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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2024-2144; Project Identifier AD-2024-00424-T; Amendment 39-23174; AD 2025-21-02]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY:

Federal Aviation Administration (FAA), DOT.

ACTION:

Final rule.

SUMMARY:

The FAA is superseding Airworthiness Directive (AD) 2022-15-06, which applied to all The Boeing Company Model 777-200, -200LR, -300, -300ER, and 777F series airplanes. AD 2022-15-06 required disconnecting certain connectors and capping and stowing the wires that had been attached to the affected transorb modules. Since the FAA issued AD 2022-15-06, the agency has determined additional connectors are affected. Also, a replacement has been developed to address the unsafe condition, which would terminate the existing actions. This AD continues to require the actions specified in AD 2022-15-06 and requires those actions for additional connectors. This AD also requires determining if affected transorb modules are installed, replacing or testing affected transorb modules, and applicable on-condition actions. This AD also prohibits the installation of affected parts. The FAA is issuing this AD to address the unsafe condition on these products.

DATES:

This AD is effective January 2, 2026.

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of January 2, 2026.

ADDRESSES:

AD Docket: You may examine the AD docket at *regulations.gov* under Docket No. FAA-2024-2144; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, any comments received, and other information. The address for Docket Operations is U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

Material Incorporated by Reference:

- For Boeing material identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; websitemyboeingfleet.com.
- You may view this material at the FAA, Airworthiness Products Section, Operational Safety Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195. It is also available at *regulations.gov* under Docket No. FAA-2024-2144.

FOR FURTHER INFORMATION CONTACT:

Raja Vengadasalam, Aviation Safety Engineer, FAA, 2200 South 216th St., Des Moines, WA 98198; phone: 206-231-3859; email: raja.vengadasalam@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

The FAA issued a notice of proposed rulemaking (NPRM) to amend [14 CFR part 39](#) to supersede AD 2022-15-06, Amendment 39-22126 ([87 FR 47334](#), August 3, 2022) (AD 2022-15-06). AD 2022-15-06 applied to all The Boeing Company Model 777-200, -200LR, -300, -300ER, and 777F series airplanes. The NPRM was published in the **Federal Register** on September 26, 2024 ([89 FR 78827](#)). The NPRM was prompted by the determination that connectors that were not identified in AD 2022-15-06 are affected and by the development of a replacement action to address the unsafe condition, which would terminate the existing actions. In the NPRM, the FAA proposed to continue to require the actions specified in AD 2022-15-06 and require those actions for additional connectors. The NPRM also proposed to require determining if affected transorb modules are installed, replacing or testing affected transorb modules, and applicable on-condition actions. The NPRM also proposed to prohibit the installation of affected parts. The NPRM was prompted by high electrical resistance within the gust suppression sensor (GSS) transorb modules due to corrosion on the transorb threads and insufficient engagement of the anti-rotation teeth. The FAA is issuing this AD to address high electrical resistance in both transorb modules, which can result in two actuator control electronics (ACEs) being exposed to damaging lightning transient voltages in excess of the qualification levels, potentially inducing erroneous or oscillatory outputs to flight control surfaces. The unsafe condition, if not addressed, could result in loss of control of the airplane.

Discussion of Final Airworthiness Directive

Comments

The FAA received comments from Air Line Pilots Association, International (ALPA), and Cathay Pacific, who supported the NPRM without change.

The FAA received additional comments from five commenters, including American Airlines, Boeing, FedEx Express, and United Airlines (United). The following presents the comments received on the NPRM and the FAA's response to each comment.

Request To Revise the Applicability

Boeing requested that paragraph (c) of the proposed AD be revised to limit the applicability to the airplanes affected by Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023. Boeing stated that if the AD applies to all The Boeing Company Model 777-200, -200LR, -300, -300ER, and 777F series airplanes (including the airplanes after line number 1726-the airplanes that will have this change already incorporated in production), then the airplanes delivered after the effective date of this AD would need to document that these AD actions were incorporated in production in an AD Letter (ADL), stating that the airplane is not affected by the AD.

The FAA disagrees with Boeing's request that paragraph (c) of this AD be revised because the transorbs are rotatable and these parts could later be installed on airplanes that were initially delivered with acceptable parts, thereby subjecting those airplanes to the unsafe condition. All airplanes are subject to the parts installation prohibition specified in paragraph (k) of this AD, which does not allow affected parts to be installed as of the effective date of the AD.

The FAA notes that airplanes produced after the effective date of this AD do not need to document that the actions in Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023, were done because paragraphs (i)(1) and (2) of this AD only apply to airplanes produced on or before the effective date of this AD. Additionally, the FAA has revised paragraphs (g) and (h) of this AD to limit those requirements to airplanes produced on or before the effective date of this AD since airplanes produced after the effective date of this AD will not be delivered with the affected transorb modules or connectors.

Request To Allow Optional Action to the Replacement of Required Actions

FedEx Express requested that the FAA revise paragraph (i)(2) of the proposed AD to allow continued flight with the GSS connectors stowed per paragraphs (g) and (h) of the proposed AD, as an optional action. The commenter stated that the reactivation in paragraph (i)(2) of the proposed AD does not appear to lend any effort towards airworthiness of the aircraft outside of passenger comfort. Additionally, the commenter noted that such a system is not a requirement of [14 CFR part 25](#) and therefore expenditure of valuable time and resources on a system not appreciably utilized by a cargo carrier would seem pointless.

The FAA acknowledges the commenter's request. The purpose of this AD is to restore the affected fleet to an acceptable level of safety. The FAA is issuing this AD to address high electrical resistance in both transorb modules, which can result in two actuator control electronics (ACEs) being exposed to damaging lightning transient voltages in excess of the qualification levels, potentially inducing erroneous or oscillatory outputs to flight control surfaces and could result in loss of control of the airplane. Allowing the connectors to be disconnected long-term may not address the unsafe condition in the affected fleet, as an operator may inadvertently reconnect the affected connectors in the future.

Therefore, the replacement of affected connectors must be done to address the unsafe condition. However, any person may request approval of an alternative method of compliance (AMOC) under the provisions of paragraph (l)(2) of this AD. This AD has not been changed regarding this request.

Request for Removing/Revising Paragraphs (g) and (h) of the Proposed AD and References to Connector D02099P

Boeing requested that the FAA remove paragraph (h) of the proposed AD, update paragraph (g) of the proposed AD by referring to bundle/connector W6313/D02098P, and remove references to connector D02099P from “Actions Since AD-2022-15-06 Was Issued” in the NPRM. Boeing suggested some revised wording for paragraph (g) of the proposed AD to account for additional wire to bundles/connector part numbers that are present on some airplanes. Boeing stated paragraph (h) of the proposed AD could be misleading to operators as it does not highlight that the difference in the bundle and connector callouts are line number dependent. In addition, Boeing stated the connectors called out in paragraph (h) of the proposed AD are incorrect and reference two disconnect points on the same wire bundle. Boeing recommended that connector D02099P not be referenced as a disconnect point in the NPRM.

United requested that the FAA revise paragraph (h) of the proposed AD to allow for disconnecting one of the connectors rather than the referenced “W6313/D02098P and W7314/D02099P,” which would require operators to unnecessarily disconnect both. United stated that the connectors are in the same wiring circuit so disconnecting either connector D02098P or D02099P would effectively deactivate the upper gust suppression transducer circuit. United noted it has disconnected, capped, and stowed connector D02099P and connector D02098P remains connected for these aircraft as allowed in AMOC letter 783-22-11124, dated January 17, 2023.

American Airlines requested that the FAA change references to wire bundles/connectors from “W6313/D02098P and W7314/D02099P” to “W6313/D02098P or W7314/D02099P,” as disconnecting either from the transorb module sufficiently complies with the level of safety required by the proposed AD.

The FAA agrees with rewording paragraph (h) of this AD to address the two disconnect points of the wire bundles being referenced as “W6313/D02098P and W7314/D02099P” to “W6313/D02098P or W7314/D02099P” to alleviate confusion of referencing disconnecting both from the transorb module; the disconnection of either bundle/connector provides an equivalent level of safety. Paragraph (h) of this AD has been updated to the reference above.

The FAA disagrees with removing paragraph (h) of this AD and updating paragraph (g) of this AD because either bundles/connectors W6313/D02098P or W7314/D02099P can be disconnected to address the unsafe condition. This AD has not been changed to remove the actions required by paragraph (h) of this AD.

Regarding the request to revise the wording in paragraph (g) of this AD, the FAA agrees to clarify. AMOC letter 783-22-11124, dated January 17, 2023, allows operators to use the wording suggested by Boeing. Paragraph (l)(4) of this AD allows operators to use AMOCs previously approved for AD 2022-15-06 for the corresponding provisions of paragraph (g) of this AD. Therefore, no change to this AD is necessary.

Regarding the request to revise “Actions Since AD-2022-15-06 Was Issued” in the NPRM, that language is not restated in this final rule; however, the FAA acknowledges that the text should have stated “disconnect the connectors and cap and stow the wires to bundles/connectors W6313/Do2098P or W7314/Do2099P.”

Conclusion

The FAA reviewed the relevant data, considered any comments received, and determined that air safety requires adopting this AD as proposed. Accordingly, the FAA is issuing this AD to address the unsafe condition on these products. Except for minor editorial changes, and any other changes described previously, this AD is adopted as proposed in the NPRM. None of the changes will increase the economic burden on any operator.

Material Incorporated by Reference Under [1 CFR Part 51](#)

The FAA reviewed Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023. This material specifies procedures for replacing affected transorb modules with new or serviceable transorb modules or testing affected transorb modules and accomplishing applicable on-condition actions. The on-condition actions include part marking any module that meets certain specifications or replacing any modules that do not meet the specifications.

This material is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in the **ADDRESSES** section.

Costs of Compliance

The FAA estimates that this AD affects 312 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

Estimated Costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
Disconnecting connectors, capping and stowing wires (retained actions from AD 2022-15-06)	3 work-hours × \$85 per hour = \$255	\$0	\$255	\$79,560.
Disconnecting additional connectors, capping and stowing wires (new action)	3 work-hours × \$85 per hour = \$255	\$0	\$255	\$79,560.
Determining if affected transorb modules are installed, and replacing or testing affected modules (new action)	Up to 3 work-hours × \$85 per hour = \$255	Up to \$3,668	Up to \$3,923	Up to \$1,223,976.

The FAA estimates the following costs to do any necessary on-condition actions that would be required based on the results of the testing. The agency has no way of determining the number of aircraft that might need these actions:

On-Condition Costs

Action	Labor cost	Parts cost	Cost per product
Part marking or replacing affected modules	Up to 3 work-hours × \$85 per hour = \$255	Up to \$3,668	Up to \$3,923.

The FAA has included all known costs in its cost estimate. According to the manufacturer, however, some or all of the costs of this AD may be covered under warranty, thereby reducing the cost impact on affected operators.

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.

The FAA is 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) Will not affect intrastate aviation in Alaska, 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.

List of Subjects in [14 CFR Part 39](#)

- Air transportation
- Aircraft

- Aviation safety
- Incorporation by reference
- Safety

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:

- Removing Airworthiness Directive (AD) 2022-15-06, Amendment 39-22126 ([87 FR 47334](#), August 3, 2022); and
- Adding the following new AD:

2025-21-02 The Boeing Company: Amendment 39-23174; Docket No. FAA-2024-2144; Project Identifier AD-2024-00424-T.

(a) Effective Date

This airworthiness directive (AD) is effective January 2, 2026.

(b) Affected ADs

This AD replaces AD 2022-15-06, Amendment 39-22126 ([87 FR 47334](#), August 3, 2022) (AD 2022-15-06).

(c) Applicability

This AD applies to all The Boeing Company Model 777-200, -200LR, -300, -300ER, and 777F series airplanes, certificated in any category.

(d) Subject

Air Transport Association (ATA) of America Code 27, Flight controls.

(e) Unsafe Condition

This AD was prompted by high electrical resistance within the gust suppression sensor (GSS) transorb modules due to corrosion on the transorb threads and insufficient engagement of the anti-rotation teeth. The FAA is issuing this AD to address high electrical resistance in both transorb modules, which

can result in two actuator control electronics (ACEs) being exposed to damaging lightning transient voltages in excess of the qualification levels, potentially inducing erroneous or oscillatory outputs to flight control surfaces. The unsafe condition, if not addressed, could result in loss of control of the airplane.

(f) Compliance

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

(g) Retained Requirement To Disconnect, Cap, and Stow Transorb Module Connectors, With Revised Affected Airplanes

For airplanes with an original airworthiness certificate or original export certificate of airworthiness issued on or before the effective date of this AD: This paragraph restates the requirements of paragraph (g) of AD 2022-15-06, with revised affected airplanes. At the later of the times specified in paragraphs (g)(1) and (2) of this AD: Disconnect the connectors and cap and stow the wires to bundles/connectors W7314/Do2006P and W7579/Do2005P from the transorb module part numbers CLPT-12SP-06, CLPT-12SP-07, and CLPT-12SP-67.

Note 1 to the introductory text of paragraph (g): Guidance on locating wire bundles/connectors W7314/Do2006P and W7579/Do2005P can be found in Section 05-55-43 of the Boeing 777 aircraft maintenance manual.

Note 2 to the introductory text of paragraph (g): Guidance on capping and stowing the wires once they are disconnected can be found in Section 20-10-11 of the Boeing Standard Wiring Practices Manual.

(1) Before the accumulation of 75,000 total flight hours or 23,000 total flight cycles, whichever occurs first.

(2) Within 3 months after August 18, 2022 (the effective date of AD 2022-15-06).

(h) New Requirement To Disconnect, Cap, and Stow Certain Other Transorb Module Connectors

For airplanes with an original airworthiness certificate or original export certificate of airworthiness issued on or before the effective date of this AD: At the later of the times specified in paragraphs (h)(1) and (2) of this AD: Disconnect the connectors and cap and stow the wires to bundles/connectors W6313/Do2098P or W7314/Do2099P from the transorb module part numbers CLPT-12SP-06, CLPT-12SP-07, and CLPT-12SP-67.

Note 3 to the introductory text of paragraph (h): Guidance on locating wire bundles/connectors W6313/Do2098P and W7314/Do2099P can be found in Section 05-55-43 of the Boeing 777 aircraft maintenance manual.

Note 4 to the introductory text of paragraph (h) : Guidance on capping and stowing the wires once they are disconnected can be found in Section 20-10-11 of the Boeing Standard Wiring Practices Manual.

(1) Before the accumulation of 75,000 total flight hours or 23,000 total flight cycles, whichever occurs first.

(2) Within 3 months after the effective date of this AD.

(i) New Required Actions

(1) For airplanes with an original airworthiness certificate or original export certificate of airworthiness issued on or before the effective date of this AD: At the later of the times specified in paragraph (i)(1)(i) or (ii) of this AD, do an inspection to determine if any airplane has a transorb module with part number CLPT-12SP-06, CLPT-12SP-07, or CLPT-12SP-67 installed. A review of airplane maintenance records is acceptable in lieu of the inspection if the part numbers can be conclusively determined from that review.

(i) Within 24 months after the effective date of this AD.

(ii) Within 24 months after the date of issuance of the original standard airworthiness certificate or the original export certificate of airworthiness.

(2) If, during any inspection or records review required by paragraph (i)(1) of this AD, any transorb module with part number CLPT-12SP-06, CLPT-12SP-07, or CLPT-12SP-67 is found: Except as specified by paragraph (j) of this AD, at the applicable times specified in the “Compliance” paragraph of Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023, do all applicable actions identified in, and in accordance with, the Accomplishment Instructions of Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023. Doing the replacement required by this paragraph terminates the requirements of paragraphs (g) and (h) of this AD.

Note 5 to paragraph (i)(2): Guidance for accomplishing the actions required by paragraph (i)(2) of this AD can be found in Boeing Alert Service Bulletin 777-27A0125, dated February 3, 2023, which is referred to in Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023.

(j) Exception to Requirements Bulletin Specifications

Where the Compliance Time column of the table in the “Compliance” paragraph of Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023, refers to the original issue date of Requirements Bulletin 777-27A0125 RB, this AD requires using the effective date of this AD.

(k) Parts Installation Prohibition

As of the effective date of this AD, no person may install a transorb module, part numbers CLPT-12SP-06, CLPT-12SP-07, and CLPT-12SP-67, on any airplane.

(l) Alternative Methods of Compliance (AMOCs)

(1) The Manager, AIR-520, Continued Operational Safety Branch, 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 responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the certification office, send it to the

attention of the person identified in paragraph (m)(1) of this AD. Information may be emailed to: AMOC@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the responsible Flight Standards Office.

(3) An AMOC that provides an acceptable level of safety may be used for any repair, modification, or alteration required by this AD if it is approved by The Boeing Company Organization Designation Authorization (ODA) that has been authorized by the Manager, AIR-520, Continued Operational Safety Branch, FAA, to make those findings. To be approved, the repair method, modification deviation, or alteration deviation must meet the certification basis of the airplane, and the approval must specifically refer to this AD.

(4) AMOCs approved for AD 2022-15-06 are approved as AMOCs for the corresponding provisions of paragraph (g) of this AD.

(m) Related Information

(1) For more information about this AD, contact Raja Vengadasalam, Aviation Safety Engineer, FAA, 2200 South 216th St., Des Moines, WA 98198; phone: 206-231-3859; email: raja.vengadasalam@faa.gov.

(2) Material identified in this AD that is not incorporated by reference is available at the address specified in paragraph (n)(3) of this AD.

(n) Material Incorporated by Reference

(1) The Director of the Federal Register approved the incorporation by reference of the material listed in this paragraph under [5 U.S.C. 552\(a\)](#) and [1 CFR part 51](#).

(2) You must use this material as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) Boeing Alert Requirements Bulletin 777-27A0125 RB, dated February 3, 2023.

(ii) [Reserved]

(3) For the material identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; website myboeingfleet.com.

(4) You may view this material at the FAA, Airworthiness Products Section, Operational Safety Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195.

(5) You may view this material at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, visit www.archives.gov/federal-register/cfr/ibr-locations or email fr.inspection@nara.gov.

Issued on October 7, 2025.

Lona C. Saccomando,

Acting Deputy Director, Integrated Certificate Management Division, Aircraft Certification Service.

[[FR Doc. 2025-21477](#) Filed 11-26-25; 8:45 am]

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