



# AIRWORTHINESS DIRECTIVE

*This Airworthiness Directive (AD) is issued pursuant to Canadian Aviation Regulation (CAR) 521.427. No person shall conduct a take-off or permit a take-off to be conducted in an aircraft that is in their legal custody and control, unless the requirements of CAR 605.84 pertaining to ADs are met. Standard 625 - Aircraft Equipment and Maintenance Standards Appendix H provides information concerning alternative means of compliance (AMOC) with ADs.*

**Number:**

CF-2021-02

**Effective Date:**

18 January 2021

**ATA:**

22

**Type Certificate:**

A-146

**Subject:**

Auto Flight – Flight Crew Inability to Control the Aeroplane Flight Path Due to Erroneous Maneuvering Characteristics Augmentation System (MCAS) Activation

**Replacement:**

Supersedes Federal Aviation Administration (FAA) AD 2018-23-51, issued 7 November 2018.

Also supersedes FAA AD 2020-24-02, issued 20 November 2020.

**Applicability:**

The Boeing Company model 737-8 aeroplanes, serial numbers 43297, 43796, 44298, 44299, 60387, 60510 through 60521 and 61207 through 61230.

**Compliance:**

Before further flight.

**Background:**

On 29 October 2018, a Boeing model 737-8 (B737-8) aeroplane operated by Lion Air (Lion Air Flight 610) was involved in an accident after takeoff from Soekarno-Hatta International Airport in Jakarta, Indonesia, resulting in 189 fatalities.

On 7 November 2018, the FAA issued Emergency AD 2018-23-51 as an interim corrective action. This AD required all operators of B737-8 and B737-9 aeroplanes to revise certificate limitations and operating procedures of the Airplane Flight Manual (AFM) to provide flight crews with runaway stabilizer trim procedures to follow under certain conditions. In addition to adopting this AD, Transport Canada worked with Canadian operators of the B737-8 to further refine these procedures. The refined procedures were implemented by the three Canadian operators of the B737-8 aeroplane.

On 10 March 2019, a B737-8 aeroplane operated by Ethiopian Airlines (Ethiopian Airlines Flight 302) was involved in an accident after takeoff from Addis Ababa Bole International Airport in Addis Ababa, Ethiopia, resulting in 157 fatalities.

On 13 March 2019, Transport Canada issued a Notice to Airmen (NOTAM) prohibiting operation of B737-8 and B737-9 aeroplanes in Canadian airspace.

Following investigation, it was determined that the crew was unable to control the aeroplane flight path due to repeated automated nose down trim of the horizontal stabilizer in combination with flight deck effects resulting from a single erroneously high angle of attack (AOA) sensor input.

The Lion Air final accident report contains findings and recommendations related to the multiple alerts and indications that adversely affected the flight crew's performance during the high workload situation that arose during the incident flights.

During subsequent Transport Canada Civil Aviation (TCCA) reviews, safety issues were identified with the MCAS design, the crew alerting system, the horizontal stabilizer trim wiring, and the AFM limitations

and procedures.

In order to address the above-mentioned unsafe conditions and return the B737-8 aeroplane to service, Transport Canada is mandating Boeing Alert Service Bulletin (SB) 737-22A1342, which requires the incorporation of a system update to correct the MCAS design issue.

This AD also mandates a revision to the MAX Display System (MDS) software through the incorporation of Boeing Special Attention SB 737-31-1860 so that the AOA DISAGREE alert is available on aeroplanes as a standard configuration.

During the validation of the flight control computer (FCC) changes, Transport Canada learned that the AOA DISAGREE alert was also missing from the HGS6000 head up display (HUD) system installed under Supplemental Type Certificate (STC) ST02522SE. This omission is being addressed and the revised software is planned to be implemented on HUD equipped aeroplanes in 2021. As an interim measure, an additional operating procedure has been added to the Transport Canada AFM Appendix advising flight crews that the alert will not be present on the HUD during an unreliable airspeed event and that crews should use all available sources to determine reliable airspeed.

This AD also requires wire routing for the horizontal stabilizer trim system to be modified in order to improve physical separation of the wiring in accordance with Boeing Special Attention SB 737-27-1318.

During dedicated simulator testing, Transport Canada test pilots found that, following the activation of the stick shaker, the constant noise and vibration was a significant impediment to the safe operation of the aeroplane for the remainder of the flight. Transport Canada therefore requires that the AFM be modified to add a means to disable a nuisance stick shaker. The disabling of the stick shaker also improves the crew's recognition of the stall warning and disables an incorrect activation of the elevator feel shift. As the means to disable the nuisance stick shaker is through the use of circuit breakers (CBs), Transport Canada is mandating the incorporation of Boeing SB 737-27-1320. This SB requires the addition of coloured caps on CBs for the stick shaker, to allow for ease of identification. The step, to disable a nuisance stick shaker within the airspeed unreliable procedure, is included in the Transport Canada AFM Appendix that is an integral part of the FCC operational program software (OPS), software version P12.1.2, modification.

The Transport Canada AFM Appendix also includes a change to the ALT DISAGREE alert procedure that differs from the FAA AD 2020-24-02, effective 20 November 2020. Transport Canada requires the inclusion of a step stating that the aircraft does not meet reduced vertical separation minimum (RVSM) operational requirements and provides additional guidance to the crew.

In addition, this AD requires the AOA vanes to be calibrated using the tooling and methods prescribed in Boeing Special Attention SB 737-00-1028 and, an operational readiness flight must also be accomplished in accordance with the same Boeing Special Attention SB, 737-00-1028.

### **Corrective Actions:**

#### **Part I – Installation/Verification of FCC OPS**

- a. Install FCC OPS version P12.1.2, part number (P/N) 2274-COL-AC2-26 on FCC A and FCC B in accordance with the Accomplishment Instructions in section 3 of Boeing Alert SB 737-22A1342, Original Issue, dated 17 November 2020.
- b. Perform a software installation verification in accordance with the Accomplishment Instructions in section 3 of Boeing Alert SB 737-22A1342, Original Issue, dated 17 November 2020.

#### **Part II – Installation/Verification of MDS Software, Addition of AOA Disagree Alert and Removal of INOP Markers**

Install revised MDS software in accordance with the Accomplishment Instructions in section 3 of Boeing Special Attention SB 737-31-1860, Revision 1, dated 2 July 2020.

Incorporation of Boeing Special Attention SB 737-31-1860, Original Issue, dated 12 June 2020, also meets the requirements of Part II of this AD.

#### **Part III – Horizontal Stabilizer (HSTAB) Trim Wire Bundle Routing Change**

Modify the wire routing for the HSTAB trim in accordance with the Accomplishment Instructions of Boeing Special Attention SB 737-27-1318, Revision 2, dated 10 November 2020.

#### **Part IV – Installation of CB Caps**

Install ivory yellow coloured caps on stick shaker CBs in accordance with the Accomplishment Instructions Group 1, Configuration 1 of Boeing SB 737-27-1320, Original Issue, dated 14 October 2020.

**Part V – AFM Revision**

Remove the AFM information previously required by FAA AD 2018-23-51 from the Certificate Limitations and Operating Procedures chapters of the applicable AFM.

**Part VI – AOA Sensor System Test**

Perform a check of the AOA sensor system in accordance with the Accomplishment Instructions in section 3 of Boeing Special Attention SB 737-00-1028, Original issue, dated 20 July 2020.

**Part VII – Operational Readiness Flight**

Following accomplishment of Parts I, II, III, IV, V and VI of this AD, perform an operational readiness flight in accordance with the Accomplishment Instructions in section 3 of Boeing Special Attention SB 737-00-1028, Original Issue, dated 20 July 2020.

A flight permit is not required to accomplish the operational readiness flight required by Part VII of this AD.

**Authorization:**

For the Minister of Transport,

*ORIGINAL SIGNED BY*

Rémy Knoerr  
Chief, Continuing Airworthiness  
Issued on 18 January 2021

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