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## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 39**

**[Docket No. FAA-2022-0588; Project Identifier AD-2022-00114-T; Amendment 39-22249; AD 2022-24-09]**

**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) 2021-14-20, which applied to all The Boeing Company Model 737 airplanes. AD 2021-14-20 required repetitive functional tests of the cabin altitude pressure switches, and on-condition actions, including replacement, if necessary. AD 2021-14-20 also required reporting test results. This AD was prompted by data collected from the reports required by AD 2021-14-20, which revealed that the switches were subject to false test failures due to lack of clear instructions for setup of the test adapters during the functional tests. This AD retains the repetitive functional tests and on-condition actions, and specifies certain adapter requirements for the functional tests. The FAA is issuing this AD to address the unsafe condition on these products.

#### **DATES:**

This AD is effective January 26, 2023.

#### **ADDRESSES:**

*AD Docket:* You may examine the AD docket at *regulations.gov* under Docket No. FAA-2022-0588; 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.

#### **FOR FURTHER INFORMATION CONTACT:**

Nicole Tsang, Aerospace Engineer, Cabin Safety and Environmental Systems Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone: 206-231-3959; email: [Nicole.S.Tsang@faa.gov](mailto:Nicole.S.Tsang@faa.gov).

#### **SUPPLEMENTARY INFORMATION:**

##### **Background**

The FAA issued a notice of proposed rulemaking (NPRM) to amend [14 CFR part 39](#) to supersede AD 2021-14-20, Amendment 39-21647 ([86 FR 38214](#), July 20, 2021) (AD 2021-14-20). AD 2021-14-20 applied to all The Boeing Company Model 737 airplanes. The NPRM published in the **Federal Register** on July 7, 2022 ([87 FR 40460](#)). The NPRM was prompted by reports of latent failures of the cabin altitude pressure switches, and the determination that using certain adapters while performing a functional test may lead to false failures of the cabin altitude pressure switches. In the NPRM, the FAA proposed to retain the repetitive functional tests and on-condition actions, and specify certain adapter requirements for the functional tests. The FAA is issuing this AD to address the unexpectedly high rate of latent failure of both pressure switches on the same airplane, which could result in the cabin altitude warning system not activating if the cabin altitude exceeds 10,000 feet, resulting in hypoxia of the flightcrew, and loss of control of the airplane.

##### **Discussion of Final Airworthiness Directive**

##### **Comments**

The FAA received a comment from the Air Line Pilots Association (ALPA), who supported the NPRM without change.

The FAA received additional comments from four commenters, including United Airlines, Delta Air Lines, American Airlines, and Boeing. The following presents the comments received on the NPRM and the FAA's response to each comment.

##### **Request To Revise Note 1 to Paragraph (g)**

Delta Air Lines (DAL) asked that the FAA revise note 1 to paragraph (g) of the proposed AD to call out equivalent applicable Boeing 737 Aircraft Maintenance Manual (AMM) procedures, in addition to calling out the procedures in the 737 Task Card. DAL stated that the 737 Task Cards called out in Note 1 to paragraph (g) of the proposed AD are not easily accessible to the maintenance personnel performing the tasks on the aircraft. DAL added that the AMM procedure is more commonly used and easily accessed by the Aircraft Maintenance Technician, so the addition of the reference to the AMM procedure avoids potential confusion when the maintenance task is being performed.

The FAA agrees with the commenter's request for the reasons provided. The FAA has revised Note 1 to paragraph (g) of this AD to include the equivalent applicable Boeing 737 Aircraft Maintenance Manual procedures referenced in Delta's comment.

### **Request To Correct Typographical Error**

DAL noted that Boeing 737-600/700/800/900 Aircraft Maintenance Manual (AMM) is identified in note 1 to paragraph (g) of the proposed AD as “Airplane Maintenance Manual” instead of “Aircraft Maintenance Manual.”

The FAA has corrected the reference accordingly.

### **Request To Return to MRB Interval**

United Airlines (UAL) asked that the interval established in the Maintenance Review Board (MRB) be eventually re-established. UAL stated that tooling was determined to be a significant contributor to inconsistencies in the testing of the cabin altitude test switch. UAL added that AD 2021-14-20 would be superseded by the proposed AD to require improved AMM content defining appropriate tooling. In light of these published AMM improvements, UAL recommended a return to the interval established in the MRB.

The FAA does not agree with the commenter's request. Boeing provided the fleet data collected from AD 2021-14-20 and the trend data after operators incorporated the improved AMM content. The FAA evaluated this data and determined through risk analysis that the interval established in the MRB was unacceptable. Therefore, the FAA has not changed this AD in this regard.

### **Request To Remove Hose Length Requirement**

American Airlines (AA) stated that the FAA should remove the hose length requirement of “25 to 40 ft” specified in figure 1 to paragraph (g) of the proposed AD. AA stated that the hose length requirement is an unnecessary restriction. AA added that a longer or shorter hose should not significantly affect the application of a controlled vacuum, and therefore should not affect the accuracy of the cabin altitude pressure switch functional test.

The FAA does not agree with the commenter's request. There are instructions to use a Barfield Pitot Hose, or equivalent 25- to 40-foot hose, to standardize the equipment that operators use while performing the cabin altitude warning switch functional test and to prevent false test failures. There is potential concern that a hose longer than 40 feet could have a kink in the hose that may be unnoticed by the operator, which could result in a false test failure. The FAA has not changed this AD in this regard.

### **Request To Use Specific Adapters for Functional Test**

Boeing asked that the proposed AD not specify particular adapters for use during performance of the pressure switch functional test. Boeing stated that the proposed AD should instead direct operators to use only those adapters listed in the current Boeing AMM revision or subsequent revisions. Boeing added that if new or improved adapters become available and/or the AMM adapter list is modified, an

alternative method of compliance (AMOC) will have to be approved to add them as approved adapters for the AD, which is not an efficient resolution.

The FAA does not agree to require operators to use only those adapters listed in the existing Boeing AMM revision or subsequent revisions. Figure 1 to paragraph (g) of this AD shows the same list of adapters identified in the current Boeing AMM. Approval of an AMOC to use new or improved adapters would not be necessary if the adapters meet the specifications in either paragraph (g)(2)(i) or (ii) of this AD. Therefore, the FAA has not changed this AD in this regard.

**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.

**Costs of Compliance**

The FAA estimates that this AD affects 2,693 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

**Estimated costs**

<b>Action</b>	<b>Labor cost</b>	<b>Parts cost</b>	<b>Cost per product</b>	<b>Cost on U.S. operators</b>
Functional test	1 work-hour × \$85 per hour = \$85 per test	*\$	\$85 per test	\$228,905 per test.

*\* If the operator needs to buy an adapter, the FAA estimates the adapter could cost up to \$3,644. The FAA has no way of determining the number of operators that might need to purchase an adapter.*

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

**On-Condition Costs**

<b>Action</b>	<b>Labor cost</b>	<b>Parts cost</b>	<b>Cost per product</b>
Switch replacement	1 work-hour × \$85 per hour = \$85	\$1,278	\$1,363

**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:

- a. Removing Airworthiness (AD) 2021-14-20, Amendment 39-21647 ( [86 FR 38214](#), July 20, 2021);

and

**b.** Adding the following new AD:

**2022-24-09 The Boeing Company:** Amendment 39-22249; Docket No. FAA-2022-0588; Project Identifier AD-2022-00114-T.

**(a) Effective Date**

This airworthiness directive (AD) is effective January 26, 2023.

**(b) Affected ADs**

This AD replaces AD 2021-14-20, Amendment 39-21647 ([86 FR 38214](#), July 20, 2021) (AD 2021-14-20).

**(c) Applicability**

This AD applies to all The Boeing Company Model 737-100, -200, -200C, -300, -400, -500, -600, -700, -700C, -800, -900, and -900ER series airplanes, and Model 737-8, 737-9, and 737-8200 airplanes, certificated in any category.

**(d) Subject**

Air Transport Association (ATA) of America Code 21, Air conditioning.

**(e) Unsafe Condition**

This AD was prompted by reports of latent failures of the cabin altitude pressure switches, and the determination that using certain adapters while performing a functional test may lead to false failures of the cabin altitude pressure switches. The FAA is issuing this AD to address the unexpectedly high rate of latent failure of both pressure switches on the same airplane, which could result in the cabin altitude warning system not activating if the cabin altitude exceeds 10,000 feet, resulting in hypoxia of the flightcrew, and loss of control of the airplane.

**(f) Compliance**

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

**(g) Repetitive Functional Tests**

(1) At the latest of the times specified in paragraphs (g)(1)(i) through (iii) of this AD, perform a functional test of the cabin altitude pressure switches having part number 214C50-2, using an adapter as specified in figure 1 to paragraph (g) of this AD, or an equivalent adapter, and matching hose to connect to the cabin altitude warning switch. Repeat the functional test thereafter at intervals not to exceed 2,000 flight hours. If, during any functional test, any cabin altitude pressure switch fails to activate at an altitude of between 9,000 and 11,000 feet, replace the switch before further flight.

(i) Within 2,000 flight hours since the last functional test of the cabin altitude pressure switches.

(ii) Prior to the accumulation of 2,000 total flight hours on the airplane.

(iii) Within 90 days after the effective date of this AD.

(2) Adapters are considered to be equivalent as long as the mating side with the switch meets the specifications in either paragraph (g)(2)(i) or (ii) of this AD:

(i) Greater than or equal to 0.265 inch (0.673 cm) X 7/16-20-UNJF-3A and less than or equal to 0.438 inch (1.113 cm) X 7/16-20-UNJF-3A for the flareless end; or

(ii) Less than or equal to 0.5 inch (1.27 cm) total with greater than or equal to 0.265 inch (0.673 cm) X 7/16-20-UNJF-3A thread for AN4 flared end.

**Figure 1 to paragraph (g) of this AD – Functional Test Adapters**

Use one of the following adapters, or an equivalent adapter, and matching hose to connect to the cabin altitude warning switch:

(1) SAE J514 part number (P/N) 070220 90 Degree Straight Thread Elbow and appropriate sized O-ring (Preferred).

- Use a Barfield Pitot Hose, or equivalent 25 feet (7.62 m) to 40 feet (12.19 m) long hose, with #4 AN fitting to the adapter and quick disconnect (if applicable) to the air data test set.
- Make sure that the flat side of the adapter is connected with the cabin altitude warning switch.

NOTE: Do not connect the flared side of the adapter with the cabin altitude warning switch. Connecting the flared side of the adapter with the cabin altitude warning switch may bottom out the cabin altitude warning switch, resulting in false test results.

(2) SAE J514 P/N 070320 45 Degree Straight Thread Elbow and appropriate sized O-ring (Preferred).

- Use a Barfield Pitot Hose, or equivalent 25 feet (7.62 m) to 40 feet (12.19 m) long hose, with #4 AN fitting to the adapter and quick disconnect (if applicable) to the air data test set.
- Make sure that the flat side of the adapter is connected with the cabin altitude warning switch.

NOTE: Do not connect the flared side of the adapter with the cabin altitude warning switch. Connecting the flared side of the adapter with the cabin altitude warning switch may bottom out the cabin altitude warning switch, resulting in false test results.

(3) SAE J514 P/N 070120 Straight Thread Connector Short and appropriate sized O-ring (Preferred).

- Use a Barfield Pitot Hose, or equivalent 25 feet (7.62 m) to 40 feet (12.19 m) long hose, with #4 AN fitting to the adapter and quick disconnect (if applicable) to the air data test set.
- Make sure that the flat side of the adapter is connected with the cabin altitude warning switch.

NOTE: Do not connect the flared side of the adapter with the cabin altitude warning switch. Connecting the flared side of the adapter with the cabin altitude warning switch may bottom out the cabin altitude warning switch, resulting in false test results.

(4) AS21900-4 (or MS21900-4) Flareless Tube to Flared Tube Adapter and appropriate sized O-ring (Preferred).

- Use a Barfield Pitot Hose, or equivalent 25 feet (7.62 m) to 40 feet (12.19 m) long hose, with #4 AN fitting to the adapter and quick disconnect (if applicable) to the air data test set.



- Make sure that the flat side of the adapter is connected with the cabin altitude warning switch.

NOTE: Do not connect the flared side of the adapter with the cabin altitude warning switch. Connecting the flared side of the adapter with the cabin altitude warning switch may bottom out the cabin altitude warning switch, resulting in false test results.

(5) P/N JUD321 Hose Fitting with MS28778-4 O-ring (Eaton Aerospace LLC, Bethel, CT 02750) (Preferred).

- Use a Barfield Pitot Hose, or equivalent 25 feet (7.62 m) to 40 feet (12.19 m) long hose, with #4 AN fitting to the adapter and quick disconnect (if applicable) to the air data test set.

(6) AN807-4D (or AS5180D04 or AS5180W04) Tube to Hose Adapter, AN924-4 nut and appropriate sized O-ring (on the mating side with the switch) and spacer or washers (Alternate).

NOTE: This adapter can be used if the steps below are carefully followed. This adapter is not preferred because if the AN924-4 nut is not connected carefully as recommended below, this may bottom out the cabin altitude warning switch, resulting in false test results.

- Use a Barfield Pitot Hose, or equivalent 25 feet (7.62 m) to 40 feet (12.19 m) long hose, with quick disconnect (if applicable) to the air data test set.
- Make sure that the thread length, including fitting end after the installation of AN924-4 nut and appropriate sized 7/16 spacer or washers, is less than 0.5 inch (1.270 cm) to avoid false test results.

**Note 1 to paragraph (g):** Additional guidance for performing the functional test required by paragraph (g) of this AD can be found in Boeing 737-200 Aircraft Maintenance Manual (AMM) 21-33-11/501, Boeing 737-300/400/500/600/700/800/900/7/8/8200/9 AMM 21-33-00/501, 737CL AMM TASK CARD 31-026-01-01, 737CL AMM TASK CARD 31-010-01-01, 737NG AMM TASK CARD 31-020-00-01, and 737MAX AMM TASK CARD 31-020-00-01, and other approved maintenance procedures.

### (h) Minimum Equipment List (MEL) Provisions

If any cabin altitude warning switch fails any functional test as required by this AD, the airplane may be operated as specified in the operator's existing FAA-approved MEL, provided provisions that specify operating the airplane at a flight altitude at or below 10,000 feet mean sea level (MSL) with the cabin altitude warning system inoperative are included in the operator's existing FAA-approved MEL.

### (i) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Seattle ACO 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 (j)(1) of this AD. Information may be emailed to [9-ANM-Seattle-ACO-AMOC-Requests@faa.gov](mailto:9-ANM-Seattle-ACO-AMOC-Requests@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, Seattle ACO 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.

#### **(j) Related Information**

(1) For more information about this AD, contact Nicole Tsang, Aerospace Engineer, Cabin Safety and Environmental Systems Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone: 206-231-3959; email: [Nicole.S.Tsang@faa.gov](mailto:Nicole.S.Tsang@faa.gov).

(2) For service information identified in this AD that is not incorporated by reference, 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](http://myboeingfleet.com).

#### **(k) Material Incorporated by Reference**

None.

Issued on December 2, 2022.

Christina Underwood,

Acting Director, Compliance & Airworthiness Division, Aircraft Certification Service.

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