DDMS

Digital Design Manufacturing & Services

16th Modelica & FMI International Conference

Lucerne, Switzerland, Sep 8-10, 2025

FMI Standard and Airbus - Usages, Needs and Expectations

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9th of September 2025

AIRBUS

FMI Standard and Airbus Needs, Usages and Expectations

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2. FMI Standard and AIRBUS: A long but episodic Story

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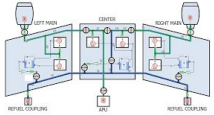
FMI Standard and Airbus - Usages, Needs and Expectations

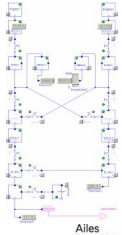
1.Introduction

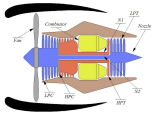
Airbus is dealing with approximately

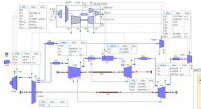
80% of Models

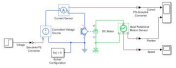
Coming from different partners and suppliers

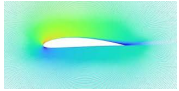


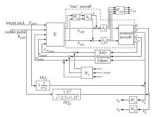


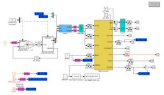


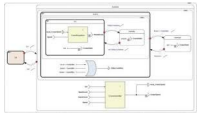


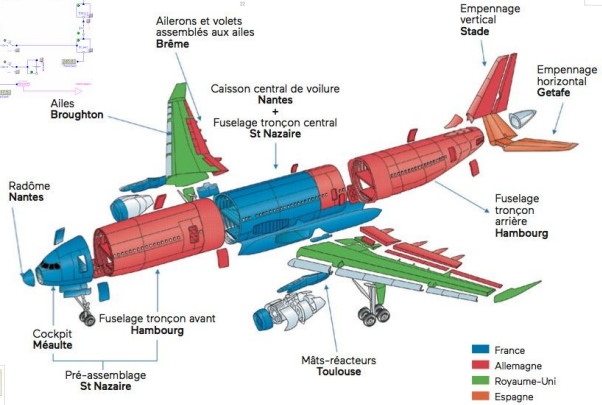


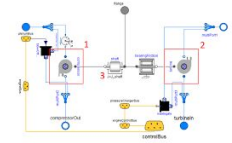


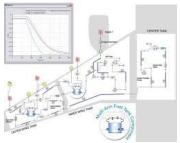


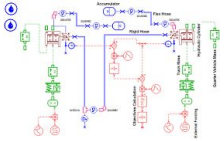












Challenges:

- Integration
- Interoperability

From Design Definition
To Detailed Design Verification and Validation

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FMI Standard and Airbus - Usages, Needs and Expectations

2.FMI Standard and Airbus A long but Episodic Story

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

Share Usages, Needs and Expectations

Member of FMI Advisory Committee
Create An Airbus Community for FMI

FMI Status and next steps Initiative 2021

FMI 2.0 Assessment - 2016

FMI 2.0 Evaluation - 2015

FMI 1.0 Evaluation - 2013

Who ? Airbus Commercial Aircraft

Who ? Airbus A/C M&S Community

Who ? Airbus Group

Who ? Airbus Commercial Aircraft

Who ? Airbus GROUP

Who ? Airbus GROUP

16th Modelica & FMI Conference - 2025

15th Modelica Conference - 2023

FMU 3.0 Release 2021

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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Because of the complexity of our **products**

Complexity means: We are using more an more models, we need to integrate/interoperate more and more models, coming from a wide range of heterogeneous sources in the most efficient way!

For instance: Time constraint leads to Take some shortcut like rebuilding the model in order to avoid the issue to integrate it … but … in reality, we have longer Integration Time and we need to add other verification/validation steps in order to ensure that the new model provides the same results as the original one.

Due to some other constraints, Airbus also has to ensure proper traceability and have updateable data instead of dead reports or documents.

The FMI standard and its implementations through the different tools is a promising way to solve the previous issues and to ease and improve our ways of working

The Standard is used in all programs within Airbus (Legacy and and next generation) and in a wide range of activities

At the different levels of the product development cycle

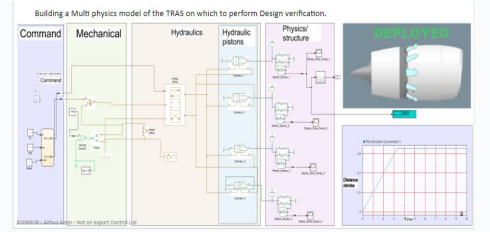
FMI is used to support the Design, Verification and Validation phase.
Physical tests (test benches, ground tests, flight tests) are an important part in the product development.

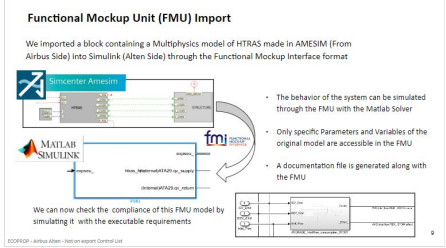
Today **SE/MBSE** is no more a nice to have at Airbus but it is a **mandatory requirement.**
We are deploying it at a large scale and **FMI is an enabler** (ease the way to exchange models, reuse models and contribute in an indirect way to improve our teams efficiency).

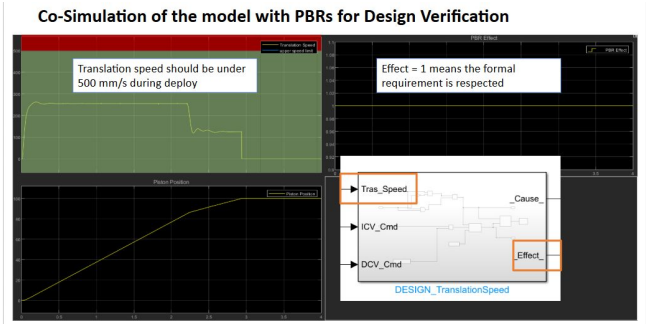
FMI Standard and Airbus - Usages, Needs and Expectations

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

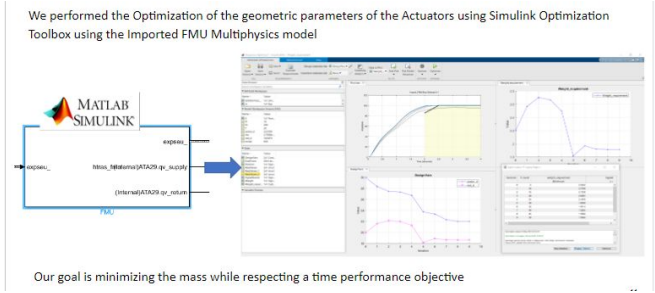
To Perform Design verification with the Specification model

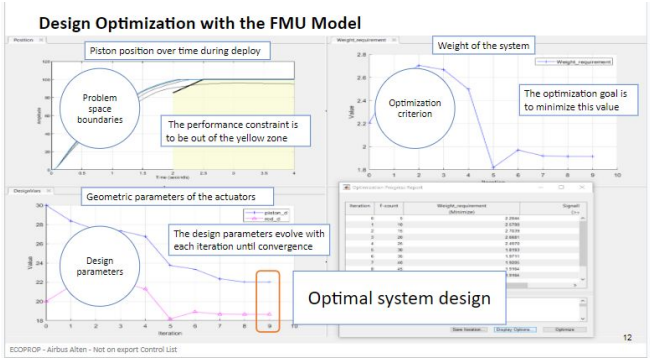






To Perform Design Optimization





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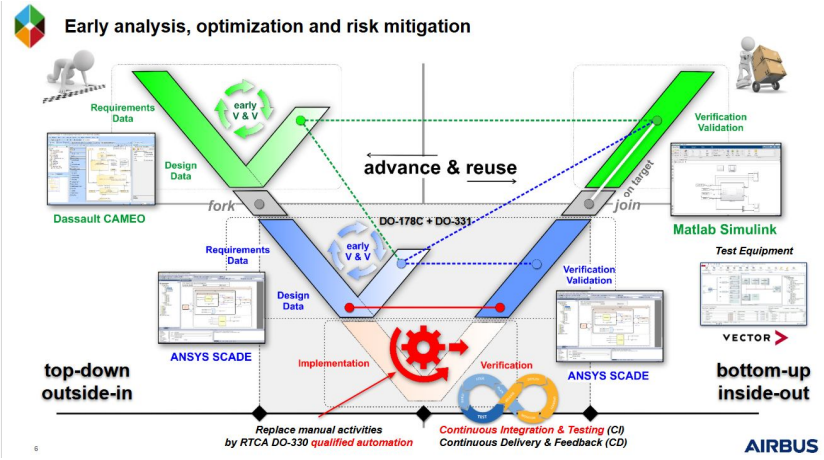
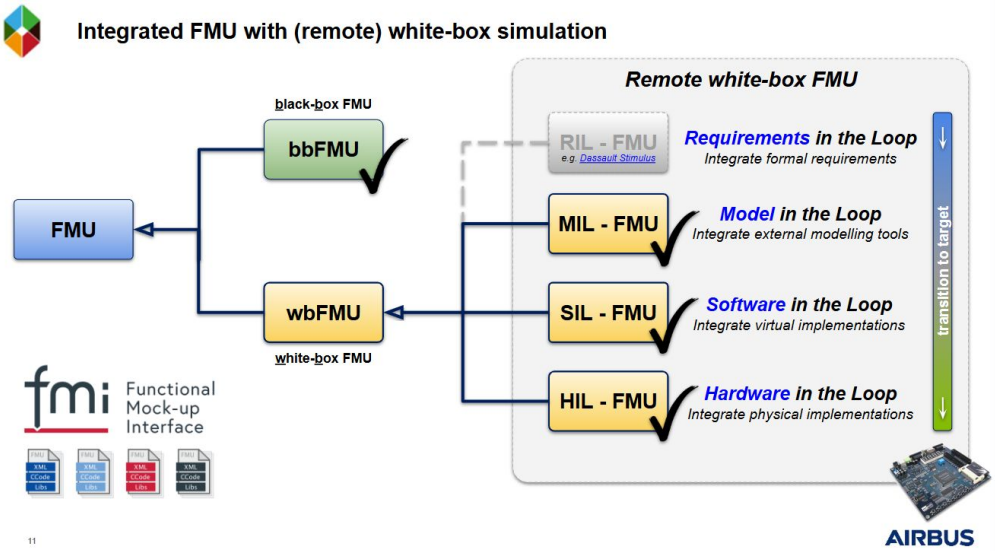
FMI Standard and Airbus - Usages, Needs and Expectations

4.FMI @AIRBUS Today

4.2.2 CoC Aircraft Cabin

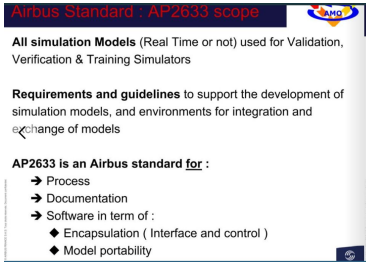


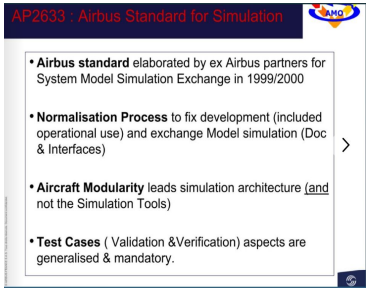


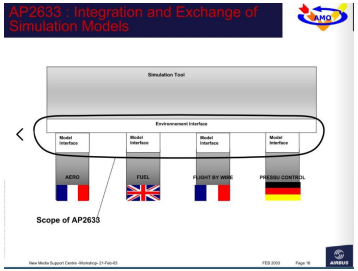
FMI Standard and Airbus - Usages, Needs and Expectations

4.FMI @AIRBUS Today

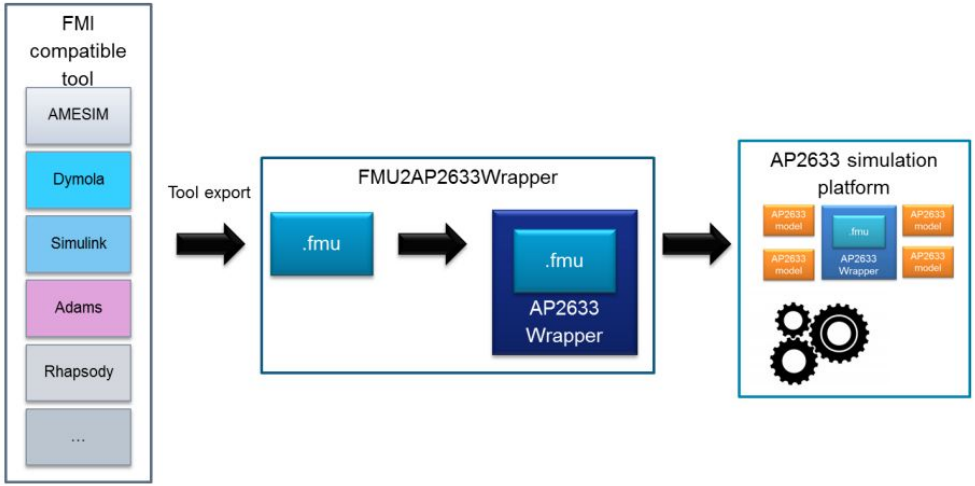
4.2.3 CoC Systems







Why Not FMI ?



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FMI Use Cases and Processes for Space Applications

Systema

Thermal Nodal Model
Power Model

Co Simulation
Model Exchange ?

fmi Functional Mock-Up Interface

MATLAB SIMULINK

Space Environment
Equipment's Physics

All Physical models
(RF ...)

fmi Functional Mock-Up Interface

Co Simulation
(Constraint = Discrete Model Only)

LLVM

Generate Serialization (To Be Done)

Wrap FMIv2 into a
SimTG Model

fmi Functional Mock-Up Interface → SimTG

SimTG
SIMULATOR T-4RD GENERATION

BouncingBallMETest

1. Integration thanks to SimMF Wrapper
2. Integration with other models using SimMF or Range DB (Assemble & Connect Models)
3. Execution Using SimTG Simulation Kernel

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SimTG

ECSS SMP for Spaces Systems

FMI Standard and Airbus - Usages, Needs and Expectations

5.FMI Level of Adoption, Usage Limitation

5.1.FMI Level of Adoption

2011 — FMI 1.0

2015 — FMI 2.0

2023 — FMI 3.0

2025

Mainly Bug corrections
Algorithm Optimizations

Technical Features
Improvements

Layered Standards
Principle

Ecosystem around FMI

Licensing Topic, IP
considerations
=> Out of the Standard

Airbus Adoption Level

Exploration mode

Use Mode … But

2.0 Formal
Assessment
Done

FMI is recommended

Extended Intensive Usage ?

3.0 Formal
Assessment
Needed ??

WHO ?

Airbus FMI community
(≊ 100 Engineers)
Gsite, Confluence pages

WHERE ?

Usage in Power Plant, Cabins, Systems, Tests, Next Gen Program (Fuel Cell Systems, H2 Systems, …), …

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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 of the suppliers' FMU is hard"

"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.”

Then how to make the situation better ?

FMI 3.0 improvements will help for sure, with its new non-negligible features (arrays, new state machine, events, clocks, terminals, …).
With its full ecosystem around (SSP, eFMI, export functions in existing modeling toolchains) and its new layered standards concepts (XCP, BUS, Struct, REF). From a technical point of view FMI 3.0 is very promising.

How can we better communicate and demonstrate to our users that they can go to FMI without having too big technological step ?

We should also be able to distinguish issues related to the standard itself from issues linked to the standard's implementation.

For some implementations, according to the version of the tool, the way to produce FMU is not the same. People need to navigate through this maze. Alone it's difficult and may lead to stopping the initiative. How can the implementers solve this issue ?

This is the challenge we are facing today, in order to deploy FMI at a large scale in our teams.

FMI Standard and Airbus - Usages, Needs and Expectations

7.Conclusion and Way Forward

Needs :

To ease integration
To enable interoperability
To improve reusability
To ensure traceability
To ensure performance(calculations)

Expectations

We want to go to FMI 3.0 BUT …
We want to have a clear vision of implementation status
We want to make FMI "easy" to use
- Guidelines on main topics
- Recommandations
  - on the way to use it
  - on the way to improve performances

We need to have some comparison (e.g. eFMI // ED247)

Usages :

We are mainly using the FMI 2.0 version of the FMI Standard:
All along the V Cycle
Considerening FMI as a strong enabler of End to End Digital Continuity
We are using FMI to exchange models (between our different teams and different suppliers)
We are using FMI in order to be able to save time (development, integration, …)

Acknowledgments

We would like to warmly thanks all Airbus teams that have contributed to this presentation by sharing their experience and knowledge on FMI

Thank you for your attention !

Thank you

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