Composite Wing and Fuel Tank Post-Crash Fire Survivability

1. The wing fuel tank structure must withstand an external fuel-fed pool fire for a minimum of 5 minutes.

2. The integrity of the wing fuel tank structure must be demonstrated at:

- Minimum fuel load, not less than reserve fuel level;
- Maximum fuel load equal to the maximum range fuel quantity; and
- Any other critical fuel loads.

3. The demonstration must consider fuel tank flammability, burn-through resistance, wing structural strength retention properties, and auto-ignition threats from localized heating of composite structure, fasteners, or any other feature that may produce an ignition source during a ground fire event for the required time duration.

Issued in Renton, Washington, on October 16, 2014.

Michael Kascycki,

Acting Manager, Transport Airplane Directorate.

[FR Doc. 2014–25239 Filed 10–22–14; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA–2014–0421; Special Conditions No. 25–571–SC]

Special Conditions: Boeing Commercial Airplanes, Model 767–2C Airplane; Interaction of Fuel Systems and Structures

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Boeing Model 767–2C airplane. This airplane 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 include the addition of four body fuel tanks and a modified fuel management system that, directly or as a result of failure or malfunction, could affect the airplane's structural performance. 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: *Effective Date:* This action is effective on November 24, 2014.

FOR FURTHER INFORMATION CONTACT: Mark Freisthler, FAA, Airframe and Cabin Safety Branch, ANM–115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057–3356; telephone 425–227–1119; facsimile 425–227–1232.

SUPPLEMENTARY INFORMATION:

Background

On January 18, 2010, Boeing Commercial Airplanes applied for an amendment to Type Certificate No. A1NM to include the new Model 767–2C. The Boeing Model 767–2C, which is a derivative of the Model 767–200 currently approved under Type Certificate No. A1NM, is a transport category airplane, intended for use as a freighter, powered by two PW4062 engines with a maximum takeoff weight of 415,000 pounds.

The Boeing Model 767–2C will have more fuel capacity than a traditional freighter through the addition of four body fuel tanks. The Model 767–2C contains fuel systems that could, directly or as a result of failure or malfunction, affect the aircraft's structural performance. Current regulations do not take into account loads for the airplane due to the effects of fuel system failures on structural performance; therefore, special conditions are needed.

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.101, Boeing must show that the Model 767–2C meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25–0 through 25–130, except for earlier amendments as agreed upon by the FAA. These regulations will be incorporated into Type Certificate No. A1NM after type certification approval of the Model 767–2C.

In addition, the certification basis includes other regulations, special conditions, and exemptions that are not relevant to these special conditions. Type Certificate No. A1NM will be updated to include a complete description of the certification basis for these model airplanes.

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 767–2C 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 or similar novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same or similar novel or unusual design feature, the special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Model 767–2C 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 767–2C will incorporate the following novel or unusual design features: Fuel system changes including the addition of forward and aft body fuel tanks, a main-to-center-tank gravity transfer system, hydraulically-powered-pumps for jettison, a nitrogen generation system for inerting of all fuel tanks, and a pressure-regulating closed fuel tank vent system. Digital electronic controls (i.e., fuel management systems) are added for control and monitoring of these systems.

Discussion

The fuel management system is designed to keep the fuel distributed in accordance with fuel usage requirements. System failures of these new and modified systems may result in adverse fuel distributions or center-of-gravity excursions that increase the airplane loads. For example, a failure of the main tank gravity drain valve may result in less wing main tank fuel than normal management; or failure of the body auxiliary tank transfer systems may result in excessive body fuel at landing. Additionally, failures of the nitrogen generation system, fuel transfer system, or vent/pressure regulating system may result in excessive fuel tank pressures. These types of failures are addressed by these special conditions.

Special conditions have been applied on past airplane programs in order to require consideration of the effects of systems on structures. These special conditions are similar to those previously applied except that the scope is limited to new fuel system features unique to the Model 767–2C. 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. 25–14–07–SC for the Boeing Model 767–2C airplane was published in the **Federal Register** on July 2, 2014 (79 FR 37670). No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Boeing Model 767–2C airplane. Should Boeing Commercial Airplanes apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on one model of airplanes. 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, 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 Commercial Airplanes Model 767–2C airplane.

1. Interactions of fuel systems and structures. General.

a. For airplanes equipped with fuel systems that affect structural performance, either directly or as a result of a failure or malfunction, the influence of these systems and their failure conditions must be taken into account when showing compliance with the requirements of 14 CFR part 25 subparts C and D.

b. The criteria in Section 2 below must be used for showing compliance with these special conditions for airplanes equipped with fuel systems that either directly or as a result of failure or malfunction affect structural performance.

c. The criteria only address the direct structural consequences of the system responses and performances and cannot be considered in isolation but should be included in the overall safety evaluation of the airplane. These criteria may in some instances duplicate standards already established for this evaluation. These criteria are only applicable to structural elements whose failure could prevent continued safe flight and landing. Specific criteria that define acceptable limits on handling characteristics or stability requirements when operating in the system degraded or inoperative mode are not provided in these special conditions.

d. Depending on the specific characteristics of the airplane, additional studies may be required that demonstrate the capability of the airplane to meet other realistic conditions such as alternative gust or maneuver descriptions for an airplane equipped with a load alleviation system.

e. The following definitions are applicable to these special conditions:

(1) Structural performance: Capability of the airplane to meet the structural requirements of part 25.

(2) Flight limitations: Limitations that can be applied to the airplane flight conditions following an in-flight occurrence and that are included in the airplane flight manual (e.g., speed limitations, avoidance of severe weather conditions, etc.).

(3) Operational limitations: Limitations, including flight limitations, that can be applied to the airplane operating conditions before dispatch (e.g., fuel, payload and Master Minimum Equipment List limitations).

(4) Probabilistic terms: The probabilistic terms (probable, improbable, extremely improbable) used in these special conditions are the same as those used in § 25.1309.

(5) Failure condition: The term failure condition is the same as that used in § 25.1309. However, these special conditions apply only to system failure conditions that affect the structural performance of the airplane (e.g., system failure conditions that induce loads, change the response of the airplane to inputs such as gusts or pilot actions, or lower flutter margins). The system failure conditions include consequential or cascading effects resulting from the first failure.

2. Effects of Fuel System Failure on Structures. The following criteria will be used in determining the influence of the fuel system and its failure conditions on the airplane structural elements.

a. *Fuel system fully operative.* With the fuel system fully operative, the following apply:

(1) Limit loads must be derived in all normal operating configurations of the fuel system from all the limit conditions specified in subpart C (or used in lieu of those specified in subpart C), taking into account any special behavior of such a system or associated functions or any effect on the structural performance of the airplane that may occur up to the limit loads. In particular, any significant nonlinearity (rate of fuel transfer, thresholds or any other system nonlinearities) must be accounted for in a realistic or conservative way when deriving limit loads from limit conditions.

(2) The airplane must meet the strength requirements of part 25 (i.e., static strength, residual strength), using the specified factors to derive ultimate loads from the limit loads defined above. The effect of nonlinearities must be investigated beyond limit conditions to ensure the behavior of the system presents no anomaly compared to the behavior below limit conditions. However, conditions beyond limit conditions need not be considered when it can be shown that the airplane has design features that will not allow it to exceed those limit conditions.

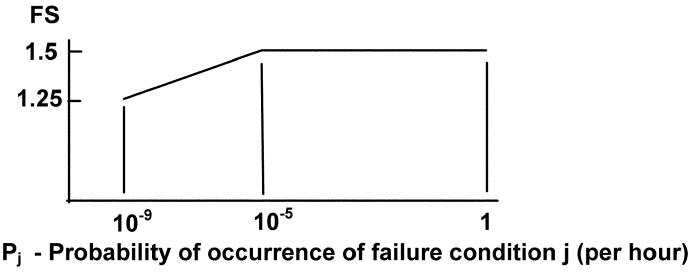
(3) The airplane must meet the aeroelastic stability requirements of § 25.629.

b. *Fuel system in the failure condition.* For any fuel system failure condition not shown to be extremely improbable, the following apply:

(1) At the time of occurrence, starting from 1-g level flight conditions, a realistic scenario, including pilot corrective actions, must be established to determine the loads occurring at the time of failure and immediately after failure.

(i) For static strength substantiation, these loads, multiplied by an appropriate factor of safety that is related to the probability of occurrence of the failure, are ultimate loads to be considered for design. The factor of safety is defined in Figure 1.

Figure 1. Factor of safety (FS) at the time of occurrence.



(ii) For residual strength substantiation, the airplane must be able to withstand two thirds of the ultimate loads defined in subparagraph 2b(1)(i). For pressurized cabins, these loads must be combined with the normal operating differential pressure.

(iii) Freedom from aeroelastic instability must be shown up to the speeds defined in § 25.629(b)(2). For failure conditions that result in speeds beyond V_C/M_C, freedom from aeroelastic instability must be shown to increased speeds, so that the margins intended by § 25.629(b)(2) are maintained.

(iv) Failures of the fuel system that result in forced structural vibrations (oscillatory failures) must not produce loads that could result in detrimental deformation of the affected structural elements.

(2) For continuation of flight, for an airplane in the system failed state and considering any appropriate reconfiguration and flight limitations, the following apply:

(i) The loads derived from the following conditions (or used in lieu of the following conditions) at speeds up to V_C/M_C, or the speed limitation prescribed for the remainder of the flight, must be determined:

(A) The limit symmetrical maneuvering conditions specified in §§ 25.331 and 25.345.

(B) The limit gust and turbulence conditions specified in §§ 25.341 and 25.345.

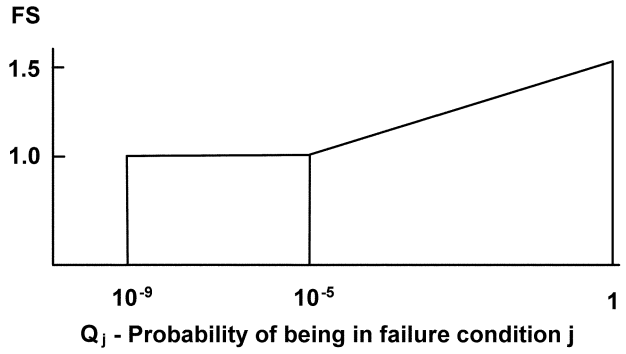
(C) The limit rolling conditions specified in § 25.349 and the limit unsymmetrical conditions specified in §§ 25.367 and 25.427(b) and (c).

(D) The limit yaw maneuvering conditions specified in § 25.351.

(E) The limit ground loading conditions specified in §§ 25.473, 25.491, and 25.493.

(ii) For static strength substantiation, each part of the structure must be able to withstand the loads in paragraph 2b(2)(i) of these special conditions multiplied by a factor of safety depending on the probability of being in this failure state. The factor of safety is defined in Figure 2.

Figure 2. Factor of safety (FS) for continuation of flight.



$Q_j = (T_j)(P_j)$ where:

T_j = Average time spent in failure condition j (in hours)

P_j = Probability of occurrence of failure condition j (per hour)

Note: If P_j is greater than 10^{-3} per flight hour, then a 1.5 factor of safety must be applied to all limit load conditions specified in subpart C.

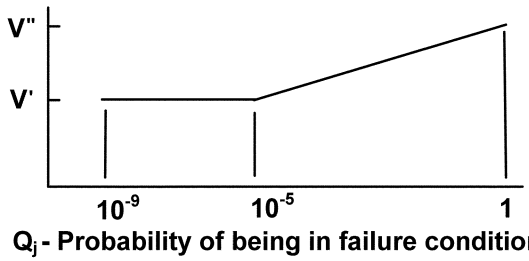
(iii) For residual strength substantiation, the airplane must be able to withstand two thirds of the ultimate loads defined in paragraph 2b(2)(ii) of these special conditions. For pressurized cabins, these loads must be combined with the normal operating differential pressure.

(iv) If the loads induced by the failure condition have a significant effect on fatigue or damage tolerance, then their effects must be taken into account.

(v) Freedom from aeroelastic instability must be shown up to a speed determined from Figure 3. Flutter clearance speeds V′ and V″ may be based on the speed limitation specified

for the remainder of the flight using the margins defined by § 25.629(b).

Figure 3: Clearance speed



V' = Clearance speed as defined by § 25.629(b)(2).
V" = Clearance speed as defined by § 25.629(b)(1).
$Q_j = (T_j)(P_j)$ where:
T_j = Average time spent in failure condition j (in hours).
P_j = Probability of occurrence of failure condition j (per hour).
Note: If P_j is greater than 10^{-3} per flight hour, then the flutter clearance speed must not be less than V".

(vi) Freedom from aeroelastic instability must also be shown up to V′ in Figure 3 above, for any probable system failure condition combined with any damage required or selected for investigation by § 25.571(b).

(3) Consideration of certain failure conditions may be required by other sections of part 25 regardless of calculated system reliability. Where analysis shows the probability of these failure conditions to be less than 10^{-9}, criteria other than those specified in this paragraph may be used for structural substantiation to show continued safe flight and landing.

c. *Failure indications.* For fuel system failure detection and indication, the following apply:

(1) The fuel system must be checked for failure conditions, not extremely improbable, that degrade the structural capability below the level required by part 25 or significantly reduce the reliability of the remaining system. As far as reasonably practicable, the flight crew must be made aware of these failures before flight. Certain elements of the fuel system, such as mechanical and hydraulic components, may use special periodic inspections, and electronic components may use daily checks, in lieu of detection and indication systems to achieve the objective of this requirement. These identified inspections must be limited to components that are not readily detectable by normal detection and indication systems and where service history shows that inspections will provide an adequate level of safety.

(2) The existence of any failure condition, not extremely improbable, during flight that could significantly affect the structural capability of the airplane and for which the associated reduction in airworthiness can be minimized by suitable flight limitations, requires a caution level alert for immediate flightcrew awareness and a warning level alert for immediate flightcrew awareness and corrective action. For example, a flightcrew alert during flight is required for failure conditions that result in a factor of safety between the airplane strength and the loads of subpart C below 1.25, or flutter margins below V″, because it could significantly affect the structural capability of the airplane.

d. *Dispatch with known failure conditions.* If the airplane is to be dispatched in a known fuel system failure condition that affects structural performance, or affects the reliability of the remaining system to maintain structural performance, then the provisions of these special conditions must be met, including the provisions of paragraph 2a for the dispatched condition, and paragraph 2b for subsequent failures. Expected operational limitations may be taken into account in establishing P_j as the probability of failure occurrence for determining the safety margin in Figure 1. Flight limitations and expected operational limitations may be taken into account in establishing Q_j as the combined probability of being in the dispatched failure condition and the subsequent failure condition for the safety margins in Figures 2 and 3. These limitations must be such that the probability of being in this combined failure state and then subsequently encountering limit load conditions is extremely improbable. No reduction in these safety margins is allowed if the subsequent system failure rate is greater than 10^{-3} per hour.

Issued in Renton, Washington, on October 16, 2014.

Michael Kaszycki,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA–2014–0532; Directorate Identifier 2014–CE–016–AD; Amendment 39–17994; AD 2014–21–02]

RIN 2120–AA64

Airworthiness Directives; Pacific Aerospace Limited Airplanes

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT).

ACTION: Final rule.