

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39 [62 FR 55732 NO. 208 10/28/97]

Docket No. 97-NM-229-AD; Amendment 39-10179; AD 97-22-07

RIN 2120-AA64

Airworthiness Directives; Boeing Model 737 Series Airplanes

AGENCY: Federal Aviation Administration, DOT

ACTION: Final rule; request for comments.

SUMMARY: This amendment supersedes an existing airworthiness directive (AD), applicable to certain Boeing Model 737 series airplanes, that currently requires repetitive inspections to detect cracking of the lower skin at the lower row of fasteners in the lap joints of the fuselage, and repair of any cracking detected. This amendment requires that the inspections be accomplished at more frequent intervals. This amendment also adds a requirement for modification of the fuselage lap joints at certain locations, which constitutes terminating action for repetitive inspections of modified areas. This amendment is prompted by reports of numerous fatigue cracks in the lower skin of the fuselage lap joints at the lower row of fasteners. The actions specified in this AD are intended to prevent such fatigue cracking, which could result in sudden decompression of the airplane.

DATES: Effective November 12, 1997.

The incorporation by reference of certain publications, as listed in the regulations, is approved by the Director of the Federal Register as of November 12, 1997.

The incorporation by reference of Boeing Alert Service Bulletin 737-53A1177, dated November 8, 1994, as listed in the regulations, was approved previously by the Director of the Federal Register as of December 27, 1994 (59 FR 63716, December 9, 1994).

Comments for inclusion in the Rules Docket must be received on or before December 29, 1997.

ADDRESSES: Submit comments in triplicate to the Federal Aviation Administration (FAA), Transport Airplane Directorate, ANM-103, Attention: Rules Docket No. 97-NM-229-AD, 1601 Lind Avenue, SW., Renton, Washington 98055-4056.

The service information referenced in this AD may be obtained from Boeing Commercial Airplane Group, P.O. Box 3707, Seattle, Washington 98124-2207. This information may be examined at the FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton,

Washington; or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

FOR FURTHER INFORMATION CONTACT: Gregory L. Schneider or Nenita K. Odesa, Aerospace Engineers, Airframe Branch, ANM-120S, FAA, Transport Airplane Directorate, Seattle Aircraft Certification Office (ACO), 1601 Lind Avenue, SW., Renton, Washington; telephone (425) 227-2028 or (425) 227-2557; fax (425) 227-1181.

SUPPLEMENTARY INFORMATION: On April 28, 1988, a Boeing Model 737 series airplane was involved in an accident in which a 15-foot long section of fuselage structure peeled open during flight. In light of this, the FAA initiated an Aging Fleet Program. The objective of that program is to identify and implement procedures to ensure the continuing structural airworthiness of aging transport category airplanes.

As part of the Aging Fleet Program, the airplane manufacturer conducted cyclic pressure (fatigue) tests to evaluate the performance of the various fuselage skin panel lap joint configurations. The fuselage skin panel joint consists of two adjacent panels that overlap each other longitudinally and are joined together by three rows of fasteners at the overlap (hence, lap joint). Cracks in the upper skin of the lap joint led to the structural failure that occurred in the 1988 accident discussed previously. These "first generation" lap joints, installed on early Model 737 series airplanes having line numbers 1-291, were modified by replacing the countersunk fasteners in the upper fastener row of the lap joint with protruding head fasteners to correct and prevent cracking in the upper skin of the lap joint. No cracking has been detected to date in the lower fastener row of these (modified) "first generation" lap joints.

In 1994, tests were conducted on "second generation" lap joints; test results revealed cracks in the lower skin of this lap joint. The airplane manufacturer determined that these cracks were caused by increased stresses in this area due to the increased bending stresses associated with the installation of a doubler on the upper skin. This doubler was installed on "second generation" lap joints as an improvement to the lap joint to prevent cracks in the upper skin. This lap joint configuration, which incorporates the additional doubler, was installed on Model 737 series airplanes having line numbers 292 through 2565.

In light of results of these tests, the manufacturer inspected the lap joints of five aging airplanes and detected a total of 273 fatigue cracks. The use of eddy current inspection techniques were required as the cracks in the lower skin are not detectable visually due to the positioning of the lower skin between the upper skin and the circumferential tear strap. Many of these cracks were found to have occurred simultaneously at adjacent fastener hole locations in the lower skin of the fuselage lap joint.

This type of cracking of the lap joint is known as multiple site damage (MSD). MSD is characterized by the simultaneous presence of fatigue cracks in the same structural element (such as the lower skin panel of the lap joint). Coalescence of cracks at adjacent fastener holes in the lower skin can lead to sudden fracture and failure of the lap joint, which could result in rapid decompression of the airplane. Due to the reduction in the residual strength of a lap joint in the presence of MSD. This reduction of the structural integrity of the fuselage may occur at loads significantly below those that would be expected for structure having a single large crack. The accident discussed previously has demonstrated dramatically that small cracks acting together can have a significant effect on the residual strength of the aircraft structure.

Issuance of Previous Rule

On December 2, 1994, the FAA issued AD 94-25-05, amendment 39-9089 (59 FR 63716, December 9, 1994), applicable to certain Boeing Model 737 series airplanes, to require repetitive eddy current inspections to detect cracking of the lower skin at the lower row of fasteners in the lap joints of the fuselage between body stations 259.50 and 1016, and repair of any cracking detected. That AD was prompted by reports of fatigue cracking occurring simultaneously at adjacent fastener hole locations in the lower skin of the fuselage lap joint. The actions required by AD 94-25-05 are intended to prevent sudden decompression of the airplane due to undetected cracking of the fuselage skin.

Actions Since Issuance of Previous Rule

Since the issuance of AD 94-25-05, the FAA has received additional reports of fatigue cracking in the lower skin of the lap joints of the fuselage on airplanes previously inspected in accordance with that AD. The FAA received reports of numerous cracks on a number of airplanes that had accumulated between 52,000 and 78,000 total flight cycles and that had been inspected using low frequency eddy current (LFEC) inspection techniques. The majority of these cracks occurred at left and right stringers 4, 10, and 14.

The FAA also received recent reports indicating that extensive cracking was found on three airplanes on which high frequency eddy current (HFEC) inspections and modification of the lap joints had been accomplished in accordance with Revision 1 of Boeing Alert Service Bulletin 737- 53A1177. Approximately eight months had elapsed since the initial LFEC inspections required by AD 94-25-05 had been accomplished. These airplanes had accumulated between 76,000 and 84,400 total flight cycles. The total number of cracks reported was between 246 and 360 on these three airplanes, and the majority of these cracks occurred at left and right stringers 4, 10, and 14. On one of these airplanes, cracking was found along a 111-inch section of stringer 4L at every fastener hole in the lower row of fasteners in the lower skin that had not been repaired during the previous LFEC inspection (82% of the total fastener holes).

In the preamble to AD 94-25-05, the FAA specified that the actions required by that AD were considered "interim action" and that the manufacturer was developing a modification to positively address the unsafe condition. The FAA indicated that it may consider further rulemaking action once the modification was developed, approved, and available. The manufacturer now has developed such a modification, and the FAA has determined that further rulemaking action is indeed necessary; this AD follows from that determination.

Explanation of Relevant Service Information

Since the issuance of AD 94-25-05, the FAA has reviewed and approved Boeing Alert Service Bulletin 737-53A1177, Revision 1, dated September 19, 1996; Revision 2, dated July 24, 1997; and Revision 3, dated September 18, 1997; which describe procedures for inspections similar to those specified in the original issue of the alert service bulletin. (The original issue of the alert service bulletin was cited in AD 94-25-05 as the appropriate source of service information).

Revision 1 of the alert service bulletin describes procedures for modification of the lap joints

at the lower row of fasteners in the lower skin of the fuselage [reference Part III ("Preventive Change") of the Accomplishment Instructions of the alert service bulletin].

The relevant changes in Revision 2 of the alert service bulletin include procedures for more frequent repetitive inspections of the lower skin at the lower row of fasteners in the lap joints of the fuselage.

For certain lap joint locations on Model 737-200 series airplanes only, Revision 2 of the alert service bulletin also describes procedures for an option to the modification ("Preventive Change") described in Revision 1 of the alert service bulletin. This option [reference Part IV ("Lap Joint Repair") of the Accomplishment Instructions of the alert service bulletin] involves installing a lap joint repair on the entire length of the skin panel at certain lap joint locations.

Revision 3 of the alert service bulletin is essentially the same as Revision 2; however, Revision 3 corrects a particular fastener size specified in Part IV of the Accomplishment Instructions of the alert service bulletin.

Accomplishment of the modification eliminates the need for the repetitive inspections only of those areas that have been modified. Accomplishment of the actions specified in the alert service bulletin is intended to adequately address the identified unsafe condition.

FAA's Determinations

Based on reports of numerous cracks detected on airplanes inspected previously, the FAA finds that, for certain airplanes, the repetitive LFEC inspections required currently by AD 94-25-05 must be accomplished at more frequent intervals to detect cracks that, in the presence of MSD, could propagate to the point of structural failure of the lap joints and result in rapid decompression of the airplane.

Based upon reports of extensive MSD found in the lower skin of the lap joints located at stringers 4, 10, and 14, there may be a significant reduction in the residual strength of these lap joints. Because of this reduction in strength, in combination with the possibility that cracks may go undetected due to human factors, the FAA finds that the reduced inspection interval provided by this AD may not be adequate to detect cracks which could propagate to the point of structural failure. As a result, for airplanes that have accumulated 70,000 or more total flight cycles, the FAA has concluded that modifications of the lap joints at stringers 4, 10, and 14 (as required by this AD) on which the most severe cracking has been detected, must be required on an emergency basis.

Explanation of Requirements of Rule

Since an unsafe condition has been identified that is likely to exist or develop on other airplanes of this same type design, this AD supersedes AD 94-25-05 to continue to require repetitive inspections to detect cracking of the lower skin at the lower row of fasteners in the lap joints of the fuselage, and repair of any cracking detected. This AD requires that the inspections be accomplished at more frequent intervals.

This AD also requires modification of the fuselage lap joints at certain locations. Accomplishment of the modification constitutes terminating action for the repetitive inspections only of those areas that have been modified in accordance with this AD.

The inspections and modification are required to be accomplished in accordance with the alert service bulletin described previously.

Explanation of Compliance Time for Initial Inspection

Operators should note that, for certain airplanes, the compliance time for accomplishment of the initial inspection required by this AD is approximately 120 days. That number of days is usually sufficient to allow for prior notice to the public and a brief comment period before adoption of a final rule. In this AD, however, that compliance time was selected because of:

- the large number of aircraft affected by the AD;
- the large number of work hours required to accomplish the inspection; and
- the availability of an adequate number of maintenance facilities able to accommodate scheduling the fleet for inspection.

A shorter compliance time might have resulted in the unnecessary removal of airplanes from service pending scheduling. Nevertheless, the FAA has determined that immediate adoption is necessary in this case because of the importance of initiating the required inspections and modification as soon as possible.

Differences Between the AD and the Relevant Service Bulletins

Operators should note that, for airplanes that have accumulated between 60,000 and 65,000 total flight cycles, the alert service bulletin specifies a repetitive inspection of 3,500 flight cycles until the airplane has accumulated 65,000 total flight cycles. However, for that group of airplanes, this AD requires that repetitive inspections be accomplished at intervals not to exceed 1,200 flight cycles. The FAA has determined that, because of the safety implications and consequences of multiple site damage associated with fatigue cracking of the fuselage skin, it is necessary to require earlier repetitive inspections to ensure the continued operational safety of the fleet.

For Boeing Model 737-200 series airplanes only, Part IV of the Accomplishment Instructions of Boeing Alert Service Bulletin 737-53A1177, Revision 3, dated September 18, 1997, recommends installation of a support cradle at station 540. However, this installation is not intended to support the weight of the airplane. Therefore, this AD does not require installation of this support cradle. In addition, to clarify the reference in the alert service bulletin for supporting the airplane in the jig position, paragraph (g)(2) of this AD explicitly requires that, prior to conducting the repair of the lap joint, the airplane be supported in the jig position, including support (removal) of the engine weight. This action is required to be accomplished in accordance with Boeing Document D6-15565, "737 Structural Repair Manual (SRM)," Chapter 51, Subject 51-50-1, Revision 70, dated July 5, 1997.

Subsequent Rulemaking

The FAA may consider separate rulemaking action for airplanes that have accumulated more than 70,000 total flight cycles to require modification of the lap joints at the remaining locations specified in Part III ("Preventive Change") of the Accomplishment Instructions of the alert service bulletin.

In addition, for airplanes that have accumulated less than 70,000 total flight cycles, the FAA may consider requiring accomplishment of this modification at all locations specified in the alert service bulletin.

Determination of Rule's Effective Date

Since a situation exists that requires the immediate adoption of this regulation, it is found that notice and opportunity for prior public comment hereon are impracticable, and that good cause exists for making this amendment effective in less than 30 days.

Comments Invited

Although this action is in the form of a final rule that involves requirements affecting flight safety and, thus, was not preceded by notice and an opportunity for public comment, comments are invited on this rule. Interested persons are invited to comment on this rule by submitting such written data, views, or arguments as they may desire. Communications shall identify the Rules Docket number and be submitted in triplicate to the address specified under the caption "ADDRESSES." All communications received on or before the closing date for comments will be considered, and this rule may be amended in light of the comments received. Factual information that supports the commenter's ideas and suggestions is extremely helpful in evaluating the effectiveness of the AD action and determining whether additional rulemaking action would be needed.

Comments are specifically invited on the overall regulatory, economic, environmental, and energy aspects of the rule that might suggest a need to modify the rule. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report that summarizes each FAA-public contact concerned with the substance of this AD will be filed in the Rules Docket.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this rule must submit a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket Number 97-NM-229-AD." The postcard will be date stamped and returned to the commenter.

Regulatory Impact

The regulations adopted herein will not have substantial direct effects 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. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

The FAA has determined that this regulation is an emergency regulation that must be issued immediately to correct an unsafe condition in aircraft, and that it is not a "significant regulatory action" under Executive Order 12866. It has been determined further that this action involves an emergency regulation under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). If it is determined that this emergency regulation otherwise would be significant under DOT Regulatory Policies and Procedures, a final regulatory evaluation will be prepared and placed in the Rules Docket. A copy of it, if filed, may be obtained from the Rules Docket at the location provided under the caption "ADDRESSES."

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.
Adoption of the Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration amends part 39 of the Federal Aviation Regulations (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. Section 39.13 is amended by removing amendment 39-9089 (59 FR 63716, December 9, 1994), and by adding a new airworthiness directive (AD), amendment 39-10179, to read as follows:

AIRWORTHINESS DIRECTIVE

Aircraft Certification Service
Washington, DC



U.S. Department
of Transportation
**Federal Aviation
Administration**

The following Airworthiness Directive issued by the Federal Aviation Administration in accordance with the provisions of Federal Aviation Regulations, Part 39, applies to an aircraft model of which our records indicate you may be the registered owner. Airworthiness Directives affect aviation safety and are regulations which require immediate attention. You are cautioned that no person may operate an aircraft to which an Airworthiness Directive applies, except in accordance with the requirements of the Airworthiness Directive (reference FAR Subpart 39.3).

97-22-07 BOEING: Amendment 39-10179. Docket 97-NM-229-AD. Supersedes AD 94-25-05, Amendment 39-9089.

Applicability: Model Boeing 737 series airplanes having line numbers 292 through 2565 inclusive, certificated in any category.

NOTE 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been otherwise modified, altered, or repaired in the area subject to the requirements of this AD. For airplanes that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (i) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated, unless accomplished previously.

To prevent sudden decompression of the airplane, accomplish the following:

(a) Perform a low frequency eddy current inspection to detect cracking of the lower skin at the lower row of fasteners in the lap joints of the fuselage at the time specified in paragraph (b) or (c) of this AD, as applicable, in accordance with Part I ("Inspection") of the Accomplishment Instructions of Boeing Alert Service Bulletin 737-53A1177, dated November 8, 1994; Revision 1, dated September 19, 1996; Revision 2, dated July 24, 1997; or Revision 3, dated September 18, 1997.

(b) For airplanes that have accumulated 70,000 total flight cycles or more as of the effective date of this AD: Perform the inspection required by paragraph (a) of this AD at the later of the times specified in paragraphs (b)(1) and (b)(2) of this AD.

(1) Within 100 flight cycles after the effective date of this AD.

(2) Within 300 flight cycles after the last inspection accomplished in accordance with AD 94-25-05, amendment 39-9089.

(c) For airplanes that have accumulated less than 70,000 total flight cycles as of the effective date of this AD: Perform the inspection required by paragraph (a) of this AD at the later of the times specified in paragraphs (c)(1) and (c)(2) of this AD.

- (1) Prior to the accumulation of 60,000 total flight cycles.
- (2) At the earliest of the times specified in paragraph (c)(2)(i), (c)(2)(ii), and (c)(2)(iii) of this AD.
 - (i) Within 3,500 flight cycles after the last inspection accomplished in accordance with AD 94-25-05, amendment 39-9089.
 - (ii) Within 1,200 flight cycles after the effective date of this AD.
 - (iii) Prior to the accumulation of 70,300 total flight cycles.

(d) If any cracking is detected during the inspection required by paragraph (a) of this AD, prior to further flight, repair it in accordance with Part II ("Crack Repair") of the Accomplishment Instructions of Boeing Alert Service Bulletin 737-53A1177, dated November 8, 1994; Revision 1, dated September 19, 1996; Revision 2, dated July 24, 1997; or Revision 3, dated September 18, 1997.

(e) Repeat the inspection required by paragraph (a) of this AD at the time specified in paragraph (e)(1) or (e)(2) of this AD, as applicable, until the modification required by paragraph (f) or (g) of this AD, as applicable, is accomplished.

(1) If the airplane had accumulated less than 70,000 total flight cycles at the time of the immediately preceding inspection, perform the next inspection within 1,200 flight cycles or prior to the accumulation of 70,300 total flight cycles, whichever occurs first.

(2) If the airplane had accumulated 70,000 or more total flight cycles at the time of the immediately preceding inspection, perform the next inspection within 300 flight cycles.

(f) Except as provided by paragraph (g) of this AD, modify the fuselage lap joints at the lower row of fasteners at stringer locations right/left stringer 4 between body station (BS) 360 and BS 1016; and right/left stringers 10 and 14 between BS 360 and BS 540, and between BS 727 and BS 1016; in accordance with Part III ("Preventive Change") of the Accomplishment Instructions of Boeing Alert Service Bulletin 737-53A1177, Revision 1, dated September 19, 1996; Revision 2, dated July 24, 1997; or Revision 3, dated September 18, 1997; at the time specified in paragraph (h) of this AD. Accomplishment of this modification constitutes terminating action for the repetitive inspections only for the areas that have been modified in accordance with this AD.

(g) For Boeing Model 737-200 series airplanes only:

(1) Except as provided in paragraphs (g)(2) and (g)(3) of this AD, in lieu of accomplishing the modification ("Preventive Change") specified in paragraph (f) of this AD, installation of the lap joint repair in accordance with Part IV ("Lap Joint Repair") of the Accomplishment Instructions of Boeing Alert Service Bulletin 737-53A1177, Revision 3, dated September 18, 1997, at the locations specified in Part IV of the alert service bulletin, may be accomplished. Accomplishment of the repair constitutes terminating action for the repetitive inspections only for the areas that have been modified in accordance with this AD.

(2) Prior to conducting the repair, support the airplane in the jig position, including support (removal) of the engine weight, in accordance with Boeing Document D6-15565, "737 Structural Repair Manual (SRM)," Chapter 51, Subject 51-50-1, Revision 70, dated July 5, 1997.

NOTE 2: Chapter 51, Subject 51-50-1 of the referenced SRM references Subjects 51-50-2, 51-50-3, and 51-60 of the referenced SRM as additional sources of service information.

(3) Notwithstanding the Accomplishment Instructions of Boeing Alert Service Bulletin 737-53A1177, Revision 3, dated September 18, 1997, the repair described in paragraph (g)(1) of this AD may be accomplished without installing a support cradle at station 540.

(h) Accomplish the modification required by paragraph (f) or (g) of this AD, as applicable, at the latest of the times specified in paragraphs (h)(1), (h)(2), and (h)(3) of this AD.

- (1) Prior to the accumulation of 70,000 total flight cycles.
- (2) Within 600 flight cycles after the effective date of this AD.
- (3) Within 80 days after the effective date of this AD.

(i) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Seattle ACO. Operators shall submit their requests through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, Seattle ACO. NOTE 3: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Seattle ACO.

(j) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

(k) The actions shall be done in accordance with Boeing Alert Service Bulletin 737-53A1177, dated November 8, 1994; Boeing Alert Service Bulletin 737-53A1177, Revision 1, dated September 19, 1996; Boeing Alert Service Bulletin 737-53A1177, Revision 2, dated July 24, 1997; Boeing Alert Service Bulletin 737-53A1177, Revision 3, dated September 18, 1997; and Boeing Document D6-15565, "737 Structural Repair Manual (SRM)," Chapter 51, Subject 51-50-1, Revision 70, dated July 5, 1997, which contains the following list of effective pages (NOTE: The issue date and revision level of the SRM are indicated only on the Title Page; no other page of the document contains this information.):

Page Number	Revision Level Shown on Page	Date Shown on Page
Title Page	70	July 5, 1997
1	Not Shown	February 5, 1989
2, 3, 11, 12	Not Shown	August 5, 1988
4	Not Shown	February 1, 1978
5, 6, 8-10	Not Shown	August 1, 1968
7	Not Shown	February 1, 1975

(1) The incorporation by reference of Boeing Alert Service Bulletin 737-53A1177, Revision 1, dated September 19, 1996; Boeing Alert Service Bulletin 737-53A1177, Revision 2, dated July 24, 1997; Boeing Alert Service Bulletin 737-53A1177, Revision 3, dated September 18, 1997; and Boeing Document D6-15565, "737 Structural Repair Manual (SRM)," Chapter 51, Subject 51-50-1, Revision 70, dated July 5, 1997; is approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.

(2) The incorporation by reference of Boeing Alert Service Bulletin 737-53A1177, dated November 8, 1994, was approved previously by the Director of the Federal Register as of December 27, 1994 (59 FR 63716, December 9, 1994).

(3) Copies may be obtained from Boeing Commercial Airplane Group, P.O. Box 3707, Seattle, Washington 98124-2207. Copies may be inspected at the FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington; or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

(l) This amendment becomes effective on November 12, 1997.