

= Boeing AH @-@ 64 Apache =

The Boeing AH @-@ 64 Apache is an American four @-@ blade , twin @-@ turboshaft attack helicopter with a tailwheel @-@ type landing gear arrangement and a tandem cockpit for a two @-@ man crew . It features a nose @-@ mounted sensor suite for target acquisition and night vision systems . It is armed with a 30 mm (1 @-@ 18 in) M230 chain gun carried between the main landing gear , under the aircraft 's forward fuselage . It has four hardpoints mounted on stub @-@ wing pylons , typically carrying a mixture of AGM @-@ 114 Hellfire missiles and Hydra 70 rocket pods . The AH @-@ 64 has a large amount of systems redundancy to improve combat survivability .

The Apache originally started as the Model 77 developed by Hughes Helicopters for the United States Army 's Advanced Attack Helicopter program to replace the AH @-@ 1 Cobra . The prototype YAH @-@ 64 was first flown on 30 September 1975 . The U.S. Army selected the YAH @-@ 64 over the Bell YAH @-@ 63 in 1976 , and later approved full production in 1982 . After purchasing Hughes Helicopters in 1984 , McDonnell Douglas continued AH @-@ 64 production and development . The helicopter was introduced to U.S. Army service in April 1986 . The first production AH @-@ 64D Apache Longbow , an upgraded Apache variant , was delivered to the Army in March 1997 . Production has been continued by Boeing Defense , Space & Security ; over 2 @-@,000 AH @-@ 64s have been produced to date .

The U.S. Army is the primary operator of the AH @-@ 64 ; it has also become the primary attack helicopter of multiple nations , including Greece , Japan , Israel , the Netherlands , Singapore , and the United Arab Emirates ; as well as being produced under license in the United Kingdom as the AgustaWestland Apache . American AH @-@ 64s have served in conflicts in Panama , the Persian Gulf , Kosovo , Afghanistan , and Iraq . Israel used the Apache in its military conflicts in Lebanon and the Gaza Strip ; British and Dutch Apaches have seen deployments in Afghanistan and Iraq .

= = Development = =

= = = Advanced Attack Helicopter = = =

Following the cancellation of the AH @-@ 56 Cheyenne in 1972 , in favor of projects like the U.S. Air Force A @-@ 10 Thunderbolt II and the Marine Corps Harrier , the United States Army sought an aircraft to fill an anti @-@ armor attack role that would still be under Army command ; the 1948 Key West Agreement forbade the Army from owning combat fixed @-@ wing aircraft . The Army wanted an aircraft better than the AH @-@ 1 Cobra in firepower , performance and range . It would have the maneuverability for terrain following nap @-@ of @-@ the @-@ earth (NoE) flying . To this end , the U.S. Army issued a Request For Proposals (RFP) for an Advanced Attack Helicopter (AAH) on 15 November 1972 . As a sign of the importance of this project , in September 1973 the Army designated its five most important projects as the " Big Five " , with the AAH included .

Proposals were submitted by Bell , Boeing Vertol / Grumman team , Hughes , Lockheed , and Sikorsky . In July 1973 , the U.S. Department of Defense selected finalists Bell and Hughes Aircraft 's Toolco Aircraft Division (later Hughes Helicopters) . This began the phase 1 of the competition . Each company built prototype helicopters and went through a flight test program . Hughes ' Model 77 / YAH @-@ 64A prototype first flew on 30 September 1975 , while Bell 's Model 409 / YAH @-@ 63A prototype first flew on 1 October 1975 . After evaluating the test results , the Army selected Hughes ' YAH @-@ 64A over Bell 's YAH @-@ 63A in 1976 . Reasons for selecting the YAH @-@ 64A included its more damage tolerant four @-@ blade main rotor and the instability of the YAH @-@ 63 's tricycle landing gear arrangement .

The AH @-@ 64A then entered phase 2 of the AAH program under which three pre @-@ production AH @-@ 64s would be built , additionally , the two YAH @-@ 64A flight prototypes and the ground test unit were upgraded to the same standard . Weapons and sensor systems were integrated and tested during this time , including the laser @-@ guided AGM @-@ 114 Hellfire

missile . Development of the Hellfire missile had begun in 1974 , originally known by the name of Helicopter Launched , Fire and Forget Missile (' Hellfire ' being a shortened acronym) , for the purpose of arming helicopter platforms with an effective anti @-@ tank missile .

= = = Into production = = =

In 1981 , three pre @-@ production AH @-@ 64As were handed over to the U.S. Army for Operational Test II . The Army testing was successful , but afterward it was decided to upgrade to the more powerful T700 @-@ GE @-@ 701 version of engine , rated at 1 @,@ 690 shp (1 @,@ 260 kW) . The AH @-@ 64 was named the Apache in late 1981 , keeping with the Army 's traditional use of American Indian tribal names for its helicopters and it was approved for full @-@ scale production in 1982 . In 1983 , the first production helicopter was rolled out at Hughes Helicopter 's facility at Mesa , Arizona . Hughes Helicopters was purchased by McDonnell Douglas for \$ 470 million in 1984 . The helicopter unit later became part of The Boeing Company with the merger of Boeing and McDonnell Douglas in August 1997 . In 1986 , the incremental or flyaway cost for the AH @-@ 64A was \$ 7M and the average unit cost was approximately \$ 13.9M based on total costs .

During the 1980s , McDonnell Douglas studied an AH @-@ 64B , featuring an updated cockpit , new fire control system and other upgrades . In 1988 , funding was approved for a multi @-@ stage upgrade program to improve sensor and weapon systems . Technological advance led to the program 's cancellation in favor of more ambitious changes . In August 1990 , development of the AH @-@ 64D Apache Longbow was approved by the Defense Acquisition Board . The first AH @-@ 64D prototype flew on 15 April 1992 , prototype testing ended in April 1995 . During testing , six AH @-@ 64D helicopters were pitted against a numerically superior group of AH @-@ 64A helicopters ; the results demonstrated the AH @-@ 64D to have a seven times increase in survivability and four times increase in lethality compared to the AH @-@ 64A . On 13 October 1995 , full @-@ scale production was approved ; a \$ 1 @.@ 9 @-@ billion five @-@ year contract was signed in August 1996 to rebuild 232 AH @-@ 64As to AH @-@ 64D standard . On 17 March 1997 , the first production AH @-@ 64D first flew , it was delivered on 31 March .

Portions of the Apache are produced by various aerospace firms . AgustaWestland has produced number of components for the Apache , both for the international market and for the British Army 's AgustaWestland Apache . Since 2004 , Korea Aerospace Industries has been the sole manufacturer of the Apache 's fuselage . Fuselage production had previously been performed by Teledyne Ryan Aeronautical ; the transfer of fuselage production led to a prolonged legal dispute between Teledyne Ryan and Boeing .

The AH @-@ 64D program cost a total of \$ 11bn through 2007 . In April 2006 , Boeing was awarded a \$ 67.6M fixed @-@ price contract for the remanufacture of several existing U.S. AH @-@ 64As to the AH @-@ 64D configuration ; between May 2009 and July 2011 , a further five contracts were issued to remanufacture batches of AH @-@ 64As to the upgraded D variant . Since 2008 , nations operating the older AH @-@ 64A have been urged to undertake modernization programs to become AH @-@ 64Ds , as Boeing and the U.S. Army plans to terminate support for the A @-@ variants in the near future .

= = Design = =

= = = Overview = = =

The AH @-@ 64 Apache has a four @-@ blade main rotor and a four @-@ blade tail rotor . The crew sits in tandem , with the pilot sitting behind and above the copilot / gunner . Both crew members are capable of flying the aircraft and performing methods of weapon engagements independently . The AH @-@ 64 is powered by two General Electric T700 turboshaft engines with high @-@ mounted exhausts on either side of the fuselage . Various models of engines have been

used on the Apache ; those in British service use engines from Rolls @-@ Royce . In 2004 , General Electric Aviation began producing more powerful T700 @-@ GE @-@ 701D engines , rated at 2 @, @ 000 shp (1 @, @ 500 kW) for AH @-@ 64Ds .

The crew compartment has shielding between the cockpits , such that at least one crew member can survive hits . The compartment and the rotor blades are designed to sustain a hit from 23 mm (0 @. @ 91 in) rounds . The airframe includes some 2 @, @ 500 lb (1 @, @ 100 kg) of protection and has a self @-@ sealing fuel system to protect against ballistic projectiles . The aircraft was designed to meet the crashworthiness requirements of MIL @-@ STD @-@ 1290 , which specifies minimum requirement for crash impact energy attenuation to minimize crew injuries and fatalities . This was achieved through incorporation of increased structural strength , crashworthy landing gear , seats and fuel system .

On a standard day where temperatures are 59 ° F (15 ° C) , the AH @-@ 64 has a vertical rate of climb of 1 @, @ 775 feet per minute , and a service ceiling of 21 @, @ 000 feet (6 @, @ 400 m) . However , on a hot day where temperatures are 70 ° F (21 ° C) , its vertical rate of climb is reduced to 1 @, @ 595 fpm , and service ceiling is reduced to 19 @, @ 400 feet (5 @, @ 900 m) due to less dense air .

= = = Avionics and targeting = = =

One of the revolutionary features of the Apache was its helmet mounted display , the Integrated Helmet and Display Sighting System (IHADSS) ; among its capabilities , either the pilot or gunner can slave the helicopter 's 30 mm automatic M230 Chain Gun to their helmet , making the gun track head movements to point where they look . The M230E1 can be alternatively fixed to a locked forward firing position , or controlled via the Target Acquisition and Designation System (TADS) . On more modern AH @-@ 64s , the TADS / PNVs has been replaced by Lockheed Martin 's Arrowhead (MTADS) targeting system .

U.S. Army engagement training is performed under the Aerial Weapons Scoring System Integration with Longbow Apache Tactical Engagement Simulation System (AWSS @-@ LBA TESS) , using live 30 mm and rocket ammunition as well as simulated Hellfire missiles . The Smart Onboard Data Interface Module (SMODIM) transmits Apache data to an AWSS ground station for gunnery evaluation . The AH @-@ 64 's standard of performance for aerial gunnery is to achieve at least 1 hit for every 30 shots fired at a wheeled vehicle at a range of 800 ? 1 @, @ 200 m (870 ? 1 @, @ 310 yd) .

The AH @-@ 64 was designed to perform in front @-@ line environments , and to operate at night or day and during adverse weather conditions . Various sensors and onboard avionics allows the Apache to perform in these conditions ; such systems include the Target Acquisition and Designation System , Pilot Night Vision System (TADS / PNVs) , passive infrared countermeasures , GPS , and the IHADSS . Longbow @-@ equipped Apaches can locate up to 256 targets simultaneously within 50 km (31 mi) . In August 2012 , 24 U.S. Army AH @-@ 64Ds were equipped with the Ground Fire Acquisition System (GFAS) , which detects and targets ground @-@ based weapons fire sources in all @-@ light conditions and with a 120 ° Visual field . The GFAS consists of two sensor pods working with the AH @-@ 64 's other sensors , and a thermographic camera that precisely locates muzzle flashes .

In 2014 , it was announced that new targeting and surveillance sensors were under development to provide high @-@ resolution color imagery to crews , replacing older low definition black @-@ and @-@ white imaging systems . Lockheed received the first contract in January 2016 , upgrading the Arrowhead turret to provide higher @-@ resolution color imaging with longer ranges and a wider field of view . In 2014 , the U.S. Army was adapting its Apaches for increased maritime performance as part of the Pentagon 's rebalance to the Pacific . Additional avionics and sensor improvements includes an extended @-@ range radar capable of detecting small ships in littoral environments , software adaptations to handle maritime targets , and adding Link 16 data @-@ links for better communications with friendly assets .

== Armaments and configurations ==

The AH-64 is adaptable to numerous different roles within its context as Close Combat Attack (CCA). In addition to the 30 mm M230E1 Chain Gun, the Apache carries a range of external stores and weapons on its stub-wing pylons, typically a mixture of AGM-114 Hellfire anti-tank missiles, and Hydra 70 general-purpose unguided 70 mm (2.75 in) rockets. One 18-aircraft Apache battalion equipped with Hellfire missiles is capable of destroying 288 tanks. Since 2005, the Hellfire missile is sometimes outfitted with a thermobaric warhead; designated AGM-114N, it is intended for use against ground forces and urban warfare operations. The use of thermobaric "enhanced blast" weapons, such as the AGM-114N, has been a point of controversy. In October 2015, the U.S. Army ordered its first batch of Advanced Precision Kill Weapon System (APKWS) guided 70 mm rockets for the Apache.

Starting in the 1980s, the Stinger and AIM-9 Sidewinder air-to-air missiles and the AGM-122 Sidearm anti-radiation missile were evaluated for use upon the AH-64. The Stinger was initially selected; the U.S. Army was also considering the Starstreak air-to-air missile. External fuel tanks can also be carried on the stub wings to increase range and mission time. The stub-wing pylons have mounting points for maintenance access; these mountings can be used to secure externally personnel for emergency transportation. Stinger missiles are often used on non-U.S. Apaches, as foreign forces do not have as many air superiority aircraft to control the skies. The AH-64E initially lacked the ability to use the Stinger to make room for self-defense equipment, but the capability was re-added following a South Korean demand.

The AH-64E Apache has the ability to control unmanned aerial vehicles (UAVs), used by the U.S. Army to perform aerial scouting missions previously performed by the OH-58 Kiowa. Apaches can request to take control of an RQ-7 Shadow or MQ-1C Grey Eagle from ground control stations to safely scout via datalink communications. There are four levels of UAV interoperability (LOI): LOI 1 indirectly receives payload data; LOI 2 receives payload data through direct communication; LOI 3 deploys the UAV's armaments; and LOI 4 takes over flight control. UAVs can search for enemies and, if equipped with a laser designator, target them for the Apache or other friendly aircraft.

Boeing has suggested that the AH-64 could be fitted with a directed energy weapon. The company has developed a small laser weapon, initially designed to engage small UAVs, that uses a high-resolution telescope to direct a 2-10 kW beam with the diameter of a penny out to a range of 5-4 nmi (10-0 km; 6-2 mi). On the Apache, the laser could be used to destroy enemy communications or radio equipment.

On 14 July 2016 it was reported that the AH-64 had successfully completed testing of the MBDA Brimstone anti-armor missile.

== Operational history ==

== United States Army ==

== Early service ==

The U.S. Army formally accepted its first production AH-64A in January 1984 and training of the first pilots began later that year. The first operational Apache unit, 7th Battalion, 17th Cavalry Brigade, began training on the AH-64A in April 1986 at Fort Hood, Texas. Two operational units with 68 AH-64s first deployed to Europe in September 1987 and took part in large military exercises there.

Upon fielding the Apache, capabilities such as using the FLIR for extensive night operations made it clear that it was capable of operating beyond the forward line of own troops (FLOT) to which

previous attack helicopters were normally restricted . It was discovered that the Apache was coincidentally fitted with the Have Quick UHF radio system used by the U.S. Air Force , allowing inter @-@ service coordination and joint operations such as the joint air attack teams (JAAT) . The Apache have operated extensively with close air support (CAS) aircraft , such as the USAF 's Fairchild Republic A @-@ 10 Thunderbolt II and the USMC 's McDonnell Douglas AV @-@ 8B Harrier II , often acting as a target designator to conserve the Apache 's own munitions . The Apache was first used in combat in 1989 , during Operation Just Cause , the invasion of Panama . The AH @-@ 64 participated in over 240 hours of combat attacking various targets , mostly at night . General Carl Stiner , the commander of the operation , commented that : " You could fire that Hellfire missile through a window from four miles away at night " .

= = = = Gulf War and Balkans = = = =

Nearly half of all U.S. Apaches were deployed to Saudi Arabia following Iraq 's invasion of Kuwait . During Operation Desert Storm on 17 January 1991 , eight AH @-@ 64As guided by four MH @-@ 53 Pave Low IIIs destroyed part of Iraq 's radar network in the operation 's first attack , allowing aircraft to evade detection . The Apaches each carried an asymmetric load of Hydra 70 flechette rockets , Hellfires , and one auxiliary fuel tank . During the 100 @-@ hour ground war a total of 277 AH @-@ 64s took part , destroying 278 tanks , numerous armored personnel carriers and other Iraqi vehicles . One AH @-@ 64 was lost in the war , to a rocket @-@ propelled grenade (RPG) hit at close range , the Apache crashed but the crew survived .

While effective in combat , the AH @-@ 64 also presented serious logistical complications . Findings reported in 1990 stated " maintenance units could not keep up with the Apache ? s unexpectedly high work load ... " To provide spare parts for combat operations , the U.S. Army unofficially grounded all other AH @-@ 64s worldwide ; Apaches in the theater flew only one @-@ fifth of the planned flight @-@ hours . These problems were evident before the Gulf War .

The AH @-@ 64 played roles in the Balkans during separate conflicts in Bosnia and Kosovo in the 1990s . During Task Force Hawk , 24 Apaches were deployed to a land base in Albania in 1999 for combat in Kosovo . These required 26 @,@ 000 tons of equipment to be transported over 550 C @-@ 17 flights , at a cost of US \$ 480 million . During these deployments , the AH @-@ 64 encountered some problems , such as deficiencies in training , night vision equipment , fuel tanks , and survivability . On 27 April 1999 , an Apache crashed during training in Albania due to a failure with the tail rotor , causing the fleet in the Balkans to be grounded in December 2000 .

In 2000 , Major General Dick Cody , 101st Airborne 's commanding officer , wrote a strongly worded memo to the Chief of Staff about training and equipment failures . No pilots were qualified to fly with night vision goggles , preventing nighttime operations . The Washington Post printed a front @-@ page article on the failures , commenting : " The vaunted helicopters came to symbolise everything wrong with the Army as it enters the 21st century : Its inability to move quickly , its resistance to change , its obsession with casualties , its post @-@ Cold War identity crisis " . No Apache combat missions took place in Kosovo due to fears of casualties .

= = = = Afghanistan and Iraq = = = =

U.S. Apaches served in Operation Enduring Freedom in Afghanistan from 2001 . The Apache was the only Army platform capable of providing accurate CAS duties for Operation Anaconda , regularly taking fire during the intense early fighting , they were typically repaired quickly . U.S. AH @-@ 64Ds typically flew in Afghanistan and Iraq without the Longbow Radar in the absence of armored threats . On 21 December 2009 , a pair of U.S. Apaches attacked a British @-@ held base in a friendly fire incident , killing one British soldier . In 2006 , Thomas Adams noted that Apaches often fought in small teams with little autonomy to react to threats and opportunities , requiring lengthy dialogue with command structures in an effort to centrally micromanage each unit .

In 2003 , the AH @-@ 64 participated in the invasion of Iraq during Operation Iraqi Freedom . On 24 March 2003 , 31 Apaches were damaged , and one shot down and captured , in an unsuccessful

attack on an Iraqi Republican Guard armored brigade near Karbala . Iraqi tank crews had set up a " flak trap " among terrain and effectively employed their guns . Iraqi officials claimed a farmer with a Brno rifle shot down the Apache , but the farmer denied involvement . The helicopter came down intact and both the pilot and co @-@ pilot were captured . The AH @-@ 64D was destroyed via air strike the following day .

By the end of U.S. military operations in Iraq in December 2011 , several Apache helicopters had been shot down by enemy fire , and others lost in accidents . In 2006 , an Apache was downed by a Soviet @-@ made Strela 2 (SA @-@ 7) in Iraq , despite the Apache being typically able to avoid such missiles . In 2007 , four Apache helicopters were destroyed on the ground by insurgent mortar fire using web @-@ published geotagged photographs taken by soldiers . Several AH @-@ 64s were lost to accidents in Afghanistan as of 2012 . Most Apaches that took heavy damage were able to continue their missions and return safely .

= = = = Recent service = = = =

As of 2011 , the U.S. Army Apache fleet had accumulated more than 3 million flight hours since the first prototype flew in 1975 . A DOD audit released in May 2011 , found that Boeing had significantly overcharged the U.S. Army on multiple occasions , ranging from 33 @. 3 percent to 177 @, 475 percent for routine spare parts in helicopters like the Apache .

On 21 February 2013 , the 1st Battalion (Attack) , 229th Aviation Regiment at Joint Base Lewis @-@ McChord became the first U.S. Army unit to field the AH @-@ 64E Apache Guardian ; a total of 24 AH @-@ 64E were received by mid @-@ 2013 . On 27 November 2013 , the AH @-@ 64E achieved initial operating capability (IOC) . In March 2014 , the 1st @-@ 229th Attack Reconnaissance Battalion deployed 24 AH @-@ 64Es to Afghanistan in the type ' first combat deployment . From April through September 2014 , AH @-@ 64E in combat maintained an 88 percent readiness rate . The unit 's deployment ended in November 2014 , with the AH @-@ 64E accumulating 11 @, 000 flight hours , each helicopter averaging 66 hours per month . The AH @-@ 64E flies 20 mph (32 km / h) faster than the AH @-@ 64D , cutting response time by 57 percent , and has better fuel efficiency , increasing time on station from 2 @. 5 ? 3 hours to 3 @-@ 3 @. 5 hours ; Taliban forces , which were familiar with the AH @-@ 64D and based their tactics accordingly , were surprised by the AH @-@ 64E arriving and attacking sooner and for longer periods . AH @-@ 64Es also worked with medium and large unmanned aerial vehicles (UAVs) to find targets and maintain positive ID , conducting 60 percent of the unit 's direct @-@ fire engagements in conjunction with UAVs ; Guardian pilots often controlled UAVs and accessed their video feeds to use their greater operating altitudes and endurance to see the battlespace from standoff ranges .

The Army is implementing a plan to move all Apaches from the Army Reserve and National Guard to the active Army to serve as scout helicopters to replace the OH @-@ 58 Kiowa . Using the AH @-@ 64 to scout would be less expensive than Kiowa upgrades or purchasing a new scout helicopter . AH @-@ 64Es can control UAVs like the MQ @-@ 1C Grey Eagle to perform aerial scouting missions ; a 2010 study found the teaming of Apaches and UAVs was the most cost @-@ effective alternative to a new helicopter and would meet 80 percent of reconnaissance requirements , compared to 20 percent with existing OH @-@ 58s and 50 percent with upgraded OH @-@ 58s . National Guard units , who would lose their attack helicopters , criticized the proposal . In March 2015 , the first heavy attack reconnaissance unit was formed , comprising 24 attack Apaches , 24 reconnaissance Apaches , and 12 Shadow UAVs .

In July 2014 , the Pentagon announced that Apaches had been dispatched to Baghdad to protect embassy personnel from Islamic State militant attacks . On 4 October 2014 , Apaches began performing missions in Operation Inherent Resolve against Islamic State ground forces . In October 2014 , U.S. Army AH @-@ 64s and Air Force fighters participated in four air strikes on Islamic State units northeast of Fallujah . In June 2016 , Apaches were used in support of the Iraqi Army 's Mosul offensive .

== Israel ==

The Israeli Air Force (IAF) first received AH @-@ 64As in 1990 , for a total fleet of 42 . There was some controversy over the Air Force 's choice to purchase Apaches over upgrading existing AH @-@ 1 Cobra attack helicopters . In 2000 , Israel was interested in acquiring up to 48 AH @-@ 64Ds , but U.S. reluctance to share the software source code complicated the prospect . In April 2005 , Boeing delivered the first AH @-@ 64D to the IAF . In 2001 , the U.S. government was allegedly investigating misuse of the Apache and other US @-@ supplied military equipment against Palestinian leaders and facilities . In 2009 , an arranged sale of six AH @-@ 64Ds was reportedly blocked by the Obama Administration , pending interagency review , over concerns the helicopters may pose a threat to civilian Palestinians in Gaza . In IAF service , the AH @-@ 64A was named as the Peten (Hebrew : ??? , for Cobra) , while the AH @-@ 64D was named Saraph (??? , also as " Seraph " , Hebrew for venomous / fiery winged serpent) .

During the 1990s , Israeli AH @-@ 64As frequently attacked Hezbollah outposts in Lebanon . On 13 April 1996 , during Operation Grapes of Wrath , an Apache fired two Hellfire missiles at an ambulance in Lebanon , killing six civilians . During the al @-@ Aqsa Intifada in 2000 , AH @-@ 64s were used to kill senior Hamas figures , such as Ahmed Yassin and Adnan al @-@ Ghoul . On 24 May 2001 , a privately owned Lebanese @-@ registered Cessna 152 flew into Israeli airspace , it was intercepted by two AH @-@ 64s and shot down by a Hellfire missile , killing the pilot . On 22 March 2004 , an Israeli AH @-@ 64 used a Hellfire missile to kill Hamas leader Ahmed Yassin , also killing his two bodyguards and nine bystanders . IAF Apaches played a prominent role in the 2006 Lebanon War , launching strikes into Lebanon targeting Hezbollah forces .

There have also been accidents involving the Apache helicopter in Israeli service . During the Lebanon War in 2006 , two IAF AH @-@ 64A helicopters collided , killing one pilot and critically wounding three . In another incident in the conflict an IAF AH @-@ 64D crashed due to a malfunction in the main rotor , killing the two crew . In late 2007 , the Israeli Air Force put further purchases and deliveries of AH @-@ 64Ds on hold during an investigation upon the aircraft 's performance envelope . However , Israeli officials have since praised the Apache for its role in Operation Cast Lead in 2008 , against Hamas in Gaza . In recent years , Israeli Apaches have been used to patrol the skies over Gaza ; strike operations against insurgents using these helicopters has become a frequent occurrence .

Since recent orders of new AH @-@ 64Ds have been blocked , Israel has pursued upgrades to its AH @-@ 64A fleet . In June 2010 , Israel decided not to upgrade all AH @-@ 64As to D configuration , due to funding constraints and lack of U.S. cooperation . In December 2010 , the IAF was examining the adoption of a new missile system as a cheaper and lightweight complement to the Hellfire missile , either the American Hydra 70 or the Canadian CRV7 . In 2013 , Israeli AH @-@ 64As had been receiving a comprehensive upgrade of their avionics and electrical systems . The AH @-@ 64As are being upgraded to the AH @-@ 64Ai configuration , which is near the AH @-@ 64D standard .

== United Kingdom ==

The UK currently operates a modified version of the Apache Longbow ; initially called the Westland WAH @-@ 64 Apache , it is designated the Apache AH1 by the British Army . Westland built 67 WAH @-@ 64 Apaches under license from Boeing , following a competition between the Eurocopter Tiger and the Apache for the British Army 's new Attack Helicopter in 1995 . Important deviations made by AgustaWestland from the U.S. Apache variants include changing to more powerful Rolls @-@ Royce engines , and the addition of a folding blade assembly for use on naval ships .

On 11 July 2016 , the UK Ministry of Defence confirmed a \$ 2 @. @ 3 billion order for 50 AH @-@ 64Es to be built in Mesa , Arizona . The purchase is via a Foreign Military Sales (FMS) agreement with the US government . Leonardo Helicopters in the UK is to maintain the current fleet of Apaches until 2023 ? 24 , with a long @-@ term plan for Leonardo and other UK companies to " do most of the work " on the new fleet . The deal includes an initial support contract for maintenance of the new

helicopters , along with spare parts and training simulators for UK pilots . The first UK helicopters are due off the US production line in early 2020 and will begin entering service with the British Army in 2022 . " To further guarantee value for money , systems from the current Apache fleet , such as the Modernised Target Acquisition & Designation System , and the Longbow Fire Control Radar , will be reused and incorporated into the new helicopters where possible . " Approval for the re @-@ manufacture of fifty of the UK 's WAH @-@ 64 Mk 1 fleet to AH @-@ 64E Apache Guardian standard had been given by the Defense Security Cooperation Agency in August 2015 . The aircraft will utilise the General Electric T700 engine rather than the Turbomeca RTM322 from the current fleet ; the first off @-@ the @-@ shelf purchase of a GE engine by the UK MOD .

= = = Netherlands = = =

The Dutch government initially showed an interest in acquiring Apache helicopters in the late 1980s , where it stated that it may purchase as many as 52 . A competition held in 1994 against the Eurocopter Tiger and the Bell AH @-@ 1 SuperCobra led to the Royal Netherlands Air Force ordering 30 AH @-@ 64D Apaches in 1995 . Deliveries began in 1998 and ended in 2002 . The RNLAf Apaches are equipped with the Apache Modular Aircraft Survivability Equipment (AMASE) self @-@ protection system to counter infrared (IR) missile threats .

The RNLAf Apaches ' first deployment was in 2001 to Djibouti , Africa . They were also deployed alongside U.S. AH @-@ 64s in support of NATO peacekeeping forces in Bosnia and Herzegovina . In 2004 , six Dutch AH @-@ 64s were deployed as part of the Netherlands contribution to Multinational force in Iraq to support the Dutch ground forces . The Apaches performed close combat support and display of force missions , along with providing reconnaissance information to ground forces . In February 2006 , the Netherlands contribution to NATO forces in Afghanistan was increased from 600 to 1 @,@ 400 troops and 6 AH @-@ 64s were sent in support .

Shortly after Apaches were deployed to Hamid Karzai International Airport , as part of the Netherlands contribution to ISAF , on 10 April 2004 a pair of Dutch Apaches came under light gunfire close to the Afghan capital . On 17 December 2007 , an RNLAf Apache flew into powerlines during a night flying exercise in the Netherlands , forcing an emergency landing and causing a lengthy blackout in the region . On 17 March 2015 a RNLAf Apache crashed during a training mission in Mali . Both pilots died . The ministry of defence opened an investigation into the cause of the crash .

= = = Saudi Arabia = = =

Following the 1991 Gulf War , during which many U.S. Apaches operated from bases within Saudi territory , Saudi Arabia purchased twelve AH @-@ 64As for the Royal Saudi Land Force . It has been speculated that the Saudi purchase had motivated Israel to also procure the Apaches . In August 2006 , the Saudi Arabian government began negotiations for Apache upgrades worth up to \$ 400M , possibly remanufacturing their AH @-@ 64As to the AH @-@ 64D Longbow configuration . In September 2008 , the U.S. Government approved the purchase of 12 AH @-@ 64Ds requested by Saudi Arabia . In October 2010 , Saudi Arabia requested a further 70 AH @-@ 64Ds as part of a possible , massive arms deal .

In November 2009 , the Royal Saudi Land Force , as part of a military effort against insurgent intrusions of the kingdom 's border , started using the Apache in Operation Scorched Earth ; this also involved launching air strikes against Houthi rebels operating inside neighboring Yemen . In January 2010 the rebels claimed to have shot down an Apache ; this was denied by the Saudi military . In late January 2010 , the leader of the Shiite rebels announced their withdrawal from Saudi territory , this announcement followed a key battle on 12 January when Saudi forces reportedly took control of the border village of Al Jabiri .

= = = Egypt = = =

In 1995 , the Egyptian Air Force placed an order for 36 AH @-@ 64A helicopters . These Apaches were delivered with most of the advanced avionics used on the U.S. fleet at that time , with the exception of localized radio equipment . In 2000 , Boeing announced an order to remanufacture Egypt 's existing Apache fleet to the AH @-@ 64D configuration . Notably , the AH @-@ 64D upgrade did not include the procurement of the Longbow radar , the supply of which had been refused by the U.S. government . Egypt requested a further 12 AH @-@ 64D Block II Apaches through a Foreign Military Sale in 2009 .

In August 2012 , the Egyptian Armed Forces undertook a large @-@ scale military operation to regain control of the Sinai Peninsula from armed militants . Air cover throughout the operation was provided by the Egyptian Air Force 's Apache helicopters ; reportedly the Apaches destroyed three vehicles and killed at least 20 militants . Up to five Egyptian Apaches were temporarily stationed in the Sinai following an agreement between Egypt and Israel . In September 2015 , an Egyptian Apache attacked a group of foreign tourists in the Egyptian part of the Libyan Desert , killing 12 people and injuring 10 , they were mistaken for Islamist militants , the Egyptian Interior Ministry stated that the group were in a restricted area .

= = = Other users = = =

The United Arab Emirates purchased 30 AH @-@ 64A helicopters in 1991 and 1994 , which they are now upgrading to AH @-@ 64D specification . In 2005 , Kuwait purchased 16 Longbow helicopters .

Greece received 20 AH @-@ 64As by 1995 ; another 12 AH @-@ 64Ds were ordered in September 2003 .

Singapore purchased 20 AH @-@ 64Ds aircraft in two batches between 1999 and 2001 ; during October 2010 Apache training was suspended following the forced crash @-@ landing of an Apache .

Japan ordered 50 AH @-@ 64Ds , which are being built under license by Fuji Heavy Industries , designated " AH @-@ 64DJP " . The first helicopter was delivered to the JGSDF in early 2006 .

Taiwan (Republic of China) reached an agreement with the U.S. to purchase 30 AH @-@ 64Es with weapons , and associated equipment in June 2011 . On 5 November 2013 , Taiwan received the first 6 AH @-@ 64s . On 25 April 2014 , a Taiwanese AH @-@ 64E crashed into a three @-@ story building during a training flight in bad weather conditions , the first airframe loss of an AH @-@ 64E . An investigation ruled out mechanical failure and concluded human error as responsible , that the pilots descended too fast through clouds at low altitude without checking flight panels to maintain adequate height ; the Army responded by stepping up simulator training for pilots . In October 2014 , the fifth and final batch of AH @-@ 64Es was delivered to Taiwan , completing the order .

In 2009 , South Korea showed interest in acquiring Apaches . This move may be related to U.S. plans to withdraw many of its Apaches from South Korea . On 21 September 2012 , the U.S. Congress was notified of the possible purchase of 36 AH @-@ 64D Block III Apaches , along with associated equipment and armament . The Apache competed against the Bell AH @-@ 1Z Viper and the TAI / AgustaWestland T @-@ 129 ; in April 2013 , South Korea announced that it would purchase 36 AH @-@ 64Es . The first four AH @-@ 64Es were delivered in May 2016 , with all to be delivered by early 2017 .

= = = Future and possible users = = =

In 2008 , the Indian Air Force (IAF) released a tender for 22 attack helicopters ; there were six contending submissions ? Sikorsky 's UH @-@ 60 Black Hawk , the AH @-@ 64D , Bell 's AH @-@ 1 Super Cobra , Eurocopter 's Tiger , Mil 's Mi @-@ 28 and AgustaWestland 's A129 Mangusta . In October 2008 , Boeing and Bell withdrew . In 2009 , the competition was restarted . In December 2010 , India requested the possible sale of 22 Apaches and associated equipment . On 5 October 2012 , IAF Chief NAK Browne confirmed the Apache 's selection . The IAF sought control of the 22

proposed Apaches for air combat missions , while the Army Aviation Corps argued that they would be better used in army operations . In April 2013 , the Indian Ministry of Defence (MoD) decided that the IAF would receive the 22 AH @-@ 64s . In May 2013 , the Indian Army requested 11 AH @-@ 64Es ; and has a requirement for 39 Apaches . The Indian Ministry of Defence approved the procurement in August 2014 , as did India 's Cabinet Committee on Security (CCS) in September 2015 . On 28 September 2015 , a contract was formally signed ; the first helicopter is expected to be delivered to India in the next three to four years .

On 26 August 2013 , the U.S. and Indonesia formalized a \$ 500 million deal for 8 AH @-@ 64E Apaches .

Iraq requested the sale of 24 AH @-@ 64s in April 2013 ; In January 2014 , a sale , including the helicopters , associated parts , maintenance , and training , was cleared by Congress . However , the proposal was not accepted by the Iraqi government and expired in August 2014 .

In July 2012 , Qatar requested the sale of 24 AH @-@ 64D Apache Block III helicopters , with associated equipment , training , and support . The sale was approved on 27 March 2014 .

In July 2016 , the UK placed an order for 50 AH @-@ 64Es through the US Foreign Military Sales (FMS) programme instead of upgrading their Westland @-@ built WAH @-@ 64s .

= = Variants = =

= = = AH @-@ 64A = = =

The AH @-@ 64A is the original production attack helicopter . The crew sit in tandem in an armored compartment . It is powered by two GE T700 turboshaft engines . The A @-@ model was equipped with the ? 701 engine version until 1990 when the engines were switched to the more powerful ? 701C version .

U.S. Army AH @-@ 64As are being converted to AH @-@ 64Ds . The service 's last AH @-@ 64A was taken out of service in July 2012 before conversion at Boeing 's facility in Mesa , Arizona . On 25 September 2012 , Boeing received a \$ 136.8M contract to remanufacture the last 16 AH @-@ 64As into the AH @-@ 64D Block II version and this was forecast to be completed by December 2013 .

= = = AH @-@ 64B = = =

In 1991 , after Operation Desert Storm , the AH @-@ 64B was a proposed upgrade to 254 AH @-@ 64As . The upgrade would have included new rotor blades , a Global Positioning System (GPS) , improved navigation systems and new radios . Congress approved \$ 82M to begin the Apache B upgrade . The B program was canceled in 1992 . The radio , navigation , and GPS modifications , were later installed on most A @-@ model Apaches through other upgrades .

= = = AH @-@ 64C = = =

Additional funding from Congress in late 1991 resulted in a program to upgrade AH @-@ 64As to an AH @-@ 64B + version . More funding changed the plan to upgrade to AH @-@ 64C . The C upgrade would include all changes to be included in the Longbow except for mast @-@ mounted radar and newer ? 700C engine versions . However , the C designation was dropped after 1993 . With AH @-@ 64As receiving the newer engine from 1990 , the only difference between the C model and the radar @-@ equipped D model was the radar , which could be moved from one aircraft to another ; thus the decision was made to simply designate both versions " AH @-@ 64D " .

= = = AH @-@ 64D = = =

The AH @-@ 64D Apache Longbow is equipped with a glass cockpit and advanced sensors , the most noticeable of which being the AN / APG @-@ 78 Longbow millimeter @-@ wave fire @-@ control radar (FCR) target acquisition system and the Radar Frequency Interferometer (RFI) , housed in a dome located above the main rotor . The radome 's raised position enables target detection while the helicopter is behind obstacles (e.g. terrain , trees or buildings) . The AN / APG @-@ 78 is capable of simultaneously tracking up to 128 targets and engaging up to 16 at once , an attack can be initiated within 30 seconds . A radio modem integrated with the sensor suite allows data to be shared with ground units and other Apaches ; allowing them to fire on targets detected by a single helicopter .

The aircraft is powered by a pair of uprated T700 @-@ GE @-@ 701C engines . The forward fuselage was expanded to accommodate new systems to improve survivability , navigation , and ' tactical internet ' communications capabilities . In February 2003 , the first Block II Apache was delivered to the U.S. Army , featuring digital communications upgrades . The Japanese Apache AH @-@ 64DJP variant is based on the AH @-@ 64D ; it can be equipped with the AIM @-@ 92 Stinger air @-@ to @-@ air missiles for self @-@ defense .

== = AH @-@ 64E == =

Formerly known as AH @-@ 64D Block III , in 2012 , it was redesignated as AH @-@ 64E Guardian to represent its increased capabilities . The AH @-@ 64E features improved digital connectivity , the Joint Tactical Information Distribution System , more powerful T700 @-@ GE @-@ 701D engines with upgraded face gear transmission to accommodate more power , capability to control unmanned aerial vehicle (UAVs) , full IFR capability , and improved landing gear . New composite rotor blades , which successfully completed testing in 2004 , increase cruise speed , climb rate , and payload capacity . Deliveries began in November 2011 . Full @-@ rate production was approved on 24 October 2012 , with 634 AH @-@ 64Ds to be upgraded to AH @-@ 64E standard and production of 56 new @-@ build AH @-@ 64Es to start in 2019 / 20 . Changes in production lots 4 through 6 shall include a cognitive decision aiding system and new self @-@ diagnostic abilities . The updated Longbow radar has an oversea capacity , potentially enabling naval strikes ; an AESA radar is under consideration . The E model is to be fit for maritime operations . The Army has expressed a desire to add extended @-@ range fuel tanks to the AH @-@ 64E to further increase range and endurance . AH @-@ 64Es are to have the L @-@ 3 Communications MUM @-@ TX datalink installed in place of two previous counterparts , communicating on C , D , L , and Ku frequency bands to transmit and receive data and video with all Army UAVs . Lots 5 and 6 will be equipped with Link 16 data @-@ links .

== = AH @-@ 64F == =

In 2014 , Boeing conceptualized an Apache upgrade prior to the introduction of the U.S. Army 's anticipated attack version of the Future Vertical Lift aircraft , forecast to replace the Apache by 2040 . The conceptual AH @-@ 64F would have greater speed via a new 3 @, @ 000 shp turboshaft engine from the improved turbine engine program , retractable landing gear , stub wings to offload lift from the main rotor during cruise , and a tail rotor that can articulate 90 degrees to provide forward thrust .

== = Sea Apache == =

During the 1980s Naval versions of the AH @-@ 64A for the United States Marine Corps and Navy were examined . Multiple concepts were studied with altered landing gear arrangements , improved avionics and weapons . The USMC was very interested and conducted a two @-@ week evaluation of the Apache in September 1981 , including shipboard operation tests .

Funding for a naval version was not provided ; the Marine Corps continued to use the AH @-@ 1 . The Canadian Forces Maritime Command also examined a naval Apache . In 2004 , British Army

AgustaWestland Apaches were deployed upon the Royal Navy 's HMS Ocean , a Landing Platform Helicopter , for suitability testing ; there was U.S. interest in the trials .

During the 2011 military intervention in Libya , the British Army extensively used Apaches from HMS Ocean . In 2013 , U.S. 36th Combat Aviation Brigade AH @-@ 64Ds were tested on a variety of U.S. Navy ships .

= = = Export Apaches = = =

Several models have been derived from both AH @-@ 64A and AH @-@ 64D for export . The British @-@ built AgustaWestland Apache (assembled from kits purchased from Boeing) is based on the AH @-@ 64D Block I with several different systems , including more powerful engines , folding rotor blades , and other modifications for operation from Royal Navy vessels .

= = = Block modification = = =

While a major change in design or role will cause the type designator suffix to change , for example from AH @-@ 64D to AH @-@ 64E , the helicopters are also subject to Block modification . Block modification is the combining of equipment changes into blocks of modification work orders , the modifications in the block (sometimes called a block package) are all done to the helicopter at the same time .

= = Operators = =

Egypt

Egyptian Air Force (AH @-@ 64D)

Greece

Hellenic Army (AH @-@ 64A / D)

India

Indian Air Force (AH @-@ 64E : 22 on order)

Indonesia

Indonesian Army (AH @-@ 64E : 8 on order)

Israel

Israeli Air Force (AH @-@ 64A / D)

Japan

Japan Ground Self @-@ Defense Force (AH @-@ 64D)

Kuwait

Kuwait Air Force (AH @-@ 64D)

Netherlands

Royal Netherlands Air Force (AH @-@ 64D)

Saudi Arabia

Royal Saudi Land Forces (AH @-@ 64A / D / E)

Singapore

Republic of Singapore Air Force (AH @-@ 64D)

Republic of Korea

Republic of Korea Army (AH @-@ 64E : 36 on order)

Taiwan (Republic of China)

Republic of China Army (AH @-@ 64E)

United Arab Emirates

United Arab Emirates Air Force (AH @-@ 64D)

United Kingdom

See also AgustaWestland Apache

United States

United States Army (AH @-@ 64D / E)

= = Specifications (AH @-@ 64A / D) = =

Data from Jane 's Information Group , Bishop

General characteristics

Crew : 2 (pilot , and co @-@ pilot / gunner)

Length : 58 @. @ 17 ft (17 @. @ 73 m) (with both rotors turning)

Rotor diameter : 48 ft 0 in (14 @. @ 63 m)

Height : 12 @. @ 7 ft (3 @. @ 87 m)

Disc area : 1 @, @ 809 @. @ 5 ft ² (168 @. @ 11 m ²)

Empty weight : 11 @, @ 387 lb (5 @, @ 165 kg)

Loaded weight : 17 @, @ 650 lb (8 @, @ 000 kg)

Max. takeoff weight : 23 @, @ 000 lb (10 @, @ 433 kg)

Powerplant : 2 × General Electric T700 @-@ GE @-@ 701 turboshafts , 1 @, @ 690 shp (1 @, @ 260 kW) [upgraded to T700 @-@ GE @-@ 701C (for AH @-@ 64A / D from 1990) , 1 @, @ 890 shp (1 @, @ 409 kW)] each

Fuselage length : 49 ft 5 in (15 @. @ 06 m)

Rotor systems : 4 blade main rotor , 4 blade tail rotor in non @-@ orthogonal alignment

Performance

Never exceed speed : 197 knots (227 mph , 365 km / h)

Maximum speed : 158 knots (182 mph , 293 km / h)

Cruise speed : 143 knots (165 mph , 265 km / h)

Range : 257 nmi (295 mi , 476 km) with Longbow radar mast

Combat radius : 260 nmi (300 mi , 480 km)

Ferry range : 1 @, @ 024 nmi (1 @, @ 180 mi , 1 @, @ 900 km)

Service ceiling : 21 @, @ 000 ft (6 @, @ 400 m) minimum loaded

Rate of climb : 2 @, @ 500 ft / min (12 @. @ 7 m / s)

Disc loading : 9 @. @ 80 lb / ft ² (47 @. @ 9 kg / m ²)

Power / mass : 0 @. @ 18 hp / lb (0 @. @ 31 kW / kg)

Armament

Guns : 1 × 30 mm (1 @. @ 18 in) M230 Chain Gun with 1 @, @ 200 rounds as part of the Area Weapon Subsystem

Hardpoints : Four pylon stations on the stub wings . Longbows also have a station on each wingtip for an AIM @-@ 92 Stinger twin missile pack .

Rockets : Hydra 70 70 mm , CRV7 70 mm , and APKWS 70 mm air @-@ to @-@ ground rockets

Missiles : Typically AGM @-@ 114 Hellfire variants ; AIM @-@ 92 Stinger may also be carried .

Avionics

Lockheed Martin / Northrop Grumman AN / APG @-@ 78 Longbow fire @-@ control radar (Note : can only be mounted on the AH @-@ 64D / E)

= = Notable appearances in media = =