

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

In the matter of the petition of

**Embraer Empresa Brasileira de Aeronáutica
S.A. (Embraer)**

for an exemption from § 25.979(b)(2) of Title 14,
Code of Federal Regulations

Regulatory Docket No.
FAA-2002-13283

GRANT OF EXEMPTION

By letter dated August 29, 2002, Mr. Paulo C. Olenski, Certification Manager, Embraer Empresa Brasileira de Aeronáutica S.A., Av. Brigadeiro Faria Lima 2170, 12227-901 – Sao Jose dos Campos SP, Brazil, petitioned the Federal Aviation Administration on behalf of Embraer Empresa Brasileira de Aeronáutica S.A. (Embraer) for an exemption from § 25.979(b)(2) of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption would permit relief from the requirement to provide indication at each fueling station of failure of the shutoff means to stop the fuel flow at the maximum quantity approved for that tank for the Model EMB-135BJ and EMB-145XR series airplanes. The current design of the refueling panel of the Model EMB-135BJ and EMB-145XR series airplanes provides a display that can show current quantity and desired quantity of the tank being refueled, but there is no dedicated failure indication when fuel quantity increases beyond the tank's maximum. The proposed exemption, if granted, would permit type certification approval of the Model EMB-135BJ and EMB-145XR series airplanes with this non-compliant type design for a limited time.

Sections of the Federal Aviation Regulations (FAR) Affected

Section 25.979(b)(2) requires that an automatic shutoff means provide indication at each fueling station of failure of the shutoff means to stop the fuel flow at the maximum quantity approved for that tank.

Petitioner's Supportive Information

The petitioner's supportive information is summarized as follows:

As a condition for the granting of the requested time-limited exemption, Embraer will redesign, test, and certify a pressure refueling system that will detect failure of the automatic shutoff system to stop refueling flow when the quantity reaches the maximum approved for that tank and provide failure indication at the refueling panel. This will alert the refueler to shut off the refueling flow. Embraer is committed to having available the redesign of the refueling system and the refueling panel to include the High Level Exceeding Warning Indication by June 2003. Retrofit of the Model EMB-135BJ and EMB-145XR series airplanes delivered under the terms of the exemption will be accomplished by June 2004.

Embraer asserts that the safety impact of this exemption request is very small. The only potential hazard that is not fully accommodated is the external ignition of overflow fuel. The probability of fuel spillage due to failure of the automatic shutoff falls well into the improbable range and this failure would have to be combined with the presence of an external ignition source to result in a hazard. In addition, other type designs with earlier certification bases that are in commercial service have a similar panel design.

The refueling system of the Model EMB-145 series airplanes, and a similar system in the Model EMB-120 series airplanes, have proven to be very reliable in service. A review of the service history of both models indicates that overfueling incidents are improbable events (approximately 8×10^{-7} per flight hour). The precheck function, which is performed automatically in the Model EMB-145 series airplanes when pressure is first applied at the refueling panel adaptor, fully tests the shutoff function prior to the start of refueling. This serves to limit the exposure time for shutoff system failures to the time between the precheck and the tank becoming full (approximately 20 minutes to completely refill the wing and fuselage/ventral tanks).

Embraer maintains that the principal hazard from lack of dedicated failure indication is the fire hazard from the excess fuel routed through the vent system after shutoff failure. This fuel exits the vent system at the vent outlet near the wingtip. The Model EMB-145 series airplanes, like other transport airplanes, are designed with the assumption that the atmosphere in and around the vent system is always flammable.

The remaining ignition hazard during refueling is due to external sources, principally service vehicles such as refueling trucks, catering vans, etc. While there is no way for the EMB-145 design to fully prevent possible ignition from these external sources, the airplane is less susceptible to this scenario than larger commercial transports. The wingtip location of the fuel vents is only about 6.5 feet above the ground, which prevents most service vehicles from driving under the wing and serves to keep them a further distance away from the airplane due to the increased danger of aircraft damage from service vehicle accidents. The vent outlets for the auxiliary tanks are on the lower fuselage near the wing where they are even further from external ignition sources.

Interim Hazard Mitigation

The parking of any kind of vehicle or equipment inside the areas of fuel discharge will be prohibited during the airplane refueling operation. There will be a placard in the refueling station instructing this procedure to the operators. This will serve to minimize the presence of an ignition source external to the airplane near the vent outlets.

The attached sketches show the EMB-135BJ and EMB-145XR areas of fuel discharge in the event of fuel tanks overfilling and the placard that will be displayed in the refueling station.

Petitioner's Public Interest Statement

Embraer states that granting this time-limited exemption would be in the public interest for the following reasons:

1. The probability of a failure of the automatic refueling shutoff provisions in the Model EMB-145 series airplanes has been demonstrated to be well into the improbable range based on service history. Such a failure would have to be coupled with the presence of an external ignition source to pose any hazard.
2. The hazard to passengers is minimal since operators typically do not refuel the airplane with passengers on board.
3. Other airplanes with similar refueling panel designs have been in commercial service for a long time with acceptable service history.
4. The denial of this petition for exemption would result in the delay of certification and delivery of a significant number of Model EMB-135BJ and EMB-145XR series airplanes. While these airplanes are not manufactured in the United States, a significant portion of the airplane, including the engines, avionics, and interiors, are manufactured by American suppliers. Denial of this exemption request would result in the loss of revenue for the American suppliers and have an adverse impact on the American balance of trade, both of which are counter to the public interest.
5. Embraer's customers have made fleet schedule plans based on the agreed-upon delivery schedule of these airplanes. To require Embraer to modify these airplanes prior to service entry will unavoidably delay delivery and require our customers to cancel flights and to take other actions that will impose significant financial penalties on their businesses as well as impose inconvenience and potential lost-time costs to the traveling public. This action would be counter to the public interest.

Notice and Public Procedure Provided

The FAA has determined that good cause exists for waiving the requirement for Federal Register publication for the following reasons:

1. The petition for exemption was submitted in a timely manner from the time the petitioner was advised that their airplanes were noncompliant.
2. Any delaying action will affect the petitioner adversely.
3. Although the waiver of publication will set a precedent, that is mitigated by Embraer's agreement to bring these two new model airplanes into compliance.

FAA's Analysis of the Petition

After reviewing the applicant's information, and relying on the service histories of the Model EMB-145 and EMB-120 series airplanes, which have a similar system, we accept their findings and concur with their conclusion that any risk inherent in the design of these airplanes exists only during the approximately 20 minutes the refueling takes place.

Section 25.979 of 14 CFR part 25, at Amendment level 25-72, dated July 20, 1990, requires that pressure refueling systems automatically shut off fuel flow at the maximum quantity for each fuel tank to protect the tanks from overpressure due to overfilling. In addition, the rule addresses failures of the automatic shutoff system by requiring that it can be functionally checked prior to refueling, that the failure of the shutoff function be indicated at each fueling station, and that a means be provided to prevent structural damage from the overpressure effects of failure to shut off the refueling flow.

As the applicant noted in their supporting material, the Model EMB-135BJ and EMB-145XR series airplanes, which have similar refueling panel displays (other than the differences associated with the differences in fuselage/ventral tank configuration), have a refueling system that meets the requirements of § 25.979 with the exception of the requirement for the failure indication. The refueling system of the Model EMB-135BJ and EMB-145XR series airplanes provides an automatic shutoff of fuel when the tank reaches the maximum quantity approved for that tank. Prior to refueling, the system performs a complete precheck for appropriate shutoff operation, including the simulation of a high fuel level, to ensure that the automatic shutoff is functioning properly. To protect against structural damage from overpressure of fuel should the system fail, the vent system of the airplane has been sized to safely relieve refueling pressure.

The EMB-135BJ and EMB-145XR systems do not provide a dedicated failure indication (“FAIL” light or flashing fuel quantity indications are common failure indications) that activates if the automatic shutoff provisions fail to terminate the refueling flow at the maximum quantity. Failure indication is intended to alert the person conducting the refueling that the system has failed so that the refueler may shut off the refueling flow at the fuel source.

Should the automatic shutoff function fail after the precheck, during the approximately 20 minutes while the airplane is being refueled, there would be no indication of the failure. The possibility would exist for overfilling the fuel tanks. Excess fuel would be routed through the vent system and exhausted through the vent outlets (near the wingtip in the event of failure of the wing tank shutoff or through fuselage vent outlets if the shutoff failure is in the ventral/fuselage tanks). Consequently, the danger arising from this system configuration is not overpressure to the fuel system and structure, but the fuel spilled from the venting system that may be exposed to an ignition source outside of the airplane.

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

FAA Analysis - Public Interest

The petitioner has committed to redesign, test, and certify a pressure refueling system that will detect failure of the automatic shutoff system to stop refueling flow when the quantity reaches the maximum approved for that tank and provide failure indication at the refueling panel. The failure indication will alert the refueler to shut off the refueling flow. The petitioner has committed to bringing this new design into the EMB-135BJ and EMB-145XR production lines no later than June 30, 2003, and having it incorporated into the Model EMB-135BJ and EMB-145XR series airplane fleets no later than June 30, 2004.

The present design of these two airplanes includes an automatic precheck for the automatic shutoff function before refueling begins. In our analysis of this system as it compares to the design requirements, the time element of risk for fuel overflow is limited to the approximately 20-minute period during which refueling takes place. Should the automatic shutoff fail during that time, excess fuel would be expelled from the airplane through vent outlets in the wingtip or the fuselage. To alleviate the hazard from this possibility during the interim period between certification of the airplanes and their retrofit with a new refueling system, any possibility of an ignition source for spilled fuel must be addressed. The FAA will require placards prohibiting the presence of vehicles and equipment in potential fuel spill areas during refueling. The design of the airplanes also serves to limit potential ignition hazards, since the low height of the wings makes it unlikely that vehicles will drive underneath them into potential fuel spillage areas.

The cost of delivering airplanes affects not only the manufacturer, but the operators, and the operators' ability to acquire new technology. Delays in acquiring new airplanes for an operator's fleet also begin to affect the public's ability to travel around the country easily, as well as affecting the members of the American public who are involved in airplane manufacturing.

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

FAA Analysis - Effect on Safety

As discussed above, the fueling systems on these airplane models have features in place to prevent over-fueling situations, although there is no dedicated indication if those safety features fail. While such a system does not meet the design standards set forth in 14 CFR § 25.979(b)(2), we have determined that this design will not adversely affect safety for the limited time of exposure ending June 30, 2004.

The petitioner has committed to redesigning and certifying a pressure refueling system that will detect failure of the automatic shutoff system and indicate such failure at the refueling panel. Moreover, the petitioner has committed to incorporating the redesigned system into production airplanes no later than June 30, 2003 and retrofitting airplanes that did not have the redesigned system installed no later than June 30, 2004. Given the short implementation period for the petitioner's commitments, combined with the safety features already installed on the fueling system, the historically low overfueling events for similar models, and the interim limitations designed to minimize the presence of external ignition sources by designating prohibited areas around the airplane, the Model EMB-135BJ and EMB-145XR series airplanes should maintain a higher level of safety than other commercial service airplanes with earlier certification bases that are still in operation.

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

The Grant of Exemption

In consideration of the foregoing, I find that a grant of exemption is in the public interest and will not adversely affect safety. Therefore, pursuant to the authority contained in 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, Embraer Empresa Brasileira de Aeronáutica S.A. (Embraer) is granted an exemption with time-limited conditions from § 25.979(b)(2) to the extent necessary to allow type certification of the Embraer Model EMB-135BJ and EMB-145XR series airplanes with a pressure refueling system not in compliance with the requirements of § 25.979(b)(2) as they relate to the indication of failure of the shutoff means. For the Model EMB-135BJ and EMB-145XR series airplanes, this exemption is subject to the following conditions and limitations:

1. Embraer must certify and incorporate into the production line requirements a pressure refueling panel, fully compliant with the requirements of § 25.979(b)(2), into the Model EMB-135BJ and EMB-145XR series airplanes no later than June 30, 2003.

2. Embraer must retrofit the Model EMB-135BJ and EMB-145XR series airplanes delivered under the terms of this exemption with the new pressure refueling panel described in Condition 1 above no later than June 30, 2004.
3. Until the incorporation of the changes required in the above Conditions 1 and 2 of this exemption has been completed, Embraer must display the attached (Figure 3) placard at each of the refueling stations and add to the airplane flight manual (AFM) "Limitations" section for the Model EMB-135BJ and EMB-145XR series airplanes the limitation prohibiting any kind of vehicle or equipment inside defined areas of fuel vent discharge during airplane refueling operations.
4. For airplanes subject to Condition 2 of this exemption, the operating limitations section of the airplane flight manual (AFM) must include the following statement:

"No person may operate this airplane after June 30, 2004, unless the pressure refueling panel has been modified in accordance with the terms of Exemption No. 7909."

This statement may be removed from the AFM after the required modification has been made.

Issued in Renton Washington on October 18, 2002.

/s/Ali Bahrami

Ali Bahrami
Acting Manager
Transport Airplane Directorate
Aircraft Certification Service

FIGURE 1 – EMB-135BJ SHADOW AREAS

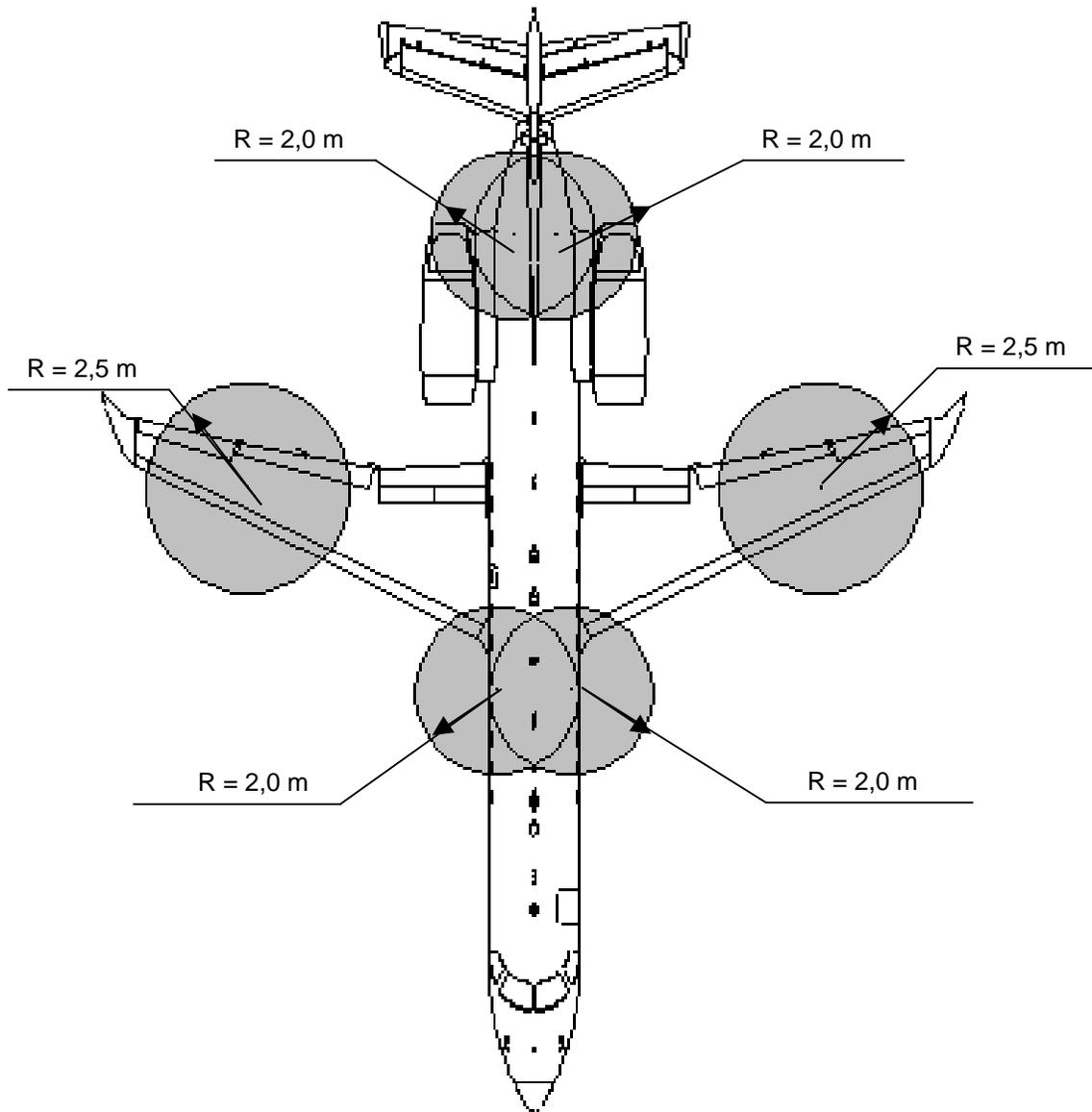


FIGURE 2 – EMB-145XR SHADOW AREAS

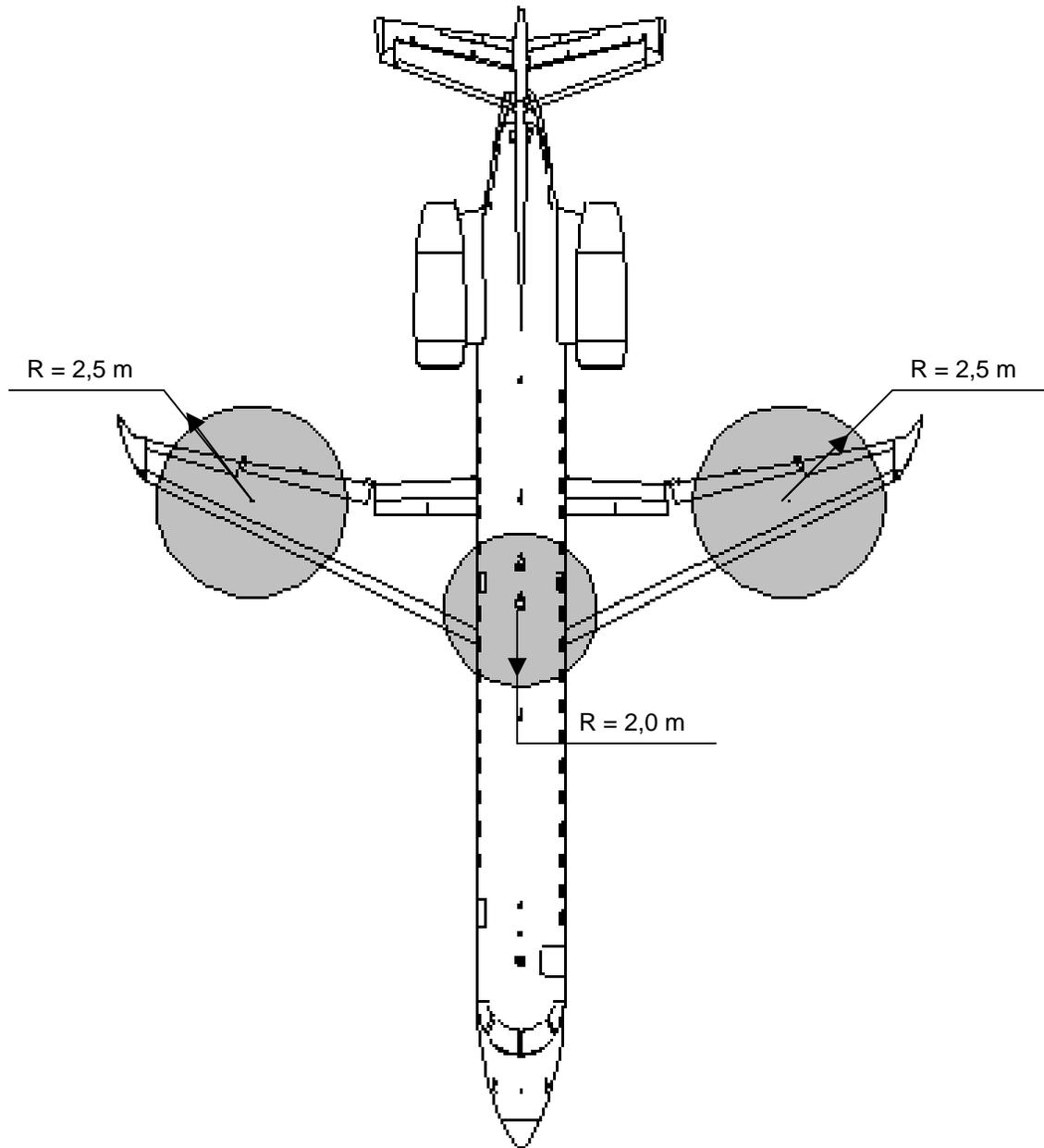


FIGURE 3 – Refueling Station Placard

CAUTION

During refueling operation keep the shadow areas in the figure free of vehicle and equipment.

Aircraft figure:

- . Figure 1 – EMB-135BJ
- . Figure 2 – EMB-145XR