



[4910-13]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

[Docket No. FAA-2015-3324; Special Conditions No. 25-650-SC]

**Special Conditions: L-3 Communications Integrated Systems; Boeing Model 747-8 Series Airplanes, Large Non-Structural Glass in the Passenger Compartment**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions.

**SUMMARY:** These special conditions are issued for the Boeing Model 747-8 airplane. This airplane, as modified by L-3 Communications Integrated Systems (L-3 Communications), 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 the installation of large, non-structural glass panels in the cabin area of an executive interior occupied by passengers and crew. 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 [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**FOR FURTHER INFORMATION CONTACT:** Jayson Claar, FAA, Airframe and Cabin Safety, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind

Avenue SW., Renton, Washington, 98057-3356; telephone 425-227-2194; facsimile 425-227-1320.

## **SUPPLEMENTARY INFORMATION:**

### **Background**

On May 10, 2011, L-3 Communications applied for a supplemental type certificate for large, non-structural glass panels in the passenger compartment in Boeing Model 747-8 airplanes. The Model 747-8 airplane is a derivative of the Boeing Model 747-400 airplane approved under type certificate no. A20WE. The airplane, as modified by L-3 Communications, is a four-engine, transport-category airplane that will have a maximum takeoff weight of 970,000 lbs, capacity for 24 crewmembers, and seating for 143 passengers.

### **Type Certification Basis**

The certification basis for the Boeing Model 747-8 airplane, as defined in type certificate no. A20WE, is Title 14, Code of Federal Regulations (14 CFR) part 25 as amended by amendments 25-1 through 25-120, with exceptions for structures and systems that were unchanged from the 747-400 design.

Under the provisions of § 21.101, L-3 Communications must show that the Model 747-8 airplane, as changed, continues to meet the applicable provisions of the regulations listed in type certificate no. A20WE, or the applicable regulations in effect on the date of application for the change.

The certification basis includes certain special conditions, exemptions, or later amended sections of the applicable part that are not relevant to these special conditions.

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 Boeing Model 747-8 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 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 747-8 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**

L-3 Communications Integrated Systems is modifying a Boeing Model 747-8 airplane to install an executive interior. This airplane, as modified, will have a novel or unusual design feature that is the installation of large, non-structural glass panels in the cabin area of an executive interior occupied by passengers and crew. The installation of these glass items in the passenger compartment, which can be occupied during taxi, takeoff, and landing, is a novel or unusual design feature with respect to the material being installed. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature.

### **Discussion**

No specific regulations address the design and installation of large glass components in airplane passenger cabins. Existing requirements, such as §§ 25.561, 25.562, 25.601, 25.603, 25.613, 25.775, and 25.789, in the Boeing Model 747-8 airplane certification basis applicable to

this supplemental type certificate project, provide some design standards appropriate for large glass component installations. However, additional design standards for non-structural glass are needed to complement the existing requirements. The addition of glass involved in this installation, and the potentially unsafe conditions caused by damage to such components from external sources, necessitate assuring that adequate safety standards are applied to the design and installation of the feature in Boeing Model 747-8 airplanes.

For purposes of these special conditions, a large glass component is defined as a glass component weighing 4 kg (9 lbs) or more. Groupings of glass items that individually weigh less than 4 kg, but collectively weigh 4 kg or more, also would need to be included. These special conditions also apply when showing compliance with the applicable performance standards in the regulations for the installation of these components. For example, heat-release and smoke-density testing must not result in fragmentation of the component.

The use of glass has resulted in trade-offs between the one unique characteristic of glass—its capability for undistorted or controlled light transmittance, or transparency—and the negative aspects of the material, such as extreme notch-sensitivity, low fracture resistance, low modulus of elasticity, and highly variable properties. While reasonably strong, glass is nonetheless not a desirable material for traditional airplane applications because it is heavy (about the same density as aluminum), and when it fails, it breaks into extremely sharp fragments that have the potential for injury and which have been known to be lethal. Thus, the use of glass traditionally has been limited to windshields, and instrument or display transparencies. The regulations only address, and thus only recognize, the use of glass in windshield or window applications. These regulations do address the adverse properties of glass, but even so, pilots are

occasionally injured from shattered glass windshields. FAA policy allows glass on instruments and display transparencies.

Other installations of large, non-structural glass items have included the following:

- Glass panels integrated onto a stairway handrail closeout.
- Glass panels mounted in doors to allow visibility through the door when desired.
- Glass doors on some galley compartments containing small amounts of service items.

These special conditions will reduce the hazards from breakage, or from these panels' potential separation from the cabin interior.

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. 25-16-04-SC, for L-3 Communications modifications to the Boeing Model 747-8 airplane, was published in the **Federal Register** on February 25, 2016 (81 FR 9365). One comment was received.

By letter no. B-H020-REG-16-TLM-16 dated March 24, 2016, on behalf of The Boeing Company (Boeing), Capt. Terry L. McVenes, Director, System Safety & Regulatory Affairs, wrote that Boeing provides a

... comprehensive set of comments that identify areas of the proposed text where changes would be beneficial for better clarity and accuracy. [Boeing] consider[s] such clarifications important to ensure consistent and standardized interpretation and application of the requirements and guidance provided in the document.

Boeing recommends that proposed special condition no. 1, Material, and proposed special condition no. 2, Fragmentation, be revised to more-clearly define what each of these special conditions require, and how these two requirements are different. We agree that those two conditions could be addressed with a single test, so we combined those two conditions into a single condition, special condition no. 1, in this document, for clarity. The subsequent special conditions have been renumbered accordingly.

Boeing commented that the load conditions in special condition no. 4, which corresponds to special condition no. 3 in this document, should include all flight and landing loads, rather than only emergency landing. These special conditions are in addition to the load requirements in the certification basis for the glass installation, rather than in lieu of the load requirements. Thus, it is not necessary to repeat that all of these loads apply to this installation. The emergency-landing load condition is not normally applied to installations of this type, but for the use of large glass in the cabin, we determined that this additional safety standard is necessary. We made no changes to special condition number 3 in response to the Boeing comments.

Boeing recommends that the loading conditions in proposed special condition no. 3 (which is now special condition no. 2), Strength, and proposed special condition no. 4 (which is now special condition no. 3), Retention, be the same. Proposed special condition no. 3 (which is now special condition no. 2), Strength, is required to address the unique, extremely notch-sensitive characteristics of the glass as having low fracture resistance, low modulus of elasticity, and highly variable properties. Special condition no. 3 (which is now special condition no. 2) specifically accounts for abuse loads in addition to the loads required per subparts C & D of 14 CFR part 25. Special condition no. 4 (which is now special condition no. 3) accounts for loads

encountered during directional loading and rebound resulting from emergency landing loads of 14 CFR part 25. We have made minor grammatical modifications to the requirements.

Boeing recommends that, for proposed special condition no. 4 (which is now special condition no. 3), Retention, the statement, “Both the directional loading and rebound conditions must be assessed,” be removed, because these both are covered in proposed special condition no. 3. As explained above, special condition nos. 3 (which is now special condition no. 2) and 4 (which is now special condition no. 3) account for different loading conditions. We have made minor grammatical modifications to the requirements.

### **Applicability**

As discussed above, these special conditions are applicable to Boeing Model 747-8 series airplanes as modified by L-3 Communications. Should L-3 Communications apply at a later date for a supplemental type certificate to modify any other model included on type certificate no. A20WE 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 airplane. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of this feature on the airplane.

### **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, for large glass components installed in a cabin occupied by passengers or crew who are not otherwise protected from the injurious effects of failure of the glass installations, as part of the type certification basis for Boeing 747-8 airplanes modified by L-3 Communications.

1. **Material Fragmentation** – The applicant must use tempered or otherwise treated glass to ensure that, when fractured, the glass breaks into small pieces with relatively dull edges. The glass component installation must retain all glass fragments to minimize the danger from flying glass shards or pieces. The applicant must demonstrate this characteristic by impact and puncture testing, and testing to failure. The applicant may conduct this test with or without any glass coating that may be utilized in the design.
2. **Strength** – In addition to meeting the load requirements for all flight and landing loads, including any of the applicable emergency-landing conditions in subparts C & D of 14 CFR part 25, the glass components that are located such that they are not protected from contact with cabin occupants must not fail due to abusive loading, such as impact from occupants stumbling into, leaning against, sitting on, or performing other intentional or unintentional forceful contact with the glass component. The applicant must assess the effect of design details such as geometric discontinuities or surface finish, including but not limited to embossing and etching.
3. **Retention** – The glass component, as installed in the airplane, must not come free of its restraint or mounting system in the event of an emergency landing, considering both the directional loading and resulting rebound conditions. The applicant must assess the effect

of design details such as geometric discontinuities or surface finish, including but not limited to embossing and etching.

4. **Instructions for Continued Airworthiness:** The instructions for continued airworthiness must reflect the method used to fasten the panel to the cabin interior, and must ensure the reliability of the methods used (e.g., life limit of adhesives, or clamp connection). The applicant must define any inspection methods and intervals based upon adhesion data from the manufacturer of the adhesive, or upon actual adhesion-test data, if necessary.

Issued in Renton, Washington, on February 14, 2017.

/s/

Michael Kaszycki  
Acting Manager, Transport Airplane Directorate  
Aircraft Certification Service  
[FR Doc. 2017-05330 Filed: 3/16/2017 8:45 am; Publication Date: 3/17/2017]