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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 29

[Docket No. FAA-2024-0895; Notice No. 29-24-01-SC]

Special Conditions: Bell Textron Inc. (Bell) Model 525 Helicopter; Static Longitudinal Stability Compliance

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed special conditions.

SUMMARY: This action proposes special conditions for the Bell Model 525 helicopter. This helicopter will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport category helicopters. This design feature is a four-axis full authority digital fly-by-wire (FBW) flight control system (FCS) that provides for aircraft control through pilot input or coupled auto pilot modes. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These proposed 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: Send comments on or before [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Send comments identified by Docket No. FAA-2024-0895 using any of the following methods:

Federal eRegulations Portal: Go to 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.

Docket: Background documents or comments received may be read at https://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: Gregory Thumann, Performance and Environment Unit, AIR-621A, Technical Policy Branch, Policy and Standards Division, Aircraft Certification Service, Federal Aviation Administration, 1801 S. Airport Road, Wichita, KS 67209; telephone and fax (405) 666-1052;
e-mail Gregory.G.Thumann@faa.gov.

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites 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 proposed special conditions, explain the reason for any recommended change, and include supporting data.

The FAA will consider all comments received by the closing date for comments, and will consider comments filed late if it is possible to do so without incurring delay. The FAA may change these special conditions based on the comments received.

Privacy

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in title 14, Code of Federal Regulations (14 CFR) 11.35, the FAA will post all comments received without change to www.regulations.gov, including any personal information you provide. The FAA will also post a report summarizing each substantive verbal contact received about these special conditions.

Confidential Business Information

Confidential Business Information (CBI) is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to these special conditions contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to these special conditions, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as "PROPIN." The FAA will treat such marked submissions as confidential under the FOIA, and the indicated comments will not be placed in the public docket of these proposed special conditions. Send submissions containing CBI to the individual listed in the For Further Information Contact section above. Comments the FAA receives, which are not specifically designated as CBI, will be placed in the public docket for these proposed special conditions.

Background

On December 15, 2011, Bell applied for a type certificate for a new 14 CFR part 29 transport category helicopter designated as the Model 525. Bell applied for multiple extensions to its certification application, with the most recent occurring on September 21, 2023. The helicopter is a medium twin-engine rotorcraft. The maximum takeoff weight is 20,500 pounds, with a maximum capacity of 16 passengers and a crew of 2.

Type Certification Basis

Under the provisions of 14 CFR 21.17, Bell must show that the Model 525 meets the applicable provisions of part 29, as amended by Amendments 29-1 through 29-55 thereto. The Bell Model 525 certification basis date is December 31, 2019.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 29) do not contain adequate or appropriate safety standards for the Bell Model 525 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, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Bell Model 525 helicopter must comply with the 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 § 21.17(a)(2).

Novel or Unusual Design Feature

The Bell Model 525 helicopter will incorporate the following novel or unusual design feature: a four-axis full authority digital FBW FCS that provides aircraft control through pilot input or coupled auto pilot modes in addition to degraded modes.

Discussion

For a conventional rotorcraft having mechanical linkages from the primary cockpit flight controls to the rotor, static longitudinal stability means that a pull force on the controller (i.e., cyclic) will result in a reduction in speed relative to the trim speed, and a push force will result in a higher speed relative to the trim speed. Longitudinal stability is required by the regulations for the following reasons:

- Airspeed change cues are provided to the pilot through increased and decreased forces on the controller.
- Short periods of unattended control of the rotorcraft do not result in significant changes in attitude, airspeed, or load factor.
- A predictable pitch response is provided to the pilot.
- An acceptable level of pilot workload, to attain and maintain trim speed and altitude, is provided to the pilot.
- Longitudinal stability provides gust stability.

The pitch control movement of the controller (i.e., cyclic) for the FBW FCS is an attitude command, which results in a rotor movement to attain the commanded pitch attitude. The flight path commanded by the initial cyclic input will remain stick-free until the pilot gives another command. This control function is applied during normal control laws within the approved flight envelope. The relevant regulations in part 29, which are §§ 29.173(b), 29.175 for visual flight rules (VFR) operations, and Appendix B to part 29 sections IV and VII – Airworthiness Criteria for Helicopter Instrument Flight, are inadequate for the Bell 525 because the longitudinal flight control laws for the Bell 525

provide neutral and negative static stability, rather than positive static stability, within the normal operational envelope. As detailed in § 29.173(b) and considered in Advisory Circular (AC) 29.173A, “Static Longitudinal Stability” (AC 29.173A), which is contained in AC 29-2C, “Certification of Transport Category Rotorcraft” (AC 29-2C), and the positive control force stability requirements in Appendix B to part 29, sections IV and VII, the slope of the control position (i.e., cyclic) versus airspeed curve must be positive (i.e., provide positive static stability) throughout the full range of altitude for which certification is requested and with the throttle and collective pitch held constant.

The proposed 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.

In lieu of meeting the requirements of §§ 29.173(b), 29.175 for VFR operations and the airworthiness criteria for helicopter instrument flight requirements of Appendix B to part 29, sections IV and VII, the proposed special conditions would require the rotorcraft to be shown to have suitable longitudinal stability and acceptable rotorcraft handling qualities. The suitable static longitudinal stability must be primarily based on a positive control movement, which is described as "control sense of motion" in AC 29.173A contained in AC 29-2C. Additionally, the static longitudinal stability and rotorcraft handling qualities are determined through an assessment of pilot workload, cues, and pilot compensation for specific test procedures performed during the flight test evaluation.

The language “must be primarily based on a positive control movement” reflects a pilot’s perception of aircraft control where the first concern is that the control movements are primarily positive in control movement. Once that is established, the pilot must observe that the second concern of "rotorcraft handling qualities" is not degraded or mis-aligned where the anticipated flight behavior is not what the pilot is witnessing. The

proposed special conditions address the concern that these highly computer-controlled control systems can cause the pilot to become disconnected or out-of-sync with the aircraft's control. Such a situation can lead to control input errors and undesirable feedback that can in turn result in loss of control.

Applicability

As discussed above, these proposed special conditions are 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, these special conditions would apply to the other model as well.

Conclusion

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

List of Subjects in 14 CFR Part 29

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, and 44704.

The Proposed Special Conditions

In lieu of meeting the requirements of §§ 29.173(b), 29.175 for VFR operations and the airworthiness criteria for helicopter instrument flight requirements of Appendix B to part 29, sections IV and VII, the Federal Aviation Administration (FAA) proposes the following special conditions as part of the type certification basis for Bell Model 525 helicopters.

The rotorcraft must be shown to have suitable longitudinal stability in any condition normally encountered in service, including the effects of atmospheric disturbance. The showing of suitable static longitudinal stability must be primarily based on a positive control movement in addition to acceptable rotorcraft handling qualities, both of which are determined by assessing pilot workload, cues, and pilot compensation for specific test procedures during the flight test evaluation.

Issued in Des Moines, Washington, on May 16, 2024.

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[FR Doc. 2024-11158 Filed: 5/21/2024 8:45 am; Publication Date: 5/22/2024]