



Federal Aviation Administration

Memorandum

Date: September 7, 2012

To: Manager, New York ACO, ANE170

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Kent Fredrickson, ANE-173

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Flight
Critical Thrust Reverser on BD-500-1A10 and 1A11,
FAA Project *TC4948NY-T*

ELOS Memo#: TC4948NY-T-P-20

Regulatory Ref: § 21.21(b)(1), § 25.933(a)(1), § 25.1309(b)(1)

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 Bombardier BD-500-1A10 and 1A11.

Background

Bombardier Aerospace (BA) is proposing an Equivalent Level of Safety Finding (ELOS) using the established rules of European Aviation Safety Agency (EASA) certification specifications (CS) 25.933(a)(1), in lieu of applying the Title 14, Code of Federal Regulations (14 CFR) 25.933(a)(1) regulation.

CS 25.933(a)(1) allows certification of a Thrust Reverser (TR) system based on reliability methods.

CS 25.933(a)(1) and associated guidance material in AMC 25.933(a)(1) were adopted in CS 25 at Amendment 1 (NPA13/2004) following the recommendations of the Powerplant Installation Harmonization Working Group (PIHWG) convened by the Federal Aviation Administration (FAA) Aviation Rulemaking Advisory Committee (ARAC). Part 25 has not been harmonized with EASA CS 25 at this time.

Applicable regulation(s)

§§ 21.21(b)(1), 25.933(a)(1), 25.1309(b)(1)

Regulation(s) requiring an ELOS finding

§ 25.933(a)(1)

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 BA C-Series airplane TR system is a conventional reverse translating cowl system with blocker doors and fixed cascades to control the efflux pattern using airplane hydraulics for actuation.

It is controlled by the Throttle Quadrant Assembly (TQA) and the engine's Full Authority Digital Engine Control (FADEC). Permissions to allow TR actuation include TQA position sensors (micro switches and rotary variable differential transformer (RVDT) feedback); ground logic to control hydraulic pressure to the unit; hydraulic control to overstroke the unit to unlock the actuator locks (4 per engine); and electrical and hydraulics to unlock the track locks (2 per engine). The FADEC maintains the engine at idle during the TR transition; continuously monitors the health of the TR system and annunciates failure to the crew; and records faults for and inhibits its operation as required.

Bombardier will show compliance to EASA CS 25.933(a)(1) in lieu of 14 CFR 25.933(a)(1). Bombardier will also follow the guidance provided in CS 25 AMC 25.933(a)(1) as a suitable means to demonstrate compliance to the requirement and show inadvertent deployment to be extremely improbable.

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

Bombardier will show that in-flight thrust reversal is extremely improbable and does not result from a single failure or malfunction.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in project Issue Paper P-20. 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 type certificate data sheet under the certification basis section (TC's & ATC's).

Equivalent Level of Safety Findings have been made for the following regulation(s):
§ 25.933(a)(1) Reversing Systems(documented in TAD ELOS Memo TC4948NY-T-P-20)

Original signed by Victor Wicklund

10/3//2012

Transport Airplane Directorate,
Aircraft Certification Service

Date

ELOS Originated by NYACO:	Kent Fredrickson, 516 228-7364	ANE-173
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