



Federal Aviation Administration

Memorandum

Date: June 24, 2014

To: Manager, Military Certification Office, ACE-100M

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Frank Mokry, ACE-100M

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for
Vibration/Buffeting Compliance Criteria on Airbus Model A319-133,
FAA Project Number ST00329MC-T

Memo No: ST00329MC-T-F-1

Reg. Ref: 14 CFR 25.251(b)

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate (TAD) on the establishment of an equivalent level of safety (ELOS) finding for the Airbus Model A319-133.

Background

The means of demonstrating compliance with Title 14, Code of Federal Regulations (14 CFR) 25.251(b) is cited in the rule (“each part of the airplane must be demonstrated in flight to be free from excessive vibration under any appropriate speed and power conditions up to V_{DF}/M_{DF} ”). Therefore, a flight demonstration out to V_{DF}/M_{DF} is required to demonstrate compliance with the rule. When external modifications are made to an existing type design, compliance with § 25.251(b) must be addressed.

FedEx proposed an ELOS with § 25.251(b) by means other than flight testing up to V_{DF}/M_{DF} , that the installation would not cause excessive vibration under any appropriate speed and power conditions up to V_{DF}/M_{DF} .

Applicable regulation(s)

14 CFR 25.251(b)

Regulation(s) requiring an ELOS finding

14 CFR 25.251(b)

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 following procedure shows the original aircraft type design § 25.251(b) compliance demonstration remains valid for the case of multiple external flush mounted installations to the Airbus Model A319-133:

1. The Navier-Stokes based software, CFD++, previously accepted by the FAA as a computational fluid dynamics (CFD) tool, is capable of accurately assessing whether a shock is present, including its strength and location, and the area of separated flow. The design and location of the modifications installed on the Airbus Model A319-133 results in acceptable downstream flow field conditions at local Mach numbers.
2. A Navier-Stokes CFD model developed for the Airbus Model A319-133 installation is used to make calculations for flight conditions V_{MO}/M_{MO} and V_D/M_D . The Airbus Model A319-133 CFD model fidelity, grid size, and spacing matches that of a previously validated CFD model. Shock locations, strengths and downstream total pressure loss for the Airbus Model A340-300 results are in acceptable ranges.
3. Flight testing out to V_{MO}/M_{MO} on the Airbus Model A319-133 aircraft installation is used to further demonstrate there is no impact to the original § 25.251(b) compliance predicted by the analysis accomplished in Item 2 above.
4. Provided that above Items 1 through 3 are shown, this installation on the Airbus Model A319-133 does not invalidate the existing § 25.251(b) compliance demonstration for the original Airbus Model A319-133.

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

Well-designed modifications (not extensive from a complete aircraft perspective) strategically placed in regions having minimal downstream flow field impact should not pose a significant impact to overall aircraft aerodynamics or vibration characteristics. In such cases, the original aircraft type certification § 25.251(b) compliance demonstration should remain valid.

Given these factors, the criticality/risks of performing high speed tests, the Airbus Model A319-133 installations are shown compliant, and the above Items 1 through 4 in the previous section are shown, the Airbus Model A319-133 installations provide an ELOS to the requirements of § 25.251(b).

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in project issue paper F-1. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The TAD has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Limitations and Conditions section of the STC. An example of an appropriate statement is provided below.

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

14 CFR 25.251(b) Vibration and buffeting

(documented in TAD ELOS Memo ST00329MC-T-F-1)

Original Signed by

Robert Duffer

Transport Airplane Directorate,
Aircraft Certification Service

June 24, 2014

Date

ELOS Originated by MCO	Frank Mokry	ACE-100M
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