



BOEING 737 MAX GROUNDING

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**NCAA PRESENTATION BY
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Applicable NAMCARs:

- NAMCAR PART 21, SUBPART 2: Aircraft Type Certificate requires that an aircraft complies with the appropriate airworthiness design standards as prescribed in Document NAMCATS-AR.

Applicable NAMCATS

- NAMCATS-AR 21.02.3(3) : Specifies the appropriate airworthiness design standards that Namibia as a State of Registration recognizes for the purpose of accepting the Type Certificates issued by the design State.
- NAMCAR, 2001 restricted the acceptable codes for large aeroplanes to FAR 25 (FAA) and EASA CS-25 Airworthiness Codes ;

Applicable Annexes

Annex 8: Airworthiness of Aircraft — Contains minimum design criteria and performance standards from which aircraft design states develops their Airworthiness Codes.

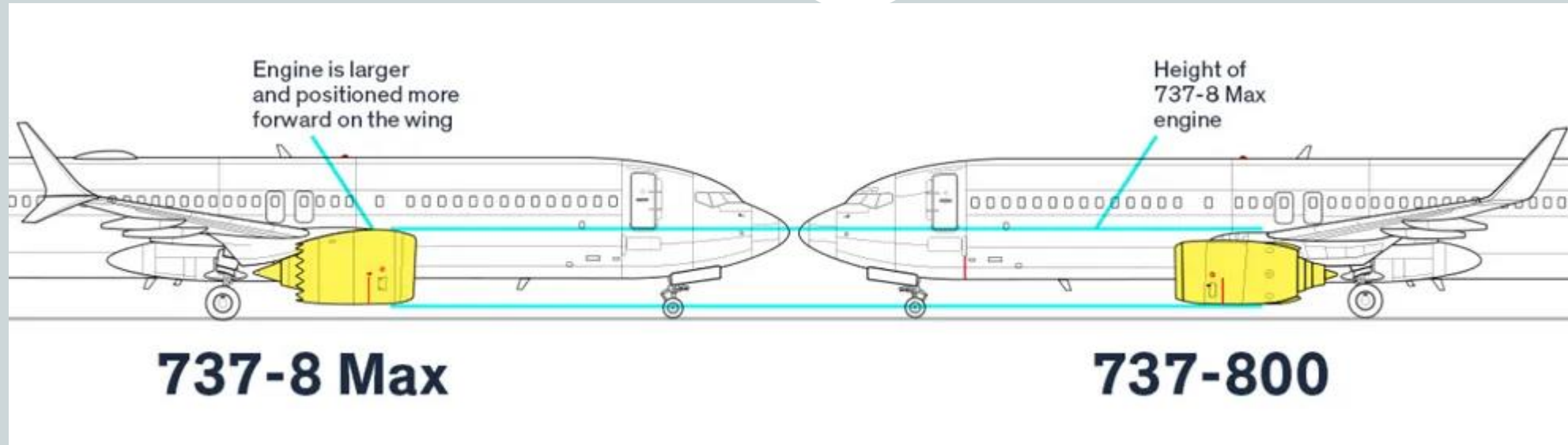
BACKGROUND FOR THE GROUNDING

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- The B737 Max was grounded in March 2019 after investigation revealed that evidence of similarities existed in two crashes of the aircraft, that were operated by Lion Air and Ethiopian Airlines, and attributed to Maneuvering Characteristics Augmentation System (MCAS) failure.
- Other factors established by investigating agencies were:
 - faulty aircraft design
 - maintenance (a faulty Angle of Attack (AOA) Sensor was replaced with a reworked sensor instead of a new one and recording functional test was carried out after the replacement, resulting in the misalignment of the left AOA sensor to the right sensor)
 - flight crew actions (pilot ignored *Stick Shakers* designed to warn pilots of an impending stall)

ROOT CAUSE

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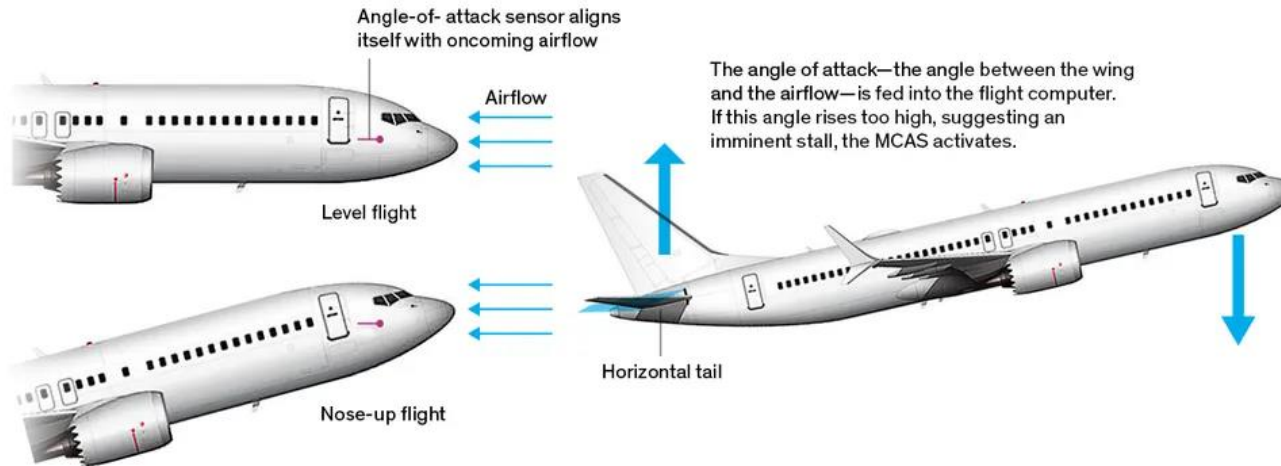


The design solution for the larger engine was to extend the engine up and well in front of the wing. However, doing so also meant that the centerline of the engine's thrust changed. Now, when the pilots applied power to the engine, the aircraft would have a significant "pitch up," or raise its nose.

ROOT CAUSE

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How the new Max flight-control system (MCAS) operates to prevent a stall



When MCAS senses that the angle of attack is too high, it commands the aircraft's trim system (the system that makes the plane go up or down) to lower the nose.

MCAS in more detail

- The MCAS prevented stall (a sudden loss of lift due to the angle of the wing) by “pushing” the nose down. Stall is indicated through an angle of attack (AoA) sensor – the 737 Max is fitted with two, but MCAS only used one. If that AoA sensor failed, then the MCAS could activate when it shouldn't, unnecessarily pushing the nose down.

In Conclusion ...

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- ✓ Excessive delegation of aircraft design certification review and verification duties by FAA to Boeing resulted in the inappropriate MCAS Software Development Assurance Level (DAL) designation.
- ✓ Instead of assigning a DAL A(Catastrophic Failure) corresponding to the criticality of a single failure as established in Functional Hazard Analysis; the MCAS was allocated a DAL of Level B (Hazardous Failure) implying no redundancy or diversification of components supporting crucial functions were required.

- Following extensive redesign, the FAA and EASA recertified the type with the following provisos:
 - Software upgrades to ensure there both AofA sensors are use in the MCAS and that the system only activates once
 - Modification of the pilot's QRH procedures for handling these failures
 - Modification of the MEL to ensure required equipment is operatable
 - Approved pilot training including MCAS and AofA failures

Return to Namibian Skies

- After careful deliberation of all departments within the NCAA, research, focus on other States actions, and careful review of the airworthiness directives from the FAA and EASA, NCAA in May 2022 NCAA issued an AIC indicating that the aforementioned ban on the B737 Max has been lifted.
- The ban currently applies to our foreign operators (FOPs) and they are required to prove compliance with the ADs prior to the B737 Max being placed back on their FOPs.

- Questions?