



Federal Aviation Administration

Memorandum

Date: November 20, 2015

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Mark Freisthler, ANM-120S

Subject: INFORMATION: Equivalent Level of Safety (ELOS) for Aeroelastic Stability Requirements on Boeing Models 787-8/-9/-10 (Project Nos. TC6918SE-T, PS06-0496, PS06-0497, PS13-0546 and PS14-1031)

Memo No.: TC6918SE-T-A-13

Reg. Ref.: §§ 25.629, 25.671(c)(2)

The purpose of this memorandum is to inform the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate on the establishment of an equivalent level of safety finding for the Model 787-8 series of aircraft.

This memo was subsequently revised to extend this ELOS to the Boeing Model 787-9 and 787-10 airplanes.

Background

The aeroelastic stability requirements of Title 14, Code of Federal Regulations (14 CFR) 25.629 include consideration of the failure criteria identified in § 25.671 (Control systems). To demonstrate compliance with the failure criteria referenced in § 25.629, Boeing has requested to use the draft harmonized proposal from the Flight Controls Harmonization Working Group (FCHWG) Aviation Rulemaking Advisory Committee (ARAC) in lieu of the current § 25.671(c)(2), as well as the draft harmonized Advisory Circular (AC)/Advisory Material Joint (AMJ) 25.1309 (“ARSENAL” version) from the System Design and Analysis Harmonization Working Group (SDAHWG).

Applicable regulation(s)

§§ 25.629, 25.671(c)(2)

Regulation(s) requiring an ELOS

§ 25.629

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

This equivalent safety finding is similar to Boeing's request for equivalent safety finding to § 25.671(c)(2) by using the draft harmonized rule from the FCHWG ARAC report, and utilizing the means of compliance guidance in the associated draft harmonized advisory material, as well as the draft harmonized AC/AMJ 25.1309, from the SDAHWG. This equivalent safety finding applies to § 25.629. It requires the consideration of the failure criteria specified in § 25.671.

For this equivalent safety finding, Boeing will highlight all significant latent failures in the safety analysis that could leave the airplane one failure away from a catastrophic failure condition. Boeing will review all significant latent failures with the FAA. Boeing will document that in the presence of any single failure in the flight control system (excluding jams), any additional failure states that could prevent continued safe flight and landing have a combined probability of less than 1 in 1000.

Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

As a condition for the equivalent safety finding, failure conditions that are classified as catastrophic and that occur as a result of two failures, either of which is latent, must be highlighted in the system safety assessment and are subject to review by the FAA. This review will ensure that any such failure conditions are, in fact, extremely improbable by assessing the failure rates and service history of each component, the inspection type and interval for any component whose failure would be latent, and any possible common cause or cascading failure modes.

These criteria are derived from guidance material recently developed by ARAC for use in the proposed revision to AC 25.1309. This guidance states, "The use of periodic maintenance or flight crew checks to detect significant latent failures when they occur is undesirable and should not be used in lieu of practical and reliable failure monitoring and indications. Where this is not accomplished, the system safety assessment should highlight all those significant latent failures that leave the airplane one failure away from a failure condition classified as catastrophic. These cases should be discussed with the FAA as early as possible after identification."

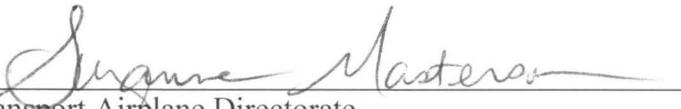
In accordance with Federal Aviation Administration (FAA) policy, an applicant may request the use of a mature ARAC proposal, in lieu of the current requirement(s), as providing an equivalent level of safety.

FAA approval and documentation of the ELOS

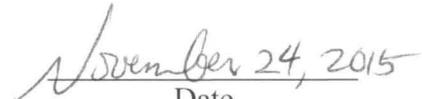
The FAA has approved the aforementioned ELOS finding in project Issue Paper A-13 or Administrative Collector Issue Paper G-6. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The

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 type certificate data sheet under the Certification Basis section. An example of an appropriate statement is provided below.

Equivalent Safety Findings have been made for the following regulation(s):
§ 25.629, "Design and Construction – Aeroelastic Stability Requirements" (documented in TAD ELOS Memo TC6918SE-T-A-13).



Transport Airplane Directorate,
Aircraft Certification Service



Date

ELOS Originated by ACO:	Mark Freisthler	ANM-120S
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