

**NOTICE OF PROPOSED REGULATION  
BRAZILIAN AIRWORTHINESS DIRECTIVES**

**REPÚBLICA FEDERATIVA DO BRASIL  
AGÊNCIA NACIONAL DE AVIAÇÃO CIVIL – ANAC  
Gerência Geral de Certificação de Produto Aeronáutico**

**Reference:** NPR/AD 2023-737-01

**Date:** 27 Dec. 2023

*In accordance with the provisions of RBAC 11, The Continuing Airworthiness Technical Branch (GTAC) is proposing the issuance of a Brazilian Airworthiness Directive applicable to the aeronautical product referred below.*

*All the persons interested may send their comments until the date specified in item 2, indicating the **Reference** above, to the following address:*

*National Civil Aviation Agency (ANAC) – Continuing Airworthiness Technical Branch (GTAC)  
Rua Doutor Orlando Feirabend Filho, nº 230  
Centro Empresarial Aquárius - Torre B - 14 o ao 18 o andares  
Parque Residencial Aquárius  
12246-190 – São José dos Campos – SP - Tel.: (12) 3203-6600 - E-mail: pac@anac.gov.br.*

**1. Proposer:** Continuing Airworthiness Technical Branch (GTAC).

**2. Comments:** Must be received until 31 Mar. 2024.

**APPLICABILITY:**

(a) This Airworthiness Directive (AD) applies to BOEING airplanes model 737-8, all serial numbers.

**CANCELLATION / REVISION:**

Not applicable.

**REASON:**

The reason for this AD is the finding of potential interference in radio altimeters from wireless broadband operations in the 3.300 MHz to 3.700 MHz frequency band (5G C-Band). 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 degraded deceleration performance could lead to a runway excursion.

Since this condition may occur in other airplanes and affects flight safety, corrective action is required. Thus, sufficient reason exists to request compliance with this AD in the indicated time limit.

**REQUIRED ACTION:**

Airplane Flight Manual (AFM) Revision

**COMPLIANCE:**

Required as indicated below, unless already accomplished.

**(b) Airplane Flight Manual Revision**

(1) For airplanes identified in paragraph (a) of this AD, that do not meet the criteria for a “radio altimeter tolerant airplanes”, as established by PORTARIA Nº 13.365/SAR, de 14 de dezembro de 2023, within 10 days after the effective date of this AD, revise the Limitations Section of the existing AFM to include the following information:

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

Due to the presence of 5G C-Band wireless broadband interference, the following limitations are required to dispatch or release to airports, and takeoff and landing on runways, in the Brazilian airspace.

**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 Systems
- 32-44-01 – Parking Brake Valve

**Landing Operations on Runways with ice, wet ice, water on top of compacted snow, dry snow, or wet snow over ice**

Dispatch or release to, or takeoff or landing on, runways with ice, wet ice, water on top of compacted snow, dry snow, or wet snow over ice is prohibited.

**Takeoff and Landing Performance**

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

- (2) For airplanes identified in paragraph (a) of this AD, that do not meet the criteria for a “radio altimeter tolerant airplanes”, as established by PORTARIA N<sup>o</sup> 13.365/SAR, de 14 de dezembro de 2023, within 10 days after the effective date of this AD, revise the Operating Procedures Section of the existing AFM to include the following information:

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

**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 reverses 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

**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

- Use the distance for MAX MANUAL braking configuration with the appropriate runway condition at the estimated time of arrival.

- Apply all of the appropriate distance adjustments to include the reverse thrust adjustment for NO REVERSE (NO REV)

For non-contaminated runway condition, increase the resulting unfactored distance by 15% to obtain the required landing distance.

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

\*A runway is contaminated when more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by: — water more than 3 mm (0.125 in) deep; or — compacted snow or ice, including wet ice.

**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	Subtract from ASDA
Dry	950 feet
Wet (non-contaminated)	3,700 feet
Contaminated	4,900 feet

\*A runway is contaminated when more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by: — water more than 3 mm (0.125 in) deep; or — compacted snow or ice, including wet ice.

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	ASDA Factor
Dry	0,86
Wet (non-contaminated)	0,71
Contaminated	0,65

\*A runway is contaminated when more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by: — water more than 3 mm (0.125 in) deep; or — compacted snow or ice, including wet ice.

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 conditions.

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	Percentage
Dry	23%
Wet (non-contaminated)	65%
Contaminated	113%

\*A runway is contaminated when more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by: — water more than 3 mm (0.125 in) deep; or — compacted snow or ice, including wet ice.

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 and 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 non-contaminated runway condition, increase the resulting unfactored distance by 15% to obtain the required landing distance.

For contaminated runway condition, 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 One Position Tailskid, FLAPS 30, VREF30									
Landing Distance 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	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
Dry	4870	250/-270	130/170	-210/680	80/-70	130/-130	310	180	280
Wet (non-contaminated)	7330	450/-450	250/340	-360/1270	310/-250	220/-220	420	910	2090
Wet (contaminated)	8290	610/-570	330/460	-470/1660	440/-340	280/-280	450	1530	4410

737-8 Two Position Tailskid, FLAPS 30, VREF30									
Landing Distance 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	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
Dry	4670	250/-250	130/170	-210/680	80/-70	120/-120	300	160	280
Wet (non-contaminated)	7050	430/-420	240/340	-360/1240	300/-240	210/-200	410	850	1960
Wet (contaminated)	7980	590/-540	330/460	-460/1640	420/-330	270/-270	450	1430	4110

737-8 One Position Tailskid, FLAPS 40, VREF40									
Landing Distance 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	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
Dry	4630	300/-250	140/170	-210/670	90/-80	120/-120	330	160	250
Wet (non-contaminated)	6900	510/-420	240/340	-350/1230	310/-240	200/-200	410	800	1830
Wet (contaminated)	7670	670/-520	320/450	-450/1610	410/-320	260/-260	450	1260	3430

737-8 Two Position Tailskid, FLAPS 40, VREF40									
Landing Distance 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	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
Dry	4600	310/-250	140/170	-210/670	90/-70	120/-120	330	160	250
Wet (non-contaminated)	6870	520/-410	250/340	-350/1220	310/-240	200/-200	410	800	1820
Wet (contaminated)	7630	680/-520	330/450	-450/1610	410/-320	260/-260	450	1250	3400

\*A runway is contaminated when more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by: — water more than 3 mm (0.125 in) deep; or — compacted snow or ice, including wet ice.

\*\*For landing distance at or below 8,000 ft, 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 the threshold to touchdown associated with a flare time of 7 seconds.

Distances are based on SPOILERS failure distances which conservatively approximate 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 settings 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 normal inputs to ensure proper control of the 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:** The AFM alteration required by this AD may be accomplished by inserting a copy of this AD into the Aircraft Flight Manual.

**NOTE 2:** For the purpose of this AD, a “radio altimeter tolerant airplane” is the one for which ANAC accepts that the combination airplane-radio altimeter demonstrates tolerance to the limits specified in this PORTARIA N<sup>o</sup> 13.365/SAR, de 14 de dezembro de 2023.

- (3) For airplanes identified in paragraph (a) of this AD, that are defined as “radio altimeter tolerant airplanes”, according to the established by PORTARIA N<sup>o</sup> 13.365/SAR, de 14 de dezembro de 2023, no action is required

#### **(c) Terminating Action to the AFM Revision**

Modification of a “non-radio altimeter tolerant airplane” to a “radio altimeter tolerant airplane”, according to PORTARIA N<sup>o</sup> 13.365/SAR, de 14 de dezembro de 2023, terminates the limitations required by paragraphs (b)(1) and (b)(2) of this AD. After modification to a “radio altimeter tolerant airplane”, according to PORTARIA N<sup>o</sup> 13.365/SAR, de 14 de dezembro de 2023, remove the AFM revision required by paragraphs (b)(1) and (b)(2) of this AD.

#### **(d) Compliance with PORTARIA NO 13.365/SAR, de 14 de dezembro de 2023.**

For the purpose of this AD, the acceptance of the combination airplane-radio altimeter as a “radio altimeter tolerant airplane” depends on the data provided to demonstrate the tolerance limits established in PORTARIA N<sup>o</sup> 13.365/SAR, de 14 de dezembro de 2023. These data should be submitted to ANAC through [5g@anac.gov.br](mailto:5g@anac.gov.br).

**(e) Alternative methods of compliance (AMOCs).**

A different method or a different compliance time from the requirements of this AD may be used if approved by the Manager of the Continuing Airworthiness Technical Branch (GTAC) of ANAC.

**(f) Addition information**

For questions or further information, please contact [pac@anac.gov.br](mailto:pac@anac.gov.br)