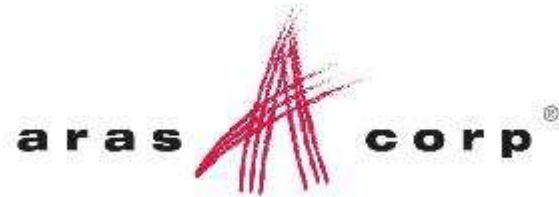


INNOVATION
WITHOUT LIMITATION



New Approaches to ALM / PLM

Cross-Discipline Product Development

Andreas Keis, Airbus

Steve Denman, IBM

Doug Macdonald, Aras

Based on joint aerospace use case presentation at
ProSTEP iViP – OASIS OSLC ALM-PLM Integration Conference
20 October 2015 | Möhringen Germany

Industry Collaboration

- Industrial initiative led by Daimler and Airbus about cross-discipline engineering interoperability
→ Supported by Bombardier, Philips, IBM, PTC, Aras and others
- Practical solutions to real world challenges for engineering complex products
- Necessity is the driver – doing NOW because we have to
- Initiative last year, continuing this year
ProSTEP iViP & OASIS OSLC ALM-PLM Integration Conference
20 October 2015 | Möhringen Germany



AIRBUS GROUP



Airbus Group at a Glance



Airbus Group Employees by country*



* As of December 2010

AIRBUS	AIRBUS HELICOPTERS	AIRBUS DEFENCE & SPACE
<p>Globally leading aircraft manufacturer</p> <ul style="list-style-type: none"> Since 2000, Airbus commercial deliveries grew by 60% Backlog more than doubled in one decade (now equating 8 years of production) 	<p>Leading helicopter manufacturer</p> <ul style="list-style-type: none"> Accounts for 1/3 of the global helicopter fleet Delivered about 4,000 helicopters throughout the past decade 	<p>Europe's No. 1 defence and space company</p> <ul style="list-style-type: none"> Worldwide, it ranks second for space and is among the top ten defence companies Revenues of approximately €14 billion per year

Our Key Challenges for Application / Product Lifecycle Management

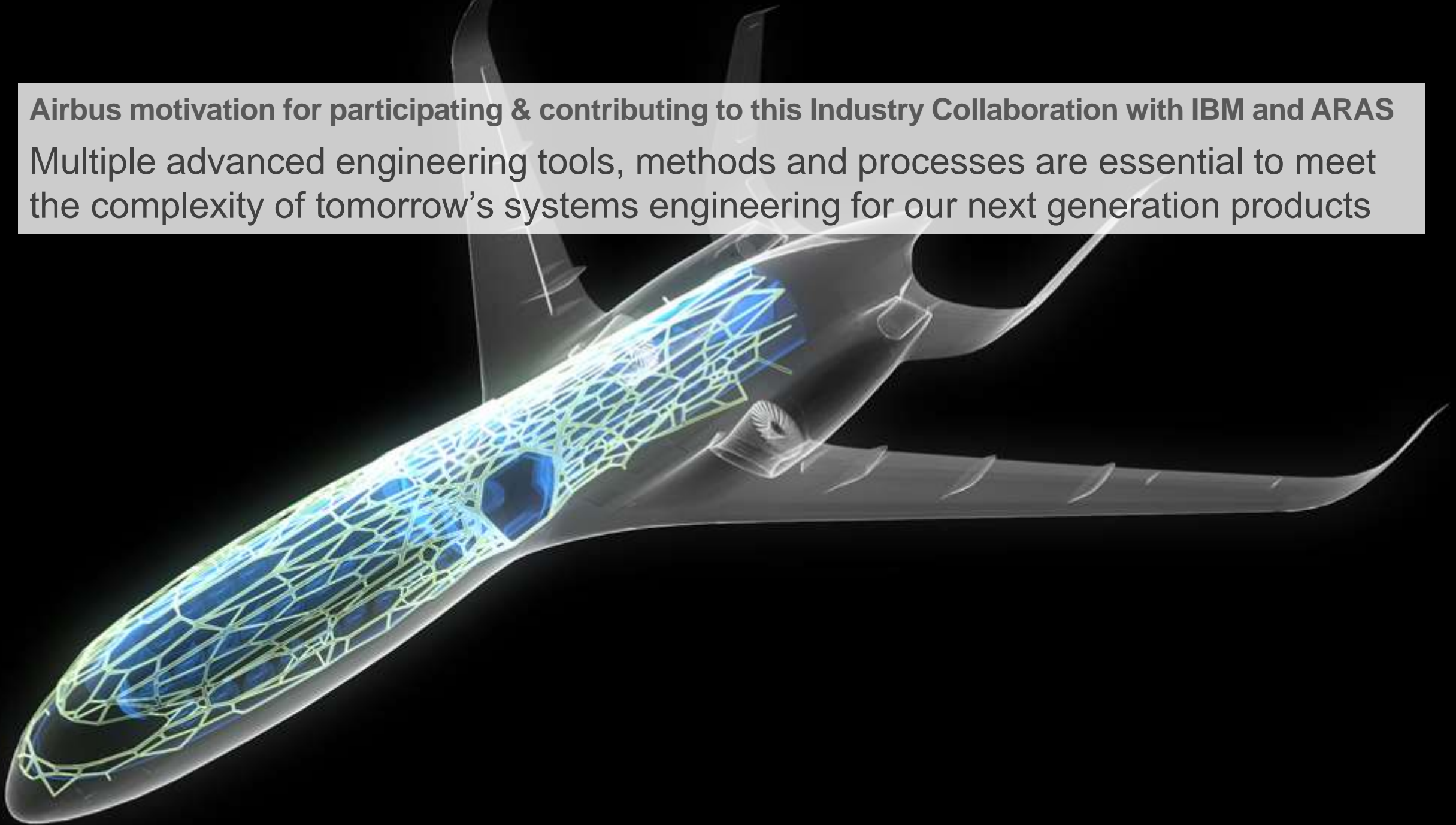
- Complex Products
- Safety-critical Systems (Certification)
- Geographically distributed product development teams
- Complex IT infrastructure

Airbus A320, a truly global programme

Work sharing for the A320neo*



Airbus motivation for participating & contributing to this Industry Collaboration with IBM and ARAS
Multiple advanced engineering tools, methods and processes are essential to meet the complexity of tomorrow's systems engineering for our next generation products



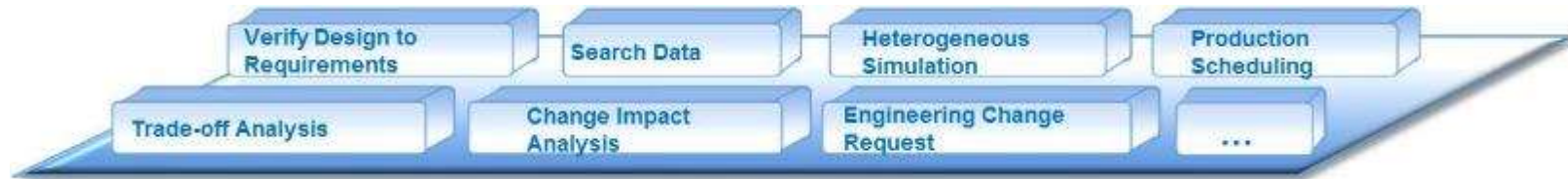
Digital Transformation

End-to-end Engineering across Disciplines

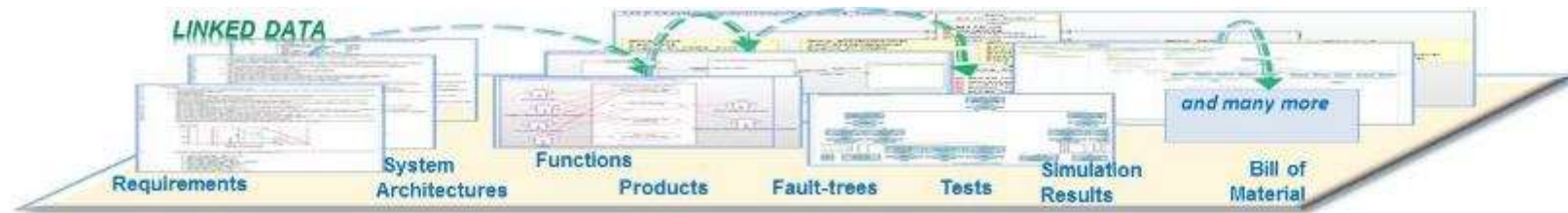
Industrial Workflows



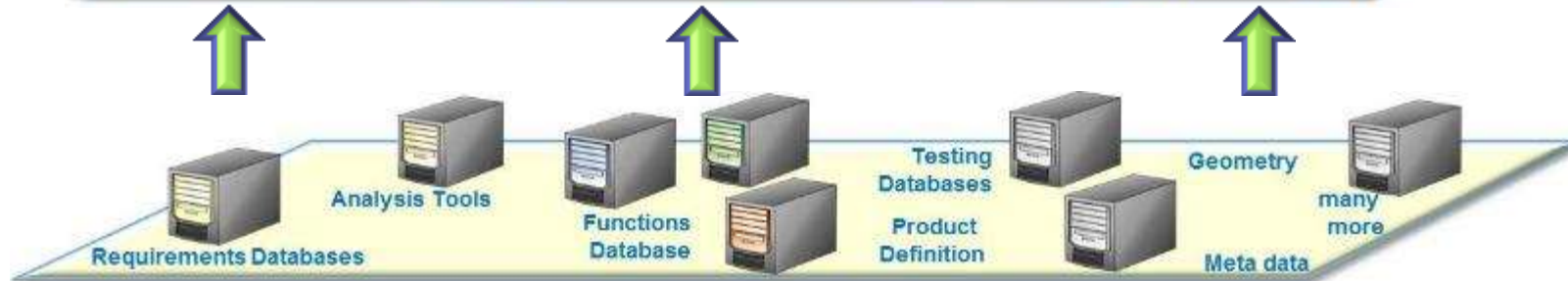
Engineering Methods



Platform Layer



Tool / Data Layer





Helping our engineers fly by breaking through the integration barrier

Improving tool interoperability helps us

- Respond effectively to change
- Deliver on time
- Master complexity

Approach must provide

- Real world use cases
- Powerful capabilities for the future
- Minimal disruption & replacement

Cross Discipline Product Development - Breaking through the Integration Barrier

Standards are key!

- Standards for Engineering Data Collaboration and Interoperability are a key enabler for our future Cross Discipline Product Development environment
- Airbus Group is actively involved in a set of established / emerging standards and is collaborating with other industries and tool vendors on standard development and application



- OSLC



- SysML
- UML
- ReqIF



- STEP AP233
- STEP AP242
- JT



- Modelica
- FMI

OASIS OSLC Specification

<http://open-services.net> (Community web site)

<http://www.oasis-oslc.org> (Standard Development web site)

- OSLC = Open Services for Lifecycle Collaboration
 - An open community building practical specifications for integrating software
 - RESTful services with any resource accessible to multiple platforms & tools via URLs
 - Open specifications are freely available to use and extend
- Robust, flexible connections
- Able to analyze, track, and explore data to make better decisions
- Reduces risk & cost



Open Services for Lifecycle Collaboration

Our commitment towards OSLC

- Airbus Group is a supporter of OSLC since 2008
- Participation in pre-standardization on “open-services.net” until 2013
- Founding Member of OASIS OSLC Member Section in 2013
- Member of OASIS OSLC Steering Committee since 2013
- Contributor to OSLC Core Specification
- Promotion and adoption of OSLC in European embedded systems community (cf. CRYSTAL R&D project: www.crystal-artemis.eu)
- Development of OSLC Adapters for in-house tools
- Application of OSLC within R&D and in Methods & Tools perimeter up to TRL 6
- Linked Data / OSLC is part of our RFI criteria for selecting new tools within ALM / PLM
- Key Challenge regarding OSLC is the application across disciplines, e.g. MBSE / PLM



ALM-PLM Open Reference Architecture Implementation Partnership

Joining forces for the development of the products of the future

Meeting the Challenges

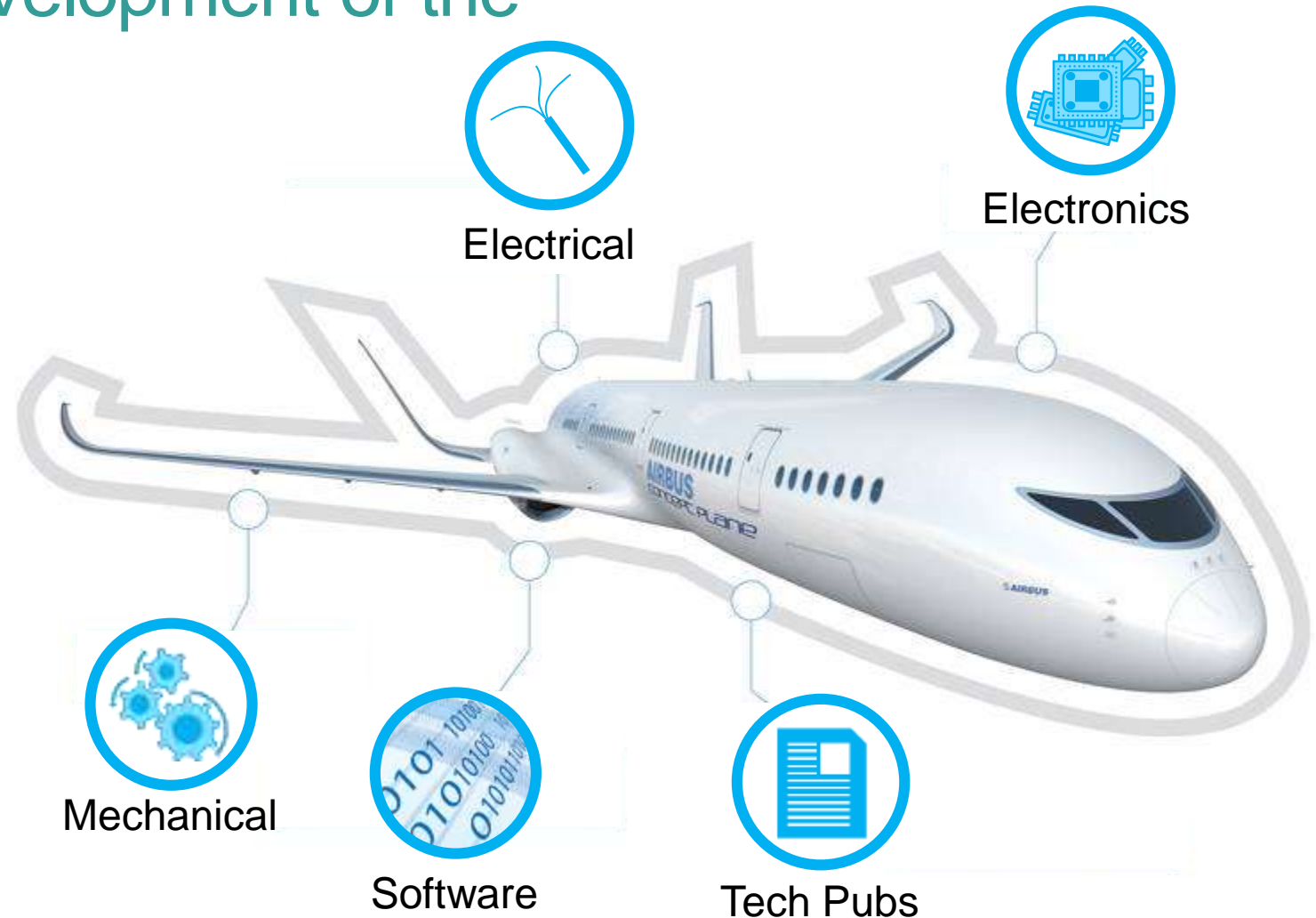
- Product / system configuration complexity
- System-centric development
- Connected / Intelligent systems

IBM-Aras approach

- ALM-PLM Across the Disciplines
- Open industry architecture
- Standards-based (OSLC)
- Building on CRYSTAL dissemination

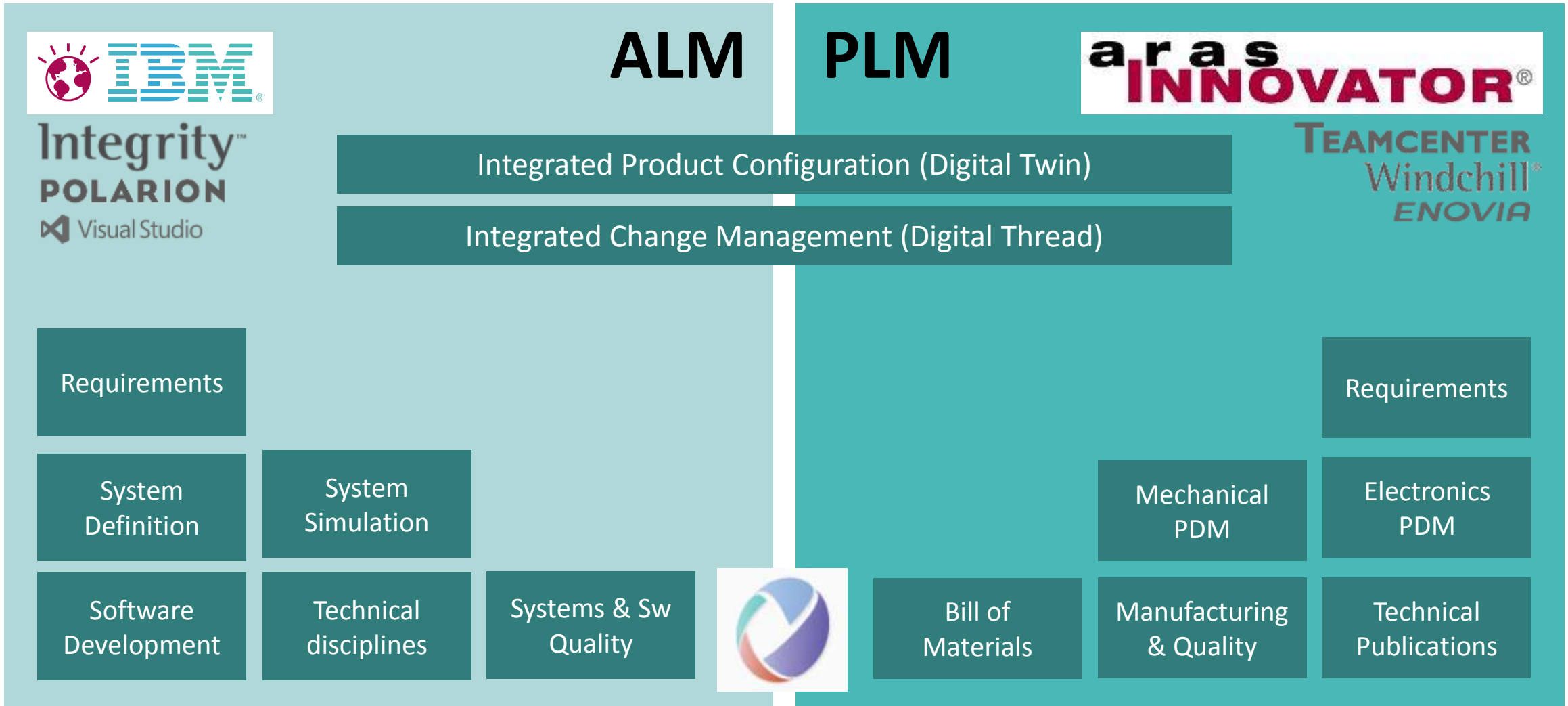
Helping clients with

- Minimum tool disruption
- Regulatory compliance
- Liability
- Traceability into the Future



ALM-PLM Open Reference Architecture

Integrates System-Level Definition, Physical Product Configuration and Change Control with Best-of-Breed Tools & Processes

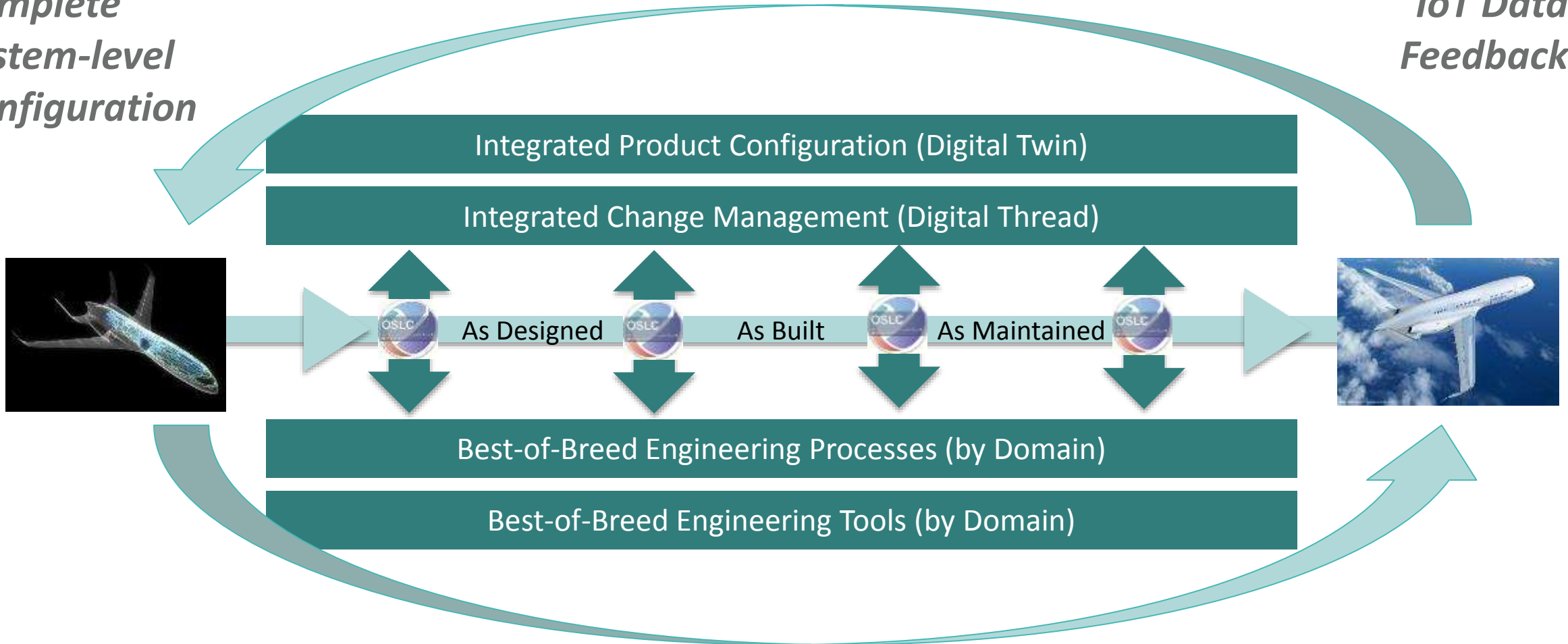


Supporting IoT Lifecycle

Open reference architecture provides configuration context to interpret IoT data

**Complete
System-level
Configuration**

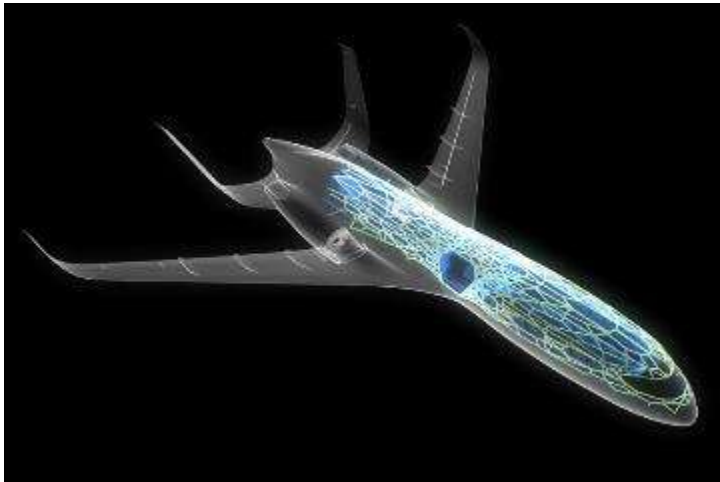
**IoT Data
Feedback**



Chief Engineer's Dilemma

If I must make a change, how do I know what we're changing?
My system definition is in models, my software is in ALM,
and my physical product is in PLM...

Design



as designed

Manufacture



as built

Operate



as maintained

NECESSITY FOR CONTROLLED CHANGE

How am I supposed to do impact analysis?!?

Public Aerospace Use Case

Aircraft De-Icing System

Purpose:

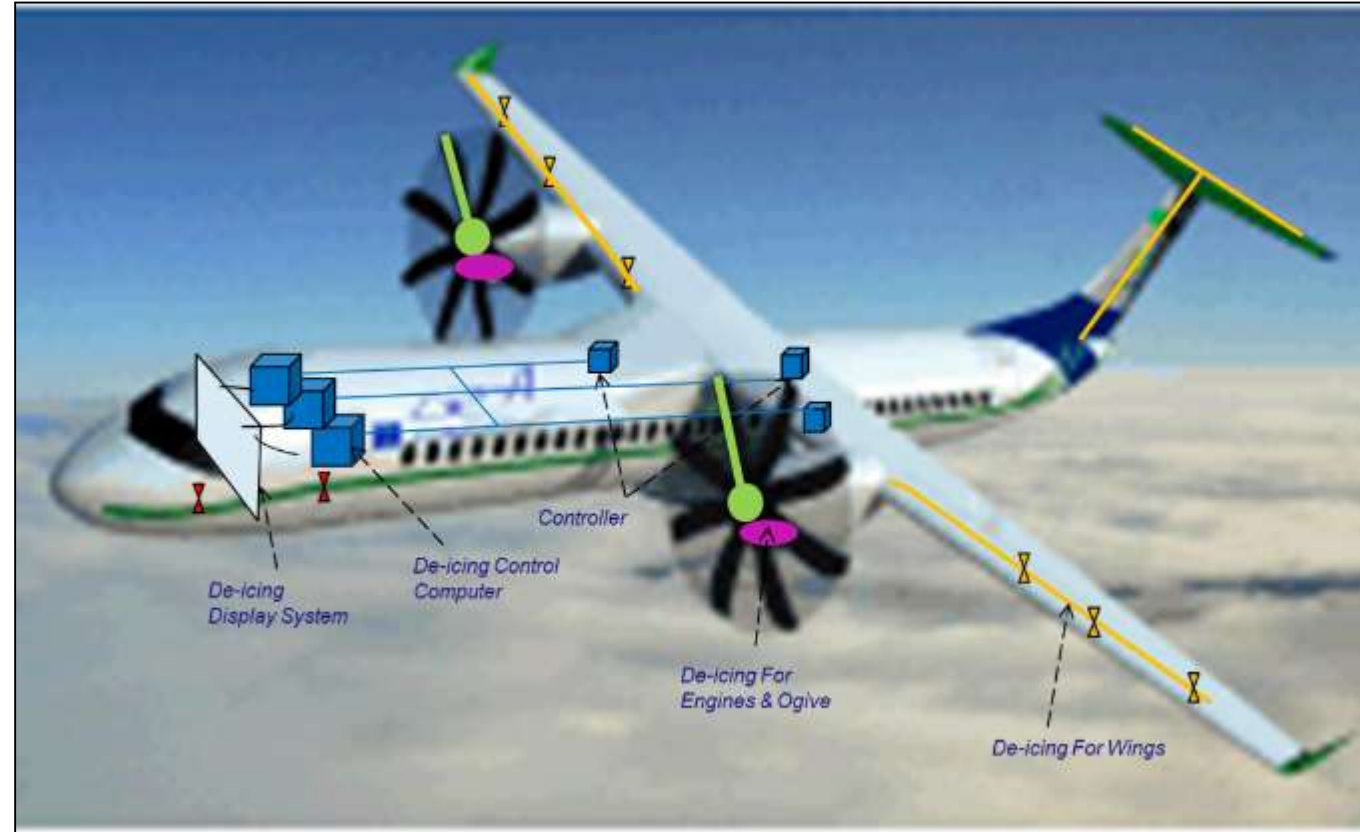
- Artificial but realistic use case,
 - to explain industry needs
 - to evaluate IT solutions
 - for publication without facing IPR issues

Use Case Objective:

- Definition of De-icing System for Regional Turboprop Aircraft, with:
 - Minimal Cost, Weight, Power Consumption
 - Fulfilling safety constraints
 - Fulfilling functional needs (i.e. keep Aircraft components free-of ice)

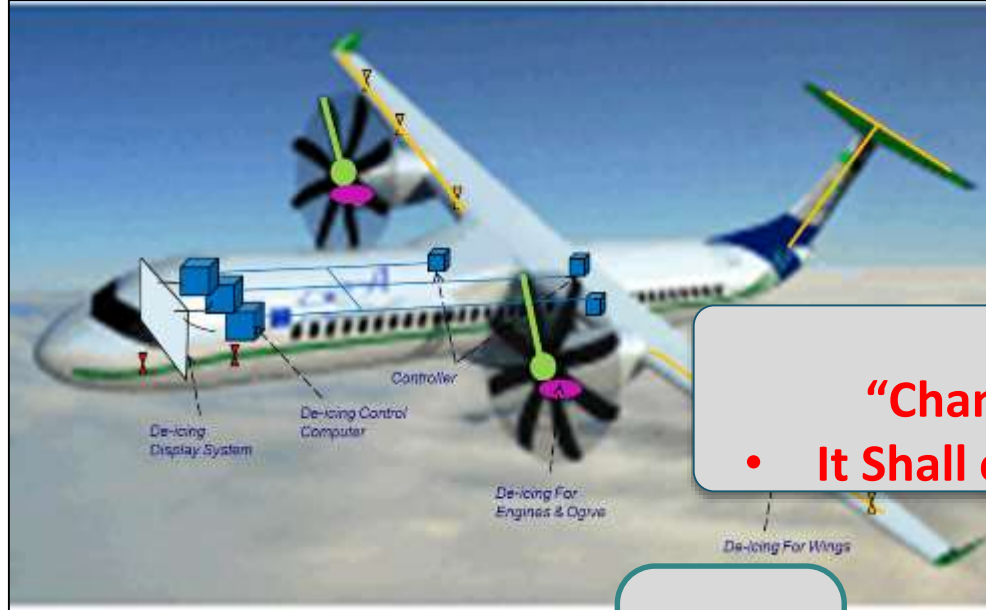
Dissemination result of CRYSTAL Project:

- EU funded research project
- Around 70 partners
- Special thanks to Polito, Alenia, IBM, Airbus for setting up this Use Case



Public Aerospace Use Case

Aircraft De-Icing System



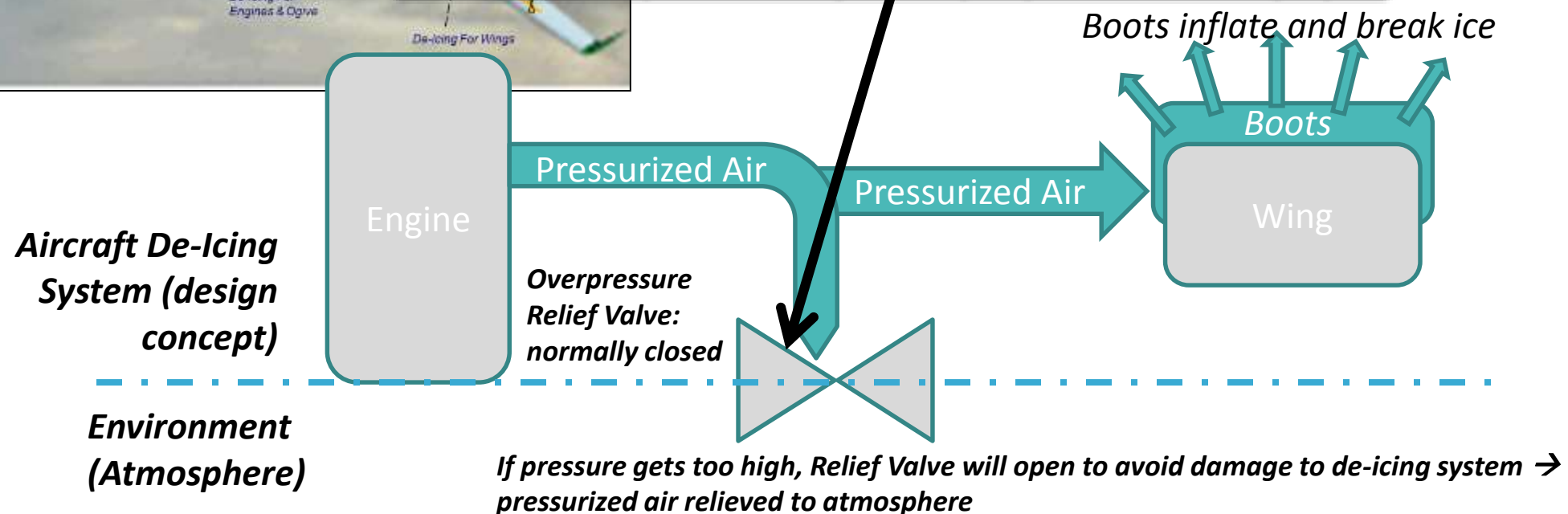
Scenario:

- We have selected a Design (Design Freeze)
- We have started to define a Product Breakdown Structure (PLM)
- Now we receive a Change Request

Certification Authorities:

“Change That Overpressure Relief Valve!:

- **It Shall open already at 19 psi (instead of 21 psi)”**



Certification Authorities:
"Change the Overpressure Relief Valve!
It Shall open at 19 psi (instead of 23 psi)"



ALM

PLM



Create child Change Request
Investigate AML managed artefacts
Probe combined ALM-PLM change impact

Notify ALM

Notify PLM



Create child Change Order (Work Item)
Update Requirements, System design,
Software, etc.

Notify ALM

Notify PLM

Create Problem Report

Create master Change Request
Add initial list of impacted artefacts
Complete list of impacted items

Go/No Go

Create master Change Order
Authorize ALM to make changes
Authorize MCAD/ECAD to make changes
Update Physical structures in PLM

ECR

ECO

Certification Authorities:
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**Traceability
Digital Thread
is Created**

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Target benefits

Better approach to managing whole product configuration & changes over lifecycle

- Greater visibility, coordination and traceability using multi-vendor linked data
 - Respond effectively to change
 - Deliver on time
 - Assure safety
- Ability to use best of breed tools & processes with minimal disruption / replacement (software, electronics, mechanical, etc)
- Sustainable over time
- Reduce risk & cost

Video Here

Next steps

Further development of ALM-PLM Open Reference Architecture

Build out scenarios across industries to advance best practices

Aero, Auto, High Tech, Healthcare/Medical, Rail, etc

- ALM-PLM for MBSE
- Product, system and software quality
- Joint product and software lifecycle management

ALM-PLM Interoperability User Group

User Group open to all interested parties!

Contribute scenarios, provide feedback and/or participate directly

CALL TO ACTION: Sign up now

http://open-services.net/mailman/listinfo/oslc-plm_open-services.net

...don't hesitate to contact us...

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AIRBUS
CONCEPT PLANE

F-EIAT