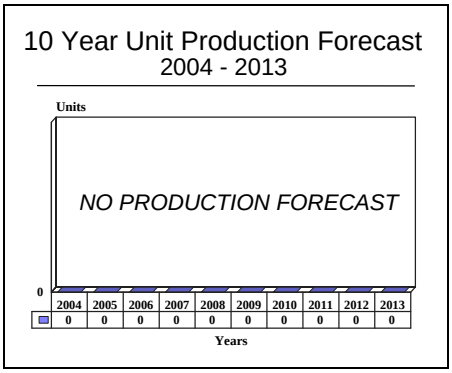
Boeing/Sikorsky RAH-66 Comanche - Archived 11/2005

Outlook

- U.S. Army Comanche program has been terminated
- Planned procurement had been set at 650 helicopters



Orientation

Description. Twin-engine, two-seat armed reconnaissance helicopter.

Sponsor. U.S. Army Aviation & Missile Command, Redstone Arsenal, Alabama, USA.

Status. The U.S. Army Comanche program was terminated in early 2004.

Total Produced. Two prototypes were produced.

Application. Armed reconnaissance, light attack, and air combat.

Price Range. Estimated at $58.9 million in FY04 dollars.

Contractors

Boeing Sikorsky RAH-66 Comanche Joint Program Office, 5030 Bradford Drive NW, Bldg 48-99, Suite 100 Mailstop JE-01, Huntsville, AL 35805 United States, Tel: + 1 (256) 217-0000, Fax: + 1 (256) 217-0500, Prime

Light Helicopter Turbine Engine Co, Suite 119, Meadow Green Centre, 9238 Highway 20, West Madison, AL 35758 United States, Tel: + 1 (256) 461-6009, Fax: + 1 (256) 461-6979 Defunct (T800 Turboshaft Engine)

Technical Data

Design Features. Tandem-seat helicopter with a single main rotor consisting of an all-composite rotor head and five all-composite blades. The anti-torque system, called Fantail, was derived from the Aerospatiale Fenestron licensed to Sikorsky. Other Comanche features included dual triplex fly-by-wire flight controls, retractable landing gear, and detachable stub wings for additional weapons carriage and/or auxiliary fuel tanks.

	Metric	U.S.
Dimensions		
Overall length[(a)]	14.58 m	47.84 ft
Height	3.37 m	11.06 ft
Main rotor diameter	12.20 m	40.03 ft

	Metric	U.S.
Weight		
Empty	4,218 kg	9,300 lb
Primary mission T-O weight	5,799 kg	12,784 lb
Max T-O weight[(b)]	7,896 kg	17,408 lb
Capacities		
Total fuel capacity	4,549 liters	1,202 U.S. gallons
Internal fuel capacity	1,142 liters	302 U.S. gallons
External fuel capacity	3,407 liters	900 U.S. gallons
Performance		
Dash speed	324 km/h	175 kt
Maximum range	2,226 km	1,200 nm

Propulsion

RAH-66 (2) Light Helicopter Turbine Engine Company (Rolls-Royce/Honeywell) T800-LHT-800 twin-spool, centrifugal-flow turboshaft engines rated at 895 kW (1,200 shp) each. T800-LHT-802, rated at 1,254 kW (1,681 shp), was planned for production aircraft.

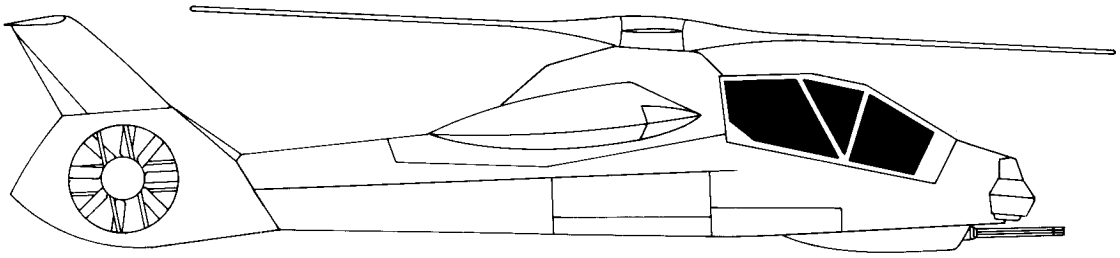
Armament

Undernose turret with three-barrel 20mm cannon. Fixed forward cannon optional. Weapons bay doors could mount up to three HELLFIRE anti-tank missiles or six Stinger air-to-air missiles each. Optional stub wings could each carry four HELLFIREs or eight Stingers, or an auxiliary fuel tank.

[(a)]With rotor turning.
[(b)]Self-deployability.

BOEING/SIKORSKY RAH-66

Source: Boeing



BOEING/SIKORSKY RAH-66

Source: Forecast International

Variants/Upgrades

RAH-66 Comanche. Armed reconnaissance helicopter. The RAH-66 was intended to replace AH-1 light attack and OH-58 scout helicopters in the U.S. Army fleet.

One-third of the Army's RAH-66 fleet was to be equipped with the Lockheed Martin/Northrop Grumman Longbow fire control radar (FCR), but all were to have provisions to carry it.

UH-66A. Proposed utility version, incorporating Comanche dynamic systems with a European- or Japanese-designed airframe.

Program Review

Background. As originally conceived in the early 1980s, the Light Helicopter Experimental (LHX), subsequently known as the Light Helicopter (LH), was envisioned as a new family of single-pilot, rotary-wing aircraft to fill scout, attack, and utility requirements of the U.S. Army in the 1990s. In fact, the LH had as its genesis the aborted Advanced Scout Helicopter (ASH). The ASH was to have been a direct one-for-one replacement for the Army's fleet of OH-6 and OH-58 scout helicopters.

The Army later decided to forgo development of a new dedicated scout, and instead combined scout, light attack, and utility missions into one family of aircraft based upon a single airframe design. Thus, the LH was formed. The Army planned to procure approximately 4,200 aircraft to replace existing Bell AH-1 Cobra light attack helicopters, McDonnell Douglas/Hughes OH-6 Cayuse and Bell OH-58 Kiowa scouts, and Bell UH-1 utility/transport helicopters. The LH was to have a maximum gross weight of 8,500-9,500 pounds and an average unit flyaway cost of $5.0 million.

During the Army's definition of the LH and its mission requirements, cost estimates continued to escalate due to a combination of added missions and parallel weight growth of the basic airframe. The more that the Army wanted the LH to do, the more it grew in weight and cost.

Program Revisions. In 1987, the escalating cost of the LH and growing support for reductions in the overall Army procurement budget forced the Army to drop the utility portion of the requirement. It noted that it was then planning to procure only 2,096 LH units for the armed scout role. Total program cost estimates were similarly reduced, from $66 billion to $37 billion.

The LH program called for selection of a winner in 1991, with a prototype of the winning design to take to the air in mid- to late 1993 or early 1994. Demonstration/validation Phase I contracts were completed in September 1990. During the FY91 budget process, both the House and the Senate refused to fund full-scale engineering development. Instead, Congress directed the Pentagon to keep the LH in demonstration/ validation for another two years, with contractor downselect remaining in early to mid-1991. Then-Defense Secretary Richard Cheney announced this demonstration/validation extension in August 1990. The Boeing/Sikorsky "First Team" was selected in April 1991 to continue with the demonstration/ validation process.

Prior to the FY91 congressional markup, the Pentagon reduced the LH program once again to a minimum 1,292 units, with the potential to increase that total to just over 1,600.

Beginning in January 1993, the program was placed under a restructured demonstration/validation program. Plans called for the Boeing/Sikorsky contractor team to build three flying prototypes, a structural test article, and a propulsion system testbed. The demonstration/ validation contract was to run until November 1997, and was designed to lead directly to a five-year engineering and manufacturing development (EMD) and low-rate initial production (LRIP) program, resulting in an initial operating capability in 2003.

The 1993 restructuring of the demonstration/validation contract added the requirement that the Comanche team demonstrate integration of the Longbow fire control radar with the helicopter's mission equipment package. All production Comanches were to be able to carry a fire control radar, but the radar was to be installed on only one-third of the fleet.

Approval in 1995 by the Department of Defense (DoD) for an Army plan involving construction of two prototypes and six early operational capability (EOC) aircraft gave new life to the Comanche program. In December 1994, the DoD had postponed Comanche production indefinitely, and had restructured the Comanche effort as a technology program, leading to the manufacture of two prototypes.

The six EOC aircraft were to be delivered to the Army around 2001 for a one-year user evaluation. While the evaluation was being conducted, plans called for the Boeing/Sikorsky team to build 10 low-rate initial production (LRIP) Comanches with which to complete development and equip the first operational Army unit.

In 1998, the Comanche program plan again changed. The six EOC helicopters were now to be produced as fully capable preproduction aircraft. Delivery of the six helicopters would be delayed until 2003. The new plan also called for installation of the fire control radar (FCR) to be accelerated from production Lot 6 in 2010 to the initial operational capability (IOC) version, which would be fielded in 2006.

In 2002, the program again underwent changes. The planned procurement total was reduced to 650 helicopters, from 1,213. The maximum procurement rate for the Comanche was set at 60 helicopters per year. The start of LRIP was delayed to 2007, and the number of LRIP aircraft was reduced to 73 from 84.

In addition, the number of preproduction prototypes was reduced to nine from 13. These nine aircraft were scheduled for delivery in 2005-2006. Deliveries of production aircraft were scheduled to start in 2009.

The Army had intended to procure the Comanche in three block configurations. All 73 LRIP Comanches were to be built in the initial Block 1 configuration. Blocks 2 and 3 were to add various items, including additional communications capability in Block 2, and an air-to-air missile and a wing for mounting external fuel tanks and weaponry in Block 3. Weight reduction was to be part of all three blocks. Starting with the 74th production Comanche, a total of 106 Block 2 helicopters was to be produced. Production of Block 3 Comanches was to then follow.

The Winning Team: Boeing/Sikorsky. In June 1985, Boeing Helicopters and Sikorsky Aircraft formed the "First Team" to participate in the LH competition. The team was selected in April 1991 as the winning contractor. Boeing was responsible for MEP integration, flight controls, the aft fuselage, and the rotor blades. Sikorsky was responsible for airframe integration, dynamics, the rotor hub, and crew station design.

Subcontractors included:

- BAE Systems (flight controls processor, controller grips)
- General Dynamics (20mm gun system)
- Hamilton Sundstrand (electrical distribution system, environmental control system, air data system)
- Harris Corp (controls and displays, fiber-optic databuses)
- Kaiser Electronics (helmet-mounted display)
- LHTEC (T800 engine)
- L-3 Communications Link Simulation and Training (simulation and training)
- Lockheed Martin (fire control radar, electro-optical sensor system)
- Moog (flight control actuators)
- Northrop Grumman (inertial navigation sensors, fire control radar, mission computer cluster, target acquisition system software, RF HELLFIRE missile system, communication and navigation equipment, aircraft survivability equipment)
- Williams International (secondary power unit)

Other announced subcontractors included Intel Corp, for supply of the i960 microprocessor in the common avionics processor (CAP-32), and El-Op, for a laser designator/rangefinder.

The Losing Team: Bell/McDonnell Douglas Helicopter. Bell and McDonnell Douglas also formed an LH partnership, called the "Super Team," complemented by various subcontractors.

Bell had already produced a scaled-down tiltrotor design for the LH requirement, and McDonnell Douglas Helicopter, while still Hughes Helicopters, showed drawings of a design incorporating the manufacturer's NOTAR (no-tail rotor) system. The Army basically told the contractors that tiltrotor was not suitable due to technical risks and higher unit flyaway costs. Bell and McDonnell Douglas Helicopter then committed to a NOTAR-equipped helicopter.

Propulsion History. The U.S. Army selected two contractor teams to continue developing their respective T800 turboshaft engine designs. The ultimate goal was the selection of one design and one team to complete development and produce the definitive T800 engine for the Army's LH. Teams awarded contracts in July 1985 were Pratt & Whitney/Textron Lycoming and Garrett Engine Division/Allison Gas Turbine (later known as Light Helicopter Turbine Engine Company, or LHTEC). The T800 program was essentially an extrapolation of technology developed by Lycoming and Allison during their ATDE development efforts originally intended for the ASH. Lycoming's PLT34 became the baseline for its T800 powerplant design with Pratt & Whitney. Allison, which produced the GMA800 for the ATDE, teamed with Garrett and ultimately selected the latter's TSE 109 turboshaft as its T800 baseline, with Allison contributing its hot section expertise.

Textron/P&W was awarded a $240 million, five-year contract, while the Allison/Garrett team received one for $263.95 million. Each team was to be funded through completion of at least 3,000 preliminary flight rating test-hours scheduled through the middle of 1988. Allison has since been acquired by Rolls-Royce. Garrett was absorbed by AlliedSignal, which later merged with Honeywell. In late 1988, the Army chose LHTEC to continue development through 1990.

The winning Garrett/Allison T800 was also known as the ATE 109, a turboshaft derivative of the Garrett F109 turbofan engine for the Fairchild/USAF T-46A trainer. The ATE 109/T800 incorporates most of the F109 core engine technology but adds such Rolls-Royce/Allison developments as Lamilloy for combustion and turbine components. A version of the ATE 109, the TSE 109, made its maiden flight aboard a Bell UH-1 testbed in August 1984.

Mission Equipment Package. Boeing was the integrator of the RAH-66's Mission Equipment Package (MEP). The MEP contained a digital avionics suite, an integrated helmet-mounted head-up display, a night-vision pilotage system, an electro-optical target acquisition and detection system, self-healing digital mission electronics, and triple-redundant onboard system diagnostics.

Funding

Research and development was funded under the U.S. Army's Comanche program (0604223A). Recent and planned funding is shown in the chart below.

U.S. FUNDING

	FY02		FY03		FY04		FY05 (Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
Comanche	-	754.4	-	865.6	-	1,068.0	-	-

All $ are in millions.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Boeing/Sikorsky	$3,392.7	Nov 2002 – Increment as part of a $6.6 billion contract from the U.S. Army for a partial definitization of a change order requirement to restructure the RAH-66 Comanche engineering and manufacturing development contract.

Timetable

Month	Year	Major Development
	1981	Concept formulation effort begins
Jan	1984	Six ARTI contracts awarded by Army
Jun	1985	Sikorsky/Boeing team formed
Early	1988	Program reorganized, reduced to 2,096 units
Jun	1988	Formal airframe RFPs issued
Oct	1988	Boeing/Sikorsky and McDonnell Douglas/Bell awarded dem/val contracts
Sep	1990	Completion of initial dem/val contracts
Apr	1991	Boeing/Sikorsky selected to develop RAH-66 Comanche
Jan	1993	Boeing/Sikorsky team receives $2.1 billion dem/val contract
Jan	1996	First flight of initial Comanche prototype
Mar	1999	First flight of second Comanche prototype
	2004	U.S. Army Comanche program terminated

Worldwide Distribution

Not applicable.

Forecast Rationale

In February 2004, as part of a restructuring of U.S. Army aviation, the Army's RAH-66 Comanche program was terminated. The Boeing/Sikorsky Comanche team received formal notification of contract termination in March 2004. Meanwhile, little if any support appeared in the U.S. Congress to revive the Comanche effort.

According to the Army, termination of the Comanche program enables the reallocation of approximately $14.6 billion that had been slated for Comanche to other Army aviation efforts in the FY04-FY11 time period. With part of the diverted funding, the service intends to procure 796 more new-build aircraft than it previously had planned.

Despite cancellation of the Comanche, the Army still intends to retire the OH-58D Kiowa Warrior and buy a new armed reconnaissance helicopter. A total of 368 helicopters would be procured. The Army plans to ask industry for ideas on how to meet this requirement.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level			Speculative			
Aircraft	(Engine)	thru 03	04	05	06	07	08	09	10	11	12	13	Total 04-13
BOEING/SIKORSKY (Consortium)													
RAH-66	T800-800	2	0	0	0	0	0	0	0	0	0	0	0
Total Production		2	0	0	0	0	0	0	0	0	0	0	0