



## Existing CS25.603 AMC Text

### Color-Coded Scheme for Review of Draft AC 20-107B/AMC 20-29 Content (based upon August 2008 CMH-17 Ottawa meeting)

**Green text indicates it comes from AC 20-107A/AMC, with little or no change**

**Blue text suggests that it is considered a minor addition that is not likely to be controversial**

**Red text highlights that it is considered a major addition that may be controversial**

#### AMC – SUBPART D

##### AMC No.1 to CS 25.603 Composite Aircraft Structure

- **Now generic AMC 20-29 (CS23, 25, 27, 29.603 to be altered to reference AMC – differences to be retained in CS's, e.g. flammability and lightning requirements)**

1 *Purpose.* This AMC sets forth an acceptable means, but not the only means, of showing compliance with the provisions of CS-25 regarding airworthiness type certification requirements for composite aircraft structures, involving fibre reinforced materials, e.g. carbon (graphite), boron, aramid (Kevlar), and glass reinforced plastics. Guidance information is also presented on associated quality control and repair aspects.

- **Links with CSs 23, 25, 27 and 29 type certification requirements**
- **Some wording changes (e.g., Kevlar, Boron deleted, carbon & glass as examples of fiber types retained)**

**NOTE:** **New section (to become new section 2) added - 'TO WHOM IT MAY CONCERN'. Added to clarify and enhance relevance to this broad document across manufacture, design, and continued airworthiness activities**

- **applicants, certificate/approval holders, operators, parts manufacturers, material suppliers, maintenance and repair organizations**
- **to become new section 2. This is a post 'Ottawa meeting' change, so document is to be renumbered accordingly at a later date**

**This AMC material is identical, apart from minor editing, to the structural content of FAA Advisory Circular AC 20.107A, dated 25 April 1984. The individual CS paragraphs applicable to each AMC paragraph are listed in Table 1 of this AMC. 2**

*Definitions* For the purpose of Subpart D, the following definitions apply:

- **Moved to appendix 2 (harmonise content organisation).**

2.1 *Design values.* Material, structural element, and structural detail properties that have been determined from test data and chosen to assure a high degree of confidence in the integrity of the completed structure (see CS

25.613(b)).

2.2 *Allowables*. Material values that are determined from test data at the laminate or lamina level on a probability basis (e.g. A or B base values).

2.3 *Laminate level design values or allowables*. Established from multiply laminate test data and/or from test data at the lamina level and then established at the laminate level by test validated analytical methods.

2.4 *Lamina level material properties*. Established from test data for a single ply or multiply single direction oriented lamina lay-up.

2.5 *Point design*. An element or detail of a specific design which is not considered generically applicable to other structure for the purpose of substantiation (e.g. lugs and major joints). Such a design element or detail can be qualified by test or by a combination of test and analysis.

2.6 *Environment*. External, non-accidental conditions (excluding mechanical loading), separately or in combination, that can be expected in service and which may affect the structure (e.g. temperature, moisture, UV radiation, and fuel).

2.7 *Degradation*. The alteration of material properties (e.g. strength, modulus, coefficient of expansion) which may result from deviations in manufacturing or from repeated loading and/or environmental exposure.

2.8 *Discrepancy*. A manufacturing anomaly allowed and detected by the planned inspection procedure. They can be created by processing, fabrication or assembly procedures.

2.9 *Flaw*. A manufacturing anomaly created by processing, fabrication or assembly procedures.

2.10 *Damage*. A structural anomaly caused by manufacturing (processing, fabrication, assembly or handling) or service usage. Usually caused by trimming, fastener installation or foreign object contact.

2.11 *Impact damage*. A structural anomaly created by foreign object impact.

2.12 *Coupon*. A small test specimen (e.g. usually a flat laminate) for evaluation of basic lamina or laminate properties or properties of generic structural features (e.g. bonded or mechanically fastened joints).

2.13 *Element*. A generic element of a more complex structural member (e.g. skin, stringers, shear panels, sandwich panels, joints, or splices).

2.14 *Detail*. A non-generic structural element of a more complex member (e.g. specific design configured joints, splices, stringers, stringer runouts, or major access holes).

2.15 *Subcomponent*. A major three dimensional structure which can provide complete structural representation of a section of the full structure (e.g. stub-box, section of a spar, wing panel, wing rib, body panel, or frames).

2.16 *Component*. A major section of the airframe structure (e.g. wing, body, fin, horizontal stabiliser) which can be tested as a complete unit to qualify the structure.

- **Maintained list from existing AMC plus:**
  - **Will update as needed to be consistent with major standards groups**
  - **Eliminated “laminate level design values or allowables”, “lamina level material properties”**(not in existing document or necessary in amended document), **and “flaw”** (replaced by ‘intrinsic’ and ‘discrete’ flaws)
  
- **Additional terms being considered**
  - **Anisotropic**
  - **Heterogeneous**
  - **Critical Structure\***
  - **Primary Structure**
  - **Shared Database**
  - **Load Enhancement Factor (LEF)**
  - **Categories of Damage**
  - **Weak Bond**
  - **Debond**
  - **Disbond (same as debond)**

- **Structural Bonding**
- **Intrinsic Flaw**
- **Discrete Flaw**
- **Overload Factor**
- **Delamination**
- **No Growth Approach**
- **Slow Growth Approach**
- **Arrested Growth Approach**

- **Purpose is to include any terms used that may cause confusion for readers.**

\* **Note: 'Critical Structure' a load bearing structure/element whose integrity is essential in maintaining the overall flight safety of the aircraft** – definition added due to reduced part count, increased structure size, system protection, different internal OEM sub-classifications, varied interpretations of PSE etc

### 3 General

3.1 This AMC is published to aid the evaluation of certification programmes for composite applications and reflects the current status of composite technology. It is expected that this AMC will be modified periodically to reflect technology advances.

3.2 The extent of testing and /or analysis and the degree of environmental accountability required will differ for each structure depending upon the expected service usage, the material selected, the design margins, the failure criteria, the data base and experience with similar structures, and on other factors affecting a particular structure. It is expected that these factors will be considered when interpreting this AMC for use on a specific application.

- **Retained AMC 3.1, 3.2 (disclaimer & intro statements)**
- (107A 4a) **Added rationale for periodic updates (evolution of composite technology, data from service experiences and expanding applications)**
- (107A 4b) **Added thoughts that overall objective is to achieve equivalent or higher levels of safety to metals technology**
- (107A 4b) **Added general statements on: 1) issues unique to specific materials and processes and 2) a need to consider the anisotropic properties and heterogeneous nature of composites as evident in scaled processes**

### 4 Material and Fabrication Development

4.1 To provide an adequate design data base, environmental effects on the design properties of the material system should be established.

4.2 Environmental design criteria should be developed that identify the most critical environmental exposures, including humidity and temperature, to which the material in the application under evaluation may be exposed. This is not required where existing data demonstrate that no significant environmental effects, including the effects of temperature and moisture, exist for material systems and construction details, within the bounds of environmental exposure being considered. Experimental evidence should be provided to demonstrate that the material design values or allowables are attained with a high degree of confidence in the appropriate critical environmental exposures to be expected in service. The effect of the service environment on static strength, fatigue and stiffness properties should be determined for the material system through tests (e.g. accelerated environmental tests, or from applicable service data). The effects of environmental cycling (i.e. moisture and temperature) should be evaluated. Existing test data may be used where it can be shown directly applicable to the material system.

4.3 The material system design values or allowables should be established on the laminate level by either test of the laminate or by test of the lamina in conjunction with a test validated analytical method.

4.4 For a specific structural configuration of an individual component (point design), design values may be established which include the effects of appropriate design features (holes, joints, etc.).

4.5 Impact damage is generally accommodated by limiting the design strain level.

#### **New opening paragraph on need for qualified materials & processes**

- **Justified by effect of material & process control on composite performance**

(107B 5a) **Material and Process Control (new subsection)**

- **Opens with content from AMC, Paragraph 8.6 (Production Specs)**

- **Includes content taken from AMC, Paragraph 8.5 (Quality Control)**
- **New content on material requirements based on qualification test results**
- **Environmental durability tests recommended for structural bonding**
- **New content on equivalency sampling tests for new users of shared databases (e.g. AGATE, NCAMP)**
- **New content on a need for material specifications and process info linked with shared qualification databases**
- **New content on a need to demonstrate repeatable processes at sufficient scale as related to material and process control of product structural details**
- **Reference to Appendix 3 (containing info on "Change of Material" taken from CS 25.603, AMC No. 1 & 2)**
- **Added note that regulatory bodies don't certify materials & processes independent of aircraft product certification**

(107B 5b) **Manufacturing Implementation (new subsection)**

- **New content on use of specifications and documentation to control materials, fabrication and assembly steps in the factory**
- **New content on control of the environment and cleanliness of manufacturing facilities to levels validated by qualification and proof of structure testing**
- **New content on production tolerances validated in building block tests**
- **New content on manufacturing records of allowed defects, rework and repair**
- **New content on "new suppliers for previously certified aircraft products"**

(107B 5c) **Structural Bonding (new subsection not using the word 'secondary')**

- **New content outlining the need for qualified materials and bond surface preparation for metal bonding and composite secondary bonding**
- **New content on physical, chemical and mechanical qualification tests, including tests for evaluating proper adhesion (e.g., some form of peel test)**
- **New content on in-process control of critical bond processing steps**
- **An explanation of the intent of CS 23.573(a)(5) for damage tolerance substantiation of structure with bonded joints (explanation of the 3 options in addition to a well-qualified bonding process and rigorous QC)**
- **Thoughts on actions taken for adhesion failures found in service**

(107B 5d) **Environmental Considerations (based on AMC 4.2)**

- **Retains all text from AMC 4.2.**
- **Added sentence on substantiating accelerated test methods**
- **Added sentence on need to consider residual stresses for dissimilar materials**

(107B 5e) **Protection of Structure (based on AMC 8.4)**

- **Retains AMC text from 8.4. with added words for clarification**
- **Adds new sentence on a need to isolate some materials to avoid corrosion**

(107B 5f) **Design Values (based on AMC 4.3)**

- **Retains AMC 4.3 text with added words for clarification**
- **Added sentence on a need to derive design values from parts made using mature materials and processes (under control)**
- **Added final sentence with equivalent thoughts for non-laminated composites**

(107B 5g) **Structural Details**  
(based on AMC merging 4.4 and 4.5)

- **Retains AMC text from 4.4 and 4.5 (at the start and end)**
- **Added a sentence with thoughts on testing for the effects of impact damage**

*Proof of Structure – Static*

**Retained AMC intent of text from 5.2, 5.3**

**Merged thoughts from AC 20-107A 6b. into 6a.**

**Eliminated AMC 5.7 (too specific to rotorcraft)**

**Opening statement**

- **Kept text from opening statement of AMC 5.1 (moved to middle)**
- **Added introductory thoughts on what needs to be considered in static strength substantiation based on content in AC 29-2C, MG8 (critical load cases, failure modes, environment, non-detectable damage, allowed mfg. defects)**
- **Added sentences on use of analysis to identify critical load cases and associated failure modes and necessary experience for analysis validation**

5.1 The static strength of the composite design should be demonstrated through a programme of component ultimate load tests in the appropriate environment, unless experience with similar designs, material systems and loadings is available to demonstrate the adequacy of the analysis supported by subcomponent tests, or component tests to agreed lower levels.

5.2 The effects of repeated loading and environmental exposure which may result in material property degradation should be addressed in the static strength evaluation. This can be shown by analysis supported by test evidence, by tests at the coupon, element or subcomponent level, or alternatively by relevant existing data.

5.3 Static strength structural substantiation tests should be conducted on new structure unless the critical load conditions are associated with structure that has been subjected to repeated loading and environmental exposure. In this case either –

a. The static test should be conducted on structure with prior repeated loading and environmental exposure, or

b. Coupon/Element/Subcomponent test data should be provided to assess the possible degradation of static strength after application of repeated loading and environmental exposure, and this degradation accounted for in the static test or in the analysis of the results of the static test of the new structure.

(107B 6a) **Effects of repeated load & environment**  
(based on AMC 5.2 and 5.3)

- **Starts with the same words as AMC 5.2.**
- **Adds a reference to effects of environment on material properties (107B 5d.) and protection of structure (107 5e.)**
- **Merges thoughts from AMC 5.3 on two approaches to account for repeated load and environment (same as fifth area of AC 29-2C, MG8)**

(107B 6b) **Building block approach (based on AC 29-2C, MG8)**

- **Most text taken directly from AC 29-2C, MG8 (2005 version)**

- Two figures added to support the text
- Additional generic descriptions justifying use of a building block approach

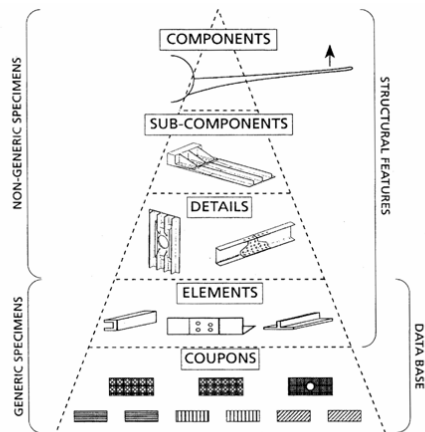


Figure A: Schematic diagram of building block tests for a fixed wing.

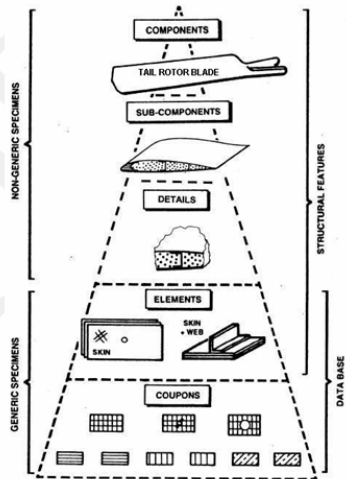


Figure B: Schematic diagram of building block tests for a tail rotor blade.

5.4 The component static test may be performed in an ambient atmosphere if the effects of the environment are reliably predicted by subcomponent and/or coupon tests and are accounted for in the static test or in the analysis of the results of the static test.

(107B 6c) **Component static test** (identical to AMC 5.4)

- **May be redundant with new content provided in AMC 6a.**

5.5 The static test articles should be fabricated and assembled in accordance with production specifications and processes so that the test articles are representative of production structure.

(107B 6d) **Processing of static test article** (based on AMC 5.5)

- **Initial text is identical to AMC 5.5**
- **Added statement to include defects consistent with limits set by mfg. acceptance criteria**

5.6 When the material and processing variability of the composite structure is greater than the variability of current metallic structures, the difference should be considered in the static strength substantiation by –

- Deriving proper allowables or design values for use in the analysis, and the analysis of the results of supporting tests, or
- Accounting for it in the static test when static proof of structure is accomplished by component test.

(107B 6e) **Material & process variability considerations**

(based on AMC 5.6)

- Keeps the same text as AMC 5.6
- Adds text from AC 29-2C, MG8 for purposes of clarification.
- Method 1 is referred to as: “substantiated by analysis supported by tests”
- Method 2 is referred to as: “substantiated by tests” (use of overload factors)

5.7 Composite structures that have high static margins of safety may be substantiated by analysis supported by subcomponent, element and/or coupon testing.

5.8 It should be shown that impact damage that can be realistically expected from manufacturing and service, but not more than the established threshold of detectability for the selected inspection procedure, will not reduce the structural strength below ultimate load capability. This can be shown by analysis supported by test evidence, or by tests at the coupon, element or subcomponent level.

(107B 6f) **Non-detectable impact damage** (based on AMC 5.8)

- Starts with the same text as AMC 5.8.
- Added “component level” in reference to analysis supported by test evidence
- Added BVID as an example for visual detection procedures
- Added sentences on selection of impact sites
- (107B 6g) add one sentence ref. to Appendix 3 for material & process change (previously CS 25.603 AMC Note 2)

6 Proof of Structure – Fatigue/Damage Tolerance

**Retained AMC 6.1, 6.2, 6.3 text**

**Added a new sections (107B 7a (1) and 7a (5)), while renumbering existing sections.**

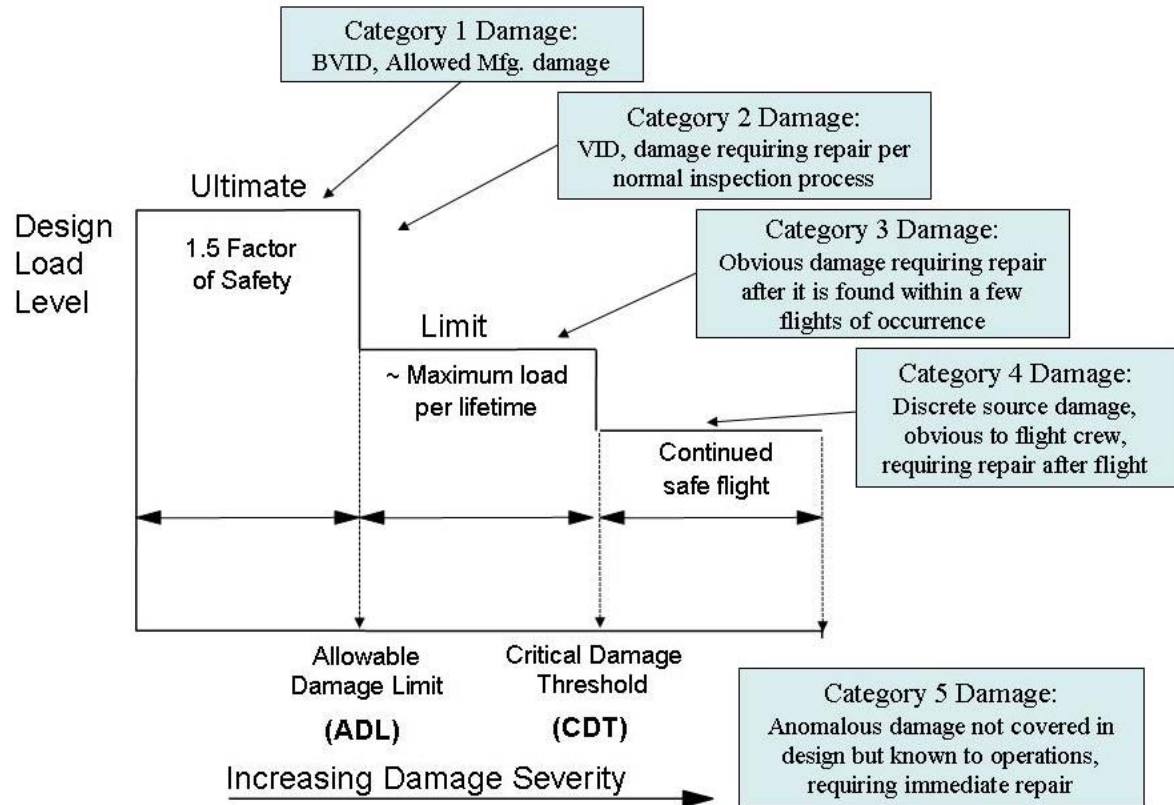
6.1 The evaluation of composite structure should be based on the applicable requirements of CS 25.571. The nature and extent of analysis or tests on complete structures and/or portions of the primary structure will depend upon applicable previous fatigue/damage tolerant designs, construction, tests, and service experience on similar structures. In the absence of experience with similar designs, approved structural development tests of components, subcomponents, and elements should be performed. The following considerations are unique to the use of composite material systems and should be observed for the method of substantiation selected by the applicant. When selecting the damage tolerance or safe life approach, attention should be given to geometry, inspectability, good design practice, and the type of damage/degradation of the structure under consideration.

- Kept text from opening paragraph of AMC 6
  - Updated references to rules (added CS 23.573a)
  - Added text (based on CS 25.571) on need to avoid catastrophic failure due to fatigue, environmental effects, manufacturing defects, accidental damage
  - Added text on component damage tolerance & fatigue tests (coupling with component static strength tests & considerations needed for metal structure)
  - Added a reference to use of a building block approach (107B 6b) and a need to consider material & process changes (Appendix 3)
- (107B 7a) **Damage Tolerance Evaluation**  
(1) **Damage threat assessment (new subsection)**
- Add text on identification of critical elements and a need for damage threat assessment (words taken directly from the new rule, CS 29.573)
  - Describe considerations for damage threat assessment of a given structure

(107B 7a) **Damage Tolerance Evaluation**

(1) Damage threat assessment (new subsection), *cont.*

- Described foreign object impact considerations, including impact surveys with configured structure (much of the added text from AC 29-2C, MG8)
- Added text classifying various damage types from a damage threat assessment into five categories of damage



- Added 1 page description of five categories of damage

6.2 Damage Tolerance (Fail Safe) Evaluation

6.2.1 Structural details, elements, and subcomponents of critical structural areas should be tested under repeated loads to define the sensitivity of the structure to damage growth. This testing can form the basis for validating a no-growth approach to the damage tolerance requirements. The testing should assess the effect of the environment on the flaw growth characteristics and the no-growth validation. The environment used should be appropriate to the expected service usage. The repeated loading should be representative of anticipated service usage. The repeated load testing should include damage levels (including impact damage) typical of those that may occur during fabrication, assembly, and in service, consistent with the inspection techniques employed. The damage tolerance test articles should be fabricated and assembled in accordance with production specifications and processes so that the test articles are representative of production structure.

6.2.2 The extent of initially detectable damage should be established and be consistent with the inspection techniques employed during manufacture and in service. Flaw/damage growth data should be obtained by repeated load cycling of intrinsic flaws or mechanically introduced damage. The number of cycles applied to validate a no-growth concept should be statistically significant, and may be determined by load and/or life considerations. The growth or no growth evaluation should be performed by analysis supported by test evidence, or by tests at the coupon, element or subcomponent level.

(107B 7a) Damage Tolerance Evaluation  
(2) Structural tests for damage growth (based on AMC 6.2.1)

- Keeps all text from AMC 6.2.1
- Adds AC 29-2C, MG8 text on inspection intervals for a no growth approach, established considering residual strength of assumed damage.

- Adds AC 29-2C, MG8 text on slow growth and arrested growth options, including conditions when they are allowed (stable and predictable)
- Adds text and figures for purposes of clarification (e.g., growth options)
- Figures from 7a. (2)

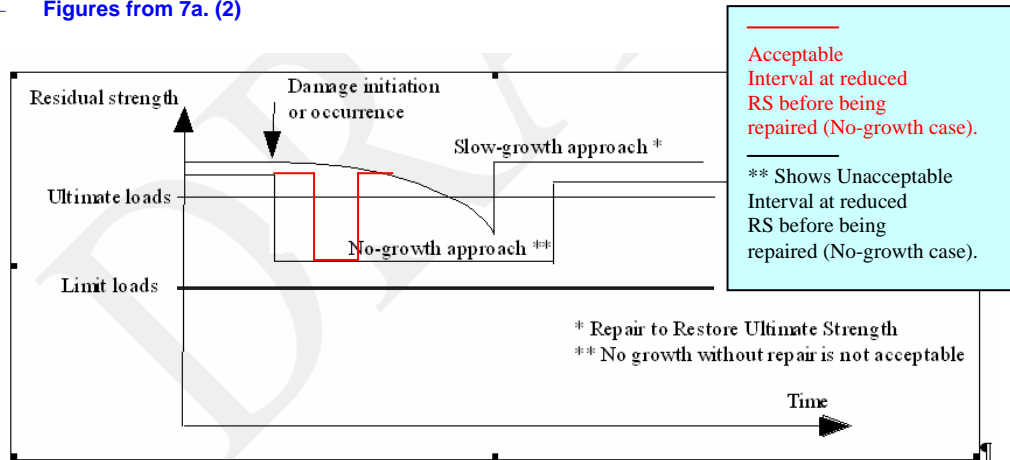


Figure C: Schematic diagram of residual strength versus time illustrating an undesirable state of significant accidental damage that is left in the structure without repair for too long of time.

- Figures from 7a. (2)

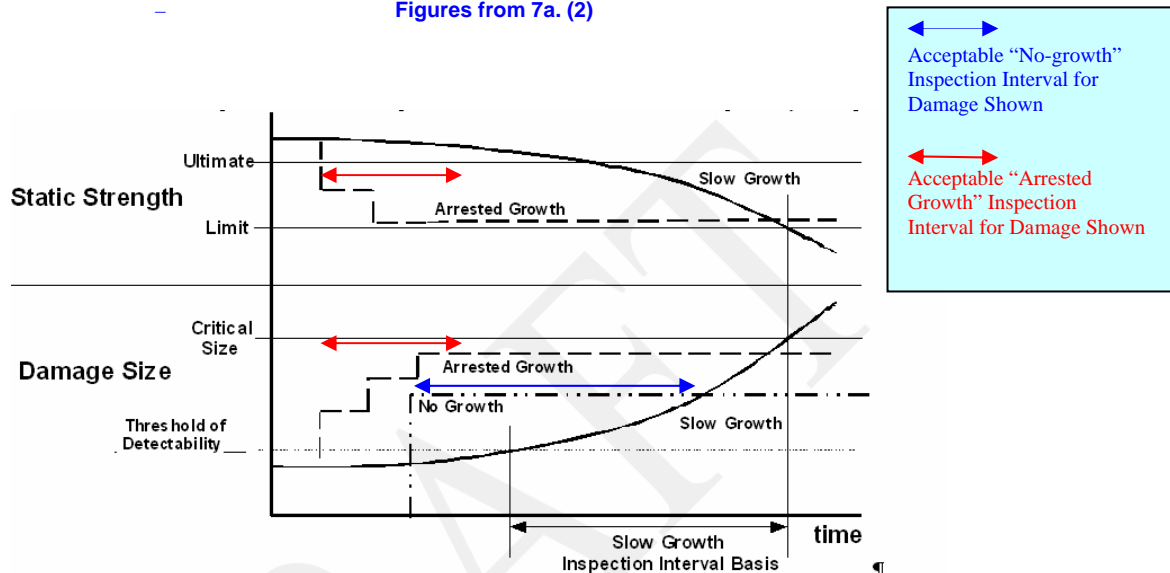


Figure D: Illustrations of residual strength and damage size relationships for three different approaches to composite structural damage tolerance substantiation.

(107B 7a) **Damage Tolerance Evaluation**

**(3) Extent of initially detectable damage (based on AC 20-107A, 7a. (2))**

- Keeps all text from AC 20-107A, 7a (2)
- Added text on the threshold between Category 1 and 2 damage (i.e., inspection methods used by trained inspectors in scheduled maintenance)
- Added text that obvious (Category 3) damage should be detectable by untrained personnel in shorter time intervals

6.2.3 The extent of damage for residual strength assessments should be established. Residual strength evaluation by component or subcomponent testing or by analysis supported by test evidence should be performed considering that damage. The evaluation should demonstrate that the residual strength of the structure is equal to or greater than the strength required for the specified design loads (considered as ultimate). It should be shown that stiffness properties have not changed beyond acceptable levels. For the no growth concept, residual strength testing should be performed after repeated load cycling.

(107B 7a) **Damage Tolerance Evaluation**  
**(4) Extent of damage/residual strength (based on AMC 6.2.3)**

- Keeps all text from AMC 6.2.3
- Adds words referencing the residual strength requirements for the first four categories of damage
- Adds words on environmental effects and statistical significance
- References special residual strength considerations for bonded joints (107B 5c)
- Covers large damage capability of Category 2 & 3, depending on location
- Promotes same level of fail-safe assurance as metal structure (B-basis link)

(107B 7a) **Damage Tolerance Evaluation**  
**(5) Repeated load testing (new subsection)**

- Added general text on spectrum load development and truncation of low loads when shown not to contribute (based on AC 29-2C, MG8)
- Added text to cover variability through load enhancement or life scatter factors (based on AC 29-2C, MG8)
- Added text on a need for building block test data to justify load enhancement or life scatter factors used to demonstrate reliability in component tests

6.2.4 An inspection programme should be developed consisting of frequency, extent, and methods of inspection for inclusion in the maintenance plan. Inspection intervals should be established such that the damage will be detected between the time it initially becomes detectable and the time at which the extent of damage reaches the limits for required residual strength capability. For the case of no growth design concept, inspection intervals should be established as part of the maintenance programme. In selecting such intervals the residual strength level associated with the assumed damage should be considered.

(107B 7a) **Damage Tolerance Evaluation**  
**(6) Inspection program (based on AMC 6.2.4)**

- Keeps all text from AMC 6.2.4
- Adds text to refer back to Figure D as related to unacceptable time intervals for detecting larger no-growth and arrested growth damage sizes
- Discusses difference in inspection intervals for category 2 & 3 damage types
- Discusses a need for expanded inspection of Category 4 and 5 damage types

6.2.5 The structure should be able to withstand static loads (considered as ultimate loads) which are reasonably expected during the completion of the flight on which damage resulting from obvious discrete sources occur (i.e. uncontained engine failures, etc.). The extent of damage should be b7a. Damage Tolerance Evaluation

(107B 7a) **Damage Tolerance Evaluation**  
**(7) Discrete source damage (based on AMC 6.2.5)**

- Keeps all text from AMC 6.2.5
- Added thoughts for Category 4 damages, including those requiring specified inspections (e.g., severe in-flight hail)

6.2.6 The effects of temperature, humidity, and other environmental factors which may result in material property degradation should be addressed in the damage tolerance evaluation.

(107B 7a) **Damage Tolerance Evaluation**  
**(8) Environmental effects (based on AMC 6.2.6)**

- Keeps all text from AMC 6.2.6

- **Added text on a need for more general class of time-related aging when appropriate**
- **Added text on the use of environmental knock down factors when appropriate (based on AC 29-2C, MG8)**

6.3 *Fatigue (Safe Life) Evaluation*. Fatigue substantiation should be accomplished by component fatigue tests or by analysis supported by test evidence, accounting for the effects of the appropriate environment. The test articles should be fabricated and assembled in accordance with production specifications and processes so that the test articles are representative of production structure. Sufficient component, subcomponent, element or coupon tests should be performed to establish the fatigue scatter and the environmental effects. Component, subcomponent and/or element tests may be used to evaluate the fatigue response of structure with impact damage levels typical of those that may occur during fabrication, assembly, and in service, consistent with the inspection procedures employed. The component fatigue test may be performed with an as manufactured test article if the effects of impact damage are reliably predicted by subcomponent and/or element tests and are accounted for in the fatigue test or in analysis of the results of the fatigue test. It should be demonstrated during the fatigue tests that the stiffness properties have not changed beyond acceptable levels. Replacement lives should be established based on the test results. An appropriate inspection programme should be provided.

**(107B 7b) Fatigue Evaluation (based on AMC 6.3)**

- **Removed “(Safe-Life)” from title**
- **Keeps all text from AMC 6.3**
- **Added one sentence linking Category 1 damage to this evaluation, including the expectation that ultimate load capability will be retained for the life of the aircraft**

**(107B 7c) Combined Damage Tolerance and Fatigue Evaluation (new section)**

- **Added the general need to establish both an inspection interval and retirement time for critical composite structure (from AC 29-2C, MG8)**
- **Indicated that there will be a limit to retirement time (similar to metals)**
- **Outline expectations for increasing structural life of composite parts  
*Evidence from component repeated load testing  
Fleet leader programs (including NDI and destructive tear-down inspections)  
Appropriate statistical assessments of accidental damage & environmental data***

7 *Proof of Structure – Flutter*.

The effects of repeated loading and environmental exposure on stiffness, mass and damping properties should be considered in the verification of integrity against flutter and other aeroelastic mechanisms. These effects may be determined by analysis supported by test evidence, or by tests of the coupon, element or subcomponent level.

**Title change to include “other aeroelastic instabilities”  
(but still recognize the phenomena of flutter)**

**Kept much of the text from AMC 4.7**

**Added text to outline flutter considerations and other aeroelastic evaluations (non-composite specific)**

- **Added words to ensure adequate tolerance for quantities affecting flutter**
- **Added general words on aeroelastic evaluations that are needed**

**Added text for composite structure evaluation**

- **Add words to consider the effects of large Category 3 and 4 damage and potential mass increase for sandwich panel water ingress**
- **Emphasized that composite control surfaces may be relatively fragile and prone to accidental damage & environmental degradation**
- **Added words on concerns for a) weight & stiffness changes due to repair or multiple layers of paint and b) structures in proximity of heat sources**

- **Para. 9: Continued Airworthiness**

**New paragraph, including content from AMC 8.7 and 8.8**

**Introductory statements that repaired composite structures shall meet all other requirements covered in this AC**

**(107B 9a) Design for Maintenance (new subsection)**

- **Text on design to allow access for repair and inspection in field maintenance environment**
- **Repair documentation should recognize inspection/repair issues and training for critical damage difficult to detect, characterize and repair**
- **Document inspection intervals, life limits and levels of damage to a part that will not allow repair (requiring replacement)**

**(107B 9b) Maintenance Practices (new subsection with three parts)**

- **Opening statement taken from AMC 8.7**
- **Identifies the need for maintenance, inspection, and repair documentation because “standard Practices” are not common (using examples of jacking, disassembly, handling, and part drying methods)**
- **Three parts include: (1) Damage Detection, (2) Inspection, (3) Repair**
- **(1) Damage Detection. Describes links between damage tolerance substantiation and procedures for detecting degradation in structural integrity and protection of structure (incl. degradation in lightning protection system as related to structural integrity, fuel tank safety and electrical systems)**
- **(1) Damage Detection. Details on considerations for visual methods used in damage detection (lighting conditions, inspector eye sight standards, dent depth relaxation, and surface color, finish & cleanliness)**
- **(2) Inspection. Discusses the general difference between damage detection methods and inspection procedures used to characterize damage and perform a repair (both in-process & post-process)**
- **(2) Inspection. Describes the need for substantiation of in-process & post-process inspection procedures**
- **(2) Inspection. Describes design considerations for bonded repairs, which require same level of structural redundancy as base structure**
- **(3) Repair. Recommends reporting of service difficulties, damage and degradation for continuous updates on damage threat assessments (support updates to design criteria, analysis & test databases) and future design detail & process improvements**
- **(3) Repair. Describes need for substantiation of bonded & bolted repairs, (incl. replacement of protective surface layers and lightning strike protection)**
- **(3) Repair. Describes the need for repair records for subsequent maintenance actions**
- **(3) Repair. Outlines safety issues (bond material compatibilities, bond surface prep, cure thermal management, composite machining, special composite fasteners & installation techniques, and in-process controls)**

**(107B 7c) Substantiation of Repair, (new subsection)**

- **Opening statement taken from AMC 8.8.**
- **Outlines a need for documentation on Allowable Damage Limits (ADL) and Repairable Damage Limits (RDL)**
- **Limits on bonded repair (per redundancy considerations outlined in section 107B 5c)**

- Describes additional substantiation data needs for damage types and sizes not considered in development (as related to damage tolerance and repair)
- Comments that Category 3, 4 and 5 type damages will generally need special instructions for field repair, inspection and QC
- Warning for MRO and airlines to work with OEM for major composite repair and alteration due to significant data needs for certificated repair design and process substantiation

(107B 9d) **Damage Detection, Inspection & Repair Competency, (new subsection)**

- Ref. SAE AIR 5719 on training for awareness of safety issues in composite maintenance and repair (but notes it is not for specific "skill-building")
- Describes the need for technician, inspector and engineering training for the skills necessary for damage disposition and repair
- Describes the need to train pilots, line maintenance, and other operations personnel to be aware of anomalous ground service and flight events, which may create critical damage not covered by design or scheduled maintenance (i.e., need for immediate reporting and likely expanded inspections beyond those covered in the SRM)

8 *Additional Considerations*

(107B 10) **(Updated section that used to be AMC para 8)**

- **Text from AMC 8.4, 8.5, 8.6, 8.7, 8.8, 8.9 moved to new section 10** (also new AMC & 107B Section 5 and 9)

8.1 *Impact Dynamics*. The present approach in airframe design is to assure that occupants have every reasonable chance of escaping serious injury under realistic and survivable impact conditions. Evaluation may be by test or by analysis supported by test evidence. Test evidence includes, but is not limited to, element or subcomponent tests and service experience. Analytical comparison to conventional structure may be used where shown to be applicable.

(107B 10a) **Crashworthiness (Renamed)**

- **AMC 8.1 content in the subsection entitled "Impact Dynamics" was effectively captured in new text**
  - **New content has a basis in special conditions recently developed for composite transport fuselage crashworthiness**
  - **Recognizing differences between unique rules for each aircraft product type (more considerations for transport airplanes & rotorcraft)**
  - **Realistic and survivable crash impact conditions seeking equivalent levels of safety with comparable metal aircraft types**
  - **Allowance for an approach using analysis supported by test evidence**
  - **Four main criteria areas to contrast composite & metal aircraft structure**
  - **Occupants must be protected during crash from release of items of mass (e.g., seats, overhead bins)**
  - **Emergency egress paths must remain following a crash**
  - **Accelerations and loads experienced by occupants during a survivable crash must not exceed critical thresholds**
  - **Survivable volume of occupant space must be retained following crash**
  - **Outlines a need for transport airplane fuel tank structural integrity for a survivable crash as related to fire safety**

- Lists special composite considerations for valid tests and analyses.
- A need to consider analysis and test sensitivity to modeling parameters and realistic physical/mechanical and other design factors that can be expected to affect structural performance
- Likely benefits from validated analyses in meeting performance expectations (considerations for multiple scenarios, e.g., different impact velocities and crash angles)

8.2 *Flammability.* (See appropriate CS requirements in Table 1 of this AMC.)

(107B 10b) **Fire Protection, Flammability and Thermal Issues (Renamed)**

- AC 20-107A content under (1) in the subsection entitled “Flammability” was effectively captured in new text (Note: no content in current AMC. Note requirements not fully harmonized, e.g. CS 25 does not have equivalent to FAR 25.856 etc. Text will be reviewed by appropriate EASA specialists)
- Obsolete info in AC 20-107A (2) was removed [and a footnote was added to indicate AC 20-109B/AMC 20-29 does not cover rules and guidance materials for aircraft interiors and baggage compartments]
- Background on traditional flammability safety concerns (firewalls, engine mounts and other powerplant structures), with discussion of new issues for expanded use of composites in wing and fuselage transport structures
- In-flight cabin fire protection and the role of composite airframe structure
- Exterior fire protection after crash landings: fuel-fed fire exposures for fuselage and wing structures (time for passenger egress & fuel tank fire safety issues)
- Likely need for special conditions to outline expectations
- In-flight fire protection: use of composite structures should not add to in-flight fire hazards (release of toxic gas, fire progression) vs. existing metal structures
- Post-crash fire protection: exterior fuel-fed fire exposure should allow the same level of safe passenger egress (toxic gas, burn-through) as existing metal structure
- New content on thermal issues for composite structure exposed to high temperatures
- List of potential sources of high temperature (failed systems, engine and interior fires)
- Description of irreversible heat damage as related to thresholds in composite material properties (glass transition temperatures)
- Need for special inspections, tests and analyses to determine the airworthiness of structures exposed to high temperatures (inspection data defining damage metrics for disposition)

8.3 *Lightning Protection.* (See appropriate CS requirements in Table 1 of this AMC.)

(107B 10c) **Lightning Protection.**

- AC 20-107A content in the subsection by the same name was effectively captured in new text [(1) appears in various subsections of 107B 10c. and (2) was captured in 9b (1)] (Note: no content in current AMC. Requirements and interpretation not fully harmonized, Text will be reviewed by appropriate EASA specialists)
- Opening Paragraph outlining issues related to composite structures
- Substantiation by tests (industry standards)
- Dependent on lightning protection zone designated for specific parts of aircraft

- Evaluation of repairs to lightning protection system
- References to other AC, policy, FAA Handbook (which references other technical guidance and industry standards)
- (1) **Lightning Protection for Structural Integrity.**
- Describes technical issues and typical design features needed (mesh, wires, electrical bonding)
- Limit structural damage in lightning tests to Category 1 or 2
- References to other AC and policy (which references other technical guidance and industry standards)
- **Lightning Protection for Fuel Systems.**
- Eliminate structural penetration, arcing, sparks or other ignition sources
- Transport airplane regulations ( 25.981)
- List of typical design features needed (mesh, joints, fasteners and support to fuel system plumbing)
- References to other AC and policy (which reference other technical guidance and industry standards)
- **Lightning Protection for Electrical and Electronic Systems.**
- Physical description of the issues
- List of typical design features needed (mesh, foil & electrical bonding)
- References to AC (which references other technical guidance and industry standards)

**10 d. Health Monitoring Systems (originally included as new section but dropped due to lack of experience for suitable guidance)**

8.4 *Protection of Structure.* Weathering, abrasion, erosion, ultraviolet radiation, and chemical environment (glycol, hydraulic fluid, fuel, cleaning agents, etc.) may cause deterioration in a composite structure. Suitable protection against and/or consideration of degradation in material properties should be provided for and demonstrated by test.

8.5 *Quality Control.* An overall plan should be established and should involve all relevant disciplines (i.e. engineering, manufacturing and quality control). This quality control plan should be responsive to special engineering requirements that arise in individual parts or areas as a result of potential failure modes, damage tolerance and flaw growth requirements, loadings, inspectability, and local sensitivities to manufacture and assembly.

8.6 *Production Specifications.* Specifications covering material, material processing, and fabrication procedures should be developed to ensure a basis for fabricating reproducible and reliable structure. The discrepancies permitted by the specifications should be substantiated by analysis supported by test evidence, or tests at the coupon, element or subcomponent level.

8.7 *Inspection and Maintenance.* Maintenance manuals developed by manufacturers should include appropriate inspection, maintenance and repair procedures for composite structures.

8.8 *Substantiation of Repair.* When repair procedures are provided in maintenance documentation, it should be demonstrated by analysis and/or test, that methods and techniques of repair will restore the structure to an airworthy condition.

9 *Change of composite material* (See also AMC No. 2 to CS 25.603)

**Delete section - addressed within new AMC 20-29 text and Appendix 3**

2 For composite structures a change of material is defined as any of the following situations (even though the structural design remains unchanged).

- a. Any change in the basic constituents.
- b. The same basic constituents but any change of the impregnation method.
- c. The same material, but modification of the processing route.

9.2 For any material change the showing of compliance with CS 25.603 should cover AMC paragraphs

9.2.1 to 9.2.5 in detail.

9.2.1 The nature and extent of the material change should be clearly defined.

9.2.2 Substantiation should be based on a comparability study between the structural performances of the material accepted for type certification and the replacement material. An acceptable approach would be to select from the original substantiating testing those tests that are to be repeated and to justify the omission of others. The extent of testing required will depend on the airworthiness significance of the part and the nature of the material change.

9.2.3 Pass/fail targets should be established as part of the test programme. Any properties that show a significant change in the replacement material should be given special consideration.

9.2.4 The test substantiation selected should interrogate the critical failure modes of the component.

9.2.5 Design allowables should be established to the same level of statistical confidence for the replacement material.

**Appendix 1:**

TABLE 1

- **CS 23, 25, 27, and 29 to be captured in a single table**
- **Amend for differences, e.g. flammability, lightning etc**

AMC Paragraphs and related CS texts	
AMC Paragraphs	CS-25 Paragraphs

1 Purpose	No relevant CS paragraph
2 Definitions	No relevant CS paragraph
3 General	No relevant CS paragraph
4 Material and Fabrication Development	25.603 25.605 25.613 25.619
5 Proof of Structure – Static	25.305 25.307(a)
6 Proof of Structure – Fatigue/Damage Tolerance	25.571
7 Proof of Structure – Flutter	25.629
8 Additional Considerations	
8.1 Impact Dynamics	25.561 25.601 25.721 25.783(c) and (g) 25.785 25.787(a) and (b) 25.789 25.801 25.809 25.963(d) and (e)

TABLE 1 (continued)

AMC Paragraphs	CS–25 Paragraphs
8.2 <span style="color: red;">Flammability</span>	<span style="color: red;">25.609(a)</span> <span style="color: red;">25.853</span> <span style="color: red;">25.855</span> <span style="color: red;">25.859</span> <span style="color: red;">25.863</span> <span style="color: red;">25.865</span> <span style="color: red;">25.867</span> <span style="color: red;">25.903(c)(2)</span> <span style="color: red;">25.967(e)</span> <span style="color: red;">25.1121(c)</span> <span style="color: red;">25.1181</span> <span style="color: red;">25.1182</span> <span style="color: red;">25.1183</span> <span style="color: red;">25.1185</span> <span style="color: red;">25.1189(a)(2)</span> <span style="color: red;">25.1191</span> <span style="color: red;">25.1193(c), (d) and (e)</span>

8.3	Lightning Protection	25.581 (see AMC 25.899 Paragraph 6)
8.4		25.609
8.5		25.899 (see AMC 25.899 Paragraph 6)
8.6		25.954 (see AMC 25.899 Paragraph 6)
	Protection Structure	25.609 25.1529
	Quality Control	**
	Production Specifications	25.603 25.605

\*\*Guidance material on quality control for composites is under consideration.

### 1. Applicable Regulations

- "A list of applicable regulations is provided for subjects covered in this AMC. In most cases, these regulations apply regardless of the type of materials used in aircraft structures."
- Footnotes
  - Disclaimer (1): "This list may not be all inclusive and there may be differences between certification agencies."
  - Disclaimer (2): "Special conditions may be issued for novel and unusual design features (e.g., new composite materials systems)."

### 2. Guidance

- Brief description of purpose of AMC as guidance
- "The guidance listed below is deemed supportive of this AMC" (reference list will be reviewed by appropriate EASA specialists)

## Appendix 3:

### AMC No. 2 to CS 25.603 Change of composite material

#### - becomes Appendix 3

1 PURPOSE This Acceptable Means of Compliance (AMC) provides guidance for the recertification of composite structures that, in production, use a different material from that proposed and substantiated at the time of certification of the original structure. Like all advisory material, this document is not, in itself, mandatory and does not constitute a regulation. It is issued to provide guidance and to outline an acceptable method of showing compliance with CS 25.603.

2 SCOPE The AMC only addresses already certificated composite structures where there is no change to the design and use other than the material change. Components that have a change in geometry or design loading may need to be addressed in a different way.

3 BACKGROUND The showing of compliance of a new material with CS 25.603, as an alternative to the previously selected material, should normally involve the following steps:

- identify the key material parameters governing performances,
- define the appropriate tests able to measure these parameters,
- define pass/fail criteria for these tests.

The problem with composites is much more complex than with metallic materials, because their performance is much more process dependant. So, until we are capable of accurately identifying the key material parameters governing processability, there will be a need for tests directly interrogating material performance through specimens representative of the actual design details of the composite structure

Today, showing the suitability of a composite material for its anticipated use, requires a large amount of test data ranging from the coupon level to specimens representative of the most complex features of the structure design. The time needed to perform all these tests and the associated costs are the reasons why, in most cases, only one material can be proposed for type certification.

Such diversity of testing is required with composites because these materials develop their mechanical properties only when the component is processed (or at least, the resin cured) i.e. that the design of the structure and the associated production processes govern these properties.

To give a more technical interpretation of this specific character of composites, it is necessary to go back to the general principles for dimensioning a structure. Theoretically the strength of a structure could be calculated with analytical models capable, from the knowledge of relevant material properties, of anticipating the mechanical behaviour of complex design details. Unfortunately with composites these analytical models are still insufficiently precise at the level of failure prediction and require a step by step testing verification with more and more complex specimens (the 'pyramid' approach).

Moreover, as the design and the associated manufacturing process can affect the eventual properties, the failure modes along with composite failure prediction models can vary from one material to another. Consequently, they both need to be examined for any material change.

'In house' composite material 'qualification' procedures developed by every manufacturer involve specifications covering:

- physical plus, in some cases, chemical properties,
- mechanical properties measured at the coupon level,
- reproducibility (checked by testing several batches).

But interchangeability for a structural application is not guaranteed between two materials meeting the same manufacture specification (as it could be for materials that are much less process dependant, metallic materials for instance). Under these circumstances, a material that meets the 'qualification' required by a specification does not necessarily produce satisfactory components.

#### 4 DEFINITION OF MATERIAL CHANGE

There is a material change in any of the following situations:

A A change in one or both of the basic constituents

- resin,
- fibre (including sizing or surface treatment alone).

B Same basic constituents but any change of the impregnation method

- prepregging process (e.g. solvent bath to hot melt coating),
- tow size (3k, 6k, 12k) with the same fibre areal weight,
- prepregging machine at the same suppliers,
- supplier change for a same material (licensed supplier), etc.
- curing cycle,

C Same material but modification of the processing route (if the modification to the processing route governs eventual composite mechanical properties):

- tooling,
- lay-up method,
- environmental parameters of the laying room.

A classification is to be made between a new material which is intended to be a replica of the former one (cases 'B' or 'C') and a 'truly new material' (case 'A'). So, two classes are proposed:

- 'Identical materials' in case of a replica.
- 'Alternative materials' for truly new materials.

Within the 'identical materials' class, a sub-classification can be made between a change of the prepregging machine alone at the supplier and licensed production elsewhere. For the time being, a change to a new fibre produced under a licensed process and reputed to be a replica of the former one, will be dealt with as an 'alternative material'.

Some changes within this class may not interact with structural performances (e.g. prepreg release papers, some bagging materials etc..) and should not be submitted to an agency approval. However the manufacturers (or the supplier) should develop a proper system for screening those changes, with adequate proficiency at all relevant decision levels.

Case 'A' (alternative material) should always be considered as an important change. It is not recommended to try a sub classification according to the basic constituents being changed, as material behaviour (e.g. sensitivity to stress concentrations) may be governed by interfacial properties which may be affected either by a fibre or a resin change.

## 5 SUBSTANTIATION METHOD

Only the technical aspects of substantiation are addressed here.

### a. Compliance philosophy

Substantiation should be based on a comparability study between the structural performances of the material accepted for type certification, and the second material. Whatever the modification proposed for a certificated item, the revised margins of safety should remain adequate. Any reduction in the previously demonstrated margin should be investigated in detail. Identical material (case 'B' and 'C'):

- allowables and design values, whatever the level of investigation; material or design, should remain valid,
- calculation models – including failure prediction should remain the same,
- the technical content of the procurement specification (case 'B') should not be changed.

Alternative material (case 'A'):

- new allowables and design values for all relevant properties should be determined,
- analytical models, including failure prediction models, should be reviewed and, if necessary, substantiated by tests,
- the procurement specification should be evaluated (or a new specification suited to the selected material should be defined) to ensure control quality variations are adequately controlled,

– example changing from 1st to 2nd generation of carbon fibres may improve tensile strength properties by more than 20%: so keeping the same acceptability threshold in the process specification would not allow the detection of quality variations.

### b. Tests to be performed

The pyramid of tests (building block approach) illustrated in Figure 1 is a consistent way to prepare and present structural substantiation for approval. Each stage of this pyramid refers to an investigation level in terms of specimen category (coupon, element, detail, subcomponent and component) as they are defined in the AMC No. 1 to CS 25.603. Coupons and elements are generic specimens which form the data base and can be common to several pyramids. The non-generic specimens (detail, subcomponent, component) are specific to each composite item.

Under these circumstances substantiation to be provided for a changed material cannot be independent from the structural item concerned and a universal list of tests cannot be established. The approach would then consist in selecting, within each pyramid, those tests that are to be duplicated with the second material for the component under examination and the justification of the omission of others.

As a first approach, the investigation level might be restricted to the generic specimens for an identical material, but for an alternative material non generic ones should be included.

Typically, substantiation should always cover the inherent structural behaviour of composites. The test programme should be established considering the material change proposed and the airworthiness significance of the part. An example list of tests is given in Table 1.

This table applies also for a change in the process route Case C. In some instances (e.g. a cure cycle change) possible consequences can be assessed by tests on generic specimens only. For other changes like those involving tooling (e.g. from a full bag process to thermo expansive cores) the assessment should include an evaluation of the component itself (sometimes called the 'tool proof test'). In this case, an expanded non destructive inspection procedure should be required for the first items to be produced. This should be supplemented – if deemed necessary – by 'cut up' specimens from a representative component, for physical or mechanical investigations.

c. *Number of batches*

The purpose for testing a number of batches is the demonstration of an acceptable reproducibility of material characteristics. The number of batches required should take into account:

- material classification (identical or alternative)
- the investigation level (non-generic or generic specimen)
- the source of supply,
- the property under investigation.

d. *Pass/Fail Criteria*

Target pass/fail criteria should be established as part of the test programme. As regards strength considerations for instance, a statistical analysis of test data should demonstrate that new allowables derived for the second material provide an adequate margin of safety. Therefore, provision should be made for a sufficient number of test specimens to allow for such analysis. At the non generic level, when only one test article is used to assess a structural feature, the pass criteria should be a result acceptable with respect to design ultimate loads. In the cases where test results show lower margins certification documentation will need to be revised.

e. *Other considerations*

For characteristics other than strength (all those listed in AMC No. 1 to CS 25.603, paragraphs 7 and 8) the substantiation should also ensure an equivalent level of safety.

- **Started with EASA AMC No. 2 to 25.603**
  - **Generally reduced size to account for thoughts already captured in previous parts of AC 20-107B/AMC 20-29**
- **Title changed to “Change of Composite Material and/or Process”**
- **Updated the appendix purpose:**
  - **“This appendix covers material and/or process changes, but does not address other changes to design (e.g., geometry, loading).”**
- **Highlights the need for testing at multiple building block scales**
- **Provides an update to three classes of material or process change, including examples.**
- **Added links to previous sections of AC 20-107B/AMC 20-29 and references**
- **Plans to remove table & figure from EASA AMC No. 2 to 25.603 (now have adequate references CMH-17, AGATE documents etc)**

**AMC 25.603(b)**

**Approved Material Specifications**

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

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# CS 25

## Rule:

Amend title CS 25.603:

**CS 25.603 Materials (For Composite Materials see AMC No.1 and No.2 to 25.603)**

to read

**CS 25.603 Materials (For Composite Materials see [AMC 20-29](#))**

## AMC:

Amend titles

**AMC No.1 to CS 25.603 Composite Aircraft Structure**

**AMC No.2 to CS 25.603 Composite Aircraft Structure**

to read

**AMC No.1 and No.2 to CS 25.603: Superseded by AMC 20-29**

Delete content of AMC No.1 and No.2 to CS 25.603:



# CS23



## Rule:

Amend title CS 23.603:

**CS 23.603 Materials and workmanship**

(See AMC 23.603)

to read

**CS 23.603 Materials and workmanship (For Composite Materials see [AMC 20-29](#))**

## AMC:

Amend title **AMC 23.603 Material and workmanship Composite Aeroplane Structure (Acceptable Means of Compliance)**

to read

**AMC 23.603 Material and workmanship Composite Aeroplane Structure (For Composite Materials see [AMC 20-29](#)):**

Delete content of AMC 23.603 Material and workmanship Composite Aeroplane Structure (Acceptable Means of Compliance)

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# CS 29

## Rule:

Amend title:

**CS 29.603 Materials**

to read

**CS 29.603 Materials** (For Composite Materials see **AMC 29.603** and **AMC 20-29**)

## AMC:

- **Harmonised AC 29-2C will require minor revision**
- **MIL-23 to be replaced by new CMH-17 Vol. 6 (TBC in timescale):**

Amend title and content to read:

AC 29.603. § 29.603 (Amendment 29-17) MATERIALS. (also see **AMC 20-29**)

a. Explanation. The rule requires that the suitability and durability of materials, the failure of which could adversely affect safety, must be determined by three-fold considerations:

- (1) Considerations based on experience or tests.
- (2) Meeting approved specifications.

- (3) Taking into account environmental conditions such as temperature and humidity.

b. Procedures.

(1) Experience may be used to show a material's resistance to wear and deterioration from environmental effects (environmental effects include both natural environmental effects such as exposure to sunlight, water, salt spray, etc., and installation environmental effects such as exposure to fuel, hydraulic fluids, deicing fluids, etc.). Installation environmental effects should consider both direct exposure contact and expected migration of potentially deleterious fluids and compounds. Testing for environmental effects may use either coupon testing, full-scale testing, or a combination. A combination of testing and experience may also be used.

(i) MIL-HDBK's -5, -17, and -23 include consideration of some environmental effects and contain reference to additional methods of testing for environmental effects.

(ii) The use of **AC 20-107A**, Composite Aircraft Structure, is recommended for environmental and damage tolerance considerations of advanced composite materials. (Also see paragraph AC 29 MG 8.)

(iii) The effects of excessive wear and delamination of elastomeric and self-lubricated bearings used in critical load carrying applications in relation to redistribution of loading should be considered.

(2) Where possible, materials that meet widely accepted specifications such as AISI, SAE, MIL, or AMS and alloys which have favorable experience or tests should be used. Where company-developed materials are used, approved specifications are required to ensure the developed properties are duplicated in each lot of material. Raw material quality control is defined in FAA Order N8020-11 which is scheduled to be integrated into a forthcoming advisory circular. Documented specification usage is necessary to maintain quality assurance of materials.

(3) Section 29.613 concerns strength properties and design values. (See paragraph AC 29.613.)

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# CS 27

## Rule:

Amend title:

**CS 27.603 Materials**

to read

**CS 27.603 Materials** *(For Composite Materials see AMC 27.603 and AMC 20-29)*

## AMC:

- **Harmonised AC 27-2B will require minor revision**
- **MIL-23 to be replaced by new CMH-17 Vol. 6 (TBC in timescale):**

Amend title and content to read:

AC 27.603. § 27.603 (Amendment 27-16) MATERIALS. *(also see AMC 20-29)*

a. Explanation. The rule requires that the suitability and durability of materials, the failure of which could adversely affect safety, must be determined by three-fold considerations:

- (1) Considerations based on experience or tests.
- (2) By meeting approved specifications.
- (3) By taking into account environmental conditions such as temperature and humidity.

b. Procedures.

(1) Where possible, materials that meet widely accepted specifications such as AISI, SAE, MIL, or AMS and alloys which have favorable experience or tests should be used. Where company-developed materials are used, approved specifications are required to ensure the developed properties are duplicated in each lot of material.

(2) Environmental conditions may be taken into account by service experience, coupon testing, full-scale testing, or a combination of testing and experience. MIL-HDBK's -5, -17, and -23 include consideration of some environmental effects and contain reference to additional methods of testing for environmental effects.

(3) Section 27.613 concerns strength properties and design values. (See paragraph AC 27.613.)