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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2023-0163; Project Identifier AD-2022-01380-T; Amendment 39-22468; AD 2023-12-10]

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) 2022-02-16, which applied to all The Boeing Company Model 787-8, 787-9, and 787-10 airplanes. AD 2022-02-16 required revising the limitations and operating procedures sections of the existing airplane flight manual (AFM) to incorporate limitations prohibiting certain landings and the use of certain minimum equipment list (MEL) items, and to incorporate operating procedures for calculating landing distances, when in the presence of interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band) as identified by Notices to Air Missions (NOTAMs). Since the FAA issued AD 2022-02-16, the FAA determined that additional limitations are needed due to the continued deployment of new 5G C-Band stations whose signals are expected to cover most of the contiguous United States at transmission frequencies between 3.7-3.98 GHz. This AD requires revising the limitations section of the existing AFM to incorporate limitations prohibiting certain landings and the use of certain MEL items, and retains the operating procedures from AD 2022-02-16 for calculating landing distances, due to the presence of 5G C-Band interference. The FAA is issuing this AD to address the unsafe condition on these products.

DATES:

This AD is effective June 21, 2023.

ADDRESSES:

AD Docket: You may examine the AD docket at *regulations.gov* under Docket No. FAA–2023–0163; 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:

Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational Safety Branch, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712–4137; phone: 817–222–5390; email: operationalafety@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

The FAA issued a notice of proposed rulemaking (NPRM) to amend [14 CFR part 39](#) to supersede AD 2022–02–16, Amendment 39–21913 ([87 FR 2692](#), January 19, 2022) (AD 2022–02–16). AD 2022–02–16 applied to all The Boeing Company (Boeing) Model 787–8, 787–9, and 787–10 airplanes. The NPRM published in the **Federal Register** on May 3, 2023 ([88 FR 27716](#)).

The NPRM was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience 5G C-Band interference, and a determination that, during landings, as a result of this interference, certain airplane systems may not properly transition from AIR to GROUND mode when landing on certain runways, resulting in a longer landing distance than normal due to the effect on thrust reverser deployment, speedbrake deployment, and increased idle thrust.

In the NPRM, the FAA proposed to retain the AFM revisions required by AD 2022–02–16 until June 30, 2023. On or before June 30, 2023, the FAA proposed to require replacing those AFM revisions with limitations prohibiting the same landings and use of certain MEL items at all airports for non-radio altimeter tolerant airplanes. For radio altimeter tolerant airplanes, the FAA proposed to allow the prohibited operations at 5G C-Band mitigated airports (5G CMAs) as identified in an FAA Domestic Notice. Lastly, the FAA proposed to retain the operating procedures from AD 2022–02–16 for calculating landing distances. The FAA proposed this AD to address degraded deceleration performance and longer landing distance, which could lead to a runway excursion.

Discussion of Final Airworthiness Directive

Comments

The FAA provided the public with an opportunity to comment on the proposed AD and received comments from five commenters. The following presents the comments received on the NPRM and

the FAA's response to each comment.

Support for NPRM

Boeing and the Air Line Pilots Association, International (ALPA), supported the NPRM without change.

The supportive comments from ALPA included additional viewpoints without a suggestion specific to the AD or a request the FAA can act on. These comments are outside the scope of this final rule.

Request To Revise AFM Limitations

Comment summary: All Nippon Airways Co., Ltd. (All Nippon), requested the FAA revise paragraph (h)(2) of the proposed AD to refer to the new landing distances instead of HYD PRESS L+R failure distances, based on the new landing distance tables established by Boeing.

FAA response: The FAA has not received or reviewed a new landing distance table as described by the commenter. Anyone may propose alternative data to address the unsafe condition under the AMOC procedures referenced in paragraph (k) of this AD.

Request for Additional AMOC Relief

Comment summary: All Nippon requested that the FAA revise the proposed AD to allow AMOCs approved for AD 2023–10–02, Amendment 39–22438 ([88 FR 34065](#), May 26, 2023) (AD 2023–10–02) as AMOCs for the new AFM revisions for radio altimeter tolerant airplanes specified in paragraph (j) of the proposed AD.

FAA response: The FAA does not agree. An airplane that is a radio altimeter tolerant airplane for purposes of AD 2023–10–02 will also be a radio altimeter tolerant airplane for purposes of this AD. However, because the hazards mitigated by AD 2023–10–02 are separate and distinct from the hazards mitigated by this AD, the FAA has determined that AMOCs approved for compliance with AD 2023–10–02 may not always be appropriate to address the unsafe condition specified in this AD. For this reason, operators with an approved AMOC for AD 2023–10–02 will need to request approval of it as an AMOC for compliance with this AD.

Request To Extend Compliance Time

Comment summary: All Nippon and American Airlines expressed concern regarding the compliance time for the proposed actions and requested the FAA revise the AD to provide a minimum of 3 to 4 weeks from the effective date of the AD.

FAA response: The FAA understands the commenters' concerns and made every effort to publish this AD as soon as possible. After refraining from operating at their FCC-authorized levels for a year and a half, wireless companies are now able to operate at higher levels, yet still not at the levels authorized. Specifically, wireless companies expect to operate their networks in urban areas with minimal restrictions due to the completion of retrofits. Additionally, the FAA anticipates 19 additional telecommunication companies will begin transmitting in the C-Band after June 30, 2023. Although the FAA continues to work with the companies that intend to transmit in the 3.7–3.98–GHz band near

5G CMAs, the FAA has no agreement with those companies to provide the FAA with tower locations and other information necessary to support the current NOTAM/AMOC process. Therefore, the FAA will not be able to extend the compliance date beyond June 30, 2023.

Request for Clarification of Domestic Notices and 5G CMA List

Comment summary: Virgin Atlantic requested clarification on how to access Domestic Notices, as well as the mechanism to know when an airport is no longer on the 5G CMA list.

FAA response: The Domestic Notice referenced in this AD can be found at https://www.faa.gov/air-traffic/publications/domesticnotices/domestic_gen.html. The FAA considers this 5G CMA list permanent based upon the voluntary agreements in place with the telecommunication companies. In the event an airport from the 5G CMA list needs to be removed, the FAA will issue a NOTAM until a more permanent solution is put in place.

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. This AD is adopted as proposed in the NPRM.

Interim Action

The FAA considers this AD to be an interim action. Once the Technical Standard Order (TSO) standard for radio altimeters is established, which will follow the existing international technical consensus on the establishment of the minimum operational performance standards (MOPS), the FAA anticipates that the MOPS will be incorporated into the TSO. Once a new radio altimeter TSO is developed, approved, and available, the FAA might consider additional rulemaking.

Effective Date

Section 553(d) of the Administrative Procedure Act (APA) ([5 U.S.C. 551 et seq.](#)) requires publication of a rule not less than 30 days before its effective date. However, section 553(d) authorizes agencies to make rules effective in less than 30 days when the agency finds “good cause.” Radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 5G C-Band. During landings, as a result of this interference, certain airplane systems may not properly transition from AIR to GROUND mode when landing on certain runways, resulting in a longer landing distance than normal due to the effect on thrust reverser deployment, speedbrake deployment, and increased idle thrust, which could lead to a runway excursion. To address this unsafe condition, the actions required by this AD must be accomplished before the compliance date of June 30, 2023. The FAA based this date on the changes to the 5G C-Band environment beginning on July 1, 2023. These changes include increased wireless broadband deployment and transmissions closer to the parameters authorized by the FCC. The earlier operators learn of the requirements in this AD, the earlier they can take action to ensure compliance. An effective date less than 30 days would ensure the AD is codified earlier, thereby increasing awareness of its requirements. Therefore, the FAA finds that good cause exists pursuant to [5 U.S.C. 553\(d\)](#) for making this amendment immediately effective.

Costs of Compliance

The cost information below describes the costs to change the AFM. Although this AD largely maintains the AFM limitations currently required by AD 2022–02–16, the FAA acknowledges that this AD may also impose costs on some aircraft operators from having to change their conduct to comply with the amended AFM. However, the FAA lacks the data necessary to quantify the costs associated with aircraft operators changing their conduct.

The FAA estimates that this AD affects 145 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

Estimated Costs for Required Actions

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
AFM revision (retained action from AD 2022–02–16)	1 work-hour × \$85 1 per hour = \$85	\$0	\$85	\$12,325
New AFM revision (new required action)	1 work-hour × \$85 per hour = \$85	0	85	2 12,325

- 1 The labor rate of \$85 per hour is the average wage rate for an aviation mechanic.
- 2 The estimated cost for this revision would not constitute a significant economic impact (even for small entities) because \$85 is a minimal cost compared to the regular costs of maintaining and operating a Model 787–8, 787–9, or 787–10 transport category airplane.

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 Directive (AD) 2022–02–16, Amendment 39–21913 ([87 FR 2692](#), January 19, 2022), and

b. Adding the following new AD:

2023–12–10 The Boeing Company: Amendment 39–22468; Docket No. FAA–2023–0163; Project Identifier AD–2022–01380–T.

(a) Effective Date

This airworthiness directive (AD) is effective June 21, 2023.

(b) Affected ADs

This AD replaces AD 2022–02–16, Amendment 39–21913 ([87 FR 2692](#), January 19, 2022) (AD 2022–02–16).

(c) Applicability

This AD applies to all The Boeing Company Model 787–8, 787–9, and 787–10 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 landings, as a result of this interference, certain airplane systems may not properly transition from AIR to GROUND mode when landing on certain runways, resulting in a longer landing distance than normal due to the effect on thrust reverser deployment, speedbrake deployment, and increased idle thrust. The FAA is issuing this AD to address degraded deceleration performance and longer landing distance, which could lead to a runway excursion.

(f) Compliance

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

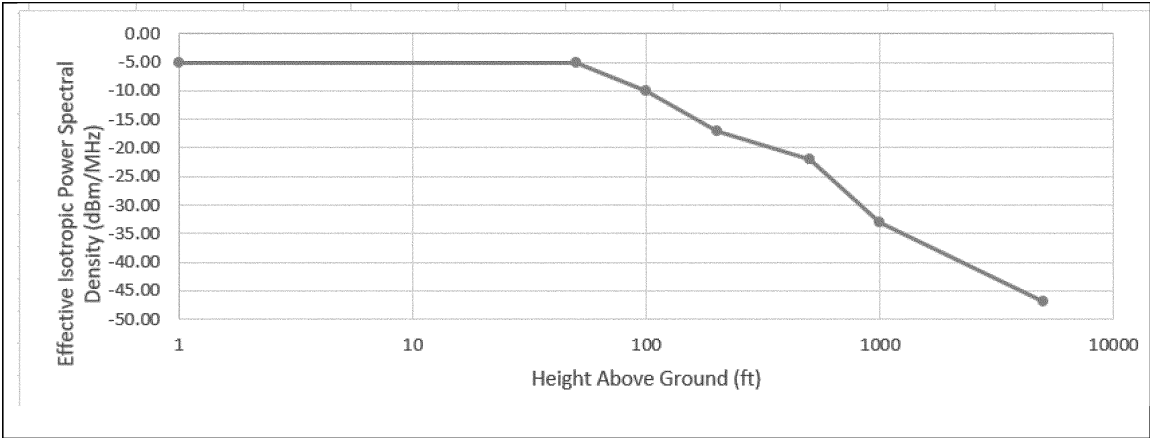
(g) Definitions

(1) For purposes of this AD, a “5G C-Band mitigated airport” (5G CMA) is an airport at which the telecommunications companies have agreed to voluntarily limit their 5G deployment at the request of the FAA, as identified by an FAA Domestic Notice.

(2) For purposes of this AD, a “radio altimeter tolerant airplane” is one for which the radio altimeter, as installed, demonstrates the tolerances specified in paragraphs (g)(2)(i) and (ii) of this AD, using a method approved by the FAA.

(i) Tolerance to radio altimeter interference, for the fundamental emissions (3.7–3.98 GHz), at or above the power spectral density (PSD) curve threshold specified in figure 1 to paragraph (g)(2)(i) of this AD.

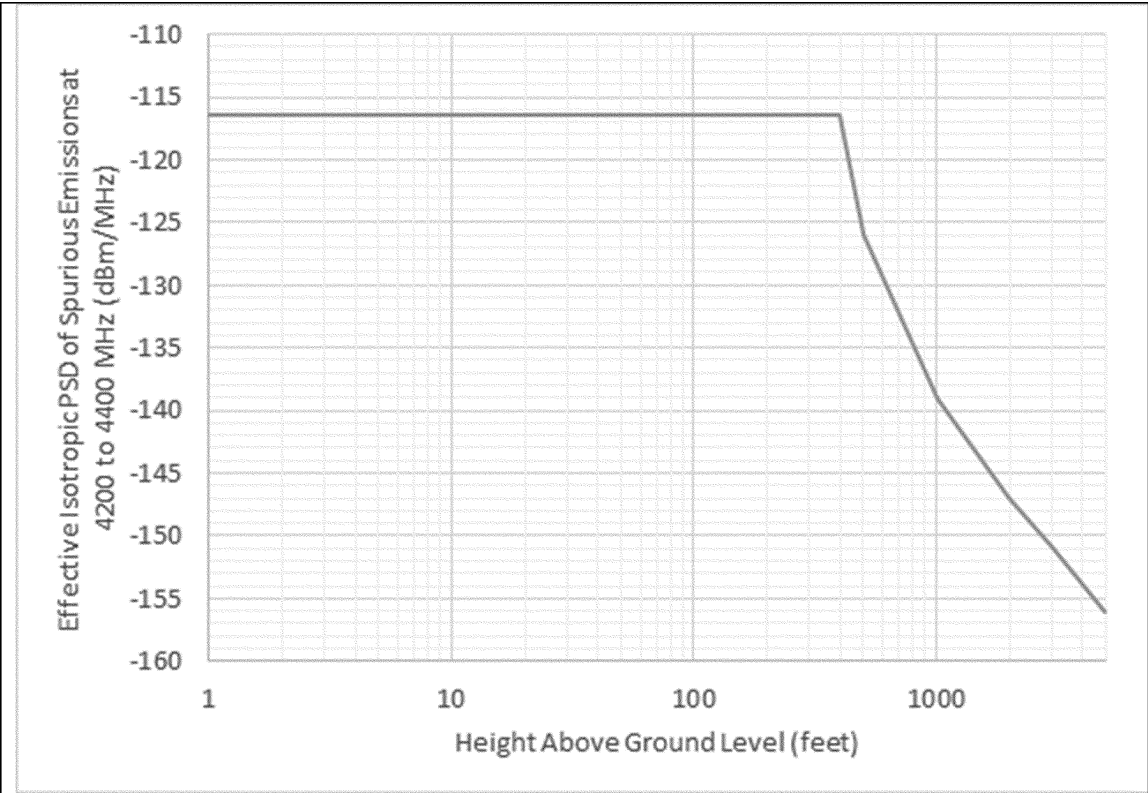
Figure 1 to paragraph (g)(2)(i)— *Fundamental Effective Isotropic PSD at Outside Interface of Aircraft Antenna*



Height above ground (ft)	Effective Isotropic PSD (dBm/MHz)
Aircraft on the ground	-5
50	-5
100	-10
200	-17
500	-22
1000	-33
5000	-47

(ii) Tolerance to radio altimeter interference, for the spurious emissions (4.2–4.4 GHz), at or above the PSD curve threshold specified in figure 2 to paragraph (g)(2)(ii) of this AD.

Figure 2 to paragraph (g)(2)(ii)— *Spurious Effective Isotropic PSD at Outside Interface of Aircraft Antenna*



<u>Aircraft Altitude (ft AGL)</u>	<u>Effective Isotropic PSD (dBm/MHz)</u>
1	-116.50
400	-116.50
500	-126.00
1000	-139.00
2000	-147.00
3000	-151.00
5000	-156.00

(3) For purposes of this AD, a “non-radio altimeter tolerant airplane” is one for which the radio altimeter, as installed, does not demonstrate the tolerances specified in paragraphs (g)(2)(i) and (ii) of this AD.

(4) Runway condition codes are defined in figure 3 to paragraph (g)(4) of this AD.

Figure 3 to paragraph (g)(4)— *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 3 mm (0.12 inch) 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 Greater than 3 mm (0.12 inch) of: dry snow or wet snow Compacted snow at OAT warmer than -15°C (5°F)	Medium
2	Greater than 3 mm (0.12 inch) 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) Retained Airplane Flight Manual (AFM) Revision

This paragraph restates the requirements of paragraph (h) of AD 2022-02-16.

(1) Within 2 days after January 19, 2022 (the effective date of AD 2022-02-16): Revise the Limitations Section of the existing AFM to include the information specified in figure 4 to paragraph (h)(1) of this AD. This may be done by inserting a copy of figure 4 to paragraph (h)(1) of this AD into the existing AFM.

Figure 4 to paragraph (h)(1)— *AFM Limitations Revisions*

(Required by AD 2022-02-16)**Radio Altimeter 5G C-Band Interference, Landing Distance**

The following limitations are required if dispatching or releasing to 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:

- 32-42-02 – Antiskid Control Systems
- 32-45-01 – Wheel Brake Systems
- 32-45-01-01 – Wheel Brake Systems, Electric Brake Actuator Systems

Landing Operations on Runways with Condition Code 1 or 0

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

Landing Distance Calculations for Runway Condition Codes 6 through 2

Operators must follow the 5G C-Band Interference Landing Distance Procedure contained in the Operating Procedures Section of this AFM.

(2) Within 2 days after January 19, 2022 (the effective date of AD 2022-02-16): Revise the Operating Procedures Section of the existing AFM to include the information specified in figure 5 to paragraph (h)(2) of this AD. This may be done by inserting a copy of figure 5 to paragraph (h)(2) of this AD into the existing AFM.

Figure 5 to paragraph (h)(2)—AFM Operating Procedures Revision

(Required by AD 2022-02-16)**5G C-Band Interference Landing Distance**

When dispatching or releasing to or landing on runways with a runway condition code of 6 through 2:

- Dispatch or Release:
 - No additional landing distance calculations are required for runway condition codes 6 and 5.
 - For runway condition codes 4 through 2, use Table 1 through 6, as applicable, to determine the unfactored landing distance, applying all adjustments. Multiply the resulting unfactored landing distance by 1.15 to obtain the minimum required landing distance.

Table 1:

787-10 / TRENT 1000

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	440,000 LB Landing Weight	Per 10,000 LB Above / Below 440,000 LB	Per 1,000 ft	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5640	110 / -90	160	-240 / 790	90 / -80	150 / -150	230	0	0
5	7680	170 / -150	330	-430 / 1570	250 / -210	280 / -270	390	0	0
4	8450	170 / -150	340	-450 / 1610	330 / -270	280 / -280	390	0	0
3	9180	170 / -150	340	-470 / 1680	440 / -340	290 / -280	390	0	0
2	12180	280 / -250	560	-770 / 2850	970 / -690	480 / -460	540	0	0

Table 2:

787-10 / GENx

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	440,000 LB Landing Weight	Per 10,000 LB Above / Below 440,000 LB	Per 1,000 ft	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5670	110 / -90	170	-240 / 800	90 / -80	150 / -150	230	0	0
5	7760	160 / -150	350	-440 / 1590	260 / -220	280 / -280	400	0	0
4	8550	160 / -150	350	-450 / 1640	340 / -280	290 / -280	400	0	0
3	9300	170 / -150	360	-480 / 1710	450 / -350	290 / -290	400	0	0
2	12400	280 / -250	610	-790 / 2930	1010 / -710	480 / -470	540	0	0

Table 3:

787-9 / TRENT 1000

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	420,000 LB Landing Weight	Per 10,000 LB Above / Below 420,000 LB	Per 1,000 ft	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5470	100 / -90	160	-240 / 780	80 / -80	150 / -150	230	0	0
5	7500	160 / -150	330	-430 / 1550	250 / -210	280 / -270	390	0	0
4	8280	160 / -150	330	-440 / 1600	330 / -270	280 / -270	390	0	0
3	9010	170 / -160	340	-470 / 1670	430 / -340	290 / -280	390	0	0
2	11740	270 / -260	540	-750 / 2780	910 / -650	460 / -440	530	0	0

Table 4:

787-9 / GENx

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	420,000 LB Landing Weight	Per 10,000 LB Above / Below 420,000 LB	Per 1,000 ft	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5500	100 / -90	170	-240 / 790	90 / -80	150 / -150	230	0	0
5	7580	160 / -150	340	-430 / 1580	250 / -210	280 / -280	390	0	0
4	8380	160 / -150	350	-450 / 1630	340 / -280	280 / -280	390	0	0
3	9130	170 / -150	360	-480 / 1700	450 / -350	290 / -280	390	0	0
2	11960	270 / -260	590	-770 / 2860	940 / -670	460 / -460	530	0	0

Table 5:

787-8 / TRENT 1000

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	380,000 LB Landing Weight	Per 10,000 LB Above / Below 380,000 LB	Per 1,000 ft	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5050	110 / -80	150	-230 / 750	80 / -70	130 / -130	220	0	0
5	6990	180 / -140	310	-410 / 1510	230 / -190	260 / -250	370	0	0
4	7410	140 / -130	250	-370 / 1270	280 / -230	210 / -210	310	0	0
3	8370	170 / -150	290	-440 / 1500	410 / -320	250 / -250	340	0	0
2	10800	290 / -240	520	-720 / 2680	820 / -590	430 / -420	510	0	0

Table 6:

787-8 / GENx

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	380,000 LB Landing Weight	Per 10,000 LB Above / Below 380,000 LB	Per 1,000 ft	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5100	110 / -80	160	-230 / 760	80 / -70	130 / -140	220	0	0
5	7100	180 / -140	330	-420 / 1550	240 / -200	260 / -250	380	0	0
4	7530	140 / -120	260	-380 / 1290	290 / -240	210 / -220	310	0	0
3	8530	160 / -140	300	-450 / 1530	430 / -330	250 / -250	340	0	0
2	11090	290 / -240	560	-740 / 2790	880 / -620	430 / -430	510	0	0

Reference distance is based on Max Manual Braking, sea level, standard day, no wind or slope, and no reverse thrust.

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

Distances are based on HYD PRESS L+R failure distances which conservatively approximate the effects of 5G interference.

Actual (unfactored) distances are shown.

Note: per procedure, Max Manual Braking is not required for normal operations and is to be used only in the event that significant 5G interference effects occur.

- En route:
 - Plan to use Flaps 30 and V_{REF30} (with appropriate wind additives) for landing.
 - For runway condition codes 6 to 2, compute time of arrival (en route) landing distance using Table 1 through 6, as applicable, applying all adjustments. Multiply the resulting unfactored landing distance by 1.15 to obtain the minimum required landing distance at the destination. This approximates a minimum required landing distance resulting from 5G C-Band interference.
 - Determine desired AUTOBRAKE setting by using the normal configuration landing distance information from an approved source. Maximum manual braking may not be required.

- During approach and landing:
 - Monitor radio altimeter for anomalies.
 - Normal use of autothrottles is allowed. 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.
 - If the autothrottle does not reduce the thrust to IDLE at 25 feet, manually reduce the thrust to idle, hold the thrust levers in the idle position and disconnect the autothrottle to prevent autothrottle from advancing the thrust levers after touchdown.

Caution: If the autothrottle advances the thrust levers after landing, the speedbrakes will stow and the autobrake will disarm. It will not be possible to raise the reverse thrust levers to deploy the thrust reversers until the thrust levers are at idle.
 - Manual deployment of the speedbrakes may be required.
 - If the thrust reversers do not deploy, immediately ensure the speedbrakes are extended, apply manual braking and modulate as required for the existing runway conditions.

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

(i) New Requirement: AFM Revision for Non-Radio Altimeter Tolerant Airplanes

For non-radio altimeter tolerant airplanes, do the actions specified in paragraphs (i)(1) and (2) of this AD.

(1) On or before June 30, 2023, revise the Limitations Section of the existing AFM to include the information specified in figure 6 to paragraph (i) of this AD. This may be done by inserting a copy of figure 6 to paragraph (i) of this AD into the existing AFM. Incorporating the AFM revision required by this paragraph terminates the AFM revision required by paragraph (h)(1) of this AD.

(2) Before further flight after incorporating the limitations specified in figure 6 to paragraph (i) of this AD, remove the AFM revision required by paragraph (h)(1) of this AD.

Figure 6 to paragraph (i)— *AFM Revision for Non-Radio Altimeter Tolerant Airplanes*

(Required by AD 2023-12-10)**Radio Altimeter 5G C-Band Interference, Landing Distance**

Due to the presence of 5G C-Band wireless broadband interference, when dispatching or releasing to or landing on runways in the contiguous U.S. airspace, the following limitations are required.

Minimum Equipment List (MEL)

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

- 32-42-02 – Antiskid Control Systems
- 32-45-01 – Wheel Brake Systems
- 32-45-01-01 – Wheel Brake Systems, Electric Brake Actuator Systems

Landing Operations on Runways with Condition Code 1 or 0

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

Landing Distance Calculations for Runway Condition Codes 6 through 2

Operators must follow the 5G C-Band Interference Landing Distance Procedure contained in the Operating Procedures Section of this AFM.

(j) New Requirement: AFM Revision for Radio Altimeter Tolerant Airplanes

For radio altimeter tolerant airplanes, do the actions specified in paragraphs (j)(1) and (2) of this AD.

(1) On or before June 30, 2023, revise the Limitations Section of the existing AFM to include the information specified in figure 7 to paragraph (j) of this AD. This may be done by inserting a copy of figure 7 to paragraph (j) of this AD into the existing AFM. Incorporating the AFM revision required by this paragraph terminates the AFM revision required by paragraph (h)(1) of this AD.

(2) Before further flight after incorporating the limitations specified in figure 7 to paragraph (j) of this AD, remove the AFM revision required by paragraph (h)(1) of this AD.

Figure 7 to paragraph (j)— *AFM Revision for Radio Altimeter Tolerant Airplanes*

(Required by AD 2023-12-10)**Radio Altimeter 5G C-Band Interference, Landing Distance**

Due to the presence of 5G C-Band wireless broadband interference, when dispatching or releasing to or landing on runways in the contiguous U.S. airspace, the following limitations are required unless operating at a 5G C-Band mitigated airport as identified in an FAA *Domestic Notice*.

Minimum Equipment List (MEL)

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

- 32-42-02 – Antiskid Control Systems
- 32-45-01 – Wheel Brake Systems
- 32-45-01-01 – Wheel Brake Systems, Electric Brake Actuator Systems

Landing Operations on Runways with Condition Code 1 or 0

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

Landing Distance Calculations for Runway Condition Codes 6 through 2

Operators must follow the 5G C-Band Interference Landing Distance Procedure contained in the Operating Procedures Section of this AFM.

(k) Alternative Methods of Compliance (AMOCs)

(1) The Manager, 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 Operational Safety Branch, send it to the attention of the person identified in paragraph (l) 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) 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 requirements specified in paragraph (h) of this AD until June 30, 2023.

(l) Related Information

For more information about this AD, contact Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational Safety Branch, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712–4137; phone: 817–222–5390; email: operationalsafety@faa.gov.

(m) Material Incorporated by Reference

None.

Issued on June 9, 2023.

Michael Linegang,

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

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