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CAE's new digital offering will make military pilot training more efficient



THE PERFECT FIT

SEAGUARDIAN'S ABILITY TO PROVIDE PERSISTENT MARITIME ISR AND FLY IN CIVIL AIRSPACE IS ATTRACTING ATTENTION

► Arun Sivasankaran

General Atomics Aeronautical Systems, Inc.'s (GA-ASI's) MQ-9B is the first remotely piloted aircraft (RPA) that is being developed to fly in civil airspace alongside manned aircraft, but that is not the only reason why the drone has evoked immense interest among militaries in the Asia Pacific, as well as the MENA region.

Both the MQ-9B variants – the land-based SkyGuardian and its maritime variant the SeaGuardian – retain the best features of the MQ-9A and incorporate many enhancements, all designed to make it a truly multi-mission aircraft and not just a strike drone. The nine external hardpoints of the RPA enable it to be used for a wide variety of critical missions, including environmental protection, maritime domain awareness, search and rescue, and military patrol.

Not surprisingly, GA-ASI has seen strong demand for the RPA from various militaries around the world. Reports indicate that India will be the first country to add the SeaGuardian to its arsenal. Other countries in the Asia Pacific are also reportedly eyeing the drone. The RPA has been designed to provide a protective eye and persistent situational awareness across vast maritime domains. It not only gives the military a more cost-effective option than using manned aircraft, but also ensures that aircrew are not put at risk.

Final Stages of Discussion

There is plenty of excitement among military circles in India, as discussions between the U.S. and the country on the potential sale of 22 SeaGuardian drones, which began in 2017, enter the final stages. The addition of the drones is expected to significantly improve the Indian Navy's surveillance capabilities in the strategic Indian Ocean region. According to Indian Navy officials, the addition of the SeaGuardian would provide for greater interoperability with the US and allied forces that use GA-ASI systems. The drone will

also help India develop its credible capabilities, thus helping it in naval power projection. With the drone capable of taking the country's maritime patrol and surveillance missions to the next level, the Indian Navy will also be able to better handle challenges such as cross-border terrorism, narcotics trafficking and piracy.

Meanwhile, the UK Royal Air Force (RAF), which has operated the MQ-9 Reaper RPA over the last ten years, is poised to take delivery of the SkyGuardian, as the Protector RG Mk1, in the early 2020s. "Protector will be a step change for us in terms of capability," says RAF Group Captain Lyndon Jones. "The new aircraft will offer greater range and endurance and will be certified to fly in UK airspace."

Surging Demand

As the UK awaits its first delivery of the SkyGuardian, demand from other parts of the world, including countries that already have the MQ-9 Reaper or other GA-ASI drones, has grown. In November last year, the Belgium government announced that it had approved the start of negotiations with GA-ASI for the sale of the unmanned aerial vehicle. The sale will be based on terms that will be decided during negotiations between the U.S. and Belgian governments. "We look forward to providing our unmanned aircraft systems to meet Belgium's mission requirements, while also supporting the

NATO Alliance," said Linden Blue, GA-ASI CEO. "We are also eager to work with our industrial partners in Belgium on a host of activities ranging from manufacturing to maintenance."

Increasing the market potential of the MQ-9B is the fact that a number of countries, including the U.S., U.K., France and Italy, operate MQ-9A systems. The United Arab Emirates operates the Predator XP RPA while the Spanish Air Force is scheduled to take delivery of MQ-9 systems this year. In July last year, GA-ASI announced that it would deliver its Predator B/MQ-9 Reaper to the Royal Netherlands Defence Force. "SkyGuardian has generated considerable interest with international customers," said Robert Schoeffling, GA-ASI International Strategic Development Regional Director. "Many partner nations view the certifiability of the MQ-9B as the new benchmark for UAS systems."

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Taking it to the Next Level

A ground-up redesign of earlier variants, the multi-mission MQ-9B builds upon the mature system architecture of the MQ-9A and its more than two million flight hours. The enhancements over earlier variants include longer wings. The MQ-9B's wings are 24 meters long, four meters longer than the MQ-9A, giving it greater lift and endurance because of the additional fuel capacity. The wing extension adds two hard-points for a total of nine that can accommodate a maximum external payload of 2,155 kilograms. "GA-ASI envisions the SeaGuardian and SkyGuardian to be effective for both mili-



tary and civilian purposes," said Schoeffling. "Some examples of civilian purposes include security force, critical infrastructure monitoring, resource management such as fisheries, poaching, etc., humanitarian assistance/disaster relief, major event monitoring, communications relay, and broad-area, wide-band communications node."

In the basic Intelligence, Surveillance, and Reconnaissance (ISR) configuration, the standard SeaGuardian is equipped with a high-definition Electro-optical/Infrared (EO/IR) sensor, a high-performance 360° multi-mode maritime radar and Electronic Surveillance Measures (ESM) to support maritime patrol and surveillance missions. It has a range of 6,000-plus nautical miles and an endurance of more than 40 hours. In May 2017, the company flew the MQ-9B for 48.2 hours on 2,721 kg of fuel.

In July last year, the RPA drew worldwide attention to its endurance by becoming the first Medium-altitude, Long-endurance (MALE) RPA system to complete a trans-Atlantic flight when it landed at the Royal Air Force (RAF) Fairford in Gloucestershire, UK. The flight originated from GA-ASI's Flight Test and Training Center in Grand Forks, North Dakota, USA, and covered the 3,760 nautical mile flight in 24 hours, 2 minutes.

Persistent Maritime ISR

Exceptional endurance isn't the only quality that make the SeaGuardian an attractive product for militaries in the Asia Pacific and MENA regions. Equipped with state-of-the-art sensors, the RPA also offers unmatched ISR capabilities for a wide range of operational and threat environments.

"SeaGuardian provides allied nations the ability for persistent surveillance across the vastness of the region at a fraction of the cost associated with same sensor capabilities found on manned platforms," said Schoeffling. "There are multiple nations in the Asia Pacific region that are seriously considering the SeaGuardian."

Capable of operating at Beyond Line of Sight (BLOS) ranges at altitudes over 40,000 feet and in inclement weather conditions, the MQ-9B can also provide EO/IR Full Motion Video (FMV), Synthetic Aperture Radar (SAR) imagery, and Ground Moving Target Indicator

(GMTI) data about potential threats to military commanders in real-time from stand-off ranges without harm to the aircrew. In the maritime role, the platform is equipped with a multi-mode maritime search radar, an Inverse Synthetic Aperture Radar (ISAR) capability, and an Automatic Identification System (AIS) detection capability and ESM that provides a true Maritime Wide Area Search (MWAS) and allows for the identification and interdiction of maritime targets. As part of its efforts to make the SeaGuardian even more attractive for navies, the company is currently working on adding Anti-submarine Warfare (ASW) capability to its capabilities.

Poised to Make History

GA-ASI, which has taken the lead on RPA airworthiness and certification issues, has designed MQ-9B to operate even outside military-controlled airspace and to integrate seamlessly with manned aircraft in non-segregated airspace. The company expects the drone to set a new standard for other RPAS when it achieves



certification in the early 2020s. The aircraft initially will meet NATO STANAG-4671 airworthiness standards, and subsequently will meet commercial airworthiness certification standards in cooperation with the U.S. Federal Aviation Administration (FAA).

The company continues on its aggressive path towards certifying the MQ-9B to fly in civil airspace. “There were two capstone accomplishments in the past year that contribute directly to achieving that goal,” said Schoeffling. “One was accomplishing the first international transit of a MALE UAS through civilian airspace when MQ-9B made its trans-Atlantic flight in July 2018; and the other was the first unaccompanied flight of a UAS in civilian airspace, enabled by a Detect and Avoid (DAA) system, in June 2018. For the DAA flight, a team of NASA and GA-ASI personnel worked with the FAA to receive the first No Chase Certificate of Authorization (COA) to fly a large UAS without a chase plane in airspace shared with manned aircraft.” The aircraft’s ability to share non-segregated airspace with manned aircraft, and coordinate with air traffic control, is due to its extensively-tested DAA system that is made up of a radar, Traffic Collision Avoidance System (TCAS), and Automatic Dependent Surveillance-Broadcast (ADS-B). The aircraft has the ability to blend that surveillance onboard in support of alerting and maneuvering guidance to the pilot in the Ground Control Station (GCS). To comply with STANAG airworthiness requirements for airframe fatigue and integrity, the SeaGuardian and SkyGuardian have been constructed with certified composite materials using riveting and

bonding processes that yield a service life of 40,000 flight hours – double the service life of the MQ-9A aircraft.

The MQ-9B will be controlled by a GCS that will also be certified. The number of key features that have been designed to enhance safety and situational awareness for the remote pilot include the Launch and Recovery Element (LRE), Mission Control Element (MCE), dual control Pilot/Sensor Operator (PSO) stations, full automation or manual “pilot-in-the-loop” operations, and design standards to meet the FAA’s DO-178/DO-254 airborne systems and equipment certification.

ATLC and All-Weather Performance

The SeaGuardian system has Auto Takeoff and Landing Capability (ATLC), which helps minimize the aircraft’s launch and recovery footprint, and reduce manning and equipment requirements at a Forward Operating Base (FOB). This capability allows aircrew on a Main Operating Base (MOB) to land, taxi and launch the aircraft from a separate FOB, requiring only a small team equipped with a ruggedized laptop at the FOB. Both SeaGuardian and SkyGuardian are capable of all-weather day/night operations. The cold weather engine start capability allows ground operations down to -41°C. The drone also has an Electro-expulsive De-icing system (EEDS) for wing leading edges, anti-ice heated engine inlet, heated pitot tube and static ports, and lightning protection.

Delivering More

GA-ASI is also developing an Anti-submarine Warfare (ASW) capability to add to the capabilities of its RPAs. In October 2017, the company demonstrated remote detection and tracking of submerged contacts using an MQ-9A RPA. The drone MQ-9A used sonobuoys to gather acoustic data and track underwater targets. The sonobuoy data was transmitted to the MQ-9A, relayed via SATCOM to the GCS, and then processed at the GCS.

The demonstration successfully paired sonobuoy receiver and data processing technology capability for the MQ-9A. The company is currently working on developing SeaGuardian’s capability to carry and dispense sonobuoys and to transmit the acoustic data via BLOS SATCOM. Once the drone is equipped to do that, navies would be able to use it by itself or to complement other manned maritime patrol aircraft in the hunt for submerged vessels.