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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. NM147; Special Conditions No. 25–139–SC]

Special Conditions: Boeing Model 757–300; High-Intensity Radiated Fields

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Boeing Model 757–300 airplane. This airplane will utilize new avionics/electronic systems that provide critical data to the flightcrew. The applicable regulations do not contain adequate or appropriate safety standards for the protection of these systems from the effects of high-intensity radiated fields. 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.

EFFECTIVE DATE: August 14, 1998.

FOR FURTHER INFORMATION CONTACT: John Dimtroff, FAA, Airplane and Flight Crew Interface Branch, ANM–111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98055–4056, telephone (425) 227–2117 or facsimile (425) 227–1320.

SUPPLEMENTARY INFORMATION:

Background

On February 21, 1996, the Boeing Commercial Airplane Group, P. O. Box 3707, Seattle, Washington 98124–2207, applied for an amendment to Type Certificate No. A2NM to include the new Model 757–300, a derivative of the 757–200. The 757–300 is a swept-wing, conventional-tail, twin-engine, turbofan-powered transport. Each engine is capable of delivering 43,100 pounds of thrust. The flight controls are unchanged beyond those changes deemed necessary to accommodate the stretched configuration. The airplane has a seating capacity of up to 295, and a maximum takeoff weight of 270,000 pounds (122,470 Kg).

Type Certification Basis

Under the provisions of Title 14 CFR 21.101, Boeing must show that the Model 757–300 meets the applicable provisions of the regulations incorporated by reference in Type Certificate No. A2NM, or the applicable regulations in effect on the date of application for the change to the Model 757–300. The regulations incorporated by reference in the type certificate are commonly referred to as the ''original type certification basis.'' The regulations incorporated by reference in Type Certificate No. A2NM include 14 CFR part 25, as amended by Amendments 25–1 through 25–45, and certain other later amended sections of part 25 that are not relevant to these special conditions. Except for certain earlier amended sections of part 25 that are not relevant to these special conditions, Boeing has chosen to comply with part 25 as amended by Amendments 25–1 through 25–85, the applicable regulations in effect on the date of application. In addition to the applicable airworthiness regulations and special conditions, the 757–300 must comply with the fuel vent and exhaust emission requirements of part 34, effective September 10, 1990, plus any amendments in effect at the time of certification; and the noise certification requirements of part 36, effective December 1, 1969, as amended by Amendment 36–1 through the amendment in effect at the time of certification. These special conditions form an additional part of the type certification basis.

If the Administrator finds that the applicable airworthiness regulations (i.e., part 25, as amended) do not contain adequate or appropriate safety standards for the 757–300 because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16 to establish a level of safety equivalent to that established in the regulations.

Special conditions, as appropriate, are issued in accordance with § 11.49 of the FAR after public notice, as required by §§ 11.28 and 11.29(b), and become part of the type certification basis in accordance with § 21.101(b)(2).

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, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of § 21.101(a)(1).

Novel or Unusual Design Features

The 757–300 airplane avionics enhancement utilizes electronic systems that perform critical functions, including the following airframe Line Replaceable Units (LRU): Multi-Mode Receiver (MMR), Flight Control Computer (FCC), Yaw Damper Stabilizer Trim Module (YSM), Air Data Inertial Reference System (ADIRS), and the Allied Signal Radio Altimeter (RA). These systems may be vulnerable to high-intensity radiated fields (HIRF) external to the airplane.

Discussion

There is no specific regulation that addresses protection requirements for electrical and electronic systems from HIRF. Increased power levels from ground based radio transmitters, and the growing use of sensitive electrical and electronic systems to command and control airplanes, have made it necessary to provide adequate protection.

To ensure that a level of safety is achieved equivalent to that intended by the regulations incorporated by reference, special conditions are needed for the 757–300, which require that new technology electrical and electronic systems, such as the MMR, FCC, YSM, ADIRS, and RA, be designed and installed to preclude component damage and interruption of function due to both the direct and indirect effects of HIRF.

High-Intensity Radiated Fields

With the trend toward increased power levels from ground based transmitters, plus the advent of space and satellite communications, coupled with electronic command and control of

the airplane, the immunity of critical digital avionics systems to HIRF must be established.

It is not possible to precisely define the HIRF to which the airplane will be exposed in service. There is also uncertainty concerning the effectiveness of airframe shielding for HIRF. Furthermore, coupling of electromagnetic energy to cockpit-installed equipment through the cockpit window apertures is undefined. Based on surveys and analysis of existing HIRF emitters, an adequate level of protection exists when compliance with the HIRF protection special condition is shown with either paragraphs 1 or 2 below:

1. A minimum threat of 100 volts per meter peak electric field strength from 10 KHz to 18 GHz.

a. The threat must be applied to the system elements and their associated wiring harnesses without the benefit of airframe shielding.

b. Demonstration of this level of protection is established through system tests and analysis.

2. A threat external to the airframe of the following field strengths for the frequency ranges indicated.

Frequency	Field strength (volts per meter)					
	US		UK/European		Consolidated	
	Peak	Avg.	Peak	Avg.	Peak	Avg.
10 kHz–100 kHz	30	30	50	50	50	50
100 kHz–500 kHz	40	30	60	60	60	60
500 kHz–2 MHz	30	30	70	70	70	70
2 MHz–30 MHz	190	190	200	200	200	200
30 MHz–70 MHz	20	20	30	30	30	30
70 MHz–100 MHz	20	20	30	30	30	30
100 MHz–200 MHz	30	30	150	30	150	30
200 MHz–400 MHz	30	30	70	70	70	70
400 MHz–700 MHz	80	80	700	40	700	80
700 MHz–1 GHz	690	240	1700	80	1700	240
1 GHz–2 GHz	970	70	5000	360	5000	360
2 GHz–4 GHz	1570	350	4500	360	4500	360
4 GHz–6 GHz	7200	300	5200	300	7200	300
6 GHz–8 GHz	130	80	2000	330	2000	330
8 GHz–12 GHz	2100	80	3500	270	3500	270
12 GHz–18 GHz	500	330	3500	180	3500	330
18 GHz–40 GHz	780	20	NA	NA	780	20

The field strengths are expressed in terms of peak root-mean-square (rms) values.

The threat levels identified above differ from those used in previous special conditions and are the result of an FAA review of existing studies on the subject of HIRF, in light of the ongoing work of the Electromagnetic Effects Harmonization Working Group of the Aviation Rulemaking Advisory Committee. In general, these standards are less critical than the threat level that was previously used as the basis for earlier special conditions

Discussion of Comments

Notice of Proposed Special Conditions No. 25–98–02–SC for the 757–300 was published in the **Federal Register** on March 25, 1998 (63 FR 14381). Three commenters responded.

The first commenter, representing the interests of airline pilots, concurs with the special conditions as proposed.

The second commenter, the United Kingdom Civil Aviation Authority (CAA), states that harmonized HIRF requirements and associated guidance material arising from FAA/Joint Aviation Authorities (JAA) participation in a working group of the Aviation Rulemaking Advisory Committee (ARAC) are well established and known to the FAA and should be applied by the FAA where special conditions of this nature are required. The commenter also states that the JAA has applied the harmonized requirements and means of compliance, and as the FAA may be faced with finding compliance on behalf of the JAA, it may be inappropriate for the FAA to apply any special condition or means of compliance that is not in accordance with the harmonized standards.

The FAA concurs with this commenter; however, at the time of application for certification of the 757–300, the requirements depicted in the certification program were not fully harmonized. The HIRF requirements in place at the time were as depicted in the proposed special condition. Future airplane certification programs will include the fully harmonized requirements. Also, Boeing can elect to use the newer, harmonized requirement table if they so choose.

The applicant, Boeing Commercial Airplane Group, also provided comments on the proposed special conditions. Boeing does not believe a HIRF special condition should be applied to existing production airplane models. The FAA does not agree. Section 21.101 of 14 CFR part 21 states that special conditions can be applied to both new and substantially complete redesigns of a component, equipment installation, or system installation. Upgrades of existing production airplanes, if the upgrade incorporates new or substantially complete redesigns of a component, equipment installation, or system installation, do fall within the scope of § 21.101.

Boeing also states that applying the HIRF special conditions would deter them from upgrading existing airplane models. The FAA has consistently applied the requirements in the HIRF special condition to avionics upgrades of existing production model airplanes. Many of these upgrades have been in the form of supplemental type certifications on Boeing airplanes and were designed and installed by applicants other than Boeing. The special conditions have not deterred other applicants from upgrading existing Boeing airplanes. Also, Boeing already applies the requirements within the HIRF special conditions to existing production model airplanes. When Boeing certified the Model 777–200 and the Model 777–300, components, equipment installations, or system installations from the Model 777–200, which were new or substantially redesigned, were shown to comply with the requirements of the HIRF special condition. When the engines on the Model 767 were upgraded to include Full Authority Digital Engine Controls

(FADECs), the FADECs were shown to comply with the HIRF special conditions. The FAA HIRF requirements have been consistent, and Boeing has been aware of and complied with these requirements for several years.

Boeing further states that the HIRF special condition would effectively deter them from upgrading electronic equipment that incorporates safety and reliability enhancing features. The FAA requirements in the HIRF special condition reflect the need to address a known environmental hazard, recognized by the technical and regulatory community worldwide. Protection against this known environmental hazard is required by FAA for all systems performing functions whose failure would contribute to or cause a catastrophic failure condition that would prevent the continued safe flight and landing of the airplane. This policy applies, regardless of whether the new or significantly changed component, equipment, or system is intended to improve an unrelated safety or reliability issue. Improving one aspect of safety or reliability should not degrade another aspect of safety.

The FAA has consistently applied the requirements in the HIRF special conditions to certification programs for over 12 years, regardless of whether the certification was based on a new airplane type, or a change to an existing airplane. Changing this policy for one model of Boeing airplanes would not be consistent with the FAA policy over the last 12 years. Therefore, special conditions for the 757–300 are adopted as proposed in Notice 25–98–02–SC.

Applicability

As discussed above, these special conditions are applicable initially to the Model 757–300 airplane. Should Boeing apply at a later date 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 the provisions of § 21.101(a)(1).

Conclusion

This action affects certain design features only on the Model 757–300. It is not a rule of general applicability and affects only the manufacturer who applied to the FAA for approval of these features on this model.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

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 Boeing Model 757–300 series airplanes.

1. *Protection from Unwanted Effects of High-Intensity Radiated Fields (HIRF).* Each electrical and electronic system that performs critical functions must be designed and installed to ensure that the operation and operational capability of these systems to perform critical functions are not adversely affected when the airplane is exposed to high-intensity radiated fields.

2. For the purpose of this special condition, the following definition applies:

Critical Functions. Functions whose failure would contribute to or cause a failure condition that would prevent the continued safe flight and landing of the airplane.

Issued in Renton, Washington, on July 7, 1998.

John J. Hickey,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 98–18857 Filed 7–14–98; 8:45 am]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 98–NM–41–AD; Amendment 39–10651; AD 98–15–01]

RIN 2120–AA64

Airworthiness Directives; Empresa Brasileira de Aeronautica S.A. (EMBRAER) Model EMB–145 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This amendment adopts a new airworthiness directive (AD), applicable to certain EMBRAER Model EMB–145 series airplanes, that requires a one-time inspection to detect bulging or cracking of the pitot 1 and pitot 2 drain tubes in the forward electronic compartment; and cleaning the tubes or replacing drain tubes with new tubes, if necessary. This amendment also requires modification of the pitot/static system. This amendment is prompted by issuance of mandatory continuing airworthiness information by a foreign civil airworthiness authority. The actions specified by this AD are intended to detect and correct bulging and cracking of the pitot 1 and pitot 2 drain tubes in the forward electronic compartment caused by cycles of water freezing and expanding inside the tubes, which could result in erroneous airspeed indications to the flight crew and reduced operational safety in all phases of flight.

DATES: Effective August 19, 1998.

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of August 19, 1998.

ADDRESSES: The service information referenced in this AD may be obtained from Empresa Brasileira de Aeronautica S.A. (EMBRAER), P.O. Box 343—CEP 12.225, Sao Jose dos Campos—SP, Brazil. This information may be examined at the Federal Aviation Administration (FAA), Transport Airplane Directorate, Rules Docket, 1601 Lind Avenue, SW., Renton, Washington; or at the FAA, Small Airplane Directorate, Atlanta Aircraft Certification Office, One Crown Center, 1895 Phoenix Boulevard, suite 450, Atlanta, Georgia; or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

FOR FURTHER INFORMATION CONTACT: Neil Berryman, Aerospace Engineer, Systems and Flight Test Branch, ACE–116A, FAA, Small Airplane Directorate, Atlanta Aircraft Certification Office, One Crown Center, 1895 Phoenix Boulevard, suite 450, Atlanta, Georgia 30337–2748; telephone (770) 703–6066; fax (770) 703–6097.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations (14 CFR part 39) to include an airworthiness directive (AD) that is applicable to certain EMBRAER Model EMB–145 series airplanes was published in the **Federal Register** on April 8, 1998 (63 FR 17130). That action proposed to require a one-time inspection to detect bulging or cracking of the pitot 1 and pitot 2 drain tubes in the forward electronic compartment; and cleaning the tubes or replacing drain tubes with new tubes, if necessary. That action also proposed modification of the pitot/static system.

Comments

Interested persons have been afforded an opportunity to participate in the making of this amendment. Due consideration has been given to the single comment received.