[Federal Register Volume 87, Number 20 (Monday, January 31, 2022)]
[Rules and Regulations]
[Pages 4787-4797]
From the Federal Register Online via the Government Publishing Office [www.gpo.gov]
[FR Doc No: 2022-01995]

---

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 39**

**[Docket No. FAA-2022-0017; Project Identifier AD-2022-00058-T; Amendment 39-21937; AD 2022-03-20]**

**RIN 2120-AA64**

**Airworthiness Directives; The Boeing Company Airplanes**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule; request for comments.

---



**SUMMARY:** The FAA is adopting a new airworthiness directive (AD) for all The Boeing Company Model 737-8, 737-9, and 737-8200 airplanes. This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band), and a recent determination that, during takeoffs and landings, as a result of this interference, certain airplane systems may not properly function, resulting in longer than normal landing or rejected takeoff distances due to the effect on thrust reverser deployment, spoilers, speedbrake deployment, and increased idle thrust, regardless of the approach type or weather. This AD requires revising the limitations and operating procedures sections of the existing airplane flight manual (AFM) to incorporate limitations prohibiting the use of certain minimum equipment list (MEL) items, and to incorporate operating procedures for calculating takeoff and landing distances, when in the presence of 5G C-Band interference as identified by Notices to Air Missions (NOTAMs). The FAA is issuing this AD to address the unsafe condition on these products.

**DATES:** This AD is effective January 31, 2022.

The FAA must receive comments on this AD by March 17, 2022.

**ADDRESSES:** You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to https://www.regulations.gov. Follow the instructions for submitting comments.
- Fax: 202-493-2251.
- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

- Hand Delivery: Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**Examining the AD Docket**

You may examine the AD docket at https://www.regulations.gov by searching for and locating Docket No. FAA-2022-0017; 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 street address for the Docket Operations is listed above.

**FOR FURTHER INFORMATION CONTACT:** Dean Thompson, Senior Aerospace Engineer, Systems and Equipment Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3165; email: dean.r.thompson@faa.gov.

**SUPPLEMENTARY INFORMATION:**

**Background**

In March 2020, the United States Federal Communications Commission (FCC) adopted final rules authorizing flexible use of the 3.7-3.98 GHz band for next generation services, including 5G and other advanced spectrum-based services.[1] Pursuant to these rules, C-Band wireless broadband deployment was permitted to occur in phases with the opportunity for operations in the lower 0.1 GHz of the band (3.7-3.8 GHz) in certain markets beginning on January 19, 2022. This AD refers to "5G C-Band" interference, but wireless broadband technologies, other than 5G, may use the same frequency band.[2] These other uses of the same frequency band are within the scope of this AD since they would introduce the same risk of radio altimeter interference as 5G C-Band.

The radio altimeter is an important aircraft instrument, and its intended function is to provide direct height-above-terrain/water information to a variety of aircraft systems. Commercial aviation radio altimeters operate in the 4.2-4.4 GHz band, which is separated by 0.22 GHz from the C-Band telecommunication systems in the 3.7-3.98 GHz band. The radio altimeter is more precise than a barometric altimeter and for that reason is used where aircraft height over the ground needs to be precisely measured, such as autoland, manual landings, or other low altitude operations. The receiver on the radio altimeter is typically highly accurate, however it may deliver erroneous results in the presence of out-of-band radio frequency emissions from other frequency bands. The radio altimeter must detect faint signals reflected off the ground to measure altitude, in a manner similar to radar. Out-of-band signals could significantly degrade radio altimeter functions during critical phases of flight, if the altimeter is unable to sufficiently reject those signals.

The FAA issued AD 2021-23-12, Amendment 39-21810 (86 FR 69984, December 9, 2021) (AD 2021-23-12) to address the effect of 5G C-Band interference on all transport and commuter category airplanes equipped with a radio (also known as radar) altimeter. AD 2021-23-12 requires revising the limitations section of the existing AFM to incorporate limitations prohibiting certain operations, which require radio altimeter data to land in low visibility conditions, when in the presence of 5G C-Band interference as identified by NOTAM. The FAA issued AD 2021-23-12 because radio altimeter anomalies that are undetected by the automation or pilot, particularly close to the ground (e.g., landing flare), could lead to loss of continued safe flight and landing.

Since the FAA issued AD 2021-23-12, Boeing has continued to evaluate potential 5G C-Band interference on aircraft systems that rely on radio altimeter inputs. Boeing issued Boeing Multi

[1] The FCC's rules did not make C-Band wireless broadband available in Alaska, Hawaii, and the U.S. Territories.

[2] The regulatory text of the AD uses the term "5G C-Band" which, for purposes of this AD, has the same meaning as "5G", "C-Band" and "3.7-3.98 GHz."

Operator Message MOM-MOM-22-0016-01B(R1), dated January 16, 2022, and Boeing Flight Crew Operations Manual Bulletin TBC-26, "Radio Altimeter Anomalies due to 5G C-Band Wireless Broadband Interference in the United States," dated January 17, 2022.

Based on Boeing's data, the FAA identified an additional hazard presented by 5G C-Band interference on The Boeing Company 737-8, 737-9, and 737-8200 airplanes. The FAA determined anomalies due to 5G C-Band interference may affect multiple other airplane systems using radio altimeter data, regardless of the approach type or weather. These anomalies may not be evident until very low altitudes. Impacted systems include, but are not limited to: Autopilot flight director system; autothrottle system; engines; thrust reversers; flight controls; flight instruments; traffic alert and collision avoidance system (TCAS); ground proximity warning system (GPWS); and configuration warnings.

As a result of erroneous radio altimeter data provided to these systems in the event of 5G C-Band interference, takeoff and landing performance can be adversely impacted. This may have multiple effects, including:

- Autothrottle may remain in speed (SPD) mode and may increase thrust to maintain speed during flare instead of reducing the thrust to IDLE at 27 feet radio altitude (RA) or may reduce thrust to IDLE prematurely.
- Thrust reversers may not deploy during rejected takeoff or landing roll.
- Engines may be at higher idle during rejected takeoff or remain at approach idle after touchdown.
- Automatic speedbrake may not deploy after touchdown during the landing roll.
- SPEEDBRAKE EXTENDED light may not be available or may illuminate erroneously during the landing roll.
- SPEEDBRAKE time critical visual and aural warnings may not be available during the landing roll.
- Spoilers may be limited to their maximum in-flight position during manual deployment after rejected takeoff or touchdown during the landing roll.
- Landing Attitude Modifier may be erroneous.
- Other simultaneous flight deck effects associated with the 5G C-Band interference could increase pilot workload.

As a result of these effects, lack of thrust reverser and speedbrake deployment, limited spoiler extension, and increased idle thrust may occur; and brakes may be the only means to slow the airplane. Therefore, the presence of 5G C-Band interference can result in degraded deceleration performance, subsequently resulting in longer than normal landing or rejected takeoff distances, which could lead to a runway excursion. This is an unsafe condition.

The severity of the hazard created by a lack of thrust reverser and speedbrake deployment, limited spoiler extension, and by increased idle thrust, increases when the runway is contaminated with frozen or liquid precipitation. The FAA categorizes runway surface conditions with codes from 6 through 0, with 6 being a dry runway and therefore no detrimental effect on braking, and a code of 0 denoting surface conditions, such as wet ice, in which braking may not be effective.

This AD mandates procedures for operators to account for this longer than normal landing or rejected takeoff distances, for all runway conditions, in the presence of 5G C-Band interference as identified by NOTAM. It prohibits operators from dispatching or releasing airplanes to or from affected airports when certain braking and anti-skid functions on the airplane are inoperable. It also prohibits operators from dispatch or release to, or takeoff or landing on, runways with condition codes 1 and 0.

The FAA is issuing this AD to address the unsafe condition on these products.

**FAA's Determination**

The FAA is issuing this AD because the agency has determined the unsafe condition described previously is likely to exist or develop in other products of the same type design.

**AD Requirements**

This AD requires revising the limitations and operating procedures sections of the existing AFM to incorporate limitations prohibiting the use of certain MEL items, and to incorporate operating procedures for calculating takeoff and landing distances, when in the presence of 5G C-Band interference as identified by NOTAMs.

**Compliance With AFM Revisions**

Section 91.9 prohibits any person from operating a civil aircraft without complying with the operating limitations specified in the AFM. FAA regulations also require operators to furnish pilots with any changes to the AFM (14 CFR 121.137) and pilots in command to be familiar with the AFM (14 CFR 91.505).

**Interim Action**

The FAA considers this AD to be an interim action. If final action is later identified, the FAA might consider further rulemaking.

**Justification for Immediate Adoption and Determination of the Effective Date**

Section 553(b)(3)(B) of the Administrative Procedure Act (APA) (5 U.S.C. 551 et seq.) authorizes agencies to dispense with notice and comment procedures for rules when the agency, for "good cause," finds that those procedures are "impracticable, unnecessary, or contrary to the public interest." Under this section, an agency, upon finding good cause, may issue a final rule without providing notice and seeking comment prior to issuance. Further, section 553(d) of the APA authorizes agencies to make rules effective in less than thirty days, upon a finding of good cause.

An unsafe condition exists that requires the immediate adoption of this AD without providing an opportunity for public comments prior to adoption. The FAA has found that the risk to the flying public justifies forgoing notice and comment prior to adoption of this rule because during takeoffs and landings, as a result of 5G C-Band interference, certain airplane systems may not properly function, resulting in longer than normal landing or rejected takeoff distances due to the effect on thrust reverser deployment, spoilers, speedbrake deployment, and increased idle thrust, regardless of the approach type or weather. This could result in a runway excursion. The urgency is based on C-Band wireless broadband deployment, which was expected to occur in phases with operations beginning on January 19, 2022. Accordingly, notice and opportunity for prior public comment are impracticable and contrary to the public interest pursuant to 5 U.S.C. 553(b)(3)(B).

In addition, the FAA finds that good cause exists pursuant to 5 U.S.C. 553(d) for making this amendment effective in less than 30 days, for the same reasons the FAA found good cause to forgo notice and comment.

**Comments Invited**

The FAA invites you to send any written data, views, or arguments about this final rule. Send your comments to an address listed under ADDRESSES. Include Docket No. FAA-2022-0017 and Project Identifier AD-2022-00058-T at the beginning of your comments. The most helpful comments reference a specific portion of the final rule, explain the reason for any recommended change, and

include supporting data. The FAA will consider all comments received by the closing date and may amend this final rule because of those comments.

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received, without change, to https://www.regulations.gov, including any personal information you provide. The agency will also post a report summarizing each substantive verbal contact received about this final rule.

**Confidential Business Information**

CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this AD contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this AD, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as "PROPIN." The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this AD. Submissions containing CBI should be sent to Dean Thompson, Senior Aerospace Engineer, Systems and Equipment Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3165; email: dean.r.thompson@faa.gov. Any commentary that the FAA receives that is not specifically designated as CBI will be placed in the public docket for this rulemaking.

**Regulatory Flexibility Act**

The requirements of the Regulatory Flexibility Act (RFA) do not apply when an agency finds good cause pursuant to 5 U.S.C. 553 to adopt a rule without prior notice and comment. Because the FAA has determined that it has good cause to adopt this rule without notice and comment, RFA analysis is not required.

**Costs of Compliance**

The FAA estimates that this AD affects 177 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 |
|---|---|---|---|---|
| AFM revision | 1 work-hour × $85 per hour = $85 | $0 | $85 | $15,045 |

**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, and

(2) Will not affect intrastate aviation in Alaska.

**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 adding the following new airworthiness directive:

**2022-03-20 The Boeing Company:** Amendment 39-21937 ; Docket No. FAA-2022-0017; Project Identifier AD-2022-00058-T.

**(a) Effective Date**

This airworthiness directive (AD) is effective January 31, 2022.

**(b) Affected ADs**

None.

**(c) Applicability**

This AD applies to The Boeing Company Model 737-8, 737-9, and 737-8200 airplanes, certificated in any category.

**(d) Subject**

Air Transport Association (ATA) of America Code 34, Navigation.

**(e) Unsafe Condition**

This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band), and a determination that, during takeoffs and landings, as a result of this interference, certain airplane systems may not properly function, resulting in longer than normal landing or rejected takeoff distances due to the effect on thrust reverser deployment, spoilers, speedbrake deployment, and increased idle thrust, regardless of the approach type or weather. The FAA is issuing this AD to address degraded deceleration performance, which could lead to a runway excursion.

**(f) Compliance**

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

**(g) Definitions**

Runway condition codes are defined in figure 1 to paragraph (g) of this AD.

**Figure 1 to paragraph (g) – *Runway Condition Codes***

| Runway Condition Code | Runway Condition Description | Reported Braking Action |
|---|---|---|
| 6 | Dry | Dry |
| 5 | Wet (smooth, grooved, or porous friction course (PFC)) or frost<br>3 mm (0.12 inches) or less of: water, slush, dry snow, or wet snow | Good |
| 4 | Compacted snow at or below -15°C (5°F) outside air temperature (OAT) | Good to medium |
| 3 | Wet (slippery), dry snow, or wet snow (any depth) over compacted snow<br>Greater than 3 mm (0.12 inches) of: dry snow or wet snow<br>Compacted snow at OAT warmer than -15°C (5°F) | Medium |
| 2 | Greater than 3 mm (0.12 inches) of: water or slush | Medium to poor |
| 1 | Ice | Poor |
| 0 | Wet ice, water on top of compacted snow, dry snow, or wet snow over ice | Nil |

## (h) Airplane Flight Manual (AFM) Revision

(1) Within 2 days after the effective date of this AD: Revise the Limitations Section of the existing AFM to include the information specified in figure 2 to paragraph (h)(1) of this AD. This may be done by inserting a copy of figure 2 to paragraph (h)(1) of this AD into the existing AFM.

**Figure 2 to paragraph (h)(1) – *AFM Limitations Revision***

**(Required by AD 2022-03-20)**

**Radio Altimeter 5G C-Band Interference, Takeoff and Landing Performance**

The following limitations are required for dispatch or release to airports, and takeoff or landing on runways, in U.S. airspace in the presence of 5G C-Band wireless broadband interference as identified by NOTAM (NOTAMs will be issued to state the specific airports or approaches where the radio altimeter is unreliable due to the presence of 5G C-Band wireless broadband interference).

**Minimum Equipment List (MEL)**

Dispatch or release with any of the following MEL items is prohibited:

- 32-42-01 – Antiskid Systems
- 32-42-02 – Alternate Antiskid Valves
- 32-42-03 – Automatic Brake System
- 32-44-01 – Parking Brake Valve

**Landing Operations on Runways with Condition Code 1 or 0**

Dispatch or release to, or takeoff or landing on, runways with a runway condition code of 1 or 0 is prohibited.

**Takeoff and Landing Performance**

Operators must use the 5G C-Band Interference Takeoff Performance and Landing Distance Calculations procedure contained in the Operating Procedures Section of this AFM.

(2) Within 2 days after the effective date of this AD: Revise the Operating Procedures Section of the existing AFM to include the information specified in figure 3 to paragraph (h)(2) of this AD. This may be done by inserting a copy of figure 3 to paragraph (h)(2) of this AD into the existing AFM.

**Figure 3 to paragraph (h)(2) – *AFM Operating Procedures Revision***

**(Required by AD 2022-03-20)**

**5G C-Band Interference Takeoff Performance and Landing Distance Calculations**

**Dispatch Guidance – Takeoff Performance**

Stopping distance during a rejected takeoff (RTO) can be significantly increased due to the following potential effects on airplane systems:

- Limited spoiler extension
- Higher engine idle
- Thrust reversers may not deploy

For the increased stopping distance during an RTO, refer to the Departure Airport, Takeoff Performance section below.

**Dispatch Guidance – Destination or Alternate Airport – Landing Performance**

Calculate the required landing distance (select Method A or Method B).

**Method A: Use of normal landing performance increased by a predetermined percentage**

Use Prior to Descent, Required Landing Distance section below.

**Method B: Use of the Non-Normal Configuration Landing Distance table for SPOILERS**

Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance chapter of the AFM, or the applicable table below, for flaps 30 or flaps 40.

- Use the distance for MAX MANUAL braking configurations with the appropriate runway condition at estimated time of arrival.
- Apply all of the appropriate distance adjustments to include the reverse thrust adjustment for no reverse (NO REV).

For runway condition codes 6 and 5, obtain the required landing distance by using the higher of:

- The resulting unfactored distance increased by 15%, or
- The normal dispatch calculations.

For runway condition codes 4 and 3, increase the resulting unfactored distance by 15% to obtain the required landing distance.

For runway condition code 2, increase the resulting unfactored distance by 30% to obtain the required landing distance.

**End of Method B**

**Departure Airport, Takeoff Performance**
Select Method 1 or 2 to adjust the accelerate stop distance available (ASDA).
Note: Both methods provide an acceptable margin of safety.

**Method 1: Adjust the ASDA by a predetermined value.**
Adjust the ASDA by using the following adjustment:

| Runway Condition Code | Runway Condition Description | Subtract from ASDA |
|---|---|---|
| 6 | Dry | 950 feet |
| 5 | Wet skid resistant* | 2,600 feet |
| 5, 4, or 3 | Wet/dry snow/wet snow/compact snow/slippery | 3,700 feet |
| 2 | Slush or standing water | 4,900 feet |

*Provided approval to use wet skid resistant data has been received from the appropriate regulatory authority in accordance with the AFM.

Use the adjusted ASDA and complete the takeoff performance calculations using actual departure runway conditions and actual departure environmental conditions. Do not take credit for use of reverse thrust when calculating takeoff performance.

**End of Method 1**

**Method 2: Adjust the ASDA by a predetermined factor.**

Multiply the ASDA by the following factor:

| Runway Condition Code | Runway Condition Description | ASDA Factor |
|---|---|---|
| 6 | Dry | 0.86 |
| 5 | Wet skid resistant* | 0.76 |
| 5, 4, or 3 | Wet/dry snow/wet snow/compact snow/slippery | 0.71 |
| 2 | Slush or standing water | 0.65 |

*Provided approval to use wet skid resistant data has been received from the appropriate regulatory authority in accordance with the AFM.

Use the adjusted ASDA and complete the takeoff performance calculations using actual departure runway conditions and actual departure environmental conditions. Do not take credit for use of reverse thrust when calculating takeoff performance.

**End of Method 2**



**Prior to takeoff:**
Verify normal radio altimeter indications.

**Climb out:**
- TO/GA mode may not be available

- Monitor pitch mode engagement
- Monitor roll mode engagement
- Autopilot may not engage

**Prior to Descent, Required Landing Distance**

Do a time of arrival (en route) landing distance assessment using Method A or B. Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance chapter of the AFM, or the applicable table below, for flaps 30 or flaps 40.

**Method A: Use of normal landing performance and increase by a predetermined percentage.**

Use the Normal Configuration Landing Distance table for flaps 30 or flaps 40.

Note: The distances and adjustments shown in the Normal Configuration Landing Distance tables are factored and have been increased 15%.

Select the appropriate runway condition.

Select the distance for the MAX MANUAL braking configuration.

Apply all of the appropriate distance adjustments.

Note: Do not apply adjustments for reverse thrust.

To obtain the required landing distance, increase the resulting factored distance by the percentage below in Table 1 based on the runway condition code or runway braking action.

**Table 1**

| Runway Condition Code | Reported Braking Action | Percentage |
|---|---|---|
| 6 | Dry | 23% |
| 5 | Good | 63% |
| 4 | Good to medium | 56% |
| 3 | Medium | 65% |
| 2 | Medium to poor | 113% |

Determine autobrake settings using the Determine Autobrake Settings section below.

**End of Method A**

**Method B: Use of the Non-Normal Configuration Landing Distance table for SPOILERS**

Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance chapter of the AFM, or the applicable table below, for flaps 30 or flaps 40.

Select the appropriate runway condition.

Select the distance for MAX MANUAL braking configuration.

Apply all of the appropriate distance adjustments including the reverse thrust adjustment for no reverse (NO REV).

For runway condition codes 6 to 3, increase the resulting unfactored distance by 15% to obtain the required landing distance.

For runway condition code 2, increase the resulting unfactored distance by 30% to obtain the required landing distance.

Determine autobrake settings using the Determine Autobrake Settings section below.

## SPOILERS Non-Normal Configuration Landing Distance Tables

**737-8 and 737-8200 One Position Tailskid, FLAPS 30, VREF30**

| | Landing Distances and Adjustments (Feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Reference Distance | Weight Adjustment | Altitude Adjustment* | Wind Adjustment per 10 Knots | Slope Adjustment per 1% | Temperature Adjustment per 10°C | Approach Speed Adjustment | Reverse Thrust Adjustment | |
| Runway Condition Code | 150,000 LB Landing Weight | Per 10,000 LB Above / Below 150,000 LB | Per 1,000 ft STD / HIGH | Head / Tail Wind | Down / Up Hill | Above / Below ISA | per 5 KTS above VREF | One Reverser | No Reverser |
| 6 | 4870 | 250 / -270 | 130 / 170 | -210 / 680 | 80 / -70 | 130 / -130 | 310 | 180 | 280 |
| 5 | 6300 | 420 / -410 | 230 / 320 | -330 / 1160 | 200 / -170 | 210 / -210 | 420 | 510 | 1300 |
| 4 | 6890 | 430 / -430 | 240 / 330 | -350 / 1210 | 260 / -210 | 210 / -210 | 420 | 740 | 1820 |
| 3 | 7330 | 450 / -450 | 250 / 340 | -360 / 1270 | 310 / -250 | 220 / -220 | 420 | 910 | 2090 |
| 2 | 8290 | 610 / -570 | 330 / 460 | -470 / 1660 | 440 / -340 | 280 / -280 | 450 | 1530 | 4410 |

**737-8 and 737-8200 Two Position Tailskid, FLAPS 30, VREF30**

| | Landing Distances and Adjustments (Feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Reference Distance | Weight Adjustment | Altitude Adjustment* | Wind Adjustment per 10 Knots | Slope Adjustment per 1% | Temperature Adjustment per 10°C | Approach Speed Adjustment | Reverse Thrust Adjustment | |
| Runway Condition Code | 150,000 LB Landing Weight | Per 10,000 LB Above / Below 150,000 LB | Per 1,000 ft STD / HIGH | Head / Tail Wind | Down / Up Hill | Above / Below ISA | per 5 KTS above VREF | One Reverser | No Reverser |
| 6 | 4670 | 250 / -250 | 130 / 170 | -210 / 670 | 80 / -70 | 120 / -120 | 300 | 160 | 250 |
| 5 | 6030 | 410 / -380 | 220 / 320 | -320 / 1130 | 190 / -160 | 200 / -200 | 410 | 550 | 1170 |
| 4 | 6610 | 420 / -400 | 230 / 330 | -340 / 1180 | 240 / -200 | 200 / -200 | 410 | 680 | 1480 |
| 3 | 7050 | 430 / -420 | 240 / 340 | -360 / 1240 | 300 / -240 | 210 / -200 | 410 | 850 | 1960 |
| 2 | 7980 | 590 / -540 | 330 / 460 | -460 / 1640 | 420 / -330 | 270 / -270 | 450 | 1430 | 4110 |

**737-9 FLAPS 30, VREF30**

| | Landing Distances and Adjustments (Feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Reference Distance | Weight Adjustment | Altitude Adjustment* | Wind Adjustment per 10 Knots | Slope Adjustment per 1% | Temperature Adjustment per 10°C | Approach Speed Adjustment | Reverse Thrust Adjustment | |
| Runway Condition Code | 160,000 LB Landing Weight | Per 10,000 LB Above / Below 160,000 LB | Per 1,000 ft STD / HIGH | Head / Tail Wind | Down / Up Hill | Above / Below ISA | per 5 KTS above VREF | One Reverser | No Reverser |
| 6 | 5030 | 250 / -250 | 140 / 170 | -210 / 690 | 90 / -80 | 130 / -130 | 310 | 170 | 270 |
| 5 | 6530 | 410 / -380 | 250 / 330 | -340 / 1180 | 220 / -180 | 210 / -210 | 420 | 610 | 1290 |
| 4 | 7090 | 420 / -400 | 260 / 340 | -350 / 1230 | 270 / -220 | 220 / -220 | 420 | 720 | 1560 |
| 3 | 7550 | 430 / -420 | 270 / 350 | -370 / 1290 | 330 / -260 | 220 / -220 | 420 | 880 | 1990 |
| 2 | 8530 | 590 / -530 | 360 / 480 | -480 / 1690 | 460 / -360 | 290 / -290 | 460 | 1480 | 4070 |

**737-8 and 737-8200 One Position Tailskid, FLAPS 40, VREF40**

| | Landing Distances and Adjustments (Feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Reference Distance | Weight Adjustment | Altitude Adjustment* | Wind Adjustment per 10 Knots | Slope Adjustment per 1% | Temperature Adjustment per 10°C | Approach Speed Adjustment | Reverse Thrust Adjustment | |
| Runway Condition Code | 150,000 LB Landing Weight | Per 10,000 LB Above / Below 150,000 LB | Per 1,000 ft STD / HIGH | Head / Tail Wind | Down / Up Hill | Above / Below ISA | per 5 KTS above VREF | One Reverser | No Reverser |
| 6 | 4630 | 300 / -250 | 140 / 170 | -210 / 670 | 90 / -80 | 120 / -120 | 330 | 160 | 250 |
| 5 | 5980 | 490 / -380 | 230 / 310 | -320 / 1110 | 190 / -160 | 190 / -190 | 420 | 510 | 1070 |
| 4 | 6450 | 500 / -390 | 230 / 320 | -340 / 1170 | 250 / -200 | 190 / -190 | 420 | 640 | 1380 |
| 3 | 6900 | 510 / -420 | 240 / 330 | -350 / 1230 | 310 / -240 | 200 / -200 | 410 | 800 | 1830 |
| 2 | 7670 | 670 / -520 | 320 / 450 | -450 / 1610 | 410 / -320 | 260 / -260 | 450 | 1260 | 3430 |

737-8 and 737-8200 Two Position Tailskid, FLAPS 40, VREF40

| | Landing Distances and Adjustments (Feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Reference Distance | Weight Adjustment | Altitude Adjustment* | Wind Adjustment per 10 Knots | Slope Adjustment per 1% | Temperature Adjustment per 10°C | Approach Speed Adjustment | Reverse Thrust Adjustment | |
| Runway Condition Code | 150,000 LB Landing Weight | Per 10,000 LB Above / Below 150,000 LB | Per 1,000 ft STD / HIGH | Head / Tail Wind | Down / Up Hill | Above / Below ISA | per 5 KTS above VREF | One Reverser | No Reverser |
| 6 | 4600 | 310 / -250 | 140 / 170 | -210 / 670 | 90 / -70 | 120 / -120 | 330 | 160 | 250 |
| 5 | 5830 | 500 / -370 | 230 / 310 | -320 / 1110 | 190 / -160 | 190 / -190 | 420 | 510 | 1060 |
| 4 | 6420 | 510 / -390 | 240 / 320 | -330 / 1160 | 250 / -200 | 190 / -190 | 420 | 630 | 1370 |
| 3 | 6870 | 520 / -410 | 250 / 330 | -350 / 1220 | 310 / -240 | 200 / -200 | 410 | 800 | 1820 |
| 2 | 7630 | 680 / -520 | 330 / 450 | -450 / 1610 | 410 / -320 | 260 / -260 | 450 | 1250 | 3400 |

737-9 FLAPS 40, VREF40

| | Landing Distances and Adjustments (Feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Reference Distance | Weight Adjustment | Altitude Adjustment* | Wind Adjustment per 10 Knots | Slope Adjustment per 1% | Temperature Adjustment per 10°C | Approach Speed Adjustment | Reverse Thrust Adjustment | |
| Runway Condition Code | 160,000 LB Landing Weight | Per 10,000 LB Above / Below 160,000 LB | Per 1,000 ft STD / HIGH | Head / Tail Wind | Down / Up Hill | Above / Below ISA | per 5 KTS above VREF | One Reverser | No Reverser |
| 6 | 4920 | 330 / -250 | 150 / 180 | -210 / 690 | 90 / -80 | 130 / -130 | 330 | 170 | 260 |
| 5 | 6280 | 520 / -370 | 250 / 340 | -330 / 1160 | 210 / -180 | 200 / -200 | 430 | 550 | 1150 |
| 4 | 6850 | 520 / -390 | 250 / 340 | -350 / 1200 | 270 / -220 | 210 / -210 | 430 | 660 | 1410 |
| 3 | 7300 | 540 / -410 | 260 / 350 | -360 / 1260 | 330 / -260 | 210 / -210 | 430 | 820 | 1830 |
| 2 | 8140 | 690 / -510 | 340 / 470 | -460 / 1650 | 450 / -340 | 270 / -270 | 460 | 1290 | 3420 |

*For landing distance at or below 8,000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8,000 ft, first apply the STD adjustment to derive a new reference landing distance for 8,000 ft then apply the HIGH adjustment to this new reference distance.

Reference distance is based on MAX MANUAL braking, sea level, standard day, no wind or slope and maximum reverse thrust.

Reference distance includes a distance from threshold to touchdown associated with a flare time of 7 seconds.

Distances are based on SPOILERS failure distances which conservatively approximates the effects of 5G interference after the Reverse Thrust Adjustment for no Reversers is applied.

Actual (unfactored) distances are shown.

Note: per procedure, MAX MANUAL braking is not required for normal operations.

**End of Method B**

## Determine Autobrake Settings

- Determine desired AUTOBRAKE setting by using the normal configuration landing distance.

  Note: Normal manual or normal autobrakes can be used. The use of maximum brakes is not needed except as stated in the During Landing section below.

## During Approach

- Monitor radio altimeters for anomalies.
- Monitor performance of autopilot and autothrottle. If the autopilot or autothrottle is not performing as expected, disconnect both the autopilot and autothrottle and apply manual inputs to ensure proper control of flight path.

## At DA(H), MDA(H), or the Missed Approach Point

- If suitable visual reference is established, disengage the autopilot and autothrottle and continue for a normal manual landing.

- If a go-around is needed, do the go-around and the missed approach procedure either in manual or automatic flight.

**During Landing**

- Radio altitude-based altitude aural callouts during approach may not be available or may be erroneous.
- Manual deployment of the speedbrakes may be needed.
- If the thrust reversers do not deploy, immediately ensure the speedbrakes are extended, apply manual braking, and modulate as needed for the existing runway conditions.

Note: In some conditions, maximum manual braking may be needed throughout the entire landing roll.

**During Go-around and Missed Approach**

- TO/GA mode may not be available.
- Monitor thrust and verify that thrust increases.
- Monitor pitch mode engagement.
- Monitor roll mode engagement.
- Autopilot may not engage.

Note 1 to paragraph (h): Guidance for accomplishing the actions required by this AD can be found in Boeing Multi Operator Message MOM-MOM-22-0016-01B(R1), dated January 16, 2022, and Boeing Flight Crew Operations Manual Bulletin TBC-26, "Radio Altimeter Anomalies due to 5G C-Band Wireless Broadband Interference in the United States," dated January 17, 2022.

**(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.

(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) AMOCs approved for AD 2021-23-12, Amendment 39-21810 (86 FR 69984, December 9, 2021) providing relief for specific radio altimeter installations are approved as AMOCs for the provisions of this AD.

**(j) Related Information**

(1) For more information about this AD, contact Dean Thompson, Senior Aerospace Engineer, Systems and Equipment Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3165; email: dean.r.thompson@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 Westminster Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; internet https://www.myboeingfleet.com.

**(k) Material Incorporated by Reference**

None.

Issued on January 26, 2022.

Lance T. Gant,

Director, Compliance & Airworthiness Division, Aircraft Certification Service.

[FR Doc. 2022-01995 Filed 1-27-22; 4:15 pm]