

Boeing 737 CAP/FO Quick Review Cards (QRC) March 2024

• INTRODUCTION

DISCLAIMER:

UAL nor the FAA endorse the QRC. The QRC ("Quick Review Cards") is a best effort summary of many need to know United Flight Manual and Operations Manual items (certainly not everything, and not perfect)! The QRC is for review purposes only!! The United FM and FOM are the absolute final word.

THIS DOCUMENT IS NO LONGER BEING UPDATED! If you would like to help keep it updated, contact brucesprague@mac.com.

Recommend Bill Bulfer's excellent **737 Cockpit Companion** and his **FMC User's Guide**. You can contact Bill at: billbulfer@comcast.net or: www.cockpitcompanion.com

• CHECKRIDE HINTS

- **VVM**: Verbalize, Verify, Monitor
- Use CRM! Call for QRC/QRH! On LOE: brief FAs, check MRD.
- Carry updated IPAD, minimum charge 67%; or flight deck ac power outlet, or other approved source for charging, and at least 1 other EFB meets power requirement.
 - Report EFB as damaged if discharge from 100% to 50% <2 hours or 8-hour AC charge provides < 80% battery charge. (FOM17.20)
- Go slow, rotate slow (TO and MA), and configure early on approaches.
- "Nail" the ADI pitch, and constantly check it.
- WBBBBA: Weather, Build, Bug, Brake, Brief, Descent Checklist.

• PREFLIGHT: Maintenance/ Flight Planning: (FM Chap. 3)

MEL/CDL Applicability:

**For items discovered *before* flight, maintenance must be notified and a new MRD received prior to takeoff. (FOM 5.20.2)

**Equipment that becomes inoperative during flight is *not* subject to MEL/CDL until after flight. (FOM 5.20.2)

- **MEL**: certain systems or components are inoperative (FOM5.10.2)
 - P code = performance penalty
 - M code = Maintenance procedure (crew may position CB's or switches)
 - O code = Operation procedure
 - use "system" number to find in MEL
- **CDL**: Configuration Deviation List: Additional limitations with secondary airframe and engine parts missing. (FOM 5.10.2)

•Not all FRM codes invalidate the MRD. Always confirm the status of the MRD with the Confirmation Message (ex. CB Cycling). (737 Fleet MRM Codes)

Fuel Planning Policy: no less than:

- Domestic 60 minutes REMF and Flag 75 minutes REMF. (FOM 4.40.5)
- Reserve fuel for flight planning only. In flight, reserve fuel may be used for unanticipated delays with no legal consequences. (FOM 4.40.7)
- "Reserve" on Perf Init Page: No less than 4.0 (FM5.40.5)
- ALTERNATES** (FOM 4.30)

- **Need T/O Alternate**: IF Departure field **below** landing mins. Must be within 400 miles. (FOM 4.30.2)

- Minimums for T.O. alternate are **same** as regular alternate

- **Need destination alternate if**: Forecast ± 1 hr. ETA, destination **below** 2000' or 3 miles (gouge "123").

Exemption 8653: for lower 48 and return from Extended Domestic:

- 1-1-3 CAT I Aircraft: RWY Avail and Legal
- 1-1-2 CAT II/III Aircraft: RWY Avail and Legal
- ***Both no TS (PROB or Temp) +/- 1 hr ETA
- **Need 2 alternates if**: Destination and 1st alternate are "Marginal" (**Dest**: <400'/1mi - **Alt**: <600'/2mi)
 - **Alternate Minimums**: HAT/HAA plus 400' and Cat I + 1 mile (**Or** if 2 Rwy/2 Approaches: +200' and +1/2 mile)

- IF diverting to alternate, then **regular** landing minimums apply.
- IF dispatched w/o alt; and after departure, Destination WX degrades that would require an alternate, you may **continue**; however if landing minimums are threatened a new course of action is required (adding alternate/fuel stop) (FOM 4.30.1)
- Call **dispatcher** enroute if need to **divert**; they have "now time" data on weather, airports, and traffic situation
- **OpSpec C067** (FOM 4.30.5) Flight may be dispatched w/o alternate if: Destination forecast wx @ ETA to be at or above landing mins and two hour fuel reserve added.

First flight or airplane change items: Fire Tests, CVR, Boeing Door, WX radar/PWS, O2 Mask Stab Trim Cutout Switches. (FM 0.20.1)

DEPARTURE BRIEFING (Use Briefing Card)

• PREFLIGHT CHECKLIST (FM 3.20.39)

Before Push Flow/Checklist Sequence: (FM3.30.1-4)

1. **FO**: initiate flow when gate agent confirms boarding is complete (hydraulic pumps on ≥ 2800 psi)
2. **CA**: calls for checklist when purser gives cabin ready/All doors closed

3. Before push checklist complete then Transponder: ON
4. Once pushback clearance is received: Anti Collision switch and Sterile light switch: ON

- **Engine Start**: Min Oil Qty 70% (FM 1.30.15)
- **Starter duty cycle**: **On**: 2 min NG/3 min MAX: min 10 seconds **OFF** between start attempts. (FM 1.30.13)
- Key start **events**: starter valve OPEN, N2, N1, OIL PSI rising, FF, EGT (within 15 sec.; hot start 725°C NG/ 753°C MAX), starter cutout 56% NG/63% MAX, OIL PSI by Idle. The engine is stable at idle when EGT start limit redline is no longer shown. (FM 3.50.4)
- Max Motoring N2 < 1% in 5 seconds (FM 3.50.3)
- **High altitude starts above 5,000'**: An indication of N1 rotation, plus max motoring and a min. of 20% N2 are required prior to introducing fuel to the engine. (FM 5.60 Sup)
- **Engine Start-First Flight of Day**: If the temperature is below 5° C/41° F. Ignition select switch to both (FM 5.60 Sup)
- 3 min for engine warm up before advancing thrust lever to high power. 5 min if not flown in the past 5 hours. (FM 3.50.1)
- MAX: min oil temp is 31°C for T.O. (FM 3.50.1)

• TAXI

- SMGCS: In effect when RVR below 1,200 ft., SMGCS or foreign equivalent chart is required for RVR<600. RVR is not controlling for taxi operations. (FOM 6.10.4)
- Hold Short ILS Critical Area <800/2 Miles
- Speed above 20Kts use caution to avoid over-controlling with the tiller. (FM 3.70.6)
- Straight taxi speed should not exceed 30 kt: 10 kts turn off on dry runway (FM 3.70.6)

• TAKEOFF PERFORMANCE: (FM 7.20)

- **Sabre Flight Plan Manager**: Final Weight Manifest is automatically sent to the ACARS printer along with the PERF INIT uplink when weights are finalized. Sabre applies MEL/CDL Penalties, WX, R/W Clutter, Bleed Config, and uses unbalanced field length for calculations. (Defaults are: Dry R/W, Bleeds On: defaults must be manually changed.)
- Sabre uses actual conditions to calculate engine failure (EO) accel heights. Small changes can affect the EO accel height published on the 10-7 page or the ACARS
- **Engine Failure on T.O. Procedures provided on T.O. Data message is the most current and should be used if different from the procedures on the airport information pages (10.7 etc).** (FM 7.20.16)

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TAKEOFF PERFORMANCE Continued:

- Anti-ice data is required when engine anti-ice will be used for T.O. or used prior to EO accel height. (FM 7.20.12)
- Possible T.O. Flap Settings: 1, 5, 10, 15, or 25 (FM 7.20.14)
- **Max tailwind:** Up to 15k provided the actual T/W component does not exceed the value authorized by ACARS TAKEOFF DATA MESSAGE. No interpolation is allowed for tailwind. (FM 7.20.15)
- Partial runway codes N/A for 737 on TAKEOFF Data Message (FM 7.20.16)

NO REDUCED THRUST WHEN: (FM 7.20.11)

1. Gusty winds and strong crosswinds
 2. Reported or suspected windshear
 3. Snow, slush standing water penalty applied
 4. MEL/CDL restriction prohibits the use
 5. MRD displays a message stating MAX THRUST TAKEOFF DUE.
- (When using "assumed" temp, throttles are set to reduced thrust; the bugs will **always** show max. thrust)

Max Rec. CW: T.O. Split Scimitar:

- *R/W Condition Code 6: "Dry": 33 kts
- *R/W Condition Code 5: "Good": 25 kts
- *R/W Condition Codes 0-4: Look up in FM. (FM 1.20.7)

Request new T.O Data (FM 5.40.21)

- Using Max Thrust & actual OAT is greater than TEMP.
- Using reduced thrust and actual OAT is greater than ASSMD TMP.
- Altimeter decreases by 1hPa or .03".
- diff. between FWM CG and T.O. REF page exceed 3 points (ex 21% to 24.1%)

Capt. must contact Dispatch: (FOM 4.10.4)

- Actual T.O. weight >2,000 lbs. than Flight Plan
- Actual T.O weight exceeds M1 ENRTE ATOG (if planned Method 1)
- CALL DD on FWM.

ORDER OF TAKEOFF BUGS: (FM 8.100.40.7)

- 5 bugs displayed by FMC
- V1 [1] (Go / No Go, call "V1" at 5K prior
- VR [R] ("ROTATE")
- V2 Command Speed (Magenta Bug)
- V2 + 15 [white bug]
- Flap Maneuver Speed

VNAV shall not be armed on the ground:

- If the engine failure procedure requires: Completion of a turn to a specific heading or established on a defined lateral course before accelerating. (FM 5.40.8)

• **Note:** L2 entries, and/or the selection of VNAV, *cannot be made until all entries are made into the PERF INIT page.* (FM 5.40.9)

TAKEOFF:

LOW VIS TAKEOFFS: (FOM 6.40.2-3)

- See LOW VIS takeoff minimums on Jepp plate 10-9A
- No lower than 500 RVR
- FO Takeoff Limitation: T.D. Zone RVR 1000', Rollout 1,000', Mid can substitute for an unavailable T/D or rollout. (FOM 14.10.7)
- Contaminate R/W or braking action less than medium Captain should consider performing the takeoff. (FM 3.90.17)

• Exterior lights ON when cleared to "line up and wait".

RUNWAY ALIGNMENT: When lined up on the departure runway, both pilots will verify the AC symbol on the ND MAP display is on the assigned RW and that the aircraft and RW heading agree. (FM 3.90.2)

• **Stabilize N1:** approximately 40%, then manually advance the thrust levers toward the takeoff thrust setting; when satisfied engine acceleration is normal (near vertical position) engage TOGA.

• "Check Thrust", THRUST SET xx %"(N1)

• "100 kts", now reject **only** for "Engine Failure, Fire Warning or unsafe to fly"

• "V1", committed to Take off, hands off Throttles until "Gear up Call" (FM 3.90.3)

• "Rotate" at 2-2.5"/sec, 15° pitch, maintain V2+20k (FM 3.90.4)

- Rotate S – L – O – W and **visually** look at the end of the runway for correct rudder correction.

- limit bank to 15° until V2+15 (White Bug).

• **At 400ft RA**

Heading engages if VNAV was selected on the ground and LNAV was not used for the departure procedure.

- try to delay turns until 400' AGL (50' minimum for obstacles, engine out, noise abatement, adverse conditions)

• **At Acceleration Altitude:** (Standard: NADP 2 is 800'), approx. 10° pitch, call **VNAV** (if not selected on the ground) **OR**, if VNAV is not available or not desired: "LVL CHG, Set Clean Maneuvering Speed, Flaps____." Retract Flaps on Schedule.

• "Flaps UP: After Takeoff Check", climb at VM 0 until 3,000' AFE

-A/P may be turned on **above** 400' AFE

• At 10,000ft or when cleared by ATC select "ECON CLIMB" when ready to accelerate (assuming L3 climb set).

• **NADP-1 Noise Abatement:** Need to check THR reduction and Accel HT on FMC Takeoff Ref page 2/2. Should uplink (FM 3.90.8)

1500': Thrust Reduction

3000': Accel HT: Aircraft accelerates

CALL: AFTER TAKE-OFF CHECKLIST

• Flap retraction altitude is no lower than 3000 ft AFE for NADP-1 or 800 ft AFE for NADP-2. Higher acceleration altitudes may be displayed on the Takeoff Data Message. (FM 3.90.16)

REJECTED TAKEOFF:

- **Below** 100k (any abnormality should be announced: e.g., system failures, configuration, fire or smoke, wind shear, etc.)
- **After** 100k reject only for **Engine Failure; any fire indication; unsafe/unable to fly; PWS warning or caution.**
- **Captain** calls "REJECT"; and:
 1. Closes thrust levers,
 2. Disconnect A/T,
 3. Use RTO autobrakes (if available),
 4. Raise the speed brake lever,
 5. Apply maximum Reverse Thrust.
- Stay on the runway, **hold** brakes
- **F/O** call **Tower**, and **PA** to "remain seated, remain seated"
- Captain call's for "REJECTED TAKEOFF Checklist":
- consider brake cooling/engine fire/evacuation.

ENGINE FAILURE/Shutdown Procedure:

(FM 26.20.17)

- **ENGINE FAILURE**, maintain track (rudder), slow pitch up to 7-11°, positive rate, gear up, silence bell, V2 (orange bug) to V2+20k...
- **At 400'**: "HDG SEL", Fly appropriate ground track (add approx. 5 units of rudder trim toward the good engine.
*If **FIRE** is indicated, the appropriate Checklist may be called for by the FP and executed by the PM aircraft is under control, gear retracted and a safe altitude has been obtained (minimum 400 ft AFE) (FM 6.20.20)

• **At Acceleration Altitude:** VNAV will accelerate: if VNAV was not used "SET CLEAN MANEUVERING SPEED"

- Retract flaps on schedule,

• "Flaps up" (next call **after Vmo is reached**)

• "SET MAX CONTINUOUS THRUST, ENGINE FAILURE Checklist." (15° bank until V2+15)

-Declare **EMERGENCY**, sq. 7700

- **Failure in turn:** YOKE first, then RUDDER.

- "Do not" accept a vector until **1500 feet AFE, or follow the Engine Failure procedure track and altitude if published.** (FOM 6.20.20)

WINDSHEAR Takeoff: See Supplementary Flight Procedures Section

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CLIMB/ENROUTE

10,000' MSL: CA announces cabin altitude (FM 3.10)

FL 180: Fuel Panel Check (PM) (FM 3.110.3)

AP must be operative and engaged during level cruise in RVSM Airspace. (FL290 up to and including FL410) (FM 3.10.4)

Required Dispatch Reports (FOM 4.50.7)

1. Actual ETA > 15 minutes from planned.
2. Cruise altitude varies by 4,000' or more from the flight plan
3. Lateral deviation from the planned route exceeds 100 miles
4. Any enroute failure of a flight deck fuel quantity indicator
5. Apparent all Contingency Fuel will be used
6. Flight encounters weather significantly different than forecast or any time moderate or severe turbulence is encountered.
7. The flight is assigned enroute or arrival holding.
8. Unplanned or sustained use of deicing/anti-icing systems
9. Assigned a CDR
10. ATC initiated call sign change

Turbulence: When FA's are to be seated the command **must** be given over the PA (FOM 7.10.3)

- "Flight attendants, take your jumpseats" gives FA's 5 minutes. If sooner than 5 minutes "Flight Attendants take your jumpseat in X minutes."
- Impending: "FA's, take your jumpseats" FA will stop service, move carts to a safe location and take their jumpseats.
- Unexpected: not enough time to return to FA J/S: "FA be seated immediately, be seated immediately". FA stop, drop and hold on.
- FMC: INTC CRS always type **inbound** course, **not** radial.
- Crew Oxygen: (FOM 3.60.5)
 - Above FL 410 one pilot must don & use O2 mask.
 - Cabin altitude **over** 10,000': **both** pilots wear masks.
- DIVERSIONS: to change destination station.
 - FMC RTE page / ACT RTE page 1/3 - ACARS / INFLIGHT / DIVERSION page –
 - Be sure to figure "**bingo** fuel"
Burn **A**lternate **R**eserve

DESCENT

• "FA, please prepare the cabin for landing" (5 minute narrow body: 10 minute wide body to complete cabin checks and be seated) (FOM 3.100.3)

• **OFF indicates Bleeds off Landing:** bleeds off landing is required unless coordinated with dispatch. APU supply pressurization prior to glide slope Intercept altitude. (FM 5.10.2)
-prior to commencing the approach no later than the FAF. (FM 5.20.2)

• **Landing distance must be checked:** (FM 3.130.4)

1. Landing at other than planned destination
2. Available R/W < 9,000 ft.
3. Reported Braking action < dry (Code<6)
4. Using autobrakes < 3
5. Non-normal affecting stopping distance,
6. Landing with a tailwind
7. Engine inop: for missed approach proc.

ARRIVAL BRIEFING - (See/use Briefing Card)

• WBBBBBA: Weather, Build, Bug, Brake, Brief, Descent Checklist.

• ACARS Landing data accounts for MEL/CDL items that have been deferred by Tech Ops. Applicable MEL/CDL items are listed on the Landing Data message. (FM 3.130.4)
Normal land flap 30 (FOM 3.130.5)

TARGET SPEEDS: (FM 3.130.6)

• VREF + 5 (1/2 steady state headwind component + full gust, not to exceed 15 knots or flap placard minus 5 knots if lower)

ORDER OF LANDING BUGS (5): (FM 3.130.6)

• **REF** for landing: Normal is VREF 30: *S.E. is VREF 15.*

• **Target** (Command Speed): +5 min, +15 maximum; this is your S.E. go-around speed.

- Using A/T for auto land, add **only** +5
- Use VREF+5 knots for any reported tailwind.

• **[White Bug] VREF + 20k** (800/900) **+15** (700)
- This is your "**go around**" speed with **both** engines and your SE landing config. speed.

Reference Airspeed Bugs: (FM 3.130.6)

• **VM:** Flaps 0 [UP]=Vref 40+70
Flap 1=Vref40+50
Flap 5=Vref40+30
Flap 15=Vref40+20
Flap 25=Vref40+10

FINAL APP. SEG. (FAS): (FOM 6.100)

• FAS = Final Approach Segment (FAF = Final Approach Fix).

• ILS = at "published" Glide Slope Intercept Altitude (GSIA) (**or** at glide slope intercept if **lower** than the GSIA).

• NP = at FAF (if no FAF, then at point where PT intercepts the inbound course).

• **Must have approach minimums to start** approach. Note: **no** "look see" option!

• If **after** FAS, visibility goes below minimums, **may continue** to DA / DDA / MDA and land if

inflight visibility is OK on CAT I & CAT II. CAT III must have required RVR to land.

GENERAL APPROACH GUIDELINES:

No RNAV substitutions for LOC or LDA approach, but can be for VOR, NDB, DME or TACAN. (FOM 6.100.15)

• **STANDARD APPROACH CALLOUTS** (FM 3.10.1)

- Cleared for the approach no later than **2500 RA: PM/FP** "____ in/hPa"

- **Auto/PM:** "1000" RA - FP: "Set missed approach altitude, Cleared to land (runway)"

-OR- "No landing clearance"
- **AUTO/PM** "500" RA - PF "Stable" or "Unstable going around" / "Flare armed, stable" (AL)

- **PM** "Approaching minimums" (DDA / MDA + 100')

- **Auto/PM:** "Minimums" PF "Landing" or "Going Around"

• **disengage A/P** by 50' agl on ILS/GLS: 50 below DA / DDA / MDA on non-precision.

• **disengage A/T** before 50' AGL.

Stabilized APPROACH Guidance: (FOM 6.80)

• **By 1500 ft. AGL/RA or the FAF**

-Landing gear down

-Airspeed no greater than 180 KIAS

• **By 1000 ft. AGL**

-Final landing configuration

-Landing checklist complete

-Airspeed +15 to -5 knots of target speed

-On lateral profile

-On vertical profile, or correcting with bracketing maneuvers, not to exceed:

*+/- 300 FPM

*+/- 1 degree

*sustained V/S > 1200 fpm

-PM shall announce deviations

• **At or below 500 ft. AGL/RA:**

-Except for momentary airspeed and descent rate deviations, PM announces "Go around" and reason (i.e. "flaps")

• All approaches are based on **RVR/Vis**; unless noted, ceiling is advisory. (There are **different** minimums if TDZ, CL, or ALS are **inop!**)

• "Basic" RVR governs and overrides tower visibility: ex: "RVR 2400, variable 1100, tower vis ¼" = you are legal to land based on RVR.

• Must have visibility to **initiate** approach. (If visibility goes below minimums **after** FAF, continue to DA/ MAP.) (FOM 6.100.)

• Use proper Category for Straight in Approach (C/D), all Circling Approaches are Category D. (FM 1.20.1)

• For **Circle to Land Maneuver:** Use the higher of category D minimums or 1000 ft. HAA and 3 sm. (FOM 6.100.3)

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GENERAL APPROACH GUIDELINES Continued:

- Low visibility approaches: approaches with visibility minimums less than CAT I. Autoland app. procedures are required and the approach with the lowest minimums the aircraft & pilots are authorized to conduct must be briefed. (i.e.: Cat III even if Cat II is legal) (FM 3.165.1)
- Autoland Approach Briefing [hyperlink](#)
- If conditions are below 4000 RVR or ¾ mile visibility, Autopilot, or F/D in the approach mode is required. (FOM 6.100.1)
- Do not use level change on approach below 1000 ft AFE (FM 3.150.2)
- Items to brief: Use Briefing Card!!
- Considered "ON" Final Approach Course (to start descents): ILS/VOR: within 1 dot
- You should be 200' AGL over the end of the strobes (about 1/2 mile from the end of the runway), and 50' AGL over the threshold.
- Jepp plate DA (H): DA = decision altitude (H) = HAT
- Monitor/Verbalize FMA for capture modes!

ILS/GLS Approach:

- Downwind, "FLAPS 1"; base leg "FLAPS 5,
- "CLEARED" for the approach AND on intercept HDG (within 30° hdg): arm "APP"
- At 11/2 dots below G/S: "GEAR DN, FLAPS 15"
- At G/S capture: "Set TDZE":
- By 1,000' agl Flaps "___" Landing Checklist
- At 1000' agl "Set missed approach altitude" "Cleared to land /No landing Clearance"

- CAT I: If you see **strobes**, may continue to 100' above TDZE, but **then** must have visual reference to land **or you must go around**.

ILS PRM: Precision Runway Monitor (FM3.167.1)

- Brief Jepp page and required Equipment
- #1 VHF on "Tower", #2 VHF on "Monitor";
- TCAS on "TA/RA" unless contrary to Jepp PRM instructions.
- A/P, if available must be used until visual condition.
- Hand fly "Breakouts": Do **not** push TOGA, A/P **OFF**, A/T **ON**, configure **after** established on new heading. PM turn FD's off, reset MCP (HDG, ALT, FD's on, LVL CHG, HDG SEL).
- **CAT II / III Autoland CRITERIA:** The Captain is controlling the autopilot during the approach and performing a Coupled Autoland.
- Use Autoland FM [hyperlink](#)
- CAT II, you must have visual reference at DH, which is 100' above TDZE .
- **Autoland (Flap 30/40)** = use **both** A/Ps: "A" A/P 1st, "B" after "APP" mode is armed; Go Around = TOGA, call for flaps, gear, monitor A/P.
- "A" A/P is now the master.

- Suggestion: Flaps 40°, seat up, landing lights off: may provide additional ability to view the landing environment on a low vis app.

NON ILS/GLS APPROACHES:

- **Below 1000/3:** A/P must be used on NPA. (FOM 6.100.9)
- **RNAV (RNP) App:** A/P is **mandatory** from IAF to DA **regardless** of WX except:
 1. Runway in sight. A/P should be used on RF leg. Fly published Lateral and Vertical path.
 2. Parallel runways: A/P can be disconnected when R/W in sight **and** aligned with R/W centerline. (FOM 6.100.9)
- **RNP AR (MAX) operations with minima below .3 NM are prohibited (FMC U14.1) (FM 1.30.21)**
- **BASIC FMC SET-UP:**
 - Verify CRZ ALT was achieved.
 - Select procedure and transition.
 - Verify (GPx.xx) is available.
 - If RNP is controlling, refer to approach plate for appropriate value. Manual entry may be required. (.3 RNP to as low as 0.10 RNP.)
 - If temp < -15°C refer to FOM cold temperature altimeter corrections – N/A for RNP approaches.
 - Distance rings from FAF, as desired.
 - VREF select.
 - WIND CORR select (if other than +5 knots).
 - Set DA or DDA (MDA+50 feet).
 - **RNAV (RNP): QRH Setup**
 - **R**adios: Inhibit all VOR & DME updating from NAV OPTIONS page 2, prior to IAF.
 - **N**otams: If dispatched for approach, verify RAIM prediction in flight papers or via ACARS.
 - **A**ltimeters: Set local, +/- 100 feet and verify CA and FO altimeters are within 100' before passing FAF, 2 Radar Altimeters required.
 - **V**erify GPS updating from FMC NAV STATUS page 1, prior to IA. **R**NP manually set per approach Plate (as low as 0.10 NM)
 - RNP >= 0.15 NM can be hand-flown.
 - RNP < 0.15 NM **two autopilots** required to begin the approach. **N**avigate on 10 NM scale or less (if appropriate). **P**ROG page 4: Monitor
 - XTK ERROR not to exceed RNP value left or right of course (IAF Inbound).
 - VTK ERROR not to exceed 75' from the PDI inside the FAF. **N**otes: V/S backup N/A.
 - *Execute missed approach if: UNABLE REQD NAV PERF –RNP.*
 - *FMC DISAGREE, or any VERIFY POSITION alert message from IAF inbound or continue visually if runway in sight.*
 - *Loss of LNAV or VNAV path guidance on both displays and runway NOT in sight (FAF inbound).*

- Cleared for the Approach (outside IAF) **with LNAV/VNAV (path) engaged** set FAF altitude. Once inside IAF set "TDZE", to the nearest 100 feet above in the MCP window.

- **RNAV (GPS, GNSS, VOR, or NDB substitution procedure):** Manually set RNP 0.30 NM. (FM 3.172.8)

- Navigate on 10 NM scale or less (if appropriate).
- PROG page 4: Monitor XTK ERROR < 0.3 NM (IAF inbound)
- **VOR, LOC, LDA, SDF, NDB:** Raw data, if available, must be monitored.
 - LOC BC app. not authorized. (FM 1.30.22)
 - When unable to monitor raw data on the Final Approach Segment (F.A.S.) of a VOR or NDB approach: VOR & NDB F.A.S procedures as outlined in the FOM must be followed.
 - If "VNAV SPD" shows, select PATH on Descent page; VNAV will revert to VNAV PATH at GP intercept.
 - Will GP cross at or above step down fix? If not, use VS to cross Restriction. **DO NOT** add ANY fixes after FAF!
 - Approach must show "gradient path" (GP) or **cannot** use VNAV

TRAFFIC PATTERN: Non-ILS/GLS

- Downwind, "FLAPS 1"
- Base or IAF outbound, "FLAPS 5"
- When "cleared" for the approach and on intercept heading (within 30°)

LAVSFT:

- **Lateral:** Lateral VOR/LOC or LNAV
- **Altitude:** TDZE if VNAV Path or FAF/FAP/GP Intercept if not above.
- **Vertical:** VNAV or verify Crossing Restrictions.
- **Speed:** Speed Inter (if installed) may be used.
- **FMA's:** Confirm FMA's match briefed mode
- **TDZE:** Set TDZE once established on app.
- Approach must show "gradient path" (GP) or **cannot** use VNAV
 - If **no** GP, use pre-briefed VVI rate on MCP (Vert Spd = VS)

Suggestions when VNAV is not available:

- No greater than 1000 fpm below 1000' AGL
- At LOC/LNAV capture and ALT HOLD, **set** the next altitude for step down.
- **4 mi from FAF: "Gear Dn, F15, verify LNAV-or - VOR/LOC is engaged, Verify appropriate altitude on MCP (FAF Altitude if not in ALT Hold or DDA rounded up if in ALT Hold) 2 mi from FAF: Flaps 30 or 40, Target "Landing Checklist"**
- At FAF & cleared app: verify MCP to DDA rounded up and VS to briefed VS for descent.

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- **Single Engine:** at G/S capture: "GEAR DOWN, FLAPS 15, LANDING CHECKLIST"; Target is VREF 15 + additive

Engine Failure ON FINAL Approach: (FM 6.20.28)

- AP / AT OFF, "FLAPS 15", Thrust up, (approx. 15%) VREF + 15k (700): VREF +20k (800/900.) "WHITE BUG", GPWS inhibit. If stable may continue to landing OR if unstable: Normal single engine go-around will be accomplished.
- Visual single engine glide path: 300'/mile ratio (ex: 6 mi = 1800' AFE)

• MISSED APPROACH

- **Must go around if:** at minimums and cannot land, or at or below 500' AGL outside Stabilized Approach Criteria.
- **GPWS:** Anytime you get a "whoop - whoop pull up, terrain, or configuration" warning you **must** do a go around.
- ** May disregard GPWS warning if **above** 500' agl day VMC: for all **other** GPWS warnings, you perform escape maneuver until warning stops.

Normal Go Around:

- "Going Around, Flaps 15, Check Thrust,
- "Positive Rate, Gear Up, Set MA Altitude" (fly White Bug)
- At 400': "HDG SEL" or "LNAV"
- At 800': "LVL CHG, SET CLEAN MANEUVERING SPEED, FLAPS 5" (retract flaps on schedule)
- After T/O Check"

(800-9ER/MAX) ALT. GO-AROUND:

(FM6.40.1)

- Dual Channel A/P approach approved
- Plan Flaps 30 landing with a flaps 5 go-around if required.
- Follow normal go around procedures except, when going around, call "Flaps 5."

- Single Engine Go Around:

- "FLAPS 1, CHK THRUST,
- POSITIVE RATE, GEAR UP, SET MISSED APPROACH ALTITUDE"
- At 400'... "HDG SEL"
- At Obstacle Clearance Altitude (minimum 800'): "SET CLEAN MANEUVERING SPEED"
- "FLAPS UP"
- "SET MAX CONT. THRUST, ABBREVIATED AFTER T/O CHECKLIST" (15° bank to White Bug).

• LANDING INFORMATION

FO landing limitation: RVR 1800 or ½ mile visibility. (FOM 14.10.7)

• Max recommended crosswind: Landing Split Scimitar Wing

*R/W Condition Code 6: "Dry":37 kts

*R/W Condition Code 5: "Good":37 kts

R/W Condition Codes 0-4: Look up in FM. (737 FM 1.20.7&8)

• LAHSO (ops spec A027) information on 10-7 page. (FOM 6.80.4)

• Taxi, Takeoff and Landings are prohibited if braking action is 0 or RWYCC of 0. (FOM 7.20.1)

c You may tend to flare too high if the R/W width is less than 200' due to depth perception.

Short Field or Contaminated Runway procedure. (FM6.40.7)

• Runway <7500 ft or when braking action is expected to require most of the available runway.

- Touchdown 1000 ft from the threshold with minimum flare and maximum deceleration.

- If landing will occur beyond 1500 ft a go-around is required.

- Flaps 40: unless gusty winds or Alternate Go-Around procedure are to be used.

- Dry runway: autobrakes 3 or MAX. For other than dry runway use auto brakes MAX.

- Stay on vertical path until approximately 200 ft RA, then shift aiming point toward runway threshold.

- Can request F41 data at specific airports when noted on OFP. "grooved runway" Only authorized at specific airports noted on the 10-7 page or company NOTAMs.

-

WINDSHEAR Approach and Landing: See W/S Escape Maneuver in Supplementary Flight Procedures Section.

• **Engine Cool Down Period:** 3 minutes, only exception is that engines can be shut down after parking regardless of cool down. (FM 3.210)

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EMERGENCIES

GENERAL: (FOM 2.10.1)

- IF possible: F/O flies on A/P and handles routine ATC comm, Capt. manage problem.
 - Declare an emergency IF:
 - Critical system redundancy is lost
 - Engine Failure/shutdown
 - Engine, APU, cargo or wheel well fire
 - Persistent smoke or fire on board
 - Emergency Descent
 - Cabin prepared for evacuation
 - Non-normal situation requiring more time in a critical phase of flight.
- Give ATC:** Reason, Fuel (in minutes, ex.: 17.3 = 173 minutes), SOB, Sq. 7700
- Notify the Company and FA of emergency
 - Irregular Ops Report (IOR) (FOM 12.30.1)
 - On any non-normal, always call for "QRC first (if item is on QRC, then) or QRH checklist"

QRC ITEMS: All Caps have immediate action items:

1. Rejected takeoff
2. APU Fire
3. Cargo fire
4. LOSS OF THRUST IN BOTH ENGINES
5. ENGINE FIRE OR ENGINE SEVERE DAMAGE OR SEPARATION
6. ENGINE OVERHEAT
7. ENGINE LIMIT OR SURGE OR STALL
8. ENGINE STAR-ABORTED START
9. Driftdown
10. AIRSPEED UNRELIABLE
11. SMOKE, FIRE, OR FUMES
12. CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION/EMERGENCY DESCENT
13. FLIGHT DECK DOOR EMER ENTRY ACTIVE LIGHT/AUTOMATIC UNLOCK
14. RUNAWAY STABILIZER
15. Evacuation

IMMEDIATE ACTION ITEMS: (FM 0.30.7)

- The pilot who notices the abnormality announces the condition, from memory, all pilots accomplish the items in their areas of responsibility:
 - On the ground without delay
 - In flight when the altitude and flight path are stabilized, and no lower than 400 feet AFE

APU FIRE

1. APU fire switchCONFIRM.....PULL, ROTATE & HOLD
 - Rotate to the stop and hold for 1 second
2. APU switch.....OFF

LOSS OF THRUST IN BOTH ENGINES

1. Engine start switches (Both)FLT
2. Engine start levers (Both)CUTOFF
3. When EGT decreases:
 - Engine start levers (both)IDLE DETEND

Notes:

- Really have dual engine flameout?-OR- loss of 2 Generators!!
 - N1 and EGT gauges spool down, "Low Oil PSI" lights up...
 - If in **doubt**, push Thrust Levers up to see if you get a response!

ENGINE FIRE OR SEVERE DAMAGE OR SEPARATION

1. Autothrottle (if engaged).....Disengage
2. Thrust lever (A/E)Confirm.....Close

ENGINE OVERHEAT

1. Autothrottle (if engaged).....Disengage
2. Thrust lever (A/E)Confirm.....Close

ENGINE LIMIT OR SURGE OR STALL

1. Autothrottle (if engaged).....Disengage
2. Thrust lever (A/E).....Confirm.....Retard

ENGINE START -ABORTED START

1. Engine start lever (A/E).....CUTOFF

AIRSPEED UNRELIABLE

1. Autopilot (if engaged).....Disengage
2. Autothrottle (if engaged).....Disengage
3. Flight director switches (both).....OFF
4. Set the following G/U pitch att. and thrust:
 - Flaps extended.....10° and 80% N1
 - Flaps up.....4° and 75% N1***On T.O: maintain T.O thrust and 15° Pitch until accel altitude.*

SMOKE, FIRE OR FUMES

1. Oxygen masks and regulators ... ON, 100%
2. Crew communicationsEstablish

CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION / EMERGENCY DESCENT

1. Oxygen masks & regulatorsON, 100%
 2. Crew communications..... ESTABLISH
 3. Seatbelt sign ON
- Emergency Descent: If structural integrity in doubt, limit airspeed.
 - Descent gouge "CONT, Spin, LVL CHG, Pull, Pull, Advise"
 - Ignition to CONT; SPIN, MCP to 10,000' or MEA; Select LVL CHG, descend at VMO/MMO; Pull Thrust Levers to Min, Pull Speed Brake to Flight Detent, Advise ATC

FLIGHT DECK DOOR EMER ENTRY ACTIVE LIGHT/AUTOMATIC UNLOCK

JAMCO FLIGHT DECK DOOR

- Flight Deck Door HARD LOCK Switch ...Push

BOEING FLIGHT DECK DOOR

- FLT DK DOOR lock selectorRotate to DENY and hold for 1 second

RUNAWAY STABILIZER

1. Control column.....Hold firmly
2. Autopilot (if engaged).....Disengage
3. Autothrottle (if engaged).....Disengage
4. Control column and thrust levers.....
 - Control airplane pitch attitude and airspeed
5. Main electric stabilizer trim.....Reduce control column forces
6. Choose one:
 - ØThe runaway stops after the autopilot is disengaged
 -
 - ØThe runaway continues after the autopilot is disengaged:

STAB TRIM CUTOFF SWITCHES (both).....CUTOFF

- If the runaway continues:
 - Stabilizer trim wheel..Grasp & hold

EMERGENCY SIGNALS:

- When a T.E.S.T briefing is required, alert lead F/A via interphone or PA. Once briefed, the lead F/A will relay the briefing to the other F/A's and assign responsibilities

"T-E-S-T": Type of emergency, Evacuation (if necessary?) Special Instruction, Time to land.

- Brace signal + 30 secs: "BRACE! BRACE! BRACE!"
- PA "REMAIN SEATED, REMAIN SEATED" = Do not evacuate

EVACUATION COMMAND:

- PA "RELEASE YOUR SEATBELTS AND GET OUT" (F/A will specify which exits to use)

TRANSPONDER:

- Hijack: 7500 (do NOT use 7700)
- Lost COMM: 7600 (stay VFR & land, or fly last clearance)
- Emergency: 7700 ("Declare Emergency")

SECURITY: (FOM 11.10.1)

- Inflight Disturbance: OSIR report any time Law enforcement meets the aircraft.
 - Inflight Security Coordinator is **Captain**.
 - Ground Security Coordinator is **Station Duty Manager**.
 - Sabotage: (FOM 11.50.1)
 - BOMB ON BOARD (FM 2.05.3)
- Least risk bomb location: centered right aft galley door (2R)

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SUPPLEMENTARY FLIGHT PROCEDURES:

WINDSHEAR: (FM 5.10.47)

When the words "microburst," or "shears of 30 kts" or > are being broadcast, T.O. and descents below 1000' AGL for the affected runway are prohibited. Execute a M.A. if below 1000' AGL. (FM 5.10.52)

Windshear: Takeoff :

• **Use:** longest runway, flaps 5, 10, or 15 unless limited by obstacle clearance or climb gradient, full thrust, Flight Directors "ON", use higher VR MAX on ACARS T.O. DATA (FM 5.10.48)

Committed to takeoff, and windshear is encountered prior to the actual gross weight (GW) VR: Accelerate to the actual GW VR, but do not delay rotation beyond 2000' usable runway remaining. (FM 5.10.49)
(Ref: last 3,000' R/W centerline lights alt red/white, 2000' R/W edge lights amber, last 1000ft centerline lights all red. (Use these lights as reference in windshear conditions)

Windshear: Approach and Landing:

• Target speed for the approach will be based on the surface wind additive or the reported loss, whichever is greater, not to exceed VREF+15. (FM 5.10.50)

• ex: "reported Loss of A/S on final 10k":
- H/W 12G20 = +14 target; Target is +14
- H/W 12 = +6 target; Target is now +10 for A/S loss

• Enhancements / Reactive = "windshear" on Grnd. Prox. test
• Predictive = "W/S ahead" on radar test

• **Windshear ahead** = avoid, go around (trim and clean up)

• **In Windshear: No Config changes, perform Escape Maneuver ++**

• **Windshear Escape Maneuver:** (FM 5.10) "MAX THRUST, STOW SPEEDBRAKE",

• **With A/P and A/T engaged:** Press TO/GA, verify: TO/GA on FMA, GA thrust set, retract speed brakes, and monitor A/C perf.

• **Manual Flight:** Press TO/GA, aggressively apply Max Thrust (Mech. stops), disconnect A/T, simultaneously roll wings level and rotate toward an initial pitch of 15°, retract speed brake, follow F/D TO/GA (if available).

-Do not change trim or configuration until w/s is no longer a factor. -Monitor vertical speed and altitude - Do not attempt to regain lost airspeed until W/S is no longer a factor.

- **CFIT / "TERRAIN: "MAX THRUST, STOW SPEED BRAKE" (FM 6.40)**

AT / AP off, roll level, 20° pitch, keep gear and flaps, call out any trend toward terrain contact. When clear of terrain, slowly decrease pitch and accelerate.

UPSET RECOGNITION & RECOVERY (FM 6.40):

Undesired Aircraft State:

-Pitch > 25° nose up

-Pitch > 10° nose down

-Bank angle > 45°

-Less than the above, but flying at an airspeed inappropriate for the conditions.

Recovery Strategy:

"Upset"

Autopilot and Autothrottle disconnect

"Push" - until light in seat

"ROLL" - to orient lift vector

"THRUST" - to manage energy state

"STABILIZE" - to attain control and desired state of flight

SUPPLEMENTARY INFORMATION:

Operating Priorities: Safe, Caring, Dependable, and Efficient. (FOM 1,10)

CRM/TEM - CUS Words: Concerned, Uncomfortable, Safe. (FOM 3.20)

Max Cooling On Ground With APU Running: (FM 5.10.20)

- APU Bleed Air Switch: ON

- Isolation Valve: Open

- Pack Switches (Both): High

- Recirculation Fan Switch: Auto

- Temp Selectors: Auto Cool

ORCA Operations: Oceanic and remote continental airspace operations

• Use ORCA procedures outlined in (FM Section 4)

Below 2,500 AGL: PF (FOM 3.60.6)

-One hand on the throttles

-One hand on the Flight Controls

-Feet on the Rudder

HOLDING NOTES:

• "Standard" = Right turns

• Must start to slow down within 3 min. of fix. VNAV will slow down for you.

(Should receive holding instructions within 5 minutes)

• **Speeds:** MHA thru 6000' = **200k** max;

> 6000' thru 14000' = **230k** (210k where published);

>14000' = **265k**

• **Inbound times:** 14,000' or less = **1 min**; over 14,000' = **1 1/2 min** (Adjust Outbound time)

- Small box with number is published time in minutes for pattern.

• **Call:** "Position, Time (Z) and Altitude" upon entering hold.

• If no pattern charted and no instructions, hold **standard pattern (Right)** on **inbound course** to fix, at **last assigned altitude**.

• Be sure to figure "bingo fuel" to start diversion! (Burn + Alternate + Reserve)

• Send a message to Dispatch

Memory Recall Limitations (FM Section 1)

***Max Operating Pressure Altitude:** 41000

***Max Tailwind: T.O. and Landing:** 15 Kts

***Recommended Severe Turbulence**

Penetration speed:

-Cruise: Turb. N1 Setting from Cruise page

-Climb & Descent: 280kts/.76 Mach

***Crosswind Limitations:** Blended Winglet/ Split Scimitar Winglet:

• **Takeoff:**

*R/W Condition Code 6: "Dry": 34/33 kts

*R/W Condition Code 5: "Good": 25/25 kts

• **Landing:**

*R/W Condition Code 6: "Dry": 40/37 kts

*R/W Condition Code 5: "Good": 40/37 kts

***Ice and Rain Limitation:** (visible moisture)

-OAT 10 degrees or below on ground

-TAT 10 degrees or below in flight

***Autoflight limitation:**

1. Takeoff or missed approach do not engage autopilot below 400' AGL

2. ILS/GLS, no autoland: 50' AGL

3. Non-precision: 50' below MDA/DA

*Do not use LVL CHG on final approach below 1000 feet AFE. (AUTOFLIGHT PARAMETERS)

***Auto-land Max winds Flaps 30 and Flaps 40, wind including gust.**

Head wind: 25 Kts

Crosswind: 15 Kts

Tailwind: 10 Kts***

***737-900 Aircraft 401-412 flaps 30 tailwind further restrictions:

10 Kts to 4000'

5 Kts from 4001 to 6000

0 Kts above 6000

*Max flap extension Altitude is FL200

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