Federal Aviation Administration

Memorandum

Date:

To: Thomas Boudreau, Manager, Engine Certification Office, ANE-140

From: Colleen D'Alessandro, Manager, Engine & Propeller Directorate, ANE-100

Prepared by: Brian Klinka, ANE-141

Subject: INFORMATION: Equivalent Level of Safety (ELOS) finding for the GE Passport 20-17BB1A, GE Passport 20-18BB1A, GE Passport 20-19BB1A Engines

ELOS Memo #: TC 3323EN-E-P-10

Regulatory Ref: 14 CFR 21.21 and 33.76 Bird Ingestion

The Engine & Propeller Directorate established an equivalent level of safety finding for the GE Passport 20-17BB1A, GE Passport 20-18BB1A, GE Passport 20-19BB1A Engines.

Background

On March 23, 2015, GE notified the FAA that during post-test data reduction they identified that three changes in thrust level specific in §33.76(c)(7) took longer than the 10 seconds prescribed in §33.76(c)(7)(ix). All other requirements of §33.76(c) were successfully achieved. The three throttle movements included one acceleration (idle to 75% thrust) and two decelerations (40% thrust to idle and 75% thrust to idle). These throttle movements took 13 seconds, 18 seconds, and 12 seconds, respectively.

GE proposed to use a combination of engineering test data and analysis to substantiate that the certification test engine would not have experienced any operability issues had the throttle movements been accomplished in the time prescribed in §33.76(c)(7)(ix).

Applicable regulation(s)

14 CFR 21.21, 14 CFR 33.76(c) (7) (ix)

Regulation(s) requiring an ELOS finding

14 CFR 33.76(c) (7) (ix)

Description of compensating design features or alternative Methods of Compliance (MoC) which allow the granting of the ELOS (including design changes, limitations or equipment needed for equivalency)

GE substantiated an equivalent level of safety to the requirement in 33.76(c) (7) (ix) with the following compensating factors:

a) Conducted a transient model analysis of the post-test run-on for medium bird simulating throttle movements that are in compliance with 33.76(c)(7)(ix) and comparing to the as tested throttle movements.
b) Conducted an engineering test on an engine that is significantly representative of the original test engine in post bird event condition.
c) The engine test data was used to validate the transient model.
d) The engine test data showed that the engine capability in acceleration meets or exceeds the requirement for 10 second throttle movements.
e) The validated transient model results showed that 10 second throttle movements have similar accel rate, fuel to air ratio and fan speeds as the medium bird certification run-on test. Thus, the data showed the throttle movements that exceeded 10 seconds did not impact the certification test results.

Explanation of how design features or alternative Methods of Compliance (MoC) provide an equivalent level of safety to the level of safety intended by the regulation

The compensating factors listed above constitute an ELoS to Section 33.76 because the transient model analysis and the follow-on engine test have demonstrated that the medium flocking bird test engine response would have been acceptable had the original test been run in accordance with the regulation and therefore the 3 test segments where the 10 second throttle movement rate requirement was exceeded, had no impact on the certification test results.

FAA approval and documentation of the ELOS finding:

The FAA has approved the aforementioned ELOS finding in GE Passport 20, issue paper P-10. This memorandum provides standardized documentation of the ELOS findings that are nonproprietary and can be made available to the public. The Engine & Propeller Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number will be listed in the Type Certificate Data Sheet under the Certification Basis. An example of an appropriate statement is provided below.

Equivalent Level of Safety Findings has been made for the following regulation(s):

14 CFR 33.76(c) (7) (ix) Bird Ingestion documented in ELOS Memo TC 3323EN-E-P-10

This ELOS is initially applicable to the engine model(s) listed herein. When the type certificate for that engine model is amended to include other engine model(s) where we find that the compensating factors described herein constitute an ELOS, we will apply this ELOS to the additional engine model(s). In that case, the complete list of models incorporating this ELOS is included in the certification basis section of the Type Certificate Data Sheet.

/s/

Manager, Engine & Propeller Directorate
Aircraft Certification Service

01/06/2016

Date

ELOS Originated by ACO:	ACO Manager:	Routing Symbol:
Engine Certification Office	Thomas Boudreau	ANE-140