

A Legacy of Expertise

With its RQ-4 Global Hawk, RQ-5 Hunter, and RQ-8 Fire Scout, Northrop Grumman today is one of the undisputed industry leaders in the design, development, and production of Unmanned Aerial Vehicles (UAV) as well as a major contender in the growing market for the UAV's aggressively mission-focused successor, the Unmanned Combat Aerial Vehicle (UCAV).

Northrop Grumman's expertise in this business area is a logical outgrowth of decades of experience developing and producing progressively more autonomous aircraft, beginning with innovative subscale aerial targets. The company's current UAV development expertise has benefited greatly from both legacy Northrop Grumman targets design experience and from the complementary target capabilities added in 1999 with the acquisition of Ryan Aeronautical.

Origins

Northrop Grumman's aerial targets heritage can be traced back to the very beginning of the unmanned targets field. The first target drone flight in the United States occurred in 1935 when film star and model airplane enthusiast Reginald Denny demonstrated a radio-controlled balsa-and-plywood target air vehicle to U.S. Army observers at Fort McArthur, California.

Denny subsequently founded the Radioplane Company in 1939, which eventually became the Ventura Division of the Northrop Corporation. The company produced over 90,000 free-flying targets during World War II and in the years immediately after.

Ryan Aeronautical entered the targets arena in 1948 by winning the design competition for an experimental, high-subsonic, jet-powered remotely piloted target aircraft which was designated the Q-2 Firebee. The system went into production after its first free-flight in 1951 and by 1954 all three U.S. Services were operating Firebees.

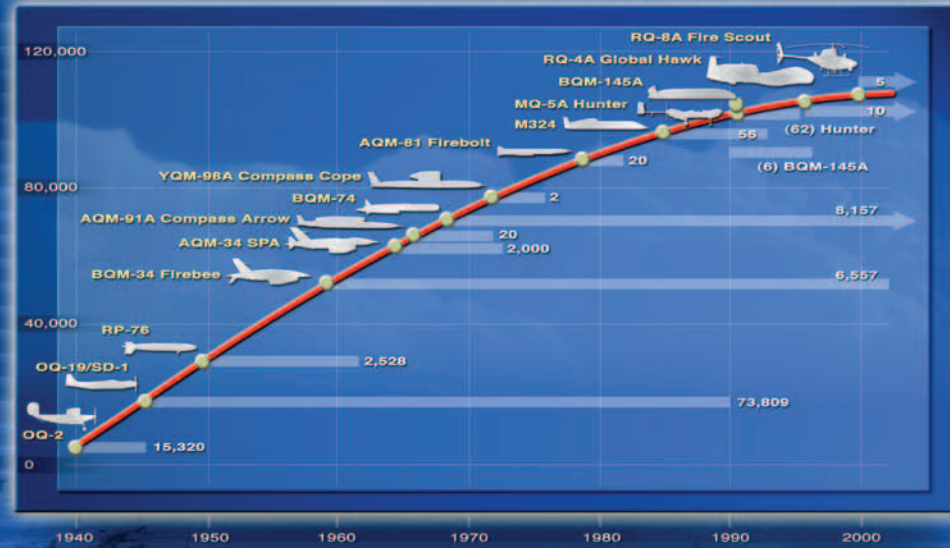
The BQM-34 designation was first applied in 1959 and remains in place today. Due to its size, the Firebee has long been a work horse with great payload flexibility. Over 8,500 of the air vehicles have been manufactured to date, including some 2,000 variants used for a variety of non-target missions.

The current mainstay of the Northrop Grumman targets line is the BQM-74 which first entered production in 1966. Since then, over 8,000 units have been manufactured. This target system remains in service with the U.S. Navy and several international customers today, and is currently undergoing yet another capability-enhancing upgrade. The BQM-74 is a formidable low cost target that can be reconfigured easily to support diverse customer requirements. With a small operational footprint and exceptional payload flexibility, it has proven an ideal platform to simulate threats in operational scenarios for both test and training purposes.

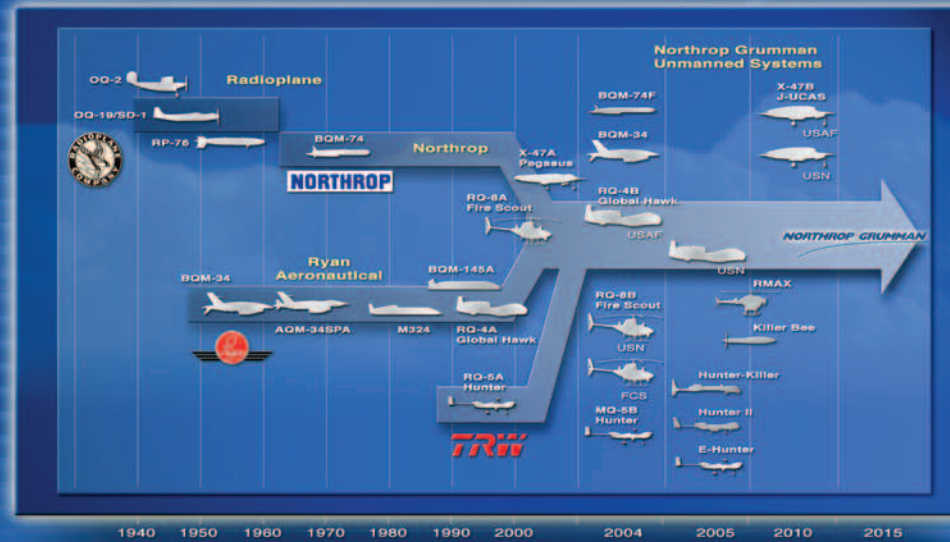
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Northrop Grumman has delivered more than 100,000 UAVs over the past 60 years.



Unmanned Systems History



The Legacy Continues...

NORTHROP GRUMMAN

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Unmanned Systems

Targets

The First UCAVs Continue to Show Versatility



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The First UCAVs Continue to Show Versatility for Non-Target Applications

While the BQM-34 Firebee and the BQM-74 may be best known for their versatile target applications, each has also served in a variety of operational configurations. Both the BQM-34 and BQM-74 have the flexibility to interface with customer-specific command and control requirements. Capabilities include fixed site and deployed operations for surface, shipboard, and/or air launch. Mobile ground launchers provide the flexibility to support quick reaction requirements while the air launch capability has been used successfully to provide greater range and payload flexibility. Of equal importance today, both systems can be operated with full autonomy using a GPS waypoint navigation system, and both can execute missions delivering payloads with a high degree of accuracy.

In an early exploitation of the capabilities offered by unmanned target systems, Firefly and Lightning Bug variants of the Firebee configured with cameras and other sensors executed over 3,500 reconnaissance missions during the Vietnam War era, some of which covered up to 1,400 nautical miles. During that same period, weaponized versions of the Firebee were explored. Ordnance carrying capability was demonstrated in 1964 when a modified Firebee was surface-launched with a thousand-pound bomb load for Army observers, and in 1971 a modified Firebee scored a direct hit against a simulated SAM site with an AGM-65 Maverick in the first missile launching from a UAV. Other weapons were also released successfully in continuing tests.



The First UCAV? BGM-34Bs demonstrated weapons delivery capabilities during the early 1970s in testing at Hill Air Force Base, Utah.

Length 28.5 ft
 Wingspan 14.5 ft
 Max Gross Weight 4,740 lbs
 Cruise Speed 500 kts
 Cruise Altitude 60,000 ft
 Range 725 nm
 Engine J69-T41A Turbojet
 1,920 lbs SLST



In a later demonstration of air vehicle versatility and company responsiveness, the same attributes that make the BQM-74 a great targets platform were capitalized on during the 1991 Gulf War to saturate and spoof the Iraqi air defense system in the initial raids of Operation Desert Storm. For this effort, BQM-74Es were configured for clandestine operations utilizing autonomous flight capabilities to deliver operational payloads and serve as decoys for enemy air defenses.



BQM-74Es were used over Iraq in 1991 during Gulf War I.

Recently, Northrop Grumman supported a request to demonstrate the ability of a BQM-34 to deliver payloads at a range of approximately 400 miles. This request culminated in a test program during which a modified BQM-34-53 Firebee successfully demonstrated the ability to ground launch from a remote facility, fly a long-range autonomous mission at high and low altitudes using GPS waypoint navigation, and provide precision delivery of an 85-pound payload.

BQM-34-53s were configured to support the evaluation of new payload delivery capabilities.



Launching a successful demonstration of the extended range BQM-34-53 with payload delivery system.

Modified BQM-34-53 Firebee with pre-launch security.



In February 2003, Northrop Grumman supported a quick reaction request to provide modified BQM-34s for Operation Iraqi Freedom. Using the history gained through numerous successful Firebee modification programs, it took a team of Northrop Grumman professionals just 17 days to deliver five BQM-34-53 air vehicles capable of both ground and air launch for payload delivery to a distant location using autonomous GPS waypoint navigation.



Modified BQM-34-53s for DC-130 air launch are ready to go.



DC-130 carrying three modified BQM-34-53 Firebees.

Summary

Northrop Grumman has demonstrated a unique capability to utilize existing aerial target platforms to support multi-role requirements. While their primary role is threat emulation for weapons systems development and training, Northrop Grumman clearly has demonstrated the ability of its targets to operate as both armed and unarmed UCAVs.