Note: Boeing must demonstrate that the installation of seats via plinths or pallets meets all applicable requirements. Compliance with the guidance contained in policy memorandum PS–ANM–100–2000–00123, ''Guidance for Demonstrating Compliance with Seat Dynamic Testing for Plinths and Pallets,'' dated February 2, 2000, is acceptable to the FAA.

7. Head Injury Criteria (HIC):

The HIC value must not exceed 1000 at any condition at which the pretensioner does or does not deploy, up to the maximum severity pulse that corresponds to the test conditions specified in § 25.562. Tests must be performed to demonstrate this, taking into account any necessary tolerances for deployment.

When an airbag device is present in addition to the pretensioner restraint system, and the anthropormorphic test device (ATD) has no apparent contact with the seat/structure but has contact with an airbag, a HIC unlimited scored in excess of 1000 is acceptable, provided the HIC15 score (calculated in accordance with 49 CFR 571.208) for that contact is less than 700. ATD head contact with the seat or other structure, through the airbag, or contact subsequent to contact with the airbag, requires a HIC value that does not exceed 1000.

8. Protection During Secondary Impacts:

The pretensioner activation setting must be demonstrated to maximize the probability of the protection being available when needed, considering secondary impacts.

9. Protection of Occupants Other than 50th Percentile:

Protection of occupants for a range of stature from a 2-year-old child to a 95th percentile male must be shown. For shoulder harnesses that include pretensioners, protection of occupants other than a 50th percentile male may be shown by test or analysis. In addition, the pretensioner must not introduce a hazard to passengers due to the following seating configurations:

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 pregnant woman.

10. Occupants Adopting the Brace Position:

Occupants in the traditional brace position when the pretensioner activates must not experience adverse effects from the pretensioner activation.

11. Inadvertent Pretensioner Actuation:

a. The probability of inadvertent pretensioner actuation must be shown to be extremely remote (*i.e.,* average probability per flight hour of less than 10^{-7}).

b. The system must be shown not susceptible to inadvertent pretensioner actuation as a result of wear and tear, or inertia loads resulting from in-flight or ground maneuvers likely to be experienced in service.

c. The seated occupant must not be seriously injured as a result of inadvertent pretensioner actuation.

d. Inadvertent pretensioner activation must not cause a hazard to the airplane, nor cause serious injury to anyone who may be positioned close to the retractor or belt (*e.g.,* seated in an adjacent seat or standing adjacent to the seat).

12. Availability of the Pretensioner Function Prior to Flight:

The design must provide means for a crewmember to verify the availability of the pretensioner function prior to each flight, or the probability of failure of the pretensioner function must be demonstrated to be extremely remote (*i.e.,* average probability per flight hour of less than 10^{-7}) between inspection intervals.

13. Incorrect Seat Belt Orientation:

The system design must ensure that any incorrect orientation (twisting) of the seat belt does not compromise the pretensioner protection function.

14. Contamination Protection:

The pretensioner mechanisms and controls must be protected from external contamination associated with that which could occur on or around passenger seating.

15. Prevention of Hazards:

The pretensioner system must not induce a hazard to passengers in case of fire, nor create a fire hazard, if activated.

16. Functionality After Loss of Power:

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

Issued in Des Moines, Washington, on June 22, 2020.

James E. Wilborn,

Acting Manager, Transport Standards Branch, Policy and Innovation Division, Aircraft Certification Service.

[FR Doc. 2020–13759 Filed 7–9–20; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA–2019–0841; Special Conditions No. 25–770–SC]

Special Conditions: The Boeing Company Model 787–10 Series Airplanes; Dynamic Test Requirements for Single-Occupant Oblique Seats With Pretensioner Restraint Systems

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

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for The Boeing Company (Boeing) Model 787–10 series airplanes. These airplanes will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport category airplanes. This design feature is single-occupant oblique seats equipped with pretensioner restraint systems. 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: Effective August 10, 2020.

FOR FURTHER INFORMATION CONTACT: Shannon Lennon, Airframe and Cabin Safety Section, AIR–675, Transport Standards Branch, Policy and Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 2200 South 216th Street, Des Moines, Washington 98198; telephone and fax 206–231–3209; email *shannon.lennon@faa.gov*.

SUPPLEMENTARY INFORMATION:

Background

On July 18, 2018, Boeing applied for a change to Type Certificate No. T00021SE for single-occupant oblique seats with pretensioner restraint systems, instead of airbags, which are the typical restraints used to protect the passengers from head injuries. These seats are to be installed in Boeing Model 787–10 series airplanes. The Boeing Model 787–10 series airplanes are twin-engine, transport-category airplanes with passenger seating capacity of 440 and a maximum takeoff weight of 560,000 pounds.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, Boeing must show that the Model 787–10 series airplanes, as changed, continue to meet the applicable provisions of the regulations listed in Type Certificate No. T00021SE or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (*e.g.,* 14 CFR part 25) do not contain adequate or appropriate safety standards for Boeing Model 787–10 series airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

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, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, Boeing Model 787–10 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.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

Novel or Unusual Design Features

The Boeing Model 787–10 series airplanes will incorporate the following novel or unusual design feature:

Single-occupant oblique seats with pretensioner restraint systems to protect the passengers from head injuries.

Discussion

Boeing will install, in Model 787–10 series airplanes, oblique (side-facing) seats that incorporate seatbelts with a pretensioner system at each seat place, to comply with the occupant injury criteria of § 25.562(c)(5).

The FAA has been conducting and sponsoring research on appropriate injury criteria for oblique seat installations. However, the FAA research program is not complete, and the FAA may update these criteria as further research results are collected. To reflect current research findings, the FAA issued policy statements PS–ANM–25–03–R1, ''Technical Criteria for Approving Side-Facing Seats,'' November 12, 2012, which updates injury criteria for fully side-facing seats, and PS–AIR–25–27, ''Technical Criteria for Approving Oblique Seats,'' July 11, 2018, to define injury criteria for oblique seats. These policies provide background and technical information as well as applicable injury criteria.

The installation of obliquely oriented passenger seats are novel such that the current certification basis does not adequately address occupant-protection expectations with regard to the occupant's neck and spine for seat configurations that are positioned at an angle greater than 18 degrees from the airplane longitudinal centerline.

The installation of passenger seats at angles between 18 and 45 degrees from the airplane longitudinal centerline are unusual due to the seat occupant interface with the surrounding furniture, and which introduce occupant alignment and loading concerns with or without the installation of 3-point or airbag-restraint systems.

FAA-sponsored research has found that an unrestrained flailing of the upper torso, even when the pelvis and torso are nearly aligned, can produce serious spinal and torso injuries. At lower impact severities, even with significant misalignment between the torso and pelvis, these injuries did not occur. Tests with the FAA Hybrid III anthropomorphic test device (ATD) have identified a level of lumbar spinal tension corresponding to the no-injury impact severity. This level of tension is included as a limit in the special conditions. The spinal-tension limit selected is conservative with respect to other aviation injury criteria because it corresponds to a no-injury loading condition, but the degree of conservatism is unknown because the precise spinal-loading level at which injuries would begin to occur is unknown. The small number of human-subject tests accomplished during this research project limits the robustness of the selected tension limit.

Other restraint systems have been used to comply with the occupant injury criteria of § 25.562(c)(5). For instance, shoulder harnesses have been widely used on flight attendant seats, flight-deck seats, in business jets, and in general-aviation airplanes to reduce occupant head injury in the event of an emergency landing. Special conditions, pertinent regulations, and published guidance exist that relate to other restraint systems. However, the use of pretensioners in the restraint system on transport-airplane seats is a novel design.

Pretensioner technology involves a step-change in loading experienced by the occupant for impacts below and above that at which the device deploys, because activation of the shoulder harness, at the point at which the pretensioner engages, interrupts upper-torso excursion. This could result in the head injury criteria (HIC) being higher at an intermediate impact condition than that resulting from the maximum impact condition corresponding to the test conditions specified in § 25.562. See condition 7 in these special conditions.

The ideal triangular maximum-severity pulse is defined in Advisory Circular (AC) 25.562–1B. For the evaluation and testing of less-severe pulses for purposes of assessing the effectiveness of the pretensioner setting, a similar triangular pulse should be used with acceleration, rise time, and velocity change scaled accordingly. The magnitude of the required pulse should not deviate below the ideal pulse by more than 0.5g until 1.33 t_1 is reached, where t_1 represents the time interval between 0 and t_1 on the referenced pulse shape as shown in AC 25.562–1B. This is an acceptable method of compliance to the test requirements of the special conditions.

Additionally, the pretensioner might not provide protection, after actuation, during secondary impacts. Therefore, the case where a small impact is followed by a large impact should be addressed. If the minimum deceleration severity at which the pretensioner is set to deploy is unnecessarily low, the protection offered by the pretensioner may be lost by the time a second larger impact occurs.

The existing special conditions for Model 787 oblique seat installations do not adequately address oblique seats with 3-point and pretensioner restraint systems. Therefore, the proposed configuration requires special conditions.

Conditions 1 through 6 address occupant protection in consideration of the oblique-facing seats. Conditions 7 through 10 ensure that the pretensioner system activates when intended, to provide the necessary protection of occupants. This includes protection of a range of occupants under various accident conditions. Conditions 11 through 16 address maintenance and reliability of the pretensioner system, including any outside influences on the mechanism, to ensure it functions as intended.

The 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.

Discussion of Comments

The FAA issued Notice of Proposed Special Conditions No. 25–20–02–SC for the Boeing Model 787–10 series airplane, which was published in the **Federal Register** on March 2, 2020 (85 FR 12230). The FAA received responses from three commenters.

Boeing suggested one edit for clarity, to the paragraph immediately preceding the list of conditions in the Special Conditions section, to change text that reads, ''. . . passenger seats installed at an angle 18 degrees and 45 degrees . . .'' to read, ''. . . passenger seats installed at an angle between 18 degrees and 45 degrees . . .'' The FAA concurs with the suggested change because the change more correctly conveys the installation angle range for oblique seats discussed in these special conditions.

Boeing recommended adding two sentences at the end of condition no. 7 regarding HIC, to be consistent with same-topic special conditions previously issued. It is the FAA's understanding that the proposed pretensioner restraint system is intended to replace the use of an airbag system as mentioned in the Background section of this document. Therefore, the information Boeing requested, pertaining to HIC associated with airbag contact, would not apply to these special conditions as originally proposed. However, in the event that an airbag device is incorporated in conjunction with a pretensioner restraint system, the FAA agrees to include the additional information consistent with the information provided in recently published oblique-seat special conditions. When present, the airbag device (*e.g.,* inflatable lap-belt airbag or structure-mounted airbag) must also meet the existing special conditions applicable to either inflatable lap belts or structure-mounted airbags.

An individual commenter states, ''Diagrams of the proposed seat installation with and without a person sitting in it would provide the visual context to the proposed regulation. Also, a seat diagram would help clarify how neck injuries will be mitigated by the restraint system is vague. Assuming a crash, would a person's neck just receive minor injuries resulting in whiplash [or] is the seat designed to reduce head movement during crashes?''

The pretensioner restraint system, which is incorporated into the seat design, is intended to eliminate slack in the shoulder harness, and to pull the occupant back into the seat prior to impact. This has the effect of reducing occupant forward translation and reducing head movement, thus minimizing the potential for injuries. Based on this description of the pretensioner restraint system, the FAA has determined that it is not necessary to provide a seat diagram to convey the same information. Further discussion regarding the development of criteria to address occupant injuries can be found in FAA Policy Statement PS–AIR–25–27, Appendix A.

Another individual commenter asks, ''Has an investigation been completed as to how much aircraft evacuations may be affected by canting the seats at an angle from centerline?''

An investigation of the effects of obliquely positioned (canted) seat installations on aircraft evacuations has not been conducted because it is not necessary to do so. Occupants in oblique seats have access to egress aisles as well as visibility of emergency exits and exit signs similar to occupants of non-oblique, forward-facing seats. Furthermore, for all interior configuration variants, it is the installer's responsibility to demonstrate evacuation capability of the airplane, via demonstration of compliance to § 25.803, prior to certification.

Except as discussed above, the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to Boeing Model 787–10 series airplanes. Should Boeing apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on one model series of airplanes. It is not a rule of general applicability.

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(f), 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 Boeing Model 787–10 series airplanes.

In addition to the requirements of § 25.562, passenger seats installed at an angle between 18 degrees and 45 degrees from the airplane longitudinal centerline must meet the following:

1. Body-to-Wall and Body-to-Furnishing Contact:

If a seat is installed aft of structure, such as an interior wall or furnishings, and which does not provide a homogenous contact surface for the expected range of occupants and yaw angles, then additional analysis and tests may be required to demonstrate that the injury criteria are met for the area which an occupant could contact. For example if, in addition to a pretensioner restraint system, an airbag device is present, different yaw angles could result in different airbag-device performance, then additional analysis or separate tests may be necessary to evaluate performance.

2. Neck Injury Criteria:

a. The seating system must protect the occupant from experiencing serious neck injury. In addition to a pretensioner restraint system, if an airbag device also is present, the assessment of neck injury must be conducted with the airbag device activated, unless there is reason to also consider that the neck injury potential would be higher for impacts below the airbag-device deployment threshold.

b. The N_{ij} (calculated in accordance with 49 CFR 571.208) must be below 1.0, where $N_{ij} = F_z/F_{zc} + M_y/M_{yc}$, and N_{ij} critical values are:

F_{zc} = 1530 lbs for tension
F_{zc} = 1385 lbs for compression
M_{yc} = 229 lb-ft in flexion
M_{yc} = 100 lb-ft in extension

c. Peak F_z must be below 937 lbs in tension and 899 lbs in compression.

d. Rotation of the head about its vertical axis relative to the torso is limited to 105 degrees in either direction from forward facing.

e. The neck must not impact any surface that would produce concentrated loading on the neck.

3. Spine and Torso Injury Criteria:

a. The lumbar spine tension (F_z) cannot exceed 1200 lbs.

b. Significant concentrated loading on the occupant's spine, in the area between the pelvis and shoulders during impact, including rebound, is not acceptable. During this type of contact, the interval for any rearward (X

direction) acceleration exceeding 20g must be less than 3 milliseconds as measured by the thoracic instrumentation specified in 49 CFR part 572, subpart E, filtered in accordance with SAE recommended practice J211/1, ''Instrumentation for Impact Test—Part 1–Electronic Instrumentation.''

c. The occupant must not interact with the armrest or other seat components in any manner significantly different than would be expected for a forward-facing seat installation.

4. Pelvis Criteria:

Any part of the load-bearing portion of the bottom of the ATD pelvis must not translate beyond the edges of the seat bottom seat-cushion supporting structure.

5. Femur Criteria:

Axial rotation of the upper leg (about the Z-axis of the femur per SAE Recommended Practice J211/1) must be limited to 35 degrees from the nominal seated position. Evaluation during rebound does not need to be considered.

6. ATD and Test Conditions:

Longitudinal tests conducted to measure the injury criteria above must be performed with the FAA Hybrid III ATD, as described in SAE 1999–01–1609. The tests must be conducted with an undeformed floor, at the most-critical yaw cases for injury, and with all lateral structural supports (*e.g.* armrests or walls) installed.

Note: Boeing must demonstrate that the installation of seats via plinths or pallets meets all applicable requirements. Compliance with the guidance contained in policy memorandum PS–ANM–100–2000–00123, ''Guidance for Demonstrating Compliance with Seat Dynamic Testing for Plinths and Pallets,'' dated February 2, 2000, is acceptable to the FAA.

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The HIC value must not exceed 1000 at any condition at which the pretensioner does or does not deploy, up to the maximum severity pulse that corresponds to the test conditions specified in § 25.562. Tests must be performed to demonstrate this, taking into account any necessary tolerances for deployment.

When an airbag device is present in addition to the pretensioner restraint system, and the anthropormorphic test device (ATD) has no apparent contact with the seat/structure but has contact with an airbag, a HIC unlimited scored in excess of 1000 is acceptable, provided the HIC15 score (calculated in accordance with 49 CFR 571.208) for that contact is less than 700. ATD head contact with the seat or other structure, through the airbag, or contact subsequent to contact with the airbag, requires a HIC value that does not exceed 1000.

8. Protection During Secondary Impacts:

The pretensioner activation setting must be demonstrated to maximize the probability of the protection being available when needed, considering secondary impacts.

9. Protection of Occupants Other than 50th Percentile:

Protection of occupants for a range of stature from a 2-year-old child to a 95th percentile male must be shown. For shoulder harnesses that include pretensioners, protection of occupants other than a 50th percentile male may be shown by test or analysis. In addition, the pretensioner must not introduce a hazard to passengers due to the following seating configurations:

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 pregnant woman.

10. Occupants Adopting the Brace Position:

Occupants in the traditional brace position when the pretensioner activates must not experience adverse effects from the pretensioner activation.

11. Inadvertent Pretensioner Actuation:

a. The probability of inadvertent pretensioner actuation must be shown to be extremely remote (*i.e.,* average probability per flight hour of less than 10^{-7}).

b. The system must be shown not susceptible to inadvertent pretensioner actuation as a result of wear and tear, or inertia loads resulting from in-flight or ground maneuvers likely to be experienced in service.

c. The seated occupant must not be seriously injured as a result of inadvertent pretensioner actuation.

d. Inadvertent pretensioner activation must not cause a hazard to the airplane, nor cause serious injury to anyone who may be positioned close to the retractor or belt (*e.g.,* seated in an adjacent seat or standing adjacent to the seat).

12. Availability of the Pretensioner Function Prior to Flight:

The design must provide means for a crewmember to verify the availability of the pretensioner function prior to each flight, or the probability of failure of the pretensioner function must be demonstrated to be extremely remote (*i.e.,* average probability per flight hour of less than 10^{-7}) between inspection intervals.

13. Incorrect Seat Belt Orientation:

The system design must ensure that any incorrect orientation (twisting) of the seat belt does not compromise the pretensioner protection function.

14. Contamination Protection:

The pretensioner mechanisms and controls must be protected from external contamination associated with that which could occur on or around passenger seating.

15. Prevention of Hazards:

The pretensioner system must not induce a hazard to passengers in case of fire, nor create a fire hazard, if activated.

16. Functionality After Loss of Power:

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

Issued in Des Moines, Washington, on June 22, 2020.

James E. Wilborn,

Acting Manager, Transport Standards Branch, Policy and Innovation Division, Aircraft Certification Service.

[FR Doc. 2020–13760 Filed 7–9–20; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 71

[Docket No. FAA–2020–0361; Airspace Docket No. 20–AEA–9]

RIN 2120–AA66

Amendment of the Class D and Class E Airspace and Revocation of Class E Airspace; Erie and Corry, PA

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This action amends the Class D airspace, Class E surface area airspace, and Class E airspace extending upward from 700 feet above the surface at Erie International Airport/Tom Ridge Field, Erie, PA; revokes the Class E airspace area designated as an extension to Class D and Class E surface area at Erie International Airport/Tom Ridge Field; and amends the Class E airspace extending upward from 700 feet above the surface at Corry-Lawrence Airport, Corry, PA. This action is the result of airspace reviews due to the decommissioning of the Tidioute VHF omnidirectional range (VOR) navigation aid as part of the VOR Minimum Operational Network (MON) Program.

DATES: Effective 0901 UTC, September 10, 2020. The Director of the Federal Register approves this incorporation by