Evolution of PLM and SE inside Airbus

Presented by
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Agenda

1. EADS & Airbus at a glance
2. PLM today at Airbus
3. What’s next
4. Conclusion
AIRBUS GROUP at a glance
Evolution & growth of the Airbus family

- **13,034 orders**
- **740 customers & operators**

Order book of **5,109 orders !!!**

- **7,925 delivered to date**
- **295 delivered since Jan-13**
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The PLM landscape needs to support this evolving industrial model

Process & Methods
- Local Optimisation
- Concurrent Engineering Principles Introduced
- Consolidation of Airbus Processes
- Deployment of Airbus processes to Suppliers
- Architecture & Integration
- Robustness & Convergence

Tools
- CAD/AM 2D then 3D Homegrown ERP
- First Digital Mockup – A3456 SAP Introduced
- Digital Product Digital Factory
- Consolidation to common Airbus ERP
- Global Supply Chain Offshore Engineering Centres

Organisation
- Design Build Teams Introduced
- Design Build Teams Consolidated
- Engineering Centres of Excellence created
- First RSPs

Airbus supply-chain & delivery model is evolving from a “Built-to-Print” model to an “Integrator” model with an RSP strategy.

### From...
- Platform Assembly
- Large-scale Integration
- Value-added Parts and Assemblies
- Make-to-print Parts and Assemblies
- Raw Materials

### To...
- System Integrator
  - TIER 1 RSPs

#### High degree of vertical integration.
- Development responsibility mainly on Airbus.
- Local sourcing of BtP packages in an “extended workbench” approach.

#### Airbus as an A/C integrator.
- Focus on overall A/C architecture and requirements for structure, systems & cabin.
- +70% of all A/C parts are developed by suppliers.
- Sourcing of major components from a network of D&B risk sharing partners (“extended enterprise”)
PLM Information System “Ten years of evolution”

A380 IS (“4+1”)  
One IS by Natco  
+ One common IS

A400M IS (“Fourfold”)  
One IS multiplied by 4  
+ One common IS

A350 IS (“Single 1”)  
One central IS

We are in the right direction
One PLM system for A350 is a reality!

Facts & Figures

- About 100 Risk Sharing Partners connected
- PDM Mecha: 7200 users weekly connected (20000 users declared)
- VPM: 4000 users weekly connected
- 85% users in Extended Enterprise
- 24/7 availability by 2012
- Data doubled every 6 months (vs 12-18 months in other industries)
- 700 DMU computed daily
- cDMU updated every 60 min EE included – (no exchanges anymore)

DMU review of full A/C
- Extended Enterprise connected in real time through a common Digital Mock-up (cDMU)
- Design in context with VPM
- Full 3D process for electrics (Manufacturing + Engineering)
The vision ...

Starting point
- 80% of the landscape are obsolete
- Architecture & standardization suppressed last few years
- A350 platform is the reference ... Best in class!

Vision
One sustainable
Airbus PLM Platform

Strategy
- Right balance of Functional development
- Obsolescence management
- Architecture & Standardizations
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There are several important improvement axis

- Harmonization across A/C (aircraft) programs
- Broaden beyond Engineering
- Integration of System Engineering
## Harmonization across A/C programs

<table>
<thead>
<tr>
<th>Gen 1</th>
<th>Gen 2</th>
<th>Gen 3</th>
<th>Gen 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A320 family</td>
<td>A380 family</td>
<td>A400M family</td>
<td>A350 family</td>
</tr>
<tr>
<td>Main characteristics</td>
<td>Individual PLM systems per “company”</td>
<td>Individual PLM systems per “company” + common integration layer</td>
<td>Common system but “company” based and replicated</td>
</tr>
<tr>
<td>Main components</td>
<td>Catia4/5, Cads5, Home-grown PLM, no DMU, UNIX/mainframe</td>
<td>Catia4/5, Cads5, Home-grown PLM, Windchill, DMU services, DEX for Suppliers, UNIX/mainframe</td>
<td>Catia v5r16, Windchill 6, DMU services, DEX for Suppliers, UNIX/Client-Srver</td>
</tr>
<tr>
<td>Expected end-of-life</td>
<td>&gt;2025</td>
<td>&gt;2030</td>
<td>&gt;2050</td>
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Strategy needed to sustain the life and harmonize across A/C
Broaden beyond Engineering
Digital Mock-Up (DMU) example

Need to have a simple and friendly access to DMU

- Today as-is: usage of CATIA/VPM or Delmia is limited to CAD designers or Manufacturing engineering specialists

! These new customers want to have access to DMU to perform consultation, analysis, documentation creation, ...
What is Mixed (Augmented) Reality?

**What does it mean?**

"Augmented reality (AR) is a term for a live direct or an indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input." [Source: Wikipedia]

**What is it for (us)?**

- Bring the Digital Mock Up into the aircraft production environment, enabling us to compare the manufactured with the designed product.
- Support, enhance and sustain production activities, making a bridge between Engineering and Manufacturing.
- Improve product quality while reducing costs & lead time.
Integration of System Engineering
Concept phase vs Detailed Design phase

**CONCEPT PHASE**
(TRADE / ARCHITECTURE / INNOVATE)

**DETAILED DESIGN PHASE**
(FINALIZE / CONVERGENCE / DAMP)

About 80% of a system's performance and cost is determined by the functional specifications and preliminary architecture.
Integration of System Engineering
Enable earlier global integration loops & smooth transition to detailed design

1. Enable flexible but clear conf management during concept phase (trade process)

2. Enable early axis reconciliation (keep global view)

3. Enable global / local back & forth analysis (foresee details from global choice, check details are aligned with global decision)

4. Enable multi-disciplinary assessment in extended enterprise context (leveraging new off-the-shelf simulation capabilities)
Integration of System Engineering
Our key areas of attack

Virtual A/C definition (concept phase)
Flexible & incremental with level of details navigability
System of systems
Design decision trace-ability (inc.requirements)

Virtual A/C multi-disciplinary evaluation
Clutching together requested domain ecosystems to support a given process
Piloting MDA/MDO analysis in EE context

Multi-disciplinary detailed / tightly coupled evaluation
Tightly coupled phenomenon’s (e.g. flutter, buffet, aero-vibro-acoustics...)

Virtual A/C definition (detailed design)
Scaling up to millions of items
70 years sustainability for core information

Mono-disciplinary evaluation
Running specific solver / model

Instances of generic Multi-System simulation platform
→ MBSE, SMS, PAM

A320 Sharklet

A/C program
Product definition & conf management

Aerodynamics
information system

Structure
information system

Loads Loop
information system

Electrical
information system

Cabin & Cargo
information system

Aerodynamics
information system

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Flexible & incremental with level of details navigability
System of systems
Design decision trace-ability (inc.requirements)
Integration of System Engineering
Our key areas of attack – examples of projects

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**A/C program**
Product definition & conf management

**Aerodynamics**
information system

**Structure**
information system

**Loads Loop**
information system

**Landing Gear**
information system

**Electrical**
information system

**Cabin & Cargo**
information system

**Loads Loop**
information system

**A330 Freighter**
A320
Sharklet

**Instances of generic Multi-Physics simulation platform**

**Instances of generic Multi-System simulation platform**

**Virtual A/C**

**A320 Sharklet**

**Mono-disciplinary evaluation**
Running specific solver / model

**Commercial solver / SLM**

**Virtual A/C multi-disciplinary evaluation**
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Piloting MDA/MDO analysis in EE context

**Virtual A/C definition** (detailed design)
Scaling up to millions of items
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**Traditional PDM/PLM**

**Backbone / Authoring Tools**

**MBSE, SMS, PAM**

**BDA, Crescendo, TOICA**

**FlowSimulator**
Behavioural Digital Aircraft

Architecture validation

BDA Architecture Specification

BDA Architecture Implementation

Implementation

Test Case Demonstrations

Use Case Demonstrations

Thermal A/C

Powerplant integration

Testing high level BDA cooperation capability including extended enterprise & lifecycle issues

Testing BDA capability to deal with heavy simulation (incl. HPC)
Behavioural Digital Aircraft
Cooperation & automation capabilities
There are several important improvement axis

Harmonization across A/C (aircraft) programs
Broaden beyond Engineering
Integration of System Engineering

New architecture
Obsolescence management
Standardisation & Openness
New architecture
Backbones and Right use of COTS

A Backbone is a target technical solution to implement functionalities in a way to ensure harmonization, cross Program convergence, reusability and future upgrade at limited cost.

Based on the “Right use of COTS” policy, new architecture will support all PDM/CM processes:

- PDM Airbus Single and Simplified (PASS) – is a Windchill based PDM with only agreed customization
- Airbus PDM Services (APS) – is an Oracle / java based solution to support Airbus specific processes

As a main aspect of the new partnership setup to strengthen PTC/Airbus collaboration:

- Support PTC’s “Product/Market Fit” by allowing valuable competitive differentiators retrofit in Core Product
- Allow Airbus to anticipate Major Technical Changes and get a visibility on forecasted OOTB new Functionalities
Obsolescence management

- **Reminder ....**
  - Our Product platform last more than 40 years
  - Includes the Supply Chain

- **Impacts for PLM Software**
  - Product cycle times have to be longer
  - Migration has to be at "zero cost"
EADS involvement in international standards development

There is not a lack of standardization bodies … … but where is the result!
Summary & conclusion

• Full value of PLM comes through integration across disciplines and through covering the complete life cycle of products

• Airbus don’t believe in a monolithic system
  • Impossible to align the product range on one system

• Airbus don’t want a monolithic system
  • To high dependency on one Vendor
  • Need to be able to use best-of-bread technology

Openness & Standards are the key to success

“Compete with content not interfaces & data formats”
This is what it is all about ..... 

- Video taken out
Thank you

for your attention