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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2007-0308; Directorate Identifier 2007-NM-160-AD; Amendment 39-15731; AD 2008-23-10]

RIN 2120-AA64

Airworthiness Directives; Boeing Model 747-100, 747-100B, 747-100B SUD, 747-200B, 747-200C, 747-200F, 747-300, 747-400, 747-400D, 747-400F, and 747SR Series Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: We are adopting a new airworthiness directive (AD) for certain Boeing Model 747 airplanes identified above. This AD requires modifying the outboard flap track and transmission attachments. This AD results from a joint Boeing and FAA multi-model study (following in-service trailing edge flap structure and drive system events) on the hazards posed by skewing and failed flaps. This study identified the safety concerns regarding the transmission attachment design and the potential loss of an outboard trailing edge flap. We are issuing this AD to prevent certain discrepancies associated with this design (for example, a flap skew or lateral control asymmetry that can cause collateral damage to adjacent hydraulic tubing and subsequent loss of a hydraulic system), which could result in the asymmetric flight control limits being exceeded, and could adversely affect the airplane's continued safe flight and landing.

DATES: This AD is effective December 22, 2008.

The Director of the Federal Register approved the incorporation by reference of certain publications listed in this AD as of December 22, 2008.

ADDRESSES: For service information identified in this AD, contact Boeing Commercial Airplanes, P.O. Box 3707, Seattle, Washington 98124-2207.

Examining the AD Docket

You may examine the AD docket on the Internet at http://www.regulations.gov; 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 (telephone 800-647-5527) is the Document

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: Doug Tsuji, Aerospace Engineer, Systems and Equipment Branch, ANM-130S, FAA, Seattle Aircraft Certification Office, 1601 Lind Avenue, SW., Renton, Washington 98057-3356; telephone (425) 917-6487; fax (425) 917-6590.

SUPPLEMENTARY INFORMATION:

Discussion

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 to include an airworthiness directive (AD) that would apply to certain Boeing Model 747-100, 747-100B, 747-100B SUD, 747-200B, 747-200C, 747-200F, 747-300, 747-400, 747-400D, 747-400F, and 747SR series airplanes. That NPRM was published in the Federal Register on December 11, 2007 (72 FR 70247). That NPRM proposed to require modifying the outboard flap track and transmission attachments.

Actions Since NPRM Was Issued

Since we issued the NPRM, Boeing has issued Service Bulletins 747-27A2398, Revision 1, dated July 31, 2008; and 747-27A2421, Revision 1, dated July 10, 2008; to add longer grip length bolts necessary to install the new support housing and optional part numbers for the new support housing. In the NPRM, we referred to the original issue of the service bulletins, both dated April 19, 2007, as the sources of service information for modifying the outboard trailing edge flaps. The procedures in the original issue of the service bulletins are essentially the same as those in Revision 1. Therefore, we have revised paragraph (f) of this AD to refer to Revision 1 of the service bulletins as the appropriate sources of service information for modifying the outboard trailing edge flaps. We have also revised paragraphs (c) and (g) of this AD to refer to Revision 1 of the service bulletins. In addition, we have added a new paragraph (h) to the AD to give credit for using the original issue of the service bulletins for accomplishing the required actions before the effective date of the AD.

Comments

We gave the public the opportunity to participate in developing this AD. We considered the comments received.

Request To Extend Compliance Period

All Nippon Airways Co. Ltd. (ANA) and KLM Royal Dutch Airlines–Fleet Services request that the compliance period be extended from a tiered 3 years and 6 years to 5 years and 8 years. The commenters cite difficulties in accomplishing the proposed actions (difficulties related to manpower and facility requirements) and claim that the proposed actions are better suited to correspond to scheduled "D" check maintenance.

We disagree with the request to extend the compliance times. We have determined that the tiered compliance times of 3 years and 6 years, as proposed, are commensurate with the unsafe condition associated with the loss of the transmission. We have not changed the final rule regarding this issue.

Request To Revise Cost Estimate

British Airways (BA) and Boeing state that the work-hour estimate specified in the NPRM (150 work hours) is too low. Boeing reports that its original work-hour estimate has been updated based on

further evaluation and the results of the service bulletin validation. (The work hours specified in the NPRM are based on information provided in the service bulletin.) Boeing's recalculation now estimates that the actions will take 310 total hours (258 hours on the airplane and 52 hours for component work).

We agree, based on Boeing's explanation. We have revised the cost estimates in this final rule.

Request to Allow Repetitive Maintenance Instead of Modification

Singapore Airlines Limited states that the intent of the proposed AD can be achieved through regular replacement of the flap transmission bolts (with non H-11 bolts) and regular nondestructive testing (NDT) inspections on the Nos. 1, 2, 7, and 8 transmission housings. The commenter notes that AD 2001-03-10 (amendment 39-12114, 66 FR 10951, February 21, 2001) mandates replacing H-11 bolts (which failed prematurely) with Inconel bolts. Service history has shown no bolt failures after the bolts were replaced.

We infer that the commenter is requesting that we revise the NPRM to allow repetitive inspections and replacements instead of the modification. We do not agree. The intent of this AD is to remove an identified single failure condition that can result in a catastrophic event. Although AD 2001-03-10 requires replacing a known source of failures on the same airplanes affected by this new AD, and service history has shown no failures of the existing transmission attachment fitting, the potential single failure condition would still exist if no further action were taken. We have not changed the final rule regarding this issue.

Request for Alternative Method

According to Lufthansa, the existing transmission attachment (solid Inconel bolts) is a damage-tolerant design, and the new attachment with a double load path bolt is a fail-safe design. A cracked hollow bolt could go undetected, which Lufthansa claims is a disadvantage compared to the existing design.

We partially agree with the commenter's assertions. We agree that a cracked hollow bolt could go undetected. A planned inspection program must be developed to detect a fractured hollow bolt before the nested inner solid bolt fractures. For this reason, the FAA is considering additional rulemaking to address this broader issue. We disagree, however, that the solid Inconel bolt is a damage-tolerant design. Neither the existing single bolt design nor the new double load path bolt design would be classified as damage tolerant without planned inspections to detect a fractured bolt. The single bolt design was identified as a potential safety issue because a single bolt failure could lead to overload failure of the two remaining transmission mounting bolts, which is a static strength issue. A planned inspection program of the double load path bolt design will provide a transmission mount attachment design that is damage tolerant. While we might issue additional rulemaking related to the broader issue of inspecting to detect a fractured hollow bolt, we have not changed this final rule regarding this issue.

Request To Clarify Relationship of NPRM to Existing ADs

We cited Boeing Alert Service Bulletin 747-27A2398, dated April 19, 2007, in the NPRM as an appropriate source of service information for the modification. Japan Airlines (JAL) and ANA request that the actions specified in that service bulletin be considered an alternative method of compliance (AMOC) to paragraphs (a) and (b) of AD 2001-03-10 and paragraph (a) of AD 2001-23-13 (amendment 39-12512, 66 FR 58918, November 26, 2001) (a correction of that rule was published in the Federal Register on February 14, 2002 (67 FR 6864)).

The commenters also request that we describe the relationship among AD 2001-03-10, AD 2001-23-13, and the NPRM. We provide this summary information in the table titled "Breakdown of Actions."

Breakdown of Actions

AD action	Boeing Service Bulletin	Actions
AD 2001-03-10	747-27A2376, dated July 1, 1999	Replacing H-11 bolts with Inconel bolts at the trailing edge (TE) flap transmission attachment fitting
AD 2001-23-13	747-27-2374, dated November 18, 1999	Replacing the TE flap transmission torque brake and changing the flap transmission P/N, after a torque brake is replaced
The NPRM	747-27A2398, dated April 19, 2007	Replacing the bolts with non-Inconel, dual load path bolts; installing new flap tracks; and installing the new transmission attachment fitting.

The commenters state that the NPRM and Boeing Service Bulletin 747-27A2398 show part numbers for the No. 2 and No. 7 transmission assemblies that are different from the part numbers specified in Boeing Service Bulletin 747-27-2374.

We agree that the requirements of this AD may terminate certain other requirements. This AD requires replacing the Inconel attach bolts installed by AD 2001-03-10 used for the transmission attachment fitting. Installation of the new bolts in accordance with Boeing Service Bulletin 747-27A2398, dated April 19, 2007, was previously approved as an AMOC to the requirements of paragraphs (a) and (b) of AD 2001-03-10 by FAA Letter 130S-08-47a, dated February 21, 2008. We have revised the AD in newly added paragraph (i) to clarify the relationship between the two ADs.

AD 2001-23-13 requires re-identifying the transmission assembly after replacing a discrepant torque brake with a new, improved torque brake. Before doing the requirements of this AD, operators should have already done the requirements of AD 2001-23-13, so the "new" part numbers created by AD 2001-23-13 are the "existing" part numbers in this AD. The modification required by this AD creates "new" part numbers. The "new" part numbers created by this AD were previously approved as an AMOC to paragraph (a)(2)(ii) of AD 2001-23-13 by FAA Letter 130S-08-48a, dated February 5, 2008. This final rule does not terminate any requirement of AD 2001-23-13.

Request to Revise Compliance Time for Paragraph (h)

Paragraph (h) of the NPRM (paragraph (j) in this final rule) would prohibit installing unmodified flap transmissions as of the effective date of the AD. BA, ANA, KLM, and Boeing request that we revise this provision to allow the continued use of unmodified hinge braces and support assemblies during the proposed compliance period for the modification. As written, paragraph (h) of the NPRM would require modifying a flap transmission and associated flap track whenever a flap transmission or hinge brace is replaced in service, regardless of the reason. The modification requires removing the outboard flaps and corresponding flap track, and is intended to be performed during planned maintenance. The modification would require significant manpower and use of proper facilities, equipment, tooling, etc. The commenters state that, if a transmission or hinge brace would need to be replaced outside of the planned schedule, such as for miscellaneous damage or an oil leak, the airplane would have to be taken out of service for modification, resulting in significant economic and operational impact.

We agree with the request and the commenters' rationale. The intent of this AD is to phase out a potential catastrophic failure mode that currently exists on Model 747 airplanes; service history indicates that immediate modification is not required. We have revised paragraph (j) of this AD to correspond with the modification specified in paragraph (f) of this AD.

Request to Clarify Compliance Times

Boeing requests that we revise the Relevant Service Information section of the NPRM, which indicates that the compliance time is based on flight cycles on the "airplane," which, Boeing asserts, should instead be on the flap "transmission." Paragraph 1.E. of Boeing Service Bulletins 747-27A2398 and 747-27A2421 explains that the compliance time is 6 years for flap transmissions known to have fewer than 20,000 total flight cycles, and 3 years for all other transmissions.

We agree with the commenter's explanation. We intended that the compliance times in this AD match the compliance times in the service bulletins. Although the Relevant Service Information section is not repeated in a final rule, the compliance time clarification provided by the commenter applies to paragraphs (f) and (g) in this final rule.

Request To Allow Flowchart for Deriving Compliance Time

Boeing requests that we revise the NPRM to include matrices (flowcharts) to help operators determine whether the 6-year or 3-year compliance time applies to a specific transmission. Alternatively, the commenter requests that flowcharts be considered for a future AMOC. Boeing states that the FAA agreed that operators may use transmission age and/or configuration to select the proper compliance time when the number of flight cycles on the flap transmission is unknown. Boeing reports that its flowcharts mirror the compliance time recommendations agreed on by Boeing and the FAA.

We disagree with the request to include flowcharts in the AD, although we generally agree that using transmission age and/or configuration is acceptable for selecting the proper compliance time. If the number of cycles is unknown, operators can estimate from the flap transmission configuration the date it was put into service, and can thus estimate the number of cycles on the transmission. But flowcharts can be variously interpreted and are often subject to misinterpretation, so they are generally not enforceable and therefore cannot be included in ADs. However, according to the provisions of paragraph (k) of the final rule, a request may be made to use a specific flowchart if the derived compliance times would accurately reflect the requirements of the AD.

Clarification of NPRM Discussion

In the Discussion section of the NPRM, we stated that we received a report about a joint Boeing and FAA multi-model study. Although the Discussion section is not repeated in a final rule, we provide the following to clarify events leading up to this AD. In the late 1990s/early 2000s, the FAA participated with Boeing in a multi-model investigation on the effects of trailing edge wing flap skew and flap loss. As a result of this investigation, a simulation study revealed potential failures that could cause a flap skew and subsequent flap loss, with potentially catastrophic results.

Conclusion

We reviewed the relevant data, considered the comments received, and determined that air safety and the public interest require adopting the AD with the changes described previously. We also determined that these changes will not significantly increase the economic burden on any operator or increase the scope of the AD.

Costs of Compliance

There are about 990 airplanes of the affected design in the worldwide fleet. The following table provides the estimated costs for U.S. operators to comply with this AD.

Estimated Costs

Work hours	Average labor rate per hour	Parts	Cost per airplane	Number of U.S.-registered airplanes	Fleet cost
310	$80	$80,023	$104,823	141	$14,780,043

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), and

(3) 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.

You can find our regulatory evaluation and the estimated costs of compliance in the AD Docket.

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 AD:

2008-23-10 Boeing: Amendment 39-15731. Docket No. FAA-2007-0308; Directorate Identifier 2007-NM-160-AD.

Effective Date

(a) This airworthiness directive (AD) is effective December 22, 2008.

Affected ADs

(b) None.

Applicability

(c) This AD applies to Boeing Model 747-100, 747-100B, 747-100B SUD, 747-200B, 747-200C, 747-200F, 747-300, 747-400, 747-400D, 747-400F, and 747SR series airplanes, certificated in any category; as identified in Boeing Service Bulletins 747-27A2398, Revision 1, dated July 31, 2008; and 747-27A2421, Revision 1, dated July 10, 2008.

Unsafe Condition

(d) This AD results from a joint Boeing and FAA multi-model study (following in-service trailing edge flap structure and drive system events) on the hazards posed by skewing and failed flaps. This study identified the safety concerns regarding the transmission attachment design and the potential loss of an outboard trailing edge flap. We are issuing this AD to prevent certain discrepancies associated with this design (for example, a flap skew or lateral control asymmetry that can cause collateral damage to adjacent hydraulic tubing and subsequent loss of a hydraulic system), which could result in the asymmetric flight control limits being exceeded, and could adversely affect the airplane's continued safe flight and landing.

Compliance

(e) You are responsible for having the actions required by this AD performed within the compliance times specified, unless the actions have already been done.

Modification

(f) Do the following, as applicable: At the time specified in paragraph 1.E. of Boeing Service Bulletins 747-27A2398, Revision 1, dated July 31, 2008; and 747-27A2421, Revision 1, dated July 10, 2008; except as provided by paragraph (g) of this AD, modify the outboard flap track and transmission attachments by doing all actions specified in the Accomplishment Instructions of the service bulletin.

(g) Where Boeing Service Bulletins 747-27A2398, Revision 1, dated July 31, 2008; and 747-27A2421, Revision 1, dated July 10, 2008; specify compliance times relative to the date on the

service bulletin, this AD requires compliance within the specified compliance time after the effective date of this AD.

Credit for Actions Done According to Previous Issue of Service Bulletins

(h) Actions done before the effective date of this AD in accordance with Boeing Alert Service Bulletins 747-27A2421 and 747-27A2398, both dated April 19, 2007, are acceptable for compliance with the requirements of paragraph (f) of this AD.

Terminating Action for Certain Requirements of AD 2001-03-10

(i) Accomplishment of the modification specified in paragraph (f) of this AD terminates the requirements of paragraphs (a) and (b) of AD 2001-03-10, amendment 39-12114.

Parts Installation

(j) After completing the modifications required by paragraph (f) of this AD, no person may install a part identified in Table 1 of this AD on the modified airplane.

Table 1 – Parts Prohibited from Installation

Part	Part number
Hinge brace assembly for Tracks 1 and 8	65B15515-1
	65B15515-2
	65B15515-9
	65B15515-10
Hinge brace assembly for Tracks 2 and 7	65B15525-1
	65B15525-2
	65B15525-7
	65B15525-8
	65B17092-1
	65B17092-2
Support housing assembly for Tracks 1 and 8	65B81982-( )
Support housing assembly for Tracks 2 and 7	65B81950-( )

Alternative Methods of Compliance (AMOCs)

(k)(1) The Manager, Seattle Aircraft Certification Office (ACO), FAA, ATTN: Doug Tsuji, Aerospace Engineer, Systems and Equipment Branch, ANM-130S; telephone (425) 917-6487; fax (425) 917-6590; has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19.

(2) To request a different method of compliance or a different compliance time for this AD, follow the procedures in 14 CFR 39.19. Before using any approved AMOC on any airplane to which the AMOC applies, notify your appropriate principal inspector (PI) in the FAA Flight Standards District Office (FSDO), or lacking a PI, your local FSDO.

Material Incorporated by Reference

(l) You must use Boeing Service Bulletin 747-27A2398, Revision 1, dated July 31, 2008; or Boeing Service Bulletin 747-27A2421, Revision 1, dated July 10, 2008; as applicable; to do the actions required by this AD, unless the AD specifies otherwise.

(1) The Director of the Federal Register approved the incorporation by reference of this service information under 5 U.S.C. 552(a) and 1 CFR part 51.

(2) For service information identified in this AD, contact Boeing Commercial Airplanes, P.O. Box 3707, Seattle, Washington 98124-2207; telephone 206-544-9990; fax 206-766-5682; e-mail DDCS@boeing.com; Internet https://www.myboeingfleet.com.

(3) You may review copies of the service information incorporated by reference at the FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington; or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

Issued in Renton, Washington, on October 23, 2008.
Ali Bahrami,
Manager, Transport Airplane Directorate,
Aircraft Certification Service.