Exemption No. 9793B

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 §§ 25.783(g), 25.807(a)(1), 25.809(a), and 25.813(a) of Title 14, Code of Federal Regulations

Regulatory Docket No. FAA-2008-0348

PARTIAL GRANT OF EXEMPTION

By letter BDCO-10-03041, dated July 20, 2010, C. M. Thompson, Lead Project Administrator, Development Projects, The Boeing Company, PO Box 3707, Seattle, Washington, 98124-2207, petitioned the Federal Aviation Administration (FAA) for an amendment to Exemption No. 9793A. If granted, this amendment would permit additional relief from the requirements of §§ 25.783(g), 25.807(a)(1), 25.809(a), and 25.813(a) of Title 14, Code of Federal Regulations (14 CFR). Also, Boeing requested that Limitation 16 of Exemption No. 9793A be revised, to allow the optional escape slide at the crew service door to partially block the clear projected exit opening. Currently, this limitation requires a clear projected open access to the crew service door. The current exemption (9793A) is a partial grant which permits the carriage of six non-crewmembers (commonly referred to as supernumeraries) in a compartment behind the flight deck on Boeing Model 747-8F airplanes and allows in-flight access to the class E cargo compartment by these supernumeraries, with certain limitations. This proposed amendment would allow the crew service door to be a Type III exit and permit a limited viewing area where evacuees would make first contact with the ground when using the crew service door. This proposed amendment would also change current Limitation No. 16 to allow the crew service door escape slide to partially block the opening to the exit.

The petitioner requests relief from the following regulations:

Section 25.783(g), at Amendment 25-23, each passenger entry door in the side of the fuselage must qualify as a Type A, Type I, or Type II passenger emergency exit and must meet the requirements of Sections 25.807 through 25.813 that apply to that type of passenger emergency exit.

Section 25.807(a)(1), at Amendment 25-67, provides requirements for type and location of emergency exits. For the purpose of this part, the types and locations of exits are as follows: (1) Type I. This Type must have a rectangular opening of not less than 24 inches wide by 48 inches high, with corner radii not greater than one-third the width of the exit. Type I exits must be floor-level exits.

Section 25.809(a), at Amendment 25-116, each emergency exit, including each flightcrew emergency exit, must be a movable door or hatch in the external walls of the fuselage, allowing an unobstructed opening to the outside. In addition, each emergency exit must have means to permit viewing of the conditions outside the exit when the exit is closed. Means must also be provided to permit viewing of the likely areas of evacuee ground contact. The likely areas of evacuee ground contact must be viewable during all lighting conditions with the landing gear extended as well as in all conditions of landing gear collapse.

Section 25.813(a), at Amendment 25-46, requires a passageway between individual passenger areas, and leading from each aisle to each Type I and Type II emergency exit. These passageways must be unobstructed and at least 20-inches wide.

Related sections of 14 CFR

Section 121.583(a) contains, in pertinent part, a listing of categories of persons who may be carried aboard an airplane in part 121 service without complying with all the requirements of part 121 pertaining to carriage of passengers.

The petitioner supports its request with the following information:
The pertinent parts of Boeing's petition are quoted below, with minor editorial changes for clarity. The complete petition is available on-line at *regulations.gov* under docket number FAA-2008-0348.

The extent of relief being sought

Regulation	Requires:	Relief is necessary because:
14 CFR 25.783 (g) Amendment 23	The crew door and Door 1 LH to be considered entry doors and thus would need to be a Type A, I or II exit.	Main deck Door 1 LH is a Type A size door without any evacuation assist means and thus does not meet this regulation. This is unchanged from the 747-400F design. The configuration of the upper deck crew door does not meet all Type I exit requirements in section 14 CFR 25.807 through 14 CFR 25.813 although the fuselage cutout meets the Type I exit dimensions. Some of the requirements not met are covered in Exemption No. 9793/9793A for the 747-8F; however the Exemption 9793/9793A does not provide relief from this requirement to provide a Type A, I, or II size exit.
14 CFR 25.807(a)(1) Amendment 67	The crew door as a Type I exit to be a floor-level exit.	The crew door can no longer be considered a Type I floor-level exit due to a step-up to the exit when the airplane is configured with inertia reels as the only evacuation means. A previously granted Exemption No. 9735 has acknowledged this same condition on the 747-400F and considered the rating of the exit as a Type III.
14 CFR 25.809(a) Amendment 116	The crew door as an emergency exit to have a means to view the evacuee ground contact area in all combinations of gear collapse.	The provided viewing window on the crew door is not capable of viewing the evacuee ground contact area in all combinations of gear collapse for either evacuation means prior to the exit being opened. The configuration of the 747-8F airplane includes exterior body-mounted lights which will meet the requirement for lighting for both evacuation means. A similar grant of Exemption No. 9696 was extended for the 767-300BCF based on the exit porthole combined with inertia reel assist means, six person occupancy, and additional crew procedures which will be drawn upon for the 747-8F.
14 CFR 25.813(a) Amendment 46	The crew door as a Type I exit to have a 20-inch passageway	The passageway to the exit is less than 20-inches with the manually deployed slide installed in the 747-8F interior configuration. As a customer selectable option, the 747-400F manually-deployed escape slide at the crew door has been selected by a majority (5 of 6) of 747-8F airline customers as an additional evacuation means at that location. Although the interior configuration for the 747-8F is changed from the 747-400F, a similar condition exist on the 747-400F.
Limitation 16 from Exemption 9793A	The crew door escape slide be labeled with instructions to move the escape slide aft to clear the projected opening of the exit	The interior configuration of the 747-8F does not allow the escape slide to be moved far enough aft to directly comply with the requirement to "clear" the projected opening. However, the design and configuration of the 747-8F does allow the slide to be moved aft to allow outside access by rescue personnel which will be demonstrated. Thus the Limitation could instead require the crew door be shown to allow access into the airplane from the outside by rescue personnel. Limitation 16 is to address a concern in Exemption 9793A that *"the escape slide is partially blocking the access to the airplane when the crew service door is opened from the outside, which may prevent rescue personnel from rapidly entering the airplane in an emergency."* This concern can be addressed without fully clearing the projected door opening. There is no similar requirement in Exemption series 1870 for this similar configuration and condition on the 747-200F/400F airplanes which have a proven safety record.

Description of the Issue

The Model 747-8F is a derivative aircraft based on the 747-400F. The fuselage of the 747-8F is 220″ longer than the 747-400F. The 747-8F emergency exits, crew door window, exterior body-mounted light for the escape slide, and the escape means are identical to the 747-400F with the exception that the escape slide is a customer selectable option on the 747-8F where as it was basic on the 747-400F. For the 747-8F, the escape slide has been selected by a majority (5 of 6) of the airline customers as the evacuation means at the crew door.

Like the 747-400F, the 747-8F has a required flightcrew of two (2) and is allowed the carriage of up to six (6) supernumeraries. Like the 747-400F and its predecessors, the 747-8F airplane flight manual (AFM) will limit the airplane to eight (8) occupants. The eight (8) inertia reel descent devices located on the flight deck are identical in part number and location to the 747-400F and will be included on all 747-8F airplanes, with one for each airplane occupant to use either through the crew door or from the flight deck overhead exit. Additionally, there are eight (8) harnesses installed basic in the 747-8F supernumerary seating areas, two (2) more than the 747-400F, one for each occupant to don and connect to their descent device before evacuating the airplane.

The optional manually-deployed escape slide is attached to a platform that moves fore and aft on rails inside of the upper deck crew door. When the escape slide is deployed through the crew door, the forward side of the platform is stationary and remains in the interior creating the boundary to the passageway out the exit. The escape slide system also has a flexible, non-inflatable, chute hinged to the platform to assist as a guide in slide deployment. This chute also remains in the interior creating a boundary to the passageway out the exit. When the optional escape slide is installed the 20-inch passageway leading to the exit is not maintained from the slide platform to the interior monument, nor is the escape slide chute itself 20-inches.

The current design on the 747-8F provides the capability to move the escape slide aft providing access for rescue personnel with instructions that are affixed to the outboard side of the slide pack such that they can be seen when the door is opened from the outside. The ability to gain access, including the effectiveness of the instructions, will be demonstrated by rescue personnel in accordance with Exemption 9793A Limitation 16.

A new body-mounted exterior light was added to the 747-8F. This new light illuminates the ground contact area of the inertia reels, in all combinations of gear collapse, before and after door opening. The existing exterior body-mounted light illuminates the ground contact area of the escape slide, in all combinations of gear collapse when the slide is usable, before and after door opening. Both exterior lights will be installed on all airplanes regardless of evacuation means selected by the customer. These lights are activated (1) automatically upon loss of main electrical power (28 VDC bus) when the system is armed, or (2) manually via the emergency light switches located on the flight deck or in the supernumerary seating area.

Statement of No Adverse Effect on Safety

The petitioner strives to provide acceptable safety conditions such that 747-8F cargo operators can safely operate their airplanes with evacuation means and procedures consistent with the current fleet. The majority (5 of 6) of the airline customers that have purchased the 747-8F also operate fleets of earlier model 747 freighters, including the 747-400F. The surest, safest, and most cost effective manner of operating these cargo aircraft is to have consistent airplane designs and crew/supernumerary training with respect to evacuation safety features of the airplane. A grant of exemption will result in consistent operator's procedures for evacuation of the 747-8F with the 747-400F fleet when the escape slide is installed and similar to other airplane models with only inertia reels installed, thus enhancing safety.

Granting the exemption to § 25.783(g) at Amendment 23 for Door 1 LH and the upper deck crew door will not have an appreciable affect on safety based upon the following factors which are summarized here and discussed as necessary in more detail below:

- Limited number of trained supernumeraries
- Specific to Door 1 LH, while it will be used for entry it will not be marked with any exit signs visible from the upperdeck supernumerary seating area
- Specific to the crew door, while it is sized as a Type I door, it will not practically be used as an entry door due to it's location on the upper deck approximately 26 feet above the ground.
- The crew door will be marked with exit signs visible from the upperdeck supernumerary seating area and have appropriate evacuation means available at the exit.

Previously the FAA recognized in Exemption No. 4808 for the 757-200PF *"The intent of 14 CFR 25.783(g) is to ensure that the door through which people enter an airplane is also useable as an emergency exit." "Because of the better trained, operator-approved, small number of noncrewmembers allowed in the flight deck, the FAA finds that the entry door provided in the Model 757-200PF can safety be used as an emergency exit and that the requirements that the entry door be a Type A, I or II is unnecessary."* Although the 747-8F has a different configuration than the 757-200PF, the circumstances are similar in training and small number of non-crew members. The personnel (maximum of 8) aboard the 747-8F are required to be briefed by the flightcrew prior to each flight on the use of the exits in accordance with Exemption No. 9793/9793A. This additional level of knowledge afforded to these occupants when compared to the normal passenger provides an enhancement in evacuation normally afforded. Door 1 LH will be used as the entry door on the 747-8F however it will not be used as the emergency exit. It will be out of sight and no exit signs will lead personnel to Door 1 LH once the supernumeraries have taken their seats in the upper deck thus it is unnecessary to make it a useable emergency exit with evacuation means as other exits will be available, appropriately marked, and equipped with the evacuation means (same as previous 747 Freighter models).

Granting the Exemption to § 25.807(a)(1) at Amendment 67 and § 25.813(a) at Amendment 46 for the non-floor-level exit and less than 20-inch passageway, respectively, at the upper deck crew door will not have an appreciable affect on safety based upon the following factors, which are summarized here and discussed as necessary in more detail below:

- Limited number of trained supernumeraries (see discussion, above)
- Consideration of the crew door rating similar to a Type III exit with a 19 inch passageway being maintained
- a small step-up of approximately 8 inches

Per § 25.807(c)(1) at Amendment 67, a pair of Type I exits would allow 40-79 passengers, while a pair of Type III exits would be sufficient for between 20 and 39 occupants. In combination with the flight deck overhead exit, having the 747-8F airplane configured with a Type I size cut out and nearly meeting the Type I passageway requirements, while only needing to provide evacuation capability for 8 occupants, the overall design is considered sufficiently safe.

While a 20-inch passageway is required for a Type I sized exit, the crew door can be considered, based on the number of passengers being evacuated, similar to a Type III exit. The applicable regulations, § 25.813(c)(1)(2) at Amendment 46, do not specify a passageway requirement for Type III exits rather only that the projected opening may not be obstructed and there may be no interference in opening the exit. Considering the 747-8F crew door as similar to a Type III exit, with a method of compliance associated with the projected opening by providing a 19-inch passageway at the crew door and no obstruction in opening the exit, is sufficiently safe for the 8 occupants. A step-up of 20-inches is allowed for a Type III exit. The 747-8F step-up when the escape slide is not installed is approximately 8 inches and there is no step-up when both the inertia reels and slide are installed. The FAA recognized a similar condition in Exemption No. 9735 for

the 747-400F *"...have a crew service door the size of a Type I exit, but because the door has a step-up inside the airplane it is rated as a Type III exit and is available for evacuation."*

Granting the exemption to § 25.809(a) at Amendment 25-116 will not adversely affect safety based upon the following factors, which are summarized here and discussed in more detail below:

- Flight deck and supernumerary windows
- Crew awareness
- Manually-deployed escape slide and inertia reels
- Exit height
- Exterior body-mounted lights

It is understood § 25.809(a) at Amendment 25-116 was codified to address the potential for a crew member or supernumerary to mistakenly open or use an emergency exit when there is an external hazard (such as a fire, water or terrain/obstacles) that is not visible (due to lack of means to view outside and/or from inadequate lighting) that could pose an immediate threat to the occupants of the airplane, damage the evacuation means, pose a threat to personnel using the evacuation means, and/or delay the evacuation.

Previous industry design practice has provided outside viewing means (windows) installed on or adjacent to the passenger emergency exits in the majority of cases. Additionally, the large flight deck windows provide a means to view the surrounding area by the flightcrew as the airplane is on approach. These windows have proven an effective means for quickly assessing conditions outside the emergency exit prior to the emergency exit being opened in order to avoid delay in opening the emergency exits and initiating the evacuation.

In addition to the flight deck windows, a window is installed in the crew door of the 747-8F. Additionally, the 747-8F includes three standard passenger sized windows (for the supernumeraries) on the right and left hand side of the airplane aft of the crew door and located in the supernumerary compartment. One window (each side) is located in the crew bunk area of the supernumerary compartment.

All windows provide a view of the surrounding area with the airplane resting on all landing gear. Once the airplane has slowed to a stop, viewing of all of the likely areas of evacuee ground contact prior to the exit being opened will not be fully possible since they are directly beneath the aircraft when inertia reels are used. However, a view of the surrounding area as the airplane comes to a stop as well as the surrounding view from the flight deck and supernumerary windows once stopped provides the ability to make assessments and appropriate evacuation decisions as follows:

- In most cases, the presence of a fire in the vicinity of the flight deck windows and crew door large enough to be a hazard if the exit is opened would be readily and easily recognizable by the flightcrew as the airplane slows to a stop. In these cases, the flightcrew would command evacuation from the appropriate exit.

- Recalling, the supernumeraries are required to be briefed in the use of the exits, the presence of a fire or water in the surrounding area of the crew door large enough to be a hazard would likely be recognized by the supernumeraries from windows in the supernumerary area, in conjunction with the body-mounted lights as necessary, and could be communicated to the flightcrew when determining which exit to utilize.

It is understood 14 CFR 25.809(a) at Amendment 25-116 is also to prevent the deployment of an escape slide into a hazard, since this deployment is irreversible, and door re-closure is necessarily impeded by the deployed slide due to its interface with floor structure immediately inboard of the door sill. In the case of the 747-8F, the evacuation means is manually-deployed after the emergency exit is opened. If a hazard such as fire, water, or terrain is detected near the crew door, after the door is opened, the door may be easily closed again because the manually deploy passenger escape slide or inertia reels would not be in the way of the door mechanism.

The location of the emergency exit is approximately 13.5 feet above the water line in the unplanned ditching scenario, which is worst case. The crew door is far enough above the water level after a ditching event such that if this emergency exit were to be opened without first assessing outside conditions it could easily and quickly be re-closed without consequence.

Additionally the 747-8F airplane is configured with body-mounted lights (reference Figure 5) providing the illumination in dark of night conditions to assess the surrounding area prior to emergency exit opening. After emergency exit opening and before evacuating through the exit, making an assessment of safety to evacuate can be done by viewing out the open exit utilizing the body-mounted exterior lights, which will fully illuminate the ground contact area of both evacuation means before those means are deployed.

While a means that provides viewing of the evacuee ground contact area for all combinations of gear collapse does not exist for the crew door when equipped with inertia reels or manually-deployed escape slides, the airplane design provides an acceptable level of safety as noted above.

Similar conditions were recognized and accepted by the FAA in Exemption No. 9696 for the 767-300BCF. *"We agree in this specific case with the petitioner's rationale that in most cases the presence of a fire in the vicinity of the lefthand flight deck window and Door 1 L would be recognizable by the flight deck crew...." "Because the assist means is an inertia reel, the evacuee has a bit more control over the landing zone...."* Similar to the inertia reels, there is also control over the deployment of the optional escape slide for the 747-8 and rationale for no adverse affect on safety for the optional slide in relation to § 25.809(a) is contained herein.

Limitation 16

It is proposed that the FAA accept an adequate opening to allow access from outside the airplane at the crew door by providing relief from Limitation 16 of Exemption No. 9793A which requires in part, *"For airplanes with the optional escape slide installed at the crew door Boeing must develop instructions for moving the escape slide aft to clear the projected opening of the exit from outside the airplane."*

Exemption 9793A noted a concern that *"the escape slide is partially blocking the access to the airplane when the crew service door is opened from the outside, which may prevent rescue personnel from rapidly entering the airplane in an emergency."* An acceptable level of safety can be maintained without the specific requirement to fully clear the projected opening of the exit based on:

- providing adequate access for rescue personnel from outside the airplane
- rescue personnel procedures
- maintaining all of the other aspects of Limitation 16.

The exit maintains the physical structural cutout of a Type I exit as well as the function of being openable from the outside allowing entry into the airplane. If the slide has not been deployed, then the rescue personnel can move the slide pack aft by following the instructional placards added to the outboard of the slide pack, thus providing an entry way.

In the nose down adverse attitudes, the 747-8F slide does not have a detent on the track for it to lock in the full open position. The force to move the slide is less than 30 pounds which is within the capability of rescue personnel.

Safety is maintained because the requirements of Limitation 16 provide an increase in safety as compared to the 747-400F by including instructions for rescue personnel in the type design (via placarding) in addition to including instructions in the rescue and fire fighting procedures.

Proposed Revision to Limitation 16

Request to Revise Limitation 16: Boeing hereby requests the FAA revise Limitation 16 to remove the "clear opening" requirement. Boeing proposed wording - *"For airplanes with the optional escape slide installed at the crew door Boeing must develop instructions for moving the escape slide aft to provide an entryway sufficient to allow access into the airplane for the purposes of rescuing occupants from the outside. These instructions must be added to the outboard side of the escape slide assembly so that rescue personnel can read the instructions and move the escape slide out of the way. These instructions must be demonstrated to be effective for rescue personnel."*

Statement of Public Interest

The public interest will be advanced by the grant of this exemption as it is in the best economic interest of the United States. Increased sales of airplanes contribute to the balance-of-trade, the gross domestic product and economic health of the United States. Marketability of the 747-8F is improved, leading to increased sales, by keeping the sales price and operating cost of the 747-8F down while providing flexibility to the airlines in a choice of evacuation means.

Purchase prices could increase due to extensive design changes associated with providing fully compliant designs for both evacuation means which would be necessary to allow the operational flexibility in evacuation means. Design changes likely to be necessary include:

- New escape slide
- Revisions to provide for a floor-level exit for operators who select only the inertia reels
- Means to view the evacuee ground contact area for both the inertia reel and escape slide
- Changes to the door structure and/or door mechanisms
- Interior configuration changes to allow the escape slide to be moved further aft to fully clear the projected opening of the exit

Operating costs are kept down by:

- Having common training and operating procedures with the 747 Freighter Fleet when the escape slide is installed while avoiding the cost of maintaining different material in the training, maintenance, dispatch and operations manuals for the 747-8F and 747-400F. Every 747-400F delivered from Boeing was equipped with an escape slide installed in a similar interior configuration, a window in the crew door, and an exterior body-mounted light to illuminate the evacuee ground contact area of the escape slide. The majority (4 of 6) of the airline customers that have purchased the 747-8F also operate fleets of earlier model 747 Freighters and will have the escape slides installed on their 747-8F, same as the 747-400F.
- Common training and operating procedures to other freighter models for those airlines selecting only the inertia reels as the evacuation means.
- Having common escape slide spares with existing 747 Freighter fleets.
- Avoiding the weight and fuel penalty and system maintenance costs including any economic penalties associated with flight delays that would otherwise be realized by the required design changes as noted above in the purchase price impacts.
- Weight and fuel benefits for operators choosing the inertia reels as the evacuation means

Lower purchase and operating costs will help maintain cargo shipping rates aboard freighter airplanes at their current levels, which benefits the U.S. economy as a whole.

A grant of exemption, as requested in this petition, is in the best interest of the travelling public through introduction of this new product into the marketplace that has advanced the certification basis in many areas as compared to the 747-400F. Enabling common operating procedures for evacuation not only maintains purchase price and operating cost as noted above, but avoids the potential for human error, which may be introduced when procedures vary for similar products.

For the reasons noted above, it is the petitioner's opinion that the overall level of safety is improved by comparison to the previous 747 freighter models that are certified with similar configurations and evacuation systems and safety is maintained which is in the public's best interest.

Privileges of this Exemption Outside the United States

Per 14 CFR 11.81(h), Boeing requests that the privileges of this exemption be extended outside the United States. This extension of privileges is necessary for operations based within foreign countries having bilateral agreements with the United States accepting FAA 14 CFR part 25 as their airworthiness standards for transport category aircraft. The 747-8F is intended for the global market place.

Conclusion

The 747-8F maintains the level of safety previously afforded on the 747 freighter series from an exit rating and evacuation systems standpoint. The 35 year service history of the 747F series has proven its safety. Granting relief from § 25.783(g) at Amendment 23, § 25.807(a)(1) at Amendment 67, and § 25.809(a) at Amendment 116 for the 747-8F model is justified based on this exit meeting the pertinent aspects of the Type I exit and considering that it will only be used by a limited number of trained and capable occupants. Granting relief from § 25.809(a) at Amendment 116 for the 747-8F model is justified based on the capability of the airplane to provide safe evacuation means including illumination.

Granting the revision to Limitation 16 is justified based on providing adequate access by rescue personnel from outside the airplane and maintaining all of the other aspects of Limitation 16. If Limitation 16 is revised the crew door will maintain an effective opening adequate for rescue personnel to enter from outside the airplane if necessary.

Federal Register publication

A summary of this petition was published in the *Federal Register* on July 20, 2010 (75 FR 42187). No comments were received.

The FAA's analysis

We have reviewed the design of the crew service door and the installation of the optional escape slide on the 747-8F. We agree with Boeing that the basic design of the crew service door on the 747-8F is the same as the 747-400F and other earlier model 747 freighter airplanes. The baseline 747 airplane has a step-up of 8 inches from the floor of the airplane to the exit. Section 25.783(g) requires that each passenger entry door in the side of the fuselage be a Type A, Type I, or Type II passenger emergency exit. Also, § 25.807 requires that all Type A and Type I exits be floor-level and that Type II exits not located over the wing be floor-level. We do not agree with the Boeing statement that "…there is no step-up when both the inertia reels and slide are installed." When the escape slide is installed and it is deployed there is a ramp section from the floor of the airplane to the point where the evacuee would jump onto the escape slide. The ramp section makes it appear that there is not a step-up to the exit. However, when the escape

slide is slid aft (not deployed) there is a step-up to the exit. We agree with Boeing that Exemption No. 9735 identified this issue with the crew service door step-up and that the exit does qualify for a Type III exit rating. However, Exemption No. 9735 did not specifically address the issue that each passenger entry door in the side of the fuselage must be a Type A, Type I, or Type II floor-level exit.

For the 747-8F and all earlier model 747 freighters, the normal route for the flightcrew and the supernumeraries to enter the airplane is using door 1 left located on the main deck of the airplane. Since the supernumeraries are trained and receive a pre-flight briefing concerning the evacuation means for the exit, we agree that it is not necessary for the airplane entry door to be available as an emergency exit.

Regarding Boeing's discussion on the acceptability of the access to the crew service door, we do not agree with the statement about the number of exits required. Boeing states "a pair of Type I exits would allow 40-79 passengers, while a pair of Type III exits would be sufficient for between 20 and 39 occupants." The requirements for the type and number of exits required for the 747-8F are found in § 25.807(c)(1), Amendment 25-67. For a passenger capacity of 20 through 39 there must be at least one Type II and one Type III exit in each side of the fuselage. For a passenger capacity of 40 through 79 there must be at least one Type I and one Type III exit in each side of the fuselage.

The access to the crew service door is a 19-inch-wide passageway with an 8-inch step-up at the exit. This access is much better than what is required for a Type III exit with less than 9 passengers. We agree that for this airplane configuration and passenger capacity this access is acceptable.

We agree with Boeing that viewing the external conditions before opening the crew service door is not possible for all cases of landing gear collapse. When using inertia reels out the crew service door the location where the evacuee is likely to make contact with the ground is directly below the exit. Therefore, the location is not visible with the viewing window provided on this exit. We agree with Boeing that the design of the airplane and location of the crew service door effectively eliminates many of the effects external conditions could have if the crew service door is opened under hazardous conditions. Also, we agree that prior to the deployment of the escape slide or inertia reels the crew service door could be closed if the conditions were not acceptable for evacuation.

Concerning Limitation 16 of exemption 9793A, that the escape slide, when moved to the aft location, must clear the projected opening, Boeing proposed to provide adequate access for rescue personnel to enter the airplane. Boeing did not propose a minimum amount of unobstructed opening or a method to evaluate what is adequate access for the rescue personnel. Reviewing the requirement for exit openings the minimum width is 19 inches for a Type IV exit. Based on this requirement we would accept a 19-inch-wide passageway leading from outside the airplane to inside the airplane to the main aisle on the upper deck of the airplane. A smaller passageway may be found acceptable by test, however, Boeing would need to develop and the FAA accept the test criteria.

The FAA's decision

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest because this design provides an acceptable level of safety for the maximum number of occupants that will be allowed on the airplane. 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. 9793A from §§ 25.783(g), 25.807(a)(1), 25.809(a), and 25.813(a) to the extent necessary to allow type certification of Boeing Model 747-8F series airplanes with provisions for the carriage of supernumeraries. Limitation 16 has been modified and Limitation 17 has been added. All other limitations from Exemption No. 9793A have been repeated below for clarity. The following limitations apply and Limitation numbers 1-6 and 10-11 must be documented in the Limitations Section of the Airplane Flight Manual:

1. A maximum of six supernumeraries may occupy the area just aft of the flight deck. The total maximum occupancy of the airplane is limited to eight persons, including the flightcrew.

2. The supernumeraries are limited to the categories specified in §§ 121.583(a)(1) through 121.583(a)(7).

3. Main Deck Class E Cargo Compartment Access Limitations:

   a. Supernumeraries are prohibited from being in the cargo area during taxi, take-off, and landing. The pre-flight briefing must inform supernumeraries of this requirement.

   b. Access into the main deck Class E cargo compartment in-flight is allowed for only three types of operation. They are:

      - Carriage of live animals requiring care/attention during flight and associated material only, no other cargo. The maximum number of supernumeraries allowed in the main deck Class E cargo compartment is six.

      - Cargo only, no live animal requiring care/attention during flight. The maximum number of supernumeraries allowed in the main deck Class E cargo compartment is three.

      - Carriage of live animals requiring care/attention during flight and other cargo. The maximum number of supernumeraries allowed in the main deck Class E cargo compartment is six.

4. Prior to each flight, a flightcrew member must brief the supernumeraries on the following:

    - The use of exits, including instructions to inspect the ground to determine whether a safe landing can be achieved before using an assist means.
    - Location and use of emergency equipment.
    - The prohibition from being in the cargo area during taxi, take-off, and landing.
    - The aural and visual decompression alerting system and what actions they are required to take.
    - The visual turbulence alerting system and the requirement that persons must return to their seats.
    - The aural and visual fire or smoke alerting system and what actions they are required to take.
    - That access is limited to the care and handling of animals and cargo only.
    - That access is limited to a maximum of three unless live animals requiring care/attention in-flight and associated material are being carried.
    - That access is limited to a maximum of six when live animals requiring care/attention in-flight are being carried.
    - That the smoke barrier must be secured (i.e., the door or curtain must be closed) except when entering or leaving the cargo compartment.
    - That a portable oxygen bottle (with full face mask attached) must be carried at all times when accessing the cargo compartment by each person entering the cargo compartment.
    - That smoking is not allowed within the cargo compartment.
    - That the compartment must not be entered in case of fire/smoke being detected inside the Class E cargo compartment.

5. The operator must determine that each supernumerary is physically able and trained to accomplish the necessary emergency procedures.

6. Supernumeraries Portable Oxygen:

a. There must be at least one portable oxygen unit with a mask attached to it provided for each supernumerary allowed to enter the main deck Class E cargo compartment during flight. The unit must provide an indication to the user that oxygen is flowing.

b. The portable oxygen unit must meet the performance requirements of § 25.1443(a) or § 25.1443(b), or the equipment must be shown to protect the supernumerary from hypoxia at an activity level required to return to his or her seat following a rapid decompression to 25,000 feet cabin altitude.

c. During flight, the supernumerary must carry the portable oxygen unit whenever he or she is in the Class E cargo compartment.

d. The supernumeraries must be trained in the use of the oxygen units. The supernumeraries must also be trained in making the determination whether oxygen is being delivered to the dispensing units.

e. The oxygen units must be sized adequately for continuous and uninterrupted use during worst-case flight duration following decompression, or must be of sufficient duration to allow the supernumeraries to return to their seats where oxygen is readily accessible for the remainder of the decompression.

f. Additionally, since the petitioner has decided to provide the same alert for both decompression and smoke/fire, the oxygen unit must meet the protective breathing equipment (PBE) requirements in §§ 25.1439(b)(1), (2)(i), and (4), and the equipment and system must be designed to prevent any inward leakage to the inside of the device and prevent any outward leakage causing significant increase in the oxygen content of the local atmosphere (i.e., full face mask type.)

7. An automatically activated aural and visual decompression alerting system must be present and immediately recognizable in accessible areas of the Class E cargo compartment to notify supernumeraries when to don oxygen masks. If there are two or more alerts that a supernumerary may hear or is expected to respond to there must be an automatic visual alert in addition to the automatic aural alert. The pre-flight briefing must include training in the sound of the alerting system, the meaning of the alerting system, and the response to the signal (i.e., procedures for donning the masks and activating the flow of oxygen).

8. Turbulence Alert:

   A flightcrew operated visual alerting system, which is recognized in accessible areas in the Class E cargo compartment, must be installed to indicate, during turbulence, that persons must return to their seats. Appropriate procedures and limitations must be established to ensure that the flightcrew alerting systems notify the supernumeraries to return to their seats at the onset of turbulence and prior to landing. The pre-flight briefing must explain this alerting system to the supernumeraries.

9. Smoke/Fire Alert:

   A flightcrew activated aural and visual alerting system, which is recognized in the Class E cargo compartment, must be installed. This aural or visual alerting system is to indicate that, in the event of fire or smoke in the Class E cargo compartment, persons must return to their seats and ensure that the smoke barrier is secured (i.e., the door or curtain is closed). Appropriate procedures and limitations must be established to ensure that, at the onset of a fire or smoke event, the flightcrew alerting systems the supernumeraries to return to their seats and secure the smoke barrier. The pre-flight briefing must explain these alerting systems to the supernumeraries.

10. Placards:

    Placards are to be located in the supernumerary area, in a conspicuous location either on or adjacent to the smoke barrier doors. The placards must indicate the following:

    - Access is limited to the care and handling of animals and cargo only.
    - Access is limited to a maximum of three unless live animals requiring care/attention in-flight and associated material are being carried.
    - The smoke barrier must be secured (i.e., the door or curtain must be closed) except when entering or leaving the cargo compartment.
    - A portable oxygen bottle (with full face mask attached) must be carried at all times when accessing the cargo compartment by each person entering the cargo compartment
    - Smoking is not allowed within the cargo compartment.
    - The compartment must not be entered in case of fire/smoke being detected inside the Class E cargo compartment.

- Do not occupy the Class E cargo compartment during taxi, takeoff, and landing.

11. Alerting requirements:

    - Must be distinctive and effective.

    - Visual alerts must be visible from all occupant locations and orientations, during all expected operational conditions including a rapid decompression where moisture in the air may condense.

    - Aural alerts must be loud enough to be heard during all expected operational conditions including a rapid decompression where the ambient noise level will increase.

12. For the crew service door, emergency lighting must provide adequate illumination at the ground end of the assist means, where an evacuee would normally make first contact with the ground, with the airplane in each of the attitudes corresponding to the collapse of one or more legs of the landing gear and worse case center of gravity location. This condition does not apply to the overhead hatch.

13. There must be eight inertia reels and harnesses installed on the flight deck. No flight deck door may be installed between the supernumerary compartment and the flightdeck that would prevent access to the overhead hatch and eight inertia reels and harnesses. In accordance with FAA-approved test plan(s), the intended inertia reels and harnesses must be demonstrated to be a suitable assist means for the expeditious and safe evacuation of the maximum number of trained occupants allowed by approved seating. This/these demonstration(s) should also address, to the satisfaction of the FAA, the capability of trained occupants to utilize the intended inertia reels and harnesses to safely and expeditiously evacuate incapacitated occupants. Additionally, this/these demonstration(s) should also address, to the satisfaction of the FAA, the suitability of the intended devices from both high and low sill heights representative of § 25.810(a)(1)(iii) gear-collapse conditions including worse case center of gravity location.

14. For all cargo or mixed cargo and live animal operations involving four or more supernumeraries, a portable system that protects against smoke inhalation must be provided. A portable system (e.g., smoke hood, full face mask oxygen system, etc.) that affords protection from smoke inhalation must be carried at all times when accessing the cargo compartment. Note that a single system that meets both protection from smoke inhalation and hypoxia could be used (e.g., a full face mask with oxygen unit).

15. Flight tests must be conducted to show compliance with the provisions of § 25.857 concerning the entry of hazardous quantities of smoke into compartments occupied by the crew or passengers. The amount of time that the smoke barrier is open, as a result of the supernumeraries evacuating the main deck cargo compartment, must be accounted for in the testing.

16. For airplanes with the optional escape slide installed at the crew service door, Boeing must develop instructions for sliding the escape slide aft to provide a passage from the main aisle and out of the exit at least 19 inches in width. These instructions must be added to the outboard side of the escape slide assembly so rescue personnel can read the instructions and move the escape slide out of the way. These instructions must be demonstrated to be effective for rescue personnel.

17. For the upper deck occupancy the following items apply:

    a. The requirement of § 25.783(g) that each passenger entry door must qualify as a Type A, Type I, or Type II passenger emergency exit is exempted because the airplane entry door is on the main deck and the main deck entry door is not part of the supernumerary compartment.

    b. The crew service exit opening is the size of a Type I exit but has an 8-inch step-up inside the airplane.

    c. For the crew service door, the viewing outside through the viewing window does not meet the requirements of § 25.809(a). With the door closed it is acceptable to only be able to view the general location where occupants would likely make first contact using the optional escape slide in normal gear conditions and lower sill height conditions. After the crew service door is open all locations where occupants would likely make first contact using the optional escape slide and/or the inertia reels must be visible from the exit opening.

Note: The briefings and associated procedures in Limitations 7, 8, and 9 are not required if an Airplane Flight Manual limitation is established to prohibit supernumeraries in the Class E cargo compartment during flight. If access is prohibited, placards must be revised to indicate this limitation.

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