



# Federal Aviation Administration

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## Memorandum

Date: November 3, 2010

To: Manager, Engine Certification Office (ECO), ANE-140

From: Manager, Engine & Propeller Directorate, ANE-100

Prepared by: John F. Dargin (ECO), ANE-142

Subject: **INFORMATION:** Equivalent Level of Safety (ELOS) Finding for Pratt & Whitney (PWA) JT8D-217C/-219 (JSTARS) Certification Program, FAA project # 2932EN-E

ELOS Memo#: 8040-ELOS-10-NE04

Regulatory Ref: 14 CFR Part 33, Section (§) 33.87 Endurance Test

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### Background

In accordance with the provisions of 14 CFR Part 21, §21.21(b)(1), the FAA has determined an alternate method of compliance to §33.87(b)(2)(ii) is needed for the JT8D-217C/-219 major engineering change in design of the tower shaft drive train system, through an Equivalent Level of Safety (ELOS) finding. Alternative testing was chosen as the alternate method of compliance. In particular, PWA proposed to assess durability for the redesigned tower shaft drive train system using alternative test cycles and durations from which the cumulative damage will meet or exceed damage demonstrated under direct compliance to §33.87(b)(2)(ii).

Applicable Regulation(s)

§ 33.87, Endurance Test:

**Regulation(s) requiring ELOS**

§ 33.87(b)(2)

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

The alternative method of compliance, which allows the granting of the ELOS, was to subject the tower shaft drive train system to 186 takeoff increments resulting in 5.6 hours of test time, versus the ten 30 minute segments (5 hours) required by §33.87 (b)(2)(ii). Additionally, the hardware was subjected to 50 hours at the Maximum Continuous rating, running at higher torque loads.

**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 186 takeoff increments (5.6 hours of test time) created a more challenging situation for the tower shaft drive train system through the application of load-on followed by load-off cycling in comparison to §33.87 (b)(2)(ii).

Additionally, the hardware was subjected to 50 hours of Maximum Continuous run time, 5 hours more than required, during which it was exposed to higher torque loads due to the power, torque, speed relationship (Torque=power/speed). Thus, running at the lower speed associated with the Maximum Continuous rating, while extracting 90kVA of power, resulted in a more severe test demonstration than that required by § 33.87 (b)(2)(ii), which is at the higher speed, and consequently lower torque, associated with the Takeoff rating.

The FAA has determined that this alternate method of compliance PWA demonstrated, for the major change in design of the tower shaft drive train system, provides an equivalent level of safety to the level of safety intended by compliance to § 33.87(b)(2)(ii), for the JT8D-217C/-219 engine models.

**FAA approval and documentation of the ELOS finding:**

The FAA has approved the aforementioned equivalent level of safety finding in the JT8D-217C/-219 Issue Paper P-1. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The FAA has assigned a unique ELOS Memorandum number, (8040-ELOS-10-NE04), to facilitate archiving and retrieval of this ELOS documentation. This ELOS Memorandum number will be listed in the Type Certificate Data Sheet as part of the certification basis for the JT8D-217C/-219 engine models with MEC 01HA018 installed:

Equivalent Level of Safety Findings have been made for the following regulation(s):  
14 CFR § 33.87, Endurance Test, para (b)(2)(ii), (documented in ELOS No. 8040-ELOS-10-NE04)



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11-05-2010  
Date