

## AIRTECH

## AIRCRAFT TECHNOLOGY INDUSTRIES

## PARTICIPATING COMPANIES:

EADS CASA: (Spain)  
Dirgantara: (Indonesia)

Airtech was formed by CASA (now part of EADS) and IPTN (now known as Dirgantara) to develop the CN-235 twin-turboprop transport; design and production was shared equally. The partnership applied only to the Series 10 and Series 100/110, with later versions being developed independently by CASA, according to a statement by that company.

## UPDATED

## AIRTECH CN-235

## Spanish Air Force designations: T.19A and T.19B

TYPE: Twin-turboprop transport.

PROGRAMME: Launched as joint venture between CASA and Indonesian manufacturer IPTN (now Dirgantara, which see), which formed Airtech company to manage programme. Series 10 and Series 100/110 versions covered by this agreement; subsequent versions, notwithstanding Indonesian Series 220 and 330 equivalents, stated by CASA to be wholly Spanish.

Preliminary design began January 1980, prototype construction May 1981; one prototype completed in each country, with simultaneous roll-outs 10 September 1983; first flights 11 November 1983 (by CASA's ECT-100) and 30 December 1983 (IPTN's PK-XNC); Spanish and Indonesian certification 20 June 1986; first flight of production aircraft 19 August 1986; FAA type approval (FAR Pts 25 and 121) 3 December 1986; deliveries began 15 December 1986 from IPTN line and 4 February 1987 from CASA; entered service (with Merpati Nusantara Airlines) 1 March 1988; JAR 25 type approval October 1993.

Licence agreement with TAI (see Turkish section) announced January 1990, initially to assemble and later to manufacture locally 50 of 52 ordered; first flight of Turkish-assembled aircraft 24 September 1992; first delivery 13 November 1992; final air force delivery 10 August 1998, but TAI subsequently produced follow-on batch of nine maritime patrol variants and may build further 10 for maritime missions.

In 1995, CASA unilaterally launched development of a stretched CN-235, as C-295; this is described under CASA heading in Spanish section.

CURRENT VERSIONS: **CN-235 Series 10:** Initial production version (15 built by each company), with CT7-7A engines.

**CN-235 Series 100/110:** Generally as Series 10, but CT7-9C engines in new composites nacelles; replaced Series 10 in 1988 from 31st production aircraft. Series 100 is Spanish-built and, following JAA certification, was certified by FAA in February 1992. Series 110 is Indonesian-built, with improved electrical, warning and environmental systems to comply with JAR 25; certification of this version achieved in Europe (JAA), July 1995.

Detailed description applies to the above version except where indicated.

**CN-235 Series 200/220:** Structural reinforcements to cater for higher operating weights, aerodynamic improvements to wing leading-edges and rudder, reduced field length requirements and much-increased range with maximum payload; Series 200 is Spanish-built and was certified by FAA March 1992. Series 220 is Indonesian-built, with improvements similar to Srs 110; prototype, flown early 1996, is converted from a company development aircraft (PK-XNV, the 20th production aircraft from the Indonesian line); orders include six for Malaysian Air Force, all of which completed to Srs 220 standard (including three in maritime patrol configuration) by early 1998 (34th to 39th Indonesian-built). Revised leading-edge shape led to requirement to requalify pneumatic de-icer boots, delaying initial deliveries. Further orders for Series 220 from South Korea (eight, including one for VIP use and one for VVIP use) and Pakistan (four).

**CN-235 Series 300/330:** IPTN originally offered Series 330 **Phoenix** (with new Honeywell avionics, ARL-2002 EW system and 16,800 kg; 37,037 lb MTOW) to Royal Australian Air Force to meet Project Air 5190 tactical airlift requirement, but was forced by financial constraints to withdraw in 1998. Separately, CASA offered its own Series 300 to meet the same specification.

CN-235 Series 300 under certification in 2000 with an open-systems avionics architecture, based on MIL-STD-1553B and ARINC 429 digital databuses. Full NVG-compatible cockpit; four-dimensional navigation system with avionics suite, including Thales (Sextant) Topdeck colour weather radar, radios, solid-state flight data and cockpit voice recorders, enhanced TCAS, enhanced GPWS and four 152 × 203 mm (6 × 8 in) LCDs; twin HUDs and Totem 3000 ring laser gyro INS optional. Other features include in-flight refuelling capability, improved pressurisation (2,440 m; 8,000 ft cabin environment at 7,620 m; 25,000 ft) and provision for optional twin nosewheel installation to provide better soft-field taxiing capability.

CN-235 PRODUCTION  
(at mid-2003)

Customer	Qty	First order	First aircraft	First delivery	Delivered	Mfr
<b>Civil version:</b>						
Austral (Argentina)	2 <sup>15</sup>	19 Dec 1989	LV-VHM	1993	2	CASA
Binter Canarias (Spain)	4 <sup>1, 16</sup>	10 Jun 1988	EC-EMO	22 Dec 1988	4	CASA
Binter Mediterraneo (Spain)	4 <sup>2</sup>	19 Dec 1989	EC-FAD	4 Sep 1990	4	CASA
Mandala Airlines (Indonesia)	3	-	-	-	0	Dirgantara
Merpati Nusantara (Indonesia)	15 <sup>1</sup>	-	PK-MNA	15 Dec 1986	15	Dirgantara
<b>Military version:</b>						
Abu Dhabi Air Force	7	-	810	31 Aug 1993	7	Dirgantara
Botswana Defence Force	2 <sup>1</sup>	10 Jun 1986	OG-1	21 Dec 1987	2	CASA
Brunei Air Wing	3 <sup>3</sup>	-	-	-	0	Dirgantara
-	1	-	ATU-501	1997	1	Dirgantara
Chilean Army	4	12 Feb 1989	E-216	31 Aug 1989	4	CASA
Colombian Air Force	3 <sup>2</sup>	Jul 1997	1260	28 Jan 1998	3	CASA
Colombian Navy	2	Dec 2002	ARC 801	2003	2	CASA
Devon Holding & Leasing Inc	1	-	N168D	March 2002	1	CASA
Ecuadorean Army	1	6 Jun 1989	AEE-502	6 Jun 1989	1	CASA
Ecuadorean Navy	1	27 Jul 1988	ANE-204	13 Jun 1989	1	CASA
French Air Force	15 <sup>8</sup>	11 Apr 1990	043	28 Feb 1991	15	CASA
-	5 <sup>2</sup>	2002	152	2002	5	CASA
Gabon Air Forces	1	26 Feb 1990	TR-KJE	19 Mar 1991	1	CASA
Indonesian armed forces	24 <sup>11</sup>	-	A-2301	12 Jan 1993	7	Dirgantara
Irish Air Corps	1 <sup>13</sup>	3 Apr 1991	250	10 Apr 1991	1	CASA
-	2 <sup>3</sup>	3 Apr 1991	252	8 Dec 1994	2	CASA
Malaysian Air Force	8 <sup>7, 9</sup>	-	M44-01	26 Aug 1999	6	Dirgantara
Moroccan Air Force	7 <sup>10</sup>	19 Sep 1989	CNA-MA	27 Sep 1990	7	CASA
Oman Police	2	15 Feb 1992	A40-CU	14 Jan 1993	2	CASA
Pakistan Air Force	4 <sup>9</sup>	29 Jun 01	-	2004	0	Dirgantara
Panama National Guard	1 <sup>1, 12</sup>	19 Mar 1987	SAN-265	13 Sep 1988	1	CASA
Papua New Guinea Defence Force	2	26 Oct 1991	P2-0501	15 Nov 1991	2	CASA
Saudi Air Force	4 <sup>1</sup>	5 Feb 1984	118	9 Feb 1987	4	CASA
South African Air Force (ex-Bophuthatswana)	1 <sup>1</sup>	29 May 1990	8026	6 Jan 1991	1	CASA
South Korean Air Force	12	19 Aug 1992	078	13 Nov 1993	12	CASA
-	8 <sup>9</sup>	21 Oct 1997	-	18 Dec 2001	8	Dirgantara
Spanish Air Force	2 <sup>4</sup>	16 Nov 1988	T.19-01	7 Dec 1988	2	CASA
-	18	28 Dec 1990	T.19-03	1 Feb 1991	18	CASA
-	4 <sup>3</sup>	-	-	-	0	CASA
Thai Ministry of Agriculture and Co-operatives	2 <sup>9</sup>	Oct 1996	2221	Apr 1999	2	Dirgantara
Thai Police	0 <sup>2, 14</sup>	Apr 1995	28053	4 Mar 1996	0	CASA
Turkish Air Force	52 <sup>6</sup>	11 Dec 1990	051	25 Jan 1992	52	TAI/CASA
Turkish Navy	6 <sup>3</sup>	23 Sep 1998	TCB-651	23 Dec 2001	6	TAI/CASA
Turkish Coast Guard	3 <sup>3</sup>	23 Sep 1998	TCSG-551	23 Dec 2001	3	TAI/CASA
US Coast Guard	2	May 2003	-	2006	-	CASA
<b>Subtotals</b>	<b>239</b>				<b>204</b>	
Demo/trials	3 <sup>5</sup>		EC-016		3	CASA
-	5		PK-XNC		5	Dirgantara
<b>Totals</b>	<b>247</b>				<b>212</b>	

<sup>1</sup> Series 10

<sup>2</sup> Series 200

<sup>3</sup> Maritime patrol

<sup>4</sup> VIP version

<sup>5</sup> Includes one -100QC; plus one -200QC sold in 1996 to East Texas Aircraft Services Corporation, then Turbo Flight Aviation, March 1998

<sup>6</sup> 50 built in Turkey by TAI

<sup>7</sup> Including two ordered 2002

<sup>8</sup> Including option on seven taken up in February 1996; first eight as Srs 100, but upgraded to Srs 200 from 1999

<sup>9</sup> Series 220

<sup>10</sup> Includes one VIP version

<sup>11</sup> Includes six maritime patrol of which three on firm order

<sup>12</sup> To Flight International (USA) 1995

<sup>13</sup> Withdrawn at end of lease, 1995

<sup>14</sup> Former demonstrator

<sup>15</sup> Converted from -100 to Series 200

<sup>16</sup> Withdrawn 1998; three to Luftmeister, South Africa; one to Turkish Army

**Note:** All are Series 100/110 unless indicated otherwise. Croatian order not counted by CASA, which reported 189 military orders by mid-2000 and implies reduction in Indonesian requirement.



CN-235 Srs 300 demonstrator, before its lease to Austria

0106524



Airtech CN-235 Srs 200 of the French Air Force (Paul Jackson)

NEW/0554433

**CN-235 AEW:** Proposals were revealed in December 1995 for fitment of an Ericsson Erieye electronically scanned phased-array radar above the fuselage of a CN-235. Initial interest was from the Indonesian Air Force, but primarily in the ocean surveillance role; retrofit of three existing aircraft was considered, but has not been undertaken. Radar, three surveillance operators' positions and associated equipment increase aircraft weight by approximately 2,000 kg (4,409 lb).

**CN-235ER:** Extended-range version (based on Series 300) originally selected by US Coast Guard in 2002 as fixed-wing element of Project Deepwater re-equipment programme, but subsequently shelved in favour of the basic CN-235 Series 300M. At time of announcement, in June 2002, it was revealed that total of 35 aircraft would be purchased. Firm order for initial batch of six aircraft anticipated in mid-2002, but still awaited in mid-2003, although FY03 budget included US\$147 million appropriation for first two aircraft to be delivered in 2006. Will feature EADS CASA Fully Integrated Tactical System (FITS).

**CN-235 M:** Other military transport versions.

**CN-235 MP Persuader and CN-235 MPA:** Maritime patrol versions; described separately.

**CN-235 QC:** Quick-change cargo/passenger version; certified by Spanish DGAC May 1992.

**CN-245:** Indonesian stretched version; not built.

**C-295:** Spanish stretched version; described separately under CASA heading.

**N2XXM:** Project abandoned.

**CUSTOMERS:** See table. One (s/n 66049) acquired (presumably second-hand) by USAF in 1998. Turkey signed a lease agreement on 16 April 1999 to allow a one-year renewable lease of two Turkish Air Force CN-235s to Jordan. Switzerland leased a Spanish Air Force CN-235 in 1999 to support peacekeeping operations in the former Yugoslavia. Three Merpati aircraft leased to Air Venezuela from May 1999; three leased to Asian Spirit Airlines, Philippines, from March 2000, including two on lease-purchase. Intention to buy a further two announced by Papua New Guinea in mid-1998. National Jet Systems of Australia interested in two coastal patrol variants; signed MoU for possible acquisition of two, plus five options, February 1998. One CN-235-300 (first of this subvariant in service) leased by Austrian Ministry of Defence for six months from April 2000. CN-235 is contender in Taiwanese requirement for 18 to 22 light transports, and for the US Army Airborne Common Sensor platform requirement. Winner of US Coast Guard Project Deepwater competition, with total of 35 aircraft to be acquired.

**COSTS:** US\$17.1 million (2002) programme unit cost, Malaysia.

**DESIGN FEATURES:** Optimised for short-haul operations, enabling it to fly four 860 n mile (1,593 km; 990 mile) stage lengths (with reserves) before refuelling and to operate from paved runways or unprepared strips; high-mounted wing; pressurised fuselage (including baggage compartment) of flattened circular cross-section, with upswept rear end incorporating cargo ramp/door; sweptback fin (with dorsal fin) and rudder; low-set non-swept fixed incidence tailplane and elevators; two small ventral fins; vortex generators on rudder and elevator leading-edges; optional extended nose radome.

NACA 65-218 aerofoil with no-dihedral/constant chord centre-section; tapered outer panels have 3° dihedral and 3° 51' 36" sweepback at quarter-chord.

**FLYING CONTROLS:** Conventional and manual. Ailerons, elevators and rudder statically and dynamically balanced (duplicated actuation for ailerons); mechanical servo tab and electric trim tab in each aileron, rudder and starboard elevator, trim tab only in port elevator; single-slotted inboard and outboard trailing-edge flaps (each pair interchangeable port/starboard), actuated hydraulically by Dowty irreversible jacks.

**STRUCTURE:** Conventional semi-monocoque, mainly of aluminium alloys with chemically milled skins; composites (mainly glass fibre or glass fibre/Nomex honeycomb sandwich, with some carbon fibre and Kevlar)

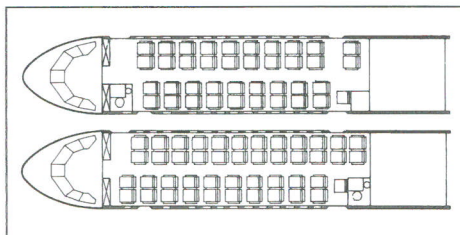
for leading/trailing-edges of wing/tail moving surfaces, wing/fuselage and main landing gear fairings, wing/fin/tailplane tips, engine nacelles, ventral fins and nose radome. Propeller blades are of glass fibre, with metal spar and urethane foam core.

CASA builds wing centre-section, inboard flaps, forward and centre fuselage, engine nacelles; Dirgantara builds outer wings, outboard flaps, ailerons, rear fuselage and tail unit; both manufacturers use numerical control machinery extensively. Final assembly line in each country. Part of tail unit built by ENAER Chile under subcontract from CASA. TAI (Turkey) initially assembled under licence before progressing gradually to local manufacture of balance of 50 aircraft for Turkish Air Force.

**LANDING GEAR:** Messier-Bugatti retractable tricycle type with levered suspension, suitable for operation from semi-prepared runways. Electrically controlled hydraulic extension/retraction, with mechanical back-up for emergency extension. Oleo-pneumatic shock-absorber in each unit. Each main unit comprises two wheels in tandem, retracting rearward into fairing on side of fuselage. Mainwheels semi-exposed when retracted. Single steerable nosewheel (±48°) retracts forward into unpressurised bay under flight deck. Dunlop 28x9.00-12 (12 ply) tubeless mainwheel tyres standard, pressure 5.17 bar (75 lb/sq in) on civil version, 5.58 bar (81 lb/sq in) on military version; low-pressure mainwheel tyres optional, size 11.00-12 (10 ply), pressure 3.45 bar (50 lb/sq in). Dunlop 24x7.7 (10/12 ply) tubeless nosewheel tyre, pressure 5.65 bar (82 lb/sq in) on civil version, 6.07 bar (88 lb/sq in) on military version; optional 8.50x10 (12 ply). Dunlop hydraulic differential disc brakes; Dunlop anti-skid units on main gear. Chilean Army aircraft used in Antarctic have wheel/ski gear. Minimum ground turning radius 9.50 m (31 ft 2 in) about nosewheel, 18.98 m (62 ft 3/4 in) about wingtip.

**POWER PLANT:** Two General Electric CT7-9C turboprops (CT7-9C3 in Srs 300), each flat rated at 1,305 kW (1,750 shp) (S/L, to 41°C) for take-off and 1,394.5 kW (1,870 shp) up to 31°C with automatic power reserve. Hamilton Sundstrand 14RF-21 (14RF-37 in Srs 300) four-blade constant-speed propellers, with full feathering and reverse-pitch capability. Fuel in two 1,042 litre (275 US gallon; 229 Imp gallon) integral main tanks in wing centre-section and two 1,592 litre (421 US gallon; 350 Imp gallon) integral outer-wing auxiliary tanks; total fuel capacity 5,264 litres (1,391 US gallons; 1,158 Imp gallons), of which 5,128 litres (1,355 US gallons; 1,128 Imp gallons) are usable. Single pressure refuelling point in starboard main landing gear fairing; gravity filling point in top of each tank. Propeller braking permits No. 2 engine to be used as on-ground APU. Oil capacity 14 litres (3.7 US gallons; 3.1 Imp gallons).

**ACCOMMODATION:** Crew of two on flight deck, plus cabin attendant (civil version) or third crew member (military version). Accommodation in commuter version for up to 44 passengers in four-abreast seating, at 76 cm (30 in) pitch, with 22 seats each side of central aisle. Lavatory, galley and overhead luggage bins standard. Pressurised baggage compartment at rear of cabin, aft of movable bulkhead; additional stowage in rear ramp area and in overhead lockers. Can also be equipped as mixed passenger/cargo combi (for example, 19 passengers and



CN-235 in typical configurations for 38 (top) and 44 passengers

two LD3 containers), or for all-cargo operation, with roller loading system, carrying four standard LD3 containers, five LD2s, or two 2.24 x 3.18 m (88 x 125 in) and one 2.24 x 2.03 m (88 x 80 in) pallets; or for military duties, carrying up to 57 fully equipped troops or 46 paratroops (51 troops or paratroops on Srs 300). Other options include layouts for aeromedical airlift (18 stretchers and two medical attendants on Srs 300), electronic warfare, geophysical survey or aerial photographic duties.

Main passenger door, outward- and forward-opening with integral stairs, aft of wing on port side, serving also as a Type I emergency exit. Type III emergency exit facing this door on starboard side. Crew/service downward-opening door (forward, starboard) has built-in stairs, and serves also as a Type I emergency exit, or as passenger door in combi version; second Type III exit opposite this door on port side. Wide ventral door/cargo ramp in underside of upswept rear fuselage, for loading of bulky cargo. Accommodation fully air conditioned and pressurised.

**SYSTEMS:** Hamilton Sundstrand air conditioning system, using engine compressor bleed air. Honeywell electropneumatic pressurisation system (maximum differential 0.25 bar; 3.6 lb/sq in) giving cabin environment of 2,440 m (8,000 ft) up to operating altitude of 5,480 m (18,000 ft) on Srs 200; Srs 300 cabin pressurisation increased to 0.38 bar (5.5 lb/sq in), giving cabin environment of 2,350 m (7,700 ft) at altitude of 7,620 m (25,000 ft). Hydraulic system, operating at nominal pressure of 207 bar (3,000 lb/sq in), comprises two engine-driven, variable displacement axial electric pumps, a self-pressurising standby mechanical pump, and a modular unit incorporating connectors, filters and valves; system is employed for actuation of wing flaps, landing gear extension/retraction, wheel brakes, emergency and parking brakes, nosewheel steering, cargo ramp and door, and propeller braking. Accumulator for back-up braking system.

28 V DC primary electrical system powered by two 400 A Auxilec engine-driven starter/generators, with two 24 V 37 Ah Ni/Cd batteries for engine starting and 30 minutes' (minimum) emergency power for essential services. Constant frequency single-phase AC power (115/26 V) provided at 400 Hz by three 600 VA static inverters (two for normal operation plus one standby); two three-phase engine-driven alternators for 115/200 V variable frequency AC power. Fixed oxygen installation for crew of three (single cylinder at 124 bar; 1,800 lb/sq in pressure); three portable units and individual masks for passengers.

Pneumatic boot anti-icing of wing (outboard of engine nacelles), fin and tailplane leading-edges. Electric anti-icing of propellers, engine air intakes, flight deck windscreen, pitot tubes and angle of attack indicators. No APU; starboard engine, with propeller braking, can be used to fulfil this function. Engine fire detection and extinguishing system.

**AVIONICS (civil):** Comms: Two Rockwell Collins VHF-22B com radios, one Avtech DADS crew interphone, Rockwell Collins TDR-90 ATC transponder. Fairchild A-100A cockpit voice recorder, Avtech PACIS PA system. Dorne & Margolin ELT 8-1 emergency transmitter. Optional second TDR-90; optional HF-230 radio.

**Radar:** Rockwell Collins WXR-300 weather radar.

**Flight:** Two VIR-32 VOR/ILS/marker beacon receivers; DME-42; ADF-60A; two 332D-11T vertical gyros; two MCS-65 directional gyros; two ADI-85A; two HSI-85; two RMI-36; APS-65 autopilot/flight director; ALT-55B radio altimeter; two 345A-7 rate of turn sensors (all by Rockwell Collins); SFENA H-301 APM standby attitude director indicator; Hamilton Sundstrand Mk II GPWS; and Fairchild/Teledyne flight data recorder. Options include second DME-42 and ADF-60A, Rockwell Collins RNS-325 radar nav, Litton LTN-72R inertial nav or Global GNS-500A Omega navigation system.

**Instrumentation:** Rockwell Collins EFIS-85B five-tube CRT system standard.

**AVIONICS (military)** (Indonesian aircraft): Comms: Rockwell Collins AN/ARC-182 VHF/UHF; Rockwell Collins HF 9000 HF; IFF.

**Flight:** Rockwell Collins VIR-32 VHF nav; Litton LTN92 GPS-aided INS; Rockwell Collins DF-206A ADF; Rockwell Collins AN/APS-65F autopilot; GPWS.

**Instrumentation:** Rockwell Collins EFIS-85B(14) EFIS (four or five screens). IPTN developing cockpit lighting system compatible with night vision goggles.

**AVIONICS (military):** Series 300: Thales Avionics Topdeck suite (see Current Versions) as core system.

**Flight:** Twin ADU 3000 air data units, GPSs and AHRs; radar altimeter; TCAS; GPWS; weather radar; optional Totem 3000 LINS, Cat. II landing capability, MLS and satcom.

**Instrumentation:** Four 152 x 203 mm (6 x 8 in) LCDs; optional HUDs. Optional electro-optical sensors display imagery on LCDs. NVG compatibility.

**Mission:** Four-dimensional navigation FMS calculates high-altitude and computed air release points for load-dropping.

**EQUIPMENT:** Navigation lights, anti-collision strobe lights, 600 W landing light in front end of each main landing gear fairing, taxiing lights, ice inspection lights, emergency door lights, flight deck and flight deck emergency lights,

cabin and baggage compartment lights, individual passenger reading lights, and instrument panel white lighting, all standard. Hand-type fire extinguishers on flight deck (one) and in passenger cabin (two); smoke detector in baggage compartment.

**ARMAMENT** (military version): Three attachment points under each wing. Weapons can include Harpoon anti-ship missiles; Indonesian MPA version (which see) can be fitted with two Mk 46 torpedoes or AM 39 Exocet anti-shiping missiles.

*Data follow for CASA-built Srs 300.*

#### DIMENSIONS, EXTERNAL:

Wing span	25.81 m (84 ft 8 in)
Wing chord: at root	3.00 m (9 ft 10 in)
at tip	1.20 m (3 ft 11 1/4 in)
Wing aspect ratio	10.2
Length overall, standard nose	21.40 m (70 ft 2 1/2 in)
Fuselage: Max width	2.90 m (9 ft 6 in)
Max depth	2.615 m (8 ft 7 in)
Height overall	8.18 m (26 ft 10 in)
Tailplane span	10.60 m (34 ft 9 1/4 in)
Wheel track (c/l of mainwheels)	3.90 m (12 ft 9 1/2 in)
Wheelbase	6.92 m (22 ft 8 1/2 in)
Propeller diameter: Srs 200	3.35 m (11 ft 0 in)
Srs 300	3.66 m (12 ft 0 in)
Propeller ground clearance	1.66 m (5 ft 5 1/2 in)
Distance between propeller centres	7.00 m (22 ft 11 1/2 in)
Passenger door (port, rear) and service door (stbd, fwd):	
Height	1.70 m (5 ft 7 in)
Width	0.73 m (2 ft 4 3/4 in)
Height to sill	1.22 m (4 ft 0 in)
Paratroop doors (port and stbd, rear, each):	
Height	1.75 m (5 ft 9 in)
Width	0.90 m (2 ft 11 1/2 in)
Height to sill	1.22 m (4 ft 0 in)
Ventral upper door (rear): Length	2.365 m (7 ft 9 in)
Width	2.35 m (7 ft 8 1/2 in)
Height to sill	1.22 m (4 ft 0 in)
Ventral ramp/door (rear): Length	3.04 m (9 ft 11 1/4 in)
Width	2.35 m (7 ft 8 1/2 in)
Height to sill	1.22 m (4 ft 0 in)
Type III emergency exits (port, fwd, and stbd, rear):	
Height	0.92 m (3 ft 0 1/4 in)
Width	0.51 m (1 ft 8 in)

#### DIMENSIONS, INTERNAL:

Cabin, excl flight deck: Length	9.65 m (31 ft 8 in)
Max width	2.70 m (8 ft 10 1/2 in)
Width at floor	2.365 m (7 ft 9 in)
Max height	1.88 m (6 ft 2 in)
Floor area	22.8 m <sup>2</sup> (246 sq ft)
Volume	43.2 m <sup>3</sup> (1,527 cu ft)

#### AREAS:

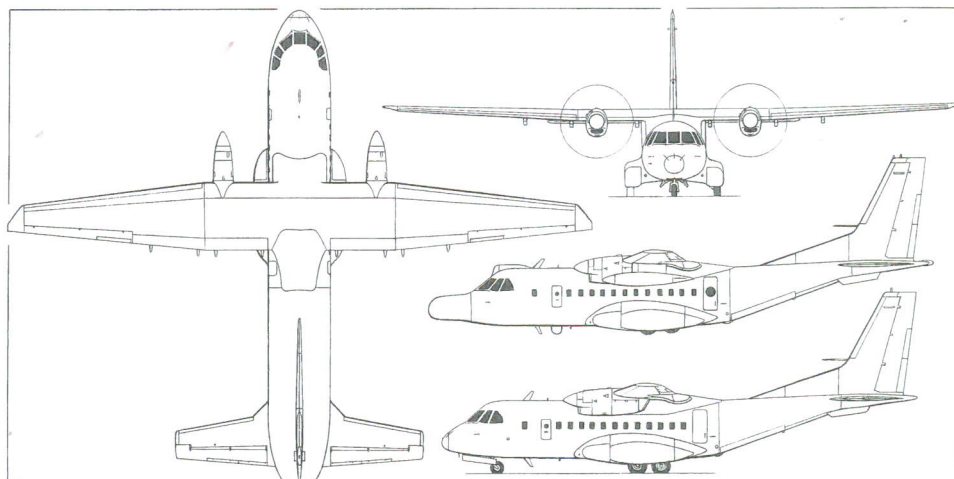
Wings, gross	59.10 m <sup>2</sup> (636.1 sq ft)
Ailerons (total, incl tabs)	3.14 m <sup>2</sup> (33.80 sq ft)
Trailing-edge flaps (total)	10.87 m <sup>2</sup> (117.00 sq ft)
Fin, incl dorsal fin	11.11 m <sup>2</sup> (119.59 sq ft)
Rudder, incl tabs	4.20 m <sup>2</sup> (45.21 sq ft)
Tailplane	21.20 m <sup>2</sup> (228.2 sq ft)
Elevators (total, incl tabs)	6.17 m <sup>2</sup> (66.41 sq ft)

#### WEIGHTS AND LOADINGS (Srs 300):

Operating weight empty	9,909 kg (21,846 lb)
Max payload	6,000 kg (13,228 lb)
Max fuel weight	4,230 kg (9,326 lb)
Max T-O weight	16,500 kg (36,376 lb)
Max ramp weight	16,550 kg (36,486 lb)
Max landing weight	16,500 kg (36,376 lb)
Max zero-fuel weight	15,400 kg (33,951 lb)
Max wing loading	279.2 kg/m <sup>2</sup> (57.19 lb/sq ft)
Max power loading (without APR)	6.33 kg/kW (10.39 lb/shp)

#### PERFORMANCE (Srs 300):

Max cruising speed	246 kt (455 km/h; 283 mph)
Max rate of climb at S/L	183 m (600 ft)/min
Service ceiling	9,145 m (30,000 ft)
Service ceiling, OEI	4,275 m (14,020 ft)
T-O run	398 m (1,305 ft)
T-O to 15 m (50 ft)	754 m (2,474 ft)
Landing from 15 m (50 ft)	603 m (1,978 ft)



**CASA CN-235 twin-turboprop multipurpose transport, with additional side view (centre) of a representative CN-235 MPA (Dennis Punnett)**

#### Range:

with max fuel	2,701 n miles (5,003 km; 3,108 miles)
with 4,000 kg (8,818 lb) payload	
	1,549 n miles (2,870 km; 1,783 miles)
with max payload	393 n miles (727 km; 452 miles)
g limits: at MTOW	+2.5/-1
below 14,100 kg (31,085 lb)	+3/-1

**UPDATED**

#### AIRTECH CN-235 MP PERSUADER and CN-235 MPA

**TYPE:** Maritime surveillance twin-turboprop.

**CURRENT VERSIONS:** **CN-235 MP Persuader:** CASA version; different avionics from Indonesian MPA. In service with Irish Air Corps and ordered by Spain (four) and Turkey (nine: six for Navy, three for Coast Guard, assembled by TAI at Ankara). In mid-1999, Turkey sought proposals from at least seven potential integrators of surveillance systems to provide radar, FLIR and an acoustics suite for naval CN-235s; on 6 September 2002, contract signed with Thales covering supply and integration of maritime patrol mission equipment for these nine aircraft by 2006. Contract worth US\$350 million and could be followed by further 10 systems to equip additional batch of aircraft.

**CN-235 MPA:** Indonesian-developed version; available either with lengthened nose housing radar and IFF; or with normal CN-235 nose, plus belly radar; CN-235 prototype PK-XNC served as testbed. Maximum T-O weight 15,400 kg (33,951 lb), endurance more than 8 hours. Provision for quick-change configuration for general transport, communications or other duties. Required by Indonesian Navy (six included in national order for 24), Indonesian Air Force (three) and Brunei (three).

Indonesia confirmed initial three firm orders in May 2000, when Thomson-CSF (now Thales) selected to supply AMASCOS airborne maritime situation control system, comprising Elettronica ALR-733 RWR, T-CSF Ghlio thermal imager and Sextant Gemini navigation computer. Brunei chose Boeing as Argo Systems integrator for its three aircraft in late 1995, specifying individual sensors in October 1996 as AN/AAQ-21 FLIR, BAE Sky Guardian ESM, Cossor 3500 IFF and AN/APS-134 radar, plus two operators' consoles. BAE Systems Australia marketing CN-235 MPA in Asia-Pacific region under September 1997 agreement; BAE also to provide advanced systems development for proposed configurations.

**AVIONICS (Persuader):** Radar: Litton APS-504(V)5.

**Mission:** FLIR-2000HP undernose-mounted night vision system and Litton AN/ALR-85(V) ESM system, fully integrated via a central tactical processor with reconfigurable consoles.

**AVIONICS (CN-235 MPA):** Radar: BAE Systems Seaspray 4000, or Raytheon AN/APS-134 (LW) or Thales Ocean Master 100.

**Flight:** Litton LN92 ring laser gyro INS; Trimble TNL 7900 Omega/GPS.

**Mission:** Argo data processing and display system with multifunction consoles. BAE Systems Sky Guardian SG-300, or Argo Systems AR-700 or Litton AN/ALR-93(V)4 ESM. FLIR Systems AN/AAQ-21 Safire or BAE Systems MRT FLIR. Cossor 3500 IFF interrogator. (Trials aircraft originally equipped with APS-504 and Ocean Master; SG-300. Reconfigured by 1994 with AN/APS-134, MRT, AR-700, LN92 and TNL 7900. Further alternatives available at customer's option.)

**UPDATED**



**Maritime surveillance CN-235 MP Persuader of the Irish Air Corps (Paul Jackson)**

**NEW/0561587**

## AM

### AIRBUS MILITARY SAS

15 avenue Didier Daurat 31707 Blagnac Cedex, France

Tel: (+33 05) 62 11 07 82

Fax: (+33 05) 62 11 06 11

Web: <http://www.airbusmilitary.com>

CHAIRMAN: Noël Forgeard

PRESIDENT AND MANAGING DIRECTOR: Francisco Fernandez Sainz

TECHNICAL DIRECTOR: Alain Cassier

COMMERCIAL DIRECTOR: Richard Thompson

INDUSTRIAL DIRECTOR: Angel Hurtado

HEAD OF MARKETING: David R Jennings

PARTICIPATING COMPANIES:

Airbus SAS (France)

EADS CASA (Spain)

FLABEL (Belgium)

OGMA (Portugal)

TAI (Turkey)

Airbus Military was legally established in January 1999 as a 'Société par Actions Simplifiées' as the prospective manufacturer of the Airbus A400M, formerly known as the Future Large Aircraft (FLA). Airbus is the major (63 per cent) shareholder in Airbus Military; TAI, OGMA and FLABEL are full risk-sharing partners. Airbus Military has assigned overall programme management, during development, to Airbus in Toulouse; as the programme reaches production, responsibility will progressively transfer to Spain.

Conceptual work was undertaken by the European FLA Group (Euroflag). Euroflag Srl originally formed 17 June 1991, with headquarters in Alenia head office in Rome, to manage European FLA development. Aerospaziale, Alenia,

British Aerospace, CASA and Daimler-Benz Aerospace Airbus (DaimlerChrysler from 1998) had equal shares in Euroflag Srl; MoUs established 1992 with FLABEL (SABCA, SONACA, ASCO and BARCO) of Belgium, OGMA of Portugal and Turkish Aerospace Industries (TAI) of Turkey to allow integrated participation in FLA programme; BAE and FLABEL were industrial, not national, partners contributing their own funds, although the UK government announced in December 1994 that membership was to be upgraded to national participation.

The partners agreed in September 1994 to industrialise the programme by transferring it to their existing airliner production company; formal announcement was made on 14 June 1995 that Airbus Military Company would be established, replacing Euroflag, which then disbanded. Programme makes use of Airbus procedures and industrial infrastructure and takes advantage of technologies developed

for Airbus airliners. The projected percentage shares for R&D financing at that time were Germany 25.7, France 17.2, UK 15.5, Italy 15.1, Spain 12.4, Turkey 6.9, Belgium 4.1 and Portugal 3.1.

By early 1997, the FLA programme had lost development sponsorship by the principal participating governments, although military commitments remained, subject to the aircraft being produced with commercial funding. Programme was weakened during 1997 by unilateral German negotiations with Ukraine over Antonov An-7X (Westernised An-70). German MoD attempts to involve Russia and Ukraine continued into 1999, but these were not supported by Airbus Industrie, which declined to become the prime contractor and assume the commercial risk of a programme based on the An-70; a study commissioned by the German MoD and carried out by DaimlerChrysler Aerospace reached a similar conclusion in September 1998. By mid-2000, senior German government sources were stressing the need for a European solution, prompting Airbus to request assurances that its An-7X was still under consideration.

Airbus Military submitted responses to the seven-nation FLA RFP (request for proposals, dated September 1997) on 29 January 1999 and to the competitive Future Transport Aircraft (FTA) RFP issued to Boeing, Airbus and Lockheed Martin by Belgium, France, Spain and the UK on 31 July 1998. Acceptance of A400M was formally announced by all seven members on 27 July 2000; subsequently, on 19 June 2001, MoU signed by seven of nine participating nations (Belgium, France, Germany, Luxembourg, Spain, Turkey and the UK) concerning joint procurement through OCCAR, with Italy and Portugal expected to follow suit in the near future, although Italy announced intention to withdraw from project on 25 October 2001, with Portugal following suit in early 2003.

Programme encountered further difficulties in 2002, with official launch still not having occurred by year's end. Although OCCAR signed contract with AM on 18 December 2001 for 196 aircraft for eight countries, Germany failed to secure parliamentary approval for funding before agreement expired on 31 January 2002; Germany finally announced intention to go ahead with purchase at beginning of December 2002, although the number of aircraft involved had fallen from 73 to 60. Subsequently, on 27 May 2003, launch order for 180 aircraft signed in Bonn by OCCAR and Airbus Military; previously, on 6 May, Europrop International TP400-D6 engine chosen to power the A400M.

UPDATED

## AIRBUS MILITARY A400M

TYPE: Strategic transport.

PROGRAMME: Original FIMA programme replaced April 1989 by five-nation industry MoU to develop four-turboprop, new technology transport to replace C-130 Hercules and C.160 Transall; Independent European Programme Group (IEPG) defined Outline European Staff Target (OEST) during 1991; initial studies undertaken by Euroflag organisation, which name reflected working designation Future Large Aircraft (FLA). Western European Union report in third quarter of 1991 concluded Euroflag FLA should form core of future European military transport capability to support Rapid Reaction Corps; national armament directors of Belgium, France, Germany, Italy, Portugal, Spain and Turkey affirmed support for 12 month prefeasibility study completed by Euroflag in late 1992; UK MoD declined involvement, but retained observer status; UK participation privately maintained by BAe and Shorts (10 per cent of BAe work); European Staff Target and intergovernmental MoU signed by seven nations in 1993; full feasibility programme officially started October 1993, by which time cargo hold width and height increased from original 3.66 m (12 ft 0 in) and 3.55 m (11 ft 7 7/8 in), respectively; study finished May 1995 and submitted to



Artist's impression of the turboprop-powered Airbus Military A400M

NEW/0558573

European defence ministries. Meanwhile, FLA underwent profound change in April 1994 when turboprops deemed incapable of providing desired performance; aircraft recast with four turboprops of new design. Discussion of a 'close association' between Euroflag and Airbus Industrie began third quarter of 1993 and formalised in June 1995.

Launch of the predevelopment phase (PDP) was postponed at least six months from early 1996 as a result of funding uncertainties. Original intention was for PDP to run from 1996 to 1998 and define a comprehensive specification for the aircraft and contractual forms and conditions against which the partner nations would make commitments. Full development and production phase (DPP) scheduled to follow directly on from PDP and terminate with first flight in 2002. Customer deliveries were then planned to begin in 2004.

France announced funding withdrawal from FLA development on 13 May 1996 and UK failed to rejoin the programme later that year, despite intention announced in December 1994 (when the RAF purchased Lockheed Martin C-130J Hercules). However, Germany became first to sign a European Staff Requirement, on 24 July 1996, although having terminated official funding for FLA development in previous month. AMC accordingly announced a 'single-phase' programme in May 1996.

The new programme schedule started in mid-1998 with a set of formal prelaunch activities (PLA), largely funded by industry and lasting 12 months, leading to a fully documented proposal for the Airbus A400M. This contained the technical proposal, including the aircraft specification and performance guarantees, and the commercial proposal with firm and fixed prices; a full set of contractual terms and conditions; and detailed planning of the single-phase programme. Strategic workshares (detailed enough to allow industry to provide the necessary resources to complete the proposal) were agreed at the start of PLA.

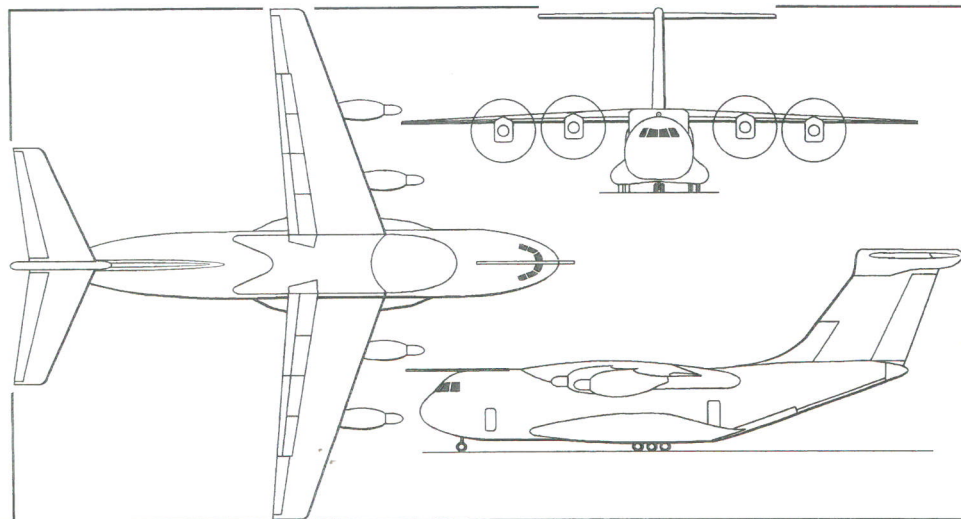
February 1999 delivery of the A400M proposal, initiated a 12-month period of negotiation of individual national requirements before planned official launch during early 2000 to meet an ESR now supported by Belgium, France, Germany, Italy, Spain, Turkey and the UK, but not Portugal. The 'PLA + single phase' programme provides industry with an uninterrupted development schedule and strong commitments from governments, while it also meets the customers' requirement that industry carries as much of the development risk as possible.

A meeting in March 2000 saw Belgium, France, Italy, Spain and Turkey identify a requirement for 131 A400Ms (37 fewer than expected) while, on 16 May, UK announced its intention to buy 25 aircraft (becoming first to fully commit). France and Germany followed on 9 June 2000. Seven participating nations announced selection of A400M on 27 July, committing to 225, including one for Luxembourg, although Turkey had reduced planned procurement to 10 at time of MoU signature in June 2001. Portugal announced requirement for four shortly thereafter and subsequently rejoined programme as a risk-sharing and industrial partner in early 2001. By June 2001, however, number of aircraft had fallen to three and it subsequently withdrew in early 2003. MoU of 19 June 2001 on development and acquisition of A400M covered 196 aircraft, omitting 16 for Italy which in late October 2001 revealed it would not proceed with purchase. Formal launch was expected in early 2002, but delayed for more than a year as consequence of German failure to obtain parliamentary funding approval. However, Germany made commitment in December 2002 to 60 aircraft and programme officially launched on 27 May 2003, with signature of contract by OCCAR and Airbus Military. Programme then anticipated production of 180 aircraft for seven customers.

Flight testing is expected to be at EADS CASA's Seville plant and Airbus' Toulouse facility, with certification by a single authority; six prototypes to be built, of which five will be refurbished and sold on completion of test duties. EADS CASA at Seville will have sole production line, assembling components from the UK (wings), France (cockpit management and flight control systems), Germany (main fuselage), Spain (horizontal stabiliser), Belgium (wing leading edges and flaps), Italy (aft fuselage and other subsystems), Turkey (structural elements) and Portugal (wing/fuselage and undercarriage fairings). Germany committed US\$4.4 billion to the programme in November 2000, though this represented 60 per cent of the amount required to guarantee Germany's 73 aircraft and planned 33 per cent workshare. France committed US\$2.6 billion at the same time.

A timetable of 56 months between contract and first flight has been agreed, with first delivery 77 months after contract signature. Maiden flight now tentatively scheduled for February 2008, with deliveries beginning in 2009-10. France and Turkey will be first to accept aircraft, with Germany and the UK receiving their first A400Ms in 2010.

CURRENT VERSIONS: Primarily for carriage of military personnel and outsize cargoes such as helicopters, armoured fighting vehicles, trucks and 40 ft ISO containers. Also designed to provide full aerial delivery and tactical air land capability, particularly into soft,



Provisional drawing of the Airbus Military A400M military transport (Paul Jackson)

NEW/0568970



Flight deck of the Airbus Military A400M, created by computer imagery

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natural surface airstrips. Typical strategic air transport capability will be 30,000 kg (66,139 lb) payload over 2,450 n miles (4,537 km; 2,819 miles) with full reserves, or 20,000 kg (44,092 lb) payload over 3,550 n miles (6,574 km; 4,085 miles). A400M can be modified to operate as a single-hose refueller (or, in conjunction with wing pods, as a three-point refueller); a pallet-mounted hose drum unit, secured to the closed rear ramp, will dispense fuel via a centreline hose passing through a resealable aperture in the ramp. Fuel load can be increased by installation of additional tanks in cargo hold, up to total capacity of 11,500 kg (25,350 lb). With additional fuel tanks installed, an A400M could transfer 40,000 kg (88,185 lb) of fuel at a point 400 n miles (740 km; 460 miles) from base with loiter time of two hours. A400M speed envelope permits safe refuelling of fighter and large multi-engined aircraft, as well as helicopters.

**CUSTOMERS:** Procurement agency is Organisation Conjointe de Co-operation en matière d'Armement (OCCAR) in Bonn, acting for all prospective NATO purchasers. First deliveries reserved for France, followed by Turkey, then Germany and UK. Exports expected, and attempts made in early 1995 to interest Japan; Australia briefed in February 2001 and again in November 2002 and may acquire A400M as eventual replacement for existing fleet of C-130H Hercules; export market estimated at 400 aircraft over 25 years, with A400M to secure 50 per cent share. Other countries that could acquire A400M include Canada, Norway and Sweden.

#### A400M REQUIREMENTS (at June 2003)

Country	Original	Current
Belgium	12	7
France	50	50
Germany	75	60
Italy	44	0
Luxembourg	0	1
Spain	36	27
Turkey	26	10
UK	45	25
<b>Total</b>	<b>288</b>	<b>180</b>

**COSTS:** Total development cost expected to be €20 billion. Unit price estimated in early 2003 as €85 million, for basic aircraft. In December 2002, however, average flyaway price said to be €118.5 million, including 16 per cent VAT. Discrepancy probably explained by different equipment configuration.

**DESIGN FEATURES:** High-wing, T-tailed aircraft with rough-field landing gear and much larger cabin/hold floor area and cross-section than C-130/C.160, permitting high payload factors with low-density cargo, vehicles or mixed passenger/cargo loads. Use of propellers felt to be essential for adequate thrust-reverse performance for taxiing and short landing; for maximising power response; and for minimising FOD vulnerability. Long-range cruising speed of M0.68 to M0.72 up to 11,280 m (37,000 ft). Tactical mission parameters of 150 m (500 ft) AGL in IMC on predetermined route with civil standard of safety. Airbus Military has noted that its extensive use of new technology gives twice the volume and payload of the C-130J at the same life-cycle cost. Compared with the C-17, the A400M

is said to be less than half the price and to have one third of the life-cycle cost. Minimum service life 30,000 hours, including allowance for low-level flight and short-field performance. Optimised for autonomous deployment; AMC offering 15-day away-from-base serviceability guarantee, all necessary support being within flight crew's capabilities.

Wing sweep 15° at 25 per cent chord; anhedral 2°; taper ratio 0.334; mean aerodynamic chord 5.690 m.

**FLYING CONTROLS:** Fly-by-wire, hydraulically powered; manually actuated electrohydrostatic back-up for ailerons, elevator and rudder. Four spoilers and two-section flaps on each wing; tailplane trimmable by screw-jack. No slats. Spoilers used for roll control, lift dumping and as speed brakes.

**STRUCTURE:** Aluminium alloy, with titanium alloy in highly loaded areas (around windscreen, wing/fuselage joint and landing gear anchorage) and glass fibre or carbon fibre for lightly loaded components (landing gear doors and various fairings). Tailplane has aluminium alloy central structural box and two outer composites box structures; elevator primary structure of carbon fibre. Fin has three-spar main box, trailing-edge shroud and single-piece rudder, all primarily of composites, plus metal/composites removable leading-edge. Rudder of carbon fibre, with aluminium, hinge-connecting ribs. Extensive use of composites in wing for skins, stringers, spars and moving surfaces; metal for ribs, engine mountings and fuselage pick-ups. Front spar at 15 per cent chord; composites rear spar at 62.5 per cent chord. Modern design and manufacturing techniques expected to afford major reductions in maintenance man-hour requirements and increases in aircraft availability/survivability.

Responsibilities and workshares are *Belgium:* detailed wing machined elements, including manufacture of leading-edges and main landing gear doors; *France:* overall systems integration and FCS, plus manufacture of front fuselage, wing centre-section, rear ramp and engine bearers; *Germany:* overall fuselage leadership and composites, plus manufacture of wing skins, wing/fuselage fairing, fin, rudder, fin tip, flaps and (with Belgium) rear fuselage; *Portugal:* overwing fairings and elevators; *Spain:* final assembly line and composites, plus manufacture of engine nacelles and (with Portugal) tailplane; *Turkey:* forward centre fuselage, ailerons and spoilers; and *United Kingdom:* overall wing leadership, plus manufacture of wing main structure.

**LANDING GEAR:** Retractable tricycle type with sufficient 'floatation' for semi-prepared and/or unsurfaced runways. Each main unit has six wheels in tandem pairs, retracting rearwards into fairings on fuselage sides. Each pair of mainwheels has independent, lever-type shock-absorbers. Twin nosewheels retract forwards. Emergency gravity extension of all units. Multidisc carbon brakes on mainwheels can operate differentially to assist steerable nosewheel in ground manoeuvring. Turning radius: landing gear 15 m (50 ft); wingtip 28.6 m (94 ft). Mainwheels can 'kneel' for unloading of large cargoes. Hydraulic strut at rear of each sponson supports and stabilises aircraft during loading and unloading.

**POWER PLANT:** Initial candidate engines rated at approximately 6,898 kW (9,250 shp): M138 turboprop offered by Turboprop International SNECMA (33 per cent), MTU (33 per cent), Fiat Avio (22 per cent) and ITP (12 per cent) and based on SNECMA M88-2 core; Rolls-Royce Deutschland proposed a turboprop development of the BR715 turbofan, 8,949 kW (12,000 shp) BR700-TP;

and Pratt & Whitney Canada offered a 'Twinpac' version of the existing PW150. Required engine power, as defined by Airbus, was up to 7,457 kW (10,000 shp).

Choice initially settled on three-shaft 7,457 to 9,694 kW (10,000 to 13,000 shp) turboprop TP400 developed by Fiat Avio, ITP, MTU, Rolls-Royce, SNECMA and Techspace Aero, although this also rejected in February 2002 on basis of being too costly and too heavy as well as insufficiently powerful. Engine competition subsequently re-opened, with European and US manufacturers invited to submit proposals. Airbus announced intent to choose engine by September 2002, but decision delayed until 6 May 2003, when 8,202 kW (11,000 shp) EuroProp International (ITP, MTU, Rolls-Royce and SNECMA) TP400-D6 selected in preference to Pratt & Whitney Canada PWC180. Engines are to be 'handed', with one of each wing pair rotating in opposite direction to the other, offering reduction in torque and elimination of asymmetric airflow over wing.

Fuel capacity 64,030 litres (16,915 US gallons; 14,085 Imp gallons) in five tanks (no transfer tank) inside wing box; electric pumps and valves all mounted outside tanks. Detachable in-flight refuelling probe. Provision for inert gas system; provision for wing-mounted refuelling pods; optional HDU in cargo hold; and optional additional fuel tanks, totalling up to 14,400 litres (3,804 US gallons; 3,168 Imp gallons), in fuselage. Pressure refuelling, with gravity back-up.

**ACCOMMODATION:** Two-man, NVG-compatible flight deck with dual sidestick controllers and additional forward-facing workstation for third 'mission crew member' to assist with tactical and special tasks, when required. View from flight deck exceeds JAR 25 and MIL-STD-850B. Provision for bulletproof flight deck windows, 68 mm (2 3/4 in) thick, and armour protection around crew's and loadmaster's seats. Loadmaster station forward of and overlooking cargo area. Two fixed, screened urinals and fixed hand-basin, starboard rear. Astro dome for formation surveillance expected. Flight crew rest area with two foldaway bunks.

Two passenger doors forward; two rear. Forward, port, for normal access; forward, starboard, for emergency exit; rear doors for paratroop dropping. Three emergency exits in roof for flight crew and passengers. Cargo door, hinged at aft end, raised hydraulically to hold roof for loading via rear ramp. Closed-circuit TV surveillance of cargo hold, with imagery selectable on flight deck displays.

Cargo floor with 250 tiedown rings stressed to 4,536 kg (10,000 lb) and 60 to 11,340 kg (25,000 lb). Typical loads include Warrior, MRAP or LAV-III armoured vehicles; Super Puma or two Tiger helicopters; nine pallets (88 × 108 in military or 88 × 125 in civil); plus 57 troops and second loadmaster on permanent (tip-up) sidewall seats; two 20 ft ISO containers; Patriot SAM system; six Land Rovers, plus trailers; 66 stretchers and 10 medical attendants; or 120 armed troops on sidewall and removable centreline seats. Ramp stressed for 6,000 kg (13,228 lb) loads and has three hydraulically powered toes and 90 tiedowns stressed to 4,536 kg (10,000 lb).

**SYSTEMS:** FBW FCS derived from Airbus airliners, including sidestick controllers (left hand for captain, right hand for co-pilot, with conventional central power-lever throttle quadrant).

Electrical power provided by four engine-driven generators, each of 75 kVA. Additional power from three-phase generator on APU (90 kVA) in landing gear sponson; three-phase generator on RAT; emergency battery; and external power receptacle. DC power from four 200 A transformer/rectifier units: two feed separated, main DC busbar; one feeds the 'flight essential' busbar and charges the emergency busbar and battery; and one feeds the APU starting system. Two Ni/Cd batteries are additional source for DC power.

Two hydraulic systems, Blue and Yellow, each operating at 207 bar (3,000 lb/sq in). Blue (driven by Nos. 1 and 4 engines) powers port aileron and elevator, No. 4 (inboard) and No. 2 spoiler on each wing, back-up brakes, cargo ramp and ground stabiliser struts. Yellow (Nos. 2 and 3 engines) responsible for starboard aileron and elevator, Nos. 2 and 4 spoilers on each side, landing gear kneeling, brakes and landing gear actuation. Both systems power flaps, rudder, trimmable horizontal stabiliser and steering. Each system has 140 litre (37.0 US gallon; 30.8 Imp gallon)/min engine-driven pump and 40 litre (10.6 US gallon; 8.8 Imp gallon)/min alternate current motor pump; power transfer unit between systems for emergency use.

Pneumatic system for air conditioning and pressurisation; wing and engine air intake anti-icing; engine starting; and pressurisation of other onboard systems. Two computers control four engine air bleed units. Interior divided into three air conditioning zones; flight deck and two in cargo hold. Cabin pressure altitude 2,440 m (8,000 ft) when flying at 11,280 m (37,000 ft).

**AVIONICS:** *Comms:* HF and V/UHF with COMSEC capability, SELCAL and optional Inmarsat SATCOM. Audio management system, wireless intercom system, cockpit voice recorder and passenger address system. ELT and IFF transponder.

*Radar:* Civil weather radar; replaceable by optional military radar with ground mapping mode.

*Flight:* Three inertial platforms with embedded air data systems. VOR, DME, Tacan, ADF (optional), multimode receiver (ILS, MLS and GNSS), two radar altimeters and



### Airbus Military A400M manufacturing partners






Enhanced-GPWS. Terrain-referenced navigation system and future air navigation system (FANS A) as options.

**Instrumentation:** Two HUDS; seven identical full-colour head-down displays (HDDs); two keyboard devices and two cursor control devices (CCDs); an eighth identical HDD, a third keyboard device and a third CCD as options for a third crew member.

**Mission:** Two flight management computers and two military mission management computers; optional MIDS tactical datalink.

**Self-defence:** Modular defensive aids subsystem (DASS) with optional elements including central computer, RWR, MWS (passive/active), LWR, expendables dispensing system (chaff/flare), direct energy infra-red countermeasures and towed radar decoy.

**EQUIPMENT:** Winch at forward end of cargo hold. Optional 5-tonne power crane in roof above cargo ramp. Provision for one 1,200 kg (2,646 lb)/min refuelling pod under each wing and/or 1,800 kg (3,968 lb)/min HDU in rear of cargo hold.

	<b>BELGIUM</b> Detailed Wing Machined Elements
	<b>FRANCE</b> Overall Systems Integration/PCS
	<b>GERMANY</b> Overall Fuselage Leadership/Composites
	<b>PORTUGAL</b> Fairings & Flight Control Surfaces
	<b>SPAIN</b> Final Assembly/Line/Composites
	<b>TURKEY</b> Major Structure Elements & Flight Control Surfaces
	<b>U.K.</b> Overall Wing Leadership

NEW/0558571

#### DIMENSIONS, EXTERNAL:

Wing span	42.40 m (139 ft 1 in)
Wing aspect ratio	8.1
Length overall	42.20 m (138 ft 5½ in)
Height overall	14.70 m (48 ft 3 in)
Wheel track	6.20 m (20 ft 4 in)
Wheelbase	13.60 m (44 ft 7½ in)
Propeller diameter	5.33 m (17 ft 6 in)
Ramp: Length	5.40 m (17 ft 8½ in)
Width	4.00 m (13 ft 1½ in)
Cargo door: Length	8.10 m (26 ft 7 in)

#### AREAS:

Wing area, gross	221.50 m <sup>2</sup> (2,384.2 sq ft)
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#### DIMENSIONS, INTERNAL:

Hold: Length excl ramp	17.71 m (58 ft 1¼ in)
Width at floor, continuous	4.00 m (13 ft 1½ in)
Height: forward of wing box	3.85 m (12 ft 7½ in)
aft of wing box	4.00 m (13 ft 1½ in)
Floor area: incl ramp	92.4 m <sup>2</sup> (995 sq ft)
Volume: incl ramp (approx)	356 m <sup>3</sup> (12,570 cu ft)
excl ramp (approx)	274 m <sup>3</sup> (9,680 cu ft)

<b>WEIGHTS AND LOADINGS:</b> (A: logistic operation at max 2.5 g, B: logistic at 2.25 g, C: tactical operation at 2.5 g):	
Operating weight, empty:	66,500 kg (146,605 lb)*
Max payload: A	34,000 kg (74,957 lb)
B	37,000 kg (81,570 lb)
C	29,500 kg (65,036 lb)
Max T-O weight: A	126,500 kg (278,885 lb)
B	130,000 kg (286,600 lb)
C	116,500 kg (256,835 lb)
Max landing weight: A, B	114,000 kg (251,325 lb)
C	106,500 kg (234,790 lb)
Max zero-fuel weight: A	100,500 kg (221,564 lb)
B	103,500 kg (228,180 lb)
C	96,000 kg (211,645 lb)
Max wing loading: A	571.1 kg/m <sup>2</sup> (116.97 lb/sq ft)
B	586.9 kg/m <sup>2</sup> (120.21 lb/sq ft)
C	526.0 kg/m <sup>2</sup> (107.72 lb/sq ft)
Max power loading: A	3.86 kg/kW (6.34 lb/shp)
B	3.96 kg/kW (6.51 lb/shp)
C	3.55 kg/kW (5.84 lb/shp)

\* including 1,000 kg (2,205 lb) allowance for optional equipment

#### PERFORMANCE (estimated):

Max operating speed and Mach No. (VMO/MMO).

M0.72 (300 kt; 555 km/h; 345 mph)

Normal cruising Mach No. 0.68

Airdrop speed 130-200 kt (241-370 km/h; 150-230 mph)

Max rate of climb at S/L 1,524 m (5,000 ft)/min

Max certified altitude 11,280 m (37,000 ft)

T-O run at 116,500 kg (256,835 lb) Military critical field length, ISA, sea level, soft/dry runway

1,285 m (4,216 ft)

Landing run at 106,500 kg (234,792 lb), 152 m (500 ft)

roll-out, ISA, sea level, soft/dry runway

615 m (2,018 ft)

Range with 5% reserves, missed approach, 200 n mile

(370 km; 230 mile) diversion and 30 min hold at

445 m (1,500 ft), B:

with 30,000 kg (66,139 lb) payload

2,450 n miles (4,537 km; 2,819 miles)

with 20,000 kg (44,092 lb) payload

3,550 n miles (6,574 km; 4,085 miles)

Ferry range 4,900 n miles (9,074 km; 5,638 miles)

UPDATED

## AMX

### AMX INTERNATIONAL

c/o Alenia, Via Giulio Vincenzo Bona 85, I-00156 Rome, Italy

Tel: (+39 06) 41 72 31

Fax: (+39 06) 411 44 39

PRESIDENT: Dott Ing Giovanni Gazzaniga (Alenia)

#### VICE-PRESIDENTS:

F Grandi (Aermacchi)

R Pesce (Embraer)

#### PARTICIPATING COMPANIES:

Alenia: see under Italy

Aermacchi: see under Italy

Embraer: see under Brazil

AMX production for the Italian and Brazilian air forces is now complete, but an order from Venezuela has still to be fulfilled.

UPDATED

### AMX AMX

Brazilian Air Force designations: A-1 and A-1B

Italian Air Force name: Ghibli (Desert Wind)

TYPE: Attack fighter.

**PROGRAMME:** Resulted from June 1977 Italian Air Force specification for small tactical fighter-bomber; original Aeritalia/Aermacchi partnership joined by Embraer July 1980; seven single-seat prototypes built (first flight 15 May 1984); production of first 30 (Italy 21, Brazil nine), and design of two-seater, began mid-1986; first production aircraft rolled out at Turin 29 March 1988, making first flight 11 May; second contract (Italy 59, Brazil 25, including six and three two-seaters respectively) placed 1988.

Deliveries to Italian Air Force (six for Reparto Sperimentale di Volo at Pratica di Mare) began April 1989; production A-1 for Brazilian Air Force (s/n 5500) made first flight 12 August 1989, deliveries (two to Nucleo A-1 training nucleus at Santa Cruz) following from 17 October 1989; in-flight refuelling test programme completed (by Embraer) August/September 1989; first flight by first (of three) two-seat AMX-T prototypes 14 March 1990 (MM55024), followed by second on 16 July; first flight of Embraer two-seater (serial number 5650), 14 August 1991; third production batch authorised early 1992 (one year late); first two-seater for Brazilian Air Force (5650) delivered 7 May 1992.

Italian single-seater production temporarily halted following delivery on 1 February 1993 of 72nd aircraft



AMX Ghibli CSX7158, an upgrade trials aircraft of the Italian Air Force's Reparto Sperimentale di Volo trials unit (Paul Jackson)

NEW/0528685

(MM7160); resumed late 1994, with both AMX and first production batch of AMX-T. Final Italian single-seater delivered in 1997; total 110, comprising 74 built by Alenia and 36 by Aermacchi. Batch 4 (35 AMX and 16 AMX-T) and Batch 5 (42 AMX and 9 AMX-T) cancelled. Final Italian two-seater followed in 1998; 26 built: 17 Alenia, nine Aermacchi. Production continued in Brazil, where 50th was delivered on 1 December 1998 and last in 1999. No further manufacture until 2005 planned delivery of Venezuelan aircraft.

Istrana- and Amendola-based AMX squadrons flew 252 combat sorties (667 flying hours) during Operation Allied Force against Yugoslavia in 1999, dropping 39 Opher LGBs.

**CURRENT VERSIONS:** **AMX:** Replaced G91R/Y and some F-104G/S in Italian Air Force (eight squadrons originally planned) and some EMB-326GB Xavante in Brazilian Air Force for close support/interdiction/reconnaissance, sharing counter-air duties with IDS Tornado (Italy) and F-5E/Mirage 50 (Brazil); in service with five Italian Stormi (see table) and 10<sup>o</sup> and 16<sup>o</sup> Grupos (Brazil); Brazilian Air Force aircraft (designated A-1) differ primarily in avionics and weapon delivery systems, have two 30 mm guns instead of Italian version's single multibarrel 20 mm

weapon and are usually fitted with in-flight refuelling probes.

**AMX-MLU:** Mid-life upgrade originally to be undertaken jointly by Brazil and Italy, but subsequently abandoned because of high cost and limited funding. Italy then opted to adopt more limited upgrade project, including GPS navigation, an improved EW suite, integration of Thales CLDP laser designator pod and ability to use newer weapons such as JDAM; consideration also reportedly being given to installing new real-time reconnaissance pod. In this guise, Italy expects upgraded aircraft to be available for service in 2005.

**Super AMX:** Obsolete designation for two-seater offered to South Africa. Would have featured wide-angle HUD, 'glass cockpit', improved HOTAS, GPS, HMD, integrated defensive aids, and new weapons. Also new radar – possibly Scipio already fitted to Brazilian AMX.

Detailed description applies to single-seater except where indicated.

**AMX-T:** Second cockpit accommodated by removing forward fuselage fuel tank and relocating environmental control system; dual controls, canopy, integration of rear cockpit GEC-Marconi HUD monitor, and oxygen systems, designed/redesigned by Embraer; intended both as