DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 29

[Docket No. SW007; Special Condition No. 29–007–SC]

Special Conditions: Eurocopter France Model EC–155 Helicopters, High-Intensity Radiated Fields

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special condition; request for comments.

SUMMARY: This special condition is issued for Eurocopter France (Eurocopter) Model EC–155 helicopters. These helicopters will have novel or unusual design features associated with the installation of electronic systems that perform critical functions. The applicable airworthiness regulations do not contain adequate or appropriate safety standards to protect systems that perform critical control functions or provide critical displays from the effects of high-intensity radiated fields (HIRF). This special condition contains the additional safety standards that the Administrator considers necessary to ensure that critical functions of systems will be maintained when exposed to HIRF.

DATES: The effective date of this special condition is October 31, 2000. Comments must be received on or before January 12, 2001.

ADDRESSES: Comments on this special condition may be mailed in duplicate to: Federal Aviation Administration, Office of the Regional Counsel, Attention: Rules Docket No. SW007, Fort Worth, Texas 76193–0007, or delivered in duplicate to the Office of the Regional Counsel at 2601 Meacham Blvd., Fort Worth, Texas 76137. Comments must be marked: Rules Docket No. SW007. Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 8:30 a.m. and 4:00 p.m.

FOR FURTHER INFORMATION CONTACT: Jorge Castillo, FAA, Rotorcraft Directorate, Rotorcraft Standards, Fort Worth, Texas 76193–0110; telephone (817) 222–5127, fax (817) 222–5961.

SUPPLEMENTARY INFORMATION: The FAA has determined that notice and opportunity for prior public comment hereon are impracticable because these procedures would significantly delay issuance of the approval design and thus delivery of the affected aircraft. In addition, notice and opportunity for prior public comment are unnecessary since the substance of this special condition has been subject to the public comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making this special condition effective upon issuance.

Comments Invited

Interested persons are invited to submit such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or special condition number and be submitted in duplicate to the address specified above. All communications received on or before the closing date for comments will be considered. The special condition may be changed in light of the comments received. All comments received will be available in the Rules Docket for examination by interested persons. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this special condition must include a self-addressed, stamped postcard on which the following statement is made: ''Comments to Rules Docket No. SW007.'' The postcard will be date stamped and returned to the commenter.

Background

On September 1, 1998, Eurocopter submitted an application for Type Validation of Model EC–155 Transport Category helicopters through the Direction Generale de l'Aviation Civile (DGAC), which is the airworthiness authority of France, and the FAA Brussels Aircraft Certification Office (ACO). Model EC–155 helicopters are a derivative of Model AS365N3 helicopters that achieved FAA Type Certification on November 8, 1998. The main design differences between Model EC–155 and Model AS365N3 helicopters include the following: a gross weight increase from 4250 kg to 4800 kg; enlarged fuselage structure; a new 5-blade speriflex main rotor and composite fenestron blades; and a new avionics instrumentation package that includes a 3-axis digital Automatic Flight Control System (AFCS) and electronic displays.

Type Certification Basis

Under the provisions of 14 CFR 21.17, Eurocopter must show that Model EC–155 helicopters meet the applicable provisions of the regulations as listed below:

—14 CFR 21.29.

—14 CFR part 29, Amendment 29–1 through Amendment 29–40 with the following exceptions:

—Excluding Amendment 29–38.

—Excluding 14 CFR 29.952, introduced at Amendment 29–35.

—Excluding 14 CFR 29.562, introduced at Amendment 29–29.

—Excluding 14 CFR 29.631, introduced at Amendment 29–40.

—Section 29.561(a), (b), and (d) at Amendment 29–1.

—Section 29.561(c) at Amendment 29–29.

—Section 29.571 at Amendment 29–20.

—Section 29.785 at Amendment 29–24.

—Section's 29.963, 29.973, and 29.975 at Amendment 29–26.

—Section 29.1305(a)(4)(i) at Amendment 29–16.

—14 CFR part 36, Appendix H through the latest amendment in effect at the time that the noise tests are conducted.

—Any Special conditions, Exemptions, and Equivalent Safety Findings deemed necessary.

In addition, the certification basis includes certain special conditions and equivalent safety findings that are not relevant to this special condition.

If the Administrator finds that the applicable airworthiness regulations do not contain adequate or appropriate safety standards for these helicopters because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, Eurocopter Model EC–155 helicopters must comply with the noise certification requirements of 14 CFR part 36; and the FAA must issue a finding of regulatory adequacy pursuant to section 611 of Public Law 92–574, the ''Noise Control Act of 1972.''

Special conditions, as appropriate, are issued in accordance with § 11.49, as required by §§ 11.28 and 11.29(b), and become part of the type certification basis in accordance with § 21.17(a)(2).

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, the special conditions would also apply to the other model under the provisions of § 21.101(a)(1).

Novel or Unusual Design Features

Eurocopter Model EC–155 helicopters will incorporate the following novel or unusual design features: electrical,

electronic, or a combination of electrical electronic (electrical/electronic) systems that will perform critical control functions or display critical information, such as electronic flight instruments that display critical information required for the continued safe flight and landing of the helicopter during operation in Instrument Meteorological Conditions (IMC); and Full Authority Digital Engine Control (FADEC) that will perform engine control functions that are critical to the continued safe flight and landing of the helicopter during Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) operations.

Discussion

Eurocopter Model EC–155 helicopters, at the time of application, were identified as incorporating one and possibly more electrical/electronic systems, such as electronic flight instruments and FADEC. After the design is finalized, Eurocopter will provide the FAA with a preliminary hazard analysis that will identify any other critical functions required for safe flight and landing that are performed by the electrical/electronic systems.

Recent advances in technology have given rise to the application in aircraft designs of advanced electrical/electronic systems that perform critical control functions or provide critical displays. These advanced systems respond to the transient effects of induced electrical current and voltage caused by HIRF incident on the external surface of the helicopter. These induced transient currents and voltages can degrade the performance of the electrical/electronic systems by damaging the components or by upsetting the systems' functions.

Furthermore, the electromagnetic environment has undergone a transformation not envisioned by the current application of § 29.1309(a). Higher energy levels radiate from operational transmitters currently used for radar, radio, and television. Also, the number of transmitters has increased significantly.

Existing aircraft certification requirements are inappropriate in view of these technological advances. In addition, the FAA has received reports of some significant safety incidents and accidents involving military aircraft equipped with advanced electrical/electronic systems when they were exposed to electromagnetic radiation.

The combined effects of the technological advances in helicopter design and the changing environment have resulted in an increased level of vulnerability of the electrical/electronic systems required for the continued safe flight and landing of the helicopter. Effective measures to protect these helicopters against the adverse effects of exposure to HIRF will be provided by the design and installation of these systems. The following primary factors contributed to the current conditions: (1) Increased use of sensitive electronics that perform critical functions; (2) reduced electromagnetic shielding afforded helicopter systems by advanced technology airframe materials; (3) adverse service experience of military aircraft using these technologies; and (4) an increase in the number and power of radio frequency emitters and the expected increase in the future.

The FAA recognizes the need for aircraft certification standards to keep pace with the developments in technology and environment and, in 1986, initiated a high priority program to: (1) Determine and define electromagnetic energy levels; (2) develop and describe guidance material for design, test, and analysis; and (3) prescribe and promulgate regulatory standards.

The FAA participated with industry and airworthiness authorities of other countries to develop internationally recognized standards for certification.

The FAA and airworthiness authorities of other countries have identified two levels of the HIRF environment that a helicopter could be exposed to, one environment for VFR operations and a different environment for IFR operations. While the HIRF rulemaking requirements are being finalized, the FAA is adopting a special condition for the certification of aircraft that employ electrical/electronic systems that perform critical control functions or provide critical displays. The accepted maximum energy levels that civilian helicopter system installations must withstand for safe operation are based on surveys and analysis of existing radio frequency emitters. This special condition will require the helicopters' electrical/electronic systems and associated wiring to be protected from these energy levels. These external threat levels are believed to represent the exposure for a helicopter operating under VFR or IFR.

Compliance with HIRF requirements will be demonstrated by tests, analysis, models, similarity with existing systems, or a combination of these methods. Service experience alone will not be acceptable since such experience in normal flight operations may not include an exposure to HIRF. Reliance on a system with similar design features for redundancy, as a means of protection against the effects of external HIRF, is generally insufficient because all elements of a redundant system are likely to be concurrently exposed to the radiated fields.

This special condition will require the aircraft-installed systems that perform critical control functions or provide critical displays to meet certain standards based on either a defined HIRF environment or a fixed value using laboratory tests. Control system failures and malfunctions can more directly and abruptly contribute to a catastrophic event than display system failures and malfunctions. Therefore, it is considered appropriate to require more rigorous HIRF verification methods for critical control systems than for critical display systems.

The applicant may demonstrate that the operation and operational capabilities of the installed electrical/electronic systems that perform critical functions are not adversely affected when the aircraft is exposed to the defined HIRF test environment. The FAA has determined that the test environment defined in Table 1 is acceptable for critical control functions in helicopters. The test environment defined in Table 2 is acceptable for critical display systems in helicopters.

The applicant may also demonstrate by a laboratory test that the electrical/electronic systems that perform critical control functions or provide critical displays can withstand a peak electromagnetic field strength in a frequency range of 10 kHz to 18 GHz. If a laboratory test is used to show compliance with the defined HIRF environment, no credit will be given for signal attenuation due to installation. A level of 100 volts per meter (v/m) is appropriate for critical display systems. A level of 200 v/m is appropriate for critical control functions. Laboratory test levels are defined according to RTCA/DO–160D Section 20 Category W (100 v/m and 150 mA) and Category Y (200 v/m and 300 mA). As stated in DO–160D Section 20, the test levels are defined as the peak of the root means squared (rms) envelope. As a minimum, the modulations required for RTCA/DO–160D Section 20 Categories W and Y will be used. Other modulations should be selected as the signal most likely to disrupt the operation of the system under test, based on its design characteristics. For example, flight control systems may be susceptible to 3 Hz square wave modulation while the video signals for electronic display systems may be susceptible to 400 Hz sinusoidal modulation. If the worst-case modulation is unknown or cannot be determined, default modulations may be

used. Suggested default values are a 1 kHz sine wave with 80 percent depth of modulation in the frequency range from 10 kHz to 400 MHz and 1 kHz square wave with greater than 90 percent depth of modulation from 400 MHz to 18 GHz. For frequencies where the unmodulated signal would cause deviations from normal operation, several different modulating signals with various waveforms and frequencies should be applied.

Applicants must perform a preliminary hazard analysis to identify electrical/electronic systems that perform critical functions. The term ''critical'' means those functions whose failure would contribute to or cause an unsafe condition that would prevent the continued safe flight and landing of the helicopters. The systems identified by the hazard analysis as performing critical functions are required to have HIRF protection. A system may perform both critical and non-critical functions. Primary electronic flight display systems and their associated components perform critical functions such as attitude, altitude, and airspeed indications. HIRF requirements would apply only to the systems that perform critical functions, including control and display.

Acceptable system performance would be attained by demonstrating that the critical function components of the system under consideration continue to perform their intended function during and after exposure to required electromagnetic fields. Deviations from system specifications may be acceptable but must be independently assessed by the FAA on a case-by-case basis.

TABLE 1.—VFR ROTORCRAFT

Field strength volts/meter

Frequency	Peak	Average
10 kHz—100 kHz	150	150
100 kHz—500 kHz	180	150
500 kHz—2 MHz	140	140
2 MHz—30 MHz	610	610
30 MHz—70 MHz	80	80
70 MHz—100 MHz	150	150
100 MHz—200 MHz	300	140
200 MHz—400 MHz	160	140
400 MHz—700 MHz	540	400
700 MHz—1 GHz	2400	400
1 GHz—2 GHz	7000	250
2 GHz—4 GHz	8600	840
4 GHz—6 GHz	13700	1270
6 GHz—8 GHz	1800	800
8 GHz—12 GHz	8000	500
12 GHz—18 GHz	3300	560
18 GHz—40 GHz	1800	700

TABLE 2.—VFR ROTORCRAFT

Field strength volts/meter

Frequency	Peak	Average
10 kHz—100 kHz	50	50
100 kHz—500 kHz	60	60
500 kHz—2 MHz	70	70
2 MHz—30 MHz	200	200
30 MHz—70 MHz	30	30
70 MHz—100 MHz	30	30
100 MHz—200 MHz	150	30
200 MHz—400 MHz	70	70
400 MHz—700 MHz	700	80
700 MHz—1 GHz	1700	240
1 GHz—2 GHz	5000	360
2 GHz—4 GHz	4500	360
4 GHz—6 GHz	7200	300
6 GHz—8 GHz	2000	330
8 GHz—12 GHz	3500	270
12 GHz—18 GHz	3500	330
18 GHz—40 GHz	780	20

Applicability

As previously discussed, this special condition is applicable to Eurocopter Model EC–155 helicopters. Should Eurocopter apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special condition would apply to that model as well under the provisions of § 21.101(a)(1).

Conclusion

This action affects only certain novel or unusual design features on one model series of helicopters. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features on the helicopter.

The substance of this special condition has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. For this reason and because a delay would significantly affect the certification of the helicopter, which is imminent, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting this special condition upon issuance. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

List of Subjects in 14 CFR Part 29

Aircraft, Air transportation, Aviation safety, Rotorcraft, Safety.

Authority: The authority citation for these special conditions is as follows: 42 U.S.C. 7572; 49 U.S.C. 106(g), 40105, 40113, 44701–44702, 44704, 44709, 44711, 44713, 44715, 45303.

The Special Condition

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special condition is issued as part of the type certification basis for Eurocopter Model EC–155 helicopters.

Protection for Electrical and Electronic Systems From High-Intensity Radiated Fields

Each system that performs critical functions must be designed and installed to ensure that the operation and operational capabilities of these critical functions are not adversely affected when the helicopter is exposed to high-intensity radiated fields external to the helicopter.

Issued in Fort Worth, Texas, on October 31, 2000.

Mark R. Schilling,

Acting Manager, Rotorcraft Directorate, Aircraft Certification Service.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 97–NM–273–AD; Amendment 39–11999; AD 2000–23–26]

RIN 2120–AA64

Airworthiness Directives; Aerospatiale Model ATR72 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This amendment adopts a new airworthiness directive (AD), applicable to all Aerospatiale Model ATR72 series airplanes, that requires a revision to the Airworthiness Limitations Section of the Instructions for Continued Airworthiness to incorporate inspections to detect fatigue cracking in certain structure, inspection intervals, and life limits for certain components. This amendment is prompted by issuance of mandatory continuing airworthiness information by a foreign civil airworthiness authority. The actions specified by this AD are intended to ensure that fatigue cracking of certain structural elements is detected and corrected; such fatigue cracking