Presented by
Charles Champion
Airbus COO and
Head of A380 Programme

ICAS
(International Council of the Aeronautical Sciences)
7th September 2006

1996 - 2000
The creation of the A3XX organisation

- The creation of the Large Aircraft Division (LAD) in April 1996 to start the design concept studies on the A3XX
- The LAD objective was to work on the requirements with Airlines, Airports and Airworthiness Authorities for the A3XX
- All the different disciplines were assembled under one organisation e.g. engineering, financial, industrial, marketing and transport
- The objective to get commitments from the Airlines to enable a launch base

Fuselage design evolution

- allow for creative spirit
- create competing concepts
- evaluate concepts relative to design targets (weight, drag, size...)
- select best solution
- refine configuration

A3XX fuselage section is new from scratch
Fuselage sections studied...

(selection only)

- Concept selection criteria: surface check, length, cargo volume
- Competitive benchmarking criteria: surface, weight, length, cost
- Refinement: surface, tail arm, door access, airline attractiveness

Aircraft compatibility as sortout criteria

- Seats abreast tourist class
- Door access: at least 2+2 doors on main deck
- Maneuvering on the apron: 80m overall length

Limited freedom of choice if all targets are to be fulfilled
Seats Abreast Decision

One fuselage section that fulfills all requirements

Limitations on seat capacity

example: 650 seats with 8+6 seats abreast cross section:
- long, thin, weak stiffness and heavy
- too long for airport manoeuvring and 9-door concept

example: 480 seat with 10+8 seats abreast cross section:
- short, stubby, relative low portion of constant sections
- few doors: non-optimal ground service

Airport compatibility is a limiting factor on seat capacity
A3XX family

High development potential

From cabin requirements to the outer dimension

- "crown"-height for system ductings
- Floor height for structural concept
- Wall thickness for shell height + insulation + trim
- Belly-depth for ditching capability (emergency landing on water) and wing integration

Early reservation of the space that is later occupied by structure
Prepared with a group of highly qualified airlines

20 leading airlines are shaping the design of the A3XX

A3XX Forums, Carcassonne
June 1996 and December 1996

Air Canada, Air France, All Nippon Airways, British Airways, Cathay Pacific, Cargolux, EVA Air, Federal Express, Iberia, Japan Airlines, KLM, Korean Air, Lufthansa, Northwest, Singapore Airlines, United, Virgin Atlantic Airways

Mapping the future: concept discussions for an aircraft larger, better than the legendary, but venerable, 747. The A380 family was the result.
**Airports: planning for the A3XX**

- Regular contacts with over 50 major airports worldwide
- Major airports are - or are getting - ready for the A3XX
- Working and planning for a smooth, trouble-free EIS

**For airports, the A3XX is part of the solution**

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**Technical progress during 1999**

More than 50 aerodynamic / geometrical changes have been incorporated in 1999

**Examples**

- Wing plan form
- Section shape / twist
- Tank arrangement
- Engine position
- Fuselage cross-section
- Door position
- Fin and HTP size
- System housing for space and c.g reasons

Application of new technologies and design principles contribute to achieving performance and operation targets
Summary of CFGs from 1996 to 2000

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<td>1996</td>
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By the end of 2004 48 Customer Focus Groups performed
A growing market

- Analysts world-wide share the Airbus view on an air traffic growth of 5% per annum over the next 20 years i.e. twice as many passengers in 15 years.

- Traffic levels in 20 years time will therefore increase by 4.9 trillion RPKs.

- When Boeing launched the B747 total world traffic levels were one tenth of today’s.

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The Air Transport Industry : cost-conscious

- We believe we cannot rely on a scenario that would provide for the quick and unrestricted availability of:
  - New airports
  - New runways
  - New gates
  - New ATC systems

- We believe that although some developments will happen, there will continue to be:
  - Physical limitations (land availability)
  - Financial bottle-necks (Budget allocation)
  - Social and political hurdles (cost of opportunity & environment)

- Everybody talks about privatisation, bottom line, shareholder value, return on investment ...

We look towards an efficient, cost-effective, productive aircraft that could minimise the infrastructure investments
The real world: consolidation and fragmentation

**CONSOLIDATION**
- More cost-effective
- Hub dominance
- Global network
- Linking major hubs
- The logic behind alliances

**FRAGMENTATION**
- Hub by-passing
- Market development
- Frequency on thin routes
- The business flyer’s dream

**A3XX**

**A330/A340**

**Market trends**

Air Traffic: where we will see it

- Air Traffic is dependant on the globalisation of the economy, the income of the population, and the need for leisure …
- In all of this, speed, reliability and economics determine the efficiency of the Air Transport contribution to serve the people needs

- Active megalopolis will continue to concentrate active, wealthy population and business leadership
Top Level Aircraft Requirements

- Comfort
- Capacity
- Range
  - Superior performance
  - Double digit economic improvement
- Efficiency
- Silence
- Environment friendliness

A380 Major systems innovations

- New and Open Avionics applied to all system controls
- Ethernet base data communication (AFDX)
- Bulbless lighting - HLD
- Dual/dual air conditioning packs
- 8 times 6"x8" LCD display units
- On Board Information System for cockpit and cabin services
- Interactive control & displays for main HMI functions
- On-board Oxygen generating system
- Electrical Flight control back-up
- Reduction of stability margins
- Split elevators and rudder
- 2 hydraulic + 2 electrical circuit architecture for power system
- Electro-hydraulic Flight Control Actuators
- 5000PSI hydraulic system pressure
- On-board Oxygen generating system
- Fuel used for wing load relief
- Variable frequency electrical power
- Solid state components for electrical distribution
Authorisation to Offer

- June: A3XX A.T.O. given
- September: Engine architecture defined for both Rolls Royce and Engine Alliance
- Key driver - Noise
  - 116 inch fan to enable QC2 departure / QC 1 arrival

The A380 is launched…

- On 19th December 2000, the A3XX was launched and named the A380 & A380F
- The launch airlines were:
  - Singapore Airlines
  - Emirates
  - Qantas
  - Air France, ILFC, Virgin and Fedex
- For a total of 60 firm aircraft
A380 launch base established

A successful launch - 60 firm orders plus option

*As of March 31st, 2001

A380 family - Potential for development

Increased Capacity
A380-900*

Increased Range
A380-800R*

Reduced Capacity
A380-700*

The virtues of a whole new programme

*Potential product development
2001 Key events and challenges

- Transition from A3XX Project to A380 Development
- Launch of the planning for the new A380 facilities across Europe
  - Broughton
  - Hamburg
  - Toulouse...
- A380 Work package allocation and start firming up Supplier selections
- Establish the A380 Programme organisation
  - Aircraft Component Management Teams (ACMT’s) created to design and manufacture the aircraft sections and systems
  - A380 Central Programme for Programme management
- Secure Engineering resources (up to over 5,000 Full Time Equivalent )
- Detailed review of aircraft definition, focus on the weight
- Flying Test Bed vehicle selected for Trent 900 :A340-300 MSN 1
- Firm up the A380 Customers
- Start to firm up commitments from Airports with Airlines
- Put in place specific A380 Transport organisation…Beluga too small!
The A380 organization

Multi-functional ACMT's (Aircraft Component Management Teams)

... for the first time the structure of a Programme is build with integrated and product related teams from Programmes, Operations and Procurement

ACMTs form the organizational backbone for the development of the A380 Programme

Programme Management

- Systems
- Landing Gear
- Fuselage
  - Nose & Centre Sections
  - Forward & aft
- Wing
- Propulsion
- Empennages
- Interiors
- FAL

Mission of ACMT
To deliver in time/cost/quality and performance aircraft components and systems

4 main locations (“Plateaux”):
Toulouse – Hamburg/Bremen - Filton - Madrid

5 “Plateaux” including Programme Directorate in Toulouse

The 4 development locations ‘plateaux’ will house:

ACMT + CMIT + CDBT

Organization of “Plateaux” is defined to ease communication between teams not in direct relationship through organizational breakdown, e.g.:
CMIT: Slats & Flaps (Bremen) <=> Secondary flight control team in BRE
The A380 Aircraft Component Management Teams (ACMTs)

- ACMT Fuselage Section 15/01
- ACMT Fuselage Section 13/14, 16-19
- ACMT Wing
- ACMT Engine
- ACMT Empennage
- ACMT Landing Gear

Not shown:
- ACMT Systems
- ACMT Interior
- ACMT Final Assembly Line

A380 Technologies for Value... add new chart winglets

- Carbon ribs
- GLARE Panels on Upper Fuselage
- Carbon Center Wing Box
- Welded Panels on Lower Fuselage
- Carbon Floor Beams on Upper Deck
- Fin Box & Rudder, Horizontal Tailplane Box & Elevators with monolithic carbon Design
- Carbon Rear Pressure Bulkhead tail and tailcone
- Advanced Aluminium Alloys for Wing Panels
- Thermoplastic Fixed Leading Edge on mid/outer Wing
81% of the outsourcing work packages are already allocated to 33 major risk-sharing participants.
The A380 programme Headquarters

A380 Engineering building - Toulouse
2002

2002 Key events and challenges

• Keep the Customers on board…
• First Metal cuts – the cruciform for the centre wing box
• Complete the plans for the new facilities across Europe
• Finalise the remaining supplier selections and work packages
• Start of Customisation process with launch airlines
• Establishment of System Test benches
• Major engine / nacelle / aircraft interfaces agreed
• Ensure completion of the Iron Bird Facility and start installation of equipment
• Maintain the ramp up plan across all the Engineering sites
• Maintain the momentum on the Airports
• Get the first drawing sets to Manufacturing
2002

23 JAN 2002: FIRST METAL CUT (FRANCE)
THE JEAN-LUC LAGARDERE SITE
The key figures

• THE ARCH
  • Dimensions 490 m x 250 m x 46 m
  • Ground limits about 100 000 m²
  • The offices 36 000 m²
  • The big doors 100 m x 27 m
  • Maximum bearing of the beam 117,50 m

• THE OVERALL PROJECT
  • Total weigh of the frame 32 000 tonnes
  • Technical galleries 5 km
  • Total Volume of the Concrete 125 000 m³

• THE WORKS
  • Maximum staff 2000 people (Sept. 2003)
  • Number of contracts more than 150
Creation of dedicated Iron Bird Facility
November 2002

2003
2003 Key events and challenges

• Keep the Customers on board…
• First section start to take shape
• Road transport trials planned for 2003
• Trent 900 First Engine to Test (FETT) in March
• FAL Toulouse readied for the delivery of the first sections
• Produce cabin mockups for the new “special cabin projects” in Hamburg
• Establishment of System Test benches
• Get the Iron Bird “flying”
• First wing box transport from Nantes to Saint Nazaire
• First wing out of jig in Brought (UK)
• Keep the weight, drag and engine intergration under control

Airbus UK – Broughton facilities

Opening 04/07/2003
**Airbus Germany - Hamburg site**

- **Dyke**
  - Flood protection is finalised

- **Land reclamation completed**

- **MCA Building**
  - Structure completed

- **Quay Facility**
  - Construction of Quay facility is finalised
  - RoRo Ramp is under construction
  - Completion planned for 12.05.2003

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**A380 Final Assembly Line - Construction underway in Toulouse**

- **ARCHE**

- **Static Test Facilities**
Toulouse - Ironbird

Iron bird facilities construction completed EIS Dec. 2003

Essential for Maturity!!

First wingbox transport – Nantes to Saint Nazaire

AUGUST 22, 2003
Main key events – A380 Achievements – Nov. 03
First Wing out of jig in Broughton

04/11/03 First wing out of jigs in Broughton

Main key events – A380 Achievements – Nov. 03
27/11/03 Centre section assembly from upper shells integration station to belly fairing installation station.
From first trial on November 14, 2003 to…

2004
2004 Key events and challenges

- First A380 cabin layout freeze and cabin vendor selections to be finalised
- First fuselage sections ready ship
- GP7200 First Engine to Test
- Trent 900 1st Flight and Flying Test bed campaign and Trent 900 certification by EASA
- First shipment of the first A380 to Toulouse (static specimen)
- Opening of the FAL by French Prime Minister
- Delivery of First Rolls Royce engine to Toulouse and First Flight on A340
- MSN 1 Rolls out of Station 40, 1st A380 to fly!
- Start of flight testing of the GP7200 in USA
- By year end MSN’s 1, 2, 4 & 7 in FAL Toulouse
- Start of detailed design phase for the Freighter

A380 Transport - Marine Transport

- Vessel built in Nanjing Jingling (China)
- Launched on 30th July 2003
- Delivery in China by April 2004

Ship owner and operator: FRET/CETAM

Vessel launched 10H30 30/07/03

Stern view

 Naming Ceremony 27th Feb-04
 Ville de Bordeaux
The “Ville de Bordeaux”

...on route from China to Cadiz, Spain

A380 Transport - Harbors

• Specific port terminals under construction or in place, located near to the Airbus plants:  - Hamburg completed Sep-03  
  - Mostyn, St Nazaire, Cadiz on progress

  Hamburg Quay & Ramp  
  Installation Apr-03

  Cadiz: lifting gantry  
  For ramp Mar-04

  St Nazaire: main pontoon  
  27th Feb-04

• Port terminal at Bordeaux/Pauillac, entry point to in-land France: full acceptance on 5th Mar-04

  Pauillac: Floating Transfer Station  
  Delivery 22nd Jan-04
A380 Transport - River Garonne

- Bordeaux
- Barge crossing Pont de Pierre
- River Garonne operator: Socatra
- Barge naming: Breuil
- 1st barge delivered 25th Feb-04
- 2nd barge by Sep-04
- Langon lock
- Delivery Mar-04

To reality April 07, 2004
No major difficulty
Good coordination of the convoy movement
Static fuselage sections delivered on time to FAL

A380 FAL Inauguration - 14th May 2004
First flight of the Trent 900 - 17th May 2004

First Flight of the Engine Alliance GP7200 – Dec 04
From the STAR Project to the A380 FAL Site

2004…a busy year

Production well underway
September 2004
2005 Key events and challenges

- The A380 is presented to the customers, the press and the world!
- First Flight 27th April 2005 – the baby is born and doing well…
- Opening of the flight envelope
- Secure 1st flight of MSN 2 & 4 in 2005
- Maturity focus on A380 – creation of dedicated team to ensure operational reliability at EIS
- Bottlenecks in engineering impact the programme leading to re-planning of certification and EIS. Resources redirected and additional support to the teams increased
- The A380 visits the world – over 20 airports visited
- Static and Fatigue testing well underway and ahead of the planning
- GP7200 Engine certification by FAA
- First pieces in manufacturing for the Freighter
The A380 is Revealed… 25 January 2005

A380 First Flight / Take-off 27th April 2005
A380 First Flight … 27th April 2005

Flight envelope fully opened in 2005

First flight – 27th April 2005

VMU tests – Istres, July 2005

Water trough tests – Istres, October 2005

Le Bourget June 2005

Full flight envelope demonstrated

excellent handling
Successfully tested at airports worldwide

Tested at Frankfurt, Terminal 2, Gate E9
29 October 2005
From small airports to large airports…

Proven at more than 20 airports visited to date…

A380 meets the world
2006

2006 Key events and challenges

• Keep the momentum with Flight test – more aircraft added
• Secure the Early Long Range Flights, key for Maturity
• Secure the route to certification before end of the year
• Consolidation of performance and noise measuring flights
• Preparations launched with the airlines for the Route proving, the last part of the certification exercise
• First Flight 27th April 2005 – the baby is born and doing well…
• Preparations underway with first airlines for the entry into service i.e. maintenance training, flight simulators and spares stock
• First flight of the GP7200 on MSN 9
• Prepare for for the Main Component Assembly (MCA) of the Freighter in January 2007
• Secure the ramp up
First A380 now painted in Hamburg

MSN 2 in Hamburg 13th January 2006

And more recently...

**Hot and High**
Medellin
January 2006

**Hot and Humid**
Pointe-à-Pitre & Fort de France
January 2006

**Cold weather**
Iqaluit
February 2006
First Customer Aircraft to fly to Hamburg…

- First production Aircraft – MSN 003
- First flight on 7th May 2006
- Ferry to Hamburg on the same day
### …in the coming months

**MSN1**
- Systems Development and Certification:
  - Landing gear, hydraulics, radio navigation and communication, electrics, fuel
- High energy RTO

**MSN 4**
- Mainly systems development & certification in conjunction with MSN 1
- Hot weather campaign started in Abu Dhabi (Al Aïn airport)

**MSN 2**
- Cabin systems development & certification
- EMI Campaign on-going
- Early Long Flights starting first week of September

**MSN 9 (Engine Alliance)**
- First flight scheduled in August

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### Last 12 months achievements

- Static tests completed, fatigue test specimen now at 15,052 flight cycles. All test benches in operation
- Both Rolls Royce and Engine Alliance engines certified
- Development Aircraft first flights:
  - MSN 001 on April 27th 2005
  - MSN 004 on October 18th 2005
  - MSN 002 on November 3rd 2005
  - MSN 007 on February 19th 2006
- Successful Emergency Cabin Evacuation Trial on MSN 007 in Hamburg on March 26: 853 passengers and 20 crew members in 78 seconds!
- First Customer Aircraft flew to Hamburg on 7th May 2006
- MSN 002 Cabin installation completed, Virtual Flight completed on 9th May 2006 now back to Toulouse for Flight Test campaign
- 15 Aircraft already assembled, including static and fatigue.
- First Freighter structural elements in production
A380 Flight testing

From 27th April 2005 to 21st July 2006

• MSN 001
  ▶ 279 flights
  ▶ 950 flight hours

• MSN 004
  ▶ 203 flights
  ▶ 605 flight hours

• MSN 007
  ▶ 2 flights
  ▶ 6 flight hours

• MSN 002
  ▶ 29 flights
  ▶ 107 flight hours

513 flights and 1669 flight hours to-date

A380 Major Structural Testing

Fatigue Test Specimen (EF)

▶ Test purpose: over 2.5 times Aircraft life and at least 1 year life before Aircraft operation
▶ 5,000 flight cycles reached on 24 Dec '05
▶ As of 19th July 2006, 15,052 FC have been accumulated
▶ Average of 950 flights reached per week
▶ A-inspection (A29) carried out 03 July '06, no major findings detected

Current Forecast:

| Summer '06 | 1 DSG |
| TC        | app. 24000 FC |
| EIS       | app. 30000 FC |

ES Ultimate Wing Bending test February 2006

* Major Static Test (ES)

▶ All Ultimate Load cases completed
▶ Max Wing Bending case achieved up to 1.45 Limit Load, demonstrating the reliability of the analysis
▶ Rupture occurred during loading to 1.5 Limit Load
▶ To meet delivery date of first Aircraft, conservative measure taken to add some strips to the top stringers.
Successful Evacuation Test - 26 March 2006

- Evacuation Test using MSN 007 on March 26 in Hamburg witnessed by Airworthiness Authorities (EASA with FAA participation)

- 873 occupants:
  - 853 passengers: 538 MD + 315 UD
  - 18 cabin crews and 2 flight crew members

- Evacuated the Aircraft in semi-darkness with half the doors inoperative... in 78 seconds!

EASA and FAA approved 853 as the maximum passenger seating capacity for the A380-800.
Cabin Virtual First Flight (CVFF) 09th May 2006

During 5 hours of testing 474 passengers and 20 crew members simulated a 15 hour flight.

Testing of the in-flight Entertainment system, the water waste system and air conditioning

All cabin operations from boarding to safety instructions, galley and trolley lift operations together with a full meal service were completed successfully

ILA Conference – Berlin – May 2006
The Freighter is in production…

Panel 5 (Outboard) for MSN037 completed in Korea

First Front Spars by Saab at Mecachrome

1st Fuselage Integral Frames manufactured in Nordenham

1st Carbon Parts manufactured in Nantes

Freighter - Engineering

Definition phase completed…….

- All Structural Design Principles including material choice agreed
- Barrier Wall concept and CFRP material confirmed
- Freighter-specific system architectures (e.g. Door Slide Management System, Cabin Intercommunication Data System, Air conditioning, …) frozen
- 100% design solutions integrated in the Digital Mock Up
- Mechanical and electrical Systems installation well advanced
- Interface agreements:
  - primary structure done
  - mechanical and electrical system installation nearing completion
- 30% of specific Freighter Drawings already released for manufacturing
- Qualification of Aluminum-Lithium skin material achieved

…… Now in full Detailed Design process
Strong Market Confidence

159 firm orders from 16 Customers

134 A380
25 A380F

Deciding Together: the market-driven A380 family

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<tr>
<td>1996</td>
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<td>40 meetings</td>
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<td>2005</td>
<td>33 meetings</td>
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By mid 2006, 242 Airline meetings have been held
And to conclude on A380…

- 159 firm orders …including 25 orders for the freighter
- 1st Flight on 27th April 2005
- 15 Aircraft now completed including static & fatigue test models
- Four development Aircraft have now flown with MSN 7 now in Hamburg and the next three in flight test phase
- Two first Customer Aircraft now in Hamburg for Cabin Furnishing
- First Freighter elements for MSN 037 in production

Coming soon to an airport near you!