

UNITED STATES OF AMERICA  
DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION  
RENTON, WASHINGTON 98055-4056

In the matter of the petition of

**THE BOEING COMPANY**

for an exemption from §§ 25.305, 25.307(a),  
25.601, 25.603(c), 25.613(a) and (b), and  
25.1103(d) of Title 14, Code of Federal  
Regulations

**Regulatory Docket No. FAA-2007-0042**

**PARTIAL GRANT OF EXEMPTION**

By letter dated September 14, 2007, D. B. Marcrander, Lead Project Administrator, Puget Sound, The Boeing Company, P.O. Box 3707, M/C 67-LR, Seattle, Washington 98124-2207, petitioned for a time-limited exemption from §§ 25.305, 25.307(a), 25.601, 25.603(c), 25.613(a) and (b), and 25.1103(d) of Title 14, Code of Federal Regulations (14 CFR) as they relate to “localized areas of temperature-related damage” observed in service on Boeing 737NG thrust reverser inner wall panels aft of the drag link fittings. Engineering studies have shown that this damage is likely due to the inner wall panels being exposed to temperatures which are higher than expected. Because of this damage, the FAA can no longer find that the type design complies with the noted regulations. The proposed exemption, if granted, would permit type certification of similarly non-compliant design changes for the current Boeing Model 737-600, -700, -700C, -800, and -900 series airplanes, line numbers 1 through 2229.

**The petitioner requires relief from the following regulation(s):**

**Section 25.305** “Strength and deformation,” which requires:

“(a) The structure must be able to support limit loads without any detrimental permanent deformation. At any load up to limit loads the deformation may not interfere with safe operation.

“(b) The structure must be able to support ultimate loads without failure for at least 3 seconds. However, when proof of strength is shown by dynamic tests simulating actual load conditions, the 3-second limit does not apply. Static tests conducted to ultimate load must include the ultimate deflections and ultimate deformation induced by the loading. When analytical methods are used to show compliance with the ultimate load strength requirements, it must be shown that—

- (1) The effects of deformation are not significant;
- (2) The deformations involved are fully accounted for in the analysis; or
- (3) The methods and assumptions used are sufficient to cover the effects of these deformations.

“(c) Where structural flexibility is such that any rate of load application likely to occur in the operating conditions might produce transient stresses appreciably higher than those corresponding to static loads, the effects of this rate of application must be considered.

(d) Reserved.

“(e) The airplane must be designed to withstand any vibration and buffeting that might occur in any likely operating condition up to  $V_D/M_D$ , including stall and probable inadvertent excursions beyond the boundaries of the buffet onset envelope. This must be shown by analysis, flight tests, or other tests found necessary by the Administrator.

“(f) Unless shown to be extremely improbable, the airplane must be designed to withstand any forced structural vibration resulting from any failure, malfunction or adverse condition in the flight control system. These must be considered limit loads and must be investigated at airspeeds up to  $V_C/M_C$ .”

**Section 25.307(a)** “Proof of structure,” which requires:

“Compliance with the strength and deformation requirements of this subpart must be shown for each critical loading condition. Structural analysis may be used only if the structure conforms to those for which experience has shown this method to be reliable. The Administrator may require ultimate load tests in cases where limit load tests may be inadequate.

**Section 25.601** “General,” which requires:

“The airplane may not have design features or details that experience has shown to be hazardous or unreliable. The suitability of each questionable design detail and part must be established by tests.

**Section 25.603(c)** “Materials,” which requires:

“The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must—

“(c) Take into account the effects of environmental conditions, such as temperature and humidity, expected in service.

**Section 25.613(a) and (b)** “Material strength properties and design values” which requires:

“(a) Material strength properties must be based on enough tests of material meeting approved specifications to establish design values on a statistical basis.

“(b) Design values must be chosen to minimize the probability of structural failures due to material variability. Except as provided in paragraph (e) of this section, compliance with this paragraph must be shown by selecting design values which assure material strength with the following probability:

(1) Where applied loads are eventually distributed through a single member within an assembly, the failure of which would result in loss of structural integrity of the component, 99 percent probability with 95 percent confidence.

(2) For redundant structure, in which the failure of individual elements would result in applied loads being safely distributed to other load carrying members, 90 percent probability with 95 percent confidence.

**Section 25.901(c)** “Installation,” which requires:

“For each powerplant and auxiliary power unit installation, it must be established that no single failure or malfunction or probable combination of failures will jeopardize the safe operation of the airplane except that the failure of structural elements need not be considered if the probability of such failure is extremely remote.

**Section 25.1103(d)** “Induction system ducts and air duct systems,” which requires:

“For turbine engine and auxiliary power unit bleed air duct systems, no hazard may result if a duct failure occurs at any point between the air duct source and the airplane unit served by the air.”

### **Summary of petitioner’s request:** <sup>1</sup>

During removal of several thrust reverser insulation blankets for repair, temperature-related damage was observed in localized areas on a number of inner wall panels. Boeing seeks an exemption to allow fleet intermix or substitution of one or both of product improvements without a finding of compliance with the regulations cited in its petition. Such a finding would possibly require repair of the thrust reverser and installation of a thermal modification package—actions which could cause significant downtime for affected airplanes.

The product improvements specified in the petition are (1) installation of CFM56-7B/3 Tech Insertion engine and (2) use of an alternate thrust reverser cascade configuration as partial resolution of a problem with in-service corrosion in the wheel wells. In its petition, Boeing indicates that “in conjunction with either of these installations, additional modifications will be made to offset any impact and retain the safety and durability of the installation as certified.” Boeing also requests that the exemption apply to future product improvements or safety enhancements that may affect the same area of the thrust reverser.

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<sup>1</sup> To see the entire petition, go to [www.regulations.gov](http://www.regulations.gov) and click on Search for Dockets at the top of the home page. Then type in FAA-2007-0042 in the Docket ID box, and click on Submit.

## **Public Interest**

The Boeing petition states that a grant of the exemption is in the public interest for the following reasons:

An expedited installation of the Tech Insertion engines will reduce fuel burn and hence reduce emissions of carbon dioxide, reduce global emissions of NOx, and reduce operating costs of airlines. In some situations, the installation will create fewer schedule interruptions and reduced loss of revenue for airlines.

Incorporation of alternate cascades will result in a decrease in corrosion of components of the wheel well and hence reduce maintenance events and the associated cost and schedule interruptions.

Finally, a grant of exemption would allow certain improvements to be made without requiring concurrent inspection, repair and modification of the thrust reverser.

## **Notice and Public Procedure Provided**

A notice of the receipt of this exemption, including a brief summary of the petition, was published in the Federal Register on November 2, 2007. The purpose of the notice was to provide opportunity for public comment on the petition. No comments were received.

## **The Federal Aviation Administration's (FAA) analysis is as follows:**

### **Background**

We interpret Boeing's reference to "all Model 737NG airplanes powered by CFM56-7B engines delivered prior to May, 2007 (Line No. 2230)," to mean all Model 737-600, -700, -700C, -800, -900 series airplanes, line numbers 1 through 2229. The FAA has concluded that the subject non-compliance also indicates a potential unsafe condition for the B737NG fleet.

Since the FAA intends to independently address the unsafe condition by issuing an Airworthiness Directive, this exemption is effectively an interim measure to permit approval of design improvements which increase safety and allow continued operation of the affected airplanes. Therefore, there is no need to include corrective actions or time limits as conditions for granting this exemption, as proposed by the petitioner.

The FAA considers non-compliance with § 25.1103(d) to result in non-compliance with § 25.901(c). Consequently the FAA has added that regulation to the list of requirements for which an exemption is being considered. While the petitioner did not specifically request an

exemption from this regulation, the conditions for granting, as delineated herein in combination with the intended Airworthiness Directive action, should acceptably limit any safety concerns which we foresee. Consequently, the FAA has expanded the scope of regulations covered by this exemption.

### **FAA Analysis – Introduction**

To obtain this exemption, the petitioner must show, as required by § 11.81(d), that granting the request is in the public interest, and, as required by § 11.81(e), that the exemption will not adversely affect safety or that a level of safety will be provided that is equal to that provided by the rules from which the exemption is sought.

Since the FAA intends to address the unsafe condition by separately issuing an Airworthiness Directive, this analysis will focus upon assuring that the design changes themselves are in the public interest and do not adversely affect safety.

### **FAA Analysis - Effect on Safety**

The petitioner will be required by the conditions for granting this exemption to demonstrate that, for each applicable design change, there is no adverse effect on safety associated with granting this exemption. That is, the risks associated with the known non-compliance would not be increased by introduction of any design change(s) approved under this exemption.

In consideration of the above, the FAA concludes that granting this petition does not adversely affect safety.

### **FAA Analysis - Public Interest**

If the FAA were to deny this petition, that would have the effect of preventing certain product improvements that increase safety of the existing design from being voluntarily implemented. Hence, there is clearly a public benefit from granting this exemption. As discussed above, granting this exemption does not adversely affect safety.

In consideration of the above, the FAA concludes that granting this petition is in the public interest.

### **The Partial Grant of Exemption**

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest and will not adversely affect safety. Therefore, pursuant to the authority contained in 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, The

Boeing Company is hereby granted an exemption from 14 CFR 25.305, 25.307(a), 25.601, 25.603(c), 25.613(a) and (b), 25.901(c) and 25.1103(d) for all Model 737-600, -700, -700C, -800, and -900 series airplanes, line numbers 1 through 2229.

The petition is granted to the extent necessary to allow type certification of all type design changes to Model 737-600, -700, -700C, -800, and -900 series airplanes, line numbers 1 through 2229, after the date of this granting without a showing of compliance with the stipulated regulations as they relate to the “localized areas of temperature-related damage” observed in service on thrust reverser inner wall panels aft of the drag link fittings on those models.

This exemption is subject to the following conditions and limitations:

The Boeing Company must demonstrate prior to an amended type certificate approval that the proposed design change:

- a. does not increase the applied loads and/or reduce the structural capability in the area covered by this exemption, and
- b. does not have any adverse effect on safety of the modified airplane compared to the unmodified airplane.

This exemption will remain in effect unless superseded or rescinded.

Issued in Renton, Washington, on December 11, 2007.

/s/ Mike Kaszycki, Acting Manager  
Transport Airplane Directorate  
Aircraft Certification Service