



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: ACTION: General Electric (GE) CF6-80C2L1F Program
Request for Review and Concurrence with Equivalent
Level of Safety (ELOS) Finding to 14 CFR Part 33,
§ 33.89 (a) (3) (ii) and (iii) Operation Test

Date: August 30, 2004

From: Manager, Engine Certification Office, ANE-140

Reply

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of: 781-238-7128

To: Manager, Engine and Propeller Standards Staff, ANE-110

Background

In accordance with the provisions of 14 CFR Part 21.21(b)(1), GE has requested an ELOS finding to the 14 CFR Part 33.89 (a)(3)(ii) and (iii) Operation Test for the CF6-80C2L1F engine model. GE is proposing to use the CF6-80C2L1F transient engine computer model to predict the thrust response for the bleed conditions outlined in § 33.89(a)(3)(ii) and (iii) for the CF6-80C2L1F model.

A review of the predicted thrust response times for the CF6-80C2L1F engine model with maximum bleed are approximately 3-5 seconds slower for some conditions compared to the previously certified CF6-80C2BF engine test demonstration. GE supports the validity of this data based on the different power management requirements between the two engine models.

However, the recognition that these values fall outside of the original test data results in the need to use the data generated by analysis to define these thrust response characteristics of the CF6-80C2L1F engine model. The use of analysis to develop this data is not in direct compliance to the requirements of § 33.89(a)(3)(ii) and (iii) and thus requires a finding on the basis of an equivalent level of safety assessment.

Affected Regulation

§ 33.89 Operation Test

The operation test must include testing found necessary by the Administrator to demonstrate--

(3) The minimum power or thrust response time to 95% rated takeoff power or thrust, from power lever positions representative of minimum idle and of minimum flight idle, starting from stabilized idle operation, under the following engine load conditions:

(ii) Maximum allowable bleed air and power extraction for aircraft use.

(iii) An intermediate value for bleed air and power extraction representative of that which might

be used as a maximum for aircraft during approach to a landing.

Compensating Factors

The FAA has reviewed and concurred with GE's use of CF6-80C2L1F transient engine computer model analysis to develop the thrust response data as an equivalent method of compliance for the bleed conditions outlined in § 33.89(a)(3)(ii) and (iii). However, to be considered for an ELOS finding for the CF6-80C2L1F model, the certification report submitted for compliance to § 33.89(a)(3)(ii) and (iii) must:

- Show that the CF6-80C2L1F FADEC engine model transient analysis can predict the acceleration times, engine rotor speeds and stall margin/operability data required by the regulations.
- Show that the analysis models the CF6-80C2L1F engine and its power management.
- Show that the analysis is correlated to the prior certification FADEC engine no bleed and bleed test results and to CF6-80C2L1F engine test results, which were conducted without bleed.

Conclusion

We have reviewed and approved GE certification report R2004AE132 Revision 2, "CF6-80C2L1F Thrust Response and Operations Test," August 2004, which shows that:

- The CF6-80C2L1F FADEC engine model transient analysis can predict the acceleration times, engine rotor speeds and stall margin/operability data required by the regulations.
- The analysis models the CF6-80C2L1F engine and its power management.
- The analysis is correlated to the prior certification FADEC engine no bleed and bleed test results and to CF6-80C2L1F engine test results, which were conducted without bleed.

Therefore, this office recommends that the Engine and Propeller Standards Staff concur with this ELOS finding to the requirements of § 33.89(a)(3)(ii) and (iii).

Upon concurrence, ELOS finding number 8040-ELOS-04-NE-02 will be listed on the CF6-80C2 type certificate data sheet as part of the certification basis for the CF6-80C2L1F engine model as follows:

Equivalent Level of Safety Finding, 8040-ELOS-04-NE-02, for § 33.89(a)(3)(ii) and (iii).

Original signed by

Robert E. Guyotte
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Concurrence

Original signed by

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File codes: Project File: AT1775EN-E, ELOS File: 8040-ELOS-04-NE