



RIM-161 SM-3

(AEGIS Ballistic Missile Defense)

On 14 February 2008 it was announced that the Navy will intercept a malfunctioning US spy satellite sometime after 20 February 2008. President Bush decided to fire a missile to bring down a broken spy satellite because of the potential danger to people from rocket fuel it is carrying. The window for intercepting the satellite would remain open for as many as seven or eight days. The military posted a NOTAM closing airspace about 1000 km West of Maui, indicating that the first intercept attempt might come on 21 February 2008 at about 03:30 UTC [10:30 PM EST on 20 February 2008]. Intercepting the satellite at about 130 nautical miles altitude will reduce the risk of debris in space. Once the satellite is hit, officials hope 50 percent of the debris will come to Earth in the first two orbits and the rest shortly thereafter. Robert Burns of the Associated Press reported 15 February 2008 that the order to launch the program came 04 January 2008. In a matter of weeks, three Navy warships — the [USS Lake Erie](#), USS Decatur and USS Russell — were outfitted with modified Aegis anti-missile systems and three SM-3 missiles were pulled off an assembly line and given the BMD Kill Vehicle.

Standard Missile-3 (SM-3) is being developed as part of the US Navy's sea-based ballistic missile defense system and will provide theater-wide defense against medium and long range ballistic missiles. In 1992, the Terrier LEAP ([Lightweight Exo-Atmospheric Projectile](#)) demonstration program culminated in four flight tests and demonstrated the feasibility of theater-wide ballistic missile defense. This program evolved into today's SM-3 development program which is based on the SM-2 Block IV airframe and propulsion stack, but incorporates a Third Stage Rocket Motor, a GPS/INS Guidance Section and the SM-3 Kinetic Warhead.

The United States Navy and the Missile Defense Agency are developing Standard Missile-3 (SM-3) as part of the Aegis Ballistic Missile Defense System that will provide allied forces and U.S. protection from short to intermediate range ballistic missiles. The SM-3 Kinetic Warhead (KW) is designed to intercept an incoming ballistic missile outside the earth's atmosphere. SM-3 is under development by Raytheon at its Missile Systems [business](#) unit in Tucson, Arizona.

Configuration

The Aegis BMDS builds upon the Strategic Defense Initiative Organization/Ballistic Missile Defense Organization (SDIO/ BMDO) investment in [Lightweight ExoAtmospheric Projectile \(LEAP\) technology](#) and the Navy's Aegis weapon system including Standard Missile and MK41 Vertical Launching System currently deployed on many U.S. Navy and international surface combatants.

The SM-3 KW is a highly modular, compact, space tested kinetic warhead designed to defend against short to intermediate range ballistic missile attacks. Raytheon has engineered two prior generations of LEAP designs starting in 1985 under contracts with SDIO and BMDO. This third generation LEAP design integrates the teamed experience of Raytheon and Boeing in KW designs and Alliant Techsystems' expertise in Solid Divert and Attitude Control. The SM-3 KW design features a large aperture wide field of view long wave infrared seeker that provides acquisition ranges greater than 300 km against typical ballistic missile threats. Seeker pointing and intercept guidance are supported by a production IFOG Inertial Measurement Unit and wooden round simplicity of the SDACS propulsion providing over 2 miles of terminal divert capability. The KW includes a fully encrypted [data](#) downlink capability for full engineering evaluation of KW performance and to support rapid kill assessment.

The SM-3 evolves from the proven SM-2 Block IV design. SM-3 uses the same booster and dual thrust rocket motor as the Block IV missile for the first and second stages and the same steering control section and midcourse missile guidance for maneuvering in the atmosphere. To support the extended range of an exo-atmospheric intercept, additional missile thrust is provided in a new third stage for the SM-3 missile, containing a dual pulse rocket motor for the early exo-atmospheric phase of flight and a Lightweight Exo-Atmospheric Projectile (LEAP) Kinetic Warhead (KW) for the intercept phase. Upon second stage separation, the first pulse burn of the Third Stage Rocket Motor (TSRM) provides the axial thrust to maintain the missile's trajectory into the exo-atmosphere. Upon entering the exo-atmosphere, the third stage coasts. The TSRM's attitude control system maneuvers the third stage to eject the nosecone, exposing the KW's Infrared (IR) seeker. If the third stage requires a course correction for an intercept, the rocket motor begins the second pulse burn. Upon completion of the second pulse burn, the IR seeker is calibrated and the KW ejects. The KW possesses its own attitude control system and guidance commands are acted upon by a solid divert propulsion system. The IR seeker acquires the target. Tracking information is continuously transmitted to the guidance assembly which controls the divert propulsion system.

Discrimination algorithms enable defense systems to compare objects in a target scene to determine which to intercept. Increasingly complex threats with separated target elements, countermeasures, and debris, require advanced signal processing and discrimination algorithms to identify object features needed to provide robust target selection. SM-3 has flown and demonstrated fundamental discrimination capability for unitary threats.

Computer program design upgrades are in work to expand the current selection accuracy and add capability against more stressing unitary and separating target scenes using target features observed by the Aegis radar system and the KW LWIR seeker to optimize selection confidence. Leveraging off discrimination architecture used across Raytheon's missile programs, SM-3 continues to evolve an integrated discrimination design for insertion with the current seeker design and each of the sensing and signal [processor](#) upgrades available to counter advancing threats.

Raytheon is working closely with the Navy to ensure that SM-3, based on legacy Standard tactical missile designs, stands ready to provide immediate emergency Aegis BMD capability against preponderant threats. The SM-3 Block I KW configuration features a single color LWIR seeker, a solid DACS propulsion, target identification and discrimination, and lethal intercept accuracy.