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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE292; Special Conditions No. 23–232–SC]

Special Conditions: Embraer Model EMB–500 Series Airplane Special Conditions for Flight Performance, Flight Characteristics, and Operating Limitations

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Embraer Model EMB–500 series airplane. This airplane will have a novel or unusual design feature(s) associated with engine location, certain performance, flight characteristics and operating limitations necessary for this type of airplane. 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: The effective date of these special conditions is November 18, 2008. We must receive your comments by December 29, 2008.

ADDRESSES: Mail two copies of your comments to: Federal Aviation Administration, Regional Counsel, ACE–7, Attention: Rules Docket No. CE292, 901 Locust, Room 506, Kansas City, Missouri 64106. You may deliver two copies to the Regional Counsel at the above address.

Mark your comments: Docket No. CE292. You may inspect comments in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

FOR FURTHER INFORMATION CONTACT: J. Lowell Foster, Federal Aviation Administration, Aircraft Certification Service, Small Airplane Directorate, ACE–111, 901 Locust, Room 301, Kansas City, Missouri 816–329–4125, fax 816–329–4090.

SUPPLEMENTARY INFORMATION: The FAA has determined that notice and opportunity for prior public comment hereon are impracticable because these procedures would significantly delay issuance of the approval design and thus delivery of the affected aircraft. In addition, the substance of these special conditions has been subject to the public comment process in several prior instances with no substantive comments received. The FAA, therefore, finds that good cause exists for making these special conditions effective on issuance.

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel about these special conditions. You may inspect the docket before and after the comment closing date. If you wish to review the docket in person, go to the address in the **ADDRESSES** section of this preamble between 7:30 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

We will consider all comments we receive by the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change these special conditions based on the comments we receive.

If you want us to let you know we received your comments on these special conditions, send us a pre-addressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it back to you.

Background

On October 5, 2005, Embraer applied for a type certificate for their new Model, the EMB–500. The EMB–500 is an all-new, high-performance, low wing, twin turbofan powered airplane. Design features include turbofan engines, aft engine location, new avionics, and certain performance characteristics inherent in this type of airplane that were not envisioned by the existing regulations.

The EMB–500 will be a new airplane and will have the following significant features incorporated:

- Two Pratt & Whitney PW617F/1 turbofan engines rated at 1,600 pounds of thrust with a Full Authority Digital Engine Control (FADEC) system.
- Garmin will provide a new avionics/instrumentation system, the G1000. This system is a state-of-the-art glass cockpit utilizing redundant Active Matrix Liquid Crystal Displays, featuring three displays.
- The aircraft's general configuration will be similar to other normal category jet airplanes, including a T-tail, and a low wing with slight leading edge wing sweep.
- The cabin will have a maximum seating configuration for 8 passengers.
- The preliminary operational design criteria are:

Parameter	Symbol	EMB–500
Limit Speeds	Vmo	275 KCAS
	M_{MO}	0.70 Mach
Max Takeoff Weight		9965 lb
Max Landing Weight		9259 lb
Max Zero Fuel Weight		8510 lb
Flap Speeds	Flaps 1	200 KIAS
	Flaps 2	160 KIAS
	Flaps 3	145 KIAS

Parameter	Symbol	EMB–500
	Flaps Full	145 KIAS
Landing Gear Speeds	V_{LO} (Retracting)	180 KIAS
	V_{LO} (Extending)	250 KIAS
	V_{LE} (Extended)	275 KIAS
Maximum Altitude		41,000 ft

Type Certification Basis

Under the provisions of 14 CFR part 21, § 21.17, Embraer must show that the EMB–500 meets the applicable provisions of part 23, as amended by Amendment 23–1 through 23–54 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 Embraer EMB–500 because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions, as appropriate, as defined in § 11.19, are issued in accordance with § 11.38, 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, the special conditions would also apply to the other model under the provisions of § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the EMB–500 must comply with the part 23 fuel vent and exhaust emission requirements of 14 CFR part 34 and the part 23 noise certification requirements of 14 CFR part 36. The FAA must also issue a finding of regulatory adequacy pursuant to section 611 of Public Law 92–574, the ''Noise Control Act of 1972.''

Novel or Unusual Design Features

The Embraer EMB–500 will incorporate the following novel or unusual design features: Aft-mounted engines, certain performance and flight characteristics, and operating limitations necessary for this type of airplane.

Applicability

As discussed above, these special conditions are applicable to the Embraer EMB–500 series. Should Embraer 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.

Conclusion

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

The substance of these special conditions has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. Therefore, because a delay would significantly affect the certification of the airplane, which is imminent, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions on issuance. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

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 14 CFR 11.38 and 11.19.

The Special Conditions

Several 14 CFR part 23 paragraphs have been replaced by or supplemented with special conditions. These special conditions have been numbered to match the 14 CFR part 23 paragraphs they replace or supplement. Additionally, many of the other applicable part 23 paragraphs cross-reference paragraphs that are replaced by or supplemented with special conditions. It is implied that the special conditions associated with these paragraphs must be applied. This principal applies to all part 23 paragraphs that cross-reference paragraphs associated with 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 EMB–500 series airplanes.

§ 23.45 General.

Instead of compliance with § 23.45, the following apply:

(a) Unless otherwise prescribed, the performance requirements of this part must be met for—

(1) Still air and standard atmosphere; and

(2) Ambient atmospheric conditions.

(b) Performance data must be determined over not less than the following ranges of conditions—

(1) Airport altitudes from sea level to 10,000 feet; and

(2) Temperature from standard to 30 °C above standard, or the maximum ambient atmospheric temperature at which compliance with the cooling provisions of § 23.1041 to § 23.1047 is shown, if lower.

(c) Performance data must be determined with the cowl flaps or other means for controlling the engine cooling air supply in the position used in the cooling tests required by § 23.1041 to § 23.1047.

(d) The available propulsive thrust must correspond to engine power, not exceeding the approved power, less—

(1) Installation losses; and

(2) The power absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

(e) The performance, as affected by engine power or thrust, must be based on a relative humidity:

(1) Of 80 percent at and below standard temperature; and

(2) From 80 percent, at the standard temperature, varying linearly down to 34 percent at the standard temperature plus 50 °F.

(f) Unless otherwise prescribed, in determining the takeoff and landing distances, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service. These procedures must be able to be executed consistently by pilots of average skill in atmospheric

conditions reasonably expected to be encountered in service.

(g) The following, as applicable, must be determined on a smooth, dry, hard-surfaced runway—

(1) Not applicable;

(2) Accelerate-stop distance of § 23.55;

(3) Takeoff distance and takeoff run of § 23.59; and

(4) Landing distance of § 23.75.

Note: The effect on these distances of operation on other types of surfaces (for example, grass, gravel) when dry, may be determined or derived and these surfaces listed in the Airplane Flight Manual in accordance with § 23.1583(p).

(h) The following also apply:

(1) Unless otherwise prescribed, the applicant must select the takeoff, enroute, approach, and landing configurations for the airplane.

(2) The airplane configuration may vary with weight, altitude, and temperature, to the extent that they are compatible with the operating procedures required by paragraph (h)(3) of this section.

(3) Unless otherwise prescribed, in determining the critical-engine-inoperative takeoff performance, takeoff flight path, and accelerate-stop distance, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service.

(4) Procedures for the execution of discontinued approaches and balked landings associated with the conditions prescribed in §§ 23.67(c)(4) and 23.77(c) must be established.

(5) The procedures established under paragraphs (h)(3) and (h)(4) of this section must—

(i) Be able to be consistently executed by a crew of average skill in atmospheric conditions reasonably expected to be encountered in service;

(ii) Use methods or devices that are safe and reliable; and

(iii) Include allowance for any reasonably expected time delays in the execution of the procedures.

§ 23.51 Takeoff speeds.

Instead of compliance with § 23.51, the following apply:

(a) Not applicable.

(b) Not applicable.

(c) The following apply:

(l) V_1 must be established in relation to VEF as follows:

(i) V_{EF} is the calibrated airspeed at which the critical engine is assumed to fail. V_{EF} must be selected by the applicant, but it must not be less than 1.05 V_{MC} determined under § 23.149(b) or, at the option of the applicant, not less than V_{MCG} determined under § 23.149(f).

(ii) The takeoff decision speed, V_1, is the calibrated airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to continue or discontinue the takeoff. The takeoff decision speed, V_1, must be selected by the applicant but must not be less than V_{EF} plus the speed gained with the critical engine inoperative during the time interval between the instant at which the critical engine is failed and the instant at which the pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during the accelerate-stop determination of § 23.55.

(2) The rotation speed, V_R, in terms of calibrated airspeed, must be selected by the applicant and must not be less than the greatest of the following:

(i) V_1;

(ii) 1.05 V_{MC} determined under § 23.149(b);

(iii) 1.10 V_{S1}; or

(iv) The speed that allows attaining the initial climb-out speed, V_2, before reaching a height of 35 feet above the takeoff surface in accordance with § 23.57(c)(2).

(3) For any given set of conditions, such as weight, altitude, temperature, and configuration, a single value of V_R must be used to show compliance with both the one-engine-inoperative takeoff and all-engines-operating takeoff requirements.

(4) The takeoff safety speed, V_2, in terms of calibrated airspeed, must be selected by the applicant so as to allow the gradient of climb required in § 23.67(c)(1) and (c)(2) but must not be less than 1.10 V_{MC} or less than 1.20 V_{S1}.

(5) The one-engine-inoperative takeoff distance, using a normal rotation rate at a speed 5 knots less than V_R, established in accordance with paragraph (c)(2) of this section, must be shown not to exceed the corresponding one-engine-inoperative takeoff distance, determined in accordance with §§ 23.57 and 23.59(a)(1), using the established V_R. The takeoff, otherwise performed in accordance with § 23.57, must be continued safely from the point at which the airplane is 35 feet above the takeoff surface and at a speed not less than the established V_2 minus 5 knots.

(6) The applicant must show, with all engines operating, that marked increases in the scheduled takeoff distances, determined in accordance with § 23.59(a)(2), do not result from over-rotation of the airplane or out-of-trim conditions.

§ 23.53 Takeoff performance.

Instead of compliance with § 23.53, the following apply:

(a) Not applicable.

(b) Not applicable.

(c) Takeoff performance, as required by §§ 23.55 through 23.59, must be determined with the operating engine(s) within approved operating limitations.

§ 23.55 Accelerate-stop distance.

Instead of compliance with § 23.55, the following apply:

The accelerate-stop distance must be determined as follows:

(a) The accelerate-stop distance is the sum of the distances necessary to—

(1) Accelerate the airplane from a standing start to V_{EF} with all engines operating;

(2) Accelerate the airplane from V_{EF} to V_1, assuming the critical engine fails at V_{EF}; and

(3) Come to a full stop from the point at which V_1 is reached.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distances if that means—

(1) Is safe and reliable;

(2) Is used so that consistent results can be expected under normal operating conditions; and

(3) Is such that exceptional skill is not required to control the airplane.

§ 23.57 Takeoff path.

Instead of compliance with § 23.57, the following apply:

The takeoff path is as follows:

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1,500 feet above the takeoff surface at or below which height the transition from the takeoff to the enroute configuration must be completed; and

(1) The takeoff path must be based on the procedures prescribed in § 23.45;

(2) The airplane must be accelerated on the ground to V_{EF} at which point the critical engine must be made inoperative and remain inoperative for the rest of the takeoff; and

(3) After reaching V_{EF}, the airplane must be accelerated to V_2.

(b) During the acceleration to speed V_2, the nose gear may be raised off the ground at a speed not less than V_R. However, landing gear retraction must not be initiated until the airplane is airborne.

(c) During the takeoff path determination, in accordance with paragraphs (a) and (b) of this section—

(1) The slope of the airborne part of the takeoff path must not be negative at any point;

(2) The airplane must reach V_2 before it is 35 feet above the takeoff surface, and must continue at a speed as close as practical to, but not less than V_2, until it is 400 feet above the takeoff surface;

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb must not be less than 1.2 percent for two-engine airplanes; and

(4) Except for gear retraction and automatic propeller feathering, the airplane configuration must not be changed, and no change in power that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path to 35 feet above the takeoff surface must be determined by a continuous demonstrated takeoff.

(e) The takeoff path to 35 feet above the takeoff surface must be determined by synthesis from segments; and

(1) The segments must be clearly defined and must be related to distinct changes in configuration, power, and speed;

(2) The weight of the airplane, the configuration, and the power must be assumed constant throughout each segment and must correspond to the most critical condition prevailing in the segment; and

(3) The takeoff flight path must be based on the airplane's performance without utilizing ground effect.

§ 23.59 Takeoff distance and takeoff run.

Instead of compliance with § 23.59, the following apply:

The takeoff distance and, at the option of the applicant, the takeoff run, must be determined.

(a) Takeoff distance is the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

(b) If the takeoff distance includes a clearway, the takeoff run is the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

§ 23.61 Takeoff flight path.

Instead of compliance with § 23.61, the following apply:

The takeoff flight path must be determined as follows:

(a) The takeoff flight path begins 35 feet above the takeoff surface at the end of the takeoff distance determined in accordance with § 23.59.

(b) The net takeoff flight path data must be determined so that they represent the actual takeoff flight paths, as determined in accordance with § 23.57 and with paragraph (a) of this section, reduced at each point by a gradient of climb equal to 0.8 percent for two-engine airplanes.

(c) The prescribed reduction in climb gradient may be applied as an equivalent reduction in acceleration along that part of the takeoff flight path at which the airplane is accelerated in level flight.

§ 23.63 Climb: General.

Instead of compliance with § 23.63, the following apply:

(a) Compliance with the requirements of §§ 23.65, 23.66, 23.67, 23.69, and 23.77 must be shown—

(1) Out of ground effect; and

(2) At speeds that are not less than those at which compliance with the powerplant cooling requirements of §§ 23.1041 to 23.1047 has been demonstrated; and

(3) Unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees.

(b) Not applicable.

(c) Not applicable.

(d) Compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.67(c)(1), 23.67(c)(2), and 23.67(c)(3) for takeoff; and

(2) Sections 23.67(c)(3), 23.67(c)(4), and 23.77(c) for landing.

§ 23.66 Takeoff climb: One-engine inoperative.

Instead of compliance with § 23.66, see § 23.67.

§ 23.67 Climb: One engine inoperative.

Instead of compliance with § 23.67, the following apply:

(a) Not applicable.

(b) Not applicable.

(c) The following apply:

(1) *Takeoff; landing gear extended.* The steady gradient of climb at the altitude of the takeoff surface must be measurably positive for two-engine airplanes with—

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear extended, and all landing gear doors open;

(iv) The wing flaps in the takeoff position(s);

(v) The wings level; and

(vi) A climb speed equal to V_2.

(2) *Takeoff; landing gear retracted.* The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be not less than 2.0 percent of two-engine airplanes with—

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear retracted;

(iv) The wing flaps in the takeoff position(s);

(v) A climb speed equal to V_2.

(3) *En route.* The steady gradient of climb at an altitude of 1,500 feet above the takeoff or landing surface, as appropriate, must be not less than 1.2 percent for two-engine airplanes with—

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at not more than maximum continuous power;

(iii) The landing gear retracted;

(iv) The wing flaps retracted; and

(v) A climb speed not less than 1.2 V_{S1}.

(4) *Discontinued approach.* The steady gradient of climb at an altitude of 400 feet above the landing surface must be not less than 2.1 percent for two-engine airplanes with—

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the approach position(s) in which V_{S1} for these position(s) does not exceed 110 percent of the V_{S1} for the related all-engines-operated landing position(s); and

(v) A climb speed established in connection with normal landing procedures but not exceeding 1.5 VS1.

§ 23.73 Reference landing approach speed.

Instead of compliance with § 23.73, the following apply:

(a) Not applicable.

(b) Not applicable.

(c) The reference landing approach speed, V_{REF}, must not be less than the greater of 1.05 V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

§ 23.75 Landing distance.

Instead of compliance with § 23.75, the following apply:

The horizontal distance necessary to land and come to a complete stop from a point 50 feet above the landing surface must be determined, for standard temperatures at each weight and altitude within the operational limits established for landing, as follows:

(a) A steady approach at not less than V_{REF}, determined in accordance with § 23.73(c) must be maintained down to the 50 foot height and—

(1) The steady approach must be at a gradient of descent not greater than 5.2 percent (3 degrees) down to the 50-foot height.

(2) In addition, an applicant may demonstrate by tests that a maximum steady approach gradient steeper than 5.2 percent, down to the 50-foot height, is safe. The gradient must be established as an operating limitation and the information necessary to display the gradient must be available to the pilot by an appropriate instrument.

(b) A constant configuration must be maintained throughout the maneuver.

(c) The landing must be made without excessive vertical acceleration or tendency to bounce, nose over, ground loop, porpoise, or water loop.

(d) It must be shown that a safe transition to the balked landing conditions of § 23.77 can be made from the conditions that exist at the 50 foot height, at maximum landing weight, or at the maximum landing weight for altitude and temperature of § 23.63(d)(2).

(e) The brakes must be used so as to not cause excessive wear of brakes or tires.

(f) Retardation means other than wheel brakes may be used if that means—

(1) Is safe and reliable; and

(2) Is used so that consistent results can be expected in service.

(g) If any device is used that depends on the operation of any engine, and the landing distance would be increased when a landing is made with that engine inoperative, the landing distance must be determined with that engine inoperative unless the use of other compensating means will result in a landing distance not more than that with each engine operating.

§ 23.77 Balked landing.

Instead of compliance with § 23.77, the following apply:

(a) Not applicable.

(b) Not applicable.

(c) Each airplane must be able to maintain a steady gradient of climb of at least 3.2 percent with—

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from the minimum flight idle position;

(2) Landing gear extended;

(3) Wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(c).

§ 23.177 Static directional and lateral stability.

Instead of compliance with § 23.177, the following apply:

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from 1.2 V_{S1} up to V_{FE}, V_{LE}, or V_{FC}/M_{FC} (as appropriate). The angle of sideslip for these tests must be appropriate to the type of airplane. At larger angles of sideslip, up to that at which full rudder is used or a control force limit in § 23.143 is reached, whichever occurs first, and at speeds from 1.2 V_{S1} to V_O, the rudder pedal force must not reverse.

(b) The static lateral stability, as shown by the tendency to raise the low wing in a sideslip, must be positive for all landing gear and flap positions. This must be shown with symmetrical power up to 75 percent of maximum continuous power at speeds above 1.2 V_{S1} in the takeoff configuration(s) and at speeds above 1.3 V_{S1} in other configurations, up to V_{FE}, V_{LE}, or V_{FC}/M_{FC} (as appropriate) for the configuration being investigated, in the takeoff, climb, cruise, and approach configurations. For the landing configuration, the power must be that necessary to maintain a 3 degree angle of descent in coordinated flight. The static lateral stability must not be negative at 1.2 V_{S1} in the takeoff configuration, or at 1.3 V_{S1} in other configurations. The angle of sideslip for these tests must be appropriate to the type of airplane, but in no case may the constant heading sideslip angle be less than that obtainable with a 10 degree bank, or if less, the maximum bank angle obtainable with full rudder deflection or 150 pound rudder force.

(c) Paragraph (b) of this section does not apply to acrobatic category airplanes certificated for inverted flight.

(d) In straight, steady slips at 1.2 V_{S1} for any landing gear and flap positions, and for any symmetrical power conditions up to 50 percent of maximum continuous power, the aileron and rudder control movements and forces must increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. At larger slip angles, up to the angle at which the full rudder or aileron control is used or a control force limit contained in § 23.143 is reached, the aileron and rudder control movements and forces must not reverse as the angle of sideslip is increased. Rapid entry into, and recovery from, a maximum sideslip considered appropriate for the airplane must not result in uncontrollable flight characteristics.

§ 23.201(e) Wings level stall.

Instead of compliance with § 23.201(e), the following apply:

(e) Compliance with the requirements of this section must be shown under the following conditions:

(1) The flaps, landing gear, and speedbrakes in any likely combination of positions and altitudes appropriate for the various positions.

(2) Thrust—

(i) Idle; and

(ii) The thrust necessary to maintain level flight at 1.6 $_{S1}$ (where V_{S1} corresponds to the stalling speed with flaps in the approach position, the landing gear retracted, and maximum landing weight).

(3) Trim at 1.4 V_{S1} or the minimum trim speed, whichever is higher.

§ 23.203(c) Turning flight and accelerated turning stalls.

Instead of compliance with § 23.203(c), the following apply:

(c) Compliance with the requirements of this section must be shown under the following conditions:

(1) The flaps, landing gear, and speedbrakes in any likely combination of positions and altitudes appropriate for the various positions.

(2) Thrust—

(i) Idle; and

(ii) The thrust necessary to maintain level flight at 1.6 V_{S1} (where V_{S1} corresponds to the stalling speed with flaps in the approach position, the landing gear retracted, and maximum landing weight).

(3) Trim at 1.4 V_{S1} or the minimum trim speed, whichever is higher.

§ 23.251 Vibration and buffeting.

Instead of compliance with § 23.251, the following apply:

(a) The airplane must be demonstrated in flight to be free from any vibration and buffeting that would prevent continued safe flight in any likely operating condition.

(b) Each part of the airplane must be shown in flight to be free from excessive

vibration under any appropriate speed and thrust conditions up to V_{DF}/M_{DF}. The maximum speeds shown must be used in establishing the operating limitations of the airplane in accordance with special condition § 23.1505.

(c) Except as provided in paragraph (d) of this special condition, there may be no buffeting condition, in normal flight, including configuration changes during cruise, severe enough to interfere with the control of the airplane, to cause excessive fatigue to the crew, or to cause structural damage. Stall warning buffeting within these limits is allowable.

(d) There may be no perceptible buffeting condition in the cruise configuration in straight flight at any speed up to V_{MO}/M_{MO}, except that stall warning buffeting is allowable.

(e) With the airplane in the cruise configuration, the positive maneuvering load factors at which the onset of perceptible buffeting occurs must be determined for the ranges of airspeed or Mach number, weight, and altitude for which the airplane is to be certified. The envelopes of load factor, speed, altitude, and weight must provide a sufficient range of speeds and load factors for normal operations. Probable inadvertent excursions beyond the boundaries of the buffet onset envelopes may not result in unsafe conditions.

§ 23.253 High speed characteristics.

Instead of compliance with § 23.253, the following apply:

(a) *Speed increase and recovery characteristics*. The following speed increase and recovery characteristics must be met:

(1) Operating conditions and characteristics likely to cause inadvertent speed increases (including upsets in pitch and roll) must be simulated with the airplane trimmed at any likely cruise speed up to V_{MO}/M_{MO}. These conditions and characteristics include gust upsets, inadvertent control movements, low stick force gradient in relation to control friction, passenger movement, leveling off from climb, and descent from Mach to airspeed limit altitudes.

(2) Allowing for pilot reaction time after effective inherent or artificial speed warning occurs, it must be shown that the airplane can be recovered to a normal attitude and its speed reduced to V_{MO}/M_{MO}, without:

(i) Exceptional piloting strength or skill;

(ii) Exceeding V_D/M_D, V_{DF}/M_{DF}, or the structural limitations; and

(iii) Buffeting that would impair the pilot's ability to read the instruments or control the airplane for recovery.

(3) There may be no control reversal about any axis at any speed up to V_{DF}/M_{DF}. Any reversal of elevator control force or tendency of the airplane to pitch, roll, or yaw must be mild and readily controllable, using normal piloting techniques.

(b) *Maximum speed for stability characteristics,* V_{FC}/M_{FC}. V_{FC}/M_{FC} is the maximum speed at which the requirements of § 23.175(b)(1), special condition §§ 23.177, and 23.181 must be met with flaps and landing gear retracted. It may not be less than a speed midway between V_{MO}/M_{MO} and V_{DF}/M_{DF} except that, for altitudes where Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

§ 23.703 Takeoff warning system.

Instead of compliance with § 23.703, the following apply:

Unless it can be shown that a lift or longitudinal trim device that affects the takeoff performance of the aircraft would not give an unsafe takeoff configuration when selection out of an approved takeoff position, a takeoff warning system must be installed and meet the following requirements:

(a) The system must provide to the pilots an aural warning that is automatically activated during the initial portion of the takeoff roll if the airplane is in a configuration that would not allow a safe takeoff. The warning must continue until—

(1) The configuration is changed to allow safe takeoff, or

(2) Action is taken by the pilot to abandon the takeoff roll.

(b) The means used to activate the system must function properly for all authorized takeoff power settings and procedures and throughout the ranges of takeoff weights, altitudes, and temperatures for which certification is requested.

§ 23.735 Brakes.

In addition to paragraphs (a), (b), (c), and (d), the following apply:

(e) The rejected takeoff brake kinetic energy capacity rating of each main wheel brake assembly must not be less than the kinetic energy absorption requirements determined under either of the following methods—

(1) The brake kinetic energy absorption requirements must be based on a conservative rational analysis of the sequence of events expected during a rejected takeoff at the design takeoff weight.

(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel brake assembly may be derived from the following formula—

$$KE = 0.0443\ WV^2 / N$$

Where:

KE = Kinetic energy per wheel (ft.-lbs.);
W = Design takeoff weight (lbs.);
V = Ground speed, in knots, associated with the maximum value of V_1 selected in accordance with § 23.51(c)(1);
N = Number of main wheels with brakes.

§ 23.1323 Airspeed indicating system.

In addition to paragraphs (a), (b), (c), and (d), the following apply:

(e) In addition, the airspeed indicating system must be calibrated to determine the system error during the accelerate-takeoff ground run. The ground run calibration must be obtained between 0.8 of the minimum value of V_1 and the maximum value of V_2, considering the approved ranges of altitude and weight. The ground run calibration must be determined assuming an engine failure at the minimum value of V_1.

(f) Where duplicate airspeed indicators are required, their respective pitot tubes must be far enough apart to avoid damage to both tubes in a collision with a bird.

§ 23.1505 Airspeed limitations.

Instead of compliance with § 23.1505, the following apply:

(a) The maximum operating limit speed (V_{MO}/M_{MO} -airspeed or Mach number, whichever is critical at a particular altitude) is a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent), unless a higher speed is authorized for flight test or pilot training operations. V_{MO}/M_{MO} must be established so that it is not greater than the design cruising speed V_C/M_C and so that it is sufficiently below V_D/M_D or V_{DF}/M_{DF}, to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between V_{MO}/M_{MO} and V_D/M_D or V_{DF}/M_{DF} may not be less than that determined under § 23.335(b) or found necessary in the flight test conducted under special condition § 23.253.

§ 23.1583 Operating limitations.

Instead of compliance with § 23.1583, the following apply:

The Airplane Flight Manual must contain operating limitations determined under this part 23, including the following—

(a) *Airspeed limitations.* The following information must be furnished:

(1) Information necessary for the marking of the airspeed limits on the indicator as required in § 23.1545, and the significance of each of those limits and of the color-coding used on the indicator.

(2) The speeds V_{MC}, V_O, V_{LE}, and V_{LO}, if established, and their significance.

(3) In addition, for turbine powered airplanes—

(i) The maximum operating limit speed, V_{MO}/M_{MO} and a statement that this speed must not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training;

(ii) If an airspeed limitation is based upon compressibility effects, a statement to this effect and information as to any symptoms, the probable behavior of the airplane, and the recommended recovery procedures; and

(iii) The airspeed limits must be shown in terms of V_{MO}/M_{MO} instead of V_{NO} and V_{NE}.

(b) *Powerplant limitations.* The following information must be furnished:

(1) Limitations required by § 23.1521.

(2) Explanation of the limitations, when appropriate.

(3) Information necessary for marking the instruments required by § 23.1549 through § 23.1553.

(c) *Weight.* The airplane flight manual must include—

(1) Not applicable;

(2) Not applicable;

(3) Not applicable;

(4) The maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which—

(i) The airplane complies with the climb requirements of § 23.63(d)(1); and

(ii) The accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if utilized; and either:

(iii) The takeoff distance determined under § 23.59(a) is equal to the available runway length; or

(iv) At the option of the applicant, the takeoff distance determined under § 23.59(a) is equal to the available runway length plus the length of any clearway and the takeoff run determined under § 23.59(b) is equal to the available runway length.

(5) The maximum landing weight for each airport altitude within the range selected by the applicant at which—

(i) The airplane complies with the climb requirements of § 23.63(d)(2) for ambient temperatures within the range selected by the applicant; and

(ii) The landing distance determined under § 23.75 for standard temperatures is equal to the available runway length.

(6) The maximum zero wing fuel weight, where relevant, as established in accordance with § 23.343.

(d) *Center of gravity.* The established center of gravity limits.

(e) *Maneuvers.* The following authorized maneuvers, appropriate airspeed limitations, and unauthorized maneuvers, as prescribed in this section.

(1) Not applicable.

(2) Not applicable.

(3) Not applicable.

(4) Not applicable.

(5) Maneuvers are limited to any maneuver incident to normal flying, stalls (except whip stalls), and steep turns in which the angle of bank is not more than 60 degrees.

(f) *Maneuver load factor.* The positive limit load factors in g's, and, in addition, the negative limit load factor for acrobatic category airplanes.

(g) *Minimum flight crew.* The number and functions of the minimum flight crew determined under § 23.1523.

(h) *Kinds of operation.* A list of the kinds of operation to which the airplane is limited or from which it is prohibited under § 23.1525, and also a list of installed equipment that affects any operating limitation and identification as to the equipment's required operational status for the kinds of operation for which approval has been given.

(i) *Maximum operating altitude.* The maximum altitude established under § 23.1527.

(j) *Maximum passenger seating configuration.* The maximum passenger-seating configuration.

(k) *Allowable lateral fuel loading.* The maximum allowable lateral fuel loading differential, if less than the maximum possible.

(l) *Baggage and cargo loading.* The following information for each baggage and cargo compartment or zone—

(1) The maximum allowable load; and

(2) The maximum intensity of loading.

(m) *Systems.* Any limitations on the use of airplane systems and equipment.

(n) *Ambient temperatures.* Where appropriate, maximum and minimum ambient air temperatures for operation.

(o) *Smoking.* Any restrictions on smoking in the airplane.

(p) *Types of surface.* A statement of the types of surface on which operations may be conducted. (See §§ 23.45(g) and 23.1587(a)(4) and (d)(4)).

§ 23.1585 Operating procedures.

Instead of compliance with § 23.1585, the following apply:

(a) For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the achievement of the scheduled performance must be furnished, including—

(1) An explanation of significant or unusual flight or ground handling characteristics;

(2) The maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds;

(3) A recommended speed for flight in rough air. This speed must be chosen to protect against the occurrence, as a result of gusts, of structural damage to the airplane and loss of control (for example, stalling);

(4) Procedures for restarting any turbine engine in flight, including the effects of altitude; and

(5) Procedures, speeds, and configuration(s) for making a normal approach and landing, in accordance with § 23.73 and § 23.75, and a transition to the balked landing condition.

(6) For seaplanes and amphibians, water handling procedures and the demonstrated wave height.

(b) Not applicable.

(c) In addition to paragraph (a) of this section, for all multiengine airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making an approach and landing with one engine inoperative;

(2) Procedures, speeds, and configuration(s) for making a balked landing with one engine inoperative and the conditions under which a balked landing can be performed safely, or a warning against attempting a balked landing;

(3) The V_{SSE} determined in § 23.149; and

(4) Procedures for restarting any engine in flight including the effects of altitude.

(d) Not applicable.

(e) Not applicable.

(f) In addition to paragraphs (a) and (c) of this section the information must include the following:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff.

(2) Procedures and speeds for carrying out an accelerate-stop in accordance with § 23.55.

(3) Procedures and speeds for continuing a takeoff following engine failure in accordance with § 23.59(a)(1) and for following the flight path determined under § 23.57 and § 23.61(a).

(g) For multiengine airplanes, information identifying each operating condition in which the fuel system independence prescribed in § 23.953 is necessary for safety must be furnished,

together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(h) For each airplane showing compliance with § 23.1353(g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

(i) Information on the total quantity of usable fuel for each fuel tank, and the effect on the usable fuel quantity, as a result of a failure of any pump, must be furnished.

(j) Procedures for the safe operation of the airplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.

§ 23.1587 Performance information.

Instead of compliance with § 23.1587, the following apply:

Unless otherwise prescribed, performance information must be provided over the altitude and temperature ranges required by § 23.45(b).

(a) For all airplanes, the following information must be furnished—

(1) The stalling speeds V_{SO} and V_{S1} with the landing gear and wing flaps retracted, determined at maximum weight under § 23.49, and the effect on these stalling speeds of angles of bank up to 60 degrees;

(2) The steady rate and gradient of climb with all engines operating, determined under § 23.69(a);

(3) The landing distance, determined under § 23.75 for each airport altitude and standard temperature, and the type of surface for which it is valid;

(4) The effect on landing distances of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g); and

(5) The effect on landing distances of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component.

(b) Not applicable.

(c) Not applicable.

(d) In addition to paragraph (a) of this section, the following information must be furnished—

(1) The accelerate-stop distance determined under § 23.55;

(2) The takeoff distance determined under § 23.59(a);

(3) At the option of the applicant, the takeoff run determined under § 23.59(b);

(4) The effect on accelerate-stop distance, takeoff distance and, if determined, takeoff run, of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(5) The effect on accelerate-stop distance, takeoff distance, and if determined, takeoff run, of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(6) The net takeoff flight path determined under § 23.61(b);

(7) The enroute gradient of climb/descent with one engine inoperative, determined under § 23.69(b);

(8) The effect, on the net takeoff flight path and on the enroute gradient of climb/descent with one engine inoperative, of 50 percent of the headwind component and 150 percent of the tailwind component;

(9) Overweight landing performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights) as follows—

(i) The maximum weight for each airport altitude and ambient temperature at which the airplane complies with the climb requirements of § 23.63(d)(2); and

(ii) The landing distance determined under § 23.75 for each airport altitude and standard temperature.

(10) The relationship between IAS and CAS determined in accordance with § 23.1323(b) and (c).

(11) The altimeter system calibration required by § 23.1325(e).

Issued in Kansas City, Missouri, on November 18, 2008.

John Colomy,

Acting Manager, Small Airplane Directorate, Aircraft Certification Service.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA–2006–23605; Directorate Identifier 2005–NE–48–AD; Amendment 39–15743; AD 2008–24–03]

RIN 2120–AA64

Airworthiness Directives; Rolls-Royce plc Models RB211 Trent 768–60, Trent 772–60, and Trent 772B–60 Turbofan Engines

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

ACTION: Final rule; request for comments.

SUMMARY: The FAA is superseding an existing airworthiness directive (AD) for Rolls-Royce plc (RR) models RB211 Trent 768–60, Trent 772–60, and Trent 772B–60 turbofan engines that have not incorporated RR Service Bulletin (SB) No. RB.211–72–E708, SB No. RB.211–72–F227, or SB No. RB.211–72–E965, at original issue or later revision. That AD currently requires initial and repetitive borescope inspections of the high-pressure/intermediate-pressure (HP/IP) turbine bearing internal oil vent tube, scavenge tube, and tube heat shields for wear and cracking, and removing tubes from service if found with any cracks beyond serviceable limits. That AD also currently requires installation of a new or modified HP/IP turbine bearings support as terminating action for the repetitive borescope inspections. This AD has the same requirements, and adds a repetitive inspection of the vent flow restrictor for blockage. This AD results from RR revising their alert service bulletin for inspection of the HP/IP turbine bearing internal oil vent tube, scavenge tube, and tube heat shields for damage, to include a repetitive inspection of the vent flow restrictor for blockage. We are issuing this AD to prevent oil ejecting from the HP/IP turbine bearings chamber and igniting. Burning oil can cause the intermediate-pressure (IP) shaft to fracture, the IP turbine to overspeed, and possible uncontained failure of the engine.

DATES: Effective December 15, 2008. The Director of the Federal Register approved the incorporation by reference of certain publications listed in the regulations as of December 15, 2008.

We must receive any comments on this AD by January 27, 2009.

ADDRESSES: Use one of the following addresses to comment on this AD.

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- *Mail:* Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC 20590–0001.
- *Hand Delivery:* Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* (202) 493–2251.

Contact Rolls-Royce plc, PO Box 31, Derby, England, DE248BJ; telephone: 011–44–1332–242424; fax: 011–44–1332–245418, for the service information identified in this AD.

FOR FURTHER INFORMATION CONTACT: James Lawrence, Aerospace Engineer, Engine Certification Office, FAA, Engine and Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; e-mail: *james.lawrence@faa.gov*; telephone (781) 238–7175; fax (781) 238–7199.