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## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 25

[Docket No. NM198; Special Conditions No. 25-187-SC]

#### Special Conditions: Boeing Model 777 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 Boeing Model 777 series airplanes. These airplanes, which are manufactured by Boeing Commercial Airplanes, will have novel and unusual design features 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 October 3, 2001. Comments must be received on or before November 13, 2001.

**ADDRESSES:** Comments on these special conditions may be mailed in duplicate to: Federal Aviation Administration (FAA), Transport Airplane Directorate, ANM-113, Attention: Rules Docket No. NM198, 1601 Lind Avenue, SW., Renton, Washington 98055-4056, or delivered in duplicate to the Transport Airplane Directorate at the above address. All comments must be marked: Docket No. NM198. Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4:00 p.m.

#### FOR FURTHER INFORMATION CONTACT:

Jayson Claar, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98055-4056; telephone (425) 227-2194; facsimile (425) 227-1149.

**SUPPLEMENTARY INFORMATION:** The FAA has determined that notice and opportunity for prior public comment hereon are unnecessary because these special conditions are substantially identical to those that have been issued on three previous occasions, and that further new comments are unlikely.

#### Comments Invited

Interested persons are invited to submit such written data, views, or arguments as they may desire. Communications should identify the Rules Docket number identified above and be submitted in duplicate to the address specified above. All communications received on or before the closing date for comments specified above will be considered. The special conditions may be changed in light of the comments received.

All comments received will be available in the Rules Docket for examination by interested persons, both before and after the closing date for comments. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the Rules Docket.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this request must submit a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket Number NM198." The postcard will be date stamped and returned to the commenter.

#### Background

On April 20, 2001, Boeing Commercial Airplanes, P.O. Box 3707, Seattle, Washington 98124, applied for a type certificate design change to install inflatable lapbelts for head injury protection on certain seats in Boeing Model 777 series airplanes. The Model 777 series airplane is a swept-wing, conventional-tail, twin-engine, turbofan-powered transport. The inflatable lapbelt is designed to limit occupant forward excursion in the event of an accident. This will reduce the potential

for head injury, thereby reducing the Head Injury Criteria (HIC) measurement. The inflatable lapbelt behaves similarly to an automotive airbag, but in this case the airbag is integrated into the lapbelt, and inflates away from the seated occupant. While 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 or other rigid interior feature or, where 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 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 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.

Amendment 25-64 is part of the Model 777 certification basis. Therefore, the seat installation with inflatable lapbelts must meet the requirement that a HIC of less than 1000 be demonstrated for occupants of seats incorporating the inflatable lapbelt.

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 need to be developed that do fully address the safety concerns specific to occupants of these seats.

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, for example, and

second, it can provide essentially equivalent protection for occupants of all stature. 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 Federal Aviation Regulations (FAR). 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. These potential advantages must be balanced against the 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 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 for activation so that it is available 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. Boeing Commercial Airplanes 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 into account wear and tear 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-78 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. There is no requirement for the inflatable lapbelt to provide protection for 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 inflatable 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 may 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 seats so equipped by children whether 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. Since the bag deflates to absorb energy, 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 much quicker than ten seconds.

Finally, it should be noted that the special conditions are certification requirements applied 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, Boeing Commercial Airplanes must show that the Model 777 series airplanes, as changed, continue to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. T00001SE or the applicable regulations in effect on the date of application for the change. 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. T00001SE are as follows: Amendments 25–1 through 25–82 for the Model 777–200 and Amendments 25–1 through 25–86 with exceptions for the Model 777–300. The U.S. type certification basis for the Model 777 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. T00001SE.

If the Administrator finds that the applicable airworthiness regulations (i.e., part 25 as amended) do not contain adequate or appropriate safety standards for Boeing Model 777 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, the Boeing Model 777 must comply with the fuel vent and exhaust emission requirements of part 34 and the noise certification requirements of part 36.

Special conditions, as appropriate, are issued in accordance with § 11.19 after public notice, as required by § 11.38, and become part of the type certification basis in accordance with § 21.101(b)(2).

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified 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).

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

The Model 777 series airplanes will incorporate the following novel or unusual design features: Boeing Commercial Airplanes is proposing to install an inflatable lapbelt on certain seats of Boeing Model 777 series airplanes, in order to reduce the potential for head injury in the event of an accident. The inflatable lapbelt works similar to an automotive airbag, except that the airbag is integrated with the lap belt of the restraint system.

The CFR states the performance criteria for head injury 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 Boeing Model 777 series airplanes equipped with inflatable lapbelts. Other 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 the 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 substantially agreed with the commenter, but noted that the substance of the comment was already addressed in the special conditions. Therefore, this comment did not result in a change to the special conditions.

### **Applicability**

As discussed above, these special conditions are applicable to the Model 777 series airplanes. Should Boeing Commercial Airplanes apply at a later date for a change to the type certificate to modify any other model included on Type Certificate No. T00001SE to incorporate the same novel or unusual design feature, the 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 the Boeing Model 777 series airplanes. It is not a rule of general applicability, and it affects only Model 777 series airplanes listed on TCDS T00001SE.

### **Immediate Adoption of Special Conditions**

The FAA has determined that notice and opportunity for prior public comment hereon are unnecessary because these special conditions are substantially identical to those that have been issued on three previous occasions, and that further new comments are unlikely.

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

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

### **Authority Citation**

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, pursuant to the authority delegated to me by the Administrator, the following special

conditions are issued as part of the type certification basis for the Boeing Model 777 series airplanes.

1. *Seats With Inflatable Lapbelts.* 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. 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 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—78 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 October 3, 2001.

**Ali Bahrami,**

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

[FR Doc. 01–25753 Filed 10–11–01; 8:45 am]

**BILLING CODE 4910–13–U**

## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 39

[Docket No. 2000–CE–28–AD; Amendment 39–12462; AD 2001–20–14]

**RIN 2120–AA64**

#### **Airworthiness Directives; Fairchild Aircraft, Inc., Models SA226 and SA227 Series Airplanes**

**AGENCY:** Federal Aviation Administration, DOT.

**ACTION:** Final rule.

**SUMMARY:** This amendment adopts a new airworthiness directive (AD) that applies to certain Fairchild Aircraft SA226 and SA227 series airplanes. This AD requires you to replace the brake shuttle valves with parts of improved design and install a shield over the hydraulic lines. This AD also requires replacing the rubber fuel hose with a

metal device for certain SA226 series airplanes. This AD is the result of a report of a wheel brake system malfunction caused by a faulty brake shuttle valve. The actions specified by this AD are intended to correct potential brake shuttle valve problems, which could cause the brake assembly to drag and overheat. Hydraulic or fuel line damage could then occur if the overheated brake assembly is retracted into the main wheel well, with a consequent fire if the hydraulic or fuel lines ruptured.

**DATES:** This AD becomes effective on November 21, 2001.

The Director of the Federal Register approved the incorporation by reference of certain publications listed in the regulations as of November 21, 2001.

**ADDRESSES:** You may get the service information referenced in this AD from Fairchild Aircraft, Inc., P.O. Box 790490, San Antonio, Texas 78279–0490; telephone: (210) 824–9421; facsimile: (210) 820–8609. You may view this information at the Federal Aviation Administration (FAA), Central Region, Office of the Regional Counsel, Attention: Rules Docket No. 2000–CE–28–AD, 901 Locust, Room 506, Kansas City, Missouri 64106; or at the Office of the Federal Register, 800 North Capitol Street, NW, suite 700, Washington, DC.

**FOR FURTHER INFORMATION CONTACT:** Werner Koch, Aerospace Engineer, FAA, Airplane Certification Office, 2601 Meacham Boulevard, Fort Worth, Texas 76193–0150; telephone: (817) 222–5133; facsimile: (817) 222–5960.

#### **SUPPLEMENTARY INFORMATION:**

##### **Discussion**

##### *What Events Have Caused This AD?*

The FAA received a report of an accident involving a Fairchild Model SA226-TC airplane where the flight crew lost control of the airplane at low altitude during the final approach for landing. Prior to the accident, the flight crew reported a loss of hydraulic pressure and a fire on the left side of the airplane.

Investigation of this accident indicates the following:

- The flight crew applied right rudder power during the takeoff roll to compensate for a dragging and overheated left wheel brake and then raised the landing gear into the left wheel well;
- The overheated left wheel brake ignited the tires and the hydraulic fluid; and
- The resultant fire burned the rubber fuel crossover hose and resulted in fuel leakage with a consequent fuel fire.