



Federal Aviation Administration

Memorandum

Date: January 28, 2016

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Ian Won, ANM-120S

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

Memo No.: TC6918SE-T-A-11

Reg. Ref.: §§ 25.391, 25.393, 25.415, and 25.519

The purpose of this memorandum is to inform 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 Model 787-8 airplane.

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

Background

Boeing has requested to use the certification requirements of the European Aviation Safety Agency (EASA) Certification Specification (CS) 25, Initial Issue published October 17, 2003, for showing compliance to the ground gust requirements for control system and surface loads of Title 14, Code of Federal Regulations (14 CFR) 25.391, 25.395, and 25.415.

Within the Aviation Rulemaking Advisory Committee (ARAC) forum, regulatory authorities and industry proposed revisions to ground gust requirements for control system and surface loads: §§ 25.391, 25.395, and 25.415. The technical aspects of this recommendation were agreed upon and accepted by the ARAC Loads and Dynamics Harmonization Working Group. The ARAC recommendation was incorporated by EASA CS-25 in its initial issue, and by the FAA in Amendment 25-141. The certification bases of Boeing Models 787-8, 787-9, and 787-10 were

established prior to the FAA's issuance of Amendment 25 141. Therefore, this equivalent safety finding is necessary for §§ 25.391, 25.395(b) and 25.415 at the amendment levels prior to amendment 25-141, which were the amendment levels of these rules included in the certification bases of Boeing Models 787-8, 787-9, and 787-10.

Applicable regulation(s)

§§ 25.391, 25.393, 25.415, 25.519

Regulation(s) requiring an ELOS

§ 25.391 amendment 25-86,
§ 25.395 amendment 25-72, and
§ 25.415 amendment 25-91

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

The requirement to consider the effects of ground gusts on control surface and control system loads has been applied to large transport category airplanes since 1950. The purpose of the requirement was to protect the flight control system from excessive peak ground wind loads while the airplane is parked or while taxiing downwind.

There were several incidents and accidents in the past caused by hidden damage that had previously occurred in ground gust conditions. Although many of these events were for airplanes that had used lower wind speeds from the earlier rules, analysis indicates that the most significant contributor to the damage was the dynamic load effect. The dynamic effects were most significant for control system designs in which the gust locks were designed to engage the control system at locations far from the control surface horn. Based on these events, additional factors are defined in the ARAC recommendations / EASA CS-25 for use in those portions of the system and surface that could be affected by dynamic effects.

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

Within the Aviation Rulemaking Advisory Committee (ARAC) forum, regulatory authorities and industry have proposed revisions to current ground gust requirements for control system and surface loads - §§ 25.391, 25.395, and 25.415. In addition, the ARAC recommendation includes corresponding advisory material. The technical aspects of this recommendation have been agreed upon and have been accepted by the ARAC Loads and Dynamics Harmonization Working Group. The ARAC recommendation has been incorporated by EASA CS-25, and was adopted into 14 CFR at amendment 25-141.

In accordance with Federal Aviation Administration (FAA) policy, an applicant may request the use of a mature ARAC proposal, in lieu of the corresponding requirement(s), as providing an equivalent level of safety. This issue paper documents the Boeing request and FAA finding.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned ELOS finding in project Issue Paper A-11 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 regulations:

§ 25.391 Control Surface Loads: General

§ 25.395 Control System

§ 25.415 Ground Gust Conditions

(documented in TAD ELOS Memo TC6918SE-T-A-11).

Transport Airplane Directorate,
Aircraft Certification Service

Date

ELOS Originated by ACO:	Ian Won	ANM-120S
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