

The AH-64 Apache Helicopter: Evolution—Certainly. Revolution—Absolutely.

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Evolution is a process of formation, growth, or development. Revolution may be defined as a sudden, complete, or marked change. The AH-64 Apache has most certainly evolved, and many in the rotorcraft world would say that its development is revolutionary, resulting in a radical and pervasive change in the capabilities of an attack platform that is now the AH-64D Apache Block III helicopter.

Apache Block III is the latest in the Army's fleet of Apache helicopters. This Block III model flies over Yuma Proving Ground, AZ, during flight tests. (Photo courtesy of Boeing.)



In a Shephard Press book titled *Promises Kept: 25 Years of the Apache*, Al Winn, Boeing's Vice President of Apache Programs, was quoted on the helicopter's revolutionary evolution, "Apache ... Block III is a visionary concept based on a legacy of success. In 1984, when the U.S. Army accepted delivery of the first A-model Apache, the operational effectiveness of the [service] was positively altered. With the advantages and capabilities of the AH-64A, U.S. Army aviators coined the phrase 'we own the night.' And as those who flew the A-model helicopter in conflict can attest, the applications and usefulness of helicopters in battle was forever changed."

Phased Development Begins

Conceptual design and development of what would ultimately become the Apache began in 1973 as the Secretary of Defense initiated a phased development effort for a new Advanced Attack Helicopter program. Bell Helicopter and Hughes Helicopters were awarded contracts to design and fabricate a static test article, a ground test vehicle, and two flying prototypes. Understanding that tank killing for a Fulda Gap scenario was a critical capability, Hughes designers developed an aircraft with a range of

performance advantages—integrating weapons and sensor systems, developing drive and rotor system components for maneuverability, and designing a crew station that enhanced survivability. The development team also spotlighted aspects of reliability, availability, and maintainability in the helicopter's initial design.

The Hughes YAH-64 was selected by the Army's engineering flight test detachment at Edwards Air Force Base, CA, following a flyoff in which it was determined that the helicopter met more of the specified requirements than its competitor. The first Apaches were produced and delivered beginning in 1984.

Powered by two General Electric T700-GE-701 turbine engines, the self-deployable, multimission AH-64A Apache, like today's AH-64D, carried a lethal array of armaments including missiles, aerial rockets, and a 30mm Chain Gun. Author Scott R. Gourley, in *Promises Kept*, said, "that dry description of power and lethal capabilities hardly did the Apache justice. The fact is that, even as the first Apaches started moving off the production line at the new plant in Mesa, [AZ,] it became

quite apparent to Army aviators that they were dealing with a true revolution in aerial platform capabilities."

The U.S. Army Aviation Systems Command conducted a product improvement study of the Apache in 1983 to determine potential capabilities improvements. The result was initiation of a requirement for an advanced configuration of the helicopter. The FY88 budget included a program that led to an advanced Apache model being operational in 1994.

Apache Longbow Leverages Capabilities

The first AH-64D Apache Longbow was rolled out for its first public flight in September 1993. It featured a new digital crew station and a mast-mounted, millimeter wave fire control radar (FCR) with a passive radio-frequency interferometer, along with airframe modifications and an upgraded processing system.

The AN/APG-78 Longbow FCR is the principal component of the revolutionary Longbow Weapon System, comprising the FCR, AN/APR-48A Radar Frequency Interferometer,

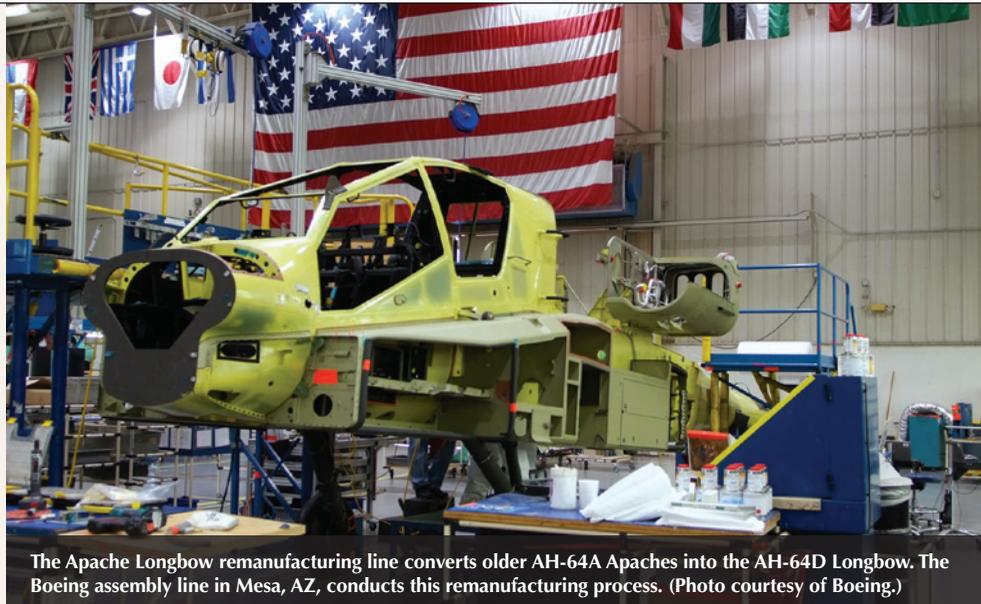


The Apache Longbow with Fire Control Radar maneuvers over desert terrain. The Longbow currently has two different production lines ongoing: a remanufacturing line that converts older AH-64A model Apaches into the newer AH-64D Longbow, and a new-build production line that makes new Longbow aircraft. (Photo courtesy of Boeing.)

M299 Launcher, and fire-and-forget AGM-114L Longbow Hellfire missile. The FCR was designed to meet three needs: increased performance in bad weather and battlefield obscurants, rapid wide-area search, and increased survivability against specific air defense systems that threaten the Apache in low-level environments.

Leveraging the expertise of development engineers and the experience of former Army aviators, the new D-model introduced cockpit management attributes employing new technologies that managed, by exception, the cockpit's systems and the information available to the aviators. The collective information and data are available to pilots, but are not apparent unless a need-to-know is evident, allowing the pilots to focus time and effort on the mission outside the cockpit. Specifically, this eliminates the need to scan information that is deemed acceptable; information is provided to the crewmember only when there is an abnormal condition.

The Army's initial operational test and evaluation of the AH-64D Apache Longbow, which concluded in 1995, demonstrated that the modernized helicopter was 28 times more effective than the A-model Apache. The effectiveness was measured by the U.S. Army test community in terms of aircraft



The Apache Longbow remanufacturing line converts older AH-64A Apaches into the AH-64D Longbow. The Boeing assembly line in Mesa, AZ, conducts this remanufacturing process. (Photo courtesy of Boeing.)

survivability and lethality. Through testing, it was determined that the D model was seven times more survivable than the A model and four times as lethal.

Operational validation of the AH-64D Apache Longbow came after the Sept. 11, 2001, attacks, when the helicopters were deployed to Iraq in support of *Operation Iraqi Freedom* and later to Afghanistan, following the AH-64As in supporting allied efforts in *Operation Enduring Freedom*. Reports from battlefield commanders, aviators, maintainers, and Soldiers affirmed the capabilities of the Apaches. MG Virgil Packett II, then-U.S. Army Aviation Branch Chief and Commanding General of the U.S.

Army Aviation Warfighting Center, said, "The Apache is a symbol around the world that brings the best in industry, technology, the best in Soldiers, and it brings confidence because in the heat of battle, it is there when you need it."

The completion of two multiyear contracts and delivery of 501 AH-64Ds marked a milestone for the Apache program along with a new beginning, as follow-on orders for additional remanufactured and new-build AH-64Ds for the Army and helicopters for international customers sustained production. Evolution is a continuous process, and the Army continued working on another modernization plan for the AH-64D that would result in the Apache Block III helicopter.

The Army further enhanced the Apache Longbow by awarding the Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS) contract in 2000. This competitively won system design and development program advanced the helicopter's forward looking infrared (FLIR) capability to the next generation and replaced the aging electronics in the forward avionics bays. Lockheed Martin rolled out the first system to the Army in May 2005 and completed the first unit equipped in June of that year.



The AH-64D Apache Block III is the next phase of the Apache's evolution. Block III is a remanufacturing program that adds additional capability, addresses obsolescence, and improves the sustainability and maintainability of the airframe by Soldiers and logisticians. Block III low rate initial production is scheduled for FY11. (Photo courtesy of Boeing.)

M-TADS/PNVs vastly improved the capabilities of the legacy system. The most important of these improvements is the FLIR's ability to simply see better. Visual acuity, measured in resolution (more pixels), increased tenfold. Crews can see things with M-TADS/PNVs that are not visible in the legacy system. This greatly increased the standoff range to enemy gunners, making the Apache helicopter inherently more survivable. Utilization of the M-TADS/PNVs systems has resulted in a tremendous improvement in mean time between failure and mean time between maintenance actions.

While these statistics are impressive, the real-world result of the system's fielding has been the success of the Apache warfighters in the defense of friendly combatants, attacks on enemy fighters, and identifying and neutralizing enemy teams emplacing improvised explosive devices. The M-TADS/PNVs has had a significant impact on combat support for the Army Team. The aircrews now see farther and more clearly, and they prosecute far more threat combatants than before. The result is a significant increase in lethality and survivability for the Apache helicopter and the crews that fly them.

Block III Enhancements

The Army signed a development contract in early 2006 with a plan to complete a limited user test in late 2009 and wrap up a Milestone C decision in 2010, in anticipation of entering low rate initial production for AH-64D Apache Block III helicopters. The operational deployment of Apaches in support of today's requirements makes evident the need to bring the technologies planned for the Block III helicopter through test and into production for on-time delivery to Soldiers.

Flip the calendar forward through design, development, and testing on a rigorous schedule for the AH-64D Apache Block III, and the July 2008



Members of 2nd Attack Reconnaissance Battalion, 159th Aviation Regiment depart for a mission while supporting operations in *Operation Iraqi Freedom*. The AH-64D Apache has proven to be one of the major combat multipliers in theater. Apache units provide convoy security, search and destroy, route reconnaissance, deliberate attack, and area security missions on a daily basis. The AH-64D Apache Longbow pictured here also has several of the mission modifications specific to wartime deployment. (U.S. Army photo.)

ceremony to celebrate the first flight of the Army's AH-64D Apache Block III prototype aircraft comes into sharp focus. Major enhancements that make up the AH-64D Apache Block III include Future Force connectivity through seamless Global Information Grid communications, availability of off-board sensors carried on unmanned aerial platforms for extended-range sensing, and increased survivability through extended-range sensors and weapons. All of these enhancements are facilitated through open systems architecture, enhanced aircraft performance with an improved transmission and drive system, and reduced operations and support cost for increased aircraft readiness.

New capabilities and advancing technology continue to play a significant role in the future of Apache, as the needs of the ground commander bring about new requirements. Several programs are in the works to respond to these growing needs. The Modernized Day Sensor Assembly will complete the modernization of M-TADS/PNVs to enhance performance and prevent obsolescence. This modernization will include a new laser, a color TV, an internal measurement unit, and an image fusion capability. VNsight, a visible/near infrared sensor, is a low-light-level TV integrated into

the M-PNVs. VNsight provides the warfighter with increased situational awareness and enhanced flight safety, resulting in significant tactical advantages blending visible light imagery with the pilotage FLIR. These new capabilities are expected to be in production over the next several years and will reach the field between 2012 and 2016.

The Apache has brought about major change in the way our Army fights across the spectrum of conflict. The evolution of the Apache program demonstrates the manner in which a revolutionary change in a product must evolve with the current state of technology while meeting the needs of our commanders. The Apache Project Office and industry partners are committed to ensuring that our Soldiers have the tools necessary to fight, win, and come home safely.

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