737 Captain / First Officer Quick Reference Card (QRC) 1 Jan 9, 2000

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• INTRODUCTION

WARNING! The QRC ("quick reference card") is a best effort summary of many need to know Flight Manual and Operations Manual items (certainly **not** everything, and **not** perfect)! The QRC is for **training** purposes only, and as always, the company flight and operation manuals are the absolute **final** word. QRC's with **older** print dates (see date above) may have erroneous information, and should be **destroyed**. You are responsible to insure that you have the latest version (periodically check for latest date)! The QRC is **not** sanctioned by Continental nor the FAA.

REPRINTS: The QRC is **free** as a service to my fellow Continental 737 pilots! This PDF version on Bill Bulfer's web site does **not** contain hijack procedures. You can pick up the latest complete QRC (printed on a **single** sheet) in V-Files (IAH-Sprague **or** CLE-Knopp **or** EWR-Butcher), **No** requests by email, please! Please send corrections to: bmsprague@earthlink.net. I **no** longer publish the **737 Pilot Guide** or **737 Cockpit Panel Notes (CPN)**. Bill Bulfer now publishes the **CPN** (along with his excellent **FMC User's Guide**). You can contact Bill at (281) 358-7252 **or** email to: bbulfer@firstnethou.com **or** at his web site: www.http://www.firstnethou.com/fmcman/

Have a **safe** flight, and a good simulator PC,
Bruce Sprague 737 IAH

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• GENERAL INFORMATION

FLIGHT MANUAL EMPHASIS ITEMS:

- Sec 1: Limitations (Captain should carry)
- Sec 2: Non Normals, emergencies, abnormals, etc.
- Sec 3: Normals, Weather, TCAS, GPWS, Training
- Sec 5: Performance (Captain should carry)
- Sec 6-19: Systems (also see Cockpit Panel Notes)
- Training Bulletins

OPERATIONS MANUAL EMPHASIS ITEMS:

- Sec 1: Emergency: Bomb, Hijack, Captain Irregularity Report, Reject
- Sec 2: Flt Ops: Preflight, Crew Coord.,Departure, Enroute, Arrival, Weather
- Sec 3: Customer Service
- Sec 4: Pilot Policies: Responsibilities, Jumpseat, Sched.
- Sec 5: International: Latin America, Caribbean
- Sec 8: Weather
- Sec 10: Forms: Release, Flight Plan, Accuload, PDC, etc.

PROFICIENCY CHECK HINTS:

- Bring: Flt Man secs 1 thru 5, Jepps, medical, license, headset, glasses
- Prebrief partner on:
  "Warning" if off Alt / Hdg / AS, "Ask..." if something overlooked, Tune / Ident nav aids, Set headings and altitudes, Call intercepts, Ask questions! Use CRM! Call for QRH! On Loft: brief FA's, fill out logbook
- Seat up (see HSI) to see runway at V1 cut and VDP
- Use A/P; other pilot fly while setting up.
- Go slow, rotate slow (TO and MA), configure early,
- WX? Mins OK? Clearance for T/O? SID? Lost Comm? Page 10-7? Anti-ice? Brief MA point (time, DME)
- NP Approach: figure VDP, get sink going to MDA! Time!
- On eng out missed, request vectors (in lieu of published missed).
- Tip: "nail" the ADI pitch, and constantly check it.
- Review Performance and Planning (see P&P in Section 5)
- Read Cockpit Panel Notes to prepare for oral
- "Call" for checklists (Inrange!) and announce "complete"!
- Problem areas: NP approaches, 1 **or** 2 eng go arounds
- FMC Setup: before each takeoff, update:
  - Perf Page: ZFW and Temp - Route Page: KIAH to KIAH
- Proficiency Check Mins: (see profile: Flt Man Sec 3)
  Alt: ±100' (Eng. out 800' -0') A/S: ±5k Head: ±5°

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• PREFLIGHT

WEATHER: see Ops Man Sec 8

- C° to F°: double C° minus 10% +32° (if above 0°) **OR** - 32° (if below 0°) **ex**: 18°C = 36 - 4 + 32 = 64°F

ALTERNATES: see Ops Man Sec 2

- Need destination alternate if: Forecast ±1 hr ETA, destination **below** 2000' **or** 3 miles (gouge "123").
- 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 Rwys/2 Approaches: +200' and +1/2 mile)
- IF diversion to alternate, then **regular** landing minimums apply, **and** no alternate for the alternate is required
- IF stronger headwinds cause you to fly into your Alt / Res fuel, you do **not** have to make an unscheduled fuel stop This is "Dispatch" requirement **only**.
- IF enroute, and destination weather goes down that would require an alternate, you may **continue** on if **both** Captain and Dispatcher consider it safe.
- Call **dispatcher** enroute if need to **divert**; he has "now time" data on weather, airports, and traffic situation

FLT PLANS / RELEASE: see Ops Man Sec 2 and 10

- equip. suffix = "**/E or F**" ("**/G**" for GPS) (see PDC and OM 2-48)
- must have "Minimum Fuel" at takeoff (Ops Man Sec 2)

CHECKS / INSPECTIONS: see Flt Man Sec 3

- **Exterior** Safety Check: surfaces, chocks, logbook
- **Cockpit** Safety Check: "**B**e **H**appy, **G** o **R**egular" (**B**att Sw "on" & 23v; **H**yd off; **G**ear dn, 3 green; **R**adar off)
- **Cockpit** Interior Inspection: "rainbow"
- **Cabin** Inspection:
  - Lavs (fire ext.), Emergency Equipment, Cabin
- **Exterior** Check (walk around):
  - brakes **set**, fuel / hyd **on**, WW lights **on**
- "**Receiving** A/C" Check: (Radar should be in "Test"!)
  - **1st checks** signed off : O2 mask; Stby Pwr; Inst. Comparator; Radio Altimeter; Fire Panel tests; Acars link; Cockpit Voice Rec.

PRE BOARDING: see Ops Man Sec 2 & 3

- Require **one** FA to board (all 3 for boarding **originating** or deplaning **terminating** flights); need one FA on ground with pax on.

PREFLIGHT:

- PDC: see Ops Man Sec 2 and 10
- FMC: do a full align (10 mins). If after a fast align, the GS is **not** "0", then do a **full** alignment.

PERF & PLANNING (P&P): Flt Man Sec 5 / Ops Man Sec 10

- Items **not** figured on **Accuload**:
  - V speeds for **Anti-Skid** inop (weights **are** figured)
  - VMCG adjusted for **PMC** inop (V speeds and weights **are** figured)
  - destination **below** 46°F and/or enroute icing (this item **may** be figured in; see line 10 in "RMKS")
  - if **no** Accuload, must use Pilot Weight Manifest Worksheet and **call** for data (read back ZFW / Trim)
  - if 1st Class/Coach count off by **more** than 2/10 **OR** by the **variance** on Accuload, then get new **trim** setting.
- Automated **Runway Analysis** Data:
  - **not** as accurate as Accuload data
  - **always** shows data with bleeds **off**; if going with bleeds **on**, you must **add** the 4000# (5100#/-800) penalty!
  - to figure an assumed temp, enter with **actual** GTOW (add #4000 (5100#/-800) if bleeds are **on**).
  - **may** show shortened runway data, **if** data is shown in "length" on Runway Analysis printout.
- QRH P&P information:
  - **charts** (in back of QRH) for buffet speeds, landing distances, N1 values, V speeds, max altitudes, etc

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• TAXI

ENGINE START: see Flt Man Sec 3

• verify "oil psi rising" **and** N1 and N2 rotation **before** start lever to "Idle"
• start lever to "Idle" at 25% N2 (or 20% if max motoring)
Technique: wait until 4% N1
• cutout at 46% N2 (56% N2 for -700, -800), verify psi increase ("start valve closed", start valve light out)
• starter **duty cycle**:
2 mins **on**, 20 seconds **off**, 2 mins **on**, 3 mins **off**
- do not **engage** starter if N2 **above** 20%
• **Start malfunctions:** see Flt Man Sec 2
- **always** call for "QRH" for procedures
- Key start **events**: starter valve open, N2, N1, oil psi rising, fuel flow, EGT (within 10 secs; hot 725°C), starter cutout, "fire" (see QRH pg 75), fire light (see QRH back cover), hung start, oil psi by idle.
• **Start malfunction procedures: (except** for start valve light **or** failure to close at 50% N2 (60% N2 -7,-800)
- **before start lever to "Idle"**: start switch **OFF**
- **after start lever to "Idle"**:
- **before** starter cutout: **"cutoff"**, motor for 60 secs
- **after** starter cutout: **"cutoff"**, N2 **below** 20%, motor for 60 secs
• 2 mins for engine to **stabilize** before takeoff

MARSHALLER SIGNALS: see Ops Man Sec 2

• When you are **ready** to taxi = Taxi Light **On**
• When clear to taxi **salute** = Taxi Light **Off** (**then** on if needed)

EQUIP MALFUNCTION: After Block Out **(**Ops Man Sec 2)

• Refer to MEL and CDL (see Flt Man Sec 4C)
• MEL: Minimum Equipment List
- 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 (**ex:** GPWS = 34-26)
• CDL: Configuration Deviation List
- additional limitations with secondary airframe and engine parts missing; penalties are cumulative

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• TAKEOFF

WINDS T/O and LDG: see Ops Man Sec 2

• Maximum "demonstrated" Xwind (peak **gusts**) = 35k
• Maximum Tailwind (peak **gusts**) = 10k
• Tailwind (peak **gusts**) = weight penalties!
• Headwind (**steady**) = adjustments only **if** Capt says so

WINDSHEAR: see Flt Man Sec 3

• Enhancements/Reactive = "windshear" on Grd. Prox. test
• Predictive = "windshear ahead" on radar test
• **Setup**: delay 30 mins (>15k & **increasing**); delay 15 mins (<15k & **decreasing**), use longest runway, flaps 5, full power, FD **on** if "Enhancements", use higher VR of RLL weight (Flt Man 3-241)
• **Shear**: "**Max Throttle**", TOGA if enhancement, pitch 15°, in/out shaker, **no** trim, **no** config. changes, watch "sink".
• **Windshear Gouge**:
- **windshear ahead (alerts)** = avoid, go around (**trim** and **clean** up)
- **IN windshear** = recovery (**no** trim or config. change)

TAKEOFF MINS: Ops Man Sec 2 **and** Jepp Intro page 126

• see takeoff minimums on Jepp plate 10-9A

TAKEOFF ALTERNATE: see Ops Man Sec 2

• NEED IF: Departure field **below** CAT I landing minimums. Based on "**tower**" report of vis. or RVR.
• T/O ALTERNATE: must be within **1 hour** at normal cruise speed in **still air** with one **engine inop**: distance equals 300nm (340nm/-7,-800). Mins for alt **same** as regular alt.

NO REDUCED POWER IF: see Flt Man Sec 5

• anti skid inop, runway contaminates, wet runway, anti ice on, use of de-ice / anti-ice fluids, windshear, improved climb data, PMC **or** FMC inop, altimeter below 29.70
• setting an assumed temp means the FMC **will** compute a reduced throttle setting (N1 bugs will **always** show maximum power). To go **full** power, do **not** set assumed temp.

reduced throttle setting (N1 bugs will **always** show maximum power). To go **full** power, do **not** set assumed temp.

ORDER OF TAKEOFF BUGS:

5 bugs: from accuload **or** QRH **or [FMC]** (-700,-800)
• V1 **[1]** (Go / No Go, call "**V1**" at 5K **before** bug; normally double bug)
• VR **[R]** ("**Rotate**"; normally double bug)
• V2 (Orange Bug)
• V2 + 15 **[white bug]**
• VM Flaps 0° **[UP]** ("top bug", 220)
• for "Improved Climb Performance", V1, VR, and V2 are **increased** and you **set** them on bugs
- **not** authorized if "car": **c**ontaminated rnwy **or**, **a**nti skid inop **or r**ed. thrust
• when flying **below** 220k, flaps should be used, with the following "recommended" **fixed flap maneuvering speeds** (*** above** 117,000 GW) **OR [FMC** -700,-800**]**:

- Flaps 0	220k	**[UP]**
- Flaps 1	200k	**[1]**
- Flaps 5	190k	**[5]**
- Flaps 10	170k	**[10]**
- Flaps 15	150k/160k*	**[15]**
- Flaps 25	140k/150k*	**[25]**

TAKEOFF BRIEFING: see Flt Man Sec 3-73

• **Capt required brief items (5)**: takeoff weather (runway conditions), terrain, transition alt, discuss abnormals, etc., that may affect safety of flight, and reject procedures
• **Additional brief items**: SID, Emer return, noise abatement profile, Jepp notes, P&P problems, different V1 and Rotate speeds?, anti ice, TO alternate, evacuation duties, "Crew Effectiveness Markers" (Flt Man Sec 3-295), will 800' level off (after V1 cut) clear obstacles?, etc.

TAKEOFF: see Flt Man Sec 3

• Capt makes **all** takeoffs **if** runway "clutter" **penalties**
• delay exterior lights until "**cleared**" for takeoff
• stabilize to 40% ±5% N1, **then** 70% and TOGA (set power) "**check power", "power set xx %N1**"
• at 64k (84k, EFIS) check "THR HOLD"
• call "**100 kts, V1** (call 5kts before)**, Rotate, Pos Rate, Gear Up**"
- concentrate on "100 knot" call (reject now **only** for "power loss"), **and** "V1" call (committed; do V1 cut if "power loss").
- rotate at 3°/sec, 15° pitch, **maintain** V2 +20k (25k if light)
- rotate (slow!) by **visually** looking at end of runway (if V1 cut, this will help guide you to keep runway heading!)
- 30° bank if V2 + 15 (bug) **or greater**
- if using reduced power and desire more power, position throttles manually to bugs
• **at 400'**, call "**Heading Select**" or "**LNAV**"
- Delay turns until 400' AGL: 50' minimum for FAR's: obstacle, eng. out, noise abatement, adverse cond.
• **at 1000'**, 10° pitch, V2 + 15 and accelerating:
• call "**Flaps 1 (or 5), VNAV**"
- do **not** use blo 3000' if special noise abatement procedures; ie: SNA
- must preset 220k in "Tgt Spd" Climb page, L2
- select "Econ" when ready to accelerate
OR, if VNAV is not available **or** not desired:
- "**Flaps 1 (or 5), Climb Pwr, Lvl Chg, Set Top Bug**"
- next flap retractions **at** the fixed maneuvering speeds **and** accelerating
• call "**Flaps up; After Takeoff Check**", climb **at** 220k/[UP], turn A/P on (**above** 1000')
- for flaps 1 takeoff, retract at fixed speeds and accelerating
• **at 3000'**, call "**V NAV**" **or** stay in LVL CHG at 250k
• go to **L NAV** when appropriate (as early as 400'), **after** confirming: FMC accuracy (vs. raw data), both pilots place NAV radios to "Auto Tuning" (FMC max capability) by both going to NAV (EFIS, both must go to "Auto" on VHF NAV radio panels). If in mountainous terrain, one pilot must stay on raw data until **over** FL250.
• **ICAO-A / Noise Abatement:** at 1500', "Climb Power, LVL CHG"; at 3000', "Flaps 1 or 5, Set Top Bug"

REJECTED TAKEOFF: see Flt Man Sec 2

• **below** 100k (fires, smoke, failures, configuration, windshear, etc.), taxi off runway, run checklists
• **after** 100k only for "**Pwr Loss**" or serious / takeoff warning horn
- If **over** 100k, stay on runway, **hold** brakes (unless evacuation, then **set** brakes), run checklists
• at V1 you **must** continue takeoff
• **Capt** calls "**Reject**"; and **accomplishes**:
- throttles idle, AT off, speed brakes, thrust revs, RTO (or max brakes)
• **F/O** call "**tower**", **and** PA to "**remain seated**"
• **call** for Reject checklist (brake cooling?), eng. fire?, evacuation (see signals)?, fill out irregularity report

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ENG FAILURE "AFTER" V1: see Flt Man Sec 2

- "**Power Loss**", maintain **track** (rudder), slow **pitch** up to 13°, **gear** up, silence **bell**, **V2** (Orange Bug) **to V2 +20k**
- at 400': "**HDG SEL**", maintain heading, radio call, **ask** for 5 units of rudder trim towards good engine
- at 800': decrease climb, "**set top bug**", flaps up, "**set MCThrust**", call for "**Eng Fail/Fire Checklist**" (if **fire**, run after "top bug", and bring flaps up)
- declare emergency, sqk 7700, fuel balance, give FA "TEST", call company, get Wx, call for "**1 Eng Inop/Appr & Ldg**" checklist, consider restarting failed eng

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• FMC / CDU USE

- see "Cockpit Panel Notes" **and** "FMC Users Guide"

FMC/CDU LATERAL NAV:

- technique: bring waypoint up to 1L, but do **not** "**Exec"**, for "**dynamic**" position awareness.
- define new **waypoint** as: SEA **or** SEA250/40 **or** SEA180/ELN270
- **DIR INTC**: "DIR INTC", then waypoint to R6 (-7,-800: waypoint to L1, then enter "INTC CRS")
- **DNTKFX**: set up on FIX page; non EFIS **only** works **this** side of fix; EFIS can define **either** way: IAH/15 or IAH/-15
- "**INTC CRS**" always put **inbound** course, **not** radial

FMC/CDU VERTICAL NAV:

- **ENTERING SPEED AND ALTITUDE**:
  - can define speed **and** altitude (**ex:** 250/100)
  - can define **speed** only (**ex:** 250/)
  - can define **altitude** only (**ex:** 100)
  - can define "at **or above/below**" alt (**ex:** 100 **A or B**)
- **FPA, V/B, V/S, VERT DEV** (on Descent Page):
  - **FPA** = **actual** flt path angle (should be **= or steeper** than V/B)
  - **V/B** = **computed** angle (vertical bearing to **meet** 3R crossing)
  - **V/S** = **required** vert speed to **achieve** the displayed V/B
  - **VERT DEV** = **present** dev from computed vert path (for EFIS / NG aircraft: LNAV **must** be engaged for this to be correct!)

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• ENROUTE

GENERAL:

- ACARS enroute: see Ops Man Sec 7
- -700, -800 Handset Codes: 5 = FA, 8 = PA (then "reset")

IFR ALTITUDES:

- **Below** FL290:
  - **West** = 180, 200, etc. - **East** = 190, 210, etc.
- FL290 and **above**:
  - **West** = 310, 350, 390 - **East** = 290, 330, 370, 410

ALTITUDES: see Ops Man Sec 2

- **MEA**: Minimum **Enroute** Alt (low altitude charts) if it changes, do **not** begin climb / descent until **after** passing the fix:
  - 2000' clearance 5nm of mountains
  - 1000' clearance all else
- **MCA**: Min **Crossing** Alt. Must cross fix **at or above** this alt.
- **MOCA**: Minimum Obstruction Clearance Alt; **ex:** "1600T"
- **MSA**: (Minimum Safe Alt) **within** 25 NM radius of approach aid (shown on plate). 1000' clearance. Lines are bearings **to** the fix.
- **MORA**: (Minimum Off Route Altitude)
  - clearance **within** 10nm of route (does **not** provide navaid signal)
  - 2000' clearance if >5000' terrain, 1000' if <5000' terrain
  - Displayed just below MEA, with an "a" next to it
- **GRID MORA:** same above except defined within section outlined by latitude and longitude lines.
- **AMA**: Area Minimum Altitude same as MORA, but applicable to shaded AMA envelopes on **arrival area charts**.
- **MHA**: Minimum Holding Altitude (see plate or pub. pattern)
- PF sets altitude window when A/P is engaged; PM sets it if A/P is not engaged. Both pilots **verbally** and **visually** verify all changes.
- When within 1000' of assigned altitude, PM makes call out: **ex:** "**six thousand for seven thousand**"
- Set intermediate (next) altitude in MCP window! (ex: "cleared to cross XYZ at FL210, then cross ABC at 17,000", **set** 21000 in window)
  Exception: during an FMS arrival with multiple crossings restrictions **and** flown in V-NAV, **IF** desired you **may** set the lowest altitude restriction, but **monitor** crossings!
- Maintain minimum of 1500' AGL until necessary to land.
- If on unpublished route **or** Radar Vector, **maintain** last assigned altitude when approach clearance received
  - Unless **new** altitude assigned.
  - Until A/C is **established** on published route with altitude.
- Accept no altitude clearance **below** MOCA.
- QNE: 29.92 ("near enroute"), QNH: Local ("near home"), QFE: AGL ("near field elevation")
- **At or above** 18,000' is **always** set at 29.92
  - IF Local Altimeter is **below** 29.92, FL180 is **unusable**.

DIVERSIONS: see Ops Man Sec 2 and 7

- CHANGE IN DESTINATION: (For safety,wx,etc.)
  - Need: Release Amendment for new **destination** **OR** proceed to **alternate** (advise dispatcher).
- CHANGE IN ALTERNATE:
  - If **alternate weather** goes down, need: **new** Release Amendment for new alternate **or** new destination
- Use **ACARS**: "ETA 1" for **delay**, "ETA 2" for **diversion**
- Legality is OK if proceeding to **alternate**
- Contact Dispatcher (Arinc or CAL): may have better idea

CREW OXYGEN: see Ops Man Sec 2

- up to FL250: masks "**available**"
- **over** FL250 to 410: one pilot **wear** unless 2 pilots in seat
- "**cabin** altitude" **over** 10,000': **both** pilots wear

MAINTENANCE LOG: see Ops Man Sec 2

- Airworthiness Release: considered good if the logbook has no **open** write-ups
- Cabin Log: make sure only **non**-airworthiness items are entered (see inside cover of cabin log book for **list**)

ARINC / MEDLINK / AIRPHONE: OM Sec 3, 7 & QRH

- contact ARINC for phone patch (**or** use Airphone "speed dial" # on release) to dispatch or MedLink. Use for inflight **medical** emergencies (see QRH MedLink card), and **diversion** recommendations.

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• EMERGENCIES

GENERAL: see Flt Man Sec 2 **and** Ops Man Sec 1

- IF possible: F/O **fly** on A/P, Capt **resolve** problem.
- **Immediate Actions** have **double lined** boxes. Do them **from memory**! **Then** refer to QRH for **more** information!
- QRH items are **also** in the Flight Manual with "expanded" information in Sec 2 (Non Normals).
- With exception of the 3 "Immediate Action" checklists, **all** QRH checklists are "Read and Do", challenge and response checklists, and are considered "Secondary Action" items. Always call for "**QRH**".
- QRH Emphasis Items: Emergency Evac, Eng Failure/ Fire/Shutdown, APU Fire, Wheel Well Fire, Eng Overheat One Eng Inop Appr/Ldg, Eng Fail in Ldg Config, Jammed Controls, Runaway Stab, Smoke in Cockpit, Min Fuel
- Checklists incorporate "OR" arrows and Conditional Boxes (Yes **OR** No...if No, skip **entire** box), ----Phase Lines---- (may **temporarily** stop procedure), ***** (indicates **end** of procedure)
- Declare an emergency **IF**: Engine loss, standby power appr., priority handling required, if about to break a FAR, etc. (**Give**: Reason, Fuel, Souls Onboard) Sqk 7700
- Notify company **and** FA of emergency (PA: "folks, had problem...Linda to the cockpit") see FA Emer Signals.
- Overweight landings: see Ops Man Sec 1
- Crash or Ditching: see Flt Man Sec 2
- Irregularity Report:see Ops Man Sec 1 and 10

TWO ENGINE FLAMEOUT: ////////////////////////////

- **FLT, CUTOFF** (EGT ↓3-5 secs), **IDLE** (**see** QRH !!)
- **Really** have dual eng flameout, **OR** loss of 2 Gens?
  - N1 **and** EGT gauges **spool down**, "Low Oil PSI" lite
  - If in **doubt**, push up throttles to see if you get **response**!

LOSE PSI / DECOMP / DESCENT: ////////////////

- **ON/100%, CREW COMM, SEAT/SMOKE**
- **see** QRH for **more** procedures!
- **IF** Emergency Descent (damage?, smooth air?):
  - PA "**O2, Rapid Descent**", call ATC
  - descent gouge: "**PA, FLT, Spin, Spin, Pull, Pull"** (ignition **FLT**, **spin** MCP to 10M' or MEA, V/S **spin**, **pull** throttles, **pull** speedbrakes, **LVL CHG** at barber pole)

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UNCOMMANDED YAW or ROLL: //////////////////////

- **A/P & A/T - DISENGAGE**
- **Symmetrical Thrust - VERIFY**
- **IF yaw or roll continues - Yaw Damper: OFF**
- **see** QRH and Flight Manual for **more** procedures:
  - Jammed or Restricted: "Rudder" **or** "Elev. **or** Aileron"

EMERGENCY SIGNALS: see Ops Man Sec 1

- 4 or more chimes (from pilot **or** FA) = **an emergency!** (pilot does **not** leave cockpit until emerg. reason known)
- Give FA "TEST": **T**ype of emer, **E**vacuation?, **S**ignals, **T**ime to land. Also, select ABA's.
- Brace signal +30 secs: "**Brace for Impact**" (2 times)
- Evacuation signal (use slides): "**Easy Victor**" (2 times)
- PA "**This is the Captain: Easy Victor, Easy Victor**" (Flight Attendants will specify which exits to use)
- PA "**Remain seated**" (2 times) = Do **not** evacuate!

TRANSPONDER: see Ops Man Sec 1 and 7

- Hijack: 7500 (then 7700?, see hijack below)
- Lost Comm: 7600 (stay VFR & land, **or** fly last clearance)
- Emergency: 7700 ("Declare Emergency")

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APPROACH

HOLDING ENTRY RULES: see Flt Man Sec 3

- **use** FMC "Hold Page", otherwise use following method
- **note**: Draw pattern if in doubt, so you'll know what radial, fix, L or R, direction ("hold East, etc"), and outbound hdg

1. **Set Heading Marker (L or R)**: put Heading Marker at 20° above **right** wing (for Standard, **right** hand turns. If **left** turns, above **left** wing)
2. **Set Tail For Outbd Radial:** put Course Arrow (CA) TAIL on **outbound turn** radial (window shows inbd. course)
3. **Turn:**
   - If CA **tail** falls in quadrant from nose to heading mark, then do a **teardrop** (±30° off outbound heading towards **top** of case, for 45 secs) If close call, always choose the teardrop.
   - If CA **tail** falls in quadrant from heading mark to 20° below opposite wing, then enter **direct** (turn to **outbound** heading on published side).
   - If CA **tail** falls in remaining quadrant, then enter **parallel** (turn to **outbound** heading on **non**published side).

HOLDING NOTES: see Flt Man Sec 3

- "Hold East on 090 radial" ("Standard" = **Right** turns)
- Must start to slow down within 3 mins of fix (should receive holding instructions within 5 minutes)
- **Speeds**: MHA thru 6000" = **200k** max; >6000' thru 14M' = **230k** (210k where published); >14M' = **265k**
- **Inbound times**: (adjust outbound leg to get **inbound** time) 14,000' or **less** = **1 min**; **over** 14,000' = **11/2 min**
  - small box with number is pub. time in **mins** for pattern.
- **Call**: "Position, Time (Z) and Alt" upon entering
- If no pattern charted and no instructions, hold **standard pattern** on **inbd course** to fix, at **last assigned altitude.**
- Be sure to figure "**bingo** fuel" to start diversion!
- Send ACARS "appr. delay" msg (see Ops Man Sec 7)

STEEP TURNS: see Flt Man Sec 3

- "Inrange Check", A/P and A/T on; 250 kts
- **note** entry pitch and FF; A/P, A/T and ALT HOLD off
- Turn (use **no** trim, use armrests):
  - > 25° bank, increase pitch by 1° (to about 5 1/2° at 45°)
  - increase power by about 10%
  - use F/S indicator: F = less throttle; S = more throttle
  - centered F/S needle = right thrust to capture speed
- **monitor**: altimeter, ADI, F/S, airspeed (VSI slight climb)
- lead rollout by 15°, return to **entry** pitch and FF
- A/P and A/T on; speed to VM Flaps 0 (to set up for stalls)

STALL SERIES: see Flt Man Sec 3

- "Inrange Check", A/P and A/T on to set up; set GA N1 (N1 Limit Pg), use the "**recommended**" man. speeds
- **CLEAN:** set 40% N1 at VM Flaps 0
- **DEPARTURE / TURNING:**
  - Flaps **5**, **gear** down, set 50% N1 at VM Flaps 5, **then** 20° bank
- **LANDING:**
  - Flaps **30**, **gear** dn, set 50% N1 at VM Flaps 30 (Target)
- **note** pitch and FF, then A/P and A/T off, **set** N1
  - Have V speeds **established** (**not** sliding thru a/s) **before** pulling back to N1 settings.
- **maintain** altitude or slight climb; **trim** out during maneuver
- **at stall:**
  - **firewall** throttles, call "**Max Throttle**"
  - **level** wings; **maintain** altitude!
  - push nose if pitch up, **retrim**, return to **entry** pitch angle
  - return to initial speed (**pull** back throttles!); **stabilize!**
  - A/P & A/T on to set up for next stall
  - when done: do a "go around" to clean up

UNUSUAL ATTITUDE RECOVERY:

- call "**Attitude**"; A/P **and** A/T **off**
- "fly to diamond" with **full** rudder **and** aileron
- nose high = **increase** bank to no greater than 90°
- nose low = **reduce** bank **before** adjusting pitch
- **no** back yoke pressure until bank **less** than 10°
- adjust thrust: differential thrust, if **below** crossover point (**add** power to **low** wing)

ORDER OF LANDING BUGS (5):

- **[FMC, -700,-800]** line selecting "Ref' will set bugs
- **80 kts**, put bug for "80k" call out
- **VREF [R]** bug for landing flaps, see Appr Ref page)
  - normally VREF 30 or 40; single engine is VREF 15
- **Target** (Orange Bug) +5 min, +20 max; **if** using A/T (**throughout** approach and landing), add **only** +5
  - if **ice** on tail, will have to **add** +10 to target
  - this is your "**go around**" speed for **single** engine
- **VREF + 15k [white bug]** ("**go around**" flaps maneuvering speed, **both** engines)
  - set this at VREF **30°** + 15k if using **30° flaps**
  - set this at VREF **40°** + 15k if using **40°** flaps (**not** VREF **30°** + 15k for **40°** flaps!)
  - this is your "**go around**" speed with **both** engines
  - this is your eng. failure in landing configuration spd.
- **VM Flaps 0 [UP]** ("top bug", 220)
- **see** takeoff section for "recommended" **fixed** flap maneuvering speeds

TARGET SPEEDS:

- **VREF + 5** (1/2 wind + gust, 20 **max**)
  - example: "wind 12G20" **use** 6 + 8 = 14
  - **if** using A/T (throughout appr and ldg), **only** add +5k (regardless of winds; A/T compensates)!
  - Single Engine: do **not** use A/T
  - if **windshear** "loss", see Landing section

FINAL APPR. SEG. (FAS): see Ops Man Sec 2

- 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.
- If **prior** to FAS, **must have** approach **minimums** to **start** approach. Note: **no** "look see" option!
- If **after** FAS, and visibility goes below minimums, **may continue** to DA / MDA (and land **if** visibility OK).

VISIBILITY: see Ops Man Sec 2

- Use CAT-C (use CAT-D for circle)
- All approaches based on **visibility**, ceiling is advisory.
  - there are **different** mins if TDZ, CL, or ALS are inop!
- Must have visibility to **start** approach. If visibility goes below mins **after** FAS, continue to DA (for NP to MAP).
- RVR: reported only if 6000 or less **or** prevailing visibility 11/2 mile or less. Otherwise, ask for it. **IF** Rollout RVR is inop, you **can** use MID RVR (for Cat II)
- CURRENT / VARIABLE READINGS: **Current** governs
  - **ex:** "RVR **2400**, variable 1300": you are OK to land
    1/4 mile = 1600 RVR 1/2 mile = 2400 RVR
    5/8 mile = 3200 RVR 3/4 mile = 4000 RVR
- RVR / GROUND visibility: May be interchanged **except**:
  - If minimums **below** 2400 RVR, must use TDZ RVR if reported, MID RVR may be substituted for TDZ if TDZ is not reporting (Cat I only)
  - Rollout or MID (both are just **advisory**) must be reported if RVR **<**1600 (TDZ RVR **still** controlling)
  - For **circle**, must have **prevailing** visibility.
- PREVAILING VISIBILITY (PV): **Average** airport visibility

737 Captain / First Officer Quick Reference Card (QRC) 5 Jan 9, 2000

GENERAL APPROACH GUIDELINES:

- get **weather**; do "**In Range Check**"
- **both** F/D **on** to allow guidance in go arounds
- **Approach Briefing**: (other pilot sets up, **then** flys plane, then you set up, **then** give briefing):
  - mins (bugs), missed appr, timing, terrain, VDP, callouts, set next altitudes in MCP, use CRM, etc.
  - if emergency, consider longer runway, wind, systems
- Considered "**on**" Final Appr Course (to **start** descents):
  ILS: within **1/2** of the full scale deflection (**1 dot = 1°**)
  (EADI "expanded mode" each dot = **1/2**°!)
  VOR: within **1/2** of the full scale deflection (**1 dot**)
  ADF: within **5°** of the required bearing
- You should be 200' AGL over end of strobes (about **1/2** mile from end of runway), **and** 50' AGL over threshold.
- Jepp plate DA(H): DA = decision altitude (H) = HAT
- MAP mode is recommended for all approaches, except for VOR **or** LOC BC: one pilot **must** be on **raw** data prior to intercepting final approach course ("VOR/ILS" **or** EFIS "FULL VOR/ILS or EXP VOR/ILS; ADI raw data does **not** count!) Also, 1 pilot in raw data if mountainous terrain and below FL250.
- **"Speed, Spd":** use FMC set speed bugs or fixed speeds

MONITORED APPROACH: see OM Sec 2 & QRH

- All precision apprs. to 2400 RVR **or less** (max Xwind 10k): **use** "monitored approach" (same as CAT II)
  - **F/O** flys on A/P; spring loaded for go around
  - **Captain** monitors approach; lands if no go around
  - If autopilot inop, fly manually.
- If RVR is 2000 **or less**, then brief to **lowest** category minimums capable (ie: Cat II, even if Cat I is legal)

ILS: see Flt Man Sec 3

- Cat I approaches use **barometric** / electric altimeter
- Cat II approaches use **radio** altimeter
- downwind, "**Flaps 1, Spd**"; base "**Flaps 5, Spd, Appr. Chk**"
- "**cleared**" for the appr **and** on **intercept** (use 30° hdg): call "**VOR LOC**" (**prior** to 5° of course), "**Appr Check**", at Loc capture, go "**APP ARM**"
- **at** Loc capture and altitude hold, **or** glide slope intercept, **set** missed approach altitude
- **at** 1 1/2 dots below G/S: "**Gear Dn, Flaps 15, Spd, Ldg Chk**"
  - **Single Engine**: at 1 dot below G/S: "Gear Down, Flaps 15, **Target**, Ldg Chk" - Target is VREF 15 + additive
- **at** G/S capture: "**Flaps 30/40, Target**" (set MCP to MA alt)
  - EFIS: **must** have Loc capture **before** you can capture G/S. Use caution if capturing G/S from **above**!
  - flaps 40° if low ceiling & vis (**Cat II**), short & slick runway
  - **Single Engine:** at G/S capture, you **stay** at flaps 15
- for landing, A/P **off** no later than 50' radio altimeter
- see Flight Manual Sec 4 for chart of standard pilot callouts
- **CALL OUTS**:
- "**1000 feet, 500** ("**Flare Armed**", F/O), **400, 300, 200**" (TDZE + 500, etc., from baro altimeter)"
- Call Out **Speed / Sink** if varies by 5K, and / or >1000 FPM
- "**Approaching Minimums**" (DA + 100')
- "**Approach Lights In Sight**" (If see **strobes**, may go **below** DA to100' **above** TDZE, but **then** must have visual reference (**one** of ten items: lights, markings, etc), **or go around**. For Cat II, you must have visual reference **at** DH, which is 100' above TDZE)
- "**Runway In Sight**" **OR** "**Approach Lights in Sight**" **OR** "**Minimums**" (at DA and lights **not** in sight)
- On a monitored approach **or** CAT II / IIIa:
  "**Approaching Minimums, I'm Going Heads Up**" (Capt)
  - Captain: hands behind throttles

  "**I Have The Aircraft**" (Capt)
  - Capt initiates go around **if** needed after this call

  "**Minimums, Going Around**"(F/O)
- "**100, 50, 30, 20,10**" (from radio altimeter; calls below 100' **optional** on visual; 100' call mandatory)
- Monitor GS intercept altitude to avoid false GS angles!
- DA based on highest point in **touchdown zone** (HAT) (1st 3000') and MSL. At DA must land **or** go missed!
- Monitor FMA for capture modes! Be configured by OM
- Jepp Plate: GS shows glide slope **angle** and expected **VVI**
- RVR values: see Ops Man Sec 2

ILS PRM: Precision Runway Monitor

- Brief (see Jepp page), MEL (ILS, TCAS and/or Transponder, 2 VHF radios)
- #1 VHF on "Tower", #2 VHF on "Monitor"; set volume
- TCAS on "TA"
- Hand fly "Breakouts": Do **not** push TOGA, A/P **off**, A/T **on**, configure **after** on new heading. PM turn FD's off, reset MCP (Hdg, Alt), FD's on, Lvl Chg, Hdg Sel

CAT II / IIIA CRITERIA: see Ops Man Sec 2, Flt Man Sec 3

- use Monitored Approach Concept, give brief, see QRH
- Cat II use RA (**or** Inner Marker if appl.) on **radio** altimeter
- Cat IIIA: set radio altimeter (RA) to 50'; baro to TDZE + 50'
- Captain set up, configure, give to F/O to fly early
- Mins: RVR 1200 / RA 100' (IIIa = RVR 700 / RA<100 or AH)
  (For **IIIa**, DH is 50. AH = Alert Height: see Ops Man Sec 2-80, not for 737?)
  (**Only** do IIIa approaches in the New Generation aircraft: -700, -800)
- IF RVR is **below** 1600, must get advisory on **midfield** and / or **rollout** RVR (but **TDZ** RVR is always the **controlling** RVR [**IIIa**: TDZ **and** MID RVR are controlling]). If **only** TDZ RVR, then mins are 1600 RVR (RA 150 in Jepps were for "certification" process only...disregard: use RA 100).
- see callouts above (ILS section)
- See Requirements For Cat II: (see QRH)
- Cat II Landing **Techniques**:
  - flaps **40°** is recommended
  - have seat **adjusted** properly, to see visual cues
  - near DA, Capt places hand behind throttles
  - use A/P to 50' AGL
  - keep landing lights **off** until **after** touchdown
  - if unable to land **within** 3000' (last painted marker): Go Around
  - be sure to set radio altimeter to **RA** value, **not** HAT!
- **Autoland** (CAT II / IIIA, optional CAT I): "B" A/P 1st, "A" after "APP" mode; Go Around = TOGA, call for flaps, gear, monitor. On missed, A A/P pops off, B A/P is now master.

NON PRECISION: see Flt Man Sec 3

- downwind, "**Flaps 1, Speed**"
- base or IAF outbound, "**Flaps 5, Speed**"
- when "cleared" for the approach and intercept heading:
  - "**VOR LOC**" **OR** "**HDG SEL** or **L-NAV**" (for BC or ADF); call for "**Appr Check**". Use MCP for **all** NP approaches.
  - use V/S (**not** LVL CHG) to descend to next altitudes at 1000 to1500 fpm (**no** >1500 fpm, or GPWS will go off!)
    - no greater than 1000 fpm below 1000' AGL
- at Loc capture and alt hold, **set** next altitude for stepdown
  - set in next **higher** altitude (ie: if MDA is 620; set at 700)
- **4 mi from FAF**: "**Gear Down, Flaps 15, Speed, Ldg Chk**"
  - **Single Engine**: at 1 to 1**1/2** mi from FAF, call for "Gear Down, Flaps 15, **Target**, Landing Check" (if **heavy** and airport is **high** and its **hot**, may have to **delay** gear and use **flaps** 10 or 5).
- **2 miles from FAF**: "**Flaps 30/40, Target**", use 65% N1
- **at FAF:** start time and descend to MDA at 1500 fpm (over 1500 fpm = GPWS!) 1000 fpm below 1000' AGL.
- when at MDA, "**set M/A altitude**"; tweak MDA if needed (V/S it down 500 fpm or more; then Alt Hold)
- at **VDP**, use V/S at about 750 fpm (see notes below)
- for landing, A/P **off** before descending more than 50' **below** MDA (call "deselect altitude hold" to **remove** F/D bar)
- **Call Outs for NP**: see Flt Man Sec 3
  - "**1000 feet, 500, 400,....**" (above TDZE from baro. alt.)
  - "**Approaching Minimums**" (MDA + 100')
  - "**Minimums**" (at MDA) "**Set missed approach altitude**"
  - "**Missed Approach Point**" (approach lights **not** in sight)
  - "**Approach Lights in Sight**" **OR** "**Runway in Sight**"

NP APPROACH NOTES: see Flt Man Sec 3

- **Back Course**: put in published **front** course. Ident may be different from ILS, even if same frequency! Use small course corrections (very sensitive due to closeness of transmitter)! **Use** "HDG SEL". or "LNAV". Do **not** use "VOR LOC"!
- PT: 1 min past FAF turn barb heading, 30-60 secs out
- FAF = Maltese Cross symbol (on NP approaches **only**)
  - Determine FAF **location**. Side Jepp depiction shows distance to end of **runway**, which is **not** necessarily the DME to the VOR!
- be sure to start time at FAF (adjust for winds)
- 1000-1500 FPM descent, reach MDA **before** VDP
- Do **not** go **above** MDA, or you may **lose** sight of runway!
- 30° flaps **at** FAF desensitizes GPWS
- Timing as depicted **unless** DME portrayed (then use DME)
- Note: **HAT** is value you set in the **radio** altimeter, **MDA** is value you set in the **barometric** altimeter.
- MDA based on: highest point of airport (HAA) **or** HAT and MSL.
- Do **not** descend below MDA **prior** to VDP. If no VDP, you must **plan your own VDP**:
  - If **DME** only: use 1 mile for each 300' descent from HAT (**ex:** HAT **450 ÷ 300** = **1.5 miles** from Rwy end is VDP) (Caution: DME and miles shown to runway on FMC may be different!)
  - If **TIME** only: use (**HAT x 10%**) = seconds to subtract from MAP time. (**ex:** MAP time 2:20, HAT 450/10 = 45
    2:20 - 45 = **1:35 secs** to the VDP **from** FAF)
  - **use** the VASI or PAPI if available!
- VDP is shown as a **V** on the chart, if published.

- just prior to VDP, use V/S to about 750 fpm; **when** stabilized disconnect A/P and A/T and fly manually. Visually should see end of runway in windshield center; hold 800-1000 fpm. May need to descend **prior** to VDP if tailwind **or** abnormal flap setting.
- Could **build** NP approach in FMC, display it on the HSI (or Map display on EHSI) and fly **coupled** "LNAV".
- Go Missed Approach if **exceed** (unless momentary and correcting the deviation):
  - LOC deviation ± 1 dot
  - VOR course deviation ± 1 dot
  - NDB ± 5° on bearing pointer
  - Airspeed -5 to +10 of target (Orange Bug)
  - GPWS activation
- **Simulator Pitfalls**: premature and illegal descents, too fast, too high, past VDP, poor callouts, no visual contact

RNAV APPROACHES: see Tng Bul 99-11

- Flown in LNAV and VNAV; flown as a NP approach!
- set mins (DA) on baro (leave Radar Alt set at 0)
- "select" Vref speed (double click; make "big")
- both in "Auto"; set RNP (6L Legs Pg) to 0.3 **before** FAF
- LNAV before Approach Check
- at FAF altitude, press ALT HOLD, MCP to 0, engage VNAV
- disengage A/P by 50' below DA

ADF (NDB):

To Stay On ADF / NDB Course:

- **1st General Premise**: "Head" of the ADF needle always **falls** towards bottom of case. Tail always "rises".
- **2nd General Premise**: If "on course" **inbound**, "head" will be at **top** of case, and "on course" **outbound**, "head" will be at **bottom** of case
- **3rd General Premise**: To fly the NDB approach:
  - determine the **desired** course, imagine a pencil placed **vertically** over it, and **if**:
    - "Head" is to **left** of pencil, turn **left**
    - "Head" is to **right** of pencil, turn **right**

PROCEDURE TURN: see Flt Man Sec 3

- At FAF outbound, go 30 secs (ILS), **or** 1 min (NP)
- Turn to "barb" heading, go out 30 - 60 secs (at 5° flaps).
  - Usually stay within 10NM.

CIRCLING APPROACH: see Ops Man Sec 2

- **Use Cat D or** CAL minimums **1000' / 3 miles**, **w/greater**
- Accomplish all **within** 2 miles
- On final: "FLAPS 30 or 40"
- Must have prevailing and / or runway visibility. Ceiling required only if noted (Jepp), but circle may **not** be started unless **visual** reference to runway at MDA
- If missed approach, turn toward **landing runway** and continue until established on missed approach procedure of original approach

DME ARC: see Flt Man Sec 3

- Turning **to** arc, lead 1% GS (200k = 2 miles)
- Turning **off** arc, lead 10° (depends on DME/ 15 DME =10°)
- Use needle "head": **ahead** of wing tip to **lower** DME, **below** wing tip to **increase** DME. Considered "on" arc ±2 mi.
- **Caution**: If LOC is tuned, it's needle will point to **90°** point!
  - Use **correct** needle!
- **use** flaps 15 and gear down on arc (considered **base** leg)

MISSED APPROACH: see Flt Man Sec 3

- **Must go around if**:
  - safe landing not possible at DA or MAP
  - not stabilized "in slot" by 1000' AGL (500' if VMC) (glide path, trim, config, AS +15k/-5k, VVI >1500fpm, or < 45/55% N1)
  - can not safely land in touchdown zone
  - safety is compromised
  - "TERRAIN" or "PULL UP" **below** 500' AGL
- **GPWS**: Anytime you get a "whoop whoop pull up, terrain, **or** configuration" warning you **must** do a go around (may disregard if **above** 500' day VMC; for **other** GPWS warnings you pull up **until** the warning goes away).
- "**TOGA**" (**press** button) **and** push up throttles (unless A/T)
  - A/P will disengage when TOGA pressed
  - **second** TOGA press gives **full** power
  - G/A mode armed below 2000'
- **15° pitch up** (and fly "runway heading")
  - **Single Engine: 13°** pitch up (very smooth and slow!)
- "**Flaps 15, Check Power, Positive Rate, Gear Up**"
  - **Single Engine**: "**Flaps 1**, Chk Pwr, Pos. Rate, Gear Up "
    - smoothly add power **and** rudder; maintain heading
  - **Note**: if have **both** engines **and** landing with flaps 15 (flap problem, etc.), you will **keep** flaps at 15 for the go around (ie: do **not** pull up to Flaps 1, like a single engine go around).
- **fly VREF + 15** (white bug above target bug)
  - maximum of 15° bank **below** VREF + 15
  - **Single Engine**: use Target spd min (allows 15° bank)
  - Target speed is equivalent to VREF 15 + 5
- "**Check Missed Approach Altitude**"
- **at 400'**: "**HDG SEL**" or "**LNAV**"
  - **after** 400', call "going missed"; take care of flying **first**
- **at 1000'**: 10° pitch up; "**Flaps 5, Climb Pwr, Lvl Chg, Set top bug**", "**Flaps 1, Flaps Up** (optional), **After T/O Check**"
  - **Single Engine at 800' or** obstacle clearance altitude: "**Set top bug**" "**Flaps Up** (optional), **Max Cont Thrust, Review Engine Failure/Fire Checklist** "
- **at 3000'**, call "**VNAV**"
- **rejected landing** is same, except **do not** attempt if thrust reversers were used
- **Simulator Pitfalls**: wrong procedures or sequence, wrong pitch, no G/A thrust, wrong MAP (time, DME)

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• LANDING

LANDING INFORMATION:

- **Stabilized by:** 1000' (500' if VMC)
- **VASI** (**3 lite**) 737 / use **near** 2 (**Far** 2 VASI for wide body)
- **TCA/Class B Floor**: Clearance for "visual" is **not** authorization to go below TCA floor! (**ex:** IAH: 30-20 DME = 4000'; 20-15 DME = 3000')
- **Landing Flap Selection**: normally 30°; use 40° **if:**
  - short **or** slippery runway
  - **low** ceiling and visibility (CAT II)
  - occasional **proficiency** practice
- **Judgment**: go around if lousy approach!

Landing Procedure:

- call outs "100, 50, 30, 20, 10" (from radio altimeter, calls **below** 100 optional on visual, 100' call is **mandatory**)
- cross threshold at 50', touchdown **target** is just beyond 1000'. Rwy painted markers 500' apart, **last** one = 3000'.
- if speed brakes fail to come up, **manually** extend
- use thrust reversers as soon as possible to about 80% N1
- should always use **#1** brakes (quicker, brake wear saving), **and** plan to use **#2 or #3** if **short** or **slippery** runways, or strong **crosswind**.
- if need to do a Rejected Landing, do a normal **go-around**
  - do **not** attempt if reverser thrust has been initiated
- Last 3000' to 1000' of Rwy, ctr line lights are red **&** white
- Last 2000' of runway shows amber **edge** lights
- Last 1000' of runway, center line lights are **all** red
- hard landing = log book writeup (see Ops Man Sec 1)
- if maximum braking used, see brake cooling chart (QRH)
- if given a "land and hold short of runway xx" clearance, you should have 6000' runway, **IF: max** landing weight, 7500' **MSL**, **dry** runway, and **no** tailwind (or must check P&P charts). To **determine** how much runway you have: see Jepp pages (runway information) OR ask tower.
- In absence of a specific "hold short" clearance, you must **clear** landing runway, even if that means protruding on another adjacent Rwy or taxiway (see Ops Man Sec 2). See Jepp 10-7 for exceptions (ex: CLE).

- **Landing Techniques**:
- bad weather: favor **upwind** side of runway
- braking action: **poor** = **no** room for error! **nil** = do **not** land!
- Gear Up Landing: land to runway side of "extended" main gear; evacuate out "low" side
- you may tend to flare too **high** if runway width is 200' due to depth perception; ie: keep it coming down! If runway is narrow (**ex:** 75', IAH 14R), you will tend to flare too late!

LANDING WITH ENGINE OUT ON FINAL:

- AT / AP **off,** "**Flaps 15**", power **up**, VREF + 15k, GPWS inhibit **OR** If go around: maintain VREF + 15k, retract to Flaps 1
- if on short final, consider leaving bad engine (with fire or failure) **running**, then take care of it **after** landing

WINDSHEAR: see Flt Man Sec 3

- see windshear techniques in Takeoff section
- Target bug **set** for **normal surface** wind additive, **not** for A/S loss, but actually **fly** VREF + "A/S loss additive" (no > 20k) **or** target, whichever is **greater**. Do **not** use A/T.

TAXI-IN / SHUTDOWN: see Flt Man Sec 3

- allow #2 engine **cooling** for 1 min (3 mins desired), then off (+30 secs **before** block in).
- do Termination Check if **last** flight for day **or** lengthy ground time. Also, should do a **walkaround** if RON at **non-maintenance** station (see Flt Man Sec 3).
- leave cockpit **clean**! Radar should be in "Test"!

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Updates:
April 13: missed approach: stabilized approach