

EASA	CERTIFICATION MEMORANDUM
	<p>EASA CM No.: EASA CM - S – 004 Issue: 01</p> <p>Issue Date: 14th of January 2014</p> <p>Issued by: Structures section</p> <p>Approved by: Head of Certification Experts Department</p> <p>Regulatory Requirement(s): CS 2X.603, CS 2X.605, CS 2X.613, CS-E 70 and CS-P 170</p>

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Subject

Composite Materials – Shared Databases

**Acceptance of Composite Specifications and Design Values
Developed using the NCAMP Process**

Log of Issues

Issue	Issue date	Change description
01	14.01.2014	First issue.

Table of Contents

1. INTRODUCTION	4
1.1. Purpose and Scope	4
1.2. References	4
1.3. Abbreviations	5
1.4. Definitions.....	5
2. BACKGROUND	6
2.1. General.....	6
2.2. History.....	6
2.3. Discussion.....	7
3. EASA CERTIFICATION POLICY	7
3.1. EASA Policy	7
3.1.1. FAA policy (<i>quoted in italics</i>)	7
3.1.2. EASA policy (<i>continued, further to 3.1.1</i>)	8
3.2. Who this Certification Memorandum Affects	8
4. REMARKS	9

1. INTRODUCTION

1.1. PURPOSE AND SCOPE

This Certification Memorandum (CM) provides an interim EASA position regarding acceptance of composite material data developed specifically using the NCAMP shared database process, which has been developed during the last 15 years to improve standardisation of lower test pyramid data for composite materials, similar to that commonly accepted for metals using the well-established MMPDS process. Mature standardisation processes are considered to be potentially beneficial to industry and safety.

Although this is primarily a USA industry based process, initially developed by the FAA, its development included some European industry and regulatory (NAA and EASA) involvement, e.g. via document review and interface with CMH-17. Currently, there is also involvement from organisations from other non-USA countries. Furthermore, the process will maintain some regulatory involvement.

This CM presents an interim EASA position, because EASA believes that some further work remains to be completed in order to fully harmonise the processes.

Note: This CM is in broad agreement with the FAA Memo AIR-100-10-120001 'Acceptance of Composite Specifications and Design Values Developed using the NCAMP Process', dated 22/7/2010, and related PS-AIR-100-120-07 'Policy Memo on Guidance for Component Contractor Generated Composite Design Values for Composite Structure', dated 20/9/2013.

1.2. REFERENCES

It is intended that the following reference materials be used in conjunction with this CM:

Reference	Title	Code	Issue	Date
CS 2X.603	Materials and workmanship	CS-2X	---	---
CS 2X.605	Fabrication Methods	CS-2X	---	---
CS 2X.613	Material Strength Properties and Design Values	CS-2X	---	---
CS-E 70	Materials and Manufacturing Methods	CS-E	---	---
CS-P 170	Materials and Manufacturing Methods	CS-P	---	---
AMC 20-29	Composite Aircraft Structure	CS-2X		
AC 23-20	Acceptance Guidance on Material Procurement and Process Specifications for Polymer Matrix Composite Systems			19/9/2003
AC 27-1	Certification of Normal Category Rotorcraft			30/9/2008
AC 29-2	Certification of Transport Category Rotorcraft			30/9/2008
DOT/FAA/AR-03/19	Material Qualification and Equivalency for Polymer Matrix Composite Material Systems: Updated Procedure			September 2003
NCAMP NSP	NCAMP Standard Operation Procedures (SOP), Doc NSP 100(E)			22/9/2009

1.3. ABBREVIATIONS

The following abbreviations are used in this Certification Memorandum:

Abbreviation	Meaning
AER	A uthorised E ngineering R epresentative (NCAMP)
AFF	A rbeitskreis F aserverbund F lugzeugbau
AGATE	A dvanced G eneral A viation T ransport E xperiment
AIR	A uthorised I nspection R epresentative (NCAMP)
AMC	A cceptable M eans of C ompliance
CFR	C ode of F ederal R egulations
CM	C ertification M emorandum
CMH	C omposite M aterial H andbook
CS	C ertification S pecification
FAA	F ederal A viation A dministration
ft	F eet
HFF	H andbuch F aserverbund F lugzeuge
lbs	P ounds
MAB	M anufacturer A dvisory B oard (NCAMP)
NAA	N ational A irworthiness A uthority
NASA	N ational A eronautical and S pace A dministration
NCAMP	N ational C entre for A dvanced M aterials P erformance
NIAR	N ational I nstitute for A viation R esearch
PRT	P erformance R evision T eam (NCAMP)
RGB	R egulatory G overning B oard (NCAMP)
SAB	S upplier A dvisory B oard (NCAMP)
WSU	W ichita S tate U niversity

1.4. DEFINITIONS

The following definitions are used in this Certification Memorandum:

Definition	Meaning
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2. BACKGROUND

2.1. GENERAL

The development of detailed harmonised guidance and practices regarding the definition and use of composite material data remains relatively immature compared to the well-established metallic protocols.

AMC 20-29 'Composite Aircraft Structure' paragraph 6.a.(7) 'Material and Process Control' states:

"...the Agency does not certify materials and processes. However, materials and processes specifications are part of the type-design subject to type-certification. Appropriate certification credit may be given to products and organisations using the same materials and processes in similar applications subject to substantiation and applicability. In some cases, material and processing information may become part of accepted shared databases used throughout the industry. New users of shared qualification databases must control the associated materials and processes through proper use of the related specifications and demonstrate their understanding by performing equivalency sampling tests for key properties."

This CM provides clarification regarding the acceptability of material specifications, material strength properties and material design values (allowables) developed by the National Centre for Advanced Materials Performance (NCAMP) for composite materials. NCAMP has published a standard operating procedures document detailing the organisation, methods, and processes that they will use to work with material suppliers, manufacturers, and regulatory bodies to develop composite material specifications and limited associated material allowables. These procedures are based on experience gained from the Advanced General Aviation Transport Experiment (AGATE) and NCAMP. Throughout this timeframe, AGATE and NCAMP have had a strong interface with FAA (including European NAA and EASA involvement), including the regulatory oversight occurring in related certification programmes and special projects. In addition, the National Institute of Aviation Research (NIAR) at Wichita State University (WSU), which oversees the AGATE and NCAMP programs, performed a supporting role in the FAA development of related guidance for composite material qualification and material & process specifications and the associated protocol for methods, shared databases, quality control, and equivalency sampling tests. Material specifications developed following the NCAMP standard operation procedures are compliant with the US regulations regarding CFR 2X.603(a)&(b). Applicants who wish to use associated NCAMP databases and material allowables should validate the applicability of that data to their project with a limited test program to be compliant with 2X.605 and 2X.613(a)&(b). In addition, NCAMP specifications are acceptable for showing compliance with CFR 33.15 and 35.17 (equivalent to CS-E 70 and CS-P 170 respectively) for materials used in engine and propeller applications.

2.2. HISTORY

Non-proprietary material specifications for composite materials have not been made public like those currently available for Metallic Materials. This has been partly due to the difficulty suppliers experience sharing material property data and associated specifications which are relevant to more than one manufacturer's production processes. Each manufacturer has typically developed their own composite material specifications and design allowables. In contrast, specifications and allowables for metallic materials are readily available to aerospace industry. The result has been that for metallic designs, individual manufacturers generally have not had to expand their resources in this area. However, work is in progress to improve this situation, e.g. SAE International is working to develop existing NCAMP specifications into publicly available consensus specifications.

2.3. DISCUSSION

The final mechanical behaviour of composite structures is extremely dependent on both the materials and the production processes controlled by the manufacturers (material producers and product manufacturers). In an effort to reduce the cost of using composite materials the National Aeronautical and Space administration (NASA), industry, and FAA, formed the Advanced General Aviation Transport Experiment (AGATE) research consortium. AGATE developed an approach for sharing composite material property data from multiple sources. This allowed the development for tools which permitted the creation of non-proprietary material allowables for composite materials. The AGATE process has become accepted practice in the general aviation industry.

The AGATE programme has since evolved into NCAMP. The objective of NCAMP is to take the experience gained from the AGATE program and develop acceptable methods for developing common material specifications and basic material property data suitable for general use in the certification of general aviation aircraft, transport category airplanes, and other aircraft product types. To achieve that goal, NCAMP has documented procedures that allow the development of non-proprietary specifications and material design values similar in the industry-wide applicability as what is now available for metallic materials. NCAMP is working closely with Composite Materials Handbook 17 (CMH-17) consortium to incorporate NCAMP procedures into the CMH-17 methodology.

EASA acknowledges that NCAMP presents similarities in process to some existing, and accepted, lower pyramid data development and sharing activities within Europe which include shared databases, e.g., the well-established German smaller airplane industry activities presented in HFF (Handbuch Faserverbund Flugzeuge = Handbook Fibre Composite Aircrafts), by AFF (Arbeitskreis Faserverbund Flugzeugbau = Working Group Fibre Composite Aircraft Design) etc. This CM does not change or compromise acceptance of such established activities in relation to project certification, but simply identifies that an international activity is also available to European Industry regarding the development and use of lower test pyramid data.

3. EASA CERTIFICATION POLICY

3.1. EASA POLICY

EASA accepts data developed through the FAA process described below, subject to review as required by standard project Certification and Validation processes.

3.1.1. FAA policy (*quoted in italics*)

'Material specifications and related databases developed using the NCAMP process, as described in NCAMP Standard Operating Procedures (SOP), Doc. # NSP 100 are considered to be compliant with 2X.603(a)&(b). In addition, NCAMP specifications are acceptable for showing compliance with 33.15 and 35.17 (note: equivalent to EASA CS-E 70, and CS-P 170) for materials used in engine and propeller applications. However, to show compliance with the requirements of the 2X.605, 2X.613(a)&(b), 33.15 and 35.17 regulations, material allowables published by NCAMP should be validated as being applicable for each applicant's application by the following provisions:

- *Procure materials per specifications developed using NCAMP procedures;*
- *Applicants who develop the original data following NCAMP procedures may use the resulting allowables;*
- *If not the original applicant, (who developed the original data) applicants wishing to utilise existing NCAMP allowables should conduct a limited test plan to validate the equivalency of materials, production processes and the associated material & process*

controls being used on their program to those used to derive NCAMP allowables. Guidance on what testing is needed is provided in technical report DOT/FAA/AR-03/19.

Note that the allowables provided by the NCAMP processes are not intended to fulfil all of the design needs of every project. In general, NCAMP allowables only cover basic lamina and limited laminate data associated with the lower levels of the building block approach (see CMH-17 Vol.3). Applicants should assess the applicability of provided allowables to the specification properties, environments, laminate architecture, and loading situations needed for their individual projects. In particular, applicants should be able to demonstrate that material allowables are compatible with their validated analytical tools and design methodology. If additional allowables are needed to support higher levels of the building block approach for their designs, it is the applicant responsibility to supplement the NCAMP data with an appropriate test program for their project to be fully compliant with 2X.613.

Data generated by the NCAMP organisation following the procedures defined in NCAMP Standard Operation Procedures (SOP), Doc. # NSP 100 is acceptable to FAA without further showing. Any testing conducted by non-NCAMP organisations should be performed per FAA (or EASA) approved test programme or processes.'

3.1.2. EASA policy *(continued, further to 3.1.1)*

EASA accepts the processes and data generated, as described in para. 3.1.1, as appropriate and subject to review in accordance with standard project Certification and Validation processes, for:

- project Validations, e.g. for EASA Validation of FAA products
- EASA product Certification, when the applicant has fully engaged with the NCAMP processes, as acceptable to NCAMP and EASA

Subject to appropriate European Industry interest being expressed to EASA, EASA may consider further development of the harmonisation process. This could include identification of NCAMP tasks which may be completed directly within Europe under EASA acceptance and approval, e.g. the independent panel testing by a recognised European test facility and/or data review could be completed within Europe as part of a harmonised process. Benefits to Europe could include reduced process time, transportation, and travel costs etc.

EASA understands that some process differences exist between European and USA processes, e.g. the SOPs, and supporting documents, identify ASTM test standards, whilst European organisations may be using EN test standards etc. However, EASA will work with European Industry, as required, to address such matters.

This CM may be amended, subject to changes in associated EASA regulations, e.g. regarding acceptance of third party industry activities etc. Similarly, the integration of the NCAMP process with CMH-17 is in progress and may broaden and change the scope of future revisions to this CM.

3.2. WHO THIS CERTIFICATION MEMORANDUM AFFECTS

This CM could affect applicants who need to show compliance with CS-2X.603, 2X.605, and 2X.613 structure and material requirements, including the related requirements in CS-22, CS-VLA, CS-E and CS-P, unless addressed by other means . It also affects regulators processing applications.

4. REMARKS

1. Suggestions for amendment(s) to this EASA CM should be referred to the Certification Policy and Planning Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu or fax +49 (0)221 89990 4459.
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