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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee - New Task

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC).

SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee (ARAC) a new task to provide recommendations regarding revision of the damage-tolerance and fatigue requirements of Title 14, Code of Federal Regulations (14 CFR), part 25, including subparts C and E of 14 CFR part 26, and development of associated advisory material for metallic, composite, and hybrid structures. Past changes to the damage-tolerance and fatigue airworthiness standards and advisory material have been more specific to transport airplanes constructed predominantly of metal, using skin-stringer-frame architecture. Today, the trend in industry is to use more composite and hybrid structures (i.e., structure that includes a combination of composite and metallic parts and assemblies) to improve the performance of transport airplanes. As a result, the damage-tolerance and fatigue airworthiness standards and advisory material may not be adequate to address this trend. This notice informs the public of the new ARAC activity and solicits membership for the new Transport Airplane Metallic and Composite Structures Working Group.

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SUPPLEMENTARY INFORMATION:

ARAC Acceptance of Task

As a result of the December 18, 2014, ARAC meeting, the FAA has assigned and ARAC has accepted this task establishing the Transport Airplane Metallic and Composite Structures Working Group, under the Transport Airplane and Engine (TAE) Subcommittee. The working group will serve as staff to the ARAC and provide advice and recommendations on the assigned task. The ARAC will review and approve the recommendation report and will submit it to the FAA.

Background

The FAA established the ARAC to provide information, advice, and recommendations on aviation related issues that could result in rulemaking to the FAA Administrator, through the Associate Administrator of Aviation Safety.

The Transport Airplane Metallic and Composite Structures Working Group will provide advice and recommendations to the ARAC on the damage-tolerance and fatigue requirements of part 25 and any associated advisory material for metallic, composite, and hybrid structures. This includes the requirements of and regulatory guidance material for subparts C and E of part 26 and any associated advisory material.

The requirements of § 25.571 apply equally to structure constructed from either metallic or nonmetallic materials. Guidance material is contained in the Federal Aviation Administration (FAA) Advisory Circulars (AC) 25.571-1D and 20-107B for metallic and composite structures, respectively. The changes to § 25.571 that the FAA has adopted over the years have been more specific to the technical issues primarily associated with metallic structure. In Amendment 25-132 to § 25.571, the FAA added requirements for applicants to establish a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV)

and to demonstrate that widespread fatigue damage (WFD) will not occur in the airplane prior to reaching the LOV. The objective of this change, along with the development of the related guidance material, was focused on addressing the normal fatigue wear-out of metallic structure. Among other things, § 25.571 requires applicants to establish an LOV based on WFD considerations, and identify in the structural-maintenance program all maintenance actions required to address fatigue, environmental damage, and accidental damage throughout the operational life of the airplane. In a similar way, subpart C requires certain actions to prevent catastrophic failure due to WFD throughout the operational life of certain existing transport category airplanes. The FAA also adopted subpart E of part 26 to require holders of design approvals to make available to operators damage tolerance data for repairs and alterations to fatigue critical airplane structure. In addition to AC 25.571-1D, guidance material for subparts C and E of part 26 are contained in ACs 120-104 and 120-93, respectively. Because the adoption of those requirements and § 25.571 were primarily focused on metallic structure, the FAA needs to evaluate those rules and advisory material to determine whether further changes are required to address composite structures.

Remaining Rulemaking Recommendations

In 1995, the FAA tasked the ARAC to recommend appropriate revisions for harmonization of § 25.571, supporting policy and guidance material, and corresponding paragraph 25.571 of the Joint Aviation Requirements (JAR), which is now Certification Specification (CS) 25.571 under the European Aviation Safety Agency (EASA). The ARAC formed the General Structures Harmonization Working Group (GSHWG) to carry out that task. In 2003, the GSHWG submitted the Working Group Report on § 25.571 and JAR 25.571 [CS 25.571] to ARAC. That report described proposed changes to harmonize the rules and related

guidance material. The GSHWG recommended revising or adding requirements for inspection thresholds, LOV, and structural damage capability.

Subpart C of part 26 and § 25.571, Amendment 25-132, incorporated the recommendation to add requirements for establishing an LOV. The FAA has not yet addressed the GSHWG recommendations related to inspection thresholds and structural damage capability, and would request these be considered in the context of this rulemaking, which include:

- Replacing the prescriptive requirement of § 25.571(a)(3) for setting damage-tolerance inspection thresholds with a performance-based requirement.
- Adding a requirement for showing structural capability in the presence of damage, so that even if the structure fails partially, there will still be enough structure remaining to be safe.

Increased Use of Composites

Today, the trend in industry is to use more composite structures than in the past. The Small Airplane and Rotorcraft Directorates addressed this trend by creating separate rules for parts 23, 27 and 29 for composite structures (§ 2X.573). This tasking will consider the changes to those rules as part of the evaluation of the damage-tolerance and fatigue airworthiness standards and associated advisory material.

In June of 2009, the FAA Transport Airplane Directorate sought comments through the Federal Register (74 FR 26919) on a need for future rulemaking to address extensive use of composite materials in transport category airplane construction. Several candidate technical areas were noted in the request, including fire safety, crashworthiness, lightning protection, fuel tank safety and damage-tolerance. The response by industry indicated that each area needs

improved guidance and possible rulemaking. We believe the damage-tolerance requirements would require relatively small changes versus some of the updates desired in other areas.

Composite considerations the working group will need to address include:

- Composite analyses and test protocols as related to evolving industry practices and the development of regulatory standards.
- Composite damage threats (e.g., environmental and accidental damage) and associated maintenance practices.
- Large-scale test demonstration of repeated-load reliability and a need to use load enhancement factors for composite structure.
- Thermal stresses generated between metal-composite interfaces, which are difficult to replicate in structural repeated-load testing but are required by § 25.571 to be considered.

Future Applicability

Any future change to § 25.571 should be performance-based to the extent possible, allowing application to not only current aerospace materials and material systems, but those yet to be developed (i.e., emerging technology). Guidance material, including changes to AC 25.571-1D, or AC 20-107B, should provide complete guidance for traditional metal structure, composite structure, and hybrid structure (i.e., structures that include a combination of composite and metallic parts and assemblies).

There are other FAA initiatives in the area of transport crashworthiness, fuel tank lightning protection, and composite flammability testing, which will lead to further standardization of requirements related to composite airframes. These initiatives would not affect § 25.571.

The Task

The Transport Airplane Metallic and Composite Structures Working Group is tasked to:

1. Evaluate § 25.571, subparts C and E of part 26, and associated regulatory guidance material (e.g., advisory circulars and policy statements) to determine whether any changes to the airworthiness standards and/or guidance material are required to address transport airplanes being constructed of metallic, composite, and hybrid structures. The working group is also tasked to evaluate whether any changes to part 25 and the associated regulatory guidance material are required to provide consistency with the damage-tolerance and fatigue airworthiness standards and associated guidance material for parts 23, 27, and 29. The working group is requested to include in its evaluation a review of the following advisory circulars (AC) and policy statements (PS):

a. Advisory Circulars: AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure; AC 20-107, Composite Airframe Structure; AC 120-93, Damage Tolerance Inspections for Repairs and Alterations; AC 120-104, Establishing and Implementing Limit of Validity to Prevent Widespread Fatigue Damage; AC 27-1, Certification of Normal Category Rotorcraft (specifically, Subpart C – Strength Requirements); and AC 29-2, Certification of Transport Category Rotorcraft (specifically, Subpart C – Strength Requirements).

b. Policy Statements: PS-ANM100-1989-00048, Policy Regarding Impact of Modifications and Repairs on the Damage Tolerance Characteristics of Transport Category Airplanes; PS-ACE100-2001-006, Static Strength Substantiation of Composite Airplane Structure; PS-AIR-100-120-07, Guidance for Component Contractor Generated Composite Design Values for Composite Structure; PS-ACE100-2002-006, Material Qualification and Equivalency for Polymer Matrix Composite Material Systems; PS-ANM-100-1991-00049,

Policy Regarding Material Strength Properties and Design Values, § 25.613; PS-ANM100-1993, Compliance with § 25.571(e) Discrete Source Damage (Uncontained Engine Failure).

2. Advise and make written recommendations on whether to change 14 CFR part 25, subparts C and E of 14 CFR part 26, and related regulatory guidance material, such as ACs 25.571-1, 20-107, 120-93, and 120-104, to address the use of metallic, composite, and hybrid structures in transport airplanes. In developing the recommendations, the working group is requested to consider:

a. The threats associated with fatigue, environmental exposure, and accidental damage that must be addressed per § 25.571.

b. Applicability to emerging technology materials.

c. The recommendations contained in the 2003 General Structures Harmonization Working Group (GSHWG) report entitled, “Damage Tolerance and Fatigue Evaluation of Structures, FAR/JAR § 25.571.” You can find the GSHWG report at

http://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/384. The working group recommendations should include whether it

is appropriate to:

i. Require applicants to assume the structure contains an initial flaw of the maximum probable size that could exist as a result of manufacturing or service-induced damage.

ii. Add a requirement for showing structural capability in the presence of damage, so that even if the structure fails partially, there will still be enough structure remaining to be safe.

d. The continued operational safety of composite and hybrid structures as they age, including any airworthiness limitations in the structural maintenance program.

- e. The testing of hybrid structure, including, but not limited to, addressing thermal effects, test duration, load enhancement factors, and crack-growth retardation.
 - f. The bonding or bolting of repairs to metallic, composite, and hybrid structures.
 - g. The certification of large structural modifications on transport airplanes constructed of composite or hybrid structures.
 - h. The EASA rulemaking activity on aging aircraft for harmonization purposes.
3. Provide recommendations on appropriate performance-based requirements to address the results of the evaluations above, with consideration of applicability not only to metals and known composites, but also other emerging technology materials.
4. Provide recommendations on any new guidance or changes to existing guidance, including AC 25.571-1D, and AC 20-107B to address the results of the evaluations above.
5. Provide initial qualitative and quantitative costs and benefits. Based on the recommendations, perform the following:
- a. Estimate the costs to implement the recommendations;
 - b. Estimate the benefits of the recommendations in terms of potential fatalities averted;
 - c. Estimate any other benefits (e.g., reduced administrative burden) that would result from implementation of the recommendations.
6. Develop a report containing recommendations on the findings and results of the tasks explained above.
- a. The recommendation report should document both majority and dissenting positions on the findings and the rationale for each position.
 - b. Any disagreements should be documented, including the rationale for each position and the reasons for the disagreement.

7. The working group may be reinstated to assist the ARAC by responding to the FAA's questions or concerns after the recommendation report has been submitted.

Schedule

The recommendation report must be submitted to the FAA for review and acceptance no later than 24 months after publication of this notice.

Working Group Activity

The Transport Airplane Metallic and Composite Structures Working Group must comply with the procedures adopted by the ARAC. As part of the procedures, the working group must:

1. Conduct a review and analysis of the assigned tasks and any other related materials or documents.
2. Draft and submit a work plan for completion of the task, including the rationale supporting such a plan, for consideration by the Transport Airplane and Engine Subcommittee.
3. Provide a status report at each Transport Airplane and Engine Subcommittee meeting.
4. Draft and submit the recommendation report based on the review and analysis of the assigned tasks.
5. Present the recommendation report at the Transport Airplane and Engine Subcommittee meeting.
6. Present the findings from the additional tasks at the Transport Airplane and Engine Subcommittee meeting.
7. Present the findings in response to the FAA's questions or concerns about the recommendation report at the Transport Airplane and Engine Subcommittee meeting.

Participation in the Working Group

The Transport Airplane Metallic and Composite Structures Working Group will be comprised of technical experts having an interest in the assigned task. A working group member need not be a member representative of the ARAC. The FAA would like a wide range of members to ensure all aspects of the tasks are considered in development of the recommendations. The provisions of the August 13, 2014, Office of Management and Budget guidance, “Revised Guidance on Appointment of Lobbyists to Federal Advisory Committees, Boards, and Commissions” (79 FR 47482), continues the ban on registered lobbyists participating on Agency Boards and Commissions if participating in their “individual capacity.” The revised guidance now allows registered lobbyists to participate on Agency Boards and Commissions in a “representative capacity” for the “express purpose of providing a committee with the views of a nongovernmental entity, a recognizable group of persons or nongovernmental entities (an industry, sector, labor unions, or environmental groups, etc.) or state or local government.” (For further information see Lobbying Disclosure Act of 1995 (LDA) as amended, 2 U.S.C 1603, 1604, and 1605.)

If you wish to become a member of the Transport Airplane Metallic and Composite Structures Working Group, write the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire. Describe your interest in the task and state the expertise you would bring to the working group. The FAA must receive all requests by **[insert date 30 days after publication of this notice]**. The ARAC and the FAA will review the requests and advise you whether or not your request is approved.

If you are chosen for membership on the working group, you must actively participate in the working group by attending all meetings, and providing written comments when requested to do so. You must devote the resources necessary to support the working group in meeting any

assigned deadlines. You must keep your management chain and those you may represent advised of working group activities and decisions to ensure the proposed technical solutions do not conflict with the position of those you represent. Once the working group has begun deliberations, members will not be added or substituted without the approval of the Transport Airplane and Engine Subcommittee Chair, the FAA, including the Designated Federal Officer, and the Working Group Chair.

The Secretary of Transportation determined the formation and use of the ARAC is necessary and in the public interest in connection with the performance of duties imposed on the FAA by law.

ARAC meetings are open to the public. However, meetings of the Transport Airplane Metallic and Composite Structures Working Group are not open to the public, except to the extent individuals with an interest and expertise are selected to participate. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on January 16, 2015.

Lirio Liu,
Designated Federal Officer
Aviation Rulemaking Advisory Committee.

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