

actuation. 28 V electrical system includes two 300 A engine-driven starter/generators, one 34 Ah Ni/Cd battery and two 400 Hz solid-state invertors supplying 115 V DC and 26 V AC power for avionics and instruments. Constant flow oxygen system of 4,420 litre (156 cu ft) capacity standard. Engine inlet screen anti-ice protection, exhaust heated engine inlet lips, fuel vent heating, electric propeller and windscreen de-icing systems standard. Brake de-icing optional. Pneumatic de-icing boots on wings, tailplane, tailsets and stabilons. Self-monitoring continuous detection loop and one-shot fire extinguisher in each engine nacelle.

AVIONICS: Comms: Rockwell Collins Pro Line II digital technology radios; cabin briefer; cockpit voice recorder.

Flight: Dual flight directors; GPWS; provision for TCAS1. GPS and Collins TWR-850 colour weather radar optional.

Instrumentation: Rockwell Collins EFIS-84 four-tube EFIS. Primary display consists of multicolour CRT panels, remote display processor unit and system control units; CRT displays provide conventional electronic attitude director indicator (EADI) and electronic horizontal situation indicator (EHSI) functions.

DIMENSIONS, EXTERNAL:

Wing span over winglets	17.67 m (57 ft 11¼ in)
Wing chord: at root	2.18 m (7 ft 1¾ in)
at tip	0.91 m (3 ft 0 in)
Wing aspect ratio	10.9
Length overall	17.63 m (57 ft 10 in)
Height overall	4.57 m (14 ft 11¾ in)
Tailplane span	5.63 m (18 ft 5¾ in)
Wheel track	5.23 m (17 ft 2 in)
Wheelbase	7.25 m (23 ft 9½ in)
Propeller diameter	2.78 m (9 ft 1½ in)
Propeller ground clearance	0.35 m (1 ft 1¾ in)
Distance between propeller centres	5.23 m (17 ft 2 in)
Passenger door: Height	1.63 m (5 ft 4¼ in)
Width	0.64 m (2 ft 1¼ in)
Cargo door: Height	1.45 m (4 ft 9 in)
Width	1.32 m (4 ft 4 in)
Emergency exits (each): Height	0.80 m (2 ft 7½ in)
Width	0.51 m (1 ft 8 in)
Turning radius	12.56 m (41 ft 2½ in)

DIMENSIONS, INTERNAL:

Cabin (incl flight deck and rear baggage compartment):	
Length	12.03 m (39 ft 5½ in)
Max width	1.37 m (4 ft 6 in)
Max height	1.80 m (5 ft 10¾ in)
Floor area	15.3 m² (165 sq ft)
Pressurised volume	26.0 m³ (918 cu ft)
Volume of passenger cabin	18.1 m³ (640 cu ft)
Baggage volume, cabin: forward	0.34 m³ (12.0 cu ft)
underseat	0.91 m³ (32.0 cu ft)
rear	5.0 m³ (175 cu ft)

AREAS:

Wings, gross	28.80 m² (310.0 sq ft)
Ailerons (total)	1.67 m² (18.00 sq ft)



Beech 1900D (two P&WC PT6A turboprops) (Paul Jackson)

NEW/0568413

Trailing-edge flaps (total)	4.17 m² (44.90 sq ft)	T-O field length, T-O flap setting	1,139 m (3,737 ft)
Fin	4.86 m² (52.30 sq ft)	Landing from 15 m (50 ft) at max landing weight	829 m (2,720 ft)
Rudder (incl tab)	1.40 m² (15.10 sq ft)		
Tailsets (total)	0.63 m² (6.80 sq ft)		
Tailplane	6.32 m² (68.00 sq ft)		
Elevator (incl tab)	1.79 m² (19.30 sq ft)		
Stabilons (total)	1.44 m² (15.50 sq ft)		

WEIGHTS AND LOADINGS:

Basic operating weight	4,831 kg (10,650 lb)
Max fuel (usable)	2,022 kg (4,458 lb)
Max baggage	939 kg (2,070 lb)
Max ramp weight	7,738 kg (17,060 lb)
Max T-O weight	7,688 kg (16,950 lb)
Max landing weight	7,530 kg (16,600 lb)
Max zero-fuel weight	6,804 kg (15,000 lb)
Payload with max fuel	947 kg (2,087 lb)
Max wing loading	267 kg/m² (54.68 lb/sq ft)
Max power loading	4.03 kg/kW (6.63 lb/shp)

PERFORMANCE:

Max cruising speed at AUW of 6,804 kg (15,000 lb):	
at FL80	272 kt (504 km/h; 313 mph)
at FL160	284 kt (526 km/h; 327 mph)
at FL250	277 kt (513 km/h; 319 mph)
Unstick speed, T-O flap setting	105 kt (195 km/h; 121 mph) IAS
Approach speed at max landing weight	117 kt (217 km/h; 135 mph)
Stalling speed at max T-O weight:	
wheels and flaps up	101 kt (187 km/h; 116 mph)
wheels down, T-O flap setting	90 kt (167 km/h; 104 mph)
Stalling speed at max landing weight, wheels and flaps down	84 kt (156 km/h; 97 mph)
Max rate of climb at S/L	800 m (2,625 ft)/min
Rate of climb at S/L, OEI	206 m (676 ft)/min
Service ceiling	10,058 m (33,000 ft)
Max certified operating altitude	7,620 m (25,000 ft)
Service ceiling, OEI	5,334 m (17,500 ft)

BEECH 390 PREMIER I

TYPE: Light business jet.

PROGRAMME: Design started early 1994 as PD374 (later PD390) and approved early 1995; originated in former Beech design offices, but was first aircraft to carry only the Raytheon name; brief details of 'new light business jet' revealed June 1995; launched at National Business Aircraft Association Convention in Las Vegas 26 September 1995 with full-scale fuselage/cabin mockup; wind-tunnel tests of one-eighth model conducted early 1996 at Boeing, Boeing V/STOL, NASA-Lewis and Wichita State University facilities; to compete with Cessna CitationJet.

First forward fuselage completed in February 1997 and mated to aft fuselage in April 1998; roll-out (N390RA, c/n RB-1) 19 August 1998; first flight 22 December 1998. Second aircraft (N704T) first flown 4 June 1999, followed by third (N390TC), first with complete interior, on 17 September 1999; public debut (N390TC) at National Business Aviation Association Convention at Atlanta, Georgia, October 1999; more than 720 flight test hours accumulated by 23 December 1999, at which time eight production aircraft were in final assembly; static testing of wing to 150 per cent of design load completed on 17 December 1999; four aircraft undertook 1,400 hour flight test programme culminating in FAA FAR Pt 23 certification on 23 March 2001, followed by German certification on 3 September 2001; FAA RVSM approval



Beech Premier I light business jet

NEW/0568421

granted in May 2003; certified in Bermuda, Denmark, Mexico, Israel, South Africa and Switzerland in 2002, and in China in November 2003. Deliveries began with three aircraft in third quarter of 2001: RB-4, -6 and -7 to Tyrose Investments, Raytheon and Town & Country Food Markets, respectively. 100th Premier I production fuselage completed 24 July 2003. Target production rate 60 per year from 2003.

CUSTOMERS: More than 300 orders received by October 2001 from customers in 27 countries, of which some 100 were from outside the USA and 51 from Europe, representing a backlog until 2005. Total of 65 delivered by September 2003, including 29 in 2002; 49 scheduled for delivery in 2003, of which 18 delivered in the first nine months of the year. Customers include Raytheon Travel Air, the fractional ownership subsidiary of Raytheon Aircraft, which has ordered 71 for delivery beginning 2001; the Jordan Grand Prix racing team, which has ordered one; and Aviation Leasing Group (ALG Transportation Inc) of London, which ordered three in August 2000, two of which will be used by the Civil Aviation Training Centre (CATC) in Thailand for training student pilots for Thai Airways International and other Pacific Rim carriers.

COSTS: US\$5.3 million. Estimated direct operating cost US\$680 per hour (60th 2001).

DESIGN FEATURES: Conventional small business jet, developed with assistance of CATIA programmes. Rear-mounted engines, T tail and wing mounted below fuselage for additional cabin space. Sweepback 20° at 25 per cent chord; 2° 30' dihedral; tailplane sweepback 25° at 25 per cent chord.

FLYING CONTROLS: Conventional and manual. Activation via pushrods and cables. Pitch trim via electrically actuated, variable incidence tailplane and mechanically driven geared tab on each elevator; electrically actuated trim tab on each aileron; electrically actuated rudder trim tab. Electrically signalled, hydraulically powered, three-segment spoilers on upper surface of each wing augment aileron roll control; outboard and middle panels provide roll, airbrake and post-landing lift-dump functions; inboard panel provides lift-dump function only. 75 per cent span, four-segment, electrically controlled Fowler flaps, deflections 0, 10, 20 and 30°. Rudder boost, for asymmetric thrust and yaw damper, standard.

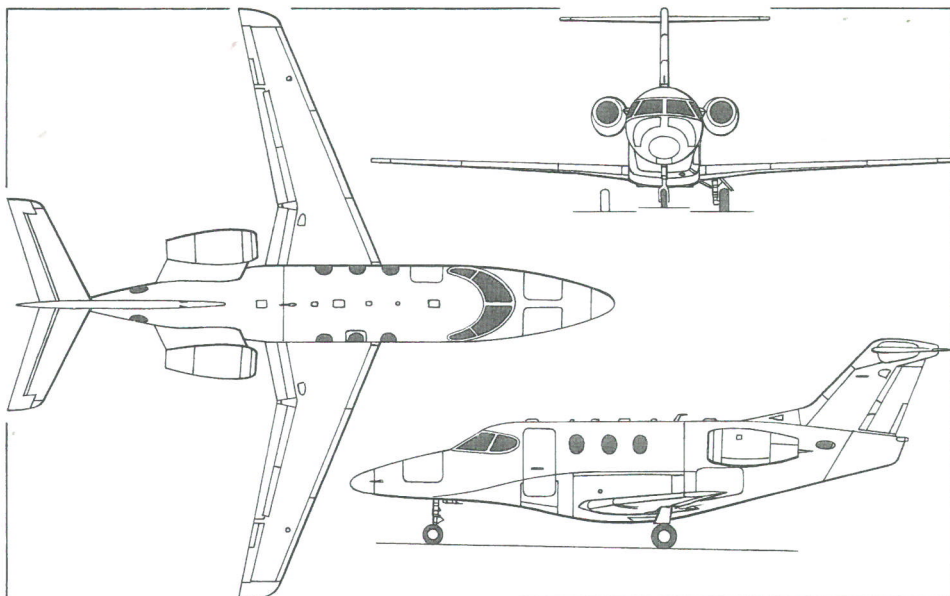
STRUCTURE: Fuselage of graphite/epoxy laminate and honeycomb composites, formed by Cincinnati Milacron Viper automatic fibre-placement machines over aluminium mandrel, placing fibres at speeds up to 46 m (150 ft) per minute, enabling entire fuselage to be completed in one week; elimination of all internal frames, and skin thickness of 20 mm (0.78 in), increase cabin volume by 13 per cent and afford a weight saving of some 20 per cent over conventional alloy construction. Wing of aluminium alloy with six-spar wing box, manufactured using high-speed equipment capable of machining more than 93 m² (1,000 sq ft) of material per minute, and automatic riveting machines; with exception of three small bays along trailing-edge, entire wing is used for fuel storage. Ailerons and flaps of graphite/epoxy composites; fin has aluminium alloy spars and ribs with graphite/epoxy honeycomb skin; tailplane has one-piece, composites forward-and-rear spar with alloy centre rib, composites mid- and tip ribs and Nomex composites skin.

LANDING GEAR: Hydraulically actuated, retractable tricycle type with free-fall emergency extension system; single wheel on each unit. Mainwheel size 22×8.2 (12 ply); nosewheel 18×4.4 (6 ply). Mainwheels retract inwards; nosewheel forwards. Steerable nosewheel, maximum pedal-commanded deflection ±35°, increasing to ±45° with differential braking and asymmetric thrust. Hydraulic disc brakes with electric anti-skid system.

POWER PLANT: Two pod-mounted Williams FJ44-2A turbofans, each rated at 10.23 kN (2,300 lb st). Fuel contained in integral wing tanks, each of four sections, plus inboard collector tank; total usable capacity 2,040 litres (539 US gallons; 449 Imp gallons), with gravity filling point on each wing. Single-point pressure refuelling/defuelling optional.

ACCOMMODATION: Crew of one or two, with dual controls standard; six passengers in cabin, comprising four in standard club seating arrangement with tracking, swivelling and reclining capability and stowable writing tables and two on fixed forward-facing seats to rear; lavatory at rear, doubling as flight-accessible baggage compartment, maximum capacity 64 kg (140 lb). Refreshment/hang-up baggage cabinet on forward starboard side of cabin. Airstair door on port side to rear of flight deck; single plug-type emergency exit on starboard side. Three cabin windows on each side. Accommodation is air conditioned and pressurised. Externally accessible, unpressurised main baggage compartment to rear of cabin, with upward-opening door on port side, can accommodate large items such as skis; heating optional; forward baggage compartment in nose on port side with swing-up door.

SYSTEMS: Pressurisation system, maximum differential 0.58 bar (8.4 lb/sq in), maintains 2,440 m (8,000 ft) cabin altitude to 12,500 m (41,000 ft). Vapour cycle, ozone-safe R134a air conditioning system. Hydraulic system, maximum pressure 207 bar (3,000 lb/sq in), for landing gear, brakes, anti-skid and spoilers. Electrical system comprises two 28 V 300 A engine-driven starter/



Beech Premier I (two Williams FJ44 turbofans) (James Goulding)

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generators, 24 V 40 Ah lead/acid main battery, 24 V 5 Ah standby battery and 28 V external power receptacle; system is configured so that load-shedding is primarily automatic in the event of failure of any or all main electrical power sources. Oxygen system, capacity 1,134 litres (40 cu ft) standard, 2,182 litres (77 cu ft) optional, with diluter-demand masks for crew and continuous flow masks for passengers. Engine bleed-air anti-icing for wing leading-edges and nacelle inlets; electromagnetic expulsion de-icing (EMED) for tailplane leading-edges, automatically activated by dual nose-mounted, heated, ice detectors; electrically heated windscreens (with silicone coating for rain dispersal), pitot tubes and AoA probes.

AVIONICS: Rockwell Collins Pro Line 21 EFIS avionics suite as core system.

Comms: Dual Rockwell Collins VHF-422A transceivers, TDR-94 Mode S transponders and DB Model 438 audio systems; single CTL-23 nav/com tuning unit; four-speaker cabin paging unit.

Radar: Rockwell Collins WXR-800 colour weather radar.

Flight: Dual Rockwell Collins AHC-3000 AHRS, ADC-3000 air data computers, CDU-3000 control/display units and VIR-432 nav receivers; IAPS-3000 lightweight, integrated avionics processing system; FGC-3000 flight guidance system, FMS-3000 flight management system with database, ADF-462, DME-442, GPS-4000, ALT-4000 radio altimeter and MDC-3000 maintenance diagnostic computer.

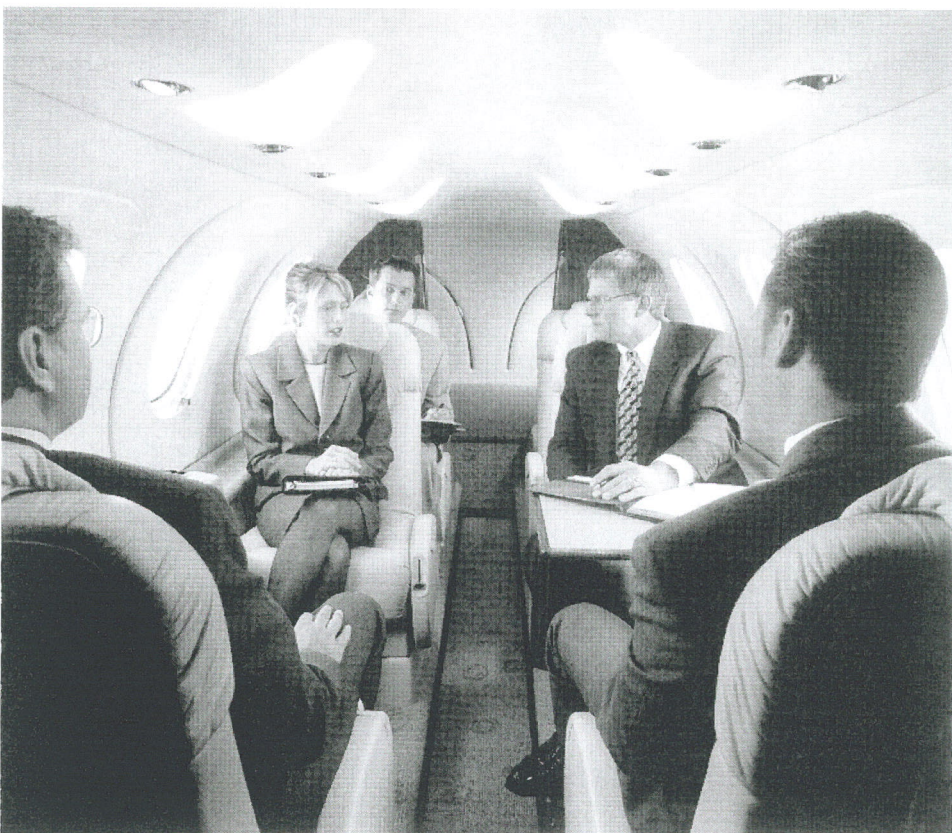
Instrumentation: Rockwell Collins AFD-3010 integrated EFIS comprising two 254 × 203 mm (10 × 8 in) active matrix LCD adaptive flight displays providing PFD and MFD functions, with CRT HSI and back-up electromechanical rate/sensor/attitude instrument and ASI on right side; second PFD optional, but not mandatory for RVSM compliance.

DIMENSIONS, EXTERNAL:

Wing span	13.56 m (44 ft 6 in)
Wing aspect ratio	8.0
Length overall	14.02 m (46 ft 0 in)
Height overall	4.67 m (15 ft 4 in)
Tailplane span	4.90 m (16 ft 1 in)
Wheel track	2.79 m (9 ft 2 in)
Wheelbase	5.36 m (17 ft 7 in)
Crew/passenger door: Height	1.27 m (4 ft 2 in)
Width	0.64 m (2 ft 1½ in)

DIMENSIONS, INTERNAL:

Cabin:	
Length: between pressure bulkheads	5.69 m (18 ft 8 in)
excl flight deck	4.11 m (13 ft 6 in)
excl flight deck and lavatory	3.40 m (11 ft 2 in)
Width: max	1.68 m (5 ft 6 in)
at floor	1.22 m (4 ft 0 in)
Max height	1.65 m (5 ft 5 in)
Volume excl lavatory	8.9 m ³ (315 cu ft)
External baggage compartment volume:	
main	1.25 m ³ (44 cu ft)
forward (nose)	0.28 m ³ (10.0 cu ft)

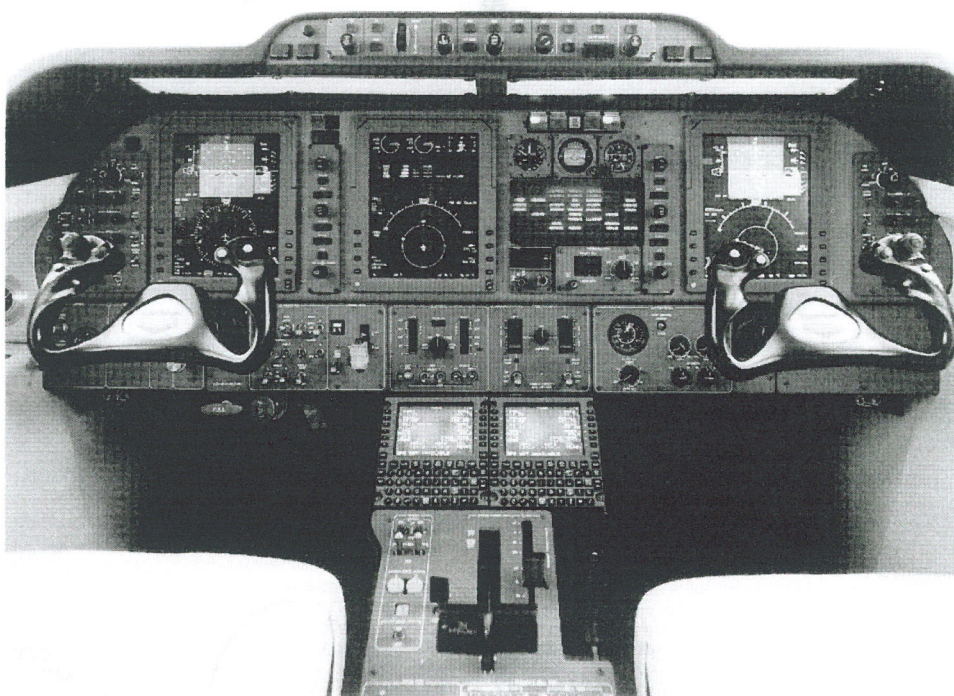


Beech Premier I cabin

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AREAS:	
Wings, gross	22.95 m ² (247.0 sq ft)
Horizontal tail surfaces (total)	4.65 m ² (50.00 sq ft)
Vertical tail surfaces (total)	4.78 m ² (51.5 sq ft)
WEIGHTS AND LOADINGS:	
Basic operating weight	3,781 kg (8,335 lb)
Baggage capacity: main	181 kg (400 lb)
forward (nose)	68 kg (150 lb)
internal: forward	27 kg (60 lb)
rear (lavatory)	64 kg (140 lb)
Max fuel weight (usable)	1,665 kg (3,670 lb)
Max-T-O weight	5,670 kg (12,500 lb)
Max ramp weight	5,710 kg (12,590 lb)
Max landing weight	5,262 kg (11,600 lb)
Max zero-fuel weight	4,536 kg (10,000 lb)
Max wing loading	247.1 kg/m ² (50.61 lb/sq ft)
Max power loading	277 kg/kN (2.72 lb/lb st)
PERFORMANCE:	
Max operating speed:	
S/L to FL270	320 kt (593 km/h; 368 mph)
above FL270	M0.80
Max cruising speed at FL330	451 kt (835 km/h; 519 mph)
Max operating altitude	12,500 m (41,000 ft)
T-O field length	1,157 m (3,795 ft)
Landing run	966 m (3,170 ft)
Range with single pilot, four passengers, NBAA IFR reserves	1,460 n miles (2,703 km; 1,680 miles)
g limits	+3.2/-1.28
UPDATED	

Beech Premier I flight deck
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BELL

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During 1970-81, Bell Helicopter Textron was unincorporated division of Textron Inc; became wholly owned subsidiary of Textron Inc from 3 January 1982. Bell Helicopter Textron Canada (see Canadian section) formed at Montréal/Mirabel under contract with Canadian government October 1983; transfer to Mirabel, completed January 1987, of Bell 206B JetRanger and 206L LongRanger production. Production of Bell 212/412 transferred mid-1988 and early 1989 respectively; Bell 230, 430, 427 and 407 programmes also undertaken in Canada, although some of these now terminated.

Bell and Boeing collaborate in design and manufacture of V-22 Osprey tiltrotor aircraft, as described in the following entry. New 41,800 m² (450,000 sq ft) factory at Amarillo International Airport, Texas, completed in 1999 as a Tiltrotor Assembly Centre (TAC) for the V-22 and the commercial BA609; latter tiltrotor, previously also a joint venture with Boeing, became a solely Bell programme on 1 March 1998 and is now (with the AB139) the core of a joint venture effort undertaken in conjunction with Agusta of Italy; an agreement establishing the Bell/Agusta Aerospace Company was signed in November 1998.

Bell helicopters built in USA detailed here. Those currently built in Canada listed under Canada; other models built under licence by Dirgantara in Indonesia and Agusta in Italy; KAI is co-producing Bell 427 as SB 427 in Republic of Korea; Bell Helicopter Asia (Pte) Ltd is wholly owned Singapore-based company for marketing and support in Southeast Asia.

In 2002, Bell USA delivered one new V-22 Osprey, plus 22 upgraded OH-58s to US DoD, plus 16 Huey II upgrades to foreign order; Canadian shipments added 102 light helicopters, including 10 TH-67s to US Army and five Bell 412s to Saudi Arabia.

UPDATED

BELL 449 SUPERCobra and KING COBRA US Navy/Marine Corps designations: AH-1W and AH-1Z

TYPE: Attack helicopter.

PROGRAMME: Prototype Bell 209, derived from single-engined UH-1, first flew as tandem-seat combat aircraft on 7 September 1965. Built for US armed forces and export and under licence in Japan, as described in previous editions of *Jane's*. Universally known as HueyCobra.

First twin-engined Cobra was AH-1J SeaCobra, delivered from mid-1970; AH-1T Improved SeaCobra followed from 1977. All surviving US Marine Corps AH-1J SeaCobras withdrawn and 44 (including one

ground-based trainer) AH-1T Improved SeaCobras converted to AH-1W to augment new production.

CURRENT VERSIONS: **AH-1W SuperCobra:** Bell flew AH-1T powered by two GE T700-GE-700; first flight of improved AH-1T+, including GE T700-GE-401 engines, 16 November 1983. USMC received 169 new-build examples as well as two maintenance trainers; 10 supplied to Turkey and 63 to Taiwan. Missions of AH-1W include anti-armour, escort, multiple-weapon fire support, armed reconnaissance, search and target acquisition.

AH-1W Upgrades: Following abandonment of the proposed Integrated Weapon System (IWS) project in July 1995 and the Marine Observation and Attack Aircraft programme which was intended to provide a replacement for both the AH-1W SuperCobra and the UH-1N Iroquois, the US Marine Corps has opted for a two-stage upgrade of the AH-1W, allowing it to be retained in the active inventory until about 2030. Phase 1 concerned installation of a Night Targeting System (NTS), under which USMC AH-1Ws fitted with the Israeli Tamam laser NTS for dual TOW/Hellfire day, night and adverse weather capability.

Conversion of a prototype (162533) was authorised in December 1991, with an initial batch of 25 sets being built by Tamam for delivery from January 1993; joint production with Kollsman was approved in May 1994. A total of 250 sets was required by the USMC, with further sets produced for Turkey and Taiwan. Deliveries of modified aircraft to operational units of the USMC began in June 1994.

A further improvement programme, involving installation of an Embedded Global Positioning System/Inertial Navigation System (EGI), has been undertaken. Two prototype conversions (162532 and 163936) were delivered to test units for trials in November 1995 and March 1996, with EGI installed on new-build aircraft from Lot 9 onwards, as well as older AH-1Ws as a retrofit programme.

Phase 2 entails installation of the Bell 680 four-blade rotor, offering a 70 per cent reduction in vibration; formerly designated **AH-1W (4BW)**, but now known as **AH-1Z**. Initial trials of the four-blade rotor system were undertaken with AH-1W 161022; bench testing of the new drive system began in second quarter of 1999 and was completed in first quarter of 2000. Bell also demonstrated 30-minute run-dry capability of new intermediate and tail rotor gearboxes in March 2000. The AH-1Z will be fitted with a new four-blade, all-composites, hingeless/bearingless rotor system; four-blade composites tail rotor; a new transmission rated at 1,957 kW (2,625 shp); endplates on horizontal tail surfaces and new wing assemblies able to carry twice the number of anti-armour missiles, as well as more fuel and additionally permitting concurrent carriage of two air-to-air self-defence missiles.

Lockheed Martin selected to develop and manufacture AN/AAQ-30 Hawkeye advanced target sighting system (TSS), with work on US\$8 million, 54 month, engineering development and integration programme beginning in July 1998. TSS features imaging technology by Wescam of Canada and Lockheed Martin's Sniper third-generation FLIR, as well as colour TV camera, laser ranger, spot-tracker and designator.

Also to feature on the AH-1Z are 'glass cockpits'; Northrop Grumman (formerly Litton Industries) has been selected as prime contractor for this aspect of the upgrade. Digital transfer of information on tactical situation, weaponry and flight data will enable crew interchangeability and allow AH-1Z to be flown from either front or rear seat. Major subcontractors include Rockwell Collins, which will supply active matrix liquid crystal displays (AMLCDs); Smiths Industries (fire-control system); Meggitt Avionics (standby air data and inertial sensing devices); and BAE Systems (air data computers). Other elements of the upgrade include new stores management system, onboard systems monitoring, mission data loader, HOTCC (hands on throttle, collective and cyclic) controls, airborne target handover system and a new EW suite.

A US\$310 million cost-plus-fixed-fee contract was awarded to Bell in November 1996, for design, development, fabrication, installation, test and delivery of three engineering development AH-1W SuperCobra Upgrade Aircraft. Assembly of first AH-1Z begun at Hurst, Texas, in April 1999, by which time 85 per cent of drawings had been released, with design work due for completion by end of 1999. Initial AH-1Z (162549, c/n 59001) completed final assembly in second quarter of 2000 and moved to Bell Flight Research Center at Arlington, Texas, for installation of instrumentation and functional testing that included restrained ground running which was completed in October 2000. Formal roll-out at Arlington on 20 November 2000, with first flight following on 7 December; subsequently redesignated as NAH-1Z and may eventually adopt new identity of 166477. Second development aircraft (163933/166478, c/n 59002) was due to fly in 2001, but handling quality problems that emerged early in flight test programme necessitated redesign of horizontal stabiliser assembly and caused delay; this eventually flew for first time on 4 October 2002, having been forestalled by third development aircraft (162532/166479, c/n 59003), which made its maiden flight on 26 August 2002. By mid-November 2002, all three aircraft had accumulated 390 flight hours, demonstrating 160 kt (296 km/h; 184 mph) cruise and 220 kt (407 km/h; 253 mph) maximum speed. Programme includes flight test and evaluation at Patuxent River, Maryland, to where first AH-1Z was airlifted by C-5 Galaxy on 31 March 2001. Weapons testing will take place at Yuma Proving Ground, Arizona with other trials at China Lake, California. Operational Test and Evaluation (OT&E) due to begin in fourth quarter of FY03 and will mostly be conducted at Patuxent River. Testing of full-scale AH-1Z structural test article at Arlington began in April 2000; on 22 November 2002, significant milestone passed with completion of 20,000 hour fatigue life demonstration, but further fatigue and static loads evaluation to follow, with airframe also earmarked for survivability assessment on completion of test duty. Finalisation of the cockpit upgrade design occurred in FY99, with first order for remanufacture due to be placed in FY04. IOC scheduled for 2007, with peak production rate requiring 24 AH-1Ws to be upgraded annually. Initial deliveries will be to HMT-303 at Camp Pendleton, California.