



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 29

[Docket No. FAA-2021-0065; Notice No. 29-054-SC]

Special Conditions: Bell Textron Inc., Model 525 Helicopter; Fly-By-Wire (FBW) Flight Control System (FCS)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed special conditions.

SUMMARY: This action proposes special conditions for the Bell Textron Inc. (Bell) Model 525 helicopter. This helicopter will have a novel or unusual design feature associated with a fly-by-wire (FBW) flight control system (FCS). 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 PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Send comments identified by Docket No. FAA-2021-0065 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: Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, 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).

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 proposed 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 proposed 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 they will not be placed in the public docket of these proposed special conditions. Submissions containing CBI should be sent to John VanHoudt, FAA, Dynamic Systems Section, AIR-627, Technical Innovation Policy Branch, Policy and Innovation Division, Aircraft Certification Service, 10101

Hillwood Parkway, Fort Worth, TX 76177-98198; telephone and fax 817-222-5193; e-mail John.G.Van.Houdt@FAA.Gov. Any commentary that the FAA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

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: John VanHoudt, FAA, Dynamic Systems Section, AIR-627, Technical Innovation Policy Branch, Policy and Innovation Division, Aircraft Certification Service, 10101 Hillwood Parkway, Fort Worth, TX 76177-98198; telephone and fax 817-222-5193; e-mail John.G.Van.Houdt@FAA.Gov

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites you to send any written relevant data, views, or arguments about this proposal. Send your comments to an address listed under ADDRESSES. Include “Docket No. FAA-2021-0065; Notice No. 29-054-SC” at the beginning of your comments. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. The FAA will consider all comments received by the closing date and may amend these proposed special conditions because of those comments.

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, with the most recent occurring on November 12, 2020. The date of the updated type certification basis is December 31, 2016, based upon the applicant’s proposed type certificate issuance date of

December 31, 2021. The Model 525 is a medium twin-engine rotorcraft. The design maximum takeoff weight is 20,500 pounds, with a maximum capacity of 19 passengers and a crew of 2.

The Bell Model 525 helicopter will be equipped with a four axis full authority digital FBW FCS that provides for aircraft control through pilot input and coupled flight director modes. The design of the Bell Model 525 FBW controls, which provides no direct hydro-mechanical linkage between the primary cockpit flight controls or inceptors and the main and tail rotor actuators, is a first for commercial rotorcraft use. Therefore, the regulations do not contain adequate or appropriate safety standards for this new design feature.

The rotorcraft industry is producing new generations of helicopters, and gradually increasing size, speed, load capacity, and technical sophistication. In recent years, an accelerated trend has occurred using rotorcraft for a wide range of commercial and industrial applications. This has resulted in increased complexity of modern control systems and increased use of automation in flight control systems, including the implementation of advanced flight control systems such as FBW FCS.

Title 14, Code of Federal Regulations (CFR), § 29.671(c), which provides requirements for transport category rotorcraft control systems, does not contain adequate or appropriate safety standards for this new design feature. 14 CFR 29.671(c) requires, in part, a means to allow the pilot to determine that full control authority is available prior to flight. This command control authority is typically achieved by verifying movement of the control quadrant through an unassisted mechanical pilot-initiated manipulation of the primary flight controls prior to flight. Although this approach does not guarantee that 100% maximum control movement of the flight controls has been achieved prior to flight, it has been deemed appropriate for mechanical flight control systems.

Unlike traditional mechanical flight control systems, the FBW FCS reduces the opportunity for jamming of the flight controls due to mechanical bind, improper servo adjustment resulting from faulty maintenance, or presence of a foreign object in the control

mechanism that will impair safety. This reduced exposure for jams is due to the replacement of the mechanical linkages between the primary cockpit flight controls or inceptors and the main and tail rotor actuators with digital signal processing wiring. However, the FBW FCS does increase the potential for latent failures or faults that could impair full control authority, unless a means exists to ensure the FBW FCS is fully functional and free of control authority impairment prior to flight. A FBW system may have the ability to verify full control authority without having to move the primary flight controls.

Although part 29 does not contain adequate or appropriate safety standards for this novel or unusual design feature, 14 CFR 25.671, amendment 25-23, provides these requirements for transport category airplanes. Accordingly, these proposed special conditions are based on § 25.671 to provide requirements for a FBW FCS on the Bell Model 525 helicopter. 14 CFR 25.671(c) provides the same level of safety as that intended by § 29.671(c) when employing a FBW FCS by including requirements for jamming and failure analysis. The proposed special conditions would require a comprehensive safety analysis of the aircraft's FBW FCS to include failures due to command logic (software), mechanical and electronic interfaces to other systems, jamming and maintenance. Therefore, in conjunction with § 29.671(a) and (b), the proposed special conditions incorporate provisions from § 25.671(c) to establish a level of safety equivalent to that established in the regulations.

Type Certification Basis

Under the provisions of 14 CFR 21.17, Bell must show that the Model 525 helicopter meets the applicable provisions of part 29, as amended by Amendments 29 through 55 thereto. The Bell Model 525 certification basis date is December 31, 2016.

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 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 Bell Model 525 helicopter must comply with the noise certification requirements of 14 CFR part 36, and the FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the "Noise Control Act of 1972."

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 Features

The Bell Model 525 helicopter will incorporate the following novel or unusual design features: a FBW FCS.

This new design feature has no direct hydro-mechanical linkage between the primary cockpit flight controls or inceptors and the main and tail rotor actuators, thereby eliminating the more complex elements of either a manual movement of the controls by the pilot, or another manual means.

Discussion

The proposed special conditions would require that a means be available to show full control authority for all powered control systems.

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.

Applicability

As discussed above, these special conditions are applicable to the Bell Model 525 helicopter. Should Bell 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 a certain novel or unusual design feature on the Bell Model 525 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, 44704.

The Proposed Special Conditions

Accordingly, the Federal Aviation Administration (FAA) proposes the following special conditions in lieu of § 29.671(c) as part of the type certification basis for the Bell Textron Inc. Model 525 helicopter:

The rotorcraft must be shown by analysis, tests, or both, to be capable of continued safe flight and landing after any of the following failures or jamming in the flight control system within the normal flight envelope, without requiring exceptional piloting skill or strength. Probable failures must have only minor effects.

- (1) Any single failure not shown to be extremely improbable, excluding jamming.
- (2) Any combination of failures not shown to be extremely improbable, excluding jamming.
- (3) Any jam in a control position normally encountered during hover, takeoff, climb, cruise, normal turns, descent, and landing, unless the jam is shown to be extremely improbable or can be alleviated.

Issued in Fort Worth, Texas

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