Certification Service, 1601 Lind Avenue SW, Renton, WA 98055–4056; telephone (206) 227–2279.

SUPPLEMENTARY INFORMATION

Comments Invited

The FAA has determined that good cause exists for making these special conditions effective upon issuance; however, interested persons are invited to submit such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or special conditions number and be submitted in triplicate to the address specified above. All communications received on or before the closing date for comments will be considered by the Administrator. These special conditions may be changed in light of the comments received. All comments submitted will be available in the Docket for examination by interested persons, both before and after the closing date for comments. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the Docket. Persons wishing the FAA to acknowledge receipt of their comments submitted in response to this request must submit with those comments a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. NM-104." The postcard will be date stamped, and returned to the commenter.

Background

On November 9, 1994, Modern Avionics, Inc., of Eden Praire, Minnesota, applied for a supplemental type certificate to modify the Cessna 550 series airplanes. The Cessna 550 is a business jet with two aft-mounted turbofan engines. The airplane can carry two pilots and up to 11 passengers, depending on the exit and interior configuration, and is capable of operating to 43,000 feet altitude. The proposed modification incorporates the installation of digital avionics consisting of an electronic flight instrument system (EFIS) that is potentially vulnerable to HIRF external to the airplane.

Supplemental Type Certification Basis

Under the provisions of § 21.101 of the FAR, Modern Avionics, Inc., must show that the modified Cessna 550 series airplanes continue to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. A22CE, or the applicable regulations in effect on the date of application for the change. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type certification basis."

The regulations incorporated by reference in Type Certification No. A22CE include the following: Part 25 of the Federal Aviation Regulations (FAR), dated February 1, 1965, including Amendments 25–1 through 25–17. In addition the following sections of the FAR apply to the EFIS installation: §§ 25.1303(b) and 25.1322, as amended through Amendment 25-38; §§ 25.1309, 25.1321 (a), (b), (d), and (e), 25.1331, 25.1333, and 25.1335, as amended by Amendment 25-41. These special conditions will form an additional part of the supplemental type certification basis.

If the Administrator finds that the applicable airworthiness regulations (i.e., part 25, as amended) do not contain adequate or appropriate safety standards for the Cessna 550 series airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16 to establish a level of safety equivalent to that established in the regulations.

Special conditions, as appropriate, are issued in accordance with § 11.49 of the FAR after public notice, as required by §§ 11.28 and 11.29, and become part of the type certification basis in accordance with § 21.101(b)(2).

Discussion

There is no special regulation that addresses protection requirements for electrical and electronic systems from HIRF. Increased power levels from ground based radio transmitters and the growing use of sensitive electrical and electronic systems to command and control airplanes have made it necessary to provide adequate protection.

To ensure that a level of safety is achieved equivalent to that intended by the regulations incorporated by reference, special conditions are needed for the Cessna 550 series airplanes that would require that new technology electrical and electronic systems, such as EFIS and digital avionics systems be designed and installed to preclude component damage and interruption of function due to both the direct and indirect effects of HIRF.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of $\S 21.101(a)(1)$.

High-Intensity Radiated Fields (HIRF)

With the trend toward increased power levels from ground based transmitters, plus the advent of space and satellite communications, coupled with electronic command and control of the airplane, the immunity of critical digital avionics systems, such as the EFIS, to HIRF must be established.

It is not possible to precisely define the HIRF to which the airplane will be exposed in service. There is also uncertainty concerning the effectiveness of airframe shielding for HIRF. Furthermore, coupling of electromagnetic energy to cockpit installed equipment through the cockpit window apertures is undefined. Based on surveys and analysis of existing HIRF emitters, an adequate level of protection exists when compliance with the HIRF protection special condition is shown with either paragraph 1 or 2 below:

1. A minimum threat of 100 volts per meter peak electric field strength from 10 KHz to 18 GHz.

a. The threat must be applied to the system elements and their associated wiring harnesses without the benefit of airframe shielding.

b. Demonstration of this level of protection is established through system tests and analysis.

2. A threat external to the airframe of the following field strengths for the frequency ranges indicated.

Frequency	Peak (V/M)	Average (V/M)
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	33
200 MHz-400 MHz	70	70
400 MHz-700 MHz	4,020	935
700 MHz–1 GHz	1,700	170
1 GHz–2 GHz	5,000	990
2 GHz–4 GHz	6,680	840
4 GHz–6 GHz	6,850	310
6 GHz–8 GHz	3,600	670
8 GHz–12 GHz	3,500	1,270
12 GHz-18 GHz	3,500	360
18 GHz-40 GHz	2,100	750

The envelope given in paragraph 2 above is a revision to the envelope used in previously issued special conditions in other certification projects. It is based on new data and SAE AE4R subcommittee recommendations. This revised envelope includes data from Western Europe and the U.S. It will also be adopted by the European Joint Aviation Authorities.

As discussed above, these special conditions are applicable to the Cessna 550 series airplanes, modified by