[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 27

[Docket No.FAA-2019-0106; Notice No. 27-046-SC]

Special Conditions: Robinson Helicopter Company, Model Robinson R66, Visual Flight Rules Autopilot and Stability Augmentation System (AP/SAS System)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Robinson Helicopter Company (Robinson) Model R66 helicopter. This helicopter will have a novel or unusual design feature associated with installation of the autopilot and stability augmentation system (AP/SAS system). 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: These special conditions are effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FINAL REGISTER**].**

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SUPPLEMENTARY INFORMATION:

Background

On June 8, 2018, Robinson applied to amend type certificate (TC) Number R00015LA to install an AP/SAS system on the Robinson Model R66 helicopter. The Robinson Model R66 helicopter is a 14 CFR part 27 normal category, single turbine engine, conventional helicopter designed for civil operation. This helicopter model is capable of carrying up to four passengers with one pilot and has a maximum gross weight of up to 2,700 pounds, depending on the model configuration. The major design features include a 2-blade main rotor, an anti-torque tail rotor system, a skid landing gear, and a visual flight rule basic avionics configuration. Robinson proposes to modify this model helicopter by installing an AP/SAS system.

The AP/SAS system provides attitude stabilization in two or three axes (pitch and roll with optional yaw) as well as higher-level autopilot functions such as altitude hold, heading command and navigation tracking. However, the possible failure conditions for this system, and their effect on the continued safe flight and landing of the helicopter, are more severe than those envisioned by the present rules.

The effect on safety is not adequately covered under 14 CFR 27.1309 for the application of new technology and new application of standard technology. Specifically, the present provisions of § 27.1309(c) do not adequately address the safety requirements for systems whose failures could result in catastrophic or hazardous/severe-major failure conditions, or for complex systems whose failures could result in major failure conditions. The current regulations are inadequate because when § 27.1309(c) was promulgated, it was not envisioned that this type of rotorcraft would use systems that are complex or whose failure could result in "catastrophic" or "hazardous/severe-major" effects on the rotorcraft. This is particularly true with the application

of new technology, new application of standard technology, or other applications not envisioned by the rule that affect safety.

Type Certification Basis

Under 14 CFR 21.101, Robinson must show that the Model R66 helicopter, as modified by the installed AP/SAS, continues to meet the applicable regulations in effect on the date of application for the change to the type certificate. The baseline certification basis for the unmodified Robinson Model R66 helicopter is listed in TC Number R00015LA. Additionally, compliance must be shown to any applicable equivalent level of safety findings, exemptions, and special conditions prescribed by the Administrator as part of the certification basis.

The Administrator has determined the applicable airworthiness regulations (that is, 14 CFR part 27), as they pertain to this amended TC, do not contain adequate or appropriate safety standards for the Robinson Model R66 helicopter because of a novel or unusual design feature. Therefore, special conditions are prescribed under § 21.16.

In addition to the applicable airworthiness regulations and special conditions, Robinson must show compliance of the AP/SAS amended TC altered model R66 helicopter with 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(d).

Novel or Unusual Design Features

The Robinson Model R66 helicopter will incorporate the following novel or unusual design features: AP/SAS. An autopilot (AP) is a system used to control the trajectory of an aircraft without constant input from the pilot. This allows the pilot to focus on other aspects of operations such as weather and systems. A stability augmentation system (SAS) is another type

of automatic flight control system; however, instead of maintaining the aircraft on a predetermined attitude or flight path, the SAS will reduce pilot workload by dampening aircraft buffeting regardless of the attitude or flight path.

Discussion

To comply with the provisions of the special conditions, the FAA requires that Robinson provide the FAA with a systems safety assessment (SSA) for the final AP/SAS installation configuration that will adequately address the safety objectives established by a functional hazard assessment (FHA). This process will ensure that all failure conditions and their resulting effects are adequately addressed for the installed AP/SAS. The SSA process is part of the overall safety assessment process discussed in FAA Advisory Circular 27-1B, Certification of Normal Category Rotorcraft, and Society of Automotive Engineers document Aerospace Recommended Practice 4761, Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.

These special conditions require that the AP/SAS installed on a Robinson Model R66 helicopter meet the requirements to adequately address the failure effects identified by the FHA, and subsequently verified by the SSA, within the defined design integrity requirements.

Failure conditions are classified according to the severity of their effects on the rotorcraft. Radio Technical Commission for Aeronautics, Inc. (RTCA) Document DO-178C, Software Considerations in Airborne Systems and Equipment Certification, provides software design assurance levels most commonly used for the major, hazardous/severe-major, and catastrophic failure condition categories. The AP/SAS system equipment must be qualified for the expected installation environment. The test procedures prescribed in RTCA Document DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment, are recognized by the

FAA as acceptable methodologies for finding compliance with the environmental requirements. Equivalent environment test standards may also be acceptable. Environmental qualification provides data to show that the AP/SAS system can perform its intended function under the expected operating condition. Some of the main considerations for environmental concerns are installation locations and the resulting exposure to environmental conditions for the AP/SAS system equipment, including considerations for other equipment that may also be affected environmentally by the AP/SAS equipment installation. The level of environmental qualification must be related to the severity of the considered failure conditions and effects on the rotorcraft.

Discussion of Comments

Notice of proposed special conditions No. 27-046-SC for the Robinson Model R66 helicopter was published in the Federal Register on June 26, 2019 (84 FR 30050). Comments were received from two commenters. The commenters stated that special conditions previously issued for an AP/SAS system on a different model helicopter were more aligned with rulemaking whereas this special condition text seemed more appropriate for guidance material. The commenters requested the FAA change the proposed special conditions to be consistent with those previously issued for the same type of equipment. The FAA agrees that an effort should be made to maintain consistency and has revised the proposed special conditions to align with previously issued special conditions.

The commenters also noted the Discussion section of the proposed special conditions contains references to specific revisions of RTCA Document DO-178 and RTCA Document DO-160G and requested these references to specific revisions be removed. The FAA disagrees, however an applicant may request to use a later approved revision to these documents if the applicant shows the later revision meets the safety level intended by the special condition.

Except for the changes previously discussed, these special conditions are adopted as proposed.

Applicability

These special conditions are applicable to the AP/SAS installed as an amended TC approval in Robinson Model R66 helicopter, TC Number R00015LA.

Conclusion

This action affects only certain novel or unusual design features for an AP/SAS amended TC installed on one model helicopter. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features.

List of Subjects in 14 CFR Part 27

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, the Federal Aviation Administration (FAA) issues the following special conditions as part of the amended type certification basis for installation of the autopilot and stability augmentation system (AP/SAS) on Robinson Model R66 helicopters.

Instead of the requirements of 14 CFR 27.1309(b) and (c), the following must be met for certification of the AP/SAS system installed on Robinson Model R66 helicopters:

a. The equipment and systems must be designed and installed so that any equipment and systems do not adversely affect the safety of the rotorcraft or its occupants.

b. The rotorcraft systems and associated components considered separately and in relation to others systems, must be designed and installed so that:

(1) The occurrence of any catastrophic failure condition is extremely improbable;

(2) The occurrence of any hazardous failure condition is extremely remote; and

(3) The occurrence of any major failure condition is remote.

c. Information concerning an unsafe system operating condition must be provided in a timely manner to the crew to enable them to take appropriate corrective action. An appropriate alert must be provided if immediate pilot awareness and immediate or subsequent corrective action is required. Systems and controls, including indications and annunciations, must be designed to minimize crew errors which could create additional hazards.

Issued in Fort Worth, Texas on November 13, 2019.

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