Global Hawk Drone Northrop Grumman RQ-4

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| **RQ-4 Global Hawk** |
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| An RQ-4 Global Hawk flying in 2007 |
| **Role** | [Surveillance](https://en.wikipedia.org/wiki/Surveillance_aircraft) [UAV](https://en.wikipedia.org/wiki/Unmanned_aerial_vehicle) |
| **National origin** | [United States](https://en.wikipedia.org/wiki/United_States) |
| **Manufacturer** | [Northrop Grumman](https://en.wikipedia.org/wiki/Northrop_Grumman) |
| **First flight** | 28 February 1998 |
| **Status** | In service |
| **Primary users** | [United States Air Force](https://en.wikipedia.org/wiki/United_States_Air_Force)[NASA](https://en.wikipedia.org/wiki/NASA)[NATO](https://en.wikipedia.org/wiki/NATO) |
| **Produced** | 1998-present |
| **Number built** | 42 RQ-4Bs as of FY2013 |
| **Program cost** | US$10 billion (USAF cost through FY2014)  |
| **Unit cost** | US$131.4M (FY13) US$222.7M (with R&D)  |
| **Developed into** | [Northrop Grumman MQ-4C Triton](https://en.wikipedia.org/wiki/Northrop_Grumman_MQ-4C_Triton) |

The **Northrop Grumman RQ-4 Global Hawk** is an [unmanned](https://en.wikipedia.org/wiki/Unmanned_aerial_vehicle) (UAV) [surveillance aircraft](https://en.wikipedia.org/wiki/Surveillance_aircraft). It was initially designed by [Ryan Aeronautical](https://en.wikipedia.org/wiki/Ryan_Aeronautical) (now part of [Northrop Grumman](https://en.wikipedia.org/wiki/Northrop_Grumman)), and known as **Tier II+** during development. The Global Hawk performs a similar role as the [Lockheed U-2](https://en.wikipedia.org/wiki/Lockheed_U-2). The RQ-4 provides a broad overview and systematic surveillance using high-resolution [synthetic aperture radar](https://en.wikipedia.org/wiki/Synthetic_aperture_radar) (SAR) and long-range electro-optical/infrared (EO/IR) sensors with long [loiter](https://en.wikipedia.org/wiki/Loiter_%28aeronautics%29) times over target areas. It can survey as much as 40,000 square miles (100,000 km2) of terrain a day.

The Global Hawk is operated by the [United States Air Force](https://en.wikipedia.org/wiki/United_States_Air_Force). It is used as a [high-altitude platform](https://en.wikipedia.org/wiki/High-altitude_platform) covering the spectrum of [intelligence collection](https://en.wikipedia.org/wiki/Intelligence_collection) capability to support forces in worldwide military operations. According to the United States Air Force, the superior surveillance capabilities of the aircraft allow more precise weapons targeting and better protection of friendly forces. Cost overruns led to the original plan to acquire 63 aircraft being cut to 45, and to a 2013 proposal to mothball the 21 [Block](https://en.wikipedia.org/wiki/1962_United_States_Tri-Service_aircraft_designation_system#Block_number) 30 [signals intelligence](https://en.wikipedia.org/wiki/Signals_intelligence) variants. Each aircraft was to cost US$60.9 million in 2001, but this had risen to $222.7 million per aircraft (including development costs) by 2013. The [U.S. Navy](https://en.wikipedia.org/wiki/United_States_Navy) has developed the Global Hawk into the [MQ-4C Triton](https://en.wikipedia.org/wiki/Northrop_Grumman_MQ-4C_Triton) maritime surveillance platform.

The Global Hawk took its first flight on 28 February 1998. The first seven aircraft were built under the Advanced Concept Technology Demonstration (ACTD) program, sponsored by [DARPA](https://en.wikipedia.org/wiki/DARPA), in order to evaluate the design and demonstrate its capabilities. Demand for the RQ-4's abilities was high in the Middle East; thus, the prototype aircraft were actively operated by the U.S. Air Force in the [War in Afghanistan](https://en.wikipedia.org/wiki/War_in_Afghanistan_%282001%E2%80%93present%29). In an unusual move, the aircraft entered initial low-rate production while still in engineering and manufacturing development. Nine production Block 10 aircraft, sometimes referred to as RQ-4A, were produced; of these, two were sold to the US Navy and an additional two were deployed to [Iraq](https://en.wikipedia.org/wiki/Iraq) to support operations there. The final Block 10 aircraft was delivered on 26 June 2006.

In order to increase the aircraft's capabilities, the airframe was redesigned, with the nose section and wings being stretched. The modified aircraft, designated RQ-4B Block 20, can carry up to 3,000 lb. (1,360 kg) of internal payload. These changes were introduced with the first Block 20 aircraft, the 17th Global Hawk produced, which was rolled out in a ceremony on 25 August 2006. First flight of the Block 20 from the USAF [Plant 42](https://en.wikipedia.org/wiki/Plant_42) in [Palmdale, California](https://en.wikipedia.org/wiki/Palmdale%2C_California) to [Edwards Air Force Base](https://en.wikipedia.org/wiki/Edwards_Air_Force_Base) took place on 1 March 2007. Developmental testing of Block 20 took place in 2008.

**United States Navy version**

*Main article:*[*Northrop Grumman MQ-4C Triton*](https://en.wikipedia.org/wiki/Northrop_Grumman_MQ-4C_Triton)

The prototype MQ-4C on its first flight

The [United States Navy](https://en.wikipedia.org/wiki/United_States_Navy) took delivery of two of the Block 10 aircraft to evaluate their [maritime surveillance](https://en.wikipedia.org/wiki/Maritime_patrol) capabilities, designated N-1 (BuNo 166509) and N-2 (BuNo 166510). The initial navalised example was tested at Edwards Air Force Base briefly, before moving to [NAS Patuxent River](https://en.wikipedia.org/wiki/Naval_Air_Station_Patuxent_River) in March 2006 for the Global Hawk Maritime Demonstration (GHMD) program, operated by Navy squadron [VX-20](https://en.wikipedia.org/wiki/VX-20). In July 2006, the GHMD aircraft flew in the Rim of the Pacific ([RIMPAC](https://en.wikipedia.org/wiki/RIMPAC)) exercise for the first time; although it was in the vicinity of [Hawaii](https://en.wikipedia.org/wiki/Hawaii), the aircraft was operated from Edwards, requiring flights of approximately 2,500 mi (4,000 km) each way to the area. Four flights were performed, resulting in over 24 hours of persistent maritime surveillance coordinated with [*Abraham Lincoln*](https://en.wikipedia.org/wiki/USS_Abraham_Lincoln_%28CVN-72%29) and [*Bonhomme Richard*](https://en.wikipedia.org/wiki/USS_Bonhomme_Richard_%28LHD-6%29). For the GHMD program, the Global Hawk was tasked with maintaining maritime situational awareness, contact tracking, and imagery support of exercise operations. Images were transmitted to NAS Patuxent River for processing and then forwarded to the fleet off Hawaii.

Northrop Grumman entered a RQ-4B variant in the US Navy's [Broad Area Maritime Surveillance](https://en.wikipedia.org/wiki/Broad_Area_Maritime_Surveillance) (BAMS) UAV competition. On 22 April 2008, it was announced that Northrop Grumman's *RQ-4N* had won and that the Navy had awarded a US$1.16 billion contract. In September 2010, the RQ-4N was officially designated the *MQ-4C*. The Navy MQ-4C differs from the Air Force RQ-4 mainly in its wing. While the Global Hawk remains at high altitude to conduct surveillance, the Triton climbs to 50,000 ft to see a wide area and can drop to 10,000 ft to get further identification of a target. The Triton's wings are specially designed to take the stresses of rapidly decreasing altitude. Though similar in appearance to the Global Hawk's wings, the Triton's internal wing structure is much stronger and has additional features including anti-icing capabilities and impact and lightning strike protection.

**Cost increases and procurement**

Development [cost overruns](https://en.wikipedia.org/wiki/Cost_overrun) placed the Global Hawk at risk of cancellation. In mid-2006, per-unit costs were 25% over baseline estimates, caused by both the need to correct design deficiencies as well as to increase its capabilities. This caused concern over a possible congressional termination of the program if its national security benefits could not be justified. However, in June 2006, the program was restructured. Completion of an operational assessment report by the USAF was delayed from August 2005-November 2007 due to manufacturing and development delays. The operational assessment report was released in March 2007 and production of the 54 air vehicles planned was extended by two years to 2015.

A maintenance crew preparing a Global Hawk at [Beale Air Force Base](https://en.wikipedia.org/wiki/Beale_Air_Force_Base)

In February 2011, the USAF reduced its planned purchase of RQ-4 Block 40 aircraft from 22 to 11 in order to cut costs. In June 2011, the U.S. Defense Department's [Director, Operational Test and Evaluation](https://en.wikipedia.org/wiki/Director%2C_Operational_Test_and_Evaluation) (DOT&E) found the RQ-4B "not operationally effective" due to reliability issues. In June 2011, the Global Hawk was certified by the Secretary of Defense as critical to national security following a breach of the [Nunn-McCurdy Amendment](https://en.wikipedia.org/wiki/Nunn-McCurdy_Amendment); the Secretary stated: "The Global Hawk is essential to national security; there are no alternatives to Global Hawk which provide acceptable capability at less cost; Global Hawk costs $220M less per year than the U-2 to operate on a comparable mission; the U-2 cannot simultaneously carry the same sensors as the Global Hawk; and if funding must be reduced, Global Hawk has a higher priority over other programs."

On 26 January 2012, the Pentagon announced plans to end Global Hawk Block 30 procurement as the type was found to be more expensive to operate and with less capable sensors than the existing U-2. Plans to increase procurement of the Block 40 variant were also announced. The Air Force's fiscal year 2013 budget request said it had resolved to divest itself of the Block 30 variant; however, the [National Defense Authorization Act for Fiscal Year 2013](https://en.wikipedia.org/wiki/National_Defense_Authorization_Act_for_Fiscal_Year_2013) mandated operations of the Block 30 fleet through the end of 2014. The USAF plans to procure 45 RQ-4B Global Hawks as of 2013. Before retiring in 2014, ACC commander, General Mike Hostage said of the U-2's replacement by the drone that "The combatant commanders are going to suffer for eight years and the best they’re going to get is 90 percent".

From 2010-2013, costs of flying the RQ-4 fell by more than 50%. In 2010, the cost per flight hour was $40,600, with contractor logistic support making up $25,000 per flight hour of this figure. By mid-2013, cost per flight hour dropped to $18,900, contractor logistic support having dropped to $11,000 per flight hour. This was in part due to higher usage, spreading logistics and support costs over a higher number of flight hours.

**EuroHawk**

EuroHawk at the [ILA](https://en.wikipedia.org/wiki/Berlin_Air_Show) 2012

The [German Air Force](https://en.wikipedia.org/wiki/German_Air_Force) (*Luftwaffe*) ordered a variant of the RQ-4B, to be equipped with a customized sensor suite, designated *EuroHawk*. The aircraft was based on the RQ-4B Block 20/30/40 and was to be equipped with an [EADS](https://en.wikipedia.org/wiki/EADS)-built [SIGINT](https://en.wikipedia.org/wiki/Signal_intelligence) package; it was intended to fulfill Germany's requirement to replace their aging [Dassault-Breguet](https://en.wikipedia.org/wiki/Dassault_Aviation) [Atlantique](https://en.wikipedia.org/wiki/Breguet_Atlantique)electronic surveillance aircraft of the [Marineflieger](https://en.wikipedia.org/wiki/Marineflieger) (*German Naval Air Arm*). The EADS sensor package is composed of six wing-mounted pods; reportedly these sensor pods could potentially be used on other platforms, including manned aircraft.

The EuroHawk was officially rolled out on 8 October 2009 and its first flight took place on 29 June 2010. It underwent several months of flight testing at [Edwards Air Force Base](https://en.wikipedia.org/wiki/Edwards_Air_Force_Base). On 21 July 2011, the first EuroHawk arrived in [Manching](https://en.wikipedia.org/wiki/Manching), [Germany](https://en.wikipedia.org/wiki/Germany); after which it was scheduled to receive its SIGINT sensor package and undergo further testing and pilot training until the first quarter of 2012. The Luftwaffe planned to station the type with [Reconnaissance Wing 51](https://en.wikipedia.org/wiki/Taktisches_Luftwaffengeschwader_51). In 2011 the German ministry of defense was aware of difficulties with the certification for use within the European airspace. During flight trials, problems with the EuroHawk's flight control system were found; the German certification process was also complicated by Northrop Grumman refusing to share technical data on the aircraft with which to perform evaluations.

On 13 May 2013, German media reported that the EuroHawk would not be certifiable under [ICAO](https://en.wikipedia.org/wiki/ICAO) rules without an anti-collision system; thus preventing any operations within European airspace or the airspace of any ICAO member. The additional cost of certification was reported to be more than [€](https://en.wikipedia.org/wiki/%E2%82%AC)600 million (US$780 million). On 15 May 2013, the German government announced the immediate termination of the program, attributing the cancellation to the certification issue. Reportedly, the additional cost to develop the EuroHawk to the standards needed for certification may not have guaranteed final approval for certification. German defense minister [Thomas de Maizière](https://en.wikipedia.org/wiki/Thomas_de_Maizi%C3%A8re) stated EuroHawk was "very important" for Germany in 2012, then referred to the project as being "a horror without end" in his 2013 statement to the [Bundestag](https://en.wikipedia.org/wiki/Bundestag). The total cost of the project before it was canceled was €562 million. Northrop Grumman and EADS have described reports of flight control problems and high costs for certification as "inaccurate"; they have stated their intention to provide an affordable plan to complete the first EuroHawk's flight testing and produce the remaining four aircraft.

On 8 August 2013, the EuroHawk set an endurance record by flying continuously in European airspace for 25.3 hours, reaching an altitude of 58,600 feet (17,900 m). It was the longest flight by an unrefueled UAS weighing more than 30,000 lb. (14,000 kg) in European skies. On 5 October 2014, German [Minister of Defense](https://en.wikipedia.org/wiki/Federal_Ministry_of_Defence_%28Germany%29) [Ursula von der Leyen](https://en.wikipedia.org/wiki/Ursula_von_der_Leyen) was reportedly considering reactivating the EuroHawk program to test its reconnaissance abilities over a long period at altitudes of up to 20,000 m (66,000 ft). Attempting to test the recon system on Airbus aircraft and an Israeli drone as alternate platforms had proven unsuccessful. The [Bundeswehr](https://en.wikipedia.org/wiki/Bundeswehr) would use it to detect, decrypt, and potentially interfere with enemy communications signals. If tests prove successful, a carrier would be purchased, likely "similar" to the U.S. Global Hawk. Germany is considering installing the EuroHawk's SIGINT payloads onto the [U.S. Navy](https://en.wikipedia.org/wiki/U.S._Navy) [MQ-4C Triton](https://en.wikipedia.org/wiki/MQ-4C_Triton) Global Hawk derivative, as the electronic and communications intelligence sensors would be more difficult to place on other substitute aircraft. It already has icing and lightning-strike protection, and was built with certification over civilian airspace in mind, meeting the [STANAG 4671](https://en.wikipedia.org/wiki/NATO_STANAG_4671) requirements that had ended the EuroHawk program.

**Universal Payload Adapter and new payloads**

In January 2014, President Obama signed a budget that included a $10 million study on adapting the [U-2](https://en.wikipedia.org/wiki/Lockheed_U-2)'s superior sensors for the RQ-4. In April 2015, Northrop Grumman reportedly installed the U-2's [Optical Bar Camera](https://en.wikipedia.org/wiki/KA-80_Optical_Bar_Camera) (OBC) and [Senior Year Electro-Optical Reconnaissance System](https://en.wikipedia.org/wiki/Senior_Year_Electro-Optical_Reconnaissance_System) (SYERS-2B/C) sensors onto the RQ-4 using a Universal Payload Adapter (UPA). Successful testing indicated that all RQ-4s could be similarly retrofitted.

On 14 July 2015, Northrop Grumman and the USAF signed an agreement to demonstrate an RQ-4B fitted with the U-2's OBC and SYERS-2C sensors; two Global Hawks are to be fitted with the UPA, involving the installation of 17 payload adapter fixtures and a new payload bay cover, as well as software and mission system changes for each sensor. The UPA can support 1,200 lb. (540 kg) of sensors and will create a canoe-shaped sensor bay on the fuselage's underside. The RQ-4's ability to operate these sensors will likely influence the U-2's planned retirement by 2019. In addition, Northrop also expects to receive a contract to integrate the [UTC Aerospace Systems](https://en.wikipedia.org/wiki/UTC_Aerospace_Systems) MS-177 multispectral sensor used on the [E-8C JSTARS](https://en.wikipedia.org/wiki/E-8_Joint_STARS) onto the RQ-4; the MS-177 will replace the SYERS-2 and includes modernized optronics and a gimbaled rotation device to increase field of view by 20 percent. The RQ-4B flew with the SYERS-2 on 18 February 2016.

Design

Northrop Grumman RQ-4 Global Hawk parts

**Overview**

The Global Hawk UAV system comprises the RQ-4 air vehicle, which is outfitted with various equipment such as sensor packages and communication systems; and a ground element consisting of a Launch and Recovery Element (LRE), and a Mission Control Element (MCE) with ground communications equipment. Each RQ-4 air vehicle is powered by an [Allison Rolls-Royce](https://en.wikipedia.org/wiki/Rolls-Royce_Holdings) [AE3007H](https://en.wikipedia.org/wiki/Rolls-Royce_AE_3007) [turbofan](https://en.wikipedia.org/wiki/Turbofan) engine with 7,050 lbf (31.4 kN) thrust, and carries a payload of 2,000 pounds (910 kilograms). The fuselage comprises an aluminum, semi-monocoque construction with [V-tail](https://en.wikipedia.org/wiki/V-tail); the wings are made of composite materials.

There have been several iterations of the Global Hawk with different features and capabilities. The first version to be used operationally was the RQ-4A Block 10, which performed [imagery intelligence](https://en.wikipedia.org/wiki/Imagery_intelligence) (IMINT) with a 2,000 lb. (910 kg) payload of a [synthetic aperture radar](https://en.wikipedia.org/wiki/Synthetic_aperture_radar) (SAR) with [electro-optical](https://en.wikipedia.org/wiki/Electro-optics) (EO) and [infrared](https://en.wikipedia.org/wiki/Infrared_camera) (IR) sensors; seven A-model Block 10s were delivered and all were retired by 2011. The RQ-4B Block 20 was the first of the B-model Global Hawks, which has a greater 3,000 lb. (1,400 kg) payload and employs upgraded SAR and EO/IR sensors; four Block 20s were converted into communications relays with the [Battlefield Airborne Communications Node](https://en.wikipedia.org/wiki/Battlefield_Airborne_Communications_Node) (BACN) payload. The RQ-4B Block 30 is capable of multi-intelligence (multi-INT) collecting with SAR and EO/IR sensors along with the Airborne Signals Intelligence Payload (ASIP), a wide-spectrum [signals intelligence](https://en.wikipedia.org/wiki/Signals_intelligence) (SIGINT) sensor. The RQ-4B Block 40 is equipped with the multi-platform radar technology insertion program (MP-RTIP) [active electronically scanned array](https://en.wikipedia.org/wiki/Active_electronically_scanned_array) (AESA) radar, which provides SAR and [moving target indication](https://en.wikipedia.org/wiki/Moving_target_indication) (MTI) data for wide-area surveillance of stationary and moving targets.

Since the RQ-4 is capable of conducting sorties lasting up to 30 hours long, scheduled maintenance has to be performed sooner than on other aircraft with less endurance. However, since it flies at higher altitudes than normal aircraft, it experiences less wear during flight.

**System and ground facilities**

[Raytheon](https://en.wikipedia.org/wiki/Raytheon)'s Integrated Sensor Suite (ISS) consists of a synthetic aperture radar (SAR), electro-optical (EO), and thermographic camera (IR) sensors. Either the EO or the IR sensors can operate simultaneously with the SAR. Each sensor provides wide area search imagery and a high-resolution spot mode. The SAR has a [ground moving target indicator (GMTI)](https://en.wikipedia.org/wiki/Moving_target_indication) mode, which can provide a text message providing the moving target's position and velocity. Both SAR and EO/IR imagery are transmitted from the aircraft to the MCE as individual frames, and reassembled during ground processing. An onboard inertial navigation system, supplemented by [Global Positioning System](https://en.wikipedia.org/wiki/Global_Positioning_System) updates, comprises the navigational suite.

Global Hawk is capable to operate autonomously and "[untethered](https://en.wikipedia.org/w/index.php?title=Untethered_device&action=edit&redlink=1)". A [military satellite](https://en.wikipedia.org/wiki/Military_satellite) system ([X Band Satellite Communication](https://en.wikipedia.org/wiki/X_Band_Satellite_Communication)) is used for sending data from the aircraft to the MCE. The common data link can also be used for direct down link of imagery when the UAV is within line-of-sight of compatible ground stations. For dense flight areas the autonomous navigation is switched off and the RQ-4 is remote controlled via the satellite link by pilots on the ground who are supplied with the same instrument data and who carry the same responsibilities as pilots in manned planes.

The [ground segment](https://en.wikipedia.org/wiki/Ground_segment) consists of a [Mission Control Element](https://en.wikipedia.org/wiki/Mission_control_center) (MCE) and Launch and Recovery Element (LRE), provided by Raytheon. The MCE is used for mission planning, [command and control](https://en.wikipedia.org/wiki/Command_and_control), and [image processing](https://en.wikipedia.org/wiki/Image_processing) and dissemination; an LRE for controlling launch and recovery; and associated ground support equipment. The LRE provides precision [Differential GPS](https://en.wikipedia.org/wiki/Differential_GPS) corrections for navigational accuracy during takeoff and landings, while precision coded GPS supplemented with an [inertial navigation system](https://en.wikipedia.org/wiki/Inertial_navigation_system) is used during mission execution. By having separable elements in the ground segment, the MCE and the LRE can operate in geographically separate locations, and the MCE can be deployed with the supported command's primary exploitation site. Both ground segments are contained in military shelters with external antennas for line-of-sight and [satellite communications](https://en.wikipedia.org/wiki/Satellite_communication) with the air vehicles.

**Sensor packages**

Photograph taken by US Navy Global Hawk with an aerial view of wildfires in Northern California, 2008

**Radar**

*Main article:*[*Airborne ground surveillance*](https://en.wikipedia.org/wiki/Airborne_ground_surveillance)

The Global Hawk carries the Hughes Integrated Surveillance & Reconnaissance (HISAR) sensor system. HISAR is a lower-cost derivative of the ASARS-2 package that Hughes developed for the [Lockheed U-2](https://en.wikipedia.org/wiki/Lockheed_U-2). It is also fitted in the US Army's [RC-7B](https://en.wikipedia.org/wiki/De_Havilland_Canada_Dash_7) Airborne Reconnaissance Low Multifunction (ARLM) manned aircraft, and is being sold on the international market. HISAR integrates a [SAR](https://en.wikipedia.org/wiki/Synthetic_aperture_radar)-[MTI](https://en.wikipedia.org/wiki/Moving_target_indication) system, along with an optical and an [thermography](https://en.wikipedia.org/wiki/Thermography) imager. All three sensors are controlled and their outputs filtered by a common processor and transmitted in real time at up to 50 Mbit/s to a ground station. The SAR-MTI system operates in the [X band](https://en.wikipedia.org/wiki/X_band) in various operational modes; such as the wide-area MTI mode with a radius of 62 mi (100 km), combined SAR-MTI strip mode provides 20 ft (6.1 m) resolution over 23 mi (37 km) wide sections, and a SAR spot mode providing 6 ft (1.8 m) resolution over 3.8 square miles (9.8 square kilometers).

In July 2006, the US Air Force began testing the Global Hawk Block 30 upgrades in the [Benefield Anechoic Facility](https://en.wikipedia.org/wiki/Benefield_Anechoic_Facility) at [Edwards AFB](https://en.wikipedia.org/wiki/Edwards_AFB); such as the Advanced Signals Intelligence Payload, an extremely sensitive [SIGINT](https://en.wikipedia.org/wiki/Signal_intelligence) processor. In 2006, a specialist [active electronically scanned array](https://en.wikipedia.org/wiki/Active_electronically_scanned_array) radar system, the [Multi-Platform Radar Technology Insertion Program](https://en.wikipedia.org/wiki/Multi-Platform_Radar_Technology_Insertion_Program), or MP-RTIP, began testing on the [Scaled Composites Proteus](https://en.wikipedia.org/wiki/Scaled_Composites_Proteus); one modified Global Hawk shall carry the radar following validation. In 2010, Northrop spoke on the sensor capabilities of the new Block 40 aircraft, including MP-RTIP radar, emphasizing surveillance over reconnaissance.

On 14 April 2014, a Block 40 Global Hawk completed the first [Maritime Modes](https://en.wikipedia.org/wiki/Maritime_patrol) program risk reduction flight to enhance the Air Force's maritime surveillance capabilities. Maritime Modes is made up of a Maritime Moving Target Indicator and a Maritime [Inverse synthetic aperture radar](https://en.wikipedia.org/wiki/Inverse_synthetic_aperture_radar) (MISAR) that function together to provide ISR information on vessels traveling on the water's surface. During the 11.5 hour flight off of the California coast, the MISAR collected data on over 100 items of interest. Maritime Modes is planned to be integrated with the RQ-4B's existing MP-RTIP radar to detect and produce synthetic aperture [radar imagery](https://en.wikipedia.org/wiki/Radar_imagery) of ground vehicles.

In November 2015, Northrop Grumman selected the [Garmin International](https://en.wikipedia.org/wiki/Garmin_International) GSX 70 weather radar to be installed on Air Force Global Hawks. The GSX 70 is designed to provide operators with real-time weather information, offering horizontal scan angles of up to 120 degrees for better visibility into the strength and intensity of convective activity and a vertical scanning mode to analyze storm tops, gradients, and cell buildup activity. It also has a Turbulence Detection feature to identify turbulence in air containing precipitation and other airborne particulates and Ground Clutter Suppression that removes ground returns from the display so operators can focus on weather. Installation is expected to begin in early 2016.

**Visible light/infrared**

The visible and infrared imagers share the same gimballed sensor package, and use common optics, providing a telescopic close-up capability. It can be optionally fitted with an auxiliary [Signals intelligence](https://en.wikipedia.org/wiki/Signals_intelligence) package. To improve survivability, the Global Hawk is fitted with a Raytheon developed [AN/ALR-89](https://en.wikipedia.org/w/index.php?title=AN/ALR-89&action=edit&redlink=1) self-protection suite consisting of the AN/AVR-3 [Laser warning receiver](https://en.wikipedia.org/wiki/Laser_warning_receiver), AN/APR-49 [Radar warning receiver](https://en.wikipedia.org/wiki/Radar_warning_receiver) and a jamming system. An [ALE-50 towed decoy](https://en.wikipedia.org/wiki/ALE-50) also aids in the deception of enemy air defenses.

**Nuclear power**

Sandia National Laboratories and Northrop Grumman have studied the possibility of equipping the Global Hawk with a nuclear power plant with US Air Force Research Laboratory funding. A nuclear powered Global Hawk would have a very large range and endurance, and more power for on-board systems. Apart from the technical feasibility, the major drawback however is the fact that drones sometimes crash. So whether this type of propulsion will ever be used on Global Hawk (or any aircraft) is questionable.

Operational history

**U.S. Air Force**

Following the [September 11th attacks](https://en.wikipedia.org/wiki/September_11th_attacks), the normal acquisition process was ditched almost immediately and early developmental Global Hawk models were employed in overseas contingency operations beginning in November 2001. Global Hawk ATCD prototypes were used in the [War in Afghanistan](https://en.wikipedia.org/wiki/War_in_Afghanistan_%282001%E2%80%93present%29) and in the [Iraq War](https://en.wikipedia.org/wiki/Iraq_War). Since April 2010, they fly the Northern Route, from Beale AFB over Canada to South-East Asia and back, reducing flight time and improving maintenance. While their data-collection capabilities have been praised, the program lost three prototype aircraft to accidents, more than one quarter of the aircraft used in the wars. The crashes were reported to be due to "technical failures or poor maintenance", with a failure rate per hour flown over 100 times higher than the [F-16](https://en.wikipedia.org/wiki/F-16_Fighting_Falcon) fighter. Northrop Grumman stated that it was unfair to compare the failure rates of a mature design to that of a prototype aircraft. In June 2012, a media report described the Global Hawk, the [MQ-1 Predator](https://en.wikipedia.org/wiki/MQ-1_Predator) and the [MQ-9 Reapers](https://en.wikipedia.org/wiki/MQ-9_Reaper) "... the most accident-prone aircraft in the Air Force fleet." On 11 February 2010, the Global Hawks deployed in the Central Command AOR accrued 30,000 combat hours and 1,500 plus sorties.

Initial operational capability was declared for the RQ-4 Block 30 in August 2011. The USAF did not plan to keep the RQ-4B Block 30 in service past 2014 due to the U-2 and other platforms being less expensive in the role; but Congress sought to keep it in service until December 2016. The USAF had 18 RQ-4 Block 30s by the time of the passage of the [National Defense Authorization Act for Fiscal Year 2013](https://en.wikipedia.org/wiki/National_Defense_Authorization_Act_for_Fiscal_Year_2013), which directed a further three RQ-4s to be procured as part of Lot 11; The USAF felt that additional aircraft were "excess to need" and likely become backup or attrition reserve models. Despite the potential retirement of the Block 30 fleet due to low reliability, low mission readiness, and high costs, the USAF released a pre-solicitation notice on 12 September 2013 for Lot 12 aircraft. In planning the USAF's FY 2015 budget, the Pentagon reversed its previous decision, shifting $3 billion from the U-2 to the RQ-4 Block 30, which had become more competitive with the U-2 due to increased flying hours. Factors such as cost per flight hour (CPFH), information gathering rates, mission readiness, adverse weather operational capability, distance to targets, and onboard power still favored the U-2.

After the [2011 Tōhoku earthquake and tsunami](https://en.wikipedia.org/wiki/2011_T%C5%8Dhoku_earthquake_and_tsunami), RQ-4s flew 300 hours over the affected areas in Japan. There were also plans to survey the No. 4 reactor at the [Fukushima Daiichi Nuclear Power Plant](https://en.wikipedia.org/wiki/Fukushima_Daiichi_Nuclear_Power_Plant).

By November 2012, Northrop Grumman had delivered 37 Global Hawks to the USAF. As of March 2014, 42 Global Hawks are in use around the world, with 32 in use by the USAF.

The USAF stated that U-2 pilot and altitude advantages allow better functionality in the stormy weather and airspace restrictions of the East Asia region and its altitude and sensor advantages allow it to see further into hostile territory. In October 2013, the U.S. secured basing rights to deploy RQ-4s from Japan, the first time that basing rights for the type had been secured in Northeast Asia. RQ-4s are stationed at [Andersen Air Force Base](https://en.wikipedia.org/wiki/Andersen_Air_Force_Base) in [Guam](https://en.wikipedia.org/wiki/Guam), but bad weather often curtailed flights. Basing in Japan as opposed to Guam enhances spying capabilities against [North Korea](https://en.wikipedia.org/wiki/North_Korea) by eliminating range as a factor. Two RQ-4s moved from Anderson AFB to Misawa AFB in mid-2014 in the type's first deployment to Japan; they were speculated to have focused on maritime patrol missions. The two RQ-4s successfully performed their missions from Misawa AFB during a six-month deployment, with none cancelled due to poor weather. It was the first time that they had operated out of a civil-military airport, sharing airspace and runways with commercial aircraft safely without additional restrictions, usually taking off and landing during quieter periods of air traffic. Officials only stated that they had operated at "various places around the Pacific."

On 19 September 2013, the RQ-4 Block 40 Global Hawk conducted its first wartime flight from [Grand Forks Air Force Base](https://en.wikipedia.org/wiki/Grand_Forks_Air_Force_Base).

In November 2013, an USAF RQ-4 deployed to the Philippines after [Typhoon Haiyan](https://en.wikipedia.org/wiki/Typhoon_Haiyan) to assist in relief efforts. It flew from [Andersen Air Force Base](https://en.wikipedia.org/wiki/Andersen_Air_Force_Base) in Guam to relay imagery of afflicted areas to response personnel and ground commanders.

In planning for the FY 2015 budget, the U-2 was to be retired in favor of the RQ-4, made possible by reductions of RQ-4 operating costs and would be the first time an unmanned aircraft would completely replace a manned aircraft. The Block 40 Global Hawk may have to be retired in FY 2016 if sequestration is not repealed. The U-2 will continue to fly through 2018 without replacement.

In May 2014, a U.S. Global Hawk conducted a surveillance mission over Nigeria as part of the search for the [kidnapped Nigerian schoolgirls](https://en.wikipedia.org/wiki/2014_Chibok_kidnapping). The Global Hawk joined [MC-12](https://en.wikipedia.org/wiki/Beechcraft_C-12_Huron) manned aircraft in the search.

The Global Hawk has been used in [Operation Inherent Resolve](https://en.wikipedia.org/wiki/Operation_Inherent_Resolve) against the [Islamic State of Iraq and the Levant](https://en.wikipedia.org/wiki/Islamic_State_of_Iraq_and_the_Levant) (ISIL). The aircraft provide real-time imagery and signals intelligence to identify friendly and enemy forces, do long-term target development, and track enemy equipment movement, enabling combatant commanders to act on better information and make key decisions. The BACN version allows ground troops to contact aircraft when they are in need of assistance, such as [close air support](https://en.wikipedia.org/wiki/Close_air_support). On 11 November 2015, an EQ-4 became the first Global Hawk aircraft to reach flying 500 [sorties](https://en.wikipedia.org/wiki/Sortie). All three EQ-4s in operation are supporting OIR. Upon landing, maintainers can complete ground maintenance and make the aircraft mission ready again within five hours; missions can last up to 30 hours, with each aircraft getting a "day off" in between combat flights. On 1 April 2017, an EQ-4 completed 1,000 continuous sorties, without incurring a single maintenance cancellation, while supporting Operation Inherent Resolve.

On 4 April 2016 it was reported that a USAF Global Hawk had completed its third flight over Germany under an initiative (the European Reassurance Initiative) to reassure NATO members concerned over Russian involvement in the conflict in Ukraine. Germany has opened its airspace for up to five Global Hawk flights a month until the middle of October 2016. The Sigonella, Sicily-based Global Hawk flies over Italian and French airspace and an air corridor through Germany with its sensors switched off on its way to its area of operations over the Baltic Sea.

**Records**

On 24 April 2001, a Global Hawk flew non-stop from Edwards in the US to [RAAF Base Edinburgh](https://en.wikipedia.org/wiki/RAAF_Base_Edinburgh) in Australia, making history by being the first pilotless aircraft to cross the [Pacific Ocean](https://en.wikipedia.org/wiki/Pacific_Ocean). The flight took 22 hours, and set a world record for absolute distance flown by a UAV, 13,219.86 kilometers (8,214.44 mi).

On 22 March 2008, a Global Hawk set the endurance record for full-scale, operational unmanned aircraft UAVs by flying for 33.1 hours at altitudes up to 60,000 feet over [Edwards Air Force Base](https://en.wikipedia.org/wiki/Edwards_Air_Force_Base).

From its first flight in 1998 to 9 September 2013, the combined Global Hawk fleet flew 100,000 hours. 88 percent of flights were conducted by USAF RQ-4s, while the remaining hours were flown by NASA Global Hawks, the EuroHawk, the Navy BAMS demonstrator, and the MQ-4C Triton. Approximately 75 percent of flights were in combat zones; RQ-4s flew in operations over Afghanistan, Iraq, and Libya; and supported disaster response efforts in Haiti, Japan, and California.

From 10–16 September 2014, the RQ-4 fleet flew a total of 781 hours, the most hours flown by the type during a single week. 87 percent of flights were made by USAF RQ-4s, with the rest flown by the Navy BAMS-D and NASA hurricane research aircraft.

The longest Global Hawk combat sortie lasted 32.5 hours.

**NASA**

A Global Hawk at NASA's Dryden Flight Research Center

In December 2007, two Global Hawks were transferred from the U.S. Air Force to NASA's [Dryden Flight Research Center](https://en.wikipedia.org/wiki/Dryden_Flight_Research_Center) at [Edwards Air Force Base](https://en.wikipedia.org/wiki/Edwards_Air_Force_Base). Initial research activities beginning in the second quarter of 2009 supported NASA's high-altitude, long-duration Earth science missions. The two Global Hawks were the first and sixth aircraft built under the original DARPA Advanced Concept Technology Demonstration program, and were made available to NASA when the Air Force had no further need for them. Northrop Grumman is an operational partner with NASA and will use the aircraft to demonstrate new technologies and to develop new markets for the aircraft, including possible civilian uses.

According to an article in the March 2010 issue of Scientific American (p. 25-27), NASA's Global Hawks were expected to begin scientific missions that month, and had been undergoing tests in late 2009, with. Initial science applications included measurements of the ozone layer and cross-Pacific transport of air pollutants and aerosols; the author of the Scientific American piece speculates that it could be used for Antarctic exploration while being based in Chile. In August–September 2010, one of the two Global Hawks was loaned for NASA's GRIP Mission (Genesis and Rapid Intensification Program). Its long-term on station capabilities and long range made it a suitable aircraft for monitoring the development of Atlantic basin [Hurricanes](https://en.wikipedia.org/wiki/Tropical_Cyclone). It was modified to equip weather sensors including [Ku-band](https://en.wikipedia.org/wiki/Ku-band) radar, lightning sensors and [dropsondes](https://en.wikipedia.org/wiki/Dropsonde). It successfully flew into Hurricane off the United States East Coast on 2 September 2010.

**NATO**

*Main article:*[*Alliance Ground Surveillance*](https://en.wikipedia.org/wiki/Alliance_Ground_Surveillance)

In 2009, NATO announced that it expects to have a fleet of up to eight Global Hawks by 2012. The aircraft are to be equipped with MP-RTIP radar systems. NATO has budgeted US$1.4 billion (€1 billion) for the project, and a letter of intent has been signed. NATO signed a contract for five Block 40 Global Hawks in May 2012. 12 NATO members are participating in the purchase. On 10 January 2014, [Estonia](https://en.wikipedia.org/wiki/Estonia) revealed it wanted to participate in NATO Global Hawk usage. In July 2017, the USAF assigned the Mission Designation Series (MDS) of RQ-4D to the NATO AGS air vehicle.

**Potential operators**

[Australia](https://en.wikipedia.org/wiki/Australia) considered the purchase of a number of Global Hawks for maritime and land surveillance. The Global Hawk was to be assessed against the [MQ-9 Mariner](https://en.wikipedia.org/wiki/MQ-9_Reaper#Naval_version) in trials in 2007. The Global Hawk aircraft would have operated in conjunction with manned [Boeing P-8 Poseidon](https://en.wikipedia.org/wiki/Boeing_P-8_Poseidon) aircraft by 10 and 11 Squadrons of the RAAF, as a replacement of aging [AP-3C Orion](https://en.wikipedia.org/wiki/AP-3C_Orion) aircraft. In the end, the Australian government decided not to proceed and canceled the order. In 2012, a procurement effort for seven UAVs by 2019 was initiated. In May 2013 the Australian government confirmed its interest in acquiring the [MQ-4C Triton](https://en.wikipedia.org/wiki/Northrop_Grumman_MQ-4C_Triton) maritime surveillance variant.

[Canada](https://en.wikipedia.org/wiki/Canada) has also been a potential customer, looking at the Global Hawk for maritime and land surveillance as either a replacement for its fleet of [CP-140 Aurora](https://en.wikipedia.org/wiki/CP-140_Aurora) patrol aircraft or to supplement manned patrols of remote Arctic and maritime environments, before withdrawing from the joint effort in August 2011. [Spain](https://en.wikipedia.org/wiki/Spain) has a similar requirement, and has existing contacts with Northrop Grumman.

On 24 August 2013, [Japan](https://en.wikipedia.org/wiki/Japan) announced that the [Japan Air Self-Defense Force](https://en.wikipedia.org/wiki/Japan_Air_Self-Defense_Force) plans to operate one Global Hawk jointly with the U.S. by 2015. On 21 November 2014, the [Japanese Ministry of Defense](https://en.wikipedia.org/wiki/Ministry_of_Defense_%28Japan%29) officially decided to procure the Global Hawk, which beat out the [General Atomics](https://en.wikipedia.org/wiki/General_Atomics) [Guardian ER](https://en.wikipedia.org/wiki/MQ-9_Reaper); Japan has also been interested in the purchase of three aircraft.

In 2011, [South Korea](https://en.wikipedia.org/wiki/South_Korea)'s Defense Acquisition Program Administration (DAPA) expressed interest in acquiring at least four RQ-4Bs to increase intelligence capabilities following the exchange of the Wartime Operational Control from the U.S. to the Republic of Korea. Officials debated on the topic of the Global Hawks and domestic UAV programs. In September 2011, the US and South Korea discussed aircraft deployments near its land border to view North Korea and the North Korea–China border. In January 2012, DAPA announced that it would not proceed with a purchase due to a price rise from US$442M to US$899M, and that other platforms such as the [Global Observer](https://en.wikipedia.org/wiki/Global_Observer) or the [Phantom Eye](https://en.wikipedia.org/wiki/Phantom_Eye) were being investigated. However, in December 2012, South Korea notified Congress of a possible [Foreign Military Sale](https://en.wikipedia.org/wiki/Foreign_Military_Sale) of 4 RQ-4 Block 30 (I) Global Hawks with the Enhanced Integrated Sensor Suite (EISS) at an estimated cost of $1.2 billion. On 5 July 2013, the Korean National Assembly advised the government to re-evaluate the RQ-4 purchase, again citing high costs. On 17 December 2014, Northrop Grumman was awarded a $657 million contract by South Korea for four RQ-4B Block 30 Global Hawks, the first pair to be delivered in 2018 and the second pair in 2019.

The [New Zealand Defense Force](https://en.wikipedia.org/wiki/New_Zealand_Defence_Force) is studying the Global Hawk, which has the range to conduct surveillance in the Southern Ocean around Antarctica, and in the Pacific Islands. The acquisition process has not moved beyond an expression of interest.

The [Indian Navy](https://en.wikipedia.org/wiki/Indian_Navy) has expressed interest in acquiring six to eight MQ-4C Maritime Surveillance Unmanned Aircraft Systems.

Variants

RQ-4A on display at the [Museum of Aviation](https://en.wikipedia.org/wiki/Museum_of_Aviation_%28Warner_Robins%29), [Robins AFB](https://en.wikipedia.org/wiki/Robins_AFB)

**RQ-4A**

Initial production version for the USAF, 16 built.

**RQ-4B**

Improved version with increased payload, wingspan increased to 130.9 ft (39.9 m) and length increased to 47.7 ft (14.5 m). Due to the increased size and payload the range is reduced to 8,700 nm.

**RQ-4D**

NATO Alliance Ground Surveillance (AGS).

**RQ-4E Euro Hawk**

Version for Germany based on RQ-4B and equipped with an [EADS](https://en.wikipedia.org/wiki/EADS) reconnaissance payload for [SIGINT](https://en.wikipedia.org/wiki/SIGINT). Germany canceled its order in May 2013; it received one of five Euro Hawks originally ordered.

[**MQ-4C Triton**](https://en.wikipedia.org/wiki/Northrop_Grumman_MQ-4C_Triton)

For USN Broad Area Maritime Surveillance (BAMS) role; previously known as the *RQ-4N*; 4 ordered, 68 total planned.

**EQ-4B**

Equipped with the [Battlefield Airborne Communications Node](https://en.wikipedia.org/wiki/Battlefield_Airborne_Communications_Node) (BACN) system.

**Autonomous tanker variant**

[KQ-X](https://en.wikipedia.org/wiki/KQ-X) was a proposed autonomous tanker variant.

**Model 396**

[Scaled Composites](https://en.wikipedia.org/wiki/Scaled_Composites) and Northrop Grumman also offered an armed, 50% smaller version of the RQ-4A, known as the **Scaled Composites Model 396**, as part of the [USAF Hunter-Killer](https://en.wikipedia.org/wiki/USAF_Hunter-Killer) program. The aircraft was rejected in favor of the [MQ-9 Reaper](https://en.wikipedia.org/wiki/General_Atomics_MQ-9_Reaper).

Operators

A NASA Global Hawk in flight

[**United States**](https://en.wikipedia.org/wiki/United_States)

* [**United States Air Force**](https://en.wikipedia.org/wiki/United_States_Air_Force)
	+ [Air Combat Command](https://en.wikipedia.org/wiki/Air_Combat_Command)
		- [9th Reconnaissance Wing](https://en.wikipedia.org/wiki/9th_Reconnaissance_Wing) – [Beale Air Force Base](https://en.wikipedia.org/wiki/Beale_Air_Force_Base), [California](https://en.wikipedia.org/wiki/California)
			* [9th Operations Group](https://en.wikipedia.org/wiki/9th_Operations_Group)
				+ [1st Reconnaissance Squadron](https://en.wikipedia.org/wiki/1st_Reconnaissance_Squadron)
			* [69th Reconnaissance Group](https://en.wikipedia.org/wiki/69th_Reconnaissance_Group) – [Grand Forks Air Force Base](https://en.wikipedia.org/wiki/Grand_Forks_Air_Force_Base), [North Dakota](https://en.wikipedia.org/wiki/North_Dakota)
				+ [12th Reconnaissance Squadron](https://en.wikipedia.org/wiki/12th_Reconnaissance_Squadron)
				+ [348th Reconnaissance Squadron](https://en.wikipedia.org/wiki/348th_Bombardment_Squadron)
		- [53d Wing](https://en.wikipedia.org/wiki/53d_Wing)
			* [53d Test and Evaluation Group](https://en.wikipedia.org/wiki/53d_Test_and_Evaluation_Group)
				+ [31st Test and Evaluation Squadron](https://en.wikipedia.org/wiki/31st_Test_and_Evaluation_Squadron) – [Edwards Air Force Base](https://en.wikipedia.org/wiki/Edwards_Air_Force_Base), [California](https://en.wikipedia.org/wiki/California)
	+ [Air Force Reserve Command](https://en.wikipedia.org/wiki/Air_Force_Reserve_Command)
		- [940th Wing](https://en.wikipedia.org/wiki/940th_Wing) – [Beale Air Force Base](https://en.wikipedia.org/wiki/Beale_Air_Force_Base), [California](https://en.wikipedia.org/wiki/California)
			* [940th Operations Group](https://en.wikipedia.org/w/index.php?title=940th_Operations_Group&action=edit&redlink=1)
				+ [13th Reconnaissance Squadron](https://en.wikipedia.org/wiki/13th_Reconnaissance_Squadron) – [Beale Air Force Base](https://en.wikipedia.org/wiki/Beale_Air_Force_Base), [California](https://en.wikipedia.org/wiki/California)
* [**United States Navy**](https://en.wikipedia.org/wiki/United_States_Navy)
	+ [MQ-4C Triton](https://en.wikipedia.org/wiki/MQ-4C_Triton)
		- [Air Test and Evaluation Squadron Twenty](https://en.wikipedia.org/wiki/VX-20) - [Naval Air Station Patuxent River](https://en.wikipedia.org/wiki/Naval_Air_Station_Patuxent_River), [Maryland](https://en.wikipedia.org/wiki/Maryland)
* [**NASA**](https://en.wikipedia.org/wiki/NASA)
	+ [Dryden Flight Research Center](https://en.wikipedia.org/wiki/Dryden_Flight_Research_Center)
* [**380th Expeditionary Operations Group**](https://en.wikipedia.org/wiki/380th_Expeditionary_Operations_Group)
* [*12th Reconnaissance Squadron*](https://en.wikipedia.org/wiki/12th_Reconnaissance_Squadron)
* [*Al Dhafra AB*](https://en.wikipedia.org/wiki/Al_Dhafra_AB), [United Arab Emirates](https://en.wikipedia.org/wiki/United_Arab_Emirates), since early 2002
	+ RQ-4B (Block 20), RQ-4B [Block](https://en.wikipedia.org/wiki/1962_United_States_Tri-Service_aircraft_designation_system#Block_number)30 , RQ-4N Since 2013 and Two EQ-4B Since March 2014

Specifications (RQ-4B Block 30/40)

*Data from* Northrop Grumman USAF

**General characteristics**

* **Crew:** 0 onboard (3 remote: Launch and Recovery Element (LRE) pilot; Mission Control Element (MCE) pilot and sensor operator)
* **Length:** 47.6 ft (14.5 m)
* **Wingspan:** 130.9 ft (39.9 m)
* **Height:** 15.3 ft (4.7 m)
* **Empty weight:** 14,950 lb. (6,781 kg)
* **Gross weight:** 32,250 lb. (14,628 kg)
* **Powerplant:** 1 × [Rolls-Royce F137-RR-100](https://en.wikipedia.org/wiki/Rolls-Royce_F137-RR-100) [turbofan](https://en.wikipedia.org/wiki/Turbofan) engine, 7,600 lbf (34 kN) thrust

**Performance**

* **Maximum speed:** 391 mph (629 km/h; 340 kn)
* **Cruise speed:** 357 mph (575 km/h; 310 kn)
* **Range:** 14,154 mi (12,299 nm.; 22,779 km)
* **Endurance:** 32+ hours
* **Service ceiling:** 60,000 ft (18,000 m)