

**DEPARTMENT OF TRANSPORTATION****Federal Aviation Administration****14 CFR Part 25**

[Docket No. FAA-2013-0897; Special Conditions No. 25-523-SC]

**Special Conditions: Airbus Model A350-900 Airplane; Transient Engine-Failure Loads**

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

**ACTION:** Final special conditions.

**SUMMARY:** These special conditions are issued for Airbus Model A350-900 airplanes. These airplanes will have a novel or unusual design feature associated with the new generation of high-bypass engines and the potential loads resulting from extreme engine-failure conditions.

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:* September 8, 2014.

**FOR FURTHER INFORMATION CONTACT:**

Todd Martin, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone (425) 227-1178; 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 accommodates 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.

The existing regulations are inadequate because the new, large-

bypass fan engines of the Model A350-900 airplanes can cause more damage in a failure event than could the previous engines. To maintain the level of safety envisioned by Title 14, Code of Federal Regulations (14 CFR) 25.61(b), more comprehensive criteria are needed for the new generation of high-bypass engines. The more severe events resulting from extreme engine-failure conditions would be treated as dynamic-load conditions. The special conditions would distinguish between the more common engine-failure events and those rare events resulting from structural failures. The more common events would continue to be treated as static torque-limit load conditions. The severe events would be considered ultimate loads, and include all transient loads associated with the event. An additional safety factor would be applied to the more critical airframe supporting structure.

**Type Certification Basis**

Under 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 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 Model A350-900 airplane will incorporate the following novel or unusual design features: engines with large-bypass fans capable of producing

much higher failure loads than previous engines. The Model A350-900 airplane will therefore require additional dynamic-load analyses to assess the most severe engine-failure events. The loads resulting from these conditions would be considered as ultimate loads, with an additional safety factor applied to the airframe supporting structure.

**Discussion**

The size, configuration, and failure modes of jet engines has changed considerably from those envisioned by 14 CFR 25.361(b) when the engine-seizure requirement was first adopted. Engines have become larger and are now designed with large-bypass fans capable of producing much higher failure loads. Relative to the engine configurations that existed when the rule was developed in 1957, the present generation of engines are sufficiently different and novel to justify special conditions for Model A350-900 airplanes. Service history has shown that the engine-failure events that tend to cause the most severe loads are fan-blade failures, and these events occur much less frequently than the typical "limit" load condition.

The regulatory authorities and industry developed a standardized requirement in the Aviation Rulemaking Advisory Committee (ARAC) forum. The technical aspects of this requirement have been agreed upon and have been accepted by the ARAC Loads and Dynamics Harmonization Working Group. These special conditions reflect the ARAC recommendation and are essentially harmonized with the corresponding European Aviation Safety Agency (EASA) Certification Specifications (CS) 25. In addition, the ARAC recommendation includes corresponding advisory material that is incorporated in CS-25. This advisory material is considered an acceptable means of compliance to the special conditions.

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. 25-13-29-SC for Airbus Model A350-900 airplanes was published in the **Federal Register** on November 12, 2013 (78 FR 67323). No substantive comments were received, and the special conditions are adopted as proposed.

## Applicability

As discussed above, these special conditions apply to the 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 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 lieu of § 25.361(b), the following special conditions apply:

1. For turbine-engine installations, the engine mounts, pylons, and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
  - a. Sudden engine deceleration due to a malfunction that could result in a temporary loss of power or thrust, and
  - b. the maximum acceleration of the engine.
2. For auxiliary power-unit installations, the power-unit mounts and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
  - a. Sudden auxiliary power-unit deceleration due to malfunction or structural failure, and
  - b. the maximum acceleration of the power unit.
3. For engine-supporting structure, an ultimate loading condition must be considered that combines 1g flight loads with the transient dynamic loads resulting from:
  - a. The loss of any fan, compressor, or turbine blade, and separately
  - b. where applicable to a specific engine design, any other engine structural failure that results in higher loads.

4. The ultimate loads developed from the conditions specified in special conditions 3.a. and 3.b. are to be multiplied by a factor of 1.0 when applied to engine mounts and pylons, and multiplied by a factor of 1.25 when applied to adjacent supporting airframe structure.

5. The airplane must be capable of continued safe flight considering the aerodynamic effects on controllability due to any permanent deformation that results from the conditions specified in special condition 3.

Issued in Renton, Washington, on July 15, 2014.

**John P. Piccola, Jr.,**

*Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.*

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## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

### 14 CFR Part 25

[Docket No. FAA–2013–0903; Special Conditions No. 25–525–SC]

### Special Conditions: Airbus Model A350–900 Series Airplane; Side-Stick Controllers

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

**ACTION:** Final special conditions.

**SUMMARY:** These special conditions are issued for Airbus Model A350–900 airplanes. These airplanes will have a novel or unusual design feature associated with side-stick controllers for pitch and roll control, instead of conventional wheels and columns. 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:* September 8, 2014.

**FOR FURTHER INFORMATION CONTACT:** Loran Haworth, FAA, Airplane and Flight Interface Branch, ANM–111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057–3356; telephone (425) 227–1133; 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 accommodates 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.

The Airbus Model A350–900 airplane, like its predecessors the Model A320, A330, A340 and A380 airplanes, will use side-stick controllers for pitch and roll control. Regulatory requirements pertaining to conventional wheel and column controls, such as pilot strength and controllability, are not directly applicable for the side stick. In addition, pilot-control authority may be uncertain because the side sticks are not mechanically interconnected as with conventional wheel and column controls.

## 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.

The FAA has determined that Airbus Model A350–900 airplanes must comply with §§ 25.143, 25.145(b), 25.175(b), 25.671, and 25.1329(a).

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 Airbus 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 special conditions, the Airbus Model A350–900 airplane must comply with the fuel-vent