



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2022-0205; Special Conditions No. 25-844-SC]

Special Conditions: Lufthansa Technik AG, Airbus Models A319-133 and A321-200 Series Airplanes; Supercapacitor Systems and Installation

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Airbus Model A319-133 and A321-200 series airplanes. These airplanes, as modified by Lufthansa Technik AG (Lufthansa), will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport category airplanes. This design feature is the installation of an uninterruptible power supply (UPS) system based on supercapacitor technology. The current 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 [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

FOR FURTHER INFORMATION CONTACT: Daniel Poblete, Electrical Systems, AIR-626A, Technical Policy Branch, Policy and Standards Division, Aircraft Certification Service, Federal Aviation Administration, 3960 Paramount Blvd., Suite 100 Lakewood, CA 90712-4137; telephone and fax (562) 627-5335; e-mail daniel.d.poblete@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On February 17, 2021, Lufthansa applied for a supplemental type certificate for the installation of a UPS system in the Model A319-133 and A321-200 series airplanes. The Airbus Model A319-133 and A321-200 series airplanes are twin-engine, transport category airplanes. The Airbus Model A319-133 airplane has a maximum passenger seating capacity of 160, and a maximum takeoff weight of 154,322 pounds. The Airbus Model A321-200 airplane has a maximum passenger seating capacity 230, and a maximum takeoff weight of 213,848 pounds.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, Lufthansa must show that the Model A319-133 and A321-200 series airplanes, as changed, continue to meet the applicable provisions of the regulations listed in Type Certificate No. A28NM or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (e.g., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Airbus Model A319-133 and A321-200 series airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

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, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Airbus Model A319-133 and A321-200 series airplanes 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.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

Novel or Unusual Design Features

The Airbus Model A319-133 and A321-200 series airplanes will incorporate the following novel or unusual design features:

This design feature for this installation of a UPS system is based on supercapacitor technology.

Discussion

Currently, there are no regulatory or industry standards for supercapacitors and their installation on transport category airplanes. Supercapacitors are used to provide power to non-essential cabin equipment when the normal power source is interrupted for a short period of time. In this design, the supercapacitor UPS system will allow connected equipment to be provided back-up power if normal electrical power source is interrupted, and remain operational such as during power transfers as well as provide transient voltage surge suppression should harmful high voltage transients occur. The UPS is only used for systems not critical to continued safe flight and landing.

Since the supercapacitor is being used as a high-capacity electrical storage device and functions similarly to rechargeable batteries, the special conditions used for lithium batteries are appropriate for supercapacitor installations and the hazardous conditions that could be presented. These special conditions are necessary to assist in the testing and installation of this supercapacitor on the aircraft.

Special condition 1 requires that the supercapacitor installation be designed to preclude propagation of a thermal event, such as self-sustained, uncontrolled increases in temperature or pressure. Special condition 1 is intended to ensure that the supercapacitor

system is designed to eliminate the potential for uncontrollable failures. However, a certain number of failures will occur due to various factors beyond the control of the supercapacitor designer. Therefore, other special conditions are intended to protect the airplane and its occupants if other failures occur.

Special conditions 2, 6, 8, and 9 are self-explanatory.

Special condition 3 makes it clear that the flammable fluid fire protection requirements of § 25.863 apply to supercapacitor installations. Section 25.863 is applicable to areas of the airplane that could be exposed to flammable fluid leakage from airplane systems. Supercapacitors may contain an electrolyte that is a flammable fluid.

Special condition 4 requires that each supercapacitor installation not damage surrounding structure or adjacent systems, equipment, or electrical wiring interconnection system (EWIS) components from corrosive fluids or gases that may escape in such a way as to cause a hazardous condition.

While special condition 4 addresses corrosive fluids and gases, special condition 5 addresses heat. Special condition 5 requires that each supercapacitor installation have provisions to prevent any hazardous effect on surrounding structure or adjacent systems, equipment, or EWIS components, caused by the maximum amount of heat the supercapacitor installation can generate due to any failure of the supercapacitor installation or any of the individual supercapacitors. The means of meeting special conditions 4 and 5 may be the same, but the requirements are independent and address different hazards.

Special condition 7 requires that supercapacitor be disconnected or otherwise removed from its charging source without the need for crew intervention should the supercapacitor become overheated or fail in a manner that may create a safety hazard. This requirement applies to all supercapacitor installations and is not limited to those whose proper functioning is required for the safe operation of the airplane.

The 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.

Discussion of Comments

The FAA issued Notice of Proposed Special Conditions No. 25-22-02-SC for the Airbus Model A319-133 and A321-200 series airplanes, which was published in the *Federal Register* on June 1, 2023 (88 FR 35781). The FAA received one comment from The Boeing Company (Boeing).

Boeing recommended the FAA add a definition of what constitutes a supercapacitor and high-capacity electrical storage device and to include their thresholds such as capacity, voltage, and dielectric strength. Boeing stated that this clarification of supercapacitor terminology will avoid any ambiguity and confusion when applying special conditions and their applicability, specifically with the inapplicability to small capacitors that are used on various electrical systems used in electronics.

The FAA acknowledges Boeing's recommendation that adding a definition of what constitutes a supercapacitor is important for clarification and to ensure these special conditions' inapplicability to small capacitors used in various electrical systems in aviation electronics. However, the FAA declines to create a definition for supercapacitors through special conditions. Currently, the FAA is not aware of an industry standard regarding the design and installation of supercapacitors. With no supercapacitor industry standard currently available, the similarity of the function of the supercapacitor closely relates to the rechargeable lithium batteries. Therefore, the special conditions used for lithium batteries are being used for this supercapacitor installation. The applicant and the FAA will review the design and installation of the supercapacitor to ensure these special conditions will apply only to supercapacitors used as energy storage devices similar to rechargeable lithium batteries.

Applicability

As discussed above, these special conditions are applicable to the Airbus Model A319-133 and A321-200 series airplanes. Should Lufthansa apply at a later date for a change to the supplemental type certificate to include another model incorporating the same novel or unusual design feature included on Type Certificate No. A28NM, these 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 certification date for the Airbus Model A319-133 and A321-200 series airplanes is imminent, the FAA finds that good cause exists to make these special conditions effective upon publication.

Conclusion

This action affects only a certain novel or unusual design feature on Airbus Models A319-133 and A321-200 series 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.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

Authority Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701, 44702, 44704.

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 Airbus Model A319-133 and A321-200 series airplanes, as modified by Lufthansa Technik AG. Each supercapacitor installation must:

1. Be designed to preclude the occurrence of uncontrolled increases in temperature or pressure under all foreseeable operating and failure conditions to prevent fire and explosion.
2. Not emit explosive or toxic gasses, in normal operation or as the result of its failure that may accumulate in hazardous quantities in any area of the airplane.
3. Meet the requirements of § 25.863.
4. Not damage surrounding structure or adjacent systems, equipment, or electrical wiring interconnection system (EWIS) components from corrosive fluids or gases that may escape to cause a hazardous condition.
5. Have provisions to prevent any hazardous effect on surrounding structure or adjacent systems, equipment, or EWIS components, caused by the maximum amount of heat it can generate during any failure including any individual supercapacitors.
6. Have a means to prevent overheating or overcharging of the supercapacitor.
7. Have a means to automatically disconnect it from its charging source in the event of an over-temperature condition or failure.
8. Have a monitoring and alerting feature that alerts the flightcrew when the capacity has fallen below acceptable levels if its function is required for safe operation of the airplane. The flightcrew alerting must be in accordance with the requirements of § 25.1322.
9. Have a means to prevent insufficient charging if required for safe operation of the airplane.

Note: A supercapacitor installation consists of the supercapacitor(s) and any protective, monitoring and alerting circuitry or hardware inside or outside of the supercapacitor. This includes EWIS components as defined by § 25.1701. It also includes any venting or cooling system and packaging. For the purpose of these special conditions, a supercapacitor and the supercapacitor installation is referred to as a supercapacitor.

Issued in in Kansas City, Missouri, on January 8, 2024.

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