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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE203, Special Condition 23-143A-SC]

Special Conditions; Avidyne Corporation, Inc.; Various Airplane Models; Protection of Systems for High Intensity Radiated Fields (HIRF)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Amended final special conditions; request for comments.

SUMMARY: These amended special conditions are issued to Avidyne Corporation, 55 Old Bedford Road, Lincoln, MA 01773, for a Supplemental Type Certificate for the models listed under the heading "Type Certification Basis." This special condition amends special condition 23-143, which was published on February 25, 2004 (69 FR 8551), to add two more airplane models and to change the Avidyne part number from Model 700-00006-1XX to 700-00006-XXX. This amendment also removes three aircraft models that do not require these special conditions. AC 23-143 includes various airplane models to streamline the certification process needed to improve the safety of the airplane fleet by fostering the incorporation of new technologies that can be certificated affordably under 14 CFR part 23.

The airplanes will have novel and unusual design features when compared to the state of technology envisaged in the applicable airworthiness standards. These novel and unusual design features include the installation of an electronic flight instrument system (EFIS) display, Model 700-00006-XXX(), manufactured by Avidyne Corporation, Inc., for which the

applicable regulations do not contain adequate or appropriate airworthiness standards for the protection of these systems from the effects of high intensity radiated fields (HIRF). These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to the airworthiness standards applicable to these airplanes.

DATES: The effective date of these special conditions is March 17, 2004. Comments must be received on or before April 26, 2004.

ADDRESSES: Comments may be mailed in duplicate to: Federal Aviation Administration, Regional Counsel, ACE-7, Attention: Rules Docket Clerk, Docket No. CE203, Room 506, 901 Locust, Kansas City, Missouri 64106. All comments must be marked: Docket No. CE203. Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

FOR FURTHER INFORMATION CONTACT: Wes Ryan, Aerospace Engineer, Standards Office (ACE-110), Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 901 Locust, Room 301, Kansas City, Missouri 64106; telephone (816) 329-4127.

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 delivery of the affected aircraft. In addition, the substance of these special conditions 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 these special conditions 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 notice 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 by the

Administrator. The special conditions may be changed in light of the comments received. All comments received will be available in the Rules 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. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. CE203." The postcard will be date stamped and returned to the commenter.

Background

On July 3, 2003, Avidyne Corporation, 55 Old Bedford Road, Lincoln, MA 01773, made an application to the FAA for a new Supplemental Type Certificate for airplane models listed under the type certification basis. The models are currently approved under the type certification basis listed in the paragraph headed "Type Certification Basis." The proposed modification incorporates a novel or unusual design feature, such as digital avionics consisting of an EFIS that is vulnerable to HIRF external to the airplane.

Type Certification Basis

Under the provisions of 14 CFR part 21, § 21.101, Avidyne Corporation must show that affected airplane models, as changed, continue to meet the applicable provisions of the regulations incorporated by reference in Type Certificate Numbers listed below 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" and can be found in the Type Certificate Numbers listed below. In addition, the type certification basis of airplane models that embody this modification will include § 23.1301 of Amendment 23-20; §§ 23.1309, 23.1311, and 23.1321 of Amendment 23-49; and § 23.1322 of Amendment 23-43; exemptions, if any; and the special conditions adopted by this rulemaking action.

| Aircraft make | Aircraft model(s) | Type certification No. | Certificate basis |
|------------------------------------|--|------------------------|-------------------|
| The New Piper Aircraft, Inc | PA-23, PA-23-160, PA-23-235, PA-23-250, PA-E23-250 | 1A10 2A13 | CAR 3. CAR 3. |
| | PA-28-140, PA-28-150, PA-28-151, PA-28-160, PA-28-180, PA-28S-160, PA-28S-180, PA-28-235, PA-28-236, PA-28R-180, PA-28R-200, PA-28-181, PA-28-161, PA-28R-201, PA-28R-201T, PA-28RT-201, PA-28RT-201T, PA-28-201T. | | |
| | PA-30, PA-39, PA-40 | A1EA | CAR 3. |
| | PA-31, PA-31-300, PA-31-325, PA-31-350 | A20SO | CAR 3. |
| | PA-31P, PA-31T, PA-31T1, PA-31T2, PA-31T3, PA-31P-350 | A8EA | CAR 3. |
| | PA-32-260, PA-32-300, PA-32S-300, PA-32R-300, PA-32RT-300, PA-32RT-300T, PA-32R-301 (SP), PA-32R-301 (HP), PA-32R-301T, PA-32-301, PA-32-301T, PA-32-301FT, PA-32-301XTC. | A3SO | CAR 3. |
| | PA-34-200, PA-34-200T, PA-34-220T, PA-34-220T (III), PA-34-220T (IV). | A7SO | CAR 3. |
| | PA-42, PA-42-720, PA-42-1000 | A23SO | FAR 23. |
| | PA-42-720R | A32SO | FAR 23. |
| | PA-44-180, PA-44-180T | A19SO | 14 CFR 23. |
| | PA-38-112 | A18SO | 14 CFR 23. |
| | PA-46-310P, PA-46-350P | A25SO | 14 CFR 23. |
| Raytheon Aircraft Company | H35, J35, K35, M35, 35-33, N35, 35-A355, 35-B33, P35, S35, 35-C33, E33, F33, V35, V35A, V35B, 35-C33A, E33A, E33C, 36, A36, F33A, F33C, G33, A36TC, B36TC. | 3A15 | CAR 3. |
| | 95, B95, 95-55, 95-A55, B95A, D95A, E95, 95-B55, 95-B55A, 95-B55B, 95-C55, D55, 95-C55A, D55A, 55, E55A, 56TC, A56TC, 58, 58A. | 3A16 | CAR 3. |
| | 58P, 58PA, 58TC, 58TCA | A23CE | 14 CFR 23. |
| | F90 | A31CE | FAR 23. |
| | 99, 99A, 99A (FACH), A99, A99A, B99, C99, 100, A100 (U-21F), A100A, A100C, B100. | A14CE | FAR 23. |
| | 200, A100-1 (U-21J), 200C, 200CT, 200T, A200C (C-12A) or (C-12C), A200C (UC-12B), A200CT (C-12D) or (FWC-12D) or (RC-12D) or (C-12F) or (RC-12G) or (RC-12H) or (RC-12K) or (RC-12P) or (RC-12Q), B200, B200C (C-12F) or (UC-12F) or (UC-12M), or (C-12R), B200CT, B200T, 300, B300, B300C, 300LW, 1900, 1900C (C-12J), 1900D. | A24CE | FAR 23. |
| | 65-90, 65-A90, B90, C90, C90A | 3A20 | CAR 3, FAR 23. |
| Revo, Incorporated | Colonial C-1, Colonial C-2, Lake LA-4, LA-4A, LA-4P, Lake LA-4-200, Lake 250. | 1A13 | CAR 3, 14 CFR 23. |
| Sky International | Husky A-1, A-1A, A-1B | A22NM | FAR 23. |
| Socata Aerospatiale | TB 20, TB 10, TB 21, TB9, TB 200 | A51EU | 14 CFR 23. |
| | TBM 700 | A60EU | 14 CFR 23. |
| Twin Commander Aircraft Corp | 500, 500-A, 500-B, 500-U, 500-S, 520, 560, 560-A, 560-E | 6A1 | CAR 23. |
| | 560-F, 680, 680E, 680F, 720, 680FL, 680FL(P), 680T, 680V, 680W, 681, 685, 690, 690A, 690B, 690C, 690D, 695, 695A, 695B. | 2A4 | CAR 23. |
| | 700 | A12SW | FAR 23. |

Discussion

If the Administrator finds that the applicable airworthiness standards do not contain adequate or appropriate safety standards because of novel or unusual design features of an airplane, special conditions are prescribed under the provisions of § 21.16.

Special conditions, as appropriate, as defined in § 11.19, are issued in accordance with § 11.38 after public notice and become part of the type certification basis in accordance with § 21.101(b)(2) of Amendment 21-69.

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 already 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 § 21.101.

Novel or Unusual Design Features

Avidyne Corporation plans to incorporate certain novel and unusual design features into an airplane for which the airworthiness standards do not contain adequate or appropriate safety standards for protection from the effects of HIRF. These features include EFIS, which are susceptible to the HIRF environment, that were not envisaged by the existing regulations for this type of airplane.

Protection of Systems From High Intensity Radiated Fields (HIRF)

Recent advances in technology have given rise to the application in aircraft designs of advanced electrical and electronic systems that perform functions required for continued safe

flight and landing. Due to the use of sensitive solid-state advanced components in analog and digital electronics circuits, these advanced systems are readily responsive to the transient effects of induced electrical current and voltage caused by the HIRF. The HIRF can degrade electronic systems performance by damaging components or upsetting system functions.

Furthermore, the HIRF environment has undergone a transformation that was not foreseen when the current requirements were developed. Higher energy levels are radiated from transmitters that are used for radar, radio, and television. Also, the number of transmitters has increased significantly. There is also uncertainty concerning the effectiveness of airframe shielding for HIRF. Furthermore,

coupling to cockpit-installed equipment through the cockpit window apertures is undefined.

The combined effect of the technological advances in airplane design and the changing environment has resulted in an increased level of vulnerability of electrical and electronic systems required for the continued safe flight and landing of the airplane. Effective measures against the effects of exposure to HIRF must be provided by the design and installation of these systems. The accepted maximum energy levels in which civilian airplane system installations must be capable of operating safely are based on surveys and analysis of existing radio frequency emitters. These special conditions require that the airplane be evaluated under these energy levels for the protection of the electronic system and its associated wiring harness. These external threat levels, which are lower than previous required values, are believed to represent the worst case to which an airplane would be exposed in the operating environment.

These special conditions require qualification of systems that perform critical functions, as installed in aircraft, to the defined HIRF environment in paragraph 1 or, as an option to a fixed value using laboratory tests, in paragraph 2, as follows:

(1) The applicant may demonstrate that the operation and operational capability of the installed electrical and electronic systems that perform critical functions are not adversely affected when the aircraft is exposed to the HIRF environment defined below:

| Frequency | Field strength (volts per meter) | |
|--------------------|-------------------------------------|---------|
| | Peak | Average |
| 10 kHz–100 kHz ... | 50 | 50 |
| 100 kHz–500 kHz | 50 | 50 |
| 500 kHz–2 MHz | 50 | 50 |
| 2 MHz–30 MHz | 100 | 100 |
| 30 MHz–70 MHz ... | 50 | 50 |
| 70 MHz–100 MHz | 50 | 50 |
| 100 MHz–200 MHz | 100 | 100 |
| 200 MHz–400 MHz | 100 | 100 |
| 400 MHz–700 MHz | 700 | 50 |
| 700 MHz–1 GHz ... | 700 | 100 |
| 1 GHz–2 GHz | 2000 | 200 |
| 2 GHz–4 GHz | 3000 | 200 |
| 4 GHz–6 GHz | 3000 | 200 |
| 6 GHz–8 GHz | 1000 | 200 |
| 8 GHz–12 GHz | 3000 | 300 |
| 12 GHz–18 GHz ... | 2000 | 200 |
| 18 GHz–40 GHz ... | 600 | 200 |

The field strengths are expressed in terms of peak root-mean-square (rms) values.

or,

(2) The applicant may demonstrate by a system test and analysis that the electrical and electronic systems that

perform critical functions can withstand a minimum threat of 100 volts per meter, electrical field strength, from 10 kHz to 18 GHz. When using this test to show compliance with the HIRF requirements, no credit is given for signal attenuation due to installation.

A preliminary hazard analysis must be performed by the applicant, for approval by the FAA, to identify either electrical or electronic systems that perform critical functions. The term “critical” means those functions whose failure would contribute to, or cause, a failure condition that would prevent the continued safe flight and landing of the airplane. The systems identified by the hazard analysis that perform critical functions are candidates for the application of HIRF requirements. 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 indication. The HIRF requirements apply only to critical functions.

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

Applicability

As discussed above, these special conditions are applicable to one modification to the airplane models listed under the heading “Type Certification Basis.” Should Avidyne Corporation apply at a later date for a supplemental type certificate to modify any other model on the same type certificate to incorporate the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of § 21.101.

Conclusion

This action affects only certain novel or unusual design features of one modification to several models of airplanes. 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 airplane.

The substance of these special conditions 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 some airplane models, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions 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 23

Aircraft, Aviation safety, Signs and symbols.

Citation

■ The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113 and 44701; 14 CFR 21.16 and 21.101; and 14 CFR 11.38 and 11.19.

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 airplane models listed under the “Type Certification Basis” heading modified by Avidyne Corporation, to add an EFIS.

1. Protection of Electrical and Electronic Systems from High Intensity Radiated Fields (HIRF). Each system that performs critical functions must be designed and installed to ensure that the operations, and operational capabilities of these systems to perform critical functions, are not adversely affected when the airplane is exposed to high intensity radiated electromagnetic fields external to the airplane.

2. For the purpose of these special conditions, the following definition applies: Critical Functions: Functions whose failure would contribute to, or cause, a failure condition that would prevent the continued safe flight and landing of the airplane.

Issued in Kansas City, Missouri, on March 17, 2004.

James E. Jackson,

Acting Manager, Small Airplane Directorate, Aircraft Certification Service.

[FR Doc. 04–6748 Filed 3–25–04; 8:45 am]

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