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## Defense Primer: U.S. Precision-Guided Munitions

The effectiveness, cost, and availability of U.S. precision-guided munitions (PGMs) are subjects of long-standing congressional interest and debate. The U.S. Department of Defense (DOD) has requested funds from Congress to increase the U.S. military's procurement of PGMs, modernize and upgrade ageing munitions, and to invest in industrial capacity. Congress may consider whether or not to provide more, the same, or less funding for PGMs than requested. Congress may further consider whether or not the U.S. military's current portfolio of PGMs is sufficient for the types of threats the United States may face. This In Focus provides an introduction to a selection of the guided missiles, bombs, and rockets that constitute the U.S. military's PGM portfolio.

According to DOD, a PGM is a "guided weapon intended to destroy a point target and minimize collateral damage." In contrast to unguided munitions such as certain artillery rounds and rockets, a guided munition can change its flight trajectory to correct for targeting errors, weather, or other issues, and to increase the munition's probability of striking a target. Also known as "smart bombs," precision-guided munitions leverage guidance components such as inertial measurement units, global positioning system (GPS) receivers, laser seekers, and millimeter-wave radar seekers.

Although the development of guided munitions can be traced to the First World War, the introduction of laser guidance, semiconductors, and other advancements in missilery in the 1960s improved munitions' ability to strike a target with greater accuracy. In time, as such technologies became more widely available, the term "precision" became less associated with a particular guidance system, munition type, or measurement of accuracy than with guided munitions writ large, as well as with the quality of the intelligence, planning, and decisionmaking that are meant to underpin their use.

### Air-to-Air Precision Munitions

- **Advanced Medium-Range Air-to-Air Missile (AMRAAM).** The Air Intercept Missile (AIM)-120 AMRAAM is an air-to-air missile in service with the Air Force and Navy and produced by Raytheon, an RTX Corporation subsidiary. The AIM-120D3, the latest AMRAAM variant, includes upgrades for obsolete components, according to the DOD Director of Operational Test and Evaluation (DOT&E). The Air Force and Navy are developing a successor to the AMRAAM, the Joint Advanced Tactical Missile (JATM), or AIM-260.
- **Air Intercept Missile-9X (AIM-9X).** The AIM-9X Sidewinder, a Navy-led program with Air Force participation, is a short-range air-to-air missile produced

by Raytheon and a modified version of the AIM-9 Sidewinder. The latest version of the missile is the AIM-9X Block II, production of which began in 2011. The Air Force has reportedly tested the AIM-9X in an air-to-surface role, and the Army has evaluated the AIM-9X as a surface-to-air missile.

### Air-to-Surface Precision Munitions

- **Advanced Anti-Radiation Guided Missile–Extended Range (AARGM-ER).** The AARGM-ER, a Navy-led program with Air Force involvement, provides hardware and software updates to the Air-to-Ground Missile (AGM)-88 High-Speed Anti-Radiation Missile (HARM), an air-launched ground attack missile designed to target radar-equipped air defenses. The AGM-88G, the latest variant of the missile, is an extended-range (ER) variant that is produced by Northrop Grumman.
- **Joint Air-to-Ground Missile (JAGM).** The AGM-179 JAGM, an Army-led joint service program, is an air-to-ground guided missile produced by Lockheed Martin and a replacement for the Hellfire and Longbow missiles. The JAGM combines the warhead, motor, and flight control systems of the AGM-114R Hellfire missile with a upgraded seeker, according to the DOD DOT&E. Designed primarily for attack helicopters, the JAGM is also compatible with some fixed-wing aircraft.
- **Joint Air-to-Surface Standoff Missile (JASSM).** The AGM-158 JASSM is a family of cruise missiles comprised of baseline and extended range configurations and compatible with a variety of fighter and bomber aircraft. The JASSM program is Air Force-led with Navy involvement. The JASSM-ER AGM-158B-2 is the latest fielded variant and produced by Lockheed Martin; a successor, the AGM-158B-3, and an extreme-range variant, the AGM-158D, are under development, according to the Air Force's FY2026 budget submission to Congress.
- **Joint Direct Attack Munition (JDAM).** The JDAM, a joint Air Force and Navy program, provides a tail-mounted, bolt-on guidance kit for various 500-, 1,000-, and 2,000-pound unguided bombs. The Air Force first used JDAMs during 1999 Operation Allied Force. The latest version of the JDAM, which is produced by Boeing, is equipped with a military-code (M-code) GPS receiver for operations in denied environments, according to the Air Force.
- **Long Range Anti-Ship Missile (LRASM).** The AGM-158C LRASM is an air-launched anti-ship cruise missile. The LRASM shares a production line with the

Air Force's JASSM and is part of the Navy's Offensive Anti-Surface Warfare (OASuW) program. The Navy approved the start of low-rate initial production of the missile in 2016. The Navy is developing a LRASM variant, the AGM-158C-3, that will reportedly feature an extended range and improved communications, according to the DOD DOT&E.

- **Massive Ordnance Penetrator (MOP).** The Massive Ordnance Penetrator, or Guided Bomb Unit (GBU)-57, is a "30,000-lb class precision-guided penetrator designed to defeat hard and deeply buried targets," according to the Air Force. The Air Force launched the MOP program in 2004; the MOP became a program of record in 2017. Produced by Boeing, the MOP is reportedly equipped with a GPS guidance package and compatible with the B-2 Spirit bomber. The United States first used the MOP in strikes on Iranian nuclear facilities in 2025.
- **Small Diameter Bomb I and II (SDB).** The SDB Increment I and II are air-launched guided bombs produced by Boeing and Raytheon, respectively. The GBU-39B SDB I is equipped with a GPS-aided inertial navigation system (INS) for guidance and designed primarily for striking stationary targets. The GBU-53/B SDB II features a multimode seeker with millimeter-wave radar and an infrared sensor. The Air Force began fielding SDB I in 2006. DOD approved the start of low-rate initial production of the SDB II in 2015.

## Surface-to-Air Precision Munitions

- **Evolved Sea Sparrow Missile (ESSM).** The RIM-162 ESSM is a sea-launched anti-air missile produced by Raytheon. Based on the AIM-7 medium-range air-launched anti-aircraft missile, the ESSM is a variant of the RIM-7P Sea Sparrow that features upgrades designed to improve its performance against anti-ship cruise missiles. The U.S. Navy first deployed the missile in 2004. The ESSM Block 2 features an upgraded guidance section, according to the Navy.
- **Standard Missile-6 (SM-6).** The SM-6, or RIM-174 Extended Range Active Missile (ERAM), is a multi-mission missile produced by Raytheon. The SM-6, which began development in 2004, combines elements of the SM-2 Block IV with the guidance system of a medium-range air-to-air missile. It is designed to be launched from AEGIS cruisers and destroyers and intercept aircraft, drones, and cruise missiles. The Navy is reportedly developing an air-to-air variant, the AIM-174B, for Super Hornet fighters. The Army has selected the SM-6—and the Tomahawk—for its Typhon Mid-Range Capability system.
- **Stinger.** The FIM-92 Stinger is a fire-and-forget surface-to-air missile designed to intercept low-flying fixed- and rotary-wing aircraft, cruise missiles, and drones. Produced by Raytheon, the Army first fielded the Stinger in 1981, and it has since invested in upgrades to the missile, including, most recently, to its propulsion system. Several U.S. military air defense systems are

equipped with the Stinger, including the Army's SGT STOUT maneuver short-range air defense system.

## Surface-to-Surface Precision Munitions

- **Army Tactical Missile System (ATACMS).** The MGM-140 ATACMS, an Army program, is a ground-launched missile produced by Lockheed Martin. The Army developed the ATACMS in the 1980s to replace the Lance missile. In 2017, the Army launched a service life extension program to modernize the warhead and seeker on aging ATACMS munitions.
- **Guided Multiple Launch Rocket System (GMLRS).** The GMLRS is a guided artillery rocket produced by Lockheed Martin. The Army approved the low-rate initial production of the GMLRS in 2003. In recent years, the Army has acquired standard- and extended-range variants of GMLRS rockets, each with two different types of warheads: a unitary warhead, a 200-pound high explosive warhead, and an alternative warhead (AW) that is designed to "engage area or imprecisely located targets," according to DOD.
- **Naval Strike Missile (NSM).** The RGM-184 NSM is a low-observable anti-ship cruise missile developed by Kongsberg Defence Systems, a Norwegian defense company, in the early 2000s. In 2018, the Navy awarded a Kongsberg-Raytheon team a contract to provide the NSM for the Navy's Over-The-Horizon Weapon System (OTH-WS), an armament on the Littoral Combat Ship. The Navy Marine Corps Expeditionary Ship Interdiction System (NMESIS), a ground-based anti-ship missile system, also features the NSM. The Air Force is procuring an air-launched version of the NSM, the AGM-184 Joint Strike Missile, for the F-35A fighter.
- **Precision Strike Missile (PrSM).** The PrSM, an Army program, is a ground-launched missile produced by Lockheed Martin. The PrSM is designed to replace the ATACMS and to strike targets approximately 400 kilometers (249 miles) away, according to DOD. The Army announced in 2023 that it had accepted delivery of the first PrSM Increment 1 missiles. Increments 2 and 3, which will reportedly have a modified guidance system and longer range, respectively, remain under development, according to DOD.
- **Tomahawk.** The Tomahawk is a long-range cruise missile produced by Raytheon. It is designed to be launched from submarines (UGM-109) and surface ships (RGM-109) against fixed and mobile targets. The Navy reportedly announced in 2020 that it would convert all Block IV Tomahawk missiles to the RGM/UGM-109E Block V, which features upgrades to its communications, according to the Navy. Since its first combat deployment in Operation Desert Storm in 1991, the Tomahawk has been a fixture of various U.S. military actions, including the U.S. strikes on Iranian nuclear facilities in 2025.

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