

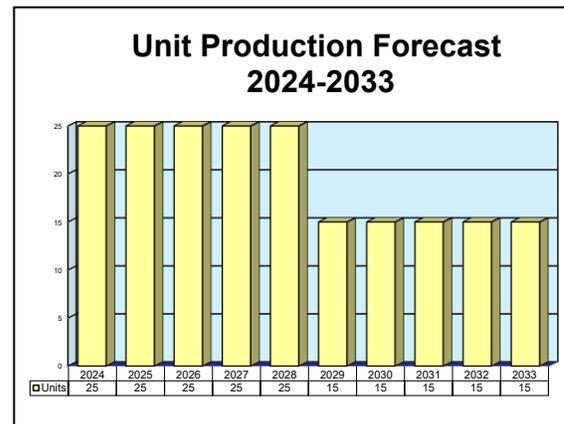
ARCHIVED REPORT

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Bushmaster II/Mark 44 30/40mm Cannon

Outlook

- The Bushmaster II/Mark 44 cannon currently supports the U.S. Air Force AC-130W Stinger II platform, the U.S. Navy Mk 46 Mod 2 GWS, and the U.S. Army Stryker ICV 30mm Lethality Upgrade Program
- Mark 44s have been donated to Ukraine, mounted on Polish Rosomak (AMV), Slovenian Valuk (Pandur), and Swedish CV90 IFVs
- Production forecast reflects ongoing procurement by the U.S. Department of Defense, as well as export sales



Orientation

Description. A medium-caliber ordnance system, optimized for the infantry combat vehicle.

Sponsor. Alliant Techsystems (later Orbital ATK, now operating as a component of Northrop Grumman) developed the Bushmaster II as a private venture.

The U.S. Navy originally sponsored U.S. Marine Corps procurement of the Mark 44 for the Expeditionary Fighting Vehicle.

The U.S. Air Force sponsors Mark 44 procurement for the MC-130W Dragon Spear / AC-130W Stinger II program.

Licensees. None.

Status. Development through serial production.

Total Produced. Through 2023, we estimate the prime contractor produced 1,856 Bushmaster II/Mark 44 cannon.

Application. Armament system for infantry combat vehicles and ground attack aircraft.

Price Range. In 2024 U.S. dollars, the Bushmaster II/Mark 44 carries an estimated unit price of \$90,286 for U.S. Department of Defense procurement.

Contractors

Prime

Northrop Grumman Defense Systems, Armament Systems	http://www.northropgrumman.com , 3309 N Reseda Circle, Mesa, AZ 85215 United States, Tel: + 1 (480) 324-8600, Fax: + 1 (480) 324-8758, Prime
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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

Bushmaster II/Mark 44 30/40mm Cannon

Technical Data

Crew. Per platform application.

Muzzle Brake. Multi-port.

Recoil System. Hydromechanical.

Breech Mechanism. Reciprocating, open bolt.

Method of Operation. Power-driven endless chain.

Ammunition. Crews can configure the Bushmaster II/Mark 44 to fire the following ammunition types:

- NATO-standard 30x173mm
- British 30x170mm RARDEN
- 40mm Super Forty

Dimensions. The following data reflect the Mark 44 production standard.

	<u>SI Units</u>	<u>U.S. Units</u>
Caliber	30mm	1.18 in
Length	3.405 m	11.17 ft
Width	34.3 cm	1.12 ft
Height	39.2 cm	1.28 ft
Weight	156.0 kg	344.0 lb

Performance. The muzzle velocity data reflect the firing of Armor Piercing Discarding Sabot-Tracer (APDS-T) ammunition.

	<u>SI Units</u>	<u>U.S. Units</u>
Muzzle velocity	1,219.2 m/sec	4,000 ft/sec
Rate of fire	Single shot, 200/400 rds/min	Single shot, 200/400 rds/min
Time to rate	0.17 sec	0.17 sec
Time to stop	0.15 sec	0.15 sec
Maximum effective range	1,500 m	1,640.4 yd
Dispersion	0.5 mil	0.5 mil

Alliant Techsystems claims the Mark 44 maintains a mean rounds between stoppage (MRBS) rate of 30,000 rounds.

Power. The Bushmaster II/Mark 44 requires 5.97 kilowatts (8.0 hp) at 28 volts direct current for operation.



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Source: Northrop Grumman Defense Systems (Orbital ATK)

Variants/Upgrades

Variants. None. Mark 44 is the U.S. Navy designation for the Bushmaster II, modified to fire both 30mm and 40mm Super Forty ammunition. The Mark 44 configuration is the current production standard. In July 2012, the U.S. Air Force type-classified the

Mark 44 and GAU-23 for integration on the AC-130W Stinger II gunship.

Modernization and Retrofit Overview. Not applicable.

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AC-130W Stinger II Armament

Source: U.S. Air Force

Program Review

Background. Concurrent with its private development of the AH-64 Apache attack helicopter in the early 1970s, (then) Hughes Helicopters began development of a new armament system of revolutionary design in 1972.

Enter the Chain Gun

This new armament system – featuring the unique Chain Gun mechanism – stressed light weight, ruggedness, simplicity, and reliability. When the U.S. Army selected the Hughes AH-64 as the next-generation attack helicopter in 1976, the then-designated XM230 became the gun component of the new aircraft.

Following the introduction of the M230, Hughes developed new applications for the Chain Gun mechanism, including the 25mm M242 Bushmaster and 30mm Bushmaster II. For a detailed discussion of the M230, see the "M230 Aircraft Cannon" report in this service; for information on the M242 Bushmaster, see the "M242 Bushmaster 25mm Cannon" report.

In 1984, McDonnell Douglas acquired the Hughes Helicopter Company; in 1997, Boeing purchased McDonnell Douglas. In 2002, Alliant Techsystems (ATK) purchased the cannon business of Boeing. In 2014, ATK announced it would merge its aerospace and defense operations with Orbital Sciences Corporation, forming Orbital ATK (now Northrop Grumman), which continues development of the Chain Gun technology.

Description. The heart of the Chain Gun mechanism is a single, double-row roller chain that moves in a racecourse pattern over four sprockets. This chain operates the weapon's sliding bolt mechanism. The weapon requires an external power source for operation.

Advantages of Constant Timing

This mechanism offers a number of advantages. In addition to significantly reducing the number of moving parts, the Chain Gun principle allows for open-bolt operation without the need for declutching mechanisms. The primary advantage of this operating system lies in

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the fact that the chain drive ensures constant timing of the mechanism, despite ammunition variations. The long bolt-lock time provides for essentially gasless action. The constant, chain-driven timing of the mechanism results in a weapon system with greatly enhanced reliability.

Bushmaster II: Second Generation

In 1986, (then) McDonnell Douglas Helicopters began development of a next-generation Chain Gun optimized for tactical vehicle applications. From the outset, the Bushmaster II program capitalized as much as possible on the original M242 Bushmaster. In fact, the Bushmaster II shares a 70 percent parts commonality with the M242, while being slightly larger and heavier than its progenitor. Like the M242, the Bushmaster II uses forward case ejection.

The Bushmaster II features the capability to fire either NATO-standard 30x173mm ammunition or British-pattern 30x170mm RARDEN ammunition through a simple change of barrel, bolt, and rear feed plate.

The Mark 44 is essentially a Bushmaster II modified to meet U.S. Navy specifications. The new features include:

- Components modified to fire 40mm Super Forty (also known as Supershot) ammunition
- Corrosion-resistant stainless steel components
- An integral titanium mount assembly, accommodating standard vehicle pintle mounts

Thus, the Mark 44 can now fire three ammunition types (30x173mm, 30x170mm, 40mm Super Forty) through the simple change of barrel, bolt, and feed components. Since 2002, the Mark 44 has been the Bushmaster II production standard.

The EFV Affair

By 1992, ATK had integrated the Bushmaster II with the Stridsfordon CV9030 and the M2 Bradley Fighting Vehicle for demonstrations.

In 1998, the U.S. Marine Corps selected the modified Bushmaster II as the main armament in the Mark 46 Mod 0 weapon system turret for the Advanced Amphibious Assault Vehicle program. The U.S. Navy then designated the weapon the Mark 44. In July 2003, the Commandant of the Marine Corps redesignated the AAV the Expeditionary Fighting Vehicle.

However, after two decades of development, the U.S. Marine Corps had little to show for the EFV program. Finally, in January 2011, (then) U.S. Secretary of Defense Robert Gates announced the termination of the EFV program. Gates said that the EFV would eat up the

bulk of the Marine Corps' vehicle budget for the foreseeable future, and even most of the service's budget as a whole. The U.S. Marine Corps subsequently announced it would withdraw all further funding for the EFV program.

European AIFV Applications

In 2003, the Polish Ministry of National Defense selected the Mark 44 for its KTO armored infantry fighting vehicle program. This selection marked the first large-scale adoption of a Western-made weapon system by a new (former Warsaw Pact) member of the NATO Alliance.

In 2006, Rafael Armament Development Authority Ltd (Haifa, Israel) awarded ATK a subcontract, reportedly worth about \$20 million, to provide the Mark 44 for integration onto the 8x8 Pandur II armored fighting vehicles that Steyr-Daimler-Puch Spezialfahrzeug (Vienna, Austria) is building for the Army of the Czech Republic. Initially, Steyr SSF was to deliver up to 234 Pandur II vehicles through 2012. In December 2007, the Czech Republic Defense Ministry canceled the Pandur procurement.

In March 2009, the Czech Ministry of Defense finally approved a contract award to Steyr, worth \$647.5 million, for 107 Pandur II vehicles. The key to this revised contract appears to have been the inclusion of 150 percent offsets, of which 40 percent were direct – involving the licensed assembly of 90 vehicles in the Czech Republic. Deliveries were completed by the end of 2012.

The Mark 44 in the Czech Pandur II application mounts the Rafael RCWS-30 remote-control weapons system, which also includes a 7.62x51mm NATO (.308 Winchester) coaxial machine gun and a launcher pod for two Rafael SPIKE-LR anti-tank missiles.

A Spooky Future?

In June 2011, the U.S. Air Force publicly announced the Dragon Spear conversion of the Air Force Special Operations Command's MC-130W aircraft. The Dragon Spear conversion, which includes the Mark 44 in a custom roll-on/roll-off mount, carried a unit cost of approximately \$7.6 million.

By the time of the U.S. Air Force announcement, however, the Dragon Spear had been in active service for almost a year. On July 29, 2010, the first MC-130W Dragon Spear aircraft was delivered to the 73rd Special Operations Squadron (Cannon AFB, New Mexico). AFSOC assigned all 12 converted MC-130W Dragon Spear aircraft to the 73rd SOS.

In May 2012, the U.S. Air Force redesignated the MC-130W Dragon Spear the AC-130W Stinger II. In

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July 2012, the Air Force type-classified the Mark 44 as the GAU-23 for integration on the AC-130W Stinger II gunship.

Up-Gunning Strykers

In June 2015, the House Appropriations defense subcommittee draft spending bill authorized the U.S. Army's \$412 million request for retrofitting 81 Stryker infantry carrier vehicles with the Bushmaster II/Mark 44 cannon. The House funding allocation matched the

original General Dynamics proposal of \$314 million in procurement funding and \$98 million for research and development. The Army's plans stemmed from an operational needs statement submitted earlier in the year by the 2nd Cavalry Regiment, based in Germany. While the Army had wanted to "up-gun" Stryker vehicles anyway, part of the push toward funding the unit's recently identified need was a suggestion by the service that doing so now would deter Russia.



Up-Gunned Stryker Prototype

Source: U.S. Army

Funding

Alliant Techsystems funded the development of the Bushmaster II/Mark 44 as a private venture. The U.S. Department of Defense maintains no distinct line items for Bushmaster II/Mark 44/GAU-23 procurement in annual budget request documentation.

Worldwide Distribution/Inventories

Export Potential. The prime selling points of Chain Gun weapons are their simplicity and high levels of reliability. The Alliant Techsystems Chain Gun concept will continue to be a significant factor in the medium-caliber vehicle ordnance market. In April 1994, Norway became the first export customer for the Bushmaster II.

In April 2023, open-source stories emerged that the U.S. Department of Defense was going to provide Ukraine with an unspecified quantity of truck-mounted Mark 44 systems for short-range air defense. To date, the Forecast International Weapons Group has been unable to confirm such stories.

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Nevertheless, all of the Polish KTO Rosomaks (a variant of the Patria Armored Modular Vehicle), Slovenian Valuks (a variant of the General Dynamics European Land Systems Pandur), and Swedish CV90 Infantry Fighting Vehicles donated to Ukraine mount the Mark 44 as their main armament.

Countries. Czech Republic, Finland, Lithuania, Norway, Poland, Portugal, Slovenia, Switzerland, Ukraine, the United Kingdom, and the United States. According to the prime contractor, the Bushmaster II/Mark 44 is also in production for an unspecified number of unidentified European, Middle Eastern/North African, and Southeast Asian customers.

Forecast Rationale

The center of gravity for the Bushmaster II/Mark 44 program remains support of three U.S. Department of Defense initiatives.

cannon on a remotely operated turret for integration onto the Stryker ICV platform.

AC-130W Stinger II

In May 2012, the U.S. Air Force redesignated the MC-130W Dragon Spear the AC-130W Stinger II. In July 2012, the Air Force type-classified the Mark 44 as the GAU-23 for integration on the AC-130W Stinger II gunship.

Mark 44s to Ukraine

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Mk 46 Mod 2 Gun Weapon System

General Dynamics Land Systems integrates the 30mm Bushmaster II/Mark 44 cannon into its Mk 46 Mod 2 Gun Weapon System for the Littoral Combat Ship program and the San Antonio class Landing Platform Dock.

Nevertheless, all of the Polish KTO Rosomaks (a variant of the Patria Armored Modular Vehicle), Slovenian Valuks (a variant of the General Dynamics European Land Systems Pandur), and Swedish CV90 Infantry Fighting Vehicles donated to Ukraine mount the Mark 44 as their main armament.

Stryker ICV Lethality Upgrade

Under the auspices of the Stryker Infantry Carrier Vehicle 30mm Lethality Upgrade, General Dynamics Land Systems is mounting the Bushmaster II/Mark 44

Shadowy Export Market

According to the prime contractor, the Bushmaster II/Mark 44 is also in production for an unspecified number of unidentified European, Middle Eastern, North African, and Southeast Asian customers.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence					Good Confidence			Speculative			Total
	Thru 2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Northrop Grumman Defense Systems (Orbital ATK)												
Bushmaster II Mark 44												
	1,856	25	25	25	25	25	15	15	15	15	15	200
Total	1,856	25	25	25	25	25	15	15	15	15	15	200