U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave
Washington, DC 20591

March 12, 2020

Ms. Yvette A. Rose
Chair, Aviation Rulemaking
Advisory Committee
Cargo Airline Association
1620 L Street, NW, Suite 610
Washington, DC 20036

Dear Ms. Rose:

The Federal Aviation Administration (FAA) is requesting clarification regarding the recommendations provided by the Engine Harmonization Working Group (EHWG) for an engine alternate endurance test as noted in the Aviation Rulemaking Advisory Committee's (ARAC) final recommendation report entitled *"Alternate Test to 14CFR33.87 Endurance Test EHWG task from Federal Register Vol.79, #14 Jan 22nd 2014."* The FAA accepted the report in a letter dated April 23, 2018. The objective for requesting clarification is to ensure the recommended approach to an alternate endurance test is consistently applied among the industry.

Description of Issues:

The FAA found that certain ambiguities in the referenced report could lead to disparate approaches to developing an alternate test under title 14, Code of Federal Regulations (14 CFR) § 33.87, *Endurance test*. These disparate approaches became apparent during a recent engine certification program, leading to significant delays while trying to arrive at an agreed way forward.

The specific issues encountered were related to:

1. The severity equivalence demonstration.

2. The implication that the alternate approach allows a wide scope for an applicant to define its own test, leading to different interpretations and potentially significant differences between applicants. The FAA considers that this should be more precisely defined.

3. The test option based on component metal temperature (Tmetal) to determine the power levels for test points was not exercised by the applicant during a recent program. As this method introduces significant complexity to the justification process for the proposed test conditions, the FAA is requesting that the need for this aspect be reviewed.

Related report recommendations and rationale for clarifications:

The issues listed above are tied to the following sections of the recommendation report:

1. The ARAC recommendation report reflects an intent that the alternate test must meet a benchmarked severity level. Sections 6 and 7 regard creep as a comparative arbiter for test severity and adds an unspecified amount of damage to account for other failure modes that are typical of modern engine designs. Specifically, in sections 2.3(c), 6.3, and 7.2.5 through 7.2.57, the severity benchmark is based on creep levels, while sections 6.3.2, 6.3.3, and 6.3.3.1 suggest the possibility of other damage criteria being used instead, leading to the confusion over the options that are being suggested. Furthermore, there are references (section 6.3.2) that indicate these other damage mechanisms should be identified in the Critical Point Analysis (CPA) process in section 6.2. However, the description of the CPA process (section 6.2) does not cover this.

2. The ARAC recommendation report presents the concept that the alternate test embodies a hybrid of performance-based and prescriptive elements (sections 2.3, 6.3.3, and 7.1). This concept has been interpreted that the applicant may compose a hybrid approach with a relatively high degree of freedom to determine severity targets, among outcomes affecting the overall cycle content and test duration.

3. The ARAC recommendation report, section 6.4.3, describes a Tmetal method to determine the power levels for test points (also introduced in 2.3(b)). It is understood that once successfully substantiated, this approach would allow a less conservative test to be completed. However, the FAA notes that substantiation of this method is likely to be complex. The report does not address how this substantiation might be controlled. Therefore, retaining this option will present challenges within the confines of a certification exercise to the FAA in establishing the adequacy of the methods.

Specific clarification requested:

The FAA requests clarification regarding the following areas of the ARAC recommendation report–

1. Severity equivalence process and its intended purpose.

2. Severity equivalence process for other than creep failure modes, including failure modes not currently addressed by § 33.87 regulation.

3. Constraints for implementing the recommended hybrid performance-based and prescriptive solutions.

4. Role of the engine CPA.

5. Simplify the possible approaches by removing the Tmetal option.

6. Various acceptable outcomes for an alternate endurance test.

The FAA asks if the ARAC would consider the option of reconvening the EHWG to aid the FAA with this effort in determining how best to clarify the recommendation report.

Sincerely,

Brandon Roberts
Acting Executive Director, Office of Rulemaking