Rules and Regulations

Federal Register
Vol. 81, No. 161
Friday, August 19, 2016

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA–2015–5758; Special Conditions No. 25–632–SC]

Special Conditions: The Boeing Company, Boeing Model 737–8 Airplane; Non-Rechargeable Lithium Battery Installations

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Boeing Company (Boeing) Model 737–8 airplane. This airplane 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 associated with non-rechargeable lithium battery installations. 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 April 22, 2017.

FOR FURTHER INFORMATION CONTACT: Nazih Khaouly, Airplane and Flight Crew Interface Branch, ANM–111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057–3356; telephone 425–227–2432; facsimile 425–227–1149.

SUPPLEMENTARY INFORMATION:

Future Requests for Installation of Non-Rechargeable Lithium Batteries

The FAA anticipates that non-rechargeable lithium batteries will be installed in other makes and models of airplanes. We have determined to require special conditions for all applications requesting non-rechargeable lithium battery installations, except the installations excluded in the Applicability section, until the airworthiness requirements can be revised to address this issue. Applying special conditions to these installations across the range of all transport-airplane makes and models ensures regulatory consistency among applicants.

The FAA issued special conditions no. 25–612–SC to Gulfstream Aerospace Corporation for their GVI airplane. Those are the first special conditions the FAA issued for non-rechargeable lithium battery installations. We explained in that document our determination to make those special conditions effective one year after publication of those special conditions in the **Federal Register**, and our intention for other special conditions for other makes and models to be effective on this same date or 30 days after their publication, whichever is later.

Background

On January 27, 2012, Boeing applied for an amendment to type certificate no. A16WE to include a new Model 737–8 airplane. The Model 737–8 airplane is a twin-engine, transport-category airplane that is a derivative of the Model 737–800 airplane. The Model 737–8 has a maximum passenger capacity of 200 and a maximum takeoff weight of 181,200 lbs.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, Boeing must show that the Model 737–8 airplane meets the applicable provisions of the regulations listed in type certificate no. A16WE or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA. The regulations listed in the type certificate are commonly referred to as the ''original type certification basis.'' The regulations listed in type certificate no. A16WE are 14 CFR part 25 effective February 1, 1965 including Amendments 25–1 through 25–77 with exceptions listed in the type certificate. In addition, the certification basis includes other regulations, special conditions, and exemptions that are not relevant to these special conditions. Type certificate no. A16WE will be updated to include a complete description of the certification basis for this airplane model.

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 Model 737–8 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 airplane model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified 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 737–8 airplane 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 Boeing Model 737–8 airplane will incorporate non-rechargeable lithium batteries.

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 ''battery system'' are referred to as a battery.

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 re-codification of CAR 4b that established 14 CFR part 25 in February 1965. We basically reworded the battery requirements, which are currently in § 25.1353(b)(1) through (4), from the CAR requirements.

Non-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. A National Transportation Safety Board (NTSB) letter to the FAA, dated May 22, 2014, which is available at *http://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 S5/2013 describes this event.

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.

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.

Special condition 1 requires that each individual cell within a non-rechargeable lithium battery be designed to maintain safe temperatures and pressures. Special condition 2 addresses these same issues but for the entire battery. Special condition 2 requires that the battery be designed to prevent propagation of a thermal event, such as self-sustained, uncontrolled increases in temperature or pressure from one cell to adjacent cells.

Special conditions 1 and 2 are intended to ensure that the non-rechargeable lithium battery and its cells are designed to eliminate the potential for uncontrolled failures. However, a certain number of failures will occur due to various factors beyond the control of the 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, and the FAA does not provide further explanation for them at this time.

Special condition 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 electrolyte that is a flammable fluid.

Special condition 5 requires each non-rechargeable lithium battery installation to not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape. Special condition 6 requires each non-rechargeable lithium battery installation to 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. The means of meeting these special conditions may be the same, but they are independent requirements addressing different hazards. Special condition 5 addresses corrosive fluids and gases, whereas special condition 6 addresses heat.

These special conditions will apply to all non-rechargeable lithium battery installations in lieu of § 25.1353(b)(1) through (4) at Amendment 25–123. Sections 25.1353(b)(1) through (4) at Amendment 25–123 will 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.

Discussion of Comments

Notice of proposed special conditions no. 25–16–02–SC, for the Boeing 737–8 airplane, was published in the **Federal Register** on February 11, 2016 [81 FR 7249]. We received two substantive comments.

The Aerospace Industries Association (AIA) provided several comments that were identical to their comments for special conditions no. 25–612–SC (81 FR 23573), which we issued to Gulfstream Aerospace Corporation for non-rechargeable lithium battery installations on Gulfstream GVI airplanes. The FAA responded to each of these comments in that final special conditions document. We incorporated the same revisions into this Boeing 737–8 special conditions that we incorporated into the Gulfstream GVI special conditions as a result of AIA's comments.

Boeing commented that they fully support AIA's comments.

Boeing requested that the FAA provide adequate time before non-rechargeable lithium battery special conditions become effective to support validation activities by foreign civil airworthiness authorities (FCAA) and to not adversely impact future airplane deliveries by all applicants. The FAA considered this same comment from Boeing for special conditions no. 25–612–SC and provided a detailed response in that document. We determined the effective date for these Boeing 737–8 special conditions based on Boeing's comment and other factors stated in special conditions no. 25–612–SC.

Boeing commented that the FAA needs to clearly define the applicability of these special conditions. The FAA concurs. Boeing's comment is similar to

their comment on special conditions no. 25–612–SC. We provided a detailed response in special conditions no. 25–612–SC and have now clearly defined the applicability for these Boeing 737–8 special conditions. One aspect of Boeing's comment that we did not address in special conditions no. 25–612–SC is that some design changes may not change a lithium battery installation but affect it, which results in these special conditions being applicable. For example, adding a heat source next to a lithium battery can increase its possibility of entering into thermal runaway. Lithium battery installations affected by design changes must meet these special conditions. Some examples of changes that affect lithium battery installations are those that:

- Increase the temperatures or pressures in a battery,
- Increase the electrical load on a battery,
- Increase potential for imbalance between battery cells,
- Modify protective circuitry for a lithium battery,
- Increase the airplane level risk due to the location of an existing lithium battery. An example is installation of a new oxygen line next to an existing part that has a lithium battery. The airplane level risk may increase due to the potential hazard of a lithium battery fire in the proximity of oxygen.

The FAA has determined that ''uncontrolled'' in special condition 2 should be ''uncontrollable'' to more accurately describe the concern. This revision does not change the intended meaning of this special condition.

Except as discussed above, the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Model 737–8 airplane. Should the applicant apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, these special conditions would apply to that model as well.

These special conditions are only applicable to design changes applied for after the effective date of the special conditions. The existing airplane fleet and follow-on deliveries of airplanes with previously certified non-rechargeable lithium battery installations are not affected.

These special conditions are not applicable to previously certified non-rechargeable lithium battery installations where the only change is either cosmetic or relocating the installation to improve the safety of the airplane and occupants. The FAA determined that this exclusion is in the public interest because the need to meet all of the special conditions might otherwise deter such design changes that involve relocating batteries. A cosmetic change is a change in appearance only, and does not change any function or safety characteristic of the battery installation.

Conclusion

This action affects only certain novel or unusual design features on one model of airplane. It is not a rule of general applicability.

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, the following special conditions are part of the type certification basis for the Boeing Model 737–8 airplane.

Non-Rechargeable Lithium Battery Installations

In lieu of § 25.1353(b)(1) through (b)(4) at Amendment 25–123, each non-rechargeable lithium battery installation must:

1. Maintain safe cell temperatures and pressures under all foreseeable operating conditions to prevent fire and explosion.
2. 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 flightcrew 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 ''battery system'' are referred to as a battery.

Issued in Renton, Washington, on August 12, 2016.

Michael Kaszycki,

Assistant Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 2016–19856 Filed 8–18–16; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA–2015–3986; Directorate Identifier 2015–NM–057–AD; Amendment 39–18613; AD 2016–16–15]

RIN 2120–AA64

Airworthiness Directives; Bombardier, Inc. Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: We are adopting a new airworthiness directive (AD) for certain Bombardier, Inc. Model DHC–8–400, –401, and –402 airplanes. This AD was prompted by reports of chafing damage due to insufficient clearance on the main landing gear (MLG) stabilizer brace, the nacelle A-frame structure, and the adjacent electrical wiring harnesses. An insufficient fillet radius may also exist on certain airplanes. This AD requires, depending on airplane configuration, an inspection of the nacelle A-frame structure for insufficient fillet radius; an inspection for cracking of affected structure, and rework or repair if necessary, and rework of the nacelle A-frame structure; repetitive inspections of the nacelle A-frame structure and the MLG stabilizer brace for insufficient clearance and damage, and repair if necessary, and rework of the nacelle A-frame structure, which would terminate the repetitive inspections; installation of new stop brackets and a shim on each MLG stabilizer brace assembly; and rework of the electrical wiring harnesses in the nacelle area. We are issuing this AD to