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Standardized Composite Training Program

RATIONALE

With the increased use of composites in the construction of structures in commercial aircraft, there is a growing need to train skills and knowledge in the airline workforce, depending on the individual staff function in the composite maintenance, damage assessment, repair disposition, and inspection.

FAA AC 20-107B and EASA AMC 20-29, in addition to other regulatory publications, refer to “technicians, engineers, and inspectors,” as well as “pilots, ramp maintenance, and other operations personnel that service aircraft,” these being the most generic descriptions of functions. Within these functions, personnel roles and tasks may be further subdivided. As an example, “technicians” may be divided into maintenance certifying and supporting staff, composite structure specialists, painters, and others.

The desired knowledge and skills regarding composites may differ significantly between these roles. Consequently, the appropriate level and duration of training and qualification may also be fundamentally different.

To ensure that only qualified persons design, maintain, and operate aircraft composite structures, an organization should develop a detailed composite training and qualification program as part of its quality management exposition. Each organization should evaluate the specific types of composite structures that are operated, maintained, repaired, or modified by the organization. The organization’s training program needs to identify the necessary knowledge and skills to ensure that the employees are proficient to perform these activities, meeting the highest reasonably achievable level of safety.

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1. SCOPE

This AIR provides means of developing a composite training program, as stipulated by FAA AC 20-107B, FAA AC 65-33A, EASA AMC 20-29, and other similar regulatory guidance. Its approach is a comprehensive, sequential training curriculum build-up, customized to the specific needs of the organization (see Figure 2).

It contains recommendations for the skill-building, training, and qualification of persons involved in the design, fabrication, maintenance, and repair of aircraft composite structures or other aviation composite components. It further addresses the qualification of administrative personnel and instructors. Flight operations are usually not in the scope of an SAE CACRC Standard; however, the recommendations of this report may be used also for this target audience.

This report addresses persons responsible for the definition of training, qualification and authorization, or the supervision of aviation personnel. Its content intends to facilitate the development of a formal composite training program which describes the means to train, qualify, and authorize the organization's personnel.

SAE CACRC has produced several training standard documents, each representing the best-practice, recommended minimum training syllabus for its targeted audience. The purpose of this report is to promote the use of these training standards for developing training programs for employees in airlines and maintenance organizations, and as reference in regulatory guidance material. It provides a quick reference to the SAE CACRC training standard documents (see 2.1.1). Thereby, it allows its users to either develop appropriate in-house trainings or to select external training providers and courses that acceptably conform with the syllabi covered by the SAE CACRC training standard documents. It also supports the organization to recognize existing training records of individuals by comparing their equivalence with these standards.

This report does not intend to introduce new training content/syllabus.

This report does not intend to establish a licensing standard.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR4844	Composites and Metal Bonding Glossary
AIR4938	Composite and Bonded Structure Technician/Specialist Training Document
AIR5278	Composite and Bonded Structure Engineers: Training Document
AIR5719	Teaching Points for a Class on "Critical Issues in Composite Maintenance, Repair and Overhaul"
AIR6825	Identification and Assessment of Damage to Composite Aircraft Structures Training Document
AIR7491	Training Guidance for Solid Laminate Composite Nondestructive Inspection/Testing to Enhance Proficiency and Improve Reliability

2.1.2 EASA Publications

Available from European Union Aviation Safety Agency, Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany, Tel: +49 221 8999 000, www.easa.europa.eu.

EASA AMC 20-29 Composite Aircraft Structure

2.1.3 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

FAA AC 20-107B Composite Aircraft Structure

FAA AC 65-33A Development of Training/Qualification Programs for Composite Maintenance Technicians

2.1.4 Other Publications

CMH-17, Vol. 3 Polymer Matrix Composites: Materials Usage, Design, and Analysis

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 Code of Federal Regulations (CFR) Publications

Copies of these documents are available online at <https://www.ecfr.gov>.

14 CFR Part 65, Subpart D Mechanics

14 CFR Part 145, Subpart D Personnel

2.2.2 EASA Publications

Available from European Union Aviation Safety Agency, Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany, Tel: +49 221 8999 000, www.easa.europa.eu.

EASA Part-66

EASA Part-145, 145.A.30 Personnel requirements

EASA Part-145, AMC1 to
AMC3 145.B.200(a)(3) Qualification and training of inspectors

EASA UG.CAO.00024-009 Foreign Part-145 approvals - User Guide for Maintenance Organisation Exposition

EASA Part-CAMO, CAMO.A.305 Personnel requirements

EASA Part-CAMO, AMC1 to
AMC3 CAMO.B.200(a)(3) Qualification and training of inspectors

EASA Part-21, 21.A.243 Approval requirements; Statement of qualifications and experience

EASA CS-MCSD Certification Specifications and Guidance Material for Maintenance Certifying Staff Data

2.2.3 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

FAA AC 145-10

Repair Station Training Program

3. TRAINING PROGRAM CONCEPT

3.1 Target Groups

- Maintenance and Repair Organizations
- Commercial Air Transport Operators and Continued Airworthiness Management Organizations
- Design Organizations
- Production Organizations
- Training Organizations
- Certification and Airworthiness Authorities

3.2 Training and Qualification Program

The individual company, organization, or agency is responsible for establishing in its quality management system an appropriate composite training and qualification program in compliance with the applicable regulation and acceptable means of compliance.

The following recommendations may be useful to establish such a program. It should be noted that the recommendations of this report may be used also to supplement already existing programs to train and qualify aviation personnel.

Means to describe the control and administration of personnel training, evaluation, qualification, certification, and documentation should already be an inherent part of the quality management system of any organization in the commercial aviation industry. However, a number of observations specifically for composite-related training may be worth discussing.

Due to the complex nature of composite maintenance, and due to its differences to metallic structures, composite training should typically follow a sequential build-up of training and associated practical experience ("learning path") to obtain a certain qualification or authorization within the organization. This schedule should start with awareness trainings to familiarize the individual with basic knowledge about the characteristics of composites and the challenges in the operation and maintenance of composite structures. From that point on, initial training and qualification requirements, including practical experience, should be tailored to the specific tasks an individual accomplishes. To that effect, competencies should be defined per each relevant function and role. Some of these competencies may require acceptable methods for maintaining proficiency over time, including continuous demonstration of acquired skill and knowledge, and steps to retrain or requalify an individual, as necessary.

It is important to recognize that proficiency in a certain competency is the result of the combination of training and experience. The necessary level of training can be achieved by attending courses which cover the self-teaching, classroom, or laboratory syllabi covered in the referenced SAE CACRC training documents (see 2.1.1). However, experience can be attained only by exposure to practical work in the intended environment. Experience is the observation, comprehensive on-the-job-training, and performance of specific task-related skills conducted in the work environment, resulting in the acquisition of knowledge and skill. It hence needs to be emphasized that attending training alone, without appropriate practical experience, would not be sufficient to become proficient.

The following guidance may be used to schedule the training and qualification program of employees ("Learning Path"):

- Awareness initial trainings should occur as early as possible.
- Initial trainings regarding surface protection, damage assessment, composite reworks and general bonded repairs, engineering, and nondestructive testing should occur early in the formation phase, typically before issuance of the relevant company authorization (Aircraft Maintenance, NDT, Engineering, etc.).
- Thereafter, with increasing practical experience, further skill building by training for more advanced repair, engineering, or inspection techniques may be added.
- Tools and techniques for inspection or repair that are specific to a component manufacturer or aircraft type are required only if an employee works on these components or aircraft types; initial training should be considered in the preparation for entry-into-service of such aircraft or component.
- Individuals that certify maintenance work on composite structures should typically have, at a minimum, the same level of training as the one required to actually perform that work. In addition, they should possess an acceptable level of experience.
- Training instructors should have demonstrated practical experience and knowledge of composite maintenance and repair practices. They should have at least the proficiency to master the competency they train to other employees; it is recommended that they have the same proficiency as composite structure specialists.

When introducing such a training and qualification program, it is strongly recommended to consider a bridging concept for employees that have already passed their initial formation phase. Many of these employees may have extensive experience in design, maintenance, repair, or inspection of metallic aircraft, yet they may not have been exposed often to composite structures in the past. In addition, composite-specific training is often underrepresented in basic and type trainings.

It should be noted that EASA AMC 20-29, FAA AC 20-107B, and FAA AC 65-33A, in addition to other regulatory publications, demand a continuous demonstration of acquired skills beyond the initial training. The following means are considered acceptable means to continuously demonstrate the competence:

- Continuation training and competence assessment
- Recurrent training
- Practical records and hands-on demonstration of skills

The referenced SAE CACRC training standard documents (see 2.1.1) provide guidance regarding the appropriate continuous demonstration of competencies.

Some specific skills are required only for technical tasks that are not necessarily related to a company maintenance authorization. As an example, training regarding Damage Assessment on Composite Structures is recommended for all technicians that are actively involved in assessing structural damage against SRM limits, to make a valid decision on the aircraft's airworthiness. This training may even be aircraft type specific. However, not all technicians holding a company maintenance authorization will need such training, since they may not be exposed to the task of damage assessment in their practical work. This document intends to provide the flexibility to adjust the number of trained staff to the actual needs. Likewise, engineering personnel that support maintenance staff in performing such tasks should typically undergo the same training, although they may not hold any maintenance authorization. The training program can therefore be used also to identify the appropriate amount of personnel, tailored to the specific need of an organization, and to select individuals that need to be trained and authorized. It is recommended to issue a statement that an individual has met the requirements of an accepted standard as a testimony of qualification and authorization within the organization. Company-internal authorizations are useful for that purpose.