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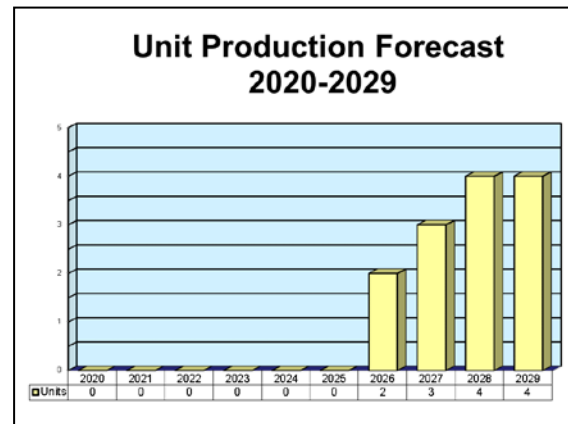
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Airbus Helicopters Tiger

Outlook

- Various opportunities exist for sales of new Tigers and retrofits of existing Tigers
- Work has begun on the Mk III mid-life upgrade program for the Tiger



Orientation

Description. Twin-turboshaft-powered, anti-tank/fire support helicopter.

Sponsor. French and German defense ministries.

Status. The Tiger remains available for sale. Various upgrade programs for existing Tigers are ongoing.

Total Produced. Through 2019, Airbus Helicopters (formerly Eurocopter) produced five Tiger prototypes,

two preproduction helicopters, and 185 production helicopters.

Application. All-weather, day/night anti-tank, ground support, anti-helicopter, and armed escort missions.

Price Range. Estimated unit cost, \$30.8-\$40.6 million in 2020 U.S. dollars.

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Tiger

Source: Airbus Helicopters

Contractors

Prime

Airbus Helicopters	http://www.airbus.com/helicopters.html , Aeroport Int'l Marseille Provence, Marignane, France, Tel: + 33 4 42 85 85 85, Fax: + 33 4 42 85 85 00, Prime
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Subcontractor

Liebherr-Aerospace Lindenberg GmbH	http://www.liebherr.com , Pfaenderstrasse 50-52, Lindenberg/Allgau, Germany, Tel: + 49 8381 46 0, Fax: + 49 8381 46 4377 (Tail Landing Gear)
MTU Turbomeca Rolls-Royce GmbH (MTR)	http://www.mtr390.com , Am Söldnermoos 17, Hallbergmoos, Germany, Tel: + 49 811 600 90 10, Fax: + 49 811 600 90 20, Email: info@mtr390.com (MTR390-2C Turboshaft Engine)
MTU Turbomeca Rolls-Royce ITP GmbH (MTRI)	http://www.mtr390.com , Am Söldnermoos 17, Hallbergmoos, Germany, Tel: + 49 811 600 90 10, Fax: + 49 811 600 90 20, Email: info@mtr390.com (MTR390-E Turboshaft Engine)
Safran Landing Systems	http://www.safran-landing-systems.com , Inovel Parc Sud 7, rue Général Valérie André, Velizy-Villacoublay, France, Tel: + 33 1 46 29 81 00, Fax: + 33 1 46 83 02 00 (Main Landing Gear)

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Airbus Helicopters Tiger**Technical Data**

Design Features. Single-main-rotor helicopter with a three-blade tail rotor. The main rotor is equipped with four composite rotor blades. The airframe is constructed primarily of composite materials (80 percent by weight). Fixed-wheel landing gear are employed. The engines are fitted into hardened nacelles with inlet particle separators and exhaust infrared suppressors. Airframe composite materials usage is as follows: fuselage panels – Kevlar and carbon skins over Nomex honeycomb core; fuselage frames and beams – carbon/epoxy or carbon/Kevlar laminates; stub wings – aluminum spars with carbon ribs and skins; tailboom – upper and lower shells of carbon laminate.

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Overall length, rotors turning	15.82 m	51.90 ft
Main rotor diameter	13.0 m	42.65 ft
Tail rotor diameter	2.70 m	8.86 ft
Weight		
Maximum takeoff weight	6,600 kg	14,553 lb
Performance		
Cruise speed (MTOW; SL)	271 km/h	146 kt
Max range (unarmed) with external fuel tanks	1,130 km	610 nm
Propulsion		
Tiger	(2)	MTU Turbomeca Rolls-Royce GmbH MTR390-2C turboshaft engines rated 958 kW (1,285 shp) each at takeoff; or
	(2)	MTU Turbomeca Rolls-Royce ITP GmbH MTR390-E turboshaft engines rated 1,092 kW (1,464 shp) each at takeoff.

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Seating

Tandem crew of two.

Armament

HAC: Up to eight TriGAT or HOT anti-tank missiles and four Mistral air-to-air missiles.

HAP: Below-nose-mounted turret for Nexter 30mm cannon; Mistral air-to-air missiles and rocket pods can be mounted on the stub wings.

HAD: Below-nose-mounted turret for Nexter 30mm cannon; HELLFIRE or SPIKE-ER anti-tank missiles, Mistral air-to-air missiles, and rocket pods can be mounted on the stub wings.

UHT: TriGAT or HOT anti-tank missiles; Stinger air-to-air missiles; rocket pods; 12.7mm gun pods.

Variants/Upgrades

HAC Tiger. The Helicoptere Anti-Char (HAC) Tiger is a basic anti-tank model originally intended for the French Army. It is equipped with a mast-mounted sight. The HAC can carry anti-armor missiles and Mistral air-to-air missiles.

HAP Gerfaut. An escort and fire support version for the French Army, the Helicoptere d'Appui et de Protection (HAP) can carry a chin-turret-mounted 30mm cannon as well as Mistral air-to-air missiles and/or rocket pods. The HAP is equipped with a roof-mounted sight.

UHT. The Unterstuetzungs-Hubschrauber-Tiger (UHT) is a German combat support version with limited anti-tank capability. The UHT replaced the PAH-2 (Panzerabwehr Hubschrauber) Tiger anti-tank model, development of which was canceled in 1993. The UHT can be armed with TriGAT or HOT anti-tank missiles. The UHT was previously known as the UHU.

ARH Tiger. The Armed Reconnaissance Helicopter (ARH) is a hybrid version proposed and selected for the Australian armed reconnaissance helicopter program. The ARH is based on both the HAC and HAP versions. It has a 30mm cannon, a roof-mounted sight, and

provision for underwing rocket pods. It can carry anti-armor missiles.

The first ARH made its initial flight in February 2004.

HAD Tiger. The Helicoptere d'Appui Destruction (HAD) model is a multirole version of the Tiger. It has the roof-mounted sight and 30mm cannon of the HAP. It is equipped with anti-armor missiles.

The HAD is powered by an uprated version of the MTR390 engine, called the MTR390 Enhanced or MTR390-E. The MTR390-E is approximately 14 percent more powerful than the original MTR390-2C version. It is produced by MTU Turbomeca Rolls-Royce ITP GmbH (MTRI), which was founded in 2005 to reflect the participation of ITP in the MTR390-E consortium. The MTR390-2C is produced by MTU Turbomeca Rolls-Royce GmbH (MTR).

HCP Tiger. The Helicoptere de Combat Polyvalent (HCP), or Multi-Role Combat Helicopter, is an export Tiger version derived from the HAP. The HCP was designed to meet various requirements, with priority given to fire support and air-to-air defense missions. It also features a strong standoff anti-tank capability.

Program Review

Background. The Tiger was launched in May 1984, when the defense ministers of France and the Federal Republic of Germany signed a Memorandum of Understanding (MoU) covering development of a new anti-tank helicopter for use by the two countries in the 1990s. The main contractor for the airframe was initially to be Eurocopter Groupement d'Interet Economique (Eurocopter GIE), a French-registered concern equally owned by Aerospatiale and MBB. It was registered in France to allow eventual export sales without having to deal with the strict West German weapons trading laws. To overcome West German concerns about the structure of the French-based organization, the two manufacturers created a

commercial company called Eurocopter GmbH. With limited liability and headquartered in Munich, the firm was a wholly owned subsidiary of Eurocopter GIE.

In 1992, Eurocopter SA was formed through a merger of Aerospatiale and MBB helicopter operations, and the new company eventually absorbed the older Eurocopter organization. The Tiger became one of many rotorcraft products in the overall Eurocopter line. In January 2014, Eurocopter was renamed Airbus Helicopters.

Manufacturers' Work Shares. In 1988, Eurocopter GmbH announced that MBB (now Airbus Helicopters Deutschland) would be responsible for the forward and

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rear fuselage, prototype assembly, the main rotor, the hydraulics and flight control systems, stress/vibration analysis and control, flight performance/characteristics, and simulation. Aerospatiale (now Airbus Helicopters) would have responsibility for the aircraft's tail rotor; fuel and electrical systems; weight; maintainability, reliability, and survivability; and center fuselage, including engine installation and aerodynamics.

Avionics Systems. The Tiger is equipped with a glass cockpit and fly-by-wire flight controls. Avionics systems include an integrated duplex automatic flight control system (AFCS) from Thales and Nord-Micro and a fully redundant navigation system from Thales, Collins, and Airbus SE. The navigation system includes Thales three-axis laser scopes, Thales silicon accelerometers, a CMC Electronics/Collins CMA-2012 Doppler radar, and an Airbus altimeter. The AFCS is a fully digital duplex system based on two computers using 69020 microprocessors and Ada language.

Main computers are provided by a group consisting of Diehl, Northrop Grumman LITEF, and Thales. Multifunction displays based on liquid crystal technology are provided by Diehl and Thales. All standby instruments are also the responsibility of Diehl and Thales. Diehl and Airbus SE provide a moving map display. Landing gear are the responsibility of Safran Landing Systems and Liebherr.

Airbus SE, in cooperation with Thales, provides an electronic warfare suite (EWS) for the Tiger. The EWS consists of a passive sensor unit and an active unit for countermeasures. The sensor unit encompasses a radar warning sensor, a laser sensor, and a missile launch detector. It also includes an evaluation system for analyzing sensor data and transferring threats to the crew for optical and acoustic warning. Countermeasures equipment includes chaff and flares.

Beyond these and some other common avionics systems, the HAC and the HAP have separate mission equipment packages that include a mast-mounted sight for the HAC and a roof-mounted sight for the HAP.

Design Frozen

In October 1994, Eurocopter froze the design of the Tiger after implementing certain changes to resolve handling problems. The primary change involved reducing the tailplane to half of its original size in order to correct problems caused by interaction with the downwash from the main rotor.

In June 1995, the governments of France and Germany signed an MoU covering the production investment phase of the Tiger effort.

In June 1997, the French and German governments awarded Eurocopter a production investment contract worth DEM733.6 million (\$426 million) for the Tiger program. The two governments also awarded a contract to MTU Turbomeca Rolls-Royce GmbH (MTR) for preproduction work on the Tiger's MTR390 engine.

In May 1998, officials from the French and German defense ministries signed an MoU regarding production of the Tiger. This agreement concerned an initial production run of 160 helicopters.

In addition to five Tiger prototypes, Eurocopter built a preproduction HAP helicopter, which made its initial flight in December 2000. This helicopter, called PS01, was very close to the production configuration. It replaced the fourth prototype (PT4), which had been destroyed in a 1998 crash in the flight test program.

In 1999, Eurocopter was awarded a contract worth approximately \$3.3 billion for an initial production batch of 160 Tigers, including 80 for France and 80 for Germany.

Australian Acquisition. In August 2001, the Australian government announced its selection of the Tiger as its new armed reconnaissance helicopter. The Tiger was selected over the Boeing AH-64 Apache and the Bell AH-1Z. A contract for 22 ARH Tigers was signed in December 2001. The helicopters replaced Bell 206B-1 Kiowas in the Australian Army fleet.

Eurocopter's subsidiary Australian Aerospace delivered the 22nd and final Australian ARH in December 2011. Australian Aerospace had assembled 18 of the ARHs in Brisbane, Australia. The first four were assembled by Eurocopter in Marignane, France.

First Flight

First flight of the initial production Tiger occurred in August 2002. This helicopter, a UHT model, was called UHT S01. The initial production HAP, called HAP S01, made its first flight in March 2003.

Spanish Acquisition. Spain selected the Tiger in 2003 over the AH-64 Apache for an attack helicopter acquisition. Six HAPs and 18 HADs were acquired. The helicopters replace BO 105s in the Spanish Army fleet.

The six Spanish HAPs were built in Marignane, and were delivered between 2007 and 2010. The first Spanish HAD was also built in Marignane, and made its initial flight in late 2007. It was used in the HAD flight test campaign. The 17 remaining Spanish HADs were built in Albacete, Spain, by Airbus Helicopters Espana.

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Type Certification

In March 2004, the HAP version received military type certification from the French armament agency Delegation Generale pour l'Armement (DGA). Later that same month, the European military procurement agency Organisation Conjointe de Cooperation en Matiere d'Armement (OCCAR) granted initial qualification for the HAP. Type certification and qualification were required prior to the start of HAP deliveries to the French Army.

In August 2004, the UHT version was granted type certification by the German armament agency Bundesamt fuer Wehrtechnik und Beschaffung (BWB) and initial qualification by OCCAR. This was a prerequisite for UHT deliveries to the German Army.

Tiger deliveries began in December 2004 when two ARH Tigers were delivered to the Australian Army.

In March 2005, Eurocopter delivered the first series-production HAP to the French Army. Deliveries to the service had been scheduled to begin in 2004, but were delayed by now-resolved software problems.

Initial delivery of a UHT to German Army Aviation occurred in April 2005.

French Tigers were built in Marignane. German UHTs were built in Donauworth, Germany.

HAD Contract Signed

In November 2005, a formal contract concerning the HAD multirole version of the Tiger was signed between Eurocopter and OCCAR. This new agreement superseded an Instruction to Proceed (ITP) signed in 2004, which had officially launched the HAD version.

The contract covered development and production investments in the HAD model for Spain and France, as well as production of 18 new-build HADs and retrofit of

six HAPs to the HAD standard for Spain. In 2013, though, budgetary difficulties led to the retrofit effort being scrapped. The Spanish government may attempt to sell the six HAPs.

HAD Flight Testing

Three helicopters were utilized in the HAD flight test campaign. The first was the initial new-production Spanish HAD, which took to the air in 2007. The second was an HAD model converted from one of the original Tiger prototypes. This helicopter, which first flew in its new configuration in June 2009, was the first Tiger to be equipped with the new, more powerful MTR390-E engine. (The Spanish HAD that flew in 2007 was initially equipped with the earlier MTR390-2C version that powered other Tiger variants. It was refitted in 2010 with MTR390-E engines.)

The third helicopter used in the HAD flight test effort was a preproduction French HAD that made its initial flight in December 2010.

The MTR390-E powers French and Spanish HADs, and was installed on the final 17 German UHTs.

Order Adjustments

In 2014, budgetary difficulties led the French government to negotiate a reduction in its acquisition of Tiger HADs to 24 new-build helicopters from 40. In December 2015, though, seven additional HADs were ordered, bringing the buy to 31 new-build HADs. Thus, the total French Tiger acquisition numbered 71 helicopters, including the 31 HADs plus 40 previously delivered HAP models.

Budgetary stringencies also resulted in the German government negotiating an adjustment in 2014 to its Tiger acquisition plans. Thus, a total of 68 German UHTs (rather than 80) were ultimately produced and delivered.

Funding

Tiger development costs were estimated at DEM2.2 billion (\$1.4 billion).

An initial DEM270 million (\$143 million) development contract was issued to Eurocopter in September 1988. This funded an 18-month development phase that covered the basic helicopter, the European Mission Equipment Package for the PAH-2/HAC Tiger, and mission equipment package integration for the HAP Tiger. The main development contract was awarded to Eurocopter in November 1989.

In June 1997, the French and German governments awarded Eurocopter a production investment contract worth DEM733.6 million (\$426 million) for the Tiger program.

In June 1999, the two governments awarded Eurocopter a contract worth approximately \$3.3 billion for the initial production batch of 160 Tigers: 80 for France and 80 for Germany.

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Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Apr	1974	German PAH requirement drawn up
Oct	1976	Franco-West German declaration of intent to proceed with joint venture
Oct	1979	MoU signed; definition phase begun
Dec	1983	Collaborative design selected
May	1984	MoU signed by France and West Germany for joint development
Dec	1987	Full-scale development approved
Sep	1988	Initial development contract issued
Nov	1989	Main development contract issued to Eurocopter GmbH
Apr	1991	Prototype flight tests begun
Mar	2002	Roll-out of initial production UHT Tiger
Aug	2002	First flight of initial production UHT Tiger
Mar	2003	First flight of initial production HAP Tiger
Dec	2004	Initial ARH Tiger delivery
Mar	2005	Initial HAP Tiger delivery
Apr	2005	Initial UHT Tiger delivery
Apr	2013	Initial HAD Tiger delivery

Worldwide Distribution/Inventories

Operator	Designation	Quantity
Australia Army	ARH Tiger	22
France Army	HAP Tiger	35
France Army	HAD Tiger	35
Germany Army	UHT Tiger	66
Spain Army	HAP Tiger	6
Spain Army	HAD Tiger	18

Forecast Rationale

With the delivery in January 2020 of the Spanish Army's 18th and final HAD Tiger, all Tiger deliveries to the service were completed. The Army's final HAD had actually been built in 2007, and had been used as a test aircraft for development of Spain's HAD fleet. It was updated to a Block 2 (B2) configuration prior to delivery to the Army.

As of the spring of 2020, no order backlog existed for the Tiger. While it is possible that no more new Tigers will be produced, a number of potential sales opportunities do exist for the helicopter, including in Brazil, Mexico, Norway, Poland, Portugal, and Sweden, among other nations.

Whether or not new orders materialize, though, Airbus Helicopters will still be busy with various Tiger retrofit

and upgrade programs. The manufacturer is currently converting 36 of the French Army's HAP Tigers to the HAD configuration. As of early 2020, at least four of the conversions had been completed.

The French Army's final 24 HAP-to-HAD conversions will be to an improved standard called HAD Mk II. The Mk II configuration will include Aculeus laser-guided rockets from Thales subsidiary TDA Armements, as well as a GPS Selective Availability Anti-Spoofing Module (SAASM) receiver and a Controlled Radiation Pattern Antenna (CRPA) system from Thales.

Airbus Helicopters has also begun converting the Spanish Army's first four HADs to the same B2 configuration as the service's other HADs. The four

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helicopters had been produced in an initial Block I configuration.

Airbus Helicopters has also begun work on a Tiger Mk III configuration, which represents a mid-life upgrade for the Tiger with the intention of keeping the helicopter in service beyond 2040. The program is a cooperative effort between France, Germany, and Spain. Australia is an observer on the effort.

The Mk III configuration is to incorporate various improvements and modifications to the helicopter's avionics and weaponry, including a new anti-tank missile. Redeliveries of operational Mk III helicopters are slated to begin in the 2025-2026 timeframe.

Our production forecast is for new-build Tigers, and is based on a presumption that the Tiger Mk III will be marketed as a new-build helicopter as well as a retrofit package.

In August 2019, Airbus Helicopters proposed to upgrade the Australian Army's fleet of 22 ARH Tigers in response to a Request for Information regarding a new armed reconnaissance helicopter for the service. The Army is looking to acquire up to 29 of the helicopters. Initial Operational Capability with a squadron of 12 helicopters is scheduled for the 2025-2026 timeframe.

Airbus Helicopters has not outlined the scope of the upgrade package that it is proposing for the Australian Army Tigers, but it may include many, if not all, of the elements of the Tiger Mk III mid-life upgrade. Other contenders for the Australian acquisition include the Bell AH-1Z and the Boeing AH-64E.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION													
Designation or Program	Thru 2019	High Confidence					Good Confidence			Speculative			Total
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		
Airbus Helicopters													
Tiger <> MTR 390													
	0	0	0	0	0	0	0	2	3	4	4	13	
Total	0	0	0	0	0	0	0	2	3	4	4	13	