



Civil Aviation Authority

AIRWORTHINESS DIRECTIVE

Number: G-2021-0001 R1

Issue date: 14 May 2021



Note: In this Airworthiness Directive, references to EU regulations are to those regulations as retained and amended in UK domestic law under the European Union (Withdrawal) Act 2018 and are referenced as "UK Regulation (EU) year/number or UK Regulation (EU) No. number/year".

This Airworthiness Directive (AD) is issued by the UK CAA, acting as the Authority of the State of Registry for the affected product(s) under Article 34 of the Air Navigation Order 2016 (ANO) and UK Regulation (EU) 2018/1139, in accordance with UK Regulation (EU) No. 748/2012 Part 21.A.3B.

In accordance with UK Regulation (EU) No. 1321/2014 Annex I, Part-M, M.A.301, the continuing airworthiness of an aircraft shall be ensured by accomplishing any applicable ADs. Consequently, no person may operate an aircraft to which an AD applies, except in accordance with the requirements of that AD, unless otherwise specified or agreed by the CAA [Part-M, M.A.303].

Design Approval Holder's Name:

THE BOEING COMPANY

Type/Model Designation(s):

737-8 and 737-9 aeroplanes

TCDS:

EASA.IM.A.120

Revision:

This AD revises CAA AD G-2021-0001 dated 27 January 2021, which superseded EASA AD 2019-0051R1 dated 25 March 2019.

ATA 22, 27, 31 and 34

ATA 22 – Auto Flight – Flight Control Computer Software – Installation / Test
ATA 27 – Flight Controls – Horizontal Stabilizer Trim Wire Bundle Routing – Modification / Stall Warning System Stick Shaker Circuit Breaker Buttons (Coloured Caps) – Installation
ATA 31 – Instruments – Operational Program Software – Updates
ATA 34 – Navigation – Angle of Attack Sensors – Test
– Airplane Flight Manual – Limitations / Operating Procedures – Amendment
– Master Minimum Equipment List – Amendment
– Operational Readiness Flight / Pilot Training / Flight Simulation Training Devices

Manufacturer(s):

The Boeing Company

Applicability:

Model 737-8 and 737-9 (commercially known as 'MAX') aeroplanes, all manufacturer serial numbers (MSN).

Definitions:	<p>For the purpose of this AD, the following definitions apply:</p> <p>Ferry flight: Any non-passenger, non-commercial flight conducted after 27 January [the effective date of the original issue of this AD], operating with a permit-to-fly issued under Annex I (Part 21) of UK Regulation (EU) No. 748/2012, and under flight conditions approved by CAA.</p> <p>Affected FCC OPS: Flight Control Computer (FCC) Operational Program Software (OPS) P11.1, (for model 737-8) and P.10.0 (for model 737-9), or earlier FCC OPS.</p> <p>Affected MDS DPC OPS: MAX Display System (MDS) Display Processing Computer (DPC) Operational Program Software (OPS), Block Point (BP) 1.5, or earlier MDS DPC OPS/BP.</p> <p>Serviceable FCC OPS: FCC OPS P12.1.2, Part Number (P/N) 2274-COL-AC2-26, or later FCC OPS and corresponding P/N.</p> <p>Serviceable MDS DPC OPS: MDS DPC OPS, BP 1.5.1, P/N COL49-0078-0006, or later MDS DPC OPS/BP and corresponding P/N.</p>
	<p>The applicable SB: Boeing Alert Requirements Bulletin (RB) 737-22A1342 RB, for the FCC OPS P12.1.2 introduction; Service Bulletin (SB) 737-27-1320, for the stick shaker circuit breakers button (coloured cap) installation; Special Attention SB 737-31-1860 (at any revision), for the MDS OPS update; Special Attention SB 737-27-1318 Revision 2, for the horizontal stabilizer trim wiring wire bundle routing modification; Special Attention SB 737-00-1028, for the angle-of-attack (AOA) sensor system test and operational readiness flight; as applicable.</p> <p>Groups:</p> <p>Group 1 aeroplanes are those MSN identified by line number in Boeing Special Attention SB 737-31-1860 original issue, dated 12 June 2020. Refer to Boeing Document D6-19567 Part 3 for the line number and the corresponding MSN.</p> <p>Group 2 aeroplanes are all other MSN.</p>

Reason:	<p>EASA issued Proposed Airworthiness Directive (PAD) 20-184 on 24 November 2020 proposing an AD to supersede EASA AD 2019-0051R1 and requesting comments. This was published whilst EASA was the “competent authority” for aircraft design for the UK. Following the disposition of comments responding to EASA PAD 20-184, the content of this CAA AD is based on EASA’s technical findings in relation to the identified unsafe conditions.</p> <p>Prompted by two fatal accidents with Boeing 737-8 aeroplanes, EASA issued Emergency AD 2019-0051-E (later revised) to suspend all flight operations of the two affected models. EASA AD 2019-0051R1 allowed non-passenger, non-commercial ferry flights and defined the conditions for such ferry flights. (Note: These EASA ADs were applicable to UK registered aircraft as they were issued prior to 1 January 2021)</p> <p>Previously, FAA issued AD 2018-23-51, which was adopted by EASA. Since that AD was issued, FAA issued AD 2020-24-02, superseding FAA AD 2018-23-51 which is no longer valid. This CAA AD is the Authority’s decision not to adopt FAA AD 2020-24-02 for UK registered aeroplanes.</p> <p>The results of safety investigations conducted by the States where these events occurred, as well as EASA’s safety review, have confirmed that, with affected FCC OPS installed, a single erroneous high AOA sensor input to the FCC on an affected aeroplane during manual flight with flaps up may have prompted the Manoeuvring Characteristics Augmentation System (MCAS) to input incremental nose down trim. In this scenario, the flight crew may be unable to respond appropriately by applying opposing nose-up stabilizer trim, returning the aeroplane to a trimmed state, and by actuating the stabilizer trim cut-out switches.</p> <p>This condition, if not corrected, could lead to a stabilizer position that cannot be fully countered with elevator input, possibly resulting in loss of control of the aeroplane.</p> <p>Prompted by those findings, Boeing developed new OPS for FCC and MDS DPC and issued the applicable SB to provide instructions for OPS in-service installation. Boeing also updated the Airplane Flight Manual (AFM) to introduce new flight crew procedures and limitations, and the applicable flight crew training programme(s), introducing new training to ensure pilot understanding of the MCAS functions, the consequences of introducing the serviceable OPS, and the new ‘Airspeed unreliable’ procedure.</p> <p>EASA conducted a comprehensive review of the measures proposed by Boeing, including flight testing, and considers that these measures adequately address the above described unsafe condition. The CAA has coordinated with EASA, acting as its Technical Agent and concurs with this position.</p> <p>.</p>
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	<p>For the reasons described above, the CAA issued AD G-2021-0001 on 27 January 2021, now revised by this AD, to supersede EASA AD 2019-0051R1, cancelling the ‘suspension of flight operations’ requirements of that AD. The affected Boeing 737-8 and 737-9 aeroplanes can be returned to service, provided that the actions required by this AD have been accomplished. To achieve this, this AD requires installation of serviceable FCC OPS and serviceable MDS DPC OPS, embodiment of certain modifications, including wiring changes, accomplishment of a sensor test, and installation of buttons (coloured caps) on the stick shaker circuit breakers. This AD also requires certain changes to the AFM to introduce the new flight crew procedures and limitations, including a prohibition to perform Required Navigation Performance - Authorization Required (RNP AR) approaches, until EASA AMC 20-26 compliance activities related to RNP AR approaches are completed. This AD also requires amendment of the EASA approved Boeing 737 MAX B 737-8/-9 Master Minimum Equipment List (MMEL) and the operator’s approved minimum equipment list (MEL) for certain items. Following all these actions, this AD requires an operational readiness flight to be conducted. Finally, this AD prohibits (re)installation of affected FCC OPS and affected MDS DPC OPS, as defined in this AD.</p> <p>EASA participated in a Joint Operational Evaluation Board (JOEB) meeting convened by the FAA, also including Agência Nacional de Aviação Civil (ANAC) of Brazil and Transport Canada Civil Aviation (TCCA). This JOEB evaluated the procedural changes and the pilot training proposed by Boeing for the 737-8/-9 (MAX). The JOEB validated Boeing’s proposed training changes, and Boeing embodied them in the Operational Suitability Data for Flight Crew (OSD FC), Boeing documents D626A014 and D626A014-1, both Revision NEW, as part of the EASA Boeing 737 validated type certificate, together with other changes. In particular, and in addition to initial type rating training, differences training from the Boeing 737-600 through 737-900ER series (NG) to the MAX has been improved with the addition of training elements, including new training areas of special emphasis (TASE). In order to support the new training elements, changes which are necessary for Flight Simulation Training Devices (FSTD) are described in the form of dedicated Simulator Data Bulletins (SDB), issued by Boeing Simulator Support. In order to ensure safe operation of the 737-8/-9 (MAX) upon return to service, this AD requires that “return to service” (RTS) training, including ground and flight training in a suitable full flight simulator (FFS), is performed prior to pilots operating the 737-8/-9 (MAX). The RTS training content is documented in a specific Appendix to the B737 OSD FC. Parts of the RTS training can also be done on a Boeing 737 NG FFS, being equivalent to the Boeing 737 MAX FFS for specific manoeuvres, as has been demonstrated during the JOEB process.</p> <p>In conjunction with this AD, the CAA has also issued Safety Directive (SD) 2021/003 containing requirements for UK and third country operators (TCO) to meet before conducting operations of their Boeing 737-8 and 737-9 aeroplanes into, within or out of UK airspace, or for UK operators anywhere.</p> <p>Revision 1 of this AD introduces a Note, which was inadvertently omitted, into Figure 2 of Appendix 1, and to correct paragraph (3) of the Required Actions in order to avoid any possible conflict with later approved AFM revisions. No other changes have been made to the requirements of the original version of this AD.</p>
Effective Date:	Revision 1: 14 May 2021 Original issue: 27 January 2021

<p>Required Action(s) and Compliance Time(s):</p>	<p>Required as indicated, unless accomplished previously:</p> <p>Installation/Test of FCC OPS:</p> <p>(1) For Group 1 aeroplanes: Before next flight after 27 January 2021 [the effective date of the original issue of this AD], install serviceable FCC OPS, as defined in this AD, and accomplish a software installation test in accordance with the instructions of the applicable SB. During the installation test, if the serviceable FCC OPS P/N is not shown as being installed on FCC A and FCC B (see Note 1 of this AD), before further flight, accomplish applicable corrective action(s) until the serviceable FCC OPS P/N is installed on FCC A and FCC B. Later-approved FCC OPS versions are only those Boeing software versions that are approved as a replacement for the affected FCC OPS, and are approved as part of the type design after 27 January 2021 [the effective date of the original issue of this AD].</p> <p>Note 1: The flight control system for 737 MAX aeroplanes includes two FCC units (FCC A and FCC B) which process inputs from the pilots and aeroplane sensors to move the control surfaces. Guidance for performing the installation, and verifying correct installation, of FCC OPS software can be found in the Boeing 737-7/8/8200/9/10 Aircraft Maintenance Manual (AMM), Section 22-11-33.</p> <p>This paragraph corresponds to paragraph (g) of FAA AD 2020-24-02.</p> <p>Stall Warning System Stick Shaker Circuit Breakers – Button (Coloured Cap) Installation:</p> <p>(2) For Group 1 and Group 2 aeroplanes: Before next flight after 27 January 2021 [the effective date of the original issue of this AD], install a button (coloured cap) on each stick shaker circuit breaker, on panels P6-1 and P18-2, in accordance with the instructions of the applicable SB.</p> <p>This paragraph does not correspond to any paragraph of FAA AD 2020-24-02.</p> <p>AFM Amendment(s):</p> <p>(3) For Group 1 aeroplanes: Before next flight after 27 January 2021 [the effective date of the original issue of this AD], amend the applicable AFM, Boeing Document D631A002, by including the changes as specified in Appendix 1 of this AD. This can be accomplished by inserting a copy of Figures 1 through 11 of Appendix 1 into the applicable AFM.</p> <p>Revising the applicable AFM by introducing a later approved AFM revision is an acceptable method to comply with this requirement.</p> <p>In addition, before the next flight after 27 January 2021 [the effective date of the original issue of this AD], remove the AFM information previously required by FAA AD 2018-23-51 (which will be superseded by the Final Rule AD for FAA AD 2020-24-02) from the Certificate Limitations and Operating Procedures chapters of the applicable AFM.</p> <p>This paragraph corresponds to, but is different from, paragraph (h) of FAA AD 2020-24-02.</p>
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MMEL Provisions for Inoperative Flight Control System Functions:

- (4) For Group 1 aeroplanes: From 27 January 2021 [the effective date of the original issue of this AD], do not operate (dispatch) an aeroplane, unless the provisions specified in Figure 12 of Appendix 1 of this AD are incorporated into the EASA-approved Boeing 737 MAX B 737 8/ 9 MMEL, on the basis of which the operator's approved MEL must be amended. This can be accomplished by inserting a copy of Figure 12 of Appendix 1 into the applicable operator MEL.

The required changes are contained in EASA approved Boeing 737 MAX B-737-8/-9 MMEL, Boeing document D639A001-02, Revision 2. Revising the operator MEL by introducing that Revision 2, or a later EASA approved MMEL revision, is an acceptable method to comply with this requirement.

This paragraph corresponds to, **but is different from**, paragraph (i) of FAA AD 2020-24-02.

Installation/Verification of MDS Software, Removal of INOP Markers:

- (5) For Group 1 aeroplanes: Before the next flight after 27 January 2021 [the effective date of the original issue of this AD], accomplish all applicable actions identified as "RC" (required for compliance) in, and in accordance with the instructions of, the applicable SB.

This paragraph corresponds to paragraph (j) of FAA AD 2020-24-02.

Horizontal Stabilizer Trim Wire Bundle Routing Change

- (6) For Group 1 aeroplanes: Before the next flight after 27 January 2021 [the effective date of the original issue of this AD], accomplish all applicable actions identified as "RC" in, and in accordance with the instructions of, the applicable SB.

This paragraph corresponds to paragraph (k) of FAA AD 2020-24-02.

AOA Sensor System Test

- (7) For Group 1 aeroplanes: Before next flight after 27 January 2021 [the effective date of the original issue of this AD], accomplish all applicable actions identified as "RC" for the "AOA Sensor System Test" as specified in, and in accordance with the instructions of, the applicable SB.

This paragraph corresponds to paragraph (l) of FAA AD 2020-24-02.

Operational Readiness Flight

- (8) For Group 1 aeroplanes: Before next flight after accomplishment of the actions required by paragraphs (1) through (7) of this AD, accomplish all applicable actions identified as "RC" for the "Operational Readiness Flight" as specified in, and in accordance with, the instructions of the applicable SB. The CAA approved flight conditions, as specified in Appendix 2 of this AD, form the basis on which a Permit to Fly can be issued in accordance with Annex I (Part 21) of UK Reg (EU) No. 748/2012 to accomplish the operational readiness flight required by this paragraph.

No additional CAA flight conditions approval is required for the operational readiness flight.