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**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

**[Docket No. FAA-2013-0902; Special Conditions No. 25-521-SC]**

**Special Conditions:** Airbus Model A350-900 Series Airplane; Electronic Flight-Control System (EFCS) to Limit Pitch and Roll

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

**ACTION:** Final special conditions.

**SUMMARY:** These special conditions are issued for the Airbus Model A350-900 airplane. This airplane will have a novel or unusual design feature associated with the electronic flight-control system (EFCS) that limits pitch- and roll-attitude functions. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES: Effective Date: [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].**

**FOR FURTHER INFORMATION CONTACT:** Joe Jacobsen, FAA, Airplane and Flightcrew Interface Branch, 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:**

### **Background**

On August 25, 2008, Airbus applied for a type certificate for their new Model A350-900 airplane. Later, Airbus requested, and the FAA approved, an extension to the application for FAA type certification to November 15, 2009. The Model A350-900 airplane has a conventional layout with twin wing-mounted Rolls-Royce Trent XWB engines. It features a twin-aisle, 9-abreast, economy-class layout, and accommodates side-by-side placement of LD-3 containers in the cargo compartment. The basic Model A350-900 airplane configuration will accommodate 315 passengers in a standard two-class arrangement. The design cruise speed is Mach 0.85 with a maximum take-off weight of 602,000 lbs.

A special condition to supplement § 25.143 concerning pitch and roll limits was developed for the Airbus Model A320, A330, A340, and A380 airplanes wherein performance of the limiting functions was monitored throughout the flight-test program. The FAA expects similar monitoring to take place during the A350 flight-test program to substantiate the pitch- and roll-attitude limiting functions, and the appropriateness of the chosen limits.

### **Type Certification Basis**

Under Title 14, Code of Federal Regulations (14 CFR) 21.17, Airbus must show that the Model A350-900 airplane meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-129.

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 A350-900 airplane because of a novel or unusual design feature, special conditions are prescribed under § 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 or similar novel or unusual design feature, the special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and final special conditions, the Model A350-900 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 must issue a finding of regulatory adequacy under section 611 of Public Law 92-574, the “Noise Control Act of 1972.”

The FAA issues special conditions, as defined in 14 CFR 11.19, under § 11.38, and they become part of the type-certification basis under § 21.17(a)(2).

### **Novel or Unusual Design Features**

The Airbus Model A350-900 series will incorporate the following novel or unusual design features: an EFCS that, when operating in its normal mode, will prevent airplane pitch attitudes greater than +30 degrees and less than –15 degrees, and roll angles greater than plus or minus 67 degrees. In addition, positive spiral stability is introduced for roll angles greater than 33 degrees at speeds below  $V_{MO}/M_{MO}$ . At speeds greater than  $V_{MO}$  and up to  $V_{DF}$ , maximum aileron-control force is limited to only 45 degrees maximum bank angle.

### **Discussion**

It is expected that high thrust-to-weight ratios provide the most critical cases for the positive-pitch limit. A margin in pitch control must be available to enable speed control in maneuvers such as climb after takeoff, and balked landing climb. The pitch limit must not impede likely maneuvering made necessary by collision avoidance efforts. A negative-pitch limit

must similarly not interfere with collision-avoidance capability, or with attaining and maintaining speeds near  $V_{MO}/M_{MO}$  for emergency descent.

Spiral stability, which is introduced above 33 degrees roll angle, and the roll limit must not restrict attaining roll angles up to 66 degrees (approximately 2.5g level turn) with flaps up and 60 degrees (approximately 2.0g level turn) with flaps down. The implementation of this spiral stability requires a steady aileron-control force to maintain a constant bank angle above 33 degrees. This force must not require excessive pilot strength as stated in § 25.143(f).

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.

## **Discussion of Comments**

Notice of proposed special conditions no. 25-13-25-SC for the Airbus Model A350-900 airplane was published in the *Federal Register* on November 12, 2013 (78 FR 67320). One comment supporting the special conditions was received. These special conditions are adopted as proposed.

## **Applicability**

As discussed above, these special conditions apply to Airbus Model A350-900 airplanes. Should Airbus apply later for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

## **Conclusion**

This action affects only certain novel or unusual design features on the Airbus Model A350-900 airplanes. It is not a rule of general applicability.

## **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 Airbus Model A350-900 airplanes. In addition to § 25.143, the following requirements apply:

1. The pitch-limiting function must not impede normal maneuvering for pitch angles up to the maximum required for normal maneuvering, including a normal all-engines-operating takeoff, plus a suitable margin to allow for satisfactory speed control.
2. The pitch and roll limiting functions must not restrict or prevent attaining pitch attitudes necessary for emergency maneuvering, or roll angles up to 66 degrees with flaps up or 60 degrees with flaps down. Spiral stability, which is introduced above 33 degrees roll angle, must not require excessive pilot strength to achieve these roll-limit angles. Other protections, which further limit the roll capability under certain extreme angle-of-attack, attitude, or high-speed conditions, are acceptable as long as they allow at least 45 degrees of roll capability.

Issued in Renton, Washington, on July 11, 2014.

Michael Kaszycki  
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Aircraft Certification Service

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