

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

In the matter of the petition of

Embraer S.A.

for an exemption from § 25.813(e) of Title
14, Code of Federal Regulations

Regulatory Docket No. FAA-2013-1052

DENIAL OF EXEMPTION

By letters dated December 9, 2013, and April 29, 2014, Mr. Sergio Augusto Viana de Carvalho, Airworthiness Manager, Embraer, Av. Brigadeiro Faria Lima, 2170 - PC 179 12227-901, Sao Jose dos Campos, Brazil, petitioned the Federal Aviation Administration (FAA) for an exemption from the requirements of § 25.813(e) of Title 14, Code of Federal Regulations (14 CFR). This exemption, if granted, would permit the installation of doors in the passenger compartment on Embraer EMB-550 airplanes. The requested exemption is specifically for the installation of a door between the main passenger compartment and the emergency exit in the lavatory on Embraer EMB-550 airplanes, which would be operated for both private use only (14 CFR part 91 operations) and for hire (14 CFR part 135 operations).

The petitioner requests relief from the following regulations:

Section 25.813(e), Amendment 25-116 – No door may be between any passenger seat that is occupiable for takeoff and landing and any passenger emergency exit, such that the door crosses any egress path (including aisles, crossaisles and passageways).

The petitioner supports its request with the following information:

This section quotes the relevant information from the petitioner's request, with minor edits for clarity. The complete petition is available at the Department of Transportation's Federal Docket Management System, on the Internet at regulations.gov, in docket no. FAA 2013-1057.

Specific Section from Which Exemption is Required.

14 CFR 25.813 Emergency exit access.

(e) No door may be installed between any passenger seat that is occupiable for takeoff and landing and any passenger emergency exit, such that the door crosses any egress path (including aisles, crossaisles and passageways).

Extent of Relief and Reason for Seeking Relief

In accordance with the provisions of 14 CFR Part 11.61(b), Embraer requests an exemption to 14 CFR Part 25.813(e) to allow installations of an electrically activated lavatory pocket door. This will allow the EMB-550/545 aircraft to provide a safe, private lavatory for crew and passenger use. Embraer proposes that specific design features, and additional compensating features will provide an overall level of safety equal to or better than that intended when the FAA published Amendment 25-116. The EMB-550/545 is an executive use aircraft that will be type certificated to no more than 12 passengers with two crew members. Embraer additionally proposes that this exemption be applicable to both private use aircraft (14 CFR Part 91) and those used in for hire operations (14 CFR Part 135).

The preamble to Amendment 25-116 discusses the changes to 14 CFR Part 25.813(e). The FAA noted that Amendment 25-116 was published due to concerns over the passengers' ability to:

1. Recognize that an exit exists beyond an interior door forward or aft of the passenger compartment; and
2. Reach the exit beyond the door in the event of failure of the interior door to open.

From the preamble for Amendment 25-116, the FAA states:

- “It is now considered undesirable to permit the installation of a door between any passenger and an exit. Should such a door (either through omission or mechanical failure) become jammed in the event of an emergency evacuation, persons could be prevented or delayed in evacuating which could result in fatalities or injuries that would not otherwise have occurred. The hazards associated with a jammed door are still present whether or not passengers are on both sides of the door, and the recognition factor has not been mitigated. Either could result in the same consequences – failure of some passengers to evacuate the airplane.”
- While discussing existing designs of transport aircraft used in corporate and executive operations: “the FAA has not identified an unsafe condition with interior doors in those types of operations, and is therefore not requiring retrofit of this segment of the fleet.”
- “One common installation on corporate aircraft is a seat integrated into the lavatory, that can be occupied for takeoff and landing. Because the lavatory has a door, this effectively becomes a “door between passenger compartments,” and not permitted under the current requirements. However, the FAA has accepted such

installations under certain conditions, on an equivalent level of safety basis. It is important to note that the amendment in this final rule would not change the status of such occupied lavatories. They would continue to be assessed on a case-by-case basis and, if the requirements for equivalency were met, could be approved.”

Embraer believes that aircraft specifically designed for executive use should be eligible for granting of exemptions for cabin characteristics that do not comply with certain regulations, if an equivalent level of safety can be demonstrated. Embraer will accomplish this by incorporating specific design features that provide a level of safety equal to or better than the current regulations. These features will ensure that design will not diminish the passengers’ ability to effectively identify the exit and egress the aircraft. The following characteristics are unique to executive jets and provide compensating features that are not normally provided in commercial jets:

- The number of passengers in executive jets is smaller than that in commercial airplanes
- The passengers in executive jets are typically frequent fliers and familiar with the safety features of the specific airplane they are aboard
- The interior arrangement is static, allowing crew and passengers to become acquainted with the configuration of the airplane, emergency equipment provided, and the location of the emergency exits. They also have regular contact with “repeated” passengers, which promotes a positive influence on communicating safety issues

The following design features of the EMB-550/545 will ensure that passengers and crew will recognize that an exit exists in the rear portion of the aircraft within the lavatory.

- Emergency exit locator and markings signs and emergency lighting in accordance with 14 CFR Part 25.811 and 25.812 will be installed prominently
- The AFM will be modified to instruct the flight crew to show a video briefing that will demonstrate how to open the exit.
- The video briefing will show the actions twice;
 - Once in slow motion so the viewer understands the necessary actions; and
 - Once in real time so the viewer understands the speed at which the actions should be accomplished
- The video briefing will show the frangibility demonstration for the lavatory door in both slow motion and real time

The following design features of the EMB-550/545 will ensure that passengers and crew can effectively and efficiently evacuate the aircraft.

- The lavatory door will be designed to automatically open (stow) when the main entrance door (MED) is closed and will remain in the stowed position until the aircraft flaps and landing gear are commanded up.
- The lavatory door will be designed to automatically open (stow) when the flaps or gear are commanded down.
- The lavatory door will be equipped with two operation switches, one on each side of the lavatory door.
- The lavatory door will be designed to stop its motion and return to its stowed position, if it is blocked during deployment.
- The compressive force of the lavatory door closing on body parts between the door and the door jamb will be shown not to be a hazard.
- The lavatory door design will be shown to protect components from damage caused by items blocking door operation, misalignment of the mechanism, and minor deformation of the structure that would prevent the door from being correctly positioned for TT&L.
- The lavatory door will be designed to prevent overheating of the components that could be an ignition source.
- The operation of the lavatory door to the closed (deployed) position will require manual activation.
- The lavatory door will only be able to be closed when the gear and flaps are commanded up (airborne configuration) or when on the ground, five minutes after the MED is opened.
- The failure probability of the stowing function of the lavatory door will be shown to be 10⁻⁵ per flight hour or less.
- The lavatory door will be equipped with a manual override that will permit an occupant to open the door in the event that the electrical system fails.
- The minimum width of the passageway will be maintained at 15" or greater with no encroachment from the lavatory passageway to the overwing exit (OWE).
- The lavatory door will be equipped with dual locking mechanisms to hold the lavatory door in the open (stowed) position.
- The locking mechanism will be able to withstand the loads imposed upon them when the lavatory door is subjected to the ultimate inertia forces specified in 14 CFR Part 25.561.

- The lavatory door’s direction of travel is across the main aisle of the airplane (at a right angle to the longitudinal axis) minimizing the chance that the inertia loads could force the door to close (deploy).
- The latching mechanisms and lavatory door will be cycle-tested to a minimum of 100,000 cycles to ensure a robust and reliable design.
- The lavatory door will be placarded to be open and latched for taxi, takeoff, and landing (TT&L).
- The lavatory door will have placards on both sides of the door describing how to break through the lavatory door utilizing the frangibility design.
- A cabin-alerting system (CAS) message, “Pocket Door Not Open,” will be provided for the flight crew when the lavatory door is not open (stowed) and locked for TT&L.
- A self-stowing OWE will be installed in the lavatory. The self-stowing OWE will ensure that the exit is not obstructed by the OWE door during emergency egress.
- The self-stowing OWE will be designed to require a positive action to disengage the OWE door from the fully opened position once fully opened.
- Embraer will conduct lavatory door and OWE opening tests to demonstrate that both the lavatory door and OWE can be opened within 10 seconds.
 - The test will include passing through the lavatory pocket door (by utilizing the frangibility design) and opening the OWE exit.
 - A 5th percentile female will break the lavatory door open creating a large enough opening that a 95th percentile male can pass through.
 - The Type III OWE will be considered fully open according to 14 CFR Part 25.809(i).
 - The test will be conducted under emergency lighting conditions and normal aircraft attitude.
 - The test will show that the Type III OWE hatch will not impede egress from the aircraft.
 - The test will show that no hazards are present after breaking through the lavatory pocket door.

- The frangibility design of the lavatory pocket door will be shown from both directions.
- The Airplane Flight Manual (AFM) will provide procedures and limitations to ensure that the lavatory door is in the proper position for TT&L.

The following additional features of the EMB-550/545 will ensure the continued operational safety of this design.

- The AFM will be modified to explain the pocket door override function.
- The AFM will be modified to instruct the flight crew to show a video briefing the will demonstrate how to open the exit.
- The AFM will be modified to explain the CAS messages.
- The AFM will prohibit takeoff or landing if the lavatory pocket door is not open (stowed).
- The Instructions for Continued Airworthiness (ICA) will be modified to call out possible life limits, potential additional maintenance tasks and any subsequent intervals.
- The Maintenance Manual will be updated to show new tasks associated with the lavatory pocket door.

Public Interest

Embraer's customers have requested to have a lavatory door for privacy. To accommodate this request, Embraer has developed a robust and safe design to ensure that the EMB-550/545 lavatory pocket door does not diminish the safety of the passengers and crew. Without this lavatory door, customers may decide to purchase an aircraft that was designed to an earlier amendment level. This would have a negative effect on safety and the environment. The EMB-550/545 meets the requirements at a safer, later amendment level and is more fuel efficient than earlier designed aircraft. Additionally, Embraer believes that the lavatory pocket door design ensures that the safety of egress to or better than that obtained by literal compliance with the regulations. Further to the general public interest, the executive aircraft market continues to grow even while some areas of the world economy have slowed. Embraer utilizes multiple vendors in the United States, Brazil, and throughout the world. Granting of this petition would allow Embraer to continue, and grow, their use of these vendors, thereby contributing to the growth of the world economy and benefiting the general public.

Reasons Why Exemption would Not Adversely Affect Safety

The granting of this exemption will allow the EMB-550/545 aircraft to provide a safe, private lavatory for crew and passenger use. Embraer proposes that specific design features, and additional compensating features will provide an overall level of safety equal to or better than that intended when the FAA published Amendment 25-116.

Additional Information to Support Request

Embraer believes that the statements made above show that the EMB-550/545 lavatory pocket door design allows a level of safety that is equal to, or better than, that afforded by the regulations. Additionally, Embraer believes that granting this petition for exemption is in the public interest and is consistent with the regulations.

Exercise of the privileges of the exemption outside the United States of America

In accordance with 14 CFR 11.81(h), Embraer requests that the privilege of exercising this exemption for operation outside of the United States be approved. Embraer aircraft are registered and operated in many countries throughout the world. Embraer expects that the EMB-550/545 will be an extremely popular executive use aircraft and will be registered and operated throughout the world.

Embraer response to FAA request for more information

Embraer has received from FAA the request for more information regarding this petition; therefore please consider Embraer's additional information, below:

FAA question: Please clarify why Embraer considers it to be in the public interest to have an airplane emergency exit inside a lavatory rather than in the main-cabin area.

Embraer answer: Considering the installation of the emergency exit in the lavatory, Embraer acknowledges two major aspects; safety and comfort.

With regards to safety and considering the [Embraer] Legacy 500 interior floor plan, there would be no places remaining to install the type III exit but adjacent to an executive table. The other spots are either adjacent to a seat or a side facing divan (which, in accordance to 25.813(c)(2)(ii) and AC 25-17 paragraph 411b, are not considered minor obstructions and consequently not acceptable). If installed adjacent to an executive table, this configuration would be prejudicial and/or non-certifiable in three fronts; impairing the access to the exit (25.813(c)(1)), impacting (on a non-evaluated scale) the opening time (25.809(b)(2)) of the exit, and prejudice the passenger evacuation in an emergency situation (25.807(f)(1)).

Embraer has spent many engineering hours analyzing what could be possible solutions for the installations of the exit adjacent to the [executive] table. However, none of it was deemed acceptable because the table would protrude the exit projection into a height of not less than one third of the vertical opening. Relying on a crew procedure or placards,

as stated on FAA Policy Memo No.: ANM-115-08-02, to specify a required taxi, take-off and landing configuration, such as removing and stowing the table, are not sufficient to ensure access to or openability of the exit.

With regards to comfort, the presence of a Type III exit in the Legacy 500 main passenger cabin generates at least three undesirable side effects. Due to the policy (Memo No.: ANM-115-08-02) published by the FAA in 2008, the restrictions imposed on the opening of Type III exits was made more stringent. No matter where the Type III exit is placed, at least one seat would have to have its movements limited. The first side effect would be that the necessity to remove the longitudinal tracking and swivel ability (so the seat does not protrude into the exit projection) would generate a lower level of comfort for the seat occupant. Second; the limitation of the seat movement would eliminate a feature every pair of in line adjacent seats has, which is to compose a berth. Third; independently of the technological advance of current design solutions, the existence of a fuselage cutout related to the presence of a door considerably increases the noise level and the heat loss in the adjacencies, decreasing considerably the comfort of surrounding occupants.

With these above mentioned aspects in mind and considering positive factors of the installation in the lavatory (no interference of protuberances, ease of access specifically with the installation of an electrical automatic pocket door, and reduced distance of the lavatory from the main cabin considering the aircraft overall size), Embraer has decided to migrate the installation of the exit, originally during the initial design phase in the passenger cabin, to the lavatory.

Federal Register publication

A summary of the petition was published in the *Federal Register* on May 22, 2014 (79 FR 29479). No comments were received.

The FAA's analysis

Explanation of "executive use" aircraft

Over the last 40 to 50 years, the term "executive use" typically has been associated with airplanes that have been limited, by the exit configuration of the airplane, to 19 or fewer passengers. These include airplanes similar in size to the EMB-550, such as Gulfstream GIII/GIV/GV, Canadair Challengers, Dassault Falconjets, and Hawker Model 4000s. The types of operations conducted by operators of the smaller transport airplanes have grown significantly in the past 15 to 20 years. These airplanes, with 19 or fewer passengers, typically are not used in part 121 operations but they are very frequently used in part 135 operations. The term "air carrier" is defined as any person who undertakes directly, by lease or other arrangement, to engage in air transportation. This term applies to on-demand operations for hire conducted under part 135.

The development of cabin safety standards for private-use aircraft

The FAA adopted Special Federal Aviation Regulation (SFAR) 109 to define an alternative set of cabin-safety standards for transport-category airplanes in private use (i.e., not for hire, not for

common carriage) airplanes. The intent of this activity was to recognize that private owners, who made no pretense of providing commercial passenger service, were entitled to certain considerations with respect to the regulatory requirements. Specifically, the FAA is required, by § 44701(d) of Title 49, United States Code (49 U.S.C. 44701(d)), to consider differences between air transportation and other air commerce.

SFAR 109 applies to operations that are not for hire and “not for common carriage.” It contains a provision to preclude operation of any sort in part 135. Operation in accordance with SFAR 109, paragraph 10, “Interior,” does permit installation of interior doors. However, SFAR 109 is a separate rule with its own criteria. In particular, SFAR 109 is limited to private-use operations and addresses several different regulatory issues, including interior doors.

With regard to operation under part 91, we consider the petitioner’s proposal to be in the public interest for the reasons the petitioner stated previously. However, considering that Embraer previously applied for, and was granted, a partial exemption (exemption no. 10338) from § 25.813(e) for the Model EMB-550/545 airplane, the FAA sees no reason to issue another exemption that is identical to the previously issued partial grant of exemption. That partial grant of exemption is limited to “private, not for hire, not for common carriage” operations.

Operation for hire (part 135 operations)

Amendment 25-116 to § 25.813 was adopted to address the hazard presented by a door located between passengers and an emergency exit. Should such a door (either through omission or mechanical failure) become jammed in the event of an emergency evacuation, persons could be prevented from, or delayed in, evacuating, which could result in fatalities or injuries that would not otherwise have occurred. Also, it was determined in the course of accident investigations in the 1960s that an interior door could be detrimental in evacuation of passengers, who tended not to recognize that an exit was beyond the door, even if it was the closest available exit. Either could result in the same consequences – failure of some passengers to evacuate the airplane. In the case of the EMB-550, the airplane has only two emergency exits, so any hazard presented by a lavatory door could significantly affect evacuation.

The FAA considers the petitioner’s proposal not to be in the public interest when the airplane is operated for hire (in this case, 14 CFR part 135 operations) for the following reasons:

- The petitioner’s argument that it is more in the public interest to have the privacy of a pocket door on the lavatory, in lieu of a curtain, than not having a door between passenger seats and one of the two emergency exits on the airplane, is not supported for a for-hire airplane. The interest of the public in safe evacuation from a for-hire carrier is not outweighed by an interest in additional privacy.
- The petitioner’s argument that it is more in the public interest to have the Type III emergency exit inside the lavatory with a pocket door on the lavatory, than to have the Type III emergency exit located in the main passenger cabin, is not supported for a for-hire airplane. The location of the emergency exit is a more important safety issue than

the location and operation of other interior features (seats, tables, closets, lavatory, and galley).

- The petitioner's argument that it is more in the public interest to have the Type III emergency exit located in the lavatory with a pocket door on the lavatory, to reduce the noise level and heat loss in the main passenger cabin, than to not having a door between passenger seats and one of the two emergency exits on the airplane, is not supported for a for-hire airplane.

For commercial-carriage and for-hire operations, we have consistently denied petitions for interior doors except for the Gulfstream GVI. That airplane has two pair of overwing exits which provide a total of four exits available to passengers should the interior door become unopenable, thus ensuring the availability to evacuate safely (refer to exemption number 10188). For airplanes that are operated for hire, the passenger has a high expectation of the level of safety when they purchase the ticket. The typical paying passenger has the same expectation of safety regardless of whether the operation is part 135 or part 121.

The FAA's decision

In consideration of the foregoing, I find that a grant of exemption is not in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, I deny Embraer's petition for an exemption from § 25.813(e) that would have allowed installation of an interior door on EMB-550/545 airplanes operating under part 135.

Issued in Renton Washington, on September 5, 2014.

/s/ Jeffrey E. Duven

Jeffrey E. Duven
Manager, Transport Airplane Directorate
Aircraft Certification Service