

# ARCHIVED REPORT

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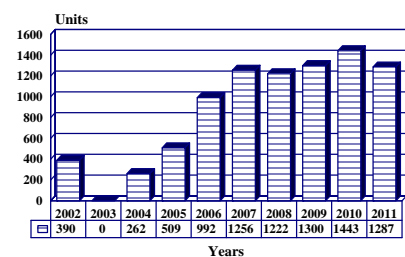
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## Brilliant Anti-Tank Weapon - Archived 12/2003

### Outlook

- Low-rate initial production of this munition is under way for the Block II model of the MGM-140 Army Tactical Missile System
- Product improvement program in place and funded
- Some technical problems still need to be addressed in product-improved model
- Integration with additional platforms ongoing

10 Year Unit Production Forecast  
2002 - 2011



### Orientation

**Description.** An anti-tank submunition.

**Sponsor.** The development of this submunition is being sponsored by the United States Department of Defense through the United States Army. The executive agency is the United States Army Missile Command, Redstone Arsenal, Alabama. The United States Air Force (the lead service for the defunct Tri-Service Stand-Off Missile, the Tactical Munitions Dispenser and the AGM-154 Joint Stand-Off Weapon) and the United States Navy (the lead service for the AGM-154 Joint Stand-Off Weapon and AGM/BGM-109 Tomahawk) are also supporting the program.

**Contractors.** The Brilliant Anti-Tank Weapon is being developed and manufactured by Northrop Grumman Corporation/Electronic Systems Division, Hawthorne, California. The serial production program is being undertaken at the company's Huntsville (Alabama) facility. Group Technologies, Physics International, and the Raytheon Company are the principal subcontractors.

**Licensees.** None

**Status.** The development of the Brilliant Anti-Tank Weapon is ongoing, as is the low-rate initial serial production of the munition. The replanned product

improvement program is in full-scale engineering development, with prototype testing and evaluations ongoing. Follow-on integration tests with various platforms are ongoing.

**Total Produced.** As of January 1, 2002, a total of 1,135 preprototype, prototype, developmental, and low-rate production Brilliant Anti-Tank Weapon munitions had been manufactured. This includes prototypes of the product-improved model.

**Application.** A submunition for the destruction of tanks and other armored vehicles. This munition is to be a component of the United States Army's Deep Strike mission area.

**Price Range.** Based on a buy of 10,000 units, the unit price of the Brilliant Anti-Tank Weapon is projected at \$127,000 in Fiscal 2002 dollars. In its deliberations on the Fiscal 2003 defense budget, a congressional report stated that basic or "vanilla" version of the Brilliant Anti-Tank Weapon had a unit price of \$200,000, while the product-improved version has a projected unit price of \$400,000. However, the report noted that a higher procurement objective would reduce the unit price to around \$100,000.

## Technical Data

**Launch/Carrier Vehicle.** The Brilliant Anti-Tank Weapon is being designed as a component of the United States Army's Deep Strike mission area; as such, it has been earmarked for integration with several of the Army's delivery systems, including the Army's version of the defunct Tri-Service Stand-Off Attack Missile, the MGM-140 Army Tactical Missile System (the initial carrier), and the M269 rocket of the M270 227 millimeter multiple launch rocket system. This list is not all inclusive, as this submunition may well be used by one or more of the three services in other dispenser systems such as the AGM-154 Joint Stand-Off Weapon, the AGM/BGM-109 Tomahawk (under the Tomahawk

Stops Attacking Regiments program) and Stand-Off Land Attack Missile version of the AGM-84 Harpoon, and the SUU-64/B Tactical Munitions Dispenser. The latest planned integration is with the Hunter unmanned aerial vehicle. The M270 Multiple Launch Rocket System, the SUU-64/B Tactical Munitions Dispenser and the AGM-154 Joint Stand-Off Weapon are covered in separate reports in this book. The MGM-140 Army Tactical Missile System, BGM-109 Tomahawk and Stand-off Land Attack Missile version of the AGM-84 Harpoon are in addition covered in Forecast International's *Missile Forecast*. The Hunter program is covered in *Unmanned Vehicles Forecast*.

**Dimensions.** Only the following dimensional data have been released on this program.

	<u>SI units</u>	<u>US units</u>
Munition length:	91.44 centimeters	36 inches
Munition diameter:	13.97 centimeters	5.5 inches
Munition weight:	20 kilograms	44 pounds

**Performance.** The armor perforation figure is predicated on the use of a conventional but advanced-design High Explosive Anti-Tank warhead on the Brilliant Anti-Tank Weapon. The figure is the result of the application of our standardized formula for High Explosive Anti-Tank warheads.

	<u>SI units</u>	<u>US units</u>
Armor perforation:	81.9 centimeters	32.24 inches

**Control and Guidance.** The Brilliant Anti-Tank Weapon uses a combination of passive infrared and acoustic sensors to detect and home in on the target and then issues the appropriate commands to the aerodynamic control surfaces. Other details, including seeker detection range and capability, are classified.

**Warhead.** The Brilliant Anti-Tank Weapon uses a tandem-type High Explosive Anti-Tank warhead incorporating a precursor charge; the top attack parameter is used. This advanced-technology warhead is effective against explosive reactive armor.

## Variants/Upgrades

**Variants.** The original or baseline Brilliant Anti-Tank Weapon is also called the "vanilla" version in order to distinguish it from the product-improved version described below.

**Modernization and Retrofit Overview.** For a number of years, the United States Army has been funding a preplanned product improvement program for the Brilliant Anti-Tank submunition. The original "vanilla" version of the weapon simply does not work as advertised. The stated goals of this program are an increased level of submunition lethality (an improved warhead), sensor capability, countermeasure resistance, and the capability to select targets. The last three enhancements are being achieved by the development and integration of alternate sensors and new software.

The sensor technologies are laser radar, millimeter wave, advanced imaging infrared, and dual-mode millimeter wave/infrared. In 1995, Northrop Grumman selected Alliant Techsystems and (the) Westinghouse Electric for the competitive development of dual-mode seeker technology for the submunition. While details are still sensitive, research indicates that an active millimeter wave radar (most likely operating in the 94 gigahertz region) combined with an advanced-design imaging infrared seeker was the technology selected by both competitors.

In July 1998, the Electronic Sensors and Systems Division of Northrop Grumman Corporation was awarded the contract. The selection was made with the concurrence of the US Army Tactical Missile System-

Brilliant Anti-Tank project office located at Redstone Arsenal in Huntsville, Alabama.

The original (“vanilla”) model of the Brilliant Anti-Tank submunition uses a passive acoustic and infrared sensor array to detect, attack and destroy moving tanks and other armored vehicles deep in hostile territory. The improved millimeter wave and infrared seeker now being developed expands the submunition’s capability against stationary and high-value targets (such as missile launch systems), and improves its performance in adverse weather.

However, the product-improved version of the Brilliant Anti-Tank submunition has run into a number of developmental problems which have delayed the program and caused some disenchantment in Congress. The situation came to a head in the deliberations on the Fiscal 2003 defense budget. Both the House and Senate

appropriations committees recommended major cuts of around \$150 million to the research and development budget of the product improved version of the weapon. Citing the “underperformance” of the improved Brilliant Anti-Tank submunition in tests, the legislators advised that the remaining \$38 million in research and developmental funding be transferred to the continued development of the seeker technology, the main area of difficulty. Meanwhile, the improved Brilliant Anti-Tank submunition has since been successfully tested three times, once from the MGM-140 Army Tactical Missile System missile. A further nine tests are ongoing or planned.

Contributing to congressional woes over the program is the US Army’s wavering over the procurement of the MGM-140 Army Tactical Missile System missile, and the potential for integration with other programs such as the Hunter unmanned aerial vehicle.

## Program Review

**Background.** As part of its Fiscal 1991 budgetary process, Congress demanded the selection of one of three competing submunitions for the Deep Strike mission area in order to consolidate the development effort and reduce overall costs. Among the three programs, the Terminally Guided Submunition program for the Phase III warhead of the M270 227 millimeter Multiple Launch Rocket System was farthest along in development. The next program, the Infrared Terminally Guided Submunition, was in competitive development by General Dynamics and Raytheon. These two programs were subsequently terminated. The third program, eventually revealed as the Brilliant Anti-Tank Weapon, was “black” in early 1991, as its existence had yet to be confirmed. In accordance with the congressional mandate, the United States Army selected the Brilliant Anti-Tank Weapon, and terminated the funding for the other two programs.

The decision by the United States to effectively pull out of the multinational Phase III warhead program for the 227 millimeter Multiple Launch Rocket System was met by considerable opposition. The program did run for several more years, but at a very low level. There was also opposition to the cancellation of the Infrared Terminally Guided Submunition program, as this move essentially terminated the Block II warhead for the Army Tactical Missile System. In June 1991, the United States Army and the contractors revealed the name of the new munition along with some technical data.

The development program for the Brilliant Anti-Tank Weapon began in 1984, with the concept development phase running through 1985. By mid-1991, approximately 34 test flights had been conducted. The

test program was conducted at the Naval Weapons Center located at China Lake, California.

**Description.** Aside from the technical data above, little detailed information has been released on the Brilliant Anti-Tank Weapon. The illustration at the end of this report shows the munition’s general configuration. The infrared sensor is located in the nose of the munition and the acoustic sensors are located at the ends of the aerodynamic control surfaces. Once dispensed by the carrier vehicle, the Brilliant Anti-Tank Weapon’s sensors detect and guide the weapon to the target. What makes this weapon brilliant is the fact that high-speed microprocessors allow it to manage sensor inputs at very high speeds.

**Carrier Platforms.** As noted above, the long-proposed Tri-Service Stand-Off Attack Missile had been the main projected platform for the Brilliant Anti-Tank Weapon. The Army stated that the payload of this missile would be 44 Brilliant Anti-Tank submunitions. By mid-1993, however, the Tri-Service Stand-Off Attack Missile program began running into technical and political trouble. By early 1994, the Army had dropped out of the program (which was subsequently canceled), and the Brilliant Anti-Tank Weapon was proposed for deployment from a number of other platforms. Congress has been instrumental in the effort to integrate the Brilliant Anti-Tank submunition with a larger number of dispensing platforms; proposals include the following:

- The MGM-140 Army Tactical Missile System. This missile, already in service, is launched from the M270 227 mm Multiple Launch Rocket System

launcher equipment. The Block II version of the missile was originally supposed to dispense the Infrared Terminally Guided Submunition or the Terminally Guided Submunition that was to be used in the Phase III warhead for the M270 227 millimeter Multiple Launch Rocket System. However, in response to congressional mandate, funding for these two advanced submunitions programs was terminated, leaving the Block II version of this missile without a warhead. As a result, the Brilliant Anti-Tank submunition was earmarked as the main submunition loading for the Block II version of the MGM-140 Army Tactical Missile System. Each Block II version of the missile (two missiles per launcher) contains 13 Brilliant Anti-Tank submunitions. The longer range Block IIA version of the missile (subsequently cancelled) would have carried six Brilliant Anti-Tank submunitions.

- The Brilliant Anti-Tank Weapon has been proposed as a replacement for the Terminally Guided Submunition that was to be used in the Phase III warhead of the M269 rocket of the M270 227 millimeter Multiple Launch Rocket System. This requirement was originally called the Battlefield Optimized Artillery Rocket. Each rocket can deploy two Brilliant Anti-Tank submunitions.
- The US Air Force has investigated the possible integration of the Brilliant Anti-Tank submunition with the AGM-154 Joint Stand-Off Weapon being manufactured by Raytheon Systems. The Air Force's anticipated use is in relation to the Silent Hard Kill program, an effort to destroy surface-to-air missile sites with non-emitting radars. The Joint Stand-Off Weapon program is covered in detail in Tab F of this book.
- The Navy has investigated the possible integration of the Brilliant Anti-Tank submunition with the BGM-109 Tomahawk cruise missile. The Navy's desired application is related to its requirement for the Naval Surface Fire Support Mission. The program is called Tomahawk Stops Attacking Regiments. Hughes Missile Systems (now Raytheon) was studying the integration. Depending on the internal configuration, from 12 to 16 Brilliant Anti-Tank submunitions could be deployed by each missile.
- Studies have been made of the possible retrofit of the Brilliant Anti-Tank submunition to the AGM-86 Air Launched Cruise Missile, retired from its

original strategic strike mission (called the Conventional Air Launched Cruise Missile) as a result of nuclear weapons reduction agreements.

- Another US Air Force program has investigated the integration of the Brilliant Anti-Tank submunition with the GBU-15(V) and its powered version, the AGM-130. Both these weapons are modular in design and adaptable to different warheads.
- The US Navy has investigated the integration of the Brilliant Anti-Tank submunition with the Stand-off Land Attack Missile version of the AGM-84 Harpoon anti-ship missile. Each missile can deploy six to eight submunitions.
- The US Air Force has studied the possible integration of the Brilliant Anti-Tank Weapon with the Tactical Munitions Dispenser SUU-64/B.
- A more recent proposal for a platform to dispense the Brilliant Anti-Tank Weapon is the new Joint Air-to-Surface Stand-Off Missile. This is a United States Navy/United States Air Force program similar to the defunct Tri-Service Stand-Off Attack Missile. This program is still in the early stages of development; it is covered in *Missile Forecast*.
- The latest proposal for a platform to dispense the Brilliant Anti-Tank munition is the Hunter unmanned aerial vehicle. This proposal gained momentum in mid-2002 when it was approved by US Army Acquisition Executive, Claud Bolton. This action was related to a possible truncation or cancellation of the Block II model of the MGM-140 Army Tactical Missile System missile.

Developmental Troubles. The entire Block II version of the MGM-140 Army Tactical Missile System, as well as the Brilliant Anti-Tank submunition, was examined under the major weapons review instituted by President George W. Bush in early 2001. This system was unsuccessfully tested in June 2001. In this test, all five submunitions deployed in the proper manner but none hit their targets. However, while the details of the test are classified, research indicates that the test conditions were not within the submunition's operating parameters.

In June 2001, the US Army tapped into some of the funding for the program to fund portions of the transformation process. Further impacting the program were the events of September 11, 2001, and the resulting reprioritization of funding.

## Funding

Prior to Fiscal 1991, funding for the development of the Brilliant Anti-Tank Weapon was sanitized. In July 1993, a US Army spokesman stated that a total of \$512 million had been spent on the program since its conception in 1984. On December 31, 1993, the total program costs were projected at \$3.254 billion, up from the previous figure of \$2.2 billion. In mid-2002, a congressional source stated that the development of the product-improved model of the Brilliant Anti-Tank Weapon had cost \$1.9 billion.

	<u>US FUNDING</u>							
	<u>FY92</u>		<u>FY93</u>		<u>FY94</u>		<u>FY95</u>	
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>
Research & Development								
PE#0604768A								
Project D641	-	115.7	-	114.5	-	119.7	-	90.0
Project D687	-	-	-	-	-	-	-	15.0
Project D688	-	-	-	-	-	-	-	9.8
Project D686	-	-	-	-	-	-	-	-
Project D2ND	-	-	-	-	-	-	-	-
<b>Total</b>	-	115.7	-	114.5	-	19.7	-	114.8

	<u>FY96</u>		<u>FY97</u>		<u>FY98</u>		<u>FY99</u>	
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>
	Research & Development							
PE#0604768A								
Project D641	-	101.4	-	79.2	-	86.1	-	17.1
Project D687	-	35.2	-	15.5	-	56.3	-	65.5
Project D688	-	53.5	-	66.8	-	82.8	-	41.4
Project D686	-	0.0	-	0.0	-	4.3	-	4.3
Project D2ND	-	0.3	-	0.5	-	0.3	-	0.3
<b>Total</b>	-	190.4	-	162.0	-	229.8	-	228.7

	<u>FY00</u>		<u>FY01</u>		<u>FY02</u>		<u>FY03</u>	
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>
	Research & Development							
PE#0604768A								
Project D641	-	17.0	-	*	-	*	-	*
Project D687	-	81.3	-	*	-	*	-	*
Project D688	-	27.5	-	*	-	*	-	*
Project D686	-	0.0	-	*	-	*	-	*
Project D2ND	-	2.2	-	*	-	*	-	*
<b>Total</b>	-	128.0	-	98.1	-	132.9	-	190.3

All dollar amounts are in millions.

\*Funding of less than \$100,000, or data not supplied.

The Fiscal 2003 data are a request.

In the Fiscal 1999 budget request, there was a line item for 24 MGM-140 Army Tactical Missile System missiles equipped with the Brilliant Anti-Tank Weapon; the cost is \$149.7 million. The Fiscal 2000 request was for \$228.1 million to procure 48 missiles, the Fiscal 2001 request was for \$213.4 million to procure 34 missiles, and the Fiscal 2002 request was for \$61 million to procure six missiles. The procurement data for the individual Brilliant Anti-Armor submunition are not shown in the documents.

Program Element number 0604768A - Brilliant Anti-Armor Submunition, or Bat (formerly called Tractor BAT), supports the development, test and integration program for the Brilliant Anti-Tank Weapon. Project number D641 has the same name. The Fiscal 1991 funding, the first announced, totaled \$26.8 million. Project number D687 is for the preplanned product improvement program for the submunition. Project numbers D688 and D686 are for integration with the Block II and IIA versions of the Army Tactical Missile System, respectively. Project number D2NT is for the operational test program for the Brilliant Anti-Tank Weapon.

## Recent Contracts

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For contract information on the various dispensing platforms, we refer the reader to the pertinent reports in this book and in *Missile Forecast*.

Although most of the contract information on this program has not been released, on June 20, 1991, it was announced that then-Northrop had been awarded \$344 million for the further development of the Brilliant Anti-Tank Weapon. The same day, Raytheon announced that it had received a cost-plus-incentive contract for \$60.2 million. This contract, covering 42 months, is for the engineering and manufacturing development program. No other details were disclosed.

Another contract was awarded to Northrop on October 18, 1993. This was a \$1.85 million increment to contract number DAAH01-93C-CA014 worth \$9,368,409. It was for planned product improvement related to the Brilliant Anti-Tank seeker assembly. On December 21, 1994, Northrop Grumman was awarded contract number DAAH01-93C-A014 worth \$9,989,865. This contract was in relation to the preplanned product improvement program for the Brilliant Anti-Tank Submunition.

A contract competition was announced on January 17, 1995, for \$72.4 million covering 42 months; it was related to Alliant Techsystems' and (then) Westinghouse Electronics' competitive development of dual-mode seekers in the preplanned product improvement program. This competition was won by the Electronic Sensors and Systems Division of Northrop Grumman in August 1998. In July 1998, the Electronics Systems Division of Northrop Grumman was awarded contract number DAAH01-99C0-0154 worth \$11,540,000 for the preplanned product improvement program for the Brilliant Anti-Tank Weapon.

In May 1998, Northrop Grumman was awarded contract number DAAH01-98C-0105 worth \$32,022,471 for the procurement of 89 Brilliant Anti-Tank submunitions for the Block II version of the MGM-140 Army Tactical Missile System. In June 1999, Lockheed Martin awarded Northrop Grumman a contract worth \$87.8 million for the low-rate initial production of 304 Brilliant Anti-Tank Weapon submunitions for the Block II version of the MGM-140 Army Tactical Missile System; this is in relation to a US Army contract awarded to Lockheed Martin for the production of 22 missiles plus test submunitions. In January 2000, Northrop Grumman was awarded a contract worth \$128 million for production of 609 Brilliant Anti-Tank Weapon submunitions for the Block II version of the MGM-140 Army Tactical Missile System.

## Timetable

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1984	Concept development initiated
	1985	Concept development phase completed, design begun
	1987-1991	Prototype development, fabrication and testing
June	1991	Brilliant Anti-Tank Weapon program unveiled
August	1991	Brilliant Anti-Tank Weapon model revealed at Association of Unmanned Vehicles convention
June	1992	Critical Design Review
February	1993	Preplanned product improvement program announced
January	1995	Competitive preplanned product improvement contracts announced
August	1998	Preplanned product improvement selection made
June	1999	Approved for low-rate production
Late	2002	Development continues; low-rate serial production ongoing

## Worldwide Distribution

**Export Potential.** No export is expected for some time, and then only after the initial domestic requirement has been met. To address the objections of European nations over the US withdrawal from the Terminally Guided Submunition effort for the Phase III warhead program, there have been calls to transfer the technology developed for the Brilliant Anti-Tank program to the European nations that were formerly involved in the development of the Phase III warhead.

**Countries. United States**

## Forecast Rationale

The Brilliant Anti-Tank program is still in trouble despite the successful tests of the product-improved model. While low-rate production of the original or “vanilla” version of the submunition is ongoing under the second contract, its future is doomed as this version of the weapon has never worked as advertised. In response to concerns over developmental problems with the product-improved version, Congress has called for major reductions in developmental funding, and this issue was being debated as this report went to press. Adding to the concern is the US Army’s vacillation over the program itself as well as its present dispensing platform, the Block II version of the MGM-140 Army Tactical Missile System. Congress is also wary of Army plans to use some of the program’s funding for its expensive transformation effort. While the proposal to integrate the submunition with the Hunter unmanned aerial vehicle is now being viewed with favor, the entire Brilliant Anti-Tank program is existing under a cloud of uncertainty.

Despite recent test successes, the technical problems of the product-improved model have yet to be fully addressed.

Notwithstanding these setbacks, the US Army is still in need of a modern long-range anti-armor capability. Therefore, we believe that the Brilliant Anti-Tank submunition program will continue to move ahead with the Block II model of the Army Tactical Missile System missile as the dispensing platform. In fact, the Brilliant Anti-Tank weapon program still shows promise of becoming one of the principal anti-armor submunition programs in the United States arsenal.

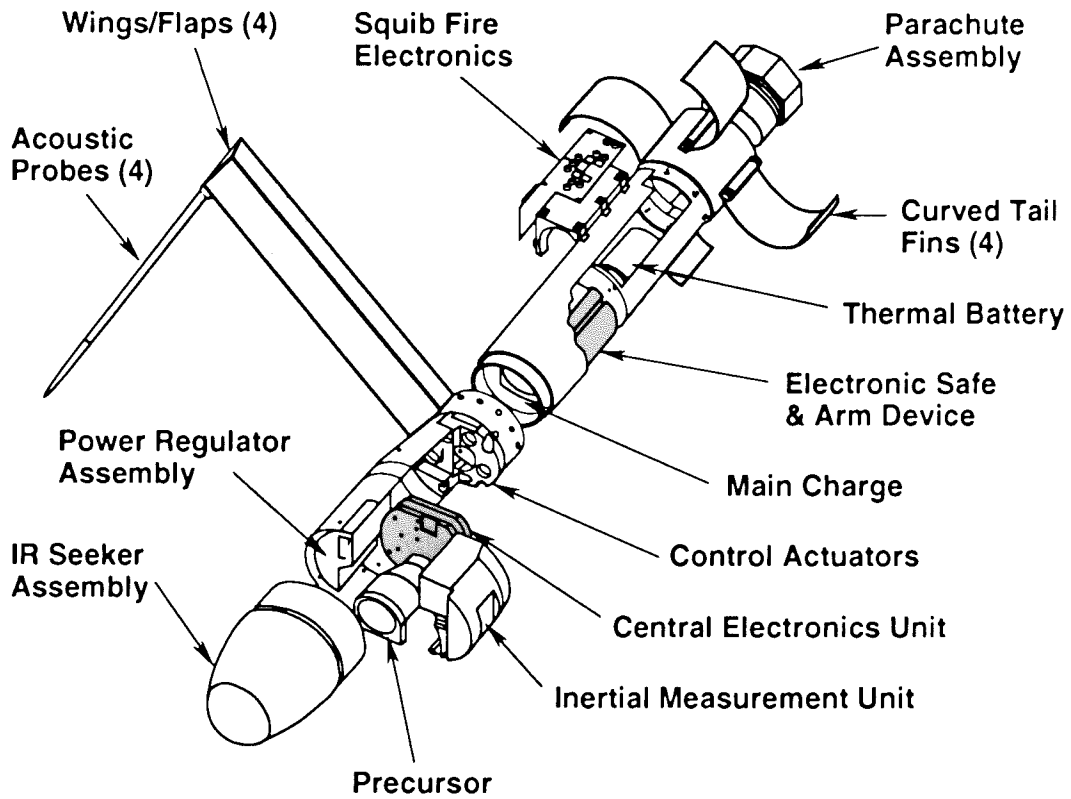
While other dispensing platforms are being investigated for the Brilliant Anti-Tank submunition, our forecast is limited to the MGM-140 Army Tactical Missile System platform, although we will continue to monitor the Brilliant Anti-Tank submunition program itself as well as the various platforms – especially the Block II version of the MGM-140 Army Tactical Missile System platform.

## Ten-Year Outlook

### ESTIMATED CALENDAR YEAR PRODUCTION

Munition	High Confidence Level				Good Confidence Level				Speculative			Total 02-11
	through 01	02	03	04	05	06	07	08	09	10	11	
NORTHROP GRUMMAN												
BRILLIANT ANTI-TANK (a)	1135	390	0	262	509	992	1256	1222	1300	1443	1287	8661
Total Production	1135	390	0	262	509	992	1256	1222	1300	1443	1287	8661

(a) Production through 2001 is for the initial developmental preprototypes, prototypes for development and integration tests with various delivery systems, and operational testing. The through 2001 production also includes the low-rate serial production which began in 1999. This initial production is for the basic or “vanilla” version of the submunition. The product-improved version should enter serial production in 2003 or early 2004. This forecast line is predicated on the 13-submunition filling on the Block II Army Tactical Missile System. Some of this production could be directed to integration with one or more unmanned aerial vehicles.



Brilliant Anti-Tank Weapon

Source: Northrop Grumman