



50TH INTERNATIONAL
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Airbus Innovation Days



With its main structural assembly and system connections complete, the first A350 XWB flight test aircraft (designated MSN1) was moved from the main assembly hall to the adjacent indoor ground test station at Airbus' final assembly line in Toulouse, France.

Visit to Airbus facilities in Toulouse, France

Now moving on to *Vayu's* visit to Airbus' facilities in Toulouse in France. Barely four days after getting back to India on 1 June from the Airbus Military visit, jetlag notwithstanding, we flew into Toulouse, France to begin the two day session (5-6 June) with the Airbus commercial team at the AID'13, an annual event! First the statistics :

It's been another good year for the Company. Infact, things are only getting better for the civilian airliner manufacturer. Airbus has delivered a company record of 588 aircraft to 89 customers (17 new) and exceeded its order target of 650 by winning 914 gross orders for 2012. These orders include 305 320s, 478 320neos, 82 A330/A340s, 40 A350 XWB and nine A380s. Airbus' backlog has infact set a new industry-wide record of 4,682 aircraft valued at over US\$638 billion. Deliveries were 10 per cent higher than the 2011 record (534) and 2012 was the 11th year in a row of increased production. In single aisles, Airbus

set a new record of 455 deliveries (421 in 2011). Widebody deliveries reached a record 103 aircraft (87 in 2011), underlining the success of the A330 Family which is being produced at the highest monthly production rates ever (9.5 in 2012 rising to 10 in Spring 2013). The A380 delivery target of 30 was achieved setting a new company record for the type (26 in 2011).

Airbus' share of total aircraft sales by value (above 100 seats) in 2012, is 41 per cent gross (41.5 percent net). Net orders reached 833 aircraft worth US\$96 billion. These include 739 A320 Family aircraft taking Airbus past the 9,000th single aisle order. Of these, 478 are for the NEO, confirming its over 62 per cent market dominance since launch. In the widebody market, 58 A330s and 27 A350 XWB were ordered. The A350-1000 won major endorsements from leading airlines through significant upsizing of orders. In the very large aircraft segment, Airbus won nine out of 10 orders demonstrating the market's preference for the A380.

(AID) 2013



During 2012, the A350 XWB progressed well. The final assembly line became fully operational, the structural assembly of the first A350 XWB that will fly was completed and “electrical power on” of the aircraft was accomplished (more later).

Airbus recruited 5,000 employees in 2012 increasing the global employee figure to 59,000 and targets recruiting some 3,000 in 2013 to support all programme developments. “Looking back over 2012, we can proudly say it was a fantastic year. We delivered a record number of aircraft which highlights our increasing efficiency, and the market again demonstrated its confidence in all our products. In 2012, we delivered the first Sharklet aircraft, and with a commanding lead in the single aisle market, the dividends from our strategic decision to invest in the kind of innovation which generates value for our customers, is paying off,” stated Fabrice Bregier, Airbus President and CEO.



A Rolls-Royce Trent 900 engine is mated to Thai's first A380 on the Airbus final assembly line.

“We are keeping our production rates at a manageable pace, which is good for our supply chain, and bodes well for our long term profitability and bright future,” he continued.

Over the last 40 years, customer focus, commercial know-how, technological leadership and manufacturing efficiency have propelled Airbus to the forefront of the industry. Airbus today consistently captures about half of all commercial airliner orders. Airbus’ comprehensive product line comprises the families of aircraft ranging from 100 to more than 500 seats: the single-aisle A320 Family, including the A320neo, “best selling aircraft in aviation history”, the wide-body long-range A330 Family including the freighter and MRTT, the all-new next generation A350 XWB Family, and the double-deck A380. “Across all its aircraft families Airbus’ unique approach ensures that aircraft share the highest commonality in airframes, on-board systems, cockpits and handling characteristics. This significantly reduces operating costs for airlines”, stated company officials.

Airbus has sold over 12,000 aircraft to more than 500 customers/operators and has delivered over 7500 aircraft since it first entered service in 1974. Headquartered in Toulouse, France, Airbus is a global enterprise of some 59,000 employees, with fully-owned subsidiaries in the United States, China, Japan and in the Middle East, spare parts centres in Hamburg, Frankfurt, Washington, Beijing, Dubai and Singapore, while Airbus Military is headquartered in Madrid (Spain). Airbus also has training centres in Toulouse, Miami, Hamburg, Bangalore and Beijing, as well as Seville for Airbus Military, and more than 150 field service offices around the world. Airbus also relies on industrial co-operation and partnerships with major companies all over the world, with a network of some 2,000 suppliers (for the flying parts alone) in more than 20 countries.

Now to the A350XWB ! Airbus has installed on the first flight-test A350 XWB (MSN001) its two flight-ready Rolls-Royce Trent XWB engines and is also installing the new Honeywell HGT1700 auxiliary power unit (APU) at Airbus’ production facilities in Toulouse. The new Trent engines were received from UTC Aerospace Systems (formerly Goodrich) which had recently prepared the fully integrated powerplants prior to their installation on the aircraft’s pylons. Recently the Trent XWB received Engine Type Certification from EASA, confirming that the engine had fulfilled EASA’s airworthiness requirements for flight. The Trent XWB has already powered a series of test flights on Airbus’ A380 Flying Test Bed (FTB) aircraft since February 2012, demonstrating a high level of maturity.

In parallel to mounting of the two Trent XWB engines in Toulouse, the A350 XWB was also fitted with its new specially developed APU – the Honeywell HGT1700 which has greater power density and higher efficiency than the previous generation APUs. With the installation of its engines and also the APU, the A350 XWB MSN001 becomes essentially a ‘completed’ aircraft. Following the ongoing ground tests, other preparations and also painting, MSN001 will then be handed over to the Airbus Flight Test team to commence preparations for ground runs and maiden flight in the summer.

The A350XWB has also been through lightning strike evaluations. These so-called ‘electromagnetic hazard’ evaluations – which took place mid-April at Airbus’ Clément Ader facility in Colomiers, France – involved the second A350 XWB flight test

Construction begins on Airbus’ U.S. assembly line

Airbus manufacturing in the United States advanced another step closer to reality in Mobile, Alabama, as construction of the company’s A320 Family Assembly Line has officially begun. The new assembly line, which is the company’s first U.S.-based production facility, will be located at the Mobile Brookley Aeroplex and will facilitate assembly of A319, A320 and A321 aircraft. Major construction of the facility will begin this summer, with aircraft assembly planned to begin in 2015, with first delivery of a Mobile-assembled aircraft in 2016. At full production, the assembly line and associated facilities would produce up to four aircraft a month which directly translates into employing as many as 1,000 high-skilled workers.



President and CEO Fabrice Brégier underscored the significance of Airbus’ U.S. A320 Family final assembly line during the 8 April 2013 groundbreaking ceremony in Mobile, Alabama.

aircraft, MSN3, to demonstrate necessary protection levels in case of lightning strikes while airborne. The A350 XWB’s aerostructure is primarily made of composite materials (carbon fibre reinforced plastic), providing more electrical resistance than an aerostructure consisting mostly of metallics. To ensure the A350 XWB aerostructure safely manages lightning strikes, Airbus developed a solution where metallic foils are embedded in the aircraft’s composite panels – increasing the aerostructure’s electrical conductivity and protecting harnesses with metallic conduits.

Metallic foils have already been used on the A380 rear fuselage section, however as the A350 XWB includes a higher percentage of composite materials, it is important to confirm that such foils provide adequate protection for systems and equipment.

The A350 XWB ‘electromagnetic hazard’ testing on MSN3 lasted around three days, consisting of lightning strike simulations and follow-up measurements of induced voltage/current levels on selected harnesses. These evaluations use a low-level current injection rather than the actual electrical current level generated by a lightning strike, with the measured voltages and current then

Airbus: demand spurs need for over 28,000 aircraft in the next 20 years

Airbus' latest Global Market Forecast (GMF) identifies a need for some 28,200 passenger and freighter aircraft (of 100 seats or more) between 2012 and 2031 worth nearly \$4.0 trillion, reconfirming an upward trend in the pace of new aircraft deliveries. Of these over 27,350 will be passenger aircraft valued at \$ 3.7 trillion.

Passenger traffic will grow at an average annual rate of 4.7 percent in the next 20 years, during which some 10,350 aircraft will be replaced by new efficient models. By 2031 the world's passenger fleet will have expanded by 110 percent from slightly over 15,550 today to over 32,550. In the same period, the world's freighter fleet will almost double from 1,600 to 3,000 aircraft.

In value terms, the single biggest market is China followed by the US, UAE and India. Demand for twin-aisle aircraft (250 to 400 seats), like the A330 and the A350 XWB, some 6,970 new passenger and freighter aircraft will be delivered valued at some US\$ 1.7 trillion. Of these, 6,500 are passenger aircraft valued at US\$ 1.6 trillion (44 percent by value of passenger deliveries, 24 percent of units). Leading demand is Asia Pacific (46 percent), Europe (17 percent) and the North America (13 percent).

extrapolated to the real threat of 200,000 amperes. This testing will be continued by similar but longer tests on the MSN4 aircraft in 2014, fulfilling a requirement for type certification of Airbus' A350-900 version.

The A350 XWB Family consists of three passenger versions with long-range capability of flying up to 8,500nm/15,580km. In a typical three-class configuration, the A350-800 will offer 270 seats while the A350-900 and the A350-1000 will offer 314 and 350 seats respectively. The A350 XWB offers a "very quiet and extremely comfortable cabin". At 220 inches/5.58 meters from armrest to armrest, the cabin provides a wide 18 inch seat in-line with the best comfort standards. Passengers will enjoy more headroom, wider panoramic windows, and larger overhead storage space. Crews will be able to relax when off-duty in extremely comfortable crew rest compartments located in the crown area, well outside the revenue generating cabin space.

Airbus recognises the need for sustainable development of air travel. Next generation Rolls-Royce Trent XWB engines and state-of-the-art aerodynamics help reduce emissions well below current and anticipated future regulatory levels. Carbon dioxide (CO₂) emissions per passenger will be up to 25 percent lower than with current generation aircraft in this category and exterior noise levels will be as much as 15 EPNdB (Effective Perceived Noise Decibel) below ICAO Chapter-4 requirements.

Turkish Airlines places its biggest ever order

Turkish Airlines, the largest airline in Turkey, has signed a contract for up to 117 A320 Family aircraft (25 A321ceo, 4 A320neo, 53 A321neo and options for 35 additional A321neo aircraft).



Lion Air orders 234 A320 Family aircraft

Indonesia's Lion Air has placed a firm order with Airbus for 234 A320 Family aircraft, comprising 109 A320neo, 65 A321neo and 60 A320ceo. The deal sees the carrier become a new customer for Airbus. Lion Air Group will use the aircraft to meet growth requirements on its expanding domestic and regional route network. The carrier will announce engine selections for the aircraft in the near future.





Frame by frame, the A350XWB emerges !



Airbus has installed its two flight-ready Rolls-Royce Trent XWB engines and the new Honeywell HGT1700 APU on the first flight-test A350 XWB (MSN001).



During lightning strike evaluations.



Fuselage sections for the third A350 XWB – which will be used for a wide range of evaluations in the flight test programme – were joined at the A350 XWB Final Assembly Line in Toulouse, France.



Airbus' first A350 XWB moved to the next phase of ground testing with its transfer from the final assembly line to the Clément Ader area 'Station 18' in Toulouse, which is primarily dedicated to fuel, pressure and radio navigability evaluations.



Painting of the first A350 XWB (MSN001) is fully complete as it emerges in its Airbus livery out from the paintshop in Toulouse. This latest milestone shows that MSN001 is progressing well on its route to first flight. The aircraft painting was achieved in less than seven days and follows the recent completion of MSN001's flight-test-instrumentation (FTI) verification.

Now onto the A380. In its sixth year of commercial service, the A380 is flying with nine airlines. To date, the worldwide fleet has carried some 36 million passengers in 100,000 flights. Previous generation Very Large Aircraft (VLA or 400 seats and above) would have required 140,000 flights. This reduction in flights brings essential relief to airport-congestion and the environment. The corresponding saving of 5.7 million tonnes of CO₂, demonstrates that A380 generates more revenue whilst minimising emissions and noise. The A380 fleet performs over 140 flights per day and carries over one and a half million people each month. Passengers can hop on board one of the A380s which are either taking off or landing every six minutes at one of the 32 international airports where it operates to date. On top of these, more than 50 other airports are getting prepared to accommodate the A380 and answer the airlines' need for more A380 destinations.

Over the next 20 years, more than 1,700 VLA, such as the A380, will have been delivered. Asia Pacific leads demand (45 percent) for these high capacity aircraft, followed by the Middle East (23 percent) and Europe (19 percent).

Typically seating 525 passengers in three classes on two decks, the aircraft is capable of flying 8,500 nautical miles or 15,700 kilometres non-stop, carrying more people at lower cost and with less impact on the environment. The spacious, quiet cabin and smooth ride have made the A380 a firm favourite with passengers, resulting in higher load factors wherever it flies.

Since 2006 the A380 has registered repeat orders by customers every year, bringing the total order book to date to 262 from 20 customers.

Moving on to the A330 Family, these span 250 to 300 seats, and includes Freighter, VIP, and Military Transport/Tanker



A380 of Thai Airways International.



The livery for British Airways' first A380 includes approximately 10,000 individual dots on the tailfin that make up its Union Flag graphic.



John Leahy, Airbus Chief Operating Officer - Customers, with a scale model A380. "We expect more than 1,700 Very Large Aircraft – such as the 21st century A380 flagship – to be delivered by 2031".

variants, which have now attracted more than 1,240 orders. Thanks to the introduction of numerous product improvements, it still remains the "most cost-efficient aircraft in its class". With more than 920 aircraft delivered to over 90 operators, the type is achieving average dispatch reliability above 99 percent. The

Lufthansa Board gives "go-ahead" for major orders

The Lufthansa's Supervisory Board has approved the acquisition of 100 A320 Family aircraft (35 A320neo, 35 A321neo and 30 A320ceo with Sharklets) and two A380s worth approximately US\$ 11.2 billion at list prices. The Lufthansa Group remains Airbus' biggest operator worldwide with 385 Airbus aircraft currently in service. These include 271 A320 Family, 41 A330s, 63 A340s, and 10 A380s.



A330-200 variant has the versatility to cover all ranges from short-haul to true long haul – ideal for point to point operations. Currently, as more A320 Family ‘single-aisle’ operators discover the “advantages of stepping-up” to the ‘twin-aisle’ A330-200, they become new A330 operators who “recognise its merits” as a compelling, alternative to larger long-range airliners with a potential for growth with the A330-300.

Airbus now offers further enhanced performance for this airliner family by increasing the maximum takeoff weight capability up to 242 metric tonnes, which will first be applied to the larger A330-300 model and subsequently to the A330-200.

The new take-off weight capability combined with the fuel capacity increase enables operators of these new A330-300s to carry additional payload on longer missions. Overall, the full payload range now increases by around 500nm over today’s 235 tonne A330-300, and by around 350nm over today’s 238 tonne A330-200.

The A330-300’s optional fuel capacity increase will be achieved by activating the centre wing tank for the first time on this model. The centre tank and its associated systems have always been present as standard on its longer-range sibling – the A330-200.

The A330 has recently been certified by EASA for extended ETOPS from 180 to 240 minutes. This will help operators further by allowing higher payloads and schedule reliability, lower fuel burn, CO₂ emissions and flight-times. Airbus is also incorporating other technical improvements directed towards improving eco-efficiency and reducing the cost of operation. A good example includes navigation upgrades such as ATSAW (Airborne Traffic Situational Awareness), leading to shortened routings at optimum flight levels and facilitating more precise approaches.



Because of strong market demand, Airbus has increased the production rate for its A330.

The single-aisle family

With over 9,100 aircraft ordered and more than 5,400 aircraft delivered to over 380 customers and operators worldwide, the A318, A319, A320 and A321 make up the “world’s best-selling single-aisle aircraft family” and are the “preferred choice” with traditional airlines and passengers, as well as with the fast-growing low-cost carrier market for which it is now the reference.

Airbus delivers 100th Airbus to Japan

With the latest delivery of an A320 to Jetstar Japan, the total number of Airbus aircraft delivered to Japanese carriers has risen to 100, underscoring the rapidly growing number of Airbus single-aisle aircraft in the country. In just nine months since beginning of operations in July 2012, Jetstar fleet has grown to 10 aircraft. Airbus delivered its first aircraft to a Japanese carrier in 1980 (an A300B2) and in the last two years deliveries have accelerated rapidly. In 2012, Airbus delivered a total of 16 A320s, and in 2013 nearly 30 A320s will be delivered to four Japanese operators.



The A320neo (new engine option) is the latest of many product upgrades as Airbus continues to invest around 300 million euros a year on the A320 Family. These new A319, A320 and A321 models were announced in December 2010 and feature new engines (the PurePower PW1100G from Pratt and Whitney or the LEAP-1A from CFM) and large wingtip devices known as Sharklets. Together they result in a 15% fuel burn reduction, corresponding to an annual CO₂ reduction of 3,600 tonnes per aircraft.

Meanwhile, Sharklets are available as a forward-fit option since the end of 2012 and are expected to result in up to 4% percent reduced fuel burn over longer sectors, corresponding to an annual CO₂ reduction of around 1,000 tonnes per aircraft. The A320 is the first model fitted with Sharklets.

Airbus also offers operators of earlier A320 Family aircraft the option of retrofitting the fresh new look, significant increase in overhead stowage capacity, ambience lighting options and noticeable noise reduction of its latest factory standard of cabin.

A320 Family operators now can also benefit from enhanced ‘Required Navigation Performance – Authorisation Required’ (RNP-AR) combined with ‘Required Time of Arrival’ (RTA) time management. This allows the aircraft to conduct a ‘continuous descent approach’ (CDA) which is more efficient than the traditional ‘dive and drive’. The net benefits are lower noise and

fuel burn since less thrust is required. RNP-AR also enhances accessibility by enabling specially trained and authorised pilots to fly to lower altitudes with a more precise and efficient route into the airport, saving fuel and emissions and helping reduce the impact of bad weather on scheduled services.



Airbus is offering airlines entirely new options for configuring the floor space offered by the A321neo. These allow more flexibility and thus increase the number of seats at the same comfort standard. In addition, the maximum exit limit is raised beyond 220 seats.



German flag carrier Lufthansa took delivery of its first A320 outfitted with fuel-saving Sharklets on 1 March 2013, and will receive 21 more A320 Family aircraft equipped with the wingtip devices by 2015.

Airbus Research & Technology

Since the introduction of jet engine aircraft, the air transport industry has achieved enormous improvements in economic efficiency and environmental performance of aircraft. For instance, in the last 40 years, the aviation industry has cut fuel burn and CO₂ emissions by 70%, NOx emissions by 90% and noise by 75%. During that time, innovation has been a key driver in Airbus' success : from the A300 to the A350 XWB, Airbus has been continually implementing new ideas.

Environmental and safety considerations have long been an integral part of the company's activities at all levels, and are a key priority in the development of all new techniques, products and processes. Through innovation, and out-of-the-box thinking,

Airbus will continue to meet its eco-efficiency goals, and ensure that air travel continues to be one of the safest, and most eco-efficient means of transportation. This is where Research and Technology (R&T) comes in.

More than 3,000 people at Airbus are working either directly or indirectly on over 100 major R&T projects. Above 90 percent of Airbus' annual investment in Research and Development (R&D) of over two billion euros has environmental benefits for current and future aircraft : Airbus files more than 500 patent applications each year.

Over the next 40 years, R&T cooperation and investment will be even more crucial because energy sources are set to become increasingly scarce and expensive, yet fuel remains the single biggest element of airline operating costs (30% for Single Aisle and 40% for Long Range aircraft), so reducing consumption (and therefore emissions) and finding new alternative sources remains a key industry driver. The aeronautics industry needs further step-changes in economic and environmental performance throughout the aircraft lifecycle to address such challenges.



The Airbus 'Concept Plane' - shown here above a virtual New York City - is an "engineer's dream" to meet the expectations of future passengers.

100th A380 delivered

Malaysia Airlines (MAS) and Airbus have marked a major achievement, with the hand-over of the 100th A380 to MAS at Airbus' Henri Ziegler Delivery Centre in Toulouse, France. The aircraft is the sixth A380 for MAS.



CleanSky and ACARE

As part of the European Union's Joint Technology Initiative *CleanSky*, Airbus is currently co-leading with Saab of Sweden a seven-year (the European Framework Programme 7: 2007 – 2013) Smart Fixed Wing Aircraft (SFWA) Integrated Technology Demonstrator (ITD) project, which aims to develop a range of fuel-efficient, low-emission vehicle sub-systems. CleanSky's objectives are closely linked to the Advisory Council for Aeronautics Research in Europe's (ACARE) Vision 2020, which seeks to reduce fuel consumption and CO₂ emissions by 50 percent, reduce perceived external noise by 50 percent and reduce NO_x by 80 percent, all by the year 2020 compared to year 2000 levels.

As 2020 approaches, Airbus and several industrial partners have renewed their commitment for continued and increased investment in research and technology on a European level. Industry foresees a continuation of the current *CleanSky* programme in the next European Research Framework to run from 2014 to 2020. The Memorandum of Understanding (MOU) on the *Clean Sky 2* programme signed in September 2012, highlights industry's commitment to increase R&T investment, for seeing an investment of €1,8bn for *Clean Sky 2* within the the next EU Framework Programme *Horizon 2020*, which will allow Airbus and its industrial partners to ensure the maturity and integration of new step-changing technologies that have been developed within the previous Framework Programme 7.

Beyond 2020, Airbus believes that there is a real need to work towards even wider-ranging R&D development goals, which are laid out in ACARE's 'Flightpath 2050'. This long-term vision places future R&D development at the heart of meeting aviation-related societal and market needs, maintaining industrial leadership as well as protecting the environment and the energy supply. Towards this end, Airbus fully supports ACARE's Strategic Research and Innovation Agenda (SRIA), a strategic roadmap for aviation research, development and innovation designed to ensure that Flightpath 2050's goals can be met through adequate public and private support and funding.



Zero emission ground operations – which is a component of Airbus' Smarter Skies campaign launched in September 2012 – supports optimised terminal space and will help remove runway and gate limitations.

VSC

Vayu would like to thank the entire Airbus team at Toulouse for the generous, highly informative and wonderfully organised tour as well as a big thanks to Avian Media in India for all their help, logistics and co-ordination.

Hawaiian Airlines orders 16 A321neos

Following a Memorandum of Understanding in January 2013, Airbus has announced a firm order for 16 A321neo aircraft from Hawaiian Airlines – the first single-aisle order of Airbus aircraft for the carrier.



IAG and British Airways select the A350

International Airline Group (IAG) and British Airways have signed a Memorandum of Understanding (MoU) to buy 18 Airbus A350-1000 aircraft plus 18 options, as part of the airline's on-going long-haul aircraft fleet renewal and modernisation strategy. IAG, owner of both British Airways and Iberia, has also secured commercial terms and delivery slots that could lead to firm orders for Iberia. The choice of the A350-1000 follows British Airways' decision in 2007 to buy 12 Airbus A380s, the first of which will be delivered this summer.

