

Signed in Washington, DC, on August 11, 2010.

Jonathan W. Coppess,

Executive Vice President, Commodity Credit Corporation.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE307; Special Condition No. 23-247-SC]

Special Conditions: AeroMech, Incorporated; Hawker Beechcraft Corporation, Model B200 and Other Aircraft Listed in Table 1, Approved Model List (AML); Installation of MD835 Lithium Ion Battery

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the AeroMech, Incorporated; Hawker Beechcraft Corporation, model B200 and other part 23 aircraft listed on the AML. These airplanes as modified by AeroMech, Incorporated will have a novel or unusual design feature(s)

associated with installation of the Mid-Continent Instruments MD835 Lithium Ion (Li-ion) battery. 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 Date:* August 9, 2010.

FOR FURTHER INFORMATION CONTACT:

James Brady, Regulations and Policy Branch, ACE-111, Federal Aviation Administration, Small Airplane Directorate, Aircraft Certification Service, 901 Locust, Kansas City, MO 64106; telephone (816) 329-4132; facsimile (816) 329-4090.

SUPPLEMENTARY INFORMATION:

Background

On September 18, 2009, AeroMech, Incorporated applied for a supplemental type certificate AML for installation of the Mid-Continent Instruments MD835 Li-ion battery in the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML. The AML covers part 23 aircraft that currently use the PS-835 lead-acid emergency battery.

The current regulatory requirements for part 23 airplanes do not contain adequate requirements for the

application of Li-ion batteries in airborne applications. AeroMech, Incorporated plans to replace an existing L-3 Communications PS-835 lead-acid emergency battery with a Mid-Continent Instruments MD835 Li-ion battery on part 23 aircraft currently equipped with the PS-835 battery. This type of battery possesses certain failure, operational, and maintenance characteristics that differ significantly from that of the nickel cadmium (Ni-Cd) and lead-acid rechargeable batteries currently approved in other normal, utility, acrobatic, and commuter category airplanes.

Type Certification Basis

Under the provisions of § 21.101, AeroMech, Incorporated must show that the Hawker Beechcraft Corporation B200 and other aircraft listed on the AML, as changed, continues to meet the applicable provisions of the regulations incorporated by reference in the type certificate of each model listed 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 certification basis for each model qualified for this modification is detailed below.

TABLE 1—APPROVED MODEL LIST

Aircraft make	Aircraft model	TCDS	Certification basis for alteration
Aero Vodochody	Ae 270	A58CE Rev 3	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Cessna	441	A28CE	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Cessna	401, 402, 411, 414, 421, 425	A7CE	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Cessna	501, 551	A27CE Rev 17	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Cessna	525, 525A, 525B	A1WI Rev 17	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Cessna	510	A00014WI Rev 3	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Dornier	228-100/-101/-200/-201/-202/-212	A16EU	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Embraer	EMB-500	A59CE Rev 0	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Embraer	EMB-110P1, EMB110P2	A21SO Rev 6	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.
Hawker Beechcraft	C90, C90A, C90GT, B90, E90, H90, C90GTi	3A20 Rev 69	14 CFR part 23 amdt 23-59, except for 14 CFR 23.1308.

TABLE 1—APPROVED MODEL LIST—Continued

Aircraft make	Aircraft model	TCDS	Certification basis for alteration
Hawker Beechcraft	200, 200C, 200CT, 200T, B200, B200C, B200CT, B200GT, B200CGT B200T, 300, 300LW, B300, B300C, 1900C, 1900D.	A24CE Rev 98	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Hawker Beechcraft	99, 99A, A99, A99A, B99, C99	A14CE Rev 37	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Hawker Beechcraft	390	A00010WI Rev 8	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Learjet	23	A5CE Rev 10	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
M7 Aerospace	SA226–T, SA226–AT, SA227–AT, SA227–TT	A5SW Rev 26	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Pacific Aerospace	750XL	A50CE Rev 3	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Piaggio	P–180	A59EU Rev 18	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Pilatus	PC–12	A78EU Rev 19	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Socata	TBM 700	A60EU Rev 18	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Twin Commander	680, 680E, 680F, 680FL, 680T, 680V, 680W, 681, 690, 690A, 690B, 690C, 690D, 695, 695A, 695B.	2A4 Rev 47	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.
Viking Air	DHC–6–1/–100/–200/–300	A9EA Rev 13	14 CFR part 23 amdt 23–59, except for 14 CFR 23.1308.

If the Administrator finds that the applicable airworthiness regulations (*i.e.*, 14 CFR part 23) do not contain adequate or appropriate safety standards for the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML, because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16. The FAA issues special conditions, as defined in § 11.19, under § 11.38 and they become part of the type certification basis under § 21.101.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate AML to modify any other model to incorporate 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 B200 and other aircraft on the AML must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36.

Novel or Unusual Design Features

The Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML will incorporate the following novel or unusual design features:

AeroMech, Incorporated proposes to replace an existing L–3 Communications PS–835 lead-acid emergency battery with a Mid-Continent Instruments MD835 Li-ion battery on part 23 aircraft currently equipped with the PS–835 battery. This type of battery possesses certain failure, operational characteristics, and maintenance requirements that differ significantly from that of the Ni-Cd and lead-acid rechargeable batteries currently approved in other normal, utility, acrobatic, and commuter category airplanes.

Discussion

The applicable part 21 and part 23 airworthiness regulations governing the installation of batteries in general aviation airplanes, including § 23.1353 were derived from Civil Air Regulations (CAR 3) as part of the recodification that established 14 CFR part 23. The battery requirements, which were identified as § 23.1353, were basically a rewording of

the CAR requirements that did not add any substantive technical requirements. An increase in incidents involving battery fires and failures that accompanied the increased use of Ni-Cd batteries in airplanes resulted in rulemaking activities on the battery requirements for business jet and commuter category airplanes. These regulations were incorporated into § 23.1353(f) and (g), which apply only to Ni-Cd battery installations.

The planned use of Li-ion batteries on the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML has prompted the FAA to review the adequacy of the existing battery regulations with respect to that chemistry. As the result of this review, the FAA determines the existing regulations do not adequately address several failure, operational, and maintenance characteristics of Li-ion batteries that could affect safety of the battery installation and the reliability of the electrical power supply on the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML.

Li-ion batteries in general are significantly more susceptible to internal failures that can result in self-sustaining increases in temperature and

pressure (*i.e.*, thermal runaway) than their Ni-Cd and lead-acid counterparts. This is especially true for overcharging a Li-ion battery, which will likely result in explosion, fire, or both. Certain types of Li-ion batteries pose a potential safety problem because of the instability and flammability of the organic electrolyte employed by the cells of those batteries. The severity of thermal runaway increases with increasing battery capacity due to the higher amount of electrolyte in large batteries.

If the discharge of the cells is below a typical voltage of 3.0 volts on some versions of Li-ion batteries, they will subsequently no longer accept a charge. This loss of capacity may not be detected by the simple voltage measurements commonly available to flight crews as a means of checking battery status, a problem shared with Ni-Cd batteries.

Unlike Ni-Cd and lead-acid cells, some types of Li-ion cells employ electrolytes that are known to be flammable. This material can serve as a source of fuel for an external fire in the event of a breach of the cell container.

The intent of these special conditions is to establish appropriate airworthiness standards for Li-ion battery installations in the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML. These special conditions adopt the following requirements as a means of addressing these concerns:

(1) Inclusion of those sections of § 23.1353 that are applicable to Li-ion batteries.

(2) Inclusion of the flammable fluid fire protection requirements of § 23.863. In the past, this rule was not applied to the batteries of business jet or commuter category airplanes since the electrolytes utilized in lead-acid and Ni-Cd batteries are not considered to be flammable.

(3) Addition of new requirements to address the potential hazards of overcharging and over discharging that are unique to Li-ion battery designs.

(4) Addition of maintenance requirements to ensure that batteries used as spares are maintained in an appropriate state of charge (SOC).

Discussion of Comments

Notice of proposed special conditions No. 23–10–01–SC for the AeroMech, Incorporated; Hawker Beechcraft Corporation, model B200 and other aircraft listed in Table 1, AML was published in the **Federal Register** on June 14, 2010, 75 FR 33553. No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML. Should AeroMech, Incorporated apply at a later date to modify any other model and list the model on the AML, the special conditions would apply to that model as well.

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the **Federal Register**; however, as the supplemental type, certification date for the Hawker Beechcraft Corporation, model B200 and those airplanes listed in the AML, as modified by AeroMech, Inc., is imminent, the FAA finds that good cause exists to make these special conditions effective upon issuance.

Conclusion

This action affects only certain novel or unusual design features on the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML. It is not a rule of general applicability, and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

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 the Hawker Beechcraft Corporation, model B200 and other airplanes on the AML modified by AeroMech, Incorporated.

1. SC 23.1353, Storage battery design and installation. The Federal Aviation Administration issues the following Special Conditions (SC), which apply to Beechcraft Corporation, model B200 and all aircraft listed on the AML equipped with MD–835 Li-ion batteries in lieu of the requirements of § 23.1353(a), (b), (c), (d), and (e), Amendment 23–49 through 23–59. Li-ion batteries and battery installations on part 23 airplanes equipped with existing PS–835 batteries must be designed and installed as follows:

(1) Safe cell temperatures and pressures must be maintained during any probable charging or discharging

condition, or during any failure of the charging or battery monitoring system not shown to be extremely remote. The Li-ion battery installation must be designed to preclude explosion or fire in the event of those failures.

(2) Li-ion batteries must be designed to preclude the occurrence of self-sustaining, uncontrolled increases in temperature or pressure.

(3) No explosive or toxic gasses emitted by any Li-ion battery in normal operation or as the result of any failure of the battery charging or monitoring system, or battery installation not shown to be extremely remote, may accumulate in hazardous quantities within the airplane.

(4) Li-ion batteries that contain flammable fluids must comply with the flammable fluid fire protection requirements of § 23.863(a) through (d).

(5) No corrosive fluids or gases that may escape from any Li-ion battery may damage airplane structure or essential equipment.

(6) Each Li-ion battery installation must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of its individual cells.

(7) Li-ion battery installations must have—

(i) a system to control the charging rate of the battery automatically so as to prevent battery overheating or overcharging, or

(ii) a battery temperature sensing and over-temperature warning system with a means for automatically disconnecting the battery from its charging source in the event of an over-temperature condition, or

(iii) a battery failure sensing and warning system with a means for automatically disconnecting the battery from its charging source in the event of battery failure.

(8) Any Li-ion battery installation whose function is required for safe operation of the airplane must incorporate a monitoring and warning feature that will provide an indication to the appropriate flight crewmembers whenever the capacity and state of charge (SOC) of the batteries have fallen below levels considered acceptable for dispatch of the airplane.

(9) The Instructions for Continued Airworthiness (ICA) must contain recommended manufacturers maintenance and inspection requirements to ensure that batteries, including single cells, meet a safety function level essential to the aircraft's continued airworthiness.

(i) The ICA must contain operating instructions and equipment limitations in an installation maintenance manual.

(ii) The ICA must contain installation procedures and limitations in a maintenance manual sufficient to ensure that cells or batteries, when installed according to the installation procedures, still meet safety functional levels essential to the aircraft's continued airworthiness. The limitations must identify any unique aspects of the installation.

(iii) The ICA must contain corrective maintenance procedures to functionally check battery capacity at manufacturer's recommended inspection intervals.

(iv) The ICA must contain scheduled servicing information to replace batteries at manufacturers recommended replacement time.

(v) The ICA must contain maintenance and inspection requirements to visually check for a battery and/or charger degradation.

(vi) The ICA must contain instructions that batteries in a rotating stock (spares) that have experienced degraded charge retention capability or other damage due to prolonged storage must be functionally checked at manufacturer's recommended inspection intervals.

(10) If the Li-ion battery application contains software and/or complex hardware, in accordance with AC 20-115B and AC 20-152, they should be developed to the standards of DO-178B for software and DO-254 for complex hardware.

(11) The Li-ion battery must meet TSO C179.

These special conditions are not intended to replace § 23.1353 in the certification basis of the Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML. These special conditions apply only to Li-ion batteries and battery installations. The battery requirements of § 23.1353 would remain in effect for batteries and battery installations on Hawker Beechcraft Corporation, B200 and other aircraft listed on the AML that do not use Li-ion batteries.

Issued in Kansas City, Missouri, on August 9, 2010.

John R. Colomy,

*Acting Manager, Small Airplane Directorate,
Aircraft Certification Service.*

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE308; Special Conditions No. 23-248-SC]

Special Conditions: Cirrus Design Corporation Model SF50 Airplane; Function and Reliability Testing

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Cirrus Design Corporation SF50 airplane. This airplane will have a novel or unusual design feature(s) associated with the complex design and performance features consistent with larger airplanes. 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 Date:* September 17, 2010.

FOR FURTHER INFORMATION CONTACT: J. Lowell Foster, Federal Aviation Administration, Small Airplane Directorate, Aircraft Certification Service, 901 Locust, Room 301, Kansas City, MO 64106; telephone (816) 329-4125; facsimile (816) 329-4090.

SUPPLEMENTARY INFORMATION:

Background

On September 9, 2008, Cirrus Design Corporation applied for a type certificate for their new model SF50 "Vision" Jet. The SF50 is a low-wing, five-plus-two-place (2 children), single-engine turboprop-powered aircraft. It incorporates an Electronic Flight Information System (EFIS), pressurized cabin, retractable gear, and a V-tail. The turboprop engine is mounted on the upper fuselage/tail cone along the aircraft centerline. It is constructed largely of carbon and fiberglass composite materials. Like other Cirrus products, the SF50 includes a ballistically deployed airframe parachute.

The model SF50 has a maximum operating altitude of 28,000 feet, where it cruises at speeds up to 300 Knots True Air Speed (KTAS). Its V_{MO} will not exceed 0.62 Mach. The maximum takeoff weight will be at or below 6,000 pounds with a range at economy cruise of roughly 1,000 nm. Cirrus intends for

the model SF50 to be certified for single-pilot operations under 14 CFR part 91 and 14 CFR part 135 operating rules. The following operating conditions will be included:

- Day and Night VFR.
- IFR.
- Flight Into Known Icing.

Discussion

Before Amendment 3-4, Section 3.19 of Civil Air Regulation (CAR) part 3 required service testing of all airplanes type certificated on or after May 15, 1947. The purpose of the testing was to "ascertain whether there is reasonable assurance that the airplane, its components, and equipment are reliable, and function properly."

Amendment 3-4 to CAR part 3 became effective January 15, 1951, and deleted the service test requirements in Section 3.19 for airplanes of 6,000 pounds maximum weight or less. The introductory text published in Amendment 3-4 explained that most of the significant changes in the amendment stemmed from "the desire for simplification of the rules in this part with respect to the smaller airplanes, specifically those of 6,000 pounds maximum weight or less, which would be expected to be used mainly as personal airplanes." The introductory material also stated the service test requirement was removed for airplanes of 6,000 pounds maximum weight or less because "experience seems to indicate that this rule imposes a burden upon the manufacturers not commensurate with the safety gained." The requirement for Function and Reliability (F&R) testing, and the exception for airplanes of 6,000 pounds or less maximum weight, is now found in 14 CFR part 21, section 21.35(b)(2).

The decision to exempt airplanes of 6,000 pounds maximum weight or less from F&R testing was based on the state of technology envisioned in 1951. At that time, airplanes of 6,000 pounds maximum weight or less were expected to be used mainly as personal airplanes. They used simple, "stand-alone" systems whose failure was more likely to be an inconvenience than an accident. The situation is different today. Technological advances allow airplanes weighing less than 6,000 pounds to be more complex and integrated than some transport airplanes. New part 23 airplanes can incorporate sophisticated equipment not previously used in a part 23 aircraft. Additionally, part 23 airplanes are being used for business and commercial transportation. They should no longer be envisioned mainly as personal airplanes. Therefore, a special condition