

BOEING 737 MAX – BREDOK3D

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PART 1 – INTRODUCTION

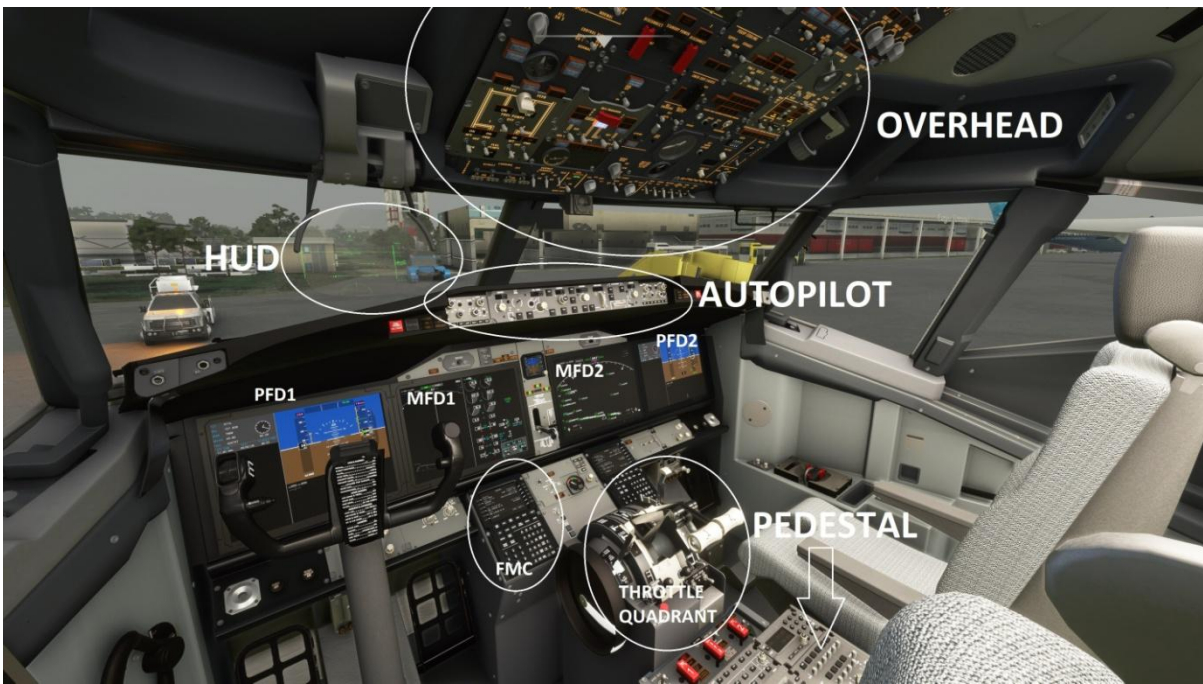
The Boeing 737 MAX is the fourth generation of the Boeing 737, a narrow-body airliner manufactured by Boeing Commercial Airplanes (BCA). It succeeds the Boeing 737 Next Generation (NG). It is based on earlier 737 designs, with more efficient CFM International LEAP-1B engines, aerodynamic changes including its distinctive split-tip winglets, and airframe modifications. The new series was publicly announced on August 30, 2011. It took its maiden flight on January 29, 2016 and was certified by the U.S. Federal Aviation Administration (FAA) in March 2017. The first delivery was a MAX 8 in May 2017, to Malindo Air, with whom it commenced service on May 22, 2017.

The 737 MAX series has been offered in four variants, offering 138 to 204 seats in typical two-class configuration[7] and a 3,215 to 3,825 nmi (5,954 to 7,084 km) range. The 737 MAX 7, MAX 8 (including the denser, 200-seat MAX 200), and MAX 9 are intended to replace the 737-700, -800, and -900 respectively, and a further stretched 737 MAX 10. As of November 2020, the Boeing 737 MAX had a backlog of 3,290.[8]

The 737 MAX was grounded worldwide from March 2019 to November 2020, after a recurring failure in the Maneuvering Characteristics Augmentation System (MCAS) caused two fatal accidents, Lion Air Flight 610 and Ethiopian Airlines Flight 302, in which 346 people died.[9] Investigations faulted cover-up of a known defect by Boeing and lapses in the certification by the FAA.[10][11] After the fatal accidents, Boeing suspended production in January 2020 with approximately 400 MAX airplanes awaiting delivery and modified the MCAS. Production resumed in May 2020 at a low rate. On November 18, 2020, the FAA cleared the MAX to return to service once necessary design modifications have been made. Transport Canada and EASA both cleared the MAX in late January 2021, subject to additional requirements. After being charged with fraud, Boeing settled to pay over \$2.5 billion.



PART 2 – COCKPIT LAYOUT




2.1 THROTTLE QUADRANT



2.2 OVERHEAD PANEL



PART 3 – FLIGHT PLANNING - FMC



The image shows the FMC interface. The display screen displays the following information:

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IDENT
MODEL          ENGINES
737-Max        CMF LEAP-1B
NAV DATA      ACTIVE
AIRAC          DEC31JAN27/20
DRAG/FF

OP PROGRAM     CO DATA
AW-P010-0-0    VS1001
OPC
AW-C010-0-0
-----
<INDEX        POS INIT>
    
```

The control panel below the display includes the following keys:

- INIT REF, RTE, DEP ARR, ATC, VNAV, -BRT +
- FIX, LEGS, HOLD, FMC COMM, PROG, EXEC
- MENU, NAV RAD
- PREV PAGE, NEXT PAGE
- Alphanumeric keys: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, SP, DEL, /, CLR
- Number keys: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, %

The FMC has three major areas: A display area that shows 6 data fields per side with corresponding Line Select Keys (LSKs) on each side of the display. A Scratchpad takes up the seventh line of the display, and it's where anything we input will display. The scratchpad is also where any FMC messages will display. To enter a value into a field in the FMC, we first type it on the scratchpad by pressing the alphanumeric keys, and then press the corresponding LSK. Conversely, pressing an LSK by itself will usually transfer the contents of the corresponding field into the scratchpad. The CLR key acts as a backspace key for the scratchpad when we're entering data, and will also clear any messages the system puts up. If you hold the CLR key for a few seconds the entire scratchpad is cleared. The DEL key is useful if we want to delete an entry in a field – just press the DEL key, which will put "DELETE" in the scratchpad, then press the appropriate LSK to delete the

The initial FMC page Looking at the display, we see the aircraft model and engine info, the current NAV DATA cycle and effective dates, and the FMC software version. LSK 6 on the right side (6R), will take us to the POS INIT page when pushed – go ahead and push it now.

contents of the field. The EXEC key tells the FMC to accept any changes you just made – it lights up when you make a change that requires recalculation. Additionally, an annunciator on the main panel lights up whenever an FMC message is generated



The POS INIT page Using the FMC keyboard, enter KTNT then press the LSK 2L key and we'll see it appear under the REF airport. Also, check that the clock on 5L matches the correct time. Then press LSK 6R to go to the ROUTE page.



The RTE page
 When we first
 bring up the
 Route page, we'll
 notice that LICA is
 still in
 the scratchpad. If
 it's not in the
 scratchpad, type
 it in, then go
 ahead and press
 LSK 1L, and put it
 in the Origin field.
 Then enter LIRN
 and press the LSK
 1R key to enter it
 as the
 Destination.



Since our flight
 plan after LICA is
 to follow DIRECT
 to SOR
 We've just
 defined a path
 from LICA to SOR
 to ELBAB, telling
 the FMC to follow
 DIRECT.



The PERF INIT page The PERF INIT page is where we tell the airplane how much it weighs, how much fuel we want to hold in reserve, how important economy is, and our cruise altitude and estimated cruise winds. First, we'll see the airplane already knows how much fuel is onboard, since 2L is already populated. We'd normally enter the Zero Fuel Weight or the Gross Weight, and the FMC would calculate the other value



The THRUST LIMIT page This page is where we could select derated thrust settings for takeoff, and our climb, perhaps for noise abatement or different climb profiles. Selecting reduced thrust also increases engine life, so it's a normal practice to use reduced thrust. Pressing the various LSKs will change the takeoff thrust rating, and the climb profiles. Since we're going to reject the first takeoff, we're happy with max thrust, but we'll select a derated climb profile by pressing LSK3R. Press LSK 6R to go to the TAKEOFF page



The TAKEOFF page On this page, we need to tell the FMC what our flap setting will be, and we can also tell it our V-Speeds or let it calculate them for us. We'll use 5 degrees of flaps, so put 5 in the scratchpad and LSK 1L. Then press LSK 1R, 2R, 3R, and the FMC will populate the Vs speeds based on the aircraft weight, thrust, outside temp, and flap settings. While this page is still up, set the calculated V2 speed of 134 in the MCP speed window – it's critical for takeoff. Finally, make a note of the TRIM setting indicated here, we'll want to make sure that is set before takeoff. We'll note that the PRE-FLT COMPLETE message is up, if we'd forgotten to enter anything critical, we'd have a prompt to another page on the display. But because we followed a logical progression, we're done. We'll take a quick look at the climb page, and then we can close the FMC



The ARR
(arrival/approach)
page
PRESS R2



This is the Arrivals page. On the left side we'd see any STARs for this airport, and on the right side we see the known approaches and runways. Since there are often lots of arrivals and approaches, the NEXT PAGE key can be used to cycle through them



LEGS page

PART 4 – START-UP PROCEDURE

 <p>A photograph of the cockpit instrument panel. A white box highlights a red master battery switch labeled 'Turn Battery Master 1 ON'. To the left, a camera settings menu is visible, listing options like COCKPIT, EXTERNAL, and SHOWCASE.</p>	<p>TURN ON MASTER BATTERY</p>
 <p>A photograph of the cockpit instrument panel, similar to the first image. A white box highlights a second red master battery switch labeled 'Turn Battery Master 2 ON'.</p>	<p>TURN ON MASTER BATTERY 2</p>
 <p>A photograph of the cockpit instrument panel focusing on the fuel pump controls. A white box highlights a switch labeled 'Turn ON left center fuel pump'. The panel includes various gauges and switches for engine and fuel systems.</p>	<p>TURN ON ALL FUEL PUMPS</p>



TURN ON THE EXTERNAL POWER



TURN ON APU GENERATOR AND
TURN ON APU MASTER GENERATORS



SET ENGINE MODE TO NORMAL



TURN ON HYDRAULIC GENERATORS 1



TURN ON HYDRAULIC GENERATORS 2



-TURN ON APU BLEED
-TURN ON RIGHT ENGINE BLEED AIR SWITCH
- TURN ON LEFT ENGINE BLEED AIR SWITCH



TURN ON APU STARTER
WAIT 30 SECONDS



WAIT THE APU STARTER AVAIL BEING GREEN



SET ENGINE 1 e 2 FUEL VALVE TO RUN



WAIT THE N2 ARRIVE TO 25.0
N1 TO 1.0 %



SET THE ENGINE MODE SELECTOR TO IGN/START



THE ENGINE IS STARTING,
WAIT TO N2 ARRIVE TO 50.0
AND N1 TO 19.5%

THE ENGINE IS NOW READY!

PART 5 – AUTOPILOT

Autopilot and Auto-Throttle



The autopilot is separated in three main components the flight director, the autopilot itself and the auto thrust system Aircraft pitch and attitude will help maintain the aircraft on a certain flight path The throttle will help maintain the aircraft on a certain speed Depending on the phase of flight (climb, cruise, descent, final approach, etc the autopilot will react differently During a climb, the AP will want to maintain the best, most fuel efficient climb to save fuel During a descent, the AP will want to slow down in order to approach the runway in a low speed high lift configuration The Auto Thrust system will control the engines for you when AT is engaged, you will see the throttle physically move by itself. The AP has two channels A and B The only time the two autopilot channels will engage simultaneously is at G/S (glide slope) intercept

Autopilot Parameter Selectors

- Course Selector: The course in COURSE display a duplicate of heading
- IAS MACH Selector: Sets speed input to aircraft autopilot.
- C/O: Change over airspeed unit (IAS (indicated airspeed) vs Mach), usually used above FL260, or 26000 ft
- Heading Selector: Sets heading input to aircraft autopilot.
- Altitude Selector: Sets altitude input to aircraft autopilot.
- Vertical Speed Selector: Sets vertical speed input to aircraft autopilot.

Autopilot, Flight Director & Autothrottle Selectors

- Auto-throttle (A/T) ARM Switch : Arms A/T for engagement. Auto-throttle engages automatically when LVL CHG, V/S, VNAV, ALT HOLD modes are used.
- Flight Director (F/D) Switch: Arms flight director
- CMD A/B: Engages autopilot in selected mode.

- CWS A: Control Wheel Steering. Used as an “attitude hold” (CWS R = Roll Angle Maintained, CWS P = Pitch Angle Maintained)
- DISENGAGE Bar: Disengages autopilot.

Autoflight–Thrust/Speed Modes

- N1: Engages auto-throttle in N1 mode maintains thrust at N1 limit selected from FMC (or manually set via the N1 Set knob). Automatically engages in certain conditions.
- SPD: Engages auto-throttle in SPEED mode (maintains IAS/MACH value in display).

Autoflight–Vertical Modes

- VNAV: Vertical Navigation mode will follow the vertical components and restrictions of the flight plan entered in the FMC.
- FL VL CHG (Level Change): Aircraft climbs or descends to selected ALTITUDE at selected IAS/MACH
- SPD INTV: Speed Intervention, aircraft limits its speed to selected IAS/MACH. Used while in VNAV mode. Used for speeds not set in FMC flight plan restrictions.
- ALT HLD: Aircraft levels off and holds its current altitude.
- V/S: Sets Vertical Speed to selected VERT SPEED.
- ALT INTV: Altitude Intervention, aircraft will climb or descend to selected ALTITUDE. Used for altitudes not set in FMC flight plan restrictions.

Autoflight–Lateral Modes

- LNAV: Lateral Navigation mode will follow the lateral components and restrictions of the flight plan entered in the FMC.
- HDG SEL: Heading and Bank Angle selector. Aircraft will roll towards the selected HEADING.
- VOR LOC: Tracks VHF OminidirectionalRange (VOR) localizer. Aircraft will only be controlled laterally.

Autoflight–Vertical + Lateral Mode

- APP: Tracks localizer and glideslope during approach. Aircraft will be controlled laterally and vertically.

END

