BOEING 737

Boeing 737

TYPE: Twin-jet airliner

US Navy designation: C-40A Clipper

PROGRAMME: Original Boeing 737 first flew 9 April 1967; -100 and -200 with Pratt & Whithney JT8D engines; -300 entered service with CFM56 engines, November 1984, followed by -400 and -500; 3,132nd and last of this generation delivered February 2000. These versions including military T-43 and Surveiller.
Current 'Next-Generation' of family (initially 737X) originated in 1991, when Boeing asked more than 30 airlines to help define improved series; company board authorized offer for sale June 1993; Southwest Airlines ordered 63 737-700s (32 converted from options for 737-300s) plus 63 new options (all, and more, taken up) 18 November 1993; roll-out (737-700) 8 Decmber 1996; first flight (N737X) 9 February 1997; certification 7 November 1997, immediately followed by first deliveries. CFM56-7B power plant first flew on Boeing 747 testbed on 16 January 1996. Flight test programme involved 10 aircraft: four 737-700s, three 737-800s and three 737-600s. FAA approval for 180-minute ETOPS granted in September 1999. By January 2000, B737s of all subtypes had flown over 100 million hours. 1,000 th NG 737 (N418WN) first flew 1 November 2001 and delivered to Southwest Airlines on 13 November.
Further enhancements, incorporated in 737-900 demonstrator, comleted in March 2002; features include quiet climb system, GPS landing and synthetic vision system.

CURRENT VERSIONS: **737-600**: Smallest of current 737 family. Known as 737-500X until officially launched 15 March 1995; 110 two-class passengers; final assembly of prototype began at Renton 29 August 1997; roll-out December 1997; first flight 22 january 1998; FAA certification 18 August 1998; first delivery (SE-DNM to launch customer SAS) 18 September 1998.
737-700: First to be ordered and manufactured; mid-size version of family, equivalent to previous ('Classic') 737-300, seating 126 passengers in two-class layout. First aircraft (N737X) rolled out 2 (officially 8) December 1996; first flight 9 February 1997, followed by second aircraft 27 February that year; second aircraft attajned maximum certified altitude of 12,500 m (41,000 ft) for the first time on 19 March 1997; FAA certification 7 November 1997, with first delivery (fourth built, N700GS to Southwest Airlines) on 17 December 1997.
737-700IGW: Formerly 737-700X; increased gross weight version, based on Boeing Business Jet airframe, including forward cargo door, port. Available as **737-700C** (Convertible) and **737-700C/QC** (Convertible/ Quick change); latter interchangeable between 140 single-class (81 cm; 32 in pitch) passengers and eight 2.24 x 3.18 m (88 x 125 in) pallets within one hour, compared to six hours of standard -700C. Max T-O weight 77,560 kg (171,000 lb); max landing weight 60,780 kg (134,000 lb); max zero-fuel weight 57,155 kg (126,000 lb); operating weight empty: -700C passenger 40,000 kg (88,190 lb), -700C cargo 38,365 kg (84,580 lb), -700C.QC passenger 41,840 kg (92,240 lb), -700C/QC cargo 38,905 kg (85,770 lb). Fuel capacity 26,025 litres (6,875 US gallons; 5,725 Imp gallons); design range: -700C passenger 3,210 n miles (5,944 km; 3,694 miles), -700C/QC passenger 3,115 n miles (5,769 km; 3,584 miles), cargo (both versions) 2,880 n miles (5,333 km; 3,314 miles). Cargo volume; lower hold 27,4 m^3 (966 cu ft), main deck (cargo conversion only) 99,7 m^3 (3,520 cu ft).
Initial two ordered 29 August 1997 as **C-40A Clipper** to meet US Navy requirement for C-9B Skytrain II replacement. First C-40A flew 17 April 2000; first delivery to US Naval Reserve Fleet Logistics Support Squadron VR-59 at NAS/JRB Fort Worth, Texas 21 April 2001; three additional C-40As operated by VR-59, and two by VR-58 at NAS Jacksonville, Florida; sixth delivered 28 October 2002.
Commercial launch customer for the 737-700C/QC was Saudi Aramco of Saudi Arabia, which took delivery of two in 2001.
First civil equivalent, designated **737-700C**, was N743A, first flown 18 September 2001 and delivered to ARAMCO on 31 October.
737-800: Known as 737-400X Stretch until launched 5 September 1994; seats 162 two-class passengers; roll-out (N737BX) 30 June 1997; first flight 31 Jly 1997; certified by FAA 13 March and JAA 9 April 1998; first delivery (D-AHFC to launch customer Hapag-Lloyd) 22 April 1998. Hapag-Lloyd became first commercial courier to operate 737-800 fitted with optional winglets in May 2001.
737-900: Formerly 737-900X; launched 10 November 1997 with an order for 10, plus 10 options, from Alaska Airlines; largest 737 variant to date, with (compared to -800) stretch by means of 1.57 m (5 ft 2 in) forward plug and 1.07 m (3 ft 6 in) aft plug and strengthened fuselage; seating for 177 two-class passengers; deliveries from early 2001. One prototype/certification aircraft only; rolled out 23 July 2000; first flight (N737X) 3 August 2000; FAA certification achieved 17 April 2001 following 156 hours of ground testing and a two-aircraft flight test programme totaling 649 flight hours in 296 sorties; first delivery (Alaska Airlines) in April 2001.
737-900X: Increased capacity, long-range version under study in 2001 and offered from 2002 to compete with Airbus A321 in European charter market; additional Type II emergency exit aft of the wing, port side, to increase certification-limited maximum capacity to 204 or 210 passengers; increase in max take-off weight to 83,551 kg (184,200 lb); max payload range 2,710 n miles (5,018 km to 3,118 miles); CFM56-7B27/B1F engines and winglets.
Boeing Business Jet (BBJ): Corporate versions.
Special missions: Military versions.

COSTS: List price (2002 – but unchanged by mid-2003; all in millons): 737-600 US$41.0 to US$49.0; 737-700 US$47.0 to US$55.0; 737-800 US$57.5 to US$64.5; 737-900 US$60.5 to 68.5.

DESIGN FEATURES: Conventional, medium-size airliner with podded engines and sweptback wing and tail surfaces. Dihedral 6° at root; sweepback 25° at quarter-chord. Greater range and speed than

previous 737s, with less noise and fewer emissions; wing area increased by some 25 per cent by means of 0.43 m (1 ft 5 in) increase in wing chord and about 4.83 m (15 ft 10 in) increase in wing span; new high-lift systems; larger tail surfaces; increased tankage gives US transcontinental range; new aircraft can use same runways, taxiways, ramps and gates as preceding variants; new variant of CFM56 turbofan derated from nominal thrust to suit smaller versions of the family. Noise on ground reduced by approximately 12 dB by new diffuser duct and cooling vent silencer on APU, new ECS fan and duct and new electrical/electronics cooling fan.

FLYING CONTROLS: Conventional and powered. All surfaces actuated by two independent hydraulic systems with manual reversion for ailerons and elevator; elevator servo tabs unlock on manual reversion; rudder has standby hydraulic actuator and system. Three outboard-powered overwing spoiler panels on each wing assist lateral control and also act as airbrakes. Variable incidence tailplane has two electric motors and manual standby.
Leading-edge Krueger flaps inboard and four sections of slats outboard of engines; two airbrake/lift dumper panels on each wing, inboard and outboard of engines; continuous-span, double-slotted trailing-edge flaps inboard and outboard of engines.
FAA Cat. II landing minima system standard using SP-300 dual digital intergrated flight director/autopilot: Cat. IIIa capability optional.

STRUCTURE: Aluminium alloy dual-path fail-safe two-spar wing structure with corrosion-resistant 7055-T77 upper skin. Aluminium alloy two-spar tailplane. Graphite composites ailerons, elevators and rudder. Aluminium honeycomb spoiler/airbrake panels and trailing-edges of slats and flaps. Fuselage structure fail-safe aluminium. Elevators, rudder and ailerons contain graphite/Kevlar; other, unstressed, components in GFRP and CFRP include nosecone, wing/fuselage fairing, fin fillet, fintip and flap actuator fairings. Rears of engine nacelles are of graphite/Kevlar/glass fibre.

LANDING GEAR: Hydraulically retractable tricycle type, with Boeing oleo-pneumatic shock-absorbers; inward-retracting main units have no doors, wheels forming wheel well seal; nose unit retracts forward; free-fall emergency extension. Twin nosewheels have tyres size 27x7.75. Main units have heavy-duty twin wheels, H40x14.5-19 heavy duty tyres, and Honeywell or Goodrich heavy-duty wheel brakes as standard. Mainwheel tyre pressure 13.45 to 14.00 bar (195 to 203 lb/sq in). Nosewheel tyre pressure 11.45 to 11.85 bar (166 to 172 lb/sq in).

POWER PLANT: 737-600: Two CFM International CFM56-7B18 turbofans, each rated at 86.7 kN (19,500 lb st) standard, or two CFM56-7B22s, each rated at 101 kN (22,700 lb st) in high gross weight version.
737-700: Two CFM56-7B20s, each rated at 91.6 kN (20,600 lb st) standard, or two CFM56-7B24S, each rated at 101 kN (22,700 lb st) in high gross weight version.
737-800: Two CFM56-7B24s, each rated at 107.6 kN (24,200 lb st) standard, or two CFM56-7B27s, each rated at 121.4 kN (27,300 lb st) in high gross weight version.
737-900: Two CFM56-7B26s, each rated at 117 kN (26,300 lb st) standard, or two CFM56-7B27S, each rated at 121.4 kN (27,300 lb st) in high gross weight version.
Fuel capacity (all) 26,025 litres (6,875 US gallons; 5,725 Imp gallons).

ACCOMMODATION: *All*: Crew of two side by side on flight deck. One plug-type door at each corner of cabin, with passenger doors on port side and service doors on starboard side. Airstair for forward cabin door optional. Overwing emergency exit on each side. One or two galleys and one modular vacuum lavatory forward and one or two galleys and lavatories aft; all lavatories interconnected to single waste collection tank at port side rear. Lightweight interior, of crushed core materials, has movable class divider, overnight seating-pitch flexibility and modular passenger service unit (PSU) including fold-down video screen in underside of baggage bin. Centreline stowage bins optional for emergency equipment and crew baggage.
Two underfloor baggage holds, forward and aft of wing. Rear hold has provision for post-delivery installation of telescopic baggage conveyor system (when additional fuel tanks not fitted). One baggage door in starboard side of each hold.
737-600: Alternative cabin layouts seat from 110 to 132 passengers. Typical arrangements offer eight first class seats four-abreast at 91 cm (36 in) pitch and 102 tourist class seats six-abreast at 81 cm (32 in) pitch in mixed class; and 132 all-tourist class at 76 cm (30 in) pitch. Total overhead baggage capacity of 6.1 m^3 (216 cu ft), equivalent to 0.045 m^3 (1.6 cu ft) per passenger.
737-700: Alternative cabin layouts seat from 126 to 149 passengers. Typical arrangements offer eight first class seats four-abreast at 91 cm (36 in) pitch and 118 tourist class seats six-abreast at 81 cm (32 in) pitch in mixed class; and 149 all-tourist class at 76 cm (30 in) pitch. Total overhead baggage capacity of 7.0 m^3 (248 cu ft), equivalent to 0.05 m^3 (1.8 cu ft) per passenger. C-40A options comprise 121 passengers, all-cargo (eight pallets) and combinations of 70 passengers and three pallets.
737-800: Alternative cabin layouts seat from 162 to 189 passengers. Typical arrangements offer 12 first class seats four-abreast at 91 cm (36 in) pitch and 150 tourist class seats six-abreast at 81 cm (32 in) pitch in mixed class; and 189 all-tourist class at 76 cm (30 in) pitch. Total overhead baggage capacity of 9.3 m^3 (328 cu ft), equivalent to 0.05 m^3 (1.7 cu ft) per passenger.
737-900: Alternative cabin layouts seat from 177 to 189 passengers. Typical arrangements offer 12 first class seats four-abreast at 91 cm (36 in) pitch and 165 tourist class seats six-abreast at 81 cm (32 in) pitch in mixed class; and 189 all-tourist class at 81 cm (32 in) pitch.

SYSTEMS: Honeywell 131-9(B) APU with air start capability to maximum certified altitude and 90 kVA electrical load capability to 11,278 m (37,000 ft). Three-wheel air cycle environmental control system with optional ozone converter and digital cabin pressure controls.

AVIONICS: Flight: Satellite navigation standard. Optional satcom and dual FMS (single standard) integrated with GPS.
Instrumentation: Honeywell Air Transport Systems common display system (CDS) with five-screen flat-panel liquid crystal display (LCD) technology and programmable software, enables operators to emulate previous 737 electronic flight instrument system (EFIS) and **747-400**/777 primary flight display-navigation display (PFD-ND) flight deck formats. Optional HUD.

DIMENSIONS, EXTERNAL:	
Wing span (all versions): standard	34.31 m (112 ft 7in)
with winglets	35.79 m (117 ft 5 in)
Wing chord: at root	5.71 m (18 ft 9 in)
at tip	1.25 m (4 ft 1 $^1/_4$ in)
Wing aspect ratio, standard	9.4

Length: overall: 600	31.24 m (102 ft 6 in)
700	33.63 m (110 ft 4 in)
800	39.47 m (129 ft 6 in)
900	42.11 m (138 ft 2 in)
fuselage: 700	32.18 m (105 ft 7 in)
800	38.02 m (124 ft 9 in)
900	40.67 m (133 ft 5 in)
Height overall: 600, 700	12.57 m (41 ft 3 in)
800, 900	12.55 m (41 ft 2 in)
Tailplane span: all	14.35 m (47 ft 1 in)
Wheel track (c/l shock-struts): all	5.71 m (18 ft 9 in)
Wheelbase: 700	12.60 m (41 ft 4 in)
800	15.60 m (57 ft 2 in)
900	17.17 m (56 ft 4 in)
Distance between engine centerlines	9.65 m (31 ft 8 in)
Main passenger door (port, fwd), all:	
Height	1.83 m (6 ft 0 in)
Width	0.86 m (2 ft 10 in)
Height to sill: at OWE	2.74 m (9 ft 0 in)
at MTOW	2.59 m (8 ft 6 in)
Passenger door (port, rear):	
Height: all	1.83 m (6 ft 0 in)
Width: all	0.76 m (2 ft 6 in)
Height to sill: 600,700: at OWE	3.10 m (10 ft 2 in)
at MTOW	2.95 m (9 ft 8 in)
800,900: at OWE	3.12 m (10 ft 2 in)
at MTOW	2.97 m (9 ft 9 in)
Emergency exits (overwing, port and stbd, each), all:	
Height	0.96 m (3 ft 2 in)
Width	0.51 m (1 ft 8 in)
Service door (stbd, fwd), all:	
Height	1.65 m (5 ft 5 in)
Width	0.76 m (2 ft 6 in)
Height to sill: at OWE	2.74 m (9 ft 0 in)
at MTOW	2.59 m (8 ft 6 in)
Service door (stbd, rear):	
Height: all	1.65 m (5 ft 5 in)
Width: all	0.76 m (2 ft 6 in)
Height to sill: 600,700: at OWE	3.10 m (10 ft 2 in)
at MTOW	2.97 m (9 ft 9 in)
800,900: at OWE	3.12 m (10 ft 3 in)
at MTOW	2.97 m (9 ft 9 in)
Baggage hold door (stbd, fwd), all:	
Height: door 1.30 m (4 ft 3 in) clear access	0.89 m (2 ft 11 in)
Width	1.22 m (4 ft 0 in)
Height to sill	1.45 m (4 ft 9 in)
Baggage hold door (stbd, rear), all:	
Height: door 1.22 m (4 ft 0 in) clear access	0.84 m (2 ft 9 in)
Width	1.22 m (4 ft 0 in)
Height to sill: 700	1.78 m (5 ft 10 in)
800,900	1.80 m (5 ft 11 in)
DIMENSIONS, INTERNAL:	
Cabin, aft of flight deck to rear pressure bulkhead:	
Length: 600	21.79 m (71 ft 6 in)
700	24.18 m (79 ft 4 in)
800	30.02 m (98 ft 6 in)
Max height: all	2.13 m (7 ft 0 in)
Floor area: 600	67.3 m^2 (725 sq ft)
700	75.1 m^2 (808 sq ft)
800	94.0 m^2 (1,012 sq ft)
Baggage hold:	
Length: 700: front	4.67 m (15 ft 4 in)
rear	8.03 m (26 ft 4 in)
800: front	7.67 m (25 ft 2 in)
rear	10.87 m (35 ft 8 in)
900: front	9.25 m (30 ft 4 in)
rear	11.94 m (39 ft 2 in)
Max width, all: at roof	3.15 m (10 ft 4 in)
atfloor	1.22 m (4 ft 0 in)
Min height, all	1.13 m (3 ft 8 $^1/_2$ in)
Volume	
600: front	7.0 m^3 (248 cu ft)
rear	13.4 m^3 (472 cu ft)
700: front	11.5 m^3 (406 cu ft)
rear	16.9 m^3 (596 cu ft)
800 : front	19.6 m^3 (692 cu ft)
rear	25.5 m^3 (899 cu ft)

900 : front	23.8 m^3 (840 cu ft)
rear	28.7 m^3 (1,012 cu ft)
AREAS:	
Wings , gross	125.00 m^2 (1,345.5 sq ft)
Vertical tail surfaces (total)	26.40 m^2 (284.2 sq ft)
Horizontal tail surfaces (total)	32.80 m^2 (353.1 sq ft)
WEIGHTS and LOADINGS:	
600:	A: CFM56-7B18 engines
	B: CFM56-7B22s
700:	A: CFM56-7B20s
	B: CFM56-7B24s
800:	A: CFM56-7B24s
	B: CFM56-7B27s
900:	A: CFM56-7B26s
	B: CFM56-7B27s
Operating weight empty:	
600,110 passengers: A, B	37,104 kg (81,800 lb)
700,126 passengers: A, B	38,147 kg (84,100 lb)
800,162 passengers: A, B	41,145 kg (90,710 lb)
900, 177 passengers: A, B	42,493 kg (93,680 lb)
Max T-O weight:	
600: A	56,245 kg (124,000 lb)
B	65,090 kg (143,500 lb)
700: A	60,330 kg (133,000 lb)
B	70,080 kg (154,500 lb)
800: A	70,535 kg (155,500 lb)
B	79,015 kg (174,200 lb)
900: A	74,840 kg (164,000 lb)
B	79.015 kg (174,200 lb)
Max ramp weight:	
600: A	56,470 kg (124,500 lb)
B	65,315 kg (144,000 lb)
700: A	60,555 kg (133,500 lb)
B	70,305 kg (155,000 lb)
800: A	70,760 kg (156,000 lb)
B	79,245 kg (174,700 lb)
900: A	74,615 kg (164,500 lb)
B	79,245 kg (174,700 lb)
Max landing weight:	
600 A, B	54,655 kg (120,500 lb)
700: A	58,060 kg (128,000 lb)
B	58,605 kg (129,200 lb)
800: A	65,315 kg (144,000 lb)
B	66,360 kg (146,300 lb)
900: A	66,360 kg (146,300 lb)
B	66,810 kg (147,300 lb)
Max zero-fuel weight:	
600: A	51,480 kg (113,500 lb)
B	51,710 kg (114,000 lb)
700: A	54,655 kg (120,500 lb)
B	55,200 kg (121,700 lb)
800: A	61,690 kg (136,000 lb)
B	62,730 kg (138,300 lb)
900: A	62,730 kg (138,300 lb)
B	63,640 kg (140,300 lb)
Max wing loading:	
600: A	450.0 kg/m^2 (92.16 lb/sq ft)
B	520.7 kg/m^2 (106.65 lb/sq ft)
700: A	482.6 kg/m^2 (98.85 lb/sq ft)
B	560.6 kg/m^2 (114.83 lb/sq ft)
800: A	564.3 kg/m^2 (115.57 lb/sq ft)
B	632.1 kg/m^2 (129.47 lb/sq ft)
900: A	595.1 kg/m^2 (121.89 lb/sq ft)
B	632.1 kg/m^2 (129.47 lb/sq ft)
Max power loading:	
600: A	324 kg/kN (3.18 lb/lb st)
B	322 kg/kN (3.16 lb/lb sf)
700: A	329 kg/kN (3.23 lb/lb st)
B	347 kg/kN (3.40 lb/lb st)
800: A	327 kg/kN (3.21 lb/lb st)
B	325 kg/kN (3.19 lb/lb st)
900: A	318 kg/kN (3.12 lb/lb st)
B	325 kg/kN (3.19 lb/lb st)
PERFORMANCE (A, B as above):	
Max operating Mach No. (Mmo):all	0.82
Cruising speed: all	M0.785
Approach speed:	
600: A, B	125 kt (232 km/h; 144 mph)

700: A	129 kt (239 km/h; 148 mph)
B	130 kt (241 km/h; 150 mph)
800: A	141 kt (261 km/h; 162 mph)
B	142 kt (263 km/h; 163 mph)
900: A, B	141 kt (261 km/h; 162 mph)
Max certified altitude: all	12,500 m (41,000 ft)
Initial cruising altitude, ISA +10°C:	
600: A	12,500 m (41,000 ft)
B	12,220 m (40,100 ft)
700: A	12,500 m (41,000 ft)
B	11,700 m (38,400 ft)
800: A	11,675 m (38,300 ft)
B	10,955 m (35,940 ft)
900: A	11,215 m (36,800 ft)
B	10,820 m (35,500 ft)
T-O field length, S/L, 30°C:	
600: A	1,616 m (5,300 ft)
B	1,796 m (5,890 ft)
700: A	1,744 m (5,720 ft)
B	1,677 m (5,500 ft)
800: A	2,100 m (6,890 ft)
B	2,308 m (7,570 ft)
900: A	2,591 m (8,500 ft)
B	2,439 m (8,000 ft)
Landing field length at max landing weight :	
600: A, B	1,342 m (4,400 ft)*
700: A	1,418 m (4,650 ft)
B	1,433 m (4,700 ft)*
800: A	1,646 m (5,400 ft)
B	1,646 m (5,400 ft)
900: A, B	1,662 m (5,450 ft)
Design range:	
600 with 110 passengers:	
A	1,340 n miles (2,481 km; 1,542 miles)
B	3,050 n miles (5,648 km; 3,509 miles)
700 with 126 passengers:	
A	1,540 n miles (2,852 km; 1,772 miles)
B+	3,260 n miles (6,037 km; 3,751 miles)
800 with 162 passengers:	
A	1,990 n miles (3,685 km; 2,290 miles)
B+	2,940 n miles (5,444 km; 3,383 miles)
900 with 177 passengers:	
A	2,060 n miles (3,815 km; 2,370 miles)
B+	2,745 n miles (5,083 km; 3,158 miles)
* *Category D Honeywell brakes* + *with optional blended winglets*	