



Federal Aviation Administration

Memorandum

Date: August 28, 2014

To: Manager, Boeing Aviation Safety Oversight Office, ANM-100B

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Kenneth Paoletti, ANM-106B

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Flight Flutter Test Requirement on a Boeing Model 767-2C Airplane, FAA Project # PS09-0863

ELOS Memo #: PS09-0863-A-2

Regulatory Ref: 14 CFR 21.21(b)(1) and 25.629(e)

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 Boeing Model 767-2C airplane.

Background

Title 14, Code of Federal Regulations (14 CFR) 25.629(e) states that “Full scale flight flutter tests at speeds up to V_{DF}/M_{DF} must be conducted for new type designs and for modifications to a type design unless the modifications have been shown to have an insignificant effect on the aeroelastic stability.” The applicant requested to show flutter compliance through analysis only and not to perform flight flutter tests.

Applicable regulation(s)

14 CFR 25.629(e)

Regulation(s) requiring an ELOS finding

14 CFR 25.629(e)

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)

The Model 767-2C modifications relative to prior Model 767 airplanes are not insignificant in their effect on aeroelastic stability. However, the changes do not have a significant adverse effect on flutter clearance margins. Boeing performed extensive ground and flight flutter testing on prior Model 767 airplanes and demonstrated considerable margin for aeroelastic stability. The compensating factors providing an ELOS for the regulations not complied with are as follows:

- **Analysis:** The Model 767-2C modifications are simple changes in structural stiffness and mass properties within the scope of changes performed to similar analytical models. Flutter analysis predicts increased margins for the modes that are primarily affected by the changes to the aircraft. No reduction in overall airplane clearance for flutter is predicted.
- **Prior Testing:** There exists a large body of test data on prior Model 767 airplanes demonstrating large margins to flutter requirements both for proper damping up to V_{DF}/M_{DF} and no large and rapid reduction in damping as V_{DF}/M_{DF} is approached. This prior testing was used to improve the analytical models and recent derivatives incorporated only very minor refinements.

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 raise the level of safety to that required by § 25.629(e) by the fact that the Model 767-2C configuration shows either no change, or an increase in flutter margins when compared to prior Model 767 airplanes which exhibit large flutter margins.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in project issue paper A-2. 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 finding. This ELOS memorandum number should be listed in the type certificate data sheet under the Certification Basis section. An example of an appropriate statement is provided below.

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

14 CFR 25.629(e) Aeroelastic stability requirements

(documented in TAD ELOS Memorandum PS09-0863-A-2)

Original Signed by

Suzanne Masterson

Transport Airplane Directorate,
Aircraft Certification Service

August 28, 2014

Date

ELOS Originated by BASOO	Project Engineer Ken Paoletti	ANM-106B
--------------------------	----------------------------------	----------