

# EASA – Structures and Materials Safety

EASA – FAA AM

INDUSTRY – REGULATOR EVENT

(virtual meeting)

November 10<sup>th</sup> - INTRODUCTION

S.Waite, Senior Expert – Materials, Certification Directorate, EASA

O. Kastanis, Propulsion Expert, Certification Directorate, EASA

M. Rife, Delta TechOps, Interiors

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# EASA - AM

## EASA FAA AM Industry – Regulator Event 2021 – Detailed Agenda: Wednesday 10<sup>th</sup> Nov.

	Day 3	Wednesday				
15:30-15:40		Opening Remarks		Simon Waite	EASA	10
		Panel session - Performance based regulation and the SDOs		Moderator: Roland Dutton	Arctos	
15:40-17:00		Theme 1 - Coordination / Collaboration across the SDOs; AMSC roadmap as a backdrop for discussion Potential themes: development of supporting M&P specs; mechanisms for better coordination / collaboration; etc. Theme 2: Data generation / databases / guidelines Potential themes: equivalence, acceptance of external M&P specs, etc.		Racheal Andrulonis, Royal Lovingfoss (CMH-17/NCAMP), Bill Mohr (AWS), Doug Hall (MMPDS), Don Godfrey (SLM), Mark Shaw (GE), Peter Doty (AMDC), Jesse Boyer (ASTM), Hector Sandoval (SAE)	CMH-17/NCAMP, AWS, MMPDS, SLM, GE, AMDC, ASTM, SAE	80
17:00-17:10		Open discussion				10
17:10-17:30		Break				20
		Mini WS - Computational Materials/Qualification/Certification - Industry Regulator Framework Discussion				
17:30-17:50			Computational Materials for Qualification and Certification (CM4QC)	Michael Gorelik	FAA	20
17:50-18:10			Effective and pragmatic introduction of simulation and CM into AM certification activities	Doug Wells	NASA	20
18:10-18:30			Potentials of model-based data analytics in manufacturing	Tommy Vene	Fraunhofer	20
18:30-18:50			ESA strategy for additive manufacturing technology	Thomas Rohr	European Space Agency (ESA)	20
18:50-19:10			Defining acceptance limits for Ni-AM powder using materials simulation	Caspar Schwalbe	MTU Aero Engines AG	20
19:10-19:30		Open Discussion				20
		Closing Remarks				10
					Total	250

# EASA - AM

EASA FAA AM Industry – Regulator Event 2021 – Detailed Agenda: Wednesday 10<sup>th</sup> Nov.

## Panel Session

- regulator move towards ‘performance’ based regulation
  - improve certification efficiency
  - reduce redundancy

### Themes:

Theme 1 - Coordination / Collaboration across the SDOs;  
AMSC roadmap as a backdrop for discussion

Potential themes: development of supporting M&P specs;  
mechanisms for better coordination / collaboration; etc.

Theme 2: Data generation / databases / guidelines

Potential themes: equivalence, acceptance of external  
M&P specs, etc.

### PANEL Members:

Racheal Andrulonis, Royal Lovingfoss (CMH-17/NCAMP)

Bill Mohr (AWS)

Doug Hall (MMPDS)

Don Godfrey (SLM)

Mark Shaw (GE)

Peter Doty (AMDC)

Jesse Boyer (ASTM)

Hector Sandoval (SAE)

see EAAMIRG action:  
Standardisation and the use  
of ‘standards’

Moderator: Roland Dutton

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Note: Regulatory link to using industry specifications and standards is well established, e.g.

### **‘AMC 25.603(b)**

#### **Approved Material Specifications**

*Approved material specifications can be for example industry or military specifications, or European Technical Standard Orders’*

Note: EASA policy regarding engagement with SDOs under review

see EAAMIRG action:  
Standardisation and the use  
of ‘standards’

# EASA – Structures and Materials Safety

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INDUSTRY – REGULATOR EVENT

(virtual meeting)

MINI WORKSHOP

Computational Materials/Qualification/Certification  
- Industry Regulator Framework Discussion

November 12/11/2021

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# EASA - AM

- AM is not the only advancing technology in aviation applications... there are many others, including those potentially, and increasingly, also impacting AM **design, production, and in-service use** in complex knowledge and supply chains, as is **extensively evident in Advanced Materials and Process (AMP) R&D activities** (see CleanSky presentation, 12/11/21, and support slides), e.g.
  - Computational Materials
  - Digital Threads/Twins
  - Big Data/Artificial Intelligence (AI)\*/Machine Learning (ML)\*\*
  - Structural Health Monitoring (SHM)
- these are increasingly challenging historically accepted means of compliance with the regulations, e.g. regarding appropriate test substantiation of analysis\*\*\*, broader digitisation\*\*\*\*etc...
- this ‘mini-workshop’ is intended to support the development of awareness, standardisation, and regulation of the integration of these technologies for AM applications

\*EASA-AI-Roadmap-v1.0.pdf (europa.eu)

\*\* [https://www.easa.europa.eu/sites/default/files/dfu/easa\\_concept\\_paper\\_first\\_usable\\_guidance\\_for\\_level\\_1\\_machine\\_learning\\_applications\\_-\\_proposed\\_issue\\_01\\_1.pdf](https://www.easa.europa.eu/sites/default/files/dfu/easa_concept_paper_first_usable_guidance_for_level_1_machine_learning_applications_-_proposed_issue_01_1.pdf)

\*\*\*for example: “‘Certification by Analysis’, or Modelling & Simulation” W. Doeland Workshop on Modelling & Simulation, Koeln, 29/30 August 2019

\*\*\*\* Digitisation in the aviation industry –Be part of the change. <https://www.easa.europa.eu/newsroom-and-events/events/digitalisation-aviation-industry-be-part-change>

# Future Composite Certification

Example supporting European Union R&D:

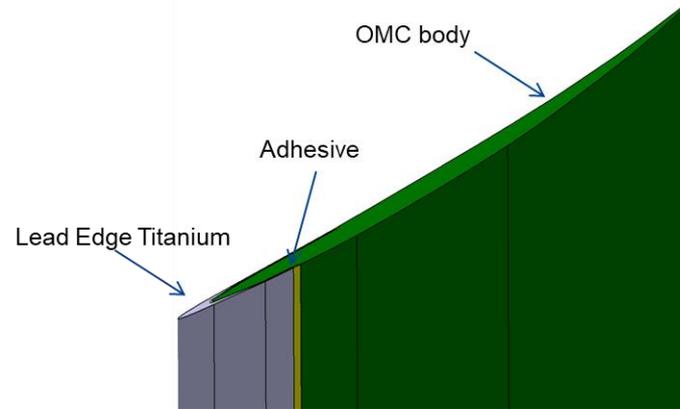


**'Manufacturing, Overhaul, Repair for Prognosis Health Overreach' (MORPHO) - Objective: '...proposes to embed *printed and fiber-optical sensors in aircraft engine fan blades*, thus providing them with cognitive capabilities already while they are manufactured. The parallel development of a *digital/hybrid twin models will drastically improve the blades' Life Cycle Management (LCM)*. Particular focus lies on the efficient, profitable and environmental-friendly manufacturing, maintenance, and *recycling* of these next-generation smart engine fan blades.'**

<https://cordis.europa.eu/project/id/101006854>



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# Future Composite Certification

Example supporting European Union R&D:



Digital method for improved Manufacturing of next generation Multifunctional airframe parts” (DOMMINIO) – Objective: ‘...*Innovative multifunctional thermoplastic filaments will be fibre-based piezoresistive strain sensors employed to incorporate novel continuous CNT in the laminate, to enable reversible joining (using magnetic NPs) and increase the structural integrity (using continuous CF) of the 3D-printed reinforcements. Flexible automation of ATL and FFF manufacturing processes will be enabled by the development of new laser-scanning and smart nozzle systems, the simulation of ATL plies consolidation and interlaminar delamination in FFF and the development of novel air-coupled ultrasound quality monitoring systems. Besides, advanced modelling will support the selection of right process window parameters and the optimal production planning strategy, ensuring the quality of the final component. In addition, physics- and data-driven models (Digital Twin) will provide real-time data-driven fault detection capabilities supporting the implementation of new methodologies for SHM&M of multifunctional airframe parts.*

<https://cordis.europa.eu/project/id/101007022>

# Future Composite Certification

Example supporting EPSRC/EASA R&D:

**‘Certification for Design: Reshaping the Testing Pyramid’ (CerTest)** – Objective: *‘...research will result in a new approach for integrated high-fidelity structural testing and multi-scale statistical modelling through Design of Experiments (DoE) and Bayesian Learning. The efficient exploitation and optimisation of advanced composite aero-structures is fundamentally prohibited by current test, simulation and certification approaches, and CerTest seeks to break this impasse by holistically addressing the challenges that are preventing step-changes in future engineering design by reshaping the ‘Testing Pyramid...’* <https://www.composites-certest.com/>

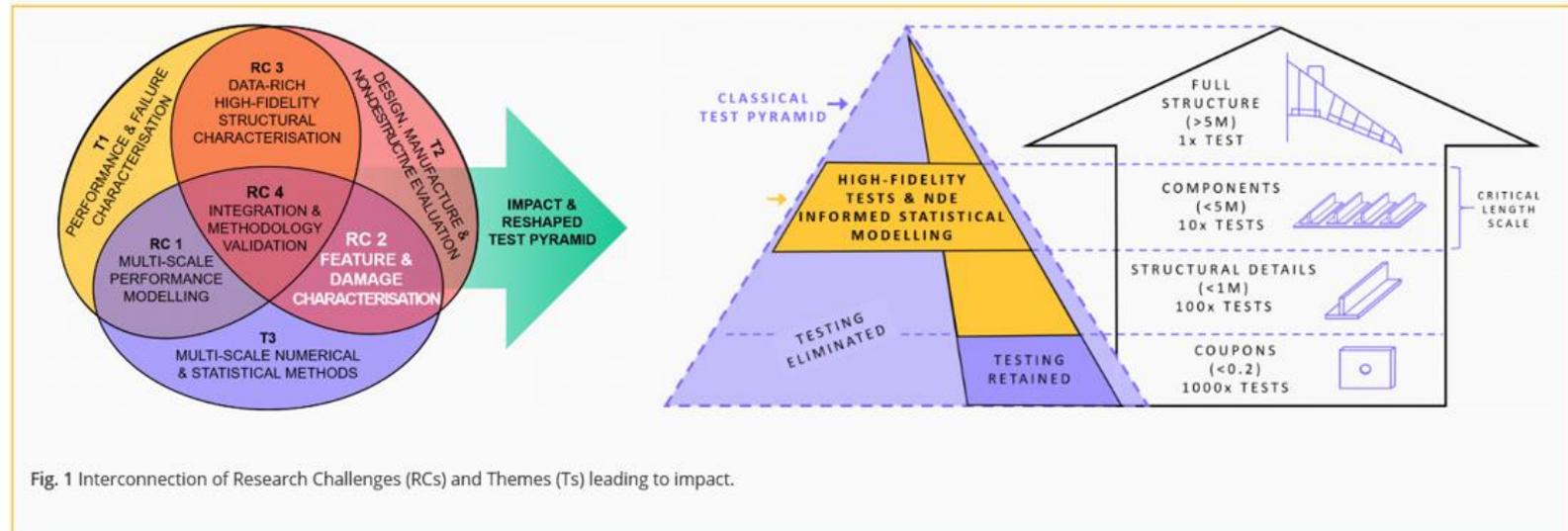


Fig. 1 Interconnection of Research Challenges (RCs) and Themes (Ts) leading to impact.

# EASA - AM

## AGILE innovation project

Aircraft 3<sup>rd</sup> Generation MDO for Innovative Collaboration of Heterogeneous Teams of Experts

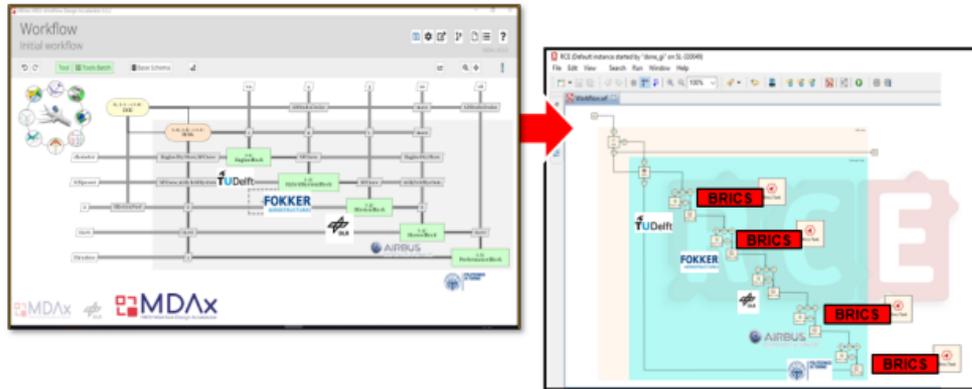


Figure 8 – Disciplinary tools can exchange information using CPACS as common language [22]; the MDAO process coupling disciplinary competences is then set-up using MDAx [23]; the workflow is finally exported and parsed in RCE [24] to get an executable workflow.

### MAIN OBJECTIVE

“ AGILE 4.0 targets the digital transformation of main pillars of the aeronautical supply-chain: design, production and certification and manufacturing. The composition of the AGILE 4.0 consortium and capabilities available enable to address realistic development scenarios integrating multiple stakeholders and covering all the aspects of the development of complex aeronautical systems. ”

AGILE 4.0 WAS BUILT ON THE SUCCESS OF AGILE PROJECT



AGILE has received the prestigious ICAS Award for Innovation in Aeronautics. This “ICAS Award for Innovation in Aeronautics” is handed out “for outstanding and innovative contributions to the development of advanced aeronautical systems”.

<https://www.agile-project.eu>

# EASA – AM

## Computational Materials for Qualification and Certification – Mini-Workshop Agenda

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# Questions?

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# Support Slides

[easa.europa.eu/connect](https://easa.europa.eu/connect)



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