DDMS

Digital Design Manufacturing & Services

Open Simulation Platform Conference, Älesund , Nov 12th-13th, 2025

FMI Standard at Airbus

Use Cases to support System Design, Verification, Validation and Reuse.

Success Story and Challenges

Presenter : Tahina Bezanahary - Modelling and Simulation Architect
Airbus SAS
12th November 2025

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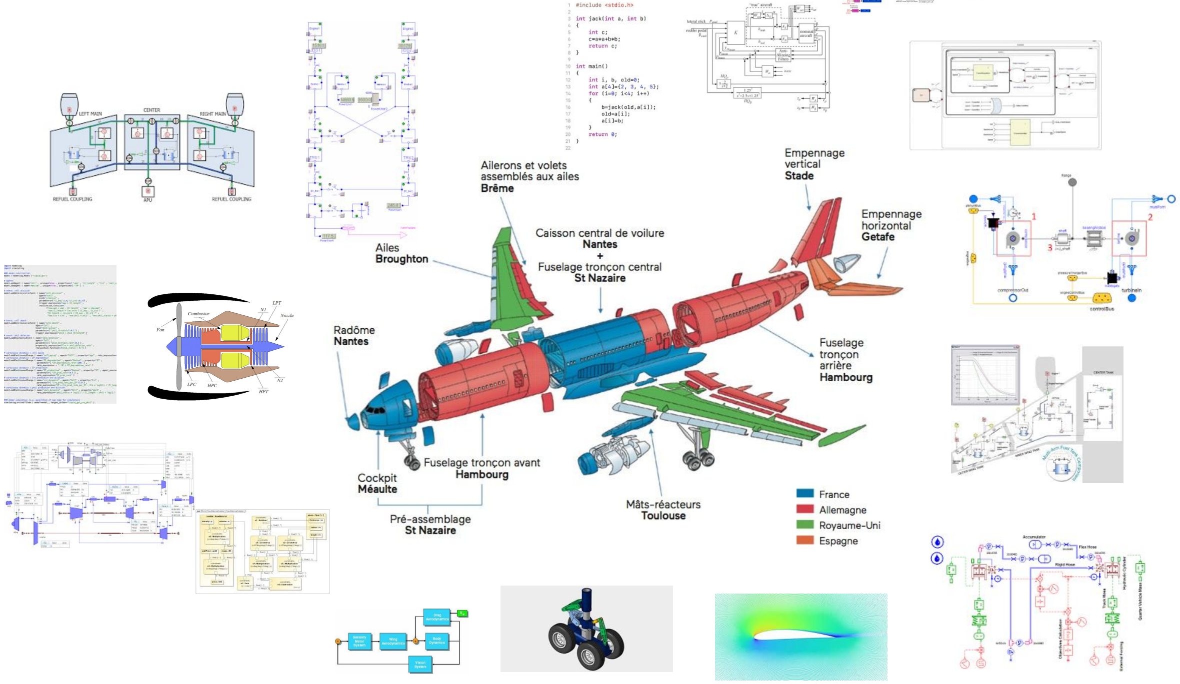
Success Story and Challenges

1.Introduction

Airbus is dealing with approximately

80% of Models

Coming from different partners and suppliers



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Challenges:

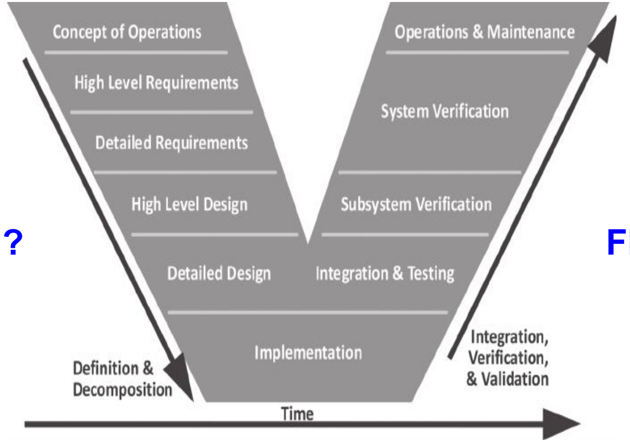
- **Integration**
- **Interoperability**

For Airbus and Ecosystem:

- Optimize tools and models integration
- Share simulation infrastructure development effort
- Reuse models, best practices, and tools
- Enable and share new business solutions for simulation tasks
- Increase collaborative spirit

FMI ?

FMI ?



FMI ?

FMI ?

Using an open standard like FMI may give access to new solutions and technologies that could be incorporated in our domain

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FMI Standard And Airbus: **Not a New Story**

Share Usages, Needs and Expectations

Who ? Airbus GROUP

Member of FMI Advisory Committee
Create An Airbus Community for FMI

16th Modelica & FMI Conference - 2025

Who ? Airbus GROUP

FMI Status and next steps Initiative 2021

15th Modelica Conference - 2023

Who ? Airbus Commercial Aircraft

FMI 2.0 Assessment - 2016

FMU 3.0 Release 2021

Who ? Airbus Group

FMI 2.0 Evaluation - 2015

Who ? Airbus A/C M&S Community

FMI 1.0 Evaluation - 2013

Who ? Airbus Commercial Aircraft

FMI 2.0 Release 2013

FMU 1.0 Release 2011

ITEA2 **MODELISAR** project 2008 - 2011

White Paper for AIRBUS Group

Recommendation: use FMI 2.0 as much as Possible

FMI has been spread across all of our Divisions at each Product Lifecycle Step

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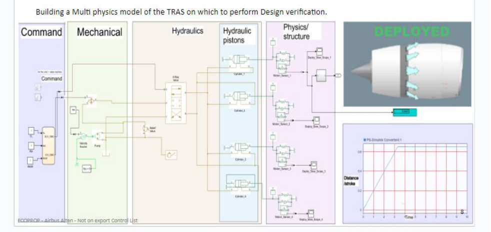
Success Story and Challenges

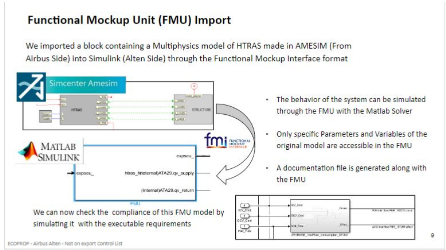
4.FMI @AIRBUS Today

4.1 CoC Powerplant

The work linked to the ECOPROP project, done in collaboration with ALTEN partner, has been funded by the DGAC

To Perform Design verification with the Specification model

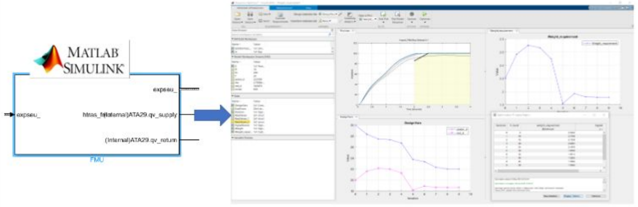




Co-Simulation of the model with PBRs for Design Verification

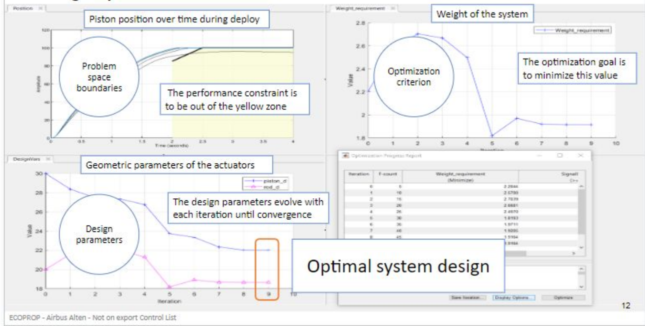
To Perform Design Optimization

We performed the Optimization of the geometric parameters of the Actuators using Simulink Optimization Toolbox using the Imported FMU Multiphysics model



Our goal is minimizing the mass while respecting a time performance objective

Design Optimization with the FMU Model



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Success Story and Challenges

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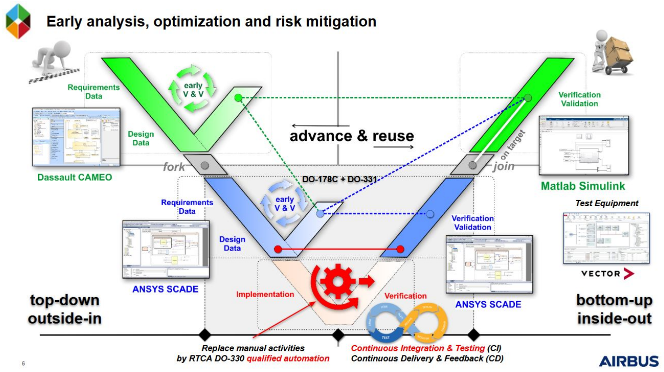
4.2 CoC Aircraft Cabin

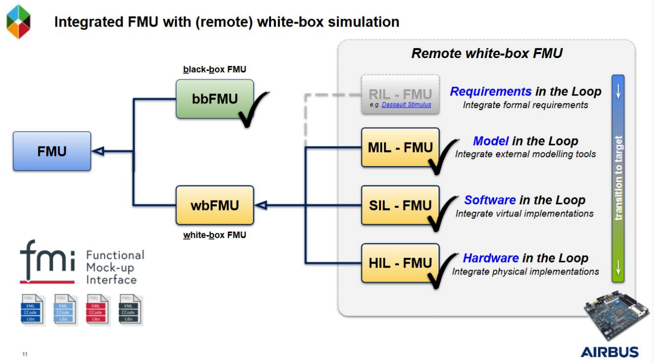
Increased E2E productivity from specifications to solutions & products

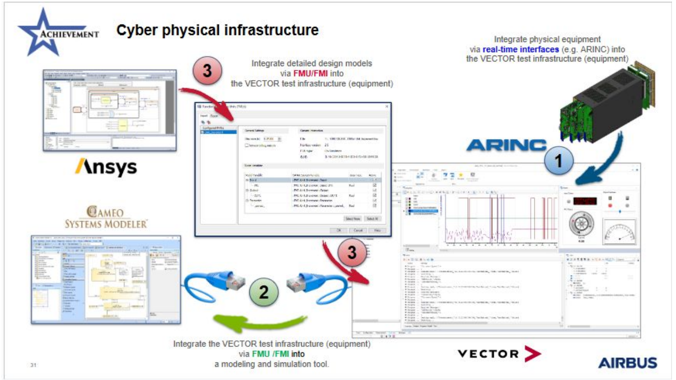
Improve end-to-end **digital continuity** (including consistency, traceability)
- *Top-down (specification & design) and bottom-up (verification) data transition and reuse*
- *Combination of classical and model based (i.e. hybrid) R-V&V approaches*
- *Connecting the different engineering disciplines (center) and stakeholders*

Implement end-to-end **model based validation & verification**
- *Introduce model based V&V for early analysis and optimization*
- *Vendor independent "Model in the Loop" (MIL)*
- *Vendor independent "Software in the Loop" (SIL)*
- *Vendor independent "Hardware in the Loop" (HIL)*

Enable **codevelopment with suppliers** via established and open standards
- *Establish exchange (collaboration) across different disciplines*
- *Establish a concept for model exchange with IP protection*







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FMI Standard at Airbus - Use Cases to support System Design, Verification, Validation and Reuse.

Success Story and Challenges

4.FMI @AIRBUS Today

4.3 CoC Systems

Airbus Standard : AP2633 scope

All simulation Models (Real Time or not) used for Validation, Verification & Training Simulators

Requirements and guidelines to support the development of simulation models, and environments for integration and exchange of models

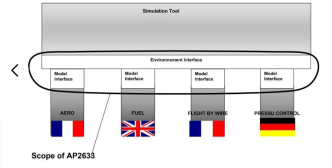
AP2633 is an Airbus standard for :

- ➔ Process
- ➔ Documentation
- ➔ Software in term of :
  - ◆ Encapsulation (Interface and control)
  - ◆ Model portability

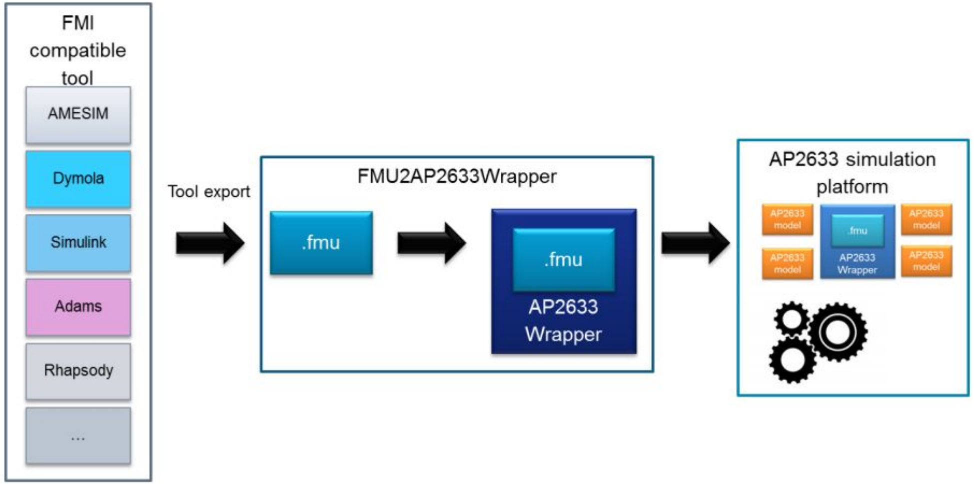
AP2633 : Airbus Standard for Simulation

- **Airbus standard** elaborated by ex Airbus partners for System Model Simulation Exchange in 1999/2000
- **Normalisation Process** to fix development (included operational use) and exchange Model simulation (Doc & Interfaces)
- **Aircraft Modularity** leads simulation architecture (and not the Simulation Tools)
- **Test Cases** (Validation &Verification) aspects are generalised & mandatory.

AP2633 : Integration and Exchange of Simulation Models



Why Not FMI ?



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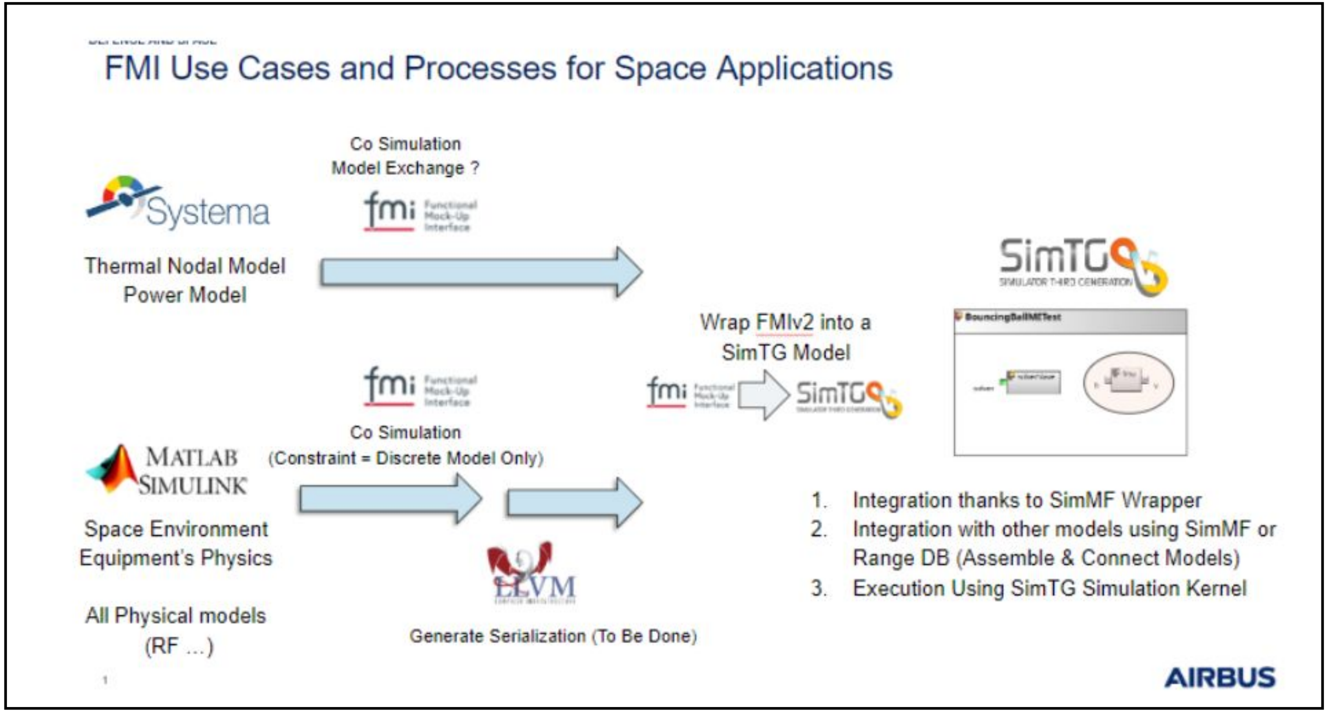
FMI Standard at Airbus - Use Cases to support System Design, Verification, Validation and Reuse.

Success Story and Challenges

4.FMI @AIRBUS Today

4.4 Space Systems Division



SimTG

ECSS SMP for Spaces Systems

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Success Story and Challenges

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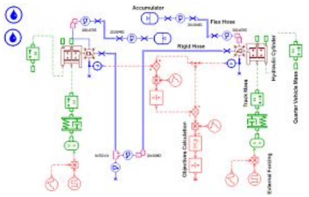
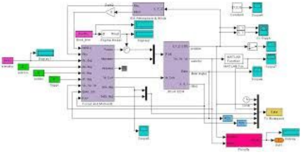
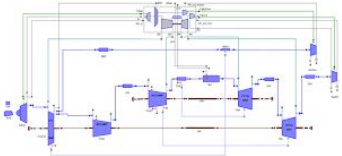
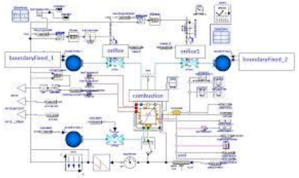
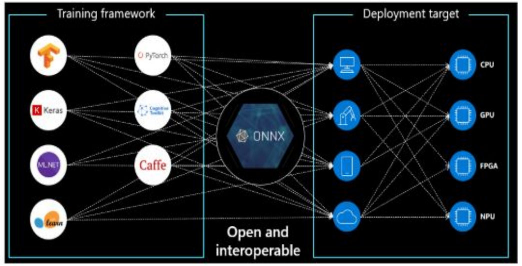
4.5. All Divisions - Usage of AI and ML Models



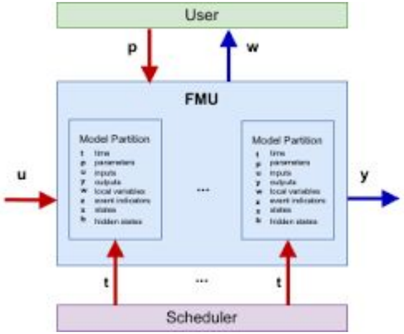








Functional **M**ockup **I**nterface



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Some statements coming from our teams:

"FMI is a complex standard"
"FMU is difficult to integrate and deploy"
"After integration, debugging FMU coming from the suppliers is difficult"
"How can I be sure that the IP of my FMU is protected?”
“Short summary of our struggles are the interfaces, e.g. cutting a mass flow is not a great idea sometimes. However, how system boundaries are built, we still have a mass flow as an interface sometimes. Leading to all different kind of instabilities.”
“Second issue is that sometimes supplier "abandon" their support for updated versions of an FMU. Especially in the case of black box FMUs, we cannot simply reverse engineer the FMU to update the system.”
“Model Exchange or Co-simulation ?”
“Calculation performances are worse than without using FMU”
“How to deal with the Models Complexity”
“Number of FMU that can be assembled”
“Are the results credible? How do I ensure the simulation credibility”
“Compatibility between 2.0 and 3.0”

"Contract"

Functional **M**ockup **I**nterface

FMI is Great but Not Magic !

Before FMI

With FMI

What some of us get

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Thank you

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