**BOEING 737 PROCEDURES**

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**BEFORE TAXI**

**Engine Starting, -200**

Normal starting procedure is to start No. 2, then No. 1 engine from APU air utilizing the APU

electrical supply.

Hold engine start switch in GRD position. When N2 reaches 20% and there is an N1 indication, move

start lever to IDLE and check fuel flow and EGT rise. Normal starting fuel flow is 800 - 1000 lbs. At

35%-40% N2, release the start switch.

Standard day, sea level, stabilized idle indications are:

JT8D-9 JT8D-15A

EPR

N1 RPM

EGT

N2 RPM

Fuel Flow

Oil Pressure

1.06

33%

300° - 400°

56%

1000 lbs/hr

40 - 50 psi

1.06

33%

300° - 400°

56%

1200 lbs/nr

40 - 50 psi

The requirement to abort an engine start is recognized by one or more of the following conditions:

No N1 rotation by 20% N2.

No oil pressure increase in 30 seconds.

Fuel flow greater than 1,100 PPH at initial start.

No increase in EGT within 20 seconds after the engine start lever is raised to IDLE.

No increase in, or very slow increases in N1 or N2 after EGT indication.

EGT rapidly approaching or exceeding the start limit.

**Engine Starting, -300**

Normal starting procedure is to start No. 2, then No. 1 engine from APU air utilizing the APU

electrical supply.

When cleared to start, position the ignition select switch to IGN L or IGN R (alternating starts and

flights) and select the engine start switch to GRD. Observe the start valve open light illuminate

and begin timing for 50 seconds. When the engine has rotated for 50 seconds and a minimum N2

RPM of 20% and a positive N1 rotation is observed, move start lever to IDLE and check for fuel flow

and EGT rise. Initial normal start fuel flow is approximately 400 lbs/hr.

Note: The 50-second motoring time, prior to introducing fuel, restores more uniform compressor

and turbine clearances, thereby improving engine start parameters.

At 46% N2, the start switch moves to OFF.

Allow the first engine to stabilize before engaging second starter. A decreasing EGT following the

peak EGT, along with stabilized N1, N2 and fuel flow are the best indication of a stabilized engine.

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Standard day, sea level, stabilized indications for CFM-56-3B1:

N1 RPM

N2 RPM

EGT

Fuel Flow

21.5%

60.3%

475° C

720 lbs/hr

The requirement to abort an engine start is recognized by one or more of the following conditions:

No N1 rotation before the engine start lever is raised to IDLE.

No oil pressure indication by the time the engine is stabilized at IDLE.

No increase in EGT within 10 seconds after the engine start lever is raised to IDLE.

No increase in, or very slow increases in N1 or N2 after EGT indication.

EGT rapidly approaching or exceeding the start limit.

**AFTER ENGINE START**

The engine anti-ice must be ON during all ground and flight operations when icing conditions exist

or are anticipated, except during climb and cruise when temperature is below -40°C SAT.

Normal takeoffs are made with Engine Bleed Switches ON. The aircraft gross weight must be at

least 2,500 lbs (-200), 1000 lbs (-300/-400) (runway limit) or 2,700 lbs (climb limit) less than the

maximum allowable gross weight for existing conditions. If these weight margins are not available,

turn off bleeds and use APU. If use APU, correct thrust by adding .03 EPR (-200) or 1% N1 (-300/-

400)

**TAXI**

Do not taxi away from the gate with an engine shut down. However, once away from the gate and

congested areas:

-200 - The No. 1 engine may be shutdown during taxiing when an outbound delay is

anticipated.

-300/-400 - Single-engine taxi is not permitted

Position the flap lever to the takeoff position after the aircraft is clear of the ramp area.

Full deflection of the rudder pedals produces approximately 7° of nose wheel turn. For the -200,

idle reverse thrust may be used during taxi to reduce brake usage, except on snow, ice, or slush

covered taxi surfaces. For the -300/-400, idle reverse is not to be used during taxi.

The minimum width of pavement for a 180° turn is:

-200 - 60 feet

-300 - 64.6 feet

-400 - 73.0 feet

Set two outer bugs on V1 and Vr. Set the airspeed inner bug on V2.

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**SPEEDS**

**Normal Speeds, -200**

Climb below 10,000 feet: 250 knots (ATC)

Climb above 10,000 feet: Performance Management System (PMS) ECON climb speed. If PMS

is INOP, climb at 280 knots or .70 Mach.

Cruise below 10,000 feet: 250 knots (ATC)

Cruise above 10,000 feet: PMS ECON cruise speed. If PMS is INOP, cruise at 320 knots/.72

Mach.

Descent from cruise altitude to 10,000 feet: Cruise Mach to crossover point, then 310 knots.

Descent below 10,000 feet: 250 knots

**Normal Speeds, -300/-400**

Climb below 10,000 feet: 250 knots (ATC)

Climb above 10,000 feet: FMCS (Flight Management Computer System) ECON climb speed. If

FMCS is INOP, climb at 280 knots or .74 Mach.

Cruise below 10,000 feet: 250 knots (ATC)

Cruise above 10,000 feet: FMCS ECON cruise speed. If FMCS is INOP, cruise at 300 knots/.74

Mach.

Descent from cruise altitude to 10,000 feet: .74 Mach/250 kts (economy) or .70M/280/250

(turbulent).

Descent below 10,000 feet: 250 knots

**TAKEOFF**

Set 1.4 EPR (-200) or 70% N1 (-300/-400) or higher (throttles vertical) prior to brake release

or as the airplane is aligned with the runway, then smoothly and rapidly advance throttles to

obtain takeoff EPR (-200) or takeoff N1 (-300) prior to 60 knots.

Keep nose wheel firmly on runway by holding slight forward pressure on the control column.

As airspeed reaches V1 (within 15 knots), the control column is moved aft of neutral. At Vr,

rotate the airplane smoothly.

Rotate initially towards 15° nose-up deck angle, until V2 + 15 to V2 + 25 knots is achieved.

Maximum deck angle is normally limited to 20 for takeoffs where the flight director is not

utilized. When the flight director is utilized, the command pitch may be flown. Rotation

should be approximately 2-3 degrees per second. Be aware of airplane attitude.

After positive rate of climb is established, retract gear and maintain takeoff flap setting.

Climb at V2 +15 to V2 + 25 knots until reaching 1,000 feet AFE.

Upon reaching 1,000 feet AFE, reduce pitch attitude to approximately one-half that required

to maintain V2 + 15 to V2 + 25 knots. Accelerate and retract flaps on schedule (see below).

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For the -200, as the flaps are retracted from 1° to 0°, the power may be reduced to 1.7 EPR

for noise abatement and continued climb to 3,000 feet AGL. At 3,000 feet AGL, set climb

thrust.

For the -300/-400, select level change and set 0° flap maneuver speed (minimum) in the

speed window. As the flaps are retracted from 1° to 0°, set climb thrust (N1).

Maintain 0° flap chart maneuver speed (minimum) to 3,000 AGL.

At 3,000 feet adjust pitch attitude as required to accelerate while maintaining an

approximate rate of climb of 1,000 fpm during acceleration to 250 knots.

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**737-200 Normal Takeoff**

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**737-300/-400 Normal Takeoff**

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**737-200 PMS A/T Takeoff**

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**737-300/-400 AFDS/AT Takeoff**

**Flap Speed Schedule**

The V-Speed Charts (Flip Chart) on board each aircraft contain a minimum maneuver speed for

each flap setting. Flaps may be operated between the minimum maneuver speeds and the

maximum placard speed. If the V-Speed Chart is not available, refer to the schedule below.

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During acceleration, select flap positions at the following initiation speeds according to Brake

Release Gross Weights (BRGW):

INITIATION SPEED, KNOTS

INITIAL FLAP

POSITION

SELECT FLAP

POSITION

BRGW AT & BELOW

117,000 LB

BRGW ABOVE

117,000 LB

TO

138,500 LB

BRGW ABOVE

138,500 LB

15 5

1

0

V2 + 15

170

190

V2 + 15

180

200

V2 + 15

190

210

5 1

0

V2 + 15

190

V2 + 15

200

V2 + 15

210

1

737-400 FLAP

1 TAKEOFF

NOT

CERTIFIED

0

190

200

210

FINAL SEGMENT CLIMB SPEED 210 220 230

Note: Flap retraction speeds (minimum maneuver speeds) may be led by 10 knots when

accelerating. Limit bank angle to 15° until reaching maneuver speeds.

**CRUISE**

**Normal Fuel Management**

Use center tank fuel to depletion followed by main tank fuel.

**DESCENT**

**Use of Speed Brakes**

Use of speed brakes below 1,000 feet AGL is not recommended. Speed brakes, flaps and gear may

be used if ATC has kept the flight high and in close proximity to the airport.

**Anti-Ice**

-200 - When using engine or engine and wing anti-ice, maintain a minimum of 40% N1 (TAT

between 0° and 10°C) or 55% N1 (TAT below 0°C), to provide sufficient airflow and

temperature for anti-ice. Using 55% N1 will increase descent distance by approximately 25%

over idle descent distance.

-300/-400 - In flight, when engine anti-ice is ON, engine idle RPM is automatically

rescheduled to a minimum of high idle RPM. The use of anti-ice and the associated thrust

required will increase descent distance required.

**BEFORE LANDING**

**Airspeed Bug Settings**

Set two outer bugs on Vref. Two bugs are used for emphasis.

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Set the airspeed cursor (inner bug) on Vref + 5 knots minimum. Position the cursor to Vref +

1/2 the reported headwind and all the gust. Maximum cursor setting is Vref + 20 knots. In

all cases, gust correction should be maintained to touchdown while steady wind correction

should be bled off as the aircraft approaches touchdown.

Set a single outer bug to V2 for flaps 1°. Setting this bug serves three purposes. The speed

is the same for all three possibilities:

o Two-Engine Go-Around: V2 for flaps 1 is the minimum speed used for flap retraction

from 15° to 5° during a two-engine go-around.

o Loss Of An Engine On Approach: If an engine fails on approach, set flaps 15° and use

the single outer bug as your target speed. Fly this bug plus wind additives.

o Single-Engine Go-Around: Go-around flap setting with an engine inoperative is 1°. V2

for flaps 1 is the minimum acceptable speed for go-around with an engine

inoperative.

**APPROACH**

**737 Normal ILS Approach and Landing**

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**737 One-Engine ILS Approach and Landing**

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**737 Dual Channel ILS Approach**

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**737 Non-Precision Approach**

**APPROACH / LANDING**

**Flap Extension**

Using flaps as speed brakes is not recommended. The following procedures and maneuvering

speeds are used for extending flaps:

Reduce speed to 0° maneuver speed as depicted on the appropriate gross weight page of the

V-speed chart.

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Subsequent flap extensions should be at speeds less than the maximum placarded speeds for

the flap selected.

Maneuvering should be conducted at speeds no higher than placarded speeds, and no lower

than maneuvering speeds as shown on the V-speed charts.

Gear should be extended prior to flaps 15° to preclude gear warning horn sounding.

Normally 30° is the recommended landing flap setting. Flaps 15° is used as a landing flap when

operating with one engine and at airports with elevations 3,000 feet and above when ambient

temperatures and high landing weights are encountered. Use of this landing flap and

corresponding approach speed results in an improved approach go-around capability.

**Power Settings**

Power must not be reduced to the extent that the engines spool down. It must be remembered

that a spooled-down engine can take 8-10 seconds to produce maximum power. Fifty-five (55%)

percent of N1 (-200) provides a good indication of a spooled-up engine. A spooled-up condition on

the -300/-400 is accomplished automatically by the high idle function when flaps 15 or greater is

selected.

**Reverse Thrust**

After speedbrakes have deployed, lower nose smoothly to the runway and initiate reverse thrust

immediately.

-200 - The maximum allowable go-around EPR may be used. Conditions permitting, limit

reverse thrust to 1.5 EPR for passenger comfort. By 60 knots, gradually reduce reverse

thrust so as to be at no more that IDLE reverse (1.1 EPR) when reaching taxi speed.

-300 - The maximum allowable go-around N1 may be used. Conditions permitting, limit

reverse thrust to 82% N1 for passenger comfort. By 60 knots, gradually reduce reverse thrust

so as to be out of reverse when reaching taxi speed.

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**737 VFR Approach and Landing**