This project has received funding from the European Union's Horizon 2020 research and innovation framework programme under grant agreement No 815122

AGILE4.0

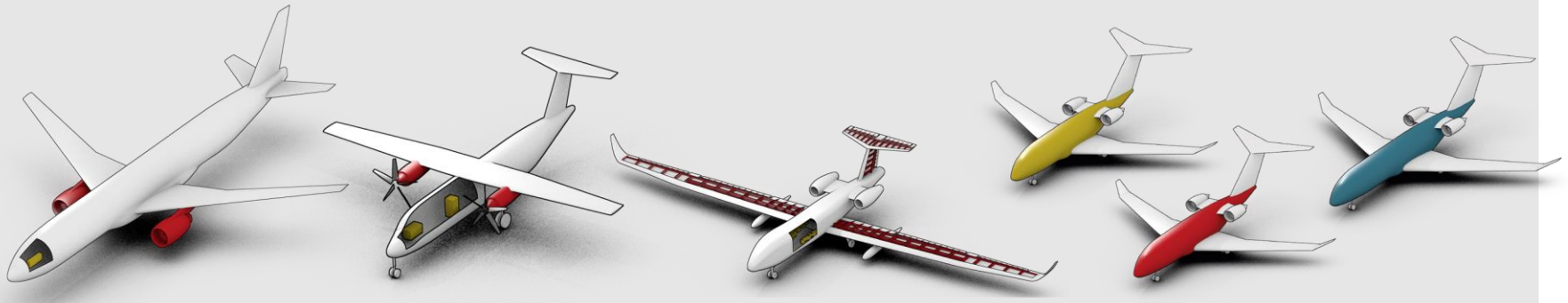
Towards cyber-physical collaborative aircraft development

German Aerospace Center (DLR) | *Luca Boggero*

AGILE 4.0 Project Consortium

EU-funded projects managed by CINEA: Aviation success stories

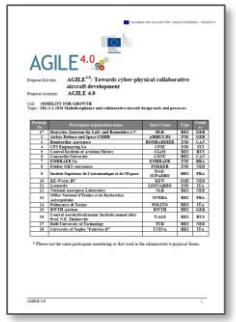
ILA Berlin Air Show | 22nd June 2022



AGILE 4.0

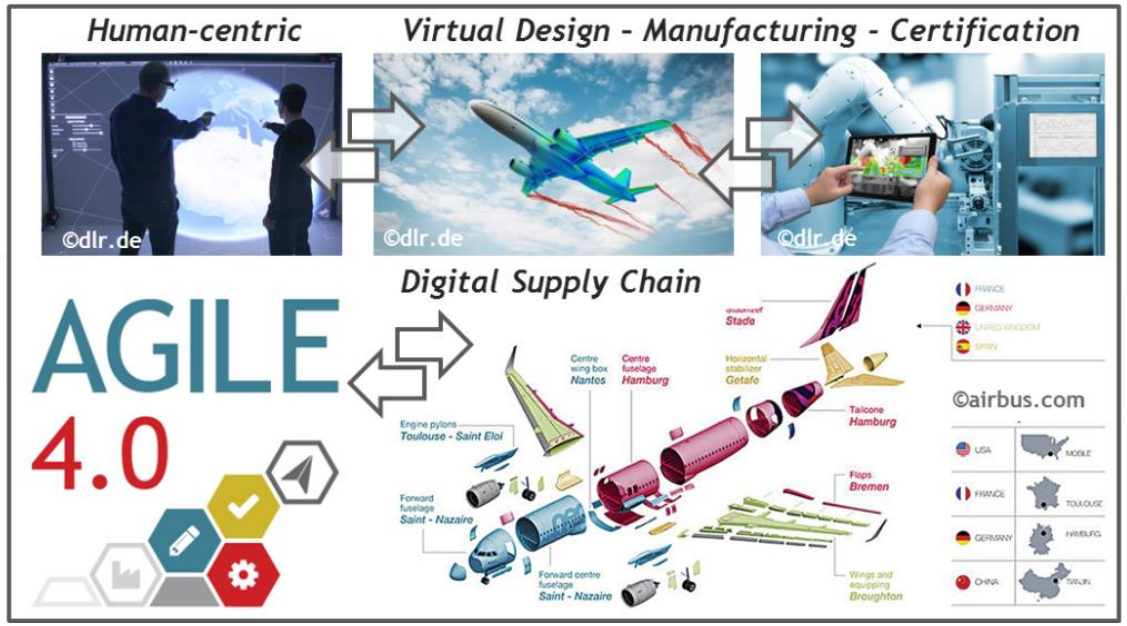
Towards cyber-physical collaborative aircraft development

AGILE4.0
Towards cyber-physical collaborative aircraft development



AGILE 4.0 project ambition:

"The high-level objective of AGILE4.0 is to bring ***significant reductions in aircraft development costs*** *and* ***time-to-market*** *through the implementation of an integrated cyber-physical* ***aeronautical supply chain****, thereby increasing the* ***competitiveness*** *of the European aircraft industry, from integrators and high-tiers suppliers to SMEs,* ***leading to innovative and more sustainable aircraft products****"*



Towards the next generation MBSE-MDO accelerating the development of complex systems

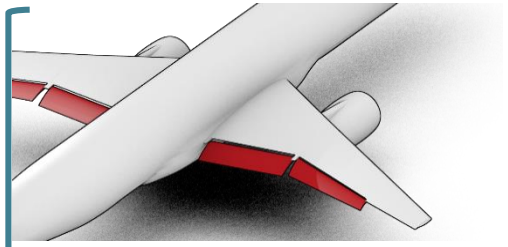
EU funded H2020 project: September 2019 – February 2023

- ***16 International Partners***
  - *Partners from UE, Brazil and Canada*
  - *Partners from Aerospace Industry, Academia, Research Institutes and Small/Medium Enterprise*
- ***Coordinated by DLR Hamburg***

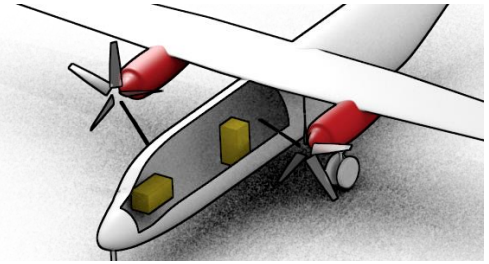
www.agile4.eu

Industrial-driven Applications

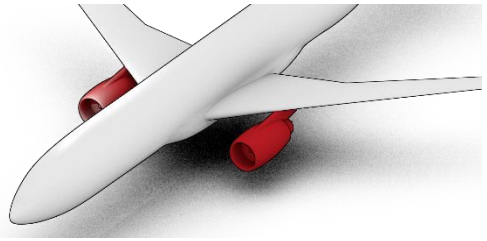
- MBSE Approach
- Ontologies
- Models
- Platforms
- Decision Making
- Optimization
- Competences



Airframe components flap\HTP



On-board systems Propulsions



Propulsion, cabin, avionics, winglet

Production

FOKKER AEROSTRUCTURES

1 *Manufacturing*

EMBRAER

2 *Supply chain*

Certification

BOMBARDIER

3 *Electrification*

EMBRAER

4 *Maintenance*

AIRBUS

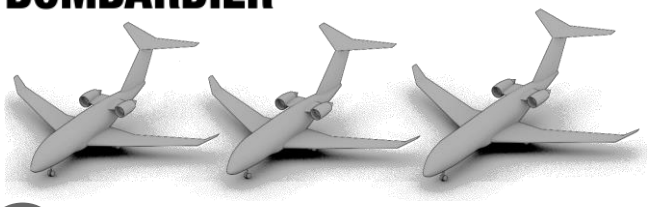
5 *Certification*

Upgrade

LEONARDO

6 *Retrofitting*

BOMBARDIER



7 *Family concept*

AGILE 4.0

Systems Engineering Approach for the Development of Aeronautical Systems

System of Interest

given policy & needs

System Identification

given goals & capabilities

System Specification

given scenarios & requirements

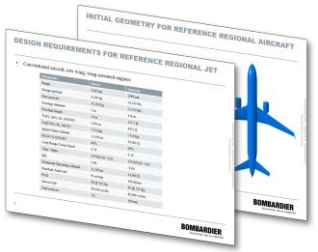
System Architecting

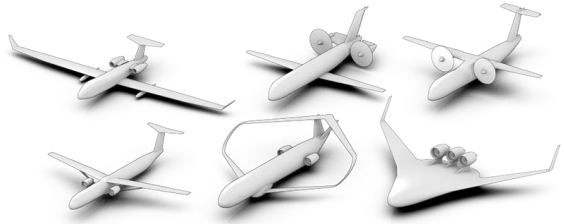
given architecture & requirements

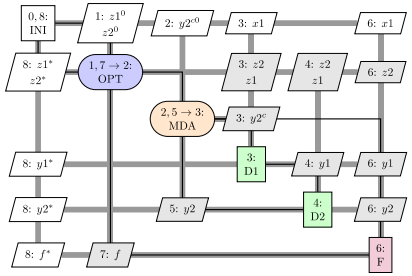
System Synthesis

given design space & objectives

System Exploration







Capabilities & Objectives | *Requirements & ConOps* | *Architecture Alternatives* | *Integration & Validation* | *Design and Optimization*

*upstream architecting **SE** (document or model based)*

Accelerating

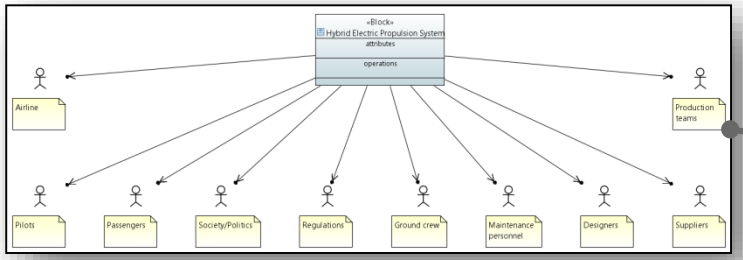
*downstream product design **MDO***

AGILE 4.0

Shifting from document based to Model Based Engineering Approaches (MBE)

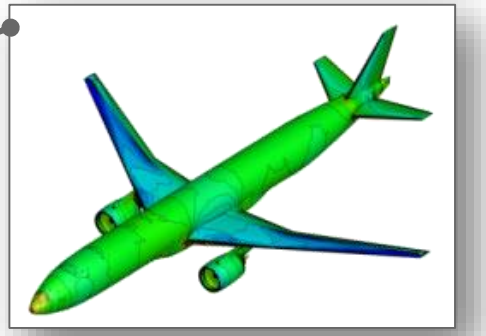
System Identification → System Specification → System Architecting → System Synthesis → System Exploration

Stakeholders

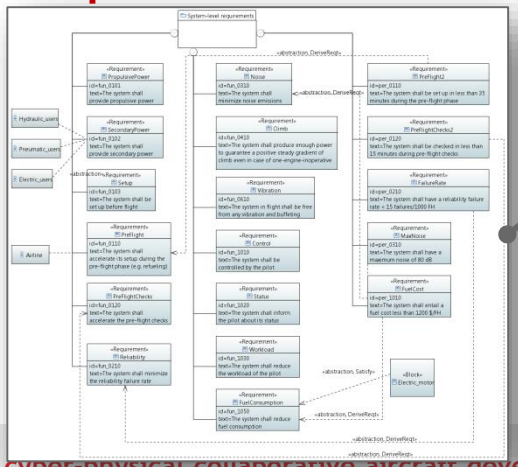


Source of Truth

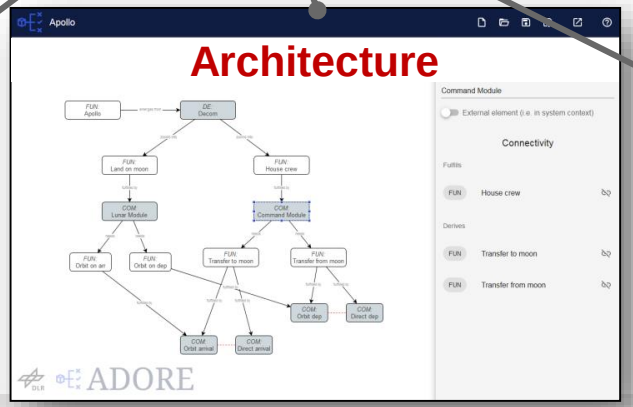
Disciplinary Capability



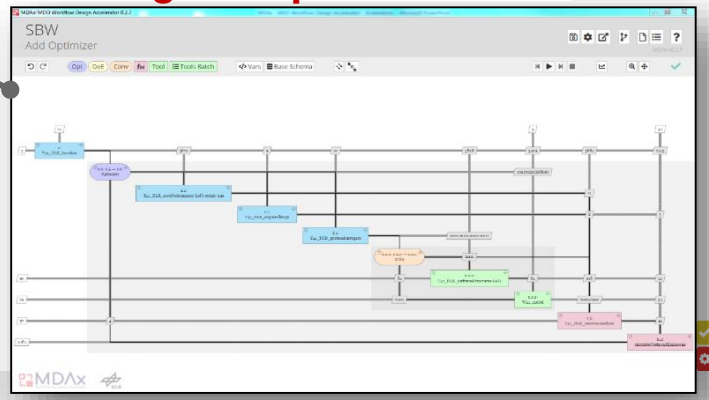
Requirements



Architecture



Design & Opt. Process



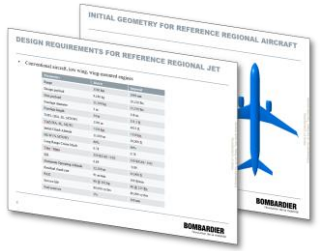
The “Development Systems” in AGILE4.0

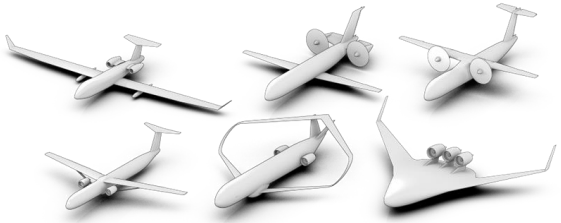
MBSE Development System

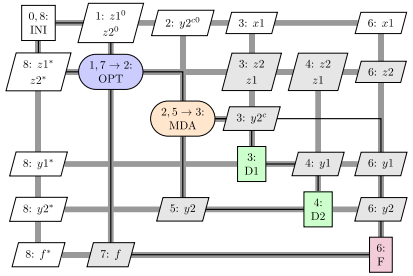
MDO Development System

System of Interest

System Identification → **System Specification** → **System Architecting** → **System Synthesis** → **System Exploration**







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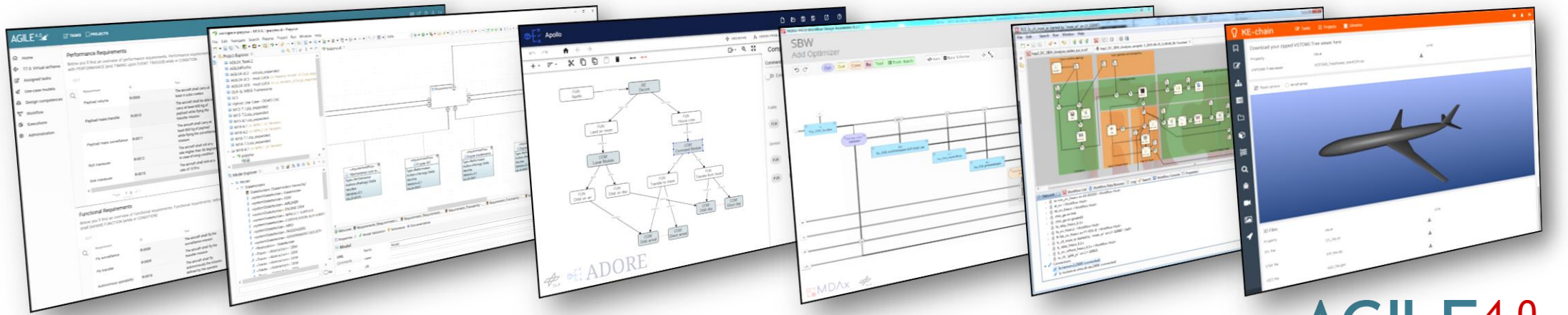


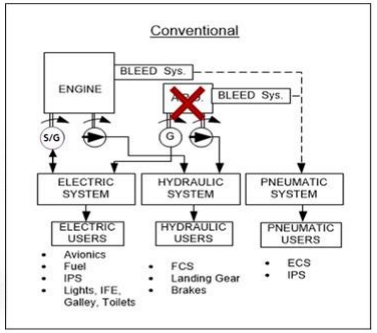
Example of Models and Results of the Applications

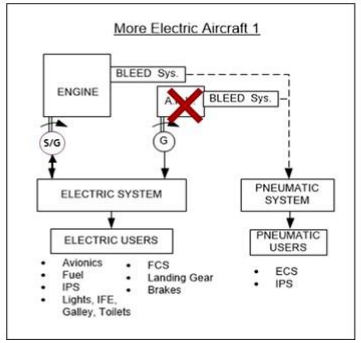
"Electrify the aircraft safely"

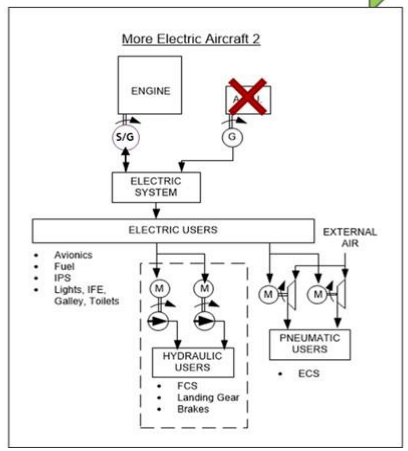
Integration of certification constraints for aircraft with conventional and innovative systems in the MDO process

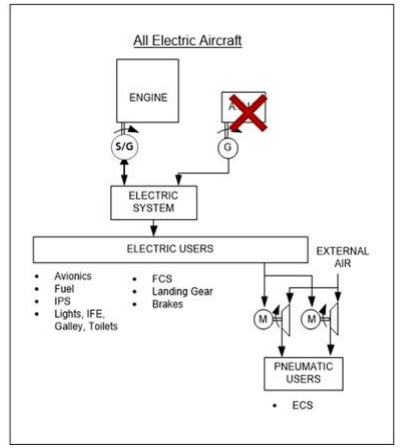
Increasing OBS Electrification Level

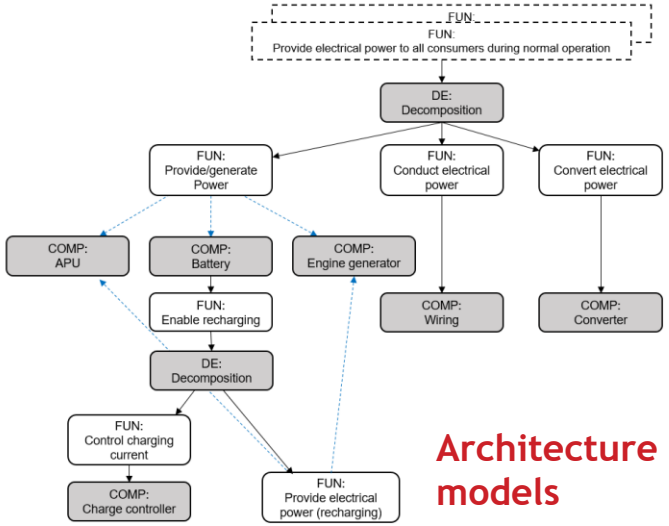
- 4 different architectures with increasing level of electrification



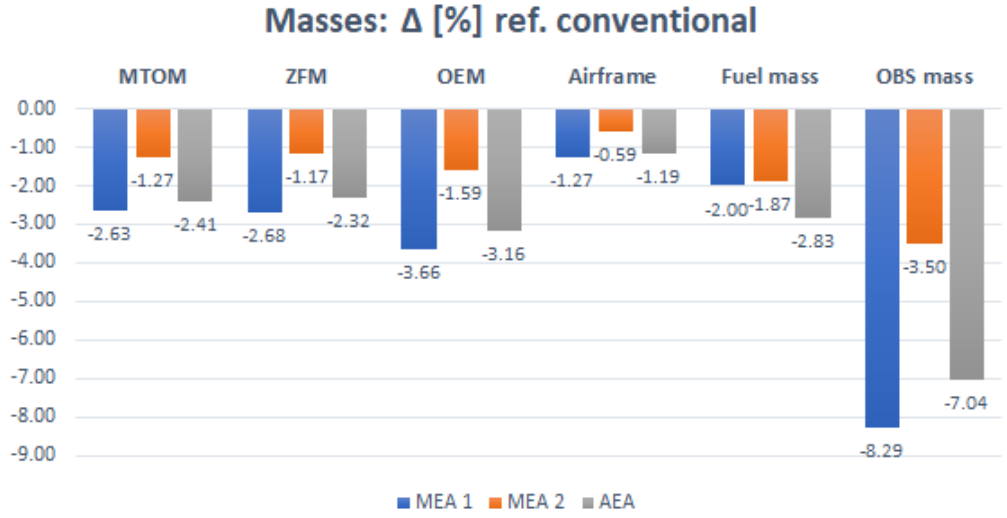






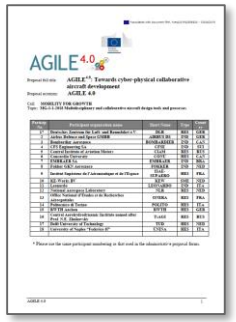


Architecture models



source: Fioriti et al., Multidisciplinary design of a more electric regional aircraft including certification constraints, AIAA 2022

Benefits of the digital AGILE 4.0 development approach



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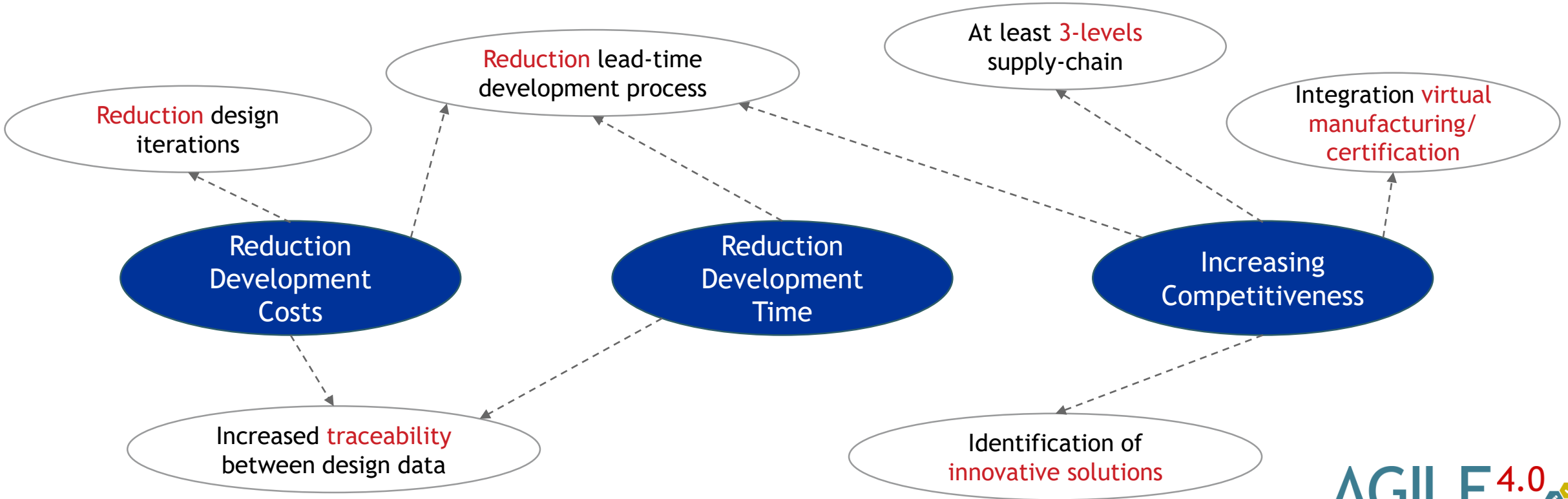
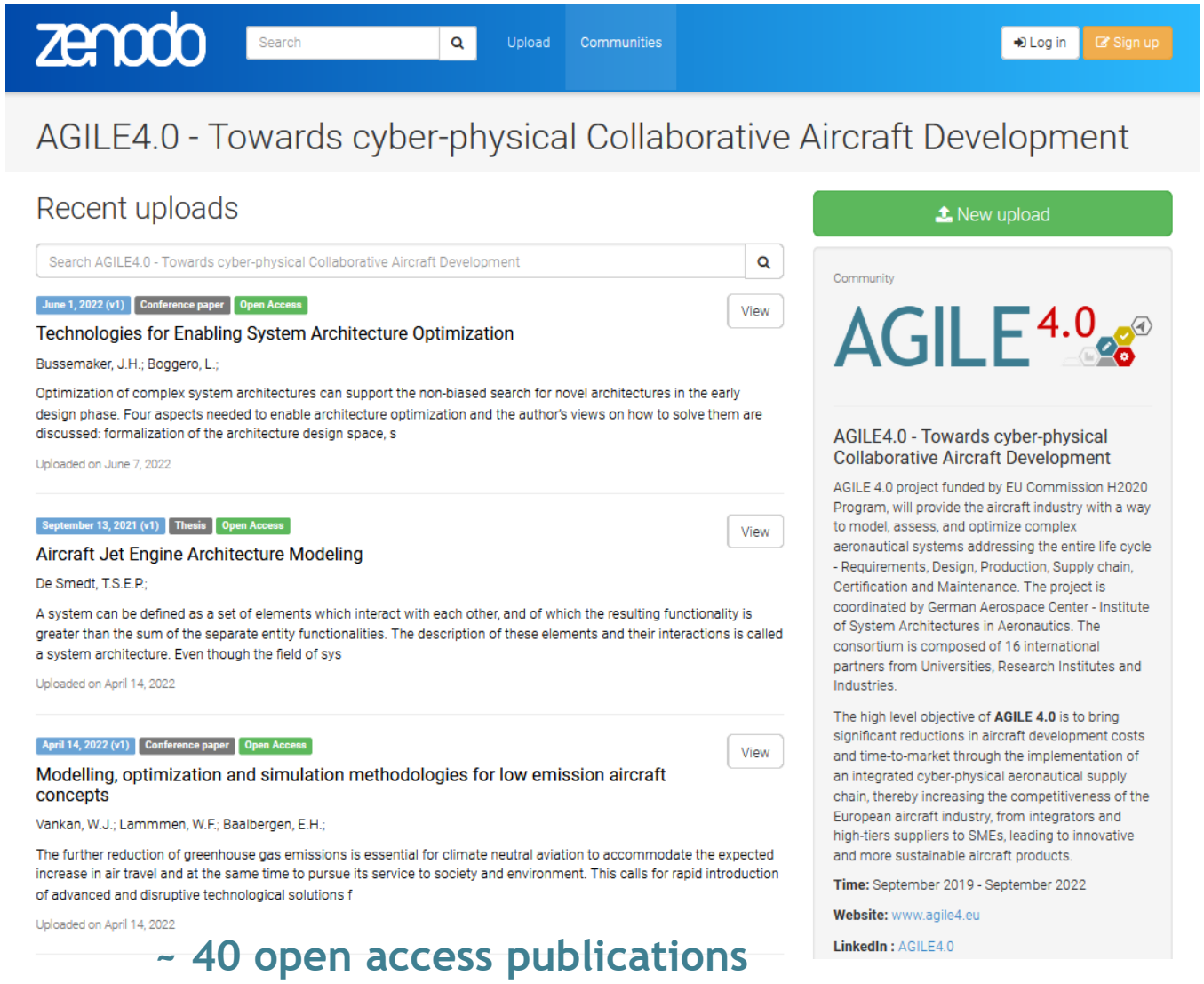


Project Dissemination



~ 40 open access publications

AGILE 4.0 Academy

Aim: Let **students** developing their aeronautical systems with **the AGILE 4.0 technologies**

Sep 2021-April 2022
For **non AGILE4.0** members

Key numbers:

- 34 Students
- 20 Organizations
- 11 Nations
- 4 Continents
- 3 Teams
- 1 Winner

Format:

- Biweekly lectures
- Video tutorials
- Presentations
- DEMO sessions
- Homework
- Review

Objectives:

- Learn about ***MBSE***
- Learn about **AGILE4.0 Technologies**
- Apply technologies on ***their own*** Task
- …WIN THE Competition!

AGILE 4.0

Thank you for your attention!

Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center
Institute of System Architectures in Aeronautics
HAMBURG
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System Integration & MDO Group
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For more information:

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