[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2017-0483; Special Conditions No. 25-708-SC]

Special Conditions: Airbus Model A330-841 and A330-941 (A330neo) Airplanes; Electronic Flight-Control System; Lateral-Directional and Longitudinal Stability, and Low-Energy Awareness

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Airbus Model A330-841 and A330-941 (A330neo) airplanes. These airplanes 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 low-energy awareness and directional stability with respect to electronic flight-control systems (EFCS). 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 Airbus on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].** Send your comments by **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].**

ADDRESSES: Send comments identified by docket number FAA-2017-0483 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).

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: Paul Giesman, FAA, Airplane and Flight Crew Interface, AIR-671, Transport Standards Branch, Policy and Innovation Division, Aircraft

Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2790; facsimile 425-227-1320.

SUPPLEMENTARY INFORMATION:

The substance of these special conditions has been published in the **Federal Register** for public comment in several prior instances with no substantive comments received. The FAA therefore finds it unnecessary to delay the effective date and finds it unnecessary to delay the effective date and finds that good cause exists for making these special conditions effective 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 January 20, 2015, Airbus applied for an amendment to Type Certificate No. A46NM to include the new Model A330-841 (A330-800neo) and A330-941 (A330-900neo) airplanes, collectively marketed as Model A330neo airplanes. These airplanes, which are derivatives of the Model A330-200 and A330-300 airplanes currently approved under Type Certificate No. A46NM, are wide-body, jet-engine airplanes with a maximum takeoff weight of 533,519 pounds and a passenger capacity of 257 (A330-841); and a maximum takeoff weight of 535,503 pounds and a passenger capacity of 287 (A330-941).

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, Airbus must show that the Model A330neo airplanes meet the applicable provisions of the regulations listed in Type Certificate No. A46NM**,** 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 Model A330neo airplanes 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 Airbus Model A330neo airplanes 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 Airbus Model A330neo airplanes will incorporate the following novel or unusual design features:

Low-energy awareness and directional stability functions of the EFCS, which are not sufficiently addressed in Special Conditions (SC) No. 25-ANM-77, "Airbus Industrie Model A330 Series Airplanes," Discussion section item 11, Flight Characteristics.

Discussion

An initial review of the Model A330 and A340 airplanes' SC 25-ANM-77, Discussion section item 11, and subsequent certifications of the Model A340-500/600, A380, and A350 airplanes, revealed that SC 25-ANM-77, item 11, does not address low-energy awareness, nor does it provide similar detail as to the demonstration of directional stability, as has become the standard in later special conditions for Airbus airplanes.

These special conditions, for the Model A330-841 and -941 airplanes, replace the current item 11b and c in SC 25-ANM-77. In addition, these special conditions, in conjunction with the application of part 25, subpart B, at Amendment 25-108 for 1g stall speeds; and § 25.177(a) and (b) at Amendment 25-135; are intended to parallel the requirements provided in type certifications of Model A340-500 and -600, A380, and A350 airplanes.

In the absence of positive lateral stability, the curve of lateral control-surface deflections against sideslip angle should be in a conventional sense and reasonably in harmony with rudder deflection during steady-heading sideslip maneuvers.

Because conventional relationships between stick forces and control-surface displacements do not apply to the load-factor-command flight-control system on the Model A330-841 and -941 airplanes, longitudinal stability characteristics should be evaluated by assessing the airplane handling qualities during simulator and flight-test maneuvers appropriate to operation of the airplane. This may be accomplished by using the Handling Qualities Rating Method presented in Advisory Circular 25-7C, "Flight Test Guide for Certification of Transport

Category Airplanes," Appendix 5, or an acceptable alternative method proposed by the Airbus. Important considerations are as follows:

1. Adequate speed control without excessive pilot workload,
2. Acceptable high- and low-speed protection, and
3. Provision for adequate cues to the pilot of significant speed excursions beyond V_{MO}/M_{MO}, and low-speed-awareness flight conditions.

The airplane should provide adequate awareness cues to the pilot of a low-energy (low-speed/low-thrust/low-height) state to ensure that the airplane retains sufficient energy to recover when flight-control laws provide neutral longitudinal stability significantly below the normal operating speeds. This may be accomplished as follows:

1. Adequate low-speed/low-thrust cues at low altitude may be provided by a strong positive-static-stability force gradient (1 pound per 6 knots applied through the sidestick), or,
2. The low-energy awareness may be provided by an appropriate warning with the following characteristics:
    a. It should be unique, unambiguous, and unmistakable.
    b. It should be active at appropriate altitudes and in appropriate configurations (i.e., at low altitude, in the approach and landing configurations).
    c. It should be sufficiently timely to allow recovery to a stabilized flight condition inside the normal flight envelope while maintaining the desired flight path, and without entering the flight controls angle-of-attack protection mode.
    d. It should not be triggered during normal operation, including operation in moderate turbulence for recommended maneuvers at recommended speeds.

e. The system should not allow the pilot to cancel the warning, or the low-energy awareness function, other than by achieving a higher energy state.

f. The various warnings should have an adequate hierarchy of alert so that the pilot is not confused and led to take inappropriate recovery action if multiple warnings occur at the same time.

3. Global energy awareness and non-nuisance of low-energy cues should be evaluated by simulator and flight tests in the whole take-off and landing altitude range for which certification is requested. This would include all relevant combinations of weight, center-of-gravity position, configuration, airbrakes position, and available thrust, including reduced and derated take-off thrust operations and engine-failure cases. A sufficient number of tests should be conducted, allowing the level of energy awareness and the effects of energy-management errors to be assessed.

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 Airbus Model A330-841 and A330-941 (A330neo) airplanes. Should Airbus 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.

Conclusion

This action affects only certain novel or unusual design features on one model series of airplane. 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 A330-841 and A330-941 (A330neo) airplanes.

In lieu of the requirements of §§ 25.171, 25.173, 25.175, and 25.177(c), the following special conditions apply:

1. The airplane must be shown to have suitable static lateral, directional, and longitudinal stability in any condition normally encountered in service, including the effects of atmospheric disturbance. The showing of suitable static lateral, directional, and longitudinal stability must be based on the airplane handling qualities, including pilot workload and pilot compensation, for specific test procedures during the flight-test evaluations.
2. The airplane must provide to the pilot adequate awareness of a low-energy (low-speed/low-thrust/low-height) state when fitted with flight-control laws presenting neutral longitudinal stability significantly below the normal operating speeds. ‘‘Adequate awareness’’ means that warning information must be provided to alert the flightcrew of unsafe operating conditions, and to enable them to take appropriate corrective action.

3. In straight, steady sideslips over the range of sideslip angles appropriate to the operation of the airplane, but not less than those obtained with one-half of the available rudder-control movement (but not exceeding a rudder-control force of 180 pounds), rudder-control movements and forces must be substantially proportional to the angle of sideslip in a stable sense; and the factor of proportionality must lie between limits found necessary for safe operation. This requirement must be met for the configurations and speeds specified in § 25.177(a).

Issued in Renton, Washington, on December 28, 2017.

Suzanne Masterson
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Aircraft Certification Service
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