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DEPARTMENT OF TRANSPORTATION

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14 CFR Part 25

[Docket No. NM–134; Special Conditions No. 25–ANM–131]

Special Conditions: Empresa Brasileira de Aeronautica S.A., (EMBRAER) Model EMB–145 Airplane; Thrust Reverser Systems

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are for the Empresa Brasileira de Aeronautica S.A., (EMBRAER) Model EMB–145 airplane. This airplane will have a novel or unusual design feature associated with thrust reversers as optional equipment. These special conditions contain the additional safety standards which the Administrator considers necessary to establish a level of safety equivalent to that established by the airworthiness standards of part 25 of the Federal Aviation Regulations (FAR).

EFFECTIVE DATE: September 29, 1997.

FOR FURTHER INFORMATION CONTACT: Colin Fender, FAA, Flight Test and Systems Branch of the Transport Standards Staff, ANM–111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW, Renton, Washington 98055–4056; telephone 425–227–2191.

SUPPLEMENTARY INFORMATION:

Background

Embraer first made application for a U.S. Type Certificate for the Model EMB–145 on August 30, 1989, to the FAA Atlanta Aircraft Certification Office through the Brazilian Centro Técnico Aeroespacial (CTA). On June 2, 1992, Embraer filed for an extension of that application. The EMB–145 is a 50 passenger, pressurized, low-winged, ‘‘T’’ tailed, transport category airplane with retractable tricycle type landing gear. The airplane is powered by two Allison Model AE3007A high bypass ratio turbofan engines mounted on the aft fuselage, which are controlled by a Full Authority Digital Engine Control (FADEC). The cockpit will include a complete set of Electronic Flight Instrumentation and Engine Indication and Crew Alerting Systems (EFIS and EICAS).

Embraer has proposed to certificate and market the EMB–145 with thrust reversers as optional equipment. Thrust reversers have been shown to play a significant role in reducing accelerate-stop distances on wet and contaminated runways and have contributed to the transport category airplane fleet's accelerate-stop safety record.

The establishment of the transport category airplane safety record, with regard to accelerate-stop and landing overruns, is tied to the availability of auxiliary braking means that are independent of wheel-brake, tire, and runway surface interaction. On early transport category airplanes with propellers driven by reciprocating engines or turbine powerplants, auxiliary braking was provided by commanding the propellers to a reverse pitch position, causing a deceleration, rather than acceleration, of air through the propeller disk. Due to the large diameter of the propellers, this was quite an effective braking means. Though these early transports did not have the high operating speeds of today's jet fleet, they also did not benefit from the sophisticated wheel-brake antiskid systems available today. As runway friction conditions degrade to those associated with a surface covered by ice, even today's antiskid systems will provide little in the way of stopping force. As runway friction conditions degrade, the braking contribution of reverse pitch systems increases considerably.

As the first generation turbojet-powered transport category airplanes went into service in the latter half of the 1950s, thrust reverser systems were developed to provide this same type of auxiliary braking as reverse pitch propellers by reversing the engine exhaust flow. As powerplant technology evolved and low bypass ratio turbofan engines entered commercial service in the early 1960's, thrust reversers were developed to reverse both the fan and core exhaust flows, thus maintaining the availability of auxiliary braking. With the advent of large high bypass ratio turbofan engines in the late 1960s, many thrust reverser systems reversed the fan exhaust flow only, which provided a substantial auxiliary braking effect due to the majority of the total inlet flow going through the fan section. Numerous test programs, by both research organizations and aerospace manufacturers, have substantiated the increased stopping benefit provided by thrust reversers as runway surface friction conditions deteriorate.

The vast majority of jet-powered transport category airplanes in service have been of the large, passenger carrying variety. Research shows that with the exception of a very limited number of airplane types, some of which had considerably slower takeoff and landing speeds than their counterparts, all these large, passenger carrying, turbojet/turbofan-powered transports included thrust reverser systems as part of their basic design (i.e., as standard equipment). The last such aircraft certified without thrust reversers as part of the basic design was the British Aerospace 146 (BAe 146) in 1983. When the sheer numerical majority of these large transports is combined with their high-use operating environment, often requiring takeoffs and landings to be made on slippery runway surfaces, it is clear that thrust reversers must have played a role in establishing their excellent safety record.

It should also be noted that as the number of small transport category airplanes in service has increased, notably corporate jets and regional airliners, there has been an increasing tendency for these airplanes to be equipped with some type of thrust reversing system. Nearly all the regional airliners are turbopropeller-powered with reverse pitch capability, and an increasing number of corporate jets include thrust reversers as standard equipment.

The accelerate-stop and landing distances presented in the FAA approved Airplane Flight Manual (AFM) are determined from measurements of the various influential parameters taken during certification flight tests. These flight tests are accomplished by FAA test pilots (or manufacturers' Designated Engineering Representative (DER) test pilots) under controlled conditions on dry runways. In the operational environment, even on dry runways, the ability of an airplane to match the AFM accelerate-stop performance is based on many factors, including the correct and timely execution of procedures by the pilot and maximum stopping performance being available from the wheel braking system. As runway surface conditions degrade to wet, contaminated, or icy, the accompanying reduction in available friction will result in an increase in stopping distances, causing the wet runway accelerate-stop distances to exceed the dry runway accelerate-stop distances published in the AFM. Obviously, if the takeoff is runway length-limited as determined from the dry runway AFM accelerate-stop distances, and the runway surface is anything but dry, the probability for an overrun accident is increased significantly. (This increased risk factor is acknowledged for the landing scenario in part 121, the operating rules for air carriers and commercial operators of large aircraft, which requires an increase in the landing field length required for landings on wet runways.)

In the operating conditions described above, any additional braking means, such as thrust reversers, will be beneficial. This is particularly true since the braking contribution of reverse thrust increases as runway surface friction decreases. This inverse relationship between reverse thrust braking contribution and runway surface friction is further enhanced as ground speed increases.

Since 1990 the Transport Airplane Directorate (TAD) has been developing new part 25 accelerate-stop criteria that includes accountability for the degradation in stopping force due to wet runway surfaces. Test results obtained from several research organizations showed a fixed stopping distance factor of two, relative to dry runway stopping distances, to be representative of what could be expected in normal operations. The proposed accelerate-stop standards, published as Notice of Proposed Rulemaking (NPRM) 93–8, assumed a similar degradation in braking by prescribing a wet/dry braking coefficient of friction ratio of one-half (i.e., μ WET = 0.5 μ DRY) as the primary basis for calculating wet runway accelerate-stop distances. An integral part of the proposed wet runway accelerate-stop rule is credit for the amount of reverse thrust available (provided certain reliability and controllability criteria are met).

The accelerate-stop certification basis for the EMB–145 is § 25.109, as amended by Amendment 25–42, effective March 1, 1978. Thrust reversing systems are not required by the FAR and, when installed, no performance credit is granted for their availability in the dry runway accelerate-stop distances required by § 25.109, as amended by Amendment 25–42, effective March 1, 1978. However, the vast majority of transport category airplanes in service at the time the regulatory changes of Amendment 25–42 were promulgated were equipped with thrust reversers. Consequently, the certification of transport category airplanes intended to be operated in Part 121-type commercial service without thrust reversers was not envisaged at the time Amendment 25–42 was promulgated.

In consideration of the intended operation of the EMB–145, the FAA considers the non-inclusion of thrust reversers into the basic airplane to be an unusual design feature that is not adequately addressed by the airworthiness regulations of part 25, and therefore proposes to apply special conditions to the EMB–145 in accordance with § 21.16. In accordance with the preamble material to Amendment 25–54 (page 274), addressing the definition of a novel or unusual design feature (as used in § 21.16), the non-inclusion of thrust reversers in the basic EMB–145 design can be considered a ''novel or unusual design feature'' since such designs were not envisaged at the time the current airworthiness standard (i.e., § 25.109, Amendment 25–42) was developed. This application requires the development of requirements not fully addressed by part 25 nor by any published FAA guidance.

These special conditions provide all the necessary requirements to determine acceptability of the EMB–145 without the incorporation of thrust reversers.

Type Certification Basis

Under the provisions of 14 CFR 21.17, Empresa Brasileira de Aeronautica S.A. must show that the Model EMB–145 meets the applicable provisions of part 25, as amended by Amendments 25–1 through 25–84.

In addition to the applicable airworthiness regulations and special conditions, the Model EMB–145 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 make a finding of regulatory adequacy pursuant to section 611 of Public Law 92–574, the ''Noise Control Act of 1972.''

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 Model EMB–145 because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions, as appropriate, are issued in accordance with § 11.49 after public notice, as required by §§ 11.28 and 11.29(b), and become part of the type certification basis in accordance with § 21.17(a)(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, these special conditions would also apply to the other model under the provisions of § 21.101(a)(1).

Novel or Unusual Design Features

The Model EMB–145 will have an unusual design feature which is the lack of incorporation of thrust reversers as standard equipment.

Discussion of Comments

Notice of Proposed Special Conditions No. SC–96–7–NM for the Empresa Brasileira de Aeronautica S.A., (EMBRAER) Model EMB–145, was published in the **Federal Register** on November 18, 1996. Three commenters submitted comments.

All commenters state the special conditions are inappropriate since thrust reversers are not required for part 25 certification and part 25 airplanes not equipped with thrust reversers have exhibited the same level of safety as those with thrust reversers. The FAA does not contest the fact that part 25 does not require thrust reversers. With regard to the level of safety issue, it is obvious that the additional braking provided by reverse thrust will always improve safety, and the amount of that improvement will increase with decreasing runway surface friction. The only accelerate-stop performance information required to be in the Airplane Flight Manual (AFM) by the current part 25 airworthiness regulations is based on a dry runway surface; these dry runway accelerate-stop distances may (and will) be used with no adjustments for takeoffs made on wet and contaminated runways. This could be of critical importance for an airplane the size of the EMB–145, which in all likelihood will see a sizable number of operations on relatively short runways, thus increasing the probability of its being dry runway takeoff or landing field length-limited.

One commenter states that the main consideration of the special conditions is that the non-inclusion of thrust reversers is classified as an unusual design feature because the EMB–145 is intended for operation in part 121-type commercial service. Consequently, the commenter states the special conditions are not appropriate under part 25 since the certification basis is independent of the rules an airplane might be operated under. The FAA does not agree with the commenter's statement. The overall operational safety of an airplane is as much the concern of the Aircraft Certification Service of the FAA as it is the Flight Standards Service, particularly where aircraft performance is a consideration since it is the Aircraft Certification Service personnel who witness the flight testing and approve the resulting Airplane Flight Manual performance that scheduled operations will be based on.

Similarly, another commenter states that if performance credit is of established benefit in part 121-type commercial operations, the appropriate rule to require thrust reversers would be under part 121 and not the certification rules (i.e., part 25). The FAA questions the use of the term ''performance credit'' since no performance credit has been given in the past, as discussed in the preceding paragraph. The FAA understands this comment to mean if thrust reversers have provided benefits in part 121-type operations, then any rule to require their installation should be proposed under part 121. The FAA disagrees with this comment. The FAA's job is to ensure the safety of the traveling public; whether that is done through the Aircraft Certification Service or the Flight Standards Service is irrelevant in this case. As discussed in the notice of proposed special conditions, the thrust reverser issue is addressed in this context because the FAA has found that Embraer's type certificate application presents a novel or unusual design feature for which the applicable airworthiness standards do not provide adequate safety standards. In accordance with 14 CFR § 21.16, special conditions are the appropriate mechanism for dealing with such issues.

One commenter states that if the FAA considers the increased stopping benefit provided by thrust reversers as substantiation (sic) for requiring their installation, then performance credit should be granted for their use. The FAA has for many years gone on record as being opposed to granting general performance credit for the use of thrust reversers. One of the primary reasons for this position is that thrust reversers provided some compensation for the minimal amount of conservatism assumed in determining the accelerate-stop distances that takeoffs will be predicated on rejected takeoff accident data indicate that pilots do not always recognize and respond to a failure condition at or near V_1 in the time period assumed in calculating the AFM accelerate-stop distances. The FAA has proposed to grant performance credit for thrust reversers in the determination of accelerate-stop distances on wet runways, provided the stopping distances are based on the associated reduced wheel-brake stopping force available and certain reliability and controllability criteria are met.

One commenter notes that the proposed special conditions do not address the Master Minimum Equipment List (MMEL) allowance for airplanes to have thrust reversers rendered inoperative, and that the FAA did not consider the economic implications of this issue. The FAA does not consider this to be a relevant argument against requiring the installation of thrust reversers on the EMB–145. The MMEL allowance referred to by the commenter is classified as Level C which, among other things, places a 10-day limitation on the thrust reversers being inoperative. The 10-day limitation is, in part, based on the probability of occurrence of a situation in which the additional braking force provided by reverse thrust would be beneficial.

One commenter states that the inclusion of a proposed rule (i.e., NPRM 93–8) as a certification requirement was not appropriate. A related comment from another commenter noted that FAA's Aircraft Certification Service management has stated the FAA would not invoke unadopted regulations or policy on active certification programs. The FAA is not mandating compliance with the criteria of NPRM 93–8 as a certification requirement. Embraer has the option of installing thrust reversers on the airplane and determining accelerate-stop distances in accordance with part 25 at the amendment level described in the type certification basis for the EMB–145. It should also be noted that in ongoing certification programs, the FAA Transport Airplane Directorate routinely considers proposed rules as showing an equivalent level of safety to existing part 25 regulations.

One commenter also states that NPRM 93–8 is not harmonized with the European Joint Aviation Authorities (JAA) requirements. This statement is incorrect. The criteria of NPRM 93–8 was developed in conjunction with the JAA; requirements identical to those of NPRM 93–8 can be found in the equivalent AAA Notice of Proposed Amendment.

One commenter requests the FAA submit this major change in certification philosophy to the appropriate regulatory/industry forum. The FAA discussed the philosophy embodied in Notice No. SC–96–7–NM with flight test specialists from several foreign civil airworthiness authorities during its development. The FAA is within its legal bounds by treating airplanes on a case-by-case basis with special conditions in accordance with § 21.16. The FAA does not believe it is necessary to submit the certification philosophy embodied in Notice No. SC–96–7–NM to a regulatory/industry forum since the wet runway accelerate-stop criteria in NPRM 93–8, which gives performance credit for available reverse thrust on wet runways, will encourage manufacturers to incorporate thrust reversers as part of the basic design of their airplanes.

One commenter states that the FAA's contention that thrust reversers have played a significant role in the safety record of transport category airplanes is not supported by any form of factual information or data. The FAA disputes this commenter's position. A significant amount of testing has been conducted over the last 40 years that has repeatedly proven the increased benefit of reverse thrust as the runway surface condition deteriorates in terms of available wheel-braking force. It is obviously difficult to point at a particular rejected takeoff as an example since any successful field length-limited RTO that may have occurred on a wet or contaminated runway, whose takeoff weight was limited by a dry runway accelerate-stop distance, would not have been recorded. However, it stands to reason that the probability of such a case occurring would be very low without the additional braking force contribution provided by thrust reversers.

As discussed above, these special conditions are applicable to the EMB–145. Should Empresa Brasileira de Aeronautica S.A. 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 only certain novel or unusual design features on one model of airplane. It is not a rule of general applicability, and it affects only the manufacturer who applied to the FAA for approval of these features on the airplane.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Federal Aviation Administration, 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 the Empresa Brasileira de Aeronautica S.A., Model EMB–145 airplanes not equipped with thrust reversers.

1. The effect of wet runway surfaces on accelerate-stop distances for the Model EMB–145 must be accounted for in accordance with the criteria contained in NPRM 93–8 and its associated guidance.

2. Takeoff limitations for operation of the EMB–145 on wet runway surfaces must be predicated on the wet runway accelerate-stop criteria contained in NPRM 93–8.

Issued in Renton, Washington, on August 18, 1997.

Stewart R. Miller,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service, ANM–100.

[FR Doc. 97–22919 Filed 8–27–97; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 71

[Airspace Docket No. 93–AWA–16]

RIN 2120–AA66

Modification of Class D Airspace South of Abbotsford, British Columbia (BC), on the United States Side of the U.S./Canadian Border, and the Establishment of a Class C Airspace Area in the Vicinity of Point Roberts, Washington (WA)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This action establishes a Class C airspace area in the United States (U.S.), southeast of Vancouver, BC, in the vicinity of Point Roberts, WA. The Vancouver Class C airspace area will have a ceiling of 12,500 feet Mean Sea Level (MSL), and a floor of 2,500 feet MSL. In addition, this action extends the existing Abbotsford, BC, Class D airspace area west into airspace which is currently Class E airspace, and lowers the ceiling of the Class D airspace area from 3,000 to 2,500 feet MSL in U.S. airspace. The FAA is taking these actions pursuant to a proposal by Transport Canada, and to assist Transport Canada in its efforts to reduce the risk of midair collision, enhance safety, and improve air traffic flows within the Vancouver and Abbotsford, BC, International Airport areas.

EFFECTIVE DATE: 0901 UTC, November 6, 1997.

FOR FURTHER INFORMATION CONTACT: Ken McElroy, Airspace and Rules Division, ATA–400, Office of Air Traffic Airspace Management, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone: (202) 267–8783.

SUPPLEMENTARY INFORMATION:

Background

In July 1994, Transport Canada proposed to extend the Vancouver, BC, Class C airspace area across the United States/Canadian border into U.S. airspace in the vicinity of the San Juan Islands and Bellingham, WA. As proposed, the Class C airspace area would have extended from Abbotsford Airport, across Bellingham Airport, to a point south of San Juan Island. Transport Canada's proposal was part of its overall airspace plan for the Vancouver area, centering around efforts to mitigate near mid-air collision potential between instrument flight rule (IFR) and unknown visual flight rule (VFR) aircraft in U.S. airspace where Canada provides air traffic services.

Class C airspace consists of controlled airspace extending upward from the surface or higher to specified altitudes within which all aircraft are subject to the operating rules and equipment requirements specified in Federal Aviation Regulations. Two-way radio communication must be established with the air traffic control (ATC) facility providing ATC services prior to entry and thereafter maintained while operating within Class C airspace. The standard Class C airspace area consists of that airspace within 5 Nautical Miles (NM) of the primary airport, extending from the surface to an altitude of 4,000 feet above that airport's elevation, and that airspace between 5 and 10 NM from the primary airport from 1,200 feet above the surface to an altitude of 4,000 feet above that airport's elevation. Proposed deviations from this standard have been necessary at some airports because of adjacent regulatory airspace, international boundaries, topography, or unusual operational requirements.

The Class C airspace area proposed by Transport Canada differed from most other Class C airspace areas in that it was to an extension of a foreign Class C airspace area serving a primary airport outside the U.S.; standard U.S. Class C airspace configurations and dimensions were therefore unsuitable.

Transport Canada's proposal also included a proposal to extend the western boundary of the Abbotsford, BC, Class D airspace area approximately 7 nautical miles (NM) west of its present location, and to lower the ceiling of the Class D airspace from 3,000 feet MSL to 2,500 feet MSL.

Class D airspace is, generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and the airspace will normally be designed to contain any published instrument approach procedures. Two-way radio communication must be established with the ATC facility providing ATC services prior to entry and thereafter maintained while operating in the Class D airspace.

The Vancouver and Abbotsford Airports are both international and public-use airports located in Canada. Passenger enplanements reported at Vancouver in 1995 were 312,000, up from 301,000 in 1994. This volume of passenger enplanements and aircraft operations meets the FAA criteria for establishing a Class C airspace area to enhance safety.

Public Meetings

As announced in the **Federal Register** on March 22, 1995 (60 FR 15172), two pre-NPRM airspace meetings were held on May 9–10, 1995, in Friday Harbor and Bellingham, WA. The purpose of these meetings was to provide local airspace users with an opportunity to present input on the Transport Canada proposal prior to initiating any regulatory action. In the ensuing comment period, which closed on July 10, 1995, over 300 comments were received in overwhelming opposition to the proposal. The majority of the opposition centered around the significant amount of airspace affected by the original proposal. The original proposal would have required the reclassification of airspace in five contiguous areas from Abbotsford Airport, across Bellingham Airport, to a point south of San Juan Island. Subsequent meetings were held between