



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: Action: Review and Concurrence, Equivalent Level of Safety Finding for Embraer S.A. Model EMB-135BJ
FAA Project Number No. AT5124AT-T

Date: August 15, 2002

Reg. Ref: 25.721(b) and 25.963(d).

From: Manager, Airframe & Cabin Safety Branch, ANM-115

Reply to
Attn of: Carla Worthey
ACE-118 A

To: Manager, Atlanta ACO, ACE-115 A

ELOS
Memo #: AT5124AT-T-A-2

Background

The EMB-135BJ aircraft has a forward belly-mounted fuel tank. In order to address concerns about forward fuel tank protection in the event of a landing where the fuel tank may possibly be damaged and leak a hazardous amount of fuel, Embraer demonstrated compliance to the new harmonized minor crash conditions requirement from the ARAC Loads and Dynamics Harmonization Working Group instead of demonstrating compliance to 14 CFR part 25.721(b) and 25.963(d). Compliance with the harmonized standards is being proposed as an equivalent means of compliance to the paragraphs above.

Applicable regulation(s)

25.721(b) and 25.963(d).

Regulation(s) requiring an ELOS

25.721(b) at Amendment 25-32, and the second sentence of 25.963(d) at Amendment 25-69

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 FAA accepts the Embraer proposal to use the draft harmonized standards for establishing the minor crash condition for showing compliance to 14 CFR part 25.721(b) and the second sentence of 25.963(d) for the airplane. The following requirements are proposed as an equivalent level of safety to the requirements of 14 CFR part 25.721(b) and 25.963(d):

In lieu of the requirements of 14 CFR part 25.721(b) (Amendment 25-32), the following apply: The airplane must be designed to avoid any rupture leading to the spillage of enough fuel to constitute a fire hazard as a result of a wheels-up landing on a paved runway, under the following minor crash landing conditions:

(1) Impact at 5 fps vertical velocity, with the airplane under control, at Maximum Design Landing Weight, all gears retracted and in any other combination of gear legs not extended. It should be demonstrated for the entire landing sequence assuming a coefficient of friction of up to 0.8, or lesser value substantiated by test, between the shoe of the keel beam skid and the prepared surface at minimum flying speed;

-that the pilot has response capability and control authority adequate to maintain the airplane with the forward fuselage held off the ground until the airplane slows to a speed where the impact of the forward fuselage with the runway is negligible, or;

-that the forward fuselage is capable of sustaining impact associated with the resulting pitching down motion of the fuselage upon airplane contact with the surface, without failure or deformations of the forward fuselage that would damage the tank.

(2) Sliding on the ground, all gears retracted up to a 20° yaw angle and as a separate condition, sliding with any other combination of gear legs not extended with 0° yaw.

In lieu of the requirements of the second sentence of 14 CFR 25.963(d) (Amendment 25-69), the following apply:

For each fuel tank and surrounding airframe structure, the effects of crushing and scraping actions with the ground should not cause the spillage of enough fuel, or generate temperatures that would constitute a fire hazard under the gear up conditions described above.

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

The ARAC proposal provides a more objective performance standard, and a crash condition potentially more severe than that required by the current regulations.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in Issue Paper A-2. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport 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 (TC's & ATC's) or on page 3 of the STC Certificate. [E.g.

Equivalent Safety Findings have been made for the following regulation(s):
25.721(b) and 25.963(d). Landing Gear-General and Fuel Tanks: General (documented in TAD ELOS Memo No. AT5124AT-T-A-2)]

Original signed by Franklin Tiangsing

Manager, Airframe & Cabin Safety Branch, ANM-115

9/18/02

Date

ELOS Originated by Atlanta ACO:	Program Manager: Carla Worthey	Routing Symbol ACE-118 A
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