McDonnell Douglas MD-80 Procedures

Compiled by Matt Zagoren

STARTING ENGINES

Engine Start Sequence

The normal starting sequence is left engine then right engine. When authorized, the Captain my elect to taxi away from the gate/ramp area with the right engine shut down. In this case, only the left engine is started.

Engine Start Procedure

- Check pneumatic pressure. Optimum starting pressure (valve closed) is 30-38 psi.
- Left Engine Start Switch - GND.
    - Check that L START VALVE OPEN light comes on.
    - Check that pneumatic pressure gauge indicates 22 psi or greater. (If starting pressure is below 25 psi, be alert for a hot or hung start.)
- Check for increasing oil pressure, N2, N1 and hyd pressure.
- At max motoring (20% N2 minimum), with approximately 5% N1, and EGT at or below 100°C set Fuel Lever - ON.
- Left Engine Start Switch - OFF at 40% N2.
- Check that N2 RPM stabilizes at 50-61%.
- With left engine stabilized at idle RPM, check the following:
    - APU or EXT PWR (L) Power In Use Light - OUT
    - L CSD OIL PRESS LOW Light - OUT
    - L OIL PRESS LOW Light - OUT
    - L HYD PRESS LOW Light - OUT
    - EGT - 300-480°C
    - Fuel Flow - 800-1100 LBS/HR
- Engine Anti-Ice (if required) - ON
- Start right engine in same manner.

Interrupting Engine Starts, Conditions

If any of the following conditions occur during starting, immediately abort the start:

- No rise in EGT within 20 seconds after Fuel Lever positioned to ON.
- Hung Start - N2 RPM acceleration stagnates.
- HOT START - Starting EGT exceeds 475°C.

Post Engine Start Notes

- Stabilized idle (50-61% N2) is the speed prior to turning on the air-conditioning or engine anti-ice.
- Lower than normal idle RPM (less than 50% N2) accompanied by higher than normal EGT and possible generator cycling may be an indication that the 13th stage start bleed valve has failed to close. When conditions permit, momentarily advance the throttle to 65% N2 and then retard to idle. This action should close the bleed valve.
- Higher than normal idle RPM may indicate actuation of the approach idle solenoid. The Minimum Equipment List (MEL) permits dispatch with one or both engines operating in approach idle.
- After the left engine has stabilized at idle RPM, the left air conditioning pack may be turned on.

ONE ENGINE TAXI
One engine taxi not authorized when the following conditions exist:

1. APU is inoperative.
2. Jet blast will be excessive.
3. Engine anti-icing is being used or will be used prior to take-off.
4. Ramps and taxiways are slippery.

Do not use more than 1.2 EPR for breakaway power. After landing and when clear of runway the right engine may be shut down for taxi-in to the gate.

TAXI
To break away from the ramp, release brakes and slowly increase thrust. In a tight gate situation, limit thrust to 1.2 EPR. When entering turns, overshoot the centerline to compensate for the aft position of the main gear which is approximately 70 feet behind the pilot.

A vertical bounce may be noticed in the cockpit between 12-14 knots and 27-30 knots ground speed. The DC-9 has very responsive nosewheel steering and a light nosewheel footprint, especially at aft center of gravities. Be especially cautious when initiating turns on wet/slippery surfaces. The limit of nosewheel deflection through the steering wheel is 82°.

When taxiing on snow or slush, keep flaps retracted until reaching the takeoff runway.

BEFORE TAKEOFF
Just prior to initiating the takeoff roll, the nose lights should be turned on to indicate the airplane is starting the takeoff roll. At Captain's discretion or if high intensity lights are inoperative, the wing landing lights and/or the ground flood lights can be used for recognition purposes and should be left on during climb out until at least 10,000. NOTE: Extended wing landing lights cause slight buffet above 200 KIAS.

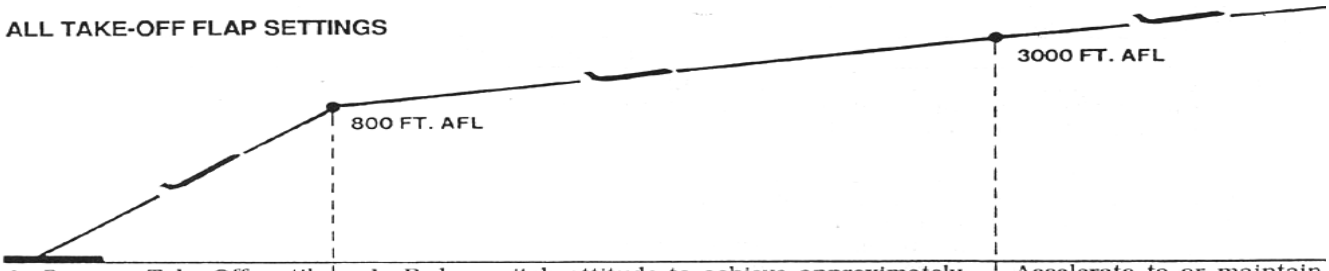
When using flaps 24 for takeoff, do not exceed the 24 mark on the dial-a-flap wheel. Positioning the wheel even slightly beyond the 24 mark may cause the "fulap" takeoff warning to sound during the takeoff roll.

Line up slightly left or right of center to avoid runway centerline lights which can cause nosewheel thump during takeoff.

TAKEOFF / INITIAL CLIMB

- The pilot making the takeoff will advance the throttles to 1.4 EPR or 80% N2 (throttles approximately vertical). If autothrottles are to be used for takeoff, move the ATS switch to AUTOTHROT. If throttles are to be used manually, rapidly but smoothly increase thrust to take-off EPR.
- When using autothrottles check that FMA annunciates the correct EPR mode selected, and changes to CLMP (clamp) at approximately 60 knots. If CLMP not indicated by 60 knots disconnect autothrottles.
- Normally a rolling takeoff will be made. However, if instructions are received to take position on runway and hold, set the throttles to approximately the vertical position, ease off brakes and engage autothrottle.
- The final adjustment to takeoff EPR should be made by 60 knots.
- Maintain directional control with rudder pedals.
- At Vr, rotate smoothly to takeoff attitude of approximately 8° pitch. Note: Tail strike will occur at 10.5° ANU with main gear on ground. As airplane becomes airborne continue rotation to climb attitude and stabilize at V2 + 10 during initial climb. The maximum deck angle is 20°.
- The initial climb speed o V2 + 10 provides approximately 20% margin above stall speed (1.2 Vs) up to a 15° bank. When more than 15° of bank will be required for maneuvering, increase speed to V2 + 20. This will provide approximately 30% margin above stall speed for bank angles up to a max of 30° bank.

MD-80 Takeoff Procedures



INITIAL CLIMB PROCEDURE

Limit bank angles to 15° after take-off and initial climb until Clean Min Maneuver Speed is attained. If more than 15° of bank is required for maneuvering, a maximum of 30° of bank is permitted in the following configurations if speed attained is as follows:

T.O. Flaps/EXT	–	V2 + 20
0/EXT	–	Slat Retraction Speed
0/RET	–	Clean Min Maneuver Speed

NOTE:
The special Take-Off Procedures listed in Flight Manual – Part II for specific airports will be substituted for the normal take-off and initial climb procedure. These procedures may require a non-standard climb speed and bank angle, however this combination of climb speed and bank angle will not provide less than 20% margin above stall speed (1.2 Vs). This 1.2 Vs meets FAA stall margin requirements.

AFTER TAKEOFF - CLIMB

- At about 1500 feet AGL rapidly cycle the No Smoking Sign Switch OFF and ON as a signal to the flight attendants that they may leave their seats.
- Retract flaps on schedule.
- For climb, fly PMS CLB OPT speed. If PMS is inoperative, maintain climb airspeed of:
    - 250 knots to 10,000 feet.
    - 290 knots to Mach crossover.
    - .74 Mach above Mach crossover to cruise altitude.
- At FL180, check that wing landing lights and/or ground flood lights are off and reset altimeters (USA only) to 29.92.

CRUISE

For cruise, fly PMS CRZ OPT. If the PMS commands a cruise Mach of ± .02 or more than the flight plan cruise Mach, fly the flight plan cruise Mach. If PMS is inoperative, fly the flight plan cruise Mach.

DESCENT

- Set airspeed reference bugs to:
    - 0/RET Min Maneuver
    - 0/EXT Min Maneuver
    - 15/EXT Min Maneuver (11/EXT Min Maneuver if required by airport analysis)
    - Vref (orange reference bug)
    - 80 knots
- Set Command Airspeed Bug as required if autothrottle is used, otherwise set to approach speed.
- For descent, maintain descent airspeeds of:
    - Cruise Mach to the 280 knot crossover point.
    - 280 knots to 10,000 feet.
    - 250 knots below 10,000 feet.
- The PMS may be operated in the DES NON-OPT mode to maintain the speed profile.
- Descending thru FL180 or leaving cruise altitude, whichever is lower set exterior lights as required and set and recheck altimeters.

Clean configuration at idle power is the normal descent method. Speed brakes should be used when they are needed to expedite traffic flow and maintain the desired descent profile. The trend

is toward descents at slower speeds where greater aerodynamic efficiency (increased L/D's) can be achieved. Barber pole descents are not economical. Optimizing the descent requires that we descend at speeds that result in improved glide ratios, and that we begin the descent at distances based on these ratios to the extent that ATC and schedule dependability allow.

Use the following rule of thumb to determine a BOD point:

1. Determine the altitude difference.
2. Drop the last three digits.
3. Multiply by three.
4. For an unrestricted descent to landing, add 10 nm.
5. For a descent to an intermediate altitude above 10,000 feet, no additive required.
6. Adjust BOD point for wind (tailwind - earlier BOD, headwind - later BOD):
    1. Add 2 nm for each 10 knots of tailwind at BOD altitude.
    2. Subtract 2 nm for each 10 knots of headwind at BOD altitude.

A 3° descent profile will help maintain a 300 fpm cabin rate of descent. To determine the rate of descent that will produce the 3° profile, multiply the ground speed by six.

In airspace beyond 12 nm of the U.S. coastline, the 250 knot restriction below 10,000 feet does not apply. Therefore descend (and climb) at the same speed specified for above 10,000 feet.

Approach speed is the final approach speed. Normally it is equal to Vref, adjusted for wind and gust as follows:

Approach Speed = Vref + 1/2 Wind + Gust. Tailwinds are excluded. Minimum Approach Speed with no wind is Vref + 5 knots. Maximum Approach Speed is Vref + 20 knots.

In gusty conditions when approaches are conducted with the autothrottles engaged, actual speed may be slightly above the Command Speed Bug setting (approx 2-6 knots).

Speed reduction should be made using speedbrakes in lieu of flap/slat extension, whenever possible. To provide adequate stall margins during approach, the speed brakes must be retracted before extending the flaps and while extending the gear.

BEFORE LANDING

- Extend flaps/slats on schedule.
- The only flap settings to be used during a normal approach and landing are:
    - 0/RET
    - 0/EXT
    - 11/EXT
    - 15/EXT

- 28/EXT
- 40/EXT

- Use of intermediate flap positions is prohibited.
- To minimize the air loads on the flaps/slats, avoid extension and operation near the max airspeeds. Extend flaps/slats near the Min Maneuver Speed for the flap/slat configuration.

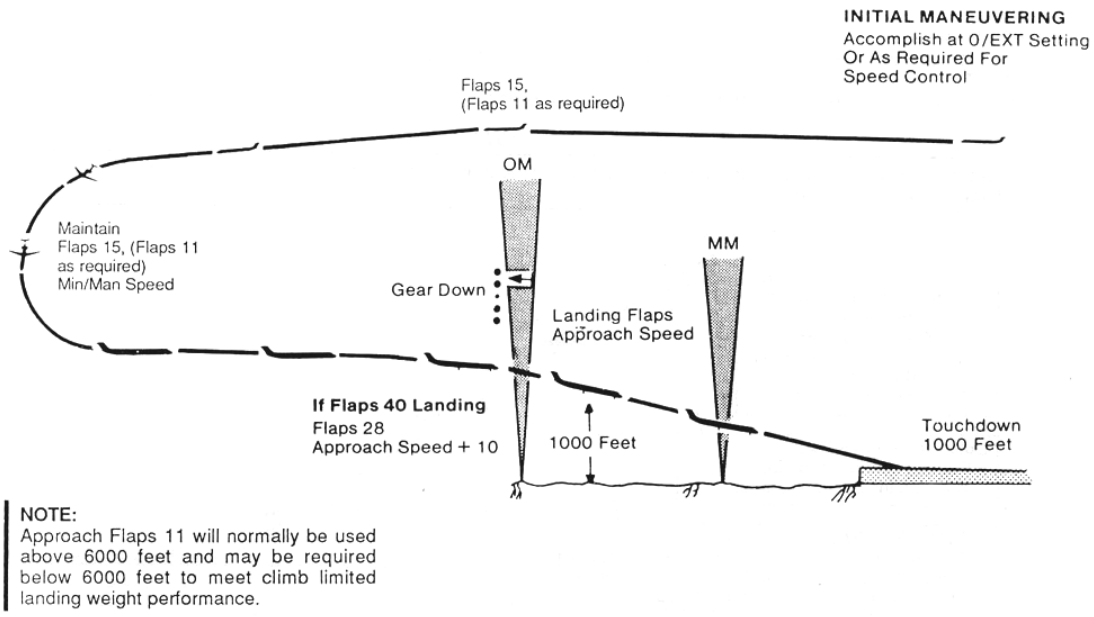
NOTES:

- Flaps should not be used for drag purposes in reducing speed - instead, they provide for operation at reduced speeds.
- When landing at airport elevations of 6000 feet or less, flaps 15 will normally be used for approach and flaps 28 or 40 will be used for landing.
- Approach flaps 11 will be used at airport elevations of 6000 feet or less if required by airport analysis to meet climb limited landing weight performance. When flaps 11 is used for approach, flaps 28 must be used for landing.
- When landing at airport elevations above 6000 feet flaps 11 will normally be used for approach and flaps 28 will normally be used for landing.
- Use of flaps 40 above 6000 feet elevation is restricted to airports which are specifically authorized to use Flaps 40 by the airport analysis.
- When landing at airports with elevations of 6000 feet or less, the use of flaps 40 is required when the anti-skid system is or may be inoperative.
- At airports with elevations of 6000 feet or less the use of flaps 40 is recommended whenever:
    - landing with a tailwind.
    - landing on wet/slippery runways.
    - landing on runways 7000 feet or less in length.
    - braking action is reported less than good.
    - the airplane is very light making speed reduction difficult.
    - the approach is steeper than normal due to ATC requirements.
    - when engine and airfoil anti-ice are on, which requires higher than normal engine power.
- For a flaps 40 landing, flaps 15 must be used for approach.
- Flaps 28 - Landing with Flaps 28 provides a smoother approach and helps conserve fuel by reducing excess drag. However, landing with flaps 28 causes the airplane to float more in ground effect than with flaps 40 if flare, speed or thrust are excessive.
- Flaps 40 - At typical landing weights, flaps 40 helps reduce overall stopping distance.

APPROACH PROCEDURES

MD-80 ILS and Non-Precision Approach Procedures

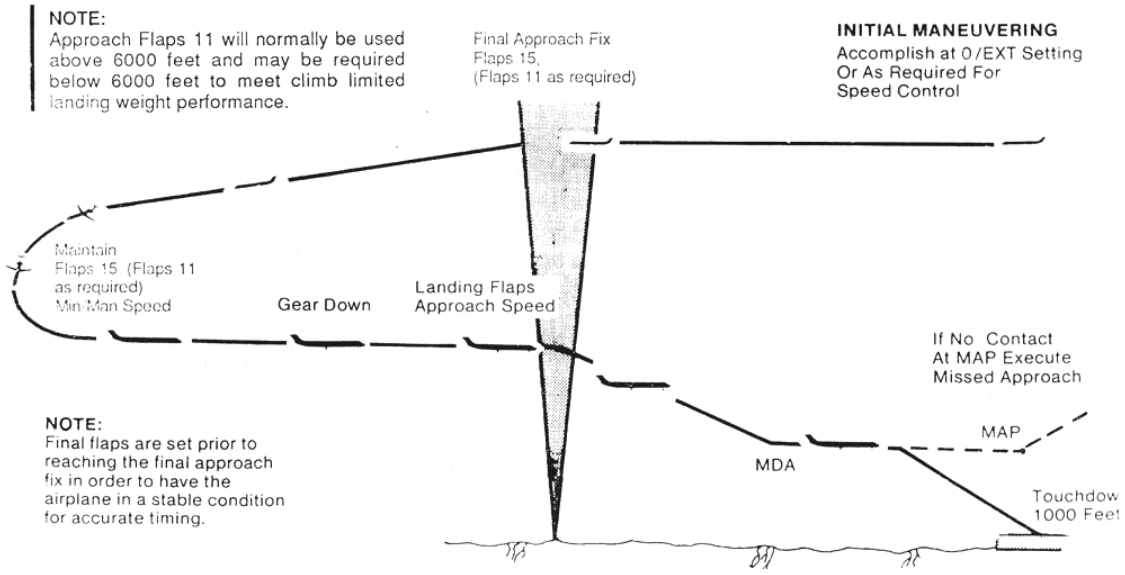
ILS HAND-FLOWN/COUPLED APPROACH



NOTE:
Approach Flaps 11 will normally be used above 6000 feet and may be required below 6000 feet to meet climb limited landing weight performance.

NON-PRECISION APPROACH

NOTE:
Approach Flaps 11 will normally be used above 6000 feet and may be required below 6000 feet to meet climb limited landing weight performance.

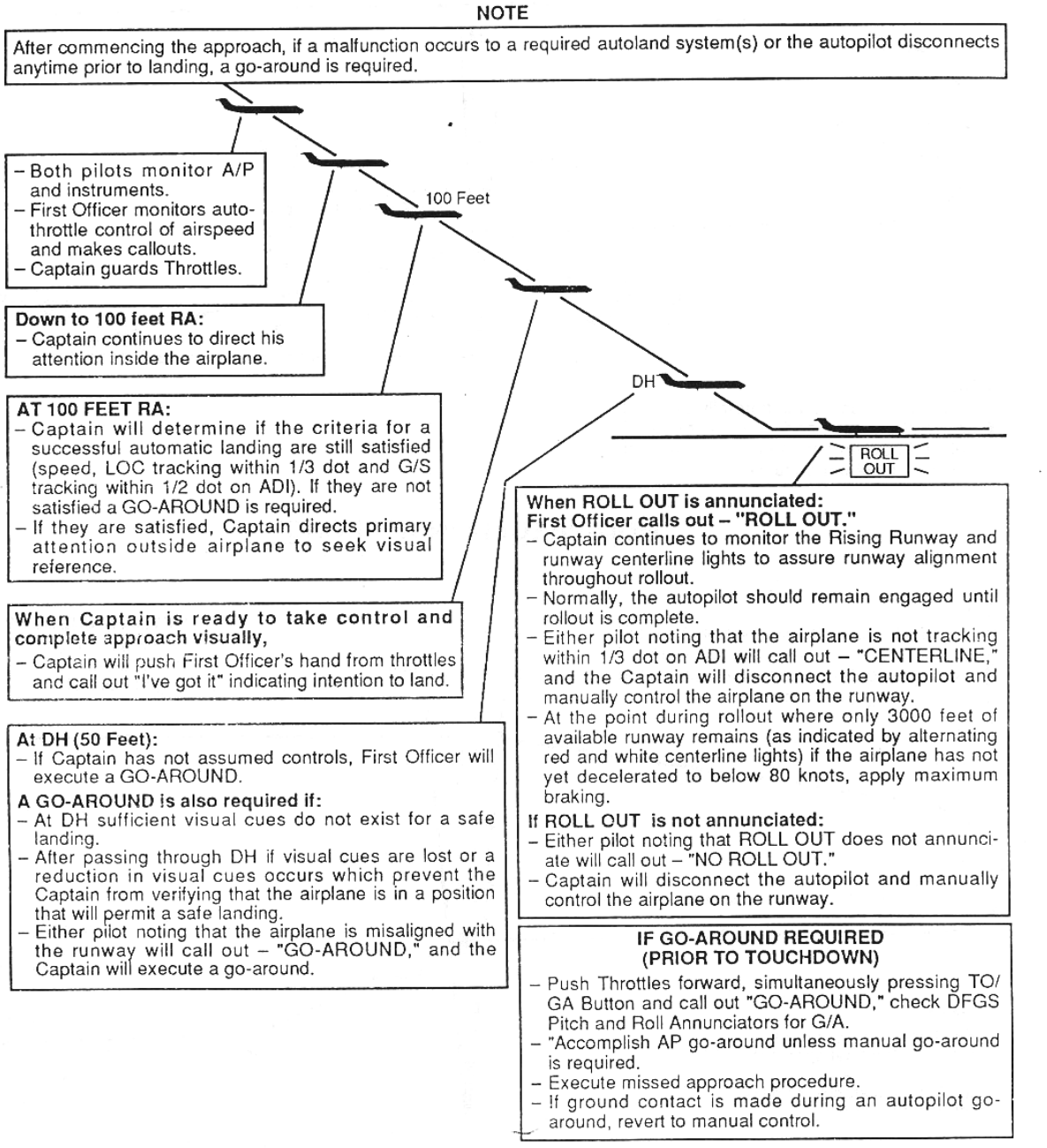


NOTE:
Final flaps are set prior to reaching the final approach fix in order to have the airplane in a stable condition for accurate timing.

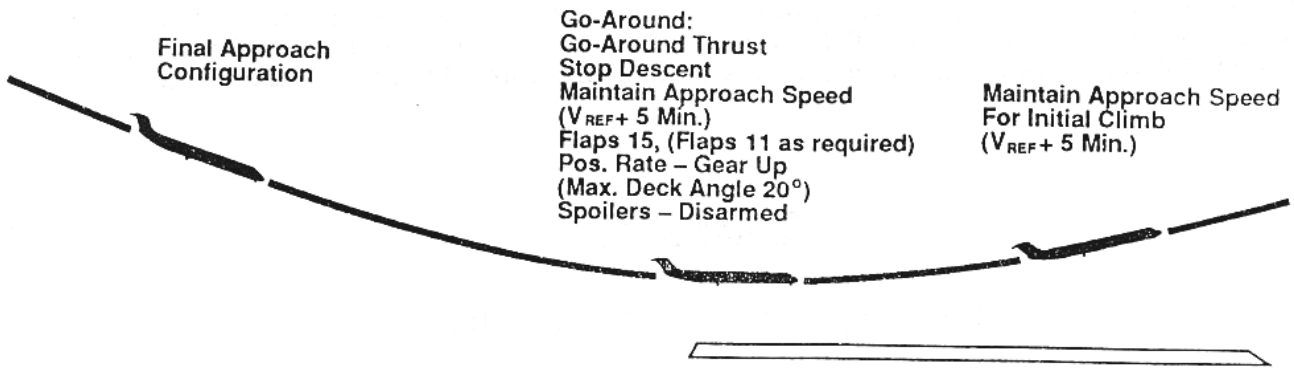
INSTRUMENT APPROACH CREW COORDINATION PROCEDURES
CAT III

GENERAL

- CAT III requires the use of AUTOLAND with the Autothrottle engaged. (For weather minimums see Flight Manual – Part I.)
- First Officer remains on instruments throughout approach and landing, and makes all callouts below 1,000 feet.



MD-80 Go-Around Procedures



Notes:

If ILS is available, it should be used whenever it provides adequate threshold clearance height, regardless of weather conditions. A wheel height crossing altitude of 20 feet has been established as a minimum for autopilot coupled approaches. At airports where the ILS provides less than the established minimum threshold crossing altitude, a displacement of one to two dots above the glide slope should be maintained from an altitude of 200 to 300 feet until flare. A glide slope TCH of less than 35 feet will product less than the desired minimum wheel crossing height over the threshold.

For visual approaches, it is important to establish the proper flight-path angle. An angle of 3° is recommended.

The throttles must be thought of as a primary flight control and used in coordination with the elevators to control airspeed, rate of descent, and position on glide path. To minimize large and abrupt throttle movements when using the autothrottles, anticipate the changes in thrust and manually advance or retard the throttles as required.

The JT8D engine normally requires about 8 seconds for acceleration from idle to go-around EPR. However, there are many variables which can affect this time and cause one engine to be considerably different than another. Such variables are engine bleed, idle trim setting, pressure altitude, bleed valve scheduling and fuel control condition.

Aim all approaches at the 1000-foot point on the runway. If it appears that touchdown will be within the first 500 feet of the runway, adjust the glide path by positive application of power. Pulling back on the yoke without positive power application forces the main gear down and creates exposure to short landings.

If neither an ILS nor a three-bar VASI is available on a visual approach, a 3 degree flight path can be approximated by maintaining 300 feet of altitude for each mile from the runway. For example, when crossing a fix five miles from touchdown, the aircraft should be at 1500 feet above the runway at that point.

If the ground speed can be estimated, the approximate rate of descent on a 3 degree glide path can be determined by the following rule of thumb to give a 3 degree glide path: One-half the ground speed times ten will give a close approximation of the descent rate required.

If the proper speed is maintained, the pitch attitude on final approach using flaps 28 will be approximately 3 to 4.5 degrees nose up or 2 to 3.5 using flaps 40.

The descent rate should be limited to less than 2000 fpm below 2000 feet AFL and 1000 fpm below 1000 feet AFL.

Flaps 28 Estimated Body Angle and Threshold Crossing Height, ILS Approach				
GLIDE PATH ANGLE (DEGREES)	ESTIMATED BODY ANGLE (DEGREES)	ANTENNA HEIGHT, Ha, AT THRESHOLD (FEET)	MAIN GEAR HEIGHT, Hg, AT THRESHOLD (FEET)	MAIN GEAR TOUCH-DOWN POINT, T (FEET)
2.5	4.9	44	29	664
2.75	4.65	48	34	708
3.0	4.4	52	39	744
Flaps 40 Estimated Body Angle and Threshold Crossing Height, ILS Approach				
GLIDE PATH ANGLE (DEGREES)	ESTIMATED BODY ANGLE (DEGREES)	ANTENNA HEIGHT, Ha, AT THRESHOLD (FEET)	MAIN GEAR HEIGHT, Hg, AT THRESHOLD (FEET)	MAIN GEAR TOUCH-DOWN POINT, T (FEET)
2.5	3.2	44	28	649
2.75	2.95	48	33	681
3.0	2.7	52	37	708

LANDING

Early stabilization of airspeed, power, and descent rate are essential for a good landing. For normal landing configuration, the descent rate will be 650 to 800 fpm. The recommended landing procedure for the DC-9 calls for reducing the sink rate at approximately 20 feet radio altitude. Only a 2-3 degree attitude change is required to reduce the rate of descent. As this attitude is being held, power should be slowly reduced. Do not attempt to hold the airplane off by further increases in attitude. Thrust should be reduced to idle at or just before touchdown. With proper airspeed control and thrust management, touchdown will occur at no less than Vref.

The airplane will float in ground effect if flare control and thrust are excessive at touchdown. If speed is excessive, it is still better to set it onto the runway as near the 1000 foot point as possible, rather than allowing it to float to bleed off speed. Deceleration on the runway is 3 times greater than in the air.

Tail contact with the runway can result from excessive pitch angles caused by flying below reference speeds on final, attempting to obtain a smooth touchdown by holding the airplane off the runway and holding the nosewheel off in an attempt to achieve aerodynamic braking. The tail cone will make contact at a 10.5° deck angle with the main landing gear struts compressed.

During normal landings as speed is being reduced, the brakes should come into action just prior to the termination of reverse thrust operation. This combination provides the most economical landing performance.

If using auto brakes on a dry runway, normally revert to manual braking between 90 to 70 knots, depending on deceleration rate and runway remaining. If runway is wet or slippery, continue auto braking until reaching taxi speed. Where possible, do not use brakes until below 100 knots unless stopping distance or other abnormal conditions dictate otherwise.

The Auto Brake system is not required for flight. Auto Brakes, if operative, must be used when braking action is reported less than good or on wet/slippery runways 7000 feet or less in length. If Auto Brakes are to be used for landing the following are recommended selections:

- MIN - Minimum for braking on wet/slippery runways greater than 7000 feet in length or on dry runways.
- MED - Medium when braking action is reported less than good or on wet/slippery runways 7000 feet or less in length.
- MAX - Maximum for emergency braking.

Throttles must be at idle for auto deployment of ground spoilers.

Reversing should be initiated as soon as practicable since reversing is more effective at higher speeds. When the nose gear is firmly on the ground, move reverse levers to reverse idle then apply reverse thrust to 1.6 EPR (overshoot up to 1.8 is allowed) unless safety dictates the use of more power.

The application of reverse thrust tends to blank out the rudder. The effectiveness of the rudder starts decreasing with the application of reverse thrust and at 90 knots and at 1.6 EPR (in reverse) it is almost completely ineffective.

At 80 knots start reducing thrust so as to be out of reverse by 60 knots.

AFTER LANDING - TAXI
The APU must operating prior to initiating any one engine taxi. If one engine taxi will not be accomplished, start APU approx 2 minutes prior to gate arrival.

The flaps may be damaged and their operation impaired by accumulation of snow, ice, or slush. If there is snow, ice, or slush on runway, retract flaps to 15 and leave flaps at 15 during taxi-in.