

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC

In the matter of the petition of *
BRITISH AEROSPACE *
for an exemption from §§ 23.471, *
23.473, 23.477, 23.479, 23.481, *
23.483, 23.485, 23.493, 23.497, *
23.499, 23.505, 23.509, 23.511, *
23.721, 23.723, 23.725, 23.726, *
23.727, 23.729, 23.731, 23.733, *
23.735, and 23.737 *
of the Federal Aviation Regulations *
*
*

Regulatory Docket No. 046CE

GRANT OF EXEMPTION

By letter dated November 24, 1987, Mr. B. J. G. Asbeek Brusse, on behalf of the British Aerospace Limited Company, Civil Aircraft Division, Prestwick Airport, Ayrshire KA9 2RW, Scotland, petitioned for exemption from certain ground load and landing gear requirements of Part 23 to permit certification of their Jetstream 3200 Series airplanes in the commuter category while meeting certain transport category ground load and landing gear requirements.

Sections of the FAR affected:

Sections 23.471 through 23.511 contain all of the Ground Load requirements for commuter category airplanes. With the exception of § 23.507, Jacking Loads, British Aerospace petitions to substitute §§ 25.471 through 25.511 of the Ground Load requirements for transport category airplanes. British Aerospace does not seek exemption from § 23.507. Sections 23.721 through 23.737 contain all of the Landing Gear requirements for commuter category airplanes. British Aerospace petitions to substitute §§ 25.721 through 25.735 of the Landing Gear requirements for transport category airplanes. Section 23.737, Skis, is listed in the exemption request, but British Aerospace omits it from the certification basis of the Jetstream Model 3200 Series airplanes as a nonapplicable requirement.

The Petitioner's supportive information is as follows:

The British Aerospace petition for exemption was published verbatim in the FEDERAL REGISTER (53 FR 2801) on February 1, 1988. Relevant contents are included herein.

The Jetstream Model 3200 Series airplane is a derivative of the Jetstream Model 3101 which is itself a derivative of the earlier Jetstream variants; the Jetstream Series 200 and the HP 137, Mk. 1. The Models 3101, Series 200, and HP 137, Mk. 1 are approved on Type Certificate Data Sheet A21EU. Previous FAA certification of the Jetstream series airplanes relies on various FAA equivalent safety findings between BCAR Section D, Part 23, and certain ground load and landing gear requirements of Part 25.

The ground loads and landing gear requirements of Part 23 are intended to provide a ruggedness for small airplanes that are often subjected to ab initio flight training using unprepared surfaces. This is not the case for the professionally piloted Jetstream airplanes. All Jetstream airplanes currently operating in the United States are flown by professional flight crews from municipal airports with hard prepared surfaces. It is anticipated that Jetstream Model 3201 will be operated in the same manner.

Pilot proficiency has a profound influence on the reliability of the landing gear. This was recognized in 1956 when the FAA significantly relaxed the landing gear design requirements for large airplanes contained in CAR 4b, which was later recodified as Part 25. Amendment 4b-3 (21 FR 989), effective March 13, 1956, introduced full wing lift accountability, rather than the previous 2/3 wing lift, in the design loading conditions for landing impact. This relaxation permitted considerable weight savings for landing gears while retaining adequate structural integrity. Full wing lift accountability remains a feature of Part 25. Its adequacy has been justified by over 30 years satisfactory experience.

Further, the Ground Loads requirements of Part 25 are more comprehensive and rational rules, with greater applicability to the operation of commuter airplanes, such as the Jetstream, than those of Part 23. Part 25 has a greater scope covering a greater variety of ground maneuvering and landing requirements than Part 23. It is, therefore, considered that, in meeting the requirements of Part 25, a level of safety is achieved which is satisfactory and was previously acceptable to the FAA.

Jetstream Model 3101 has been operating for four years in intensive commuter operations amounting to over half a million flying hours. Jetstream airplanes have been in service, both in the United States and Europe, for nearly 20 years without any structural defects which can be attributed to a shortfall in the Ground Loads requirements to which the airplane is designed.

British Aerospace has suffered significant delays and additional costs in their plans for growth of the successful Jetstream commuter airliner, resulting from the long delay of the publication of the Part 23 Commuter Category rules. In some instances, orders have been lost. British Aerospace is committed to certification and customer delivery of the Jetstream Model 3201 by mid-1988 and has initiated large-scale manufacture. Program costs and delivery schedules can be maintained only

if the established philosophy of appropriate Part 25 substitutions for similar Part 23 requirements is extended to the Jetstream Model 3201.

British Aerospace is concerned that further delays, costs and loss of revenue may be incurred as a result of the need to resubmit and reinvestigate all exemptions and findings of equivalent safety granted in earlier certifications. British Aerospace will incur additional costs and significant delays in revalidating the landing gear, the inner wing structure, and center fuselage structure in order to comply with the relevant requirements of Part 23, as amended through amendment 23-34.

If strict compliance with the requirements of the Commuter Category of Part 23 were to be imposed on Jetstream Model 3201, certain rational design cases which are invoked by Part 25 would be omitted. This would result in an inferior level of safety contrary to the interest of the traveling public. Furthermore, technically unjustifiable and substantial additional costs and delays in the certification and entry to service of the Jetstream Model 3201 would be incurred which are not in the interest of the traveling public.

British Aerospace requests that an exemption be granted on the basis of equivalent safety provided by meeting the Ground Loads and Landing Gear requirements of Part 25 in lieu of Part 23 requirements. The proposed basis has previously been accepted by the Administrator for certification of the Jetstream Model 3101 and is compatible with the Country of Origins National Code.

Comments to published petition summary:

A notice of this petition was published in the FEDERAL REGISTER (January 21, 1988; 53 FR 1699) 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 petition was published verbatim in the FEDERAL REGISTER (February 1, 1988; 53 FR 2801). The comment period closed March 21, 1988.

Comments were received from the Airline Pilots Association, the General Aviation Manufacturers Association, Fairchild Aircraft Corporation and British Aerospace. No other comments were received.

One commenter states that British Aerospace advertises the Model 3200 series airplane as being built in accordance with the "new" commuter category regulations. That commenter contends that the commuter category portion of Part 23 is intended to provide the increased safety for newly designed airplanes. Since the Jetstream 3200 is heavier and more powerful than the 3101, that commenter feels that the Jetstream Model 3200 series should meet those requirements.

The FAA agrees that the intent of the commuter category was to provide the flying public with airplanes meeting the level of safety defined by the latest amendments to Part 23. The FAA has issued policy enabling existing airplanes certificated to SFAR-41 to be upgraded to the commuter category. Since the commuter category regulation adopted by amendment 23-34 used the regulations of Part 23 through amendment 23-33

as its foundation, the FAA has found, in accordance with § 21.101, that all amendments, up to and including amendment 23-33, are directly related to the commuter category regulations. Therefore, the basis for certification of a commuter category variant of an existing type design will be the same, notwithstanding whether it is obtained through the new Type Certificate (TC), amended TC or Supplemental Type Certificate (STC) procedures. This finding assures that all commuter category airplanes meet the requirements for new airplanes.

One commenter feels that British Aerospace has placed the FAA in an awkward position by stating that additional costs and delays in certification of the Jetstream Model 3200 would have an adverse impact on the traveling public. That commenter contends that if passengers knew that the delay in certification was instituted to improve upon safety, they would wait--willingly.

The FAA recognizes the costs to British Aerospace and the delays in certification resulting from disposition of this petition for exemption. However, the FAA also recognizes its responsibility to assure that the level of safety provided is adequate for airplanes envisioned by the commuter category.

One commenter notes that in the British Aerospace petition, British Aerospace contends that if Part 23 were strictly adhered to as the minimum level of standards, there would be a decrease in the level of safety. That commenter notes that such a statement might be true, but felt that granting the exemption would not be in the best interest of the traveling public.

The FAA has carefully reviewed the petition and finds that the Petitioner's contention is not substantiated.

In comments to the docket, British Aerospace notes that they intend to exceed the requirements of § 23.479(d) by complying with comparable Part 25 criteria relative to dynamic response of structure. BAe contends that § 23.479(d) limits the consideration of dynamic response to local structure and does not require consideration of the complete airplane in the manner required by § 25.305(c). BAe contends that by providing a more comprehensive dynamic response analysis to satisfy Part 25 criteria, they provide a level of safety greater than required by Part 23. Additionally, British Aerospace notes that they intend to provide a fatigue substantiation of their landing gear which exceeds the requirements of Part 23 and would satisfy Part 25 criteria.

The FAA is aware of British Aerospace's intent to provide additional structural substantiation beyond that required by the transport category ground loads and landing gear requirements identified in their petition for exemption. British Aerospace is encouraged to provide such additional structural substantiation, but such substantiation is not a basis for this exemption.

In comments to the docket, British Aerospace provides a synopsis of in-service experience on their 3101 airplane and addresses those service difficulties that resulted in Airworthiness Directive (AD) issuance by

the FAA. British Aerospace concludes that no unsatisfactory service experience is attributable to the application of the Part 25 ground loads and landing gear design criteria in lieu of Part 23 criteria.

The FAA has reviewed the synopsis of in-service experience provided by British Aerospace, and has also reviewed the Jetstream series service history maintained by the FAA. The FAA cannot conclude that the unsafe conditions in the Jetstream landing gear, which were corrected by Airworthiness Directive, can be attributed to compliance with Part 25 requirements in lieu of Part 23 requirements.

In comments to the docket, British Aerospace notes that, after further review, they wish to amend their petition to include Part 25.735(f) and (g) as a part of the certification basis proposed in their petition.

The FAA agrees and has included these paragraphs in the certification basis accordingly.

British Aerospace, in comments to the docket, argues that the Part 23 requirement restricting wing lift accountability to 2/3 airplane weight is relevant only for light single and multiengine aircraft. They argue that the margin between approach speed and stalling speed is sufficiently high on an airplane the size of their Model 3200 to ensure that the loss of lift during the touchdown phase is improbable. They contend that the ground load conditions and assumptions of § 25.473 provide an adequate level of safety for commuter category airplanes.

The FAA is aware of the margins between approach and stall speeds for airplanes of the size of the Jetstream 3200 series airplanes and has considered the probability of stall at touchdown as a partial basis for disposition of this petition.

A number of commenters offered comments that appeared to be motivated more by competitive trade concerns than safety considerations. These comments were disregarded by FAA because the FAA's decision to grant or deny the petition must turn on the issue of equivalent safety, and will set a precedent for deciding future petitions for exemption on the same subject from other manufacturers seeking U.S. type certification irrespective of the country of manufacture.

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 exemption from certain ground load and landing gear requirements of Part 23 and the Petitioner's intent to substitute certain Part 25 requirements in lieu of those requirements.

As part of the petition, British Aerospace provides a copy of Validation Agreement (VA) Note 1 issued by the Air Registration Board of the United Kingdom (now the Civil Aviation Authority of the United Kingdom). Additionally, the Petitioner provides a copy of a letter dated June 1, 1966, from the FAA, Brussels Aircraft Certification Staff, to the Air Registration Board, wherein the FAA concurred ". . . that the BCAR ground load cases plus the Special Conditions of VA Note 1 can be used for the subject airplane on the basis of equivalent safety to Federal Aviation Regulations 23, Ground Loads." The subject airplane referred to was the HP 137, Mk. 1. The Petitioner states that the position taken by the FAA in this 1966 letter forms the basis for certification of the HP 137, Mk. 1, the Jetstream Series 200, and the Jetstream 3101 airplanes.

The FAA finds, as noted by the Petitioner, that in 1966, the FAA agreed to a finding of equivalent safety (with certain conditions) between the ground loads of Part 23 and the ground loads of the BCARs as they pertain to certification of the Model HP 137 Jetstream airplane.

The Model HP 137, Mk. 1 was approved by the FAA, April 25, 1969, on TCDS A21EU. The type certificate was amended May 17, 1977, to add the Jetstream Series 200 airplane and further amended November 30, 1982, to add the Jetstream Model 3101 airplane. Both the Model HP 137, Mk. 1 and the Jetstream Model 3101 airplane are approved to the requirements of SFAR 41.

As noted by the Petitioner, the certification basis of the Jetstream Model 3101 indicates that compliance was demonstrated to the same ground load and landing gear requirements of Part 25 which BAe wishes to substitute for Part 23 requirements.

The foundation of the petition is based on an equivalent safety finding made in 1966. The FAA cannot, in today's environment, state unequivocally that the Part 25 ground loads are equivalent to the Part 23 ground loads. The reaction that results from restricting the lift to 2/3 of the airplane weight for Part 23 certification is greater than the reaction that results from allowing the lift to equal 100 percent of the airplane weight for Part 25 certifications. This reaction cannot be compensated for by examining additional design conditions. The credit given for different values of lift, conceptually, is based on whether the airplane is in a condition of stall at landing or whether it is still airborne at the instant prior to touchdown.

In 1956, by amendment 4b-3 to CAR-4b, the FAA accepted the probability that transport category airplanes will be in an airborne condition at landing impact and that full stall landings are not a likely operating condition for transport category airplanes. This decision was based in part on landing data accumulated during the Berlin Airlift. However, the FAA continues to apply the stall condition to small airplanes.

The FAA has considered the operational similarities between the British Aerospace 3200 series airplanes and similar sized transport airplanes, as well as the past service history of the earlier Jetstream series airplanes. These airplanes comply with ground load and landing gear

requirements similar to those addressed by this petition. The margin between approach speed and stalling speed on the BAe 3200 series airplane is estimated to be 27 knots. Flight tests conducted on the BAe 3101 airplane indicate that during the most adverse conditions, speed loss during landing flare does not exceed 13 knots leaving approximately a 14 knot margin between aircraft airspeed and stalling speed.

The FAA finds that commuter category airplanes demonstrate compliance with requirements that result in approach speeds sufficiently high to expect that these airplanes will still be in an airborne condition at the instant prior to touchdown. This expectation is further reinforced by British Aerospace's intent to certificate the Jetstream 3200 series airplanes with two pilots. The FAA expects that two pilot operation will minimize the possibility of pilot distraction during the final phases of approach and landing and will, therefore, reduce the possibility of a landing stall.

The FAA recognizes that discontinuities exist between the requirements of the new commuter category and certain transport category requirements historically applied to airplanes over 12,500 pounds. The FAA finds that it is in the public interest to correct such anomalies. Therefore, the FAA intends to propose a rule change to the commuter category requirements of §§ 23.473 and 23.725 to increase the credit given for wing lift from 2/3 to 100%. This intended rulemaking action will also consider those requirements that are directly related to 100% wing lift credit. The FAA does not expect to propose this same requirement for other Part 23 airplanes and, after further study, may restrict the proposal to commuter category airplanes above 12,500 pounds only.

In consideration of the foregoing, I find that a grant of exemption is in the public interest and would not adversely affect safety. Therefore, pursuant to the authority of 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 the ground load and landing gear requirements of the Federal Aviation Regulations described herein provided that the airplane design is shown to comply with the following sections of the Federal Aviation Regulations:

Ground Loads

- § 25.471 as amended through amendment 25-23
- § 25.473 as amended through amendment 25-23
- § 25.477
- § 25.479(a) through (c) and (e) as amended through amendment 25-23
- § 25.481(a) and (c)
- § 25.483
- § 25.485
- § 25.487
- § 25.489 as amended through amendment 25-23
- § 25.491
- § 25.493(b) and (c) as amended through amendment 25-23
- § 25.495
- § 25.499 as amended through amendment 25-46

§ 25.503
§ 25.507(a) and (b)
§ 25.509 as amended through amendment 25-23
§ 25.511

Landing Gear

§ 25.721 as amended through amendment 25-32
§ 25.723 as amended through amendment 25-46
§ 25.725 as amended through amendment 25-23
§ 25.727 as amended through amendment 25-23
§ 25.729 as amended through amendment 25-42
§ 25.731
§ 25.733 as amended through amendment 25-49
§ 25.735 as amended through amendment 25-48

Issued in Washington, DC on August 24, 1988.


Thomas E. McSweeney
Acting Director, Office of Airworthiness