The most recent series of developmental tests of the GBU-15(V) were related to the Exploitation of Differential Global Positioning System for Guidance Enhancement program. This effort is investigating the integration of the economical Global Positioning System technology, which works in all weather, to existing weapons. Incorporated in the effort is the transfer of position/navigation data to the weapon prior to launch. The Exploitation of Differential Global Positioning System for Guidance Enhancement program was run at Eglin Air Force Base and lasted a year, ending in the latter part of 1995. Some of the details of the tests are listed above in the performance section of this report.

## Funding

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Funding for both the procurement and continued development of the GBU-15(V)/B is being requested.

	US FUNDING					
	Fiscal 1992		Fiscal 1993		Fiscal 1994	
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>
Procurement						
GBU-15(V)	-	-	-	-	-	-
Research and Development						
PE#0604733F(a)	-	20.6	-	-	-	1.8
Total	-	20.6	-	-	-	1.8
	Fiscal 1995		Fiscal 1996		Fiscal 1997	
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>
Procurement						
GBU-15(V)	-	5.6	-	-	-	-
Research and Development						
PE#0604733F(a)	-	0.9	-	-	-	-
Total	-	6.5	-	-	-	-

All funding amounts are in millions of dollars.

(a) Surface Defense Suppression; project GBU-15 P<sup>3</sup>I; this project improved the data link, increasing the system's reliability and improving the support equipment. More recently, it supports the AGM-130.

## Recent Contracts

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None announced in the last year.

## Timetable

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This timetable is for the GBU-15 (V)/B program only; the detailed developments of the BLU-109/B and the CBU-98/B are covered in the pertinent reports.

Mid	1960s	Paveway concept developed
Jul	1972	GBU-15 concept initiated
Apr	1973	GBU-15 development began
Apr	1977	GBU-20 developmental and operational tests began
Sep	1978	Defense Systems Acquisition Review Council Milestone 3 decision made
Aug	1979	GBU-20 developmental and operational testing terminated
Sep	1980	Full-scale production of GBU-15(V) began
May	1981	GBU-20 program terminated
Jan	1982	First production deliveries of GBU-15(V)1/B
May	1982	Follow-on contract awarded
May	1982	Tests of GBU-15(V)2/B began
Jul	1982	Integration to Australian F-111 aircraft started
Sep	1985	Testing of 2/B version stretched
Early	1991	GBU-15(V)/B extensively used in Second Gulf War
Through	1995	Integration and testing of Differential Global Positioning System guidance technology
Late	1995	Requested purchase by Saudi Arabia
Late	1997	Production of 1/B and 2/B kits continues on as needed basis; integration with BLU-109/B warhead ongoing

## Worldwide Distribution

**Export Potential.** It is somewhat surprising that an effective weapon like the GBU-15(V)/B has not been a major seller on the export market. This is probably due to restrictions put on this weapon by the United States Air Force and other agencies of the United States government. As the number of competing systems of this type is certain to grow in the next few years, the future exports of the GBU-15(V)/B are not expected to be especially sanguine. In addition to the users listed immediately below, other countries which have expressed interest in the GBU-15(V) are the Federal Republic of Germany, the United Kingdom and Saudi Arabia, which requested to purchase 556 GBU-15(V) weapons and associated equipment in late 1995.

**Countries.** In addition to **The United States, Australia** decided in 1982 to adapt its F-111 aircraft to carry the GBU-15(V); this program was completed in early 1987. The GBU-15(V)/B has also been sold to **Israel, Egypt and Saudi Arabia.**

## Forecast Rationale

As of latter 1997, and despite all the discussion by proponents of the weapon, in any of the numerous federal documents or articles in defense related publications pertaining to the AGM-154 Joint Stand-Off Weapon, it has been forgotten is that there is already a proven modular stand-off weapon in the inventory. This weapon, the GBU-15(V), was designed as a modular weapon from the outset. Our research has long indicated that instead of wasting ever more money on new stand-off weapons, the GBU-15(V) should be re-examined for additional growth potential so it can continue to fill this mission area. At least part of this statement has come to pass with the recent tests integrating the Differential Global Positioning System guidance technology with the GBU-15(V).

In the nineties, almost all military procurement programs have been suffering in the times of tight defense dollars now prevailing in the United States of

America; the GBU-15(V) is no exception. The serial production of the weapon has been winding down for some time now and was originally expected to be completed in 1995. This forecast was due to the fact that no procurement funding was requested in the Fiscal 1996 or following budgets and that no export sales were forecast. However, the large order from Saudi Arabia has breathed new life into the program.

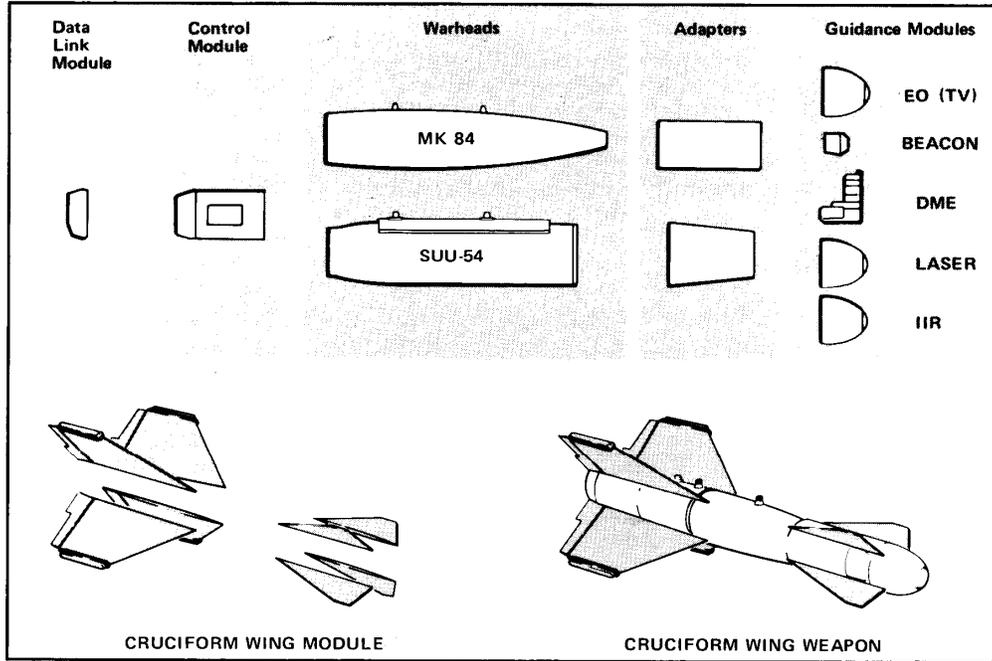
In light of the recent Saudi order plus the ongoing events in the Middle East, one or more new export sales may be made of one of the versions of the GBU-15(V); this is included in our forecast chart below. We will continue to monitor developments in these areas for further developments which could change our forecast and update this report accordingly.

*The numbers immediately below are ONLY for the GBU-15, NOT the AGM-130.*

## Ten-Year Outlook

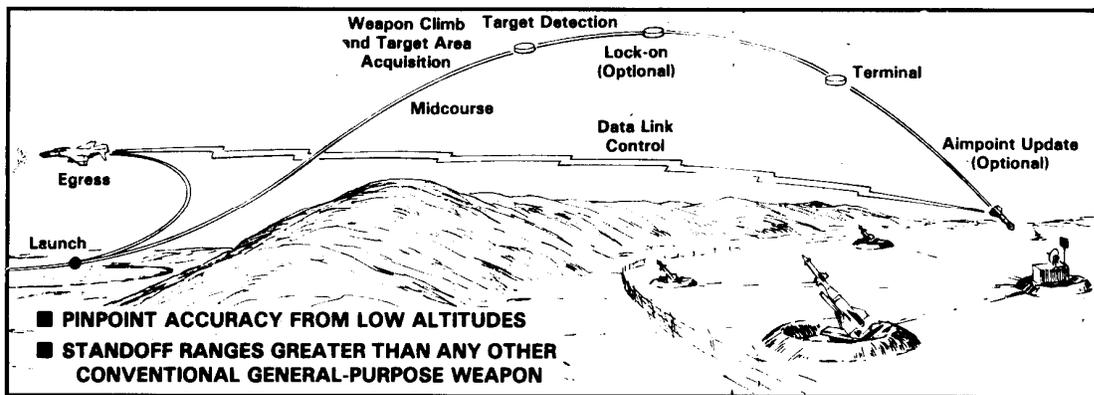
ESTIMATED CALENDAR YEAR PRODUCTION												
Munition	through 96	High Confidence Level			Good Confidence Level			Speculative			Total 97-06	
		97	98	99	00	01	02	03	04	05		06
BOEING NORTH AMERICAN (ROCKWELL INTERNATIONAL/MISSILE SYSTEMS)												
GBU-15(V)/B(a)	4071	259	0	85	121	12	0	0	0	0	0	477
Total Production	4071	259	0	85	121	12	0	0	0	0	0	477

(a)The forecast includes no prototype or contractor/operational test munitions, and does not include the AGM-130 powered version.



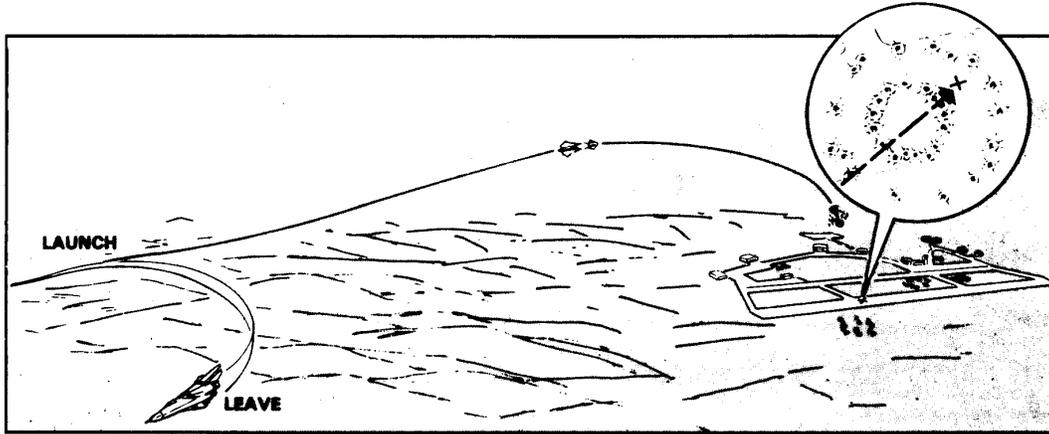
GBU-15(V) MODULAR CONCEPT

Source: Boeing North American



GBU-15(V) IN DEFENSE SUPPRESSION ROLE

Source: Boeing North American



GBU-15(V) IN ANTI-AIRFIELD ROLE

Source: Boeing North American