

Airworthiness Directive

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39 [60 FR 27008 NO. 98 5/22/95]

Docket No. 94-NM-187-AD; Amendment 39-9233; **AD 95-10-16**

Airworthiness Directives; Boeing Model 747 Series Airplanes
PDF Copy (If Available):

▼ Preamble Information

AGENCY: Federal Aviation Administration, DOT

ACTION: Final rule

SUMMARY: This amendment adopts a new airworthiness directive (AD), applicable to certain Boeing Model 747 series airplanes, that requires modification of the nacelle strut and wing structure, inspections and checks to detect discrepancies, and correction of discrepancies. This amendment is prompted by the development of a modification of the strut and wing structure that improves the damage tolerance capability and durability of the strut-to-wing attachments, and reduces reliance on inspections of those attachments. The actions specified by this AD are intended to prevent failure of the strut and subsequent loss of the engine.

DATES: Effective June 21, 1995.

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of June 21, 1995.

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: Tim Backman, Aerospace Engineer, Airframe Branch, ANM-120S, FAA, Transport Airplane Directorate, Seattle Aircraft Certification Office, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (206) 227-2776; 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 certain Boeing Model 747 series airplanes was published in the Federal Register on December 21, 1994 (59 FR 65733). That action proposed to require modification of the nacelle strut and wing structure, inspections and checks to detect discrepancies in the adjacent structure, and correction of discrepancies.

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

Revision of Descriptive Language

One commenter notes that the description of the unsafe condition that appeared in the Discussion section of the preamble to the notice refers to "the structural fail-safe capability of the strut-to-wing attachment." The commenter states that this description is inaccurate, since it implies that the strut-to-wing attachment is inadequate. The commenter suggests that a more accurate description would be "damage tolerance capability of the strut-to-wing attachment." The FAA acknowledges that the commenter's wording is more accurate. The pertinent wording in this preamble to the final rule has been revised to reflect this change. Furthermore, the FAA considers the new structure of the strut as meeting the damage tolerance requirements of amendment 45 of section 25.571, "Damage--tolerance and fatigue evaluation of structure" of the Federal Aviation Regulations (14 CFR 25.571, amendment 45), which provides an even higher level of safety than simply fail-safe requirements.

One commenter provides further information to describe the purpose of the proposed modification of the nacelle strut and wing structure. This commenter suggests that the rule should specify that the modification not only significantly improves the load-carrying and durability of the strut-to-wing attachments, but "reduces the reliance on non-routine inspections," as well. The FAA concurs with this suggestion and has revised the Summary section of the preamble to this final rule to include wording relevant to this aspect.

One commenter provides clarification of the description in the Explanation of Service Information section of the preamble to the proposal. That section of the preamble described the various terminating actions specified in the service bulletins listed in paragraph I.C., Table 2, Prior or Concurrent Service Bulletins," on page 13 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994 (which was referenced in the notice as the appropriate source of service information). The commenter notes that it is replacement of the "diagonal brace strut lower spar fitting" which is specified as a terminating action in that listing. The notice, however, incompletely described that particular terminating action as the replacement of "the diagonal brace strut and wing and attachment fittings." The FAA acknowledges that the commenter provides a more complete description of that terminating action. However, since the Explanation of Service Information section is not restated in this rule, no change to the final rule is necessary.

Clarification of NOTE 1

One commenter requests that NOTE 1 of the proposal be clarified since it is too vague to determine exactly when FAA approval of alternative methods of compliance (AMOC) is necessary. The FAA concurs. Although every effort is made to keep the language simple and clear, it is apparent that some additional explanation is necessary to clarify the intent of NOTE 1. Performance of the requirements of this final rule is "affected" if an operator is unable to perform those requirements in the manner described in this AD. For example, if an AD requires a visual inspection in accordance with a certain service bulletin, and the operator cannot perform that inspection because of the placement of a repair doubler over the structure to be inspected, then "performance of the AD is affected."

In addition, performance of the requirements is "affected" if it is physically possible to perform the requirements, but the results achieved are different from those specified in the AD. For example, if the AD requires a non-destructive test (NDT) inspection in accordance with a certain service bulletin, and the operator is able to move the NDT probe over the specified area in the specified manner, but the results are either meaningless or inaccurate because of a repair doubler placed over that area, then "performance of the AD is affected."

While NOTE 1 itself is not capable of addressing every possible situation, "affected" is normally an easy standard to apply: either it is possible to perform the requirements as specified in the AD and achieve the specified results, or it is not possible. Therefore, if the requirements of this AD cannot be performed, then operators must submit a request for an approval of an AMOC from the FAA, in accordance with the provision of paragraph (d) of this final rule.

Accomplishment of any modification requirement of an AD, such as the modification of the nacelle strut and wing structure required by this final rule, does not "affect performance of the AD;" it is performance of the AD. Every AD includes a provision, with which operators are familiar, that states, "Compliance required as indicated, unless accomplished previously." If an operator performs such a requirement before the AD is issued, the FAA is confident that the operator will recognize that it has already complied with the AD and no further action (including obtaining approval of an AMOC) is required. This is consistent with current law and practice, which NOTE 1 is not intended to change.

Compliance Time for Modification

One commenter requests that the compliance times of proposed paragraph (a), which requires modification of the nacelle strut and wing structure, be extended by 4 months. The commenter notes that a 4-month extension of the compliance times would coincide with the times recommended in the referenced Boeing Alert Service Bulletin 747-54A2159 for that modification. Furthermore, the commenter states that the referenced alert service bulletin contains numerous errors, and a 4-month extension would allow the manufacturer sufficient time to publish a revision to that alert service bulletin to correct those errors.

The FAA does not concur with the commenter's request. In developing an appropriate compliance time for this action, the FAA considered not only the degree of urgency associated with addressing the subject unsafe condition, but

the manufacturer's recommendation as to an appropriate compliance time, the availability of required parts, and the practical aspect of installing the required modification within a maximum interval of time allowable for all affected airplanes to continue to operate without compromising safety. Further, the FAA took into account the 3-year and 5-year compliance times recommended by the manufacturer, as well as the number of days required for the rulemaking process; in consideration of these factors, the FAA finds that 32 months and 56 months after the effective date of this final rule will fall approximately at the same time for compliance as recommended by the manufacturer. Furthermore, the FAA does not consider that delaying this action until after the release of the manufacturer's planned revision to the alert service bulletin is warranted, since the changes in the revised alert service bulletin are mostly minor and clarifying in nature and do not affect the procedures to accomplish the modification of the nacelle strut and wing structure.

However, under the provisions of paragraph (d) of the final rule, any operator may submit requests for adjustments to the compliance time along with data demonstrating that such requests will not compromise safety. In evaluating such requests for adjustments to the compliance time, the FAA will closely examine the operator's explanation of why an extension is needed. The FAA will also consider the operator's good faith attempt at complying within the compliance times contained in this final rule, which can be demonstrated by accomplishing the modification on a significant percentage of the airplanes in the operator's fleet prior to submitting a request for adjustments to the compliance times. The FAA will take into consideration the number of airplanes in the operator's fleet on which the modification has been accomplished and the number of unmodified airplanes remaining in the operator's fleet. Additionally, the operator may be asked to submit a schedule for accomplishing the modification on the airplanes remaining in its fleet.

Calculation of Age of Affected Airplanes

Several commenters request that the age of the airplanes be measured as of the date of issuance of Boeing Alert Service Bulletin 747-54A2159, rather than as of the effective date of the AD, as proposed in paragraphs (a)(1) and (a)(2). Some of these commenters state that this change would coincide with the thresholds recommended in that alert service bulletin. One of these commenters notes that this change would move three of the airplanes in its fleet from the applicability provisions of paragraph (a)(2) (which would allow it 32 months) to paragraph (a)(1) (which would allow it the maximum amount of time of 56 months) to accomplish the modification of the nacelle strut and wing structure.

The FAA concurs. As discussed above, the FAA's intent was to align the compliance times as closely as possible with those recommended by the manufacturer in the referenced alert service bulletin. Therefore, paragraphs (a)(1) and (a)(2) of the final rule have been revised to specify that the age of the airplane is to be measured as of November 3, 1994, which is the date of issuance of the alert service bulletin.

Service Bulletins Listed in NOTE 2

Several commenters request that NOTE 2, which follows proposed paragraph (a)(2)(i), be revised either to exclude or to add service bulletins to the list of bulletins that describe modifications that must be accomplished in order to gain the

maximum time allowable (56 months) in which to accomplish the modification of the nacelle strut and wing structure. One of these commenters requests that the list be revised to exclude all Boeing service bulletins, with the exception of the following two:

1. Boeing Alert Service Bulletin 747-54A2155, dated September 23, 1993, which specifies inspection of the midspar fittings; and
2. Boeing Alert Service Bulletin 747-54A2152, Revision 2, dated September 16, 1993, which specifies installation of (third generation fuse pins) upper link diagonal brace and midspar fuse pins [required by AD 93-17-07, amendment 39-8678 (58 FR 45827, August 31, 1993)].

This commenter states that, if the other service bulletins are excluded from the list, safety would not be compromised since various repetitive inspections already are required by numerous other AD's that are intended to ensure the structural integrity of the strut-to-wing attachments and the fail-safe capability of the strut structure.

The FAA does not concur. As stated in the preamble to the proposal, one of the purposes of this rulemaking action is to reduce reliance on inspections of the strut-to-wing attachments. The FAA has determined that long term continued operational safety will be better assured by actual modification of the airframe to remove the source of the problem, rather than by repetitive inspections. Long term inspections may not be providing the degree of safety assurance necessary for the transport airplane fleet. This, coupled with a better understanding of the human factors associated with numerous repetitive inspections, has led the FAA to consider placing less emphasis on special procedures and more emphasis on design improvements. The modification requirement of this final rule is in consonance with these considerations.

Modification of Engine Mounts

Two commenters request that the list of service bulletins be revised to exclude Boeing Alert Service Bulletin 747-71A2269, Revision 1, dated July 7, 1994, which describes procedures for modification of the engine mounts. These commenters state that modification of the engine mounts is an entirely separate subject that is not related to the unsafe condition addressed by the proposed rule. One of these commenters believes that modification of the engine mounts is addressed more appropriately in AD 94-10-05.

The FAA does not concur. The FAA finds that the unsafe conditions addressed in both AD 94-10-05 [amendment 39-8912 (59 FR 25288, May 16, 1994)] and this AD are closely related. AD 94-10-05 requires replacement of the existing nut with a new castellated nut, and references Boeing Alert Service Bulletin 747-71A2269 as the appropriate source of service information. That AD addresses migration of the bolts out of the engine lug joint, which may lead to loss of the engine from the strut. Therefore, the FAA has determined that accomplishing the requirements of AD 94-10-05, prior to accomplishing the requirements of this final rule, reduces reliance on repetitive inspections, and decreases the likelihood of the engine separating from the airplane.

Replacement of Diagonal Braces

Certain commenters request that the list of service bulletins be revised to exclude Boeing Service Bulletin 747-54-2123, which describes procedures for replacement of the diagonal braces. One of these commenters notes that it has found no significant discrepancies on any of the airplanes in its fleet while performing the inspections of this area that are required by AD 90-20-20. Therefore, this commenter contends that replacement of the diagonal braces prior to accomplishment of the proposed modification of nacelle strut and wing structure is unnecessary if the brace lugs have been modified in accordance with Boeing Service Bulletin 747-54-2126 and the diagonal braces have been inspected in accordance with Boeing Service Bulletin 747-54-2123.

Further, these commenters contend that temporarily replacing the diagonal braces is cost-prohibitive: one of these commenters estimates the cost at \$50,000 per airplane, while the other commenter estimates the cost at \$60,000 per airplane. These commenters also point out that these costs are unreasonable, especially in light of the fact that the diagonal braces must be replaced once more as part of the proposed modification of the nacelle strut and wing structure.

Additionally, one of these commenters suggests that there is potential for a parts availability problem if all operators choose to replace these diagonal braces. Consequently, these commenters request the removal of Boeing Service Bulletin 747-54-2123 from the list of service bulletins.

The FAA does not concur. In addressing these particular comments, the FAA points out that there are three types of diagonal braces currently available:

1. "Type 1 Braces" have been addressed previously by two AD's:

- AD 89-07-15, amendment 39-6167 (54 FR 11693, March 22, 1989), references Boeing Service Bulletin 747-54-2126. That AD requires the lugs of Type 1 Braces to be ultrasonically inspected every 1,000 flight cycles. That AD was prompted by reports of cracking in the lugs that had initiated at corrosion pits in the lug bores and was propagated by fatigue. Terminating action for those inspections consists of removing bushings, oversizing of the hole to eliminate corrosion, and installing high interference fit bushings. There have been reports of 11 cracked braces found during the inspections required by this AD.

- AD 90-20-20, amendment 39-6725 (55 FR 37859, September 14, 1990), references Boeing Service Bulletin 747-54-2123. That AD requires Type 1 Braces to be either visually inspected every 1,000 flight cycles, or ultrasonically inspected every 3,000 flight cycles; any cracked brace is required to be replaced with either a serviceable Type 1 Brace or a "Type 2 Brace" (see below). That AD was prompted by the finding of a completely separated brace in service. Separation was attributed to circumferential cracks initiating from a tool mark in the brace's inner surface. (There also has been one additional report of a crack found, but separation did not occur.) Terminating action for these inspections consists of replacing Type 1 Braces with "Type 2 Braces."

2. "Type 2 Braces" are not susceptible to the cracking conditions of the brace's inner surface (as was found on the Type 1 Braces) because of their revised internal and external surface finish. Additionally, during production, the lugs associated with these Type 2 Braces were modified in accordance with the terminating action specified in AD 89-07-15; with this modification, the ultrasonic inspections required by that AD are not necessary on this type of brace.

3. "Type 3 Braces" are those that are required to be installed as part of the full strut modification program on which this AD is based. These braces are optimal because they have increased strength and are not susceptible to the type of cracking found in Type 1 Braces.

The FAA points out that this final rule provides operators 32 months in which to accomplish the full strut modification if Type 1 Braces are currently installed. Likewise, this final rule provides operators 56 months in which to accomplish the full strut modification if Type 2 Braces are currently installed, or if Type 2 Braces are installed within 32 months (and the additional modifications specified in the service bulletins listed in NOTE 2 are accomplished, as well).

Optimally, the FAA would prefer that all affected airplanes be modified within 32 months. However, when developing the compliance time for this AD, the FAA recognized the high costs (down time) that would be imposed on operators when accomplishing the full strut modification program. In so doing, the FAA looked for ways to lessen that economic burden, while still ensuring that a higher level of safety would exist than that currently provided. Based on analyses following relevant accidents involving failure of the strut-to-wing attachment and subsequent separation of the engine from the airplane during flight, the FAA determined that the Type 1 Brace, with its extensive history of service difficulties, is not adequate for long term assurance of safety. Even with repetitive inspections, these Type 1 Braces have inadequate damage tolerance. In light of this and the catastrophic consequences of fatigue cracking and/or corrosion in the strut-to-wing attachments, the FAA has determined that Type 1 Braces must be removed from the fleet sooner than the other braces that have a better service record.

As for the costs of replacement of the braces, the FAA finds that the figures quoted by the commenters need clarification. The manufacturer has provided the following figures relative to costs:

- Installation of Type 2 Braces requires from 88 to 116 work hours per airplane, at an average labor rate of \$60 per work hour. The cost of each brace is, at most, \$13,282 (in 1990 dollars) per brace; there are 4 braces on each airplane. Using these figures, the cost to install four Type 2 Braces on an airplane would be, at most, \$53,128 in parts and \$6,960 in labor charges.
- Parts and labor costs for the installation of Type 3 Braces, as part of the full strut modification kit, will be absorbed by the manufacturer.

Regardless of these costs, the FAA has determined that the safety benefit justifiably outweighs the economic cost of replacing diagonal braces. Further, the replacement of the Type 1 Brace with a Type 2 Brace is required only if the operator wants the longer compliance time of 56 months for accomplishing the full strut modification. This extended compliance time lessens the economic impact on operators in terms of the costs of special scheduling and down time. The FAA notes that certain operators have already accomplished the full strut modification; these operators have found it to be more cost effective to do so, since they incur no charges for parts. A full discussion of the cost impact of this rule on U.S. operators is discussed later in this preamble.

As for the availability of parts, the manufacturer has advised that there would be a

problem with parts availability only if many of the affected operators elected to install the Type 2 Braces as an interim measure. However, as a matter of fact, both the manufacturer and the FAA expect that many operators will not elect to do this, but will opt to install the full strut modification, which includes the Type 3 Brace. The manufacturer has indicated that there are ample numbers of the full strut modification kits available.

Rework of Midspar Fitting Lugs ~

One commenter requests that the list of service bulletins be revised to add Boeing Service Bulletin 747-54-2100 as an alternative to Boeing Alert Service Bulletin 747-54A2152 (original or Revision 1). The commenter believes that procedures for rework of the midspar fitting lugs, which is described Service Bulletin 747-54-2100, is equivalent to that specified in Service Bulletin 747-54A2152.

The FAA does not concur, since it does not find that the two procedures described in the referenced service bulletins are equivalent. For example, the rework procedure described in Boeing Service Bulletin 747-54-2100 does not include an "insurance" cut that is included in the rework procedure described in Boeing Alert Service Bulletin 747-54A2152 (original issue and Revision 1). Further, Revision 2 of Boeing Alert Service Bulletin 747-54A2152 has refined the procedure even further: this revision [which is referenced in paragraphs (a)(2)(iii) and (a)(2)(iv) of the final rule] describes a magnetic particle inspection to detect cracking of the midspar fitting lugs. Consequently, the FAA finds the procedures described in Revision 2 of Boeing Alert Service Bulletin 747-54A2152 to be significantly better in detecting and removing undetected cracks than those described in the earlier versions of that alert service bulletin or in Boeing Service Bulletin 747-54-2100.

Clarification of Requirements for Modified Airplanes

One commenter requests that the requirements of proposed paragraph (a)(2)(i) be clarified. The commenter notes that Boeing Service Bulletin 747-54-2062, Revision 5, which is referenced in the list of modifications under NOTE 2 of the proposal, must be accomplished to obtain the maximum amount of time allowable (56 months) in which to accomplish the proposed modification of the nacelle strut and wing structure. (These modifications are described in the service bulletins listed in paragraph I.D., "Compliance," on page 17 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994.) However, the commenter notes that Revision 7 of that service bulletin, which is referenced in the list of terminating actions for the proposed rule, must be accomplished prior to or concurrently with the proposed modification of the nacelle strut and wing structure. (These terminating actions are described in the service bulletins listed in paragraph I.C., Table 2, "Prior or Concurrent Service Bulletins," on page 13 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994.)

The FAA concurs that clarification is warranted. Although NOTE 2 following paragraph (a)(2)(i) clearly states that subsequent revisions of the service bulletins "are acceptable and preferred for accomplishment of the modifications," a footnote has been added to the final rule following that list to point out specifically that additional actions described in a subsequent revision of that service bulletin are required to be accomplished prior to or concurrently with the modification of the nacelle strut and wing structure, required by paragraph (a) of the final rule.

Shortening the Compliance Times of Other Related AD's

One commenter considers it inappropriate to use the proposed rule to shorten the 4,000-landing compliance time of AD 87-04-13 R1, amendment 39-5546 (52 FR 3421, February 4, 1987). That AD requires repetitive ultrasonic inspections of the fastener holes of the midspar fittings. The commenter states that, if the 1,000-landing compliance time specified in proposed paragraphs (a)(2)(ii)(B) and (a)(2)(iv)(B) is appropriate to accomplish the requirements of the proposal, then it should also be appropriate for accomplishing the inspection requirements of AD 87-04-13 R1.

Similarly, the commenter states that it is equally inappropriate to use the proposal to shorten the 5,000-landing compliance time of AD 93-17-07. That AD requires repetitive ultrasonic inspections of the inboard midspar fitting lugs and references Boeing Alert Service Bulletin 747-54A2152 (original issue or Revision 1) as the appropriate source of service information. The commenter states that if the 2,500-landing compliance time specified in proposed paragraphs (a)(2)(iii)(B) and (a)(2)(iv)(C) is appropriate to accomplish the requirements of the proposal, then it should also be appropriate for accomplishing the requirements of AD 93-17-07. The commenter believes that the appropriate means to effect a change to the compliance times of AD 87-04-13 R1 and AD 93-17-07 should be by revising those AD's.

The FAA concurs with the commenter's observations.

As for AD 87-04-13 R1, the FAA will consider re-examining its compliance time to determine if a revision to it is appropriate. However, any revision to that AD would be proposed as a separate rulemaking action. Further, in re-examining the compliance times of proposed paragraphs (a)(2)(ii)(B), (a)(2)(iii)(B), (a)(2)(iv)(B), and (a)(2)(iv)(C), the FAA finds that operators may not be afforded the opportunity to obtain the maximum amount of time allowable to accomplish the modification of the nacelle strut and wing structure if the "shortened" compliance times of AD 87-04-13 R1 (from 4,000 landings to 1,000 landings) and AD 93-17-07 (from 5,000 landings or 5 years to 2,500 landings or 3 years) have already been exceeded. Therefore, the FAA has revised those paragraphs of the final rule to include a "grace period."

As for AD 93-17-07, NOTE 4 of this final rule explains that the compliance time of 2,500 landings or 3 years since rework of the lugs, whichever occurs earlier, coincides with the compliance time recommended in Revision 2 of Boeing Alert Service Bulletin 747-54A2152, dated September 15, 1993, which the FAA has approved as an alternative method of compliance for accomplishment of the requirements of AD 93-17-07. However, the FAA will consider re-examining the compliance time of AD 93-17-07 to determine if further rulemaking is warranted. In the interim, the compliance time of paragraphs (a)(2)(iii)(B) and (a)(2)(iv)(C) of this final rule will remain unchanged. Any revision to the compliance time of AD 93-17-07, if deemed necessary, must be proposed in a separate rulemaking action.

Inspection Interval for the Inboard Midspar Fitting Lugs

One commenter requests that proposed paragraph (a)(2)(iii)(B) be revised to require the reduced 2,500-cycle compliance time only for the ultrasonic inspection of the inboard midspar fitting lugs. This change would make this requirement consistent with that of AD 93-17-07, amendment 39-8678 (58 FR 45827, August 31, 1993). This commenter also notes that outboard struts do not have spring

beams.

The FAA concurs. Further, the FAA finds that this change is also applicable to paragraph (a)(2)(iv)(C) of the final rule. Therefore, paragraphs (a)(2)(iii)(B) and (a)(2)(iv)(C) of the final rule have been revised accordingly.

Correction of Typographical Error in NOTE 6

Three commenters request that a typographical error that appeared in NOTE 6 [which follows proposed paragraph (a)(2)(v)] be corrected. The commenters note that the Table in NOTE 6 erroneously referred to Boeing Alert Service Bulletin 747-54A2159. The correct reference should have been Boeing Alert Service Bulletin 747-54A2152, as it correctly appeared in paragraphs (a)(2)(iii) and (a)(2)(iv) of the proposal. The FAA concurs and has made the correction accordingly. Additionally, the FAA has reformatted the Table in NOTE 6 for purposes of clarification: the column headed "Revision Level" has been removed, and the revision level of the service bulletin has been inserted adjacent to the service bulletin number itself.

Requirements Redundant to Part 121

One commenter requests that proposed paragraph (b) be deleted since the proposed inspection and repair of components (referenced in Notes 8, 9, and 10 of the Accomplishment Instructions on page 150 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994) are redundant to the requirements of part 121 of the Federal Aviation Regulations (14 CFR 121). Furthermore, the commenter believes that the proposed torque check of the fasteners of the diagonal brace fittings (referenced in Note 11 of the alert service bulletin) should be incorporated as part of the Accomplishment Instructions of the Boeing Alert Service Bulletin 747-54A2159, rather than as merely a Note in the Accomplishment Instructions.

The FAA does not concur with the commenter that the requirements of paragraph (b) should be deleted from the final rule. According to section 39.1 of the Federal Aviation Regulations (14 CFR 39.1), the issuance of an AD is based on the finding that an unsafe condition exists or is likely to develop in aircraft of a particular type design. Further, it is within the FAA's authority to issue an AD to require actions to address unsafe conditions that are not otherwise being addressed (or addressed adequately) by normal maintenance procedures. The FAA points out that fatigue cracking and corrosion in the strut-to-wing attachments have resulted in several incidents and catastrophic accidents. Although 14 CFR 121 addresses damage found on components during other maintenance activities, the FAA has determined that the catastrophic consequences of the unsafe condition are such that reiterating the necessity of performing inspections and repairs when any damage or corrosion is found while performing the modification of the nacelle strut and wing structure is warranted and necessary. The AD is the appropriate vehicle for mandating such actions.

AD's Terminated by this Final Rule

One commenter notes that the AD's listed in proposed paragraph (c) as those that are terminated once the actions of the proposal are accomplished, differs from those listed in Table 1 of Boeing Alert Service Bulletin 747-54A2159.

The FAA concurs that a difference does exist. However, several of the AD's included in the listing contained in the Boeing alert service bulletin have been superseded by new AD's. The FAA points out that, when an AD is superseded, it is deleted from the system, and as such, no longer exists, since it has been replaced with a "new" AD that has a new (different) AD number and amendment number. The FAA considers that referencing nonexistent AD's would serve no meaningful purpose, and may result in some confusion for affected operators. Consequently, no change to paragraph (c) of the final rule is necessary.

Clarification of Cost Estimate Information

Two commenters request that the cost estimate be revised to include the cost of out-of-service time for each aircraft during the time that the modification is accomplished, and the additional fuel costs that would be incurred due to the additional weight added to each aircraft by the modification hardware.

The FAA does not concur that a revision is necessary. The appropriate number of hours required to accomplish the required actions, specified as between 7,700 and 8,892 work hours in the economic impact information, below, was developed with data provided by the manufacturer. This number represents the time required to gain access, remove parts, inspect, modify, install, and close up. The cost analysis in AD rulemaking actions typically does not include out-of-service time for each aircraft or additional fuel costs, as was suggested by the commenter. These costs would be impossible to calculate accurately due the differences in out-of-service time for each operator. Furthermore, the increase in fuel costs due to the weight added by the modification, would vary greatly from operator to operator, depending upon airplane utilization.

The Air Transport Association of America (ATA) requests that the FAA include costs "beyond just parts and labor costs" when calculating the estimated costs to accomplish the proposed actions. The ATA points out that the FAA should consider such costs to avoid requiring actions that the ATA considers inconsequential.

The FAA does not concur. Contrary to the ATA's assertion, in establishing the requirements of all AD's, the FAA does consider cost impact to operators beyond the estimates of parts and labor costs contained in AD preambles. For example, where safety considerations allow, the FAA attempts to impose compliance times that generally coincide with operators' maintenance schedules. However, because operators' schedules vary substantially, the FAA is unable to accommodate every operator's optimal scheduling in each AD. Each AD does allow individual operators to obtain approval for extensions of compliance times, based on a showing that the extension will not affect safety adversely. Therefore, the FAA does not consider it appropriate to attribute to the AD, the costs associated with the type of special scheduling that might otherwise be required.

Furthermore, because the FAA generally attempts to impose compliance times that coincide with operators' scheduled maintenance, the FAA considers it inappropriate to attribute the costs associated with aircraft "downtime" to the cost of the AD, because, normally, compliance with the AD will not necessitate any additional downtime beyond that of a regularly scheduled maintenance hold. Even if, in some cases, additional downtime is necessary for some airplanes, the FAA does not possess sufficient information to evaluate the number of airplanes that may be so affected or the amount of additional downtime that may be required.

Therefore, attempting to estimate such costs would be futile.

The FAA points out that this AD is an excellent example of the fact that costs to operators are fully considered beginning at the earliest possible stages of AD development. In this case, the service bulletin that is referenced in this final rule was developed by Boeing only after extensive and detailed consultations with large numbers of operators of Model 747's. The compliance times and various optional means of compliance presented in this AD are based on those consultations, and were developed in order to minimize the economic impacts on operators to the extent possible consistent with the service bulletin's and this AD's safety objectives. Therefore, the costs that the ATA asserts were not considered by the FAA have, in fact, been a major consideration throughout this AD process; the fact that the FAA has not attempted to quantify speculative costs does not diminish the extent of this consideration.

Conclusion

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.

Cost Impact

There are approximately 600 Model 747 series airplanes equipped with Pratt & Whitney Model JT9D series engines (excluding Model JT9D-70 engines) of the affected design in the worldwide fleet. The FAA estimates that 146 airplanes of U.S. registry will be affected by this AD.

The full strut modification required by this AD may take as many as 7,700 to 8,892 work hours to accomplish, depending upon the configuration of the airplane. The manufacturer will incur the cost of labor, on a pro-rated basis, with 20 years being the expected life of these airplanes. The total cost impact of this AD on U.S. operators is based on the median age for the fleet of Model 747 series airplanes equipped with Pratt & Whitney Model JT9D series engines, which is estimated to be 15 years. The average labor rate is estimated to be \$60 per work hour. Required parts will be supplied by the manufacturer at no cost to the operator. Based on these figures, the cost impact of this proposal on U.S. operators is estimated to be between \$50,589,000 (\$346,500 per airplane) and \$58,420,440 (\$400,140 per airplane).

This cost impact figure does not reflect the cost of the terminating actions described in the service bulletins listed in paragraph I.C., Table 2, "Prior or Concurrent Service Bulletins," on page 13 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, that are required to be accomplished prior to or concurrently with the modification of the nacelle strut and wing structure. Since some operators may have accomplished certain modifications on some or all of the airplanes in its fleet, while other operators may not have accomplished any of the modifications on any of the airplanes in its fleet, the FAA is unable to provide a reasonable estimate of the cost of accomplishing the terminating actions described in the service bulletins listed in Table 2 of the Boeing alert service bulletin.

The cost impact figure discussed above is based on assumptions that no operator

has yet accomplished any of the proposed requirements of this AD action, and that no operator would accomplish those actions in the future if this AD were not adopted. However, the FAA is aware that some operators have already installed the strut modification that is required by this AD; therefore, the future economic cost impact of this rule on U.S. operators is reduced by that amount.

The FAA recognizes that the obligation to maintain aircraft in an airworthy condition is vital, but sometimes expensive. Because AD's require specific actions to address specific unsafe conditions, they appear to impose costs that would not otherwise be borne by operators. However, because of the general obligation of operators to maintain aircraft in an airworthy condition, this appearance is deceptive. Attributing those costs solely to the issuance of this AD is unrealistic because, in the interest of maintaining safe aircraft, prudent operators would accomplish the required actions even if they were not required to do so by the AD.

A full cost-benefit analysis has not been accomplished for this AD. As a matter of law, in order to be airworthy, an aircraft must conform to its type design and be in a condition for safe operation. The type design is approved only after the FAA makes a determination that it complies with all applicable airworthiness requirements. In adopting and maintaining those requirements, the FAA has already made the determination that they establish a level of safety that is cost-beneficial. When the FAA, as in this proposed AD, makes a finding of an unsafe condition, this means that the original cost-beneficial level of safety is no longer being achieved and that the required actions are necessary to restore that level of safety. Because this level of safety has already been determined to be cost-beneficial, a full cost-benefit analysis for this AD would be redundant and unnecessary.

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.

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:

▼ Regulatory Information

95-10-16 BOEING: Amendment 39-9233. Docket 94-NM-187-AD.

Applicability: Model 747 series airplanes having line positions 001 through 814 inclusive, equipped with Pratt & Whitney Model JT9D series engines (excluding Model JT9D-70 engines), certificated in any category.

NOTE 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been 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 use the authority provided in paragraph (d) to request approval from the FAA. This approval may address either no action, if the current configuration eliminates the unsafe condition; or different actions necessary to address the unsafe condition described in this AD. Such a request should include an assessment of the effect of the changed configuration on the unsafe condition addressed by this AD. In no case does the presence of any modification, alteration, or repair remove any airplane from the applicability of this AD.

Compliance: Required as indicated, unless accomplished previously.

To prevent failure of the strut and subsequent loss of the engine, accomplish the following:

(a) Accomplish the modification of the nacelle strut and wing structure in accordance with Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, at the time specified in either paragraph (a)(1) or (a)(2) of this AD, as applicable. All of the terminating actions described in the service bulletins listed in paragraph I.C., Table 2, "Prior or Concurrent Service Bulletins," on page 13 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, must be accomplished in accordance with those service bulletins prior to or concurrently with the accomplishment of the modification of the nacelle strut and wing structure required by this paragraph.

(1) For airplanes that are younger than 15 years as of November 3, 1994, within 56 months after the effective date of this AD, accomplish the modification.

(2) For airplanes that are 15 years or older as of November 3, 1994, accomplish the modification, and other required actions, at the time specified in paragraph (a)(2)(i), (a)(2)(ii), (a)(2)(iii), (a)(2)(iv), or (a)(2)(v) of this AD, as applicable.

(i) For airplanes on which all of the modifications described in the service bulletins referenced by paragraph I.D., "Compliance," on page 17 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, have been accomplished: Within 56 months after the effective date of this AD, accomplish the modification of the nacelle strut and wing structure and perform the inspections of the adjacent structure that has not been replaced by the modification.

NOTE 2: Paragraph I.D., "Compliance," on page 17 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, references the following Boeing service bulletins. Subsequent revisions of the following service bulletins are acceptable and preferred for accomplishment of the modifications described therein:

Service Bulletin Number	Revision Level	Date
747-54-2027	1	February 23, 1973
747-54-2030	Initial Release	February 23, 1973
747-54-2062*	5	June 1, 1984
747-54A2069	6	October 22, 1982
747-54-2118	Initial Release	July 25, 1986
747-54-2123	1	March 1, 1990
747-54A2151	Initial Release	October 6, 1992
747-54A2152	2	September 16, 1993
747-54A2155	Initial Release	September 23, 1993
747-57A2235	Initial Release	June 27, 1986
747-71A2269	1	July 7, 1994

* AD 79-17-07, amendment 39-3533, requires inspection of the strut-to-diagonal brace fittings, which may be terminated by replacing the aluminum fittings with steel fittings in accordance with Revision 1 (or subsequent revisions) of Boeing Service Bulletin 747-54-2062. Revision 7 of this service bulletin (referenced in paragraph I.C., Table 2, "Prior or Concurrent Service Bulletins," on page 13 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994) specifies the replacement of aluminum fittings with steel fittings and sealing the gap between the steel fitting and the closure web.

(ii) For airplanes on which all of the modifications described in the service bulletins referenced by paragraph I.D., "Compliance," on page 17 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, have been accomplished, excluding the modification described in Boeing Service Bulletin 747-54-2118, dated July 25, 1986:

(A) Within 56 months after the effective date of this AD, accomplish the modification of the nacelle strut and wing structure and perform the inspections of the adjacent structure that has not been replaced by the modification.

(B) Repeat the ultrasonic inspections to detect cracking of the aft-most two fastener holes in both strut midspar fittings on the inboard and outboard nacelle

struts, as required by AD 87-04-13 R1, amendment 39-5546, within 4,000 landings following the immediately preceding inspection performed in accordance with AD 87-04-13 R1 or within 1,000 landings after the effective date of this AD, whichever occurs earlier, in accordance with Boeing Service Bulletin 747-54-2118, dated July 25, 1986, until the modification of the nacelle strut and wing structure is accomplished in accordance with Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994. Repeat this inspection thereafter at intervals not to exceed 1,000 landings.

NOTE 3: These inspections of the fastener holes are required by AD 87-04-13 R1, amendment 39-5546, at 4,000-landing intervals. Accomplishment of the inspections of the fastener holes, as required by this paragraph at 1,000-landing intervals, constitutes compliance with paragraph A. of AD 87-04-13 R1.

(iii) For airplanes on which all of the modifications described in the service bulletins referenced by paragraph I.D., "Compliance," on page 17 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, have been accomplished; except that rework of the midspar fitting lugs was accomplished in accordance with Boeing Alert Service Bulletin 747-54A2152, dated December 23, 1992, or Revision 1, dated July 15, 1993, instead of Revision 2, dated September 16, 1993:

(A) Within 56 months after the effective date of this AD, accomplish the modification of the nacelle strut and wing structure and perform the inspections of the adjacent structure that has not been replaced by the modification.

(B) Prior to the accumulation of 3 years since rework of the inboard lugs, or within 6 months after the effective date of this AD, whichever occurs later, perform an ultrasonic inspection to detect cracking of the midspar fitting lugs of the inboard struts, in accordance with Boeing Alert Service Bulletin 747-54A2152, Revision 2, dated September 16, 1993. Repeat this inspection thereafter as required by AD 93-17-07.

NOTE 4: This ultrasonic inspection is required by AD 93-17-07, amendment 39-8678, to be performed prior to the accumulation of 5,000 landings or 5 years since accomplishment of the rework of the lugs, whichever occurs earlier, in accordance with Boeing Alert Service Bulletin 747-54A2152, dated December 23, 1992, or Revision 1, dated July 15, 1993. Repetitive inspections are required by that AD at intervals not to exceed 500 landings for inboard struts and 1,000 landings for outboard struts. Since the issuance of that AD, the FAA has approved Revision 2 of Boeing Alert Service Bulletin 747-54A2152, dated September 16, 1993, as an alternative method of compliance for accomplishment of these ultrasonic inspections and rework of the lugs. Revision 2 of the alert service bulletin recommends that inboard lugs that have been reworked in accordance with the original issue or Revision 1 of the alert service bulletin be inspected prior to the accumulation of 2,500 landings or 3 years since accomplishment of the rework of the lugs, whichever occurs earlier. Therefore, accomplishment of ultrasonic inspections prior to the accumulation of 2,500 landings or 3 years since accomplishment of rework of the lugs, whichever occurs earlier, and thereafter as required by AD 93-17-07, constitutes compliance with paragraph (e)(2)(i)(A) of AD 93-17-07 for the inboard lugs.

(iv) For airplanes on which all of the modifications described in the service bulletins referenced by paragraph I.D., "Compliance," on page 17 of Boeing Alert

Service Bulletin 747-54A2152, dated November 3, 1994, have been accomplished; except that rework of the midspar fitting lugs was accomplished in accordance with the Boeing Alert Service Bulletin 747-54A2152, dated December 23, 1992, or Revision 1, dated July 15, 1993, instead of Revision 2, dated September 16, 1993; and excluding the modification described in Boeing Service Bulletin 747-54-2118, dated July 25, 1986:

(A) Within 56 months after the effective date of this AD, accomplish the modification of the nacelle strut and wing structure and perform the inspections of the adjacent structure that has not been replaced by the modification.

(B) Repeat the ultrasonic inspections to detect cracking of the aft-most two fastener holes in both strut midspar fittings on the inboard and outboard nacelle struts, as required by AD 87-04-13 R1, within 4,000 landings following the immediately preceding inspection performed in accordance with AD 87-04-13 R1, or within 1,000 landings after the effective date of this AD, whichever occurs earlier, in accordance with Boeing Service Bulletin 747-54-2118, dated July 25, 1986, until the modification of the nacelle strut and wing structure is accomplished in accordance with Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994. Repeat this inspection thereafter at intervals not to exceed 1,000 landings.

(C) Prior to the accumulation of 3 years since rework of the inboard lugs, or within 6 months after the effective date of this AD, whichever occurs later, perform an ultrasonic inspection to detect cracking of the midspar fitting lugs of the inboard struts, and repeat the inspection thereafter as required by AD 93-17-07, until the modification of the nacelle strut and wing structure is accomplished in accordance with Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994.

NOTE 5: NOTES 3 and 4 are also applicable to this paragraph.

(v) For all other airplanes not subject to the requirements of paragraph (a)(2)(i), (a)(2)(ii), (a)(2)(iii), or (a)(2)(iv) of this AD: Within 32 months after the effective date of this AD, accomplish the modification of the nacelle strut and wing structure and perform the inspections of the adjacent structure that has not been replaced by the modification.

NOTE 6: The following table graphically illustrates the applicability and compliance times for accomplishing the modification of the nacelle strut and wing structure as required by paragraph (a)(2) of this AD.

Paragraph	Accomplishment of Service Bulletins	Compliance Time
(i)	All in paragraph I.D.	56 months
(ii)	All except 747-54-2118	56 months
(iii)	All except 747-54A2152, Revision 2	56 months
(iv)	All except 747-54-2118 and 747-54A2152, Revision 2	56 months
(v)	(*)	32 months

* Paragraph (a)(2)(v) of this AD is applicable to all airplanes, other than those

addressed in paragraphs (a)(2)(i), (a)(2)(ii), (a)(2)(iii), and (a)(2)(iv) of this AD. As such, these airplanes may have accomplished some or none of the service bulletins listed in paragraph I.D. of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994.

(b) Perform the inspections and checks specified in paragraph III, NOTES 8, 9, 10, and 11 of the Accomplishment Instructions on pages 149 and 150 of Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, concurrently with the modification of the nacelle strut and wing structure required by paragraph (a) of this AD. Prior to further flight, correct any discrepancies found, in accordance with the alert service bulletin.

(c) Accomplishment of the modification of the nacelle strut and wing structure in accordance with Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994, constitutes terminating action for the inspections required by the following AD's:

AD Number	Amendment Number	Federal Register Citation	Date of Publication
94-17-17	39-9012	59 FR 44903	August 31, 1994
94-10-05	39-8912	59 FR 25288	May 16, 1994
93-17-07	39-8678	58 FR 45827	August 31, 1993
93-03-14	39-8518	58 FR 14513	March 18, 1993
92-24-51	39-8439	57 FR 60118	December 18, 1992
92-07-11	39-8207	57 FR 10415	March 26, 1992
90-20-20	39-6725	55 FR 37859	September 14, 1990
90-17-18	39-6702	55 FR 33279	August 15, 1990
89-07-15	39-6167	54 FR 11693	March 22, 1989
87-04-13 R1	39-5546	52 FR 3421	February 4, 1987
86-08-03	39-5289	51 FR 12836	April 16, 1986
86-07-06	39-5270	51 FR 10821	March 31, 1986
86-05-11	39-5255	51 FR 8479	March 12, 1986
86-23-01	39-5450	51 FR 37712	October 24, 1986
82-22-02	39-4476	47 FR 46842	October 21, 1982
80-08-02	39-3738	45 FR 24450	April 10, 1980
79-17-07	39-3533	44 FR 50033	August 27, 1979

(d) 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 Aircraft Certification Office (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 7: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Seattle ACO.

(e) 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.

(f) The modification, inspections, checks, and correction of discrepancies shall be done in accordance with Boeing Alert Service Bulletin 747-54A2159, dated November 3, 1994. 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.

(g) This amendment becomes effective on June 21, 1995.

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