



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2016-8031; Special Conditions No. 25-653-SC]

Special Conditions: Bombardier Inc. Models BD-700-2A12 and BD-700-2A13 airplanes; Operation Without Normal Electrical Power.

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Bombardier Inc. (Bombardier) Models BD-700-2A12 and BD-700-2A13 airplanes. These airplanes will have novel or unusual design features when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. These design features are electrical and electronic systems that perform critical functions, the loss of which could be catastrophic to the airplane. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. 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 Bombardier 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-2016-8031 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://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.

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).

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 the 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: Stephen Slotte, FAA, Airplane and Flight Crew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone 425-227-2315; facsimile 425-227-1149.

SUPPLEMENTARY INFORMATION:

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 on or before the closing date for comments. We may change these special conditions based on the comments we receive.

Background

On May 30, 2012, Bombardier applied for an amendment to type certificate no. T00003NY to include the new Model BD-700-2A12 and BD-700-2A13 airplanes. These airplanes are derivatives of the Model BD-700 series of airplanes and are marketed as the Bombardier Global 7000 (Model BD-700-2A12) and Global 8000 (Model BD-700-2A13). These airplanes are twin-engine, transport-category, executive-interior business jets. The maximum passenger capacity is 19 and the maximum takeoff weights are 106,250 lb. (Model BD-700-2A12) and 104,800 lb. (Model BD-700-2A13).

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.101, Bombardier must show that the Model BD-700-2A12 and BD-700-2A13 airplanes meet the applicable provisions of the regulations listed in type certificate no. T00003NY, 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 BD-700-2A12 and BD-700-2A13 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 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 BD-700-2A12 and BD-700-2A13 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 Bombardier Model BD-700-2A12 and BD-700-2A13 airplanes will incorporate novel or unusual design features associated with electrical and electronic flight-control systems

that perform critical functions, the loss of which may result in loss of flight controls and other critical systems, and that may be catastrophic to the airplane if not appropriately protected.

The applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. 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

The Model BD-700-2A12 and BD-700-2A13 airplanes have a fly-by-wire flight-control system that requires a continuous source of electrical power to maintain an operable flight-control system. Section 25.1351(d), “Operation without normal electrical power,” requires safe operation in visual flight rule (VFR) conditions for at least five minutes after loss of normal electrical power, excluding the battery. This rule was structured around a traditional design using mechanical control cables and linkages for flight control. These manual controls allow the crew to maintain aerodynamic control of the airplane for an indefinite time after loss of all electrical power. Under these conditions, a mechanical flight-control system provided the crew with the ability to fly the airplane while attempting to identify the cause of the electrical failure, restart engine(s) if necessary, and attempt to re-establish some of the electrical-power generation capability.

A critical assumption in § 25.1351(d) is that the airplane is in VFR conditions at the time of the failure. This is not a valid assumption in today’s airline operating environment where airplanes fly much of the time in instrument meteorological conditions on air-traffic-control-defined flight paths. Another assumption in the existing rule is that the loss of all normal

electrical power is the result of the loss of all engines. The five-minute period in the rule is to allow at least one engine to be restarted, following an all-engine power loss, to continue the flight to a safe landing. However, service experience on airplanes with similar electrical power-system architecture as the Bombardier Global 7000/8000 airplanes has shown that at least the temporary loss of all electrical power for causes other than all-engine failure is not extremely improbable. To maintain the same level of safety, envisioned by the existing rule, with traditional mechanical flight controls, the Global 7000/8000 design must not be time-limited in its operation under all reasonably foreseeable conditions, including loss of all normal sources of engine or auxiliary-power-unit (APU)-generated electrical power. Unless Bombardier can show that the non-restorable loss of the engine and APU power sources is extremely improbable, Bombardier must demonstrate that the airplanes can maintain safe flight and landing (including steering and braking on the ground for airplanes using steer- and brake-by-wire, and fly-by-wire speed-brake panels) with the use of emergency or alternate electrical power systems. These electrical power systems, or the minimum restorable electrical power sources, must be able to power loads that are essential for continued safe flight and landing.

Applicability

As discussed above, these special conditions are applicable to the Model BD-700-2A12 and BD-700-2A13 airplanes. Should Bombardier apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design features, these special conditions would apply to the other model as well.

Conclusion

This action affects only certain novel or unusual design features on two models of airplanes. It is not a rule of general applicability.

The substance of these special conditions has been subject to the public 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, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon issuance. 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 Bombardier Model BD-700-2A12 and BD-700-2A13 airplanes.

In lieu of 14 CFR 25.1351(d), the following special conditions apply:

1. Bombardier must show, by test or a combination of test and analysis, that the airplane is capable of continued safe flight and landing with all normal electrical power sources

inoperative, as prescribed by paragraphs 1.a. and 1.b., below. For purposes of these special conditions, normal sources of electrical-power generation do not include alternate power sources such as the battery, ram-air turbine, or independent power systems such as the flight-control permanent-magnet generating system. In showing capability for continued safe flight and landing, Bombardier must account for systems capability, effects on crew workload and operating conditions, and the physiological needs of the flightcrew and passengers for the longest diversion time for which Bombardier is seeking approval.

- a. In showing compliance with this requirement, Bombardier must account for common-cause failures, cascading failures, and zonal physical threats.
 - b. Bombardier may consider the ability to restore operation of portions of the electrical power generation and distribution system if it can be shown that unrecoverable loss of those portions of the system is extremely improbable. The design must provide an alternative source of electrical power for the time required to restore the minimum electrical-power generation capability required for safe flight and landing. Bombardier may exclude unrecoverable loss of all engines when showing compliance with this requirement.
2. Regardless of electrical-power generation and distribution system recovery capability shown under special condition 1, above, sufficient electrical-system capability must be provided to:

- a. Allow time to descend, with all engines inoperative, at the speed that provides the best glide distance, from the maximum operating altitude to the top of the engine-restart envelope, and
 - b. Subsequently allow multiple start attempts of the engines and auxiliary power unit (APU). The design must provide this capability in addition to the electrical capability required by existing part 25 requirements related to operation with all engines inoperative.
3. The airplane emergency electrical power system must be designed to supply:
 - a. Electrical power required for immediate safety, which must continue to operate without the need for crew action following the loss of the normal electrical power, for a duration sufficient to allow reconfiguration to provide a non-time-limited source of electrical power.
 - b. Electrical power required for continued safe flight and landing for the maximum diversion time.
4. If Bombardier uses APU-generated electrical power to satisfy the requirements of these special conditions, and if reaching a suitable runway for landing is beyond the capacity of the battery systems, then the APU must be able to be started under any foreseeable flight condition prior to the depletion of the battery, or the restoration of normal electrical power, whichever occurs first. Flight test must demonstrate this capability at the most critical condition.
 - a. Bombardier must show that the APU will provide adequate electrical power for continued safe flight and landing.

- b. The airplane flight manual (AFM) must incorporate non-normal procedures that direct the pilot to take appropriate actions to activate the APU after loss of normal engine-driven generated electrical power.
5. As part of showing compliance with these special conditions, the tests to demonstrate loss of all normal electrical power must also take into account the following:
- a. The assumption that the failure condition occurs during night instrument meteorological conditions (IMC) at the most critical phase of the flight, relative to the worst possible electrical-power distribution and equipment-loads-demand condition.
 - b. After the un-restorable loss of normal engine-generator power, the airplane engine restart capability is provided and operations continued in IMC.
 - c. The airplane is demonstrated to be capable of continued safe flight and landing. The length of time must be computed based on the maximum diversion time capability for which the airplane is being certified. Bombardier must account for airspeed reductions resulting from the associated failure or failures.
 - d. The airplane must provide adequate indication of loss of normal electrical power to direct the pilot to the non-normal procedures, and the AFM must incorporate non-normal procedures that will direct the pilot to take appropriate actions.

Issued in Renton, Washington, on March 31, 2017.

/s/

Michael Kaszycki

Assistant Manager, Transport Airplane Directorate
Aircraft Certification Service

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