UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98057-3356

In the matter of the petition of **The Boeing Company** for an exemption from §§ 25.855(b), 25.855(h)(2), 25.857(e)(2), and 25.857(e)(3), of Title 14, Code of Federal Regulations	**Regulatory Docket No. FAA-2012-0455** **and** **Regulatory Docket No. FAA-2005-21786** **and** **Regulatory Docket No. FAA 2005-22747**

AMENDED PARTIAL GRANT OF EXEMPTION

Grant of Exemption No. 8769, issued August 18, 2006, exempted Boeing Model 747-400 Large Cargo Freighter (LCF) airplanes from the requirements of Title 14, Code of Federal Regulations (CFR) 25.855(b), 25.855(h)(2), 25.857(e)(2), 25.857(e)(3), 121.221(f)(1), 121.221(f)(2), 121.221(f)(3) and 121.223. The FAA's partial grant of the petitioned exemption included a condition that the LCF Airplane Flight Manual and Type Certification Data Sheet (TCDS) included a limitation that the Boeing Model 747-400 LCF lower-lobe cargo compartments were decommissioned preventing any cargo to be carried in the lower-lobe cargo compartments. Upon further review, the FAA determined that an exemption from the part 121 operational rules cited in Exemption No. 8769 was not required. The FAA subsequently removed the specified part 121 rules from the exemption in Exemption No. 8769A.

By letter received April 18, 2012 (RA-12-01540), Mr. Robert G. Filacchione, Program Manager, Regulatory Administration, MC D800-0018, The Boeing Company, PO Box 3707, Mail Code 03-52, Seattle, WA 98124-2207, petitioned for an exemption from the requirements of 14 CFR 25.855(b), 25.855(h)(2), 25.857(e)(2) and 25.857(e)(3) for the lower-lobe cargo compartments of the Boeing Model 747-400 LCF. This would enable Boeing to carry approved cargo on the main-deck cargo compartment as well as the lower-lobe cargo compartments. The proposed exemption, if granted, would provide relief to the lower-lobe cargo compartments of this airplane from the requirements to

provide a complete cargo-compartment liner, conduct flight tests to show compliance to smoke-penetration requirements, provide a smoke-detection system within the lower-lobe cargo compartments, and provide a means to shut off the ventilating airflow to, or within, the lower-lobe cargo compartments. This petition is in public docket FAA-2012-0455.

The Previous Petitions for Exemption and Partial Grant of Exemption

By letters dated June 30, 2005 (BDCO-05-00692), and October 13, 2005 (BDCO-05-01587), Mr. D. B. Marcrander, Lead Project Administrator, The Boeing Company, PO Box 3707, Mail Code 67-LR, Seattle, WA 98124-2207, petitioned for an exemption from the requirements of 14 CFR 25.855(b), 25.855 (h)(2), 25.857(e)(2), 25.857(e)(3), 121.221(f)(1), 121.221(f)(2), 121.221(f)(3) and 121.223 of for the main-deck Class E cargo compartment of the Boeing Model747-400 LCF. The exemption was sought to relieve this airplane from the 14 CFR part 25 and part 121 requirements to provide a complete cargo-compartment liner, conduct flight tests to show compliance to smoke-penetration requirements, provide a smoke-detection system within the main-deck cargo compartment, and provide a means to shut off the ventilating airflow to, or within, the main-deck cargo compartment. The FAA initially provided a partial grant of exemption. However, upon further review, we determined that an exemption from the part 121 operational rules cited in Exemption No. 8769 was not required. The FAA subsequently removed the specified part 121 rules from the exemption in Exemption No. 8769A.

The FAA has determined that the latest Boeing request, received April 18, 2012 (RA-12-01540), can be addressed via amending Partial Grant of Exemption No. 8769A. We will issue an amendment to Exemption No. 8769A to include carriage of specified cargo in the lower-lobe cargo compartments similar to the requirements within the existing framework of the grant of exemption.

The petitioner requests relief from the following regulations:

> **Sections 25.855(b) and 25.855(h)(2)** contain the material standards and design considerations for cargo-compartment interiors. Section 25.855(b) states that a Class E cargo or baggage compartment, as defined in § 25.857, must have a liner, and the liner must be separate from (but may be attached to) the airplane structure. Section 25.855(h) requires flight tests to show compliance with the provisions of § 25.857, and § 25.855(h)(2) specifically addresses compliance with § 25.857 regarding entry of hazardous quantities of smoke or extinguishing agent into compartments the crew or passengers occupy.
>
> **Sections 25.857(e)(2) and 25.857(e)(3)** require a separate, approved, smoke- or fire-detector system to give warning at the pilot or flight-engineer station located in each Class E cargo compartment; means to shut off the ventilating airflow to, or within, the compartment; and flightcrew access to these controls in the crew compartment.

***Federal Register* publication**

The FAA published a Summary Notice of Petition Received in the *Federal Register* on May 17, 2012 (77 FR 29444). The FAA received no comments.

The petitioner supports its request with the following information:

This section summarizes the relevant information from the petitioner's request. The complete petition is available at the Department of Transportation's Federal Docket Management System, on the Internet at http://regulations.gov, in Docket No. FAA-2011-0455.

As required by 14 CFR 11.25, the petitioner has provided justification in support of its petition for exemption, as well as substantiation as to how the proposed type design would provide an acceptable level of safety and why granting the exemption would be in the public interest. The petitioner explained that the main-deck cargo compartment of the Boeing Model 747-400 LCF is currently certified to carry large Boeing Model 787 assemblies and has been granted an exemption to §§ 25.855(b) and (h)(2), and 25.857(e)(2) and (e)(3). As identified in FAA exemption Nos. 8769 and 8769A, the lower cargo compartments on the Boeing Model 747-400 LCF were deactivated, and an exemption from regulations applicable to cargo-fire protection was only requested for the main-deck cargo compartment. The petitioner has now requested that approved cargo be allowed to be carried on the lower-lobe cargo compartments as well as the main-deck cargo compartment. Currently, four Boeing Model 747-400 LCFs are in operation. The petitioner expects to have no more than five Boeing Model 747-400 LCF airplanes total.

The petitioner stated that the primary purpose of these airplanes is to carry components that support Boeing Model 787 production. The vast majority of the cargo consists of large Model Mode airplane modules (i.e., wings and fuselage sections). The petitioner also carries some other smaller Boeing Model 787 parts that can be shipped with these large modules, and some non-787 large/outsized cargo that cannot be accommodated by traditional freighter airplanes and that directly supports their corporate business activities. The Boeing Model 787 assemblies being transported are the wings and horizontal stabilizer, and fuselage sections 41, 43, 11/45, 44, 46, 47 and 48. Fuselage sections will not have seats. The petitioner reports that the Boeing Model 787 composite assemblies shipped in the LCF are generally non-flammable. Any flammable fluid present will be of limited quantity and must be sufficiently shielded from ignition sources. The term "cargo" used throughout this partial grant of exemption means only those items identified above.

Although the petitioner owns these airplanes, they are operated on their behalf by a part 121 operator, and the airplanes are N-registered. As a condition of the previous exemption, these airplanes transport only the cargo described above and are not used by the petitioner or the airplane operator to conduct commercial freight-hauling operations. The FAA interprets this to mean that neither Boeing nor the airplane operator will conduct commercial freight-hauling operations of material other than noted above and approved per this exemption. The operation of these airplanes supports the Boeing Model 787 airplane program and other Boeing business activities.

The petitioner explained that the cargo compartment necessary to carry these large modules is more than twice the volume of the main-deck cargo compartment on a Boeing Model 747-400 production freighter. Due to the design constraints necessary to carry large Boeing Model 787 airplane modules, the petitioner proposed that no fire-protection systems would be installed in the main-deck cargo compartment and showed an acceptable level of safety by adding other mitigating features and operational requirements. The petitioner requested an exemption from certain aspects of §§ 25.855 and 25.857. These sections describe the certification requirements for transport-category cargo and baggage compartments, including Class E cargo compartments. The FAA granted the petitioner the exemption from these requirements in Exemption Nos. 8769 and 8769A. When they requested the exemptions, the existing Boeing Model 747-400 lower-lobe cargo compartments were deactivated as part of the modification; therefore, an exemption from the regulations applicable to cargo-fire protection was only requested for the main-deck cargo compartment.

The petitioner's design provides partial liners, on the main-deck cargo compartment and that meet the requirements associated with Class E cargo compartments, to provide impact protection to critical systems resulting from ground/cargo handling operations. These liners on the main deck will be of a sufficient height (approximately 8 ½ feet) to reduce the likelihood of debris building up behind the liners. In addition, the design of the Boeing Model 747-400 LCF airplane includes a pressure bulkhead at STA 532. This separates the forward pressurized section of the airplane (which includes the flight deck) from the main-deck cargo compartment, which remains virtually unpressurized (i.e., the environmental-control system provides ventilation flow to maintain a temperature no lower than 40^{o} F.) However, this flow does not maintain a constant pressure within the compartment, as in the flight deck; and during cruise, the cargo compartment pressure will be lower (i.e., higher altitude) than the pressure needed to provide sufficient oxygen for combustion. This design, and the pressure differential between the pressurized and non-pressurized compartments, will exclude the possibility of hazardous quantities of smoke, flames, or noxious gases penetrating into the flightcrew compartment from the cargo compartment.

The petitioner states that a camera system will be installed to provide viewing of the unpressurized cargo compartments, which includes an electronic flight bag with camera viewing capability. The petitioner submits that, to ensure that the camera system will not interfere with pilot workload, it will be a non-procedural and non-essential system. The petitioner further submits that the camera system will provide the flightcrew a means of determining the status of the cargo compartment, and will aid in Boeing Model 747-400 LCF cargo-control criteria and cargo-control loading processes.

The operation of the Boeing Model 747-400 LCF depends upon limiting the cargo to only approved Boeing Model 787 and other airplane components described above, and thereby assuring that there will not be a fire hazard in the main-deck cargo compartment. The Boeing Model 787 composite assemblies that are being shipped in the Boeing Model 747-400 LCF airplane will not propagate a fire. The petitioner has developed flammability-related cargo-acceptance criteria (Boeing Document D926UO13-44, "Flammability Acceptance Criteria for Cargo Carriage on the Boeing Model 747-400 LCF Airplane"), which has been reviewed and approved by the cognizant FAA Directorate. Any subsequent modifications require approval of the cognizant FAA Directorate. These flammability criteria also apply to the tooling used to transport the allowable cargo. As a result, the tooling and cargo will not create an ignition source or create a fire hazard. In addition, all cargo transported on the Boeing Model 747-400 LCF require the use of certified shipping mechanical equipment (SME).

Note that all shipments must be properly attached to certified SMEs. The SMEs are shipping tools unique to the Boeing Model 747-400 LCF airplane, and are designed and built to transport Boeing Model 787 major end items from the partners/suppliers to the pre-integration and final-integration sites. Prior to shipment, the cargo must be packaged per packaging standards compliant with the flammability criteria in Document D926U013-44. All shipments will require a flammability certificate issued by the shipper indicating acceptance to load.

The petitioner stated that in-service experience over the last four years has demonstrated that the mitigating features and operational restrictions for the Boeing Model 747-400 LCF airplane been effective in preventing cargo fires on these airplanes. Additionally, operational experience has indicated that the spare cargo-carrying capacity not currently available, due to the deactivation of the lower cargo compartments, could greatly increase the utility of the Boeing Model 747-400 LCF if that space were available to carry the same type of Boeing business products allowed on the main deck. The lower cargo compartments are particularly suited to carrying the smaller Boeing Model 787 parts that can be shipped with the large modules, but are frequently shipped separately due to floor-area constraints on the main deck.

Pending FAA grant of exemption, the petitioner is planning to reactivate the lower cargo compartments to more efficiently utilize the Boeing Model 747-400 LCF airplane in support of the Boeing Model 787 program and other Boeing business activities. The petitioner is currently requesting an exemption similar to FAA Exemption Nos. 8769 and 8769A for some cargo-fire protection requirements for the lower cargo compartments, providing a similar acceptable level of safety as currently approved for the main-deck cargo compartment. If the petitioner decides to offer these or similar airplanes for sale to other parties, they will initiate a new certification project with the FAA to establish all configuration changes appropriate for the carriage of commercial cargo.

The petitioner provides the following statement of public interest:

The public interest will be advanced by the grant of this petition since the use of air shipment of large airplane parts contributes to the competitive position of air transport manufacturers in the United States. Sales of transport airplanes contribute to the balance-of-trade, the gross domestic product and economic health of the United States. The level of safety is not compromised in comparison to similar existing large transport freighter airplane designs and the airplane will not carry passengers. In addition to creation of jobs and promotion of United States commerce, the large cargo freighter global logistical transportation system contributes to the competitiveness of Boeing airplanes in the global market through the use of lean manufacturing concepts on a global level. These are all in the public interest and the design proposed in combination with this petition maintains an acceptable level of safety.

The FAA's Analysis

The FAA considered the following factors in its analysis of all of Boeing's petitions for exemption on this subject, including the current petition dated April 18, 2012:

1. Need for the exemption. The FAA agrees with the petitioner has sufficient need to request an exemption. The petition states that the intended use is required to support Boeing's need for a large cargo freighter that could support global logistical transportation of large airplane components. General comments in their public petition, as well as proprietary material provided directly to the FAA, substantiated cost and fuel savings, reduction in fuel use, and reduced environmentally harmful emissions.

2. The petitioner's design for a limited number of very large, cargo freighter airplanes that would be used exclusively for carrying cargo to support the production of Boeing Model 787 airplanes (although components from other Boeing business products could also be carried provided they meet the ignition and flammability requirements).

3. Due to the large volume and ventilation-flow rate in the compartment, conventional smoke detectors would likely not be sufficiently robust and sensitive enough to detect a fire within the parameters of the current rules (that is, within 1 minute). The challenge of designing a smoke-detector system to accomplish this task was, by itself, insufficient to justify the petition for exemption. However, when considered with (a) the limitations on cargo, (b) unpressurized cargo compartment, and (c) limited number of airplanes; the FAA acknowledged that the probability of a fire was very remote.

4. FAA acceptance that the mitigating design and operational features were sufficient to provide an adequate level of safety, considering the operational needs of the petitioner. The FAA's grant of the exemption was based on the fact that the material being carried would meet established flammability criteria and restrictions on ignition and supplemental oxygen sources.

5. The petitioner provided additional information to substantiate the benefit to the public. While this data is proprietary to the Boeing Company, it showed significant savings in flight time and fuel burn. In addition, Boeing provided estimates of substantial reduction in emissions of carbon monoxide, carbon dioxide, nitrous oxides, and total hydrocarbons if allowed to carry the designated cargo.

The FAA concluded, and again concludes, that there is sufficient justification for a partial grant of exemption from the requirements of §§ 25.855(b), 25.855 (h)(2), 25.857(e)(2), and 25.857(e)(3) provided that the 5 conditions originally specified in Exemption No. 8769, as then amended by Exemption No. 8769A, and as set forth in this amendment, are met.

In addition, the petitioner has installed a camera viewing system in the cargo compartment that affords the pilots with the capability of determining the status of the main-deck and lower-lobe cargo compartments at any time. This camera system is part of the type design and was considered in the overall assessment of the acceptability of the airplane. The presence of this camera system was a significant factor in our decision to grant the original partial grant of exemption and is still a significant factor in our decision to grant this amended partial grant of exemption. We have concluded that the safety benefits of the camera system are sufficient to warrant that Condition 2

(camera viewing system) from the original Exemption No. 8769A be retained in this amended exemption.

Also, the petitioner provided supplemental information on visual-inspection criteria carried out prior to flight; supplemental information on the pressure field in the pressurized vessel and in the unpressurized cargo compartment; a schedule of when hardware and software modifications would be completed to support implementation of this exemption; and additional justification of anticipated fuel savings and reductions in several gaseous emissions to augment their statements for public interest.

Our review of Boeing Document D926U013-44, "747-400 LCF Flammability Acceptance Criteria for Cargo Carriage," Revision D, dated February 26, 2007, found only a minor revision to this document would be required prior to operation with cargo carriage in lower-lobe cargo compartments. The applicant should complete a comprehensive review of all documents associated with the transport of cargo on the Boeing Model 747-400 LCF, including the airplane flight manual and the weights and balance manual to ensure appropriate instructions are present for the carriage of cargo on the main-deck and lower-lobe cargo compartments.

The FAA's Decision

In consideration of the foregoing, I find that an amendment to Exemption No. 8769A is in the public interest and will not affect the level of safety provided by the regulations. 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 amendment to Exemption No. 8769A from the requirements of §§ 25.855(b), 25.855 (h)(2), 25.857(e)(2), and 25.857(e)(3). The amendment is granted to the extent necessary to exclude the need for a complete cargo-compartment liner, conduct flight tests to show compliance to smoke penetration requirements, provide a smoke-detection system within the main-deck and lower-lobe cargo compartments, and provide a means to shut off the ventilating airflow to, or within, the main-deck and lower-lobe cargo compartments. This amended partial grant of exemption permits Boeing Model 747-400 LCF carriage of all material that supports Boeing's corporate business line and meets the flammability-related cargo-acceptance criteria contained in FAA approved Boeing Document D926U013-44. All of the limitations and conditions specified in Exemption No. 8769A apply to this amended exemption, and are listed below for completeness.

This amended partial grant of exemption is subject to the following limitations and conditions:

1. The Boeing Model 747-400 LCF Airplane Flight Manual (AFM) must include, in the Certificate Limitations section, a limitation for cargo carriage on the main deck and in the lower-lobe cargo compartment, and identify the FAA-approved Boeing Model 747-400 LCF Weight and Balance Manual (WBM) for the list of allowable cargo. The WBM will refer to the "Allowable Cargo" document that will identify the subassemblies acceptable for shipment, and the acceptable shipment configurations.

2. The Boeing Model 747-400 LCF AFM must include, in the Certificate Limitations section, a limitation for cargo carriage on the main deck and in the lower-lobe cargo compartment, which states that the main-deck and lower-lobe cargo compartment camera viewing system must be operational to enable cargo to be carried. The camera viewing system must provide visual coverage of the main-deck and lower-lobe cargo compartments.

3. Any modifications to the Boeing flammability-related cargo-acceptance criteria (i.e., Boeing Document D926U013-44) must be submitted to the cognizant aircraft certification office for review and approval prior to implementation for use on the Boeing Model 747-400 LCF airplane, and after any modifications to the cargo-acceptance criteria. Boeing must modify Document D926U013-44 to ensure appropriate instructions are included to enable carriage of designated cargo on the main deck and in the lower-lobe cargo compartments. Boeing must review the process for approval of revisions/modifications to this document to determine if revisions are need to accommodate carriage of cargo on the main-deck and lower-lobe cargo compartments, and have this process in place prior to operation of the first modified (i.e., with active lower-lobe cargo compartments) Boeing Model 747-400 LCF airplane.

4. Prior to operational flights, Boeing must review and revise, if needed, the Boeing cargo control process document, which defines the method of ensuring compliance to Boeing Document D926U013-44. This Boeing process instruction document will define the process for maintaining configuration control of the Boeing Model 787 and other Boeing corporate-business shipping assemblies. The information must be provided to Boeing Model 787 suppliers and other Boeing corporate-business suppliers shipping cargo on the Boeing Model 747-400 LCF prior to operational flights. Each supplier will be required to adhere to the process.

5. Any parts (including packing materials) which fail to meet the flammability criteria in Boeing Document D926U013-44 will be suitably isolated and enclosed, and a “Safe Method of Transport” will be demonstrated per the requirements of Boeing Document D926U013-44. Each such item and its method of carriage will be reviewed and approved by the cognizant aircraft certification office prior to implementation for use on the Boeing Model 747-400 LCF airplane.

Issued in Renton, Washington, on September 14, 2012.

Ali Bahrami
Manager, Transport Airplane Directorate
Aircraft Certification Service