B

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2022-0349; Special Conditions No. 25-820-SC]

Special Conditions: Airbus Model A321neo XLR Airplane; Flight-Envelope Protection Functions – General

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

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Airbus Model A321neo XLR 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 an electronic flight-control system that provides 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: Effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

FOR FURTHER INFORMATION CONTACT: Troy Brown, Performance and Environment Section, AIR-625, Technical Innovation Policy Branch, Policy and Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 1801 S. Airport Rd., Wichita, KS 67209-2190; telephone and fax 405-666-1050; e-mail troy.a.brown@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On September 16, 2019, Airbus applied for an amendment to Type Certificate No. A28NM to include the new Model A321neo XLR airplane. These airplanes are twin-engine, transport-category airplanes with seating for 244 passengers and a maximum takeoff weight of 222,000 pounds.

Type Certification Basis

Under the provisions of 14 CFR 21.101, Airbus must show that the Model A321neo XLR airplanes meet the applicable provisions of the regulations listed in Type Certificate No. A28NM, 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 (e.g., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Airbus Model A321neo XLR 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 A321neo XLR 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 § 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 A321neo XLR airplanes will incorporate the following novel or unusual design feature:

An electronic flight-control system that provides flight envelope protections.

Discussion

Many new transport-category airplanes use advanced electronic flight-control systems (EFCS), which incorporate flight-envelope protection (limiting) designed to prevent the pilot from inadvertently or intentionally exceeding any number of flight-envelope parameters. Depending on a particular EFCS design, these limiting features may or may not be active in all normal and alternate flight-control modes, and may or may not be capable of being overridden by the pilot.

The FAA currently applies 14 CFR 25.143 to airplanes incorporating EFCS. The purpose of § 25.143 is to verify that operational maneuvers conducted within the operational envelope can be accomplished smoothly with average piloting skill, and without encountering a stall warning or other characteristics that might interfere with normal maneuvering, or without exceeding structural limits. The airplane response to control input should be predictable to the pilot. However, § 25.143 does not adequately ensure that airplanes incorporating EFCS with flight-envelope protections will have a level of safety equivalent to that of existing standards.

Envelope-protection functions are intended to reduce the likelihood of excursions, either commanded or uncommanded, to unintended or potentially hazardous airplane operating states. As a consequence of preventing excursions, these functions can also restrict aircraft maneuverability, and may introduce non-traditional behavior. The special conditions will ensure that flight-envelope protection functions support safe operation,

and do not interfere with required maneuvering in normal and emergency operations, and in forseeable atmospheric conditions.

The FAA previously issued separate special conditions for general limiting, normal load-factor limiting, high-speed limiting, and pitch and roll limiting for airplanes incorporating flight-envelope protection features. However, the FAA tasked the Aviation Rulemaking Advisory Committee (ARAC) in April 2014 (79 FR 20295) to develop recommended standards for fly-by-wire flight controls for general flight-envelope protection (limiting) similar to those provided for conventional control functions in 14 CFR 25.143. The ARAC recommended,[2] among other things, performance-based requirements that would encompass general limiting, normal load-factor limiting, high-speed limiting, and pitch and roll limiting which the FAA previously issued as separate special conditions. These proposed special conditions are based on that ARAC recommendation.

These special conditions provide the same level of safety as the prescriptive, design-specific special conditions the FAA has issued in the past for general limiting, normal load-factor limiting, high-speed limiting, and pitch and roll limiting, thus the FAA need not issue separate special conditions to address each of these areas.

These special conditions are in addition to the requirements of § 25.143.

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.

---

[2] FAA Aviation Rulemaking Advisory Committee, FTHWG Topic 1 Envelope Protection, Recommendation Report- Rev. A, March, 2017, https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/09%20-%20FTHWG_Final_Report_Phase_2_RevA__Apr_2017.pdf.

Discussion of Comments

The FAA issued notice of proposed Special Conditions No. 25-22-05-SC for the Airbus Model A321neo XLR airplane, which was published in the *Federal Register* on November 17, 2022 (87 FR 68942).

The FAA received one response from the Air Line Pilots Association supporting the special conditions. The special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions apply to Airbus Model A321neo XLR 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 one model series of airplanes. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

Authority Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 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 A321neo XLR airplanes equipped with EFCS.

In addition to § 25.143, the following requirements apply:

(a) Envelope protection functions must not unduly limit the maneuvering capability of the airplane, nor interfere with its ability to perform maneuvers required for normal and emergency operations.

(b) Onset characteristics of each flight-envelope protection function must be appropriate to the phase of flight and type of maneuver, and must not conflict with the ability of the pilot to satisfactorily control the airplane flight path, speed, and attitude.

(c) Excursions of a limited flight parameter beyond its nominal design-limit value due to dynamic maneuvering, airframe and system tolerances, and non-steady atmospheric conditions must not result in unsafe flight characteristics or conditions.

(d) Operation of flight-envelope protection functions must not adversely affect aircraft control during expected levels of atmospheric disturbances, nor impede the application of recovery procedures in case of wind shear.

(e) Simultaneous action of flight-envelope protection functions must not result in adverse coupling or adverse priority.

(f) In case of abnormal attitude or excursion of flight parameters outside the protected boundaries, operation of flight-envelope protection functions must not hinder airplane recovery.

Issued in Kansas City, Missouri, on February 22, 2023.

Patrick R. Mullen,
Manager, Technical Innovation Policy Branch,
Policy and Innovation Division,
Aircraft Certification Service.

[FR Doc. 2023-03980 Filed: 2/24/2023 8:45 am; Publication Date: 2/27/2023]