U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Subject:	Information: Equivalent Level of Safety Finding for the Alenia Aeronautica Model C-27J FAA Project Number TC0371IB-T	Date:	March 17, 2010
		Reg Ref:	14 CFR 25.671(c)(2)
From:	Manager, Airframe/Cabin Safety Branch, ANM-115 Transport Standards Staff	Reply to Attn of:	Todd Martin ANM-115
To:	Manager, International Branch, ANM-116	ELOS Memo #:	TC0371IB-T-S-5

Background
The Alenia Model C-27J must be shown capable of continued safe flight and landing, without requiring exceptional piloting skill or strength, for any single failure regardless of probability, and certain combinations of failures not shown to be extremely improbable. The requirement for the consideration of failure conditions in the flight control systems are covered specifically by § 25.671 and in general by § 25.1309.

Alenia has proposed an equivalent level of safety finding with respect to § 25.671(c)(2) based on a proposal from the Aviation Rulemaking Advisory Committee's Flight Controls Harmonization Working Group (FCHWG). This proposal provides guidelines on what should be an acceptable risk level after the occurrence of any single failure in the flight control system.

Applicable regulation(s)
§ 25.671(c)(2)

Regulation(s) requiring an ELOS
§ 25.671(c)(2)

Description of compensating design features or alternative standards that allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)
In lieu of existing Section 25.671 (c)(2) the following standards apply:

I. The airplane must be shown to be capable of continued safe flight and landing after any combination of failures not shown to be extremely improbable. Furthermore, in the presence of any single failure in the flight control system, any additional failure states that could prevent continued safe flight and landing shall have a combined probability of less than 1 in 1000.

II. 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, subject to review by the FAA. This review will ensure that any such failure conditions are, in fact, extremely improbable by assessing 1) the failure rates and service history of each component, 2) the inspection type and interval for any component whose failure would be latent, and 3) any possible common cause or cascading failure modes.

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

By adopting a clear definition of acceptable risk level for subsequent failures, the ARAC proposed approach (paragraph I) has the advantage of 1) addressing latency, and 2) eliminating possible dubious judgments in the determination of probable failures. However, the ARAC proposed criteria differs from the existing § 25.671(c)(2), both in probability numbers and in how latency is considered. Therefore, to provide an equivalent level of safety to the existing rule, the Transport Airplane Directorate has added the criteria given in paragraph II.

The additional criterion are derived from guidance material recently developed by ARAC for use in the proposed revision to Advisory Circular 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."

The combined approach (paragraphs I. and II. above) provide an equivalent level of safety to § 25.671(c)(2).

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned equivalent level of safety finding as documented in Issue Paper S-5. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Airplane Directorate 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. [e.g., An equivalent level of safety finding have been made for the following regulation(s):

§ 25.671(c)(2) Flight Control System Failure Criteria (documented in TAD ELOS Memo TC03711B-T-S-5)]

Franklin Tsangaris 3/17/10

Manager, Airframe/Cabin Safety Branch, ANM-115
Transport Standards Staff,

Date

ELOS Originated by: Standards Staff, Structures Branch	Project Engineer Todd Martin	Routing Symbol ANM-115