



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2016-9401; Special Conditions No. 25-651-SC]

**Special Conditions: Avionics Design Services Ltd., Textron Model 550/S550/560/560XL
Airplanes; Rechargeable Lithium Batteries and Battery Systems**

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Textron Model 550/S550/560/560XL airplanes. These airplanes, as modified by Avionics Design Services Ltd., 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 rechargeable lithium batteries and battery systems installed in the 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: This action is effective on Textron on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Send comments identified by docket number FAA-2016-9401 using any of the following methods:

- sFederal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- aMail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- oFax:* Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Nazih Khaouly, FAA, Airplane and Flightcrew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2432; facsimile 425-227-1320.

SUPPLEMENTARY INFORMATION:

The substance of these special conditions has been subject 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. Therefore, because a delay would significantly affect the certification of the airplane, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for making these special conditions effective upon publication in the **Federal Register**.

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

Background

On July 9, 2015, Avionics Design Services Ltd. applied for a supplemental type certificate for rechargeable lithium batteries and battery systems installed in Textron Model 550/S550/560/560XL airplanes. These airplanes are twin-engine, transport-category business jets

with a maximum capacity of 8 (Models 550 and 560) or 9 (Models S550 and 560XL) passengers, and maximum takeoff weights of 15,100 lbs. (Models 550 and S550), 16,300 lbs. (Model 560), and 20,200 lbs. (Model 560XL).

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.101, Avionics Design Services Ltd. must show that the Textron Model 550/S550/560/560XL airplanes, as changed, continue to meet the applicable provisions of the regulations listed in Type Certificate No. A22CE, 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 (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Textron Model 550/S550/560/560XL airplanes, as modified by Avionics Design Services Ltd., 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 Model 550/S550/560/560XL airplanes, as modified by Avionics Design Services Ltd., 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 Textron Model 550/S550/560/560XL airplanes, as modified by Avionics Design Services Ltd., will incorporate the following novel or unusual design feature:

Installed rechargeable lithium batteries and battery systems.

Rechargeable lithium batteries are a novel or unusual design feature in transport-category airplanes. This type of battery has certain failure, operational, and maintenance characteristics that differ significantly from those of the nickel-cadmium and lead-acid rechargeable batteries currently approved for installation on transport-category airplanes.

Discussion

Rechargeable lithium batteries are novel and unusual with respect to the state of technology considered when these requirements were codified. These batteries introduce higher energy levels into airplane systems through new chemical compositions in various battery-cell sizes and construction. Interconnection of these cells in battery packs introduces failure modes that require unique design considerations, such as provisions for thermal management.

Recent events involving rechargeable and non-rechargeable lithium batteries prompted the FAA to initiate a broad evaluation of these energy-storage technologies. In January 2013, two independent events involving rechargeable lithium-ion batteries demonstrated unanticipated failure modes. These events are described in a National Transportation Safety Board letter to the FAA, dated May 22, 2014, which is available at:

<http://www.nts.gov/doclib/reletters/2014/A-14-032-036.pdf>

On July 12, 2013, an event involving a non-rechargeable lithium battery in an emergency-locator transmitter installation demonstrated unanticipated failure modes. This event is described in Air Accident Investigations Branch Bulletin S5/2013, available at:

http://www.aaib.gov.uk/cms_resources.cfm?file=/S5-2013%20ET-AOP.pdf.

Some other known uses of rechargeable and non-rechargeable lithium batteries on airplanes include:

- oFlight deck and avionics systems such as displays, global-positioning systems, cockpit voice recorders, flight-data recorders, underwater-locator beacons, navigation computers, integrated avionics computers, satellite network/communication systems, communication-management units, and remote-monitor electronic line replaceable units (LRU);
- eCabin safety, entertainment and communications equipment including life rafts, escape slides, seatbelt air bags, cabin-management systems, Ethernet switches, routers and media servers, wireless systems, internet and in-flight entertainment systems, satellite televisions, and remote controls and handsets; and,
- aSystems in cargo areas including door controls, sensors, video surveillance equipment and security systems.

Some known potential hazards and failure modes associated with rechargeable lithium batteries are:

- oInternal failures. In general, these batteries are significantly more susceptible to internal failures that can result in self-sustaining increases in temperature and pressure

(i.e., thermal runaway) than their nickel-cadmium or lead-acid counterparts. The metallic lithium can ignite, resulting in a self-sustaining fire or explosion.

- hFast or imbalanced discharging. Fast discharging, or an imbalanced discharge of one cell of a multi-cell battery, may create an overheating condition that results in an uncontrollable venting condition which, in turn, leads to a thermal event or an explosion.
- lFlammability. Unlike nickel-cadmium and lead-acid batteries, these batteries use higher energy and current in an electrochemical system that can be configured to maximize energy storage of lithium, and use liquid electrolytes that can be extremely flammable. The electrolyte, as well as the electrodes, can serve as a source of fuel for an external fire if the battery casing is breached.

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.

Applicability

As discussed above, these special conditions are applicable to the Textron Model 550/S550/560/560XL airplanes as modified by Avionics Design Services Ltd. Should Avionics Design Services Ltd. apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. A22CE to incorporate the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on one model series 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. Therefore, because a delay would significantly affect the certification of the airplane, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon publication in the **Federal Register**. 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 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 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 Textron Model 550/S550/560/560XL airplanes modified by Avionics Design Services Ltd.

Each rechargeable lithium battery installation must:

1. Be designed so that safe cell temperatures and pressures are maintained under all foreseeable operating conditions to preclude fire and explosion.
2. Be designed to preclude the occurrence of self-sustaining, uncontrolled increases in temperature or pressure.
3. Not emit explosive or toxic gases in normal operation, or as a result of its failure, that may accumulate in hazardous quantities within the airplane.
4. Meet the requirements of Title 14, Code of Federal Regulations 25.863.
5. Not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape.
6. Have provisions to prevent any hazardous effect on airplane structure or systems caused by the maximum amount of heat the installation can generate due to any failure of it or its individual cells.
7. Be capable of automatically controlling the charge rate of each cell to prevent cell imbalance, back charging, overcharging, overheating, and uncontrollable temperature and pressure.
8. Have a means to be automatically disconnected from its charging source in the event of an over-temperature condition, cell failure, or battery failure.
9. Have a failure sensing and warning system to alert the flightcrew if the installation's failure affects safe operation of the airplane.
10. If its function is required for safe operation of the airplane, the installment must have a monitoring and warning feature that alerts the flightcrew when its charge state falls below acceptable levels.

Note 1: A battery system consists of the battery, battery charger, and any protective, monitoring, and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging. For the purpose of these special conditions, a battery and battery system are referred to as a battery.

Note 2: These special conditions apply to all rechargeable lithium battery installations in lieu of Title 14, Code of Federal Regulations 25.1353(c)(1) through (c)(4) at Amendment 25-42. Section 25.1353(c)(1) through (c)(4) at Amendment 25-42 remains in effect for other battery installations.

Note 3: Section 25.863 is applicable to areas of the airplane that could be exposed to flammable fluid leakage from airplane systems. Rechargeable lithium batteries contain electrolyte that is a flammable fluid. The FAA includes special condition 4 to make it clear to applicants that the flammable-fluid fire-protection requirements of § 25.863 apply to rechargeable lithium battery installations.

Note 4: Special conditions 7 and 8 require rechargeable lithium batteries to have “automatic” means, for charge rate and disconnect, due to the fast-acting nature of lithium battery chemical reactions. Manual intervention would not be timely or effective in mitigating the hazards associated with these batteries.

Issued in Renton, Washington, on February 23, 2017.

/s/

Michael Kaszycki
Assistant Manager, Transport Airplane Directorate
Aircraft Certification Service
[FR Doc. 2017-05334 Filed: 3/16/2017 8:45 am; Publication Date: 3/17/2017]