

Exemption No. 5587B

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

In the matter of the petition of

Jetstream Aircraft Limited

for an exemption from §§ 25.562(c)(5)
and 25.785(a)
of the Federal Aviation Regulations

Regulatory Docket No. 27001

PARTIAL GRANT OF EXEMPTION

By letter AWP/JS41/250/940916 date November 23, 1994, R.D. Evans, Chief Airworthiness Engineer, Jetstream Aircraft Limited (formerly British Aerospace Regional Aircraft Limited), Prestwick Airport, Ayrshire KA9 2RW, Scotland, petitioned for an extension to Exemption 5587A regarding the Head Injury Criterion (HIC) of §§ 25.562(c)(5) and 25.785(a) of the Federal Aviation Regulations (FAR), for front row passenger seating in Jetstream Series 4100 airplanes, until December 31, 1995. The existing exemption expires on December 31, 1994.

Sections of the FAR affected:

Section 25.785(a) requires that each seat, berth, safety belt, harness, and adjacent part of the airplane at each station designated as occupiable during takeoff and landing must be designed so that a person making proper use of those facilities will not suffer serious injury in an emergency landing as a result of inertia forces specified in §§ 25.561 and 25.562.

Section 25.562(c)(5) requires that each occupant must be protected from serious head injury under the conditions prescribed in paragraph (b) of this section. Where head contact with seats or other structure can occur, protection must be provided so that the head impact does not exceed a Head Impact Criterion (HIC) of 1,000 units. The level of HIC is defined by the equation:

$$\text{HIC} = \left[(t_2 - t_1) \left[\frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a(t) dt \right]^{2.5} \right]_{\max}$$

The petitioner's supportive information is as follows:

"Exemption No. 5587 was granted with two conditions, these being:

- a requirement to report at three monthly intervals the progress of attempts to develop technical solutions, and
- a retroactive implementation schedule for technical solutions determined to be acceptable.

"JA Ltd. has submitted the following quarterly reports to the FAA Transport Airplane Certification Directorate during 1994: AWP/108/JM41 dated April 94; AWR/112/JM41 dated July 94, and AWR/121/JM41 date October 94. The 4th quarter 94 report is due for submission during January 1995. These reports show that JA Ltd. has been actively attempting to develop acceptable technical solutions. Although some progress toward demonstrating compliance with the HIC requirement has been made, JA Ltd. has been unable to develop acceptable installations. This inability is an experience which is shared with other manufacturers currently attempting to comply with the seat-to-bulkhead HIC requirements.

"With regard to the second condition, JA Ltd. has not developed HIC compliant solutions for US customer specified cabin configurations. Consequently JA Ltd. has been unable to propose a retroactive implementation schedule."

"Throughout the course of 1994, JA Ltd. has been pursuing solutions for various configurations of front passenger seat row bulkheads. The progress of these efforts has been regularly discussed with the JAA and reported to the FAA. Solutions involving energy absorbing strike pads, although occupying most of the early development work, have in general failed to produce acceptable technical solutions. Any limited successes are now questionable in the light of recent knowledge that this type of protection can produce unacceptably severe neck and cosmetic facial injuries."

"In addition to the above, the headstrike pad has limitations in respect of continued maintainability, certifiability, and interior integration.

"Three other Joint Certification commuter aircraft manufacturers have identified more than 60 dynamic tests using headstrike pads being performed without any success. JA Ltd. also understands that FAA - CAMI studies on this subject still remain inconclusive.

"Accordingly JA Ltd. is now concentrating their efforts on developing, in association with Simula Government Products Inc; Phoenix, Arizona, USA (the selected vendor), an inertia triggered inflatable airbag solution.

"The airbag solution was first explored in early 1994 as an alternative solution to strike pads. Initial airbag dynamic tests were conducted by JA Ltd. in February/March. The experience gained from these has led to the issue of a specification for selection of a

specialist vendor to add impetus to the program. Selection of the preferred vendor (Simula) was made in June 1994.

"Discussions with the JAA took place in September 1994 in order to establish a means of compliance with JAR/FAR 25.562 using the airbag method. The JAA team considered airbags to be an innovative and unprecedented solution and proceeded to raise a Certification Review Item CRI C10 to provide basic guidelines and policy on individual technical issues to achieve an acceptable means of compliance."

"JA Ltd. considers that the airbag system has the best potential for success in meeting the requirement albeit an accurate prediction of the date when success can be claimed cannot be made."

"JA Ltd. has been regularly reviewing its HIC compliance program and results with the JAA team who have reported to the JAA the JA Ltd. difficulties with compliance. JAA teams concerned with other European projects have also reported similar difficulties encountered by other manufacturers.

"As a consequence of the industry-wide inability to establish methods of compliance, two European and one Canadian manufacturer have applied to the JAA for permanent exemption from the seat to bulkhead HIC requirements. We also believe FAA have had similar requests.

"JA Ltd. will remain committed to finding a solution to this problem and are requesting JAA for a further temporary exemption until 1 January 1996."

"JA Ltd. understands that it is the JAA intention to confer with the FAA on this matter in order to coordinate common policy. JA Ltd. submit that the adoption by the FAA of a policy identical to that of the JAA would be in accordance with the acknowledged philosophy of harmonization of requirements and associated interpretations."

"JA Ltd. is committed to delivering further airplanes to at least two US customers during 1995.

"Serious financial burdens will result from an inability to honor these delivery commitments due to the continue absence of satisfactory technical solutions for the HIC problem for the front row passengers as identified in this petition.

"These financial burdens will not be confined to JA Ltd. Serious consequences would also be experienced by the U.S.A. operators who are relying on timely delivery of the contracted airplanes for their intended operations and who would be obliged to make alternative arrangements to satisfy their commitments to the traveling public. As the Jetstream Series 4100 has been selected by the U.S.A. operators principally because of its low direct operating costs, the necessary alternative arrangements cannot be but more

costly for the operators concerned and thus be to the disadvantage of the traveling public."

"JA Ltd. submit that the granting of this further exemption is in the public interest because:

- It will allow operators to realize the maximum productivity potential of the airplane by retaining its payload capability and therefore provide the service that the traveling public demands.
- Acceptable technology is not available to industry to provide head protection for front row seats in the vicinity of bulkheads of cabin interiors specified by U.S. operators.
- Currently, neither the airplane manufacturers nor the airworthiness authorities have sufficient evidence to determine which of the currently proposed systems provides the optimum protection in terms of overall safety, acceptability to the traveling public, maintainability, continued certificability, and interior integration.

"JA Ltd. remains fully committed to developing a certifiable solution which will provide the necessary protection to front seat passengers in a manner suitable for implementation on all Jetstream 4101 airplanes within a realistic time frame.

"JA Ltd. therefore requests that the Administrator find good cause to reduce the public notification and comment procedures of FAR 11.27(j)(3), and the FAR 11.25(b)(1) requirement for petition submission at least 120 days prior to the proposed effective date of this rulemaking activity which will allow the promulgation of the extended exemption before 1 January 1995 in order that scheduled airplane deliveries in early 1995 can be made."

The FAA finds, for good cause, that action on this petition should not be delayed by publication and comment procedures for the following reasons: (1) a grant of exemption would not set a precedent in that it is for a time extension from a requirement and not permanent relief from the requirement and therefore would not create a public safety issue, and (2) a delay in acting on the petition would be disruptive to the flying public and create a major economic burden on the manufacturer and operators.

The FAA's analysis/summary is as follows:

Exemption 5587A was issued on December 29, 1993, and was based on a lack of commercially available solutions to the HIC certification requirement. The FAA concurred with the petitioner's December 31, 1994, requested expiration date for that extension, as appropriate to allow sufficient development time without unduly delaying implementation of this new safety requirement benefiting passengers seated behind bulkhead structures.

The FAA considers that Jetstream Aircraft has been making a good-faith effort to observe the terms of that exemption, having engaged in developmental efforts and by documenting this activity in quarterly status reports. The principal reason for requesting this further extension is that Jetstream has changed its proposed method of compliance from an energy absorbing pad, to an airbag. Jetstream notes several problems with the energy absorbing pad concept that have led to this decision. Although not directly related to the merits of this petition, the FAA notes that testing conducted at the Civil Aeromedical Institute to assess the potential for neck injury using pads did not suggest any serious problems in that regard. Nonetheless, Jetstream has identified several areas where the energy absorbing pad presents practical problems, and may not lend itself to this application.

In their petition, Jetstream notes that they have conducted preliminary tests with airbags in early 1994, and chose a vendor in September of this year. They have therefore been exploring this means of compliance for some time, and have functioning prototype systems to work with. Development of a commercially viable product should occur sooner than were the program starting from scratch.

The FAA considers the installation of airbags on airplanes a novel and unique feature, and will require the development of special conditions in order to prescribe appropriate criteria. However, because the use of airbags has been discussed within the industry for some time, the general criteria have already been outlined. Development of special conditions should not, therefore, have an impact on the approval of such a system for the Jetstream 4100.

The FAA is concerned about prolonging the implementation of this important safety improvement any longer than is absolutely necessary. Conversely, while the airbag has the potential to provide a level of safety higher than required by the regulations, it poses a complicated certification problem and should not be hastily implemented. Therefore, given that the resultant product will likely provide a higher level of safety than might other means of compliance, the FAA considers that a one year extension of the existing compliance time is reasonable. In granting this one year extension, the FAA will also require that a proposal for retrofit of existing installations be available when the exemption expires. Given the technical maturity of airbags in the automotive industry and the absence of any clear technical obstacle to implementation in airplanes, the FAA does not anticipate granting any further extensions in this regard for newly delivered airplanes.

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest, and will not significantly affect the overall level of safety provided by the regulations. Therefore, pursuant to the authority contained in §§ 313(a) and 601(c) of the Federal Aviation Act of 1958, delegated to me by the Administrator (14 CFR 11.53), the petition of Jetstream Aircraft Limited for an extension to Exemption 5587 regarding the HIC requirements of

§§ 25.562(c)(5) and 25.785(a) of the FAR, for front row passenger seats on Jetstream Series 4100 airplanes, is granted until December 31, 1995, with the following provision..

The petitioner shall submit a schedule for retrofit of the design solution prior to the expiration this exemption.

Other provisions of Exemption 5587, together with its conditions and limitations, remain the same and are applicable to this exemption. This amendment is part of, and shall remain attached to, Exemption 5587.

Issued in Renton, Washington, on

Transport Airplane Directorate
Aircraft Certification Service

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