



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2023-2134; Special Conditions No. 25-845-SC]

Special Conditions: H4 Aerospace (UK) Ltd., Boeing Model 757-200 Airplane, Non-Rechargeable Lithium Battery and Battery System Installations

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for non-rechargeable lithium batteries and battery systems on Boeing Model 757-200 airplanes, as modified by H4 Aerospace (UK) Ltd (H4). Non-rechargeable lithium batteries are a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport category 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 H4 on [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Send comments on or before [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Send comments identified by Docket No. FAA-2023-2134 using any of the following methods:

- *Federal eRegulations Portal:* Go to www.regulations.gov and follow the online instructions for sending your comments electronically.

- *Mail:* 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.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.
- *Docket:* Background documents or comments received may be read at 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, Electrical Systems Unit, AIR-626A, Technical Policy Branch, Policy and Standards Division, Aircraft Certification Service, Federal Aviation Administration, 2200 South 216th Street, Des Moines, Washington 98198; telephone (206) 231-3160; email Nazih.Khaouly@faa.gov.

SUPPLEMENTARY INFORMATION:

The substance of these special conditions has been published in the Federal Register for public comment in several prior instances with no substantive comments received. Therefore, the FAA finds, pursuant to Title 14, Code of Federal Regulations (14 CFR) 11.38(b), that new comments are unlikely, and notice and comment prior to this publication are unnecessary.

Privacy

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received without change to www.regulations.gov, including any personal information you provide. The FAA will also post a report summarizing each substantive verbal contact received about these special conditions.

Confidential Business Information

Confidential Business Information (CBI) is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to these special conditions contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to these special conditions, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as “PROPIN.” The FAA will treat such marked submissions as confidential under the FOIA, and the indicated comments will not be placed in the public docket of these proposed special conditions. Send submissions containing CBI to the individual listed in the For Further Information Contact section above. Comments the FAA receives, which are not specifically designated as CBI, will be placed in the public docket for these proposed special conditions.

Comments Invited

The FAA invites 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.

The FAA will consider all comments received by the closing date for comments and will consider comments filed late if it is possible to do so without incurring delay. The FAA may change these special conditions based on the comments received.

Background

On February 26, 2020, H4 applied for a supplemental type certificate to install, on the Boeing 757-200 airplane, HR Smith emergency locator transmitter (ELT) 500-32-2Y-H that contain a non-rechargeable lithium battery and battery system. The Boeing Model 757-200 airplane currently approved under Type Certificate No A2NM, are twin-engine transport category airplanes with a maximum seating of capacity of 295 passengers and has a maximum takeoff weight of 255,000 pounds.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, H4 must show that the Boeing Model 757-200 airplane, as changed, continues to meet the applicable provisions of the regulations listed in Type Certificate No. A2NM 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 Boeing Model 757-200 airplane 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 Boeing Model 757-200 airplane must comply with the exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36.

Novel or Unusual Design Feature

The Boeing Model 757-200, MSN 25140 and MSN 24473 airplanes will incorporate the following novel or unusual design feature:

The installation of an HR Smith emergency locator transmitter (ELT) 500-32-2Y-H containing a non-rechargeable lithium battery and battery system.

Discussion

The FAA derived the current regulations governing installation of batteries in transport category airplanes from Civil Air Regulations (CAR) 4b.625(d) as part of the recodification of CAR 4b that established [14 CFR part 25](#) in February 1965. This recodification basically reworded the CAR 4b battery requirements, which are currently in § 25.1353(b)(1) through (4). Non-rechargeable lithium batteries are novel and unusual with respect to the state of technology considered when these requirements were codified. Non-rechargeable lithium 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 introduce failure modes that require unique design considerations, such as provisions for thermal management.

In January 2013, two independent events involving rechargeable lithium batteries revealed unanticipated failure modes. A National Transportation Safety Board (NTSB) Safety Recommendation to the FAA, dated May 22, 2014, which is available at www.ntsb.gov, filename A-14-032-036.pdf, describes these events.

On July 12, 2013, an event involving a non-rechargeable lithium battery in an emergency-locator transmitter installation demonstrated unanticipated failure modes. The

United Kingdom's Air Accidents Investigation Branch Bulletin S5/2013¹ describes this event. These events involving rechargeable and non-rechargeable lithium batteries prompted the FAA to initiate a broad evaluation of these energy-storage technologies.

On April 22, 2016, the FAA published special conditions no. 25-612-SC, in the Federal Register ([81 FR 23573](#)), applicable to Gulfstream Aerospace Corporation for the Model GVI airplane. Those were the first special conditions the FAA issued for non-rechargeable lithium battery installations. In that document, the FAA explained its decision to make those special conditions effective on April 22, 2017, one year after publication in the Federal Register. In those special conditions, the FAA stated its intention to apply non-rechargeable lithium battery special conditions to design changes on other airplane makes and models applied for after this same date.

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

- Flight 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 and communication systems, communication management units, and remote-monitor electronic line-replaceable units;
- Cabin safety, entertainment, and communications equipment, including emergency locator transmitters, 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, remotes, and handsets;
- Systems in cargo areas including door controls, sensors, video surveillance equipment, and security systems.

¹ See S5-2013_ET-AOP.pdf, available in the docket for these special conditions.

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

- *Internal 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.

- *Fast 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.

- *Flammability:* Unlike nickel-cadmium and lead-acid batteries, lithium batteries use higher energy and current in an electrochemical system that can be configured to maximize energy storage of lithium. They also 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. For the purpose of these special conditions, a battery and the battery system are referred to as a battery. A battery system consists of the battery and any protective, monitoring, and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging.

Special condition no. 1 of these special conditions requires that each individual cell within a non-rechargeable lithium battery be designed to maintain safe temperatures and pressures. Special condition no. 2 addresses these same issues but for the entire battery. Special condition no. 2 requires the battery be designed to prevent propagation of a thermal event, such as self-sustained, uncontrollable increases in temperature or pressure from one cell to adjacent cells.

Special condition nos. 1 and 2 are intended to ensure that the non-rechargeable lithium battery and its cells are 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 battery designer. Therefore, other special conditions are intended to protect the airplane and its occupants if failure occurs.

Special conditions 3, 7, and 8 are self-explanatory.

Special condition no. 4 makes it clear that the flammable-fluid fire-protection requirements of § 25.863 apply to non-rechargeable lithium battery installations. Section 25.863 is applicable to areas of the airplane that could be exposed to flammable-fluid leakage from airplane systems. Non-rechargeable lithium batteries contain an electrolyte that is a flammable fluid.

Special condition no. 5 requires that each non-rechargeable lithium battery installation not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape in such a way as to cause a major or more severe failure condition.

While special condition no. 5 addresses corrosive fluids and gases, special condition no. 6 addresses heat. Special condition no. 6 requires that each non-rechargeable lithium battery installation have provisions to prevent any hazardous effect on airplane structure or systems caused by the maximum amount of heat the battery installation can generate due to any failure of it or its individual cells. The means of meeting special conditions nos. 5 and 6 may be the same, but the requirements are independent and address different hazards.

These special conditions apply to all non-rechargeable lithium battery installations in lieu of § 25.1353(b)(1) through (4) at Amendment 25-123 on Boeing Model 757-200 airplanes, as modified by H4 and described in this application. Sections

25.1353(b)(1) through (4) at Amendment 25-123 remain in effect for other battery installations.

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 Boeing Model 757-200 airplanes. Should H4 apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. FAA STC ST001021B 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 of airplane. 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, and 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 Boeing Model 757-200 airplanes, as modified by H4 Aerospace (UK) Ltd.

In lieu of § 25.1353(b)(1) through (4) at amendment 25-123, or § 25.1353(c)(1) through (4) at earlier amendments, each non-rechargeable lithium battery installation must:

1. Be designed to maintain safe cell temperatures and pressures under all foreseeable operating conditions to prevent fire and explosion.
2. Be designed to prevent the occurrence of self-sustaining, uncontrollable increases in temperature or pressure.
3. Not emit explosive or toxic gases, either in normal operation or as a result of its failure, that may accumulate in hazardous quantities within the airplane.
4. Meet the requirements of § 25.863.
5. Not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape in such a way as to cause a major or more severe failure condition.
6. Have provisions to prevent any hazardous effect on airplane structure or systems caused by the maximum amount of heat it can generate due to any failure of it or its individual cells.
7. Have a failure sensing and warning system to alert the flightcrew if its failure affects safe operation of the airplane.
8. Have a means for the flight crew or maintenance personnel to determine the battery charge state if the battery's function is required for safe operation of the airplane.

Note: A battery system consists of the battery, 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 the battery system are referred to as a battery.

Issued in Kansas City, Missouri, on May 7, 2024.

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