Jean-Bernard Hentz
PLM R&T

Airbus PLM A350
Manufacturing Engineering strategy
Content

1. AIRBUS today
2. AIRBUS PLM Strategy for manufacturing
3. Some ideas for advanced research
4. Conclusion
Airbus is a global company rooted in Europe…

a world of cultural diversity

15 sites in Europe

Final Assembly Line
...with global outreach

- 20 languages
- 15 manufacturing sites
- More than 5,400 aircraft delivered
- 56,000 employees
- More than 88 nationalities
- 304 customers
- 160 offices
- 250 resident customer support managers
- 309 operators
- 5 spares centres
- 9 engineering design centres
- 4 training centres
- 50 flight simulators
- 1 global company
- 24 hour customer support (365 days a year)

a world of cultural diversity
Airbus’ achievements by the end of 2007 included:

- An annual turnover of TBC
- A gross market share (units) of 51%
- Delivering 453 aircraft and selling 1,341 in 2007
- Surpassing 8,000 aircraft ordered by 286 customers
- Supporting 5,000 aircraft in service with 287 operators
- Regularly achieving over 50% of large civil aircraft orders and deliveries

Data to end Dec 2007
A350 XWB firm orders end September 2008

- 453 firm orders from 28 customers
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Now, it’s not only DMU but DMUs!

3D as Master across the Company & Supply Chain
Mandate 3D at the core of Aircraft lifecycle processes (3D as a master)

PLM perimeter shall cover engineering but also Manufacturing - Support & Maintenance (including Supply Chain)

Dassault Systemes PLM solutions shall support internal and external collaborative processes (Extended Enterprise)

PLM System transformation shall increase AIRBUS productivity

Strong commercial off the shelf orientation “COTS” mainly with PTC (PDM) and Dassault Systemes (CAD/CAM/VPM)
PLM 2010 target Architecture for A350

Key PLM success factors

- PLM 2010 target Architecture for A350
- Architecture
- PDM: Primes SSCI (PTC PDMLink)
- ERP Feeding (ePDM)
- ARP (SAP)
- Assembly Routings & Shop Floor Information
- Work Sequencing
- AVL Station Scheduling

VPM for A/C Product
(Enovia VPMv4)

VPM For Resources (J&T)

3D

DELMIA for Assembly (PPR HUB)

Product + Process + Resources Environment

CATIA V5 R18

DELMIA V5 R18

DPE
DPM
CEMIT
ERGO
NC

Design
Drawing
ASL
Composite
To a Company 3D approach, with integrated Services

- 2007: Logistics Optimization
- 2008: Ergonomic & Human simulation
- 2009: Installations

Factory floor layout & program ramp up. Optimize Non recurring and recurring costs (Resources, Man Power, timing ...)

Ensure Aircraft Manufacturability (3D validation, Assembly Process Proposals)

Define & Optimize Industrial Means (from Assembly operation to the Assembly station)

Virtual simulations to support the real life: Prepare modifications and manage assembly issues

3D for manufacturing execution

3D for NC programming

3D Shop Floor
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The companies who will be able to integrate very fast the Information System innovations on their industrial processes will make the difference.

**Vision**

- Information System R&T to support the Business R&T
  - “Any new technology innovation is supported by information system capabilities. And this IS aspects have to be taken into account since the start”
  - 25%

- Information System R&T as risk coverage
  - “Technical data are mutually dependant one on each other and are used for various purposes by many actors (including extended enterprise). A global architecture of technical data is essential to control data workflows and to ensure consistency across domains and along the whole aircraft lifecycle”
  - 50%

- Information System R&T as source of innovation
  - “The PLM is a source of IS technology innovation. We have to participate to the R&T of our software providers”
  - 25%
Activities

Aeronautics and air transport

– *The greening of air transport*: reduction of emissions and noise disturbance, incorporating work on engines and alternative fuels, structures and new aircraft designs, airport operations and traffic management.

– *Increasing time efficiency*: improvement of the efficiency of operating schedules focusing on innovative air traffic management systems in line with the effective implementation of Single Sky policy which integrate air, ground and space components, including traffic flow and more aircraft autonomy.

– *Ensuring customer satisfaction and safety*: improvement of passenger comfort, innovative in-flight services and more efficient passenger handling; improvement of all safety aspects of air transport; wider choice of aircraft ranging from wide body to small size vehicles.

– **Improving cost efficiency**: reduction of costs associated with product development, manufacturing and operating costs focusing on zero maintenance aircraft, increased use of automation and simulation.

– *Protection of aircraft and passengers*: enhancement of protection measures for the traveller, crew, aircraft and air transport system such as improved data and identification methods, protecting the aircraft against attack, auto recovery and improved security design of aircraft.
EU Research Framework Program 7: Information & communication technology (extract 1/2)

**ICT for content, creativity and personal development:**
- new media paradigms and new forms of content; creation of interactive digital content; enriched user experiences; cost-effective content delivery.
- technology-enhanced learning; adaptive and contextualised learning solutions; active learning.
- ICT-based systems to support accessibility and use over time of digital cultural resources and assets, in a multilingual environment

**ICT supporting businesses and industry:**
- new forms of dynamic networked co-operative business processes, digital eco-systems; optimised work organisation and collaborative work environments.
- **Manufacturing:** rapid and adaptive design, production and delivery of highly customised goods; digital and virtual production; modelling, simulation and presentation tools; miniature and integrated ICT products;

**ICT for trust and confidence:**
identity management; authentication and authorization; privacy enhancing technologies; rights and asset management; protection against cyber threats.
EU Research Framework Program 7: Information & communication technology (extract 2/2)

ICT Technology Pillars:

- **Nano-electronics, photonics and integrated micro/nano-systems**: pushing the limits of miniaturisation, integration, variety and density; increasing performance and manufacturability at lower cost; facilitating incorporation of ICT in a range of applications; interfaces; upstream research requiring exploration of new concepts.

- **Ubiquitous and unlimited capacity communication networks**: ubiquitous access over heterogeneous networks - fixed, mobile, wireless and broadcasting networks spanning from the personal area to the regional and global area - allowing the seamless delivery of ever higher volumes of data and services anywhere, anytime.

- **Embedded systems, computing and control**: powerful, secure and distributed computing and communication systems that are embedded in objects and physical infrastructures and that can control and adapt to their environment.

- **Software, Grids, security and dependability**: dynamic, adaptive, dependable and trusted software and services, and new processing architectures, including their provision as a utility.

- **Knowledge, cognitive and learning systems**: capturing and exploiting knowledge embedded in web and multimedia content; bio-inspired artificial systems that perceive, understand, learn and evolve, and act autonomously; learning by machines and humans based on a better understanding of human cognition.

- **Simulation, visualisation, interaction and mixed realities**: tools for innovative design and creativity in products, services and digital media, and for natural, language-enabled and context-rich interaction and communication.
Advanced research ideas beyond the « product centric » manufacturing engineering activities

Manufacturing capabilities models
- Global model of the manufacturing capabilities (Machines, tools, human resources etc) and the main workflows inside or between factories.
- World wide flexible process for an highly customized aircraft. PLM simulations for a flexible shopfloor. Capacity management
- Standardization and Standard based interoperability
- Cost controlled engineering design

Manufacturing intelligence and automation. Virtual vs Real
- PLM to support NC programming of complex machines (complex processes like composites or high speed machining, machine embedded control etc). Shop-floor maintenance embedded control. Monitoring.
- Sensors and safety.
- High speed 3D acquisition.
- Jigs and tools reduction through innovative assembly processes. Flexible tolerancing.
- IS technologies: Wireless, portable devices, augmented reality, vision and motion.

Information for blue collars
- Training & ramp-up, 3D based instructions, reality. Vision and motion.

Information for mid managers around manufacturing execution
- World wide Process control. Simulations to react to unforeseen events.
- PLM to support ramp up of assembly lines
- Digital Mock-Up based KPIs and PDM linked project management oriented tools. Monitoring. Embedded controls.
- Simulations to support key decisions
- Collaborative tools for manufacturing execution

Information System for Reusability, recycling and refurbishment of Airplanes and industrial means

Maturity Level
- Discover
- Understand
- Adapt
- Validate
Conclusion

From where we are – a350:
• Dassault Systemes helped us to implement a “product centric” model (PPR Hub) and some simulations capabilities for manufacturing engineering
• SAP helped us to manage the planning for manufacturing execution (MRP)
• The a350 will integrate both approaches. It supports a strong relationship between engineering and manufacturing. It also supports the manufacturing ramp-up phase.

To where we think there could be improvements:
• A “manufacturing capability” centric approach
• Standardization
• Flexibility in the manufacturing process
• Collaboration around the manufacturing process execution
• Improvements in automation, embedded know how, simulation
• Process monitoring and problem solving
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