



**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

**[Docket No. FAA-2016-9402; Special Conditions No. 25-655-SC]**

**Special Conditions: Embraer S.A. Model ERJ 190-300 Airplane; Flight Envelope Protection, General Limiting Requirements**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Embraer S.A. (Embraer) Model ERJ 190-300 airplane. This airplane will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. This design feature is a new control architecture and a full digital flight-control system, both of which provide flight-envelope protections. 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:** This action is effective on Embraer on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

**ADDRESSES:** Send comments identified by docket number FAA-2016-9402 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

*Privacy:* The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

*Docket:* Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Joe Jacobsen, FAA, Airplane and Flightcrew Interface, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone (425) 227-2011; facsimile (425) 227-1320.

**SUPPLEMENTARY INFORMATION:**

The substance of these special conditions has been subject 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, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon publication in the **Federal Register**.

**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 will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

**Background**

On September 13, 2013, Embraer applied for an amendment to Type Certificate No. A57NM to include the new Model ERJ 190-300 airplane. The Model ERJ 190-300 airplane, which is a derivative of the Embraer Model ERJ 190-100 STD airplane currently approved under Type Certificate No. A57NM, is a 97- to 114-passenger transport-category airplane, designed

with a new wing with a high aspect ratio and raked wingtip, and a new electrical-distribution system. The maximum take-off weight is 124,340 lbs (56,400 kg).

### **Type Certification Basis**

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.101, Embraer must show that the Model ERJ 190-300 airplane meets the applicable provisions of the regulations listed in Type Certificate No. A57NM, or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model ERJ 190-300 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

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, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Embraer Model ERJ 190-300 airplane 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.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

## **Novel or Unusual Design Features**

The Embraer Model ERJ 190-300 airplane will incorporate the following novel or unusual design feature: A new control architecture and a full digital flight-control system, both of which provide flight-envelope protections.

## **Discussion**

The applicable airworthiness regulation that applies to these special conditions is 14 CFR 25.143. The purpose of § 25.143 is to verify that any airplane operational maneuvers conducted within the airplane operational envelope can be accomplished smoothly with average piloting skill, and without exceeding any structural limits. The pilot should be able to predict the airplane response to any control input. During the course of the flight-test program, the pilot determines compliance with § 25.143 primarily through qualitative methods. During flight test, the pilot evaluates all of the following:

- The interface between each protection function,
- Transitions from one mode to another,
- The aircraft response to intentional dynamic maneuvering, whenever applicable, through dedicated maneuvers,
- General controllability,
- High speed characteristics, and
- High angle-of-attack.

However, § 25.143 does not adequately ensure that the novel or unusual feature of the Embraer Model ERJ 190-300 airplane will have a level of safety equivalent to that of existing

standards. These special conditions are required to accommodate the flight-envelope-limiting systems in the Model ERJ 190-300 airplane.

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.

### **Applicability**

As discussed above, these special conditions are applicable to the Embraer Model ERJ 190-300 airplane. 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, these special conditions would apply to that model as well.

This action affects only a certain novel or unusual design feature on one model of airplane. It is not a rule of general applicability.

The substance of these special conditions has been subject 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, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon publication in the **Federal Register**. 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 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 Embraer Model ERJ 190-300 airplanes.

### **1. General Limiting Requirements:**

- a. Onset characteristics of each envelope protection feature must be smooth, appropriate to the phase of flight and type of maneuver, and not in conflict with the ability of the pilot to satisfactorily change airplane flight path, speed, or attitude as needed.
- b. Limit values of protected flight parameters (and if applicable, associated warning thresholds) must be compatible with the following:
  - i. Airplane structural limits,
  - ii. Required safe and controllable maneuvering of the airplane, and
  - iii. Margins to critical conditions. Unsafe flight characteristics/conditions must not result if dynamic maneuvering, airframe and system tolerances (both manufacturing and in-service), and non-steady atmospheric conditions, in any appropriate combination and phase of flight, can produce a limited flight parameter beyond the nominal design-limit value.
- c. The airplane must be responsive to intentional dynamic maneuvering to within a suitable range of the parameter limit. Dynamic characteristics such as damping

and overshoot must also be appropriate for the flight maneuver and limit parameter in question.

- d. When simultaneous envelope limiting is engaged, adverse coupling or adverse priority must not result.

**2. Failure States:**

- a. Electronic flight-control-system failures (including sensors) must not result in a condition where a parameter is limited to such a reduced value that safe and controllable maneuvering is no longer available.
- b. The crew must be alerted by suitable means if any change in envelope limiting or maneuverability is produced by single or multiple failures of the electronic flight-control system not shown to be extremely improbable.

Issued in Renton, Washington, on March 15, 2017.

Dionne Palermo  
Acting Manager, Transport Airplane Directorate  
Aircraft Certification Service  
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