

AREAS:	
Wings, gross	13.79 m <sup>2</sup> (148.4 sq ft)
Ailerons (total)	0.90 m <sup>2</sup> (9.69 sq ft)
Flaps (total)	1.40 m <sup>2</sup> (15.07 sq ft)
Rudder	0.63 m <sup>2</sup> (6.78 sq ft)
Tailplane	1.41 m <sup>2</sup> (15.18 sq ft)
Elevator	0.76 m <sup>2</sup> (8.18 sq ft)
WEIGHTS AND LOADINGS:	
Weight empty	675 kg (1,488 lb)

Max T-O weight	900 kg (1,984 lb)
Max wing loading	65.3 kg/m <sup>2</sup> (13.37 lb/sq ft)
Max power loading	10.49 kg/kW (17.23 lb/hp)
PERFORMANCE:	
Never-exceed speed (VNE)	135 kt (250 km/h; 155 mph)
Cruising speed	108 kt (200 km/h; 124 mph)
Stalling speed	49 kt (90 km/h; 56 mph)
Service ceiling	5,300 m (17,380 ft)
Max rate of climb at S/L	216 m (709 ft)/min

T-O run	130 m (427 ft)
Max range	783 n miles (1,450 km; 901 miles)
Endurance	6 h 0 min
g limits	+3.8/-1.52

UPDATED

## EDRA HELICENTRO

### EDRA HELICENTRO, PEÇAS e MANUTENÇÃO LTDA

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 e-mail: harusch@uniserve.com  
 Web: http://www.seastaramphibian.com

Following cessation of manufacture by the Billie company in France, the Pétrel amphibian is being produced in Brazil for local and export markets. Marketing outside South America is undertaken by Amphibian Airplanes of Canada, which built the first North American SeaStar in 1998. Components are imported and augmented by North American standard items before sale as kits.

EDRA Helicentro is one of three components of the EDRA group, founded in 1994 and with interests in pilot training, aircraft maintenance, air taxi services and aircraft dealership (Schweizer helicopters for Brazil).

UPDATED

### EDRA HELICENTRO PATURI

English name: Masked Duck

Export marketing name: SeaStar

TYPE: Two-seat amphibian/kitbuilt.

PROGRAMME: Derived from Claude Tisserand's Hydroplum II, prototype of which first flew 1 November 1986; SMAN bought design rights in 1987; construction of Pétrel prototype began January 1989; first flight July 1989. At least 70 built in France; rights passed to Billie Aero Marine. Production transferred to Brazil by 1997.

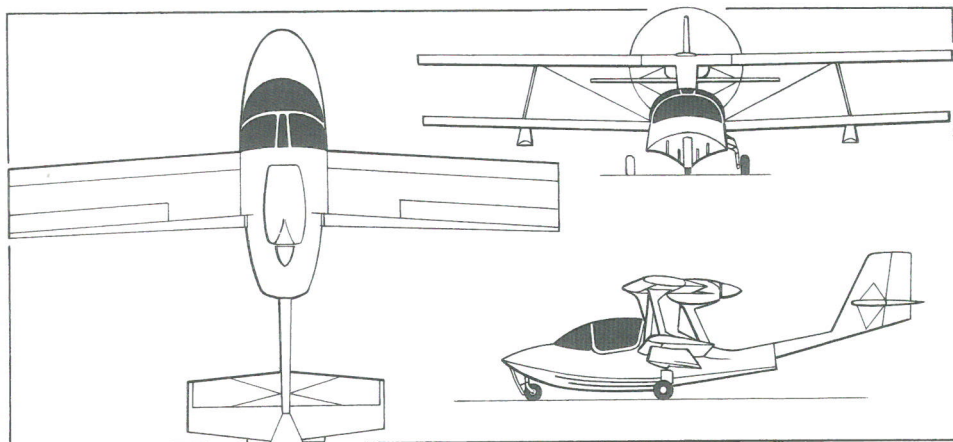
CUSTOMERS: Total of 135 produced by Edra by late 1999 (latest data known). Production rate five kits and one factory-built aircraft per month in 1999. Customers in Europe, Africa, Canada, Australia, USA and Brazil.

COSTS: Kit, less engine, US\$18,500 with basic items only, or US\$26,000 for complete components set; fly-away US\$43,000 (2003).



EDRA Helicentro Paturi, marketed abroad as the SeaStar (Paul Jackson)

0084581



Paturi amphibious two-seat lightplane (James Goulding)

0100404

DESIGN FEATURES: Experimental category pusher-engined biplane; road-towable on custom-designed trailer with assembly/disassembly time of 10 minutes. Quoted kit build time 500 hours (fast-build kit).

Equal-span, constant-chord wings, upper unit mounted on cabane; V-type interplane struts, with diagonal strut brace to fuselage from upper plane. Single-step hull. Boom-mounted empennage, wire-braced. Floats at mid-span of lower plane. (French-built Pétrels have shorter lower span with floats at tips.)

Wing section NACA 2412; dihedral 2° 13' on upper wings, 3° 26' on lower; sweepback 4° upper, 2° lower.

FLYING CONTROLS: Conventional and manual. Ailerons on upper wing only. No flaps. Actuation by wires (rudder) and pushrods. Electric trim.

STRUCTURE: Moulded monocoque single-step hull of epoxy/carbon fibre foam with carbon fibre tailboom; wings have 2014-T6 aluminium alloy tubular main spar with PVC foam ribs and glass fibre/epoxy leading-edge and tips covered with fabric and braced by single diagonal strut and V interplane struts of 6061-T6 aluminium. Wings fold for ground transportation. Tail surfaces of glass fibre spars and PVC foam ribs, with fabric and glass fibre covering, stainless steel wire braced.

LANDING GEAR: Retractable tricycle type; based on Mooney design, with Johnson bar actuation; main units retract upwards into hull and undersurface of lower wing; nosewheel retracts upwards and forwards, tyre remaining

partially exposed to serve as docking bumper when operating on water. Nosewheel maximum steering angle 80°. Hydraulic disc brakes on main units. No water rudders.

POWER PLANT: One 59.6 kW (79.9 hp) Rotax 912 UL or 73.5 kW (98.6 hp) Rotax 912 ULS four-stroke piston engine driving an Airplast 175 three-blade pusher propeller. Optional Airplast PV 50 in-flight adjustable pitch propeller with electric or manual control. Fuel capacity 50 litres (13.2 US gallons; 11.0 Imp gallons), of which 45 litres (11.9 US gallons; 9.9 Imp gallons) usable. Optional auxiliary tank, capacity 106 litres (28.0 US gallons; 23.3 Imp gallons).

ACCOMMODATION: Two, side by side in open or enclosed cockpit, with windscreen or single-piece forward-hinging canopy. Dual controls.

EQUIPMENT: Optional BRS ballistic parachute. Bilge pump.

#### DIMENSIONS, EXTERNAL:

Wing span (both)	8.25 m (27 ft 8 in)
Length overall	6.47 m (21 ft 2 3/4 in)
Height overall	2.26 m (7 ft 5 in)
Wheel track	1.78 m (5 ft 10 in)
Wheelbase	2.10 m (6 ft 10 3/4 in)
Propeller diameter	1.65 m (5 ft 5 in)

#### DIMENSIONS, INTERNAL:

Cabin max width	1.13 m (3 ft 8 1/2 in)
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#### AREAS:

Wings, gross	16.50 m <sup>2</sup> (177.6 sq ft)
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#### WEIGHTS AND LOADINGS:

Weight empty	300 kg (661 lb)
Max T-O weight	600 kg (1,323 lb)
Max wing loading	36.4 kg/m <sup>2</sup> (7.45 lb/sq ft)
Max power loading	10.08 kg/kW (16.56 lb/hp)

#### PERFORMANCE (Rotax 912 ULS):

Never-exceed speed (VNE)	98 kt (180 km/h; 112 mph)
Max level speed	92 kt (170 km/h; 106 mph)
Max cruising speed	86 kt (160 km/h; 99 mph)
Manoeuvring speed	81 kt (150 km/h; 92 mph)
Stalling speed	35 kt (65 km/h; 41 mph)
Max rate of climb at S/L	152 m (500 ft)/min
Service ceiling	3,660 m (12,000 ft)
T-O run: on land	200 m (660 ft)
on water	150 m (495 ft)
Landing run: on land	130 m (425 ft)
Range with max fuel	600 n miles (1,111 km; 690 miles)
Radius of action, auxiliary fuel	405 n miles (750 km; 466 miles)

Endurance	2 h 30 min
g limits	+4/-2

UPDATED

## EMBRAER

### EMPRESA BRASILEIRA DE AERONÁUTICA SA

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 MANAGER: Neil Patton



Created 19 August 1969, Embraer began operating on 2 January 1970. Its 250,000 m<sup>2</sup> (2,691,000 sq ft) factory at Faria Lima was officially joined on 15 January 2001 by the Eugênio de Mello plant, comprising 147,650 m<sup>2</sup> (1,589,300 sq ft) of covered space. Both facilities are near São José dos Campos. Fifth company plant, at Gavião Peixoto (300 km; 186 miles northwest of São Paulo) opened 11 June 2002; to expand over five years to 3,000,000 m<sup>2</sup> (32 million sq ft) and undertake final assembly of Legacy, Super Tucano, AMX-T and special missions versions of EMB-145.

Total Embraer workforce was 11,876 on 30 June 2002. Neiva (which see) became a subsidiary in March 1980. Embraer and subsidiaries have delivered nearly 5,500 aircraft.

Privatisation of Embraer was undertaken on 7 December 1994 with the auction of 55.4 per cent of voting stock. A consortium, led by Bozano Simonsen bank, acquired 45.44 per cent of auctioned stock, assumed a controlling interest in the company, and provided an extra US\$36 million in capitalisation. A further 10 per cent of voting stock was offered to the public within 60 days, with Embraer employees and the Brazilian government retaining 10 and 18.4 per cent respectively. In October 1999 a consortium of French aerospace companies, comprising Aerospatiale Matra (now EADS France), Dassault, SNECMA and Thomson-CSF (now Thales), acquired 20 per cent of Embraer's voting shares. Embraer also embarked on a joint venture with Liebherr International of Germany to establish Embraer-Liebherr Equipamentos do Brasil SA (ELEB) to create additional opportunities for the company's landing gear and hydraulics components business. Embraer's controlling group—with 60 per cent of voting shares—comprises pension funds Previ and Sistel, plus investment house Companhia Bozano Simonsen.

Principal current own-design manufacturing programmes are EMB-120 Brasília commuter transport, ERJ-135/ERJ-140/ERJ-145 and ERJ-170/190 regional jet families and EMB-312/EMB-314 Tucano turboprop military trainer. Subsidiary Neiva manufactures EMB-202 Ipanema agricultural aircraft and holds licences from New Piper in USA. Main production of International (with Italy) AMX attack fighter is complete, but Embraer holds outstanding contract for Venezuelan order.

In subcontract field, first deliveries made in 1994 of wingtips and vertical fin fairings for Boeing 777 under 1991 contract.

Embraer is a risk-sharing partner in the Sikorsky S-92 Helibus programme; under a June 1995 contract valued at US\$170 million, it will supply 730 sets of S-92 fuel sponsons. In 1995 Embraer signed a co-operation agreement with PZL Warszawa-Okecie of Poland under which Embraer subsidiary Neiva SA would market PZL light aircraft in Brazil and PZL subsidiary Skypol would acquire Brasília for its freight and charter services. This appears to have lapsed.

On 3 April 2002 Embraer, Dassault Aviation, SNECMA Moteurs and Thales Airborne Systems formed the Mirage 2000BR Consortium to develop a version of the Dassault Mirage 2000-5 Mk 2 as a contender for the Brazilian Air Force's F-X BR programme. If selected, FAB Mirage 2000BRs would be assembled at a new Embraer facility at Gavião Peixoto.

On 2 December 2002 Embraer signed an agreement with Harbin Aircraft Industry (Group) Co Ltd and Hafei Aviation Industry Co Ltd to form a new joint venture company, Harbin Embraer Aircraft Company Ltd, which will produce under licence the ERJ-135, ERJ-140 and ERJ-145, primarily for customers in the People's Republic of China. A 24,000 m<sup>2</sup> (847,550 sq ft) facility is to be established in Harbin, Heilongjiang Province, employing up to 220 staff. Delivery of the first Harbin Embraer-built aircraft was scheduled for December 2002.

Embraer delivered 177 aircraft (45 ERJ-135s, 112 ERJ-145s, three EMB-135s and 17 lightplanes) in 2000, 174 aircraft (two EMB-120s, 27 ERJ-135s, 22 ERJ-140s, 104 ERJ-145, seven EMB-135, one EMB-145 and 11 light aircraft) in 2001. Firm order backlog 131 aircraft (one EMB-135/145, three ERJ-135s, 36 ERJ-140s, 82 ERJ-145s and nine Legacys) in 2002. Planned target for 2003 is 110

#### EMBRAER DELIVERIES (at January 2003)

Type	Deliveries
EMB-110 Bandeirante	469
EMB-111 Bandeirante	
Patrulha	31
EMB-120 Brasília	354
EMB-121 Xingu	105
ERJ-135	91
ERJ-140	58
ERJ-145	474
EMB-200/201/202	
Ipanema	860
EMB-312 Tucano	650
EMB-326GB Xavante	182
AMX	56
Light aircraft (incl Neiva)	2,470
<b>Total</b>	<b>5,800</b>



Embraer YA-29 Super Tucano prototype

NEW/0532059

deliveries, rising to 160 in 2004. Firm order backlog valued at US\$22.2 billion at 31 December 2002, comprising 374 regional jets and 58 Legacys.

UPDATED

### EMBRAER EMB-314 SUPER TUCANO

English name: Super Toucan

Brazilian Air Force designations: A-29 and AT-29

TYPE: Basic turboprop trainer/attack lightplane.

PROGRAMME: Design of original EMB-312 Tucano started January 1978. Ministry of Aeronautics contract received 6 December that year for two flying prototypes and two static/fatigue test airframes; first prototype (Brazilian Air Force serial number 1300) made first flight 16 August 1980, second (1301) on 10 December 1980; third to fly (PP-ZDK, on 16 August 1982) was to production standard. Total of 650 built by 1998; further details in 2000-01 and previous *Jane's* and in *Jane's Aircraft Upgrades*.

Development of EMB-314 began January 1991; announced (as EMB-312H) at Paris Air Show June 1991; Embraer development aircraft PT-ZTW (c/n 312161, previously used as prototype for TPE331-powered Tucano adopted by Royal Air Force) modified as Tucano H proof-of-concept (POC) prototype, making first flight in this form 9 September 1991. This aircraft toured US Air Force/Navy bases August and September 1992 as preliminary to Super Tucano entry in JPATS competition; Embraer teamed with Northrop May 1992 to bid Super Tucano for JPATS, but was unsuccessful. Provisional Brazilian type certification granted August 1994 after 500 hour, 396 sortie test and certification programme.

CURRENT VERSIONS: **EMB-314**: Two EMB-312H prototypes (PT[later PP]-ZTV, c/n 312454, first flight 15 May 1993, and PP-ZTF, c/n 312455, first flight 14 October 1993) tailored to US JPATS requirements as EMB-312HJ. Designation subsequently changed to EMB-314 to reflect extensive modifications to structure and systems.

**ALX (EMB-314M)**: Brazilian Air Force (FAB) version, for border patrol missions under its SIVAM (*Sistema de Vigilância da Amazônia*) programme. FAB finalised specification in early 1994; trials to validate projected flight characteristics, using POC aircraft and both Super Tucano prototypes, completed 1994. US\$50 million development contract signed 18 August 1995 for two prototypes (one single-seat) to be modified from Super Tucano prototypes. The first flew in May 1996 and is being used for external stores compatibility and handling qualities testing; the second, which flew in early 1997, for testing the advanced weapons systems. Total 650 hours accumulated by early 2002, with up to 300 more required for completion.

FAB commitment to purchase 99 ALXs, of which 50 will be two-seat **AT-29**, 30 of these replacing AT-26 Xavante with 2<sup>nd</sup>/5<sup>th</sup> Grupo of Training Command at Natal AFB, remainder configured for night intruder role and expected to serve with 1<sup>st</sup>/3<sup>rd</sup> Grupo at Boa Vista and 2<sup>nd</sup>/3<sup>rd</sup> Grupo at Porto Velho; 49 will be single-seat **A-29**. Prototype 5700 (the former EMB-314 PP-ZTV), designated **YA-29**, rolled out 28 May 1999; IOC originally intended in May 2001 but FAB formal order only placed (76 firm, plus 23 options) on 8 August 2001; production started February 2002; deliveries to begin in December 2003. Elbit selected December 1996 to supply mission avionics, including ventral FLIR Systems AN/AAQ-22 turret, GPS/INS, radalt, Mode S transponder, DME, ILS, ADF, VOR, RWR, MAWS and chaff/flare dispenser. Export variants of both versions will be offered for border patrol/COIN missions and for basic/advanced pilot training. Can be flown as single-seat attack aircraft with fuel tank in rear cockpit.

Dominican Republic Air Force ordered 10 Super Tucanos on 20 August 2001.

Estimated market for 500 aircraft over 10 years.

DESIGN FEATURES: Meets requirements of FAR Pt 23 Appendix A, and MIL and CAA Section K specifications. Low-mounted wings, stepped cockpits in tandem, fully aerobatic. Small fillet forward of tailplane root each side.

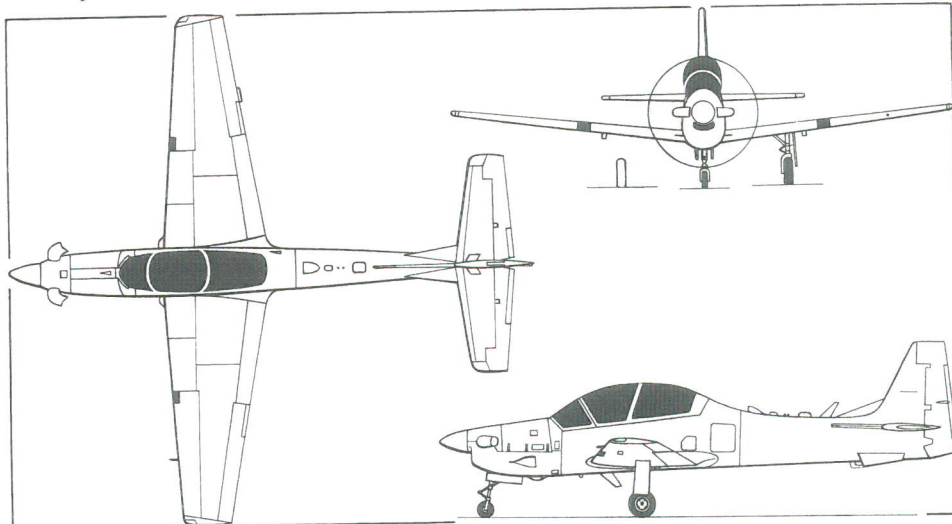
EMB-314 differs from EMB-312 mainly in having more powerful engine, reprofiled wing and plugs of 0.37 m (1 ft 2½ in) forward and 1.00 m (3 ft 3¼ in) aft of cockpit to accommodate longer engine and retain CG and stability. Other changes include strengthened airframe for higher g loads and longer fatigue life, potentially 18,000 hours for typical training missions, or 12,000 hours in operational environments, depending on mission loads and utilisation: ventral strakes; five weapons hardpoints; NVG-compatible 'glass cockpit' with HOTAS controls. Able to cover whole primary and half of advanced pilot training syllabus, and fly precision weapons delivery and target towing missions.

Wing section NACA 63-415 at root; NACA 63A-212 at tip.

FLYING CONTROLS: Conventional and manual. Primary surfaces internally balanced; electrically actuated trim tab in, and small geared tab on, each Frise aileron; electromechanically actuated spring tab in rudder and port elevator. Electrically actuated single-slotted Fowler flaps on wing trailing-edges. Fixed incidence tailplane. Ventral airbrake.

STRUCTURE: Conventional all-metal construction from 2024-series aluminium alloys; continuous three-spar wing box forms integral fuel tankage. Steel flap tracks.

LANDING GEAR: Hydraulically retractable tricycle type, with single wheel and Piper oleo-pneumatic shock-absorber on



AT-29 advanced trainer version of Embraer Super Tucano (James Goulding)

005631





Front cockpit of Embraer Super Tucano 0131837

each unit. Accumulator for emergency extension in the event of hydraulic system failure. Hydraulic steering for nose unit. Rearward-retracting steerable nose unit; main units retract inward into wings. Parker Hannifin 40-130 mainwheels, Oldi-DI-1.555-02-OL nosewheel. Tyre sizes 6.50-10 (8 ply) tubeless on mainwheels, 5.00-5 (6 ply) tubeless on nosewheel. Tyre pressures ( $\pm 0.21$  bar; 3 lb/sq in in each case) are 5.17 bar (75 lb/sq in) on mainwheels, 4.48 bar (65 lb/sq in) on nosewheel. Parker Hannifin 30-95A hydraulic mainwheel brakes.

POWER PLANT: ALX: One 1,193 kW (1,600 shp) Pratt & Whitney Canada PT6A-68-3 turboprop, with FADEC, driving a Hartzell five-blade, constant-speed, fully feathering, reversible-pitch propeller.

EMB-314: One 969 kW (1,300 shp) PT6A-68A.

Single-lever combined control for engine throttling and propeller pitch adjustment. Two integral fuel tanks in each wing, total capacity 694 litres (183.3 US gallons; 152.7 Imp gallons). Fuel tanks lined with anti-detonation plastics foam. Optional self-sealing 303 litre (80.0 US gallon; 66.6 Imp gallon) tank in rear cockpit. Single-point pressure refuelling. Fuel system allows nominally for up to 30 seconds of inverted flight. Provision for three ferry fuel tanks (centreline and inboard wing pylons), each total capacity 330 litres (87.1 US gallons; 72.6 Imp gallons).

ACCOMMODATION: Two in tandem, on Martin-Baker Mk 10 LCX zero-zero ejection seats, in air conditioned and pressurised cockpit. One-piece fully transparent vacuum-formed canopy, opening sideways to starboard, with internal and external jettison provisions. Rear seat elevated 25 cm (9.9 in). Dual controls standard. Baggage compartment in rear fuselage, with access via door on port side.

SYSTEMS: Two-axis autopilot with embedded mission planning capability. Freon air cycle conditioning system, with engine-driven compressor. Single hydraulic system, consisting basically of (a) control unit, including reservoir with usable capacity of 1.9 litres (0.5 US gallon; 0.42 Imp gallon); (b) an engine-driven pump with nominal pressure of 131 bar (1,900 lb/sq in) and nominal flow rate of 4.6 litres (1.22 US gallons; 1.01 Imp gallons)/min at 3,800 rpm; (c) landing gear and gear door actuators; (d) filter; (e) shutoff valve; and (f) hydraulic fluid to MIL-H-5606. Under normal operation, hydraulic system actuates landing gear extension/retraction and control of gear doors. Landing gear extension can be performed under emergency operation; emergency retraction also possible during landing and T-O with engine running. Reservoir and system are suitable for aerobatics. No pneumatic system. 28 V DC electrical power provided by a 6 kW starter/generator, 26 Ah battery and, for 115 V and 26 V AC power at 400 Hz, a 250 VA inverter. Onboard oxygen generation system. Canopy and propeller de-icing. Integrated Data Acquisition Recorder (IDAR) includes VCR and FDR functions.

AVIONICS: Comms: Standard Rockwell Collins equipment. Integrated nav/com. Tactical VHF/UHF with datalink provisions; transponder.

Flight: Laser INS/dual GPS; twin VOR; ILS; DME; ADF; autopilot.

Instrumentation: Two 152 × 203 mm (6 × 8 in) CMFDs in each cockpit; HUD with up-front control panel in front cockpit. NVG Gen III compatible internal/external lighting. Optional HMD.

Mission: Provision for datalink; video camera and recorder. Embedded mission planning capability. Virtual radar/armament training systems. FLIR. Chaff/flare dispensers; MAWS and RWR.

EQUIPMENT: Landing light in each wing leading-edge; taxiing lights on nosewheel unit. Optional Kevlar cockpit armour.

ARMAMENT: One 12.7 mm machine gun and 200 rounds mounted in each wing. Provision for a variety of ordnance including two Giat NC621 20 mm cannon pods, Mk 81/82 bombs, MAA-1 Piranha AAMs, BLG-252 cluster bombs, SBAT-70/19 or LAU-68A/G rocket pods or MLBs on underwing stations.

DIMENSIONS, EXTERNAL:

Wing span	11.14 m (36 ft 6½ in)
Wing chord: at root	2.30 m (7 ft 6½ in)
at tip	1.07 m (3 ft 6½ in)
Wing aspect ratio	6.4
Length overall	11.42 m (37 ft 5½ in)
Fuselage: Length (excl rudder)	10.53 m (34 ft 6½ in)
Max depth	1.86 m (6 ft 1¼ in)
Height overall (static)	3.90 m (12 ft 9½ in)
Tailplane span	4.66 m (15 ft 3½ in)
Wheel track	3.76 m (12 ft 4 in)
Wheelbase	3.36 m (11 ft 0¼ in)
Propeller ground clearance (static)	0.345 m (1 ft 1½ in)

Baggage compartment door:

Height	0.60 m (1 ft 11½ in)
Width	0.54 m (1 ft 9¼ in)
Height to sill	1.25 m (4 ft 1¼ in)

DIMENSIONS, INTERNAL:

Cockpits: Combined length	2.90 m (9 ft 6½ in)
Max height	1.55 m (5 ft 1 in)
Max width	0.85 m (2 ft 9½ in)
Baggage compartment volume	0.17 m³ (6.0 cu ft)

AREAS:

Wings, gross	19.40 m² (208.8 sq ft)
Ailerons (total)	1.97 m² (21.20 sq ft)
Trailing-edge flaps (total)	2.58 m² (27.77 sq ft)
Fin, incl dorsal fin	2.29 m² (24.65 sq ft)
Rudder, incl tab	1.38 m² (14.85 sq ft)
Tailplane, incl fillets	4.77 m² (51.34 sq ft)
Elevators, incl tab	2.00 m² (21.53 sq ft)

WEIGHTS AND LOADINGS (EMB-314, except where indicated):

Basic weight empty	2,420 kg (5,335 lb)
Max external load	1,500 kg (3,307 lb)
Max internal fuel load (usable)	538 kg (1,186 lb)
Max T-O weight: EMB-314, clean	3,190 kg (7,033 lb)
ALX	3,600 kg (7,936 lb)
Max ramp weight	3,210 kg (7,077 lb)
Max zero-fuel weight: EMB-314	2,670 kg (5,886 lb)
ALX	3,150 kg (6,945 lb)
Max wing loading	164.4 kg/m² (33.68 lb/sq ft)
Max power loading	3.29 kg/kW (5.41 lb/shp)

PERFORMANCE (EMB-314, at max clean T-O weight except where indicated):

Max level speed: EMB-314 at FL200

301 kt (557 km/h; 346 mph)

ALX with external stores 245 kt (454 km/h; 282 mph)

Max cruising speed at FL200 286 kt (530 km/h; 329 mph)

Econ cruising speed at FL200

228 kt (422 km/h; 262 mph)

Stalling speed, power off:

flaps and landing gear up

85 kt (157 km/h; 98 mph) EAS

flaps and landing gear down

78 kt (145 km/h; 90 mph) EAS

Max rate of climb at S/L

895 m (2,925 ft)/min

Service ceiling

10,670 m (35,000 ft)

T-O run

350 m (1,150 ft)

T-O to 15 m (50 ft)

550 m (1,805 ft)

Landing from 15 m (50 ft)

860 m (2,820 ft)

Landing run

550 m (1,805 ft)

Range at FL300 with max fuel, 30 min reserves

847 n miles (1,568 km; 974 miles)

Ferry range at FL250 with underwing tanks and 30 min reserves

1,495 n miles (2,768 km; 1,720 miles)

Endurance on internal fuel at econ cruising speed at

FL250, 30 min reserves

6 h 30 min

g limits: fully Aerobatic category at 2,770 kg (6,107 lb)

at 2,770 kg (6,107 lb) with external stores

+7/-3.5

+4/-2.2

UPDATED

EMBRAER ERJ-145

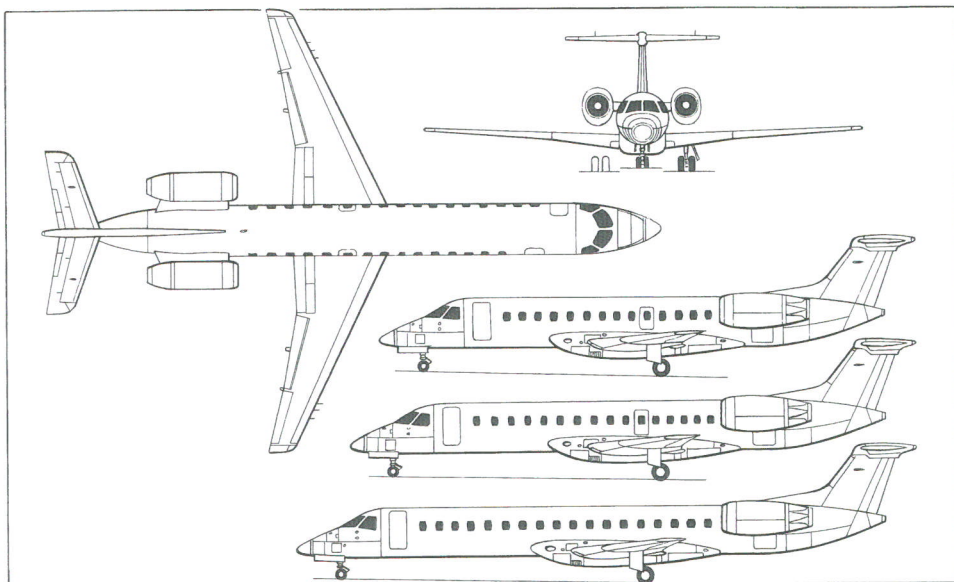
Brazilian Air Force designations: R-99A, R-99B and P-99

TYPE: Regional jet airliner.

PROGRAMME: Development plans revealed 12 June 1989, aimed at first flight late 1991 and first deliveries mid-1993; programme delayed by company cutbacks, complete redesign of wing and other changes, as described in 2000-01 and earlier *Jane's*.

First metal cut for prototype, and tooling fabrication, in second quarter 1993; assembly of prototype (PT-ZJA) began October 1994; fuselage sections mated January 1995; first flight 11 August 1995 ahead of formal roll-out and 'official' first flight a week later; first of three pre-series aircraft (PT-ZJB) first flown 17 November 1995; second ('ZJC') flew on 14 February and third ('ZJD') 2 April 1996; FAA and Brazilian CTA certification (to FAR/JAR 25, FAR Pt 36, ICAO Annex 16 and FAR Pt 121) achieved 10 December 1996. Single prototype and three pre-series aircraft undertook a 1,600 hour, 13 month development flight testing and certification programme. Deliveries began on 19 December 1996 with two aircraft (N15925 and N15926) to US launch customer Continental Express. Designation changed from EMB-145 to ERJ-145 in October 1997 to reflect 'Regional Jet' terminology, although former is retained for corporate and military variants. Certified by the aviation authorities of 27 countries by September 1998.

In addition to its suitability for executive transport and corporate shuttle roles, Embraer foresees military potential for the ERJ-145 as a tanker aircraft for small combat units, and as an AEW, elint, comint, sigint or battlefield surveillance platform. See Current Versions.



ERJ-145 rear-engined twin-turboprop regional airliner with additional side views of ERJ-135 (top) and ERJ-140 (centre) (James Goulding) 0143318

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Embraer ERJ-145 of Axon Airlines, Greece

NEW/0532060

Two static test airframes: first (802) completed trials on 30 August 1996; second (803) began 10 year programme in December 1996.

**CURRENT VERSIONS: ERJ-145:** Initial version. Certified (by FAA) 10 December 1996 at 19,200 kg (42,328 lb) MTOW.

**ERJ-145ER** (Extended Range): FAA co-certification 10 December 1996 at 20,600 kg (45,415 lb) MTOW.

**ERJ-145MR:** Certified by FAA 7 May 1998 at 22,000 kg (48,501 lb) MTOW.

**ERJ-145LR** (Long Range): FAA co-certification 7 May 1998 for full passenger payload range of 1,640 n miles (3,037 km; 1,887 miles); increases in fuel capacity and all operating weights; 22,000 kg (48,501 lb) MTOW; and uprated AE 3007A1 turbofans providing 15 per cent more thermodynamic power, but flat rated to 33.1 kN (7,430 lb st), for improved climb and hot weather cruise performance.

**ERJ-145XR** (Extra Long Range): Announced at Farnborough International Air Show 25 July 2000 with launch order for 75, plus 100 options, from Continental Express subsequently increased to 104, plus 100 options. Features strengthened fuselage, wings and horizontal stabiliser, winglets, uprated AE 3007A1E turbofans providing lower specific fuel consumption, improved hot-and-high operation and higher single-engine ceiling; and auxiliary fuel tank in wing/fuselage fairing. Prototype (PT-ZJB, modified from first pre-series ERJ-145) first flown 29 June 2001; first production aircraft (c/n 590) flew early April 2002; two aircraft took part in a 400 hour test programme. Brazilian CTA granted 3 September 2002, followed by FAA approval 22 October 2002, and first deliveries to Continental Express/ExpressJet, which was scheduled to receive 18 ERJ-145XRs by the end of 2002.

**ERJ-135:** Short-fuselage, 37-seat version; *described separately.*

**ERJ-140:** Mid-size, 44-seat version; *described separately.*

**EMB-145AEW&C:** Formerly EMB-145SA; Brazilian Air Force designation **R-99A**. Airborne early warning and remote sensing version of ERJ-145LR developed for Brazilian government's *Sistema de Vigilância de Amazônia* (SIVAM) programme for which Raytheon is prime contractor; initial requirement for five; contract signature March 1997. Selected on 15 December 1998 by Greek Air Force for its four-aircraft AEW requirement, with delivery from 2002; contract, signed 1 July 1999, valued at US\$500 million. Announced late 1996 and features a strengthened fuselage, ventral strakes, more powerful APU, increased fuel capacity (three extra tanks at extreme rear of cabin, plus jettison capability), extending endurance to more than 8 hours; enhanced electrical system, five seats for relief crew and four (with provision for additional two) operators' consoles, including tactical co-ordinator. Flight crew of two.

Mission systems comprise civil version of Ericsson PS-890 Erieye side-looking airborne radar with antenna housed in long overfuselage fairing, optimised for lower-speed targets typically encountered in border incursions; five Erieye systems purchased at cost of US\$145 million in 1997 for installation in EMB-145SAs, with first system delivery scheduled for 1999. Onboard command and control system, and BAE Systems North America Comms-Non Comms system. Radar is pulse Doppler type, operating in E/F-band, offering coverage from very low level up to about 25,000 m (82,000 ft) and at ranges exceeding 162 n miles (300 km; 186 miles). Datalink; GPS; secure communications. Second airframe (PP-XSA/6702) was first to fly, on 22 May 1999, ahead of formal roll-out on 28 May. Following systems integration by Raytheon in USA, first two R-99As and one R-99B handed over to 2°/6° Grupo at Anápolis on 24 July 2002; third and fourth R-99As followed in December 2002.

Greek selection of Erieye-equipped EMB-145 announced 1 July 1999; four aircraft ordered, of which first two delivered on 24 September 2001.

Mexican government order for one EMB-145AEW&C announced 1 March 2001; equipment includes comint system installed by Raytheon.

**EMB-145RS:** Brazilian Air Force designation **R-99B**. Remote sensing version, of which three ordered for FAB's SIVAM programme for delivery commencing first quarter 2001. Similar to AEW variant, and with ventral strakes, but different mission systems for primary roles in natural resources exploitation, environmental and river pollution control, economic activities, ground occupation monitoring and illegal activities surveillance. Main sensor is version of Canadian MacDonald Dettwiler IRIS (Integrated Radar Imaging System) synthetic aperture radar, installed in underfuselage bulge with auxiliary antennas beneath wingroots, operating in D-band interferometric mode and capable of generating 3-D imagery. Other main sensors include Star Safire FLIR mounted behind nosewheel bay, Daedalus ultraviolet/visible/infra-red linescanner and BAE Systems North America Comms-Non Comms system. Roll-out (PP-XRT/6751) November 1999, with first delivery to 2°/6° Grupo at Anápolis AFB on 24 July 2002.

**EMB-145AGS:** Airborne ground sensor version, under study during 2000; equipped with a mission package comprising Airborne Platform Subsystem (APS), Airborne Mission Equipment Subsystem (AMES) and Ground Exploitation Station Subsystem (GESS) including HF, UHF, VHF, ELINT and IMINT equipment, providing a self-deployable and cost-effective surface reconnaissance system.

**EMB-145MP** and **EMB-145MP/ASW:** Brazilian Air Force designation **P-99**. Maritime patrol and anti-submarine warfare versions, under development by 2000; equipped with surveillance radar with multiple target track-while-scan mode, autodetection, FLIR interface, digital map, incorporated tactical aids, SAR/ISAR mode allowing real-time imaging, adaptive processing for different sea states, and simultaneous side and range views; high-altitude and resolution FLIR; ESM suite; COMINT/ELINT; MAD; IFF/SSR and acoustics.

Mexican government order for two EMB-145MPs announced 1 March 2001. Equipment includes SeaVue radar and AN/APX-114 IFF interrogator to be installed by Raytheon at Greenville.

**CUSTOMERS:** Total of 675 firm orders and 475 options for EMB-145 commercial variant by 31 December 2003, of which 531 then delivered. Four hundredth ERJ series delivery was an ERJ-145 (HB-JAL) to Crossair on 22 March 2001; 500th was an ERJ-145 (N2933K) delivered to

Chatauqua Airlines of Indiana on 21 September 2001; 600th to Swiss (as HB-JAY) on 28 May 2002, and 700th to Alitalia Express on 9 May 2003. Total of 112 ERJ-145s delivered in 2000, and 104 in 2001. See table. Belgian Air Force took delivery of two ERJ-145LRs in VIP configuration (CE-03 and CE-04) on 11 December 2001 and 21 January 2002 respectively.

**EMBRAER ERJ-135/140/145 COMMERCIAL ORDERS**  
(at 1 January 2004)

Customer	Variant	Orders
Air Caraibes	145	2
Aerolitoral	145	5
Alitalia Express	145	14
American Eagle	135	40
	140	59
	145	136
Axon Airlines	145	3
bmi (British Midland)	135	4
	145	11
British Regional*	145	23
Brymon Airways	145	7
Cirrus Airlines	145	1
City Airline AB/Skyways	135	2
	145	4
ERA Spain	145	2
Express Jet	135	30
	145	245
Flandre Air	135	3
	145	7
GECAS/PB-Air		
Thailand	145	2
Jet Magic	135	1
KLM Excel	145	2
LOT Polish	145	14
Luxair	145	9
Mesa Airlines	145	36
Midwest	140	20
Occitania	135	1
Pan Européenne	135	1
Portugalia	145	8
Proteus Airlines	135	3
	145	11
Regional Airlines (France)	135	3
	145	17
Regional Air Lines (Morocco)	135	1
Republic (Chautauqua)	135	15
	145	52
Rheintalflug	145	3
Rio-Sul	145	16
Sichuan Airlines	145	5
South African Airlink	135	20
Swiss	145	25
Trans States Airlines	145	15
Wexford Management	140	15

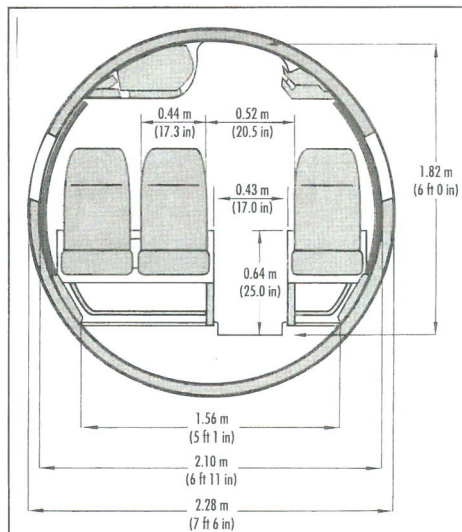
**Total** 891

**Note:** \*Formerly Manx Airlines. Total excludes military versions, EMB-135/145s in corporate service and Legacys.

**COSTS:** Estimated development costs US\$300 million. *Following description applies to ERJ-145ER except where indicated.*

**DESIGN FEATURES:** Stretched EMB-120 Brasília fuselage (with tailcone adapted for rear-mounted engine installation), allied to new-design wing with Embraer supercritical section; CBA-123 nose and cabin; T tailplane.

Wing sweepback 22° 43' 48" at quarter-chord. **FLYING CONTROLS:** Conventional and assisted. Ailerons and two-section rudder hydraulically actuated, with artificial

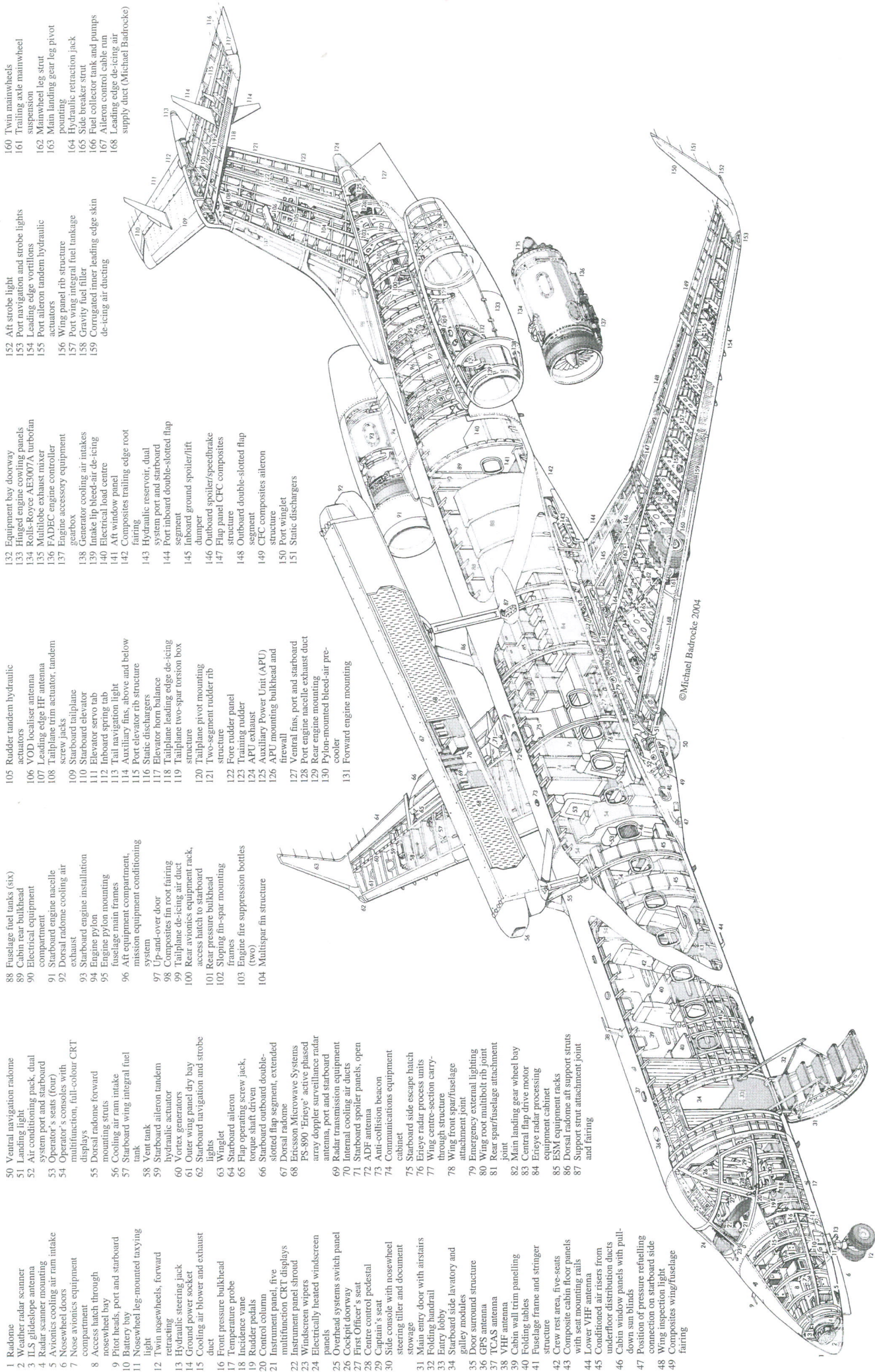


ERJ-145 fuselage cross-section

0011037



Embraer EMB145AEW&C, cutaway drawing key



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Profiles of R-99A, R-99B and P-99 versions of EMB-145

NEW/0532062

feel; mechanically actuated elevator with automatic and spring tab. Four-segment in-flight and ground spoilers; two pairs of electrically actuated double-slotted flaps, maximum deflection 45°.

**STRUCTURE:** Fuselage as for Brasília; two-spar wing with integral fuel tanks, plus auxiliary third spar supporting landing gear; T tail unit with aluminium main boxes; wing and tailplane leading-edges aluminium, fin leading-edge composites sandwich. Gamesa (Spain) builds wings, wing/body fairings, main landing gear doors and engine nacelles; rear fuselage section 1, including engine pylons and passenger/service/baggage doors, plus centre-fuselage section 1, including doors, by Sonaca (Belgium); fin, tailplane and elevators by ENAER (Chile); engine nacelles and thrust reversers by International Nacelle Systems; nose radome by Norton; passenger cabin and baggage compartment interiors by C & D Interiors (USA). Structure designed for an economical service life of 60,000 flights.

**LANDING GEAR:** Twin-wheel main legs retract inward into wing/fuselage fairings; twin-wheel nose unit retracts forward. EDE/Liebherr landing gear system, with EDE responsible for whole system and Liebherr for development and production of nose unit. Goodrich wheels and carbon brakes. Tyre sizes 30x9.5-14 (16 ply) tubeless (main), 19.5x6.75-8 (8 ply) tubeless (nose); tyre pressure 8.60 to 9.00 bar (125 to 130 lb/sq in). Minimum ground turning radius at nosewheel 12.51 m (41 ft 0 in). Minimum turning circle 29.22 m (95 ft 10 1/2 in).

**POWER PLANT:** Two turbofans pylon-mounted on rear cone of ERJ-145ER, 145MR and 145LR have 33.7 kN (7,580 lb st), Rolls-Royce AE 3007A, 3007A1/1 or 3007A1/2 as standard; 37.1 kN (8,338 lb st) AE 3007A1P optional, all with FADEC. ERJ-145XR has two 39.6 kN (8,895 lb st) AE 3007A1Es. Clamshell-type thrust reversers optional.

Parker Hannifin fuel system. Fuel capacity of ER and MR 5,201 litres (1,374 US gallons; 1,144 Imp gallons) in two wing tanks; usable fuel 5,091 litres (1,345 US gallons; 1,120 Imp gallons). ERJ-145LR capacity increased to 6,439 litres (1,701 US gallons; 1,418 Imp gallons; 6,352 litres (1,678 US gallons; 1,397 Imp gallons) usable. ERJ-145XR fuel comprises two wing tanks, each of 3,199 litres (845 US gallons; 704 Imp gallons), plus 1,037 litre (274 US gallon; 228 Imp gallon) ventral tank, for total of 7,435 litres (1,964 US gallons; 1,635 Imp gallons), of which 7,382 litres 1,950 US gallons; 1,624 Imp gallons) usable.

**ACCOMMODATION:** Two pilots, flight observer and cabin attendant. Standard accommodation for 50 passengers, three-abreast at seat pitch of 79 cm (31 in). Carry-on baggage wardrobe, galley and cabin attendant's seat at front of cabin; lavatory and main baggage compartment at rear of cabin. Cabinet plus overhead bins carry-on baggage capacity 358 kg (789 lb); underseat capacity 450 kg (992 lb); main baggage compartment capacity 1,200 kg (2,646 lb). Additional baggage cabinet or galley capacity can be provided by removing one or two single forward passenger seats. Outward-opening plug-type door, incorporating airstair, at front on port side, identical to that of EMB-120; upward-sliding baggage door at rear on port side; sideways-opening service door at front on starboard side; inward-opening emergency exit above wing on each side. Entire accommodation, including baggage compartments, pressurised and air conditioned.

**SYSTEMS:** Liebherr Aerospace pressurisation system (maximum differential 0.54 bar; 7.8 lb/sq in) maintains 2,440 m (8,000 ft) cabin altitude to 11,275 m (37,000 ft). Hamilton Sundstrand air conditioning and bleed air systems (wing and tailplane leading-edges and engine intakes anti-iced by engine bleed air); electric anti-icing system for windscreen and static and pitot tubes and sensors. Lucas electrical power generation system. Hamilton Sundstrand T-62T-40C11 or C14 APU. Honeywell air turbine starter. Parker Hannifin flight control and steering systems. Hydro-Aire brake-by-wire control system. EROS oxygen system.

**AVIONICS:** Honeywell Primus 1000 as core system.

**Comms:** Dual Primus II radios and radio management units.

**Radar:** Primus 1000 colour weather radar.

**Flight:** Dual digital air data computers, dual AHRS, TCAS and GPWS standard. FMS/GPS optional. Flight Dynamics HUD selected April 1998 for certification in 2000, providing Cat. III landing capability.

**Instrumentation:** EFIS panel comprising five 280 x 180 mm (11 x 7 in) displays, two PFDs, two MFDs and IECAS.

#### DIMENSIONS, EXTERNAL:

Wing span: ERJ-145ER/LR	20.04 m (65 ft 9 in)
ERJ-145XR over winglets	21.01 m (68 ft 11 in)
Wing chord: at root	4.09 m (13 ft 5 in)
at tip	1.04 m (3 ft 5 in)

Wing aspect ratio	7.9
Length overall	29.87 m (98 ft 0 in)
Fuselage: Length	27.93 m (91 ft 7 1/2 in)
Max diameter	2.28 m (7 ft 5 1/2 in)
Height overall	6.76 m (22 ft 2 in)
Tailplane span	7.55 m (24 ft 9 in)
Wheel track (c/l of shock-struts)	4.10 m (13 ft 5 1/2 in)
Wheelbase	14.45 m (47 ft 5 in)
Passenger door (fwd, port): Height	1.70 m (5 ft 7 in)
Width	0.71 m (2 ft 4 in)
Height to sill (max)	1.63 m (5 ft 4 in)
Baggage door (rear, port): Height	1.12 m (3 ft 8 in)
Width	1.00 m (3 ft 3 1/4 in)
Height to sill (max)	1.76 m (5 ft 9 1/4 in)
Service door (rear, stbd): Height	1.42 m (4 ft 8 in)
Width	0.62 m (2 ft 0 1/2 in)
Height to sill	1.60 m (5 ft 3 in)
Emergency exits (overwing, each):	
Height	0.92 m (3 ft 0 1/4 in)
Width	0.51 m (1 ft 8 in)

#### DIMENSIONS, INTERNAL:

Cabin (excl flight deck and baggage compartment, incl lavatory):	
Length	16.49 m (54 ft 1 1/4 in)
Max width	2.10 m (6 ft 10 1/2 in)
Max height	1.83 m (6 ft 0 in)
Max aisle width	0.52 m (1 ft 8 1/2 in)
Floor area	25.7 m² (277 sq ft)
Volume	53.0 m³ (1,872 cu ft)
Baggage compartment: Length	3.26 m (10 ft 8 1/2 in)
Baggage volume:	
wardrobe and stowage compartment	1.4 m³ (49 cu ft)
overhead bins	1.9 m³ (67 cu ft)
underseat	2.3 m³ (80 cu ft)
baggage compartment	9.2 m³ (325 cu ft)

#### AREAS:

Wings, gross	51.18 m² (550.9 sq ft)
Ailerons (total)	1.70 m² (18.30 sq ft)
Trailing-edge flaps (total)	8.36 m² (89.99 sq ft)
Spoilers (total)	2.32 m² (24.97 sq ft)
Fin	5.07 m² (54.57 sq ft)
Rudder	2.13 m² (22.93 sq ft)
Tailplane	11.20 m² (120.55 sq ft)
Elevators (total, incl tabs)	3.34 m² (35.95 sq ft)

#### WEIGHTS AND LOADINGS:

Operating weight empty:	
ERJ-145ER	11,700 kg (25,794 lb)
ERJ-145LR	11,800 kg (26,015 lb)
ERJ-145XR	12,520 kg (27,602 lb)
Baggage capacity	1,200 kg (2,646 lb)
Max payload: ERJ-145ER	5,400 kg (11,905 lb)
ERJ-145LR	6,100 kg (13,448 lb)
ERJ-145XR	5,980 kg (13,184 lb)
Max fuel: ERJ-145ER	4,173 kg (9,200 lb)
ERJ-145LR	5,187 kg (11,435 lb)
ERJ-145XR	5,987 kg (13,199 lb)
Max T-O weight: ERJ-145ER	20,600 kg (45,415 lb)
ERJ-145LR	22,000 kg (48,500 lb)
ERJ-145XR	24,100 kg (53,131 lb)
Max ramp weight: ERJ-145ER	20,700 kg (45,635 lb)
ERJ-145LR	22,100 kg (48,721 lb)
ERJ-145XR	24,200 kg (53,351 lb)
Max landing weight: ERJ-145ER	18,700 kg (41,226 lb)
ERJ-145LR	19,300 kg (42,549 lb)
ERJ-145XR	20,000 kg (44,092 lb)
Max zero-fuel weight:	
ERJ-145ER	17,100 kg (37,698 lb)
ERJ-145LR	17,900 kg (39,463 lb)
ERJ-145XR	18,500 kg (40,785 lb)
Max wing loading:	
ERJ-145ER	402.5 kg/m² (82.44 lb/sq ft)
ERJ-145LR	429.8 kg/m² (88.04 lb/sq ft)
ERJ-145XR	470.9 kg/m² (96.44 lb/sq ft)
Max power loading:	
ERJ-145ER, ERJ-145XR	305 kg/kN (3.00 lb/lb st)
ERJ-145LR	326 kg/kN (3.20 lb/lb st)
ERJ-145XR	305 kg/kN (2.99 lb/lb st)



Brazilian Air Force Embraer R-99B remote sensing aircraft

NEW/0532061



PERFORMANCE:

High cruising speed: all  
M0.78 (450 kt; 833 km/h; 518 mph)  
Time to climb to FL350 20 min  
Max certified altitude: all 11,275 m (37,000 ft)  
Service ceiling, OEI: ERJ-145ER/LR 6,100 m (20,000 ft)  
FAR T-O field length at S/L:  
ERJ-145ER/LR 1,970 m (6,465 ft)  
ERJ-145XR 2,126 m (6,975 ft)  
FAR landing field length, S/L, at typical landing weight:  
ERJ-145ER/LR 1,300 m (4,265 ft)  
ERJ-145XR 1,440 m (4,724 ft)  
Range, 50 passengers, 100 n miles (185 km; 115 mile)  
diversion, 45 min reserves  
ERJ-145ER 1,600 n miles (2,963 km; 1,841 miles)  
ERJ-145XR 2,000 n miles (3,704 km; 2,301 miles)

UPDATED

# EMBRAER ERJ-135

TYPE: Regional jet airliner.

PROGRAMME: Launched 16 September 1997; two pre-series ERJ-145s (001/PT-ZJA and 002/PT-ZJC) modified to create two prototype ERJ-135s; roll-out (PT-ZJA) 12 May 1998, followed by first flight 4 July 1998; public debut at Farnborough Air Show September 1998; second aircraft (PT-ZJC), flown 24 September 1998, for systems testing before conversion to production standard in March 1999. Brazilian Centro Técnico Aeroespacial (CTA) certification achieved in June 1999; FAA certification 15 July 1999. First delivery 23 July 1999 to Continental Express; other early aircraft to American Eagle.

CURRENT VERSIONS: **ERJ-135:** Regional airliner, as described. Available from the outset in 135ER and 135LR versions.

**EMB-135BJ Legacy:** Corporate version; described separately.

CUSTOMERS: Total of 122 firm commercial orders and seven options by 1 January 2004. See table. Additionally, one VIP-configured ERJ-135LR handed over to Greek Air Force on 7 January 2000 and two, also in VIP configuration, to the Belgian Air Force on 4 June and in August 2001, for operation by No. 21 Squadron at Melsbroek with two similarly configured ERJ-145s. Deliveries have been 16 in 1999, 45 in 2000, 27 in 2001, three in 2002 and 14 in 2003.

Programme based on estimates of 500 sales.

COSTS: Development cost US\$100 million, of which 40 per cent provided by risk-sharing partners. Unit cost US\$11.8 million.

DESIGN FEATURES: Shares 96 per cent commonality with ERJ-145 including engines, wings, tail surfaces, flight deck and main systems; fuselage shortened by 3.53 m (11 ft 7 in) by removal of two frames (4.84 m; 15 ft 10½ in

# Embraer ERJ-140 regional jet airliner

NEW/0532064

ahead of wing and 3.07 m; 10 ft 0¼ in at rear) and substitution of two shorter frames (2.85 m; 9 ft 4¼ in and 1.53 m; 5 ft 0¼ in, respectively).

FLYING CONTROLS: As for ERJ-145.

STRUCTURE: As for ERJ-145.

LANDING GEAR: As for ERJ-145.

POWER PLANT: Two 33.7 kN (7,580 lb st) Rolls-Royce AE 3007A1/3 turbofans. Fuel as ERJ-145ER and ERJ-145LR, respectively.

ACCOMMODATION: Standard accommodation for 37 passengers in three-abreast configuration.

SYSTEMS: As for ERJ-145.

DIMENSIONS, EXTERNAL: As for ERJ-145 except:

Length: overall	26.33 m (86 ft 4½ in)
fuselage	24.39 m (80 ft 0¼ in)
Wheelbase	12.43 m (40 ft 9¼ in)

DIMENSIONS, INTERNAL:

Cabin (excl flight deck and baggage compartment, incl lavatory): Length	12.95 m (42 ft 5¾ in)
Baggage compartment: Length	3.34 m (10 ft 11½ in)
Baggage volume:	
wardrobe and stowage compartment	1.0 m³ (35 cu ft)
overhead bins	1.4 m³ (49 cu ft)
underseat	1.7 m³ (60 cu ft)
Galley volume	0.99 m³ (35 cu ft)

WEIGHTS AND LOADINGS:

Operating weight empty:	
ERJ-135ER	11,200 kg (24,692 lb)
ERJ-135LR	11,300 kg (24,912 lb)
Baggage capacity	1,000 kg (2,205 lb)
Max payload: ERJ-135ER	4,400 kg (9,700 lb)
ERJ-135LR	4,700 kg (10,362 lb)

Max fuel weight: ERJ-135ER	4,173 kg (9,200 lb)
ERJ-135LR	5,187 kg (11,435 lb)
Max T-O weight: ERJ-135ER	19,000 kg (41,888 lb)
ERJ-135LR	20,000 kg (44,092 lb)
Max landing weight:	
ERJ-135ER, ERJ-135LR	18,500 kg (40,785 lb)
Max ramp weight: ERJ-135ER	19,100 kg (42,108 lb)
ERJ-135LR	20,100 kg (44,313 lb)
Max zero-fuel weight: ERJ-135ER	15,600 kg (34,392 lb)
ERJ-135LR	16,000 kg (35,274 lb)
Max wing loading:	
ERJ-135ER	371.2 kg/m² (76.04 lb/sq ft)
ERJ-135LR	390.8 kg/m² (80.04 lb/sq ft)
Max power loading:	
ERJ-135ER	282 kg/kN (2.76 lb/lb st)
ERJ-135LR	297 kg/kN (2.91 lb/lb st)

PERFORMANCE:

Max cruising speed	M0.78 (450 kt; 833 km/h; 518 mph)
Time to FL350	20 min
Max certified altitude	11,275 m (37,000 ft)
T-O field length at S/L	1,700 m (5,577 ft)
Landing field length, S/L, at typical landing weight	1,360 m (4,460 ft)
Range with 37 passengers, 100 n mile (185 km; 115 mile) diversion, 45 min reserves	1,700 n miles (3,148 km; 1,956 miles)

UPDATED

# EMBRAER ERJ-140

TYPE: Regional jet airliner.

PROGRAMME: Launched 30 September 1999 at the European Regional Airline Association annual meeting in Paris; first flight of prototype, modified from prototype ERJ-135 c/n 801/PT-ZJA, 27 June 2000; public debut at Farnborough International Air Show July 2000; Brazilian CTA and FAA certification achieved in June and 26 July 2001 respectively; first delivery (PP-XGF/N800AE) to American Eagle late July 2001.

CURRENT VERSIONS: **ERJ-140ER:** Standard version, as described. Engineering designation EMB-135KE.

**ERJ-140LR:** Long-range version. Engineering designation EMB-135KL.

CUSTOMERS: Launch customer American Eagle announced order for 66 on 27 September 2000, subsequently reduced to 59. Total of 94 firm orders and 20 options by 31 December 2003, at which time 74 had been delivered.

COSTS: US\$15.2 million (1999).

Descriptions for the ERJ-135 and ERJ-145 apply also to the ERJ-140 except as follows:

DESIGN FEATURES: Shares 98 per cent commonality with ERJ-135/145, including engines, wings, tail surfaces, flight deck and main systems; ERJ-135 fuselage stretched by 2.30 m (7 ft 6½ in) by removal of two frames (2.85 m; 9 ft 4¼ in ahead of wing and 1.35 m; 4 ft 5 in at rear) and substitution of two longer frames (3.94 m; 12 ft 11 in and 2.56 m; 8 ft 4¼ in respectively).

POWER PLANT: Rolls-Royce AE 3007A1/3 turbofans, each rated at 33.7 kN (7,580 lb st); fuel as ERJ-145ER/MR and 145LR, respectively.

ACCOMMODATION: Standard accommodation for 44 passengers, three-abreast at seat pitch of 39 cm (31 in). Flight attendant seat on port side immediately aft of flight deck standard; attendant seat in centre of aisle at rear of cabin optional. Wardrobe/carry-on baggage cabinet and galley at front of cabin, lavatory at rear.

DIMENSIONS, EXTERNAL:

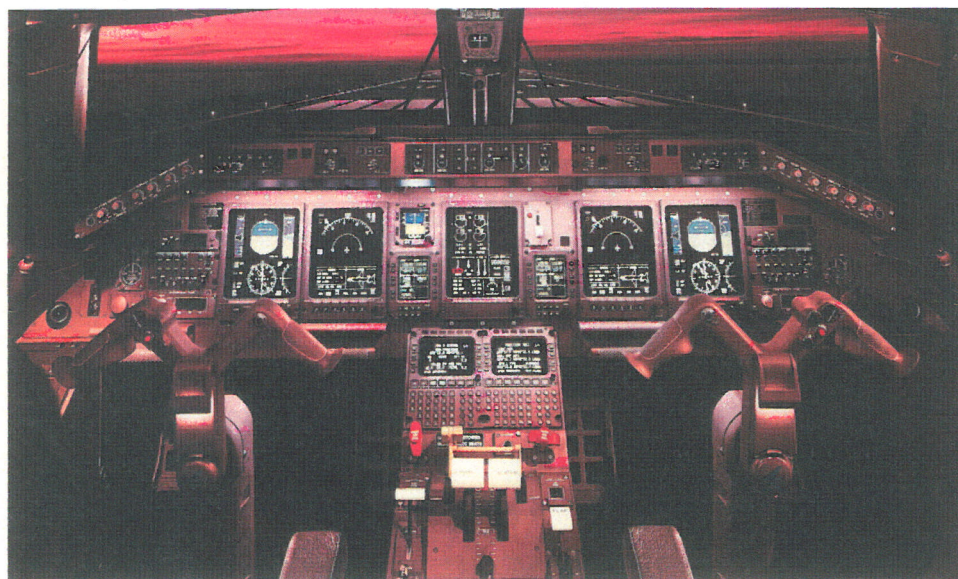
Length: overall	28.47 m (93 ft 5 in)
fuselage	26.52 m (87 ft 0 in)
Wheelbase	13.51 m (44 ft 4 in)

DIMENSIONS, INTERNAL:

Baggage volume:	
Wardrobe and stowage compartment	0.93 m³ (32.84 cu ft)

WEIGHTS AND LOADINGS:

Basic operating weight: ER, LR	11,770 kg (25,948 lb)
Baggage capacity	1,200 kg (2,646 lb)
Max fuel weight: ER	4,173 kg (9,200 lb)
LR	5,187 kg (11,435 lb)



Flight deck of Embraer Legacy and ERJ-135

0131839



Pan Européenne's Embraer ERJ-135

NEW/0532063



Max T-O weight: ER	20,100 kg (44,312 lb)
LR	21,100 kg (46,517 lb)
Max landing weight: ER, LR	18,700 kg (41,226 lb)
Max ramp weight: ER	20,200 kg (44,533 lb)
LR	21,200 kg (46,738 lb)
Max zero-fuel weight: ER, LR	17,100 kg (37,699 lb)
Max wing loading: ER	392.7 kg/m² (80.44 lb/sq ft)
LR	412.3 kg/m² (84.44 lb/sq ft)
Max power loading: ER	298 kg/kN (2.92 lb/lb st)
LR	313 kg/kN (3.07 lb/lb st)

PERFORMANCE:	
Max cruising speed: ER, LR	Mach 0.78 (450 kt; 833 km/h; 518 mph)
T-O field length: ER	1,720 m (5,643 ft)
LR	1,320 m (4,331 ft)
Time to climb to 10,670 m (35,000 ft): ER, LR	22 min
Service ceiling: ER, LR	11,278 m (37,000 ft)
Range with 44 passengers at long-range cruising speed	100 n mile (185 km; 115 mile) alternate and 45 min reserves:
ER	1,230 n miles (2,278 km; 1,415 miles)
LR	1,630 n miles (3,018 km; 1,875 miles)

UPDATED

EMBRAER EMB-135BJ LEGACY

TYPE: Business jet.

PROGRAMME: Announced on eve of Farnborough International Air Show 23 July 2000; first flight of prototype (PP-XJO), converted from second ERJ-135 prototype (PT-ZJC), 31 March 2001; Brazilian CTA certification achieved 10 December 2001, followed by JAA certification on 9 July and FAA approval on 23 August 2002. Early aircraft limited to MTOW of 22,200 kg (48,942 lb).

CURRENT VERSIONS: Offered in **Executive, Corporate Shuttle and Regional** variants.

CUSTOMERS: Total of 67 firm orders and 35 options by 31 December 2002 from customers in Europe, Africa, Middle East, Latin America and North America. See table. Launch customer Swift Aviation of Phoenix, Arizona, ordered 25, with 25 options in July 2000; other announced customers include an unnamed major energy company based in Houston, Texas, which ordered one in corporate shuttle

configuration in April 2001, the Greek Air Force, which ordered one in Executive configuration for delivery in December 2001, and Skeikh Fahad Al Athel of Saudi Arabia, who took delivery of one on 16 December 2002. Chicago-based Indigo ordered 25 Corporate Shuttle versions and placed options on 50 more in December 2001, market estimated at 240 aircraft over a ten-year period.

EMBRAER LEGACY ORDERS (at 1 January 2003*)				
	Orders	Options	Delivered	Backlog
Executive	41	35	7	34
Shuttle	25	50	1	24
Defence	1	1	1	0
Totals	67	86	9	58

\*No information supplied for 1 January 2004

COSTS: Executive US\$20.275 million, outfitted; Shuttle US\$16.1 million, outfitted; direct operating cost, Executive US\$1,243 per hour; Shuttle US\$1,162 per hour (2002).

Description for ERJ-135 applies also to the Legacy, except the following.

DESIGN FEATURES: Compared with ERJ-135 has belly and aft fuel tanks in extended underwing fairing, plus winglets.

STRUCTURE: Airframe manufactured as ERJ-135 and modified to Legacy configuration; Embraer performs interior completion, using components supplied by Nordam.

POWER PLANT: Initially two 37.1 kN (8,338 lb st) Rolls-Royce AE 3007A1P turbofans; from c/n 145625, two AE 3007A1Es, each 40.0 kN (8,995 lb st). Fuel initially 10,152 litres (2,682 US gallons; 2,233 Imp gallons). Increased from c/n 145625 to 10,266 litre (2,712 US gallons; 2,258 Imp gallons) in two wing- and two forward fuselage tanks, usable capacity 10,160 litres (2,684 US gallons; 2,235 Imp gallons).

ACCOMMODATION: Typical accommodation for 10 passengers in Executive configuration, or 31 in three-abreast arrangement at 91 cm (36 in) seat pitch in Corporate Shuttle layout. Baggage compartment at rear of cabin.



Embraer Legacy twin-turboprop business jet

NEW/0532065



Legacy Executive interior

0137437

SYSTEMS: Hamilton Sundstrand T-62T-40C14 APU.	
AVIONICS: Honeywell Primus 1000 as core system.	
DIMENSIONS, INTERNAL (A: Executive, B: Corporate Shuttle):	
Cabin volume: B	40 m³ (1,413 cu ft)
Baggage compartment volume: A	6.80 m³ (240 cu ft)
B	9.20 m³ (325 cu ft)
WEIGHTS AND LOADINGS (A, B as above):	
Basic operating weight: A	13,250 kg (29,211 lb)
B	12,250 kg (27,007 lb)
Baggage capacity	454 kg (1,001 lb)
Max payload: A	2,750 kg (6,063 lb)
B	3,750 kg (8,267 lb)
Max fuel weight: A	8,140 kg (17,946 lb)
B	5,135 kg (11,321 lb)
Payload with max fuel: A	1,110 kg (2,447 lb)
B	2,615 kg (5,765 lb)
Max T-O weight: A	22,500 kg (49,604 lb)
B	20,000 kg (44,092 lb)
Max landing weight: A, B	18,500 kg (40,785 lb)
Max ramp weight: A	22,570 kg (49,758 lb)
B	20,100 kg (44,313 lb)
Max zero-fuel weight: A, B	16,000 kg (35,274 lb)
Max wing loading: A	439.6 kg/m² (90.04 lb/sq ft)
B	390.8 kg/m² (88.04 lb/sq ft)
Max power loading: A	281 kg/kN (2.76 lb/lb st)
B	250 kg/kN (2.45 lb/lb st)
PERFORMANCE (estimated):	
Cruising speed at FL390	A, B Mach 0.78 (447 kt; 828 km/h; 514 mph)
Max certified altitude	11,885 m (39,000 ft)
T-O field length: A	1,924 m (6,312 ft)
B	1,708 m (5,604 ft)
Landing field length: A, B	1,360 m (4,462 ft)
Range with NBAA IFR reserves:	
A with 771 kg (1,700 lb) payload	3,200 n miles (5,926 km; 3,682 miles)
B with 1,996 kg (4,400 lb) payload	1,800 n miles (3,333 km; 2,071 miles)

UPDATED

EMBRAER 170 and 190

TYPE: Regional jet airliner.

PROGRAMME: Announced (officially 'pre-launch') in February 1999; designations then ERJ-170 and ERJ-190; engine selection May 1999; first orders announced 14 June 1999; risk-sharing partners (see 'Structure', below) revealed at European Regional Airline Association annual meeting in Paris, 30 September 1999. Joint definition phase leading to ERJ-170 design freeze, completed in April 2000; first metal cut for first of six pre-series ERJ-170s 14 July 2000; ERJ-170 (c/n 0001/PP-XJE) first rolled out 29 October 2001, first flight 19 February 2002; followed by c/n 0002/PP-XJC (to be HB-JCA) in Crossair (to become Swiss) colours on 9 April 2002, by which time the first aircraft had completed 40 hours of test flying; c/n 0003/PP-XJB (first equipped with full Honeywell Primus Epic avionics suite) on 25 May 2002; c/n 0004/PP-XJF on 19 June 2002; c/n 0005/PP-XJA on 14 July 2002; and c/n 0006/PP-XJS on 27 July 2002. Announced at roll-out that ERJ prefix was discontinued and that ERJ-190-200 to be known as Embraer 195; intermediate Embraer 175 simultaneously revealed.

Public debut (PP-XJE) at Regional Airline Association convention at Nashville, Tennessee 12 to 15 May 2002, followed by European debut (PP-XJA) at Farnborough International Air Show 22 July 2002, followed by European demonstration tour comprising 18 flights totalling more than 100 hours.

Six flying aircraft scheduled to conduct 1,800 hour flight test programme, culminating in CTA/JAA certification in November 2003. Further two static test airframes (801 and 802) will conduct fatigue test programme with aim of completing 5,000 simulated flights to clear aircraft for 2,500 actual flight hours by time of certification, and eventual demonstration of 80,000-cycle economic service life. Total of 23 scheduled for delivery during 2003; initial production rate up to two per month in 2003, rising to four per month in 2004, with maximum capacity of six per month. Certification and first delivery of Embraer 175 scheduled for third quarter of 2004. First flight of first of two pre-series Embraer 195s scheduled for third quarter of 2003, followed by certification and first delivery (to Swiss, formerly Crossair) in fourth quarter of 2004. First of two pre-series Embraer 190s will fly in 2004, with certification and deliveries in fourth quarter of 2005.

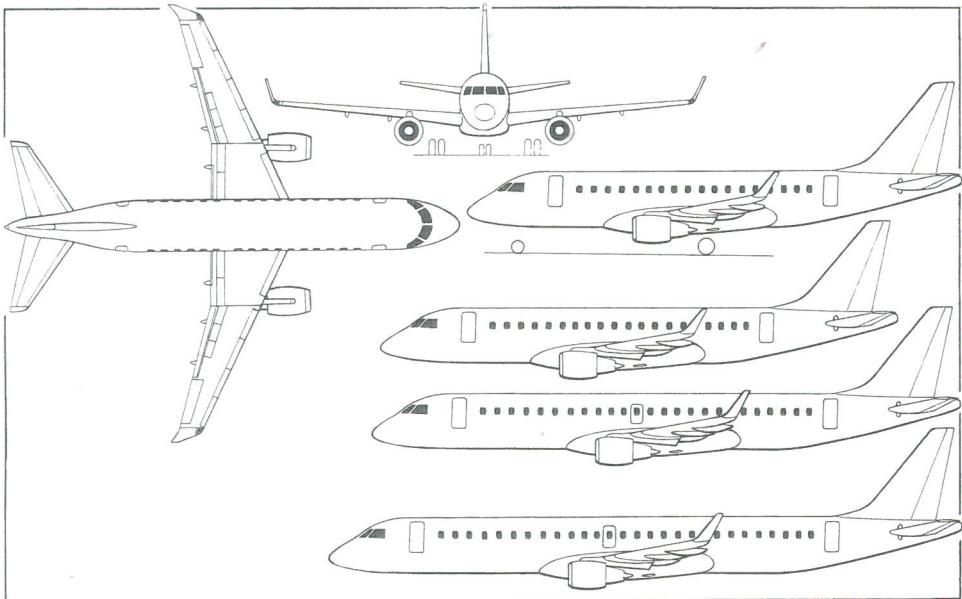
CURRENT VERSIONS: **Embraer 170:** Baseline version with 70 seats; available in Standard and Long-Range versions.

**Embraer 175:** Longer version with 1.77 m (5 ft 9 1/2 in) fuselage stretch by means of two plugs to accommodate 78 to 86 passengers; offered in Standard and Long-Range versions. First flight (c/n 0014-PP-XJD) 14 June 2003.

**Embraer 190:** Further stretch by 6.25 m (20 ft 6 in) to accommodate up to 104 passengers; wing span increased by 2.56 m (8 ft 4 3/4 in); GE CF34-8E-10 engines; strengthened landing gear; available in Standard and Long-Range versions. Launch customer jetBlue ordered 100, plus 100 options, on 10 June 2003. First delivery third quarter 2005.

**Embraer 195:** Formerly ERJ-190-200. Further stretch of Embraer 190-200 by 2.41 m (7 ft 11 in) to accommodate up to 110 passengers; available in Standard and Long-





Embraer 170 regional jet, with additional side views of Embraer 175, Embraer 190 and Embraer 195 (bottom) (James Goulding)

NEW/0526909

Range versions; first metal cut 23 August 2002; first delivery December 2004.

**Corporate:** Formerly ECJ-170. Proposed variant of Embraer 170 Long-Range with additional fuel tanks in baggage compartment area to extend range to more than 4,000 n miles (7,408 km; 4,603 miles). Launch decision expected following certification of Embraer 170.

**CUSTOMERS:** See table. Launch customers Crossair and Regional Airlines of France announced at Paris Air Show 14 June 1999; Crossair (now Swiss) ordered 30 Embraer 170s and 30 Embraer 195s, with options on a further 100 Embraer 170/195s, for intended delivery (Embraer 170) from December 2002, but subsequently reduced on 25 March 2003 to 15 of each model, with first delivery (Embraer 170) in August 2004, followed by first Embraer 195 in 2006. North American launch customer US Airways ordered 85 Embraer 170s, plus 50 options, on 12 May 2003, for delivery commencing November 2003.

EMBRAER 170/190 ORDERS  
(at 1 January 2004)

Customer	Type	Orders
Air Caraibes	170	2
Alitalia	170	6
Cirrus	170	1
GECAS	170	5
jetBlue	190	100
LOT Polish	170	6
US Airways	170	85
Swiss	170	15
	195	15
Undisclosed	190	10
Total		245

Note: Further 305 options held.

**COSTS:** Embraer 170 US\$21 million; Embraer 190, US\$24 million (both 1999). US Airways order for 85 Embraer 170s valued at US\$2.1 billion; jetBlue order for 100 Embraer 190s valued at US\$3 billion (both 2003). Development US\$850 million for whole family (2001).

**DESIGN FEATURES:** Design goals include low weight, simplicity of operation, common crew type rating, high reliability, ease and economy of maintenance and ability to operate from same airports as ERJ-135/145. Low-wing airliner of conventional appearance, with podded engine below each wing and (on Embraer 170) winglets; airframe designed for an economic life of 60,000 to 80,000 cycles.

**FLYING CONTROLS:** Fly-by-wire. Ailerons, rudder and all-moving tailplane. Double-slotted flaps, five-section leading-edge slats and five-section spoilers on each wing.

Ventral airbrake under development in late 2002 to meet steep glideslope requirements for airports such as London City and Lugano.

**STRUCTURE:** Embraer is responsible for radome, forward fuselage, centre fuselage II, wing-to-fuselage fairing and final assembly; risk-sharing partners are C & D Interiors (cabin interior); Gamesa (rear fuselage and horizontal and vertical tail surfaces); General Electric (power plant and nacelles); Hamilton Sundstrand (tailcone, APU and air management and electrical systems); Honeywell (avionics); Kawasaki (wing stub, fixed leading- and trailing-edge assemblies, flaps, spoilers, control surfaces and engine pylons); Latécoère (centre fuselage I and III); Liebherr (landing gear); Parker Hannifin (hydraulic, flight control and fuel systems); and Sonaca (wing slats).

(32 in) seat pitch. Optional first class cabin on Embraer 170 and Embraer 190 with three-abreast seating.

**AVIONICS:** Honeywell Primus Epic five-tube EFIS. Thales Avionics integrated electronic standby instrument (IESI) system standard.

**DIMENSIONS, EXTERNAL** (all versions, except where stated):

Wing span over winglets: 170	26.00 m (85 ft 3½ in)
190, 195	28.72 m (94 ft 2¾ in)
Length overall: 170	29.90 m (98 ft 1¼ in)
175	31.68 m (103 ft 11¼ in)
190	36.24 m (118 ft 10¼ in)
195	38.65 m (126 ft 9¼ in)
Height overall: 170	9.67 m (31 ft 8¾ in)
175	9.73 m (31 ft 11 in)
190, 195	10.28 m (33 ft 8¼ in)
Fuselage height: all	3.35 m (11 ft 0 in)
Fuselage width: all	3.01 m (9 ft 10¼ in)
Tailplane span: all	10.00 m (32 ft 9¼ in)

**DIMENSIONS, INTERNAL:**

Cabin (excl flight deck):	
Length: 170	19.38 m (63 ft 7 in)
175	21.16 m (69 ft 5 in)
190	25.70 m (84 ft 3¾ in)
195	28.13 m (92 ft 3½ in)
Max width: all	2.74 m (8 ft 11¼ in)
Max height: all	2.00 m (6 ft 6¼ in)
Aisle width: 170	0.46 m (1 ft 6 in)
175, 190, 195	0.50 m (1 ft 7¼ in)

**WEIGHTS AND LOADINGS:**

Basic operating weight:	
170	20,700 kg (45,637 lb)
175	21,150 kg (46,627 lb)
190	26,200 kg (57,761 lb)
195	27,100 kg (59,745 lb)
Max payload: 170	8,900 kg (19,621 lb)
175	10,550 kg (23,259 lb)
190	12,400 kg (27,337 lb)
195	12,700 kg (27,999 lb)
Max fuel: 170	9,470 kg (20,878 lb)
190, 195	13,000 kg (28,660 lb)

**LANDING GEAR:** Retractable tricycle type. Twin wheels on each unit; tyre size H38 × 13.0-18. Aircraft Braking Systems Corporation carbon brakes.

**POWER PLANT:** Embraer 170/175 series has two 62.28 kN (14,000 lb st) General Electric CF34-8E turbofans; 190/195 series has two 82.29 kN (18,500 lb st) CF34-10E turbofans; both engines have FADEC.

**ACCOMMODATION:** Total of 70 to 76 (Embraer 170), 78 to 86 (Embraer 175), 96 to 104 (Embraer 190) or 108 to 110 (Embraer 195) passengers, four abreast at 81 cm



Embraer 175 prototype during its maiden flight on 14 June 2003

NEW/0552827



Artist's impression of Embraer 195, longest of the family

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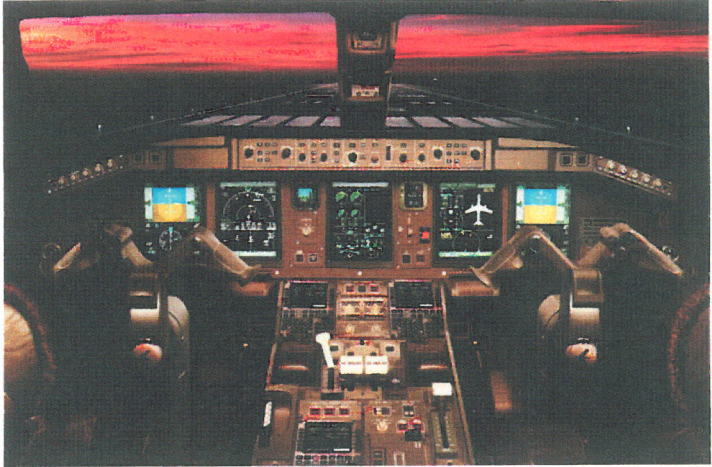
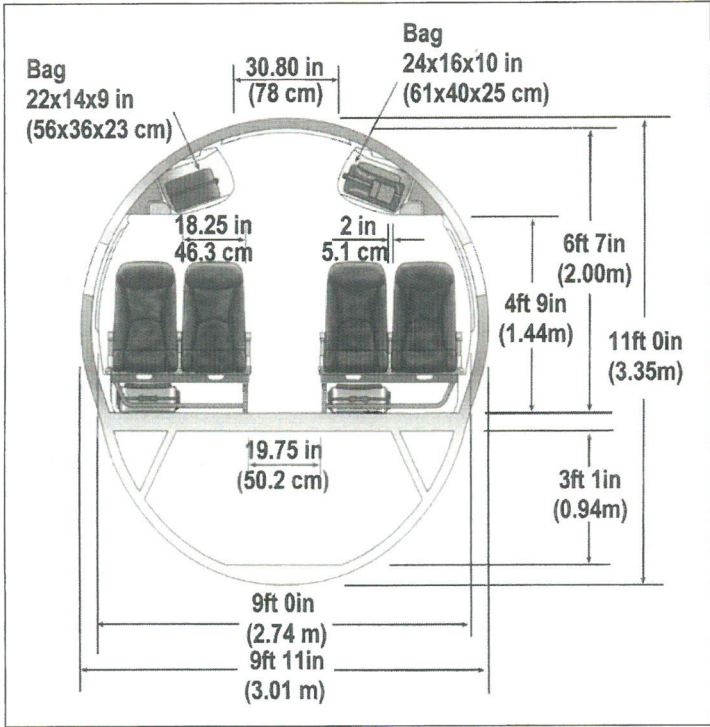


Embraer 170 prototype

NEW/0531967



Max T-O weight:		190 Long-Range	295 kg/kN (2.89 lb/lb st)	175	1,305 m (4,285 ft)
170 Standard	35,990 kg (79,344 lb)	195 Standard	285 kg/kN (2.80 lb/lb st)	190	1,318 m (4,325 ft)
170 Long-Range	37,200 kg (82,011 lb)	195 Long-Range	298 kg/kN (2.92 lb/lb st)	195	1,366 m (4,485 ft)
175 Standard	35,990 kg (79,344 lb)			Range with max passengers at long-range cruising speed:	
175 Long-Range	37,500 kg (82,673 lb)	PERFORMANCE (estimated):		170 Long-Range	2,100 n miles (3,889 km; 2,416 miles)
190 Standard	45,990 kg (101,390 lb)	Max cruising speed	M0.80 (470 kt; 870 km/h; 541 mph)	175 Standard	1,298 n miles (2,405 km; 1,494 miles)
190 Long-Range	48,500 kg (106,924 lb)	Max speed below FL100		175 Long-Range	1,598 n miles (2,960 km; 1,839 miles)
195 Standard	46,990 kg (103,595 lb)	170	300 kt (556 km/h; 345 mph)	190 Long-Range	2,300 n miles (4,259 km; 2,646 miles)
190 Long-Range	48,990 kg (108,004 lb)	Time to climb to FL300:	170	195 Standard	1,400 n miles (2,592 km; 1,611 miles)
Max landing weight:		175	18 min	195 Long-Range	1,800 n miles (3,333 km; 2,071 miles)
175	32,800 kg (72,312 lb)	190	19 min		
190	33,350 kg (73,524 lb)	T-O field length:	170		
195	42,500 kg (93,696 lb)	175	1,689 m (5,541 ft)		
Max power loading:		190	1,995 m (6,545 ft)		
170 Standard	289 kg/kN (2.83 lb/lb st)	195	1,986 m (6,515 ft)		
170 Long-Range	299 kg/kN (2.93 lb/lb st)	Landing field length at S/L, ISA, at typical landing			
190 Standard	279 kg/kN (2.74 lb/lb st)	weight:			
		170	1,160 m (3,806 ft)		



Common flight deck of Embraer 170/190

0131838

Embraer 170/190 fuselage cross-section

0137414

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COMMERCIAL AND CUSTOMER SUPPORT DIRECTOR:  
Vincent Kieffer  
MARKETING MANAGER: Luis Henrique Testa

Formed 1978; owned jointly by Grupo Bueninvest (30 per cent), MGI Participações (25 per cent) and Eurocopter France (45 per cent). First assembly hall inaugurated 28 March 1980; facility occupies 12,000 m<sup>2</sup> (129,200 sq ft); new facilities, totalling 3,800 m<sup>2</sup> (40,900 sq ft) opened at São Paulo in second quarter of 1998 for maintenance, spares, training, sales and marketing. Total of 310 personnel employed in 2002.

Assembly, marketing and overhaul, under Eurocopter licence, of single- and twin-engined Ecureuil/Fennec helicopters and twin-engined Dauphin/Panther; markets in Brazil and overhauls civil Eurocopter AS 350/355 Esquilo (Fennec), EC 130, EC 135, AS 332 Super Puma; Eurocopter/Kawasaki BK 117C-1 (EC 145); and Eurocopter/CATIC/ST Aero EC 120 (see International section).



Helibras-supplied AS 350 Esquilo operating in Chile

NEW/0531968

Total of more than 440 helicopters, including some 310 Esquilos, sold by January 2002, representing 50 per cent of the turbine-powered helicopter fleet in Brazil; to more than 90 customers, including 206 to Brazilian police forces, Army, Navy and Air Force; nearly 10 per cent of overall total

exported to Argentina, Bolivia, Chile, Paraguay and Venezuela. Supply of new EC 120B Colibri to local owners began in 1999. Details of local Esquilo versions last appeared in 2000-01 *Jane's*.

UPDATED

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DESIGNER: Joseph Kovács  
MARKETING: André Kovács

Having produced a prototype of the K-51 Peregrino two-seat aerobatic sportplane, Mr Kovacs is now working on design of

the K-55 aerobatic competition monoplane and K-32 STOL, ultralight two-seater, which will incorporate variable geometry. Further details have not been released.

UPDATED