USAF launches LRASM, a long-range, precision-guided, anti-ship missile designed for A2/AD threat environments.

China is fielding large number of long range of antiship ballistic and cruise missiles , strike aircraft, and submarines designed to overwhelm both US air bases and carrier strike groups. According to US Navy, “As the air and missile defense capabilities of potential adversaries rapidly advance, the ability of the U.S. Armed Forces to employ short-range precision guided weapons such as Joint Direct Attack Munitions (JDAMs) will be increasingly challenged. China and Russia are also increasingly fielding sophisticated electronic warfare systems that can jam the GPS and other communication links.

The LRASM is a long-range precision-guided, anti-ship standoff missile designed to meet the needs of U.S. Navy and Air Force warfighters in anti-access/area-denial threat environments. The LRASM boasts a range of well over 200 nautical miles, a payload of 1,000 pounds, and the ability to strike at nearly the speed of sound. What really makes LRASM stand out is that all of this is completely autonomous. Human beings tell the missile where the enemy fleet is, which ship to strike, and a provide it with a continuous stream of data—the missile takes care of everything else. Using artificial intelligence, the missile takes data and makes decisions all on its own.

Anti-access and area denial (A2/AD) environment could be countered by highly autonomous systems like LRASM. LRASM missile employs advanced technologies that reduce dependence

on intelligence, surveillance and reconnaissance platforms, network links, and GPS navigation in electronic warfare environments. Lockheed Martin Missiles and Fire Control LRASM surface-launch director Scott Callaway said: “This successful flight test demonstrates Lockheed Martin’s readiness to answer the US Navy’s need for new anti-surface warfare capabilities as part of the ‘distributed lethality’ concept, which calls for arming even the Navy’s smallest ships with powerful weapons that can hit targets hundreds of miles out

The US Air Force (USAF) has successfully launched the first tactical configuration long-range anti-ship missile (LRASM) at the Point Mugu Sea Range in California, US. The launch of Lockheed Martin-built LRASM was carried out by a B-1B Lancer strategic bomber from Edwards Air Force Base in California. Lockheed Martin Missiles and Fire Control LRASM director Mike Fleming said: “This was the first flight of a production representative, tactical configuration LRASM.

The US Air Force’s (USAF) B-1B Lancer bomber has successfully test-fired production configuration long-range anti-ship missiles (LRASMs) over the Sea Range at Point Mugu in California. The trial witnessed the launch of two Lockheed Martin-built LRASMs against multiple maritime targets. It met the primary test objectives, including target impact, paving the way for LRASM’s early operational capability.

Earlier, Lockheed Martin’s Long Range Anti-Ship Missile (LRASM) was successfully released from a U.S. Navy F/A-18E/F Super Hornet at NAS Patuxent River, Maryland. The jettison release of the first LRASM from the Super Hornet is used to validate the aerodynamic separation models of the missile. “The first time event of releasing LRASM from the F/A-18E/F is a major milestone towards meeting early operational capability in 2019,” said Mike Fleming, Lockheed Martin LRASM program director. “The program is executing the integration and test contract, maturing subsystems and proving flight worthiness.”

Enhanced A2/AD environment

China is fielding an ASBM, referred to as the DF-21D that is a theater-range ballistic missile equipped with a maneuverable reentry vehicle (MaRV) designed to hit moving ships at sea. This missile provides the PLA the capability to attack aircraft carriers in the western Pacific. The CSS-5 Mod 5 has a range exceeding 1,500 km [about 810 nm] and is armed with a maneuverable warhead. It can approach its target at hypersonic speed at a near-vertical ballistic angle, capable of executing a series of complex maneuvers during its descent, greatly complicating defensive counter-fire.

The warhead is thought to be composed of numerous cluster munitions that would spread out across the deck of the supercarrier, disabling or destroying exposed aircraft, radar dishes, and antennae as well as killing the flight deck crew, achieving a mission kill without necessarily sinking the ship. The recent DF-26 has a reported range of 1,800 miles to 2,500 miles, may also have an anti-ship capability.

The PLA Navy is also deploying a wide range of advanced ASCMs, the new YJ-12 ASCM provides an increased threat to naval assets, due to its long-range and supersonic speeds. It is capable of being launched from H-6 bombers.

The implication for the U.S. Navy is that it needs aircraft and weapons with longer ranges. The Navy is “going to have to adopt an offensive mindset,” naval strategist Bryan Clark, of the Center for Strategic and Budgetary Assessments, told the House Armed Services Committee’s seapower and projection forces subcommittee.

Rob McHenry, a program manager in the Tactical Technology Office at DARPA, explained to Aviation Week: “We want US Navy cruisers and destroyers to be able to stand off from outside

of potential adversaries' direct counter fire range, and be able to safely engage and destroy high value targets they may be engaging against from extended range, well beyond potential adversary ranges that we may have to face…

Standoff precision guided weapons

LRASM – a modified version of the Joint Air-to-Surface Standoff Missile – was developed as part of an urgent operational need for U.S. Pacific Command for a modern air launched anti-ship cruise missile.

The capability to employ precision guided weapons at standoff ranges in large numbers will be necessary to ensure operational success in any high-end engagement. Advanced weapons such as the Joint Air-to-Surface Standoff Missile–Extended Range (JASSM–ER), the Longe Range Anti-Ship Missile (LRASM), the Tomahawk missile and others will be key elements in attack execution.""I need weapons systems of increased lethality that go faster, go further, and are more survivable," PACOM commander Adm. Harry Harris told the Senate."

"Once the missile flies that far, it has a requirement to be able to independently detect and validate the target that it was shot at. Finding that target, the missile will have to be able to penetrate the air defenses and finally, once it gets to that target, it has to have a lethal capability to make a difference once it gets there."

LRASM is first guided by the ship that launched it, then by satellite. The missile is jam-resistant and can carry on even if it loses contact with the Global Positioning System. As part of the targeting system, the missile can be set to fly to a series of waypoints, flying around static threats, land features, and commercial shipping. LRASM can detect threats between waypoints and navigate around them. If it decides it

would be entering the engagement range of an enemy ship not on the target list, LRASM will fly around the ship, even skipping waypoints that might lie within enemy range and going on to the next one.

After locating the enemy fleet, it dives to sea-skimming altitude to avoid close-in defenses. LRASM then sizes up the enemy fleet, locates its target, and calculates the desired "mean point of impact"—the exact spot the missile should aim for, taking into account the accuracy of the missile—to ensure the missile does not miss. In most instances that is the exact center of the ship, with the angle of the ship in relation to the missile taken into consideration, reported Kyle Mizokami in PM. Using AI and datalinks, multiple LRASMs can launch a coordinated attack on an enemy fleet.

The LRASM programme supports the US Navy's Offensive Anti-Surface Warfare (OASuW) effort to improve its ability to engage and destroy high-value targets from extended range.

Lockheed conducts successful flight tests of LRASM

LRASM is armed with a proven 1,000-pound penetrator and blast-fragmentation warhead, Lockheed officials said. With a range of at least 200 nautical miles, LRASM is designed to use next-generation guidance technology to help track and eliminate targets such as enemy ships, shallow submarines, drones, aircraft and land-based targets, according to Lockheed Martin developers.

The LRASM, which is 168-inches long and 2,500 pounds, is currently configured to fire from an Air Force B-1B bomber, Navy surface ship Vertical Launch Tubes and a Navy F-18 carrier-launched fighter. The weapon is expected to be operational from an Air Force B-1B bomber and a Navy F-18 by

2019, Navy statements have said.

Earlier Lockheed Martin has successfully carried out a controlled flight test of the US Navy's long-range anti-ship missile (LRASM) surface-launch variant. Conducted from the navy's Self Defense Test ship at the Point Mugu Sea Range, California, the event marked the third successful surface-launched LRASM test. The operational LRASM was fired from the MK41 VLS launcher, which flew a pre-planned low-altitude profile, collecting aerodynamics agility data, and then returned to its pre-determined destination.

ViaSat has been contracted to deliver datalink communications for the integration and test phase of the US Navy's Long Range Anti-Ship Missile (LRASM) programme. The follow-on deal was awarded by Lockheed Martin, and will see ViaSat supply Weapon Data Link (WDL) L-Band Units (LBU) in support of missile test programme's datalink communications requirements.The weapon system will be able to communicate with launch platforms using the ViaSat datalink solution, as well as provide growth opportunities in the future.

The test proved the maturity of the missile, which loaded mission data using the modified Tactical Tomahawk Weapon Control System (TTWCS+), and aligned mission data with a moving ship in a dynamic at-sea environment.

Lockheed Martin Missiles and Fire Control LRASM surface-launch director Scott Callaway said: "This successful flight test demonstrates Lockheed Martin's readiness to answer the US Navy's need for new anti-surface warfare capabilities as part of the 'distributed lethality' concept. In 2013 and 2014, the LRASM was also tested successfully from a ground-based MK 41 VLS Desert Ship. Lockheed is planning to continue with testing of the LRASM on other surface ship applications, including topside, deck-mounted launchers.

Earlier Lockheed Martin and the U.S. Navy completed the first

Long Range Anti-Ship Missile (LRASM) prototype captive-carry flight tests on the F/A-18E/F Super Hornet. The flights were conducted at Patuxent River Naval Air Station, Maryland. These initial airworthiness flight tests used a LRASM mass-simulator vehicle attached to the Navy's F/A-18E/F to evaluate flight and handling characteristics, as well as to measure structural loads and strains on the aircraft. A future series of tests would gather noise and vibration data between the aircraft and the missile.

"LRASM is a precision-guided, anti-ship standoff missile designed to meet the needs of U.S. Navy and Air Force warfighters in anti-access/area-denial threat environments."

LRASM leverages the state-of-the-art Joint Air to Surface Standoff Missile Extended Range (JASSM-ER) airframe and incorporates additional sensors and systems to achieve a stealthy and survivable subsonic cruise missile. It is 168-inches long, weighs 2,500 pounds, and has a reported range of 500 nautical miles.

Featuring a multi-modal sensor, weapon data link, and an enhanced digital anti-jam global positioning system to detect and destroy enemy threats, the LRASM missile is armed with a 1,000lb penetrator and blast-fragmentation warhead.

The current plan is to have the weapon operational on-board an Air Force B-1B bomber by 2018 and a carrier-launched fighter Navy F-18 by 2019, Navy statements have said.

LRASM, is a collaborative effort between Lockheed, the Office of Naval Research

and the Defense Advanced Project Research Agency, or DARPA.

The joint DARPA – Navy Long Range Anti-Ship Missile (LRASM) program is investing in advanced technologies to provide a leap ahead in U.S. surface warfare capability. The LRASM is designed to detect and destroy specific targets within groups of ships by employing advanced technologies that reduce dependence on intelligence, surveillance and reconnaissance platforms, network links and GPS navigation in electronic warfare environments. Autonomous guidance algorithms should allow the LRASM to use less-precise target cueing data to pinpoint specific targets in the contested domain.

LRASM employs a multi-mode sensor, weapon data link and an enhanced digital anti-jam global positioning system to detect and destroy specific targets within a group of ships, Lockheed officials said. LRASM is engineered with all-weather capability and a multi-modal seeker designed to discern targets.

Beyond their anti-jamming digital GPS, therefore, LRASM will also rely on a 2-way data link, a radar sensor that can detect ships (and might also be usable for navigation), and a day/night camera for positive identification and final targeting. In its second flight test conducted in November 2014, the missile receiving inflight targeting updates via data-link and scoring a direct hit on the moving ship target.

The program also focuses on innovative terminal survivability approaches and precision lethality in the face of advanced counter measures. In 2015 test, in the final portion of the flight, the missile detected, tracked and avoided an object that was deliberately placed in the flight pattern to demonstrate LRASM’s obstacle-avoidance algorithms.

A key feature of this missile is a terminal guidance system that would allow it to reach a target even if the military

were denied access to GPS signals or other network links.

The Lockheed Martin recently tested Joint-Air-to-Ground Missile (JAGM) that has a multi-mode guidance section with semi-active laser (SAL) sensor for precision-strike and a fire-and-forget millimeter wave (MMW) radar for moving targets in all-weather conditions. JAGM can engage several different stationary and moving targets in the bad weather, smoke and dust, and advanced countermeasures. Laser and radar guided engagement modes enable JAGM to strike accurately and reduce collateral damage, Lockheed Martin officials say

BAE Systems has begun production of an advanced targeting sensor for LRASM

BAE Systems has begun production of an advanced targeting sensor for the emerging Long Range Anti-Ship Missile engineered to track and destroy moving targets from great distances semi-autonomously, developers said. BAE Systems is a subcontractor to main LRASM developer Lockheed Martin. Production of the sensor comes shortly after Lockheed received the first LRASM production contract award from the Navy and Air Force.

Along with advances in electronic warfare, cyber-security and communications, LRASM is design to bring semi-autonomous targeting capability to a degree that does not yet exist. As a result, some of its guidance and seeker technology is secret, developers have said. Overall, LRASM employs the multi-mode sensor, weapon data link and an enhanced digital anti-jam global positioning system to detect and destroy specific targets within a group of ships, Lockheed officials said.

Developers say the weapon is particularly well suited for the most advanced adversary weapons systems and most high-threat warfare scenarios such as a “near-peer” type of combat

engagements. Advanced threat environments are expected to include enemy forces armed with long-range sensors, electronic warfare, tactics for compromising or jamming GPS signals and a host of additional countermeasures designed to thwart incoming surface and air weapons.

“Our differentiator is that our technology can sense, identify, and help target moving ships from a great distance. With our LRASM sensor, we’ve transitioned our world-class electronic warfare capabilities from other platforms to a missile system with extremely low size, weight, and power constraints,” BAE LRASM Program Manager, Joseph Mancini, told Scout Warrior.

US Navy’s Offensive Anti-Surface Warfare (OASuW)

Offensive Anti-Surface Warfare (OASuW) will be an offensive weapon system that can be air, surface, and subsurface launched in the maritime battle space environment. OASuW will be a vital component of the Joint Force Anti-Surface Warfare capability and incorporate new and emergent technologies to support an increased offensive strike capability. Due to emerging threats, the fleet issued an Urgent Operational Needs Statement (UONS) that identified a capability gap for a long-range anti-ship missile to be filled by 2018.

Directly supporting this UONS and significantly reducing Joint Force warfighting risks, the U.S. Navy initiated OASuW Increment 1, which leverages the Defense Advanced Research Projects Agency(DARPA)/Office of Naval Research Long Range Anti-Ship Missile (LRASM) demonstration program to deliver an Early Operational Capability (EOC) in the required timeframe.

OASuW Increment I – an ongoing program between DARPA and the Navy – is being developed using the Lockheed Martin Long Range Anti-Ship Missile (LRASM) to meet an urgent operational need

from U.S. Pacific Command.

LRASM fills the most urgent air-launched capability gap to compliment, existing ASuW weapon systems and positions the Department of Defense to address evolving surface warfare threats. Longer term OASuW requirements will be addressed in the future by OASuW Increment II.

Set to start in Fiscal Year 2017, the contest for the Navy's Offensive Anti-Surface Warfare (OASuW) Increment II seeks to replace the Navy's decades-old inventory of Boeing RGM-84 Harpoons with more technologically sophisticated weapons.

The Harpoon missile does not have the range or survivability to defeat emerging surface threats. Additionally, the US Navy has reduced the number of Harpoon missiles deployed each year; the Navy's ability to effectively implement Harpoon in battle is diminished as compared to the 1980s fleet.

Navy also tested in 2015, a sea-based Tomahawk land attack missile against a moving maritime target. The TLAM, however, requires in-flight communication updates to adjust its flight path. However, It does boast nearly twice the range of the LRASM.

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