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AIRBUS Presentation

Benefits of Requirement Engineering with DOORS



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Airbus General Cultural Context

- **Incorporation of AIRBUS into a Single Entity**
- **Multinational (multi-cultural) workforce**
- **Multi domain projects**
- **Multinational, Trans-domain communication dissemination**

What is Systems Engineering - General

Systems Engineering* is the Engineering (Realizing) of a System **

(*) : Within Airbus, Systems Engineering is known as RBE (Requirement Based Engineering) since June 2003

() : A System is a collection of Components (some of which can be Systems) so interconnected as to perform a function that the components, by themselves, cannot.**

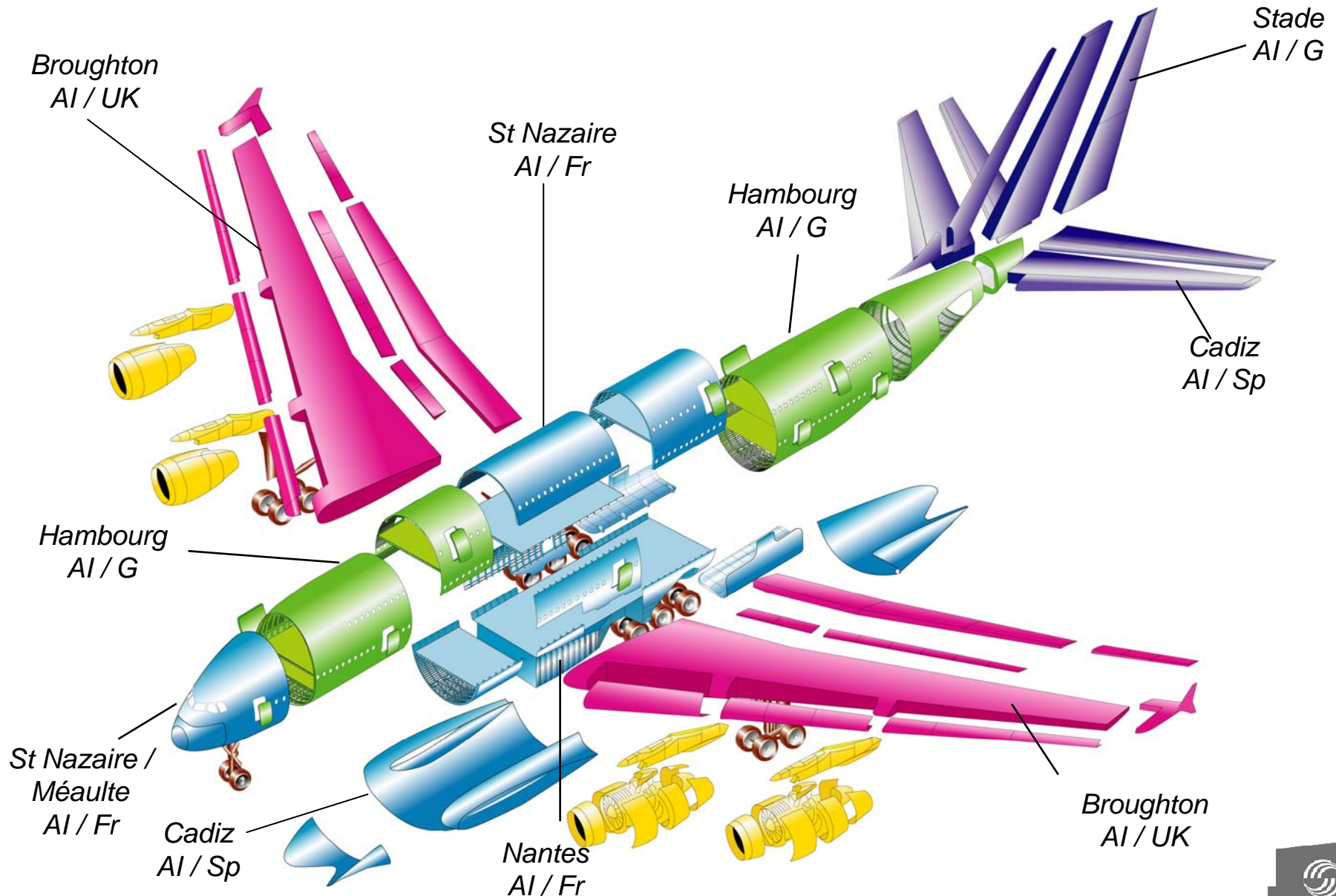
The Aircraft itself is a System, as well as a Major Components (Fuselage, Wing, Vertical Tail Plane, Power plant,...) , a “System”, an Equipment.

Systems Engineering is concerned with **Complex , Innovative Systems.**

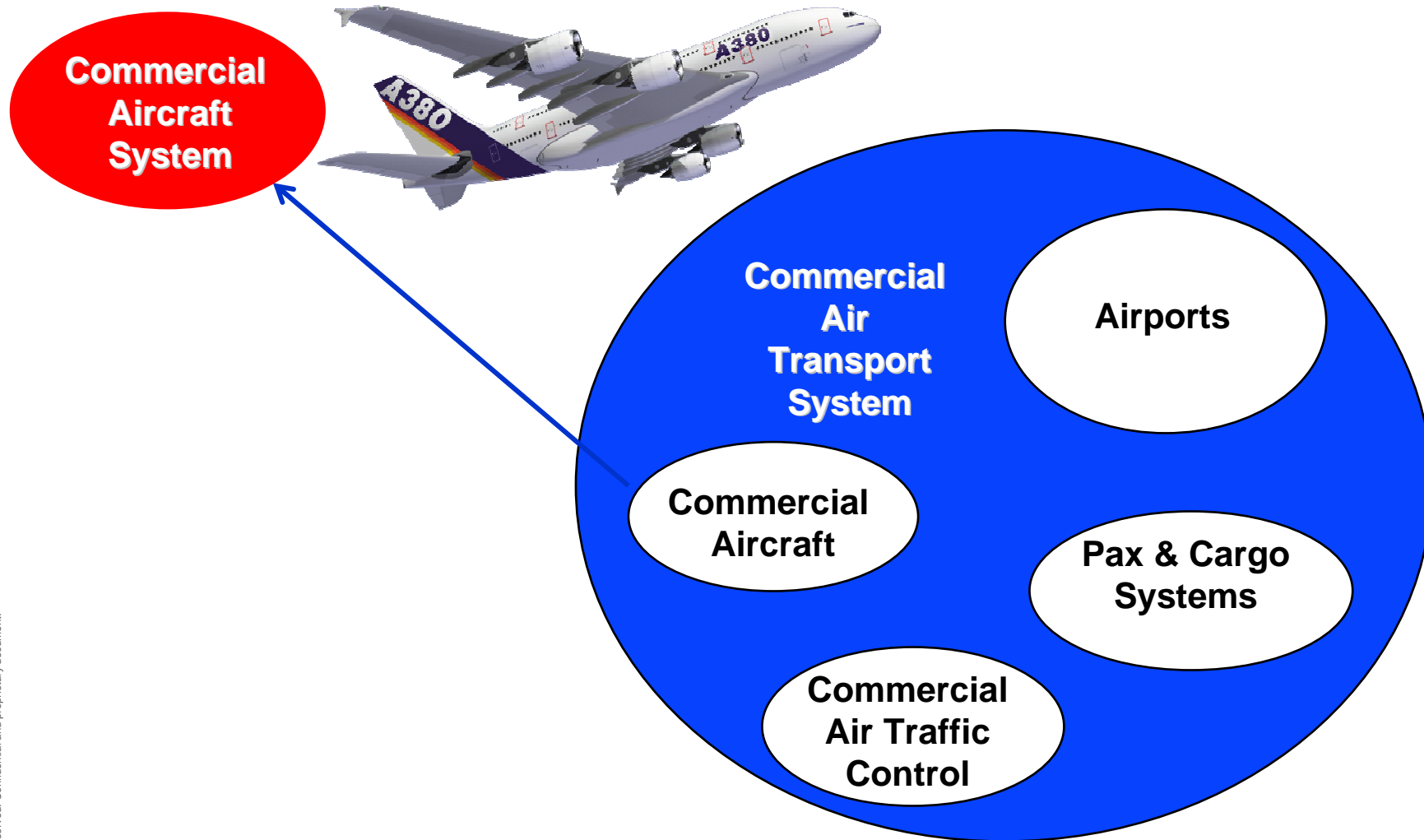
Systems Engineering is an **interdisciplinary approach used to control the development of complex products**

This approach starts with the **definition of customer needs, the identification of **product functionality** and the **intended validation** very early in the life cycle.**

The Aircraft is a system ...



The Aircraft is a System within an Overall System



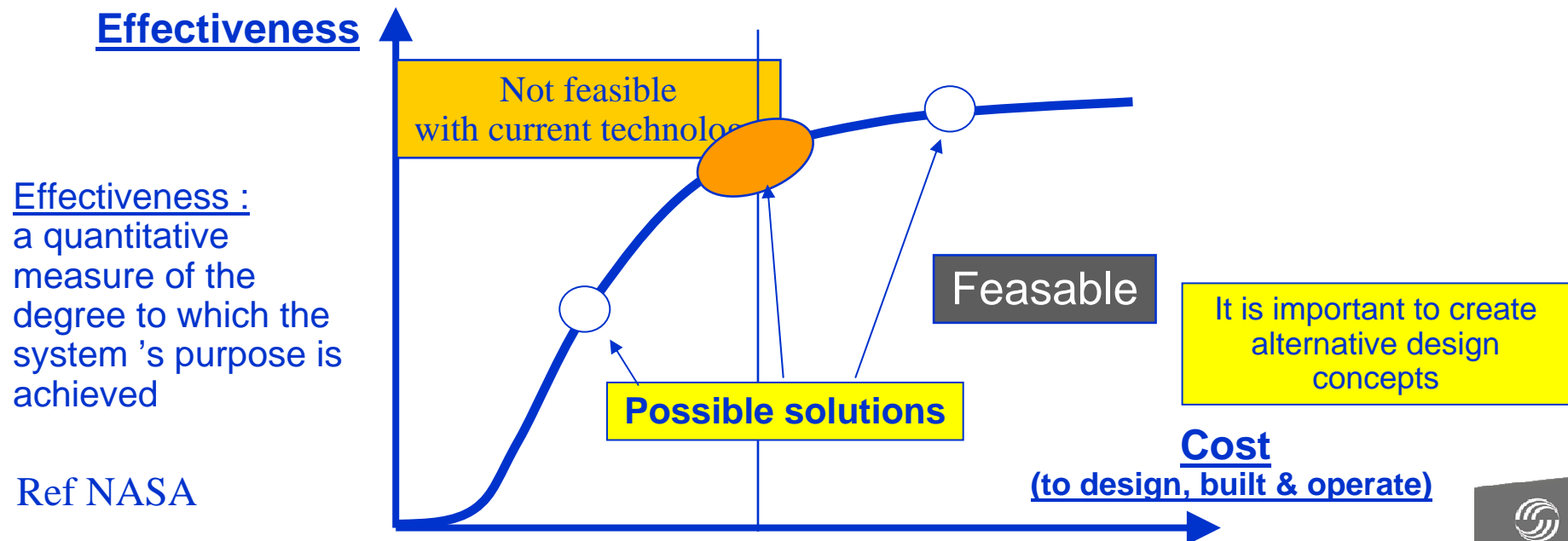
and we can also considered the Aircraft as being part of a higher System (Airport, Air Traffic Control,...)

Objectives of Systems Engineering

The objectives of Systems Engineering is to ensure that the system of interest is

- *designed*
- *built*
- *operated*
- *retired*

so that it accomplishes its purpose in the most **cost-effective** way, considering ***Performance, Cost, Schedule and Risk***



Examples of Not using System Engineering

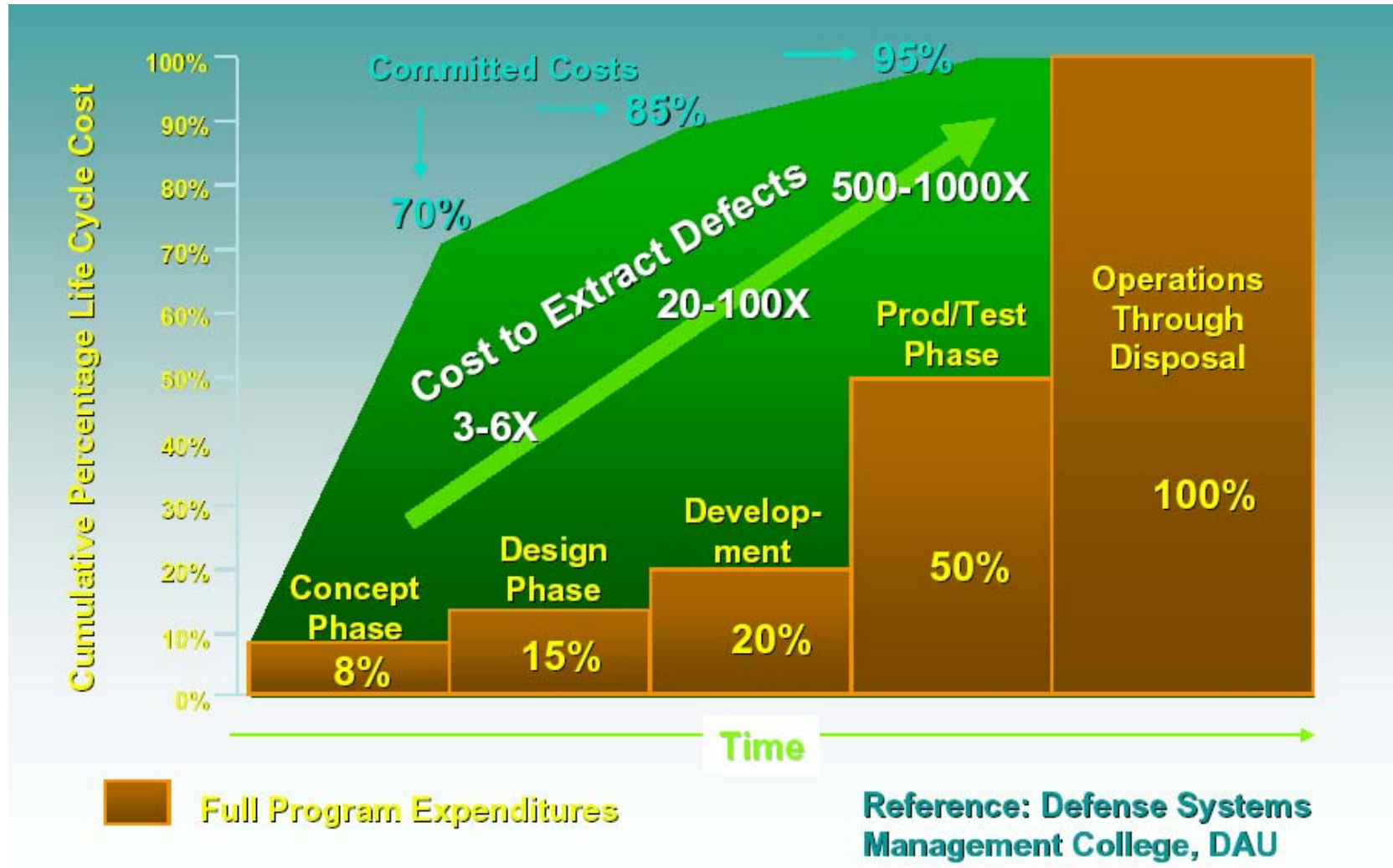
- **80% of 'defects' are inserted at requirements stage**
- **Rework costs are estimated at 45% of total costs**
- **Good requirements 'engineering' can potentially avoid up to 36% of total cost**

Reference: 'Effective Requirements Practices' (NASA)

About 35 - 50% development effort is spent for re-design!

Reference: Karl Wieggers, "In Search of Excellent Requirements"

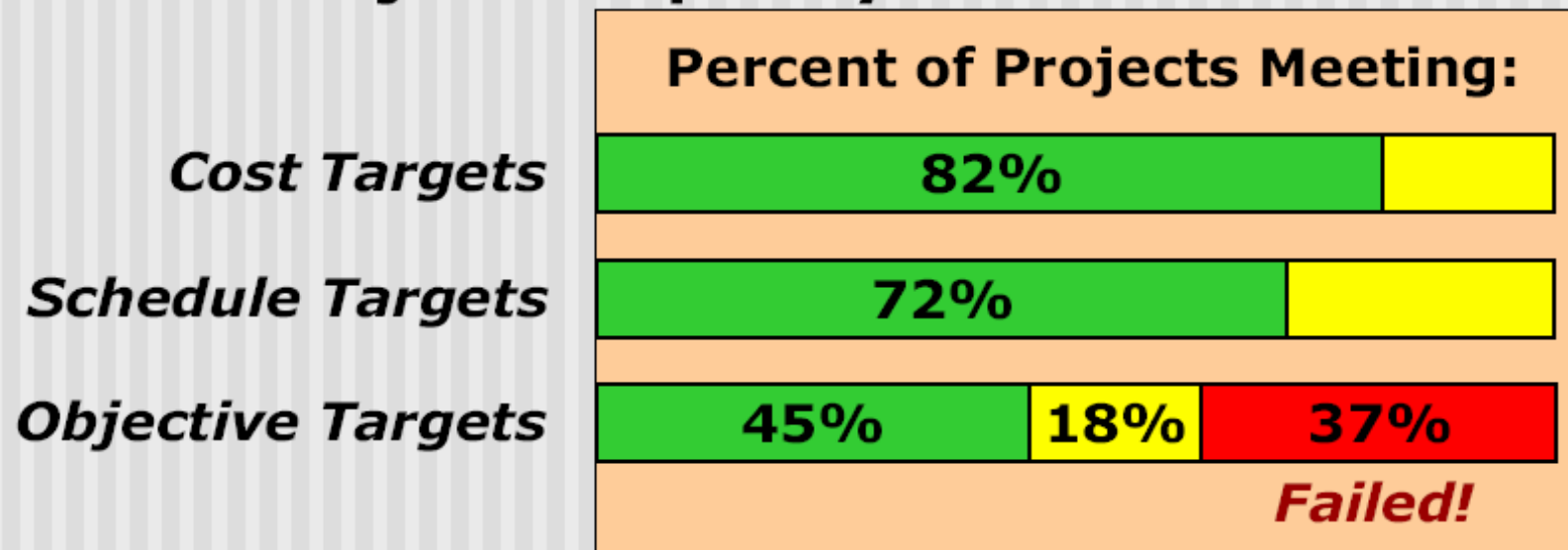
Consequences of Not Implementing SE



Consequences of Not Using SE on Large Projects

- **Study of 60 LEPs (power generation, transportation, oil production, technology)**
The Strategic Management of Large Engineering Projects, MIT Press 2000

- **Evaluation by interviews and by objective and subjective quality measures.**



Reference: INCOSE SE Centre of Excellence (SECOE)

Systems Engineering within Airbus - Overview

A/C Spec & Performance **Safety** **Certification** **Produce-ability** **Training** **Design Guidelines** **Supportability**

Needs & Requirements **Design Verification** **Product Verification** **Product Validation**

Design **Manufacturing** **Operations**

Lifecycle

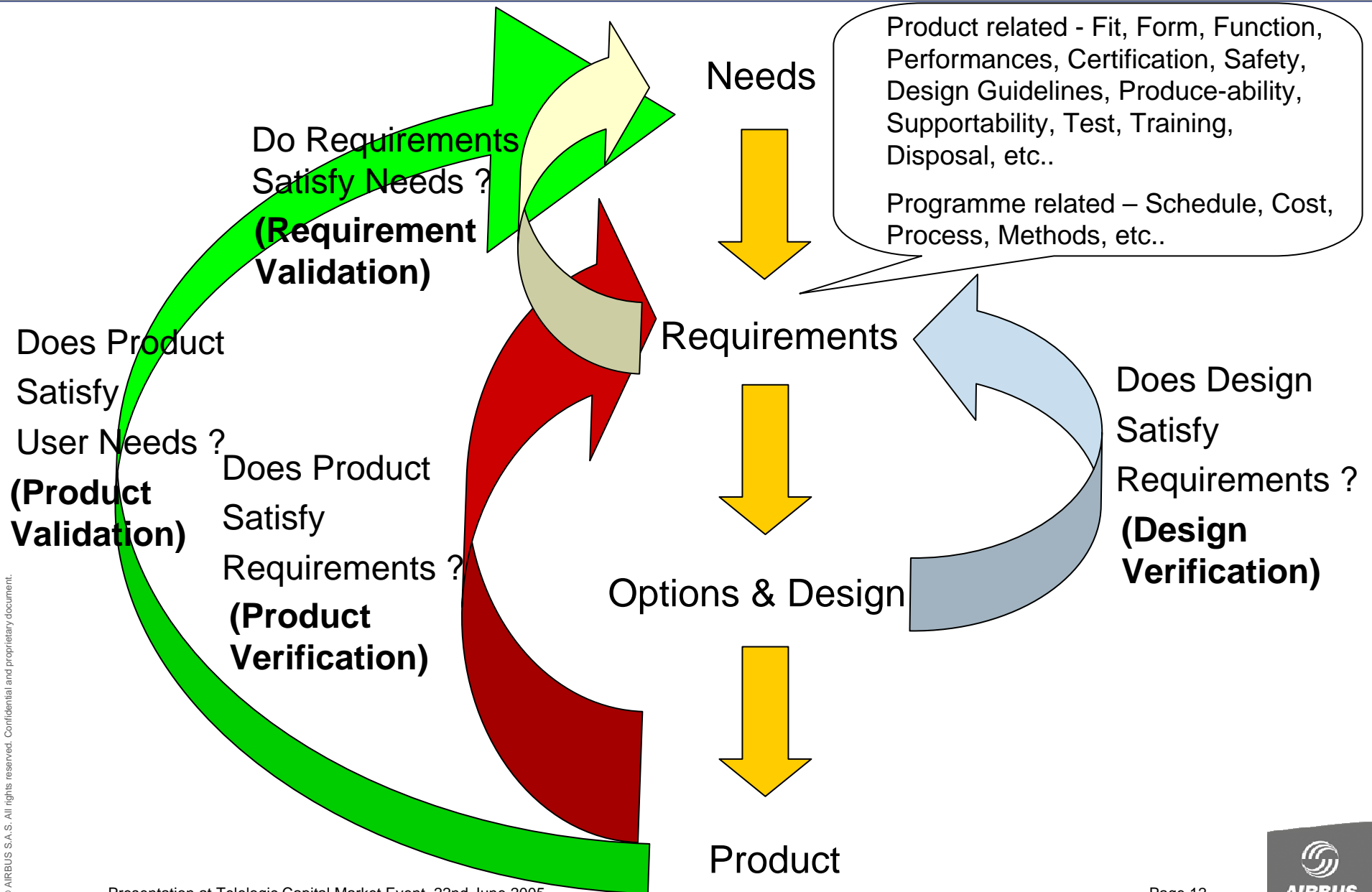
Programme related considerations

Organisation **Time** **Cost** **Process/Methods**

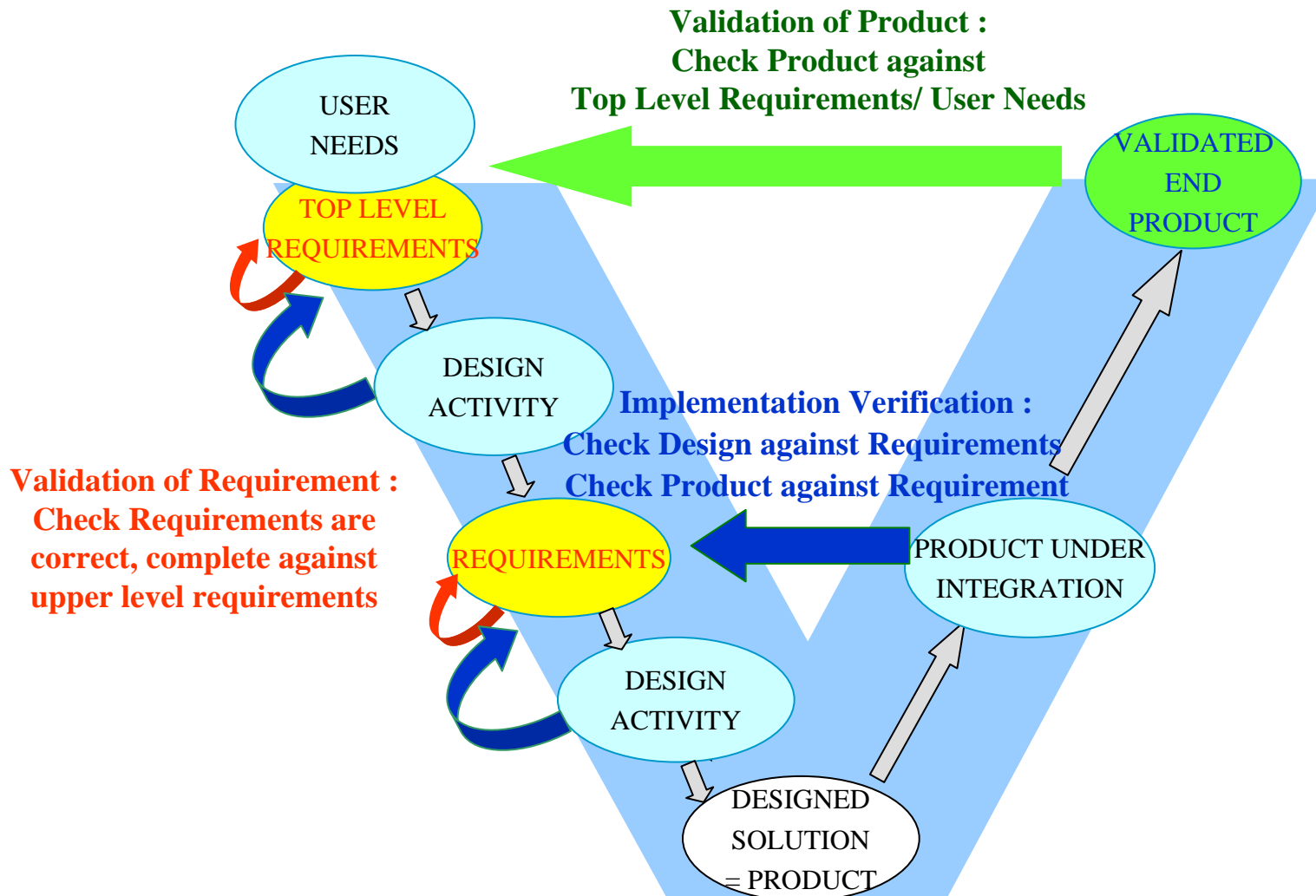
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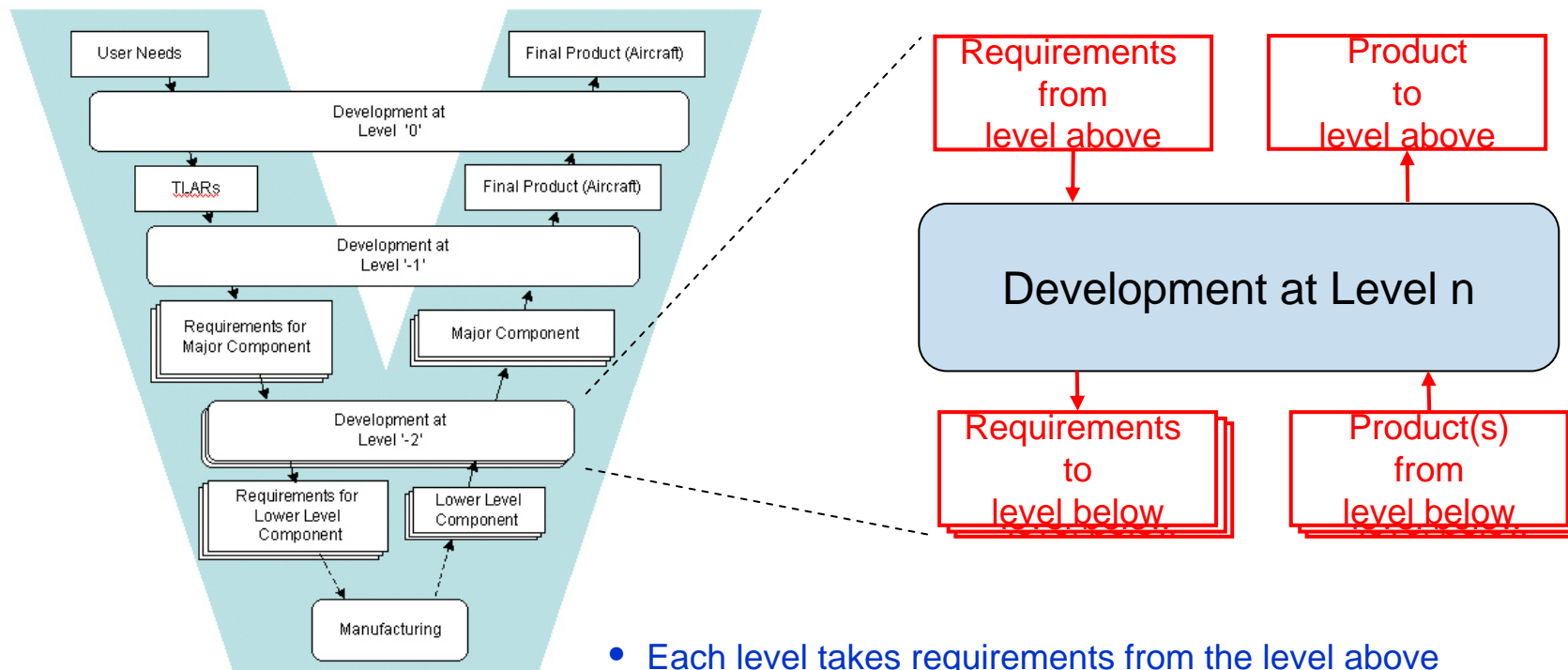
Systems Engineering within Airbus - Basics



The Requirement Based Engineering (RBE) Policy

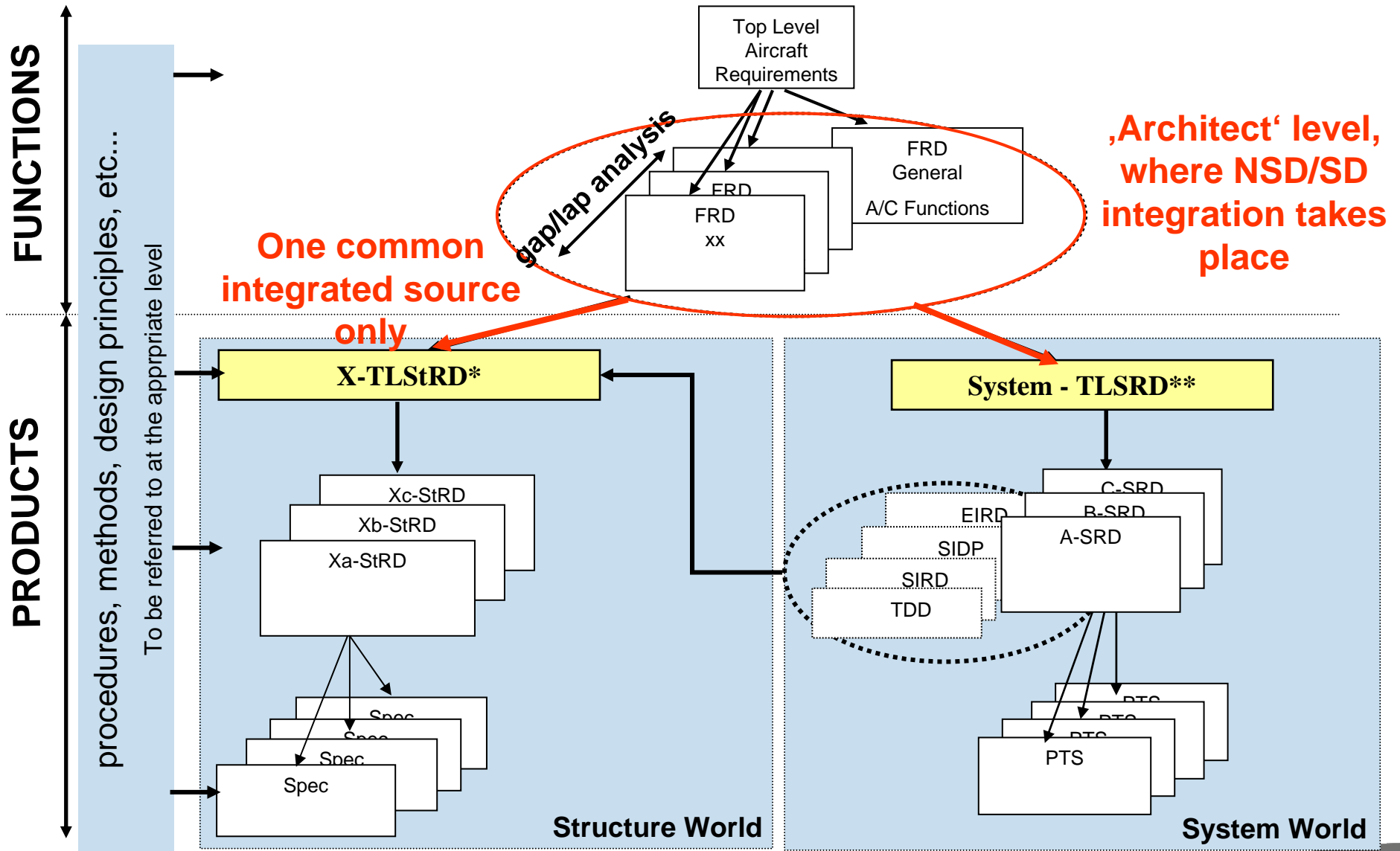


The generic RBE process at each level



- Each level takes requirements from the level above
- Generates requirements for level below
- Receives development products from level below
- Integrates development products to produce deliverable to level above

The Aircraft Requirements Cascade



* X stands for a major (structure) product like Wing Fuselage, ...

** This is not a specific document but the set of the FRD related to Systems
Presentation at Telelogic Capital Market Event 22nd June 2005

Internal Benefits of Systems Engineering / RBE

- Right first time
- Reduce Rework
- Increase Re-Use
- Increase Process, Method, Tool & People Efficiency in Engineering
- Increase benefits from Concurrent Engineering & reduce Risk Exposures to Airbus
- Use SE as a Competitive advantage

DOORS Tool Selection Process

- Looked at what our suppliers and partners were using
- Participated to Conferences and Symposiums to examine what competitors and other industries doing
- Benchmarking with some external companies
- Used internal experience of Airbus staff
- Pilot Project to
 - Evaluate capabilities of DOORS tool (end-user involvement)
 - Assess tool functioning in AIRBUS IT environment
- Used tool vendor experience
- High Level decision to validate DOORS as tool for RBE

Usage, Feedback, Users Perception

- **Usage**
 - ▶ **High acceptance of end-users (intuitive use of tool)**
 - ▶ **User number is higher than initially expected (>800 authors + readers),**
 - ▶ **Trend: growing.**

- **Feedback**
 - ▶ **Immediate SE/RE benefits seen just by the increased level of communication and transparency provided by the tool**
 - ▶ **Traceability easy to manage**

- **Key Performance Indicators (KPIs) are being set up to assess the effectiveness of the process and the tool**

THANK YOU !



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