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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2010-1115; Directorate Identifier 2010-NM-221-AD; Amendment 39-17111; AD 2012-13-09]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: We are adopting a new airworthiness directive (AD) for certain The Boeing Company Model 747-100, 747-100B, 747-100B SUD, 747-200B, 747-200C, 747-200F, 747-300, 747-400, 747-400D, 747-400F, 747SR, and 747SP series airplanes. This AD was prompted by several reports of electrical arcs at terminal "A" of the electrically heated flight deck window 1. This AD requires repetitive inspections for damage of the electrical connections at terminal "A" of the left and right flight deck window 1, and corrective actions if necessary. This AD also allows for replacing a flight deck window 1 with a new improved flight deck window 1 equipped with different electrical connections, which would terminate the repetitive inspections for that window. We are issuing this AD to prevent smoke and fire in the cockpit, which could lead to loss of visibility, and injuries to or incapacitation of the flight crew.

DATES: This AD is effective August 16, 2012.

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in the AD as of August 16, 2012.

ADDRESSES: For service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Data & Services Management, P.O. Box 3707, MC 2H-65, Seattle, Washington 98124-2207; telephone 206-544-5000, extension 1; fax 206-766-5680; Internet <https://www.myboeingfleet.com>. You may review copies of the referenced service information at the FAA, FAA, Transport Airplane Directorate, 1601 Lind Avenue SW., Renton, Washington. For information on the availability of this material at the FAA, call 425-227-1221.

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 (phone: 800-647-5527) is 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: Louis Natsiopoulos, Aerospace Engineer, Systems and Equipment Branch, ANM-130S, FAA, Seattle Aircraft Certification Office, 1601 Lind Avenue SW., Renton, Washington 98057-3356; phone: 425-917-6478; fax: 425-917-6590; email: elias.natsiopoulos@faa.gov.

SUPPLEMENTARY INFORMATION:

Discussion

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 to include an AD that would apply to the specified products. That NPRM published in the Federal Register on November 19, 2010 (75 FR 70868). That NPRM proposed to require repetitive inspections for damage of the electrical terminal at the left and right flightdeck window 1, and corrective actions if necessary. That NPRM also proposed to allow for replacing the flight deck window 1 with a new improved flight deck window 1 equipped with different electrical connections, which would terminate the repetitive inspections for that flight deck window.

Revised Service Information

The NPRM (75 FR 70868, November 19, 2010) referred to Boeing Special Attention Service Bulletin 747-30-2081, Revision 2, dated March 10, 2010, as the appropriate source of service information for the proposed actions. Boeing has since revised this service information to account for certain inconsistencies and omissions. Some of these discrepancies were reported by operators, who commented on these inconsistencies and omissions as noted below. We have reviewed Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, which addresses the following commenters' concerns:

- It extends the repetitive inspection intervals for the GKN windshields to 12,000 flight hours or 48 months, whichever occurs later, and provides more details for the conditions to look for during the investigation and corrective actions.
- It changes the inspection specified in Work Packages 1 and 2 to a detailed inspection (the type of inspection had not been specified).
- It revises Figures 1 and 2 to provide a better illustration of the electrical connections, change certain data, and add new data to the footnotes. Among other things, the new data clarifies the conditions to look for when inspecting the connectors, clarifies the associated corrective actions including replacing a connector if it or its cover has melted; specifies inspection and corrective actions of cross-threaded screws, and provides instructions on how to select the correct screw for the opted windshield.

Comments

We gave the public the opportunity to participate in developing this AD. The following presents the comments received on the proposal (75 FR 70868, November 19, 2010) and the FAA's response to each comment.

Support for the NPRM (75 FR 70868, November 19, 2010)

Air Line Pilots Association, International (ALPA), supported the intent of the NPRM (75 FR 70868, November 19, 2010).

Request To Correct Service Information Discrepancies

United Airlines (UAL) reported a number of errors and inconsistencies in the information and procedures specified in Boeing Special Attention Service Bulletin 747-30-2081, Revision 2, dated March 10, 2010 (the source of service information for the NPRM (75 FR 70868, November 19, 2010)).

As explained above, we reviewed Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, which addresses the discrepancies noted by UAL. We have revised this final rule to refer to Revision 3 of that service bulletin. We also removed paragraph (j) of the NPRM (75 FR 70868, November 19, 2010) (that paragraph had explained an exception to the proposed service information), and we re-identified subsequent paragraphs accordingly. We have, however, retained paragraph (i) in this final rule to ensure that operators are aware of the conditions that require window replacement and the compliance time for the replacement. We revised the NPRM to add credit for actions accomplished before the effective date of this AD using Boeing Special Attention Service Bulletin 747-30-2081, Revision 2, dated March 10, 2010.

Request To Extend Initial Compliance Time

UAL questioned the validity of the initial 500-flight-hour compliance time for the inspection, and requested that this compliance time be extended to mitigate the risk of operational interruptions. Based on the length of time Boeing and the FAA have been aware of the issue, UAL felt that increasing this time would have no adverse effect on flight safety.

We disagree to extend the compliance time. Most of the reported arcing events occurred within 500 flight hours after incorrect assembly of a screw/connector electrical connection during maintenance. We have not changed this compliance time in the final rule.

Request To Exclude Certain GKN Windshields

GKN Aerospace (GKN) requested that we revise the NPRM (75 FR 70868, November 19, 2010) to exclude its windshield part numbers 60B10028-17 and 60B10028-18 (GKN part numbers 06372 and 06373) from the proposed inspections. As an alternative, GKN requested that those part numbers be given longer compliance times because of the superior design of the terminal block connections at both the cockpit and windshield sides of the terminal block. GKN pointed out that the primary cause of arcing that leads to high temperatures is the melting of the solder joint used in the window side of the terminal block used by other manufacturers. The GKN-designed and -manufactured windshields do not use a soldered joint to connect the power braid to the back of the terminal block. Instead, the GKN windshield employs a ring tag crimped to a carrier wire, which is attached to the terminal insert by a screw and secured against vibration by a lock washer. The carrier wire is mechanically crimped to the braid wire from the windshield. The mechanical fixing of the power braid to the terminal block at the windshield side is superior to the soldered joint used in the standard alternative windshields. GKN also pointed out that material choices can reduce the potential for cross threading. GKN uses nickel-plated bronze terminal inserts, which are aligned with industry-accepted standards for electrical terminations that pass high power and high currents. Bronze is also more resistive to cross threading than other softer materials used in electrical connections by other manufacturers.

We agree to extend the repetitive inspection interval of GKN-manufactured windshields with screw/connector electrical heat terminals because the material used in the GKN 747 windshield terminal block has significantly better high-temperature capability and behaves significantly better

than PPG's epoxy terminal blocks, and the internal crimped connection prevents the sustained arcing that can occur with PPG's internal soldered connections. We have revised paragraph (g) in this final rule to extend the repetitive inspection intervals for GKN windshields with screw/connector electrical connections to 12,000 flight hours or 48 months, whichever occurs later.

We disagree, however, to exclude those part numbers from the required inspections. Two of five reported Model 747 windshield arcing events occurred on these GKN windshields. The GKN windshields using screw/connector type electrical terminal connections are therefore susceptible to overheating caused by a loose screw or an incorrectly assembled terminal. An overheated terminal could damage adjacent parts and become an ignition source for combustible material close to the overheated terminal. The GKN windshields with screw/connector-type electrical terminal connections therefore are not excluded from the required actions of the AD.

Request To Clarify Note (d) of Figures 1 and 2

UAL noted that STEP 2, Note (d), of Boeing Special Attention Service Bulletin 747-30-2081, Revision 2, dated March 10, 2010, considers some movement (1-3 degrees) of a tight connection to be a normal condition. UAL stated that it is not possible to distinguish between 3 degrees and, for example, 4 degrees, and requested that we clarify this condition.

We agree to provide the requested clarification. According to Boeing, the referenced Note (d) was added in STEP 2, Figures 1 and 2, of Boeing Special Attention Service Bulletin 747-30-2081, Revision 2, dated March 10, 2010 (which corresponds to Note (e) in Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011), in response to multiple inquiries from airlines regarding the brass terminal insert in the PPG windshield terminals. The airlines were concerned about the lack of information regarding the slight movement of the connector with light manual pressure while the terminal connection is tight (tight screw and not crossthreaded). This Note was added to describe the small movement—"approximately 1-3 degrees"—of the shipside of the connector with light manual pressure as being normal and not to be perceived as a loose terminal connection. The 1- to 3-degree movement is an approximation and does not require measurement. We have determined that this Note is sufficient as written and provides the information requested by the airlines. We have not changed the final rule regarding this issue.

Requests To Allow GKN Windshields as Terminating Action for AD

UAL requested we revise paragraph (k) of the NPRM (75 FR 70868, November 19, 2010) (paragraph (j) in this final rule) to consider installation of GKN screw-connector-type windshields as terminating action in the NPRM. As an alternative, UAL requested that use of GKN windshields with pin and socket arrangement part numbers 60B10028-21 and -22 be considered as terminating action. UAL also noted that the primary cause of the electrical arcs is damaged solder joints. UAL pointed out that the PPG windshield heat terminal contains an internal solder joint, but the GKN windshield heat terminal does not. The GKN windshields do not incorporate the design features that cause extreme arcing, but use mechanical fasteners instead of solder in their terminal internal joints.

We partially agree with the request. We agree that damaged solder joints are the primary cause for the electrical arcs, because the heat caused by a loose terminal exceeds the rated melting point of the solder, resulting in high voltage arcing that may damage the windshield glass. We also agree that the failure rate of GKN windshields seems to be substantially lower than that of the PPG windshields, and the severity of the failure conditions of the GKN windshields is less than those of the PPG windshields. For these reasons, we agree to extend the repetitive inspection intervals for the GKN windshields. As explained previously, we have revised the compliance times for these windshields in paragraph (g) in this final rule.

We disagree, however, to consider installation of GKN windshields with screw/connector-type heat terminals as terminating action. The primary cause of an overheated terminal is a loose connection of the screw due to incorrect torquing during the installation of the screw or incorrect

installation of the screw. A loose connection increases the heat at the terminal, which causes damage to the adjacent parts and may become an ignition source for any combustible material close to the heated terminal. A loose or incorrectly installed screw is the result of limited access on the airplane. The pin-socket connector is assembled in a controlled environment on a bench. Installation with full access is not subject to the same assembly errors as the screw/connector terminal, and the robust pin/socket connection can be verified by test during the assembly of the terminal. The screw/connector design proposed by the commenter therefore does not provide an acceptable level of safety as a terminating action.

We also disagree to allow GKN windshields with pin and socket arrangement part numbers 60B10028-21 and -22 as terminating action because those part numbers are not specified in Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, and the adequacy of those parts is unknown. Under the provisions of paragraph (l) of the final rule, however, we will consider requests to exclude from the inspection pin/socket windshield part numbers not specified in that service bulletin if sufficient data are submitted to substantiate that those part numbers would provide an acceptable level of safety.

Request To Clarify Repetitive Interval

Paragraph (h) of the NPRM (75 FR 70868, November 19, 2010) specified that a windshield replaced for failing an inspection must be re-inspected within 500 flight hours after replacement. UAL asked whether this repetitive inspection requirement applied to any replaced windshield—regardless of the reason for the replacement—and questioned why the re-inspection would be required only when a windshield fails an inspection.

We agree to provide clarification. It is not necessary to revise the AD to require inspection every time a windshield is replaced for any other cause than failure of the inspection required by the AD because, under those conditions, subsequent inspections are done as specified in the airplane maintenance manual. We have not changed the final rule regarding this issue.

Request To Clarify Intent of AD

ALPA suggested that we clarify the intent of the NPRM (75 FR 70868, November 19, 2010) by explaining that an investigation showed that the electrical arcs are caused by loose terminal "A" connections.

We agree with the request and have revised paragraphs (e) and (g) of this final rule to add a reference to "terminal 'A' connections."

Explanation of Compliance Time

While Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, includes a compliance time of 500 flight hours or 150 days, whichever occurs first, for the detailed inspection specified in paragraphs (g), (h) and (i) of this AD, we have determined that a compliance time of 500 flight hours, as specified in the NPRM (75 FR 70868, November 19, 2010), represents an appropriate interval of time in which the required actions can be performed and still maintain an adequate level of safety.

Window Heat Power Connection Disassembled and Reassembled

If a window heat power connection, on a windshield that uses a screw and connector for window heat power connection, is disassembled and reassembled, Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, specifies a detailed inspection and corrective actions within 150 days or 500 flight hours, whichever occurs first, after reassembly of the windshield heat power connection. This action was not included in Boeing Special Attention Service Bulletin 747-30-2081,

Revision 2, dated March 10, 2010, or in the NPRM. Adding this action to the AD actions at this time would expand the scope of the NPRM and necessitate issuing a supplemental NPRM to give the public the opportunity to comment on the added actions. We do not wish to further delay this action but may consider further rulemaking in the future to require these actions.

Explanation of Additional Changes to NPRM (75 FR 70868, November 19, 2010)

We have clarified the replacement conditions for paragraph (i)(2) of the NPRM (75 FR 70868, November 19, 2010). That paragraph specified a 500-flight-hour compliance time for window replacement if the connector is "tight." We have extended this condition to connectors that are "tight or can be tightened by applying the correct torque."

References to "screw/lug" have been changed to "screw/connector" in this final rule to agree with the terminology used in Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011.

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 and minor editorial changes. We have determined that these minor changes:

- Are consistent with the intent that was proposed in the NPRM (75 FR 70868, November 19, 2010) for correcting the unsafe condition; and
- Do not add any additional burden upon the public than was already proposed in the NPRM (75 FR 70868, November 19, 2010).

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

Costs of Compliance

We estimate that this AD will affect 251 airplanes of U.S. registry. We estimate the following costs to comply with this AD:

Estimated Costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
Inspection	1 work-hour × \$85 per hour = \$85 per inspection cycle.	None	\$85 per inspection cycle.	\$21,335 per inspection cycle.

We estimate the following costs to do any necessary replacements that would be required based on the results of the inspection. We have no way of determining the number of aircraft that might need these replacements:

On-Condition Costs

Action	Labor cost	Parts cost	Cost per product
Replacement of windshield	Up to 18 work-hours × \$85 per hour = \$1,530	Up to \$47,592	Up to \$49,122.

Authority for This Rulemaking

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

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

Regulatory Findings

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

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

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979),
- (3) Will not affect intrastate aviation in Alaska, and
- (4) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

List of Subjects in 14 CFR Part 39

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

Adoption of the Amendment

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

PART 39—AIRWORTHINESS DIRECTIVES

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

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

§ 39.13 [Amended]

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



2012-13-09 The Boeing Company: Amendment 39-17111; Docket No. FAA-2010-1115; Directorate Identifier 2010-NM-221-AD.

(a) Effective Date

This AD is effective August 16, 2012.

(b) Affected ADs

None.

(c) Applicability

This AD applies to The Boeing Company Model 747-100, 747-100B, 747-100B SUD, 747-200B, 747-200C, 747-200F, 747-300, 747-400, 747-400D, 747-400F, 747SR, and 747SP series airplanes, certificated in any category; as identified in Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011.

(d) Subject

Joint Aircraft System Component (JASC)/Air Transport Association (ATA) of America Code 30: Ice and rain protection.

(e) Unsafe Condition

This AD was prompted by several reports of electrical arcs at the terminal "A" connections of the electrically heated flight deck window 1. We are issuing this AD to prevent smoke and fire in the cockpit, which could lead to loss of visibility, and injuries to or incapacitation of the flightcrew.

(f) Compliance

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

(g) Detailed Inspection and Corrective Actions

Within 500 flight hours after the effective date of this AD, do a detailed inspection for damage (including but not limited to a cross-threaded screw, arcing, loose terminal, and heat damage) of the electrical terminal "A" block, connector, and wiring of the left and right flightdeck window 1, and do all applicable corrective actions, by accomplishing the actions specified in Work Packages 1 and 2 of the Accomplishment Instructions of Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011. Except as provided by paragraph (i) of this AD, do all applicable corrective actions before further flight. Except as required by paragraph (h) of this AD, repeat the detailed inspection thereafter at the applicable intervals specified in paragraph (g)(1) or (g)(2) of this AD. Doing the replacement specified in paragraph (j) of this AD terminates the repetitive inspection requirements of this paragraph for the replaced flightdeck window 1.

(1) For flightdeck window 1 manufactured by GKN with screw/connector electrical connections: Repeat the detailed inspection at intervals not to exceed 12,000 flight hours or 48 months, whichever occurs later.

(2) For flightdeck window 1 manufactured by PPG with screw/connector electrical connections: Repeat the detailed inspection at intervals not to exceed 6,000 flight hours or 24 months, whichever occurs later.

(h) Inspection for Replaced Windshield

For any window 1 that is replaced with a window 1 that uses screw and connector for the electrical heat connection in accordance with Work Package 1 or 2 of the Accomplishment Instructions of Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011: Within 500 flight hours after the corrective action, do a detailed inspection, in accordance with Work Package 1 or 2, as applicable, of the Accomplishment Instructions of Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, and repeat the detailed inspection thereafter at the applicable intervals specified in paragraph (g)(1) or (g)(2) of this AD. Doing the replacement specified in paragraph (j) of this AD terminates the repetitive inspection requirements of this paragraph for the replaced flightdeck window 1.

(i) Window 1 Conditional Replacement

If, during the inspection required by paragraph (g) or (h) of this AD, a screw is found crossthreaded, do the applicable corrective actions specified in paragraph (i)(1) or (i)(2) of this AD.

(1) If the connector is loose and cannot be tightened by applying the correct torque, before further flight, replace that window 1 in accordance with the Accomplishment Instructions of Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011.

(2) If the connector is tight or can be tightened by applying the correct torque, replace that window 1 within 500 flight hours after the inspection, in accordance with the Accomplishment Instructions of Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011.

(j) Optional Terminating Action

Replacing a flightdeck window 1 that uses screw and connector for the electrical heat connection with a flightdeck window 1 that uses pin and socket for the electrical connection, in accordance with Work Package 3 or 4 of the Accomplishment Instructions of Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011, ends the repetitive inspection requirements of this AD for that window 1 only.

(k) Credit for Previous Actions

This paragraph provides credit for the inspections and corrective actions required by this AD, and for the window replacement specified in paragraph (j) of this AD for the replaced window 1 only, if the corresponding actions were performed before the effective date of this AD using the service information identified in paragraph (k)(1), (k)(2), or (k)(3) of this AD.

(1) Boeing Special Attention Service Bulletin 747-30-2081, dated August 8, 2006.

(2) Boeing Special Attention Service Bulletin 747-30-2081, Revision 1, dated August 20, 2008.

(3) Boeing Special Attention Service Bulletin 747-30-2081, Revision 2, dated March 10, 2010.

(l) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Seattle Aircraft Certification Office (ACO), FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14

CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the ACO, send it to the attention of the person identified in the Related Information section of this AD. Information may be emailed to: 9-ANM-Seattle-ACO-AMOC-Requests@faa.gov.

(2) Before using any approved AMOC, notify your Principal Maintenance Inspector or Principal Avionics Inspector, as appropriate, or lacking a principal inspector, your local Flight Standards District Office.

(m) Related Information

For more information about this AD, contact Louis Natsiopoulos, Aerospace Engineer, Systems and Equipment Branch, ANM-130S, FAA, Seattle Aircraft Certification Office, 1601 Lind Avenue SW., Renton, Washington 98057-3356; phone: 425-917-6478; fax: 425-917-6590; email: Elias.Natsiopoulos@faa.gov.

(n) Material Incorporated by Reference

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

(2) You must use the following service information to do the actions required by this AD, unless the AD specifies otherwise.

(i) Boeing Service Bulletin 747-30-2081, Revision 3, dated December 5, 2011.

(3) For service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Data & Services Management, P.O. Box 3707, MC 2H-65, Seattle, Washington 98124-2207; telephone 206-544-5000, extension 1; fax 206-766-5680; Internet <https://www.myboeingfleet.com>.

(4) You may review copies of the service information at the FAA, Transport Airplane Directorate, 1601 Lind Avenue SW., Renton, Washington. For information on the availability of this material at the FAA, call 425-227-1221.

(5) You may also review copies of the service information that is incorporated by reference 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/cfr/ibr-locations.html>.

Issued in Renton, Washington, on June 27, 2012.
Kalene C. Yanamura,
Acting Manager, Transport Airplane Directorate,
Aircraft Certification Service.