

cause, a failure condition that would prevent the continued safe flight and landing of the airplane.

Issued in Kansas City, Missouri on August 21, 2002.

**David R. Showers,**

*Acting Manager, Small Airplane Directorate,  
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## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 25

[Docket No. NM226; Special Conditions No. 25-211-SC]

#### Special Conditions: Airbus Model A319, A320, and A321 Series Airplane; Seats With Inflatable Lapbelts

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for Airbus Model A319, A320, and A321 series airplanes. These airplanes, as modified by AMSAFE Aviation, will have a novel or unusual design feature associated with seats with inflatable lapbelts. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is August 16, 2002. Comments must be received on or before September 30, 2002.

**ADDRESSES:** Comments on this proposal may be mailed in duplicate to: Federal Aviation Administration (FAA), Transport Airplane Directorate, Attn: Rules Docket (ANM-113), Docket No. NM226, 1601 Lind Avenue SW., Renton, Washington, 98055-4056; or delivered in duplicate to the Transport Airplane Directorate at the above address. Comments must be marked: Docket No. NM226. Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

**FOR FURTHER INFORMATION CONTACT:** Alan Sinclair, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98055-4056;

telephone (425) 227-2195; facsimile (425) 227-1149.

#### SUPPLEMENTARY INFORMATION:

##### FAA's Determination as To Need for Public Process

The FAA has determined that notice and opportunity for prior public comment are unnecessary in accordance with 14 CFR 11.38, because the FAA has provided previous opportunities to comment on substantially identical special conditions, and has fully considered and addressed all the substantive comments received. Based on a review of the comment history and the comment resolution, the FAA is satisfied that new comments are unlikely. The FAA, therefore, finds that good cause exists for making these special conditions effective upon issuance.

##### Comments Invited

Although this action is in the form of final special conditions, and for the reasons stated above, is not preceded by notice and an opportunity for public comment, comments are invited on this rule. Interested persons are invited to participate in this rulemaking by submitting comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning these special conditions. The docket is available for public inspection before and after the comment closing date. If you wish to review the docket in person, go to the address in the **ADDRESSES** section of this preamble between 7:30 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

We will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change these special conditions in light of the comments we receive.

If you want the FAA to acknowledge receipt of your comments on this proposal, include with your comments a pre-addressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it back to you.

##### Background

On January 10, 2002, AMSAFE Aviation, P.O. Box 1570, Higley, Arizona 85236, applied for a

supplemental type certificate to install AMSAFE Aviation Inflatable Restraints (AAIR) inflatable lapbelts for protection against head injury and head entrapment on certain seats in Airbus Model A319, A320, and A321 series airplanes. The certification of the Airbus Model A319, A320, and A321 series airplanes is currently scheduled for August 30, 2002. The Airbus Model A319, 320, and 321 series airplanes are swept-wing, conventional tail, twin-engine, turboprop-powered transport airplanes. The inflatable lapbelt behaves similarly to an automotive inflatable airbag, but in this case the airbag is integrated into the lapbelt, and inflates away from the seated occupant. While inflatable airbags are now standard in the automotive industry, the use of an inflatable lapbelt is novel for commercial aviation.

Title 14 Code of Federal Regulations (14 CFR) 25.785 requires that occupants be protected from head injury by either the elimination of any injurious object within the striking radius of the head, or by padding. Traditionally, this has required a set back of 35 inches from any bulkhead, other rigid interior feature or, where that is not practical, specified types of padding. The relative effectiveness of these means of injury protection was not quantified. With the adoption of Amendment 25-64 to 14 CFR part 25, specifically § 25.562, a new standard that quantifies required head injury protection was created.

Section 25.562 specifies that dynamic tests must be conducted for each seat type installed in the airplane. In particular, the regulations require that persons not suffer serious head injury under the conditions specified in the tests, and that a Head Injury Criteria (HIC) measurement of not more than 1000 units be recorded, should contact with the cabin interior occur. While the test conditions described in this section of the regulations are specific, it is the intent of the requirement that an adequate level of head injury protection be provided for crash severity up to and including that specified.

It should be noted that while Amendment 25-64 is not part of the Airbus Model A319, A320, and A321 certification basis, Airbus voluntarily elected to comply with portions of 14 CFR 25.562, Amendment 25-64, for the A319 and A321 airplanes, with the exception of § 25.562(c)(5) and (c)(6) that contain the requirements for femur injury and HIC. Therefore, the seat installations with inflatable lapbelts are required to meet the requirements of § 25.562 except for § 25.562(c)(5) and (c)(6).

Because §§ 25.562 and 25.785 and associated guidance do not adequately address seats with inflatable lapbelts, the FAA recognizes that appropriate pass/fail criteria that do fully address the safety concerns specific to occupants of these seats need to be developed.

The inflatable lapbelt has two potential advantages over other means of head impact protection. First, it can provide significantly greater protection than would be expected with energy-absorbing pads, and second, it can provide essentially equivalent protection for occupants of all statures. These are significant advantages from a safety standpoint, since such devices will likely provide a level of safety that exceeds the minimum standards of the regulations. Conversely, inflatable lapbelts in general are active systems and must be relied upon to activate properly when needed, as opposed to an energy-absorbing pad or upper torso restraint that is passive, and always available. Therefore, the potential advantages must be balanced against this and other potential disadvantages in order to develop standards that will provide an equivalent level of safety to that intended by the regulations.

The FAA has considered the installation of inflatable lapbelts to have two primary safety concerns: first, that they perform properly under foreseeable operating conditions, and second, that they do not perform in a manner or at such times as would constitute a hazard to the airplane or its occupants. This latter point has the potential to be the more rigorous of the requirements, owing to the active nature of the system. With this philosophy in mind, the FAA has considered the following as a basis for the special conditions.

The inflatable lapbelt will rely on electronic sensors for signaling and pyrotechnic charges, which then activate the lapbelt when needed. These same devices could be susceptible to inadvertent activation, causing deployment in a potentially unsafe manner. The consequences of such deployment must be considered in establishing the reliability of the system. AMSAFE must substantiate that the effects of an inadvertent deployment in flight are either not a hazard to the airplane, or that such deployment is an extremely improbable occurrence (less than  $10^{-9}$  per flight hour). The effect of an inadvertent deployment on a passenger or crewmember that might be positioned close to the inflatable lapbelt should also be considered. The person could be either standing or sitting. A minimum reliability level will have to be established for this case, depending

upon the consequences, even if the effect on the airplane is negligible.

The potential for an inadvertent deployment could be increased as a result of conditions in service. The installation must take "wear and tear" into account so that the likelihood of an inadvertent deployment is not increased to an unacceptable level. In this context, an appropriate inspection interval and self-test capability are considered necessary. Other outside influences are lightning and high intensity electromagnetic fields (HIRF). Since the sensors that trigger deployment are electronic, they must be protected from the effects of these threats. Existing Special Conditions No. 25-ANM-23 regarding lightning and HIRF are therefore applicable. For the purposes of compliance with those special conditions, if inadvertent deployment could cause a hazard to the airplane, the inflatable lapbelt is considered a critical system. If inadvertent deployment could cause injuries to persons, the inflatable lapbelt should be considered an essential system. Finally, the inflatable lapbelt installation should be protected from the effects of fire, so that an additional hazard is not created by, for example, a rupture of the pyrotechnic squib.

In order to be an effective safety system, the inflatable lapbelt must function properly and must not introduce any additional hazards to occupants as a result of its functioning. There are several areas where the inflatable lapbelt differs from traditional occupant protection systems, and requires special conditions to ensure adequate performance.

Because the inflatable lapbelt is essentially a single use device, there is the potential that it could deploy under crash conditions that are not sufficiently severe as to require head injury protection from the inflatable lapbelt. Since an actual crash is frequently composed of a series of impacts before the airplane comes to rest, this could render the inflatable lapbelt useless if a larger impact follows the initial impact. This situation does not exist with energy absorbing pads or upper torso restraints, which tend to provide protection according to the severity of the impact. Therefore, the inflatable lapbelt installation should be such that the inflatable lapbelt will provide protection when it is required, and will not expend its protection when it is not needed. These special conditions contain no requirement for the inflatable lapbelt to provide protection from multiple impacts, where more than one impact would require protection.

Since each occupant's restraint system provides protection for that occupant only, the installation must address seats that are unoccupied. It will be necessary to show that the required protection is provided for each occupant regardless of the number of occupied seats, and considering that unoccupied seats may have lapbelts that are active.

Since a wide range of occupants could occupy a seat, the inflatable lapbelt should be effective for a wide range of occupants. The FAA has historically considered the range from the fifth percentile female to the ninety-fifth percentile male as the range of occupants that must be taken into account. In this case, the FAA is proposing consideration of a broader range of occupants, due to the nature of the lapbelt installation and its close proximity to the occupant. In a similar vein, these persons could have assumed the brace position, for those accidents where an impact is anticipated. Test data indicate that occupants in the brace position do not require supplemental protection, and so it would not be necessary to show that the inflatable lapbelt will enhance the brace position. However, the inflatable lapbelt must not introduce a hazard in that case by deploying into the seated, braced occupant.

Another area of concern is the use of inflatable lapbelts in seats occupied by children, who could be lap-held, in approved child safety seats, or occupying the seat directly. Similarly, if the seat is occupied by a pregnant woman, the installation needs to address such usage, either by demonstrating that it will function properly, or by adding appropriate limitation on usage.

Since the inflatable lapbelt will be electrically powered, there is the possibility that the system could fail due to a separation in the fuselage. Since this system is intended as crash/post-crash protection means, failure due to fuselage separation is not acceptable. As with emergency lighting, the system should function properly if such a separation occurs at any point in the fuselage. A separation that occurs at the location of the inflatable lapbelt would not have to be considered.

Since the inflatable lapbelt is likely to have a large volume displacement, the inflated bag could potentially impede egress of passengers. The bag deflates to absorb energy, so it is likely that an inflatable lapbelt would be deflated at the time that persons would be trying to leave their seats. Nonetheless, it is considered appropriate to specify a time interval after which the inflatable

lapbelt may not impede rapid egress. Ten seconds has been chosen as a reasonable time since this corresponds to the maximum time allowed for an exit to be openable. In actuality, it is unlikely that an exit would be prepared this quickly in an accident severe enough to warrant deployment of the inflatable lapbelt, and the inflatable lapbelt will likely deflate in much less than ten seconds.

Finally, it should be noted that the special conditions are applicable to the inflatable lapbelt system as installed. The special conditions are not an installation approval. Therefore, while the special conditions relate to each such system installed, the overall installation approval is a separate finding, and must consider the combined effects of all such systems installed.

#### **Type Certification Basis**

Under the provisions of § 21.101, Amendment 21-69, effective September 16, 1991, AMSAFE Aviation must show that the Airbus Model A319, A320, and A321, as changed, continue to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. A28NM or the applicable regulations in effect on the date of application for the change. Subsequent changes have been made to § 21.101 as part of Amendment 21-77, but those changes do not become effective until June 10, 2003. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type certification basis." The regulations incorporated by reference in Type Certificate No. A28NM are as follows:

Amendments 25-1 through 25-56 for Airbus Model A319, A320, and A321 series airplanes. The U.S. type certification basis for Airbus Model A319, A320, and A321 is established in accordance with § 21.29 and § 21.17 and the type certification application date. The U.S. type certification basis is listed in Type Certificate Data Sheet No. A28NM.

If the Administrator finds that the applicable airworthiness regulations (*i.e.*, 14 CFR part 25) do not contain adequate or appropriate safety standards for the Airbus Model A319, A320, and A321 series airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, Airbus Model A319, A320, and A321 series airplanes must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the

noise certification requirements of 14 CFR part 36.

Special conditions, as defined in § 11.19, are issued in accordance with § 11.38 and become part of the type certification basis in accordance with § 21.101(b)(2), Amendment 21-69, effective September 16, 1991.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of § 21.101(a)(1), Amendment 21-69, effective September 16, 1991.

#### **Novel or Unusual Design Features**

AMSAFE Aviation will install an inflatable lapbelt on certain seats of Airbus Model A319, A320, A321 series airplanes, in order to reduce the potential for head injury and head entrapment in the event of an accident. The inflatable lapbelt works similarly to an automotive airbag, except that the airbag is integrated with the lap belt of the restraint system. The inflatable lapbelts are considered a novel or unusual design feature.

Federal regulations state the performance criteria for head injury and head entrapment protection in objective terms. However, none of these criteria are adequate to address the specific issues raised concerning seats with inflatable lapbelts. The FAA has therefore determined that, in addition to the requirements of part 25, special conditions are needed to address requirements particular to installation of seats with inflatable lapbelts.

Accordingly, in addition to the passenger injury criteria specified in § 25.785, these special conditions are adopted for the Airbus Model A319, A320, and A321 series airplanes equipped with inflatable lapbelts. Other special conditions may be developed, as needed, based on further FAA review and discussions with the manufacturer and civil aviation authorities.

#### **Discussion**

From the standpoint of a passenger safety system, the inflatable lapbelt is unique in that it is both an active and entirely autonomous device. While the automotive industry has good experience with airbags, the conditions of use and reliance on the inflatable lapbelt as the sole means of injury protection are quite different. In automobile installations, the airbag is a supplemental system and works in conjunction with an upper torso

restraint. In addition, the crash event is more definable and of typically shorter duration, which can simplify the activation logic. The airplane operating environment is also quite different from automobiles and includes the potential for greater "wear and tear," and unanticipated abuse conditions (due to galley loading, passenger baggage, *etc.*). Airplanes also operate where exposure to high intensity electromagnetic fields could affect the activation system.

The following special conditions can be characterized as addressing either the safety performance of the system, or the system's integrity against inadvertent activation. Because a crash requiring use of the inflatable lapbelts is a relatively rare event, and because the consequences of an inadvertent activation are potentially quite severe, these latter requirements are probably the more rigorous from a design standpoint.

#### **Prior Comment**

One comment was received in response to the most recent publication of inflatable lapbelt special conditions (65 FR 60343), which are substantially identical to the special condition contained herein. The disposition of this comment is contained in Rules Docket No. NM176 and is available for examination by interested parties. In our disposition, we agreed with the commenter, but noted that the substance of the comment has already been addressed in showing compliance with existing regulations during the certification process. Therefore, this comment did not result in a change to the special conditions.

#### **Applicability**

As discussed above, these special conditions are applicable to the Airbus Model A319, A320, and A321 series airplanes modified by AMSAFE Aviation. Should AMSAFE Aviation apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. A28NM to incorporate the same novel or unusual design feature, these special conditions would apply to that model as well under the provisions of § 21.101(a)(1).

#### **Conclusion**

This action affects only certain novel or unusual design features on Airbus Model A319, A320, and A321 series airplanes. It is not a rule of general applicability, and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

The FAA has determined that notice and opportunity for prior public comment are unnecessary in accordance with 14 CFR 11.38, because the FAA has provided previous opportunities to comment on substantially identical special conditions, and has fully considered and addressed all the substantive comments received. Based on a review of the comment history and the comment resolution the FAA is satisfied that new comments are unlikely. The FAA, therefore, finds that good cause exists for making these special conditions effective upon issuance.

#### List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

**Authority:** 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

#### The Special Conditions

Accordingly, the Federal Aviation Administration (FAA) issues the following special conditions as part of the type certification basis for Airbus Model A319, A320, and A321 series airplanes modified by AMSAFE Aviation.

##### *Seats With Inflatable Lapbelts*

1. It must be shown that the inflatable lapbelt will deploy and provide protection under crash conditions where it is necessary to prevent serious head injury or head entrapment. The means of protection must take into consideration a range of stature from a two-year-old child to a ninety-fifth percentile male. The inflatable lapbelt must provide a consistent approach to energy absorption throughout that range. In addition, the following situations must be considered:

- a. The seat occupant is holding an infant.
- b. The seat occupant is a child in a child restraint device.
- c. The seat occupant is a child not using a child restraint device.
- d. The seat occupant is a pregnant woman.

2. The inflatable lapbelt must provide adequate protection for each occupant regardless of the number of occupants of the seat assembly, considering that unoccupied seats may have active seatbelts.

3. The design must prevent the inflatable lapbelt from being either incorrectly buckled or incorrectly installed such that the inflatable lapbelt would not properly deploy. Alternatively, it must be shown that

such deployment is not hazardous to the occupant, and will provide the required head injury protection.

4. It must be shown that the inflatable lapbelt system is not susceptible to inadvertent deployment as a result of "wear and tear," or inertial loads resulting from in-flight or ground maneuvers (including gusts and hard landings), likely to be experienced in service.

5. Deployment of the inflatable lapbelt must not introduce injury mechanisms to the seated occupant, or result in injuries that could impede rapid egress. This assessment should include consideration of an occupant who is in the brace position when it deploys and an occupant whose belt is loosely fastened.

6. It must be shown that an inadvertent deployment, that could cause injury to a standing or sitting person, is improbable.

7. It must be shown that inadvertent deployment of the inflatable lapbelt, during the most critical part of the flight, will either not cause a hazard to the airplane or is extremely improbable.

8. It must be shown that the inflatable lapbelt will not impede rapid egress of occupants 10 seconds after its deployment.

9. The system must be protected from lightning and HIRF. The threats specified in Special Condition No. 25-ANM-23 are incorporated by reference for the purpose of measuring lightning and HIRF protection. For the purposes of complying with HIRF requirements, the inflatable lapbelt system is considered a "critical system" if its deployment could have a hazardous effect on the airplane; otherwise it is considered an "essential" system.

10. The inflatable lapbelt must function properly after loss of normal aircraft electrical power, and after a transverse separation of the fuselage at the most critical location. A separation at the location of the lapbelt does not have to be considered.

11. It must be shown that the inflatable lapbelt will not release hazardous quantities of gas or particulate matter into the cabin.

12. The inflatable lapbelt installation must be protected from the effects of fire such that no hazard to occupants will result.

13. There must be a means for a crewmember to verify the integrity of the inflatable lapbelt activation system prior to each flight or it must be demonstrated to reliably operate between inspection intervals.

Issued in Renton, Washington, on August 16, 2002.

**Ali Bahrami,**

*Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.*

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**BILLING CODE 4910-13-P**

## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 25

**[Docket No. NM220; Special Conditions No. 25-210-SC]**

#### **Special Conditions: Bombardier Model CL-600-2C10 Series Airplanes; Seats With Inflatable Lapbelts**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Bombardier Model CL-600-2C10 series airplane. This airplane as modified by Weber Aircraft will have a novel or unusual design feature associated with inflatable lapbelts. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is August 16, 2002. Comments must be received on or before September 30, 2002.

**ADDRESSES:** Comments on these special conditions may be mailed in duplicate to: Federal Aviation Administration, Transport Airplane Directorate, Attn: Rules Docket (ANM-113), Docket No. NM220, 1601 Lind Avenue SW., Renton, Washington, 98055-4056; or delivered in duplicate to the Transport Airplane Directorate at the above address. Comments must be marked: Docket No. NM220 Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

**FOR FURTHER INFORMATION CONTACT:** Mike Thompson, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98055-4056; telephone (425) 227-1157; facsimile (425) 227-1149.

**SUPPLEMENTARY INFORMATION:**