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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2016-5595; Directorate Identifier 2015-NM-087-AD; Amendment 39-18871; AD 2017-09-09]

RIN 2120-AA64

Airworthiness Directives; Zodiac Seats California LLC Seating Systems

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: We are adopting a new airworthiness directive (AD) for certain Zodiac Seats California LLC seating systems. This AD was prompted by a determination that the affected seating systems may cause serious injury to the occupant during forward impacts when subjected to certain inertia forces. This AD requires removing affected seating systems. We are issuing this AD to address the unsafe condition on these products.

DATES: This AD is effective June 28, 2017.

ADDRESSES:

Examining the AD Docket

You may examine the AD docket on the Internet at http://www.regulations.gov by searching for and locating Docket No. FAA-2016-5595; or in person at the Docket Management Facility between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this AD, the regulatory evaluation, any comments received, and other information. The address for the Docket Office (phone: 800-647-5527) is Docket Management Facility, U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE., Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: Patrick Farina, Aerospace Engineer, Cabin Safety Branch, ANM-150L, FAA, Los Angeles Aircraft Certification Office (ACO), 3960 Paramount Boulevard, Lakewood, CA 90712-4137; phone: 562-627-5344; fax: 562-627-5210; email: patrick.farina@faa.gov.

SUPPLEMENTARY INFORMATION:

Discussion

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 by adding an AD that would apply to certain Zodiac Seats California LLC seating systems. The NPRM published in the Federal Register on April 20, 2016 (81 FR 23212) ("the NPRM"). The NPRM was prompted by a determination that the affected seating systems may cause serious injury to the occupant during forward impacts when subjected to certain inertia forces. The NPRM proposed to require removing affected seating systems. We are issuing this AD to prevent serious injury to the occupant during forward impacts in emergency landing conditions.

After the NPRM comment period closed, we reopened the comment period to allow additional time for interested parties to comment on the NPRM (81 FR 41466, June 27, 2016).

Comments

We gave the public the opportunity to participate in developing this AD. The following presents the comments received on the NPRM and the FAA's response to each comment.

Request To Withdraw the NPRM

The Industry Ad Hoc Committee (which consists of Bombardier, Embraer, HAECO Cabin Solutions, Zodiac Seats California, Zodiac Seats France, Zodiac Seats UK, and Zodiac Seats US) and Zodiac Seats California (commenting independently) questioned the basis for the requirements of the proposed AD. We infer they are requesting we withdraw the NPRM. The Industry Ad Hoc Committee and Zodiac Seats California stated the proposed AD is not supported on a technical basis and is based only on limited research. The Industry Ad Hoc Committee asked if there have been any aerospace incidents or accidents documenting the specific neck injuries being mitigated by the proposed AD. The Industry Ad Hoc Committee and Zodiac Seats California stated there has been no correlation to develop proper costs/benefits related to the type of injury mechanism specified in the NPRM with respect to actual accident injuries. The Industry Ad Hoc Committee and Zodiac Seats California cited multiple accidents where news and investigative reports from the accidents did not mention serious neck injuries.

We do not agree to withdraw the NPRM. The intent of this AD is to provide a safe outcome for passengers during a survivable crash by preventing serious injuries, such as a transection of the neck during forward impacts in emergency landing conditions. We find that sufficient data exist to demonstrate that affected seating systems might cause serious injury to the occupant during forward impacts when subjected to certain inertia forces. We note that the commenters have identified several accidents that were survivable with seating systems that are not subject to this AD. The comparison of those seating systems to the ones identified in this AD is not valid.

We have identified an unsafe condition and determined corrective action is required. Therefore, we have not revised this AD in this regard. We have provided additional details on the unsafe condition in the comment responses that follow.

Request To Revise Applicability To Exclude Seating Systems With a Certain Design

Zodiac Seats California requested that we exclude new seating systems that have been built with design solutions that remove the unsafe condition. Zodiac Seats California recommended that we refine table 1 to paragraphs (c), (g), (i), (j), and (k) of the proposed AD to further identify part numbers by specifying the part number, and then use parenthetical groups in order to segregate the part numbers for the redesigned seating systems.

We agree because the redesigned seating systems are not affected by the identified unsafe condition. The redesigned seating systems have new part numbers. Table 1 to paragraphs (c), (g), (i), (j), and (k) of the proposed AD was based upon the Zodiac Seats California technical standard order (TSO) authorization. We have revised table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD by providing additional part number details to specify only those seats having the unsafe condition.

Also, the part number format for model number 4170 in table 1 to paragraphs (c), (g), (i), (j), and (k) of the proposed AD has been revised to reflect the current format.

Request To Revise Applicability To Exclude Certain Part Numbers

Bombardier requested that we exclude certain parts from the applicability of the proposed AD. Bombardier stated that seats that do not have meal/food trays nor upper literature pockets, such as part numbers 41763002-( )-( ), 41765002-( )-( ), and 41767002-( )-( ), should be excluded. Bombardier stated that these seats are either: (1) Installed at a pitch range of 41 inches to 42 inches or a pitch of 45 inches, making it unlikely that a passenger seated behind this seat would be susceptible to neck injuries during forward impacts addressed in the proposed AD; or (2) are the last row in front of a bulkhead, and thus no passengers would ever impact the last row of seats when subjected to the forward impacts addressed in the proposed AD. Bombardier also recommended that the format of "41XX( )-( )-( )" be revised to "41XXXXXXXX-( )-( ) to specify additional detail.

We partially agree with the commenter's request. The initial installation controls the seating positions at a defined pitch range. However, table 1 to paragraphs (c), (g), (i), (j), and (k) of the proposed AD was established based on the TSO authorization of the seating systems and addresses both the initial installation and secondary market in which the seating system may have been modified after issuance of the type certificate.

Therefore, we have revised paragraph (c) of this AD to exclude part numbers 41763002-( )-( ), 41765002-( )-( ), and 41767002-( )-( ), but only if the seats have not been modified to add a food tray or an upper literature pocket. We also revised the part number format in table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD to specify additional detail.

Request To Revise Applicability To Exclude Certain Parts Based on Installation Instructions

Zodiac Seats California requested that we exclude seats from the applicability of the proposed AD based on how they were originally installed. Zodiac Seats California stated that certain seats do not have the injurious condition cited in the NPRM due to how they were installed. Zodiac Seats California cited the following examples: Last row seats that do not have aft-mounted food tables; seats installed at pitches at 39.5 inches or greater; and seats installed at pitches greater than 41 inches that do not have aft-mounted food tables on the forward exit seat. Zodiac Seats California identified multiple part numbers that should be excluded.

We do not agree. While the Zodiac Seats California "Instructions for Installation and Limitations" provides guidance for the installation of the seating systems, it is not mandatory that installers follow the guidance. The seats may be modified in the secondary market in which seat configurations and airplane interior installations may occur without Zodiac Seats California's or the airplane original equipment manufacturer's participation. Therefore, we cannot exclude seats based on the original installation. In addition, dynamic 16g head injury criteria (HIC) tests at a seat pitch of 39.5 inches using the FAA 50-percentile Hybrid II Anthropomorphic Test Device (ATD) may lead to the conclusion that the unsafe condition does not exist; however, the tests do not evaluate a range of occupants. We have not changed this AD in this regard.

Request To Revise Applicability To Exclude Seats on The Boeing Company Model MD-90-30 Airplanes

Zodiac Seats California requested that we revise the applicability of the proposed AD by excluding model number 4170 seats installed on The Boeing Company Model MD-90-30 airplanes. Zodiac Seats California stated that the MD-90-30 installation does not require 16g row-to-row HIC tests because Model MD-90-30 airplanes are not required to comply with 14 CFR 25.562(c)(5) and (c)(6). Delta Airlines (Delta) requested that we clarify whether the AD is applicable to Model MD-90-30 airplanes.

We agree to clarify the applicability because seat model number 4170 includes a group of seating systems that share a design feature that does not provide occupant impact protection. Known installations include both Model MD-90-30 and Model 717-200 airplanes. Excluding Model MD-90-30 airplanes would put passengers on those airplanes at risk for a potential serious injury. In addition, compliance with FAA standards that are in place at the time of certification (including Model MD-90-30 certification requirements) does not preclude the possibility that an unsafe condition will be identified in the future, which is the case here.

Paragraph (c) of this AD identifies affected seating systems, which are installed on, but not limited to, the airplanes identified in paragraphs (c)(1) through (c)(9) of this AD. Although Model MD-90-30 airplanes with affected seating systems are included in the applicability of this AD as a result of the phrase "but not limited to," we have added this model to paragraph (c)(1) of this AD for clarification. The phrase "but not limited to" also covers any other aircraft that these seats may have been installed on via the secondary market, such as seats that have been excessed from one air carrier and put onto another airplane not identified in this AD via a supplemental type certificate or other installation approval method. These seating systems may cause serious injury to passengers during forward impacts when subjected to certain inertia forces; therefore, these seating systems are subject to the requirements of this AD.

Request To Revise Applicability To Include Components of Seating Systems

United Parcel Service (UPS) requested that we revise the applicability of the proposed AD to include airplanes with components of the affected seating systems installed. UPS stated that the applicability of the proposed AD affects all airplanes equipped with the seating systems identified in paragraph (c) of the proposed AD. UPS added that paragraph (k) of the proposed AD has requirements that affect additional airplanes, and proposed that the applicability should specify all airplanes that may have components of the subject seat systems installed. Delta stated that the language in paragraph (k) of the proposed AD places an excessive burden on operators that may use components as spares on other seating systems.

We do not agree to change the applicability of this AD in this regard. However, we do agree to clarify the intent of paragraph (k) of this AD. Paragraph (k) only applies to airplanes affected by the applicability specified in paragraph (c) of this AD, i.e., airplanes on which affected seating systems are installed. Paragraph (k) of this AD does not prohibit installing components on airplanes that have seating systems that are not included in the applicability specified in paragraph (c) of this AD. We have not changed this AD in this regard.

Request To Revise Applicability to Exclude Seat Systems Having Part Number 4157x003-( )-( )

Embraer requested that we revise the applicability to exclude part number 4157x003-( )-( ). Embraer stated that part is no longer affected by the unsafe condition identified in the NPRM.

We agree that part number 4157x003-( )-( ) is not affected by the identified unsafe condition. As stated previously, we have revised table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD to clearly identify affected parts; that table does not include part number 4157x003-( )-( ).

Request To Delay Issuance of the Proposed AD

Austrian Airlines AG (which consists of Air Dolomiti, Austrian Airlines, and Lufthansa CityLine) stated that no technical option (such as a technical modification from Zodiac Seats California) is included in the proposed AD to keep the system on the airplane after the 60-month time limit for eliminating the unsafe condition.

We infer the commenter is requesting that we delay the proposed AD until a modification of affected seating systems is available. We do not agree with the commenter's request. We have determined that an unsafe condition exists and that the requirements in this AD are needed to address that unsafe condition. However, under the provisions of paragraph (l) of this AD, we will consider requests for approval of a modification of the seating system if sufficient data are submitted to substantiate that the modification would provide an acceptable level of safety. We have not changed this AD in this regard.

Request To Allow an Alternative Method of Compliance

Zodiac Seats California, SkyWest Airlines, and Delta requested that we allow modification of the seats via a Zodiac service bulletin. Skywest stated that paragraph (g) of the proposed AD only allows for the removal of the seats. Skywest stated that if the request cannot be added to the proposed AD, alternative methods of compliance (AMOCs) will be requested to be able to use service bulletins to modify the seats. Delta stated that Zodiac is developing a seating system design that removes the unsafe condition by modifying the seats. Zodiac Seats California proposed to add the implementation of eight service bulletins as a solution to the proposed AD requirements. Zodiac Seats California stated it has been working with the FAA's Los Angeles ACO to identify a solution that can be implemented on in-service seats.

We acknowledge the work that Zodiac Seats California has done to address the identified unsafe condition on the affected seating systems. However, Zodiac Seats California has not developed design solutions to correct the unsafe condition for each of the seating systems (all relevant service bulletins have not been issued). Once all the service bulletins have been issued, we can determine if they adequately address the identified unsafe condition. We do not consider that delaying this action until after the release of the manufacturer's planned service information is warranted, since the actions required by this AD adequately address the unsafe condition. However, under the provisions of paragraph (l) of this AD, we will consider requests for approval of an AMOC if sufficient data are submitted to substantiate that the change would provide an acceptable level of safety. We have not changed this AD in this regard.

Request To Extend Compliance Time

Austrian Airlines AG requested that we allow more time for compliance. The commenter stated that additional time for compliance is needed so that suitable alternative seating systems could be procured and installed (i.e., time is needed for research and certification).

We do not agree to extend the compliance time in this AD. Operators must comply with the actions in this AD within the compliance times specified in this AD in order to address the identified unsafe condition. The compliance times in this AD are based on the relative risk to safety resulting from non-compliance with 14 CFR 25.785 and the identified unsafe condition. However, under the provisions of paragraph (l) of this AD, we will consider requests for approval of an extension of the compliance time if sufficient data are submitted to substantiate that the new compliance time would provide an acceptable level of safety.

Request To Clarify the Determination of the Unsafe Condition for Previously Certified Seats

Austrian Airlines AG stated that the proposed AD does not mention why the Model 4157( )-( )-( ) seats were certified on Bombardier Inc. Model "CRJ 900 airplanes" and Embraer S.A. Model ERJ 190 airplanes about five years ago, but now do not fulfill FAA seat certification requirements.

Zodiac Seats California stated that since the seats identified in table 1 to paragraphs (c), (g), (i), (j), and (k) of the proposed AD were certified prior to the FAA accepting "Nij < 1" as a proposed means of evaluating neck injury, those seats should not be subject to an AD. Zodiac Seats California noted that when the regulations for HIC and spine loads were introduced, seats certified prior to that time were not required to be removed or modified.

We infer the commenters are requesting that we clarify our determination of the unsafe condition on previously certificated seats. We agree to provide clarification. As part of seat certification requirements (14 CFR 21.605(a)(3), amendment 21-67, and 14 CFR 21.603(a)(1), amendment 21-92), an applicant makes a statement of conformance certifying that they have met the requirements of the applicable regulations and that the article concerned meets the applicable TSO that is effective on the date the application is made. Complying with FAA standards that are in place at the time of certification does not preclude the possibility that an unsafe condition will be identified in the future, which is the case here. Therefore, we have not revised this AD in this regard.

Regarding the use of "Nij < 1 " for evaluating neck injuries, the method was originally proposed by Zodiac Seats California in 2015 to define the limits of the unsafe condition, and the method was accepted by the FAA. In 2016, the Industry Ad Hoc Committee asked for and received clarification from the FAA on this method. 49 CFR 571.208 currently defines a criterion for neck tension and compression, as well as a criterion that combines the effect of the neck-bending moment and axial force, called Nij.

Request To Revise Unsafe Condition Language

The Industry Ad Hoc Committee and Zodiac Seats California requested that we revise the language for the unsafe condition in the proposed AD. The commenters stated that the focus should be on the injury mechanism that both industry and FAA find to be unacceptable (direct neck contact), and that we should delete the description of head motion and excessive neck loading. The commenters stated the Zodiac Seats California data do not support statements in the NPRM that refer to unimpeded sliding motion down the back of the seat occurring during testing. The commenters noted that the seats were certified according to certain regulations and, after a later review, the FAA determined that the interaction between the neck/chin and tray table was not acceptable. The commenters agreed that direct neck interaction and soft tissue contact is not acceptable. However, the commenters stated that Zodiac Seats California has been working to redesign and recertify some of the seat models.

The commenters also expressed disagreement that to show compliance with 14 CFR 25.785, the ATD must demonstrate an unimpeded sliding motion down the back of the seat. The commenters stated that a review of the ATD head motion during a dynamic test is subjective and inaccurate, and there is no established level of performance defined in 14 CFR 25.785 or in any other part 25 regulation with regard to sliding head motion or neck injury. The Industry Ad Hoc Committee referred to a Zodiac Seats California report that does not corroborate the statements specified in the proposed AD.

The Industry Ad Hoc Committee and Zodiac Seats California stated that the associated criterion establishing proper evaluation to prevent a serious injury provided by the FAA is incomplete for validating airplane interior performance and practically impossible to duplicate. The Industry Ad Hoc Committee and Zodiac Seats California noted that the FAA is still actively developing and clarifying both the measuring techniques and requirements to support the NPRM. The Industry Ad Hoc Committee and Zodiac Seats California stated the rationale for the NPRM creates an inconsistent interpretation of 14 CFR 25.785 when it includes requiring an unimpeded sliding motion of the head

and neck bending without verifying this condition does not exist across other seat designs. The Industry Ad Hoc Committee and Zodiac Seats California also asked how an applicant is expected to ensure compliance to 14 CFR 25.785 using guidance published in Advisory Circular (AC) 25-17A ("Transport Airplane Cabin Interiors Crashworthiness Handbook"), May 18, 2009, for all other areas on the seat within potential head strike range not specifically impacted during a 14 CFR 25.562 test event.

We do not agree with the request to revise the unsafe condition language. However, we will further explain our assessment. The FAA and Agência Nacional de Aviação Civil (ANAC) (Brazil) reviewed seven videos from the technical standard order authorization for TSO-C127a seating systems. Based on the video, the FAA characterized the interaction of the ATD chin and the tray table into five cases: two that are normal (typical) interactions, and three that are not. In the two typical interactions, the head either slides down the seat back and tray table unimpeded, or the head crushes the tray table inward and dislodges it downward. The FAA and Zodiac Seats California agreed that two of the abnormal cases are unsafe and corrective action is required.

The remaining interaction involves a scenario where the bottom of the chin (the area closest to the face) catches the top of the tray table, dislodging the table downward as the head slides down the seat back. This condition, which was limited to seating systems with the marketing identification of Slim Plus, needed further investigation. On June 2, 2015, Zodiac Seats California proposed the pass/fail criteria for the investigation of those seating systems in which one or both ATD exhibited this interaction. In August 2015, the FAA witnessed testing of three seating systems at the Zodiac Seats California facility to evaluate this interaction. Zodiac Seats California concluded that design changes to the upper literature pocket and food tray table are necessary.

This AD does not specify that ATD interaction between the ATD and seat back must be a sliding motion. The unsafe condition is based upon the Los Angeles ACO's review of TSO -C127, TSO-C127a, and TSO-C127b videos from numerous applicants (including, but not limited to, Embraer Aero Seating Technologies, Recaro, and TIMCO) for seating systems. The Zodiac Seats California design is such that a new potential injury to the occupant is introduced with neck/chin interaction. Zodiac Seats California proposed a method of compliance to quantify the injury for these seating systems (including the use of Nij), and the FAA found the methodology to be acceptable. However, compliance with Nij is not being required by this AD.

Regarding the requests to revise the unsafe condition description, this information was included in the Discussion section of the NPRM, which is not restated in this final rule. Therefore, there is no need to revise this final rule in this regard.

Request To Clarify the Determination of Unsafe Condition

The Industry Ad Hoc Committee and Zodiac Seats California stated the NPRM was initiated with inconclusive data, creating a non-standard approach within industry based on a number of unanswered questions. The commenters requested clarification of how the unsafe condition was determined. The commenters questioned if the FAA has determined that an "unimpeded sliding motion" and/or Nij is the right criteria for evaluating neck injury in aircraft interiors.

The Industry Ad Hoc Committee and Zodiac Seats California also stated that evaluation of potential neck injury severity by reviewing test videos of the Hybrid II ATD head motion along the seat back surface is inaccurate and subjective. The Industry Ad Hoc Committee and Zodiac Seats California reiterated that it is not possible to determine the extent of neck bending loads leading to neck injury by video evaluation only. The Industry Ad Hoc Committee and Zodiac Seats California stated that any new regulatory performance criteria defined by the FAA must be developed through comprehensive research to assess validity, repeatability, and feasibility. The Industry Ad Hoc Committee concluded that the FAA should establish appropriate injury criteria with FAA research data, follow the proper rulemaking process, and perform a cost benefit analysis of new regulations on type certificate/supplemental type certificate projects. The Industry Ad Hoc Committee requested that FAA continue research with the FAA Hybrid III ATD and fully substantiate Nij pass/fail criteria

before establishing a threshold of Nij < 1 and associated force/moment limits for row-to-row dynamic impact tests, which forces the industry to a more conservative value than necessary. The Industry Ad Hoc Committee noted the seat supplier community has already attempted to clarify and mitigate the FAA's concerns and has offered a more specific evaluation method.

Delta suggested that further testing and industry discussion should take place prior to any rulemaking that would allow inclusion of National Highway Traffic Safety Administration (NHTSA) neck criteria and potential neck interactions into injury testing requirements to comply with 14 CFR 25.785.

We agree to clarify our determination of the unsafe condition. No new criteria have been established by the FAA. However Zodiac Seats California has proposed, and the FAA accepted, criteria that substantiated the unsafe condition. The use of Nij has been volunteered and accepted as one means of demonstrating compliance to 14 CFR 25.785.

The FAA reviewed screen captures when Zodiac Seats California approached the FAA with a concern of the ATD and seat back interaction. The FAA advised Zodiac Seats California to revise the design to address the interaction. We acknowledge that loads and injury cannot be evaluated by video only and note that Zodiac Seats California proposed criteria that included neck bending loads to determine whether the FAA concern about injuries was substantiated. The potential for injury was quantified and substantiated.

We do not agree that additional research is necessary to establish the human tolerance for neck injuries. The Nij, as implemented by NHTSA, was specifically intended to evaluate an injurious combined tension/extension loading condition that can be created by airbag interaction or when the ATD chin hangs up on a protruding seat back feature (e.g., downward sliding is arrested, chin catches, hangs or impedes with a tray ledge or other seat feature).

Therefore, the FAA finds that when a quantitative assessment is necessary, the NHTSA Nij and load limit criteria are well-suited to assessing the injury potential of seat back interactions and airbag/wall interactions. We have not changed this AD in this regard.

Request To Clarify the Determination of the Injury Criteria and the Effect on the Regulations

Delta requested that we provide additional details on the relevant information evaluated for this NPRM. Delta asked that we further define the testing and findings that were used to determine new injury mechanisms and neck bending loads that were found to contribute to the unsafe condition on previously approved seats. Delta also requested confirmation that the NPRM does not formalize the FAA's position that new neck injury mechanisms should be included in injury criteria requirements of 14 CFR 25.785. Delta also requested that we confirm that the NPRM does not redefine or add requirements to 14 CFR 25.785. Delta stated that Nij < 1 is not injury criteria under 14 CFR 25.562 or 14 CFR 25.785.

We agree to provide clarification. This AD does not redefine or add requirements to 14 CFR 25.785. However, new seating system designs are introducing new serious injury mechanisms that are considered unsafe conditions. When the new injury mechanisms are observed, it is up to industry to identify them as injurious even when criteria to define them may not exist, and to develop safety features that minimize those injuries or remove the injury mechanisms. This AD does not impose, nor does it identify, new criteria to quantify such injury mechanisms.

However, if a test method would be proposed to quantify the injury in an AMOC, we would review the AMOC proposal for corrective action to these seating systems. The use of Nij and its tension, compression, flexion, extension, rotation, neck impact, and chin-concentrated loading is one method of showing the system is not injurious. This AD does not mandate using particular criteria; however, the use of Nij was a method proposed by Zodiac Seats California and found acceptable by the FAA.

Request To Revise the Parts Installation Limitations and Prohibition

Bombardier, Embraer, and Zodiac Seats California requested that we delay the implementation of paragraph (i) of the proposed AD, "Parts Installation Limitations: Seating Systems." Embraer also requested that we delay the implementation of paragraph (k) of the proposed AD, "Parts Installation Prohibition: Components of Seating Systems." Bombardier requested that we change "As of the effective date of this AD, no person may install . . ." in paragraph (i) of the proposed AD to a date that would be approximately six months after the effective date of the AD. Zodiac Seats California requested that we allow installation of seats, except for part numbers 4157( )-( )-( ) and 4175( )-( )-( ), to be installed for several months after the effective date of the AD.

Bombardier stated that it currently deliveries Model CRJ900 and Q400 airplanes that have the affected seats to operators outside of the United States. Bombardier noted that Transport Canada Civil Aviation (TCCA) has stated it will adopt the FAA's AD immediately and added that Zodiac Seats California has not certified alternative seats. Bombardier stated that since operators will refuse delivery of airplanes without seats, it requests delaying the effective date of paragraph (i) of the proposed AD. Bombardier stated that additional time is necessary to completely assess the situation and provide a suitable plan in order to not affect future production deliveries.

Embraer requested that we revise paragraph (i) of the proposed AD, as well as paragraph (k) of the proposed AD, to allow certain defined part numbers to be installed on newly manufactured aircraft beyond the effective date. Embraer stated that paragraph (i) of the proposed AD will effectively stop deliveries of Model ERJ 170 and ERJ 190 airplanes. Embraer stated no other seat replacements are currently available and, therefore, the proposed AD would affect the delivery of 16 airplanes from Embraer to the United States. Embraer stated that the proposed change would result in a negligible increase in the number of seats affected by the proposed AD.

We disagree with the commenters' requests. Zodiac Seats California has confirmed that affected seats are not being delivered to aircraft manufacturers and only seats with a new design (i.e., seats that are not affected by this AD) are being delivered. Therefore, production delivery of aircraft should not be impacted. Operators that receive aircraft with the affected seats have the compliance time of 60 months to comply with this AD.

We have determined that this AD should prohibit installation of the unsafe parts as of the effective date of this AD, except under certain conditions, as specified in paragraphs (i)(1) and (i)(2) of this AD. We have not changed this AD in this regard. However, under the provisions of paragraph (l) of this AD, we will consider requests for approval of an extension of the compliance times for parts installations if sufficient data are submitted to substantiate that the change would provide an acceptable level of safety.

Request To Revise the Parts Installation Provisions

Skywest Airlines requested that we change the text in the parts installation provisions of paragraph (j) of the proposed AD from " . . . other than those installed as direct spares, . . . " to " . . . other than those installed as direct spares, or on production aircraft, ..." The commenter stated that paragraphs (i) and (j) of the proposed AD do not adequately address the installation of affected seats on newly built airplanes.

We do not agree with the request to allow the installation of known affected seating systems on production airplanes. The intent of paragraphs (i) and (j) of this AD is to limit the introduction of known unsafe parts in the worldwide fleet. Granting the request would increase the population of seating systems that may cause serious injury to the occupant during forward impacts when subjected to certain inertia forces. We have not revised this AD in this regard.

Request To Clarify Prohibition of Components

Two commenters requested that we revise paragraph (k) of the proposed AD. Delta requested that we revise paragraph (k) of the proposed AD to prohibit only seat system components that directly contribute to the unsafe condition identified in the proposed AD. Delta stated that there are various components, such as cushions, seat covers, etc., that are not related to the unsafe condition.

UPS stated that the description of "component" is too generic. UPS stated it does not think the intent is to limit the installation of a certain restraint system, or even a bolt, on all airplanes because the part was installed on an affected seating system. UPS stated the proposed AD should identify specific parts that are prohibited from use.

We agree to clarify the prohibited components. There are items such as the seat cushions, seat pans, restraint systems, and track fittings that are not critical components of the injurious mechanism. We have revised paragraph (k) of this AD by replacing the text "any component" with "components critical to the unsafe condition mechanism." We have also added a sentence to the introductory text of paragraph (k) of this AD to specify that components critical to the unsafe condition mechanism are identified as the seat back assembly, including food tray assembly, food tray latch, food tray arms, hydraulic seat lock (hydrolock), and energy absorbing system.

Request To Revise Cost

Multiple commenters (SkyWest Airlines, UBS Equity Research–Aerospace and Defence, Bombardier, Austrian Airlines AG, Delta, Zodiac Seats California, and the Industry Ad Hoc Committee) requested that we clarify or increase the cost estimate. UBS Equity Research–Aerospace and Defence asked if the cost of seat modification is estimated to be $85 per seat or whether a replacement is necessary. Multiple commenters asked that the cost analysis include the costs to procure replacement seats; several commenters specified research costs, development costs, engineering certification costs, and the cost of seat replacement. The commenters also asked us to account for loss of revenue; several commenters noted that commercial airplanes cannot be operated for their intended purpose without seats installed. Skywest Airlines noted that the cost of replacement seats is estimated to be between $250,000 and $500,000 for the affected seats in one airplane. Bombardier suggested adding 2 work-hours for procuring and reinstalling alternate certified seats.

We do not agree to revise the costs specified in this AD. We have included the estimated cost of the actions required by this AD, which is applicable to the U.S. fleet. This AD requires removal of non-compliant seats, and we have included the costs for that action. Removing non-compliant seats addresses the unsafe condition and restores compliance to the airworthiness regulations.

While this AD does not require modifying or replacing seats, we recognize that operators could choose to replace non-compliant seating systems or modify affected seats. However, we are unable to make a reasonable assessment of how many seats would be required to be replaced or to assess the cost of modifying affected seats. Modifications would need to be approved as an AMOC in accordance the procedures specified in paragraph (l) of this AD. We also acknowledge that, for operators that remove non-compliant seats, there could a loss of revenue.

We also do not consider it appropriate to attribute the costs associated with airplane "down time" to an AD. Normally, compliance with an AD will not necessitate any additional down time beyond that of a regularly scheduled maintenance hold. Even if additional down time is necessary for some airplanes in some cases, we do not have sufficient information to evaluate the number of airplanes that may be affected or the amount of additional down time that may be required. Therefore, attempting to estimate such costs is impractical. We have not revised this AD in this regard.

Request To Clarify "Vague" Terminology

The Industry Ad Hoc Committee and Zodiac Seats California stated that the proposed AD used subjective and "vague" terms such as "catch" and "unimpeded sliding motion down." The Industry Ad Hoc Committee requested that the FAA work with industry to develop additional research and avoid these terms. The Industry Ad Hoc Committee suggested terms such as "directly impedes the head's downward sliding motion" and "chin hang-up."

We agree to provide further clarification. Our review of certification testing has shown that in dynamic seat tests, impact of an ATD head onto a typical transport passenger seat back normally results in an initial head strike followed by an unimpeded sliding motion down the back of the seat. In addition, as stated in the Discussion section of the NPRM, the design of the affected seating systems introduced new injury mechanisms, such that the chin can "catch" on the seats, causing high neck bending loads and direct concentrated loading on the neck. We have not changed this AD in this regard.

Request for Collaborative Research

Boeing recommended an all-inclusive, industry-wide research and data analysis evaluation to develop a common and measurable standard with acceptable limitations for any new requirement such as neck injury criteria. Boeing stated it welcomes a collaborative research approach with the FAA and industry partners to develop appropriate neck injury criteria for aircraft seats prior to any rulemaking activity.

We agree that a collaborative research approach is beneficial. As early as October 2007, during the Fifth Triennial International Aviation Fire and Cabin Safety Research Conference, industry was notified of the potential for seat back interaction to produce high neck loads. The data available at that time, however, did not indicate that neck injury was a significant risk in most of the forward facing configurations tested.

An example of this specific type of injury was brought to industry attention during The Seventh Triennial International Fire & Cabin Safety Research Conference in December 2013. The FAA welcomes additional research, as appropriate, and the development of appropriate neck injury criteria for aircraft seats.

Conclusion

We reviewed the relevant data, considered the comments received, and determined that air safety and the public interest require adopting this AD with the changes described previously and minor editorial changes. We have determined that these minor changes:

- Are consistent with the intent that was proposed in the NPRM for correcting the unsafe condition; and
- Do not add any additional burden upon the public than was already proposed in the NPRM.

We also determined that these changes will not increase the economic burden on any operator or increase the scope of this AD.

Costs of Compliance

We estimate that this AD affects 10,482 seating systems installed on, but not limited to, various transport category airplanes of U.S. registry.

We estimate the following costs to comply with this AD:

Estimated Costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
Removal	1 work-hour × $85 per hour = $85	$0	$85	$890,970

Authority for This Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

We are issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: "General requirements." Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

This AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify that this AD:

(1) Is not a "significant regulatory action" under Executive Order 12866,

(2) Is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979),

(3) Will not affect intrastate aviation in Alaska, and

(4) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

Adoption of the Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

PART 39–AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

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

§ 39.13 [Amended]

2. The FAA amends § 39.13 by adding the following new airworthiness directive (AD):

2017-09-09 Zodiac Seats California LLC: Amendment 39-18871; Docket No. FAA-2016-5595; Directorate Identifier 2015-NM-087-AD.

(a) Effective Date

This AD is effective June 28, 2017.

(b) Affected ADs

None.

(c) Applicability

This AD applies to Zodiac Seats California LLC seating systems having the model numbers and part numbers identified in table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD, as installed on, but not limited to, the airplanes identified in paragraphs (c)(1) through (c)(9) of this AD; all type certificated models in any category; except that model number 4157 seating systems having part numbers 41763002-( )-( ), 41765002-( )-( ), and 41767002-( )-( ) that have not been modified to add a food tray or an upper literature pocket are not affected by this AD. If any model number 4157 having part number 41763002-( )-( ), 41765002-( )-( ), or 41767002-( )-( ) is modified to add a food tray or an upper literature pocket, the requirements of this AD apply.

(1) The Boeing Company Model 717-200 airplanes and Model MD-90-30 airplanes.
(2) Bombardier, Inc. Model CL-600-2C10 (Regional Jet Series 700, 701, & 702) airplanes.
(3) Bombardier, Inc. Model CL-600-2D24 (Regional Jet Series 900) airplanes.
(4) Bombardier, Inc. Model DHC-8-400, -401, and -402 airplanes.
(5) Empresa Brasileira de Aeronautica S.A. (Embraer) Model EMB-145XR airplanes.
(6) Embraer S.A. Model ERJ 170-100 LR airplanes.
(7) Embraer S.A. Model ERJ 170-200 LR, and -200 STD airplanes.
(8) Embraer S.A. Model ERJ 190-100 STD, -100 LR, and -100 IGW airplanes.
(9) Embraer S.A. Model ERJ 190-200 LR airplanes.

Table 1 to Paragraphs (c), (g), (i), (j), and (k) of This AD–Affected Seating Systems

Model No.	Part No. (where x = 2, 3, 4, 5, 6, or 7)	Description
4157	4157x001-( )-( )	Double Seat Assembly System.
4157	4157x002-( )-( )	Double Seat Assembly System.
4157	4158x001-( )-( )	Double Seat Assembly System.
4157	4158x002-( )-( )	Double Seat Assembly System.
4157	4175x001-( )-( )	Double Seat Assembly System.
4157	4175x002-( )-( )	Double Seat Assembly System.

4157	4176x001-( )-( )	Double Seat Assembly System.
4157	4176x002-( )-( )	Double Seat Assembly System.
4157	4177x001-( )-( )	Double Seat Assembly System.
4157	4177x002-( )-( )	Double Seat Assembly System.
4157	4178x001-( )-( )	Double Seat Assembly System.
4157	4178x002-( )-( )	Double Seat Assembly System.
4170	4169x001-( )-( )	Double Seat Assembly System.
4170	4170x001-( )-( )	Triple Seat Assembly System.
4170	4171x001-( )-( )	Single Seat Assembly System Exit Row.
4170	4172x001-( )-( )	Double Seat Assembly System Exit Row.
4184	4184x002-( )-( )	Double Seat Assembly System.

(d) Subject

Air Transport Association (ATA) of America Code 2520, Passenger Compartment Equipment.

(e) Unsafe Condition

This AD was prompted by a determination that the affected seating systems may cause serious injury to the occupant during forward impacts when subjected to certain inertia forces. We are issuing this AD to prevent serious injury to the occupant during forward impacts in emergency landing conditions.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

(g) Seating System Removal

Within 60 months after the effective date of this AD, remove all seating systems having a model number and part number identified in table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD.

(h) Definition of a “Direct” Spare

For the purposes of this AD, a “direct” spare has the same part number as the part it replaces.

(i) Parts Installation Limitations: Seating Systems

As of the effective date of this AD, no person may install on any airplane any Zodiac Seats California LLC seating systems having any model number and part number identified in table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD that are approved under technical standard order (TSO) TSO-C127a; except as specified in paragraphs (i)(1) and (i)(2) of this AD.

(1) Seating systems may be removed from service for the purpose of performing maintenance activities and reinstalled on airplanes operated by the same operator, but only until the operator complies with the removal of affected seating systems required by paragraph (g) of this AD.

(2) New seating systems may be installed as direct spares for the same part number seating systems, but only until the operator complies with the removal of affected seating systems required by paragraph (g) of this AD. Seating systems installed as direct spares are subject to the applicable requirements and compliance times specified in this AD.

(j) Parts Installation Provisions: Installation and Rearrangement

Installation of a seating system having any model number and part number identified in table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD, other than those installed as direct spares, is considered a new installation that needs approval; except that re-arrangement of the existing installed seating systems on an airplane is acceptable until the operator complies with the removal of affected seating systems required by paragraph (g) of this AD, provided the re-arrangement follows the same installation instructions and limitations as the original certification (e.g., if the original limitations allowed 32-inch to 34-inch pitch, the new layout must be pitched within that range).

(k) Parts Installation Prohibition: Components of Seating Systems

As of the effective date of this AD, no person may install, on any airplane, any component critical to the unsafe condition mechanism of any seating system having any model number identified in table 1 to paragraphs (c), (g), (i), (j), and (k) of this AD that is approved under TSO-C127a; except as specified in paragraphs (k)(1), (k)(2), and (k)(3) of this AD. Components critical to the unsafe condition mechanism are identified as the seat back assembly, including food tray assembly, food tray latch, food tray arms, hydraulic seat lock (hydrolock), and energy absorbing system.

(1) Components critical to the unsafe condition mechanism of seating systems specified in paragraph (g) of this AD may be removed from service and re-installed on airplanes operated by the same operator, but only until the operator complies with the removal of affected seating systems required by paragraph (g) of this AD.

(2) New components critical to the unsafe condition mechanism of seating systems may be installed as direct spares for the same part number components, but only until the operator complies with the removal of affected seating systems required by paragraph (g) of this AD.

(3) Components critical to the unsafe condition mechanism of seating systems specified in paragraph (g) of this AD that are installed as direct spares are subject to the applicable requirements and compliance times specified in paragraph (g) of this AD.

(l) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Los Angeles Aircraft Certification Office (ACO), FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the ACO, send it to the attention of the person identified in paragraph (m) of this AD. Information may be emailed to: 9-ANM-LAACO-AMOC-Requests@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

(m) Related Information

For more information about this AD, contact Patrick Farina, Aerospace Engineer, Cabin Safety Branch, ANM-150L, FAA, Los Angeles ACO, 3960 Paramount Boulevard, Lakewood, CA 90712-4137; phone: 562-627-5344; fax: 562-627-5210; email: patrick.farina@faa.gov.

(n) Material Incorporated by Reference

None.

Issued in Renton, Washington, on April 27, 2017.
Paul Bernado,
Acting Manager, Transport Airplane Directorate,
Aircraft Certification Service.