



## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 29**

**[Docket No. FAA-2021-1143; Special Conditions No. 29-055-SC]**

#### **Special Conditions: Airbus Helicopters Model H160-B Helicopter; Extended**

#### **Duration of Flight After Loss of Main Gearbox Lubrication**

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

**ACTION:** Final special conditions.

**SUMMARY:** These special conditions are issued for the Airbus Helicopters (Airbus) Model H160-B helicopter. This helicopter has a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for helicopters. This design feature is the extended duration of continued safe flight and landing beyond 30 minutes after indication to the flightcrew of the loss of main gearbox lubrication. 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 PUBLICATION IN THE FEDERAL REGISTER].

**FOR FURTHER INFORMATION CONTACT:** Kamron Dowlatabadi, Mechanical Systems, AIR-623, Technical Policy Branch, Policy and Standards Division, Aircraft Certification Service, 10101 Hillwood Parkway, Fort Worth, TX, 76177; telephone (817) 222-5219; email [Kamron.M.Dowlatabadi@faa.gov](mailto:Kamron.M.Dowlatabadi@faa.gov).

## **SUPPLEMENTARY INFORMATION:**

### **Background**

On July 10, 2023, Airbus applied for an amendment to Type Certificate No. R00009RD for the Model H160-B helicopter to include continued safe flight and landing beyond 30 minutes after indication to the flightcrew of the loss of main gearbox lubrication.

The Airbus Model H160-B helicopter is a transport-category, twin-turboshaft-engine helicopter certificated under 14 CFR part 29. This helicopter has a maximum takeoff weight of 13,436 lbs. with seating for 12 passengers and 2 flightcrew members. The Airbus Model H160-B helicopter is also characterized by the integration of composite materials in its airframe, five main rotor blades (Blue Edge technology), a Fenestron tail rotor, and a Helionix avionics suite.

### **Type Certification Basis**

Under the provisions of 14 CFR 21.101, Airbus must show that the Model H160-B helicopter meets the applicable provisions of the regulations listed in Type Certificate No. R00009RD, 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 29) do not contain adequate or appropriate safety standards for the Airbus Model H160-B helicopter 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 Airbus Model H160-B helicopter must comply with 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 H160-B helicopter will incorporate the following novel or unusual design feature:

Extended duration of continued safe flight and landing beyond 30 minutes after indication to the flightcrew of the loss of main gearbox lubrication.

### **Discussion**

Current regulations do not prescribe a duration for continued safe flight and landing to be specifically called out in the rotorcraft flight manual when a loss of main gearbox lubrication is indicated to the flightcrew. Although § 29.927(c)(1) requires a 30-minute test to show that the rotor drive system, which is defined in § 29.917(a) and includes the main gearbox, is operational for 30 minutes following the indication to the flightcrew of a loss of lubrication, the associated bench test conditions may not be representative of aircraft flight conditions because a 30-minute bench test of the main gearbox may not translate to 30 minutes of continued safe flight and landing.

The novel or unusual design feature of the Airbus Model H160-B helicopter is intended to enable the helicopter to continue safe flight and landing, for a minimum of 30 minutes, to the intended destination or to a safe landing location after the indication to the flightcrew of a loss of main gearbox lubrication. To meet this minimum 30 minutes of continued safe flight and landing, the Airbus Model H160-B helicopter main gearbox is designed with a redundant lubrication system. This main gearbox redundant lubrication system would allow continued safe operation after the failure of a single lubrication

system. Current regulations do not address a redundant lubrication system that allows operation after the failure of a single lubrication system because at the time the existing regulations were issued, the agency did not envision that a flight duration of more than 30 minutes after the indication to the flightcrew of the loss of main gearbox lubrication was needed. Accordingly, these special conditions provide testing criteria to ensure the reliability of the redundant lubrication system to provide an extended period for safe flight and landing beyond 30 minutes after indication to the flightcrew of the loss of the main gearbox lubrication.

These special conditions add new requirements in lieu of the existing airworthiness standards in §§ 29.917(a) and 29.927(c) and add a requirement to § 29.1585.

At the time of the issuance of the existing regulations, the FAA did not envision the evolving operations for these types of aircraft and the regulations did not include the main gearbox lubrication system components in the required design assessment of the rotor drive system. Accordingly, these special conditions include requirements for addressing “any associated lubrication system components including oil coolers” in the design assessment required by § 29.917(b).

These special conditions add a safety margin over the current 30-minute rotor drive system test specified in § 29.927(c)(1) by requiring a test duration of more than 30 minutes to ensure that the rotor drive gearbox system has an in-flight operational endurance capability of at least 30 minutes following a failure of any one pressurized, normal-use lubrication system. The 30-minute test interval starts when the lubrication-failure indication to the flightcrew is triggered and the engine is at maximum continuous power. These special conditions require a bench test of the rotor drive system main gearbox for a minimum of 30 minutes to establish a maximum period of in-flight operation following loss of main gearbox lubrication, and to ensure that the main gearbox

continues to operate safely for at least 30 minutes after an indication to the flightcrew of a loss of lubrication.

The term “confidence” specified in Category A and B in these special conditions necessitates the applicant provide supporting data with respect to the mechanical behavior of the main gearbox and must reflect the applicant’s confidence in the repeatability of the certification test data. Test loading, in the context of these special conditions, refers to the engine, main gearbox, clutch system, and rotors (or similar test apparatus) interconnected and operating in unison, as this combination of mechanical elements pertains to power input transmitted to the main gearbox and subsequent reaction torques simulating operating conditions.

These special conditions add a requirement that the maximum duration of operation after a failure, which results in a loss of main gearbox lubrication and an associated indication to the flightcrew, must be furnished in the rotorcraft flight manual, and the duration must not exceed the maximum period of in-flight operational endurance capability substantiated.

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**

The FAA issued Notice of Proposed Special Conditions No. 29-21-01-SC for the Airbus Model H160-B helicopter, which was published in the *Federal Register* on May 12, 2023 (88 FR 30680). The FAA received several comments from Leonardo Helicopters regarding the proposed special conditions.

Leonardo Helicopters requested the FAA generally maintain harmonization and alignment with the EASA certification specifications (CS) 29 requirements by implementing the same changes to part 29 that were introduced by EASA rulemaking

task RMT.0608, following notice of proposed amendment (NPA) 2017-07, *Rotorcraft gearbox loss of lubrication*, through Amendment 5.

This request relating to the pursuit of future rulemaking for part 29 is beyond the scope of these special conditions. No change was made to these special conditions as a result of this comment.

Leonardo Helicopters stated that EASA's CS-29 requirements and acceptable means of compliance (AMC) clearly define how to establish the operational endurance capability through the application of reduction factors. However, the correlation between 30 and 60 minutes, and the criteria for defining this correlation, is not clear in the proposed special conditions. Leonardo Helicopters requested the FAA revise the proposed special conditions to define the proposed reduction factors and allow the public to comment. The FAA infers that Leonardo Helicopters is also requesting clarification regarding the correlation between 30 and 60 minutes for the bench test.

The FAA disagrees with the commenter's request to include reduction factors and related material in these special conditions. The FAA considers the details referenced by Leonardo Helicopters, including the correlation between the test duration and substantiated safe operation duration, to be related to the means of compliance for these special conditions. Means of compliance for these special conditions are defined separately between the FAA and the applicant via the FAA issue paper process, which is outside the scope of these special conditions. However, to address the Leonardo Helicopters comment, the FAA has clarified language in the discussion section. Specifically, the FAA removed the previous reference in these special conditions to a 60-minute bench test scenario, since it is not a requirement under 29.927(c), but rather an example to illustrate how applicants translate the time duration of a bench test into 30 minutes of substantiated operation for continued safe flight and landing. In addition, the

term “reduction factor” has been removed from the discussion section and replaced with language to define the term “confidence” used in these special conditions.

Additionally, Leonardo Helicopters stated that EASA CS-29 does not have a similar requirement for a test duration of at least 60 minutes, and therefore the special conditions are not harmonized with the EASA requirements. The FAA infers Leonardo Helicopters is requesting that the FAA revise the proposed special conditions to address an alleged contradiction and lack of harmonization with the related EASA CS-29 requirements.

The FAA does not agree to revise the proposed special conditions to address a possible contradiction because the FAA does not find that a contradiction exists. The commenter suggests that these special conditions contain a 60-minute testing requirement. There is no specific requirement in these special conditions for a 60-minute test. However, in the preamble of the proposed special conditions, the FAA discussed a scenario where it may be necessary for an applicant to perform a 60-minute test, depending on reduction factors. As explained previously, this language has been removed to address the related public comment and replaced with language to describe the context of the word “confidence” used in these special conditions. The details related to the test duration and maximum period of in-flight operation following loss of main gearbox lubrication are associated with the means of compliance for these special conditions. As previously explained, the means of compliance are established between the FAA and applicant through the FAA issue paper process and the FAA’s acceptance of a specific means of compliance is beyond the scope of these special conditions. No changes were made to these special conditions as a result of this comment. However, the FAA has made minor editorial changes to these special conditions to ensure consistency in the language of the requirements.

## **Applicability**

As discussed above, these special conditions are applicable to the Airbus Helicopters Model H160-B helicopter. Should Airbus Helicopters 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 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, 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 the Airbus Helicopters Model H160-B helicopter. Unless stated otherwise, all requirements in §§ 29.917, 29.927, and 29.1585 still apply.

In lieu of § 29.917(a), the following special condition applies:

(a) *Design: General.* The rotor drive system includes any part necessary to transmit power from the engines to the rotor hubs. This includes gearboxes, shafting, universal joints, couplings, rotor brake assemblies, clutches, supporting bearings for shafting, any attendant accessory pads or drives, any cooling fans, and any associated lubrication-system components including oil coolers that are a part of, attached to, or mounted on the rotor drive gearbox system.

In lieu of § 29.927(c), the following special condition applies:

(c) *Lubrication system failure.* For rotor drive gearbox systems featuring a pressurized, normal-use lubrication system, the following requirements for continued safe flight and landing apply:

(1) *Category A.* Confidence must be established that the rotor drive gearbox system has an in-flight operational endurance capability of at least 30 minutes following a failure of any one pressurized, normal-use lubrication system.

(i) For each rotor drive gearbox system necessary for continued safe flight or safe landing, the applicant must conduct a test that simulates the effect of the most severe failure mode of the pressurized, normal-use lubrication system, as determined by the failure analysis required by § 29.917(b). The duration of the test must be dependent on the number of tests and the component condition after each test.

(ii) The test must begin when the indication to the flightcrew shows a lubrication failure has occurred, and its loading must be consistent with 1 minute at maximum continuous power, followed by the minimum power needed for continued flight at the rotorcraft maximum gross weight.

(iii) The test must end with a 45-second out-of-ground-effect (OGE) hover to simulate a landing phase. Test results must substantiate the maximum period of operation following a loss of lubrication by means of an extended test duration or multiple test specimens, or another approach prescribed by the applicant and accepted by the FAA.

(2) *Category B.* Confidence must be established that the rotor drive gearbox system has an in-flight operational endurance capability to complete an autorotation descent and landing following a failure of any one pressurized, normal-use lubrication system.

(i) For each rotor drive gearbox system necessary for safe autorotation descent or safe landing, the applicant must conduct a test of at least 16 minutes and 15 seconds, following the most severe failure mode of the pressurized, normal-use lubrication system, as determined by the failure analysis required by § 29.917(b).

(ii) The test must begin when the indication to the flightcrew shows that a lubrication failure has occurred, and its loading must be consistent with 1 minute at maximum continuous power. Thereafter, the input torque should be reduced to simulate autorotation for a minimum of 15 minutes.

(iii) The test must be conducted using an input torque to simulate a minimum power landing for approximately 15 seconds.

In addition to § 29.1585, the following special condition applies:

(h) *Power Plant limitations.* The maximum duration of operation after a failure, resulting in any loss of lubrication of a rotor-drive-system gearbox and an associated oil-pressure warning, must be furnished in the rotorcraft flight manual, and must not exceed the maximum period substantiated in accordance with § 29.927(c) of these special conditions.

Issued in Kansas City, Missouri on April 29, 2024.

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