

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
KANSAS CITY, MISSOURI 64106

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In the matter of the petition of *
*
BRITISH AEROSPACE *
*
for an exemption from § 23.807(d)(1)(ii) *
of the Federal Aviation Regulations *
*

Regulatory Docket No. 042CE

GRANT OF EXEMPTION

By letter dated 31 July 1987, Mr. B.J.G. Asbeek Brusse, on behalf of the British Aerospace Public Limited Company, Civil Aircraft Division, Prestwick Airport, Ayrshire KA9 2RW, England, petitioned for an amendment to Exemption No. 3548 to permit certification of the Jetstream 3200 Series Airplanes in the commuter category with a single, larger overwing exit on the side opposite the passenger entrance door in lieu of the required two smaller exits.

Sections of the FAR affected:

Section 23.807(d)(1)(ii) requires, for commuter category airplanes having a total passenger seating capacity of 16 through 19, three emergency exits, one on the same side as the passenger entrance door and two on the side opposite the door. The Jetstream 3200 Series Airplane is designed with one emergency exit on the same side of the cabin as the passenger entrance door and one emergency exit on the side of the cabin opposite the door. The petition for exemption relates only to that portion of § 23.807(d)(1)(ii) that requires two emergency exits on the side of the cabin opposite the passenger entrance door.

The Petitioner's supportive information is as follows:

Substantial portions of the petitioner's supportive information are included verbatim herein:

"BACKGROUND

"On 30 November 1982, Jetstream Model 3101 was granted an Amended Type Certificate under the rules of SFAR 41. This certification included a Grant of Exemption No. 3548 from Section 5(e) paragraph (g) of SFAR 41 which, as applied to Jetstream, requires three emergency exits that provide a clear and unobstructed opening large enough to admit a 19-by-26 inch ellipse in addition to the passenger entrance door.

"The Exemption enabled the aircraft to be certificated with two exits meeting the standards of FAR 25.807 for airplanes with a passenger seating capacity of 10 through 19. These require at least one Type III (20-by-36 inch rectangular opening) emergency exit per side. In the case of Jetstream Series 3100 these requirements are met by a main external access door of size 34-by-54 inch situated at the rear left side of the cabin and an overwing emergency exit of size 22-by-37 inch situated at the right side of the cabin.

"In February 1987, British Aerospace submitted an application for an Amended Type certificate for Jetstream Series 3200 to the rules of the Commuter Category of FAR Part 23 amendment 23-34. This application cited Exemption No. 3548 in the proposed Certification Basis, since it was viewed that the Exemption would apply equally to the similar rules for Emergency Evacuation and Emergency Exits of FAR Part 23. It was not until the end of April 1987, that British Aerospace was informed by FAA that all Exemptions previously granted would require re-submission and re-investigation for Commuter Category certification. This was confirmed at the Type Familiarisation meeting held at Prestwick in June 1987. Jetstream Series 3200 retains all the basic features of Jetstream Series 3100 to which Exemption No. 3548 applies in so far that it differs in essence only by an increase in maximum takeoff weight and installed power. It has identical passenger seating configuration and capacity of the Jetstream 3101 Airplane.

"The Commuter Category of FAR Part 23 includes under Sections 23.783 Doors, 23.803 Emergency Evacuation, 23.807 Emergency Exits and 23.815 Width of Aisle standards identical to those of SFAR 41 Section 5(e) with the addition of a single paragraph 23.807(d)(2) which specifies "A means to lock each emergency exit and to safeguard against its opening in flight, either inadvertently by persons or as a result of mechanical failure. In addition, a means for direct visual inspection of the locking mechanism must be provided to determine that each emergency exit for which the initial opening movement is outward, is fully locked."

The equivalency of these standards is therefore as follows:

Section 23.783 Doors

- Paragraph (a) and (b) are unchanged from the earlier standard referenced in SFAR 41 § 5(e).
- Paragraph (c)(1) is identical to SFAR 41 § 5(e), paragraph (b).
- Paragraph (c)(2) is identical to SFAR 41 § 5(e), paragraph (c).
- Paragraph (c)(3) is identical to SFAR 41 § 5(e), paragraph (e).
- Paragraph (c)(4) is identical to SFAR 41 § 5(e), paragraph (f), except for editorial changes of the paragraph reference numbers.

Section 23.803 Emergency Evacuation.

This section is identical to SFAR 41 § 5(e), paragraph (h).

Section 23.807 Emergency Exits.

(a) Number and Location

- Paragraph (a)(1) remains unchanged from the pre-amendment 23-34 standard.
- Paragraph (a)(3) remains unchanged from the pre-amendment 23-34 standard.

(b) Type and Operation

This section remains unchanged from the standard referenced in SFAR 41 § 5(e).

(c) Tests

This section remains unchanged from the standard referenced in SFAR 41 § 5(e).

(d) Doors and Exits

- Paragraph (d)(1) is identical to SFAR 41 § 5(e) paragraph (g), (except that under (g)(3) the SFAR 41 contains a rule for a seating capacity in excess of 23)
- Paragraph (d)(2) is new and is identical to the equivalent section of FAR 25.809(d), with which Jetstream complies under the terms of the Exemption
- Paragraph (d)(3) is identical to SFAR 41 § 5(e) paragraph (i)
- Paragraph (d)(4) is identical to SFAR 41 § 5(e) paragraph (j)

"Section 23.815 Width of Aisle

"This section is identical to SFAR 41 § 5(e) paragraph (k).

"The petitioner therefore submits that the safety finding of Grant of Exemption No. 3548 for Jetstream Series 3100 from the stated standards of SFAR 41 are equally applicable to Jetstream Series 3200 to the standards for Doors, Emergency Evacuation, Emergency Exits and Width of Aisle of the Commuter Category of FAR Part 23.

"Secondly, the petitioner submits that the operational experience of Jetstream Series 3100 during four years of intensive commuter operations amounting to nearly half a million flight hours has confirmed the safety of the emergency evacuation and emergency exit design of the airplane, and that therefore the imposition of greater weight and operating costs associated with a change of the emergency exit design to incorporate three small emergency exits in addition to the main external access door cannot be justified on the grounds of safety.

"The petitioner therefore sees no valid technical reason why the Grant of Exemption No. 3548 for Jetstream Series 3100 from the stated standards of SFAR 41 should not be amended to exempt Jetstream Series 3200 from the identical rules of the Commuter Category of FAR Part 23.

"SUPPORTING STATEMENT

"Nevertheless and without prejudice to the above submissions, British Aerospace have decided to introduce further enhancements to the emergency evacuation and exit design of Jetstream Series 3200 and to make the airplane conform more closely to the standards specified for the Commuter Category of FAR Part 23, by the installation of a further overwing emergency exit on the same side of the passenger compartment as the main external access door. This emergency exit will be of a size and shape specified for a Type IV exit in FAR 25.807(a)(4) and (b) as amended through amendment 25-46, and therefore sufficient to provide a clear and unobstructed opening large enough to admit a 19-by-26 inch ellipse conforming to the standard of FAR 23.807(b). This additional exit will therefore ensure that the left side of the airplane conforms totally with the standards of FAR 23.807 in terms of Number and Location, Type and Operation, Tests and the additional Doors and Exits standard for Commuter Category airplanes.

"British Aerospace wish to retain the single larger 22-by-37 inch rectangular overwing emergency exit of Jetstream Series 3100 provided on the right side of the passenger compartment opposite the main external access door and meeting the standards of FAR 25.807 (c)(1) as amended through amendment 25-46 for airplanes with a passenger seating capacity of 10 through 19. These standards require at least one Type III (20-by-36 inch rectangular opening) emergency exit per side conforming to the requirements of FAR 25.807(a)(3) and (b), as amended through amendment 25-46. A change from this present configuration would be incompatible with the standards for Emergency Evacuation and Emergency Exit of the Country of Origin, which for Type, Location, Number and Arrangement of Exits are essentially those of FAR Part 25. These standards do not recognize the Type IV (19-by-26 inch) size of emergency exit for airplanes with a passenger seating capacity of more than nine.

"Also, the structural configuration of the aircraft and in particular the layout of the fuselage frames in relation to the wing chord at the body side and the physical dimensions of the wing root do not permit the installation of two overwing emergency exits with adequate safety in terms of sufficient step-down area and clearance to the wing leading edge or trailing edge. Such an installation would be expected to lead to injury to passengers through falls from the leading or trailing edges and potential conflict with propeller blades.

"SAFETY ASSESSMENT

"British Aerospace submit that the total safety of the emergency evacuation and emergency exit design conferred by the single Type III overwing emergency exit at the side of the passenger compartment opposite the main entrance door is superior to that of two smaller exits installed to the standards of FAR 23.807 for the following reasons.

"1. The exit provided has dimensions 22 inch wide and 37 inch high with 6 inch corner radii, which exceed the minimum dimensions specified in FAR 25.807(a)(3) for a Type III exit (20 inch wide by 36 inch height). The exit provides a net aperture of 783 square inches, which is greater

than the total aperture of 776 square inches provided by two elliptical overwing exits as specified in FAR 23.807 (19 inch by 26 inch). The step-up to this exit from the cabin floor is 19 inches whilst the step-down to the wing surface is 16 inches, both these dimensions being less than those permitted by FAR 25.807(a)(3) for a Type III exit (20 inch step-up, 27 inch step-down).

"There are no equivalent step-up and step-down dimensions quoted for the smaller exits specified in FAR 23.807, but since these are generally disposed about the cabin windows they tend to be significantly higher, the only criteria being that the exits "be readily accessible, requiring no exceptional agility."

"For comparison, in the case of the Type IV emergency exit provided on the entrance door side of the passenger compartment of Jetstream Model 3201 the step-up from the floor is 27 inches and step-down to the wing is 24 inches. As a matter of guidance, FAR 25.807(a)(4) includes maximum dimensions of 29 and 36 inches respectively.

"British Aerospace submit that by virtue of its large aperture size, low sill height and door-like qualities, the egress rate of passengers through this single Type III overwing emergency exit is greater than the total possible through the two smaller exits of FAR 23.807. Equally importantly, the large exit will permit rapid egress by the more elderly and less agile passengers, and by mothers carrying infants, as shown during the Emergency Evacuation demonstration carried out by British Aerospace at the time of first certification of Jetstream Series 3100 using a mix of passengers as specified in FAR 25.803(c)(8).

"In a recent demonstration carried out in daylight conditions using a sample of company employees, of whom nobody was wearing skirts, the time for 21 occupants to pass through the larger exit was 30 and 33 seconds and through a single small exit 67 and 70 seconds. Clearly, under adverse night conditions, with a proportion of less agile passengers, the comparative performance of the large exit would be even more favourable.

"2. The movement of passengers to the Type III overwing exit is facilitated by the stand-up headroom of Jetstream (71 inches), the wide main aisle width (12 inches below a level 25 inches above the floor compared with a 9 inch minimum standard of FAR 23.815) and the wide and unobstructed access to the exit made possible by the pitching of the seats adjacent to the exit. These seats are arranged to conform to the requirements of Airworthiness Notice No. 79 of the Civil Aviation Authority of the United Kingdom to achieve a cross aisle width of 11 inches, which is greater than the minimum main aisle width specified in FAR 23.815. It should be noted that this standard was introduced on Jetstream Series 3100 at initial certification and is greatly superior to the certification standards in force at that time. Since then it has become mandatory in the United Kingdom for airplanes carrying 20 or more passengers following the accident to a Boeing 737 at Manchester Airport.

"Generally, the overall configuration of the passenger compartment of Jetstream, by virtue of its greater headroom, cabin cross section and

aisle width provides greater ease of movement than in other airplanes certificated to the earlier SFAR 41 rules for Doors and Exits (which are similar to those of the Commuter Category of FAR Part 23) whilst the shorter length of the Jetstream cabin ensures that no occupant is more than three seat rows away from the nearest exit.

"Under adverse night-time conditions the movement of passengers to the emergency exits is helped by the Emergency Lighting System which provides an adequate level of illumination of the cabin in addition to the exit locator signs. These signs have been disposed to permit visual and tactile location of the exits under conditions of dense smoke. The Emergency Lighting System is self activating following failure of the power supply to the normal cabin lights and remains effective for a minimum period of 10 minutes. These provisions are considerably more thorough than those of FAR 23.807 which are limited to an illuminated sign at each exit.

"3. The single Type III overwing exit and the associated reflective escape route conforming to the standard of FAR 25.803(e) ensure a clear and unambiguous route for escaping passengers under all conditions including adverse night-time conditions when movement of escaping occupants is eased by spillage of light from the interior Emergency Lighting System.

"British Aerospace are concerned that the provision of more than one overwing exit at any one side of the fuselage, the lack of adequate clearance of such exits to the leading or trailing edges of the wing and the absence of a marked escape route under FAR 23.807 regulations, may lead to a conflict of escaping occupants on the confined inner wing of the airplane with attendant risk of persons falling from the leading edge and sustaining injury from propeller blades.

"4. Safety features additional to those prescribed in FAR 23.807 have been incorporated in the design of the emergency exits.

"4.1 The emergency exits are easily openable from inside and outside the airplane within 10 seconds of actuation of the handle. Opening of the overwing exits from inside the airplane is helped by Instruction Placards clearly indicating the method of opening and disposal of the exits. These placards are located in a prominent position in front of and clearly visible to the occupant of the seat at the exit.

"4.2 A self-illuminated interior operating handle permits easy identification under adverse night-time conditions.

"4.3 Fixed seat backs are fitted to the seats adjacent to the overwing emergency exits.

"4.4 The design of the exits has been examined for freedom of jamming resulting from fuselage deformations which may arise during a minor crash landing. In fact, proper opening of both the main entrance doors and of the Type III overwing exit has been demonstrated during the limited number of accidents which Jetstream aircraft have suffered during more than 15 years of service. During a recent major, but non-

fatal, accident at New Orleans airport, the impact was of sufficient severity to displace the inner right wing and nacelle across the overwing exit, preventing its use. It was concluded that two exits mounted in close proximity over the wing would have been similarly obstructed. It is worthy of note that in this extreme condition with major damage to the fuselage structure, the main entrance door remained openable.

"5. An emergency evacuation demonstration using the single Type III overwing emergency exit to the stricter standards of FAR 25.803(c) was successfully conducted at the time of certification of Jetstream Series 3100, evacuation being completed within 73 seconds including 8 seconds to open and dispose of the exit hatch. This demonstration was witnessed by the Civil Aviation Authority of the United Kingdom on behalf of the FAA under the terms of the US/UK Bilateral Agreement. Another successful emergency evacuation demonstration took place later at Atlanta as part of the Grant of Exemption No. 4130 which permitted a narrower width of aisle at levels higher than 25 inches above the floor. In this demonstration, witnessed by the FAA, evacuation was completed in 52.6 seconds including 9.5 seconds to open the exit.

"During these demonstrations the flight crew evacuated the airplane with the passengers through the cabin exits. However, the flight deck direct vision windows can be used by flight crew for emergency evacuation.

"In tests, two crew have evacuated the flight deck in less than 15 seconds. In fact this method was used by both flight crew members during the major accident at New Orleans airport.

"PUBLIC INTEREST

"If strict compliance with the requirements of the Commuter Category of FAR part 23 was to be imposed on Jetstream Series 3200, then the large overwing emergency exit installed at the right hand side of the passenger compartment would have to be replaced by two smaller emergency exits. British Aerospace submit, on the basis of the test demonstrations and accident experience of Jetstream, that such an arrangement would be likely to reduce the overall passenger safety and is therefore not in the interest of the traveling public.

"Furthermore, technically unjustifiable and substantial additional costs, weights and delays in the certification of Jetstream Series 3200 would be incurred, particularly since the structural layout of the airplane does not permit a satisfactory installation of two overwing emergency exits on one side of the passenger compartment. The resulting additional initial and operating costs and weights are not in the interest of the traveling public."

Comments to published petition summary:

A summary of this petition was published in the FEDERAL REGISTER (October 8, 1987; 52 FR 37699) as a means of advising the public of the requested petition for exemption and to permit interested persons an opportunity to comment on the petitioner's request. The comment period was open for 20 days and closed October 28, 1987.

On October 26, 1987, Mr. W. J. Dwyer, on behalf of Fairchild Aircraft Corporation, petitioned for an extension of the 20-day comment period to allow Fairchild the opportunity to prepare a position on the petition for exemption.

After consideration of the petition of Fairchild Aircraft Corporation, the FAA reopened the comment period for an additional 60 days to allow Fairchild and other interested parties sufficient time to comment on the BAe petition for exemption. That reopening of comment period was published in the FEDERAL REGISTER (December 10, 1987; 52 FR 46879) and the comment period closed February 8, 1988. Comments were received from Fairchild Aircraft Corporation, from British Aerospace in response to the comments of Fairchild Aircraft Corporation, and from Beech Aircraft Corporation. No other comments were received.

One commenter would not oppose the requested exemption, so long as British Aerospace could demonstrate that the level of safety is not degraded by the elimination of one emergency exit. That commenter suggests that British Aerospace conduct comparison emergency evacuation tests similar to those described in FAA Advisory Circular AC 23.807-1A for demonstration of equivalencies of emergency exit size and shape.

A second commenter argues that the successful completion of an emergency evacuation test should not be used to justify the omission of one emergency exit. To support this position, the commenter points to past FAA policy which states that compliance with one requirement may not be used as justification for deviation from another requirement.

In comments to the docket, BAe points out that they do not intend to use their successful demonstration of evacuation within 90 seconds as justification for the requested omission of one emergency exit. Further, BAe notes, and the FAA agrees, that Advisory Circular AC 23.807-1A applies to comparisons of size and shape of emergency exits -- not to the comparisons of the number of emergency exits.

In general, the FAA does not agree that one larger emergency exit provides the same level of safety as two smaller, but adequately sized, emergency exits. The results of comparative evacuation testing as suggested by one commenter would not, by itself, be conclusive, even if statistically reliable comparative results were developed based on a large number of evacuation tests. Further, the FAA intends to continue the past policy of not allowing compliance with one requirement to justify deviation from another requirement.

One commenter argues that the FAA fails to apply the same policies to foreign manufacturers as they do to domestic manufacturers. That commenter lists as examples the grant of Exemptions 3548 and 4130 applicable to the BAe 3100 Series Airplanes and the denial of Exemption 4818 applicable to the Beech 300 Series Airplanes.

The FAA has reviewed the examples listed by the commenter. Exemption 4130 was granted to Eastern Metro Express (a domestic company) to permit issuance of a supplemental type certificate (STC) applicable to the BAe

3101 Series Airplanes having an aisle width less than the aisle width imposed as a limitation in Exemption 3548. Exemption 3548 imposed an aisle width greater than that required by SFAR 41, and the aisle width permitted by Exemption 4130 is also greater than that required by SFAR 41. Conversely, the aisle width proposed on the Beech 300, which was subsequently denied by Denial of Exemption 4818, was less than that required by SFAR 41.

Also, Grant of Exemption 4130 states that the FAA ". . . determined that the proposed interior passenger cabin safety system; i.e., type, number, and location of emergency exits, emergency lighting, emergency exit marking, emergency exit access, etc., maintains the level of safety set forth by the airworthiness standards for . . . SFAR 41 This determination is based upon showing compliance with standards more stringent than required by SFAR 41." Grant of Exemption 4130 goes on to note that the emergency evacuation tests accomplished by Eastern Metro Express were used to show compliance with the requirements of SFAR 41.

Another commenter would not oppose the requested exemption provided the FAA applies the same policies to the foreign applicant as have been applied to domestic applicants. That commenter lists Boeing and Fairchild as examples where the FAA has opposed the deletion of unrequired emergency exits that were in full compliance with the regulations.

The FAA recognizes the apparent similarity in the examples listed by the commenters and has considered these examples in the disposition of this petition.

One commenter questions the legality of extending Exemption 3548 to the BAe 3200 Series Airplanes as requested by BAe. For the reasons listed in the FAA analysis portion of this exemption, the FAA agrees that it is inappropriate to extend Exemption 3548 to the BAe 3200 Series airplanes. This petition for exemption is processed accordingly.

One commenter argues that Exemption 4130 was granted to Eastern Metro Express simply because comparative emergency evacuation tests pursuant to SFAR 41 were conducted. That commenter questions the FAA decision to grant Exemption 4130, especially in light of current FAA policy regarding compliance with one requirement not being used as justification for deviation from another requirement.

The FAA disagrees. As previously discussed in this exemption, the emergency evacuation test referenced in Exemption 4130 was used to show compliance with SFAR 41 and was not the basis for the exemption.

One commenter contends that Exemption 3548 contributes unfairly to Jetstream's competitive economic advantage. In support of this contention, the commenter quotes the portion of Exemption 3548 where the FAA concluded ". . . that requiring petitioner to add two more emergency exits to these aircraft would cause an increase in airplane weight and operating costs and a delay in the certification program" The commenter argues that the Jetstream 3100 is an effective competitor which has won many sales away from domestic manufacturers. The commenter

claims that Jetstream benefits from a product that can be delivered at a lower cost and which benefits from low cost, government-supported financing.

Another commenter contends that Exemption 3548 and Exemption 4130 are examples of giving foreign manufacturers an unfair competitive advantage over U.S. manufacturers.

In comments to the docket, BAe disagrees that Exemption 3548 contributed unfairly to Jetstream economic advantage. Further, they contend that BAe does not benefit from government-support either in manufacture or in financing; and that the Jetstream is not delivered to U.S. customers at a lower price than the equivalent domestic product.

The FAA has considered the comments on this issue, and the potential economic impact imposed on the petitioner, or on other manufacturers who produce similar products, as a result of disposition of this petition for exemption.

The FAA recognizes that the omission of an emergency exit, especially in a pressurized fuselage, can result in substantial weight savings, in reduced design costs, and can provide lower operational costs. Neither the petitioner nor the commenters have provided the FAA with sufficient data to quantify these reductions.

Historically, the FAA has used previously granted exemptions as the basis for initiating changes to the Federal Aviation Regulations; so long as those changes do not result in a reduction in the level of safety. In the case of the number of emergency exits required for commuter category certification, the FAA is considering a rule change to provide for compliance either with the requirement as it currently exists, or at the manufacturer's option, with requirements which impose additional airworthiness requirements intended to compensate for fewer, but larger sized, emergency exits.

Compliance with these additional airworthiness requirements may, or may not, reduce the overall cost of the product. However, the FAA expects that any economic advantage gained will be minimized. Further, if the optional approach to the number of emergency exits becomes a part of the airworthiness requirements for the commuter category, the option will be available to all applicants, domestic or foreign.

One commenter notes BAe's intent to demonstrate compliance with certain Part 25 requirements. That commenter notes that current FAA policy prohibits the use of Part 25 rules for demonstrating compliance on a Part 23 airplane. Further, the commenter notes that FAA policy dictates that special conditions must be issued if the necessary rules are not included in the certification basis. The commenter provides two examples where the FAA has either written special conditions (or has suggested special conditions) as the regulatory basis for installation of emergency lighting. The commenter states that this policy is unfortunate since it can prevent manufacturers from installing additional safety features on their products. The commenter argues that policy should nonetheless be applied impartially and consistently to both foreign and domestic applicants.

The FAA has reviewed the applicability of the referenced FAA policy and the specific examples identified by the commenter. In both cases, the installation of emergency lighting on an SFAR 41 airplane was at issue. In one case, an applicant petitioned for an exemption from the aisle width requirements of SFAR 41 and offered emergency lighting as a compensating feature. In the other case, another applicant intended to provide emergency lighting for use during the required emergency evacuation demonstration.

In the first case, the FAA denied the petition for exemption (Denial of Exemption No. 4818; Beech Aircraft Corporation) stating:

"The petitioner has not provided sufficient evidence for allowing the exit lighting system on the Model 300 to be used as a compensating factor for exemption to the aisle width requirements of SFAR 41C 5(e)(k). The FAA is aware that the lighting available during an emergency, as well as the available aisle width, has an effect on the ability to egress the airplane in the emergency. However, the ability of available lighting to compensate for aisle width restriction is a complex issue which has not been demonstrated by the petitioner. The fact that the exit marking system exceeds the illumination requirements of SFAR 41C 5(e)(i) is not justification for using this lighting as a compensating factor for exemption to the aisle width requirements."

The FAA views the requirements of aisle width and emergency evacuation as separate, although related, requirements. Since each requirement represents a "minimum standard" as "required in the interest of safety," the FAA expects compliance with each requirement. Exceeding one requirement is not justification for noncompliance with another. The installation of emergency lighting would affect the evacuation demonstration, but as stated in Denial of Exemption 4818, the ability of available lighting to compensate for aisle width restrictions was not demonstrated by the petitioner.

In the second case, Fairchild Aircraft Corporation was issued special conditions (52 FR 37599) which provided requirements for an emergency lighting system on their Model SA227-AC Airplanes. These special conditions apply to an emergency lighting system if that emergency lighting system is "used as an aid in showing compliance with any applicable regulatory requirement, including emergency evacuation demonstrations."

The requirements listed in the certification basis for the Model SA227AC requires that an emergency evacuation demonstration be conducted under simulated night conditions using participants representing average airline passengers. The evacuation must be completed within 90 seconds. Advisory Circular AC 20-118A allows the use of emergency lighting systems if they are approved. Otherwise, the evacuation demonstration is conducted without the use of the emergency lighting system.

Clearly, if the emergency evacuation demonstration can be successfully completed, in compliance with the requirements, without the use of the emergency lighting system, then no special airworthiness requirements for

that system are necessary. However, if the use of the emergency lighting system is necessary to show compliance with the required emergency evacuation demonstration, the FAA defines minimum airworthiness requirements for the system and establishes those requirements in the form of special conditions. Special conditions are necessary since the existing requirements envisioned designs that would permit evacuation without the need for emergency lighting.

Relative to the comment concerning the use of Part 25 requirements in a Part 23 certification basis, the FAA notes that the requirements for designating applicable regulations are in Part 21. As established under the provisions of § 21.101, an applicant must comply with either the regulations incorporated by reference in the type certificate or with the applicable regulations in effect on the date of the application, plus any other amendments the Administrator finds to be directly related. If the regulations incorporated by reference in the type certificate do not provide adequate standards with respect to the proposed change, the applicant must comply with the "applicable provisions of this subchapter"; and any special conditions, and amendments to those special conditions, which the Administrator finds necessary to provide a level of safety equal to that established by the regulations incorporated by reference in the type certification basis.

The words "the applicable provisions of this subchapter" in § 21.101 came from the recodification of the predecessor Civil Air Regulations (CAR) wording which was "with the provisions of this Part." To consolidate the procedural requirements into one Part (Part 21) during the recodification from separate Parts of the CAR, the wording was changed to "applicable provisions of this subchapter" which intends to mean the applicable Part. The applicability section in each Part prescribes the airworthiness standards for the issue of type certificates, and changes to those certificates, for a specified category of airplane; i.e., normal, utility, commuter, transport, etc. For an affected product category, the prescribed airworthiness standards are the regulations in the same Part and not in another Part for a different product category. For the case of emergency lighting, the FAA finds that special conditions are appropriate for the type certification basis since the airplane has novel or unusual design features not envisaged in the applicable airworthiness standards and the applicable standards do not contain adequate or appropriate airworthiness standards. Additionally, the FAA finds that special conditions are the appropriate vehicle to define airworthiness requirements for such emergency lighting systems in lieu of incorporating certain Part 25 requirements into a Part 23 certification basis.

In the case of this petition, special conditions will not be promulgated; but the additional airworthiness requirements defined in this exemption will be imposed instead. These additional airworthiness requirements provide appropriate standards for emergency lighting systems and become a part of the airplane certification basis in a manner similar to special conditions. Both special conditions and exemptions are rulemaking actions. Both respond to public comments and both are appropriate vehicles to provide standards for certification. The FAA finds that the additional airworthiness requirements imposed by this exemption are an appropriate method for the Model 3200 Series Airplane in lieu of special conditions.

One commenter notes the BAE statement that the requirement for continued operation of the emergency lighting system after a single transverse separation of the fuselage, during a crash landing, should not be applied. That commenter agrees with petitioner. However, since the FAA imposed the transverse separation requirement on Fairchild Aircraft Corporation, the commenter states that the requirement should apply to the Jetstream.

The FAA is aware that the special conditions applicable to the Fairchild Model SA227-AC Airplane (52 FR 37599) imposed the transverse separation requirement to the emergency lighting system. The FAA disagrees that such a requirement is unnecessary.

On December 14, 1987, a British Aerospace Model 3101 Airplane was involved in a survivable crash landing in Joplin, Missouri. Preliminary investigation of the accident indicates that transverse fuselage damage, just forward of the wing, was of sufficient severity to provide an egress route for one of the survivors. The FAA finds that the transverse separation requirement is valid for airplanes of the size of the Model 3200. British Aerospace, in comments to the docket, contends that the Joplin accident was classified as "non-survivable" although all passengers and crew survived with few, relatively minor injuries. The FAA is not aware of the criteria used to classify the accident "non-survivable" nor did BAE provide information identifying the authority making the classification. Preliminary classification by both the FAA and the NTSB indicates that this accident was "survivable." The appropriate additional airworthiness requirements are imposed by this exemption accordingly.

One commenter notes petitioner's statement that it is impractical to locate two exits on the same side of the airplane and still be over the wing. That commenter states that § 23.807(d)(1) anticipated this situation by providing for alternate locations with acceptable means to assist the occupants in descending to the ground. In comments to the docket, BAE states "BAE still sees no possibility of designing an acceptable assist means from a standard elliptical exit which would be free of damage of collision with the propeller or free of conflict with the escape path from the second exit."

The FAA agrees with the commenter. The Federal Aviation Regulations are not intended to dictate specific designs; but they do define safety standards. In the case of § 23.807(d)(1), the requirement provides for exits in locations other than over the wing. The FAA recognizes that at this late date, changes in the design of the Model 3200 Airplane would be extremely complex, but the FAA does not find such a design change to be beyond the capability of current engineering principles.

The Federal Aviation Administration's (FAA) analysis is as follows:

To obtain the exemption, the petitioner must show, as required by § 11.25(b)(5) of the Federal Aviation Regulations, that: (1) granting the request is in the public interest, and (2) the grant of the exemption would not adversely affect safety, or that a level of safety will be

provided which is equal to that provided by the rule from which the exemption is sought.

The FAA has carefully reviewed all of the information contained in the petitioner's request for amendment to Exemption 3548. As noted by the petitioner, Exemption 3548 was granted June 10, 1982, and exempted British Aerospace Public Limited Company (BAe) from Section 5(e) paragraphs (g), (i), and (j) of Special Federal Aviation Regulation 41 (SFAR 41) to the extent necessary to permit the certification of its Model Jetstream 3100 Airplane and the recertification of its Model HP 137 Jetstream Mk. 1 Airplane to the requirements of SFAR 41 with one emergency exit (in addition to the main entry door) in lieu of three emergency exits as required by Section 5(e) of SFAR 41.

SFAR 41 expired September 13, 1983, and is no longer available as a basis for type certification (TC) of airplanes. The FAA has determined that existing SFAR 41 airplanes cannot be modified by amended TC or by supplemental type certification (STC) if those modifications increase the number of passengers or increase the gross weight of the airplane.

Since the BAe 3200 Airplane will have a higher gross weight than the 3101 Airplane, the 3200 cannot be approved as an amendment to the 3100 type certificate using SFAR 41 as the certification basis. Even though it is a derivative of the 3100 Airplane, the FAA views this airplane as a new design. As such, the 3200 Series Airplane will be approved in the commuter category, using Part 23, amendment 34 as the certification basis. Notwithstanding the similarity of the specific wording of certain requirements of the commuter category (including the section in question) to those in SFAR 41, the certification basis for the 3200 Series will be amendment 34 of Part 23 and not SFAR 41. Therefore, it is not appropriate to amend an exemption applicable to SFAR 41 to add an airplane having a commuter category certification basis. Thus, in lieu of amending Exemption 3548 as requested by petitioner, a new exemption is processed in response to the BAe petition.

The FAA does not agree that the single larger emergency exit proposed by British Aerospace provides a level of safety equivalent to that provided by the two smaller emergency exits required for 19-passenger commuter category airplanes. The probability of total exit blockage due to fire, crash damage, or other malfunctions, obviously is greater for one exit than for two. The results of comparative evacuation testing would not by itself be conclusive, even with statistically verifiable results based on a large number of evacuation tests.

The FAA recognizes, however, that the airworthiness requirements of Part 23 do not specify the exact location of the exits relative to how far apart they should be or whether one should be located in the forward portion of the cabin and the other in the aft portion. There is no specific requirement to preclude placing the two emergency exits immediately adjacent to one another, although some practical restrictions result from the exit access requirements of § 23.807(d)(4). The FAA recognizes that two 19-by-26-inch elliptical exits placed side by side would comply with Part 23, but that a single exit having dimensions large enough to circumscribe the two elliptical exits would not comply.

In the configuration proposed by BAe, the net area of the single exit exceeds the area provided by two 19-by-26-inch elliptical exits. However, the exit proposed by BAe is not sufficiently large to admit two such ellipses side by side. Therefore, the FAA does not find that the single exit proposed can be considered a direct replacement for the two exits required by Part 23.

The FAA has determined that the single larger emergency exit, along with the additional airworthiness requirements related to cabin safety imposed by this exemption, will compensate for the reduced level of safety caused by the elimination of one emergency exit.

In determining these additional airworthiness requirements, the FAA considered BAe's intention to comply with the transport category requirements of § 25.807 as it relates to the size and number of emergency exits. The FAA then identified other transport category requirements directly related to cabin safety which provide compensation for elimination of one emergency exit. These related transport category requirements form the basis for the additional airworthiness requirements imposed in this exemption. The FAA finds that: (1) by providing the increased airworthiness requirements for emergency landing conditions which give the occupant every reasonable chance of escaping serious injury in a minor crash landing, (2) by providing emergency exits of the size and with the step-up/step-down restrictions proposed by the petitioner, (3) by providing emergency exit markings to expedite locating the exits by the passengers and to expedite operation of the exits, (4) by providing wider aisle width and specific emergency access requirements which provide quick access to the exits, and (5) by providing emergency lighting to assist evacuation during night conditions; these additional requirements act in total to provide a level of safety which compensates for the elimination of one emergency exit.

FAA Exemption 3548 established the level of safety for SFAR 41 relative to passenger egress for the 3100 Series Airplane. The similarity of design between the 3100 Series and the 3200 Series Airplanes is sufficient to indicate that the addition of a second emergency exit, along with compliance with the airworthiness requirements described in this exemption, will not have an adverse affect on the level of cabin safety envisioned for the commuter category.

PUBLIC INTEREST

The FAA has reviewed the criteria the petitioner wishes to substitute for strict compliance with § 23.807(d)(1)(ii) in conjunction with the additional criteria itemized herein. The FAA has determined that these criteria, taken as a whole, satisfactorily compensate for the elimination of the second emergency exit in the cabin on the side opposite the main entry door and that these criteria have no adverse affect on the level of safety provided by the requirements of the commuter category relative to exit size, identification, lighting, access and operation.

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in Sections

313(a) and 601(c) of the Federal Aviation Act of 1958, as amended, delegated to me by the Administrator (14 CFR 11.53), British Aerospace Public Limited Company is hereby granted an exemption from § 23.807(d)(1)(ii) of the Federal Aviation Regulations to the extent necessary to permit the type certification of its Model 3200 Series Airplane with one emergency exit installed in the cabin on the same side as the main entrance door and one emergency exit installed in the cabin opposite the main entrance door provided the airplane type design is shown to comply with the following:

1. Emergency Landing Conditions

In addition to the ultimate inertia forces required by § 23.561(b)(2), amendment 23-34, the structure must be designed to give the occupant every reasonable chance of escaping serious injury in a minor crash landing when the occupant experiences an ultimate inertia force downward of 4.5g acting separately relative to the surrounding structure, or any lesser force that will not be exceeded when the airplane absorbs the landing loads resulting from impact with an ultimate descent velocity of five f.p.s. at design landing weight with the landing gear retracted.

2. Emergency Exits

- (a) The passenger entrance door must provide a rectangular opening of not less than 20 inches wide by 44 inches high with a corner ratio not greater than one-third the width of the exit.
- (b) The emergency exit on the opposite side of the cabin from the passenger entry door must provide a rectangular opening of not less than 20 inches wide and 36 inches high, with a corner radii not greater than one-third the width of the exit, and with a step-up inside the airplane of not more than 20 inches and a step-down outside the airplane of not more than 27 inches.
- (c) The airplane must comply with the portion of § 23.807(d)(1)(ii), amendment 23-34, that addresses the emergency exit on the same side as the passenger entry door.

3. Emergency Exit Marking

- (a) Each passenger emergency exit, its means of access, and its means of opening must be conspicuously marked.
- (b) The identity and location of each passenger emergency exit must be recognizable from a distance equal to the width of the cabin.
- (c) Means must be provided to assist occupants in locating the exits in conditions of dense smoke.
- (d) Each emergency exit must be marked with the word "Exit" by a sign which has white letters 1 inch high on a red background 2 inches high, be self-illuminated or independently, internally-electrically illuminated, and have a minimum brightness of at least 160 microlamberts. The colors may be reversed if the passenger compartment illumination is essentially the same.

- (e) The location of the operating handle and instructions for opening exits from the inside of the airplane must be shown in the following manner:
- (1) Each passenger emergency exit must have, on or near the exit, a marking that is readable from a distance of 30 inches.
 - (2) Each passenger emergency exit operating handle must be self-illuminated with an initial brightness of at least 160 microlamberts or be conspicuously located and well illuminated by the emergency lighting even in conditions of occupant crowding at the exit.
- (f) Each emergency exit that is openable from the outside, and its means of opening, must be marked on the outside of the airplane. In addition, the following apply:
- (1) The outside marking for each passenger emergency exit in the side of the fuselage must include a 2-inch colored band outlining the exit.
 - (2) Each outside marking, including the band, must have color contrast to be readily distinguishable from the surrounding fuselage surface. The contrast must be such that if the reflectance of the darker color is 15 percent or less, the reflectance of the lighter color must be at least 45 percent. "Reflectance" is the ratio of the luminous flux reflected by a body to the luminous flux it receives. When the reflectance of the darker color is greater than 15 percent, at least a 30-percent difference between its reflectance and the reflectance of the lighter color must be provided.

4. Emergency Lighting

- (a) An emergency lighting system must be installed. The source of illumination may be common to both the emergency and the main lighting systems if the power supply to the emergency lighting system is independent of the power supply to the main lighting system.
- (b) There must be a caution light which illuminates in the cockpit when power is on in the airplane and the emergency lighting control device is not armed.
- (c) The emergency lights must be operable manually from the flightcrew station and be provided with automatic activation. The cockpit control device must have an "on", "off", and "armed" position so that, when armed in the cockpit, the lights will operate by automatic activation. The emergency light must be armed or turned on during taxiing, takeoff, and landing. For automatic activation of the system, the sensor must--

- (1) Activate when the airplane's normal electrical power is lost, or
 - (2) Activate when subjected to a force of 5.0, +2, -0g and greater for a duration of 11, +5, -0 milliseconds and greater in the direction of the longitudinal axis of the airplane; must not be activated under conditions less severe, and, after activation, must remain activated when subsequently subjected to shock forces in any direction of up to 50 g and having durations up to 11, +5, -0 milliseconds; or
 - (3) Activate when subjected to alternate crash forces approved by the FAA; and
 - (4) Regardless of sensor type, be capable of being reset by the flightcrew if activated by any occurrence other than a survivable crash.
- (d) The energy supply to each emergency lighting unit must provide the required level of illumination for at least 10 minutes at the critical ambient condition after emergency landing.
 - (e) If rechargeable batteries are used as the energy supply for the emergency lighting system, the charging circuit must be designed to preclude inadvertent battery discharge into charging circuit faults. If the emergency lighting system does not include a charging circuit, then battery condition monitors are required.
 - (f) Components of the emergency lighting system, including batteries, wiring relays, lamps, and switches must be capable of normal operation after having been subjected to the inertia forces listed in § 23.561(b) and condition 1 of this exemption.
 - (g) The emergency lighting system must be designed so that a single probable failure, or probable system damage following a survivable crash, will not render the entire emergency lighting system inoperative. Single transverse vertical separation of the fuselage is considered a probable event during a survivable crash.
 - (h) General illumination in the passenger cabin must be provided so that when measured along the centerline of main passenger aisle(s) at seat arm-rest height and at 40-inch intervals, the average illumination is not less than 0.05 foot-candle and the illumination at each 40-inch interval is not less than 0.01 foot-candle.

5. Emergency Exit Access.

- (a) There must be a passageway leading from each aisle to each passenger entry door. These passageways must be unobstructed and at least 20 inches wide.
- (b) There must be access from each aisle to each emergency exit. There may be minor obstructions in this region, if there are compensating factors to maintain the effectiveness of the exit.

- (c) If it is necessary to pass through a passageway between passenger compartments to reach any required emergency exit from any seat in the passenger cabin, the passageway must be unobstructed. However, curtains may be used if they allow free entry through the passageway.
- (d) No door may be installed in any partition between passenger compartments.
- (e) If it is necessary to pass through a doorway separating the passenger cabin from other areas to reach any required emergency exit from any passenger seat, the door must have a means to latch it in the open position. The latching means must be able to withstand the loads imposed upon it when the door is subjected to the ultimate inertia forces, relative to the surrounding structure, listed in § 23.561(b), amendment 23-34, and condition 1 of this exemption.

6. Aisle Width

The minimum width of the main passenger aisle shall be 12 inches below 25 inches from the floor and 15 inches for 25 inches from the floor and above.

Issued in Kansas City, Missouri on May 20, 1988.


Jerold M. Chavkin
Acting Director, Central Region