

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

In the matter of the petition of

Embraer

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

Regulatory Docket No. FAA-2007-27903

GRANT OF EXEMPTION

By letter dated October 1, 2012, Mr. Sergio Augusto Viana de Carvalho, Airworthiness Manager, Embraer, Av. Brigadeiro Faria Lima, 2170 – PC 179, São Jose dos Campos, Brazil, 12227-901, petitioned the Federal Aviation Administration (FAA) for an amendment to exemption number 9458 from the requirements of § 25.813(e) of Title 14, Code of Federal Regulations (14 CFR) to include electrical actuated interior doors. The proposed exemption, if granted, would permit the installation of electrically actuated doors in the passenger compartment on Embraer ERJ 190-100 ECJ airplanes. The proposed exemption is specifically for the installation of executive interiors on Embraer ERJ 190-100 ECJ airplanes that have been designated as “private, not-for-hire.”

The petitioner requests relief from the following regulations:

Section 25.813(e), Amendment 25-88 – No door may be installed in any partition between passenger compartments.

The petitioner supports its request with the following information:

This section quotes, in pertinent part, 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 <http://regulations.gov>, in Docket No. FAA-2007-27903.

Petition and General Information

EMBRAER is requesting an amendment to the Exemption No. 9458 to allow installation of electrical actuation of the doors between passenger compartments and the emergency exits in the ERJ 190-100 ECJ. This hybrid door system allows passengers on either side of the door to select the door open or close by pushing on a control panel.

Public Interest

The public interest established by the original petition that was granted by Exemption 9458 is equally applicable to the hybrid door and adding a different mode of door actuation does not affect the public benefits provided by the capability to provide a more comfortable and useful interior by dividing the cabin into rooms that provide more privacy.

Justification

The actuation system is being designed to maintain the same level of safety as that afforded by the existing manual door and has the following safety features to ensure that the addition of electrical actuation does not adversely affect emergency egress capability or pose any risk of physical injury to the passengers or crew:

1. The hybrid door is a typical mechanical door with the addition of an electrical actuator and a control box. The system will be equipped with 2 PAX operation switches per door: one FWD and one on the AFT side. It is necessary [for] one push to deploy the door and another push to stow it. Aside from the electrical components, the door behaves as a typical mechanical door, i.e., whether the electrical mechanism is operational (Powered) or not, it is possible to stow or deploy it manually.
2. In case the door blade is blocked during deploying, its motion is stopped. Afterwards the door blade moves into the stowed position. And in case the door blade is blocked during stowing, its motion is stopped. Afterwards it is necessary to press the switch again in order to move the door blade into the stowed position.

The other conditions required by the existing Exemption 9458 will still be met by the automatic door.

These safety requirements will maintain the same level of safety as that provided by the original issue of Exemption 9458 for the manual door and will ensure emergency egress capability even in case of system failure or failure to properly stow the door prior to taxi, takeoff, and landing. EMBRAER believes that the basic issues of a passenger finding and reaching an exit in the emergency are addressed by the above additional safety features and by the existing safety parameters inherent in the operation of private use airplanes. EMBRAER also believes that even if some extreme condition should result in a door being closed or partially closed after an accident, there are simple means to get through the door to reach the exit(s). For this reason, the amendment to the exemption, as requested, would provide a level of safety for passengers in the EMBRAER Model ERJ 190-100 ECJ that would be equal to that required for passengers of airplanes in commercial operation.

Additional Information to Support Request

Exemption N° 9458 (Regulatory Docket N° FAA-2007-27903) [was] issued to EMBRAER on August 2, 2007. This exemption is provided as evidence that the FAA has previously granted exemption from the same regulation, with the same

provisions, for the same type aircraft which is being requested by this petition for an amendment to the Exemption. In addition the contents of this petition are similar in the relevant aspects to that of Exemption 10188.

Conclusions

EMBRAER believes that the combination of the interior design of this airplane, which is specifically for private use and the proposed occupant safety features, should justify the grant for an amendment for this Exemption N° 9458.

EMBRAER also notes that the proposed occupant safety features provide an acceptable level of safety for the intended use of this airplane.

Federal Register publication

The FAA published a Summary Notice of Petition Received in the Federal Register on October 30, 2012 (77 FR 65762). The FAA received no comments.

The FAA's analysis

The FAA considers the petitioner's proposal to be in the public interest for the same reasons as those previously stated by the petitioner.

The FAA agrees that all of the conditions contained in original exemption number 9458 are applicable to both manual and powered doors.

As more transport category airplanes have been configured (or re-configured) for private use, the FAA has given considerable attention to the issue of appropriate regulation of such airplanes. Some of the current regulations governing design certification of transport-category airplanes are not compatible with private use of such airplanes. Because of this, the FAA has received a number of petitions for exemption from certain regulations. The FAA has granted such exemptions when we find that to do so is in the public interest and does not adversely affect the level of safety provided by the regulations. The FAA has published *Special Requirements for Private Use Transport Category Airplanes*, SFAR No. 109 (74 FR 21533, May 8, 2009), which, significantly reduced the need for case-by-case review of individual petitions for exemption for private-use airplanes.

The placement of interior doors is clearly quite significant to the owner/operator of the airplane. The flexibility to partition the airplane into individual rooms, such as private meeting rooms or bedrooms, is paramount to an acceptable interior. The availability of private meeting rooms and bedrooms is essential. The FAA acknowledges the desirability of these features from the operator's point of view. Additionally, the convertible feature of these partition doors, whereby a maintenance procedure renders the doors useless in the fully open position, provides an equivalent level of safety, to the regulations, for any Falcon 900 series airplane operated in part 121 or 135 service.

When the regulations pertaining to interior doors were adopted, they did not necessarily consider "rooms." They considered two possible types of interior doors in a passenger compartment. The first type is an interior door between passenger compartments. The second type is an interior door between the exit and the passenger compartment.

Until recently, only the first type of door was prohibited by § 25.813(e). However, part 25, as amended by Amendment 25-116, prohibits interior doors between the exit and the passenger compartment. In addition, Amendment 121-306 prohibits these doors in airplanes manufactured after November 27, 2006, operated under 14 CFR part 121. Amendments 25-116 and 121-306, titled *Miscellaneous Cabin Safety Changes*, were published in the Federal Register on October 27, 2004.

Airplanes configured for private-use, not-for-hire, not-for-common carriage typically use any of five different categories of door in the passenger cabins:

Category 1. A door in a room and the room is less than the full width of the airplane. An aisle is outside the room. This type of room may be occupied during takeoff and landing, and only the occupants of the room must use the door to reach an exit.

Category 2. A door in a room and that is the same as Category 1, except a single emergency exit or pair of emergency exits is within the room.

Category 3. A door or doors in a compartment and the compartment is the full width of the airplane. Passengers are seated on both sides (fore and aft) of the door(s), and the main aisle leads out of, or passes through, the compartment. The compartment does not have emergency exits. This type of compartment may be occupied during takeoff and landing.

Category 4. A door in a room and the room is the full width of the airplane. Passengers are seated on both sides (fore and aft) of the door, and a pair of emergency exits is at one end of the room. This type of room may be occupied during takeoff and landing.

Category 5. A door in a room that may be the full width of the airplane. This type of room is not occupied during takeoff and landing. This room is only occupied during flight. Passengers are not seated on both sides of the door during taxi, takeoff, and landing (TT&L). Passengers seated in TT&L seats must not need to pass through this door to get to any emergency exits.

Because not all interior doors between passenger compartments are equivalent, the FAA has determined that the following requirements will produce an adequate level of safety:

- a. To maximize the level of safety, doors in Category 2, 3, or 4 installed across the main cabin aisle must open and close in a transverse direction. That is, the direction of motion of the door must be at a right angle to the longitudinal axis of the airplane. A “pocket door” is one example of such a design. This will tend to minimize the chance that the inertia forces of an accident could force the door closed.
- b. Redundant means are necessary to latch doors open for takeoff and landing. Each latching means must have the capability of retaining the door in the takeoff and landing position under the inertia forces of § 25.561.
- c. Each interior door must be frangible, in the event that it is jammed in the closed position in flight or during TT&L. Frangibility is intended to ensure that if a door is jammed closed, occupants can escape in either direction and emergency equipment can be moved. Frangibility may be demonstrated in either of the following ways:

- A 5th percentile female can break through the door, creating a large enough opening that a 95th percentile (or larger) male can pass through. (See Advisory Circular 25-17A, Transport Airplane Cabin Interiors Crashworthiness Handbook, paragraph 43b(2)).
 - A 5th percentile female can break a hinge on the door or a hinge on a smaller door within the door such that the door can swing, so as to allow a 95th percentile (or larger) male to pass through the opening with the door swung open. This evaluation must be made with any cabin furnishing or equipment installed that could limit the swing arc of the door and placed in the most adverse position. In using this approach, one must consider the possibility that the door is physically jammed in the closed position by distortion of the fuselage or furnishings. This possibility must be considered even if the door normally translates into the open and closed positions.
- d. Doors that fall into Category 1 must be in the open position during TT&L only when the room is occupied.
 - e. Doors that fall into Categories 2, 3, or 4 must be in the open position during TT&L, regardless of occupancy.
 - f. Doors that fall into Category 5 must be in the closed position during TT&L.

With respect to the possibility that a door remains closed when it should not be, the FAA has determined that a higher level of awareness is required to address this issue. Due to the relative complexity of the cabin interior, the FAA has determined that inspection by flight attendants prior to takeoff and landing is not sufficient to verify that interior doors are in a required open position. Consequently, some type of remote indication is considered necessary. The petitioner's proposal to provide remote indication to the flightcrew is considered adequate.

Recently, the FAA has been made aware that some of these interior doors are power operated. In addition to the above criteria, the following criteria apply to all interior doors regardless of which door category applies.

- a. Powered-door operations must not be hazardous to occupants. For example, compressive force of the door closing on body parts between the door and the door jam must not be a hazard. Both crushing body parts and asphyxiation need to be considered.
- b. The powered-door system must be designed 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.
- c. The powered-door system must be designed to prevent overheating of the components that could be an ignition source.
- d. Frangibility testing must be demonstrated in any position in which the door could become jammed due to system failure.

- e. The effects of decompression on doors must also be considered in the decompression analysis.
- f. Non-powered latches/locks to latch/lock must secure the door in the correct position for TT&L. Powered latches/locks, for which the failed condition and loss-of-power condition is the locked position associated with the correct position for TT&L, may be acceptable but would require additional review.
- g. A back-up manual-operation system must be available to operate the door in the event of power-system failure. This includes configuring the door in the correct position for TT&L.
- h. Powered doors must be able to be opened from either side of the doors regardless of from which side the door was closed. If latches/locks are powered, the doors must be able to be opened from either side of the door regardless of from which side the latches/locks are engaged.

The FAA's decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in § 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, Embraer is hereby granted an amendment to exemption number 9458 to include additional conditions required for interior doors that are powered. The petition is granted to the extent necessary to allow Embraer to install an executive interior on Embraer ERJ 190-100 ECJ airplanes operated as private, not-for-profit, not-for-common-carriage airplanes. Specifically, the exemption allows relief from the prohibition of interior doors between passenger compartments for both manual and powered doors. All of the previous conditions are included in this amendment to the exemption. This exemption is subject to the following conditions:

1. The airplane is not operated for hire or offered for common carriage. This provision does not preclude the operator from receiving remuneration to the extent consistent with 14 CFR parts 125 and 91, subpart F, as applicable.
2. Each door between passenger compartments must be frangible.
3. Doors in Category 1 must be in the open position during TT&L only when the room is occupied or when passengers must pass through the room to reach an emergency exit.
4. Doors in Categories 2, 3, or 4 must be in the open position during TT&L, regardless of occupancy.
5. Appropriate procedures must be established to signal the flightcrew that a door between passenger compartments is closed, and to prohibit takeoff or landing when a door between passenger compartments is not in the proper position.
6. Doors between passenger compartments must have dual means to retain them in the open position, each of which must be capable of withstanding the inertia loads specified in § 25.561.

7. Doors in Categories 2, 3, or 4, which are installed across a longitudinal aisle, must translate laterally to open and close.

For powered doors these additional conditions apply:

8. Powered-door operations must not be hazardous to occupants. For example, compressive force of the door closing on body parts between the door and the door jam must not be a hazard. Both crushing body parts and asphyxiation need to be considered.
9. The powered-door system must be designed 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.
10. The powered-door system must be designed to prevent overheating of the components that could be an ignition source.
11. Frangibility testing must be demonstrated in any position in which the door could become jammed due to system failure.
12. The effects of decompression on doors must also be considered in the decompression analysis.
13. Non-powered latches/locks to latch/lock must secure the door in the correct position for TT&L. Powered latches/locks, for which the failed condition and loss-of-power condition is the locked position associated with the correct position for TT&L, may be acceptable but would require additional review.
14. A back-up manual-operation system must be available to operate the door in the event of power-system failure. This includes configuring the door in the correct position for TT&L.
15. Powered doors must be able to be opened from either side of the doors regardless of from which side the door was closed. If latches/locks are powered, the doors must be able to be opened from either side of the door regardless of from which side the latches/locks are engaged.

Issued in Renton Washington, on January 25, 2013.

/s/ Ali Bahrami

Ali Bahrami
Manager, Transport Airplane Directorate
Aircraft Certification Service