



European Union Aviation Safety Agency

Comment-Response Document (CRD) 2020-11

RELATED NPA: 2020-11 & ED DECISION: 2021/015/R — RMT.0673
6.12.2021

Table of contents

1. Summary of the outcome of the consultation	2
2. Individual comments and responses	4



1. Summary of the outcome of the consultation

During the consultation of Notice of Proposed Amendment (NPA) 2020-11 via the Comment-Response Tool (CRT), 44 unique comments were submitted on 10 segments by 15 different users.

The following organisations commented:

- *Aerei da Trasporto Regionale* or *Avions de transport regional* (ATR)¹,
- Airbus (including Airbus Canada (CA) & Airbus Defence and Space (DS)),
- Boeing,
- Civil Aviation Authority (CAA) Finland,
- Direction générale de l’aviation civile (DGAC)² France,
- Federal Aviation Administration (FAA),
- General Aviation Manufacturers Association (GAMA),
- Luftfahrt Bundesamt (LBA)³,
- Mitsubishi Aircraft Corporation,
- Safran Nacelles,
- Swedish Transport Agency (Transportstyrelsen), and
- CAA United Kingdom (UK).

The comments were distributed among the segments as follows:

Segment	Page	Description	Number of comments
0	N/a	(General Comments)	7
1	4-9	2. In summary—why and what	2
2	12	3. Proposed amendments — AMC 25.603	5
3	12-13	3. Proposed amendments — AMC 25.603(b)	5
4	13	3. Proposed amendments — CS 25.605	2
5	13	3. Proposed amendments — AMC 25.605(a)	4
6	13-14	3. Proposed amendments — AMC 25.605(b)	6
7	14	3. Proposed amendments — AMC 25.613	5
8	15	3. Proposed amendments — AMC 25.775(d)	7
9	16	3. Proposed amendments — AMC 25.1541	1

The majority of the comments (28 out of 44) were received on Item 3 ‘Fabrication methods’.

¹ ‘Regional Transport Airplanes’ in English.

² ‘Directorate General for Civil Aviation’ or ‘Civil Aviation Authority’ in English.

³ ‘Federal Aviation Office’ or ‘National Civil Aviation Authority’ (of Germany) in English.

8 comments were addressed to Item 4 'Windshield — Failure conditions with structural effects', and 1 comment was made on Item 2 'Turbo-propeller vibrations'.

The remainder of the comments were either neutral or supportive.

Overall, the commenters requested to clarify or improve the proposed changes and, on Item 3, to adjust some dedicated terminologies.



2. Individual comments and responses

In responding to the comments, the following terminology is applied to attest EASA's position:

- (a) **Accepted** — EASA agrees with the comment and any proposed change is incorporated into the text.
- (b) **Partially accepted** — EASA either partially agrees with the comment or agrees with it but the proposed change is partially incorporated into the text.
- (c) **Noted** — EASA acknowledges the comment, but no change to the text is considered necessary.
- (d) **Not accepted** — EASA does not agree with the comment or proposed change.

(General Comments)	-
---------------------------	---

comment	1	comment by: <i>LBA</i>
	LBA: The LBA has no comments	
response	Noted	

comment	2	comment by: <i>DGAC France</i>
	Please note that DGAC France has no specific comments on this NPA.	
response	Noted	

comment	9	comment by: <i>Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)</i>
	Thank you for the opportunity to comment on NPA 2020-11, Regular update of CS-25. Please be advised that there are no comments from the Swedish Transport Agency.	
response	Noted	

comment	15	comment by: <i>Boeing</i>
	February 24, 2021 B-H020-REG-21-MT-06	



Note to file:

The attached comprise comments from The Boeing Company submitted to EASA via the Comment Response Tool (CRT) in response to EASA Notice of Proposed Amendment (NPA) 2020-11, Regular Update of CS-25.

Sincerely,

Mildred Troegeler

Director, Global Regulatory Strategy

The Boeing Company Comments to EASA NPA 2020-11

Regular Update of CS-25: Item 3 – Fabrication Methods

COMMENT # 1 of 10			
Type of comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 12 AMC 25.603 Paragraph: 1		
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u></p> <p>Therefore, the selection of the appropriate experience and/or tests, and the necessary material and material process specifications, considered necessary to comply with CS 25.603, requires careful consideration in order to be representative of stable material and process combinations as appropriate for the design data to be used for any particular product.</p> <p><u>REQUESTED CHANGE:</u></p> <p>Therefore, the selection of the appropriate experience and/or tests, and the necessary material and material process specifications, considered necessary to comply with CS 25.603, requires careful consideration of controls on material and material processing in order to be representative of stable material and process combinations as appropriate for the design data to be used for any particular product.</p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>The phrase requested to be deleted, "in order to be representative of stable material and process combinations", is neither clear nor easily defined. The requested addition of the text "of controls on material and material processing" is more</p>		



	direct and clear and keeps the focus on controls appropriate for the design data.		
COMMENT # 2 of 10			
Type of comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 12 AMC 25.603 Paragraph: 2		
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u></p> <p>Note: When the material strength and other properties used in design data are defined by manufacturing and assembly processes and not directly by the constituent material and/or material processes, demonstration of representative stable material and material process control continues to provide important support for the development of the final design data.</p> <p><u>REQUESTED CHANGE:</u></p> <p>Note: When the material strength and other properties used in design data are defined by manufacturing and assembly processes and not directly by the constituent material and/or material processes, demonstration of representative stable material and material process control continues to provide important support for the development of the final design data.</p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>The phrase requested to be deleted, "representative stable", is neither clear nor easily defined. By deleting this text, the focus correctly remains on "material and material process control".</p>		
COMMENT #3 of 10			
Type of comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 12 AMC 25.603(b) Paragraph: 1		



<p>What is your concern and what do you want changed in this paragraph?</p>	<p><u>THE PROPOSED TEXT STATES:</u></p> <p>The approved material and material process specifications should be representative of the application, defining stable materials and processes, including the specifications necessary to support the management of raw materials/feedstock/unfinished materials as appropriate to the technology (e.g. the feedstock powder used in additive manufacturing, or pre-impregnated composites).</p> <p><u>REQUESTED CHANGE:</u></p> <p>The approved material and material process specifications should be representative of suitable for the application, defining material and material process control stable materials and processes, including the specifications requirements necessary to support the management of raw materials/feedstock/unfinished materials as appropriate to the technology (e.g. the feedstock powder used in additive manufacturing, or pre-impregnated composites).</p>		
<p>Why is your suggested change justified?</p>	<p><u>JUSTIFICATION:</u></p> <p>The phrase requested to be deleted, "stable materials and processes", is neither clear nor easily defined. The requested addition of the text "material and material process control" is more direct and clear and keeps the focus on controls appropriate for the design data.</p> <p>Replacing “representative of” with “suitable for” clarifies that the specifications should be suitable for the application. A given specification may be used for multiple applications and a determination of “suitable” is more appropriate than “representative of” the application. The replacement of “specifications” with “requirements” is appropriate because the material specifications have requirements for the management of raw materials. A material specification may have the requirements listed or they may reference a supporting specification. Using the word “requirements” is clearer.</p>		
<p>COMMENT #4 of 10</p>			
<p>Type of comment (check one)</p>	<p>Non-Concur</p>	<p>Substantive X</p>	<p>Editorial</p>



<p>Affected paragraph and page number</p>	<p>Page: 13 AMC25.603(b) Paragraph: 1</p>		
<p>What is your concern and what do you want changed in this paragraph?</p>	<p><u>THE PROPOSED TEXT STATES:</u> These specifications should identify all the acceptable types of production defects and in-service repair process defects (including size limitations) which could prevent repeated production and safe operation of a product throughout its operational lifetime.</p> <p><u>REQUESTED CHANGE:</u> These specifications should identify all the acceptable types and limits of material and process characteristics defects and in-service repair process defects (including size limitations) which are required to maintain could prevent repeated production and safe operation of a product throughout its operational lifetime.</p>		
<p>Why is your suggested change justified?</p>	<p><u>JUSTIFICATION:</u> The deleted term "defect" contradicts with a characteristic allowed by the specification. The added text "production process and product characteristics" more directly defines what the specification must control to maintain repeated production and safe operation.</p>		
<p>COMMENT #5 of 10</p>			
<p>Type of comment (check one)</p>	<p>Non-Concur</p>	<p>Substantive X</p>	<p>Editorial</p>
<p>Affected paragraph and page number</p>	<p>Page: 13 AMC 25.603(b) Paragraph: 2</p>		
<p>What is your concern and what do you want changed in this paragraph?</p>	<p><u>THE PROPOSED TEXT STATES:</u> The potential for anisotropy and competing damage modes (taking into account the effects of the environment) should be considered when defining the specifications.</p> <p><u>REQUESTED CHANGE:</u></p>		



	Remove entirely consistent with comment #8 on AMC 25.605(b)		
Why is your suggested change justified?	<p>JUSTIFICATION:</p> <p>The proposed text suggests that applicants must demonstrate this regardless of history with similar existing materials or processes. Given the multiple inclusions in the concurrent AMC (such as 25.613) improvements instructing applicants to consider potential anisotropic, competing damage modes and environmental effects, this is redundant and prescriptive.</p>		
COMMENT #6 of 10			
Type of comment (check one)	Non-Concur	Substantiven X	Editorial
Affected paragraph and page number	Page: 13 CS 25.605(a) Paragraph: 1		
What is your concern and what do you want changed in this paragraph?	<p>THE PROPOSED TEXT STATES:</p> <p>(a) The methods of fabrication used (i.e. the manufacturing and assembly methods, including consideration of the material and material processes) must produce the strength and other properties necessary to ensure a consistently safe product...</p> <p>REQUESTED CHANGE:</p> <p>(a) The methods of fabrication used (i.e. the manufacturing and assembly methods, including consideration of the material and material processes) must produce the strength and other properties necessary to ensure a consistently safe product sound structure.</p>		
Why is your suggested change justified?	<p>JUSTIFICATION:</p> <p>CS 25.605 has historically been considered to be primarily a structural regulation. Changing the regulation text from “consistently sound structure” to “consistently safe product” combined with the addition of “and other properties” appears to broaden the scope of the regulation well beyond the expertise and authority of a Structural E-UM or DER. If that is not the intent of the rule change, then it is proposed to either keep the words “consistently sound structure” or clarify that</p>		



	the fabrication methods must produce “the strength and other structural properties necessary to produce a consistently safe product.”		
COMMENT #7 of 10			
Type of comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 13 CS25.605(a) Paragraph: 1		
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u> representative and stable approved fabrication process specifications</p> <p><u>REQUESTED CHANGE:</u> <i>representative and stable approved fabrication process specifications with controls appropriate for the design data</i></p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u> The phrase requested to be deleted, "and stable", is neither clear nor easily defined. The requested addition of the text "with controls appropriate for the design data" is more direct and clear and keeps the focus on controls appropriate for the design data.</p>		
COMMENT #8 of 10			
Type of comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page:13 AMC25.605(b) Paragraph: 1		
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u> The strength and other properties resulting from each new fabrication method (which may result from a change of material, material or fabrication process, see also CS 25.603) should initially be assumed to be anisotropic and to be affected</p>		



	<p>by the environment, unless the applicant can demonstrate different characteristics.</p> <p><u>REQUESTED CHANGE:</u></p> <p><i>Remove entirely</i></p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>This paragraph suggests that applicants must demonstrate this regardless of history with the similar existing materials or processes. Given the multiple inclusions in the concurrent AMC (such as 25.613) improvements instructing applicants to consider potential anisotropic and environmental effects, this is redundant.</p>		
COMMENT #9 of 10			
Type of comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	<p>Page: 14 AMC 25.605(b)</p> <p>Paragraph: 1</p>		
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u></p> <p>“The sensitivity of the strength and other properties of the structure to these parameters, including the effect of defects, should be evaluated to ensure that the resulting fabrication process can deliver a consistently safe structure.”</p> <p><u>REQUESTED CHANGE:</u></p> <p>“The sensitivity of the strength and other properties of the structure to these parameters, including the effect of defects, should be evaluated to ensure that the resulting fabrication process can deliver a consistently safe sound structure.”</p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>Consistent with comment #6.</p>		
COMMENT #10 of 10			



Type of Comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 14 AMC 25.605(b) New Fabrication Methods Paragraph: 2		
What is your concern and what do you want changed in this paragraph?	<p>THE PROPOSED TEXT STATES:</p> <p>All the critical inspection and/or process-controlled steps used in the fabrication method should be clearly identified and substantiated. In particular, all the inherent product features and defects resulting from the fabrication method that affect the strength and other properties require thorough characterisation and correlation with non-destructive inspection (NDI) and/or process control parameters in order to ensure that safety is maintained at the aeroplane and occupant levels. Furthermore, the equipment used to support process critical manufacturing steps (particularly for those steps that are not directly supported and controlled by inspection) should be demonstrated to be under adequate process control.</p> <p>REQUESTED CHANGE:</p> <p>The requested change is to delete this section.</p>		
Why is your suggested change justified?	<p>JUSTIFICATION:</p> <p>Existing regulation is sufficient and the proposed advisory material is not defined clearly enough to be useful.</p>		

The Boeing Company Comments to EASA NPA 2020-11

Regular Update of CS-25: Item 4 – Windshield – Failure conditions

COMMENT #1 of 3

Type of Comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 15, 'AMC 25.775(d) Windshields and Windows' Paragraph: 3		
What is your concern and what	THE PROPOSED TEXT STATES:		



do you want changed in this paragraph?	<p>Unless otherwise demonstrated by the applicant, a failure condition that leads to a structural failure of a windshield should be classified as at least hazardous.</p> <p><u>REQUESTED CHANGE:</u></p> <p>Delete this paragraph</p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>Failure conditions are already assessed and classified as part of the normal 25.1309 process</p> <p>Additionally, it is irrelevant to assign a specific hazard level to a design, as this assumes that a certain type of design will be implemented. It is conceivable that a windshield design could be implemented such that the structural failure of a single windshield would not result in a rapid decompression.</p>		
COMMENT #2 of 3			
Type of Comment (check one)	Non-Concur	Substantive X	Editorial
Affected paragraph and page number	Page: 15, 'AMC 25.775(d) Windshields and Windows' Paragraph: 5		
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u></p> <p>"...that may then lead to a structural failure of the windshield"</p> <p><u>REQUESTED CHANGE:</u></p> <p>"...that may then lead to a structural failure <i>that could result in loss</i> of the windshield"</p>		
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>We recommend adding this text for clarification because the system description should already be in the compliance plan described in section 9.a.2</p>		
COMMENT #3 of 3			
Type of Comment (check one)	Non-Concur	Substantive X	Editorial



Affected paragraph and page number	Page: 15, 'AMC 25.775(d) Windshields and Windows' Paragraph: 6
What is your concern and what do you want changed in this paragraph?	<p><u>THE PROPOSED TEXT STATES:</u></p> <p>The applicant should therefore pay particular attention to common cause and cascading failures, and identify appropriate design, manufacturing, installation and maintenance precautions for the installation of windshields and the associated systems that mitigate the risk of any failure condition adversely affecting other adjacent systems or components that may lead to a structural failure of the windshield. Such considerations are generally expected to be addressed through zonal safety analysis (refer to AMC 25.1309, Appendix 1).</p> <p><u>REQUESTED CHANGE:</u></p> <p>Delete entire paragraph</p>
Why is your suggested change justified?	<p><u>JUSTIFICATION:</u></p> <p>Common cause and cascading failures are addressed in AMC 25.1309 paragraph 10, 11, and Appendix 1. Also, as EASA noted, the zonal safety analysis is also addressed in AMC 25.1309, Appendix 1. Since 25.1309 is "applied to any equipment or system as installed" (with some noted exceptions), it is not necessary to add what is essentially redundant guidance material in another AMC.</p>
response	<p><u>Item 3: 'Fabrication methods'</u></p> <p>Comment 1: accepted</p> <p>EASA considers the terms 'representative' and 'stable' appropriate. However, the text was amended accordingly as the text proposed in the comment is clearer, and was moved to the new AMC No°1 to CS 25.603(a) to be better aligned with CS 25.603(a).</p> <p>Comment 2: partially accepted</p> <p>The term 'representative stable' was replaced by 'constituent', which should meet the objective of the comment. The related text was moved to the new AMC No°1 to CS 25.603(a) to be better aligned with CS 25.603(a).</p>

Comment 3: accepted

The text was amended according to the comment.

Comment 4: partially accepted

The commented paragraph was rewritten, taking into account the comment. A reference to address potential anisotropy, when applicable, was retained.

Comment 5: accepted

However, a reference to anisotropy was added in the previous paragraph dealing with material specifications, recommending to address anisotropy, when applicable.

Comment 6: not accepted

The term 'sound structure', although long used, has no particular meaning (it possibly has a historic reference to bell casting sonic qualities). Therefore, EASA considers the term 'safe part' (not 'safe product', as originally proposed) more appropriate to harmonise the text with 'performance-based' regulatory objectives and the CS 25.603 terminology. Similarly, EASA uses 'other properties' to recognise the current terminology. Such term is becoming more and more relevant with increasingly integrated material technologies beyond the airframe structural considerations, e.g. system structures, flammability properties of interiors, etc. The amended text remains within the scope of the regulation with the objective to better reflect how the regulation should be implemented. However, this does not exclude the management of material issues under existing disciplines within an organisation's certification process.

Comment 7: accepted

Comment 8: partially accepted

The paragraph was revised based on the comment to clarify its objective, and emphasise the possibility to take credit from experience.

Comment 9: not accepted

Refer to the response to Comment 6 above.

Comment 10: partially accepted

This paragraph emphasises the need to consider both 'inspection' and 'process control' (recognising industry interest to move towards process control). However, it was deleted, while the text of the AMC was revised to indicate that adequate control is linked to safe parts.

Item 4: 'Windshields — Failure conditions with structural effects'

Comment 1: partially accepted



The commented text allows the applicant to demonstrate classifications other than hazardous ones. The text was amended to specify that reference should be made to a failure that could result in partial or complete loss of a windshield.

Comment 2: partially accepted

The text was amended to refer to 'partial or complete loss of a windshield'.

Comment 3: not accepted

As explained in NPA 2020-11, experience from in-service aeroplanes showed that common-cause analysis (e.g. zonal safety analysis) and precautions for the installation of windshields and related systems were not always sufficiently robust to prevent certain failure conditions, resulting in partial or complete loss of the windshield. Hence, AMC 25.775(d) highlights this concern.

comment	18	comment by: <i>CAA Finland</i>
	Finland supports the proposed update.	
response	Noted Thank you for your support.	

comment	28	comment by: <i>GAMA</i>
	The General Aviation Manufacturers Association (GAMA) appreciates the opportunity to comment on the proposed NPA 2020-11 'Regular Update of CS-25'. GAMA is an international trade association dedicated to fostering and advancing the welfare, safety, interests, and activities of the global general aviation industry. GAMA represents over 100 of the world's leading manufacturers of general aviation aircraft, engines, avionics, and components, as well as operators of maintenance facilities, fixed base operations, aircraft fleets, and pilot and maintenance training facilities.	
response	Noted	

2. In summary—why and what

p. 4-9

comment	39	comment by: <i>ATR</i>
---------	----	------------------------



**Item 4: Windshield – Failure conditions with structural effects and AMC 25.775(d)
Windshields and Windows proposed amendment:**

The mentioned event concerns only structural parts (A/C structure + windows), not systems. Thus, it is ATR opinion that 25.1309 does not apply in this case. Nevertheless, this failure needs to be taken into account in certain undesired events like the loss of pressurization because it is a contributor to it. Therefore, for ATR, since it is contributor to an undesired event it is an event that needs to be taken into account in the SSA, but not in the functional part (so not in the FHA part of the analysis).

response

Not accepted.

The mentioned occurrence indeed resulted in a structural failure of the windshield. However, that failure was triggered by a windshield system failure condition.

The considerations presented in AMC 25.1309, paragraph 10(c) are therefore pertinent to assessing the effects of such a windshield system failure condition.

EASA considers that common-cause analysis (e.g. zonal safety analysis) is an adequate tool that applicants should use to assess the installation of windshields and related systems.

comment

41

comment by: ATR

Item 2: Turbo-propeller vibrations

(a) Vibration indication system

EASA proposes to amend CS25.1305 to require: “(9) A vibration indication system that indicates unbalances of engine rotor systems, and, when applicable, propeller systems”.

ATR recommends to further clarify whether future turbopropeller aeroplane designs shall include a system providing vibration indications from engine rotors AND propellers, OR from propellers only.

ATR would suggest the following rewording to specifically address rotating parts: “(9) A vibration indication system that indicates unbalances of engine rotor systems, and, when applicable, **propeller rotating assembly.**”

Eventually, the intended use of the vibration indication in cockpit is not explicit. Since the parallel is made with the A400M where alerts (cautions, warnings) are triggered in case of exceedance, ATR highlights its reluctance to request an engine in-flight shutdown based on vibration level and would rather use it as an advisory condition for the flight crew to crosscheck with other available powerplant parameters before taking adequate actions.



b) Investigation of propeller vibration behaviour

EASA proposes to create a new AMC 25.907 to take credit from experience gathered from investigation on blade trunnion pin fracture events and allow applicants to identify any unacceptable loading conditions at an early stage before entry into service.

ATR intends first to recall the background around vibrations events since there are of several kinds:

- On one hand, there are severe vibrations reported after pitch change mechanism damage that is caused by aero-imbalance resulting from blade-to-blade pitch angle difference,
- On the other hand, the propeller so-called “vibration behaviour”, observed in post-processing of strain gages from investigation flight tests (Vibration Stress Survey type), in operating conditions corresponding to descent with power levers reduced at flight idle at speeds close to VMO. This is a transient trunnion pin cyclic load increase with no evidence of transmitting vibration to the aircraft. The magnitude of this observed load increase was not a concern (max peak at about 16% of trunnion yield limit).

ATR highlights that flight tests and studies carried-out in the frame of incidents investigation have indeed evidenced this “vibration behaviour” phenomenon but it has not been correlated with the root cause of the incidents so far. Besides, the peak loads during these events reached magnitudes well below levels needed to permanently deform the trunnion pin and actuator hardware and were not considered as a concern. Therefore, should any future applicant evidence similar phenomenon when following revised AMC25.907, it may be considered acceptable for above reasons.

ATR takes note that the proposed AMC25.907 refers to FAA AC 20-66B “Propeller Vibration and Fatigue”, intended for propeller TC holder applicant, but would recommend to go beyond CS-25 and include requirements in CS-P to adequately address propeller pitch change design.

Proposal is as follows:

- It is acknowledged that Hazardous propeller effects can already be found in CS-P 15 “Terminology” but they should be directly listed in CS-P 150 “Propeller Safety Analysis” as it is the case in CS-E 510 “Safety Analysis”.
- Hazardous propeller effects already include “(iv) A failure that results in excessive unbalance” but should more explicitly include blade-to-blade pitch angle difference leading to aero imbalance.
- CS-P 420 should ensure that, further to loading resulting from normal operation, components of pitch change system can also withstand forecasted pitch change failure modes (e.g. retention jamming of one or



	<p>several blades). AMC P 420 should accordingly add objective to size pitch change system.</p>
response	<p>a) Accepted</p> <p>EASA confirms that the objective of the CS is to require vibration indications from both engine rotor systems <u>and</u> propellers. Therefore, the wording ‘propeller rotating assemblies’ was introduced. EASA also confirms that there is no intent to universally mandate an in-flight shutdown solely based on vibration thresholds. The applicant should propose alert categories to comply with CS 25.1322.</p> <p>b) Noted</p> <p>EASA will consider the proposed clarifications under the next ‘Regular update of CS-P’ rulemaking task (RMT.0684).</p>

3. Proposed amendments — AMC 25.603

p. 12

comment 3

comment by: FAA

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
N/A	<p>AMC 25.603 Suitability and durability of materials. The material strength and other properties used in design data (including damage tolerance characteristics when applicable) are governed by, and can be significantly</p>	<p>Material strength and other properties are governed by more than just process parameters. It is recommended that the more general term "process variables" be used. For example, scan strategy in additive manufacturing is a process variable that is selected by the Part Producer that can affect the</p>	<p>Replace "parameters" with "variables" here and 2 instances in AMC 25.605(b).</p>	Conceptual



	<p>sensitive to, the associated material production process parameters (including raw material considerations).</p>	<p>material strength, but is not a parameter. This terminology of key process variable is becoming standardized through use by Standards Development Organizations (e.g., AIA, SAE) , FAA, NASA, and MMPDS. When appropriate, it is recommended that EASA also use the more general term "variable" in their guidance.</p>		
<p>N/A</p>	<p>AMC 25.603 Suitability and durability of materials. Furthermore, these properties may also be influenced by other fabrication processes (manufacturing and assembly), e.g. casting, bonding, or complex additively manufactured parts.</p>	<p>The intent of this sentence is not clear. It is understood that the material strength properties of a casting, forging, or plate that are used as a substrate for the AM process and are not subsequently removed can be affected by the subsequent additive manufacturing deposition. Likewise bonding of composite parts can affect the material properties of the base composite laminate. However, it is not clear this is</p>	<p>Reword sentence to provide clear guidance.</p>	<p>Editorial</p>



		the intent of the referenced text.		
N/A	<p>AMC 25.603 Suitability and durability of materials. Therefore, the selection of the appropriate experience and/or tests, and the necessary material and process specifications, considered necessary to comply with CS 25.603, requires careful consideration in order to be representative of stable material and process combinations as appropriate for the design data to be used for any particular product.</p>	<p>Process specifications are required by CS 25.605 under certain conditions. The referenced text incorrectly states material process specifications are necessary for compliance to CS 25.603. Unless specifically required by CS 25.605, fabrication method process requirements are not required to be defined in process specifications.</p>	<p>Therefore, the selection of the appropriate experience and/or tests, and the necessary material and material process specifications (considered necessary to comply with CS 25.603 and CS 25.605, respectively) requires careful consideration in order to be representative of stable material and process combinations as appropriate for the design data to be used for any particular product.</p>	Format
N/A	<p>AMC 25.603 Suitability and durability of materials. Note: When the material strength and other</p>	<p>The note provides guidance for when material strength and other properties are defined by manufacturing and assembly processes</p>	<p>Note: When the material strength and other properties used in design data are defined by manufacturing and assembly</p>	Conceptual



	<p>properties used in design data are defined by manufacturing and assembly processes and not directly by the constituent material and/or material processes, demonstration of representative stable material and material process control continues to provide important support for the development of the final design data.</p>	<p>and not directly by precursor materials. Although material strength and other properties may be influenced by manufacturing and assembly processes, material strength and other properties are not solely defined by manufacturing and assembly processes. Precursor material characteristics also effect those properties.</p>	<p>processes and not directly solely by the constituent material and/or material processes, demonstration of representative stable material and material process control continues to provide important support for the development of the final design data.</p>	
--	---	--	---	--

response

Comment 1: partially accepted

The text was amended to better address ‘variables’ and was moved to AMC 25.603(b). See also the AMC 25.605(b) text that addresses ‘variables’ and ‘parameters’.

Comment 2: accepted

The list of examples was moved to a different part of the AMC, and the text was amended to identify higher-level activities and post-processing that may affect material properties. The commented text was then moved to AMC 25.603(b).

Comment 3: partially accepted

See also the introductory text of AMC 25.603. Material-process specifications might be part of the ‘end-to-end’ requirements that are linked to CS 25.605, e.g. critical raw-material handling processes for additive material (AM), etc. Note: the integration of CS 25.603 and CS 25.605 into a single CS might be proposed under future rulemaking activities to better reflect more recent materials and process technologies.



Comment 4: accepted

The commented text was moved to AMC No°1 to CS 25.603(a).

comment

10

comment by: *SAFRAN Nacelles*

In last sentence of the Note mentioning 'simple shared material database data', do you mean a database already approved by an Authority, an internal database or a commercially available database?

A criterion for a simple shared database would be helpfull.

response

Accepted

'Simple' was deleted, and the text was amended, also in response to other comments. The objective was to remind applicants that the use of shared databases does not necessarily provide the design values. However, shared databases remain important to supporting certification. The text was moved to AMC No°1 to CS 25.603(a).

comment

24

comment by: *Airbus DS*

Last sentence of first paragraph rewording:

Instead of "Therefore, the selection (...) any particular product"

This sentence is proposed

"Previous experience and/or tests together with the necessary material and material process specifications that are used as design data to comply with CS25.603 for any particular product, need to be representative of stable material and processes.

response

Partially accepted

The text was amended to take into account this and other comments, and was moved to AMC No°1 to CS 25.603(a).

comment

29

comment by: *GAMA*

Under the proposed AMC 25.603, the last sentence of the note reads:

"This should be a consideration when using simple shared database data to support a complex product test and analysis pyramid."



response	<p>These concepts are not defined in CS-25 but are discussed for AM in proposed CM-S-008 and for composite materials in AC 20-29. Furthermore, this paragraph seems to be more applicable to production processes and specific design considerations. This topic seems to be covered in the proposed guidance for AMC 25.613. It is unclear how this topic would be part of a means of compliance to 25.603.</p> <p>Suggested change: Recommend removing this paragraph.</p> <p>Partially accepted.</p> <p>AMC 25.603 was amended to introduce a reference to AMC 20-29 test as well as analysis concepts. The commented text was moved to AMC No°1 to CS 25.603(a) because the guidance addresses ‘experience or tests’ in the context of materials, which is more representative of simple coupon testing that is completed in shared databases. Furthermore, that text relates to the previous paragraph. However, EASA agrees that such text could equally be moved to AMC 25.605 and/or AMC 25.613.</p>
comment	<p style="text-align: right;">comment by: <i>GAMA</i></p> <p>Recommend this or a similar statement based on the November 2020 TAMCSWG report concerning material and process aspects of single load-path parts (which would include AM) –</p> <p><i>Key parameters should be defined in the material specifications approved under 25.603. These specifications should also identify what key characteristics and parameters are to be monitored for in-process quality control. If stricter control of processing parameters is required to meet the properties used in the design data, those controls should be detailed in the material specification.</i></p> <p>The TAMCSWG reports are here:</p> <p>https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/3723/</p> <p>https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/4705/</p> <p>Suggested change: Add the recommended (italic) text and references to the TAMCSWG reports.</p>
response	<p>Partially accepted</p> <p>The objective of the proposed text is met in the revised text (now in AMC 25.603(b)), which also accounts for other comments (see also the amended AMC 25.605(b)).</p> <p>Note: the extended FAA Aviation Rulemaking Advisory Committee (ARAC) process is yet to be concluded.</p>

3. Proposed amendments — AMC 25.603(b)

p. 12-13

comment 4

comment by: FAA

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
N/A	<p>AMC 25.603(b) Approved Material Specifications Suitability and durability of materials. These specifications should identify all the acceptable types of production defects and in-service repair process defects (including size limitations) which could prevent repeated production and safe operation of a product throughout its operational lifetime.</p>	<p>Material specifications are developed for a specific manufacturing process (e.g. casting, forging) and alloy (e.g., composition and other technical and QA requirements) and are not specific to an application. Process specifications are typically material agnostic and not specific to an application. Application specific requirements may be defined separate from the baseline material specification requirements by drawings or other documents. This is how it has been done for certified AM parts. Accordingly, the reference text "...identify all the acceptable types of production defects and in-service repair</p>	<p>Replace the referenced text with: Anomaly types, size and frequency limits should be defined for each application in the applicable specification, drawing, or other documentation. It seems out of scope to CS 25.603, but a sentence could be added that addresses requirements for defining anomaly types, size and frequency limits in the Airworthiness Limitation Section (ALS) or Structural Repair Manual (SRM).</p>	Conceptual



		<p>process defects (including size limitations)..." is not appropriate as a requirement in material specifications.</p> <p>In-service repair process defects should be not be included in the same sentence with production as these are handled in separate documents.</p>		
--	--	---	--	--

response

Partially accepted

The commented text was deleted. Taking into account other comments, a note was introduced in AMC 25.603(b) to remind applicants that the development of ‘the material specifications, material process specifications, and/or production drawings’ ‘[...] may also help applicants identify other defect types and damage modes than the anomalies and flaws that are accepted under the specifications, including those that may occur in service. Such data may be used to help applicants show compliance with other specifications, e.g. CS 25.571.’.

Regarding repairs, a note was introduced in AMC 25.603 to remind the responsible repair design organisations that they are also expected to comply with the CSs and take into account the related AMC.

Note: the correct selection of materials and processes, which is necessary for successful certification, may be limited by the application configuration.

comment

17

comment by: *Mitsubishi Aircraft Corporation*

[Document No.Page Chapter]

NPA 2020-11, page 13,AMC25.603(b), 2nd paragraph

[Comment]

The first words in 2nd paragraph had better update.

[Reason for Change]



response	<p>The acceptable defect has been in general specified in process specification or production drawing, not typical in material specification.</p> <p>[Change Proposal]</p> <p>Replace "These specifications should identify ---" by "These specifications, process specification or production drawing should identify ---"</p>
comment	<p>25 comment by: <i>Airbus DS</i></p> <p>Second paragraph, first sentence.</p> <p>Instead of "These specifications should identify all the acceptable types of production defects and in-service repair process defects (including size limitations) which could prevent repeated production and safe operation of a product throughout its operational lifetime."</p> <p>This sentence is proposed "These specifications should identify the acceptable types of all relevant production defects (including size limitations) which could prevent repeated production and safe operation of a product throughout its operational lifetime."</p> <p>In service repairs not to be covered in this chapter. The specification should cover only defects that are considered relevant from structures perspective.</p>
response	<p>Partially accepted</p> <p>The objective of the comment is met in the revised text, which also took into account other comments.</p> <p>Note 1: responsible repair design organisations are also expected to address the applicable CSs (see also the related note introduced in AMC 25.603).</p> <p>Note 2: the need for approved specifications extends beyond structure to safety-related aspects of other disciplines, e.g. system structure, cabin safety, etc. (see also the revised first paragraph of AMC 25.605(a)).</p>
comment	<p>31 comment by: <i>GAMA</i></p> <p>In general, the evaluation of manufacturing defects should be left to 25.571 (and 25.305 as applicable). In particular, the requirement to establish "allowable defects" under</p>

25.603(b) is a roadblock to certification as there is not associated criteria or guidance provided on the desired objective. Defects beyond the range of quality controlled by the specification should be evaluated under 25.571.

The TAMCSWG, of which EASA was a participant, discusses this in their high-level June 2018 report, and the focused report on single load-path in November 2020. Also, the TAMCSWG has proposed a definition of “manufacturing defect” which may conflict with this guidance:

Manufacturing Defect — An anomaly or flaw occurring during manufacturing that can cause degradation in structural strength, durability, stiffness or dimensional stability.

The development of material and process specifications should focus on establishing the properties and quality controls to ensure the product meets **all of** the necessary performance requirements. Do not rely only on the property controls in an industry specification if they do not sufficiently control the strength, robustness and durability performance necessary for the type design. In that case, additional requirements should be specified.

Suggested change: This paragraph should be deleted and replaced with the proposed change in the previous comment.

response

Partially accepted

The commented paragraph was deleted. A note was introduced in AMC 25.603(b) to remind applicants that the development of ‘the material specifications, material process specifications, and/or production drawings’ ‘[...] may also help applicants identify other defect types and damage modes than the anomalies and flaws that are accepted under the specifications, including those that may occur in service. Such data may be used to help applicants show compliance with other specifications, e.g. CS 25.571.’.

comment

43

comment by: UK CAA

Page No: 13

Paragraph No: 1

Comment:

Some additional wording is recommended to add precision to the wording associated with in-service defects.

Justification:

To add clarity so that other in-service defects (for example, approved unrepaired allowable damage) are addressed rather than just repair related defects.

Proposed Text:



	Suggest the text in the first sentence is amended to state '... production defects and in-service <u>defects including</u> repair process defects (including size limitations) ...'
response	<p>Partially accepted</p> <p>The commented paragraph was deleted. A note was introduced in AMC 25.603(b) to remind applicants that the development of 'the material specifications, material process specifications, and/or production drawings' '[...] may also help applicants identify other defect types and damage modes than the anomalies and flaws that are accepted under the specifications, including those that may occur in service. Such data may be used to help applicants show compliance with other specifications, e.g. CS 25.571.'</p>

3. Proposed amendments — AMC 25.605

p. 13

comment	<p>32 comment by: GAMA</p> <p>Proposed amended CM-S-008 states –</p> <p>“EASA review (within the EASA AM Working Group, see Appendix 2) indicates that no CS level change is required to specifically address the use of AM.”</p> <p>Given that, and some of the confusing items discussed in comments below, it is unclear why these proposed changes to wording of the rule are necessary. The industry already has detailed understanding and procedures in place to address compliance with 25.605. Clarifications in the guidance could address each of these points raised in the proposed rule text.</p> <p>Suggested change: Recommend that clarifications are added to the guidance material instead of changing the rule.</p>
response	<p>Not accepted</p> <p>The objective of the proposed amendments to AMC 25.603, CS/AMC 25.605, and AMC 25.613 was to align them with the 'performance-based' regulation concept and to address broader material and process evolution issues, not only 'additive manufacturing'.</p>
comment	<p>42 comment by: ATR</p> <p>CS 25.605 Fabrication methods</p> <p>Could EASA clarify how to interpret CS 25.605 amendment proposal?</p> <ul style="list-style-type: none"> • To which extent is it going to be made applicable (structural parts, mechanical parts, other parts)? • Should the secondary parts (cover ...) be considered?



response	<ul style="list-style-type: none"> Should the criticality of the parts be taken into account in evaluating requirement applicability (if yes, how)?
	<p>Partially accepted</p> <p>The proposed amendment to CS 25.605 does not change the common practice as illustrated in the comment.</p> <p>Note: a reference to ‘safe parts’ was introduced to clarify that the consideration of material and process specifications extends beyond the airframe structure, e.g. to system structures, interiors, etc..</p>

3. Proposed amendments — AMC 25.605(a)

p. 13

comment	comment by: FAA			
Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
N/A	CS 25.605 Fabrication methods (a) The methods of fabrication used (i.e. the manufacturing and assembly methods, including consideration of the material and material processes) must produce the strength and other properties necessary to ensure consistently	The term "consistently sound structure" has been in place since CAR 4b and its meaning is well understood. The proposed change to "safe product" would substantially increase the scope of this regulation to include the entire product, with no rationale stated for why the change in terminology that has been in place for over 50 years is necessary. EASA proposes to revise the regulation to provide guidance	CS 25.605 Fabrication methods (a) The methods of fabrication used (i.e. the manufacturing and assembly methods, including consideration of the material and material processes) must produce the strength and other properties necessary to ensure consistently	Conceptual



	safe product—a consistently sound structure.	on what is considered a consistently safe product and specifically identifies only strength properties. All other considerations of "safe product" are lumped into "other properties". As stated earlier the meaning of "sound structure" is well understood. The proposed revision which identifies only strength properties and changes "sound structure" to "safe product" is not supported.	safe—product sound structure.	
N/A	CS 25.605 Fabrication methods (a) The methods of fabrication used (i.e. the manufacturing and assembly methods, including the consideration of the material and material processes) must produce the strength and other properties necessary to ensure a consistently safe product—a consistently	EASA proposes to revise CS 25.605 to require "a consistently safe product" rather than "a consistently sound structure." It's not clear why EASA proposes this change in terminology. The term "sound structure" has been in place for decades and its meaning is understood. It's also harmonized with the corresponding FAA regulation. The meaning behind the term "safe product" is less clear, and the change in terminology	Replace "safe product" with "sound structure" as used in the original CS 25.605.	Editorial



	sound structure.	implies a change in criteria.		
N/A	AMC 25.605(a) Fabrication methods Fabrication method processes may include, for example, composite resin transfer methods, bonding, welding, heat-treating, or additive manufacturing methods.	I believe the intent of this sentence is to provide examples of fabrication methods that require close control to produce consistently sound structure.	Fabrication method processes that require close control to produce consistently sound structure may include, for example, composite resin transfer methods, bonding, welding, heat-treating, or additive manufacturing methods.	Editorial

response

Comments 1 and 2: partially accepted

Please refer to the response to Comment 15, Item 6. The phrase ‘strength and other properties’ is common in CS 25.603. The word ‘product’ was changed to ‘part’ to be consistent with CS 25.603.

Comment 3: partially accepted

Please refer also to the response to Comment 15, Item 6.

comment

26 comment by: Airbus DS

Following note is proposed to be added add the end.

"Note: Approved fabrication process specifications and material specifications can be, for example, industry or military specifications, or European Technical Standard Orders."

It is similar to AMC25.603(b) note. As it is the AMC of a different requirement, this note can be added for clarity in this chapter.



response	Accepted
comment	<p>33 comment by: GAMA</p> <p>CS 25.605(a) below:</p> <p><i>“(a) The methods of fabrication used (i.e. the manufacturing and assembly methods, including consideration of the material and material processes) must produce the strength and other properties necessary to ensure a consistently safe product...”</i></p> <p>This proposed wording will have unintended consequences as it moves the focus from an overall performance objective to a focus on specific properties, assumed to be specified in some specification. For example, this wording would not appear to address recent issues with Environmentally Assisted Cracking (EAC). The product met the required properties of the material and fabrication specifications, but those specifications did not consider EAC. They ultimately failed to deliver a “consistently sound structure” regardless of the properties defined in the specs.</p> <p>Suggested change: Recommend that clarifications are added to the guidance material instead of changing the rule.</p>
response	<p>Partially accepted</p> <p>Some text was introduced to AMC 25.605(a) and AMC 25.605(b) to expand on the meaning of ‘other properties’. The term is consistent with what is used in CS 25.603. ‘Other properties’ would suggest that all properties relevant to the application and safety criticality need to be understood in terms of design, manufacture, and in-service phases. The proposed change does not affect the interpretation of the EAC.</p>
comment	<p>34 comment by: GAMA</p> <p>Pertaining to the highlighted text within the proposed CS 25.605(a) below:</p> <p><i>“...If a fabrication method includes processes which require close control to reach this objective, then those processes must be performed under representative and stable approved fabrication process specifications, supported by appropriately approved material specifications (including consideration of the raw/feedstock/unfinished material specifications).”</i></p> <p>The validation of a stable process is performed under a PC and often extends beyond the initial type certification. While we understand the intention, we do not have a concise means to demonstrate compliance to this under a TC program. This aspect could be addressed in the guidance, similar to that already provided in AC 25.613-1. Including this provision in the rule is a road block to certification.</p> <p>Suggested change: Propose removing the highlighted text.</p>

response

Partially accepted.

Please also refer to the response to Comment 15, Item 7. The amendment to CS 25.605(a) harmonises the wording with existing CSs and AMC, which better address common practice, and does not fundamentally change the interpretation. Furthermore, a new introduction text in AMC 25.603 reinforces the link between CS 25.603, CS 25.605, and CS 25.613. EASA considers ‘representative’ suitable to suggest that the process needs to be appropriate to the application. For example, following a thin-laminate bonding cure process might not work for bonding of thick laminates.

3. Proposed amendments — AMC 25.605(b)

p. 13-14

comment 7

comment by: FAA

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
N/A	CS 25.605 Fabrication Methods (b) Each new aircraft fabrication method must be substantiated by a test programme that is representative of the application, as necessary to support the approved specifications.	The proposed change to CS 25.603(b) could be interpreted as reducing the scope of the regulation. That is, the revised wording could be reasonably interpreted such that a test program is only required for applications that require approved specifications. Process specifications are only required for applications that require close control to produce consistently sound structure. Original CS25.603(b) is required of all new	(b) Each new aircraft fabrication method must be substantiated by a test programme that is representative of the application, as necessary to support the approved specifications.	Conceptual



		aircraft fabrication methods. This paragraph of the regulation should not be changed.		
N/A	AMC 25.605(b) New Fabrication methods. The strength and other properties resulting from each new fabrication method (which may result from a change of material, or fabrication process, see also CS 25.603) should initially be assumed to be anisotropic and to be affected by the environment, unless the applicant can demonstrate different characteristics.	The parentetical text does not provide additional clarity and may in fact, cause confusion. Material properties are specific to a given material and product form, so it doesn't need to be stated that a change in material results in a change in material properties. The point of this referenced text is that material and strength properties developed from new fabrication methods should be assumed to be anisotropic, unless different characteristics are substantiated.	Delete the text contained within the parenthesis.	Editorial
N/A	AMC 25.605(b) New Fabrication methods. The test programme required for new fabrication methods should be used to evaluate the	Development of strength and other properties is not the subject of 25.605. The test program described in the referenced text should be limited to parts that must comply with CS	Delete the reference text from AMC 25.605(b).	Conceptual



	<p>critical process parameters which govern the final strength and other properties of the product at the time of production and throughout the operational lifetime. The sensitivity of the strength and other properties of the structure to these parameters, including the effect of defects, should be evaluated to ensure that the resulting fabrication process can deliver a consistently safe structure.</p>	<p>25.613 or CS 25.571. This guidance can be added to AMC 25.613 or AMC 25.571, as appropriate.</p>		
<p>N/A</p>	<p>AMC 25.605(b) Fabrication methods "The sensitivity of the strength and other properties of the structure to these parameters, including the effect of defects, should be evaluated to</p>	<p>Similar to comment 1, EASA proposes the phrase "consistently safe structure." It's not clear why EASA proposes this change in terminology. The term "sound structure" has been in place for decades and its meaning is understood. The meaning behind the term "safe structure"</p>	<p>Replace "safe structure" with "sound structure."</p>	<p>Editorial</p>



	<p>ensure that the resulting fabrication process can deliver a consistently safe structure."</p>	<p>is less clear, and the change in terminology implies a change in criteria.</p>		
--	--	---	--	--

response

Comment 1: partially accepted

The wording ‘representative of the application’ is retained to emphasise the relevance of the configuration to the definition of the process details. The reference to ‘aircraft’ was removed to be harmonised with ‘safe part’.

Comment 2: accepted

Comment 3: partially accepted

The text was amended taking into account other comments. However, the term ‘strength and other properties’, as in CS 25.603, was used. This reflects the need to consider ‘other properties’, e.g. flammability of additive-material (AM) interior parts. Furthermore, the CS 25.605(a) ‘process’ contributes to defining the specification (e.g. acceptable anomalies, etc.) and potential defects that need to be partly addressed in CS 25.571, as explained in a note in the revised AMC 25.605(b).

Note: AMC 25.605(b) indicates the need to consider generating ‘other property’ data at a statistically credible level. This becomes more and more relevant for addressing e.g. AM variability, etc.. See also the text introduced in AMC 25.613, paragraph 4.2, which indicates the need to address small data sets, etc.. EASA may consider managing the overlapping content of CS 25.603, CS 25.605, and CS 25.613 under future rulemaking activities.

Comment 4: not accepted

Please refer to the response to Comment 15, Item 6.

comment

11

comment by: *SAFRAN Nacelles*

Could EASA define ‘a new fabrication method’ ? A definition or a criterion in the AMC would help in better understanding the scope of CS 25.605(b)

response

Accepted



'New fabrication method' was introduced in the AMC to refer to a fabrication method that is considered new by the industry, an applicant, or an application configuration.

comment

27

comment by: AIRBUS

AMC 25.605(b) New fabrication methods

"The strength and other properties resulting from each new fabrication method (which may result from a change of material, material or fabrication process, see also CS 25.603) should initially be assumed to be anisotropic and to be affected by the environment, unless the applicant can demonstrate different characteristics"

This statement is more or less a repeat of the message included for AMC25.603 and AMC25.613.

As reference is made to strength and properties, it seems not appropriate to mention this under AMC25.605 that is about the method of fabrication and the test programme.

Moreover, the statement is more restrictive under proposed AMC25.605 (...should initially be assumed to be anisotropic and to be affected by the environment...) as the one used for proposed AMC25.603 and AMC25.613 (...the potential for anisotropy should be considered...)

Airbus proposal:

To delete the proposed sentence (in italics above) from this paragraph.

response

Partially accepted

The text was amended, taking into account also other comments, to avoid repetition. Please refer also to the introductory text of AMC 25.603. CS 25.605 addresses process specifications, which contributes to the objective of the requirements, i.e. achieve adequate and consistent 'strength and other properties'.

comment

35

comment by: GAMA

Pertaining to the proposed AMC 25.605(b), highlighted text under the 2nd paragraph below:

"The test programme required for new fabrication methods should be used to evaluate the critical process parameters which govern the final strength and other properties of the product at the time of production and throughout the operational lifetime. The sensitivity of the strength and other properties of the structure to these parameters, including the effect of defects, should be evaluated to ensure that the resulting fabrication process can deliver a consistently safe structure."



response	<p>The characterization and evaluation of defects should be left to 25.571. The process should establish sufficient controls to eliminate “defects” (as defined by the TAMCSWG June 2018 report) when performed properly.</p> <p>Suggested changes: Propose removing the highlighted text.</p>
comment	<p>36 comment by: GAMA</p> <p>Under the proposed AMC 25.605(b), the 3rd paragraph, sentence 2 reads:</p> <p><i>“In particular, all the inherent product features and defects resulting from the fabrication method...”</i></p> <p>Suggested change: Suggest “range of quality” instead of “defects”.</p>
response	<p>Noted</p> <p>The commented paragraph was deleted and replaced by a note with different wording. The note reminds applicants that showing compliance with CS 25.571 may support them in showing compliance with other CSs.</p>
comment	<p>44 comment by: UK CAA</p> <p>Page No: 14</p> <p>Paragraph No: 2</p> <p>Comment:</p> <p>Additional text is recommended to ensure that identified critical inspection and/ process-controlled steps that form part of the certification have an appropriate level of substantiation/testing/evaluation prior to any changes or alterations.</p> <p>Justification:</p> <p>Reminds applicants that identified critical inspection and/ process-controlled steps that form part of the certification require an appropriate level of substantiation/testing/evaluation prior to any changes or alterations. This would include both physical and non-physical changes to the part.</p>

response	<p>Proposed Text:</p> <p>Add an additional sentence, 'Identified critical inspection and/or process-controlled steps form part of the certification and should not be amended without the appropriate evaluation.'</p>
	<p>Partially accepted</p> <p>The objective of this comment was introduced in AMC 25.605(a) with a different wording.</p>

3. Proposed amendments — AMC 25.613	p. 14
--	-------

comment	8	comment by: FAA		
Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
N/A	<p>4.2 Statistically based Design Values</p> <p>The use of some materials and processes may allow the design of complex parts for which the strength and other properties are produced at the point of production or repair, such that use of simple material test coupons (as would typically be produced, independent of the product)</p>	<p>This statement is also appropriate for non-complex parts. It should be clarified what "...may not be representative" at the end of this sentence is referring to.</p>	<p>The use of some materials and processes may allow the design of complex parts for which the strength and other properties are produced at the point of production or repair, such that use of simple material test coupons (as would typically be produced, independent of the product) may not be representative of part material strength and</p>	Editorial.



	may not be representative.		other properties.	
response	<p>Accepted</p> <p>The proposed change was introduced in the text with a slight difference in wording.</p>			
comment	12		comment by: <i>SAFRAN Nacelles</i>	
	<p>In § 4.2, could EASA precise ‘the level normally expected for the generation of statistically significant values’? An order of magnitude or a reference to an international standard would be appreciated.</p>			
response	<p>Partially accepted</p> <p>EASA understands the objective of Comments 12, 13, and 14. However, the wording of the proposed text was intended to indicate that this subject is not standardised and needs further development. Note: an example was introduced to recognise credit from previous experience and to reference conventional statistical data sets, e.g. A and B, etc..</p>			
comment	13		comment by: <i>SAFRAN Nacelles</i>	
	<p>At the end of § 4.2, could EASA define the boundary between small datasets and standard datasets?</p>			
response	<p>Please refer to the response to Comment 12.</p>			
comment	14		comment by: <i>SAFRAN Nacelles</i>	
	<p>In paragraph 4.2 about small datasets, would previously used statistical methods require a new EASA acceptance? For instance, the small sample formula has been accepted for certified products. Is it still valid?</p>			
response	<p>Please refer to the response to Comment 12.</p>			
comment	37		comment by: <i>GAMA</i>	

*“The use of some materials and processes may allow the design of complex parts for which the strength and other properties are produced at the point of production or repair, such that use of simple material test coupons (as would typically be produced, independent of the product) may not be representative. When complex higher **pyramid testing** is required, then the number of specimens may need to be reduced (for practical reasons) below the levels normally expected for the generation of statistically significant values. Therefore, other mitigating substantiation actions are likely to be necessary (e.g. coupon testing of prolongations and/or testing of coupons taken from sections of production parts, or more intensive NDI). Until industry standards exist for such situations, the need for (and the approach taken to) the use of higher test pyramid test articles and the use of small datasets to generate design data should be agreed with EASA.”*

Pyramid testing does not appear to be defined in CS-25 (Amdt 26) but is specifically discussed in AMC 20-29 which is applicable to composite materials. This new paragraph would seem to be applied to AM as discussed in proposed CM-S-008, but it is confusing without the context given in the CM.

Suggested changes: If the CM is intended to supplement the guidance, then this paragraph is not needed; a reference to the CM would be sufficient and should be added.

response

Partially accepted.

A reference to AMC 20-29 was introduced as an example of discussion of the test pyramid in AMC 25.603.

Certification Memoranda (CMs) are temporary documents and therefore not used as references in CSs. Furthermore, the CS and AMC paragraphs at stake are intended for broader application, beyond composites or ‘additive manufacturing’.

3. Proposed amendments — AMC 225.775(d)

p. 15

comment

20

comment by: Airbus-Regulations-SRg

Page 15, “8. OTHER FAILURE CONDITIONS WITH STRUCTURAL EFFECTS”

Third section, quote:

"Unless otherwise demonstrated by the applicant, a **failure condition** that leads to a structural failure of a windshield should be classified as at least hazardous."

Airbus comment

The wording "failure condition" is too generic and this kind of failure has to be more precise.

Airbus proposal:



response	<p>To replace the wording "failure condition" by "system failure condition" to read as follows:</p> <p>"[...] by the applicant, a <i>system</i> failure condition that leads [...]"</p> <p>Rationale:</p> <p>To assure better understanding.</p>
Accepted	
comment	<p>21 comment by: Airbus-Regulations-SRg</p> <p>Page 15, "8. OTHER FAILURE CONDITIONS WITH STRUCTURAL EFFECTS"</p> <p>Third section, quote:</p> <p>"... a structural failure of a windshield should..."</p> <p>Airbus comment:</p> <p>The word "structural failure of a windshield" is too generic and this failure has to be more precise.</p> <p>Airbus proposal for re-wording:</p> <p>"... a structural failure <i>which leads to the loss of the windshield</i> should ..."</p> <p>Rationale:</p> <p>To assure better understanding.</p>
response	<p>Partially accepted</p> <p>The text was amended to refer to 'a structural failure that could result in partial or complete loss of a windshield'.</p>
comment	<p>22 comment by: Airbus-Regulations-SRg</p> <p>Page 15, "8. OTHER FAILURE CONDITIONS WITH STRUCTURAL EFFECTS"</p> <p>Fourth section, quote:</p> <p>"In addition, CS 25.365(e)(3) requires the consideration of the maximum opening caused by aeroplane or equipment failures</p> <p>(such as windshield failures) that is not shown to be extremely improbable."</p> <p>Airbus comment:</p> <p>We could not see any benefit why the link to the CS 25.365(e)(3) is listed in this AMC</p> <p>Airbus proposal:</p>

response	<p>Remove this quoted sentence from this AMC to read as follows:</p> <p>"[...] Unless otherwise demonstrated by the applicant, a failure condition that leads to a structural failure of a windshield should be classified as at least hazardous.</p> <p>In addition, CS 25.365(e)(3) requires the consideration of the maximum opening caused by aeroplane or equipment failures (such as windshield failures) that is not shown to be extremely improbable.</p> <p>Service experience has shown that the failure or the deterioration of some [...]"</p> <p>Rationale:</p> <p>To ease the understanding of the amended AMC 25.775(d).</p>
	<p>Not accepted</p> <p>The commented text was slightly modified to clarify that this is a reminder to the applicant.</p>

comment	<p>23 comment by: Airbus-Regulations-SRg</p> <p>Page 15, "8. OTHER FAILURE CONDITIONS WITH STRUCTURAL EFFECTS"</p> <p>Last section, last sentence, quote:</p> <p>"Such considerations are generally expected to be addressed through zonal safety analysis (refer to AMC 25.1309, Appendix 1)."</p> <p>Airbus comment:</p> <p>The windshield is an equipment therefore considerations through the ZSA is not the appropriate way.</p> <p>The appropriate design, manufacturing, installation and maintenance precautions for the installation of windshields and the associated systems that mitigate the risk of any failure condition adversely affecting other adjacent systems or components that may lead to a structural failure of the windshield should be recorded, when appropriate, in the equipment specifications. Compliance with the specification should be demonstrated through the verification process.</p> <p>Airbus proposal:</p> <p>Remove this quoted sentence from this AMC to read as follows:</p> <p>"[...] adversely affecting other adjacent systems or components that may lead to a structural failure of the windshield</p> <p>Such considerations are generally expected to be addressed through zonal safety analysis (refer to AMC 25.1309, Appendix 1)."</p> <p>Rationale:</p>
---------	---



response	<p>To simplify the understanding of the amended AMC 25.775(d)</p> <p>Not accepted</p> <p>According to Appendix 1 — Assessment methods to AMC 25.1309, components fall within the scope of the zonal safety analysis:</p> <p>‘(1) <i>Zonal Safety Analysis</i>. This analysis has the objective of ensuring that the <u>equipment</u> installations within each zone of the aeroplane are at an adequate safety standard with respect to design and installation standards, interference between systems, and maintenance errors. In those areas of the aeroplane where multiple systems and <u>components</u> are installed in close proximity, it should be ensured that the zonal analysis would identify any failure or malfunction which by itself is considered sustainable but which could have more serious effects when adversely affecting other adjacent systems or <u>components</u>.’</p> <p>However, the commented text was amended to take into account Comment 38 to refer to the common cause analysis of Appendix 1 — Assessment methods to AMC 25.1309, which includes the zonal safety analysis tool.</p>
comment	<p>38 comment by: GAMA</p> <p>The paragraph beginning “The applicant should therefore pay particular attention to common cause...”</p> <p>Multiple common cause analysis can be used to address this issue. The consideration of installation and location issues as described for this particular issue is often identified through the Common Mode Analysis, see SAE ARP4761 Appendix K. It is recommended to more generally reference “common cause analysis” than to specify ZSA. Further, the proposed wording intends to generalize the potential application of precautions as they are whatever is necessary to “mitigate the risk of any failure condition...”</p> <p>Suggested Changes:</p> <p>The applicant should therefore pay particular attention to common causes around the installation of windshields and their contribution to cascading failures, and. Common cause analysis should identify appropriate design, manufacturing, installation and maintenance precautions for the installation of windshields and the associated systems that mitigate the risk of any failure condition adversely affecting other adjacent systems or components that may directly or indirectly lead to a structural failure of the windshield. Such consideration are generally expected to be addressed through zonal safety analysis (refer to AMC 25.1309, Appendix 1).</p>
response	<p>Accepted</p>
comment	<p>45 comment by: UK CAA</p>

	<p>Page No: 15</p> <p>Paragraph No: 2 and 6</p> <p>Comment:</p> <p>Structural issues could also be caused by lightning and static build up interacting with the windshield. It would be helpful if this amendment addressed lightning and static build up, considering:</p> <p>Their interaction with the windscreen generally (including effects on windshield structure and any heating systems) AND</p> <p>Their potential interaction with retained liquid in between layers (including explosive evaporation of accumulated water – see the reference to water ingress in the Chinese Accident Report Recommendation)</p> <p>Justification:</p> <p>This would both ensure a fuller evaluation of the potential risks, and more fully address the information in the referenced Chinese Accident Report Recommendation.</p> <p>Proposed Text:</p> <p>Consider adding a final paragraph that reads:</p> <p>“The applicant should ensure that the safety analysis undertaken to address AMC 25:775 include proper consideration of the effects of both lightning and static build up, both generally (in terms of their effect on the windshield structure) and in terms of their interaction with any retained liquids (e.g. the potential for explosive evaporation of those liquids).”</p>
response	<p>Not accepted</p> <p>The proposal is not considered suitable for this AMC.</p> <p>Its topic should rather be considered when showing compliance with CS 25.581 and CS 25.899.</p> <p>EASA intends to discuss this proposal with the EUROCAE Working Group 31, which is preparing a revision of ED-105 Aircraft Lightning Test Method’.</p>
comment	<p>46 comment by: UK CAA</p> <p>Page No: 15</p> <p>Paragraph No: 5</p> <p>Comment:</p> <p>The amendment appears to be focussed on the loss of all/part of a windshield section, however, the Chinese recommendation also refers to transparency.</p>



Although the various factors affecting transparency are covered in Section 5 of the AMC, the need to address transparency is not explicitly addressed in the proposed changes (e.g. the amendment refers to structural failure of the windshield, but it isn't clear whether this includes sudden crazing of the windshield material).

It might be helpful to make the reference to transparency more explicit, to ensure that organisations undertaking the analyses identified in the proposed change understand the need to address transparency.

Justification:

This will ensure that organisations undertake a fuller evaluation of the potential events that could lead to lack of transparency in windshields. It will also ensure that the issue of transparency raised in the referenced Chinese accident report is explicitly addressed.

Proposed Text:

Amend the penultimate sentence of the final paragraph to refer to lack of transparency as well as structural failure "...mitigate the risk of any failure condition adversely affecting other adjacent systems or components that may lead to a structural failure or the loss of transparency of the windshield"

response

Accepted

This proposed text was also introduced in the previous paragraph for consistency.

3. Proposed amendments — AMC 25.1541

p. 16

comment

16

comment by: *Mitsubishi Aircraft Corporation*

[Document No.PageChapter]

NPA 2020-11, Page 16

AMC 25.1541 Markings and Placards - General

[Comment]

Mitsubishi requires clarification on which acceptable means of compliance (GAMA Publication No. 15 or FAA AC 25.17A) has priority over the other, If there is a duplication in the application.

response

Noted

Both references provide non-binding standards for the design of symbolic placards that are acceptable to EASA. When selecting the design of placards, the applicant should ensure consistency regarding colour, size, and orientation of the placards in the interior of the aircraft. If in doubt, the applicant may consult EASA.

