



GA-ASI's SkyGuardian

1ST MALE UNMANNED AIRCRAFT TO FLY ACROSS ATLANTIC

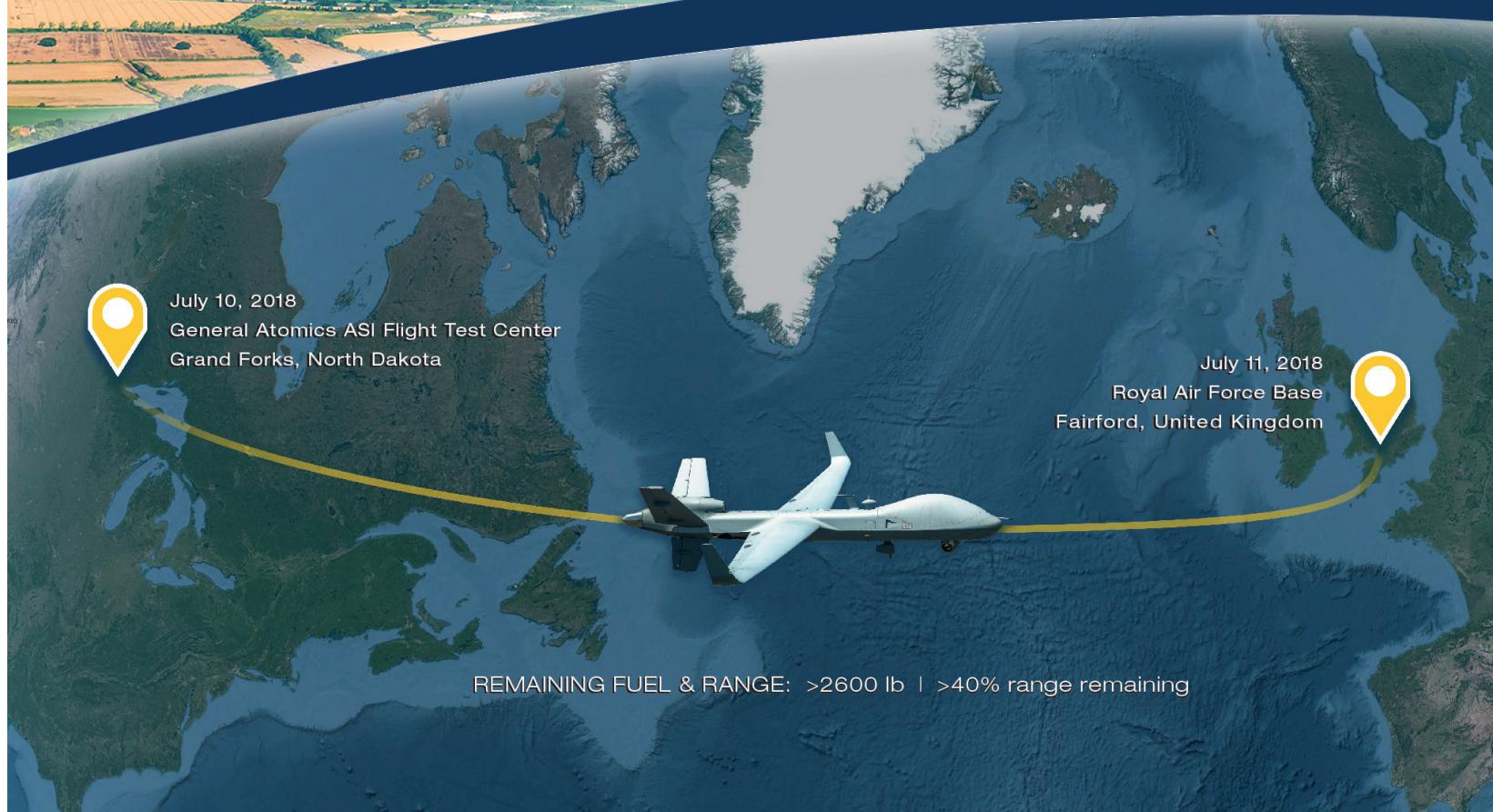
On July 11th, MQ-9B SkyGuardian became the first Medium-altitude, Long-endurance (MALE) Remotely Piloted Aircraft System (RPAS) to complete a trans-Atlantic flight when it landed at the Royal Air Force (RAF) Fairford in Gloucestershire, UK. The historic flight was made using a developmental aircraft from General Atomics Aeronautical Systems, Inc. (GA-ASI), the designer and manufacturer of MQ-9B SkyGuardian. The flight originated from GA-ASI's Flight Test and Training Center in Grand Forks, North Dakota, USA.

The flight adds to the growing list of historic accomplishments by GA-ASI, the global leader in RPAS, which includes the Predator® series. MQ-9B will become the world's most advanced RPAS when it is delivered to the RAF as the PROTECTOR RG Mk1 in the early 2020s.

The flight across the Atlantic represents a significant view of the future of military air power, which is particularly poignant as the RAF celebrates its centenary year under the banner of RAF100. Indeed, the RAF has operated RPAS for 10% of its existence with 2017 marking 10 years of partnership with GA-ASI and the MQ-9 Reaper® delivering more than 100,000 hours of operational missions.

MQ-9 Reaper will continue to support RAF operations until they are replaced by PROTECTOR. "PROTECTOR will be a step change for us in terms of capability," said RAF Group Captain Lyndon Jones. "The new aircraft will offer greater range and endurance, greater weapon capabilities and will be certified to fly in UK airspace."

A HISTORIC TRANSATLANTIC FLIGHT



REMAINING FUEL & RANGE: >2600 lb | >40% range remaining

Airworthiness certification

SkyGuardian was first conceived as a development program by GA-ASI using Internal Research and Development (IRAD) funding. One of the driving principles was to deliver a RPAS that would become the first unmanned system to achieve airworthiness approval to fly in civilian airspace. The UK will lead the way, followed by other military and civil aviation authorities around the world.

"We took a clean-sheet approach to the design of SkyGuardian," said Linden Blue, CEO, GA-ASI. "In order to achieve our objective of developing an aircraft certified to fly in civil airspace, the airframe had to conform to strict requirements, many of which are the same as traditional passenger aircraft."

SkyGuardian's airframe is designed to withstand lightning strikes, as well as meet damage-tolerance and turbulence-induced stress requirements specified by the NATO

airworthiness standards (STANAG-4671). Numerous technologies and design attributes have been incorporated into SkyGuardian to meet global certification standards. To comply with NATO STANAG-4671 requirements for airframe fatigue and integrity, the SkyGuardian development aircraft and subsequent production aircraft will be constructed with certified composite materials using riveting and bonding processes that yield a service life of 40,000 flight hours.

SkyGuardian will be fitted with a GA-ASI-developed Detect and Avoid (DAA) system comprised of an air-to-air radar, Traffic Collision Avoidance System (TCAS), Automatic Dependent Surveillance-Broadcast (ADS-B), and the ability to blend that surveillance onboard in support of alerting and providing maneuvering guidance to the pilot in the Ground Control Station (GCS). The DAA enables the aircraft to detect other platforms and safely remain 'well clear' in coordination with air traffic control.

DAA has already gone through considerable initial testing on MQ-9 aircraft being operated by NASA and the U.S. Department of Homeland Security (DHS)/Customs and Border Protection (CBP), as well as the GA-ASI SkyGuardian development aircraft. Earlier this year, the U.S. Federal Aviation Administration (FAA) approved the flight of NASA's DAA-equipped Ikhana MQ-9 into non-segregated civil airspace without a chase airplane. This pioneering flight occurred in California on June 12th.

SkyGuardian will initially meet the STANAG airworthiness standards, and will subsequently seek approval and certification from other airworthiness authorities.

GA-ASI's Advanced Certifiable GCS, the company's next-generation GCS, also has been modified to meet airworthiness approval requirements with some hardware changes required for flight-critical functions similar to what is seen on today's modern business aircraft.

Multi-mission flexibility

SkyGuardian is a multi-mission aircraft with nine hardpoints to provide unmatched configurability to meet a wide array of mission requirements.

In 2017, SkyGuardian development aircraft set a new endurance record for GA-ASI RPAs when it flew for more than 48 consecutive hours with a clean airframe. This unprecedented level of endurance enables SkyGuardian to provide persistent Intelligence, Surveillance, and Reconnaissance (ISR) at a significantly lower cost than is possible when the aircraft operates with an onboard crew. Additionally, the RPAS can use its endurance to reach areas

that are far from base, at a fraction of the cost of dispatching alternative aircraft, allowing commanders to build a much greater level of situational awareness and pattern of life than other time-constrained aircraft.

In basic ISR configuration, SkyGuardian will have a high-definition Electro-optical/Infrared (EO/IR) sensor and GA-ASI's Lynx® Multi-mode Radar. This configuration provides highly detailed intelligence from a significant standoff range. Other advanced technologies, such as change detection, allow the exploitation of raw data to meet a variety of military requirements, and are particularly applicable to the changing nature of the future battlefield.

SkyGuardian was created to be certifiable in the non-segregated airspace and to deliver multi-mission capability, leveraging GA-ASI's Predator family legacy of more than five million flight hours, 90% of which have been flown in combat. The U.S. Air Force, U.S. Army, UAE, France, Italy, the United Kingdom, and others are currently flying the Predator series in theatre.

Maritime features

SkyGuardian has an optional maritime radar that has been fielded on U.S. DHS's MQ-9 aircraft, though this is not currently a part of the UK programme. This maritime kit can host a variety of radars, including those manufactured by Raytheon or Leonardo, providing long-range surveillance, coastal surveillance, small target detection, and search and rescue operations. Further aiding maritime surveillance, MQ-9B can be fitted with an Automatic Identification System (AIS) transponder to provide positive identification of vessels.



MQ-9B SkyGuardian in Flight

The new RPAS can also be configured for Signals Intelligence (SIGINT) missions. Payloads can include Electronic Support Measures (ESM), Radar Warning Receivers (RWR), and a variety of SIGINT packages. The aircraft also will be capable of using the Link-16 military tactical data exchange network.

GA-ASI is also developing an Anti-submarine Warfare (ASW) capability. In 2017, the company demonstrated remote detection and tracking of submerged contacts using an MQ-9. The MQ-9 used sonobuoys to gather acoustic data and track underwater targets. The data was transmitted to the MQ-9, processed onboard, and then relayed to the aircraft's GCS. The demonstration successfully paired sonobuoy receiver and data processing technology onboard the MQ-9. Continuing development offers yet another cost-efficient capability to complement manned maritime patrol aircraft in the prosecution of submerged vessels. Future developments are planned to include SkyGuardian's ability to carry and dispense sonobuoys, and related payloads.

Game-changing capabilities

SATCOM Auto Takeoff and Landing Capability (ATLC) is part of the MQ-9B SkyGuardian package, designed to help minimize the aircraft's launch and recovery footprint, thereby reducing manning and equipment requirements at a Forward Operating Base (FOB). This capability enables operational flexibility and 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.

SkyGuardian is capable of all-weather day/night operations. The cold weather engine start capability allows ground operations down to -41°C. Cold weather capability includes 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.

History of performance

GA-ASI has delivered more than 800 aircraft and over 300 GCS. Every second of every day, close to 70 GA-ASI aircraft are flying in support of a variety of missions around the globe.

MQ-9B offers persistent situational awareness across vast domains. It does this without putting aircrew at risk of direct enemy action and is more cost-effective than aircraft with on-board crews. Interoperability with other

NATO assets and its multi-mission capability makes it a valued asset in a variety of scenarios – from environmental protection and maritime domain awareness to search and rescue and military surveillance. Perhaps most significantly for the RAF, it is being developed to fly in civil airspace, which will enable unrivaled aid to the civilian authorities, including humanitarian assistance and disaster relief, border protection and security, coastal survey and protection, search and rescue and even monitoring flood defenses that are notable uses in the UK.

"We worked with GA-ASI right from the outset to be able to meet all of the stringent UK laws and regulations that surround certification," said Group Captain Jones. "I know lots of countries are watching us do this. Those countries know that when the UK's stringent regulations are met, then it will meet the requirements from anywhere else in the world."

It is the RAF's commitment to the future of air power and the strength of the RAF/GA-ASI partnership has delivered this latest RPA milestone: the completion of the first trans-Atlantic flight. With more important steps to be taken and achievements to be completed, the RAF and GA-ASI look forward to fielding PROTECTOR RG Mk1.

PROTECTOR  ga-asi.com

CREW: 3 [Pilot, Sensor Operator, Mission Intelligence Coordinator]

WING SPAN: 79 ft | 24 m
LENGTH: 38 ft | 11.7 m
TAKEOFF WEIGHT: 12,500 lb | 5,670 kg

MAX. ENDURANCE: 40+ hours
MAX. ALTITUDE: 40,000 ft MSL
MAX. AIRSPEED: 210 KTAS

PLANNED WEAPONS

Brimstone Precision Guided Missile

Paveway IV 500 lb Precision Guided Munition

