DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39 [59 FR 37655 NO. 141 07/25/94]

Docket No. 94-NM-07-AD; Amendment 39-8976; AD 94-15-05

Airworthiness Directives; Boeing Model 747-400 Series Airplanes

AGENCY: Federal Aviation Administration, DOT

ACTION: Final rule

SUMMARY: This amendment adopts a new airworthiness directive (AD), applicable to all Boeing Model 747-400 series airplanes, that requires various inspections and functional tests of the thrust reverser control and indication system, and correction of any discrepancy found. This amendment is prompted by an investigation to determine the controllability of Model 747 series airplanes following an in-flight thrust reverser deployment, which has revealed that, in the event of thrust reverser deployment during high-speed climb or during cruise, these airplanes could experience control problems. The actions specified by this AD are intended to ensure the integrity of the fail safe features of the thrust reverser system by preventing possible failure modes in the thrust reverser control system that can result in inadvertent deployment of a thrust reverser during flight.

DATES: Effective August 24, 1994.

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of August 24, 1994.

ADDRESSES: 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 Federal Aviation Administration (FAA), Transport Airplane Directorate, Rules Docket, 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: Jon Regimbal, Aerospace Engineer, Propulsion Branch, ANM-140S, FAA, Transport Airplane Directorate, Seattle Aircraft Certification Office, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (206) 227-2687; fax (206) 227-1181.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations (14 CFR part 39) to include an airworthiness directive (AD) that is applicable to all Boeing Model 747-400 series airplanes was published in the Federal Register on March 4, 1994 (59 FR 10336). That action proposed to require various inspections and functional tests of the thrust reverser control and indication system, and correction of any discrepancy found.

Interested persons have been afforded an opportunity to participate in the making of this amendment. Due consideration has been given to the comments received.

One commenter supports the proposed rule.

The Air Transport Association (ATA) of America, on behalf of one of its members, requests that the proposed repetitive inspections and tests be withdrawn since those actions will be added to the revised Maintenance Planning Document. The ATA acknowledges that the proposed repetitive actions may not be incorporated uniformly into every operator's maintenance program unless an AD is issued. Therefore, the ATA asks that another provision be added to the proposal as follows: Within 3 months after the effective date of the AD, revise the FAA-approved maintenance inspection program to include a functional test of the thrust reverser control and indication system at an initial 15-month interval. Inspections for damage to the bullnose seal would be conducted at an initial 1,500 flight hour interval. The AD would no longer be applicable for operators that have acceptably revised the maintenance program. Operators complying with this paragraph could use an alternative recordkeeping method in lieu of that required by section 91.417 or 121.380 of the Federal Aviation Regulations (14 CFR 91.417 or 121.380). The FAA would be defined as the cognizant Principal Maintenance Inspector (PMI) for operators electing this alternative.

The ATA believes that its suggestion should be adopted because the proposed repetitive actions will likely continue for as long as Model 747-400 series airplanes are operated. The ATA acknowledges that, while numerous AD's that require repetitive inspections continue for the life of the aircraft, it has either been shown that a satisfactory terminating action has not been developed or that service experience has shown that control of the inspections cannot be administered safely through an operator's maintenance program. The ATA states that its proposal is intended to minimize the impact of the AD process on an operator's maintenance program and cites other AD's that contain provisions similar to its proposal.

The FAA recognizes the ATA's concerns regarding the requirement for repetitive inspections and tests of the thrust reverser control and indication systems. However, the FAA finds that this requirement is necessary in order to provide an adequate level of safety by addressing the specified unsafe condition. Further, the FAA determined the required repetitive intervals based on the service history of similar components and on an analysis of the system design to predict the reliability of the system during the service life of the aircraft. Lengthening these intervals would only be appropriate when a sufficient sample of systems is allowed to operate through an entire system overhaul cycle; adjustments made prior to that time may not account for the effects of age and wear.

The FAA finds that addressing inspections and tests of the thrust reverser control and indication systems in a document that is not FAA-approved, such as a Maintenance Planning Document, will not ensure an acceptable level of safety with regard to the thrust reverser system. The ATA's suggested provision for accomplishment of the inspections and tests would permit each operator to determine whether and how often these actions should be conducted. In light of the severity of the unsafe condition, however, the FAA has determined that allowing this degree of operator discretion is not appropriate at this time. Therefore, this AD is necessary to ensure that operators accomplish the repetitive actions in a common manner and at common intervals.

One commenter requests that the proposed compliance time for the initial inspections and functional tests of the thrust reverser control and indication systems be extended from 6 to 12 months. This commenter offers no justification for the request. A second commenter indicates a false impression that a 12-month compliance time was proposed for these inspections and functional tests, and requests that the compliance time be expressed in terms of maintenance checks (specifically, "C" checks) or 15 months to coincide with regularly scheduled maintenance. (The FAA notes that no 12-month compliance time is specified for any requirement contained in

the proposal.) Another commenter requests that the compliance times be specified in terms of maintenance check intervals ("A" checks, "C" checks, etc.). The commenter provides no justification for this request.

The FAA concurs partially. Since only two comments were received in response to the proposed 6-month compliance time, the FAA assumes that most operators are able to accommodate that proposed compliance time. In light of safety considerations, the FAA finds that a short initial compliance time for the inspections and functional tests is warranted. However, upon reconsideration, the FAA considers that extending the proposed compliance time by 3 additional months will not adversely affect safety, and will allow the required actions to be performed at a base during regularly scheduled maintenance where special equipment and trained maintenance personnel will be available, if necessary. Paragraphs (a)(2), (b)(2), and (c) of the final rule have been revised to specify a compliance time of 9 months for the initial inspections and functional tests of the thrust reverser control and indication systems.

The FAA does not agree that the compliance times specified in the final rule should be expressed in terms of maintenance check intervals. Since maintenance schedules vary from operator to operator, there would be no assurance that the actions will be accomplished during those maximum intervals. The FAA has determined that the compliance times, as specified in the final rule, represent the maximum intervals of time allowable for the affected airplanes to continue to operate prior to accomplishing the required actions without compromising safety.

Several commenters request that the proposed compliance time for repetitive inspections and functional tests of the thrust reverser control and indication systems [specified in paragraphs (a)(2), (b)(2), and (c) of the proposal] be extended from the proposed 15-month intervals to accommodate current or future scheduled "C" check maintenance intervals. Two commenters propose extension of the compliance time to 18-month intervals. One commenter indicates that Boeing Alert Service Bulletin 747-78A2115, Revision 1, dated March 10, 1994, recommends inspection intervals of 15 months or 5,000 flight hours.

The FAA concurs partially. As discussed previously, the FAA does not agree that these compliance times should be expressed in terms of maintenance check intervals. However, the FAA does concur with the commenters' requests to extend the proposed compliance time to 18 months. Extending the compliance time by 3 additional months will not adversely affect safety, and will allow the inspections and tests to be performed at a base during regularly scheduled maintenance where special equipment and trained maintenance personnel will be available, if necessary. Paragraphs (a)(2), (b)(2), and (c) of the final rule have been revised to specify a compliance time of 18 months for repetitive inspections and functional tests of the thrust reverser control and indication systems.

Several commenters request that paragraph (d) of the proposed rule be revised to allow dispatch with a thrust reverser inoperative in accordance with the FAA-approved Master Minimum Equipment List (MMEL) if any discrepancy is found during the required inspections and tests. Several commenters point out that allowing dispatch with a thrust reverser inoperative will provide operators time to obtain parts and perform any necessary corrective action. One commenter explains that, without this change, the dispatch capability of the airplane would be downgraded for problems such as proximity sensor adjustments or auto restow chafing, which are not related to the integrity of the stow lock feature. One commenter requests 14-day dispatch relief.

The FAA concurs partially. The FAA agrees that an option for dispatch relief may be allowed in

accordance with an operator's FAA-approved Minimum Equipment List (MEL). However, the FAA does not concur with the commenter's request for 14-day dispatch relief, since the MMEL specifies 10-day dispatch relief. The FAA has revised paragraph (d) of the final rule to provide an alternative for an airplane to be operated in accordance with existing provisions and limitations specified in the MEL, provided that no more than one thrust reverser on the airplane is inoperative.

Three commenters request that the proposed interval of 1,000 hours time-in-service for repetitive inspections of the bullnose seal and tests of the lock mechanism and of the position switch module and cone brake be extended to coincide with operators' scheduled maintenance intervals and to reduce the economic impact of the proposed actions. One commenter suggests a repetitive interval of 1,300 hours time-in-service. The second commenter proposes that the interval be extended to 1,500 hours time-in-service. The third commenter recommends that these actions be required every 15 months or during "C" checks.

The FAA does not concur. The FAA based the repetitive inspection interval on data obtained from a reliability analysis submitted by Boeing prior to the issuance of the proposed rule. The FAA based the proposed interval of 1,000 hours time-in-service on that analysis and on the fact that affected operators conduct "A" checks at intervals of approximately 450 hours time-in-service.

The FAA's intent was that the proposed inspections and tests be conducted during every other regularly scheduled "A" check, when the airplanes would be located at a base where special equipment and trained personnel would be readily available, if necessary. Further, the FAA has received no supporting technical analysis to supplement or refute the manufacturer's original reliability analysis. The FAA has determined that the compliance time, as proposed, represents the maximum interval of time allowable for the affected airplanes to accomplish the required repetitive actions without compromising safety.

One commenter requests that a statement be added to the proposed rule to indicate that the AD is considered to be interim action. The FAA acknowledges that this AD is interim action, as specified in the preamble to the proposed rule. The manufacturer has advised that it currently is developing a modification that will positively address the unsafe condition addressed by this AD, and that the modification should be available within approximately 24 months. Once this modification is developed, approved, and available, the FAA may consider additional rulemaking.

One commenter requests that the proposal be revised to require that operators report results from all inspections and tests, rather than only initial inspections and tests, and that these results be used to justify adjustments of inspection intervals or cancellation of inspections. The commenter offers no justification for this request. The FAA does not concur. The FAA is interested in the initial inspection results for the purpose of determining the present state of thrust reverser systems throughout the fleet. Since the actions required by this AD are considered to be interim action and terminating action is imminent, the FAA finds that gathering information for the purpose of adjusting inspection intervals and cancelling inspections is not needed and would pose an unnecessary burden on operators.

One commenter requests that the FAA review the probability calculations made by Boeing in determining that an unsafe condition exists. The commenter states that if the probability of inadvertent thrust reverser deployment is lower than 1 in 109 flight hours, an AD would not be required. The commenter points out two factors that would reduce controllability: deployment of

an outboard thrust reverser, and deployment of that reverser during climb. Neither of these factors was accounted for in the probability study that Boeing presented to the operators. In addition, for Model 747-400 series airplanes equipped with General Electric CF6-80C2 engines, deployment of a single thrust reverser sleeve half is possible, and deployment of a single sleeve half was assumed to have the same effect on airplane controllability as full (both halves) deployment of a thrust reverser.

The FAA does not concur. The analysis presented by Boeing to the FAA states clearly that the effect of deployment of an inboard thrust reverser, or the effect of deployment of a single outboard thrust reverser sleeve, had not yet been quantified. At that time, Boeing and the FAA recognized the need for further study. However, in light of the experience gained during investigation of the accident discussed in the preamble to the proposed rule, Boeing had identified design deficiencies that needed to be addressed as soon as practicable to ensure the safety of the Model 747 fleet. The FAA did not determine that an AD was warranted solely on the basis that a particular probability threshold of 1 in 109 flight hours had been exceeded. Rather, the FAA based its determination on the fact that design deficiencies exist that could lead to an unsafe condition (reduction in or loss of controllability of the airplane), which can be compensated for by periodic inspections and tests until a design change becomes available.

Since the issuance of the proposal, Boeing has issued Revision 1 of Boeing Alert Service Bulletins 747-78A2112, dated March 7, 1994; 747-78A2113, dated March 10, 1994; and 747-78A2115, dated March 4, 1994. (The original issues of these service bulletins were cited in the proposal as the appropriate sources of service information.) These alert service bulletin revisions reclassify the service bulletin type from standard to alert, recommend certain revised compliance times to coincide with operators' maintenance schedules, and revise certain test procedures. The FAA has reviewed and approved these alert service bulletins and has revised the final rule to reflect these latest revisions as additional sources of service information. In addition, the FAA has revised the final rule to specify the appropriate paragraphs of the Accomplishment Instructions of these alert service bulletins for performing the actions required by this AD.

After careful review of the available data, including the comments noted above, the FAA has determined that air safety and the public interest require the adoption of the rule with the changes previously described. The FAA has determined that these changes will neither increase the economic burden on any operator nor increase the scope of the AD.

This is considered to be interim action until final action is identified for these airplanes, at which time the FAA may consider further rulemaking.

There are approximately 286 Model 747-400 series airplanes of the affected design in the worldwide fleet. The FAA estimates that 39 Model 747-400 series airplanes powered by Pratt & Whitney PW4000 series engines of U.S. registry will be affected by this AD, that it will take approximately 48 work hours per airplane to accomplish the required actions, and that the average labor rate is $55 per work hour. Based on these figures, the total cost impact of the AD on U.S. operators of Model 747-400 series airplanes powered by Pratt & Whitney PW4000 series engines is estimated to be $102,960, or $2,640 per airplane.

The total cost impact figure discussed above is based on assumptions that no operator has yet accomplished any of the requirements of this AD action, and that no operator would accomplish those actions in the future if this AD were not adopted.

Currently, there are no Model 747-400 series airplanes powered by General Electric CF6- 80C2

series engines on the U.S. Register. However, should one of these airplanes be imported and placed on the U.S. Register in the future, it will require approximately 60 work hours to accomplish the required actions, at an average labor charge of $55 per work hour. Based on these figures, the total cost impact of this AD is estimated to be $3,300 per airplane.

Additionally, there are no Model 747-400 series airplanes powered by Rolls-Royce RB211-524G/H series engines on the U.S. Register at this time. However, should one of these airplanes be imported and placed on the U.S. Register in the future, it will require approximately 30 hours to accomplish the required actions, at an average labor charge of $55 per work hour. Based on these figures, the total cost impact of this AD is estimated to be $1,650 per airplane.

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.

For the reasons discussed above, I certify that this action (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. A final evaluation has been prepared for this action and it is contained in the Rules Docket. A copy of it 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. App. 1354(a), 1421 and 1423; 49 U.S.C. 106(g); and 14 CFR 11.89. § 39.13 - [Amended]
2. Section 39.13 is amended by adding the following new airworthiness directive:

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 14 CFR part 39, subpart 39.3).

94-15-05 BOEING: Amendment 39-8976. Docket 94-NM-07-AD.

Applicability: All Model 747-400 series airplanes, certificated in any category.

Compliance: Required as indicated, unless accomplished previously.

To ensure the integrity of the fail safe features of the thrust reverser system, accomplish the following:

(a) For Model 747-400 series airplanes powered by Pratt & Whitney PW4000 series engines: Accomplish paragraphs (a)(1) and (a)(2) of this AD.

(1) Within 90 days after the effective date of this AD, perform an inspection to detect damage to the bullnose seal on the translating sleeve of the thrust reverser, and perform a test of the lock mechanism of the center locking actuator, in accordance with paragraphs III.C. and III.E. of the Accomplishment Instructions of Boeing Service Bulletin 747-78-2112, dated November 11, 1993; or paragraphs III.E. and III.H. of the Accomplishment Instructions of Boeing Alert Service Bulletin 747-78A2112, Revision 1, dated March 7, 1994. Repeat this inspection and test thereafter at intervals not to exceed 1,000 hours time-in-service.

(2) Within 9 months after the effective date of this AD, perform inspections and functional tests of the thrust reverser control and indication systems in accordance with paragraphs III.A., III.B., III.D., and III.F. through III.M. of the Accomplishment Instructions of Boeing Service Bulletin 747-78-2112, dated November 11, 1993; or paragraphs III.C., III.D., III.F., III.G., and III.I. through III.P. of the Accomplishment Instructions of Boeing Alert Service Bulletin 747-78A2112, Revision 1, dated March 7, 1994. Repeat these inspections and functional tests thereafter at intervals not to exceed 18 months.

(b) For Model 747-400 series airplanes powered by General Electric CF6-80C2 series engines: Accomplish paragraphs (b)(1) and (b)(2) of this AD.

(1) Within 90 days after the effective date of this AD, perform an inspection to

detect damage to the bullnose seal on the translating sleeve of the thrust reverser, and a continuity test of the position switch module of the center drive unit (CDU) and a cone brake test of the CDU, in accordance with paragraphs III.B. and III.C. of the Accomplishment Instructions of Boeing Service Bulletin 747-78-2113, dated November 11, 1993; or paragraphs III.E. through III.G. of Boeing Alert Service Bulletin 747-78A2113, Revision 1, dated March 10, 1994. Repeat the inspection and tests thereafter at intervals not to exceed 1,000 hours time-in-service.

(2) Within 9 months after the effective date of this AD, perform inspections and functional tests of the thrust reverser control and indication systems in accordance with paragraphs III.A., III.D., III.F., III.G., III.H., and III.J. through III.M. of the Accomplishment Instructions of Boeing Service Bulletin 747-78-2113, dated November 11, 1993; or paragraphs III.D. and III.H. through III.N. of Boeing Alert Service Bulletin 747-78A2113, Revision 1, dated March 10, 1994. Repeat these inspections and functional tests thereafter at intervals not to exceed 18 months.

(c) For Model 747-400 series airplanes powered by Rolls-Royce RB211-524G/H series engines: Within 9 months after the effective date of this AD, and thereafter at intervals not to exceed 18 months, perform inspections and functional tests of the thrust reverser control and indication systems in accordance with paragraphs III.D. through III.K. of the Accomplishment Instructions of Boeing Service Bulletin 747-78-2115, dated October 28, 1993; or paragraphs III.D. through III.L. of the Accomplishment Instructions of Boeing Alert Service Bulletin 747-78A2115, Revision 1, dated March 4, 1994.

(d) If any of the inspections and/or functional tests required by this AD cannot be successfully performed, or if any discrepancy is found during those inspections and/or functional tests, accomplish either paragraph (d)(1) or (d)(2) of this AD.

(1) Prior to further flight, correct the discrepancy found, in accordance with Boeing Service Bulletin 747-78-2112, dated November 11, 1993, or Boeing Alert Service Bulletin 747-78A2112, Revision 1, dated March 7, 1994 (for Model 747-400 series airplanes powered by Pratt & Whitney PW4000 series engines); Boeing Service Bulletin 747-78-2113, dated November 11, 1993, or Boeing Alert Service Bulletin 747-78A2113, Revision 1, dated March 10, 1994 (for Model 747-400 series airplanes powered by General Electric CF6-80C2 series engines); or Boeing Service Bulletin 747-78-2115, dated October 28, 1993, or Boeing Alert Service Bulletin 747-78A2115, Revision 1, dated March 4, 1994 (for Model 747-400 series airplanes powered by Rolls-Royce RB211-524G/H series engines); as applicable. Or

(2) The airplane may be operated in accordance with the provisions and limitations specified in an operator's FAA-approved Minimum Equipment List (MEL), provided that no more than one thrust reverser on the airplane is inoperative.

(e) Within 10 days after performing each initial inspection and test required by this AD, submit a report of the inspection and/or test results, both positive and negative, to the FAA, Seattle Aircraft Certification Office (ACO), ANM-100S, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; fax (206) 227-1181. Information collection requirements contained in this regulation have been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.) and have been assigned OMB Control Number 2120-0056.

(f) 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,

FAA, Transport Airplane Directorate. 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: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Seattle ACO.

(g) 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.

(h) The actions shall be done in accordance with Boeing Service Bulletin 747-78-2112, dated November 11, 1993; Boeing Alert Service Bulletin 747-78A2112, Revision 1, dated March 7, 1994; Boeing Service Bulletin 747-78-2113, dated November 11, 1993; Boeing Alert Service Bulletin 747-78A2113, Revision 1, dated March 10, 1994; Boeing Service Bulletin 747-78-2115, dated October 28, 1993; or Boeing Alert Service Bulletin 747-78A2115, Revision 1, dated March 4, 1994; as applicable. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. 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.

(i) This amendment becomes effective on August 24, 1994.