EASA
European Union Aviation Safety Agency

Composite Initiatives involving EASA

Introduction to CMH17 updates

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Composite Initiatives Involving EASA
Introduction to CMH-17 Updates

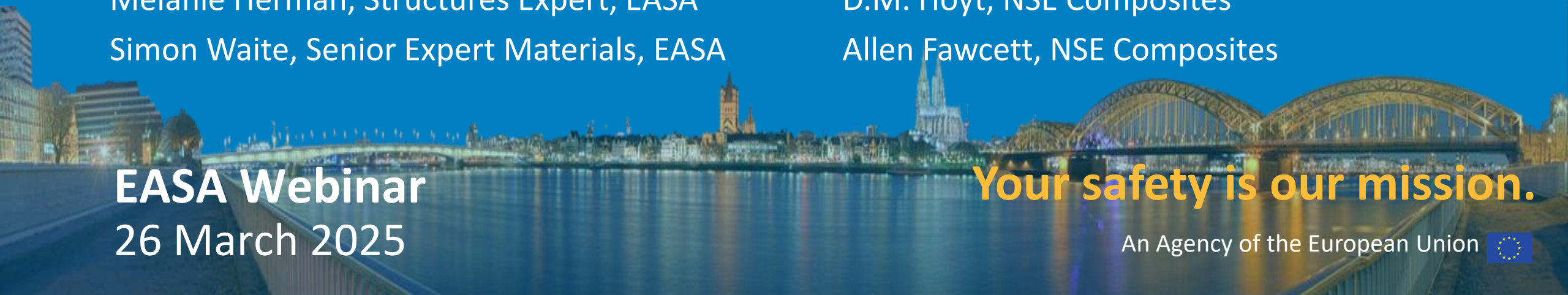
Presentation by:

Melanie Herman, Structures Expert, EASA

Simon Waite, Senior Expert Materials, EASA

D.M. Hoyt, NSE Composites

Allen Fawcett, NSE Composites



EASA Webinar
26 March 2025

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An Agency of the European Union

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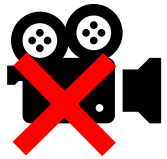

Please no recording!

Agenda

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Introduction — 5’

- Laurent Pinsard, Chief Expert Airframe, EASA

Part 1: Composite Initiatives Involving EASA — 45’

- Melanie Herman, Structures Expert, EASA
- Simon Waite, Senior Expert Materials, EASA

Q&A — 10’

Part 2: Introduction to CMH-17 Updates — 50’

- Simon Waite, Senior Expert Materials, EASA
- Allen Fawcett, NSE Composites
- D.M. Hoyt, NSE Composites

Q&A — 10’

EASA

Introduction

Laurent PINSARD
Chief Expert - Airframe

EASA

EASA
European Union Aviation Safety Agency

Composite Initiatives involving EASA

Introduction to CMH17 updates

Composite Initiatives Involving EASA

Priorities, Existing Initiatives and Road Map

Presentation by:

Melanie Herman, Structures Expert

Simon Waite, Senior Expert Materials

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Agenda – Part 1

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Composite Guidance – CS23/CS25/CS27/CS29 — 20’

- Overview of Generic and Product Specific Composite Guidance
- Selection of Means of Compliance

EASA Challenges & Priorities for Composite Initiatives — 5’

Global Composite Safety Initiatives — 15’

- Overview of Global Safety Initiatives (FAA lead)
- IRCWG, ARAC 25.571, CMH17, CACRC, ASTM, Training

EASA Composite Guidance Road Map — 5’

- EASA R&D EPAS Project DESIGN
- EASA Composite Guidance – Next Steps for 2025

Q&A Session — 10’

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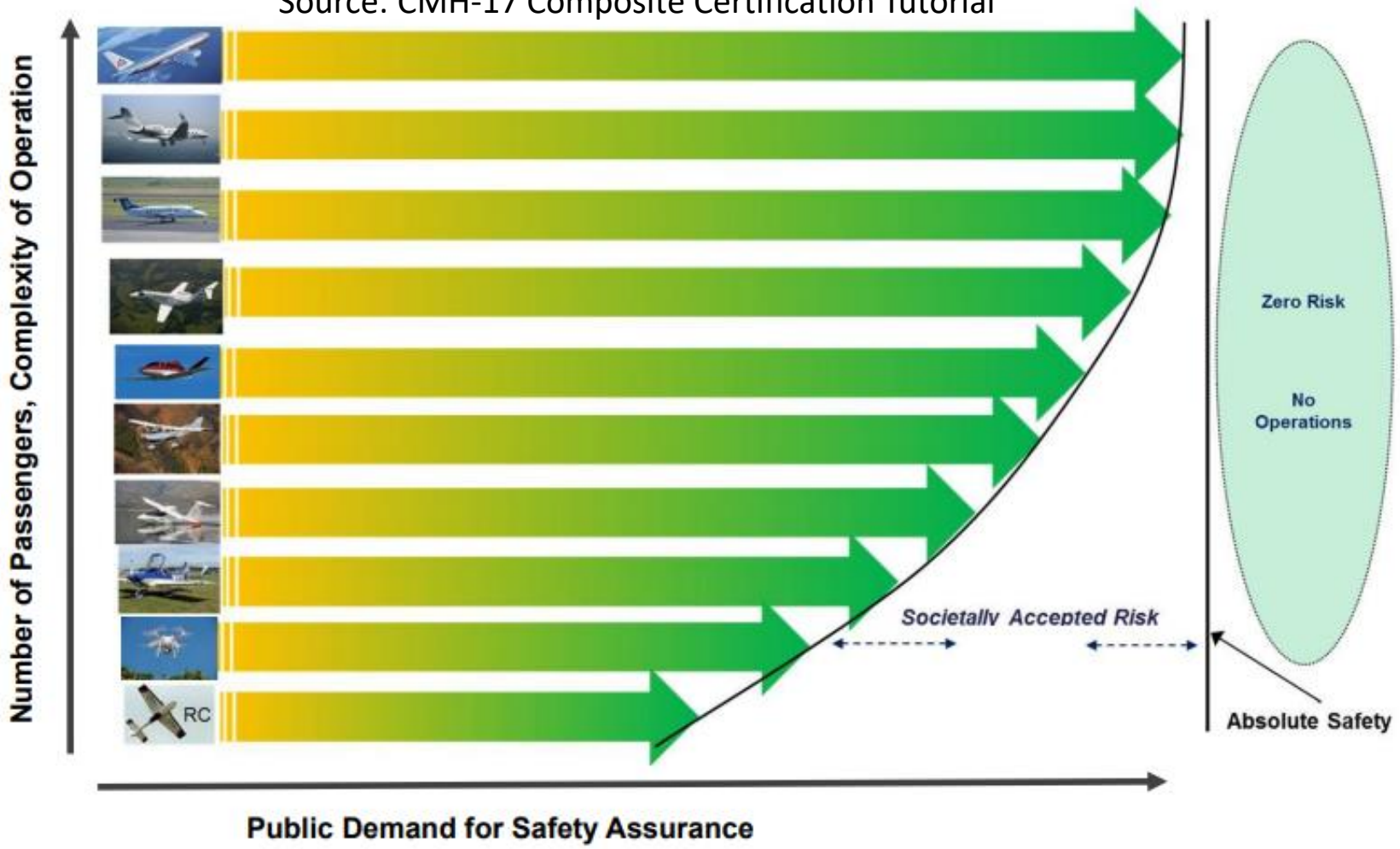
Q&A Session

Overall Aviation Safety Objectives

Source: CMH-17 Composite Certification Tutorial



Certification requirements should reflect **public expectations** regarding safety

Negative impact on safety level achieved is generally **not** directly related to **structural** aspects

No Reduction of Safety Levels for all products is EASA primary objective

Composite Guidance CS23/CS25/CS27/CS29

CS27/29
CM-S-016: Rotorcraft Elastomeric Parts

Rotorcraft
AC27/29.573
AC27/29.603
AC27/29.605
AC27/29.613
AMC27/29.613

Large Aircraft
AMC25.571
AMC25.603
AMC25.605
AMC25.613

GA / VLA
ASTM F3114
ASTM F3115
ASTM F3380
+ CS-23 Amdt 4
+ CS-VLA Amdt 1

AMC 20-29
Composite Structures
(same content as AC20-107B)

CS22 - CS-VLA
CM-S-006: Composite Light Aircraft

CS23/CS25/CS27/CS29
CM-S-004: Shared database
CM-S-005: Bonded Repair Size Limits
CM-S-010: Sandwich Structures
CM-S-008 (*): Additive Manufacturing

CM-S-004 ⇔ FAA-PS-AIR-100-2010-120-003
CM-S-005 ⇔ FAA-PS-AIR-20-130-01

(*) Metallic and non-metallic AM

Composite Materials – F&DT/Durability Guidance

- → Certification requirements (CS) are specific to products for **Materials and F&DT**
- → **Available Guidance:** Product Specific (AMC/AC), Generic (AMC 20-29) and CM

Materials	Certification requirements	AMC	GM	CM
GA	CS23.2260	ASTM F3114-21 CS23.603 Amdt4 CS23.605 Amdt4 CS23.613 Amdt4	AMC 20-29	CM-S-004 Iss 01 CM-S-005 Iss 01 CM-S-008 Iss 04 CM-S-010 Iss 01
VLA	CS23.2260	ASTM F3114-21 ASTM F3380-19 CSVLA.603/605 CSVLA.613		CM-S-004 Iss 01 CM-S-006 Iss 01 CM-S-008 Iss 04
Rotorcraft	CS27/29.603 CS27/29.605 CS27/29.613	AC27/29.603 AC27/29.605 AMC 27/29.613 AC27/29.613		CM-S-004 Iss 01 CM-S-005 Iss 01 CM-S-008 Iss 04 CM-S-010 Iss 01 CM-S-016 Iss 01
Large Aircraft	CS25.603 CS25.605 CS25.613	AMC 25.603 AMC 25.605 AMC 25.613	*AMC 20-29 for composite*	CM-S-004 Iss 01 CM-S-005 Iss 01 CM-S-008 Iss 04 CM-S-010 Iss 01

Structural Durability	Certification requirements	AMC	GM	CM
GA	CS23.2240	ASTM F3115-20 CS23.573 Amdt4	AMC 20-29	CM-S-005 Iss 01 CM-S-008 Iss 04 CM-S-010 Iss 01
VLA	CS23.2240	ASTM F3380-19 CSVLA.572/627		CM-S-006 Iss 01 CM-S-008 Iss 04
Rotorcraft	CS27/29.573	AC 27/29.573		CM-S-005 Iss 01 CM-S-008 Iss 04 CM-S-010 Iss 01 CM-S-016 Iss 01
Large Aircraft	CS25.571	AMC 25.571		CM-S-005 Iss 01 CM-S-008 Iss 04 CM-S-010 Iss 01

→ Only a limited selection of requirements is listed here, some others apply

Evolution of CS23 Regulation

→ Significant change in CS23 amdt 5 to target **performance based regulation**

- Design-independent requirements to promote innovation / disruptive technologies
- To fulfill the willingness of the Industry to be less prescriptive …
- … with growing demand for guidance and interpretive materials for certification of composite structures

→ Evolution of ASTM F3115 **is coordinated by ASTM F44.30** with EASA vote

- F3115 considered as AMC by EASA (CS23.2010)
- F3115 is referring to generic guidance (AMC 20-29)

→ How to ensure **consistency** of generic guidance (e.g. AMC 20-29) with product specific guidance (e.g. F3115) ?

→ How to manage implementation of **novel technology** requirements and guidance (e.g. thermoplastics, AM, …)?

CS23/CS27/CS29 products and environment vs CS25

Some **factors** need to be considered for **durability and damage tolerance approaches**

- Loading (no pressurization, lower speed/altitude, variety of missions, spectrum)
- Environmental conditions (range of temperature, aging, …)
- Design constraints (SLP, bonding, damage growth, ….) and practicality
- Criticality
- Safety level
- Proportionality
- Inspectability
- Affordability
- Positive past experience !

→ High diversity of operations, ranges, missions and aircraft configurations

→ Increasing safety level with increasing number of passengers

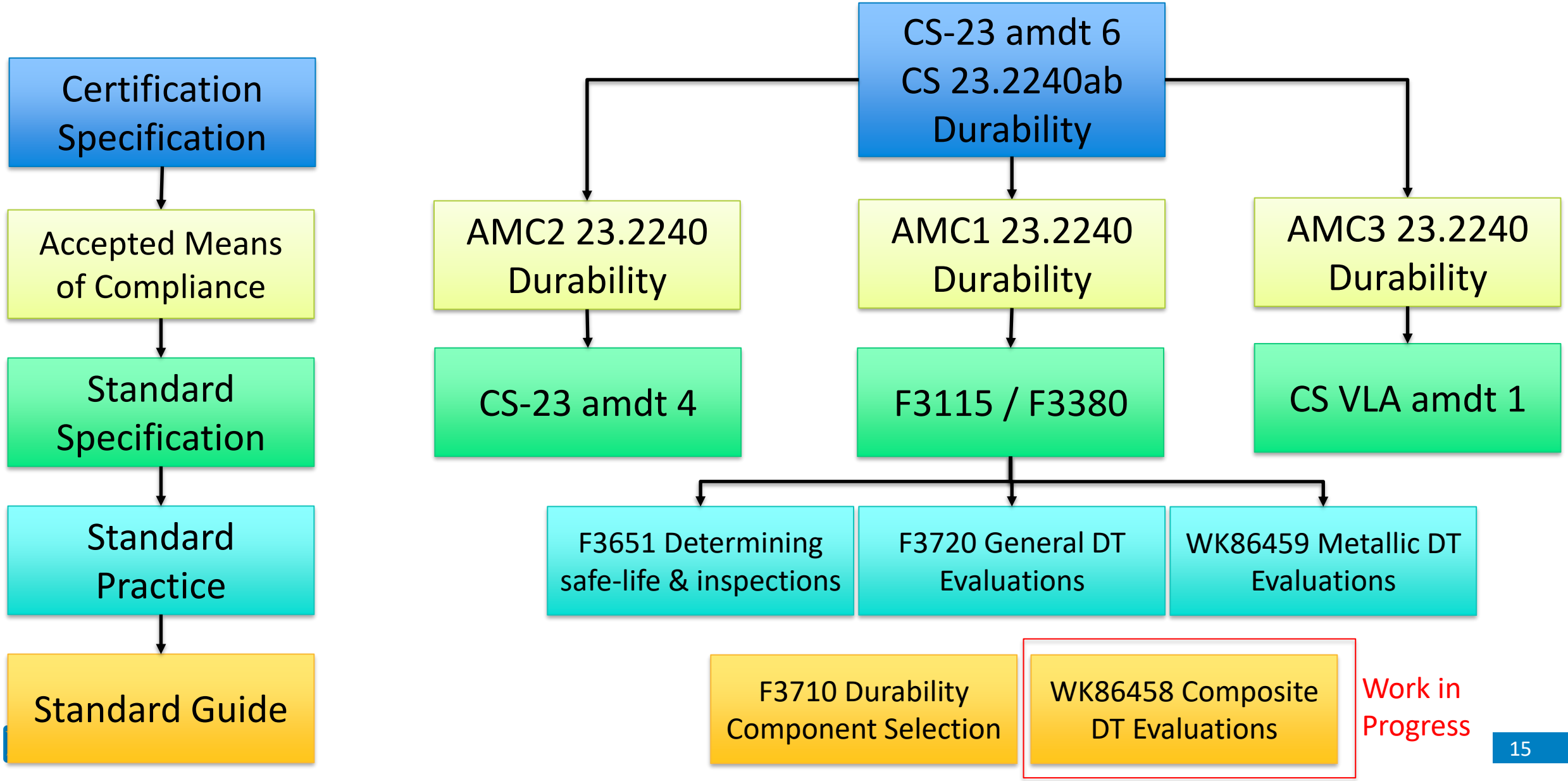
Normal Category Aeroplanes Levels

EASA Rule	MTOW	Aircraft Category	Number of Passengers	Examples
CS-23 Amdt 6	750 kg	VLA – Very Light Aircraft (subset of Level 1)	Max 2 seats Single engine – Day VFR Non aerobatic	 Blackshape BS115
	19000 lbs (8618 kg)	Level 1	0 to 1	Extra EA-300 
		Level 2	2 to 6	Cessna Skyhawk 
		Level 3	7 to 9	 Diamond Aircraft DA62
		Level 4	10 to 19	Pilatus PC-24 

→ Level of requirements “proportional” to number of passengers

→ Compliance demonstration should be **proportionate** to aircraft category

ASTM F44.30 Durability Roadmap and Standards Hierarchy:



Selection of Means of Compliance

"**Proportionality**" of the **compliance demonstration for CS23** should consider:

- → Certification level (number of passengers)
- → Performance level
- → Operations

Generic vs Specific

- → **Generic** Guidance (e.g. AMC 20-29) and **Product Specific** Guidance (e.g. AC27/29.573, F3115, AMC25.571) are typically used to propose means of compliance to certification requirements, possibly with products cross-references where applicable (e.g. AMC25.307 for CS23)
- → Typically **Product Specific** Guidance reflects specifics of the products

Nota: The product specific requirement (CS) takes always precedent over the generic guidance

Next slides will illustrate some **differences** between some products:

- → Proof of Structure: typical approaches between CS23 & CS25
- → Categories of Damages: AMC 20-29 vs AC27/29.573 for Discrete Source Damage

CS23 & CS25 Proof of Structure

CS23 Level 1, 2, 3 (e.g. non pressurized aircraft, non commercial operations)

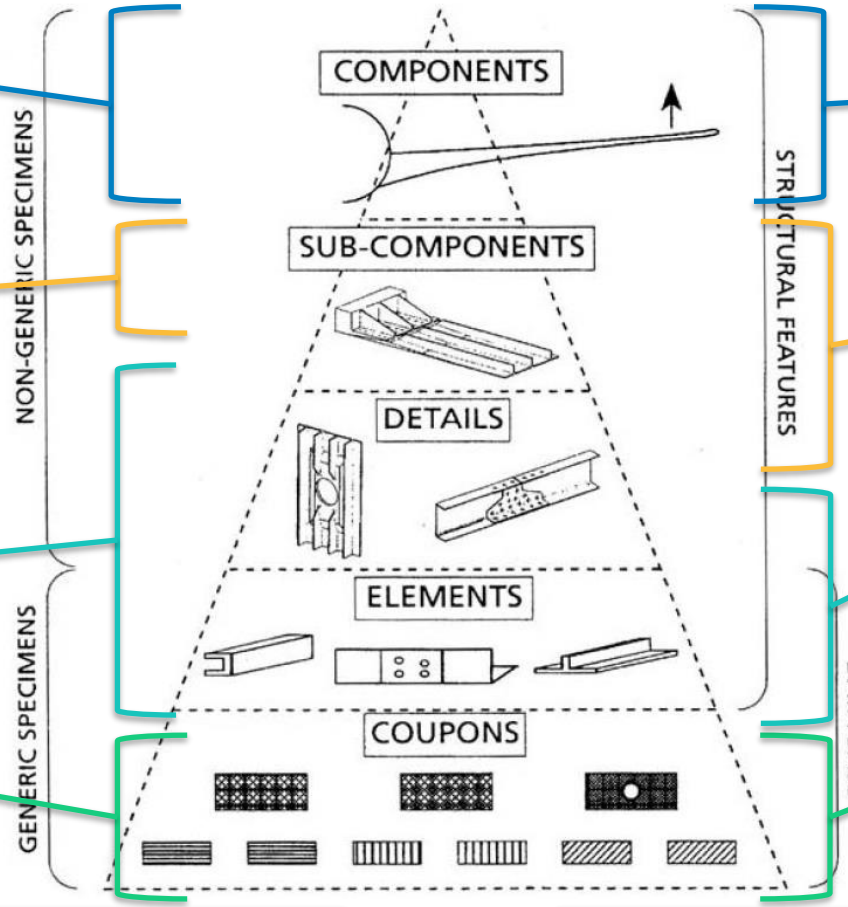
CS25, typical TC holder approach

Full scale test generally requested for compliance

Limited scope for calibration of analysis methods

Not as much populated as for CS25: limited demonstration to focus on critical design details

Materials data from shared database (NCAMP, …)



Full scale test to validate FEM / load distribution

Analysis methods calibration and validation

Design values derived for each design detail

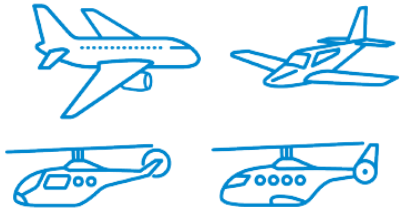
Materials data and qualification performed by the OEM

Limited testing with focus on critical design details

vs

Extensive testing supported by analysis

AMC 20-29 Categories of Damages and Residual Strength



Discrete Source Damage:
- **Cat 4** : Get Home Loads (70% LL) as RRS (AMC/AC 25.571)
- **Category 2 to 4**: LL as RRS (AC27/AC29)

AC27/29.573:

- **Obvious discrete source**, *maybe not obvious damage*
- **LL as RRS***: completion of flight*

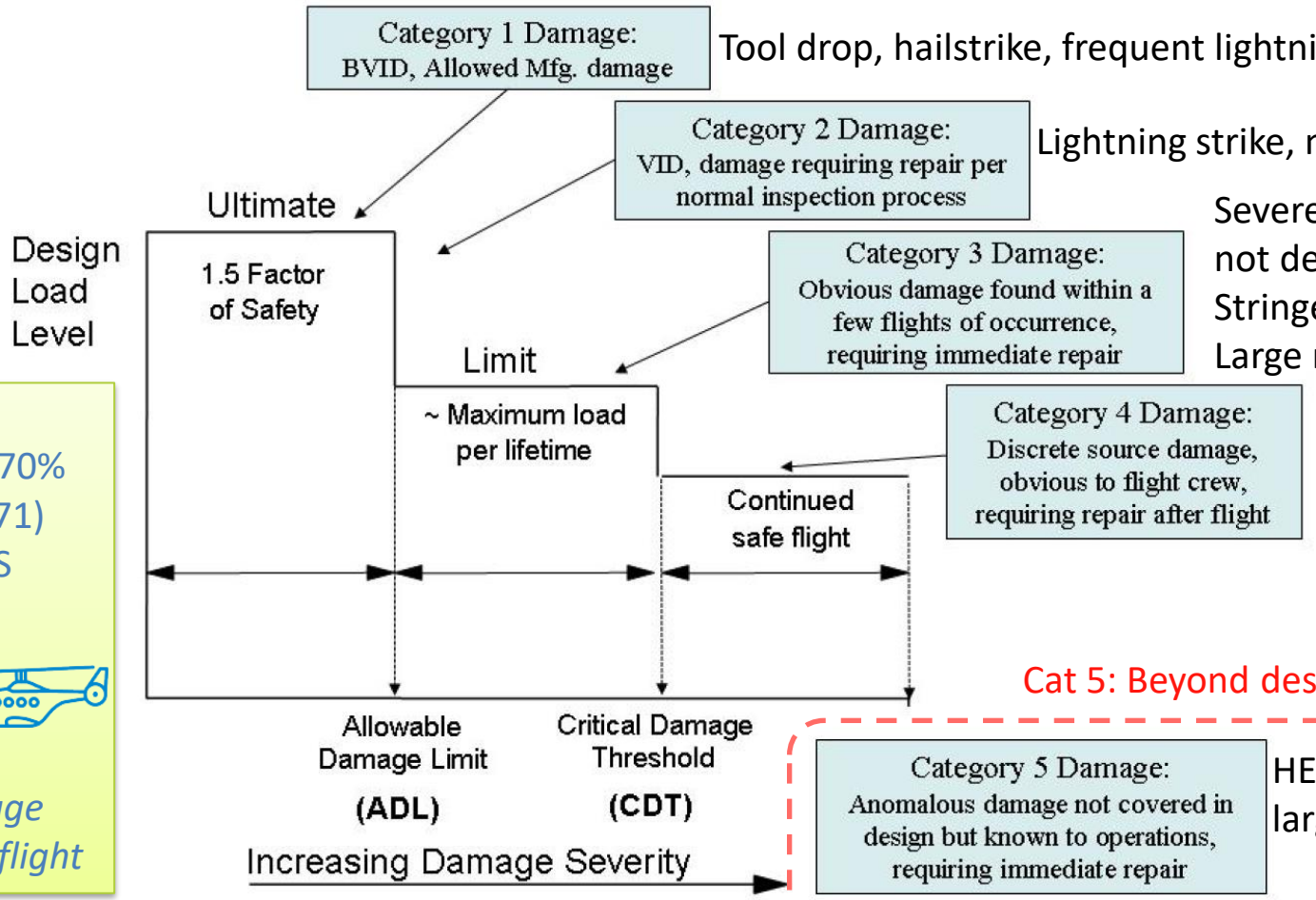


Figure 3 - Schematic diagram showing design load levels versus categories of damage severity.

RRS: Required Residual Strength
RS: Residual Strength

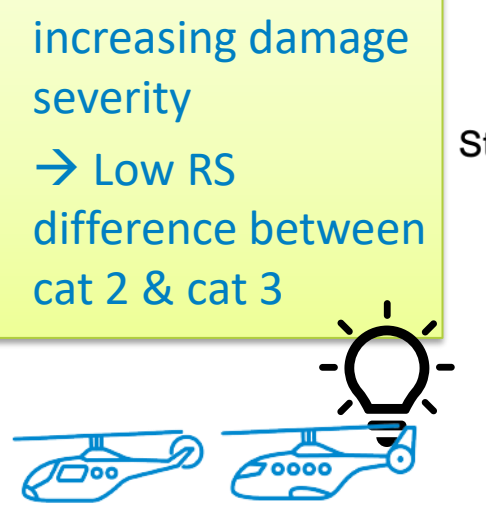
(*) Severe damages created by anomalous ground or flight events should be identified. They may result in Cat 5 damages.

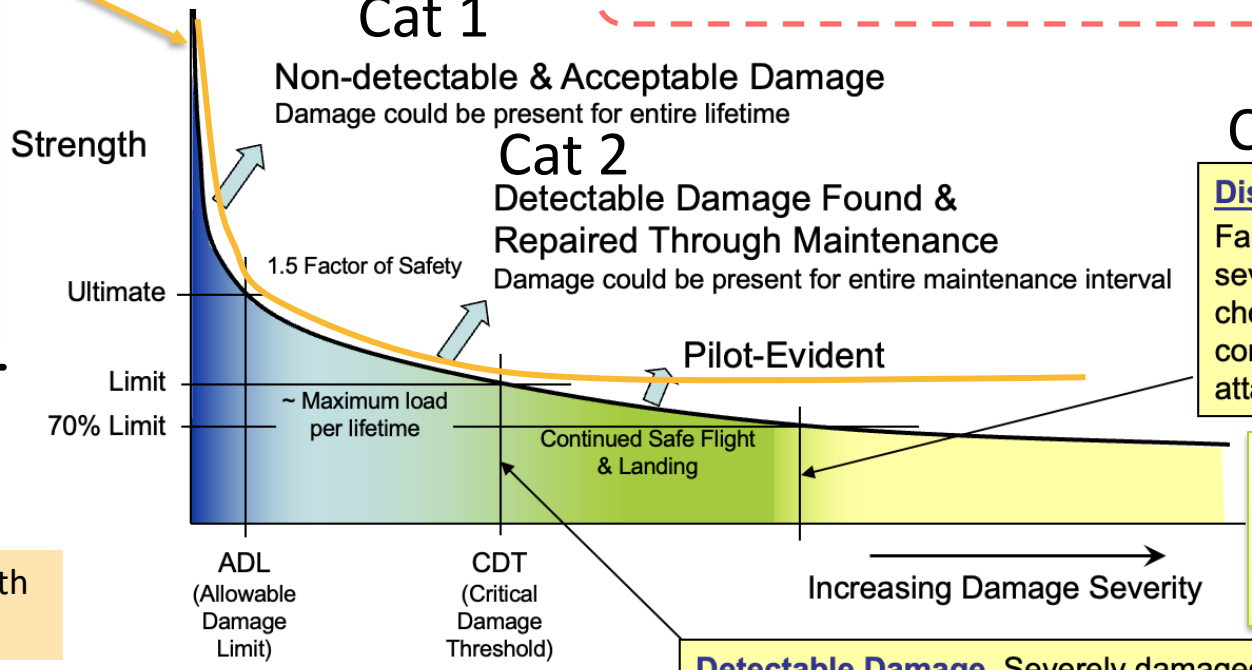
Residual Strength and Damage Severity

Rotorcraft: RS curve is **"flat"** with increasing damage severity
→ Low RS difference between cat 2 & cat 3

Discrete Source Damage: Cat 2 to 4 for Rotorcraft (AC27/29.573)
→ Obvious discrete source of damage with LL as RRS

Source: CMH17 rev H Vol3. Chapter 12.3





Cat 4

Discrete Source Damage
Failed or completely severed frame, stiffener, or chord with failed or completely severed attached skin or web

Large Aircraft: RS curve is **"flattening"** with increasing damage severity, up to GHL

RRS: Required Residual Strength
RS: Residual Strength

Minimum capability as RRS → UL LL

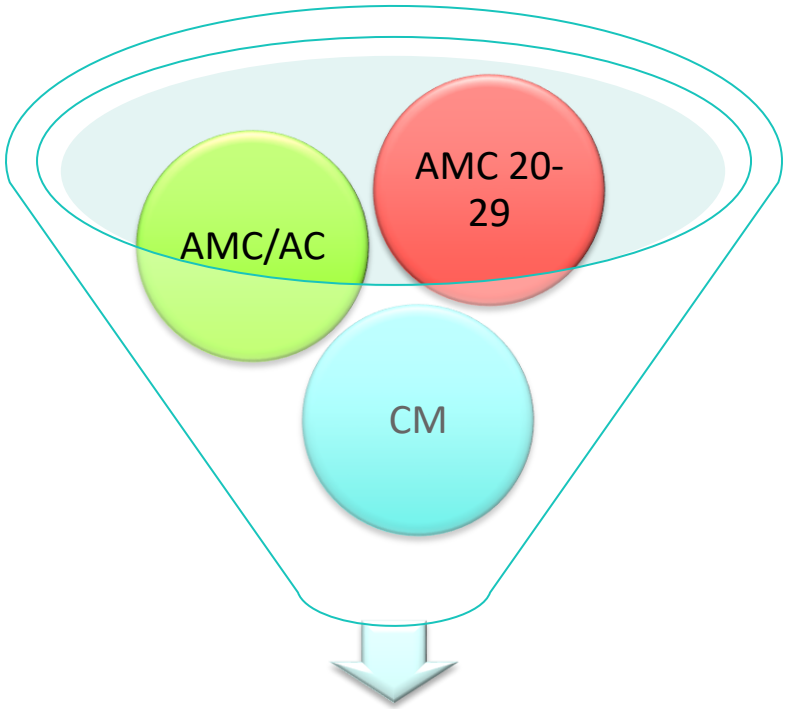
Detectable Damage Severely damaged, frame or stiffener with associated damage to attached skin or web (or) Severely damaged, skin panel or web with associated damage to attached stringers, stiffeners, frame or rib.

Cat 3

Minimum Required Residual Strength is LL capability for Rotorcraft vs GHL for Large Aircraft (70%LL)

Take Away – Composite Guidance

- CS23 amdt 6 is **performance based** regulation
- **AMC 20-29** is a generic guidance for all products, harmonized with **FAA AC 20-107B**
- Some product specifics are addressed in product AMC/AC
- EASA Certification Memorandum **(CMs)** are intended to provide **guidance and interpretative material** on a particular subject → to be considered similarly as **AMC**
- Compliance demonstration approach for CS23 should be "**proportionate**" to aircraft category levels.



Composite Guidance

Agenda – Part 1

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Q&A Session

Challenges for Safety of Composite Applications

Criticality

Novelty

Complexity

Criticality

- **Damage tolerance and maintenance practices** are key aspects of **safety**
- Sandwich for PSE
- Structural **Bonding**
- **Inspections** and Quality Control Plan
- **'End to End'** qualification / certification

Novelty for the applicant

- **Advanced Manufacturing**, AM
- Development of **greener and sustainable** technologies
- Repair, Reuse and Recycling
- Thermoplastic overmolding
- Thermoplastic Welding
- VTOL

Complexity

- **Performance based regulation** (CS23) while the applicants **request more guidance**
- **Lack of standards for composite materials and processes**, design criteria, structural substantiation methods and maintenance practices
- Increasing complexity of global supply chains and **ramp-up**
- High Rates

Knowledge Transfer

- **Increasing number of applicants** with increasing **criticality** (all products)
- **Increasing number of newcomers** in composite technologies with limited experience
- **Retiring experienced staff**
- Skill Currency

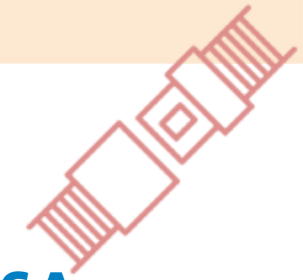
How EASA can ensure **no reduction of safety level** with **novel** technologies, **higher** rates, **newcomers** and **skills handover**?

EASA

Priorities for Composite Initiatives

No Reduction of Safety Level for all products

- **Safety risk mitigation** through regulation and adequate training, considering past airworthiness issues with some composite application
- **Proportionality** considered for CS23 applications



Work in Close collaboration with other regulators (FAA/TCCA/ANAC)

- **Harmonisation / Consistency** of requirements for consistent approvals and certification efficiency (e.g. reduction of SEI list)

Sustainable and Greener Technologies

- **Regulation framework** to support development of sustainable composite technologies and advanced manufacturing processes

Standardization and Simplification

- **Support development of industry standards** consistent with EASA requirements
- **Enhanced Certification efficiency** ensuring regular exchanges and feedback from OEM, airlines and maintenance organizations

Training

- Ensure **knowledge Transfer** internally & externally to maintain and develop competences

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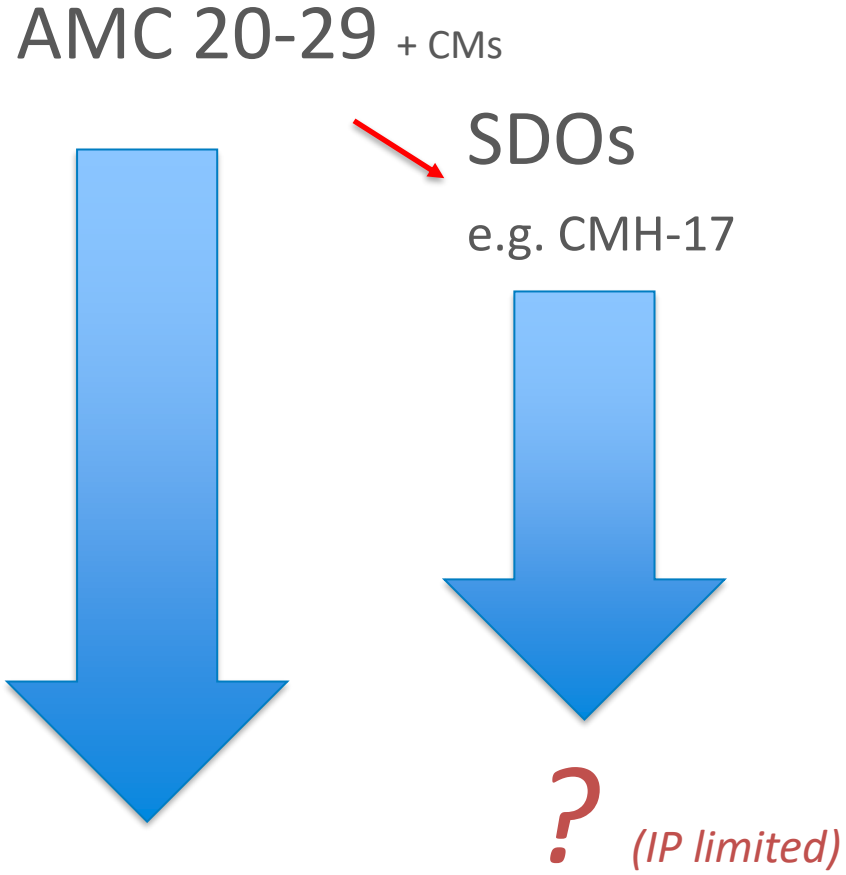
Composite Guidance: Regulator – Industry Link

Performance Based Regulations - moving work to Standards Development Organisations (SDOs)



SDO Example: CMH-17 goes some way to supporting AMC 20-29

- not ideal, but best option available
- includes some 'magic numbers' e.g. DT includes common impactor energies, impactor sizes etc… to be used with caution (Regulator 'substantiated use' warnings included)!
- developed and supported by many USA and EU composite stakeholders, including Airbus, Boeing, Bombardier, Fokker, Rolls Royce etc (up to the point where sharing balances stakeholder IP needs)

- CS25 biased, but expanding to address Engines, Rotorcraft, GA, eVTOL etc

Global Composite Safety Initiatives

CMH-17 COMPOSITE MATERIALS HANDBOOK

NSE COMPOSITES

ARAC AVIATION RULEMAKING ADVISORY COMMITTEE

ASTM INTERNATIONAL

F44.30

NIAR WICHITA STATE UNIVERSITY

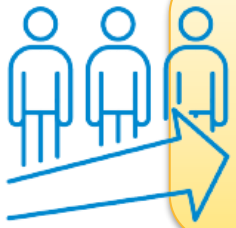
NCAMP NATIONAL CENTER FOR ADVANCED MATERIALS PERFORMANCE

EPAS DESIGN

IRCWG (Industry & Regulatory Composite Working Group)

IRCWG

- **FAA** Sponsor & Lead
- IRCWG is a **Steering Group**
- **Transport Aircraft centric up to now**
- Large and Strong forum, including Regulators, OEM, Airlines, Standardization Bodies and Research Institutes
- **Crosslinked** activities
- Openly **share knowledge** from past and current composite applications to structure
- Primary advantage comes from industry members with experience & knowledge
- Repository of the presentations (and much more) here



Capture and Share knowledge and good practices

Ensure alignment and consistencies regarding certification expectations

Achieve Certification Efficiency and No reduction of Safety Level

Transport Canada

BOEING AIRBUS BOMBARDIER

Historical Overview – IRCWG Meeting, Initiatives and Outcomes

Shared Matl. Data/Equiv.
Structural Substantiation
RC F&DT ARAC
Matl./Process Spec. Control
Bonded Structure
Workforce Educational Standards Certification Tutorial and Maintenance
AC 20-107B
AMC 20-29

2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010

Initial Meeting (Sept., 2005/ Toulouse, France)
2nd Meeting (March 2006/ Seattle, WA, US)
1st Damage Tolerance & Maintenance Workshop August, 2006, CMH-17, Chicago, US
2nd Damage Tolerance & Maintenance Workshop July 2007, SAE CACRC, Amsterdam, Netherlands
3rd Damage Tolerance & Maintenance Workshop June 2009, SAE CACRC, Tokyo, Japan

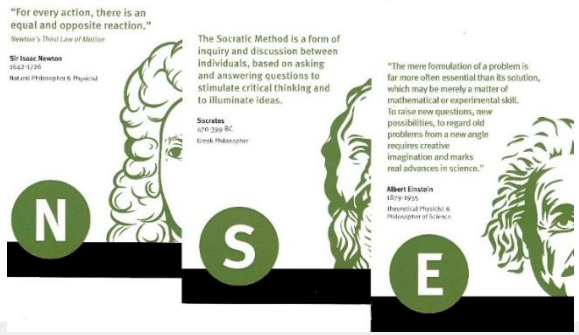
AIRBUS
Federal Aviation Administration
BOEING
EASA European Union Aviation Safety Agency
NIAR Wichita State University National Institute for Aviation Research

Workforce Educational Standards Structures and Manufacturing

CMH-17, Vol. 3, Chap. 12 – 14, Rev G
Bonded Repair
HEWABI
Main Final Report §25.571 ARAC
Extension Final Report §25.571 ARAC
2021 Bonded Repair ARAC Report
CMH-17, Vol. 3, Rev H
2025 Structural Mod SAE ARP

2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025

3rd Meeting (Feb. 2011/Seattle)
6th Meeting (Sept. 2012/Toulouse)
6th Meeting (July 2013/Wash DC)
8th Meeting (April 2015/SC, US)
10th Meeting (July 2017/Ottawa)
12th Meeting (Feb. 2020/Seattle)
13th Meeting (May 2023/Toulouse)
14th Meeting (June 2024/Charleston)
4th Damage Tolerance & Maintenance Workshop May 2011, Atlanta, GA
4th Meeting (Sept., 2011/Koln)
5th Meeting (April 2012/Tukwila)
7th Meeting (May 2014/Koln)
9th Meeting (Sept. 2016/Toulouse)
11th Meeting (June 2018/Belfast)
CMH-17, Design TG
CACRC Alternate Repair M&P Initiative Started
Sandwich Disbond (2023 Workshop)
5th Damage Tolerance & Maintenance Workshop Sept. 2015 §25.571 ARAC, Montreal, Canada



Transport Canada
BOMBARDIER
SPIRIT AEROSYSTEMS

Future Thoughts

- We need high-rate manufacturing
  - Stringent material & process controls
  - Manufacturing-induced performance benefits?
- Advanced structural scaling knowledge
- Combined building block awareness
  - How to advance efficiency, without penalties?
- How to ensure knowledge transfer?

Other Items in Work

- CMH-17, Vol. 3, Post-Rev. H
- CMH-17, Vol. 6, Rev. A
- CACRC Alternate Repair Material
- Future of CMH-17 (expanded reach-outs)
- AC 20-107C

ARAC 25.571 (Aviation Rulemaking Advisory Committee)

ARAC 25.571

1/ Objectives and Scope

In 2015, FAA assigned task for ARAC to provide recommendations to FAA regarding 14CFR, part 25 Fatigue and Damage Tolerance requirements (§25.571). Transport Airplane Metallic and Composite Structures Working Group (TAMCSWG) provided advice and recommendations on the tasking.

One of the item added in the scope was harmonization of EASA aging aircraft rulemaking

Targeted products: **Part 25 - CS25**

2/ Stakeholders

Coordinator: FAA

Industries: Boeing / Airbus / Bombardier / Dassault Aviation / Embraer / Gulfstream / Mitsubishi Aircraft / Textron Aviation

Airlines: British Airways / Delta Airlines / FedEx / United Airlines

Regulators: FAA / EASA / ANAC / TCCA / JCAB

3/ Timeline: 2015-2023

4/ Top Achievements: 4 ARAC reports issued by TAMCSWG:

Initial Report: 06/2018

Structural Bonding :07/2021

Single Load-Path Structures: 10/2021

Crack Interaction: 02/2023

Scope of ARAC 25.571 is Metallic & Composite F&DT

Note: Also ARAC tasks for crashworthiness, ditching and flammability

5/ Next Steps: **revisions of AC25.571-1D / AC20.107B / AC21-26A** to implement the recommendations of TAMCSWG

SAE-CACRC (Commercial Aircraft Composite Repair Committee)

1/ Objectives and Scope

The charter of the SAE Commercial Aircraft Composite Repair Committee (CACRC) is to promote **repair and modification standardization** and to provide guidance to composite and bonded structure maintenance providers, airlines, regulators, material suppliers and OEMs. This will be accomplished through developing and publishing AIR, ARP, AMS and other guidance documents. These guidance documents are developed to enhance safety and reduce aircraft ownership cost.

Targeted products: **Part 25 – CS25 / CS-E**

Note: EASA is on the CACRC Exec

2/ Stakeholders

Coordinator: SAE

Industries: Boeing/Airbus/Bombardier/Spirit/Embraer/Collins/Nordam

Material Manufacturers: Hexcel / Teijin/ Solvay / Henkel /Saint Gobain/…

Airlines: United / Delta/Air France/Lufthansa/TAP/Japan Airlines/ANA/Cathay Pacific

Regulators: FAA /EASA

3/ Timeline: 1991-now

4/ Top Achievements

- AIR6292 - Guidelines for Bonded Repair Process Evaluation of Fiber Reinforced Composites
- AIR7509 - Reporting of Damage to Composite Structure
- AIR4938 – Composite and Bonded Structure Technician/Specialist Training Document
- AIR6825 – Identification and Assessment for Damage to Composite Aircraft Structures
- AIR6902 - Guide for the Design of Durable, Repairable and Maintainable Aircraft Composites

5/ Next Steps, e.g.

-ARP7520 – Certification Guidelines for Aircraft Modifications Involving Composites (in progress through Mods task group)
-Development of Alternate Repair Material and Process Qualification and Substantiation Protocol involving secondary structural parts

SAE-CACRC Task Groups:
- Repair Techniques
- Repair Materials
- Procedures
- Inspection
- Training
- Design
- Mods

→ IRCWG inputs are important, work in progress

ASTM (American Society for Testing and Materials)

ASTM INTERNATIONAL

ASTM

1/ Objectives and Scope

Standardization body supporting development and delivery of voluntary consensus standards. Today, over 12,000 ASTM standards are used around the world.

Each main committee in ASTM International is composed of subcommittees that address specific segments within the general subject area covered by the technical committee.

Targeted products: **all**

2/ Stakeholders

Coordinator: ASTM

Regulators: CAA/EASA/FAA

Technical committee:
F37: Light Sport Aircraft
F38: Unmanned Aircraft Systems
F39: Aircraft Systems
F42: Additive Manufacturing Technologies
F44: General Aviation Aircraft →

Subcommittee:
F44.10: General
F44.20 Flight
F44.30 Structures →
F44.40 Powerplant
F44.50 Systems and Equipment

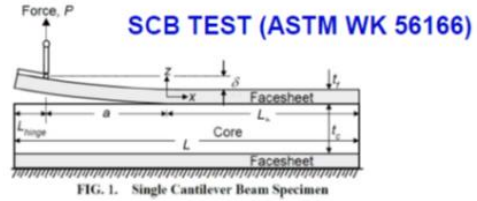
F3114-21 Standard Specification for Structures
F3115/F3115M-23 Standard Specification for Structural Durability for Small Aeroplanes
F3116/F3116M-23a Standard Specification for Design Loads and Conditions
F3254-22 Standard Specification for Aircraft Interaction of Systems and Structures
F3380-19 Standard Practice for Structural Compliance of Very Light Aeroplanes
F3396/F3396M-23a Standard Practice for Aircraft Simplified Loads Criteria
F3498-21 Standard Practice for Developing Simplified Fatigue Load Spectra
F3601-23 Standard Practice for Structural Finite Element Model Verification and Validation

3/ Timeline: 1898-Now

4/ Top Achievements

- For General Aviation aircraft, see F44 Standards Management Table : link
- Transfer of CS23 amt 5 into ASTM
- Mode 1 dominated skin to core test standard
  (supporting EASA EPAS Sandwich Structure work, including planned revision to EASA CM-S-005)

Note: ASTM provides important support for CMH-17, and EASA



SCB TEST (ASTM WK 56166)

FIG. 1. Single Cantilever Beam Specimen

5/ Next Steps

- Under F44.30 the following work is in progress
  - **WK86457--New Standard | General Damage Tolerance Evaluations**
  - WK78199--New Standard | Safe--Life, Inspection Intervals
  - WK68230--F3093 Revision | Aeroelastic Requirements
  - **WK86458--New Standard | Composite Damage Tolerance Evaluations**
  - WK86455--New Standard | Durability Components to be Evaluated

→ Needs alignment with CMH17 vol. 3 rev H !

EASA

Composite Trainings

Wichita State University

Łukasiewicz Institute of Aviation

1/ Objectives and Scope

The **WSU** training courses are targeting "workforce education" for people dealing with composite applications, covering the essential topics pertaining to composites engineering and the certification process. They have been developed by FAA:

- **CSET: Composite Structural Engineering Technology, including "Hands-on" course (WSU iLOT)** . Course development was supported by FAA and industry engineers, bringing decades of experience in both regulatory and engineering practice to the course development. (European 'hands-on' course held at iLOT)
- **CMfgT: Composite Manufacturing Technology**: provides manufacturing professionals with a technical background in the manufacturing of composites. Students examine each of the fundamental processes of composite manufacturing, and where individual processes fit within the overall fabrication scheme.
- **CMT - Composite Maintenance Technology**: provides a background in critical maintenance issues associated with composite structures. Students will gain increased understanding of safety implications concerning the maintenance and repair of composite materials utilized in aerospace

The **CMH-17** training courses are covering:

- **Statistics Tutorial** (STAT-17): This tutorial is a comprehensive treatment of the CMH-17 methods for statistical analysis and their importance to proper development of design information.
- **Composite Certification Tutorials (FAA/EASA delivery)**: The tutorial provides an overview of the subjects of certification, regulations, design substantiation, and essentials of production and maintenance delivered by subject experts, with an emphasis on structural substantiation. The linkage among design, production, and maintenance functions in the context of unique material properties of composite materials has long been recognized as a critical part of safe and efficient certification. Developing an awareness of regulations and their role is another essential understanding for practitioners engaged in certifying aircraft.
- **Structural Bonding** (new).
- **Ceramic Matrix Composites** (new)

Industry training courses from OEM (Boeing, Airbus) are also available

Targeted products: **all**

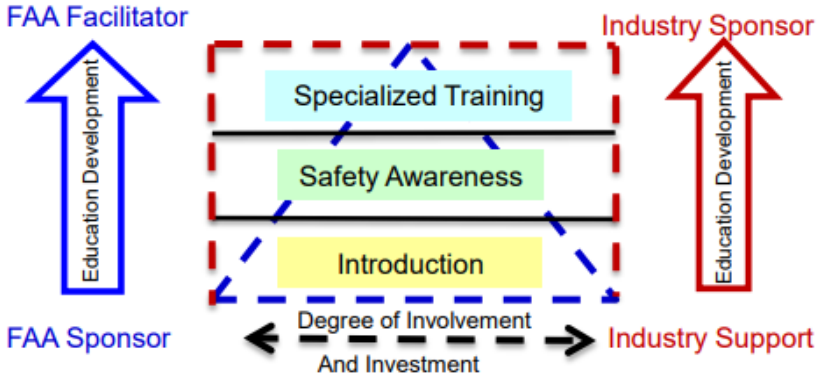
2/ Stakeholders

Coordinator: WSU – CMH-17

Regulators: FAA

EASA

*Note: CMH-17 is developing further new tutorials and potentially 'mini-tutorials', to be linked to various subject/chapter themes



Take Away – Global Composite Safety Initiatives

- → **FAA** sponsor and lead of major global composite safety initiatives
- → IRCWG is a Steering Group, involving Regulators and OEM
- → Mainly **Transport Aircraft** centric to date
- → SDO's (**Standards Development Organisation**) are key stakeholders supporting composite materials standardization (CMH-17, SAE CACRC, ASTM, …)

Key enablers for positive impact on aviation safety and certification efficiency:

- ✓ **Steering group** including OEM and Regulators to prioritize safety needs
- ✓ **Harmonization** and good collaboration between **regulators** to align on composite requirements /AMC
- ✓ Involvement of Regulators and Industry in task groups → **knowledge transfer**
- ✓ **Cross linked activities**, but no duplication or divergence of activities (e.g. between SDOs)

→ Global initiatives have mainly targeted **large aircraft** applications

→ To be developed for **GA/Rotorcraft,** (VTOL?)

Agenda – Part 1

Join at
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Composite Guidance – CS23/CS25/CS27/CS29

- Overview of Generic and Product Specific Composite Guidance
- Selection of Means of Compliance

EASA Challenges & Priorities for Composite Initiatives

Global Composite Safety Initiatives

- Overview of Global Safety Initiatives (FAA lead)
- IRCWG, ARAC 25.571, CMH17, CACRC, ASTM, Training

EASA Composite Guidance Road Map

- EASA R&D EPAS Project DESIGN
- EASA Composite Guidance – Next Steps for 2025

Q&A Session

EASA
European Union Aviation Safety Agency

This project is funded from the European Union's Horizon Europe research and innovation programme.

R&D EPAS Project DESIGN

Damage Tolerant Design of Sandwich Structures in PSE applications

Sandwich Structures in PSE

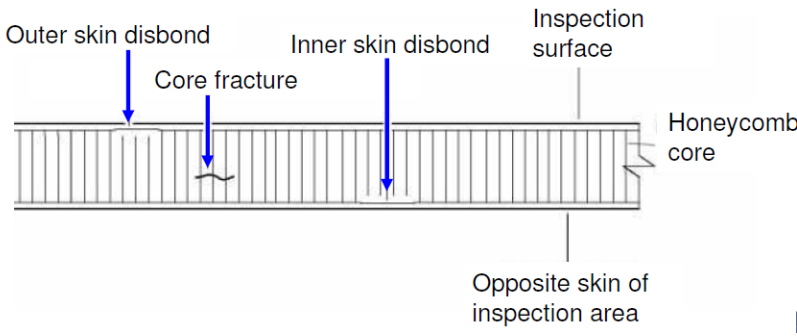
- **Lightweight** structures with high stiffness and strength to weight ratios
- Several **safety issues** experienced during the past decades with composite sandwich across a range of products, due to sandwich disbond and damage growth.
- **Sandwich disbond and damage growth behavior** are critical aspects of Damage Tolerance of sandwich applications

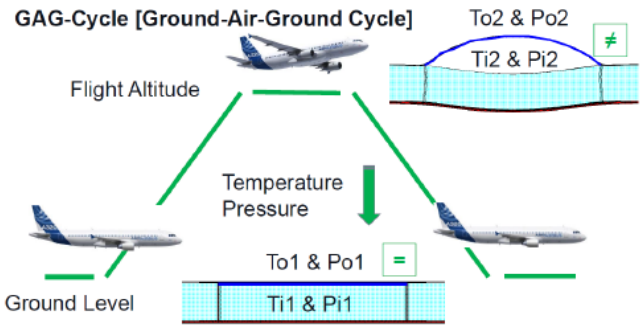
Some initiatives were launched by EASA:

- to better understand the influencing factors on sandwich disbond
- to develop some testing methods to characterize sensitivity to disbond

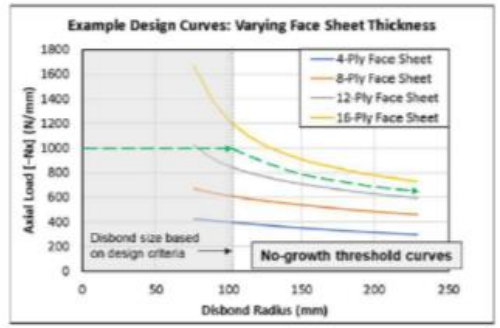
- **CM-S-010**: *The Safe Design and Use of Monocoque Sandwich Structures in Principal Structural Element Applications*
- R&D project **DoSS** "Disbond of Sandwich Structures" - 2016-2017
  - Disbond of Sandwich Structures report EASA_REP_RESEA_2016_2 (online)
  - Engineering approach for sandwich disbond analysis
  - Testing method for sandwich fracture toughness

Sandwich structure typical damages





Design Curves



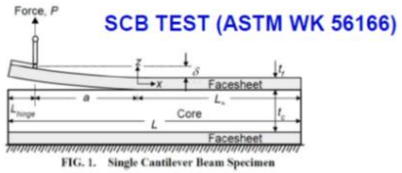


FIG. 1. Single Cantilever Beam Specimen

Practical design solution e.g. closed form design solution developed for large aircraft (NSE / FAA)

EASA R&D DESIGN Project

EASA Webpage

- **DESIGN**: *Evolutions of airworthiness standards for new aircraft structure design using materials, processes, and advanced manufacturing methods*
- Main **objective**: Develop key enablers for safe design and use of sandwich structures in PSE applications.
- Main **Tasks**:

Task 1
Provision of a "Current industry status report"

Task 2
Development of substantiated design solutions

Task 3
Improvement of damage detection for typically difficult to detect damage

Task 4
Development of Hybrid Structure Continued Airworthiness Strategies

Task 5
Conclusions, recommendations implementation roadmap and cost-benefit analysis

- Consortium Members:

2025-2027
3y

1 M€

Contractor
DTU

Project Lead
EASA

DTU
Fraunhofer IMWS
Università di Genova
NSE COMPOSITES
EASA
AIRBUS COMMERCIAL AIRCRAFT
AIRBUS HELICOPTERS
LEONARDO
DUPONT

Composite Guidance Road Map

Composite CM	CS	AMC	ASTM F44.30	SDOs	R&D
• CM-S-004 issue 02 • CM-S-005 issue 02 • CM-S-006 issue 02 • Update CM-S-010 to include outcomes of EPAS DESIGN project (sandwich)	• Correct CS23 Amdt 6 to refer to F3115-15 as AMC (already launched on FAA side)	• Launch rulemaking task to update AMC25.613	• WK86458 to develop composite DT evaluations guide (running) • F3115-2X should be released by F44.30 as CS23 AMC (F44.30 WK91509)	• CMH-17 activity to include GA + Crashworthiness TG for Rotorcraft • CMH-17 Sandwich disbond TG • SAE CACRC ARP 7520 • SAE CACRC repair material qualification	• EPAS DESIGN Project

Next Steps for 2025

- → EPAS Sandwich DESIGN: KOM 13/01/25 – 3y project
- → CM-S-004, CM-S-005, CM-S-006 updates
- → F44.30 Composite Working Group (F3115)
- → Support standardization activities
- → EASA/FAA/TCCA/ANAC exchanges to address specific topics on CS23

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