RQ-4 Global Hawk

HALE: High Altitude Long Endurance
Unmanned Aerial Reconnaissance System

Unmanned. Unmatched.

NORTHROP GRUMMAN DEFINING THE FUTURE™

RQ-4 Block 10
Air Vehicle

Wingspan
116.2 ft (35.4m)

Height
14.6 ft (4.2m)

Length
44.4 ft (13.5m)

Specifications

Wingspan	116.2 ft (35.4 m)
Length	44.4 ft (13.5 m)
Height	14.6 ft (4.2 m)
Gross Take-off Weight	26,700 lbs (12,110.9 kg)
Payload	2,000 lbs (907.2 kg)
Ferry Range	12,000 nm (22,236 km)
Maximum Altitude	> 65,000 ft (19.8 km)
Loiter Velocity	343 knots TAS
On-Station Endurance at 1,200 nm	24 Hours
Maximum Endurance	35 Hours (31.5 Hours Demonstrated)

Sensors

Synthetic Aperture Radar	1.0/0.3 M Resolution (WAS/Spot)
Electro-Optical	NIIRS 6.0/6.5 (WAS/Spot)
Infrared	NIIRS 5.0/5.5 (WAS/Spot)

Communications

Ku SATCOM Datalink	1.5, 8.67, 20, 30, 40, 47.9 Mbps
CDL LOS	137, 274 Mbps
UHF SATCOM/LOS	Command and Control
INMARSAT	Command and Control
ATC Voice	
Secure Voice	

RQ-4 Block 10 GLOBAL HAWK HALE

RQ-4 Block 20 Air Vehicle

Wingspan
130.9 ft (39.9m)

Height
15.4 ft (4.6m)

Length
47.6 ft (14.5m)

Specifications

Wingspan	130.9 ft (39.9 m)
Length	47.6 ft (14.5 m)
Height	15.4 ft (4.6 m)
Gross Take-off Weight	32,500 lbs (14,628 kg)
Payload	3,000 lbs (1,360 kg)
Ferry Range	12,300 nm (22,780 km)
Maximum Altitude	> 60,000 ft (18.3 km)
Loiter Velocity	310 knots True Air Speed (TAS)
On-Station Endurance at 1,200 nm	24 Hours
Maximum Endurance	36 Hours

Sensors

Synthetic Aperture Radar	1.0/0.3 M Resolution
	Wide Area Search (WAS/Spot)
Electro-Optical	NIIRS 6.0/6.5 (WAS/Spot)
Infrared	NIIRS 5.0/5.5 (WAS/Spot)

Communications

Ku SATCOM Datalink	1.5, 8.67, 20, 30, 40, 47.9 Mbps
CDL LOS	137, 274 Mbps
UHF SATCOM/LOS	Command and Control
INMARSAT	Command and Control
ATC Voice	
Secure Voice	

RQ-4 Block 20 GLOBAL HAWK HALE

RQ-4 Global Hawk
High Altitude Long Endurance Unmanned Aerial Reconnaissance System

Global Hawk is a high altitude, long endurance, (HALE) unmanned aerial reconnaissance system designed to provide military field commanders with high resolution, near-real-time imagery of large geographic areas. The superior performance of the Global Hawk's system significantly enhances the U.S. military's ability to prevail in all types of operations: from sensitive peacekeeping missions to full scale combat.

The system combines advanced technology sensors with a range that extends more than half way around the world and an ability to remain on station for long periods of time. These features enable the Global Hawk system to provide the warfighter with essential intelligence needed to achieve information dominance throughout the battle space.

RQ-4 Block 10 Global Hawk

The 44-foot long RQ-4 Block 10 Global Hawk has a wingspan of more than 116 feet, a height of nearly 15 feet and a gross takeoff weight of 26,700 pounds. That includes a 2,000 pound payload-carrying capacity. The distinctive V-tail empennage, the engine nacelle, and the aft fuselage are constructed of graphite composite materials, as is its wing. The center fuselage is constructed of conventional aluminum, while various fairings and radomes use fiberglass composite construction. The aircraft's 12,000 nautical mile range and 35-hour endurance, together with satellite and line-of-sight communication links to the ground system, allow for worldwide operation of the system.

The Global Hawk system features an unmanned aerial vehicle that flies at altitudes over 65,000 feet above inclement weather and prevailing winds.

High resolution sensors can look through adverse weather day or night. Global Hawk can survey vast geographic regions with pinpoint accuracy. After mission parameters are programmed into Global Hawk, it will take off, fly its mission and land autonomously. Ground-based pilots can also redirect the Global Hawk at a moments notice to respond to immediate surveillance needs in combat.

These proven capabilities are paving the way for Global Hawk and other unmanned aerial systems to assume missions suited for autonomous aircraft–supplementing manned aircraft and contributing to our national security in ways not imagined just a few years ago.

Global Hawk's design approach uses extensive system redundancy to provide for high air vehicle reliability; integrating off-the-shelf hardware and software wherever possible.

Reconnaissance imagery is obtained through the use of the Integrated Sensor Suite aboard the RQ-4 Global Hawk. It consists of the all-weather synthetic aperture radar/moving target indicator (SAR/MTI), a high resolution electro-optical (EO) digital camera

and a third-generation infrared (IR) sensor, all operating through a common signal processor that is the equivalent of an airborne super computer. The integrated design of the sensor package gives commanders on the ground the ability to select radar, infrared and visible wavelength modes as desired, and even use the SAR or MTI simultaneously with either of the two sensors. The high resolution image quality makes it possible to distinguish various types of vehicles, aircraft and missiles, and look through adverse weather, day or night.

Ground Stations

The Mission Control Element (MCE) of the Global Hawk ground segment provides management of the aircraft and its sensors and has the ability to command and control up to three Global Hawks simultaneously and disseminates near-real-time information to tactical commanders anywhere in the world. Personnel in the MCE shelter operate the command and control, mission planning, imagery quality control, and communications functions of the system. Personnel in the Launch and Recovery Element (LRE) of the ground segment system load the autonomous flight mission plan into the air vehicle from the shelter and monitor the operation of the aircraft during its automatic takeoff and landing, which is assisted by Differential Global Positioning System (DGPS). For operational use, the Global Hawk system is flown from the MCE at its home base of Beale Air Force Base, California. The LRE is located at the forward operating location of the Global Hawk.

The Global Hawk's communication system is used for line-of-sight, command and control connectivity, satellite connectivity and near-real-time data dissemination and will enable ground based operators to monitor and operate the air vehicle and its sensor suite at all times, from virtually anywhere in the world. Multiple satellite and line-of-sight data links provide numerous communication paths to the Global Hawk's MCE and the LRE. Broadband communications via commercial satellites serve as the primary data link for transmitting imagery. Command and control, as well as voice communications are achieved via UHF/VHF.

In addition, broadband line-of-sight communication is available through the Common Data Link (CDL).

The system's communication technology also will permit conversion to future air-to-air relay configurations currently under development.

The Rolls-Royce AE3007H turbofan core engine specifically developed for the Global Hawk program is a growth version of the AE3007 engine, currently in use in the Citation X and the Embraer - Regional Jet. In the 8,000-pound thrust class, the engine is a high bypass, two spool, axial flow engine, flat rated at 7,580 pounds of thrust, uninstalled, sea level static to 113 degrees Fahrenheit ambient temperature.

Numerous capabilities enhance the Global Hawk's ability to survive significant, proliferated threats anywhere in the world. Provisions for electronic support measures which include a threat warning receiver, electronic countermeasures, and towed decoys have been integrated into the Global Hawk. Using an AFMSS-based automated mission planning system, threats to the air vehicle can be detected and the flight automatically adjusted for threat avoidance. Survivability will be further enhanced by operating at very high altitudes to minimize surface-to-air missile exposure and by coordinating with such in-theater assets as the AWACS and JSTARS programs.

Deployment Operations

In 2002,while supporting Operation Enduring Freedom, Global Hawk provided Air Force and joint war-fighting commanders with more than 17,000 near real-time, high-resolution intelligence, surveillance and reconnaissance images, flying more than 60 missions and over 1,200 combat hours. In March 2003, Global Hawk redeployed in support of

MCE
C^2 and Sensor
Communications

Inside MCE

Operation Iraqi Freedom, proving to be a significant contributor to the war-fighters need for time sensitive targeting data. Flying over 15 missions and more than 350 actual combat hours in little more than a one month time period,

Global Hawk captured over 4,800 images, accounting for 55% of targeting imagery used to destroy Iraqi air defense equipment. Production version RQ-4 Block 10 Global Hawks are currently deployed in the global war on terrorism, where the system overall has flown more than 6,000 combat hours.

RQ-4 Block 20/30/40 Global Hawk

Lessons learned during these deployments have led to the next-generation, enhanced-capability RQ-4 Block 20 Global Hawk. It carries 3,000 pounds of comms and sensor payloads allowing for true multi-intelligence collection capability. The system will be able to simultaneously collect imagery intelligence, signals intelligence and infrared and radar information, and transfer it to the warfighter in near-real time. The next generation sensor suite, the Enhanced Integrated Sensor Suite will provide 50% more intelligence collection capability than the current ISS.

To accommodate the increased payload capacity, Northrop Grumman redesigned and strengthened Global Hawk's fuselage. The fuselage of the Block 20 is four feet longer than the Block 10 and the new landing gear makes the Block 20 slightly taller than the Block 10. The wingspan has also increased by approximately fifteen feet, to 131 feet, allowing it to carry more fuel and fly longer missions than its predecessor. The Block 20 also features a gross take-off weight 5800 pounds heavier than that of the Block 10.

LRE
C² Communications

Inside LRE

Another important redesign of the Block 20 is the open system architecture. As sensor technology is enhanced, new sensors will be integrated onto the airframe, without having to reconfigure the vehicle management computers. Block 30 aircraft will be able to carry the Advanced Signals Intelligence Payload (ASIP) for high and low-band electronic signals collection. Plans for the Block 40 aircraft include integrating the Multi-Platform Radar Technology Insertion Program (MP-RTIP) which is an advanced air-to-surface/air-to-air radar currently under contract for the U.S. Air Force.

Domestic Applications

The RQ-4 Block 10 Global Hawk is the first UAV to receive a military airworthiness certification from the U.S. Air Force. In granting the certificate, the Air Force evaluated the aircraft against over 500 technical criteria and determined that the Global Hawk system has a proven track record of safe and reliable operations. Global Hawk was also the first UAV to receive a National Certificate of Authorization (COA) from the Federal Aviation Administration. To receive the COA, Northrop Grumman worked closely with the Federal Aviation Administration to define airspace requirements for UAVs.

The Present

The Global Hawk system is the culmination of a successful team effort on the part of the U.S. government and industry. Today, the Global Hawk program is managed for the Department of Defense by the U.S. Air Force's Aeronautical Systems Center at Wright-Patterson Air Force Base, Ohio. Edwards Air Force Base, California is home for the Global Hawk system's Responsible Test Organization (RTO). Beale Air Force Base, California is the home of the operational Global Hawk fleet.

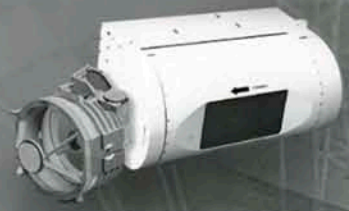
Summary

Global Hawk represents the future of aviation, both military and civilian.

Future plans may include the stand up of operating bases. International interest in high-altitude, long-endurance surveillance is growing. Countries along the Pacific Rim and Europe are exploring the benefits of acquiring the Global Hawk system.

SAR

The Synthetic Aperture Radar (SAR) gimbaled antenna can scan from either side of the aircraft to obtain 1 foot resolution spot images and 3 foot resolution images in wide area search mode.



EO/IR

Electro Optical (EO) and Infrared (IR) sensors operate through shared reflective optics.

Enhanced Integrated Sensor Suite (EISS) Improvements

- 50% EO Range Improvement
- Larger SAR Antenna
- 50% SAR Improvement
- Increased Transmitter Power
- Improved Receiver Unit Optics

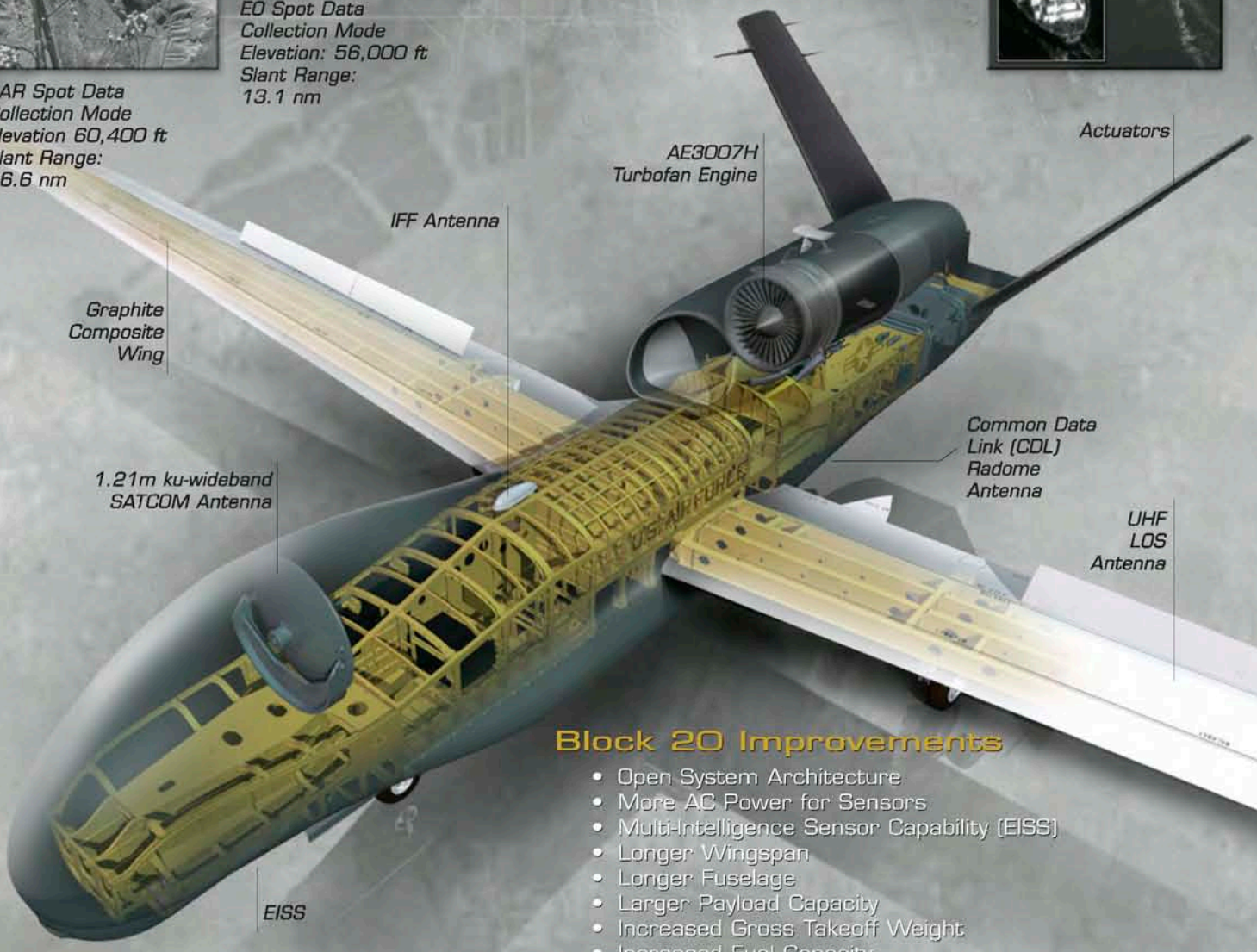
SAR Spot Data Collection Mode Elevation 60,400 ft Slant Range: 46.6 nm

EO Spot Data Collection Mode Elevation: 56,000 ft Slant Range: 13.1 nm

EO Spot Data Collection Mode Elevation: 60,000 ft

IR Spot Data Collection Mode Elevation: 60,000 ft

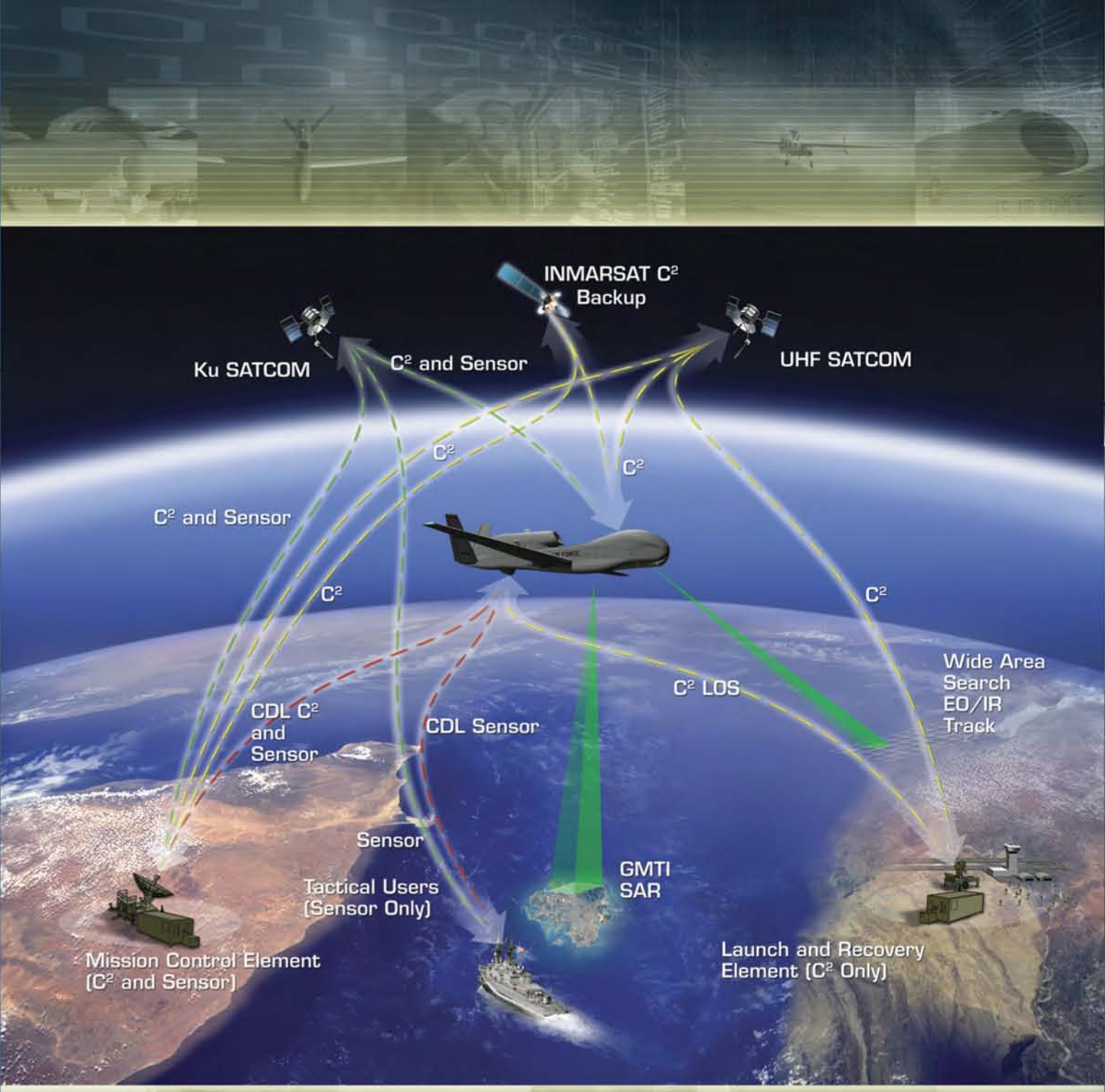
IR Spot Data Collection Mode Elevation: 60,000 ft



Block 20 Improvements

- Open System Architecture
- More AC Power for Sensors
- Multi-Intelligence Sensor Capability (EISS)
- Longer Wingspan
- Longer Fuselage
- Larger Payload Capacity
- Increased Gross Takeoff Weight
- Increased Fuel Capacity

AISSANCE SYSTEM



U.S. AIR FORCE

GLOBAL HAWK

NORTHROP GRUMMAN
DEFINING THE FUTURE™

Aurora FLIGHT SCIENCES

L3 communications

Raytheon

Rolls-Royce

Vought
Aircraft Industries, Inc.

Northrop Grumman · Integrated Systems · Western Region · P.O. Box 509066 · San Diego · California 92150-9066 · www.northropgrumman.com/unmanned
Contact: Revelle Anderson · 858.618.4405 · E-Mail: revelle.anderson@ngc.com · VM00-AS-4873_06.06