The Airbus A380 is a double-deck, wide-body, four-engine airliner manufactured by the European corporation Airbus, a subsidiary of EADS. The largest passenger airliner in the world, the A380 made its maiden flight on 27 April 2005 from Toulouse, France, and made its first commercial flight on 25 October 2007 from Singapore to Sydney with Singapore Airlines. The aircraft was known as the Airbus A3XX during much of its development phase, but the nickname Superjumbo has since become associated with it.

The A380's upper deck extends along the entire length of the fuselage, and its width is equivalent to that of a widebody aircraft. This allows for an A380-800's cabin with 5,146 square feet (478.1 m²) of floor space; 49% more floor space than the current next-largest airliner, the Boeing 747-400 with 3,453 square feet (320.8 m²), and provides seating for 525 people in a typical three-class configuration or up to 853 people in all-economy class configurations. The A380-800 has a design range of 15,200 km (8,200 nmi; 9,400 mi), sufficient to fly from New York to Hong Kong for example, and a cruising speed of Mach 0.85 (about 900 km/h or 560 mph at cruising altitude).

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### Airbus A380

**A Qantas A380 takes off at London Heathrow**

<table>
<thead>
<tr>
<th>Role</th>
<th>Airliner</th>
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<tr>
<td>National origin</td>
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<td>Airbus</td>
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<td>First flight</td>
<td>27 April 2005</td>
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<td>Introduced</td>
<td>25 October 2007 with Singapore Airlines</td>
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<tr>
<td>Status</td>
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<td>Primary users</td>
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<tr>
<td>Produced</td>
<td>2004–present</td>
</tr>
<tr>
<td>Number built</td>
<td>59 (as of 13 January 2011)[1]</td>
</tr>
<tr>
<td>Unit cost</td>
<td>US$375.3 million[2]</td>
</tr>
</tbody>
</table>

[1] as of 13 January 2011

[2] US$375.3 million
Development

Background

In the summer of 1988, a group of Airbus engineers led by Jean Roeder began working in secret on the development of a ultra-high-capacity airliner (UHCA), both to complete its own range of products and to break the dominance that Boeing had enjoyed in this market segment since the early 1970s with its 747.[3] McDonnell Douglas unsuccessfully offered its smaller, double-deck MD-12 concept for sale.[4][5] Roeder was given approval for further evaluations of the UHCA after a formal presentation to the President and CEO in June 1990. The megaproject was announced at the 1990 Farnborough Air Show, with the stated goal of 15% lower operating costs than the 747-400.[6] Airbus organised four teams of designers, one from each of its partners (Aérospatiale, Deutsche Aerospace AG, British Aerospace, CASA) to propose new technologies for its future aircraft designs. The designs would be presented in 1992 and the most competitive designs would be used.[7]

In January 1993, Boeing and several companies in the Airbus consortium started a joint feasibility study of an aircraft known as the Very Large Commercial Transport (VLCT), aiming to form a partnership to share the limited market.[8][9] This joint study was abandoned two years later, Boeing's interest having decreased because analysts thought that such a product would unlikely earn the $15-billion in development costs. Despite the fact that only two airlines had expressed public interest in purchasing such a plane, Airbus was already pursuing its own large plane project. Analysts suggested that Boeing instead would pursue stretching their 747 design, and that air travel was already moving away from the hub and spoke system that consolidated traffic into large planes, and toward more non-stop routes that could be served by smaller planes.[10]

In June 1994, Airbus began developing its own very large airliner, designated the A3XX.[11][12] Airbus considered several designs, including an odd side-by-side combination of two fuselages from the A340, which was Airbus's largest jet at the time.[13] The A3XX was pitted against the VLCT study and Boeing's own New Large Aircraft successor to the 747.[14][15] From 1997 to 2000, as the East Asian financial crisis darkened the market outlook, Airbus refined its design, targeting a 15 to 20% reduction in operating costs
over the existing Boeing 747-400. The A3XX design converged on a double-decker layout that provided more passenger volume than a traditional single-deck design,[16][17] in line with traditional hub-and-spoke theory as opposed to the point-to-point theory of the Boeing 777,[18] after conducting an extensive market analysis with over 200 focus groups.[19][20] Still, since the 1995 forecasts to the present, others including a former Airbus executive have disputed the hub-and-spoke justification, and continued to predict that the market for very large aircraft such as the A380 is small.[21][22]

**Design phase**

On 19 December 2000, the supervisory board of newly restructured Airbus voted to launch a €8.8-billion programme to build the A3XX, re-christened as the A380,[23][24] with 50 firm orders from six launch customers.[25][26] The A380 designation was a break from previous Airbus families, which had progressed sequentially from A300 to A340. It was chosen because the number 8 resembles the double-deck cross section, and is a lucky number in some Asian countries where the aircraft was being marketed.[13] The aircraft’s configuration was finalised in early 2001, and manufacturing of the first A380 wing box component started on 23 January 2002. The development cost of the A380 had grown to €11 billion when the first aircraft was completed.[9]

**Production**

Major structural sections of the A380 are built in France, Germany, Spain, and the United Kingdom. Due to their size, they are brought to the assembly hall (the *Jean-Luc Lagardère Plant*) in Toulouse in France by surface transportation, though some parts are moved by the A300-600ST *Beluga* aircraft used in the construction of other Airbus models.[27] Components of the A380 are provided by suppliers from around the world; the five largest contributors, by value, are Rolls-Royce, Safran, United Technologies, General Electric and Goodrich.[19]

For the surface movement of large A380 structural components, a complex route known as the Itinéraire à Grand Gabarit was developed. This involved the construction of a fleet of roll-on/roll-off (RORO) ships and barges, the construction of port facilities and the development of new and modified roads to accommodate oversized road convoys.[28][29]

The front and rear sections of the fuselage are loaded onto one of three roll-on/roll-off (RORO) ships in Hamburg in northern Germany, from where they are shipped to the United Kingdom.[29][30] The wings, which are manufactured at Filton in Bristol and Broughton in North Wales, are transported by barge to Mostyn docks, where the ship adds them to its cargo.[31] In Saint-Nazaire in western France, the ship trades the fuselage sections from Hamburg for larger, assembled sections, some of which include the nose. The ship unloads in Bordeaux. Afterwards, the ship picks up the belly and tail sections by Construcciones Aeronáuticas SA in Cádiz in southern Spain, and delivers them to Bordeaux. From there, the A380 parts are transported by barge to Langon, and by oversize road convoys to the assembly hall in Toulouse.[32]
After assembly, the aircraft are flown to Hamburg Finkenwerder Airport (XFW) to be furnished and painted. It takes 3,600 L (950 US gal) of paint to cover the 3,100 m² (33,000 sq ft) exterior of an A380. Airbus sized the production facilities and supply chain for a production rate of four A380s per month.[31]

**Testing**

Five A380s were built for testing and demonstration purposes.[34] The first A380, serial number MSN001 and registration F-WWOW, was unveiled at a ceremony in Toulouse on 18 January 2005.[35] Its maiden flight took place at 8:29 UTC (10:29 a.m. local time) 27 April 2005.[36] This plane, equipped with Trent 900 engines, flew from Toulouse Blagnac International Airport with a flight crew of six headed by chief test pilot Jacques Rosay. After successfully landing three hours and 54 minutes later, Rosay said flying the A380 had been “like handling a bicycle”. [37]

On 1 December 2005 the A380 achieved its maximum design speed of Mach 0.96 (versus normal cruising speed of Mach 0.85), in a shallow dive, completing the opening of the flight envelope.[34] On 10 January 2006 the A380 made its first transatlantic flight to Medellín in Colombia, to test engine performance at a high altitude airport. [citation needed] It arrived in North America on 6 February, landing in Iqaluit, Nunavut in Canada for cold-weather testing.[38]

On 14 February 2006, during the destructive wing strength certification test on MSN5000, the test wing of the A380 failed at 145% of the limit load, short of the required 150% to meet the certification. Airbus announced modifications adding 30 kg to the wing to provide the required strength. [39] On 26 March 2006 the A380 underwent evacuation certification in Hamburg. With 8 of the 16 exits blocked, 853 passengers and 20 crew left the aircraft in 78 seconds, less than the 90 seconds required by certification standards. [40] Three days later, the A380 received European Aviation Safety Agency (EASA) and United States Federal Aviation Administration (FAA) approval to carry up to 853 passengers.[41]

The maiden flight of the first A380 using GP7200 engines—serial number MSN009 and registration F-WWEA—took place on 25 August 2006.[42][43] On 4 September 2006, the first full passenger-carrying flight test took place.[44] The aircraft flew from Toulouse with 474 Airbus employees on board, in the first of a series of flights to test passenger facilities and comfort.[44] In November 2006 a further series of route proving flights took place to demonstrate the aircraft’s performance for 150 flight hours under typical airline operating conditions.[45]

Airbus obtained type certificates for the A380-841 and A380-842 model from the EASA and FAA on 12 December 2006 in a joint ceremony at the company's French headquarters.[46][47] The A380-861 model obtained the type certificate 14 December 2007.[47]

**Production and delivery delays**
Initial production of the A380 was troubled by delays attributed to the 530 km (330 mi) of wiring in each aircraft. Airbus cited as underlying causes the complexity of the cabin wiring (100,000 wires and 40,300 connectors), its concurrent design and production, the high degree of customisation for each airline, and failures of configuration management and change control.\cite{48}\cite{49} Specifically, it would appear that German and Spanish Airbus facilities continued to use CATIA version 4, while British and French sites migrated to version 5.\cite{50} This caused overall configuration management problems, at least in part because wiring harnesses manufactured using aluminium rather than copper conductors necessitated special design rules including non-standard dimensions and bend radii; these were not easily transferred between versions of the software.\cite{51}

Airbus announced the first delay in June 2005 and notified airlines that deliveries would be delayed by six months.\cite{50} This reduced the total number of planned deliveries by the end of 2009 from about 120 to 90–100. On 13 June 2006, Airbus announced a second delay, with the delivery schedule undergoing an additional shift of six to seven months.\cite{52} Although the first delivery was still planned before the end of 2006, deliveries in 2007 would drop to only 9 aircraft, and deliveries by the end of 2009 would be cut to 70–80 aircraft. The announcement caused a 26% drop in the share price of Airbus's parent, EADS,\cite{53} and led to the departure of EADS CEO Noël Forgeard, Airbus CEO Gustav Humbert, and A380 programme manager Charles Champion.\cite{50}\cite{54} On 3 October 2006, upon completion of a review of the A380 program, the CEO of Airbus, Christian Streiff, announced a third delay,\cite{50} pushing the first delivery to October 2007, to be followed by 13 deliveries in 2008, 25 in 2009, and the full production rate of 45 aircraft per year in 2010.\cite{55} The delay also increased the earnings shortfall projected by Airbus through 2010 to €4.8 billion.\cite{50}\cite{56}

As Airbus prioritised the work on the A380-800 over the A380-800F,\cite{57} freighter orders were cancelled by FedEx\cite{58}\cite{59} and UPS\cite{60} or converted to A380-800 by Emirates and ILFC.\cite{61} Airbus suspended work on the freighter version, but said it remained on offer,\cite{62} albeit without a service entry date.\cite{63} For the passenger version Airbus negotiated a revised delivery schedule and compensation with the 13 customers, all of which retained their orders with some placing subsequent orders, including Emirates,\cite{64} Singapore Airlines,\cite{65} Qantas,\cite{66} Air France,\cite{67} Qatar Airways,\cite{68} and Korean Air.\cite{69}

On 13 May 2008 Airbus announced reduced deliveries for the years 2008 (12) and 2009 (21).\cite{70} After further manufacturing setbacks, Airbus reduced plans to deliver 14 A380s in 2009, down from the previously revised target of 18.\cite{71} A total of 10 A380s were delivered in 2009.\cite{72} In 2010 Airbus delivered 18 from the expected 20 A380s, due to Rolls-Royce engine availability problems.\cite{73} Airbus plans to deliver “between 20 and 25” A380s in 2011 before ramping up to three a month in 2012.\cite{73}

**Entry into service**
The first airline to operate the aircraft was Singapore Airlines.

The A380's wing is sized for a Maximum Take-Off Weight (MTOW) over 650 tonnes in order to accommodate these future versions, albeit with some strengthening required.[13][92] The stronger wing (and structure) will be used on the A380-800F freighter. This common design approach sacrifices some fuel efficiency on the A380-800 passenger model, but Airbus estimates that the size of the aircraft, coupled with the advances in technology described below,
difficult to sense its speed, and its upper deck is so far away from the engines the noise dissipates.

—TIME[^91]

**Flight deck**

Airbus used similar cockpit layout, procedures and handling characteristics to those of other Airbus aircraft, to reduce crew training costs. Accordingly, the A380 features an improved glass cockpit, and fly-by-wire flight controls linked to side-sticks.[^95][^96] The improved cockpit displays feature eight 15-by-20 cm (5.9-by-7.9 in) liquid crystal displays, all of which are physically identical and interchangeable; comprising two Primary Flight Displays, two navigation displays, one engine parameter display, one system display and two Multi-Function Displays. These MFDs are new with the A380, and provide an easy-to-use interface to the flight management system—replacing three multifunction control and display units.[^97] They include QWERTY keyboards and trackballs, interfacing with a graphical "point-and-click" display navigation system.[^98][^99]

**Engines**

The A380 can be fitted with two types of engines: A380-841, -842 and -843F with Rolls-Royce Trent 900, and A380-861 and -863F with Engine Alliance GP7000 turbofans. The Trent 900 is a derivative of the Trent 800, and the GP7000 has roots from the GE90 and PW4000. The Trent 900 core is a scaled version of the Trent 500, but incorporates the swept fan technology of the stillborn Trent 8104.[^100] The GP7200 has a GE90-derived core and PW4090-derived fan and low-pressure turbo-machinery.[^101] Only two of the four engines are fitted with thrust reversers.[^102]

Noise reduction was an important requirement in the A380's design, and particularly affects engine design.[^103][^104] Both engine types allow the aircraft to achieve QC/2 departure and QC/0.5 arrival noise limits under the Quota Count system set by London Heathrow Airport,[^105] which is a key destination for the A380.[^13]

The A380 was used to demonstrate the viability of a synthetic fuel comprising standard jet fuel with a natural-gas-derived component. On 1 February 2008, a three hour test flight operated between Britain and France, with one of the A380's four engines using a mix of 60% standard jet kerosene and 40% gas to liquids (GTL) fuel supplied by Shell.[^106] The aircraft needed no modification to use the GTL fuel, which was designed to be mixed with normal jet fuel. Sebastien Remy, head of Airbus SAS's alternative fuel programme, said the GTL used was no cleaner in CO₂ terms than standard fuel but it had local air quality benefits because it contains no sulphur.[^107]
Advanced materials

While most of the fuselage is aluminium, composite materials comprise more than 20% of the A380's airframe. Carbon-fibre reinforced plastic, glass-fibre reinforced plastic and quartz-fibre reinforced plastic are used extensively in wings, fuselage sections (such as the undercarriage and rear end of fuselage), tail surfaces, and doors. The A380 is the first commercial airliner to have a central wing box made of carbon fibre reinforced plastic. It is also the first to have a smoothly contoured wing cross section. The wings of other commercial airliners are partitioned span-wise into sections. This flowing, continuous cross section optimises aerodynamic efficiency. Thermoplastics are used in the leading edges of the slats. The new material GLARE (GLAss-REinforced fibre metal laminate) is used in the upper fuselage and on the stabilisers' leading edges. This aluminium-glass-fibre laminate is lighter and has better corrosion and impact resistance than conventional aluminium alloys used in aviation. Unlike earlier composite materials, it can be repaired using conventional aluminium repair techniques. Newer weldable aluminium alloys are also used. This enables the widespread use of laser beam welding manufacturing techniques — eliminating rows of rivets and resulting in a lighter, stronger structure.

Avionics architecture

The A380 employs an Integrated Modular Avionics (IMA) architecture, first used in advanced military aircraft, such as the F-22 Raptor, F-35, and Dassault Rafale. The main IMA systems on the A380 were developed by Thales Group. Designed and developed by Airbus, Thales and Diehl Aerospace, the IMA suite is first used on the A380. The suite is a technological innovation, with networked computing modules to support different applications.

Together with IMA, the A380 avionics are highly networked. The data communication networks use Avionics Full-Duplex Switched Ethernet, following the ARINC 664 standard. The data networks are switched, full-duplex, star-topology and based on 100baseTX fast-Ethernet. This reduces the amount of wiring required and minimises latency.

The Network Systems Server (NSS) is the heart of A380 paperless cockpit. It eliminates the bulky manuals and charts traditionally carried by pilots; the NSS has enough inbuilt robustness to eliminate onboard backup paper documents. The A380's network and server system stores data and offers electronic documentation, providing a required equipment list, navigation charts, performance calculations, and an aircraft logbook. All are accessible to the pilot from two additional 27 cm (11 in) diagonal LCDs, each controlled by its own keyboard and cursor control device mounted in the foldable table in front of each pilot.

Systems
Power-by-wire flight control actuators are used for the first time in civil service to back up the primary hydraulic flight control actuators. During certain manoeuvres, they augment the primary actuators.\[124\] They have self-contained hydraulic and electrical power supplies. They are used as electro-hydrostatic actuators (EHA) in the aileron and elevator, electric and hydraulic motors to drive the slats as well as electrical backup hydrostatic actuators (EBHA) for the rudder and some spoilers.\[125\]

The aircraft's 350 bar (35 MPa or 5,000 psi) hydraulic system is an improvement over the typical 210 bar (21 MPa or 3,000 psi) system found in other commercial aircraft since the 1940s.\[126\][127\] First used in military aircraft, higher pressure hydraulics reduce the size of pipelines, actuators and other components for overall weight reduction. The 350 bar pressure is generated by eight de-clutchable hydraulic pumps.\[127\][128\] Pipelines are typically made from titanium and the system features both fuel and air-cooled heat exchangers. The hydraulics system architecture also differs significantly from other airliners. Self-contained electrically-powered hydraulic power packs serve as backups for the primary systems, instead of a secondary hydraulic system, saving weight and reducing maintenance.\[129\]

The A380 uses four 150 kVA variable-frequency electrical generators,\[130\] eliminating constant speed drives and improving reliability.\[131\] The A380 uses aluminium power cables instead of copper for weight reduction. The electrical power system is fully computerised and many contactors and breakers have been replaced by solid-state devices for better performance and increased reliability.\[125\]

The A380 features a bulbless illumination system. LEDs are employed in the cabin, cockpit, cargo and other fuselage areas. The cabin lighting features programmable multi-spectral LEDs capable of creating a cabin ambience simulating daylight, night, or levels in between.\[132\] On the outside of the aircraft, HID lighting is used for brighter, whiter illumination.

The A380 was initially planned without thrust reversers, as Airbus designed the aircraft with ample braking capacity to not require their use.\[133\] However Airbus elected to fit the two inboard engines with thrust reversers in a late stage of development.\[102\][134\] The two outboard engines do not have reversers, reducing the amount of debris stirred up during landing. The A380 features electrically actuated thrust reversers, giving them better reliability than their pneumatic or hydraulic equivalents, in addition to saving weight.\[135\]

**Passenger provisions**

*Main article: Seat configurations of the Airbus A380*
Onboard features expected to reduce travel fatigue include a quieter interior and greater cabin air pressure than prior aircraft; the A380 produces 50% less cabin noise than the 747-400 and is pressurised to the equivalent of 1,520 m (5,000 ft) altitude versus 2,440 m (8,000 ft) on the 747-400. The A380 has 50% more cabin area and volume, larger windows, bigger overhead bins, and 60 cm (2.0 ft) extra headroom versus the 747-400. Onboard features expected to reduce travel fatigue include a quieter interior and greater cabin air pressure than prior aircraft; the A380 produces 50% less cabin noise than the 747-400 and is pressurised to the equivalent of 1,520 m (5,000 ft) altitude versus 2,440 m (8,000 ft) on the 747-400. The A380 has 50% more cabin area and volume, larger windows, bigger overhead bins, and 60 cm (2.0 ft) extra headroom versus the 747-400.

In a 10-abreast configuration on the main deck, the A380's wider cabin allows for up to 48 cm (19 in) wide economy seats, versus 44.5 cm (17.5 in) on the 747-400. The A380 can also accommodate up to 11-abreast configurations, and its maximum certified carrying capacity is 853 passengers in an all-economy-class layout. According to Airbus, a typical three-class layout on the A380 accommodates 525 passengers, with 10 first, 76 business, and 439 economy class seats. Planned and announced configurations go from 407 passengers, to be used by Korean Air, up to 840 passengers, to be used by Air Austral.

The A380's full-length upper and lower decks are connected by two stairways, fore and aft, wide enough to accommodate two passengers side-by-side; this cabin arrangement allows multiple seat configurations. Some operators configured their aircraft for three-class service and developed special amenities for a number of passengers paying for first class or business class tickets, such as spacious private cabins with separate beds, lounges, and fully reclining seats. Airbus's initial publicity stressed the comfort and space of the A380's cabin, anticipating installations such as relaxation areas, bars, duty-free shops, and beauty salons.

On its A380s, Air France has installed an electronic art gallery exclusively for first class and business class passengers. Singapore Airlines offers twelve partly-enclosed first-class suites on its A380s, each featuring one full and one secondary seat, a full-sized bed, desk, and personal storage. Four of these suites, C and D on rows 3 and 4, have dividing walls that can be removed to create two double suites with two beds modified into one double bed. Qantas Airways has shown a product for a long flat-bed that converts from the seat but does not have privacy doors. Emirates's fourteen first-class private suites have shared access to two "shower spas". First and business class passengers have shared access to a snack bar and lounge with two sofas, in addition to a first-class-only private lounge.

It has been suggested that the significantly high levels of customisation of the planes has slowed down production speeds and increased costs. On Qantas' A380s there are 6 self serve snack bars (4 on the lower deck for First Class and economy, 2 on the upper deck for Business and premium economy) and there is an on-board lounge for First and Business class passengers at the front of the upper deck. Virgin Atlantic Airways already offers a bar as part of its "Upper Class" service on its A340 and 747 aircraft, and has announced plans to include casinos, double beds, and gymnasiums on its A380s.

Integration with infrastructure and regulations

Ground operations
In the 1990s, aircraft manufacturers were planning to introduce larger planes than the Boeing 747. In a common effort of the International Civil Aviation Organization, ICAO, with manufacturers, airports and its member agencies, the “80-metre box” was created, the airport gates allowing planes up to 80 m (260 ft) wingspan and length to be accommodated.[158] Airbus designed the A380 according to these guidelines, [159][160] and to operate safely on Group V runways and taxiways, and while the U.S. FAA opposed this at an early stage,[161][162] in July 2007, the FAA and EASA agreed to let the A380 operate on 45 m runways without restrictions.[163] The A380-800 is approximately 30% larger in overall size than the 747-400,[164][165] and can land or take off on any runway that can accommodate a 747. Runway lighting and signage may need changes to provide clearance to the wings and avoid blast damage from the engines and taxiway shoulders may be required to be stabilised to reduce the likelihood of foreign object damage caused to (or by) the outboard engines, which overhang more than 25 m (82 ft) from the centre line of the aircraft.[166]

Airbus measured pavement loads using a 540-tonne (595 short tons) ballasted test rig, designed to replicate the landing gear of the A380. The rig was towed over a section of pavement at Airbus’ facilities that had been instrumented with embedded load sensors.[167] It was determined that the pavement of most runways will not need to be reinforced despite the higher weight,[166] as it is distributed on more wheels than in other passenger aircraft with a total of 22 wheels.[168] The A380 landing gear is in a similar layout as the 747, except for four more wheels via the incorporation of six wheels on each main body gear.[168]

The A380 requires service vehicles with lifts capable of reaching the upper deck,[169] as well as tractors capable of handling the A380's maximum ramp weight.[170] Using two jetway bridges the boarding time is 45 min, using an extra jetway to the upper deck it is reduced to 34 min.[171] The A380 test aircraft have participated in a campaign of airport compatibility testing to verify the modifications already made at several large airports, visiting a number of airports around the world.[172]

**Takeoff and landing separation**

In 2005, the ICAO recommended that provisional separation criteria for the A380 on takeoff and landing be substantially greater than for the 747 because preliminary flight test data suggested a stronger wake turbulence.[173][174] These criteria were in effect while the ICAO's wake vortex steering group, with representatives from the JAA, Eurocontrol, the FAA, and Airbus, refined its 3-year study of the issue with additional flight testing. In September 2006, the working group presented its first conclusions to the ICAO.[175][176]

In November 2006, the ICAO issued new interim recommendations. Replacing a blanket 10 nautical miles (19 km) separation for aircraft trailing an A380 during approach, the new distances were 6 nmi (11 km), 8 nmi (15 km) and 10 nmi (19 km) respectively for non-A380 "Heavy", "Medium", and "Light" ICAO aircraft categories. These
Emirates, the largest A380 customer, has ordered a higher weight A380-800 variant.

In August 2008, the ICAO issued revised approach separations of 4 nmi (7.4 km) for Super (another A380), 6 nmi (11 km) for Heavy, 7 nmi (13 km) for medium/small, and 8 nmi (15 km) for light.[178]

Future variants

Improved A380-800

From 2013, Airbus will offer, as an option, improved maximum take-off weight, thus providing a better payload/range performance. The option was introduced in order to counter a perceived strength of the 747-8I, the latest revision of the Boeing 747.[179] Maximum take-off weight is increased by 4t, to 573t. The increases are made possible by optimising the fly-by-wire control laws to reduce flight loads.[180] British Airways and Emirates will be the first customers to receive this new option.[181] Vietnam Airlines has shown interest in the higher-weight variant.[182]

A380-900

In November 2007, Airbus top sales executive and chief operating officer John Leahy confirmed plans for an enlarged variant, the A380-900, which would be slightly longer than the A380-800 (79.4–73 m or 260–240 ft).[183] This version would have a seating capacity of 650 passengers in standard configuration, and approximately 900 passengers in economy-only configuration. In May 2010, Airbus announced that A380-900 development was postponed, until production of the A380-800 has stabilised.[184] Airlines that have expressed interest in the model include Emirates,[185] Virgin Atlantic,[186] Cathay Pacific,[187] Air France-KLM, Lufthansa,[188] Kingfisher Airlines,[189] as well as the leasing company ILFC.[190]

A380-800 freighter

Airbus originally accepted orders for the freighter version, offering the second largest payload capacity of any cargo aircraft, exceeded only by the Antonov An-225.[191] However, production has been suspended until the A380 production lines have settled with no firm availability date.[58][192][193]

Market
In 2006, industry analysts Philip Lawrence of the Aerospace Research Centre in Bristol and Richard Aboulafia of the consulting Teal Group in Fairfax anticipated 880 and 400 A380 sales respectively by 2025.\[19\] According to Lawrence, parallel to the design of the A380, Airbus conducted the most extensive and thorough market analysis of commercial aviation ever undertaken, justifying its VLA (very large aircraft, those with more than 400 seats) plans,\[19\] while according to Aboulafia, the rise of mid-size aircraft and market fragmentation reduced VLAs to niche market status, making such plans unjustified.\[19\] The two analysts' market forecasts differed in the incorporation of spoke-hub and point-to-point models.\[19\]

In 2007, Airbus estimated a demand for 1,283 passenger planes in the VLA category for the next 20 years if airport congestion remains at the current level. According to this estimate, demand could reach up to 1,771 VLAs if congestion increases. Most of this demand will be due to the urbanisation and rapid economic growth in Asia.\[194\] The A380 will be used on relatively few routes, between the most saturated airports. Airbus also estimates a demand for 415 freighters in the category 120-tonne plus. Boeing, which offers the only competition in that class, the 747-8, estimates the demand for passenger VLAs at 590 and that for freighter VLAs at 370 for the period 2007–2026.\[195\]

At one time the A380 was considered as a potential replacement for the existing Boeing VC-25 serving as Air Force One,\[196\][197\] but in January 2009 EADS declared that they were not going to bid for the contract, as assembling only three planes in the US would not make financial sense.\[198\]

As of June 2010, there were 234 orders for the A380-800. The break-even for the A380 was initially supposed to be reached at 270 units, but due to the delays and the falling exchange rate of the US dollar, it increased to 420 units.\[48\] In 2010, EADS CFO Hans Peter Ring said that break-even (on the aircraft that are delivered) could be achieved as early as 2015, despite the delays; there should be around 200 deliveries by that time, on current projections.\[199\] As of March 2010, the average list price of an A380 was US$ 375.3 million, depending on equipment installed.\[200\]

**Orders and deliveries**

*Main article: List of Airbus A380 orders and deliveries*

Seventeen customers have ordered the A380, including an order from aircraft lessor ILFC and one VIP order by Airbus Executive and Private Aviation.\[201\] Total orders for the A380 stand at 234 as of 8 June 2010,\[202\][203]\[204\] plus a further 6 ordered by Asiana Airlines in January 2011.\[205\] The biggest customer is Emirates, which in June 2010 increased its order by 32 aircraft to 90 total, or nearly 40% of all A380 orders at the time.\[206\] A total of 27 orders originally placed for the freighter version, A380-800F, were either cancelled (20) or converted to A380-800 (7), following the production delay and the subsequent suspension of the freighter programme.

Delivery takes place in Hamburg for customers from Europe and the Middle East and in Toulouse for
customers from the rest of the world.[207]

<table>
<thead>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Orders</td>
<td>A380-800</td>
<td>78</td>
<td>0</td>
<td>34</td>
<td>10</td>
<td>10</td>
<td>24</td>
<td>33</td>
<td>9</td>
<td>4</td>
<td>32[210]</td>
<td>6[211]</td>
</tr>
<tr>
<td>A380-800F</td>
<td>7</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>-17</td>
<td>-10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deliveries</td>
<td>A380-800</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>12</td>
<td>10</td>
<td>18[212]</td>
<td>2</td>
</tr>
</tbody>
</table>

**Commercial operators**

The following table lists airlines whose A380 aircraft have commenced commercial passenger flights. It does not include operators that have ordered A380s or taken delivery of or announced details of inaugural flights but not yet commenced commercial passenger flights. For further information, including non-commercial operators, see List of Airbus A380 orders and deliveries. Emirates is currently the largest operator of the A380 with 15 in service out of its total of 90 on order, itself the largest amount of any carrier. The shortest route that the A380 flies regularly is from Dubai to Jeddah with Emirates having a flight time of only 3 hours, although Air France has also operated the A380 on the even shorter Paris to London route during summer 2010.[213]

<table>
<thead>
<tr>
<th>Airline</th>
<th>First commercial flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air France</td>
<td>20 November 2009[214]</td>
</tr>
<tr>
<td>Emirates</td>
<td>1 August 2008[78]</td>
</tr>
<tr>
<td>Lufthansa</td>
<td>6 June 2010[215]</td>
</tr>
<tr>
<td>Qantas</td>
<td>20 October 2008[79]</td>
</tr>
<tr>
<td>Singapore Airlines</td>
<td>25 October 2007[74]</td>
</tr>
</tbody>
</table>

**Incidents and accidents**

The A380 has been involved in one aviation accident as of January 2011.[216][217]

- On 4 November 2010, Qantas Flight 32, en route from Singapore Changi Airport to Sydney Airport, suffered an uncontained engine failure, resulting in a series of related problems,[218][219] and forcing the flight to return to Singapore. There were no injuries to the passengers, crew or people on the ground despite debris falling onto the Indonesian island of Batam.[220][221] Qantas subsequently grounded all of their A380s that day subject to an internal investigation taken in conjunction with the engine manufacturer Rolls-Royce plc. Other operators of Rolls-Royce-powered A380s were also affected. Investigators later determined the cause of the explosion to be an oil leak in the Trent 900 engine.[222][223]

**Specifications**
A size comparison between four of the largest aircraft, the Antonov An-225 (green), the Hughes H-4 Hercules (gold), the Boeing 747-8 (blue), and the Airbus A380-800 (pink).

### Airbus A380-800 - Wikipedia, the free encyclopedia

**External images**

Airbus A380-800 cutaway from [Flightglobal.com](http://www.flightglobal.com/airspace/media/civilaviation1949-2006cutaways/images/6661/airbus-a340-300-cutaway.jpg)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>A380-800</th>
<th>A380-800F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cockpit crew</td>
<td>Two</td>
<td></td>
</tr>
<tr>
<td>Seating capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-class</td>
<td>525</td>
<td>644</td>
</tr>
<tr>
<td>Three-class</td>
<td>853</td>
<td></td>
</tr>
<tr>
<td>12 couriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length overall</td>
<td>72.73 m (238.6 ft)</td>
<td></td>
</tr>
<tr>
<td>Wingspan</td>
<td>79.75 m (261.6 ft)</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>24.45 m (80.2 ft)</td>
<td></td>
</tr>
<tr>
<td>Wheelbase</td>
<td>33.58 m (110.2 ft) wing landing gear</td>
<td>36.85 m (120.9 ft) body landing gear</td>
</tr>
<tr>
<td>Wheel track</td>
<td>12.46 m (40.9 ft)</td>
<td></td>
</tr>
<tr>
<td>Outside fuselage width</td>
<td>7.14 m (23.4 ft)</td>
<td></td>
</tr>
<tr>
<td>Outside fuselage height</td>
<td>8.41 m (27.6 ft)</td>
<td></td>
</tr>
<tr>
<td>Maximum cabin width</td>
<td>6.58 m (21.6 ft) Main deck</td>
<td>5.92 m (19.4 ft) Upper deck (floor level)</td>
</tr>
<tr>
<td>Cabin length</td>
<td>49.9 m (164 ft) Main deck</td>
<td>44.93 m (147.4 ft) Upper deck</td>
</tr>
<tr>
<td>Aspect ratio</td>
<td>33.5°</td>
<td></td>
</tr>
<tr>
<td>Wing area</td>
<td>845 m² (9,100 sq ft)</td>
<td></td>
</tr>
<tr>
<td>Wing sweep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum taxi/ramp weight</td>
<td>571,000 kg (1,260,000 lb)</td>
<td>592,000 kg (1,310,000 lb)</td>
</tr>
<tr>
<td>Maximum take-off weight</td>
<td>569,000 kg (1,250,000 lb)</td>
<td>590,000 kg (1,300,000 lb)</td>
</tr>
<tr>
<td>Maximum landing weight</td>
<td>391,000 kg (860,000 lb)</td>
<td>427,000 kg (940,000 lb)</td>
</tr>
<tr>
<td>Maximum zero fuel weight</td>
<td>366,000 kg (810,000 lb)</td>
<td>402,000 kg (890,000 lb)</td>
</tr>
<tr>
<td>Typical Operating empty weight</td>
<td>276,800 kg (610,000 lb)</td>
<td>252,200 kg (556,000 lb)</td>
</tr>
<tr>
<td>Maximum structural payload</td>
<td>89,200 kg (197,000 lb)</td>
<td>149,800 kg (330,000 lb)</td>
</tr>
<tr>
<td>Maximum cargo volume</td>
<td>176 m³ (6,200 cu ft)</td>
<td>1,134 m³ (40,000 cu ft)</td>
</tr>
<tr>
<td>Specification</td>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Maximum operating speed at cruise altitude</td>
<td>Mach 0.89[89] (945 km/h, 587 mph, 510 knots)</td>
<td></td>
</tr>
<tr>
<td>Maximum design speed in dive at cruise altitude</td>
<td>Mach 0.96[228] (at cruise altitude: 1020 km/h, 634 mph, 551 knots)</td>
<td></td>
</tr>
<tr>
<td>Take off run at MTOW/SL ISA</td>
<td>2,750 m (9,020 ft)[159]</td>
<td>2,900 m (9,500 ft)[159]</td>
</tr>
<tr>
<td>Range at design load</td>
<td>15,400 km (8,300 nmi, 9,500 mi)[89]</td>
<td>10,400 km (5,600 nmi, 6,400 mi)</td>
</tr>
<tr>
<td>Service ceiling</td>
<td>13,115 m (43,028 ft)[229]</td>
<td></td>
</tr>
<tr>
<td>Maximum fuel capacity</td>
<td>323,546 L (85,472 US gal)</td>
<td>310,000 L (81,893 US gal), 323,546 L (85,472 US gal) option</td>
</tr>
<tr>
<td>Engines (4 x)</td>
<td>GP7270 (A380-861) Trent 970/B (A380-841) Trent 972/B (A380-842)</td>
<td>GP7277 (A380-863F) Trent 977/B (A380-843F)</td>
</tr>
<tr>
<td>Thrust (4 x)</td>
<td>311 kN (70,000 lbf) - 355 kN (80,000 lbf)[230][231]</td>
<td></td>
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</tbody>
</table>

Sources: Airbus A380 specifications[89]

See also

- Competition between Airbus and Boeing
- List of megaprojects

Related development

- Airbus A350

Comparable aircraft

- Boeing 747-8
- Lockheed C-5 Galaxy
- Antonov An-225
- Antonov An-124

Related lists

- List of Aerospace megaprojects
- List of Airbus A380 orders and deliveries
Seat configurations of the Airbus A380

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Notes

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External links

  - Airbus A380 Navigator (http://events.airbus.com/A380/Default1.aspx)
  - A380 Airplane Characteristics (http://www.content.airbusworld.com/SITES/Technical_Data/docus/AC/DATA CONSULT/AC_A380.pdf) PDF (5.96 MB) and A380 Prestige Specifications (http://www.airbus.com/store/mm_repository/pdf/att00008394/media_object_file_A380_specifications.pdf) PDF (43.5 KB)

Airbus A3xx aircraft production timeline, 1970s-present

<table>
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<tr>
<th>1970s</th>
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<td>0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Airbus A300
  - Airbus A310
  - Airbus A320 family
    - Airbus A330
    - Airbus A340
  - Airbus A350

Airbus A380

= Out of production = In production = Future production

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