B777 Non-Normal Procedures

Last Updated: **31st July, 2015**

TheAirlinePilots.com

Rejected Takeoff

1) Abort Maneuver:

Captain's Task

- Close the thrust levers.
- Disengage the auto throttles.
- Maximum wheel brakes IF RTO does not automatically engage.
- Maximum reverse thrust.
- Verify speed brakes extended.

First Officer's Task

- Verify captain's action and call out any omission.
- Inform ATC.

2) After Abort:

Captain's Task

- Set Parking brakes
- Announce "ATTENTION, CABIN CREW AT STATIONS"

3) Non-Normal Checklist

4) Evacuation (Assess if it is Required):

First Officer's Task

- On Captain's command, select L INBD and then C/L on DSP.

Captain's Task

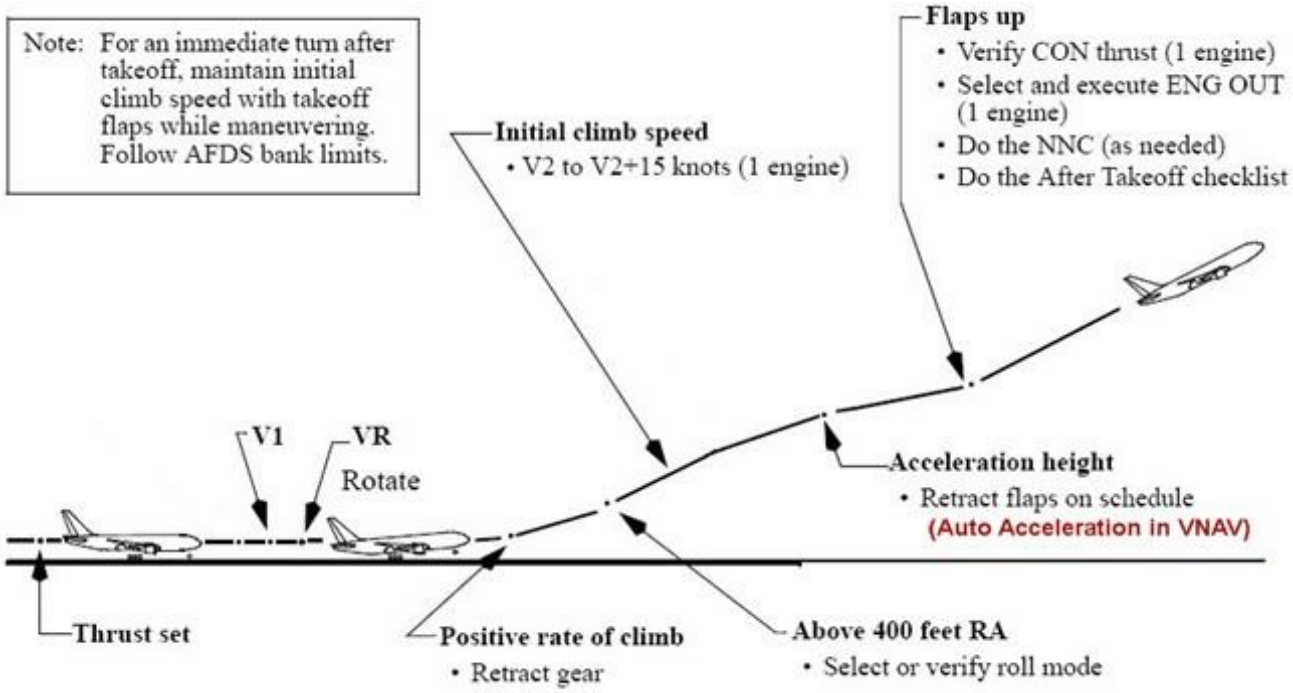
- Captain will use CCD and select non normal menu, un-annunciated, and then evacuation C/L.

Captain and First Officer's Tasks

- Both will carry out the actions as per area of responsibility defined in QRH:
    - Captain:
        - Parking Brake
        - Fuel Control Switches
        - Advise Cabin to Evacuate
    - F/O:
        - Everything else ☹

Single Engine Operation:

Engine Failure at or above V1



Note: The AFDS limits the bank angle to 15° until V2 + 10 knots to maintain at least adequate maneuver margin. The bank angle limit increases to 25° by V2 + 20 knots if LNAV is engaged, or when HDG SEL or TRK SEL is engaged with the bank limit in AUTO.

Engine Fire at or above V1

Silence aural warning

Carry out NNC recall items at 400 ft. AAL.

AT acceleration altitude (1000 AAL) clean up on speed schedule

Carry out Engine fire checklist

Coordination between PF and PM:

- A/T ARM Switch off by PF after confirmation with PM.
- Retarding of thrust lever will be done by the PF after confirmation by the PM.
- Fuel control switch will be cut off by the PM after confirmation by the PF
- Checklist to be done after clean up as conditions permit.

Coordination with Others:

ATC:

- Use DISTRESS (MAYDAY) or URGENCY (PAN) call as required.
- Request shorter vectors or holding etc (as required).
- Request for Ground Assistance if required (e.g. fire tender etc)

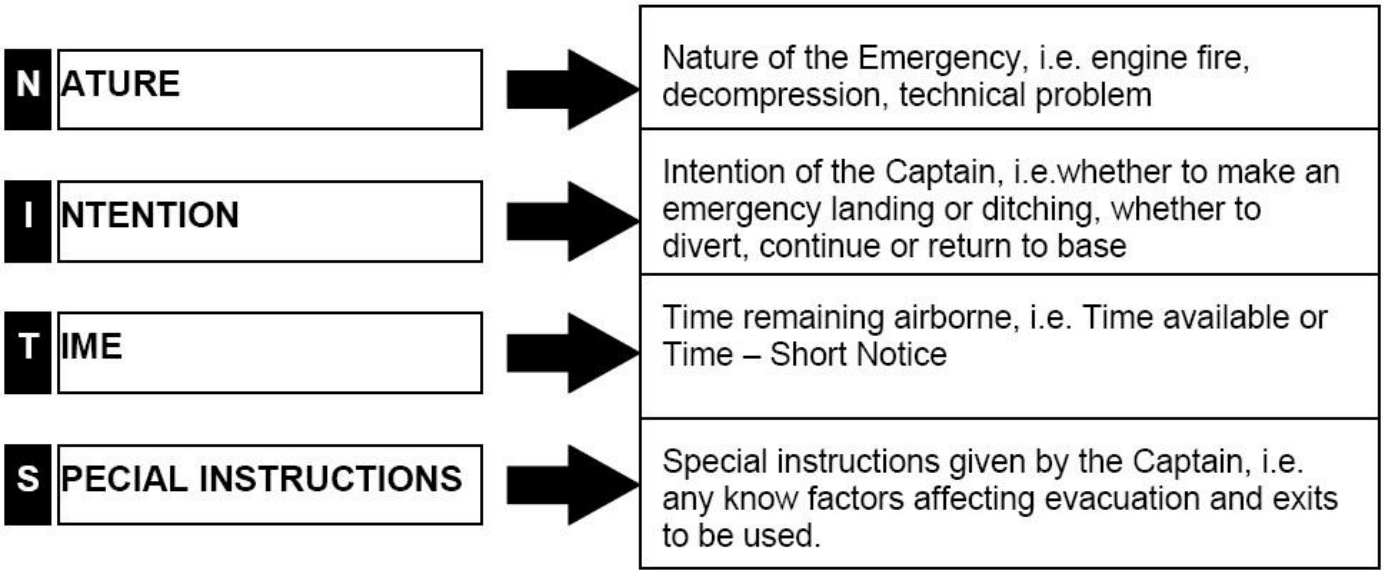
Company:

- Advise the company.

Cabin Crew:

Captain will say over the PA **"PURSER TO THE FLIGHT DECK IMMEDIATELY"**

Terminology to initiate the NITS drill is: **"THIS IS A NITS DRILL PLEASE LISTEN CAREFULLY"**



In conducting the NITS, the Captain shall clearly state the individual components of the drill, i.e.

"THE NATURE OF THE ……."

"MY INTENTIONS ARE ……."

"THE TIME AVAILABLE IS ……."

"SPECIAL INSTRUCTIONS……."

Captain's briefing will be acknowledged by repeating back the NITS given.

Anything not understood or omitted should be clarified.

Watches must be synchronized.

Passengers:

- PA: Inform them what's going on.

Engine Limit, Surge, Stall, Severe Damage and Separation

After V1	Continue
+ VE Climb	Gears UP
Gears UP → 400 Feet	PM **Announces** the Problem
After 400	PM **Identifies*** the Problem PF **Confirms** the Problem PF **Commences** the Memory Items
Standard One Engine Inoperative Procedures	

*** <u>Identification clues</u>:**

1) Engine Limit:

- Red Indications

2) Engine Surge and Stall:

- Noise
- Vibrations
- Fluctuating Parameters

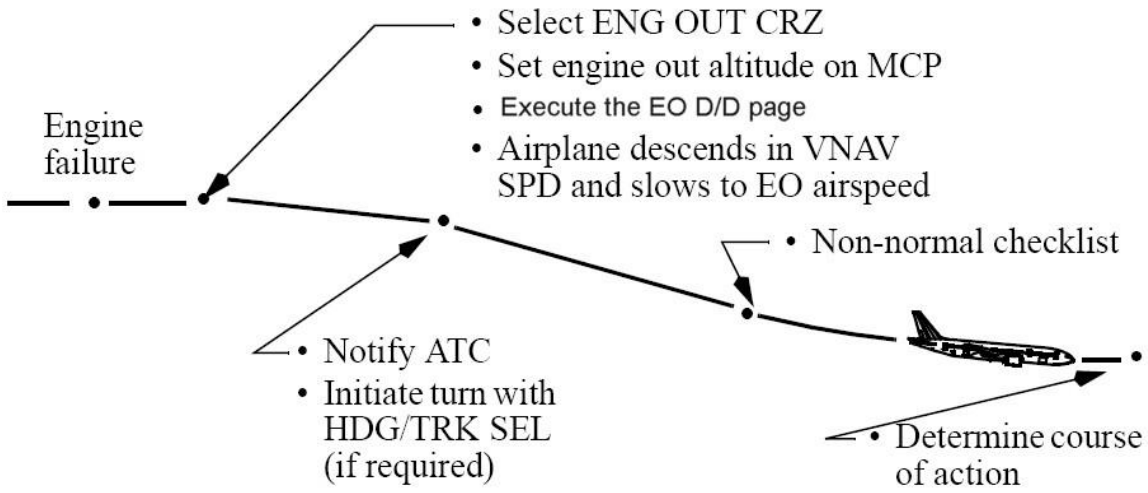
3) Engine Severe Damage:

- Vibrations
- No Indications for "<u>Some</u>" Parameters

4) Engine Separation:

- Vibrations
- No Indications for "<u>All</u>" Parameters
- Hydraulic Warning (EICAS)
- Electrical Warning (EICAS)

One Engine Inoperative Cruise / Driftdown



Drift down execution using VNAV: (Ref: FCOM 11.31.34)

Condition 1: Set the MCP altitude at or below EO MAX altitude and execute the FMC modification.

Condition 2: Execute the ENG OUT modification. Then, set the clearance altitude (lower than EO MAX) in the MCP and push the MCP altitude selector.

Condition 3: Set the clearance altitude (lower than EO MAX) in the MCP, push the altitude selector; then, after the descent is established, execute the FMC modification (ENG OUT selection).

The VNAV SPD mode may command the airplane to nearly level flight to control an airspeed increase above the driftdown target speed. If the excess airspeed cannot be reduced with the airplane in nearly level flight, then the FMC transitions to the VNAV PTH mode. In the VNAV PTH mode, the FMC commands a flight path for a 300 fpm descent rate. The autothrottle SPD mode then controls the airspeed.

At altitude capture the ENG OUT CRZ page is displayed. Maintain MCT and driftdown altitude until the EO SPD speed is established.

If required to cruise at maximum altitude, set MCT and establish a climb, decelerating slowly to EO CLB speed. At level off, select EO LRC for best fuel economy.

An alternate target driftdown speed can be selected using the MOD CRZ or EO D/D page. LRC speed would result in a lower driftdown altitude but better fuel performance. A company speed (CO SPD) could be selected, as specified in the AMI (Airline Modifiable Information file) and provides for a higher driftdown speed and a shorter flight time to the alternate.

An engine out cruise altitude can be entered on the MOD CRZ or EO D/D page. If an engine out cruise altitude is entered while the airplane is more than 150 feet above the computed maximum altitude, the FMC commands a driftdown schedule for descent to the entered engine out cruise altitude. If a cruise altitude is entered after the airplane has descended to within 150 feet of the computed maximum altitude or to a lower altitude, the FMC commands a cruise descent at approximately 1,250 fpm for descent to a lower engine out cruise altitude.

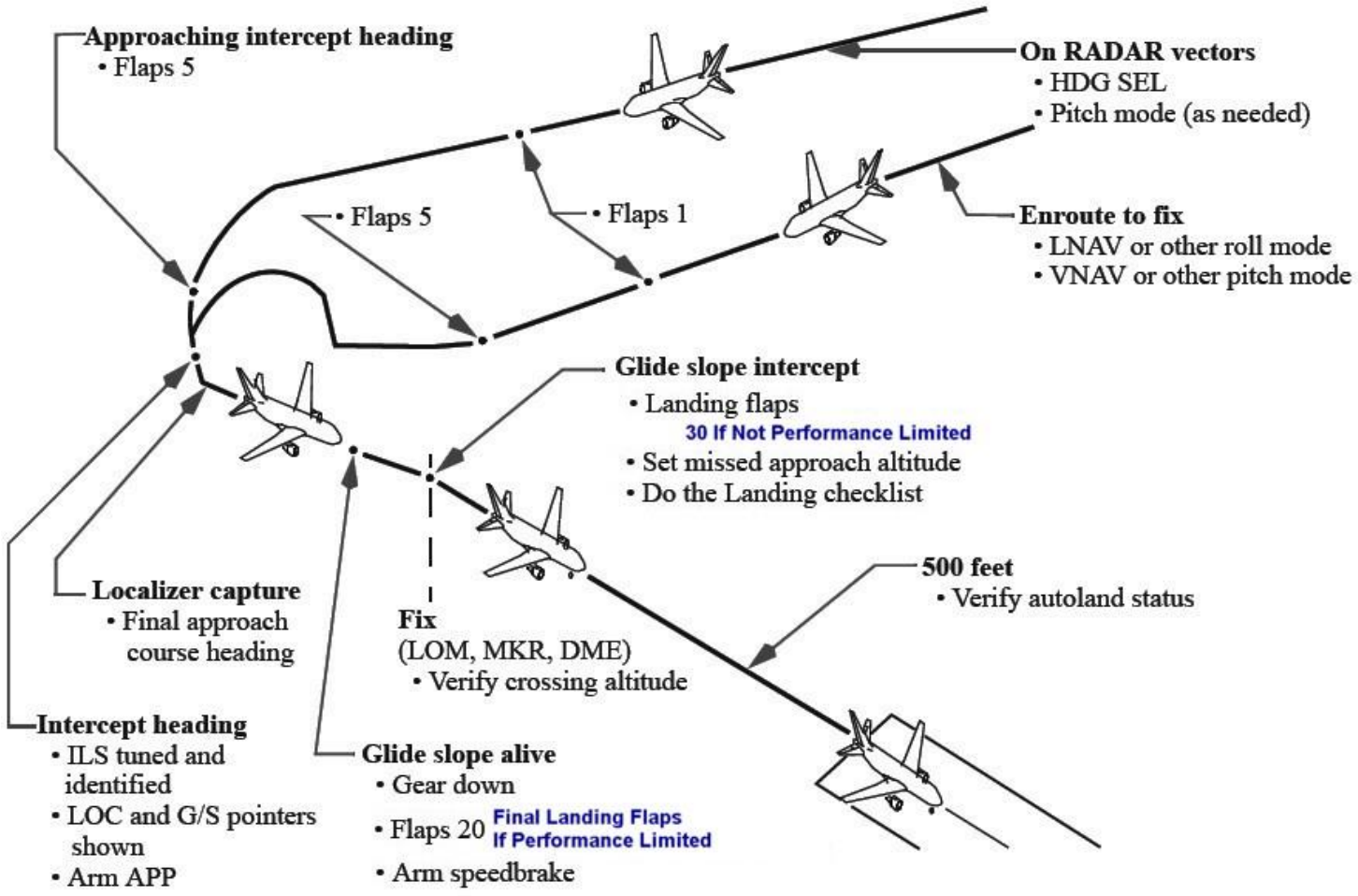
For best fuel performance select the engine-out LRC mode following a minimum drag speed (E/O) driftdown.

Drift down without using VNAV:

When VNAV is not used during engine out, set MCT on the operative engine and maintain altitude until the airplane decelerates to the displayed appropriate engine out speed. Use engine out speed from the FMC while descending to the engine out cruise altitude. Remain at MCT until the airplane accelerates to LRC, then maintain LRC speed. If the FMC is inoperative use turbulence penetration airspeed to driftdown and the engine out long-range cruise tables in the QRH.

One Engine Inoperative Approach

Refer to the PI chapter of the QRH to determine if a flaps 30 landing is permissible.



When the glide slope is alive, lower the landing gear and extend flaps to 20.

If a flaps 20 landing will be made, set final approach speed and decelerate.

If a flaps 30 landing will be made, at glide slope capture, select landing flaps, set final approach speed, and decelerate.

Engine Failure on Final Approach

It is usually preferable to continue the approach using flaps 25 or 30. At weights near the landing climb capability limit it may be preferable to continue the approach using flaps 20. This provides a better thrust margin, less thrust asymmetry and improved go-around capability.

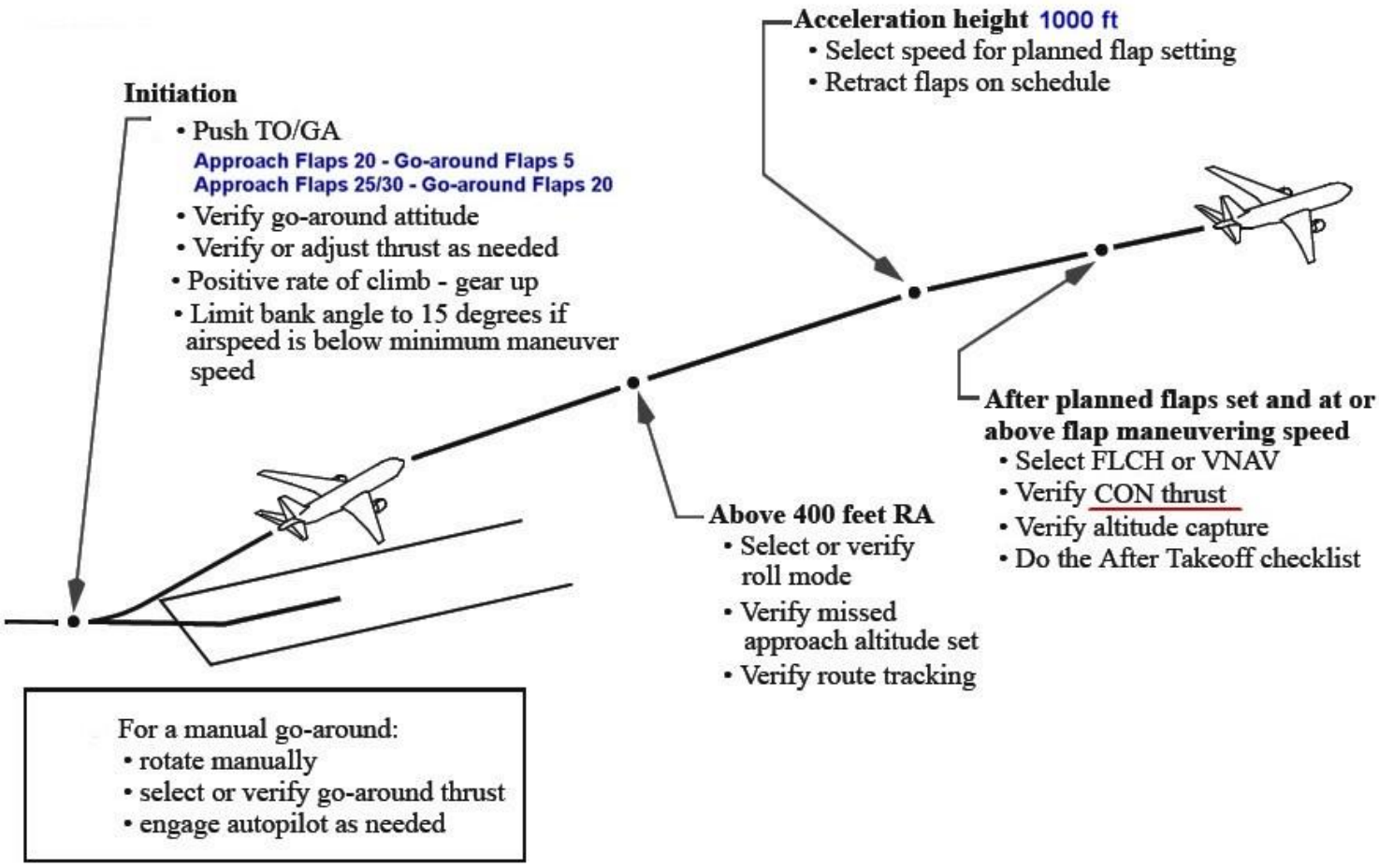
If the decision is made to reduce the flap setting, thrust should be increased at the same time as the flap selection.

Command speed should be increased over the previously set flaps 25 or 30 final approach speed.

- 15 knots for 777-200 and 777-300
- 20 knots for 777-200LR and 777-300ER

This sets a command speed that is equal to at least VREF for flaps 20 + 5 knots.

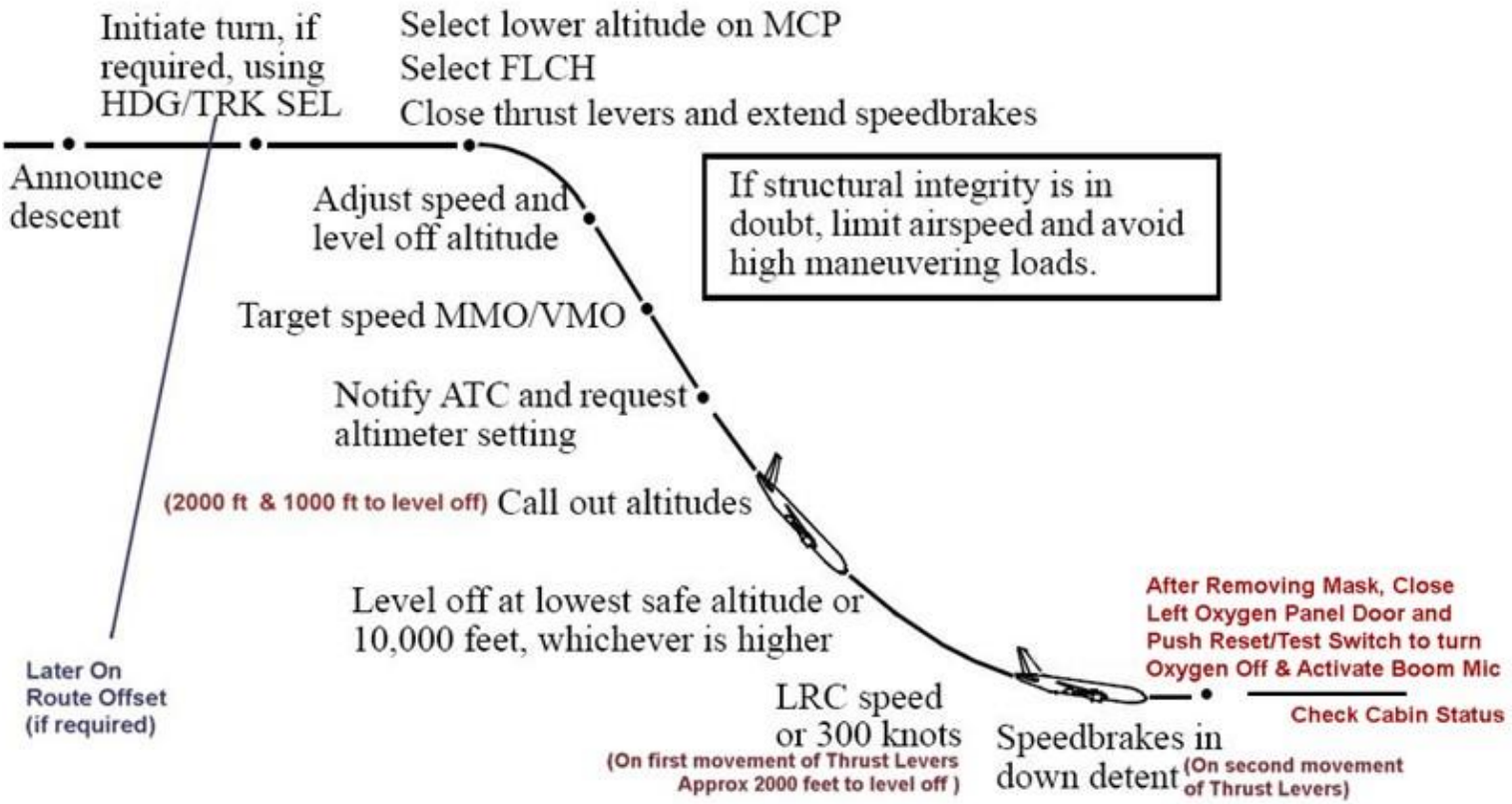
Go-Around and Missed Approach - One Engine Inoperative



Engine Failure During Go-Around and Missed Approach

- Airspeed loss be recovered to prevent a high asymmetric thrust condition at lower than recommended airspeed.
- Follow flight director guidance to recover and maintain recommended airspeed.
- Use the same procedures as used for an engine failure during a flaps 20 takeoff.
- VREF 30 plus wind additive at flaps 20 may result in an airspeed that provides less than full maneuver margin (top of the amber band).

Rapid Descent



Ground Proximity Warning System (GPWS) Response

- Disengage Autopilot
- Disconnect Autothrottle(s)
- Maximum Thrust
- Wings level and rotate to an initial pitch attitude of 20°
- Retract Speedbrakes
- If terrain remains a threat, continue rotation up to the “Pitch Limit Indicator” or “Stick Shaker” or “Initial Buffet”
- Do not change gear or flap configuration until terrain separation is assured
- Monitor radio altimeter for sustained or increasing terrain separation
- Monitor vertical speed and altitude
- Monitor radio altitude for terrain clearance and barometric altitude for a minimum safe altitude.

Windshear at Takeoff

PRECAUTIONS

- **Thrust:** Takeoff with less than full rated thrust is not recommended unless the use of a fixed derate or ATM is required to meet a dispatch performance requirement.

- **Flaps:** For optimum takeoff performance, use flaps 20 for takeoff unless limited by obstacle clearance and/or climb gradient. Flaps 15 may be used as a precautionary setting and will provide nearly equivalent performance to Flaps 20.

- **VR:** Consider increasing Vr speed to the performance limited gross weight rotation speed, not to exceed actual gross weight Vr+20 knots. Set V speeds for the actual gross weight. Rotate at the adjusted (higher) rotation speed. This increased rotation speed results in an increased stall margin, and meets takeoff performance requirements. If windshear is encountered at or beyond the actual gross weight Vr, do not attempt to accelerate to the increased Vr, but rotate without hesitation.

- **Runway:** Use the longest suitable runway provided it is clear of areas of known windshear.

- **FD:** Use the flight director after takeoff.

PREDICTIVE WINDSHEAR WARNING *("WINDSHEAR AHEAD" aural)* during takeoff roll:

- Prior to V1
    - Reject takeoff
- After V1
    - Continue Takeoff *(Perform the Windshear Escape Maneuver)*

ACTUAL WINDSHEAR ENCOUNTER during takeoff roll:

- Prior to V1
    - Continue Takeoff
    - At VR: Normal rotation towards 15 degrees.
    - After airborne, Windshear Escape Maneuver.
- Near normal VR *(with sudden decrease of airspeed and insufficient runway to stop)*
    - Normal rotation at least 2,000 feet before the end of runway (even if airspeed is low).
    - Ensure Maximum Thrust (levers full forward)

Windshear Escape Maneuver – MANUAL FLIGHT

- Disengage Autopilot
- Push either TO/GA switch
- Maximum Thrust
- Disconnect Autothrottle(s)
- Wings level
- Rotate toward an initial pitch attitude of 15°
- Retract Speedbrakes
- Follow flight director TO/GA guidance (if available). Do not exceed pitch limit indication.
- Do not change gear or flap configuration until windshear is no longer a factor
- Monitor vertical speed and altitude
- Do not attempt to regain lost airspeed until windshear is no longer a factor

Windshear in Flight:

- Indications:
    - Two-tone siren followed by “WINDSHEAR,WINDSHEAR,WINDSHEAR”; or
    - Unacceptable Flight Path Deviations (below 1000 AGL) in excess of the following:
        - 15 knots IAS
        - 500 FPM vertical speed
        - 5 degrees pitch attitude
        - 1 dot displacement from the glideslope
        - Unusual thrust lever position for a significant period of time
- Action:
    - Windshear Escape Maneuver

Windshear during Approach

- Indication: Predictive windshear warning “GO-AROUND,WINDSHEAR AHEAD” aural
- Actions:
    - Windshear Escape Maneuver; or
    - Normal go-around (pilot’s discretion)

RA in Landing Configuration

• Disengage Autopilot

• Disconnect Autothrottle.

• Maximum thrust

• FLAPS 20

• Adjust pitch to satisfy the RA command.

• Follow the planned lateral flight path
(Unless visual contact with the conflicting traffic requires some other action)

• At positive rate of climb "GEAR UP."

TA ONLY Mode

The TA ONLY mode may be appropriate under the following circumstances in order to avoid unwanted / undesirable RAs:

- Takeoff toward known nearby traffic (in visual contact).
- During closely spaced parallel runway approaches.
- When flying in known close proximity to other airplanes.
- In circumstances identified by the operator.
- Engine out operation.

Flap Extension using the Secondary or Alternate System

Since the flaps extend more slowly when using the secondary or alternate system, it is recommended that the crew delay setting the new command speed until the flaps reach the selected position. This method may prevent the crew from inadvertently getting into a low airspeed condition if attention to airspeed is diverted while accomplishing other duties.

Pilot Incapacitation

If a pilot is confirmed to be incapacitated, the other pilot should take over the controls and check the position of essential controls and switches.

• After ensuring the airplane is under control, engage the autopilot to reduce workload

• Declare an emergency

• Use the cabin crew (if available). When practical, try to restrain the incapacitated pilot and slide the seat to the full-aft position. The shoulder harness lock may be used to restrain the incapacitated pilot

• Flight deck duties should be organized to prepare for landing

• Consider using help from other pilots or crewmembers aboard the airplane.

Low Fuel Temperature

The Jet A fuel specification limits the freezing point to -40°C maximum, while the Jet A-1 limit is -47°C maximum.

Maintaining a minimum fuel temperature should not be a concern unless the fuel temperature approaches the minimum temperature limit. The rate of cooling of the fuel is approximately 3° C per hour, with a maximum of 12° C per hour possible under the most extreme conditions.

Total air temperature can be raised in the following three ways, used individually or in combination:

• Climb or descend to a warmer air mass

• Deviate to a warmer air mass

• Increase Mach number.

Note: In most situations, warmer air can be reached by descending but there have been reports of warmer air at higher flight levels. Air temperature forecasts should be carefully evaluated when colder than normal temperatures are anticipated.

It takes from 15 minutes to one hour to stabilize the fuel temperature. In most cases, the required descent would be 3,000 to 5,000 feet below optimum altitude. In more severe cases, descent to altitudes of 25,000 feet to 30,000 feet might be required.

An increase of 0.01 Mach results in an increase of 0.5° to 0.7° C total air temperature.

Low Fuel

A low fuel condition exists when the EICAS message FUEL QTY LOW is displayed.

Approach and Landing

Clean configuration should be maintained as long as possible during the descent and approach to conserve fuel. However, initiate configuration changes early enough to provide a smooth, slow deceleration to final approach speed to prevent fuel from running forward in the tanks.

The FUEL QTY LOW NNC specifically calls for a flaps 20 approach and landing rather than a normal landing configuration as in other models. Testing and analysis shows that elevator authority at flaps 30 approach speeds is not adequate to enable the crew to successfully flare the airplane for landing in the unlikely event both engines failed in the landing configuration.

Runway conditions permitting, heavy braking and high levels of reverse thrust should be avoided to prevent uncovering all fuel pumps and possible engine flameout during landing roll.

Fuel Jettison

- When fuel jettison is to be accomplished, consider the following:
- Adequate weather minimums exist at airport of intended landing.
- Fuel jettison above 4,000 feet AGL ensures complete fuel evaporation.
- Downwind drift of fuel may exceed one NM per 1,000 feet of drop.
- Avoid jettisoning fuel in a holding pattern with other airplanes below.

Tire Failure during or after Takeoff

- Advise ATC.
- Consider continuing to the destination unless there is an indication that other damage has occurred (non-normal engine indications, engine vibrations, hydraulic system failures or leaks, etc.). Continuing to the destination will allow the airplane weight to be reduced normally, and provide the crew an opportunity to plan and coordinate their arrival and landing when the workload is low.
- Considerations in selecting a landing airport include, but are not limited to:
    - Runway length and surface conditions – Possible loss of braking effectiveness.
    - Runway width – Possible directional control difficulties.
    - Altitude & temperature conditions – High ground speeds on touchdown.
    - Availability of operator maintenance personnel and support facilities

Command Speed for Landing – Non Normal

Occasionally, a non-normal checklist instructs the flight crew to use a VREF speed that also includes a speed additive such as VREF 30 + 20. When VREF has been adjusted by a NNC this becomes the VREF used for landing. This VREF does not include wind additives. For example, if a non-normal checklist specifies “Use flaps 20 and VREF 30 + 20 for landing”, the flight crew would select flaps 20 as the landing flaps and look up the VREF 30 speed in the FMC or QRH and add 20 knots to that speed.

When using the autothrottle, position command speed to VREF + 5 knots. Sufficient wind and gust protection is available with the autothrottle engaged that no further wind additives are needed.

If the autothrottle is disconnected, or is planned to be disconnected prior to landing, appropriate wind additives must be added to the VREF to arrive at command speed, the speed used to fly the approach. For example, if the checklist states “use VREF 30 + 20 knots”, command speed should be positioned to VREF (VREF 30 + 20) plus wind additive (5 knots minimum, 20 knots maximum).

Bounced Landing Recovery

If higher than idle thrust is maintained through initial touchdown, the automatic speedbrake deployment may be disabled even when the speedbrakes are armed. This can result in a bounced landing.

If the speedbrakes started to extend on the initial touchdown, they will retract once the airplane becomes airborne again on a bounce, even if thrust is not increased.

The speedbrakes must then be manually extended after the airplane returns to the runway.

Directional Control Problem on Landing Rollout (Slippery Runway with a Crosswind)

As the airplane starts to weathervane into the wind, the reverse thrust side force component adds to the crosswind component and drifts the airplane to the downwind side of the runway. Also, high braking forces reduce the capability of the tires to corner.

To correct back to the centerline, release the brakes and reduce reverse thrust to reverse idle. Releasing the brakes increases the tire-cornering capability and contributes to maintaining or regaining directional control. Setting reverse idle reduces the reverse thrust side force component without the requirement to go through a full reverser actuation cycle. Use rudder pedal steering and differential braking as required, to prevent over correcting past the runway centerline. When directional control is regained and the airplane is correcting toward the runway centerline, apply maximum braking and symmetrical reverse thrust to stop the airplane.

Note: Use of this technique increases the required landing distance.

Landing on a Flat Nose Wheel Tire

- Slowly and gently lower the nose wheels to the runway while braking lightly.
- Runway length permitting, use idle reverse thrust.
- Autobrakes may be used at the lower settings.
- Once the nose gear is down, vibration levels may be affected by increasing or decreasing control column back pressure.
- Maintain nose gear contact with the runway.

Gear Disagree

<u>Use of Speedbrakes</u>

Since the airplane is easier to control before body parts make ground contact, delay extending the speedbrakes (unless the stopping distance is critical) until after the nose and both sides of the airplane have completed touchdown. If the speedbrakes are deployed before all areas have made contact with the runway, the airplane will complete touchdown sooner and at a higher speed. It may compromise controllability of the airplane.

Use of Reverse Thrust

During a partial gear or gear up landing, an engine making ground contact could suffer sufficient damage such that the thrust reverser mechanism may not operate. Selecting reverse thrust with any gear not extended may produce an additional asymmetric condition that makes directional control more difficult. Reverse thrust should be used only when stopping distance is critical.

Both Main Gear Extended with Nose Gear Up

Land in the center of the runway.

Nose Gear Only Extended

Land in the center of the runway.

One Main Gear Extended and Nose Gear Extended

Land the airplane on the side of the runway that corresponds to the extended main gear down.

After all gear, or the engine nacelle where the gear is not extended, have made contact with the runway, braking on the side opposite the unsupported wing should be used as needed to keep the airplane rolling straight.

One Main Gear Only Extended

Land the airplane on the side of the runway that corresponds to the extended main gear down.

After all gear, or the nose or the engine nacelle in the case of gear that do not extend, have made contact with the runway, braking on the side opposite the unsupported wing should be used as needed to keep the airplane rolling straight.

All Gear Up or Partially Extended

Land in the center of the runway.