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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE280; Special Conditions No. 23–220–SC]

Special Conditions: Embraer S.A., Model EMB–500; High Fuel Temperature

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Embraer S.A., Model EMB–500 airplane. This airplane will have a novel or unusual design feature(s) associated with high fuel temperature. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: *Effective Date:* June 10, 2008.

FOR FURTHER INFORMATION CONTACT: Peter L. Rouse, Federal Aviation Administration, Aircraft Certification Service, Small Airplane Directorate, ACE–111, 901 Locust, Kansas City, Missouri, 816–329–4135, fax 816–329–4090.

SUPPLEMENTARY INFORMATION:

Background

On October 5, 2005, Embraer S.A. applied for a type certificate for their new Model EMB–500. The Model EMB–500 is a normal category, low-winged monoplane with ''T'' tailed vertical and horizontal stabilizers, retractable tricycle type landing gear and twin turbofan engines mounted on the aircraft fuselage. Its design characteristics include a predominance of metallic construction. The maximum takeoff weight is 9,965 pounds, the V_{MO}/M_{MO} is 275 KIAS/M 0.70 and maximum altitude is 41,000 feet.

Fuel temperatures on the Embraer EMB 500 are higher than envisioned by 14 CFR part 23. The rule governing fuel system hot weather operation is 14 CFR part 23, § 23.961, and the rule requires the following:

> Each fuel system must be free from vapor lock when using fuel at its critical temperature, with respect to vapor formation, when operating the airplane in all critical operating and environmental conditions for which approval is requested. For turbine fuel, the initial temperature must be 110 °F, −0°, +5° or the maximum outside air temperature for which approval is requested, whichever is more critical.

During other airplane certification projects, the fuel system temperatures associated with the PW600 series turbofan engines were much higher than those previously encountered on other engines. The engine oil/fuel heat fuel system includes an exchanger that cools the oil and heats the fuel. Consequently, the motive flow fuel that is returned to the airplane from the engine is hot and heats the airplane wing fuel and tank. As a result, on the PW615F, the engine inlet maximum fuel temperature was increased from a development value of 126 °F (52 °C) to an initial (Transport Canada) certification value of 172 °F (78 °C) for kerosene type fuels.

Initial concerns regarding the safe operation of the airplane with fuel temperatures significantly greater than 110 °F are identified as:

- Fuel degradation with resultant byproducts at high temperatures
- Operation with the higher vapor liquid ratios
- Fuel system component qualification at the higher temperatures
- Solubility of water in fuel
- Microbial growth
- Fuel tank material/surrounding structure compatibility with the elevated temperatures
- Service and maintenance personnel susceptibility to burns

An initial review of FAA experience regarding airplane fuel temperatures identifies that for large part 25 aircraft, fuel temperature upper limits are characterized by § 25.961 values, i.e. 110–120 °F. Operationally, the buildup of vapor pockets within fuel lines has been an issue from this perspective for large transport category airplanes. A summary of the maximum engine inlet fuel temperatures for engines used in part 23 and part 25 business jet airplanes that are FAA certified follows:

Engine Model	Sea level maximum inlet fuel temperature
PWC615F	126 F (52 C) draft IM
PWC615F	172 F (78 C) Transport Canada
PWC615F	190 F (88 C)
530A, 535A	135 F (57 C)
545A	135 F (57 C)
305A	135 F (57 C)
308	135 F (57 C)
JT15D–4, –4B, –4D	135 F (57 C)
FJ44–3A	200 F (93 C)
FJ44–2A	135 F (57 C)
FJ44–1B	135 F (57 C)
TFE731–2/–3	135 F (57 C)
TFE731–20	135 F (57 C)

CAR part 3, as amended to May 15, 1956, defined the maximum anticipated summer air temperatures in § 3.583; ''The maximum anticipated summer air temperature shall be considered to be 100 °F at sea level and to decrease from this value at the rate of 3.6 °F per thousand feet above sea level.'' Concurrently, § 3.438 required that ''* * * fuel system features conducive to vapor formation shall be demonstrated to be free from vapor lock when using fuel at a temperature of 110 °F under critical operating conditions.'' Building from CAR part 3, 14 CFR part 23 envisioned maximum fuel temperatures at or near 110 °F as set forth in 14 CFR part 23, § 23.961. The turbine fuel temperature requirement for hot weather operation is 110 −0, +5 °F, or the maximum outside air temperature for which approval is requested, whichever is more critical. Engine heat rejection such that the airplane fuel temperature is characterized by engine heat rejection rather than ambient air temperature is a new and novel design that was not envisioned by 14 CFR part 23.

14 CFR part 23 certification experience to date has shown that hot weather certification testing with 110 °F fuel temperatures is adequate for fuel system operations for fuel tank fuel temperatures characterized by ambient air temperatures including cooling as a result of the atmospheric temperature lapse rate. Heating that increases the airplane fuel system operational temperatures introduces several fuel

system concerns. Each must be shown to be acceptable. Compliance by design (i.e. lack of ability to shutoff the engine motive flow) may be utilized although associated type certificate data sheet information may also be necessary to assure future system changes are compliant.

A special condition for the higher fuel system temperatures of the Embraer EMB 500 airplane was proposed. The special condition requires the compliance to 14 CFR part 23, § 23.961, fuel system hot weather operation test temperature to be commensurate with the highest fuel temperature expected at the maximum outside air temperature for which approval is requested.

Type Certification Basis

Under 14 CFR part 21, § 21.17, Embraer S.A. must show that the Model EMB–500 meets the applicable provisions of 14 CFR part 23, as amended by Amendments 23–1 through 23–55, thereto.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 23) do not contain adequate or appropriate safety standards for the Model EMB–500 because of a novel or unusual design feature, special conditions are prescribed under § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the Model EMB–500 must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36, and the FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92–574, the ''Noise Control Act of 1972.''

Special conditions, as appropriate, as defined in § 11.19, are issued under § 11.38, and become part of the type certification basis under § 21.17(a).

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, the special conditions would also apply to the other model under § 21.101(a).

Novel or Unusual Design Features

The Model EMB–500 will incorporate the following novel or unusual design features: High Fuel Temperatures.

Discussion of Comments

Notice of proposed special conditions No. 23–07–05–SC for the Embraer S.A., Model EMB–500 airplanes was published on January 23, 2008 (73 FR 3881). No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Model EMB–500. Should Embraer S.A. apply later for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well under § 21.101(a).

Conclusion

This action affects only certain novel or unusual design features on one model, Model EMB–500, of airplanes. It is not a rule of general applicability, and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113 and 44701; 14 CFR 21.16 and 21.17; and 14 CFR 11.38 and 11.19.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Embraer S.A. Model EMB–500 airplanes.

1. SC § 23.961

Instead of compliance with § 23.961, the following apply:

Each fuel system must be free from vapor lock when using fuel at its critical temperature, with respect to vapor formation, when operating the airplane in all critical operating and environmental conditions for which approval is requested. For turbine fuel, the initial temperature must be the highest fuel temperature expected at the maximum outside air temperature for which approval is requested.

Issued in Kansas City, Missouri on June 10, 2008.

Kim Smith,

Manager, Small Airplane Directorate, Aircraft Certification Service.

[FR Doc. E8–13830 Filed 6–18–08; 8:45 am]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA–2008–0273; Directorate Identifier 2007–NM–369–AD; Amendment 39–15566; AD 2008–13–03]

RIN 2120–AA64

Airworthiness Directives; Boeing Model 747–400, 747–400D, and 747–400F Series Airplanes

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: The FAA is superseding an existing airworthiness directive (AD) that applies to all Boeing Model 747–400, 747–400D, and 747–400F series airplanes. That AD currently requires reviewing airplane maintenance records, doing repetitive inspections for cracking of the yaw damper actuator portion of the upper and lower rudder power control modules (PCMs), replacing the PCMs if necessary, and reporting all airplane maintenance records review and inspection results to the manufacturer. This new AD limits the applicability, reduces the initial inspection threshold and repetitive interval, removes the reporting requirement, and requires installation of a secondary retention device for the yaw damper modulating piston. Installation of the secondary retention device terminates the repetitive inspection requirements. This AD results from additional reports of failure or cracking of the PCM manifold in the area of the yaw damper cavity endcap at intervals well below the initial inspection threshold of the existing AD. We are issuing this AD to prevent an uncommanded left rudder hardover in the event of cracking in the yaw damper actuator portion of the upper or lower rudder PCMs, and subsequent failure of the PCM manifold, which could result in increased pilot workload, and possible runway departure upon landing.

DATES: This AD becomes effective July 24, 2008.

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in the AD as of July 24, 2008.

On October 13, 2006 (71 FR 52999, September 8, 2006), the Director of the Federal Register approved the incorporation by reference of Boeing Service Bulletin 747–27A2397, Revision 2, dated September 1, 2005.