737
Quick Reference Handbook

Quick Action Index

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Introduction

This introduction gives guidelines for use of the Normal Checklist (NC.)

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation

Normal checklists are used after doing all respective procedural items.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Captain	First officer	Both	Area of responsibility
BEFORE START	Captain	First officer	Both	Area of responsibility
BEFORE TAXI	Captain	First officer	Both	Area of responsibility
BEFORE TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot flying
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring
DESCENT	Pilot flying	Pilot monitoring	Both	Area of responsibility
APPROACH	Pilot flying	Pilot monitoring	Both	Area of responsibility
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Area of responsibility
SECURE	Captain	First officer	Both	Area of responsibility

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that an entire procedure was not done:

- stop the checklist
- complete the entire procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, do the checklist from the start. If the checklist is stopped for a long time, also do the checklist from the start.

After completion of each checklist, the pilot reading the checklist calls, "___ CHECKLIST COMPLETE."

Checklist Content

The checklist has the minimum items needed to operate the airplane safely.

Normal checklists have items that meet any of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system, or
- items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- needed to meet regulatory requirements, or
- items needed to maintain fleet commonality between the 737, 747-400, 757, 767, and 777, or
- items that enhance safety of flight and are not monitored by an alerting system (for example autobrakes), or
- during shutdown and secure, items that could result in injury to personnel or damage to equipment if not done.

Checklist Construction

When a checklist challenge does not end with "switch or lever", then the challenge refers to system status. For example, "Landing Gear...Down", refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with "switch or lever", then the challenge refers to the position of the switch or lever. For example, "Engine start levers...CUTOFF" refers to the position of the levers.

Introduction

The Non-Normal Checklists chapter contains checklists used by the flight crew to cope with non–normal situations. The checklists are grouped in logical sections which match the system description chapters in Volume 2. The checklists are in alphabetical order in each section.

Most checklists correspond to a Master Caution and System Annunciator light. The Master Caution and System Annunciator indicate a failure condition and are the cues to select and do the checklist.

Checklists without a Master Caution and System Annunciator light (such as DITCHING) are called unannunciated checklists. All unannunciated checklists are found in the first section of the Non–Normal Checklists chapter. Some unannunciated checklists also appear in the respective systems section (such as ENGINE FUEL LEAK in the Fuel section).

A condition statement is given for all non-normal checklists. The condition statement briefly describes the condition which caused the Master Caution to illuminate. Unannunciated checklists also have condition statements to help in understanding the reason for the checklist.

Checklists can have both recall and reference items. Recall items are critical steps that must be done from memory and are placed within a box. Reference items are actions to be done while reading the checklist. In the Table of Contents for each non-normal checklist section, the titles of checklists containing recall items are printed in bold type.

Some amplified information is included in brackets [ ] in the printed non–normal checklist when the reason for an item is not obvious.

Non-Normal Checklist Operation

Non–normal checklists start with steps to correct the situation or condition. Information for planning the rest of the flight is included. When special items are needed to configure the airplane for landing, the items are deferred to the Approach or Landing checklist. Flight patterns for some non–normal situations are located in the Maneuvers chapter and show the sequence of configuration changes.

While every attempt is made to provide needed non–normal checklists, it is not possible to develop checklists for all conceivable situations, especially those involving multiple failures. In some unrelated multiple failure situations, the flight crew may combine elements of more than one checklist or exercise judgment to determine the safest course of action. The captain must assess the situation and use good judgment to determine the safest course of action.

There are some situations where the crew must always land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non–normal checklist has the words “Plan to land at the nearest suitable airport”
- cabin smoke or fire persists
- one main AC power source remains (such as engine or APU generator)
- one hydraulic system remains (the standby system is considered a hydraulic system)
- any other situation determined by the crew to have a significant adverse effect on safety if the flight is continued

It must be stressed that for persistent smoke or a fire that cannot be positively confirmed to be completely extinguished, the earliest possible descent, landing, and passenger evacuation must be done.

Checklists prescribing an engine shutdown must be evaluated by the captain to determine whether an actual shutdown or operation at reduced thrust is the safest course of action. Consideration must be given to probable effects if the engine is operated at the minimum needed thrust.

There are no non-normal checklists associated with the loss of an engine indication or with an automatic display of the secondary engine indications. Operate the engine normally unless a limit is exceeded.

Non-normal checklists also assume:

- During engine start and prior to takeoff, the respective non-normal checklist is done if a non-normal condition is identified. Upon completion of the checklist, the Dispatch Deviation Guide or operator equivalent is consulted to determine if Minimum Equipment List relief is available.
- System controls are in the normal configuration for the phase of flight before the start of the non–normal checklists.
- Aural alerts are silenced and the system reset by the flight crew as soon as the cause of the alert is recognized.
- The EMERGENCY position of the oxygen regulator is used when needed to supply positive pressure in the masks and goggles to evacuate contaminants. The 100% position of the oxygen regulator is used when positive pressure is not needed, but contamination of flight deck air exists. The NORMAL position of the oxygen regulator is used if prolonged use is needed and the situation allows. Normal boom mic operation is restored when oxygen use is no longer needed

- Indicator lights are tested to verify suspected faults
- Flight crew reset of a tripped circuit breaker in flight is not recommended unless specifically directed to do so in a non-normal checklist. However, a tripped circuit breaker may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. A ground reset of a tripped circuit breaker by the flight crew should only be accomplished after maintenance has determined it is safe to reset the circuit breaker.
- Flight crew cycling (pulling and resetting) of circuit breakers to clear non-normal conditions is not recommended unless directed by a non-normal checklist

After engine start and prior to takeoff, illumination of Master Caution annunciator lights or red and amber caution lights require completion of the appropriate non-normal checklist. In certain cases, amber system monitor lights illuminate during the Master Caution Light recall to inform the flight crew of a failure of one element in a redundant system. If system operation is maintained by a second element, the amber system monitor light will extinguish when the Master Caution Light is reset. In these situations, the amber caution light alerts the flight crew to the fact that normal system operation will be affected if another element failure occurs. If an amber caution light illuminates during recall, but extinguishes on Master Caution reset, completion of the non-normal checklist is not required.

Each air carrier has the responsibility of establishing flight crew procedures in the event of a system failure after the aircraft has departed the gate or the parking area for the purpose of takeoff.

Non–Normal Checklist Use

Non–normal checklist use starts when the airplane flight path and configuration are correctly established. Only a few situations need an immediate response (such as a stall warning, ground proximity PULL UP and WINDSHEAR warnings, or a rejected takeoff.) Usually, time is available to assess the situation before corrective action is started. All actions must then be coordinated under the captain's supervision and done in a deliberate, systematic manner. Flight path control must never be compromised.

When a non-normal situation occurs, at the direction of the pilot flying, both crewmembers systematically and without delay do all recall items in their areas of responsibility.

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical stage of flight (such as takeoff or landing)
- all recall items are complete.

For those checklists with only recall items or a combination of recall and reference items, the pilot monitoring first verifies each recall item has been done. The checklist is normally read aloud during such verification. The pilot flying does not need to respond except for items not in agreement with the checklist. However, in the non-normal landing checklist the pilot flying verifies and responds to checklist items.

The checklist title and reference items, including the response or action and any amplifying information, are read aloud by the pilot monitoring. Read aloud as much of the condition statement as needed to verify the selection of the correct checklist. Information appearing in brackets does not need to be read aloud. The pilot flying need not repeat these items, but must acknowledge that the items were heard and understood. After moving the control, the crewmember taking the action also states the checklist response. Action is taken by the pilot flying and the pilot monitoring based on the crewmember's area of responsibility. With the airplane stationary on the ground, action is taken by the captain as pilot flying and the first officer as pilot monitoring based on preflight areas of responsibility.

Both pilots must agree before moving critical controls in flight, such as:

- the thrust lever of a failed engine
- an engine start lever
- an engine, APU or cargo fire switch
- a generator drive disconnect switch
- a flight control or spoiler switch.

This does not apply to the LOSS OF THRUST ON BOTH ENGINES checklist.

The pilot flying may also direct reference procedures to be done by recall if no hazard is created by such action, or if the situation does not allow reference to a checklist.

Checklists show lists of inoperative equipment only when knowledge of the condition of such equipment is essential for planning the rest of the flight.

The pilot flying is to be made aware when there are deferred items. These items may be delayed until the usual point during approach or landing.

Following completion of the applicable non–normal checklist items, normal checklists are used to verify that the configuration is correct for each phase of flight.

Pilots must be aware that checklists cannot be created for all conceivable situations and are not intended to replace good judgment. In some conditions, deviation from checklists may, at the captain's discretion, be needed.

The following symbol shows that the checklist is complete.

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Each checklist has a checklist complete symbol at the end.

The checklist complete symbol can also be in the body of the checklist. This occurs only when a checklist divides into two or more paths. Each path can have a checklist complete symbol. The checklist complete symbol shows the end of the applicable path. The crew need not continue the checklist after that point.

Following completion of each non–normal checklist, the pilot monitoring states: "___ CHECKLIST COMPLETE." When a non–normal checklist is complete except for the deferred items, and the normal checklist to which the items have been deferred has not yet been done, the pilot monitoring states: "___CHECKLIST COMPLETE EXCEPT FOR DEFERRED ITEMS."

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< AIRBORNE INTERCEPTION >

Condition: **Interception by another aircraft is suspected:**

Immediately on being intercepted by another aircraft:
- **Follow instructions of the intercepting aircraft. (See Jeppesen flight supplement - "EMERGENCY 7.4")**
- **Notify appropriate ATC unit, if possible**
- **Establish contact on 121.5**
- **Select A7700 on transponder.**

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ABORTED ENGINE START

Condition: **During a ground start, an abort engine start condition occurs:**

ENGINE START lever	**CUTOFF**

If the ENGINE START switch is in GRD:

Motor the engine for 60 seconds.

ENGINE START switch . . . . .OFF

■■■■

If the ENGINE START switch is in OFF:

After N2 decreases below 20%:

ENGINE START switch . . . . GRD

Motor the engine for 60 seconds.

ENGINE START switch . . . . .OFF

■■■■

Note: MOC and Engineering should be contacted before attempting subsequent start, even if no limits have been exceeded. <EZY>

AIR CONDITIONING SMOKE/FUMES

Condition: **A concentration of air conditioning smoke/fumes is identified.**

OXYGEN MASKS and SMOKE GOGGLES (if needed) . . . . ON

Crew communications (if needed) . . . . Establish

RECIRCULATION FAN switch . . . . OFF

[Eliminates possible source of smoke/fumes.]

If smoke/fumes stop:

Continue flight with the recirculation fan switch OFF.

If smoke/fumes continue:

ISOLATION VALVE switch . . . . CLOSE

R PACK switch. . . . . OFF

If smoke/fumes stop:

Continue flight with the R PACK switch OFF and ISOLATION VALVE switch CLOSE.

If smoke/fumes continue:

R PACK switch . . . . AUTO

L PACK switch . . . . OFF

If smoke/fumes stop:

Continue flight with the L PACK switch OFF and ISOLATION VALVE switch CLOSE.

If smoke/fumes continue:

L PACK switch . . . . AUTO

Plan to land at nearest suitable airport.

Accomplish the SMOKE/FUMES REMOVAL checklist, if needed.

AIRSPEED UNRELIABLE

Condition: **Pitch attitude not consistent with existing phase of flight, altitude, thrust, and weight, or noise and/or low frequency buffeting.**

Crosscheck ground speed and winds provided by the IRS and FMC to determine airspeed accuracy if indicated airspeed is questionable.

Note: Erroneous or unreliable airspeed indications may be caused by blocked or frozen pitot-static system(s), or a severely damaged or missing radome.

Airplane attitude/thrust . . . . .Adjust

Maintain airplane control. Attitude and thrust information is provided in the Performance-Inflight section,

PROBE HEAT . . . . .Check ON

MACH/AIRSPEED indicators . . . . .Cross check

■■■■

AUTO FAIL/UNSCHEDULED PRESSURIZATION CHANGE

Condition: **Automatic pressurization mode has failed, or the cabin altitude is not under control.**

Increasing thrust may ensure adequate air supply to control cabin altitude.

ENGINE BLEED AIR switches . . . . ON (one at a time)

PACK switches . . . . AUTO (one at a time)

Allow cabin rate to stabilize before placing second switch on.

If the AUTO FAIL light is illuminated or pressurization is not under control:

PRESSURIZATION MODE selector . . . . ALTN

Verify the AUTO FAIL light extinguishes.

If the AUTO FAIL light remains illuminated or the ALTN mode cannot maintain cabin pressurization:

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . As needed

Operate the outflow valve to maintain proper cabin altitude and cabin rate of change.

At traffic pattern altitude, position the outflow valve to full open.

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< BOMB THREAT >

Condition: **A suspicious article is found on board the airplane.**

On Stand:
- **Make a PA announcement to disembark due to a security problem.**
- **Disembark all passengers and crew with all hand baggage in an orderly manner. (Use slides only in extreme cases where steps, airstairs or a jetway are not available).**
- **Remove passengers to an area separated from other passengers.**
- **Remove aircraft to a remote location and quarantine it.**
- **Consult Ops Man Part A, section 10.1.6.**

Taxiing:
- **Taxi to a remote location as advised by ATC and request steps.**
- **Advise ATC of the need to disembark all passengers to an area 200m upwind of the aircraft.**
- **Advise the cabin crew of the situation and the possible use of slides.**
- **Make a PA announcement to passengers about a security problem and the need to disembark.**
- **Disembark passengers and all their hand baggage using airstairs and/or steps. (Use slides only in extreme cases where steps or airstairs are not available).**
- **Move the passengers to a position at least 200m upwind of the aircraft.**
- **Consult Ops Man Part A, section 10.1.6.**

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In Flight:

- **If the threat is received during climbout, stop the cabin altitude from climbing any further and, if possible, discontinue the climb.**
- **Declare an emergency and divert to the nearest airfield taking into account landing performance, approach aids, emergency facilities and the proximity of the approach path over densely populated areas.**
- **Even though a threat has been assessed as red, the likelihood of an explosive device on board is low. Therefore, unless a suspicious article or explosive device has been found, the airplane should be flown as normally as possible, striking a reasonable balance between the need for an expedited landing and the risks arising from undue haste.**
- **Brief the cabin crew to make a discreet search of the airplane toilets and galleys for suspicious articles (see Ops Man Part A, section 10.1.6 page 10-6).**
- **If an immediate landing cannot be made, consider briefing the cabin crew to conduct a full search of the passenger cabin.**
- **If operationally possible, reduce the cabin pressure differential by descending the airplane to cabin altitude. DO NOT RAISE THE CABIN ALTITUDE. Maintain this cabin altitude until top of descent.**
- **MSA and range considerations permitting, descend the airplane to below FL100.**
- **Minimize maneuvers and avoid turbulence.**
- **Consider carefully the choice between flying fast to reduce airborne time and flying slowly to reduce airframe loads and damage in the event of rupture. Turbulent air penetration speed is usually a good compromise.**
- **Upon landing, follow the same procedures as for taxiing.**

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CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION

Condition: **One or more of the following conditions:**

- **The intermittent cabin altitude/configuration warning horn sounds**
- **There is a rapid loss of cabin pressure with airplane altitude above 14,000 feet.**

OXYGEN MASKS and REGULATORS . . . . ON, 100%

Crew communications . . . . Establish

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . CLOSE

If pressurization is restored, continue manual operation to maintain proper cabin altitude.

Passenger signs . . . . ON

If cabin altitude is uncontrollable:

PASSENGER OXYGEN switch . . . . ON

Activate passenger oxygen if cabin altitude exceeds or is expected to exceed 14,000 feet.

EMERGENCY DESCENT . . . . Initiate

Accomplish the EMERGENCY DESCENT checklist if the airplane is above 14,000 feet MSL and control of cabin pressure is not possible, or cabin pressure is lost.

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DITCHING

Condition: **Airplane ditching and evacuation are needed.**

Send distress signals. Determine position, course, speed, altitude, situation, intention, time and position of intended touchdown and transmit mayday. Report type of aircraft and request intercept.

Alert cabin crew to prepare for ditching and seat passengers as far forward as possible.

Burn off fuel to reduce touchdown speed and increase buoyancy.

Plan to touch down on the windward side and parallel to waves and swells.

Plan a flaps 40 landing unless other configuration is needed.

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---------------------------- DEFERRED ITEMS -----------------------------

==> BELOW 5000 FEET

AURAL WARN C/B (P6-3) . . . . PULL

[Prevents warning horn with gear retracted and landing flaps selected.]

Passenger signs . . . . ON

ENGINE BLEED AIR switches . . . . OFF

[Permits depressurizing the airplane with outflow valve closed.]

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . CLOSE

[Prevents water from entering the airplane.]

Note: The outflow valve takes up to 20 seconds to close.

APU switch . . . . OFF

GROUND PROXIMITY GEAR INHIBIT switch . . . . GEAR INHIBIT

GROUND PROXIMITY TERRAIN INHIBIT switch . . . . .TERR INHIBIT

LIFE VESTS, SHOULDER HARNESSES and SEAT BELTS . . . . ON

Passenger cabin preparation . . . . Complete

Confirm that passenger cabin preparations are complete.

CAUTION: Do not open aft entry or service doors as they may be partially submerged.

Final position . . . . Transmit

Transmit all pertinent information regarding final ditching position.

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Review After Impact Procedure:

- **Engine start levers to CUTOFF.**
  Closes fuel shutoff valves to prevent discharge of fuel from ruptured fuel lines
- **Open flight deck windows to ensure no cabin differential pressure prevents the opening of the doors or emergency exits**
- **Initiate evacuation**
- **Proceed to assigned ditching stations, launch rafts and evacuate the airplane as soon as practicable. The airplane may remain afloat indefinitely if fuel load is minimal and no serious damage was sustained during landing.**

----------------------------DEFERRED ITEMS ------------------------------

==> DITCHING FINAL

Omit normal LANDING checklist.

LANDING GEAR . . . . UP & OFF

FLAPS . . . . ___ , Green light

Advise cabin crew, at 500 feet, ditching is imminent; at 50 feet, brace for impact.

Maintain airspeed at VREF. Flare airplane to achieve minimum rate of descent at touchdown. Maintain 200-300 fpm rate of descent until start of flare. At flare, rotate smoothly to touchdown attitude of 10-12 degrees, maintaining desired airspeed and rate of descent with thrust. At touchdown, reduce thrust to idle.

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ELECTRICAL SMOKE/FUMES/FIRE

Condition: **Electrical smoke/fumes/fire is identified.**

OXYGEN MASKS AND SMOKE GOGGLES (if needed) . . . . ON

Crew communications (if needed) . . . . Establish

RECIRCULATION FAN switch . . . . OFF

[Removes fan as a possible source of smoke/fumes. Stops recirculation of smoke/fumes and increases fresh air flow.]

If smoke/fumes/fire source is known:

Electrical power (affected equipment) . . . . Remove

If practical, remove power from affected equipment by switch or circuit breaker in flight deck or cabin.

If smoke/fumes/fire persists or source is unknown:

BUS TRANSFER switch . . . . OFF

[Prevents unwanted transfer of power.]

G-EZJO - G-EZKG
CAB/UTIL power switch . . . . OFF

G-EZJO - G-EZKG
IFE/PASS SEAT power switch . . . . OFF

G-EZJA - G-EZJN
GALLEY power switch . . . . OFF

EQUIPMENT COOLING SUPPLY/EXHAUST switches . . . . ALTERNATE

[Removes normal fans as a possible source of smoke/fumes.]

CABIN READING LIGHTS & GALLEY ATTENDANT WORK LIGHTS . . . . ON

Instruct flight attendants to:
- **turn on cabin reading lights**
- **turn on galley attendants work lights.**

[Prepares cabin lighting prior to depowering cabin fluorescent lights.]

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If smoke/fumes/fire persists or source is unknown: (continued)

CABIN EQUIPMENT . . . . OFF

Instruct flight attendants to:
- **turn off galley power switches**
- **turn off cabin fluorescent light switches**
- **turn off IFE and PC power switches (as installed).**

Plan to land at the nearest suitable airport.

Accomplish the SMOKE/FUMES REMOVAL checklist, if needed.

■■■■

EMERGENCY DESCENT

Condition: **Unable to control cabin pressure with airplane above 14,000 feet MSL or conditions require a rapid descent.**

EMERGENCY DESCENT . . . . .Announce

The captain will advise the cabin crew, on the PA system, of impending rapid descent. The first officer will advise ATC and obtain the area altimeter setting.

ENGINE START switches . . . . CONT

THRUST levers . . . . CLOSE

Reduce thrust to minimum or as needed for anti-ice.

SPEED BRAKE . . . . FLIGHT DETENT

DESCENT . . . . .Initiate

Target speed . . . . .Mmo/Vmo

If structural integrity is in doubt, limit speed as much as possible and avoid high maneuvering loads.

Level-off altitude . . . . Lowest safe altitude or 10,000 feet, whichever is higher

SPEED BRAKE . . . . DOWN DETENT

Smoothly lower the SPEED BRAKE lever and level off. Add thrust and stabilize on altitude at desired airspeed.

CREW OXYGEN REGULATORS . . . . .NORMAL

Flight crew must use oxygen when cabin altitude is above 10,000 feet. To conserve oxygen, position the regulator to NORMAL.

ENGINE START switches . . . . As needed

The new course of action is based on weather, oxygen, fuel remaining and available airports. Use of long range cruise may be appropriate.

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ENGINE FUEL LEAK

Condition: **An inflight engine fuel leak is suspected or confirmed.**

One or more of the following may be evidence of a fuel leak:
- **visual observation of fuel spray from strut or engine**
- **excessive fuel flow**
- **total fuel quantity decreasing at an abnormal rate**
- **fuel IMBAL indication**
- **USING RSV FUEL message**
- **INSUFFICIENT FUEL message**
- **CHECK FMC FUEL QUANTITY message.**

CENTER TANK FUEL PUMP switches . . . . OFF

[Fuel CONFIG may be displayed with fuel in the center tank.]

CROSSFEED selector . . . . CLOSED

Identify an engine fuel leak by observing one main fuel tank quantity decreasing faster than the other.

An increase in fuel imbalance of approximately 230 kgs or more in 30 minutes should be considered an engine fuel leak.

Conditions permitting, visually check for an engine fuel leak.

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If both main tank quantities decrease at the same rate:

Resume normal fuel management procedures.

If FMC message USING RSV FUEL, INSUFFICIENT FUEL or CHECK FMC FUEL QUANTITY is displayed on the CDU scratchpad:

PROGRESS PAGE 1 . . . . Select

Destination fuel estimate . . . . Check

Compare FMC fuel quantity with fuel gauges and flight plan fuel.

If fuel quantity indicator is inoperative:

FMC FUEL WEIGHT (if needed) . . . . Enter

Enter and periodically update the manually calculated fuel weight on the FMC PERF INIT page.

If an engine fuel leak is confirmed:

AUTOTHROTTLE . . . . .DISENGAGE

THRUST lever (affected engine). . . . . CLOSE

ENGINE START lever (affected engine). . . . . CUTOFF

APU . . . . START and ON BUS

PACK switch (affected side) . . . . OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

TRANSPONDER MODE selector . . . . TA

[Prevents climb commands which can exceed single engine performance capability.

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If an engine fuel leak is confirmed: (continued)

After engine shutdown, all remaining fuel can be used for the operating engine. Resume normal fuel management procedures.

Plan to land at the nearest suitable airport.

Accomplish ONE ENGINE INOPERATIVE LANDING checklist.

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If FUEL LOW indication is displayed:

MAIN TANK FUEL PUMP switches. . . . . .ALL ON

CROSSFEED selector . . . . OPEN

Apply thrust changes slowly and smoothly. If a climb is needed, maintain the minimum pitch attitude needed for safe flight.

■■■■

ENGINE IN-FLIGHT START

Condition: **Engine start is needed after a shutdown with no fire or apparent damage.**

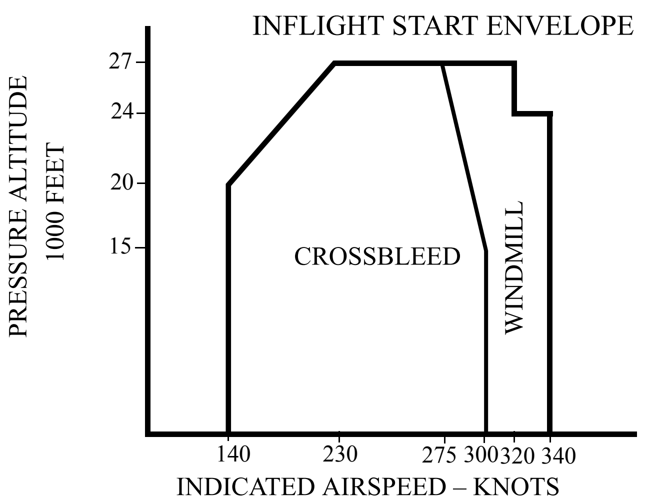
Note: Oil quantity indication as low as zero is normal if windmilling N2 RPM is below approximately 8%.

Complete the ENGINE FAILURE/SHUTDOWN checklist before attempting an in-flight engine start.

IN-FLIGHT START ENVELOPE . . . . Check

[Starts not assured outside of the inflight start envelope.]

Note: For engines shut down more than one hour, a crossbleed start is needed.



THRUST lever . . . . CLOSE

ENGINE START lever . . . . CUTOFF

If crossbleed start is needed:

PACK switch (affected side) . . . . OFF

DUCT PRESSURE . . . . .Minimum 30 PSI

If needed, advance the thrust lever to increase duct pressure.

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ENGINE START switch . . . . GRD/FLT

Use GRD if crossbleed start is needed.

ENGINE START lever . . . . IDLE DETENT

Move engine start lever to IDLE detent at a minimum of 11% N2.

Monitor EGT to ensure it does not rise rapidly or exceed the start limit of 725° C during the start attempt.

If EGT does not increase in 30 seconds or another abort start condition as listed in normal procedures occurs:

ENGINE START lever . . . . CUTOFF

ENGINE START switch . . . . OFF

Note: If engine has been shutdown for more than 1 hour, multiple start attempts may be needed.

Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT remains within limits, the start is progressing normally.

After engine start:

ELECTRICAL . . . . GENERATOR ON

PACK switch . . . . AUTO

ENGINE START switch . . . . As needed

APU . . . . As needed

TRANSPONDER MODE selector . . . . TA/RA

■■■■

< HIJACK >

Condition: **A hijacking is in progress.**

Select A7500.

Inform ATC and advise that the flight deck is secure.

Switch on fasten belt sign and brief cabin crew by interphone.

Land ASAP.

Avoid violent aircraft maneuvers.

After landing, complete the after landing checklist in its entirety.

Refer to the Ops Man Part A, section 10.1.7 page 10-8 if the situation is not resolved when on the ground.

Additional considerations:

- **Comply with demands without surrendering**
- **Avoid conflict on the airplane**
- **Do not attempt to overpower the hijackers**
- **Do not open the flight deck door under any circumstances.**

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JAMMED OR RESTRICTED FLIGHT CONTROLS

Condition: **Movement of the elevator, aileron/spoiler or rudder is restricted.**

AUTOPILOT (if engaged) . . . . .DISENGAGE

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

Verify thrust is symmetrical.

(SB changes G-EZJA - G-EZJT)

If rudder is jammed or restricted and STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP:

Accomplish the UNCOMMANDED RUDDER/YAW OR ROLL Non-Normal checklist.

■■■■

Jammed or restricted system . . . . Overpower

Use maximum force, including a combined effort of both pilots, if needed. A maximum two-pilot effort on the controls will not cause a cable or system failure.

Do not turn off any flight control switches.

Continued on next page

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If controls are normal:

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

If controls are not normal:

Use stabilizer or rudder trim to offload control forces.

If electric stabilizer trim is desired, position the Stabilizer Trim Override switch to OVERRIDE.

Do not make abrupt thrust changes. Extend or retract speedbrake slowly and smoothly.

Limit bank angle to 15°.

Plan to land at the nearest suitable airport.

Plan a flaps 15 landing.

Set VREF 15 + 5

If any of the following conditions apply, set VREF ICE = VREF 15 + 10, + 5:

- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

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---------------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP
INHIBIT switch . . . . .FLAP INHIBIT

Landing data . . . . .VREF 15 + 5 knots
or VREF ICE + 5 knots, Minimums ___

Approach briefing . . . . Completed

Go-around procedure . . . . Review

Accomplish normal go-around procedure. Advance thrust to go-around smoothly and slowly to avoid excessive pitch-up.

---------------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

---------------------------DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . .ARMED

Landing gear . . . . .DOWN

Flaps . . . . 15, green light

■■■■

LOSS OF THRUST ON BOTH ENGINES

Condition: **Loss of all thrust on both engines accompanied by illumination of both ENG FAIL alerts.**

ENGINE START switches	**FLT**
ENGINE START levers	**CUTOFF**
EGT decreasing:	
ENGINE START levers	**IDLE DETENT**

If EGT reaches 950°C, repeat the above steps.

Note: In moderate to heavy rain it may take up to 3 minutes to accelerate to idle.

APU (if available) . . . . START & ON BUS

Do not wait for successful engine start(s) prior to starting APU.

[The APU has demonstrated the capability to provide electrical and pneumatic power up to 20,000 feet. APU may be placed on either or both busses.]

If neither restart is successful and N2 is below 11%:

WING ANTI–ICE switch . . . . OFF

PACK switches . . . . OFF

APU BLEED AIR switch . . . . ON

IGNITION SELECT switch . . . . BOTH

Either ENGINE START switch . . . . GRD

Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT remains within limits, the start is progressing normally.

When engine parameters have stabilized:

APU BLEED AIR switch . . . . OFF

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When engine parameters have stabilized: (continued)

ENGINE START switch . . . . FLT

THRUST lever . . . . .ADVANCE

GENERATOR switch . . . . .ON

PACK switch . . . . AUTO

Accomplish the ENGINE IN-FLIGHT START checklist to start the other engine.

If neither IRS attitude display recovers after a transfer bus is restored:

IRS MODE SELECTOR switches . . . . ATT

Maintain wings level, constant speed flight until attitude displays recover (approximately 30 seconds).

Magnetic heading . . . . .Enter

APU . . . . As needed

■■■■

RADIO TRANSMIT CONTINUOUS (STUCK MICROPHONE SWITCH)

Condition: **A radio is continuously transmitting without crew input.**

Transmitter select switches (all audio selector panels) . . . . .Flight interphone

[Deselects radios and stops radio transmissions.]

The microphone/interphone with the stuck switch continuously transmits on flight interphone.

The associated audio selector panel should remain on flight interphone. All other audio selector panels may be used normally.

■■■■

SMOKE/FUMES REMOVAL

Condition: **Smoke/fumes removal is needed.**

OXYGEN MASKS and SMOKE GOGGLES (if needed) . . . . ON

CABIN DOOR . . . . CLOSE

[Prevents smoke/fumes contamination of/from other compartments.]

Crew communications (if needed) . . . . Establish

If pack(s) are on and smoke/fumes source is confirmed to be on the flight deck or in the main cabin:

L and R PACK switches . . . . HIGH

RECIRCULATION FAN switch . . . . OFF

LAND ALT . . . . 10,000 feet

[Increases the ventilation rate.]

ENGINE No. 1 and No. 2 BLEED AIR switches . . . . Verify ON

Engine thrust . . . . Maximum practical N1 (minimum 45%)

[Provides maximum cabin ventilation.]

FLIGHT DECK AIR CONDITIONING and GASPER OUTLETS . . . . OPEN

CAUTION: Do not open any flight deck window. Keep the cabin door closed.

If smoke/fumes are uncontrollable:

Airplane altitude . . . . Lowest safe altitude, or 10,000 feet, whichever is higher

At 14,000 feet or below:

PRESSURIZATION MODE selector . . . . MAN

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If pack(s) are on and smoke/fumes source is confirmed to be on the flight deck or in the main cabin: (continued)

If smoke/fumes are uncontrollable: (continued)

At 14,000 feet or below: (continued)

OUTFLOW VALVE switch . . . . OPEN

Position outflow valve to full open. This causes the cabin airflow to carry smoke/fumes aft.

Note: The outflow valve can take up to 20 seconds to open.

Plan to land at the nearest suitable airport.

■■■■

If packs are off and smoke/fumes source is confirmed to be on the flight deck:

CAUTION: Window should not be opened unless the source is confirmed to be originating on the flight deck.

Normal holding airspeed . . . . Establish

[High airspeed may prevent opening the window.]

First officer's sliding window . . . . Open

■■■■

STABILIZER TRIM INOPERATIVE

Condition: **The stabilizer fails to respond to electric trim inputs.**

STABILIZER TRIM CUTOUT switches . . . . CUTOUT

Manual trim . . . . Apply

Apply steady pressure on the manual trim handles until the desired trim is attained.

If required, use force to cause the disconnect clutch to disengage. Approximately 1/2 turn of the stabilizer trim wheel may be needed.

Note: A maximum two-pilot effort on the trim wheels will not cause a cable or system failure.

Note: If the failure could be due to ice accumulation, descend to a warmer temperature and attempt again.

Note: The handle(s) should be folded inside the stabilizer trim wheel when not in use.

Maintain in-trim airspeed until start of the approach.

To reduce the force required to move the stabilizer, use an airspeed which results in an in-trim condition.

Continue to trim manually for the remainder of the flight.

Plan a flaps 15 landing.

Set VREF 15.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Establish landing configuration early.

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If the stabilizer cannot be trimmed:

Anticipate higher than normal elevator forces during approach and landing

The thrust reduction at flare will cause a nose down pitch.

Note: Elevator control is sufficient to safely land the airplane regardless of stabilizer position.

----------------------------DEFERRED ITEMS -----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . .FLAP INHIBIT

Landing data . . . . VREF 15 or VREF ICE, Minimums ___

Approach briefing . . . . Completed

Go-around procedure . . . . Review

Accomplish normal go-around procedure. Advance thrust to go around smoothly and slowly to avoid excessive pitch up.

----------------------------DEFERRED ITEMS -----------------------------

==> APPROACH

Altimeters . . . . ___

----------------------------DEFERRED ITEMS -----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . .ARMED

Landing gear . . . . .DOWN

Flaps . . . . 15, Green light

■■■■

TAILSTRIKE ON TAKEOFF

Condition: **Airplane tail has contacted the ground during takeoff.**

CAUTION: Do not pressurize airplane due to possible structural damage.

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . OPEN

Hold outflow valve switch in the OPEN position until outflow VALVE position indicator shows valve full open.

Plan to land at the nearest suitable airport.

■■■■

UNCOMMANDED RUDDER/YAW OR ROLL

(SB changes G-EZJA - G-EZJT)

Condition: **Uncommanded rudder pedal displacement or pedal kicks, or uncommanded yaw or roll.**

AUTOPILOT (if engaged) . . . . DISENGAGE

Maintain control of the airplane with all available flight controls. If roll is uncontrollable, immediately reduce pitch/angle of attack and increase airspeed. Do not attempt to maintain altitude until control is recovered.

AUTOTHROTTLE (if engaged). . . . . DISENGAGE

Verify thrust is symmetrical.

If STBY RUD ON light is installed on the overhead Flight Control panel and is not placarded INOP:

Accomplish the JAMMED OR RESTRICTED FLIGHT CONTROLS Non-Normal checklist.

■■■■

If STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP:

YAW DAMPER . . . . .OFF

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If STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP: (continued)

If yaw or roll is the result of uncommanded rudder displacement or pedal kicks:

RUDDER TRIM . . . . Center

Rudder pedals . . . . Free & center

Use maximum force including a combined effort of both pilots, if needed, to free and center the rudder pedals.

If rudder pedal position and/or movement are normal:

YAW DAMPER . . . . ON

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

If rudder pedal position and/or movement are not normal:

SYSTEM B FLIGHT CONTROL switch . . . . STBY RUD

Land at the nearest suitable airport.

Note: A slight rudder deflection may remain, but continued rudder pedal pressure may help maintain an in-trim condition. Sufficient directional control is available on landing using differential braking and nose wheel steering.

Note: Crosswind capability may be reduced.

Note: Do not use auto brakes.

Note: Consider checking rudder freedom of movement at a safe altitude using slow rudder inputs while in the landing configuration and at approach speed.

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If STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP: (continued)

If yaw or roll is the result of uncommanded rudder displacement or pedal kicks: (continued)

If rudder pedal position and/or movement are not normal: (continued)

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

If the yaw or roll stops:

AUTOPILOT . . . . .ENGAGE

AUTOTHROTTLE . . . . .ENGAGE

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

VOLCANIC ASH

Condition: **Static discharge around the windshield, bright glow in the engine inlets, smoke or dust on the flight deck, or acrid odor indicates the airplane is in volcanic ash.**

Exit volcanic ash as quickly as possible. Consider a 180 degree turn.

OXYGEN MASKS and SMOKE GOGGLES (if needed). . . . . ON

Crew communications (if needed) . . . . Establish

AUTOTHROTTLE (if engaged) . . . . DISENGAGE

[Allows thrust levers to remain where manually positioned.]

THRUST levers . . . . CLOSE

Conditions permitting, operate at idle thrust.

[Reduces possible engine damage and/or flameout by decreasing EGT.]

ENGINE START switches . . . . FLT

PACK switches . . . . HIGH

WING ANTI–ICE . . . . ON

[Increases bleed air extraction to improve engine stall margin.]

ENGINE ANTI–ICE . . . . ON

[Increases bleed air extraction to improve engine stall margin.]

APU (if available) . . . . START

[Provides backup electrical and pneumatic source, if needed.]

Note: Encountering volcanic ash can lead to abnormal systems reactions such as:
- **Engine malfunctions, increasing EGT, engine stall or flameout**
- **Decrease or loss of airspeed indications**
- **Equipment Cooling OFF light.**

Continued on next page

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If engines have flamed out or stalled, or EGT rapidly approaches or exceeds limit:

Accomplish the LOSS OF THRUST ON BOTH ENGINES checklist.

■■■■

Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT remains within limits, the start is progressing normally.

Plan to land at the nearest suitable airport.

■■■■

WARNING HORN - CABIN ALTITUDE OR CONFIGURATION

Condition: **An intermittent or steady warning horn sounds:**

- **In flight, an intermittent horn indicates the cabin altitude is at or above 10,000 feet**
- **On the ground, an intermittent horn indicates an improper takeoff configuration when advancing the thrust levers to takeoff thrust**
- **In flight, a steady horn indicates an improper landing configuration.**

If an intermittent horn sounds in flight:

OXYGEN MASKS and REGULATORS . . . . ON, 100%

Crew communications . . . . Establish

Do the CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION checklist.

■■■■

If an intermittent horn sounds on the ground:

Assure proper airplane takeoff configuration.

■■■■

If a steady horn sounds in flight:

Assure proper airplane landing configuration.

■■■■

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WINDOW DAMAGE

Condition: **Arcing, delamination, shattered or cracked condition of any flight deck window is observed.**

Seat belt and shoulder harness . . . . On and locked

If the window is arcing, shattered or cracked:

WINDOW HEAT switch (affected window) . . . . OFF

Limit airspeed to 250 knots maximum below 10,000 feet.

If a cracked or shattered condition exists on:
- **Window 1, 2 or 5 inner pane**
- **Window 4 middle or outer pane**

Oxygen masks . . . . On

Crew communications . . . . Establish

Passenger signs . . . . ON

LAND ALT . . . . 9,000 FT

Descend normally to below 14,000 feet or minimum safe altitude, whichever is higher. Maintain a cabin differential pressure of 2 psi or less.

Plan to land at the nearest suitable airport.

When the cabin differential pressure is 2 psi or less, oxygen masks and shoulder harnesses may be removed.

Sustained flight below 10,000 feet is not recommended due to the greater risk of bird strike.

■■■■

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If a cracked or shattered condition exists on window 3 not heated inner and outer panes:

LAND ALT . . . . 13,000 FT

Descend normally to 13,000 feet or minimum safe altitude, whichever is higher. Maintain a cabin differential pressure of 0 psi.

Shoulder harnesses may be removed.

Sustained flight below 10,000 feet is not recommended due to the greater risk of bird strike.

■■■■

If a cracked or shattered condition exists on:
- **Window 1, 2 or 5 outer pane**
- **Window 3 not heated inner or outer pane**
- **Window 4 inner pane**

No crew action is needed.

Shoulder harnesses may be removed.

■■■■

If a delamination only condition exists on any window:

No crew action is needed.

Shoulder harnesses may be removed.

■■■■

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Non-Normal Checklists — Chapter NNC

Airplane General, Emer. Equip., Doors, Windows — Section 1

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AUTOMATIC UNLOCK

Condition: **The flight deck door AUTO UNLK light illuminated indicates the correct access code has been entered and the flight deck door is programmed to automatically unlock after a time delay.**

FLIGHT DECK DOOR selector . . . . DENY

Rotate and hold for 1 second.

[Prohibits unauthorized access to the flight deck.]

■■■■

DOOR ANNUNCIATOR

Condition: **A door annunciator light illuminated indicates an exterior door is not properly latched.**

ENTRY/SERVICE:

Handle (affected door) . . . . Check CLOSED

Check door handle and position to close if necessary.

If the door handle is in the closed position and cabin pressurization is normal:

Proceed normally.

■■■■

If the door handle will not close and/or cabin pressurization is not normal:

Plan to land at nearest suitable airport.

■■■■

OVERWING:

If cabin pressurization is normal:

Proceed normally.

■■■■

If cabin pressurization is not normal:

Plan to land at nearest suitable airport.

■■■■

EQUIP/CARGO/AIRSTAIR:

If EQUIP, FWD/AFT CARGO or AIRSTAIR light is illuminated and pressurization is normal:

Proceed normally.

■■■■

If EQUIP, FWD/AFT CARGO or AIRSTAIR light is illuminated and pressurization is not normal:

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EQUIP/CARGO/AIRSTAIR: (continued)

If EQUIP, FWD/AFT CARGO or AIRSTAIR light is illuminated and pressurization is not normal: (continued)

Passenger signs . . . . .ON

Descent . . . . .Initiate

Descend to 13,000 feet or MEA, whichever is higher.

Oxygen masks (if needed) . . . . .ON

Use oxygen masks at cabin altitudes in excess of 10,000 feet.

Crew communications . . . . Establish

LAND ALT . . . . 13,000 feet

If MEA is above 13,000 feet:

PRESSURIZATION MODE selector . . . . MAN

Adjust outflow valve to increase cabin altitude to MEA.

PASSENGER OXYGEN (if needed) . . . . .ON

Activate passenger oxygen if cabin altitude exceeds 14,000 feet.

Plan to land at nearest suitable airport.

■■■■

ELT

Condition: **The ELT light illuminated indicates the ELT has been activated and is transmitting.**

In case of uncommanded ELT activation:

ELT switch . . . . .ON then ARM

[Resets the ELT.]

■■■■

EMERGENCY EXIT LIGHTS NOT ARMED

Condition: **The NOT ARMED light illuminated indicates the EMER EXIT LIGHTS switch is not in the ARMED position.**

If the EMER EXIT LIGHTS switch is ON, individual emergency exit light batteries will provide a minimum of 10 minutes of lighting.

■■■■

If the EMER EXIT LIGHTS switch is OFF, emergency lighting is not available.

■■■■

LOCK FAIL

Condition: **The flight deck door LOCK FAIL light illuminated indicates the flight deck door lock has failed or the Flight Deck Access System switch is OFF.**

Conditions permitting:

FLIGHT DECK ACCESS SYSTEM switch . . . . OFF

[Removes electrical power to prevent possible lock overheat.]

Note: The door can be locked with the dead bolt.

■■■■

PASSENGER OXYGEN ON

Condition: **The PASS OXY ON light illuminated indicates the passenger oxygen system is activated.**

■■■■

TAILSTRIKE ON TAKEOFF

Condition: **Airplane tail has contacted the ground during takeoff.**

CAUTION: Do not pressurize airplane due to possible structural damage.

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . OPEN

Hold outflow valve switch in the OPEN position until outflow VALVE position indicator shows valve full open.

Plan to land at the nearest suitable airport.

■■■■

WINDOW DAMAGE

Condition: **Arcing, delamination, shattered or cracked condition of any flight deck window is observed.**

Seat belt and shoulder harness . . . . On and locked

If the window is arcing, shattered or cracked:

**WINDOW HEAT switch
(affected window) . . . . OFF**

Limit airspeed to 250 knots maximum below 10,000 feet.

If a cracked or shattered condition exists on:
• Window 1, 2 or 5 inner pane
• Window 4 middle or outer pane

Oxygen masks . . . . On

Crew communications . . . . Establish

Passenger signs . . . . ON

LAND ALT. . . . . 9,000 FT

Descend normally to below 14,000 feet or minimum safe altitude, whichever is higher. Maintain a cabin differential pressure of 2 psi or less.

Plan to land at the nearest suitable airport.

When the cabin differential pressure is 2 psi or less, oxygen masks and shoulder harnesses may be removed.

Sustained flight below 10,000 feet is not recommended due to the greater risk of bird strike.

■■■■

If a cracked or shattered condition exists on window 3 not heated inner and outer panes:

LAND ALT. . . . . 13,000 FT

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If a cracked or shattered condition exists on window 3 not heated inner and outer panes: (continued)

Descend normally to 13,000 feet or minimum safe altitude, whichever is higher. Maintain a cabin differential pressure of 0 psi.

Shoulder harnesses may be removed.

Sustained flight below 10,000 feet is not recommended due to the greater risk of bird strike.

■■■■

If a cracked or shattered condition exists on:
- **Window 1, 2 or 5 outer pane**
- **Window 3 not heated inner or outer pane**
- **Window 4 inner pane**

No crew action is needed.

Shoulder harnesses may be removed.

■■■■

If a delamination only condition exists on any window:

No crew action is needed.

Shoulder harnesses may be removed.

■■■■

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AIR CONDITIONING SMOKE/FUMES

Condition: **A concentration of air conditioning smoke/fumes is identified.**

OXYGEN MASKS and SMOKE GOGGLES (if needed) . . . . ON

Crew communications (if needed) . . . . Establish

RECIRCULATION FAN switch . . . . OFF

[Eliminates possible source of smoke/fumes.]

If smoke/fumes stop:

Continue flight with the recirculation fan switch OFF.

If smoke/fumes continue:

ISOLATION VALVE switch . . . . CLOSE

R PACK switch . . . . OFF

If smoke/fumes stop:

Continue flight with the R PACK switch OFF and ISOLATION VALVE switch CLOSE.

If smoke/fumes continue:

R PACK switch . . . . AUTO

L PACK switch . . . . OFF

If smoke/fumes stop:

Continue flight with the L PACK switch OFF and ISOLATION VALVE switch CLOSE.

If smoke/fumes continue:

L PACK switch . . . . AUTO

Plan to land at the nearest suitable airport.

Accomplish the SMOKE/FUMES REMOVAL checklist, if needed.

■■■■

AUTO FAIL/UNSCHEDULED PRESSURIZATION CHANGE

Condition: **Automatic pressurization mode has failed, or the cabin altitude is not under control.**

Increasing thrust may ensure adequate air supply to control cabin altitude.

ENGINE BLEED AIR switches . . . . ON (one at a time)

PACK switches . . . . AUTO (one at a time)

Allow cabin rate to stabilize before placing second switch on.

If the AUTO FAIL light is illuminated or pressurization is not under control:

PRESSURIZATION MODE selector . . . . ALTN

Verify the AUTO FAIL light extinguishes.

If the AUTO FAIL light remains illuminated or the ALTN mode cannot maintain cabin pressurization:

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . As needed

Operate the outflow valve to maintain proper cabin altitude and cabin rate of change.

At traffic pattern altitude, position the outflow valve to full open.

■■■■

BLEED TRIP OFF

Condition: **A BLEED TRIP OFF light illuminated indicates the related engine bleed air temperature or pressure is excessive.**

WING ANTI-ICE switch . . . . OFF

TRIP RESET switch . . . . Push

[The BLEED TRIP OFF light extinguishes if bleed air temperature has cooled below limits.]

If the BLEED TRIP OFF light remains illuminated:

PACK switch (affected side) . . . . OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

Avoid icing conditions.

■■■■

If the BLEED TRIP OFF light extinguishes:

WING ANTI-ICE . . . . As needed

CAUTION: Use of wing anti-ice above approximately FL350 may cause bleed trip off and possible loss of cabin pressure.

■■■■

CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION

Condition: **One or more of the following conditions:**

- **The intermittent cabin altitude/configuration warning horn sounds**
- **There is a rapid loss of cabin pressure with airplane altitude above 14,000 feet.**

OXYGEN MASKS and REGULATORS . . . . ON, 100%

Crew communications . . . . Establish

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . CLOSE

If pressurization is restored, continue manual operation to maintain proper cabin altitude.

Passenger signs . . . . .ON

If cabin altitude is uncontrollable:

PASSENGER OXYGEN switch . . . . .ON

Activate passenger oxygen if cabin altitude exceeds or is expected to exceed 14,000 feet.

EMERGENCY DESCENT . . . . .Initiate

Accomplish the EMERGENCY DESCENT checklist if the airplane is above 14,000 feet MSL and control of cabin pressure is not possible, or cabin pressure is lost.

■■■■

DUAL BLEED

Condition: **The DUAL BLEED light illuminated indicates the APU bleed valve open and No. 1 engine BLEED air switch ON, or No. 2 engine BLEED air switch ON with APU bleed air valve and isolation valve open.**

Limit engine thrust to idle while the light is illuminated.

After engine start:

APU BLEED AIR switch . . . . OFF

■■■■

DUCT OVERHEAT

Condition: **A DUCT OVERHEAT light illuminated indicates air temperature in the related duct has exceeded limits.**

TEMPERATURE selector . . . . Cooler temperature

[Prevents the air mix valves from returning to an overheat condition.]

TRIP RESET switch . . . . Push

[The DUCT OVERHEAT light extinguishes if the duct temperature has cooled below limits.]

If duct temperature increases rapidly or the air mix valve indicator moves toward full hot:

TEMPERATURE selector .MANUAL

Adjust the air mix valve position as needed.

■■■■

EMERGENCY DESCENT

Condition: **Unable to control cabin pressure with airplane above 14,000 feet MSL or conditions require a rapid descent.**

EMERGENCY DESCENT . . . . .Announce

The captain will advise the cabin crew, on the PA system, of impending rapid descent. The first officer will advise ATC and obtain the area altimeter setting.

ENGINE START switches . . . . CONT

THRUST levers . . . . CLOSE

Reduce thrust to minimum or as needed for anti-ice.

SPEED BRAKE . . . . FLIGHT DETENT

DESCENT . . . . .Initiate

Target speed . . . . .Mmo/Vmo

If structural integrity is in doubt, limit speed as much as possible and avoid high maneuvering loads.

Level-off altitude . . . . Lowest safe altitude or 10,000 feet, whichever is higher

SPEED BRAKE . . . . DOWN DETENT

Smoothly lower the SPEED BRAKE lever and level off. Add thrust and stabilize on altitude at desired airspeed.

CREW OXYGEN REGULATORS . . . . .NORMAL

Flight crew must use oxygen when cabin altitude is above 10,000 feet. To conserve oxygen, position the regulator to NORMAL.

ENGINE START switches . . . . As needed

The new course of action is based on weather, oxygen, fuel remaining and available airports. Use of long range cruise may be appropriate.

■■■■

EQUIPMENT COOLING OFF

Condition: **The Equipment Cooling Supply or Exhaust OFF light illuminated indicates a loss of airflow from the selected cooling fan.**

EQUIPMENT COOLING SUPPLY/EXHAUST switch (as needed) . . . . ALTERNATE

No further action is necessary in flight if the equipment cooling OFF light does not extinguish.

■■■■

OFF SCHEDULE DESCENT

Condition: **The OFF SCHED DESCENT light illuminated indicates the airplane descended before reaching the planned cruise altitude set in the FLT ALT indicator.**

If landing at airport of departure:

No crew action is needed.

■■■■

If not landing at airport of departure:

FLIGHT ALTITUDE indicator . . . . Reset

Reset to actual airplane altitude.

■■■■

PACK TRIP OFF

Condition: **A PACK TRIP OFF light illuminated indicates the related pack valve is closed due to temperature exceeding limits.**

TEMPERATURE selector . . . . Warmer temperature

[Reduces the work load on the affected air conditioning pack.]

TRIP RESET switch . . . . Push

[The PACK TRIP OFF light extinguishes if the pack temperature has cooled below limits.]

If both PACK TRIP OFF lights remain illuminated:

If cabin altitude increases:

Descent . . . . Accomplish

Monitor cabin altitude and rate. Descend to lowest safe altitude or 10,000 feet, whichever is higher.

At level off:

Airspeed . . . . .290 knots minimum

[Flight deck and cabin temperatures may increase rapidly below 290 knots]

PRESSURIZATION MODE selector . . . . MAN

OUTFLOW VALVE switch . . . . FULL OPEN

[Increases airplane ventilation.]

If flight deck and cabin temperatures are excessively warm:

FLIGHT DECK DOOR . . . . OPEN

[Improves flight deck ventilation.]

CABIN LIGHTING . . . . DIM

IN-FLIGHT ENTERTAINMENT systems . . . . OFF

Flight deck and cabin window shades . . . . Closed

Continued on next page

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If both PACK TRIP OFF lights remain illuminated: (continued)

If cabin altitude increases: (continued)

If flight deck and cabin temperatures are excessively warm: (continued)

GALLEY power . . . . OFF

■■■■

WING-BODY OVERHEAT

Condition: **A WING-BODY OVERHEAT light illuminated indicates a bleed air duct leak.**

ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side) . . . . OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

ENGINE BLEED AIR switch (affected side) . . . . OFF

WING ANTI-ICE switch . . . . OFF

[Prevents possible asymmetrical ice buildup on the wings.]

Avoid icing conditions.

If the left WING-BODY OVERHEAT light remains illuminated:

APU BLEED AIR switch (if APU running) . . . . OFF

[Stops the flow of bleed air from the APU to the left side pneumatic ducting.]

If the light remains illuminated:

APU switch . . . . OFF

Do not operate the APU.

If the light extinguishes:

ISOLATION VALVE switch . . . . AUTO

ENGINE No. 1 BLEED AIR switch . . . . ON

LEFT PACK switch . . . . AUTO

WING ANTI-ICE switch . . . . As needed

■■■■

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ENGINE COWL ANTI-ICE

Condition: **An engine COWL ANTI-ICE light illuminated indicates an overpressure condition in the cowl anti-ice duct.**

Flight conditions permitting:

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust levers to remain where manually positioned.]

THRUST lever (affected engine). . . . . .Retard

Reduce thrust until the COWL ANTI-ICE light extinguishes.

■■■■

ENGINE COWL VALVE OPEN/ TAI INDICATION

Condition: **An engine COWL VALVE OPEN light remaining illuminated bright blue in flight and /or an amber TAI indication indicates the cowl anti-ice valve position disagrees with the engine anti-ice switch position.**

Valve Open:

If total air temperature is above 10°C, limit thrust on the affected engine to 80% N1 if possible.

■■■■

Valve Closed:

Avoid icing conditions.

■■■■

PROBE HEAT

Condition: **Probe heat light(s) illuminated indicate related probe is not heated.**

Avoid icing conditions.

Note: Flight in icing conditions may result in erroneous flight instrument indications.

■■■■

WINDOW OVERHEAT

Condition: **A window OVERHEAT light illuminated indicates an overheat condition has been detected.**

WINDOW HEAT switch (affected window) . . . . OFF

[Extinguishes the OVERHEAT light and resets the system.]

After 2-5 minutes:

WINDOW HEAT switch . . . . ON

If the window OVERHEAT light re-illuminates:

WINDOW HEAT switch . . . . OFF

Limit airspeed to 250 knots maximum below 10,000 feet.

Windshield air controls . . . . Pull

[Vents conditioned air to the inside of the windshield for defogging.]

■■■■

WING ANTI-ICE VALVE OPEN

Condition: **A WING ANTI-ICE L VALVE OPEN and/or R VALVE OPEN light remaining illuminated bright blue in flight indicates the related wing anti-ice valve position disagrees with the wing anti-ice switch position.**

Valve Open:

If total air temperature is above 10°C or no visible moisture:

ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side) .OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

ENGINE BLEED AIR switch (affected side) . . . . . . .OFF

■■■■

Valve Closed:

WING ANTI–ICE switch . . . . .OFF

Avoid icing conditions.

■■■■

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AUTOPILOT DISENGAGE

Condition: **The flashing red A/P light illuminated and the aural tone sounding indicates the autopilot has disengaged.**

Fly the airplane manually or re–engage an autopilot.

■■■■

AUTOTHROTTLE DISENGAGE

Condition: **The flashing red A/T light illuminated indicates the autothrottle has disengaged.**

Control thrust manually or re–engage the autothrottle.

■■■■

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RADIO TRANSMIT CONTINUOUS (STUCK MICROPHONE SWITCH)

Condition: **A radio is continuously transmitting without crew input.**

Transmitter select switches (all audio selector panels) . . . . Flight interphone

[Deselects radios and stops radio transmissions.]

The microphone/interphone with the stuck switch continuously transmits on flight interphone.

The associated audio selector panel should remain on flight interphone. All other audio selector panels may be used normally.

■■■■

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BATTERY DISCHARGE

Condition: **The BAT DISCHARGE light illuminated indicates excessive battery discharge is detected with the battery switch on.**

Note: Fully charged batteries provide a minimum of 60 minutes of standby power.

■■■■

DRIVE

Condition: **A generator DRIVE light illuminated indicates a malfunction in the related generator drive.**

GENERATOR DRIVE DISCONNECT switch . . . . DISCONNECT

Hold in the DISCONNECT position momentarily.

[Prevents generator drive damage.]

APU (if available) . . . . START & ON BUS

■■■■

ELEC

Condition: **The ELEC light illuminated indicates a fault exists in the DC or standby power system.**

Note: The ELEC light only illuminates on the ground.

■■■■

ELECTRICAL SMOKE/FUMES/FIRE

Condition: **Electrical smoke/fumes/fire is identified.**

OXYGEN MASKS AND SMOKE GOGGLES (if needed) . . . . ON

Crew communications (if needed) . . . . Establish

RECIRCULATION FAN switch . . . . OFF

[Removes fan as a possible source of smoke/fumes. Stops recirculation of smoke/fumes and increases fresh air flow.]

If smoke/fumes/fire source is known:

ELECTRICAL POWER (affected equipment). . . . . Remove

If practical, remove power from affected equipment by switch or circuit breaker in flight deck or cabin.

If smoke/fumes/fire persists or source is unknown:

BUS TRANSFER switch . . . . OFF

[Prevents unwanted transfer of power.]

G-EZJO - G-EZKG
CAB/UTIL power switch . . . . OFF

G-EZJO - G-EZKG
IFE/PASS SEAT power switch . . . . OFF

G-EZJA - G-EZJN
GALLEY power switch . . . . OFF

EQUIPMENT COOLING SUPPLY/EXHAUST switches . . . . ALTERNATE

[Removes normal fans as a possible source of smoke/fumes.]

CABIN READING LIGHTS & GALLEY ATTENDANT WORK LIGHTS . . . . ON

Instruct flight attendants to:
- **turn on cabin reading lights**
- **turn on galley attendants work lights.**

[Prepares cabin lighting prior to depowering cabin fluorescent lights.]

Continued on next page

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If smoke/fumes/fire persists or source is unknown: (continued)

Cabin equipment . . . . Off

Instruct flight attendants to:
- **turn off galley power switches**
- **turn off cabin fluorescent light switches**
- **turn off IFE and PC power switches (as installed).**

Plan to land at the nearest suitable airport.

Accomplish the SMOKE/FUMES REMOVAL checklist, if needed.

■■■■

LOSS OF BOTH ENGINE DRIVEN GENERATORS

Condition: **All TRANSFER BUS OFF, SOURCE OFF, and GEN OFF BUS lights illuminated indicate the loss of both engine driven generators.**

Note: At high altitude, thrust deterioration or engine flameout may occur.

ENGINE GENERATOR switches . . . . ON

If only one SOURCE OFF light extinguishes:

APU (if available) . . . . START & ON BUS

If both SOURCE OFF lights remain illuminated:

If APU is available:

BUS TRANSFER switch . . . . OFF

[Prevents high electrical loads during attempts to restore power.]

ELECTRIC HYDRAULIC PUMP switches . . . . OFF

[Prevents high electrical loads during attempts to restore power.]

Note: APU start attempts are not recommended above 25,000 feet.

APU . . . . .START & ON BUSSES

[With both buses off, only one start attempt is recommended. Multiple start attempts reduce standby power capacity.]

BUS TRANSFER switch . . . . AUTO

ELECTRIC HYDRAULIC PUMP switches . . . . ON (one at a time)

[Prevents high peak electrical loads.]

REMOTE CONTROL circuit breaker (RCCB REMOTE) (STBY power control unit, P6). . . . . .Reset if tripped

Continued on next page

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If both primary attitude displays are inoperative:

IRS MODE SELECTOR switches . . . . ATT

Maintain straight and level, constant airspeed flight until attitude displays recover (approximately 30 seconds).

Magnetic heading . . . . Enter

[Heading may be entered on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.]

If both SOURCE OFF lights remain illuminated:

Avoid icing conditions.

Note: Flight in icing conditions may result in erroneous flight instrument indications.

Plan to land at the nearest suitable airport.

Note: Fully charged batteries provide a minimum of 60 minutes of standby power.

■■■■

SOURCE OFF

Condition: **A SOURCE OFF light illuminated indicates the related transfer bus is not powered by the last selected source.**

ENGINE GENERATOR switch . . . . ON

If SOURCE OFF light remains illuminated:

APU (if available) . . . . START & ON BUS

■■■■

STANDBY POWER OFF

Condition: **The STANDBY PWR OFF light illuminated indicates one or more of the following busses are unpowered:**
- **AC standby bus**
- **DC standby bus**
- **Battery bus.**

STANDBY POWER switch . . . . BAT

■■■■

TR UNIT

Condition: **The TR UNIT light illuminated indicates one or more TR's have failed.**

Do not use the AFDS approach mode.

■■■■

TRANSFER BUS OFF

Condition: **A TRANSFER BUS OFF light illuminated indicates the related transfer bus is not powered.**

ENGINE GENERATOR switch . . . . .ON

If TRANSFER BUS OFF light remains illuminated:

APU (if available) . . . . START & ON BUS

■■■■

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ABORTED ENGINE START

Condition: **During a ground start, an abort engine start condition occurs:**

ENGINE START lever	**CUTOFF**

If the ENGINE START switch is in GRD:

Motor the engine for 60 seconds.

ENGINE START switch . . . . .OFF

■■■■

If the ENGINE START switch is in OFF:

After N2 decreases below 20%:

ENGINE START switch . . . . GRD

Motor the engine for 60 seconds.

ENGINE START switch . . . . .OFF

Note: MOC and Engineering should be contacted before attempting subsequent start, even if no limits have been exceeded. <EZY>

■■■■

APU DET INOP

Condition: **The APU DET INOP light illuminated indicates the APU fire detection loop has failed.**

APU switch . . . . .OFF

CAUTION: Do not operate the APU. An APU fire would not be detected and the APU would continue to run.

■■■■

APU FAULT

Condition: **The APU FAULT light illuminated indicates an APU malfunction exists.**

Note: The APU shuts down automatically.

APU switch . . . . OFF

If the APU FAULT light extinguishes after 5 minutes, additional restarts may be attempted.

■■■■

APU FIRE

Condition: **Fire is detected in the APU.**

APU fire switch. . . . . Pull, rotate and hold

Rotate to the stop and hold for 1 second.

APU switch . . . . OFF

If the APU fire switch remains illuminated:

Plan to land at the nearest suitable airport.

■■■■

APU LOW OIL PRESSURE

Condition: **The APU LOW OIL PRESSURE light illuminated indicates the APU oil pressure is low.**

Note: The APU shuts down automatically.

APU switch . . . . OFF

[The LOW OIL PRESSURE light extinguishes in 5 minutes.]

■■■■

APU OVERSPEED

Condition: **The APU OVERSPEED light illuminated indicates one of the following:**
- **APU RPM limit has been exceeded resulting in an automatic shutdown**
- **the overspeed shutdown protection feature has failed a self-test during a normal APU shutdown.**

APU switch . . . . OFF

[The APU OVERSPEED light extinguishes in 5 minutes.]

■■■■

EEC ALTERNATE MODE

Condition: **An EEC ALTN light illuminated indicates the EEC is in alternate control mode.**

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust levers to remain where manually positioned.]

THRUST levers (both) . . . . Retard to mid position

[Prevents exceeding thrust limits when switching to alternate mode.]

EEC MODE switches (both). . . . . .ALTN

Push one switch at a time.

[Ensures both engines operate in alternate mode.]

AUTOTHROTTLE . . . . .ENGAGE

Note: Maximum thrust limiting is available with autothrottle engaged.

Observe engine limits.

[Alternate mode will not provide the same engine limit protections as the normal mode.]

■■■■

ENGINE CONTROL

Condition: **An ENGINE CONTROL light illuminated indicates an engine control system fault.**

Note: An ENGINE CONTROL light illuminates on the ground only.

Dispatch is not authorized.

■■■■

ENGINE FAILURE/SHUTDOWN

Condition: **Loss of all thrust on an engine accompanied by illumination of the ENG FAIL alert, or abnormal engine indications.**

Accomplish an engine shutdown only when flight conditions permit.

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust lever to remain where manually positioned.]

THRUST lever . . . . CLOSE

[Assists in recognition of affected engine.]

Conditions permitting, operate for three minutes at idle thrust.

ENGINE START lever . . . . CUTOFF

APU (if available) . . . . START & ON BUS

PACK switch (affected side) . . . . .OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

Fuel . . . . .Balance

TRANSPONDER MODE selector . . . . TA

[Prevents climb commands which can exceed single engine performance capability.

Continued on next page

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If wing anti–ice is needed:

ISOLATION VALVE switch . . . . AUTO

Plan to land at the nearest suitable airport.

Accomplish the ONE ENGINE INOPERATIVE LANDING checklist.

■■■■

ENGINE FIRE, SEVERE DAMAGE OR SEPARATION

Condition: **Fire is detected in the related engine; severe damage which may be associated with airframe vibration and/or abnormal engine indications has occurred; or the engine has separated.**

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust levers to remain where manually positioned.]

THRUST lever . . . . CLOSE

[Assists in recognition of the affected engine.]

ENGINE START lever . . . . CUTOFF

ENGINE FIRE WARNING switch . . . . Pull

To manually unlock the engine fire warning switch, press the override and pull.

If the engine fire warning switch or ENG OVERHEAT light remains illuminated:

ENGINE FIRE WARNING switch . . . . ROTATE L or R

Rotate to the stop and hold for one second.

If after 30 seconds the engine fire warning switch or ENG OVERHEAT light remains illuminated:

ENGINE FIRE WARNING switch . . . . .Rotate to remaining bottle

Rotate to the opposite stop and hold for one second.

If high airframe vibration occurs and continues after engine is shut down:

Without delay, reduce airspeed and descend to a safe altitude which results in an acceptable vibration level. If high vibration returns and further airspeed reduction and descent are not practicable, increasing airspeed may reduce vibration.

Continued on next page

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ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side) . . . . .OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

APU BLEED AIR switch . . . . .OFF

APU (if available) . . . . START & ON BUS

Fuel . . . . Balance

TRANSPONDER MODE selector . . . . TA

[Prevents climb commands which can exceed single engine performance capability.

If wing anti–ice is needed:

ISOLATION VALVE switch (after fire has been extinguished) . . . . AUTO

Plan to land at the nearest suitable airport.

Accomplish the ONE ENGINE INOPERATIVE LANDING checklist when appropriate.

■■■■

ENGINE FIRE/OVERHEAT DETECTOR FAULT

Condition: **The FAULT light illuminated indicates both loops on an engine have failed.**

The fire detection system in one or both engines is inoperative.

■■■■

ENGINE HIGH OIL TEMPERATURE

Condition: **Engine oil temperature is in the amber band, or at or above the redline.**

If temperature is at or above the redline:

Accomplish the ENGINE FAILURE/SHUTDOWN checklist.

■■■■

If temperature is in the amber band:

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust lever to remain where manually positioned.]

THRUST lever
(affected engine) . . . . RETARD

Retard until engine oil temperature is within normal operating range or thrust lever is closed.

If temperature is in the amber band for more than 45 minutes:

Accomplish the ENGINE FAILURE /SHUTDOWN checklist.

■■■■

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ENGINE IN-FLIGHT START

Condition: **Engine start is needed after a shutdown with no fire or apparent damage.**

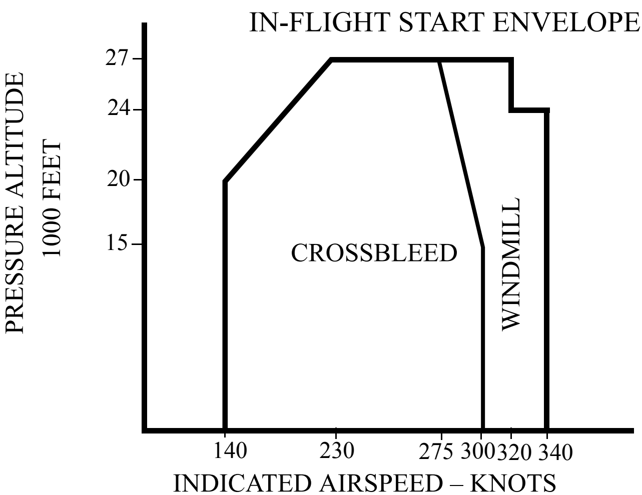
Note: Oil quantity indication as low as zero is normal if windmilling N2 RPM is below approximately 8%.

Complete the ENGINE FAILURE/SHUTDOWN checklist before attempting an in-flight engine start.

IN-FLIGHT START ENVELOPE . . . . Check

[Starts not assured outside of the in-flight start envelope.]

Note: For engines shut down more than one hour, a crossbleed start is needed.



THRUST lever . . . . CLOSE

ENGINE START lever . . . . CUTOFF

If crossbleed start is needed:

PACK switch (affected side) . . . . OFF

DUCT PRESSURE . . . . .Minimum 30 PSI

If needed, advance the thrust lever to increase duct pressure.

Continued on next page

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ENGINE START switch . . . . .GRD/FLT

Use GRD if crossbleed start is needed.

ENGINE START lever . . . . .IDLE DETENT

Move engine start lever to IDLE detent at a minimum of 11% N2.

Monitor EGT to ensure it does not rise rapidly or exceed the start limit of 725° C during the start attempt.

If EGT does not increase in 30 seconds or another abort start condition as listed in normal procedures occurs:

ENGINE START lever . . . . CUTOFF

ENGINE START switch . . . . .OFF

Note: If engine has been shutdown for more than 1 hour, multiple start attempts may be needed.

Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT remains within limits, the start is progressing normally.

After engine start:

Electrical . . . . .GENERATOR ON

PACK switch . . . . AUTO

ENGINE START switch . . . . As needed

APU . . . . As needed

TRANSPONDER MODE selector . . . . TA/RA

■■■■

ENGINE LIMIT/SURGE/STALL

Condition: **One or more of the following conditions:**

- **Engine RPM or EGT indications are abnormal, approaching or exceeding limits**
- **No response to thrust lever movement**
- **Abnormal engine noises.**

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust lever to remain where manually positioned.]

THRUST lever . . . . RETARD

Retard until indications remain within appropriate limits or the thrust lever is closed.

If indications are abnormal or EGT continues to increase:

ENGINE START lever . . . . CUTOFF

APU (If available) . . . . START & ON BUS

PACK switch (affected side) . . . . .OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

Fuel . . . . .Balance

TRANSPONDER MODE selector . . . . TA

[Prevents climb commands which can exceed single engine performance capability.

If wing anti-ice is needed:

ISOLATION VALVE switch . . . . AUTO

Plan to land at the nearest suitable airport.

Accomplish the ONE ENGINE INOPERATIVE LANDING checklist.

■■■■

If indications are stabilized and EGT decreases:

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If indications are stabilized and EGT decreases: (continued)

THRUST lever . . . . .ADVANCE

Advance slowly. Check that RPM and EGT follow thrust lever movement.

Operate engine normally or at a reduced thrust setting which is surge and stall free.

■■■■

ENGINE LOW OIL PRESSURE

Condition: **Engine oil pressure is in the amber band with takeoff thrust set, LOW OIL PRESSURE alert illuminated, or engine oil pressure is at or below the redline.**

If engine oil pressure is in the amber band with takeoff thrust set:

Do not takeoff.

■■■■

If engine oil pressure is at or below the redline:

Accomplish the ENGINE FAILURE/SHUTDOWN checklist.

■■■■

ENGINE OIL FILTER BYPASS

Condition: **An engine OIL FILTER BYPASS alert illuminated indicates an impending bypass of the scavenge oil filter.**

AUTOTHROTTLE (If engaged) . . . . Disengage

[Allows thrust lever to remain where manually positioned.]

THRUST lever . . . . Retard

Retard until the OIL FILTER BYPASS alert extinguishes or thrust lever is closed.

If the OIL FILTER BYPASS alert extinguishes:

Operate the engine at reduced thrust to keep the alert extinguished.

■■■■

If the OIL FILTER BYPASS alert remains illuminated:

Accomplish the ENGINE FAILURE/SHUTDOWN checklist.

■■■■

ENGINE OVERHEAT

Condition: **An ENG OVERHEAT light illuminated indicates an overheat is detected on the related engine.**

AUTOTHROTTLE (if engaged). . . . . DISENGAGE

[Allows thrust lever to remain where manually positioned.]

THRUST lever . . . . CLOSE

If the ENG OVERHEAT light remains illuminated:

Accomplish the ENGINE FIRE, SEVERE DAMAGE OR SEPARATION checklist.

■■■■

If the ENG OVERHEAT light extinguishes:

Operate the engine at reduced thrust to keep the light extinguished.

■■■■

ENGINE TAILPIPE FIRE

Condition: **An engine tailpipe fire is reported on the ground with no engine fire warning.**

Engine start lever (affected engine) . . . . CUTOFF

Advise the cabin.

If bleed air is available:

PACK switches (both) . . . . .OFF

[Allows maximum bleed air for engine motoring.]

ISOLATION VALVE switch . . . . AUTO

[Ensures bleed air is available for engine motoring.]

Engine BLEED AIR switches (both). . . . . .ON

If APU is on:

APU BLEED air switch . . . . .ON

If the affected ENGINE START switch is not in GRD:

Allow the affected N2 to decrease below 20%.

ENGINE START switch (affected engine) . . . . GRD

Advise the tower.

If the engine is being motored:

Continue to motor until the tailpipe fire is extinguished.

ENGINE START switch (affected engine) . . . . .OFF

■■■■

HIGH ENGINE VIBRATION

Condition: **VIB levels are in excess of 4.0 units accompanied by airframe vibrations.**

If not in icing conditions:

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust lever to remain where manually positioned.]

THRUST lever . . . . RETARD

Retard to maintain VIB below 4 units.

Note: If the VIB indication does not decrease when the thrust lever is retarded, check other engine indications. If other engine indications are normal, no further action is needed.

■■■■

If in icing conditions:

During descent or holding accomplish the following on one engine at a time at approximately 15 minute intervals:

ENGINE START switch . . . . FLT

Thrust . . . . .Adjust

Adjust thrust to 45% N1. After approximately five seconds, advance thrust lever slowly to a minimum of 80% N1.

If vibration does not decrease:

Accomplish the procedure for “If not in icing conditions.”

■■■■

LOSS OF THRUST ON BOTH ENGINES

Condition: **Loss of all thrust on both engines accompanied by illumination of both ENG FAIL alerts.**

ENGINE START switches . . . . FLT

ENGINE START levers . . . . CUTOFF

EGT decreasing:

ENGINE START levers. . . . . .IDLE DETENT

If EGT reaches 950°C, repeat the above steps.

Note: In moderate to heavy rain it may take up to 3 minutes to accelerate to idle.

APU (if available) . . . . START & ON BUS

Do not wait for successful engine start(s) prior to starting APU.

[The APU has demonstrated the capability to provide electrical and pneumatic power up to 20,000 feet. APU may be placed on either or both busses.]

If neither restart is successful and N2 is below 11%:

WING ANTI–ICE switch . . . . .OFF

PACK switches . . . . .OFF

APU BLEED AIR switch . . . . .ON

IGNITION SELECT switch . . . . BOTH

Either ENGINE START switch . . . . GRD

Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT remains within limits, the start is progressing normally.

When engine parameters have stabilized:

APU BLEED AIR switch . . . . .OFF

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When engine parameters have stabilized: (continued)

ENGINE START switch . . . . FLT

THRUST lever . . . . .ADVANCE

GENERATOR switch . . . . .ON

PACK switch . . . . AUTO

Accomplish the ENGINE IN-FLIGHT START checklist to start the other engine.

If neither IRS attitude display recovers after a transfer bus is restored:

IRS MODE SELECTOR switches . . . . ATT

Maintain wings level, constant speed flight until attitude displays recover (approximately 30 seconds).

Magnetic heading . . . . .Enter

APU . . . . As needed

■■■■

ONE ENGINE INOPERATIVE LANDING

Condition: **Landing must be accomplished with one engine inoperative.**

Plan a flaps 15 landing.

Set VREF 15.

If any of the following conditions apply, set VREF ICE = VREF 15+10:
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Maintain VREF 15 + 5 or VREF ICE + 5 minimum on final approach to assure adequate maneuver margin and speed for go-around.

Continued on next page

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---------------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

Anti–ice . . . . ___

Use engine anti–ice on the operative engine only.

If additional go–around thrust is desired, below 10,000 feet configure the pressurization system for a no engine bleed landing:

ISOLATION valve switch . . . . CLOSE

Engine No. 1 BLEED air switch .OFF

APU BLEED air switch . . . . .ON

Do not open the APU bleed valve if the engine fire warning switch remains illuminated.

Left PACK switch . . . . AUTO

Engine No. 2 BLEED air switch .OFF

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . .FLAP INHIBIT

Landing data . . . . .VREF 15 or VREF ICE, Minimums ___

Approach briefing . . . . Completed

Go–around procedure . . . . Review

Accomplish normal go–around procedure except:

- **Use flaps 1**
- **Maintain VREF 15 + 5 knots or VREF ICE + 5 knots to flap retraction altitude**
- **Limit bank angle to 15 degrees until reaching VREF 15 + 15 knots or VREF ICE + 5 knots or minimum maneuver speed**
- **Accelerate to flaps 1 maneuvering speed prior to flap retraction.**

Continued on next page

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---------------------------- DEFERRED ITEMS -----------------------------

==> APPROACH

Altimeters . . . . ___

---------------------------- DEFERRED ITEMS -----------------------------

==> LANDING

ENGINE START
switch (operating engine) . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . 15, Green light

■■■■

REVERSER

Condition: **A REVERSER light illuminated indicates a fault is detected in the related engine reverser system.**

Note: Additional system failures may cause in-flight deployment.

Expect normal reverser operation after landing.

■■■■

REVERSER UNLOCKED (IN FLIGHT)

Condition: **An amber REV indication illuminated on the engine display indicates that the related thrust reverser has moved from the stowed position.**

Note: Only multiple failures could allow the engine to go into reverse thrust.

Note: Unstowed reverser sleeves produce buffet, yaw, roll and increased airplane drag.

FORWARD THRUST lever (affected engine) . . . . Check

[The EECs prevent power above idle if the related thrust reverser has moved from the stowed position.]

CAUTION: Do not actuate the reverse thrust lever.

If the engine responds to forward thrust lever movement and no buffet or yaw exists:

Operate the engine normally.

■■■■

If the engine does not respond to forward thrust lever movement or buffet or yaw exists:

Accomplish the ENGINE FAILURE /SHUTDOWN checklist.

■■■■

START VALVE OPEN

Condition: **The START VALVE OPEN alert illuminated indicates the start valve has opened or remains open after engine start.**

ENGINE START switch . . . . OFF

If START VALVE OPEN alert remains illuminated:

ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side) . . . . OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

ENGINE BLEED AIR switch (affected engine) . . . . OFF

APU BLEED AIR switch (engine No. 1 only) . . . . OFF

If during ground operations:

Ground air source (if in use) . . . . Disconnect

ENGINE START lever . . . . CUTOFF

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VOLCANIC ASH

Condition: **Static discharge around the windshield, bright glow in the engine inlets, smoke or dust on the flight deck, or acrid odor indicates the airplane is in volcanic ash.**

Exit volcanic ash as quickly as possible. Consider a 180 degree turn.

OXYGEN MASKS and SMOKE GOGGLES (if needed). . . . . ON

Crew communications (if needed) . . . . Establish

AUTOTHROTTLE (if engaged) . . . . DISENGAGE

[Allows thrust levers to remain where manually positioned.]

THRUST levers . . . . CLOSE

Conditions permitting, operate at idle thrust.

[Reduces possible engine damage and/or flameout by decreasing EGT.]

ENGINE START switches . . . . FLT

PACK switches . . . . HIGH

WING ANTI–ICE . . . . ON

[Increases bleed air extraction to improve engine stall margin.]

ENGINE ANTI–ICE . . . . ON

[Increases bleed air extraction to improve engine stall margin.]

APU (if available) . . . . START

[Provides backup electrical and pneumatic source, if needed.]

Note: Encountering volcanic ash can lead to abnormal systems reactions such as:

- **Engine malfunctions, increasing EGT, engine stall or flameout.**
- **Decrease or loss of airspeed indications.**
- **Equipment Cooling OFF light.**

Continued on next page

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If engines have flamed out or stalled, or EGT rapidly approaches or exceeds limit:

Accomplish the LOSS OF THRUST ON BOTH ENGINES checklist.

■■■■

Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT remains within limits, the start is progressing normally.

Plan to land at the nearest suitable airport.

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AIR CONDITIONING SMOKE/FUMES

Condition: **A concentration of air conditioning smoke/fumes is identified.**

OXYGEN MASKS and SMOKE GOGGLES (if needed) . . . . ON

Crew communications (if needed) . . . . Establish

RECIRCULATION FAN switch . . . . OFF

[Eliminates possible source of smoke/fumes.]

If smoke/fumes stop:

Continue flight with the recirculation fan switch OFF.

If smoke/fumes continue:

ISOLATION VALVE switch . . . . CLOSE

R PACK switch . . . . OFF

If smoke/fumes stop:

Continue flight with the R PACK switch OFF and ISOLATION VALVE switch CLOSE.

If smoke/fumes continue:

R PACK switch . . . . AUTO

L PACK switch . . . . OFF

If smoke/fumes stop:

Continue flight with the L PACK switch OFF and ISOLATION VALVE switch CLOSE.

If smoke/fumes continue:

L PACK switch . . . . AUTO

Plan to land at nearest suitable airport.

Accomplish the SMOKE/FUMES REMOVAL checklist, if needed.

■■■■

APU DET INOP

Condition: **The APU DET INOP light illuminated indicates the APU fire detection loop has failed.**

APU switch . . . . OFF

CAUTION: Do not operate the APU. An APU fire would not be detected and the APU would continue to run.

■■■■

APU FIRE

Condition: **Fire is detected in the APU.**

APU fire switch. . . . . Pull, rotate and hold

Rotate to the stop and hold for 1 second.

APU switch . . . . OFF

If the APU fire switch remains illuminated:

Plan to land at the nearest suitable airport.

■■■■

CARGO FIRE

Condition: **Fire is detected in the related cargo compartment.**

CARGO FIRE ARM switch (FWD/AFT) . . . . ARMED

CARGO FIRE DEPR/DISCH switch . . . . Push

Push and hold for 1 second.

Note: DISCH light may require up to 30 seconds to illuminate.

RECIRCULATION FAN switch . . . . OFF

One PACK switch . . . . OFF

Plan to land at the nearest suitable airport.

WARNING: After landing, inform ground personnel not to open the cargo door until all supernumeraries and crew have exited the airplane and fire fighting equipment is nearby.

■■■■

CARGO FIRE DETECTOR FAULT

Condition: **The DETECTOR FAULT light illuminated indicates both loops in one or both cargo compartments have failed.**

The fire detection system in one or both cargo compartments is inoperative.

■■■■

ELECTRICAL SMOKE/FUMES/FIRE

Condition: **Electrical smoke/fumes/fire is identified.**

OXYGEN MASKS and SMOKE GOGGLES (if needed) . . . . ON

Crew communications (if needed) . . . . Establish

RECIRCULATION FAN switch . . . . OFF

[Removes fan as a possible source of smoke/fumes. Stops recirculation of smoke/fumes and increases fresh air flow.]

If smoke/fumes/fire source is known:

Electrical power (affected equipment) . . . . Remove

If practical, remove power from affected equipment by switch or circuit breaker in flight deck or cabin.

If smoke/fumes/fire persists or source is unknown:

BUS TRANSFER switch . . . . OFF

[Prevents unwanted transfer of power.]

G-EZJO - G-EZKG
CAB/UTIL power switch . . . . OFF

G-EZJO - G-EZKG
IFE/PASS SEAT power switch . . . . OFF

G-EZJA - G-EZJN
GALLEY power switch . . . . OFF

EQUIPMENT COOLING SUPPLY/EXHAUST switches . . . . ALTERNATE

[Removes normal fans as a possible source of smoke/fumes.]

CABIN READING LIGHTS & GALLEY ATTENDANT WORK LIGHTS . . . . ON

Instruct flight attendants to:
- **turn on cabin reading lights**
- **turn on galley attendants work lights.**

[Prepares cabin lighting prior to depowering cabin fluorescent lights.]

Continued on next page

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If smoke/fumes/fire persists or source is unknown: (continued)

Cabin equipment . . . . Off

Instruct flight attendants to:
- **turn off galley power switches**
- **turn off cabin fluorescent light switches**
- **turn off IFE and PC power switches (as installed).**

Plan to land at the nearest suitable airport.

Accomplish the SMOKE/FUMES REMOVAL checklist, if needed.

■■■■

ENGINE FIRE/OVERHEAT DETECTOR FAULT

Condition: **The FAULT light illuminated indicates both loops on an engine have failed.**

The fire detection system in one or both engines is inoperative.

■■■■

ENGINE FIRE, SEVERE DAMAGE OR SEPARATION

Condition: **Fire is detected in the related engine; severe damage which may be associated with airframe vibration and/or abnormal engine indications has occurred; or the engine has separated.**

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust levers to remain where manually positioned.]

THRUST lever . . . . CLOSE

[Assists in recognition of the affected engine.]

ENGINE START lever . . . . CUTOFF

ENGINE FIRE WARNING switch . . . . Pull

To manually unlock the engine fire warning switch, press the override and pull.

If the engine fire warning switch or ENG OVERHEAT light remains illuminated:

ENGINE FIRE WARNING switch . . . . Rotate L or R

Rotate to the stop and hold for one second.

If after 30 seconds the engine fire warning switch or ENG OVERHEAT light remains illuminated:

ENGINE FIRE WARNING switch . . . . .Rotate to remaining bottle

Rotate to the opposite stop and hold for one second.

If high airframe vibration occurs and continues after engine is shut down:

Without delay, reduce airspeed and descend to a safe altitude which results in an acceptable vibration level. If high vibration returns and further airspeed reduction and descent are not practicable, increasing airspeed may reduce vibration.

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ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side) . . . . .OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

APU BLEED AIR switch . . . . .OFF

APU (if available) . . . . START & ON BUS

FUEL . . . . .BALANCE

TRANSPONDER MODE selector . . . . TA

[Prevents climb commands which can exceed single engine performance capability.

If wing anti–ice is needed:

ISOLATION VALVE switch (after fire has been extinguished) . . . . AUTO

Plan to land at the nearest suitable airport.

Accomplish the ONE ENGINE INOPERATIVE LANDING checklist when appropriate.

■■■■

ENGINE OVERHEAT

Condition: **An ENG OVERHEAT light illuminated indicates an overheat is detected on the related engine.**

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

[Allows thrust lever to remain where manually positioned.]

THRUST lever . . . . CLOSE

If the ENG OVERHEAT light remains illuminated:

Accomplish the ENGINE FIRE, SEVERE DAMAGE OR SEPARATION checklist.

■■■■

If the ENG OVERHEAT light extinguishes:

Operate the engine at reduced thrust to keep the light extinguished.

■■■■

ENGINE TAILPIPE FIRE

Condition: **An engine tailpipe fire is reported on the ground with no engine fire warning.**

ENGINE START lever (affected engine) . . . . CUTOFF

Advise the cabin.

If bleed air is available:

PACK switches (both) . . . . OFF

[Allows maximum bleed air for engine motoring.]

ISOLATION VALVE switch . . . . AUTO

[Ensures bleed air is available for engine motoring.]

Engine BLEED AIR switches (both) . . . . .ON

If APU is on:

APU BLEED air switch . . . . .ON

If the affected ENGINE START switch is not in GRD:

Allow the affected N2 to decrease below 20%.

ENGINE START switch (affected engine) . . . . GRD

Advise the tower.

If the engine is being motored:

Continue to motor until the tailpipe fire is extinguished.

ENGINE START switch (affected engine) . . . . .OFF

■■■■

SMOKE/FUMES REMOVAL

Condition: **Smoke/fumes removal is needed.**

OXYGEN MASKS and SMOKE GOGGLES (if needed) . . . . ON

CABIN DOOR . . . . CLOSE

[Prevents smoke/fumes contamination of/from other compartments.]

Crew communications (if needed) . . . . Establish

If pack(s) are on and smoke/fumes source is confirmed to be on the flight deck or in the main cabin:

L and R PACK switches . . . . HIGH

RECIRCULATION FAN switch . . . . OFF

LAND ALT . . . . 10,000 feet

[Increases the ventilation rate.]

ENGINE No. 1 and No. 2 BLEED AIR switches . . . . Verify ON

Engine thrust . . . . Maximum practical N1 (minimum 45%)

[Provides maximum cabin ventilation.]

Flight deck air conditioning and gasper outlets . . . . Open

CAUTION: Do not open any flight deck window. Keep the cabin door closed.

If smoke/fumes are uncontrollable:

Airplane altitude . . . . Lowest safe altitude, or 10,000 feet, whichever is higher

At 14,000 feet or below:

PRESSURIZATION MODE selector . . . . MAN

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If pack(s) are on and smoke/fumes source is confirmed to be on the flight deck or in the main cabin: (continued)

If smoke/fumes are uncontrollable: (continued)

At 14,000 feet or below: (continued)

OUTFLOW VALVE switch . . . . OPEN

Position outflow valve to full open. This causes the cabin airflow to carry smoke/fumes aft.

Note: The outflow valve can take up to 20 seconds to open.

Plan to land at the nearest suitable airport.

■■■■

If packs are off and smoke/fumes source is confirmed to be on the flight deck:

CAUTION: Window should not be opened unless the source is confirmed to be originating on the flight deck.

Normal holding airspeed . . . . Establish

[High airspeed may prevent opening the window.]

First officer's sliding window . . . . Open

■■■■

WHEEL WELL FIRE

Condition: **A fire is detected in the main wheel well.**

Observe extend limit speed (270K/.82M)

LANDING GEAR lever . . . . .DOWN

Note: Do not use FMC fuel predictions with landing gear extended.

If the landing gear must be retracted for airplane performance, leave the landing gear extended for 20 minutes after the WHEEL WELL fire warning light has extinguished.

LANDING GEAR lever (if needed)
(235 KNOTS maximum) . . . . UP & OFF

Plan to land at the nearest suitable airport.

■■■■

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ALL FLAPS UP LANDING

Condition: **Leading edge devices and trailing edge flaps cannot be extended.**

Burn off fuel to reduce touchdown speed.

Set VREF 40 + 55 knots.

Check the appropriate Non–Normal Configuration Landing Distance table in the ADVISORY INFORMATION section of the Performance–Inflight chapter.

Maintain flaps up maneuvering speed until on final.

Limit bank angle to 15° until reaching flaps up maneuvering speed.

--------------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

Autobrake . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF 40 + 55 knots, Minimums ___

Approach briefing . . . . Completed

Go-around procedure . . . . Review

Accomplish normal go-around procedure except:
- **Limit bank angle to 15° until reaching flaps up maneuvering speed.**
- **Accelerate to flaps up maneuvering speed.**

--------------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

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---------------------------- DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . UP, no lights

FASTEN BELTS switch . . . . ON

■■■■

AUTO SLAT FAIL

Condition: **The AUTO SLAT FAIL light illuminated indicates failure of the auto slat system.**

No crew action needed in flight.

■■■■

FEEL DIFFERENTIAL PRESSURE

Condition: **The FEEL DIFF PRESS light illuminated indicates significant differential pressure in the elevator feel computer.**

No crew action needed in flight.

■■■■

FLIGHT CONTROL LOW PRESSURE

Condition: **A FLT CONTROL LOW PRESSURE light illuminated indicates the related hydraulic system pressure to ailerons, elevators and rudder is low.**

FLIGHT CONTROL switch . . . . STBY RUD

■■■■

JAMMED OR RESTRICTED FLIGHT CONTROLS

Condition: **Movement of the elevator, aileron/spoiler or rudder is restricted.**

AUTOPILOT (if engaged) . . . . .DISENGAGE

AUTOTHROTTLE (if engaged) . . . . .DISENGAGE

Verify thrust is symmetrical.

(SB changes G-EZJA - G-EZJT)

If rudder is jammed or restricted and STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP:

Accomplish the UNCOMMANDED RUDDER/YAW OR ROLL Non-Normal checklist.

■■■■

JAMMED OR RESTRICTED SYSTEM . . . . OVERPOWER

Use maximum force, including a combined effort of both pilots, if needed. A maximum two-pilot effort on the controls will not cause a cable or system failure.

Do not turn off any flight control switches.

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If controls are normal:

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

If controls are not normal:

Use stabilizer or rudder trim to offload control forces.

If electric stabilizer trim is desired, position the Stabilizer Trim Override switch to OVERRIDE.

Do not make abrupt thrust changes. Extend or retract speedbrake slowly and smoothly.

Limit bank angle to 15°.

Plan to land at the nearest suitable airport.

Plan a flaps 15 landing.

Set VREF 15 + 5

If any of the following conditions apply, set VREF ICE = VREF 15 + 10, + 5:

- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

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---------------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall. . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP
INHIBIT switch . . . . .FLAP INHIBIT

Landing data . . . . .VREF 15 + 5 knots
or VREF ICE + 5 knots, Minimums ___

Approach briefing . . . . Completed

Go-around procedure . . . . REVIEW

Accomplish normal go-around procedure. Advance thrust to go-around smoothly and slowly to avoid excessive pitch-up.

---------------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

---------------------------DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . .ARMED

Landing gear. . . . . .DOWN

Flaps . . . . 15, Green light

■■■■

LEADING EDGE FLAPS TRANSIT

Condition: **The LE FLAPS TRANSIT light remains illuminated to indicate asymmetrical or skewed leading edge devices or leading edge devices not in correct position.**

Note: Do not use FMC fuel predictions with flaps extended.

If the trailing edge flaps are extended and the trailing edge flap position indication disagrees with flap handle position:

Accomplish the TRAILING EDGE FLAP DISAGREE checklist.

■■■■

If the trailing edge flaps are extended and the trailing edge flap position indication agrees with flap handle position:

Plan a flaps 15 landing.

Set VREF 15 + 15.

Limit bank angle to 15° until reaching flaps up maneuvering speed.

Continue checklist at DEFERRED ITEMS, DESCENT.

If the trailing edge flaps are up:

Airspeed . . . . 230 knots maximum

If roll is encountered:

Plan a flaps 15 landing.

Set VREF 15 + 15.

Limit bank angle to 15° until reaching flaps up maneuvering speed.

Continue checklist at DEFERRED ITEMS, DESCENT.

If no roll is encountered:

Flaps . . . . Extend to flaps 1 then retract to flaps up

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If the trailing edge flaps are up: (continued)

If no roll is encountered: (continued)

If the LE FLAPS TRANSIT light extinguishes after flaps UP:

No additional crew action is required.

■■■■

If the LE FLAPS TRANSIT light remains illuminated after flaps UP:

LE DEVICES ANNUNCIATOR panel . . . . Check

If any light(s) for only one leading edge device is illuminated:

Limit airspeed to 300 knots (280 knots for turbulent air penetration) or .65 Mach, whichever is lower.

If any light(s) for more than one leading edge device is illuminated:

Limit airspeed to 230 knots.

Plan a flaps 15 landing.

Set VREF 15 + 15.

Limit bank angle to 15° until reaching flaps up maneuvering speed.

Continue checklist at DEFERRED ITEMS, DESCENT.

Continued on next page

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--------------------------- DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

Autobrake . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . .FLAP INHIBIT

Landing data . . . . VREF 15 + 15 knots, Minimums ___

Approach briefing . . . . Completed

--------------------------- DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

--------------------------- DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . 15, Green/amber light

[The light may be green or amber depending on the cause of the failure.]

Note: With asymmetrical or no leading edge devices extended, the amber LE FLAPS TRANSIT light is illuminated. Operation within the lower amber airspeed band for landing is normal for this condition.

G-EZJA - G-EZJN

Note: Due to minimum speed reversion, V/S and VNAV PTH modes may revert to LVL CHG mode.

■■■■

MACH TRIM FAIL

Condition: **The MACH TRIM FAIL light illuminated indicates failure of the mach trim system.**

Limit airspeed to 280 knots/.82 Mach.

■■■■

RUNAWAY STABILIZER

Condition: **Continuing rotation of the stabilizer trim wheel in a manner not appropriate for flight conditions.**

Control column . . . . Hold firmly

AUTOPILOT (if engaged) . . . . DISENGAGE

Do not re-engage the autopilot.

Control airplane pitch attitude manually with control column and main electric trim as required.

If runaway continues:

STABILIZER TRIM CUTOUT switches . . . . CUTOUT

If runaway continues:

Stabilizer trim wheel . . . . Grasp & hold

Stabilizer . . . . Trim manually

Anticipate trim requirements.

Complete the normal DESCENT, APPROACH and LANDING checklists.

Establish proper airspeed and in-trim condition early on final approach.

■■■■

SPEED BRAKE DO NOT ARM

Condition: **The SPEED BRAKE DO NOT ARM light illuminated indicates a fault in the automatic speed brake system.**

Note: Speed brakes may be used in flight.

Complete the normal DESCENT, APPROACH and LANDING checklists except do not arm speed brakes for landing.

Manually deploy the speed brakes immediately upon touchdown.

■■■■

SPEED TRIM FAIL

Condition: **The SPEED TRIM FAIL light illuminated indicates failure of the speed trim system.**

No crew action needed in flight.

■■■■

SPEEDBRAKES EXTENDED

Condition: **The SPEEDBRAKES EXTENDED light illuminated indicates one of the following:**

- **in flight, the speed brake lever is beyond the ARMED position with either the trailing edge flaps extended more than flaps 10 or the radio altitude less than 800 feet**
- **on the ground, the SPEED BRAKE lever is in the DOWN detent and the ground spoilers are not stowed.**

SPEED BRAKE lever . . . . ARMED/DOWN DETENT

If light is illuminated on the ground:

Do not takeoff.

■■■■

STABILIZER OUT OF TRIM

Condition: **The STAB OUT OF TRIM light illuminated indicates the autopilot is not trimming the stabilizer properly.**

Note: Momentary illumination of the STAB OUT OF TRIM light during large changes in trim requirements is normal.

If the stabilizer is not trimming:

Control column . . . . Hold firmly

Autopilot. . . . . .DISENGAGE

Stabilizer trim . . . . As needed

If the stabilizer fails to respond to electric trim inputs:

Accomplish the STABILIZER TRIM INOPERATIVE checklist.

■■■■

STABILIZER TRIM INOPERATIVE

Condition: **The stabilizer fails to respond to electric trim inputs.**

STABILIZER TRIM CUTOUT switches . . . . CUTOUT

Manual trim . . . . Apply

Apply steady pressure on the manual trim handles until the desired trim is attained.

If required, use force to cause the disconnect clutch to disengage. Approximately 1/2 turn of the stabilizer trim wheel may be needed.

Note: A maximum two-pilot effort on the trim wheels will not cause a cable or system failure.

Note: If the failure could be due to ice accumulation, descend to a warmer temperature and attempt again.

Note: The handle(s) should be folded inside the stabilizer trim wheel when not in use.

Maintain in-trim airspeed until start of the approach.

To reduce the force required to move the stabilizer, use an airspeed which results in an in-trim condition.

Continue to trim manually for the remainder of the flight.

Plan a flaps 15 landing.

Set VREF 15.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Establish landing configuration early.

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If the stabilizer cannot be trimmed:

Anticipate higher than normal elevator forces during approach and landing

The thrust reduction at flare will cause a nose down pitch.

Note: Elevator control is sufficient to safely land the airplane regardless of stabilizer position.

----------------------------DEFERRED ITEMS-----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF 15 or VREF ICE, Minimums ___

Approach briefing . . . . Completed

Go-around procedure . . . . Review

Accomplish normal go-around procedure. Advance thrust to go around smoothly and slowly to avoid excessive pitch up.

----------------------------DEFERRED ITEMS-----------------------------

==> APPROACH

Altimeters . . . . ___

----------------------------DEFERRED ITEMS-----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . 15, Green light

■■■■

STANDBY RUDDER ON

G-EZJU - G-EZKG
(SB changes G-EZJA - G-EZJT)

Condition: **STBY RUD ON light is illuminated.**

If the STBY RUD ON light is illuminated due to pilot manual positioning of FLT CONTROL A or B switch to STBY RUD or in response to a hydraulic system non-normal situation:

No crew action needed in flight.

■■■■

If the STBY RUD ON light is illuminated with no other flight deck indications:

Avoid large or abrupt rudder pedal inputs.

■■■■

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TRAILING EDGE FLAP ASYMMETRY

Condition: **An uncommanded roll occurs when a new flap selection is made and/or a difference between the left and right flap indication is observed.**

Flaps . . . . Set

Move flap lever to the detent nearest the smallest indicated flap position.

CAUTION: Do not attempt to move the trailing edge flaps with the alternate flaps switch as there is no asymmetry protection.

If flaps are 15 or more:

Set VREF for smallest flap position.

If using VREF 15 and any of the following conditions apply, set VREF ICE = VREF 15 + 10.
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Note: VREF + wind additive, or VREF ICE + wind additive if needed, must not exceed the flap placard speed for the next larger flap setting.

Continue checklist at DEFERRED ITEMS, DESCENT.

If flaps are 1 or greater and less than 15:

Set VREF 40 + 30 knots.

Check the appropriate Non–Normal Configuration Landing Distance table in the ADVISORY INFORMATION section of the Performance–Inflight chapter.

Continue checklist at DEFERRED ITEMS, DESCENT.

Continued on next page

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If flaps are less than 1:

Accomplish the TRAILING EDGE FLAPS UP LANDING checklist.

Note: Do not use FMC fuel predictions with flaps extended.

■■■■

----------------------------DEFERRED ITEMS-----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

----------------------------DEFERRED ITEMS-----------------------------

==> APPROACH

Altimeters . . . . ___

----------------------------DEFERRED ITEMS-----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . ____, Green/amber light

[The light may be green or amber depending on the cause of the failure.]

■■■■

TRAILING EDGE FLAP DISAGREE

Condition: **The flap position indicators disagree with flap handle position and no asymmetry is indicated.**

If indicated flap position is 30 or greater and less than 40:

Land using existing flaps.

Set VREF 30 for landing.

Note: VREF 30 + wind additive must not exceed the flap placard speed for flaps 40.

If indicated flap position is 15 or greater and less than 30:

Land using existing flaps.

Set VREF 15 for landing.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:

- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Note: VREF 15 + wind additive, or VREF ICE + wind additive if needed, must not exceed the flap placard speed for the next larger flap setting.

Continue checklist at DEFERRED ITEMS, DESCENT.

If indicated flap position is less than 15:

Plan to extend flaps to 15 using alternate flap extension.

Note: The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

Continued on next page

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If indicated flap position is less than 15: (continued)

Set VREF 15 for landing.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

---------------------------- DEFERRED ITEMS -----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Continued on next page

Continued from previous page

---------------------------DEFERRED ITEMS-----------------------------

==> APPROACH

Altimeters . . . . ___

If indicated flap position is less than 15:

ALTERNATE FLAPS master switch (230 knots maximum) . . . . ARM

Note: Asymmetry protection is not provided when the alternate flap extension system is used.

Note: Alternate extension time to flaps 15 can take as long as 2 minutes.

Flap lever . . . . .Set

During flap extension, set flap lever to next desired flap position.

ALTERNATE FLAPS position switch (230 knots maximum) .DOWN

Hold down to extend flaps to 15 on schedule. As flaps are extending, slow to respective maneuvering speed.

If trailing edge flap asymmetry occurs while using alternate flap extension:

ALTERNATE FLAPS position switch . . . . .Release immediately

Accomplish the TRAILING EDGE FLAP ASYMMETRY checklist.

■■■■

If the flap position indicator remains in the UP position, or less than 1, after the ALTERNATE FLAPS position switch is held down:

Accomplish the TRAILING EDGE FLAPS UP LANDING checklist.

■■■■

Continued on next page

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Note: The LE FLAPS TRANSIT light will remain illuminated until the flaps approach the flaps 10 position.

Note: Operation within the lower amber airspeed band may be needed until the LE FLAPS TRANSIT light extinguishes.

---------------------------- DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear. . . . . DOWN

Flaps . . . . ___, Green light

■■■■

TRAILING EDGE FLAPS UP LANDING

Condition: **The trailing edge flaps do not move when flaps 1 is selected.**

If no asymmetry exists:

Ensure the TRAILING EDGE FLAP DISAGREE checklist has been accomplished.

If an asymmetry exists:

Note: This procedure is to allow the Leading Edge Devices extension only<EZY>.

ALTERNATE FLAPS master switch (230 knots maximum) . . . . ARM

ALTERNATE FLAPS position switch . . . . .Momentary DOWN

Verify leading edge devices annunciator indicates FULL EXT.

Note: The LE FLAPS TRANSIT light will remain illuminated.

If the leading edge devices annunciator does not indicate FULL EXT:

Accomplish the ALL FLAPS UP LANDING checklist.

■■■■

Burn off fuel to reduce touchdown speed.

Set VREF 40 + 40 knots.

Check the appropriate Non–Normal Configuration Landing Distance table in the ADVISORY INFORMATION section of the Performance–Inflight chapter.

Maintain flaps up maneuvering speed until on final.

Limit bank angle to 15° until reaching flaps up maneuvering speed.

Continued on next page

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---------------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF 40 + 40 knots, Minimums ___

[A nuisance stick shaker may occur when slowing to VREF 40 + 40 knots at high gross weights and/or bank angles greater than 15°.]

Approach briefing . . . . Completed

Go-around procedure . . . . Review

Accomplish normal go-around procedure except:

- **Limit bank angle to 15 ° until reaching flaps up maneuvering speed.**
- **Accelerate to flaps up maneuvering speed.**
- **Do not exceed 230 knots with leading edge flaps extended.**

---------------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

Continued on next page

Continued from previous page

---------------------------DEFERRED ITEMS-----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . UP, Green/amber light

[The light may be green or amber depending on the cause of the failure. Operation within the lower amber airspeed band is normal for this condition.]

Note: Due to minimum speed reversion, V/S and VNAV PTH modes may revert to LVL CHG mode.

FASTEN BELTS switch . . . . ON

■■■■

UNCOMMANDED RUDDER/YAW OR ROLL

(SB changes G-EZJA - G-EZJT)

Condition: **Uncommanded rudder pedal displacement or pedal kicks, or uncommanded yaw or roll.**

AUTOPILOT (if engaged) . . . . DISENGAGE

Maintain control of the airplane with all available flight controls. If roll is uncontrollable, immediately reduce pitch/angle of attack and increase airspeed. Do not attempt to maintain altitude until control is recovered.

AUTOTHROTTLE (if engaged). . . . . DISENGAGE

Verify thrust is symmetrical.

If STBY RUD ON light is installed on the overhead Flight Control panel and is not placarded INOP:

Accomplish the JAMMED OR RESTRICTED FLIGHT CONTROLS Non-Normal checklist.

■■■■

If STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP:

YAW DAMPER . . . . .OFF

Continued on next page

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If STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP: (continued)

If yaw or roll is the result of uncommanded rudder displacement or pedal kicks:

RUDDER TRIM . . . . Center

Rudder pedals . . . . Free & center

Use maximum force including a combined effort of both pilots, if needed, to free and center the rudder pedals.

If rudder pedal position and/or movement are normal:

YAW DAMPER . . . . ON

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

If rudder pedal position and/or movement are not normal:

SYSTEM B FLIGHT CONTROL switch . . . . STBY RUD

Land at the nearest suitable airport.

Note: A slight rudder deflection may remain, but continued rudder pedal pressure may help maintain an in-trim condition. Sufficient directional control is available on landing using differential braking and nose wheel steering.

Note: Crosswind capability may be reduced.

Note: Do not use auto brakes.

Note: Consider checking rudder freedom of movement at a safe altitude using slow rudder inputs while in the landing configuration and at approach speed.

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If STBY RUD ON light is not installed on the overhead Flight Control panel or is placarded INOP: (continued)

If yaw or roll is the result of uncommanded rudder displacement or pedal kicks: (continued)

If rudder pedal position and/or movement are not normal: (continued)

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

If the yaw or roll stops:

AUTOPILOT . . . . .ENGAGE

AUTOTHROTTLE . . . . .ENGAGE

Accomplish the normal DESCENT, APPROACH and LANDING checklists.

■■■■

YAW DAMPER

Condition: **The YAW DAMPER light illuminated indicates the yaw damper is disengaged.**

YAW DAMPER switch . . . . OFF then ON

If light remains illuminated:

YAW DAMPER switch . . . . .OFF

Avoid areas of predicted moderate or severe turbulence. If turbulence is encountered and passenger comfort becomes affected, reduce airspeed and/or descend to a lower altitude.

Do not exceed flaps 30 if the crosswind exceeds 30 knots.

■■■■

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AIRSPEED UNRELIABLE

Condition: **Pitch attitude not consistent with existing phase of flight, altitude, thrust, and weight, or noise and/or low frequency buffeting.**

Crosscheck ground speed and winds provided by the IRS and FMC to determine airspeed accuracy if indicated airspeed is questionable.

Note: Erroneous or unreliable airspeed indications may be caused by blocked or frozen pitot-static system(s), or a severely damaged or missing radome.

Airplane attitude/thrust . . . . .Adjust

Maintain airplane control. Attitude and thrust information is provided in the Performance-Inflight section,

PROBE HEAT . . . . .Check ON

MACH/AIRSPEED indicators . . . . .Cross check

■■■■

ALT DISAGREE

Condition: **The ALT DISAGREE alert indicates the captain's and first officer's altitude indications disagree by more than 200 feet for more than 5 continuous seconds.**

Altimeter barometric settings . . . . Check

Check all altimeters set to proper barometric setting for phase of flight.

Flight is not permitted in RVSM airspace.

Transponder altitude received by ATC may be unreliable.

Maintain visual conditions if possible.

Establish landing configuration early.

Radio altitude reference available below 2, 500 feet.

Use electronic and visual glide slope indicators, where available, for approach and landing.

■■■■

CDS FAULT

Condition: **The CDS FAULT annunciation indicates a CDS fault.**

Note: CDS FAULT annunciates on the ground only, prior to the second engine start.

Dispatch is not authorized.

■■■■

DISPLAY FAILURE

Condition: **A CDS display is unusable.**

If a single display is unusable and automatic switching has occurred:

No crew action is needed.

■■■■

If a single display is unusable and automatic switching has not occurred:

MAIN PANEL DUs selector . . . . As needed

LOWER DU selector . . . . As needed

■■■■

DISPLAYS CONTROL PANEL

Condition: **The DISPLAYS CONTROL PANEL annunciation indicates failure of the related EFIS control panel.**

Note: The altimeter blanks and an ALT flag illuminates on the side corresponding to the failed control panel.

CONTROL PANEL SELECT switch . . . . BOTH ON 1 or BOTH ON 2

Select side corresponding to the operating control panel.

Verify DISPLAYS CONTROL PANEL annunciation and ALT flag extinguish.

■■■■

DSPLY SOURCE

Condition: **The DSPLY SOURCE annunciation indicates only one DEU is supplying display information. Other indications may include:**
- **no hydraulic pressure indication on failed side**
- **speed limit flag visible on failed side**
- **minimum maneuver speed and stick shaker band removed on failed side**
- **both EEC ALTN lights illuminated.**

Note: Flight director indications may be removed and autoflight mode reversions may occur.

Note: Dual autopilot approach is not available.

If the DEU fails on the same side as the engaged autopilot:

Select the opposite autopilot.

Verify the appropriate flight director indications and flight mode annunciations are displayed on the same side as the operating autopilot.

Accomplish the EEC ALTERNATE MODE checklist.

■■■■

FLIGHT RECORDER OFF

Condition: **The flight recorder OFF light illuminated indicates that the recorder is not operating.**

No crew action is needed.

■■■■

IAS DISAGREE

Condition: **The IAS DISAGREE alert indicates the captain's and first officer's airspeed indications disagree by more than 5 knots for 5 continuous seconds.**

Accomplish the AIRSPEED UNRELIABLE checklist.

■■■■

Non-Normal Checklists — Chapter NNC

Flight Management, Navigation — Section 11

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FMC FAIL

Condition: **Illumination of the FMC alert light accompanied by loss of FMC information on the CDU.**

Resume conventional navigation.

[Without an operating FMC, LNAV and VNAV are not available.]

When preparing for approach:

Use the SPD REF selector to set the reference airspeed bugs.

Use the N1 SET selector to set the N1 bugs.

■■■■

FMC/CDU ALERTING MESSAGE

Condition: **The FMC alert light and MSG light illuminated indicate an FMC/CDU alerting message exists.**

Take action as needed by the message.

■■■■

GPS

Condition: **The GPS light illuminated indicates GPS failure.**

Note: The FMC will operate using only IRS or radio inputs.

Note: Look-ahead terrain alerting and display are unavailable due to position uncertainty.

No crew action is needed in flight if ANP meets the requirements for phase of flight.

■■■■

IRS DC FAIL

Condition: **An IRS DC FAIL light illuminated indicates the related IRS DC power has failed.**

If all other IRS lights are extinguished, operate normally.

Note: With both IRS DC FAIL lights illuminated, the switched hot battery bus is not powered or the battery is nearly discharged.

■■■■

IRS FAULT

Condition: **An IRS FAULT light illuminated indicates the related IRS system has detected a fault. On the ground, the IRS FAULT light accompanied by an ALIGN light may indicate the entered present position is incorrect.**

On the ground:

If the ALIGN light is illuminated:

IRS MODE selector . . . . OFF

[The FAULT light extinguishes immediately and the ALIGN light extinguishes after approximately 30 seconds].

After the ALIGN light extinguishes:

IRS MODE selector . . . . NAV

Present position . . . . Enter

If the ALIGN light illuminates again, reenter present position.

If the FAULT light illuminates again, notify maintenance.

■■■■

In flight:

Note: The IRS ATT and/or NAV mode(s) may be inoperative.

Continued on next page

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In flight: (continued)

IRS MODE selector (affected IRS) . . . . ATT

Maintain straight and level, constant airspeed flight until attitude displays recover (approximately 30 seconds).

If the FAULT light extinguishes:

Magnetic heading . . . . Enter

Enter updated heading periodically on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

Do not use autopilot approach mode.

■■■■

If the FAULT light remains illuminated:

IRS TRANSFER switch . . . . BOTH ON L or BOTH ON R

Note: Autopilot(s) cannot be engaged.

■■■■

IRS ON DC

Condition: **An IRS ON DC light illuminated indicates the related IRS is operating from the switched hot battery bus.**

Power to the right IRS is removed after 5 minutes.

■■■■

UNABLE REQD NAV PERF - RNP

Condition: **UNABLE REQD NAV PERF-RNP is displayed in MAP or Center MAP.**

If flying an approach that has an RNP alerting requirement:

Initiate a go-around unless suitable visual references can be established and maintained.

■■■■

If flying an approach without an RNP alerting requirement:

Verify position.

■■■■

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CONFIG

G-EZKG

Condition: **The fuel CONFIG indicator indicates fuel quantity in the center tank exceeds 726 kgs and both center tank fuel pump switches are positioned OFF with either engine running.**

Do not accomplish this procedure until established in a level flight attitude.

CENTER TANK FUEL PUMP switches . . . . .ON

Verify the LOW PRESSURE lights extinguish and position both switches OFF when both LOW PRESSURE lights illuminate.

■■■■

CONFIG

G-EZJA - G-EZKF

Condition: **The fuel CONFIG indicator indicates fuel quantity in the center tank exceeds 726 kgs and both center tank fuel pumps are producing low or no pressure with either engine running.**

Do not accomplish this procedure until established in a level flight attitude.

CENTER TANK FUEL PUMP switches . . . . .ON

Verify the LOW PRESSURE lights extinguish and position both switches OFF when both LOW PRESSURE lights illuminate.

■■■■

CROSSFEED SELECTOR INOPERATIVE

Condition: **The crossfeed VALVE OPEN light remaining illuminated bright blue indicates the crossfeed valve position disagrees with the crossfeed selector position.**

Valve Closed:

Flight conditions permitting, vary thrust to maintain fuel balance. If unable to maintain acceptable balance, land as soon as possible.

■■■■

Valve Open:

Maintain fuel balance with selective use of fuel pumps.

■■■■

ENGINE FUEL LEAK

Condition: **An inflight engine fuel leak is suspected or confirmed.**

One or more of the following may be evidence of a fuel leak:
- **visual observation of fuel spray from strut or engine**
- **excessive fuel flow**
- **total fuel quantity decreasing at an abnormal rate**
- **fuel IMBAL indication**
- **USING RSV FUEL message**
- **INSUFFICIENT FUEL message**
- **CHECK FMC FUEL QUANTITY message.**

CENTER TANK FUEL PUMP switches . . . . OFF

[Fuel CONFIG may be displayed with fuel in the center tank.]

CROSSFEED selector . . . . CLOSED

Identify an engine fuel leak by observing one main fuel tank quantity decreasing faster than the other.

An increase in fuel imbalance of approximately 230 kgs or more in 30 minutes should be considered an engine fuel leak.

Conditions permitting, visually check for an engine fuel leak.

Continued on next page

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If both main tank quantities decrease at the same rate:

Resume normal fuel management procedures.

If FMC message USING RSV FUEL, INSUFFICIENT FUEL or CHECK FMC FUEL QUANTITY is displayed on the CDU scratchpad:

PROGRESS PAGE 1 . . . . Select

DESTINATION FUEL ESTIMATE . . . . Check

Compare FMC fuel quantity with fuel gauges and flight plan fuel.

If fuel quantity indicator is inoperative:

**FMC FUEL WEIGHT
(if needed) . . . . Enter**

Enter and periodically update the manually calculated fuel weight on the FMC PERF INIT page.

If an engine fuel leak is confirmed:

AUTOTHROTTLE . . . . .DISENGAGE

THRUST lever (affected engine). . . . . CLOSE

ENGINE START lever (affected engine) . . . . CUTOFF

APU . . . . START and ON BUS

PACK switch (affected side) . . . . .OFF

[Causes operating pack to regulate to high flow in flight with flaps up.]

TRANSPONDER MODE selector . . . . TA

[Prevents climb commands which can exceed single engine performance capability.

Continued on next page

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If an engine fuel leak is confirmed: (continued)

After engine shutdown, all remaining fuel can be used for the operating engine. Resume normal fuel management procedures.

Plan to land at the nearest suitable airport.

Accomplish ONE ENGINE INOPERATIVE LANDING checklist.

■■■■

If FUEL LOW indication is displayed:

MAIN TANK FUEL PUMP switches. . . . . All ON

CROSSFEED selector . . . . OPEN

Apply thrust changes slowly and smoothly. If a climb is needed, maintain the minimum pitch attitude needed for safe flight.

■■■■

FUEL FILTER BYPASS

Condition: **A fuel FILTER BYPASS light illuminated indicates impending fuel filter bypass due to a contaminated filter.**

Note: Erratic engine operation and flameout may occur due to fuel contamination.

■■■■

FUEL PUMP LOW PRESSURE

Condition: **A fuel pump LOW PRESSURE light illuminated indicates the related fuel pump output pressure is low.**

Note: Fuel pump LOW PRESSURE lights may flicker when tank quantity is low and the airplane is in turbulent air or during climb or descent.

If one main tank fuel pump LOW PRESSURE light is illuminated:

MAIN TANK FUEL PUMP switch . . . . OFF

[Sufficient fuel pressure is available for normal operation.]

■■■■

If both main tank fuel pump LOW PRESSURE lights are illuminated:

Note: At high altitude, thrust deterioration or engine flameout may occur.

■■■■

If one center tank fuel pump LOW PRESSURE light is illuminated:

CROSSFEED selector . . . . OPEN

[Prevents fuel imbalance.]

CENTER TANK FUEL PUMP switch (affected side) . . . . OFF

When the other center tank fuel pump LOW PRESSURE light illuminates:

CROSSFEED selector . . . . CLOSE

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If one center tank fuel pump LOW PRESSURE light is illuminated: (continued)

When the other center tank fuel pump LOW PRESSURE light illuminates: (continued)

Remaining CENTER TANK FUEL PUMP switch . . . . OFF

■■■■

If both center tank fuel pump LOW PRESSURE lights are illuminated:

Both CENTER TANK FUEL PUMP switches . . . . OFF

Fuel CONFIG indication may be displayed with fuel in the center tank.

Center tank fuel is unusable. Main tank fuel may not be sufficient for the planned flight.

■■■■

FUEL QUANTITY INDICATION INOPERATIVE

Condition: **The related fuel quantity indication is blank.**

FMC FUEL WEIGHT . . . . Enter

Enter and periodically update manually calculated fuel weight on the FMC PERF INIT page.

■■■■

FUEL TEMP LOW

Condition: **Fuel temperature is approaching minimum.**

When fuel temperature is approaching fuel temperature limit (3 degrees C (5 degrees F) above the fuel freeze point or - 43 degrees C (- 45 degrees F) whichever is higher):

Increase speed, change altitude and/or deviate to a warmer air mass to achieve a TAT equal to or higher than the fuel temperature limit.

TAT will increase approximately 0.5 to 0.7 degrees C for each .01 Mach increase in speed. In extreme conditions, it may be necessary to descend as low as FL250.

■■■■

IMBAL

Condition: **The fuel IMBAL indicator indicates main fuel tank quantities differ by more than 453 kgs.**

The fuel imbalance may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

- **total fuel remaining compared to planned fuel remaining**
- **fuel flow indications for an engine with excessive fuel flow**
- **individual tank quantities.**

If there is any indication of an engine fuel leak:

Accomplish the ENGINE FUEL LEAK checklist.

■■■■

If a fuel imbalance occurs without any indication of an engine fuel leak:

Fuel . . . . .Balance

■■■■

LOW

Condition: **The fuel LOW indicator indicates fuel quantity in the related main tank is less than 907 kgs.**

The fuel LOW indication may be caused by an engine fuel leak. For indications of an engine fuel leak, check:
- **total fuel remaining compared to planned fuel remaining**
- **fuel flow indications for an engine with excessive fuel flow**
- **individual tank quantities.**

If there is any indication of an engine fuel leak:

Accomplish the ENGINE FUEL LEAK checklist.

■■■■

If fuel LOW indication occurs without any indication of an engine fuel leak:

MAIN TANK FUEL PUMP switches . . . . All ON

CROSSFEED selector . . . . OPEN

[Ensures remaining fuel available to both engines.]

Apply thrust changes slowly and smoothly.

If a climb is needed, maintain the minimum pitch attitude needed for safe flight.

[Minimizes the possibility of uncovering the fuel pumps.]

■■■■

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HYDRAULIC PUMP LOW PRESSURE

Condition: **A hydraulic pump LOW PRESSURE light illuminated indicates output pressure of the related pump is low.**

HYDRAULIC PUMP switch . . . . OFF

[Intermittent illumination of the hydraulic pump LOW PRESSURE light may be the result of single electric pump operation and a high demand on the hydraulic system.]

■■■■

HYDRAULIC PUMP OVERHEAT

Condition: **A hydraulic pump OVERHEAT light illuminated indicates a fluid or motor overheat in the related electric motor-driven pump.**

ELECTRIC HYDRAULIC PUMP switch . . . . OFF

[One pump provides adequate pressure for normal system operation.]

■■■■

LOSS OF SYSTEM A

Condition: **Both system A hydraulic pump LOW PRESSURE lights illuminated accompanied by low system A pressure indicates loss of system A. Other indications include:**
- **system A flight control LOW PRESSURE light illuminated**
- **FEEL DIFF PRESS light illuminated.**

SYSTEM A FLIGHT CONTROL switch . . . . STBY RUD

SYSTEM A HYDRAULIC PUMP switches . . . . OFF

Note: Inoperative items:
- **ground spoilers**
- **flight spoilers (two on each wing)**
- **autopilot A**
- **normal nose wheel steering**
- **alternate brakes.**

Note: Engine No. 1 thrust reverser has standby pressure.

Plan for manual gear extension.

Note: When the gear has been lowered manually, it cannot be retracted. The drag penalty with gear extended may make it impossible to reach an alternate field.

NOSE WHEEL STEERING switch . . . . ALT

---------------------------- DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

Landing data . . . . VREF ___ , Minimums ___

Approach briefing . . . . Completed

---------------------------- DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

Continued on next page

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---------------------------DEFERRED ITEMS ----------------------------

==> LANDING

Landing gear lever . . . . OFF

Manual gear extension handles . . . . Pull

[The uplock is released when the handle is pulled to its limit. The related red landing gear indicator light illuminates, indicating uplock release.]

Wait 15 seconds after the last manual gear extension handle is pulled:

Landing gear lever . . . . Down

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . .ARMED

Landing gear. . . . . .DOWN

Flaps . . . . ___ , Green light

■■■■

LOSS OF SYSTEM B

Condition: **Both system B hydraulic pump LOW PRESSURE lights illuminated accompanied by low system B pressure indicates loss of system B. Other indications include:**
- **system B flight control LOW PRESSURE light illuminated**
- **FEEL DIFF PRESS light illuminated.**

SYSTEM B FLIGHT CONTROL switch . . . . STBY RUD

SYSTEM B HYDRAULIC PUMP switches . . . . OFF

Note: Inoperative items:
- **flight spoilers (two on each wing)**
- **autopilot B**
- **yaw damper**
- **alternate nose wheel steering**
- **normal brakes.**

Note: Alternate brakes are available. Engine No. 2 thrust reverser and leading edge flaps and slats have standby pressure. Trailing edge flaps have alternate electrical power.

Plan for flaps 15 landing

Set VREF 15.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Plan to extend flaps to 15 using alternate flap extension.

Note: Alternate flap extension time to flaps 15 is approximately 2 minutes.

Continued on next page

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Note: The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

---------------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall. . . . . Checked

AUTO BRAKE . . . . OFF

GROUND PROXIMITY FLAP INHIBIT switch . . . . .FLAP INHIBIT

Landing data . . . . .VREF 15 or VREF ICE, Minimums ___

Approach briefing . . . . Completed

---------------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

ALTERNATE FLAPS master switch (230 knots maximum) . . . . ARM

Note: Asymmetry protection is not provided when the alternate flap extension system is used.

Flap lever . . . . .Set

During flap extension, set flap lever to next desired flap position.

ALTERNATE FLAPS position switch (230 knots maximum) . . . . .DOWN

Hold down to extend flaps to 15 on schedule. As flaps are extending, slow to respective maneuvering speed.

Release switch if trailing edge flap asymmetry is detected during extension.

Note: The LE FLAPS TRANSIT light will remain illuminated until the flaps approach the flaps 10 position.

Note: Operation within the lower amber airspeed band may be needed until the LE FLAPS TRANSIT light extinguishes.

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Continued from previous page

---------------------------- DEFERRED ITEMS -----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . 15, green light

■■■■

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Blank

MANUAL REVERSION

Condition: **Both system A and B hydraulic pump LOW PRESSURE lights illuminated accompanied by low system A and B pressure indicates loss of both system A and B. Other indications include:**
- **system A and B flight control LOW PRESSURE lights illuminated.**

SYSTEM A and B FLIGHT CONTROL switches . . . . STBY RUD

YAW DAMPER switch . . . . .ON

SYSTEM A and B HYDRAULIC PUMP switches . . . . OFF

Note: Inoperative items:
- **ground spoilers**
- **all flight spoilers**
- **nose wheel steering**
- **autopilots A and B.**

Note: Thrust reversers and leading edge flaps and slats have standby pressure. Trailing edge flaps have alternate electrical power. Inboard and outboard brakes have accumulator pressure only.

Plan to land at the nearest suitable airport.

Plan for flaps 15 landing.

Set VREF 15.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:
- **engine anti–ice will be used during landing**
- **wing anti–ice has been used any time during the flight**
- **icing conditions were encountered during the flight and the landing temperature is below 10° C.**

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Plan for manual gear extension.

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Note: When the gear has been lowered manually, it cannot be retracted. The drag penalty with gear extended may make it impossible to reach an alternate field.

Plan to extend flaps to 15 using alternate flap extension:

Note: Alternate flap extension time to flaps 15 is approximately 2 minutes.

Note: The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

Note: The crosswind capability of the airplane is greatly reduced.

On touchdown, apply steady brake pressure without modulating the brakes.

Do not attempt to taxi the airplane after stopping.

---------------------------DEFERRED ITEMS-----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . OFF

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF 15 or VREF ICE, Minimums ___

Approach briefing . . . . Completed

Go-around procedure . . . . Review

Accomplish normal go-around procedure except:

- **Advance thrust to go-around smoothly and slowly to avoid excessive pitch-up**
- **Prepare to trim**
- **Limit bank angle to 15 degrees until minimum maneuver speed.**

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---------------------------- DEFERRED ITEMS -----------------------------

==> APPROACH

Altimeters . . . . ___

ALTERNATE FLAPS master switch (230 knots maximum) . . . . ARM

Note: Asymmetry protection is not provided when the alternate flap extension system is used.

Flap lever . . . . Set

During flap extension, set flap lever to next desired flap position.

ALTERNATE FLAPS position switch (230 knots maximum) . . . . DOWN

Hold down to extend flaps to 15 on schedule. As flaps are extending, slow to respective maneuvering speed.

Release switch if trailing edge flap asymmetry is detected during extension.

Note: The LE FLAPS TRANSIT light will remain illuminated until the flaps approach the flaps 10 position.

Note: Operation within the lower amber airspeed band may be needed until the LE FLAPS TRANSIT light extinguishes.

Continued on next page

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---------------------------- DEFERRED ITEMS ----------------------------

==> LANDING

Landing gear lever . . . . OFF

Manual gear extension handles . . . . Pull

[The uplock is released when the handle is pulled to its limit. The related red landing gear indicator light illuminates, indicating uplock release.]

Wait 15 seconds after the last manual gear extension handle is pulled:

Landing gear lever . . . . DOWN

ENGINE START switches . . . . CONT

Landing gear. . . . . DOWN

Flaps . . . . 15, Green light

■■■■

STANDBY HYDRAULIC LOW PRESSURE

Condition: **The standby hydraulic LOW PRESSURE light illuminated indicates output pressure of the standby pump is low.**

Note: With a loss of hydraulic system A and B, the rudder is inoperative.

■■■■

STANDBY HYDRAULIC LOW QUANTITY

Condition: **The standby hydraulic LOW QUANTITY light illuminated indicates low quantity in the standby hydraulic reservoir.**

■■■■

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ANTISKID INOPERATIVE

Condition: **The ANTISKID INOP light illuminated indicates a system fault is detected by the antiskid system.**

AUTO BRAKE select switch . . . . OFF

Brake with caution.

Note: Check the Non-Normal Configuration Landing Distance Table in the ADVISORY INFORMATION section of the Performance-Inflight Chapter [EZY]

■■■■

AUTO BRAKE DISARM

Condition: **The AUTO BRAKE DISARM light illuminated indicates the auto brake has disconnected after being set.**

On the ground:

AUTO BRAKE select switch . . . . OFF

If the AUTO BRAKE DISARM light remains illuminated:

Do not takeoff.

■■■■

Inflight:

AUTO BRAKE select switch . . . . OFF then reselect

If the AUTO BRAKE DISARM light re-illuminates:

AUTO BRAKE select switch . . . . OFF

Use manual brakes.

■■■■

BRAKE PRESSURE INDICATOR ZERO PSI

Condition: **The brake accumulator has no nitrogen precharge.**

Accumulator braking is not available.

Note: If hydraulic systems indications are normal, brake operation is unaffected.

■■■■

GEAR LEVER WILL NOT MOVE UP AFTER TAKEOFF

Condition: **The landing gear lever cannot be placed to the UP position in the normal manner due to one or more of the following:**

- **failure of the landing gear lever lock solenoid**
- **failure of the air/ground system**
- **failure of the ground spoiler bypass valve to close.**

Note: Do not use FMC fuel predictions.

LANDING GEAR lever . . . . .DOWN

If the takeoff configuration warning remains silent after the flaps are fully retracted and the thrust levers are beyond the vertical position:

Note: This condition indicates a failure of the landing gear lever lock solenoid.

LANDING GEAR OVERRIDE trigger . . . . Pull

LANDING GEAR lever . . . . UP & OFF

■■■■

If the takeoff configuration warning sounds when flaps are fully retracted:

Note: This condition indicates a failure of either the air/ground system or failure of the ground spoiler bypass to close.

TAKEOFF WARNING CUTOFF C/B (P6–3) . . . . Pull

The takeoff configuration warning may continue to sound intermittently depending on thrust lever and flap position.

Plan to land at the nearest suitable airport.

CAUTION: Do not operate the speed brakes in flight.

CAUTION: Do not operate the speed brakes in flight.

Continued on next page

Continued from previous page

If the takeoff configuration warning sounds when flaps are fully retracted: (continued)

----------------------DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

AUTO BRAKE . . . . ___

Landing data . . . . VREF ___ , Minimums ___

Approach briefing . . . . Completed

----------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

----------------------DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . DOWN detent

Landing gear lever . . . . Down

Landing gear . . . . DOWN

Flaps . . . . ___ , Green light

Manually deploy the speed brakes immediately upon touchdown.

■■■■

MANUAL GEAR EXTENSION

Condition: **All landing gear do not indicate down and locked when the landing gear lever is placed in the DOWN position.**

Note: If a green landing gear indicator light is illuminated on either the center main panel or the overhead panel, the related landing gear indicates down and locked.

LANDING GEAR lever . . . . OFF

MANUAL GEAR EXTENSION handles . . . . Pull

[The uplock is released when the handle is pulled to its limit. The related red landing gear indicator light illuminates, indicating uplock release.]

Wait 15 seconds after the last MANUAL GEAR EXTENSION HANDLE is pulled:

LANDING GEAR lever . . . . DOWN

If all landing gear indicate down and locked:

Land normally.

■■■■

If all landing gear do not indicate down and locked:

Accomplish the PARTIAL OR GEAR UP LANDING checklist.

■■■■

Intentionally
Blank

PARTIAL OR GEAR UP LANDING

Condition: **All landing gear do not indicate down and locked after attempting manual gear extension.**

Brief the crew and passengers on emergency landing and evacuation procedures.

Burn off fuel to reduce touchdown speed.

Plan a flaps 40 landing.

Set VREF 40.

--------------------------- DEFERRED ITEMS ----------------------------

==> DESCENT

Recall . . . . Checked

AURAL WARN C/B (P6-3) . . . . Pull

[Prevents warning horn with gear retracted and landing flaps selected.]

AUTO SPEED BRAKE C/B (P6-2) . . . . Pull

GROUND PROXIMITY GEAR INHIBIT switch . . . . GEAR INHIBIT

AUTO BRAKE . . . . OFF

Landing data . . . . VREF 40, Minimums ___

Approach briefing . . . . Completed

Continued on next page

Continued from previous page

---------------------------DEFERRED ITEMS ----------------------------

==> APPROACH

Altimeters . . . . ___

Available landing gear . . . . Extend if desired

Engine BLEED air switches . . . . OFF

[Ensures the airplane is depressurized at touchdown.]

APU switch . . . . OFF

Landing procedure. . . . . Review

- Do not extend the speed brakes unless stopping distance is critical. When stopping distance is critical, extend the speed brakes after all gear or the nose or engine nacelle have contacted the runway.
- Do not use the thrust reversers unless stopping distance is critical.
- Position the fuel pump switches OFF just prior to flare.
- After stop, accomplish the EVACUATION checklist.

---------------------------DEFERRED ITEMS ----------------------------

==> LANDING

ENGINE START switches . . . . CONT

SPEED BRAKE . . . . DOWN detent

Landing gear. . . . . ___ DOWN

Flaps . . . . 40, Green light

■■■■

WHEEL WELL FIRE

Condition: **A fire is detected in the main wheel well.**

Observe extend limit speed (270K/.82M)

LANDING GEAR lever . . . . DOWN

Note: Do not use FMC fuel predictions with landing gear extended.

If the landing gear must be retracted for airplane performance, leave the landing gear extended for 20 minutes after the WHEEL WELL fire warning light has extinguished.

LANDING GEAR lever (if needed)
(235 knots maximum) . . . . UP & OFF

Plan to land at the nearest suitable airport.

■■■■

Non-Normal Checklists — Chapter NNC
Warning Systems — Section 15

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ALTITUDE ALERT

Condition: **The ALT ALERT indication indicates that the airplane is approaching or deviating from a selected altitude.**

Reset selected altitude (if necessary).

Maintain appropriate altitude.

■■■■

GROUND PROXIMITY INOP

Condition: **The ground proximity INOP light illuminated indicates GPWS alerts may not be provided.**

Note: Some or all GPWS alerts are not available. GPWS alerts which occur are valid.

■■■■

OVERSPEED

Condition: **The Mach/airspeed warning clacker is activated when the maximum operating speed of Vmo/Mmo is exceeded.**

Reduce thrust and, if needed, adjust attitude to reduce airspeed to less than Vmo/Mmo.

■■■■

PSEU

Condition: **The PSEU light illuminated indicates a PSEU fault has been detected.**

If PSEU light does not extinguish when the Master Caution system is reset:

Do not takeoff.

Note: The PSEU light illuminates on the ground only.

■■■■

WARNING HORN - CABIN ALTITUDE OR CONFIGURATION

Condition: **An intermittent or steady warning horn sounds:**

- **In flight, an intermittent horn indicates the cabin altitude is at or above 10,000 feet**
- **On the ground, an intermittent horn indicates an improper takeoff configuration when advancing the thrust levers to takeoff thrust**
- **In flight, a steady horn indicates an improper landing configuration.**

If an intermittent horn sounds in flight:

OXYGEN MASKS and REGULATORS . . . . ON, 100%

Crew communications . . . . Establish

Do the CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION checklist.

■■■■

If an intermittent horn sounds on the ground:

Assure proper airplane takeoff configuration.

■■■■

If a steady horn sounds in flight:

Assure proper airplane landing configuration.

■■■■

Maneuvers — Chapter MAN

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Approach to Stall Recovery

The following is immediately accomplished at the first indication of stall buffet or stick shaker.

Pilot Flying	Pilot Monitoring
• Advance thrust levers to maximum thrust. • Smoothly adjusting pitch attitude* to avoid ground contact or obstacles. • Level the wings (do not change flaps or landing gear configuration). • Retract the speedbrakes.	• Verify maximum thrust. • Monitor altitude and airspeed. • Call out any trend toward terrain contact.
When ground contact is no longer a factor: • Adjust pitch attitude to accelerate while minimizing altitude loss. • Return to speed appropriate for the configuration.	

Note: *At high altitudes it may be necessary to decrease pitch attitude below the horizon to achieve acceleration.

Rejected Takeoff

The captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the rejected takeoff maneuver by V1. If the decision is to reject the takeoff, the captain must clearly announce "REJECT," immediately start the rejected takeoff maneuver and assume control of the airplane. If the first officer is making the takeoff, the first officer must maintain control of the airplane until the captain makes a positive input to the controls.

Prior to 80 knots, the takeoff should be rejected for any of the following:

- activation of the master caution system
- system failure(s)
- unusual noise or vibration
- tire failure

- abnormally slow acceleration
- unsafe takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly.

Above 80 knots and prior to V1, the takeoff should be rejected for any of the following:

- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly.

During the takeoff, the crewmember observing the non-normal situation will immediately call it out as clearly as possible.

Note: During a rejected takeoff below 90 knots, autobraking is not initiated and the AUTO BRAKE DISARM light does not illuminate.

<table>
<tr><th>Captain</th><th>First Officer</th></tr>
<tr><td>Without delay:

Simultaneously close the thrust levers, disengage the autothrottles and apply maximum manual wheel brakes or verify operation of RTO autobrakes.

If RTO autobrakes is selected, monitor system performance and apply manual wheel brakes if the AUTO BRAKE DISARM light illuminates or deceleration is not adequate.

Raise SPEED BRAKE lever.

Apply maximum reverse thrust consistent with conditions.

Continue maximum braking until certain the airplane will stop on the runway.</td><td>Verify actions as follows:

Thrust levers closed.

Autothrottles disengaged.

Maximum brakes applied.

Verify SPEED BRAKE lever UP and call “SPEEDBRAKES UP.” If SPEED BRAKE lever is not UP, call “SPEEDBRAKES NOT UP.”

Reverse thrust applied.

Call out omitted action items.</td></tr>
<tr><td>Field length permitting:

Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.</td><td>Call out 60 knots.

Communicate the reject decision to the control tower and cabin as soon as practical.</td></tr>
<tr><td colspan="2">Review Brake Cooling Schedule for brake cooling time and precautions (refer to Performance Inflight Chapter.)

Consider the following:

The possibility of wheel fuse plugs melting
The need to clear the runway
The requirement for remote parking
Wind direction in case of fire
Alerting fire equipment
Not setting the parking brake unless passenger evacuation is necessary
Advising the ground crew of the hot brake hazard
Advising passengers of the need to remain seated or evacuate
Completion of Non-Normal checklist (if appropriate) for conditions which caused the RTO.</td></tr>
</table>

Terrain Avoidance

Ground Proximity Caution

Accomplish the following maneuver for any of these aural alerts:

- SINK RATE
- TERRAIN
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- GLIDESLOPE
- BANK ANGLE
- CAUTION TERRAIN

Pilot Flying	Pilot Monitoring
Correct the flight path or the airplane configuration.	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer or backcourse approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope
- unreliable glideslope signal.

Note: If a terrain caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.

Note: Some aural alerts repeat.

Ground Proximity Warning

Accomplish the following maneuver for any of these conditions:

- Activation of "PULL UP" or "TERRAIN TERRAIN PULL UP" warning.
- Other situations resulting in unacceptable flight toward terrain.

Pilot Flying	Pilot Monitoring
Disconnect autopilot. Disconnect autothrottle. Aggressively apply maximum* thrust. Simultaneously roll 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 (if available) or stick shaker or initial buffet.	Assure maximum* thrust. Verify all required actions have been completed and call out any omissions.
Do not change gear or flap configuration until terrain separation is assured. Monitor radio altimeter for sustained or increasing terrain separation. When clear of terrain, slowly decrease pitch attitude and accelerate.	Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude.) Call out any trend toward terrain contact.

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain a positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: *Maximum thrust can be obtained by advancing the thrust levers full forward if the EEC's are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: If positive visual verification is made that no obstacle or terrain hazard exists when flying under daylight VMC conditions prior to a terrain or obstacle warning, the alert may be regarded as cautionary and the approach may be continued.

Traffic Avoidance

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with the RA if there is a conflict between the RA and air traffic control.

WARNING: Once an RA has been issued, safe separation could be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the others aircraft's compliance with the RA.

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director pitch commands until clear of conflict.

For TA:

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic.	
If traffic is sighted, maneuver as required.	

For RA, except a climb in landing configuration:

Pilot Flying	Pilot Monitoring
If maneuvering is required, disengage the autopilot and autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

For a climb RA in landing configuration:

Pilot Flying	Pilot Monitoring
Disengage the autopilot and autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 15. Smoothly adjust pitch to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	Verify maximum thrust set. Position flap lever to 15 detent.
After positive rate of climb established, call for GEAR UP.	Position gear lever up.
Attempt to establish visual contact. Call out any conflicting traffic.	

Upset Recovery

An upset can generally be defined as unintentionally exceeding the following conditions:

- Pitch attitude greater than 25 degrees nose up, or
- Pitch attitude greater than 10 degrees nose down, or
- Bank angle greater than 45 degrees, or
- Within above parameters but flying at airspeeds inappropriate for the conditions.

The following techniques represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all actions may be necessary once recovery is under way. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume that the airplane is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stick shaker activation accompanied by one or more of the following:

- Buffeting which could be heavy at times
- Lack of pitch authority and/or roll control
- Inability to arrest descent rate.

If the airplane is stalled, recovery from the stall must be accomplished first by applying and maintaining nose down elevator until stall recovery is complete and stick shaker activation ceases.

Nose High Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
• Disconnect autopilot and autothrottle • Apply as much as full nose-down elevator • * Apply appropriate nose down stabilizer trim • Reduce thrust • * Roll (adjust bank angle) to obtain a nose down pitch rate • Complete the recovery: - When approaching the horizon, roll to wings level - Check airspeed and adjust thrust - Establish pitch attitude.	• Call out attitude, airspeed and altitude throughout the recovery • Verify all required actions have been completed and call out any omissions.

Nose Low Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
• Disconnect autopilot and autothrottle • Recover from stall, if required • * Roll in shortest direction to wings level (unload and roll if bank angle is more than 90 degrees) • Recover to level flight: - Apply nose up elevator - *Apply nose up trim, if required - Adjust thrust and drag as required.	• Call out attitude, airspeed and altitude throughout the recovery • Verify all required actions have been completed and call out any omissions.

WARNING: * Excessive use of pitch trim or rudder may aggravate an upset situation or may result in loss of control and/or high structural loads.

Windshear

Windshear Caution

For predictive windshear caution alert: (“MONITOR RADAR DISPLAY” aural).

Pilot Flying	Pilot Monitoring
Maneuver as required to avoid the windshear.	

Windshear Warning

Predictive windshear warning during takeoff roll: (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural)

- prior to V1, reject takeoff
- after V1, perform the Windshear Escape Maneuver.

Windshear encountered during takeoff roll:

- If windshear is encountered prior to V1, there may not be sufficient runway remaining to stop if an RTO is initiated at V1. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway, even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach: (“GO–AROUND, WINDSHEAR AHEAD” aural)

- perform the Windshear Escape Maneuver, or, at pilot’s discretion, perform a normal go–around.

Windshear encountered in flight:

- perform the Windshear Escape Maneuver.

Note: The following are indications the airplane is in windshear:

- windshear warning (two–tone siren followed by “WINDSHEAR, WINDSHEAR, WINDSHEAR”) or
- unacceptable flight path deviations.

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 fpm vertical speed

- 5° pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time.

Windshear Escape Maneuver

Pilot Flying	Pilot Monitoring
MANUAL FLIGHT • Disconnect autopilot. • Press either TO/GA switch. • Aggressively apply maximum* thrust. • Disconnect autothrottle. • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15 °. • Retract speedbrakes. • Follow flight director TO/GA guidance (if available). AUTOMATIC FLIGHT • Press either TO/GA switch**. • Verify TO/GA mode annunciation. • Verify thrust advances to GA power. • Retract speedbrakes. • Monitor system performance***.	• Assure maximum* thrust. • Verify all required actions have been completed and call out any omissions.
• Do not change flap or gear 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.	• Monitor vertical speed and altitude. • Call out any trend toward terrain contact, descending flight path, or significant airspeed changes.

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain a positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: *Maximum thrust can be obtained by advancing the thrust levers full forward if the EEC’s are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: ** If TO/GA is not available, disconnect autopilot and autothrottle and fly manually.

WARNING: * Severe windshear may exceed the performance of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle and fly manually.**

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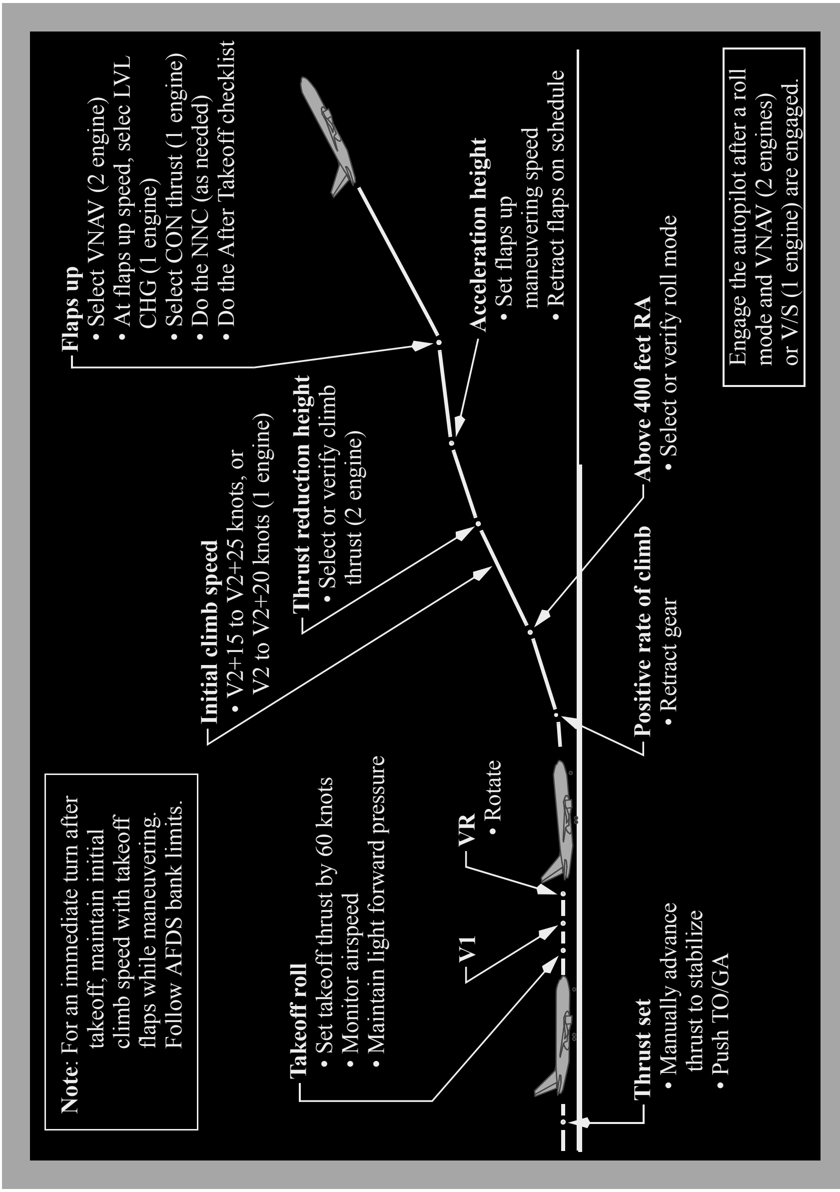
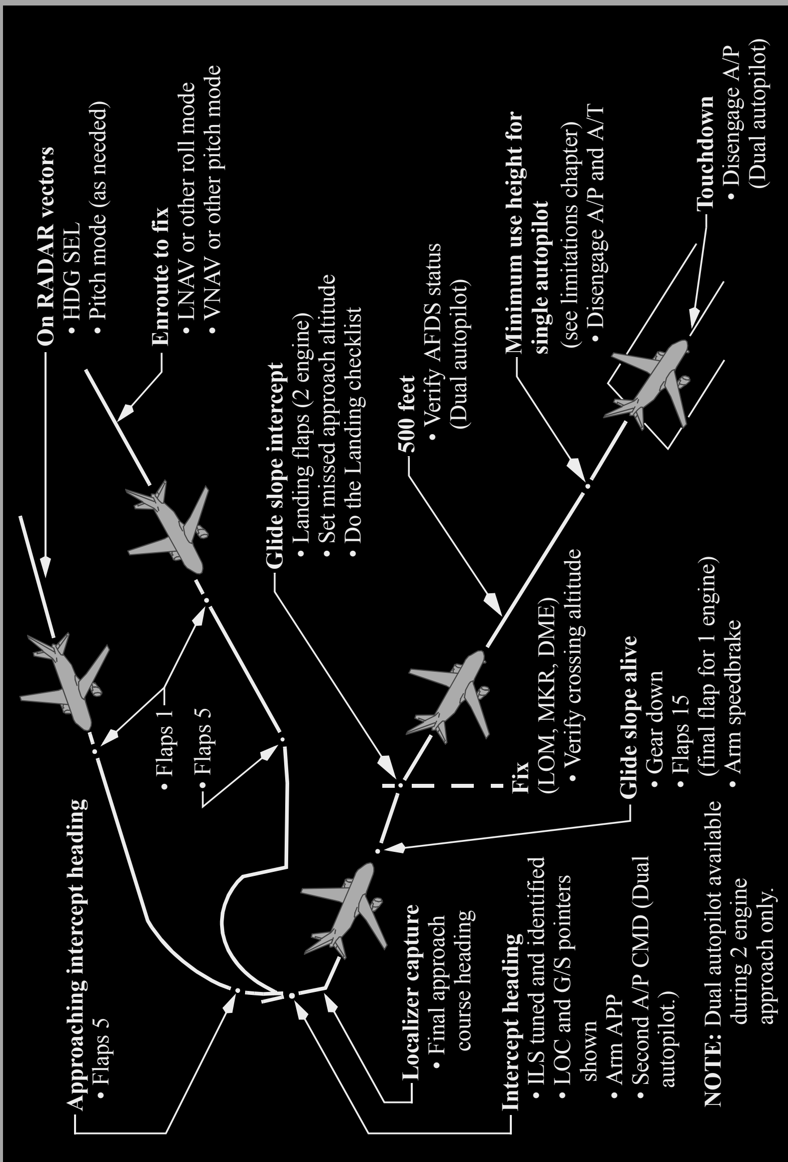
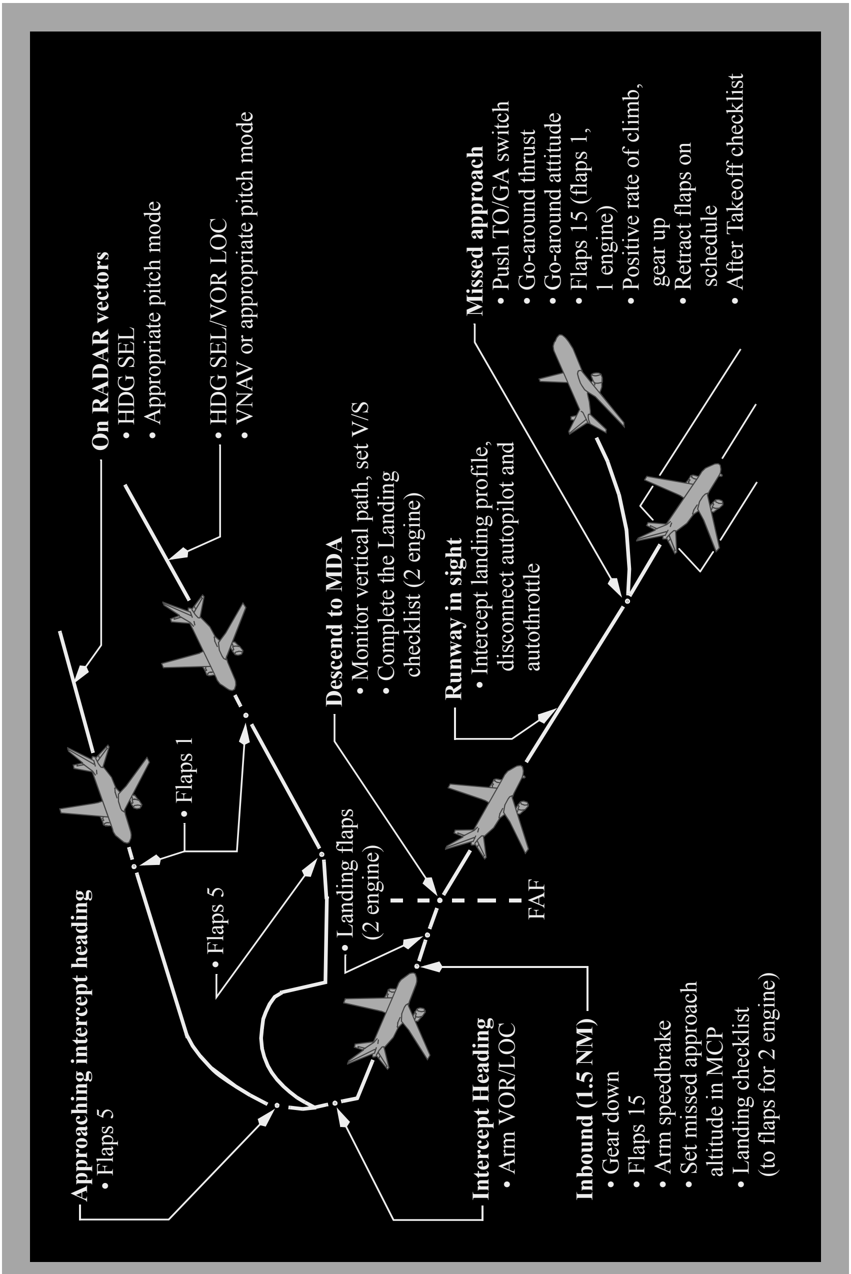
Takeoff


Note: For an immediate turn after takeoff, maintain initial climb speed with takeoff flaps while maneuvering. Follow AFDS bank limits.
Takeoff roll
• Set takeoff thrust by 60 knots
• Monitor airspeed
• Maintain light forward pressure
V1
VR
• Rotate
Thrust set
• Manually advance thrust to stabilize
• Push TO/GA
Initial climb speed
• V2+15 to V2+25 knots, or V2 to V2+20 knots (1 engine)
Thrust reduction height
• Select or verify climb thrust (2 engine)
Positive rate of climb
• Retract gear
Above 400 feet RA
• Select or verify roll mode
Acceleration height
• Set flaps up maneuvering speed
• Retract flaps on schedule
Flaps up
• Select VNAV (2 engine)
• At flaps up speed, selec LVL CHG (1 engine)
• Select CON thrust (1 engine)
• Do the NNC (as needed)
• Do the After Takeoff checklist
Engage the autopilot after a roll mode and VNAV (2 engines) or V/S (1 engine) are engaged.

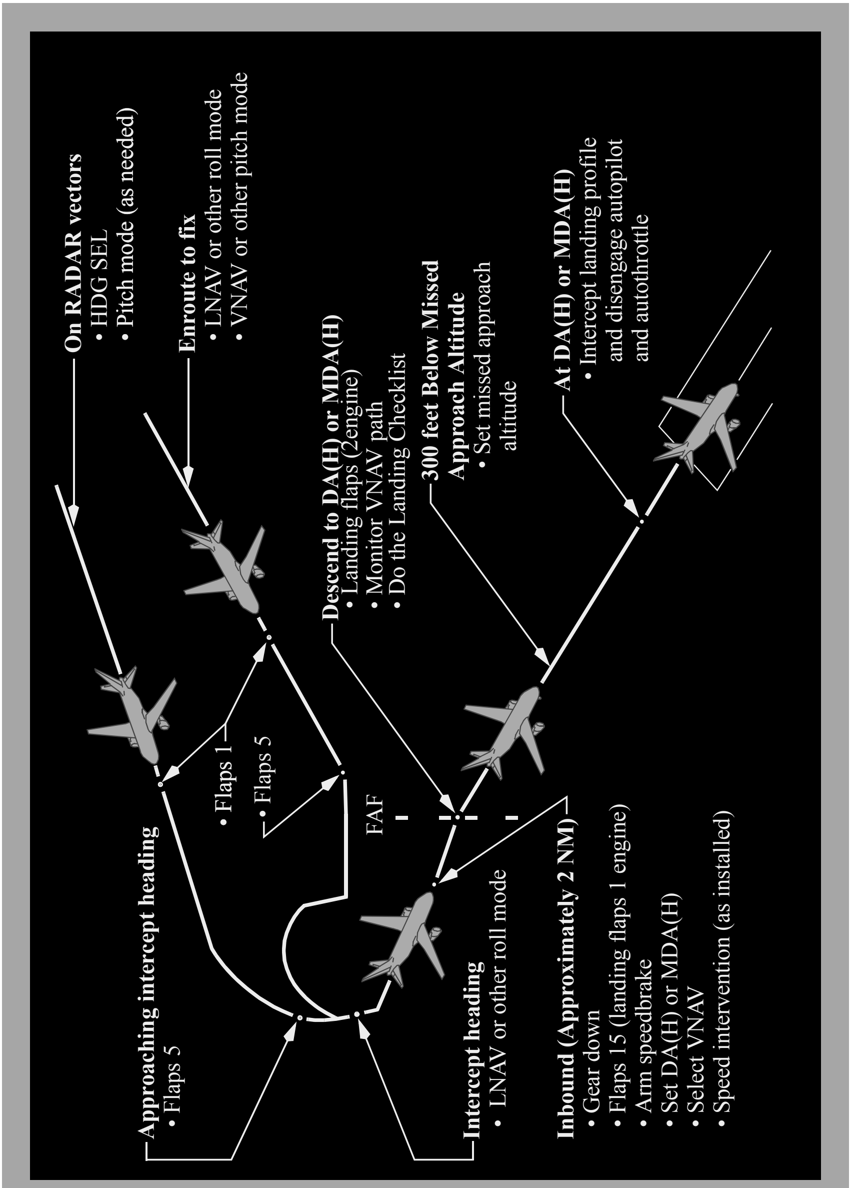
ILS Approach - Fail Passive



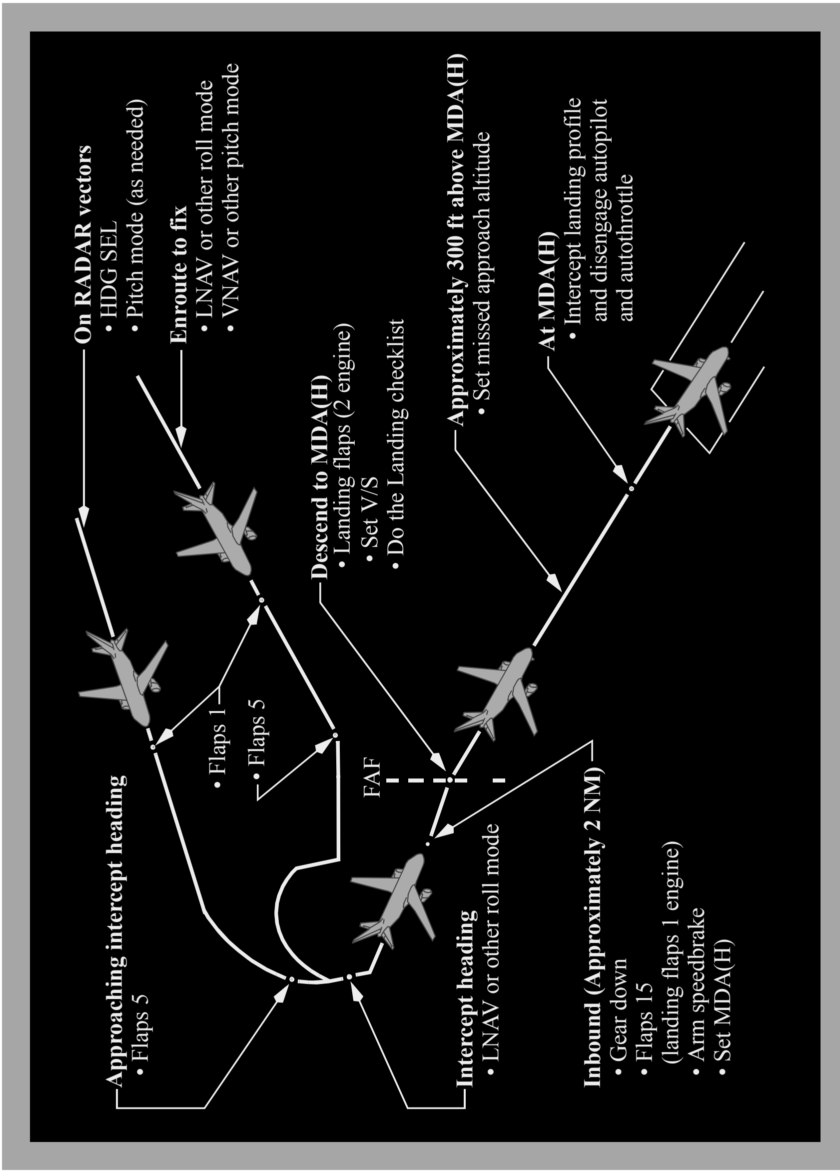
Non-Precision Approach < EZY >



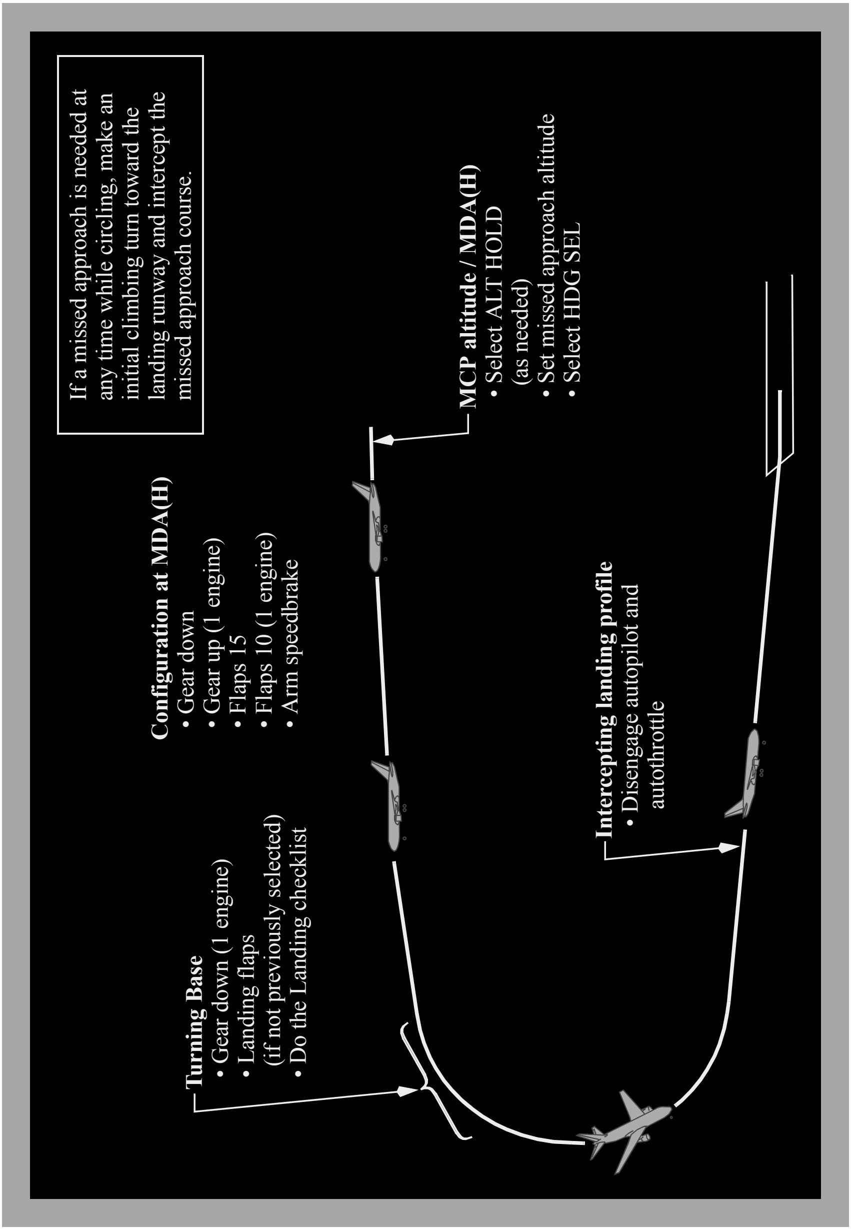
Instrument Approach Using VNAV



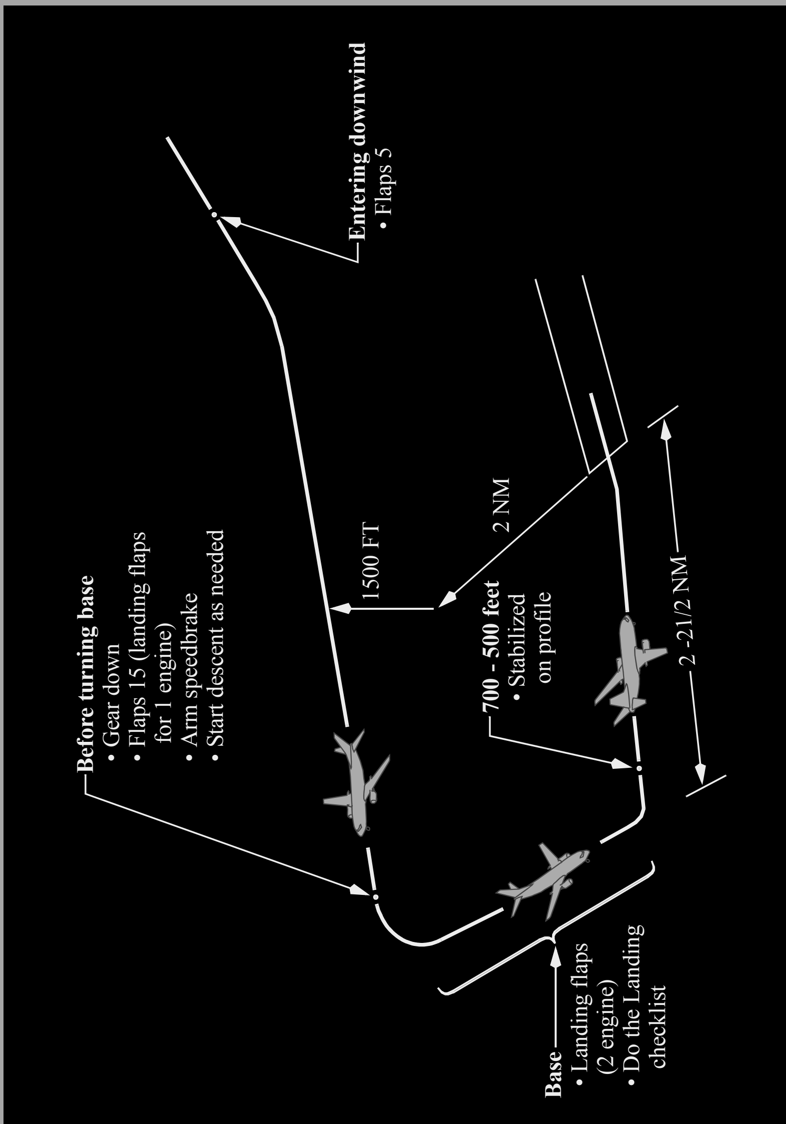
Instrument Approach Using V/S



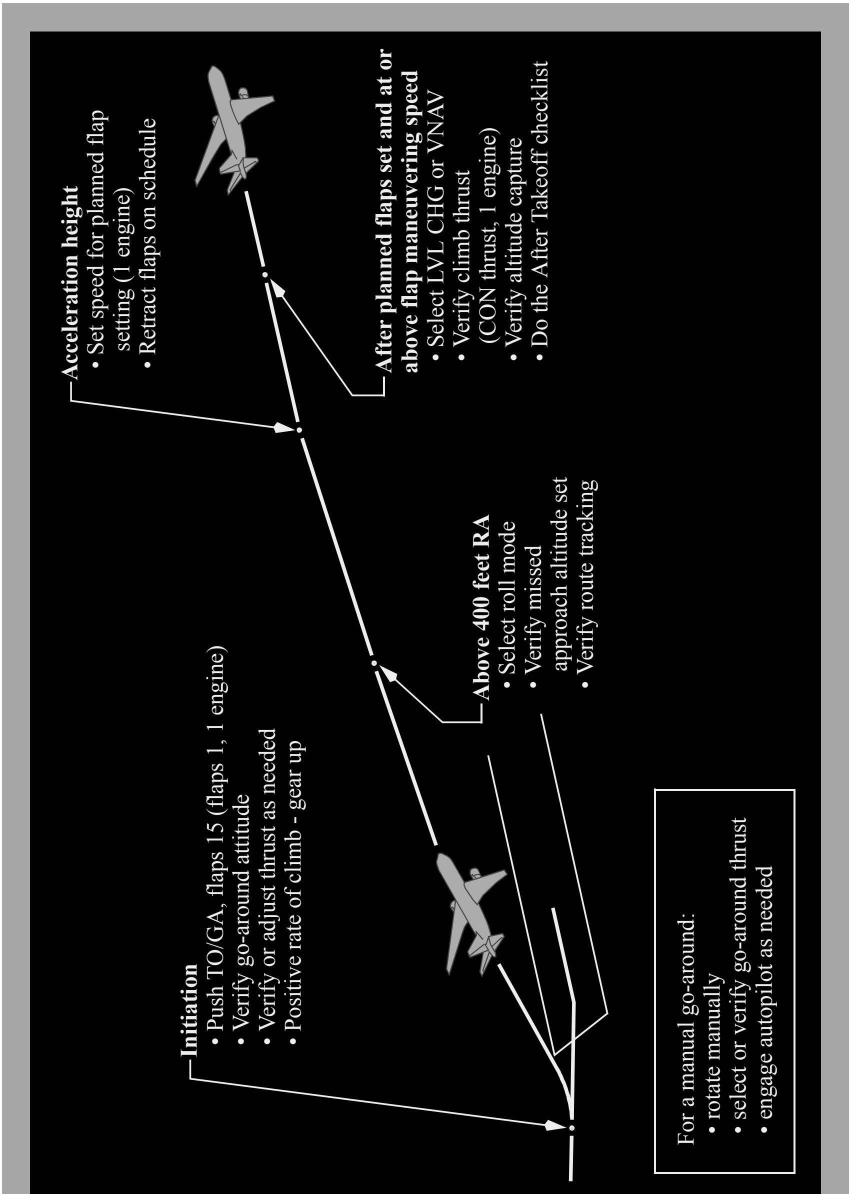
Circling Approach



Visual Traffic Pattern



Go–Around and Missed Approach



Performance Inflight — Chapter PI
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737-700 CFM56-7B20 KG JAA JAR CATA

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Takeoff Speeds - Dry Runway
Flaps 1 and 5
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
72	146	147	150			
68	142	143	147	140	140	143
64	138	138	142	134	135	139
60	132	133	138	129	130	135
56	126	127	133	124	125	130
52	120	121	128	118	119	125
48	114	115	123	112	113	120
44	108	109	118	106	107	115
40	101	102	112	99	101	110

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	6	7						6	7						-1	-1					
60	140	4	5	5	6				4	5	5	6				-1	-1	-1	-1			
50	122	3	4	4	4	5	7	9	2	4	4	4	5	7	9	-1	-1	0	0	0	-1	-1
40	104	1	2	2	2	4	6	8	1	2	2	2	4	6	8	0	0	0	0	0	0	-1
30	86	0	0	1	1	2	4	7	0	0	1	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	0	2	3	5	0	0	0	1	2	3	5	0	0	0	0	1	0	0
-60	-76	0	0	0	0	2	3	4	0	0	0	1	2	3	4	0	0	0	0	1	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-2	-1	0	1	1	-1	0	0	0	0	1	1	1
68	-2	-1	0	1	1	-1	0	0	0	0	1	1	1
64	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
60	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
56	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
52	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
48	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
44	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
40	0	0	0	1	1	-1	0	0	0	0	1	1	1

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	93	91					
60	140	93	91	92	93			
50	122	95	93	92	93	91	88	84
40	104	100	98	97	96	92	88	84
30	86	103	103	102	101	97	92	86
20	68	103	103	102	101	99	96	90
-60	-76	105	104	104	102	100	97	95

Takeoff Speeds - Dry Runway

Flaps 10, 15 and 25

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
64	128	129	133	126	126	130			
60	123	124	129	121	121	126	120	120	125
56	118	119	125	117	117	122	115	115	121
52	113	114	121	112	112	118	110	111	117
48	108	109	116	107	107	114	105	106	113
44	102	103	112	101	102	110	100	100	109
40	96	98	107	95	96	105	94	95	104

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	5	5						4	5						-2	-2					
60	140	4	4	4	5				3	4	4	4				-2	-2	-2	-2			
50	122	2	3	3	3	4	6	8	2	3	3	3	4	5	8	-1	-1	-1	-1	-2	-2	-3
40	104	1	1	1	2	3	4	7	1	1	2	2	3	4	6	0	-1	-1	-1	-1	-2	-2
30	86	0	0	0	0	2	3	5	0	0	1	1	2	3	5	0	0	0	0	-1	-1	-2
20	68	0	0	0	0	1	2	4	0	0	0	0	1	2	4	0	0	0	0	0	-1	-1
-60	-76	0	0	0	0	1	2	3	0	0	0	0	1	2	3	0	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
64	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
60	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
56	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
52	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
48	-1	-1	0	0	1	-1	-1	0	0	0	0	0	0
44	-1	0	0	1	1	-2	-1	0	0	0	1	1	1
40	-1	0	0	1	1	-2	-1	0	0	0	1	1	1

***V1 not to exceed VR**

V1(MCG)

Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	93	91					
60	140	93	91	92	93			
50	122	95	93	92	93	91	88	84
40	104	100	98	97	96	92	88	84
30	86	103	103	102	101	97	92	86
20	68	103	103	102	101	99	96	90
-60	-76	105	104	104	102	100	97	95

Takeoff Speeds - Wet Runway

Flaps 1 and 5
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
72	142	147	150			
68	137	143	147	134	140	143
64	131	138	142	128	135	139
60	126	133	138	122	130	135
56	120	127	133	117	125	130
52	113	121	128	110	119	125
48	107	115	123	104	113	120
44	100	109	118	97	107	115
40	93	102	112	91	101	110

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	10	11						6	7						-1	-1					
60	140	7	8	8	8				4	5	5	6				-1	-1	-1	-1			
50	122	4	5	5	5	7	10	13	2	4	4	4	5	7	9	-1	-1	0	0	0	-1	-1
40	104	1	3	2	2	4	8	11	1	2	2	2	4	6	8	0	0	0	0	0	0	-1
30	86	0	0	0	1	3	5	9	0	0	1	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	0	2	4	6	0	0	0	1	2	3	5	0	0	0	0	1	0	0
-60	-76	0	0	0	0	2	3	5	0	0	0	1	2	3	4	0	0	0	0	1	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-4	-2	0	3	5	-2	-1	0	0	1	2	2	3
68	-4	-2	0	3	5	-2	-1	-1	0	1	2	2	3
64	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
60	-3	-2	0	2	4	-3	-2	-1	0	1	1	2	3
56	-3	-1	0	2	4	-3	-2	-1	0	1	2	2	3
52	-3	-1	0	2	3	-3	-2	-1	0	1	2	2	3
48	-2	-1	0	2	3	-3	-2	-1	0	1	2	3	3
44	-2	-1	0	2	3	-3	-2	-1	0	1	2	3	4
40	-1	0	0	2	3	-4	-2	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	93	91					
60	140	93	91	92	93			
50	122	95	93	92	93	91	88	84
40	104	100	98	97	96	92	88	84
30	86	103	103	102	101	97	92	86
20	68	103	103	102	101	99	96	90
-60	-76	105	104	104	102	100	97	95

Takeoff Speeds - Wet Runway
Flaps 10, 15 and 25
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
64	123	129	133	124	126	130			
60	118	124	129	118	121	126	116	120	125
56	112	119	125	112	117	122	111	115	121
52	107	114	121	106	112	118	105	111	117
48	101	109	116	100	107	114	99	106	113
44	95	103	112	94	102	110	93	100	109
40	89	98	107	88	96	105	87	95	104

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	8	10						4	5						-2	-2					
60	140	6	7	7	7				3	4	4	4				-2	-2	-2	-2			
50	122	3	5	5	5	6	9	13	2	3	3	3	4	5	7	-1	-1	-1	-1	-2	-2	-3
40	104	1	2	2	2	4	6	10	1	1	2	2	3	4	6	0	-1	-1	-1	-1	-2	-2
30	86	0	0	0	0	2	4	7	0	0	1	1	2	3	5	0	0	0	0	-1	-1	-2
20	68	0	0	0	0	1	3	5	0	0	0	0	1	2	4	0	0	0	0	0	-1	-1
-60	-76	0	0	0	0	1	2	3	0	0	0	0	1	2	3	0	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
64	-3	-1	0	2	4	-3	-2	-1	0	1	1	2	3
60	-3	-1	0	2	3	-3	-2	-1	0	1	1	2	3
56	-3	-1	0	2	3	-3	-2	-1	0	1	1	2	3
52	-3	-1	0	2	3	-3	-2	-1	0	1	2	2	3
48	-2	-1	0	1	3	-3	-2	-1	0	1	2	2	3
44	-2	-1	0	1	3	-4	-2	-1	0	1	2	3	3
40	-2	-1	0	1	2	-4	-2	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	93	91					
60	140	93	91	92	93			
50	122	95	93	92	93	91	88	84
40	104	100	98	97	96	92	88	84
30	86	103	103	102	101	97	92	86
20	68	103	103	102	101	99	96	90
-60	-76	105	104	104	102	100	97	95

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	450
6000	650
8000	850
10000	1000
12000	1450
14000	1550

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
800	-4	-4	-4			
600	-4	-3	-3			
400	-3	-2	-2			
200	-2	-1	-1			
0	0	0	0	0	0	0
-200	1	1	0	1	1	1
-400	1	1	1	3	2	1
-600	1	1	1	4	3	1
-800	1	1	1	4	3	2

Use of clearway not allowed on wet runways.

Stab Trim Setting

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	9	10	12	13	16	20	24	28	31	33
70-80	8 1/2	8 1/2	8 1/2	8 1/2	7 3/4	7	6 1/4	5 1/4	4 3/4	4 1/4
60	8 1/2	8 1/2	8	8	7 1/4	6 1/2	5 3/4	5	4 1/4	3 3/4
50	8 1/4	8	7 1/2	7 1/4	6 3/4	6	5	4 1/4	3 1/2	3 1/4
35-45	7 3/4	7 1/2	7	6 3/4	6 1/4	5 1/2	4 3/4	4	3 1/4	3

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	9	10	12	13	16	20	24	28	31	33
70-80	8 1/2	8 1/2	8 1/2	8 1/4	7 1/2	6 3/4	5 3/4	5	4 1/4	3 3/4
60	8 1/2	8 1/2	8	7 3/4	7	6 1/4	5 1/4	4 1/2	3 3/4	3 1/2
50	8	7 3/4	7 1/4	7 1/4	6 1/2	5 3/4	4 3/4	4	3 1/4	3
35-45	7 1/4	7	6 1/2	6 1/2	6	5 1/4	4 1/2	3 1/2	3	2 3/4

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
80	154	156	162
75	149	151	157
70	144	146	152
65	139	141	147
60	133	135	140
55	127	129	134
50	120	123	127
45	114	117	121
40	107	110	114

Flap Maneuver Speeds

FLAP POSITION	MANEUVER SPEED
UP	VREF40 + 70
1	VREF40 + 50
5	VREF40 + 30
10	VREF40 + 30
15	VREF40 + 20
25	VREF40 + 10

ADVISORY INFORMATION

Slush/Standing Water Takeoff

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-14.9	-16.5	-18.1	-18.4	-20.0	-21.6	-30.0	-31.6	-33.1
85	-12.9	-14.5	-16.1	-15.8	-17.4	-19.0	-25.0	-26.6	-28.2
80	-11.0	-12.6	-14.2	-13.4	-15.0	-16.6	-20.4	-22.0	-23.6
75	-9.3	-10.9	-12.5	-11.3	-12.9	-14.5	-16.5	-18.1	-19.7
70	-8.0	-9.6	-11.2	-9.4	-11.0	-12.6	-13.1	-14.7	-16.3
65	-6.6	-8.1	-9.7	-7.8	-9.4	-10.9	-10.4	-12.0	-13.6
60	-5.5	-7.1	-8.6	-6.4	-8.0	-9.6	-8.4	-10.0	-11.6
55	-4.6	-6.2	-7.8	-5.3	-6.9	-8.5	-6.8	-8.4	-10.0
50	-3.9	-5.5	-7.1	-4.5	-6.1	-7.7	-5.7	-7.3	-8.8
45	-3.6	-5.2	-6.8	-4.0	-5.6	-7.2	-4.9	-6.5	-8.1
40	-3.4	-5.0	-6.6	-3.7	-5.3	-6.9	-4.6	-6.2	-7.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4200	31.3			33.6			37.2		
4600	40.1			42.3			45.6		
5000	49.0			51.1			54.2	33.1	
5400	58.1	35.7		60.2	37.9		63.1	41.4	
5800	67.6	44.5		69.5	46.6		72.2	49.9	
6200	77.4	53.5	31.3	79.2	55.6	33.6	81.7	58.6	37.2
6600	87.6	62.8	40.1	89.3	64.8	42.3	91.6	67.6	45.6
7000	98.0	72.4	49.0	99.5	74.3	51.1		76.9	54.2
7400		82.4	58.1		84.2	60.2		86.6	63.1
7800		92.8	67.6		94.4	69.5		96.6	72.2
8200			77.4			79.2			81.7
8600			87.6			89.3			91.6
9000			98.0			99.5			

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -100 ft/+90 ft for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

Slush/Standing Water Takeoff
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-3	0	0	0	0	0	0	0	0
85	-5	0	0	0	0	0	0	0	0
80	-8	-3	0	0	0	0	0	0	0
75	-10	-5	0	-2	0	0	0	0	0
70	-12	-7	-2	-6	-1	0	0	0	0
65	-14	-9	-4	-9	-4	0	0	0	0
60	-15	-10	-5	-12	-7	-2	-3	0	0
55	-17	-12	-7	-14	-9	-4	-7	-2	0
50	-18	-13	-8	-15	-10	-5	-10	-5	0
45	-19	-14	-9	-17	-12	-7	-13	-8	-3
40	-19	-14	-9	-18	-13	-8	-15	-10	-5

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slush/Standing Water Takeoff
No Reverse Thrust
Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-18.6	-21.3	-24.1	-22.4	-25.1	-27.8	-31.3	-34.1	-36.8
85	-16.0	-18.7	-21.4	-19.1	-21.9	-24.6	-26.4	-29.1	-31.9
80	-13.6	-16.3	-19.0	-16.1	-18.9	-21.6	-21.9	-24.6	-27.4
75	-11.5	-14.2	-16.9	-13.5	-16.2	-18.9	-18.0	-20.7	-23.4
70	-9.7	-12.4	-15.1	-11.2	-14.0	-16.7	-14.7	-17.4	-20.1
65	-8.2	-10.9	-13.6	-9.4	-12.1	-14.8	-12.0	-14.7	-17.4
60	-7.0	-9.7	-12.4	-7.9	-10.6	-13.3	-9.8	-12.6	-15.3
55	-6.0	-8.8	-11.5	-6.7	-9.5	-12.2	-8.3	-11.0	-13.8
50	-5.4	-8.1	-10.8	-5.9	-8.6	-11.4	-7.3	-10.0	-12.7
45	-4.7	-7.5	-10.2	-5.1	-7.8	-10.6	-6.3	-9.0	-11.7
40	-4.1	-6.8	-9.5	-4.3	-7.0	-9.8	-5.3	-8.0	-10.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5000							36.4		
5400				36.0			45.1		
5800	40.0			46.1			54.8	33.3	
6200	50.9			56.4	32.3		65.8	41.8	
6600	62.0	35.9		67.1	42.3		78.9	51.0	30.1
7000	73.1	46.8		78.2	52.5		95.2	61.5	38.5
7400	84.4	57.8	31.9	89.6	63.1	38.5		73.7	47.4
7800	95.8	68.9	42.7		74.0	48.6		88.9	57.4
8200		80.2	53.7		85.3	59.1			68.8
8600		91.6	64.7		96.8	69.9			82.7
9000			76.0			81.0			99.4
9400			87.3			92.4			
9800			98.7						

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -120 ft/+110 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-10	-7	-5	0	0	0	0	0	0
85	-12	-9	-7	0	0	0	0	0	0
80	-14	-11	-9	0	0	0	0	0	0
75	-16	-13	-11	-5	-2	0	0	0	0
70	-18	-15	-13	-9	-7	-4	0	0	0
65	-19	-17	-14	-13	-10	-8	0	0	0
60	-21	-18	-16	-16	-13	-11	-4	-2	0
55	-22	-20	-17	-19	-16	-14	-9	-7	-4
50	-23	-21	-18	-21	-18	-16	-14	-11	-9
45	-24	-22	-19	-22	-20	-17	-17	-15	-12
40	-25	-23	-20	-23	-21	-18	-20	-17	-15

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-2.7	-2.7	-2.7	-7.8	-7.8	-7.8	-12.5	-12.5	-12.5
85	-2.3	-2.3	-2.3	-6.9	-6.9	-6.9	-11.3	-11.3	-11.3
80	-1.9	-1.9	-1.9	-6.2	-6.2	-6.2	-10.1	-10.1	-10.1
75	-1.5	-1.5	-1.5	-5.6	-5.6	-5.6	-9.1	-9.1	-9.1
70	-1.3	-1.3	-1.3	-5.0	-5.0	-5.0	-8.3	-8.3	-8.3
65	-1.0	-1.0	-1.0	-4.5	-4.5	-4.5	-7.5	-7.5	-7.5
60	-0.8	-0.8	-0.8	-4.1	-4.1	-4.1	-6.8	-6.8	-6.8
55	-0.8	-0.8	-0.8	-3.7	-3.7	-3.7	-6.2	-6.2	-6.2
50	-0.8	-0.8	-0.8	-3.5	-3.5	-3.5	-5.8	-5.8	-5.8
45	-0.9	-0.9	-0.9	-3.4	-3.4	-3.4	-5.5	-5.5	-5.5
40	-1.0	-1.0	-1.0	-3.3	-3.3	-3.3	-5.3	-5.3	-5.3

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3400	38.4								
3800	52.0								
4200	65.6	43.5		31.4					
4600	79.1	57.1	35.0	41.4					
5000	92.7	70.7	48.6	51.7	30.2				
5400		84.2	62.2	62.3	40.1		30.8		
5800		97.8	75.7	73.4	50.4		37.6		
6200			89.3	84.9	61.0	38.9	44.5		
6600				96.7	72.0	49.1	51.7	30.8	
7000					83.4	59.6	59.1	37.6	
7400					95.2	70.6	66.9	44.5	
7800						82.0	74.9	51.7	30.8
8200						93.7	83.4	59.1	37.6
8600							92.1	66.9	44.5
9000								74.9	51.7
9400								83.4	59.1
9800								92.1	66.9
10200									74.9
10600									83.4
11000									92.1

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -120 ft/+110 ft for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-4	-3	-2	-12	-10	-9	-21	-20	-18
85	-4	-3	-2	-12	-10	-9	-21	-20	-18
80	-4	-3	-2	-12	-10	-9	-21	-20	-19
75	-5	-4	-2	-12	-11	-10	-22	-21	-19
70	-5	-4	-3	-13	-12	-11	-23	-22	-21
65	-6	-5	-4	-14	-13	-12	-25	-24	-22
60	-7	-6	-5	-16	-15	-13	-27	-26	-24
55	-8	-7	-6	-17	-16	-15	-29	-28	-26
50	-9	-8	-7	-19	-18	-17	-31	-30	-29
45	-10	-9	-8	-21	-19	-18	-33	-32	-31
40	-12	-10	-9	-22	-21	-20	-35	-34	-32

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slippery Runway Takeoff
No Reverse Thrust
Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-4.3	-4.3	-4.3	-10.5	-10.5	-10.5	-16.4	-16.4	-16.4
85	-3.6	-3.6	-3.6	-9.3	-9.3	-9.3	-14.7	-14.7	-14.7
80	-2.9	-2.9	-2.9	-8.3	-8.3	-8.3	-13.1	-13.1	-13.1
75	-2.4	-2.4	-2.4	-7.4	-7.4	-7.4	-11.7	-11.7	-11.7
70	-2.0	-2.0	-2.0	-6.6	-6.6	-6.6	-10.5	-10.5	-10.5
65	-1.7	-1.7	-1.7	-6.0	-6.0	-6.0	-9.4	-9.4	-9.4
60	-1.6	-1.6	-1.6	-5.5	-5.5	-5.5	-8.5	-8.5	-8.5
55	-1.6	-1.6	-1.6	-5.1	-5.1	-5.1	-7.8	-7.8	-7.8
50	-1.7	-1.7	-1.7	-4.9	-4.9	-4.9	-7.3	-7.3	-7.3
45	-1.9	-1.9	-1.9	-4.9	-4.9	-4.9	-7.0	-7.0	-7.0
40	-2.3	-2.3	-2.3	-5.0	-5.0	-5.0	-6.8	-6.8	-6.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800	43.7								
4200	58.6	38.1							
4600	73.1	53.0	32.4						
5000	87.4	67.7	47.5						
5400		82.1	62.2	40.1					
5800		96.2	76.7	53.0					
6200			90.9	66.1	41.7				
6600				79.4	54.7	30.5			
7000				92.8	67.8	43.3			
7400					81.1	56.3			
7800					94.5	69.4	33.3		
8200						82.7	42.5		
8600						96.2	51.8		
9000							61.4	34.5	
9400							71.3	43.6	
9800							81.5	53.0	
10200							91.9	62.6	35.6
10600								72.6	44.8
11000								82.8	54.2
11400								93.2	63.9
11800									73.8
12200									84.1
12600									94.5

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -90 ft/+80 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -90 ft/+80 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -140 ft/+130 ft for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-15	-12	-10	-26	-23	-21	-41	-38	-36
85	-11	-9	-6	-22	-19	-17	-36	-34	-31
80	-9	-6	-4	-18	-16	-13	-33	-31	-28
75	-7	-5	-2	-17	-15	-12	-32	-30	-27
70	-7	-5	-2	-17	-15	-12	-33	-30	-28
65	-8	-5	-3	-18	-16	-13	-34	-32	-29
60	-9	-6	-4	-20	-18	-15	-37	-34	-32
55	-10	-7	-5	-23	-20	-18	-40	-37	-35
50	-11	-9	-6	-25	-22	-20	-42	-40	-37
45	-13	-10	-8	-27	-24	-22	-44	-42	-39
40	-14	-11	-9	-28	-25	-23	-46	-43	-41

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

Takeoff %N1

Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	84.0	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
55	84.8	85.3	85.8	87.0	88.1	89.0	90.0	90.1	90.3	89.6	88.8	87.9	86.9
50	85.8	86.3	86.8	87.9	88.9	89.8	90.8	90.9	91.0	90.3	89.6	88.7	87.7
45	86.8	87.2	87.7	88.7	89.7	90.7	91.7	91.7	91.7	91.1	90.4	89.5	88.6
40	87.7	88.2	88.6	89.7	90.6	91.6	92.5	92.4	92.4	91.8	91.2	90.3	89.4
35	88.6	89.0	89.5	90.6	91.5	92.4	93.4	93.3	93.2	92.5	91.9	91.0	90.1
30	88.2	89.3	90.5	91.4	92.5	93.3	94.3	94.1	94.0	93.4	92.7	91.8	90.9
25	87.5	88.6	89.7	90.7	91.8	92.7	93.8	94.2	94.7	94.2	93.5	92.6	91.7
20	86.8	87.9	89.0	90.0	91.1	91.9	93.0	93.4	93.9	94.5	94.3	93.4	92.5
15	86.0	87.2	88.3	89.3	90.3	91.2	92.2	92.6	93.1	93.7	94.2	94.2	93.4
10	85.3	86.4	87.5	88.5	89.6	90.4	91.5	91.9	92.3	92.9	93.4	93.7	94.3
5	84.6	85.7	86.8	87.7	88.8	89.6	90.7	91.1	91.6	92.1	92.6	92.9	93.5
0	83.8	84.9	86.0	87.0	88.0	88.9	89.9	90.3	90.8	91.4	91.8	92.1	92.7
-5	83.1	84.2	85.2	86.2	87.2	88.1	89.1	89.5	90.0	90.5	91.0	91.3	91.9
-10	82.3	83.4	84.5	85.4	86.4	87.3	88.3	88.7	89.2	89.7	90.2	90.5	91.0
-15	81.6	82.6	83.7	84.6	85.6	86.5	87.5	87.9	88.3	88.9	89.3	89.7	90.2
-20	80.8	81.8	82.9	83.8	84.8	85.7	86.7	87.0	87.5	88.1	88.5	88.8	89.4
-25	80.0	81.1	82.1	83.0	84.0	84.8	85.8	86.2	86.7	87.3	87.7	88.0	88.5
-30	79.2	80.3	81.3	82.2	83.2	84.0	85.0	85.4	85.8	86.4	86.8	87.2	87.7
-35	78.4	79.5	80.5	81.4	82.4	83.2	84.1	84.5	85.0	85.6	86.0	86.3	86.8
-40	77.6	78.6	79.6	80.6	81.5	82.3	83.3	83.7	84.1	84.7	85.1	85.4	86.0
-45	76.8	77.8	78.8	79.7	80.7	81.5	82.4	82.8	83.3	83.8	84.2	84.5	85.1
-50	76.0	77.0	78.0	78.9	79.8	80.6	81.6	81.9	82.4	82.9	83.3	83.7	84.2

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9

Assumed Temperature Reduced Thrust

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°C)	PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	69	68	69	67	65	63	61	59	57	55		
35	64	63	65	66	65	63	61	59	57	55	53	
30	61	59	60	61	61	61	61	59	57	55	53	51
25	61	59	60	60	60	60	59	58	57	55	53	51
20	61	59	60	60	60	60	59	58	53	51	52	51
15	61	59	60	60	60	60	59	58	53	49	46	46
10 & BELOW	61	59	60	60	60	60	59	58	53	49	45	40

Maximum Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
75	81.4	81.5	84.0	85.8	87.2	88.8	89.7	90.6	90.4	90.1	89.8	89.4
70	82.5	82.6	84.3	85.5	86.6	88.2	89.1	89.9	89.7	89.5	89.2	88.8
65	83.4	83.7	85.2	86.4	87.2	88.2	88.5	89.3	89.1	88.9	88.6	88.1
60	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
55	85.3	85.8	87.0	88.1	89.0	90.0	90.1	90.3	89.6	88.8	87.9	86.9
50	86.3	86.8	87.9	88.9	89.8	90.8	90.9	91.0	90.3	89.6	88.7	87.7
45	87.2	87.7	88.7	89.7	90.7	91.7	91.7	91.7	91.1	90.4	89.5	88.6
40	88.2	88.6	89.7	90.6	91.6	92.5	92.4	92.4	91.8	91.2	90.3	89.4
35	89.0	89.5	90.6	91.5	92.4	93.4	93.3	93.2	92.5	91.9	91.0	90.1
30	89.3	90.5	91.4	92.5	93.3	94.3	94.1	94.0	93.4	92.7	91.8	90.9
25	88.6	89.7	90.7	91.8	92.7	93.8	94.2	94.7	94.2	93.5	92.6	91.7
20	87.9	89.0	90.0	91.1	91.9	93.0	93.4	93.9	94.5	94.3	93.4	92.5
15	87.2	88.3	89.3	90.3	91.2	92.2	92.6	93.1	93.7	94.2	94.2	93.4
10	86.4	87.5	88.5	89.6	90.4	91.5	91.9	92.3	92.9	93.4	93.7	94.3
MINIMUM ASSUMED TEMP (°C)	32	30	30	30	29	29	27	25	21	18	14	10

With engine bleed for packs off, increase %N1 by 0.9.

Assumed Temperature Reduced Thrust

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°C)	OUTSIDE AIR TEMPERATURE (°C)													
	-40	-20	0	5	10	15	20	25	30	35	40	45	50	55
110	11.2													
100	10.3	6.0												
90	10.5	8.2												
80	11.8	7.1	3.2											
70	10.7	7.4	5.3	3.6	1.8									
60	9.2	8.7	4.1	4.0	3.9	2.2	0.5							
50	7.8	7.5	4.3	2.7	2.6	3.7	2.7	0.9	0.5					
40		6.0	5.7	4.4	2.8	2.9	3.3	3.1	1.4	1.1	0.8			
30		4.6	4.4	4.3	4.2	4.1	4.0	3.9	3.5	3.3	3.0	2.8	3.4	
20			3.0	2.9	2.9	2.9	2.8	2.7	2.6	2.6	2.5	2.5	2.4	2.3
10			1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2
0			0	0	0	0	0	0	0	0	0	0	0	0

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

Takeoff Speeds - Dry Runway (18.5K Derate)

Flaps 1 and 5

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
68	143	143	146			
64	139	139	142	136	136	139
60	133	134	138	130	131	135
56	128	128	133	125	126	130
52	122	122	128	119	120	125
48	116	116	123	114	114	120
44	110	110	117	107	108	115
40	103	103	112	101	102	110

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	6	6						6	6						0	-1					
60	140	4	5	5	6				4	5	5	6				0	0	0	0			
50	122	3	3	4	4	5	7	9	3	4	4	4	6	7	9	0	0	0	0	0	-1	-1
40	104	1	2	2	2	4	6	8	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	1	1	3	4	7	0	0	1	2	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	1	2	3	5	0	0	1	1	2	4	5	0	0	0	0	0	0	0
-60	-76	0	0	0	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	0	1	1

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
68	-1	0	0	0	0	0	0	0	0	0	0	0	0
64	-1	0	0	0	0	-1	0	0	0	0	0	0	0
60	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
56	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
52	-1	-1	0	0	0	-1	0	0	0	0	0	0	0
48	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
44	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
40	-1	0	0	0	0	-1	0	0	0	0	0	0	0

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	90	88					
60	140	90	88	89	90			
50	122	92	90	89	90	88	85	81
40	104	97	95	94	92	89	85	81
30	86	100	100	99	97	93	88	83
20	68	100	100	99	98	95	92	87
-60	-76	102	101	100	99	96	94	92

Takeoff Speeds - Dry Runway (18.5K Derate)

Flaps 10, 15 and 25

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
60	124	125	129	122	122	126			
56	120	120	124	117	118	122	116	116	121
52	115	115	120	113	113	118	111	111	117
48	109	110	116	108	108	114	106	106	113
44	104	104	111	102	103	109	101	101	108
40	98	98	107	96	96	105	95	96	104

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	4	5						4	5						-2	-2					
60	140	3	4	4	4				3	4	4	4				-1	-2	-2	-2			
50	122	2	3	3	3	4	6	8	2	3	3	3	4	6	8	-1	-1	-1	-1	-2	-2	-2
40	104	1	1	1	2	3	5	7	1	1	2	2	3	4	6	0	-1	-1	-1	-1	-2	-2
30	86	0	0	0	1	2	3	5	0	0	1	1	2	3	5	0	0	0	0	-1	-1	-2
20	68	0	0	0	0	1	2	4	0	0	0	1	1	2	4	0	0	0	0	0	-1	-1
-60	-76	0	0	0	0	1	2	2	0	0	0	1	1	2	2	0	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
60	-1	0	0	0	0	-1	0	0	0	0	0	0	0
56	-1	0	0	0	0	-1	0	0	0	0	0	0	0
52	-1	0	0	0	0	-1	0	0	0	0	0	0	0
48	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
44	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
40	-1	0	0	1	1	-2	-1	0	0	0	1	1	1

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	90	88					
60	140	90	88	89	90			
50	122	92	90	89	90	88	85	81
40	104	97	95	94	92	89	85	81
30	86	100	100	99	97	93	88	83
20	68	100	100	99	98	95	92	87
-60	-76	102	101	100	99	96	94	92

Takeoff Speeds - Wet Runway (18.5K Derate)
Flaps 1 and 5
V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
68	139	143	146			
64	133	139	142	130	136	139
60	128	134	138	125	131	135
56	122	128	133	119	126	130
52	115	122	128	113	120	125
48	109	116	123	106	114	120
44	102	110	117	99	108	115
40	95	103	112	92	102	110

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	9	11						6	6						0	-1					
60	140	7	8	8	8				4	5	5	5				0	0	0	0			
50	122	4	5	5	5	8	11	14	3	4	4	4	6	7	9	0	0	0	0	0	-1	-1
40	104	1	3	3	3	5	8	12	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	1	1	3	6	9	0	0	1	2	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	1	2	4	7	0	0	1	1	2	4	5	0	0	0	0	0	0	0
-60	-76	0	0	0	1	2	3	5	0	0	1	1	2	3	4	0	0	0	0	0	1	1

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
68	-3	-1	0	3	5	-2	-1	0	0	1	2	2	3
64	-3	-1	0	2	5	-2	-1	0	0	1	1	2	3
60	-3	-1	0	2	4	-3	-2	-1	0	1	1	2	2
56	-3	-1	0	2	4	-3	-2	-1	0	1	1	2	3
52	-3	-1	0	2	4	-3	-2	-1	0	1	2	2	3
48	-2	-1	0	2	3	-3	-2	-1	0	1	2	2	3
44	-2	-1	0	2	3	-3	-2	-1	0	1	2	3	3
40	-1	0	0	2	3	-3	-2	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	90	88					
60	140	90	88	89	90			
50	122	92	90	89	90	88	85	81
40	104	97	95	94	92	89	85	81
30	86	100	100	99	97	93	88	83
20	68	100	100	99	98	95	92	87
-60	-76	102	101	100	99	96	94	92

Takeoff Speeds - Wet Runway (18.5K Derate)

Flaps 10, 15 and 25

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
60	120	125	129	121	122	126			
56	114	120	124	114	118	122	113	116	121
52	108	115	120	108	113	118	107	111	117
48	103	110	116	102	108	114	101	106	113
44	97	104	111	96	103	109	95	101	108
40	89	98	107	90	96	105	89	96	104

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	8	10						4	5						-2	-2					
60	140	6	7	7	7				3	4	4	4				-1	-2	-2	-2			
50	122	4	5	4	5	7	10	13	2	3	3	3	4	6	8	-1	-1	-1	-1	-2	-2	-2
40	104	1	2	2	3	4	7	10	1	1	2	2	3	4	7	0	-1	-1	-1	-1	-2	-2
30	86	0	0	0	1	2	4	8	0	0	1	1	2	3	5	0	0	0	0	-1	-1	-2
20	68	0	0	0	0	1	3	5	0	0	0	1	1	2	4	0	0	0	0	0	-1	-1
-60	-76	0	0	0	0	1	2	3	0	0	0	1	1	2	2	0	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
60	-2	-1	0	2	4	-3	-1	0	0	1	2	2	3
56	-3	-1	0	2	3	-3	-2	-1	0	1	1	2	3
52	-3	-1	0	1	3	-3	-2	-1	0	1	1	2	3
48	-3	-1	0	1	3	-3	-2	-1	0	1	1	2	3
44	-2	-1	0	2	3	-3	-2	-1	0	1	2	2	3
40	-1	0	0	2	3	-3	-2	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	90	88					
60	140	90	88	89	90			
50	122	92	90	89	90	88	85	81
40	104	97	95	94	92	89	85	81
30	86	100	100	99	97	93	88	83
20	68	100	100	99	98	95	92	87
-60	-76	102	101	100	99	96	94	92

Maximum Allowable Clearway (18.5K Derate)

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	450
6000	650
8000	850
10000	1000
12000	1450
14000	1550

Clearway and Stopway V1 Adjustments (18.5K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
1000	-4	-3	-3			
800	-4	-3	-3			
600	-4	-3	-2			
400	-2	-2	-1			
200	-1	-1	-1			
0	0	0	0	0	0	0
-200	1	0	0	2	1	0
-400	1	0	0	3	2	1
-600	1	0	0	3	2	1
-800	1	0	0	3	2	1
-1000	1	0	0	3	2	1

Use of clearway not allowed on wet runways.

Stab Trim Setting (18.5K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)								
	9	12	13	15	16	20	24	28	33
70-80	8 1/2	8 1/2	8 1/2	8 1/2	8 1/4	7 1/2	6 3/4	6	5
60	8 1/2	8 1/2	8 1/4	7 3/4	7 1/2	6 3/4	6	5 1/2	4 1/2
50	8 1/4	7 3/4	7 1/2	7 1/4	7	6 1/4	5 1/2	4 3/4	4
35-45	8	7 1/2	7 1/4	6 3/4	6 3/4	6	5 1/4	4 1/2	3 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)								
	9	10	12	13	16	20	24	28	33
70-80	8 1/2	8 1/2	8 1/2	8 1/4	7 1/2	6 1/2	5 3/4	5	3 3/4
60	8 1/2	8 1/2	8	8	7	6 1/4	5 1/4	4 1/2	3 1/2
50	8 1/4	8	7 1/2	7 1/4	6 1/2	5 3/4	4 3/4	4	3
35-45	7 1/4	7	6 1/2	6 1/2	6	5 1/4	4 1/2	3 1/2	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

18.5K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-15.7	-17.7	-19.8	-19.5	-21.5	-23.6	-32.1	-34.1	-36.1
85	-13.7	-15.7	-17.8	-17.0	-19.0	-21.0	-27.2	-29.2	-31.3
80	-11.7	-13.8	-15.8	-14.4	-16.5	-18.5	-22.3	-24.3	-26.4
75	-9.9	-11.9	-14.0	-12.1	-14.1	-16.2	-18.0	-20.0	-22.0
70	-8.3	-10.3	-12.4	-10.0	-12.1	-14.1	-14.2	-16.3	-18.3
65	-6.9	-8.9	-11.0	-8.2	-10.3	-12.3	-11.2	-13.2	-15.3
60	-5.7	-7.7	-9.8	-6.7	-8.7	-10.8	-8.7	-10.8	-12.8
55	-4.8	-6.8	-8.8	-5.5	-7.6	-9.6	-7.2	-9.2	-11.3
50	-4.1	-6.1	-8.2	-4.6	-6.7	-8.7	-6.1	-8.1	-10.2
45	-3.6	-5.7	-7.7	-4.0	-6.1	-8.1	-5.0	-7.0	-9.1
40	-3.4	-5.4	-7.5	-3.7	-5.8	-7.8	-3.9	-5.9	-7.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800							30.4		
4200	33.6			35.8			39.1		
4600	42.5			44.6			47.8		
5000	51.7			53.7	31.4		56.7	34.7	
5400	61.4	38.0		63.3	40.1		65.7	43.4	
5800	71.4	47.1		73.2	49.1		74.7	52.2	30.4
6200	82.1	56.5	33.6	83.7	58.5	35.8	83.9	61.2	39.1
6600	92.9	66.3	42.5	94.3	68.2	44.6	93.1	70.2	47.8
7000		76.7	51.7		78.4	53.7		79.3	56.7
7400		87.5	61.4		89.0	63.3		88.5	65.7
7800		98.4	71.4		99.6	73.2		97.8	74.7
8200			82.1			83.7			83.9
8600			92.9			94.3			93.1

1. **Enter Weight Adjustment table with slush/standing water depth and 18.5K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -100 ft/+90 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	0	0	0	0	0	0	0	0	0
85	-1	0	0	0	0	0	0	0	0
80	-4	-2	0	0	0	0	0	0	0
75	-8	-5	-3	0	0	0	0	0	0
70	-10	-8	-5	-3	0	0	0	0	0
65	-13	-10	-8	-7	-4	-2	0	0	0
60	-14	-12	-9	-10	-8	-5	0	0	0
55	-16	-13	-11	-13	-10	-8	-4	-2	0
50	-17	-15	-12	-15	-12	-10	-8	-5	-3
45	-18	-16	-13	-16	-14	-11	-11	-9	-6
40	-19	-16	-14	-17	-15	-12	-13	-11	-8

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

18.5K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-21.5	-23.5	-25.6	-26.2	-28.2	-30.3	-35.3	-37.4	-39.4
85	-18.2	-20.2	-22.2	-22.0	-24.0	-26.1	-29.6	-31.7	-33.7
80	-15.1	-17.1	-19.2	-18.2	-20.2	-22.3	-24.4	-26.4	-28.5
75	-12.5	-14.5	-16.5	-14.9	-16.9	-18.9	-19.8	-21.9	-23.9
70	-10.2	-12.3	-14.3	-12.1	-14.1	-16.1	-15.9	-18.0	-20.0
65	-8.4	-10.4	-12.5	-9.8	-11.8	-13.9	-12.8	-14.8	-16.8
60	-7.0	-9.0	-11.1	-8.0	-10.1	-12.1	-10.3	-12.3	-14.4
55	-6.0	-8.0	-10.1	-6.8	-8.8	-10.8	-8.5	-10.5	-12.5
50	-5.4	-7.5	-9.5	-6.0	-8.1	-10.1	-7.3	-9.4	-11.4
45	-5.3	-7.3	-9.3	-5.8	-7.8	-9.9	-6.9	-9.0	-11.0
40	-5.5	-7.6	-9.6	-6.1	-8.1	-10.2	-7.2	-9.2	-11.3

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4600							30.7		
5000				31.8			40.8		
5400	36.9			42.6			50.6		
5800	48.3			53.3			60.0	37.1	
6200	59.6	32.7		64.1	38.6		69.1	47.0	
6600	71.0	44.0		74.9	49.3		77.9	56.5	33.3
7000	82.5	55.4		85.7	60.1	34.5	86.5	65.7	43.3
7400	94.0	66.8	39.7	96.5	70.9	45.3	94.9	74.6	53.0
7800		78.2	51.1		81.6	56.0		83.3	62.3
8200		89.7	62.5		92.4	66.8		91.7	71.3
8600			73.9			77.6			80.1
9000			85.4			88.4			88.6
9400			96.8			99.2			97.0

1. **Enter Weight Adjustment table with slush/standing water depth and 18.5K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -120 ft/+110 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K Derate)
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-7	-5	-2	0	0	0	0	0	0
85	-9	-7	-4	0	0	0	0	0	0
80	-12	-9	-7	0	0	0	0	0	0
75	-14	-11	-9	-2	0	0	0	0	0
70	-15	-13	-10	-6	-3	-1	0	0	0
65	-17	-15	-12	-10	-7	-5	0	0	0
60	-19	-16	-14	-13	-11	-8	0	0	0
55	-20	-18	-15	-16	-14	-11	-6	-3	-1
50	-22	-19	-17	-19	-16	-14	-11	-9	-6
45	-23	-21	-18	-21	-18	-16	-15	-12	-10
40	-24	-22	-19	-22	-20	-17	-18	-15	-13

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slippery Runway Takeoff (18.5K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

18.5K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-2.1	-2.1	-2.1	-7.8	-7.8	-7.8	-11.8	-11.8	-11.8
85	-2.0	-2.0	-2.0	-7.0	-7.0	-7.0	-10.9	-10.9	-10.9
80	-1.9	-1.9	-1.9	-6.1	-6.1	-6.1	-10.0	-10.0	-10.0
75	-1.5	-1.5	-1.5	-5.5	-5.5	-5.5	-9.1	-9.1	-9.1
70	-1.1	-1.1	-1.1	-5.0	-5.0	-5.0	-8.2	-8.2	-8.2
65	-1.0	-1.0	-1.0	-4.5	-4.5	-4.5	-7.4	-7.4	-7.4
60	-0.8	-0.8	-0.8	-3.9	-3.9	-3.9	-6.7	-6.7	-6.7
55	-0.7	-0.7	-0.7	-3.7	-3.7	-3.7	-6.1	-6.1	-6.1
50	-0.8	-0.8	-0.8	-3.6	-3.6	-3.6	-5.8	-5.8	-5.8
45	-1.1	-1.1	-1.1	-3.7	-3.7	-3.7	-5.7	-5.7	-5.7
40	-1.6	-1.6	-1.6	-4.0	-4.0	-4.0	-5.8	-5.8	-5.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3400	41.9								
3800	55.7	35.0							
4200	69.3	48.8		34.9					
4600	82.7	62.5	41.9	45.2					
5000	96.1	76.0	55.7	55.8	34.9				
5400		89.4	69.3	66.8	45.2		33.9		
5800			82.7	78.1	55.8	34.9	40.9		
6200			96.1	89.8	66.8	45.2	48.1		
6600					78.1	55.8	55.5	35.6	
7000					89.8	66.8	63.3	42.6	
7400						78.1	71.4	49.9	30.4
7800						89.8	79.8	57.4	37.3
8200							88.7	65.3	44.4
8600							97.7	73.5	51.8
9000								82.0	59.4
9400								90.9	67.3
9800								99.9	75.6
10200									84.2
10600									93.2

1. **Enter Weight Adjustment table with reported braking action and 18.5K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -110 ft/+100 ft for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (18.5K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-2	-1	0	-10	-9	-8	-19	-18	-17
85	-3	-2	0	-10	-9	-8	-19	-18	-17
80	-4	-2	-1	-10	-9	-8	-19	-18	-17
75	-4	-3	-2	-11	-10	-9	-20	-19	-18
70	-5	-4	-2	-12	-11	-9	-21	-20	-19
65	-6	-4	-3	-13	-12	-11	-23	-22	-20
60	-6	-5	-4	-15	-13	-12	-25	-23	-22
55	-7	-6	-5	-16	-15	-14	-27	-25	-24
50	-8	-7	-6	-18	-16	-15	-29	-28	-26
45	-9	-8	-7	-19	-18	-17	-31	-30	-29
40	-11	-10	-8	-21	-20	-18	-33	-32	-31

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slippery Runway Takeoff (18.5K Derate)
No Reverse Thrust
Weight Adjustments (1000 KG)

18.5K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-6.4	-6.4	-6.4	-11.2	-11.2	-11.2	-17.7	-17.7	-17.7
85	-5.0	-5.0	-5.0	-9.8	-9.8	-9.8	-15.6	-15.6	-15.6
80	-3.8	-3.8	-3.8	-8.5	-8.5	-8.5	-13.7	-13.7	-13.7
75	-2.9	-2.9	-2.9	-7.4	-7.4	-7.4	-12.1	-12.1	-12.1
70	-2.1	-2.1	-2.1	-6.5	-6.5	-6.5	-10.6	-10.6	-10.6
65	-1.6	-1.6	-1.6	-5.8	-5.8	-5.8	-9.4	-9.4	-9.4
60	-1.4	-1.4	-1.4	-5.3	-5.3	-5.3	-8.5	-8.5	-8.5
55	-1.3	-1.3	-1.3	-4.9	-4.9	-4.9	-7.7	-7.7	-7.7
50	-1.5	-1.5	-1.5	-4.8	-4.8	-4.8	-7.2	-7.2	-7.2
45	-1.9	-1.9	-1.9	-4.8	-4.8	-4.8	-6.9	-6.9	-6.9
40	-2.6	-2.6	-2.6	-5.0	-5.0	-5.0	-6.9	-6.9	-6.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3400	33.0								
3800	48.4								
4200	63.2	44.6							
4600	77.5	59.5	40.7						
5000	91.3	73.9	55.8	33.3					
5400		87.9	70.4	46.6					
5800			84.4	59.9	33.3				
6200			98.2	73.1	46.6				
6600				86.3	59.9	33.3			
7000				99.4	73.1	46.6			
7400					86.3	59.9	30.9		
7800					99.4	73.1	40.4		
8200						86.3	50.0		
8600						99.4	59.8		
9000							69.7	39.2	
9400							79.9	48.8	
9800							90.3	58.5	
10200								68.5	38.0
10600								78.6	47.6
11000								89.0	57.3
11400								99.4	67.2
11800									77.3
12200									87.7
12600									98.1

1. **Enter Weight Adjustment table with reported braking action and 18.5K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (18.5K Derate)
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-18	-15	-13	-30	-28	-25	-45	-42	-40
85	-13	-11	-8	-24	-22	-19	-39	-36	-34
80	-10	-8	-5	-20	-17	-15	-34	-31	-29
75	-8	-6	-3	-17	-15	-12	-32	-29	-27
70	-7	-5	-2	-17	-14	-12	-31	-29	-26
65	-7	-5	-2	-17	-15	-12	-32	-30	-27
60	-8	-5	-3	-19	-16	-14	-34	-32	-29
55	-9	-6	-4	-21	-18	-16	-37	-34	-32
50	-10	-8	-5	-23	-20	-18	-40	-37	-35
45	-12	-9	-7	-25	-23	-20	-42	-40	-37
40	-13	-11	-8	-27	-24	-22	-44	-42	-39

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

Takeoff %N1 (18.5K Derate)

Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	82.0	82.4	82.8	83.6	84.5	85.5	86.5	86.4	86.4	85.6	85.2	84.7	84.3
55	82.8	83.3	83.7	84.5	85.5	86.4	87.3	87.3	87.2	86.5	85.8	84.8	83.8
50	83.7	84.1	84.5	85.5	86.5	87.3	88.2	88.1	88.1	87.4	86.7	85.7	84.7
45	84.6	85.1	85.5	86.4	87.4	88.2	89.0	88.9	88.9	88.2	87.5	86.6	85.6
40	85.7	86.1	86.6	87.4	88.2	89.0	89.8	89.7	89.6	89.0	88.4	87.4	86.5
35	86.6	87.1	87.5	88.3	89.1	89.9	90.7	90.5	90.4	89.8	89.2	88.3	87.4
30	86.2	87.3	88.4	89.2	90.1	90.8	91.6	91.4	91.3	90.6	90.0	89.1	88.2
25	85.5	86.6	87.7	88.5	89.4	90.2	91.0	91.6	92.0	91.5	90.9	90.0	89.0
20	84.8	85.9	87.0	87.8	88.7	89.5	90.3	90.8	91.3	91.8	91.7	90.8	90.0
15	84.1	85.2	86.3	87.1	88.0	88.8	89.5	90.1	90.5	91.1	91.6	91.7	90.8
10	83.4	84.5	85.5	86.3	87.2	88.0	88.8	89.3	89.8	90.3	90.8	91.3	91.9
5	82.7	83.7	84.8	85.6	86.5	87.3	88.0	88.5	89.0	89.5	90.1	90.5	91.1
0	82.0	83.0	84.1	84.9	85.7	86.5	87.3	87.8	88.2	88.8	89.3	89.7	90.3
-5	81.2	82.3	83.3	84.1	85.0	85.7	86.5	87.0	87.4	88.0	88.5	88.9	89.5
-10	80.5	81.5	82.5	83.3	84.2	84.9	85.7	86.2	86.6	87.2	87.7	88.1	88.7
-15	79.7	80.8	81.8	82.6	83.4	84.2	84.9	85.4	85.8	86.4	86.9	87.3	87.9
-20	79.0	80.0	81.0	81.8	82.6	83.4	84.1	84.6	85.0	85.6	86.1	86.5	87.1
-25	78.2	79.2	80.2	81.0	81.8	82.6	83.3	83.8	84.2	84.7	85.2	85.7	86.2
-30	77.5	78.4	79.4	80.2	81.0	81.8	82.5	82.9	83.4	83.9	84.4	84.8	85.4
-35	76.7	77.7	78.6	79.4	80.2	80.9	81.7	82.1	82.6	83.1	83.6	84.0	84.6
-40	75.9	76.9	77.8	78.6	79.4	80.1	80.8	81.3	81.7	82.2	82.7	83.1	83.7
-45	75.1	76.1	77.0	77.8	78.6	79.3	80.0	80.4	80.9	81.4	81.9	82.3	82.8
-50	74.3	75.2	76.2	76.9	77.7	78.4	79.1	79.6	80.0	80.5	81.0	81.4	81.9

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (18.5K Derate)

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°C)	PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	400	5000	6000	7000	8000	9000	10000
54	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	69	69	68	67	65	63	61	59	57	55		
35	64	64	63	64	65	63	61	59	57	55	53	
30	61	59	59	59	60	61	61	59	57	55	53	51
25	61	59	58	59	59	60	58	57	56	55	53	51
20	61	59	58	59	59	60	58	57	52	51	50	50
15	61	59	58	59	59	60	58	57	52	48	45	44
10 & BELOW	61	59	58	59	59	60	58	57	52	48	44	39

Maximum Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine anti-ice on or off

ASSUMED TEMP (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
75	79.8	80.1	81.1	82.7	84.5	86.2	86.7	87.3	87.1	87.0	86.6	86.2
70	80.7	81.1	81.5	82.5	83.9	85.6	86.1	86.7	86.5	86.4	86.0	85.6
65	81.6	82.0	82.6	83.5	84.5	85.6	85.5	86.1	85.9	85.8	85.4	84.9
60	82.4	82.8	83.6	84.5	85.5	86.5	86.4	86.4	85.6	85.2	84.7	84.3
55	83.3	83.7	84.5	85.5	86.4	87.3	87.3	87.2	86.5	85.8	84.8	83.8
50	84.1	84.5	85.5	86.5	87.3	88.2	88.1	88.1	87.4	86.7	85.7	84.7
45	85.1	85.5	86.4	87.4	88.2	89.0	88.9	88.9	88.2	87.5	86.6	85.6
40	86.1	86.6	87.4	88.2	89.0	89.8	89.7	89.6	89.0	88.4	87.4	86.5
35	87.1	87.5	88.3	89.1	89.9	90.7	90.5	90.4	89.8	89.2	88.3	87.4
30	87.3	88.4	89.2	90.1	90.8	91.6	91.4	91.3	90.6	90.0	89.1	88.2
25	86.6	87.7	88.5	89.4	90.2	91.0	91.6	92.0	91.5	90.9	90.0	89.0
20	85.9	87.0	87.8	88.7	89.5	90.3	90.8	91.3	91.8	91.7	90.8	90.0
15	85.2	86.3	87.1	88.0	88.8	89.5	90.1	90.5	91.1	91.6	91.7	90.8
10	84.5	85.5	86.3	87.2	88.0	88.8	89.3	89.8	90.3	90.8	91.3	91.9
MINIMUM ASSUMED TEMP (°C)	32	30	30	30	29	29	27	25	21	18	14	10

With engine bleed for packs off, increase %N1 by 0.9.

Assumed Temperature Reduced Thrust (18.5K Derate)
%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°C)	OUTSIDE AIR TEMPERATURE (°C)													
	-40	-20	0	5	10	15	20	25	30	35	40	45	50	55
110	10.4													
100	9.2	6.5												
90	9.6	7.3												
80	11.3	6.1	3.7											
70	10.5	6.5	4.4	4.0	2.4									
60	9.0	8.2	3.1	3.0	2.9	2.7	1.1							
50	7.6	7.3	3.5	1.9	1.7	2.9	2.7	1.4	1.2					
40		5.9	5.3	3.7	2.1	2.2	2.8	3.1	1.5	1.6	1.5			
30		4.5	4.3	4.2	3.9	4.0	3.9	3.8	3.5	3.3	3.2	3.4	3.4	
20			2.9	2.9	2.8	2.8	2.7	2.7	2.6	2.5	2.5	2.4	2.3	2.3
10			1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2
0			0	0	0	0	0	0	0	0	0	0	0	0

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)/SPEED (KIAS/MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	37000	41000
	280	280	280	280	280	280	280	.78	.78	.78
60	83.7	83.8	83.7	83.7	86.9	91.3	92.9	94.3	94.4	92.7
55	84.5	84.7	84.6	84.6	87.3	90.6	92.3	93.6	93.7	92.0
50	85.2	85.5	85.5	85.5	88.2	90.7	91.6	92.9	93.0	91.3
45	86.0	86.3	86.3	86.3	89.1	91.6	91.6	92.2	92.3	90.6
40	86.9	87.0	87.1	87.1	89.9	92.4	92.4	91.5	91.6	89.9
35	87.5	87.8	87.9	87.9	90.7	93.2	93.2	92.3	91.6	90.0
30	86.8	88.5	88.6	88.7	91.5	94.0	93.9	93.1	92.5	91.0
25	86.1	88.6	89.4	89.4	92.3	94.8	94.6	93.9	93.3	92.0
20	85.4	87.9	90.2	90.1	93.0	95.5	95.3	94.6	94.1	92.9
15	84.7	87.1	89.6	90.9	93.8	96.2	96.0	95.4	94.9	93.9
10	84.0	86.4	88.8	91.1	94.6	96.9	96.6	96.1	95.7	94.8
5	83.2	85.7	88.1	90.3	95.5	97.8	97.3	96.9	96.5	95.7
0	82.5	84.9	87.3	89.5	94.8	98.9	98.3	97.8	97.4	96.6
-5	81.8	84.1	86.5	88.7	94.0	98.8	99.3	98.5	98.2	97.7
-10	81.0	83.4	85.7	87.9	93.2	98.0	99.6	99.4	99.1	98.6
-15	80.3	82.6	85.0	87.1	92.4	97.3	98.8	100.4	100.1	99.6
-20	79.5	81.8	84.2	86.3	91.5	96.5	98.0	100.1	100.6	100.2
-25	78.7	81.0	83.3	85.5	90.7	95.7	97.2	99.2	99.8	99.4
-30	78.0	80.2	82.5	84.7	89.9	94.9	96.4	98.4	98.9	98.6
-35	77.2	79.4	81.7	83.8	89.0	94.0	95.5	97.6	98.1	97.7
-40	76.4	78.6	80.9	83.0	88.2	93.2	94.7	96.7	97.2	96.9

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	35	41
ENGINE ANTI-ICE	-0.6	-0.8	-0.9	-0.9	-0.8	-0.8
ENGINE & WING ANTI-ICE*	-1.8	-2.1	-2.5	-2.7	-3.0	-3.0

***Dual bleed sources**

Go-around %N1

Based on engine bleed for packs on, engine and wing anti-ice on or off

AIRPORT OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
57	134	60	84.8	85.5	86.7									
52	125	55	85.7	86.5	87.6	88.6	89.6							
47	116	50	86.6	87.4	88.5	89.4	90.4	91.4	91.4	91.5				
42	108	45	87.5	88.3	89.3	90.3	91.2	92.2	92.2	92.2	91.5	90.9		
37	99	40	88.4	89.2	90.2	91.2	92.1	93.1	93.0	92.9	92.3	91.6	90.7	89.8
32	90	35	88.6	90.1	91.1	92.1	93.0	93.9	93.8	93.7	93.1	92.4	91.5	90.6
27	81	30	87.9	90.1	91.1	92.1	93.1	94.1	94.5	94.5	93.9	93.3	92.3	91.4
22	72	25	87.2	89.3	90.3	91.4	92.3	93.3	93.8	94.3	94.7	94.1	93.2	92.2
17	63	20	86.5	88.6	89.6	90.7	91.6	92.6	93.0	93.5	94.2	94.6	94.0	93.1
12	54	15	85.8	87.9	88.8	89.9	90.8	91.8	92.2	92.8	93.4	93.8	94.1	94.0
7	45	10	85.1	87.1	88.1	89.1	90.0	91.0	91.5	92.0	92.6	93.0	93.4	93.9
2	36	5	84.3	86.4	87.3	88.4	89.3	90.3	90.7	91.2	91.8	92.2	92.6	93.1
-3	27	0	83.6	85.6	86.6	87.6	88.5	89.5	89.9	90.4	91.0	91.4	91.8	92.3
-8	18	-5	82.9	84.9	85.8	86.8	87.7	88.7	89.1	89.6	90.2	90.6	91.0	91.5
-13	9	-10	82.1	84.1	85.0	86.0	86.9	87.9	88.3	88.8	89.4	89.8	90.2	90.7
-17	1	-15	81.3	83.3	84.2	85.2	86.1	87.1	87.5	88.0	88.6	89.0	89.3	89.9
-22	-8	-20	80.6	82.5	83.4	84.4	85.3	86.3	86.7	87.2	87.8	88.2	88.5	89.0
-27	-17	-25	79.8	81.7	82.6	83.6	84.5	85.4	85.8	86.4	86.9	87.3	87.7	88.2
-32	-26	-30	79.0	80.9	81.8	82.8	83.7	84.6	85.0	85.5	86.1	86.5	86.8	87.3
-37	-35	-35	78.2	80.1	81.0	82.0	82.8	83.8	84.2	84.7	85.2	85.6	86.0	86.5
-42	-44	-40	77.4	79.3	80.2	81.1	82.0	82.9	83.3	83.8	84.4	84.8	85.1	85.6
-47	-53	-45	76.6	78.5	79.3	80.3	81.1	82.0	82.4	82.9	83.5	83.9	84.2	84.7
-52	-62	-50	75.8	77.6	78.5	79.4	80.3	81.2	81.6	82.1	82.6	83.0	83.3	83.8

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8
A/C HIGH	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb (280/.76)

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1800	1100	400		
30000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2600	2000	1500	1100	800
20000	**PITCH ATT**	**6.5**	**6.0**	**5.5**	**5.5**	**5.5**
	V/S (FT/MIN)	3700	2900	2300	1800	1400
10000	**PITCH ATT**	**8.5**	**7.5**	**7.0**	**6.5**	**6.5**
	V/S (FT/MIN)	4300	3300	2700	2200	1800
SEA LEVEL	**PITCH ATT**	**11.5**	**10.0**	**9.0**	**8.5**	**8.0**
	V/S (FT/MIN)	5200	4100	3300	2800	2300

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	83	87	92		
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	81	83	85	89	94
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	81	83	85	87
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	81	83
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**3.0**	**3.5**
	%N1	73	74	75	77	79
15000	**PITCH ATT**	**1.0**	**1.5**	**2.5**	**3.0**	**3.5**
	%N1	69	70	71	73	75

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**-2.0**	**-0.5**	**0.0**	**0.5**	**1.0**
	V/S (FT/MIN)	-2800	-2600	-2600	-2800	-3100
30000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-3200	-2700	-2400	-2200	-2100
20000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2900	-2400	-2100	-2000	-1900
10000	**PITCH ATT**	**-3.5**	**-2.5**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN	-2700	-2300	-2000	-1800	-1700
SEA LEVEL	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2600	-2200	-1900	-1700	-1600

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	63	67	70
5000	**PITCH ATT**	**5.5**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	49	54	59	63	67

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 1 (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF 40 + 50)	%N1	51	56	61	65	69
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 30)	%N1	52	57	62	66	70
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 20)	%N1	60	65	70	75	79

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 15	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**	**4.0**
(VREF 15 + 10)	%N1	42	46	51	54	57
FLAPS 30	**PITCH ATT**	**1.5**	**2.0**	**2.0**	**2.0**	**2.5**
(VREF 30 + 10)	%N1	46	51	56	59	63
FLAPS 40	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF 40 + 10)	%N1	53	58	63	67	70

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 11

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
80	31000	-8	34400*	34400*	34300	32700	31300
75	32400	-11	35900*	35900*	35600	34100	32700
70	33900	-14	37300*	37300*	37100	35500	34200
65	35500	-18	38700*	38700*	38600	37100	35700
60	37100	-19	40200*	40200*	40200*	38800	37400
55	39000	-19	41000	41000	41000	40600	39200
50	40900	-19	41000	41000	41000	41000	41000
45	41000	-19	41000	41000	41000	41000	41000
40	41000	-19	41000	41000	41000	41000	41000
35	41000	-19	41000	41000	41000	41000	41000
30	41000	-19	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
80	31000	-2	33100*	33100*	33100*	32700	31300
75	32400	-5	34900*	34900*	34900*	34100	32700
70	33900	-8	36400*	36400*	36400*	35500	34200
65	35500	-12	37900*	37900*	37900*	37100	35700
60	37100	-13	39400*	39400*	39400*	38800	37400
55	39000	-13	40900*	40900*	40900*	40600	39200
50	40900	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	41000	-13	41000	41000	41000	41000	41000
35	41000	-13	41000	41000	41000	41000	41000
30	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
80	31000	4	30800*	30800*	30800*	30800*	30800*
75	32400	0	33300*	33300*	33300*	33300*	32700
70	33900	-3	35200*	35200*	35200*	35200*	34200
65	35500	-6	36800*	36800*	36800*	36800*	35700
60	37100	-8	38300*	38300*	38300*	38300*	37400
55	39000	-8	39800*	39800*	39800*	39800*	39200
50	40900	-8	41000	41000	41000	41000	41000
45	41000	-8	41000	41000	41000	41000	41000
40	41000	-8	41000	41000	41000	41000	41000
35	41000	-8	41000	41000	41000	41000	41000
30	41000	-8	41000	41000	41000	41000	41000

***Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		23	25	27	29	31	33	35	37	39	41
80	%N1	83.1	84.5	85.7	86.9	88.3	90.3	94.3			
	MACH	.712	.736	.753	.767	.780	.790	.787			
	KIAS	310	309	303	296	289	280	267			
	FF/ENG	1515	1503	1488	1473	1468	1492	1560			
75	%N1	81.6	83.1	84.4	85.6	86.9	88.4	90.8			
	MACH	.691	.719	.742	.757	.771	.784	.791			
	KIAS	301	301	298	292	285	278	268			
	FF/ENG	1418	1415	1409	1392	1378	1378	1410			
70	%N1	80.0	81.5	83.0	84.3	85.4	86.8	88.5	91.9		
	MACH	.671	.697	.724	.746	.760	.774	.787	.790		
	KIAS	292	291	291	288	281	274	267	256		
	FF/ENG	1324	1321	1323	1316	1296	1283	1291	1341		
65	%N1	78.5	79.8	81.3	82.7	84.0	85.3	86.6	88.9	93.5	
	MACH	.652	.675	.702	.728	.749	.763	.777	.789	.789	
	KIAS	283	281	281	280	277	270	263	256	244	
	FF/ENG	1235	1226	1230	1230	1220	1200	1190	1214	1279	
60	%N1	76.8	78.1	79.5	81.0	82.4	83.7	85.0	86.8	89.7	
	MACH	.633	.654	.677	.705	.731	.751	.765	.779	.790	
	KIAS	274	272	270	271	270	265	259	252	244	
	FF/ENG	1149	1137	1134	1139	1137	1124	1105	1109	1141	
55	%N1	75.1	76.4	77.7	79.0	80.6	82.0	83.3	84.9	87.2	90.3
	MACH	.612	.633	.654	.677	.706	.733	.752	.767	.781	.790
	KIAS	265	263	261	259	260	258	254	248	241	233
	FF/ENG	1070	1051	1045	1043	1046	1042	1029	1021	1031	1063
50	%N1	73.0	74.5	75.7	77.0	78.4	80.0	81.4	83.1	85.2	87.4
	MACH	.586	.610	.631	.653	.676	.705	.732	.752	.767	.781
	KIAS	253	253	251	249	248	248	247	243	237	230
	FF/ENG	984	971	959	954	951	952	948	942	941	950
45	%N1	70.5	72.1	73.6	74.9	76.2	77.6	79.2	81.0	83.1	85.2
	MACH	.557	.581	.605	.627	.649	.673	.702	.730	.751	.765
	KIAS	240	240	240	239	237	236	236	235	231	225
	FF/ENG	894	885	879	870	863	859	859	860	861	868
40	%N1	67.6	69.4	71.0	72.5	73.9	75.2	76.6	78.5	80.8	82.9
	MACH	.525	.549	.573	.598	.621	.643	.667	.694	.724	.747
	KIAS	225	226	227	227	226	224	223	222	222	219
	FF/ENG	804	797	794	802	793	783	777	778	786	789
35	%N1	64.4	66.0	67.8	69.5	71.1	72.6	73.9	75.6	77.8	80.2
	MACH	.491	.513	.536	.561	.586	.611	.634	.657	.682	.713
	KIAS	210	211	212	212	213	213	211	209	208	208
	FF/ENG	727	721	718	716	711	703	693	690	692	700

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversions

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
303	276	252	232	215	200	190	181	173	165	158
457	415	379	349	323	300	285	271	259	248	238
612	556	506	465	431	400	380	362	345	330	317
768	696	633	582	538	500	475	452	431	412	395
924	837	761	699	646	600	570	543	518	495	474
1081	978	889	816	754	700	665	633	604	577	553
1238	1120	1017	933	862	800	760	723	690	659	632
1396	1262	1145	1050	970	900	855	813	776	742	711
1554	1404	1274	1168	1079	1000	950	904	862	824	790
1713	1547	1403	1285	1187	1100	1045	994	947	906	869
1873	1691	1532	1403	1295	1200	1139	1084	1033	988	947
2034	1835	1662	1521	1404	1300	1234	1174	1119	1070	1026
2195	1979	1792	1640	1512	1400	1329	1264	1205	1152	1104
2357	2124	1922	1758	1621	1500	1424	1355	1291	1234	1182
2519	2270	2053	1877	1729	1600	1519	1445	1377	1315	1260
2683	2415	2184	1995	1838	1700	1614	1535	1462	1397	1338
2847	2562	2314	2114	1947	1800	1708	1624	1548	1478	1416
3012	2708	2446	2233	2056	1900	1803	1714	1633	1560	1494
3177	2856	2577	2352	2165	2000	1898	1804	1718	1641	1572

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.3	0:44	1.2	0:42	1.0	0:39	0.9	0:37	0.8	0:36
300	2.0	1:05	1.9	1:02	1.6	0:57	1.4	0:54	1.3	0:52
400	2.8	1:27	2.5	1:22	2.2	1:15	2.0	1:11	1.8	1:08
500	3.5	1:48	3.2	1:42	2.8	1:33	2.5	1:28	2.3	1:24
600	4.2	2:10	3.8	2:02	3.3	1:51	3.0	1:45	2.8	1:40
700	4.8	2:31	4.5	2:23	3.9	2:10	3.6	2:02	3.3	1:56
800	5.5	2:53	5.1	2:43	4.5	2:28	4.1	2:19	3.8	2:12
900	6.2	3:15	5.7	3:04	5.1	2:47	4.6	2:36	4.2	2:28
1000	6.9	3:37	6.4	3:24	5.6	3:05	5.1	2:54	4.7	2:44
1100	7.6	4:00	7.0	3:45	6.2	3:24	5.6	3:11	5.2	3:01
1200	8.3	4:22	7.6	4:06	6.7	3:43	6.2	3:29	5.7	3:17
1300	8.9	4:45	8.3	4:28	7.3	4:02	6.7	3:46	6.2	3:34
1400	9.6	5:08	8.9	4:49	7.8	4:21	7.2	4:04	6.6	3:50
1500	10.3	5:31	9.5	5:11	8.4	4:41	7.7	4:22	7.1	4:07
1600	10.9	5:54	10.1	5:32	8.9	5:00	8.2	4:40	7.6	4:23
1700	11.6	6:17	10.7	5:54	9.5	5:20	8.7	4:58	8.0	4:40
1800	12.2	6:40	11.3	6:16	10.0	5:40	9.2	5:16	8.5	4:57
1900	12.9	7:04	11.9	6:38	10.6	6:00	9.7	5:35	9.0	5:14
2000	13.5	7:28	12.5	7:01	11.1	6:19	10.2	5:53	9.4	5:31

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
2	-0.2	-0.1	0.0	0.2	0.3
4	-0.4	-0.3	0.0	0.4	0.7
6	-0.7	-0.4	0.0	0.6	1.1
8	-0.9	-0.6	0.0	0.8	1.5
10	-1.2	-0.7	0.0	0.9	1.9
12	-1.6	-0.8	0.0	1.1	2.3
14	-1.9	-0.9	0.0	1.3	2.7

Long Range Cruise Enroute Fuel and Time - High Altitudes
Ground to Air Miles Conversions

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
547	509	476	447	422	400	382	365	349	335	323
817	762	713	671	634	600	573	548	526	505	486
1088	1016	951	895	845	800	765	732	702	674	649
1360	1270	1189	1119	1056	1000	956	915	878	843	812
1633	1525	1428	1343	1268	1200	1147	1098	1053	1012	975
1907	1781	1667	1568	1480	1400	1339	1282	1229	1181	1137
2182	2037	1906	1792	1692	1600	1530	1465	1405	1349	1299
2459	2294	2146	2018	1903	1800	1721	1648	1580	1518	1461
2736	2552	2387	2243	2116	2000	1912	1830	1755	1686	1623
3014	2810	2627	2468	2328	2200	2103	2013	1930	1854	1785
3293	3070	2868	2694	2540	2400	2294	2196	2105	2022	1946
3574	3330	3110	2920	2752	2600	2485	2379	2280	2190	2107
3856	3591	3353	3146	2965	2800	2676	2561	2455	2357	2268
4139	3853	3596	3373	3177	3000	2867	2743	2629	2524	2429
4423	4115	3839	3600	3390	3200	3057	2925	2803	2691	2590
4708	4379	4084	3828	3603	3400	3248	3107	2977	2858	2750
4996	4644	4329	4056	3817	3600	3438	3289	3151	3024	2910
5284	4910	4574	4285	4030	3800	3629	3470	3324	3191	3070
5575	5177	4821	4513	4244	4000	3819	3652	3498	3357	3229
5867	5445	5068	4743	4457	4200	4010	3833	3671	3522	3388
6161	5715	5316	4972	4671	4400	4200	4015	3844	3688	3547
6457	5985	5564	5202	4886	4600	4390	4196	4017	3853	3706
6754	6257	5813	5433	5100	4800	4580	4377	4190	4019	3864
7053	6530	6063	5664	5314	5000	4770	4558	4362	4184	4022

Long Range Cruise Enroute Fuel and Time - High Altitudes

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
400	1.9	1:04	1.8	1:03	1.7	1:01	1.7	1:00	1.6	0:59
600	2.8	1:37	2.7	1:35	2.6	1:32	2.5	1:30	2.4	1:28
800	3.7	2:10	3.6	2:06	3.5	2:03	3.3	2:00	3.2	1:57
1000	4.6	2:42	4.5	2:38	4.3	2:34	4.2	2:30	4.1	2:26
1200	5.6	3:15	5.4	3:10	5.2	3:05	5.0	3:00	4.9	2:55
1400	6.5	3:48	6.3	3:42	6.1	3:36	5.9	3:30	5.7	3:24
1600	7.4	4:21	7.2	4:14	6.9	4:07	6.7	4:00	6.5	3:53
1800	8.3	4:54	8.1	4:46	7.8	4:38	7.6	4:30	7.3	4:21
2000	9.3	5:26	9.0	5:18	8.7	5:09	8.4	5:00	8.1	4:50
2200	10.2	6:01	9.8	5:51	9.5	5:41	9.2	5:31	8.9	5:20
2400	11.0	6:35	10.7	6:24	10.3	6:14	10.0	6:02	9.7	5:51
2600	11.9	7:10	11.5	6:58	11.2	6:46	10.8	6:34	10.5	6:21
2800	12.8	7:44	12.4	7:31	12.0	7:18	11.6	7:05	11.3	6:51
3000	13.7	8:19	13.3	8:04	12.8	7:50	12.4	7:36	12.1	7:21
3200	14.6	8:55	14.1	8:39	13.6	8:24	13.2	8:09	12.8	7:52
3400	15.4	9:32	14.9	9:14	14.4	8:58	14.0	8:41	13.6	8:24
3600	16.3	10:08	15.8	9:49	15.2	9:31	14.8	9:14	14.3	8:55
3800	17.2	10:45	16.6	10:24	16.0	10:05	15.5	9:46	15.1	9:26
4000	18.0	11:22	17.4	10:59	16.8	10:39	16.3	10:19	15.8	9:58
4200	18.8	12:01	18.2	11:36	17.6	11:14	17.0	10:53	16.5	10:31
4400	19.6	12:40	19.0	12:14	18.4	11:50	17.8	11:27	17.2	11:03
4600	20.5	13:19	19.8	12:51	19.1	12:25	18.5	12:01	17.9	11:36
4800	21.3	13:58	20.6	13:28	19.9	13:01	19.2	12:35	18.6	12:09
5000	22.1	14:37	21.4	14:05	20.6	13:36	20.0	13:09	19.4	12:41

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	30	40	50	60	70	80
2	-0.3	-0.1	0.0	0.3	1.0	2.0
4	-0.6	-0.3	0.0	0.6	1.6	3.2
6	-1.0	-0.4	0.0	0.8	2.3	4.3
8	-1.4	-0.6	0.0	1.1	2.9	5.4
10	-1.8	-0.8	0.0	1.3	3.4	6.3
12	-2.2	-0.9	0.0	1.5	3.9	7.2
14	-2.6	-1.1	0.0	1.8	4.4	7.9
16	-3.0	-1.3	0.0	2.0	4.8	8.5
18	-3.5	-1.6	0.0	2.2	5.2	9.1
20	-4.0	-1.8	0.0	2.4	5.6	9.5
22	-4.5	-2.0	0.0	2.6	5.9	9.8
24	-5.0	-2.2	0.0	2.8	6.2	10.1

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)										
	80	75	70	65	60	55	50	45	40	35	30
41					23	7	0	3	15	35	62
39			42	19	6	0	3	13	29	52	80
37		32	14	4	0	3	11	26	45	69	98
35	23	10	2	0	3	11	24	41	62	87	115
33	6	1	0	4	12	24	39	58	80	104	131
31	0	1	6	14	25	39	56	75	97	121	147
29	3	8	16	27	40	55	72	92	113	136	161
27	11	19	29	41	55	71	89	108	129	151	174
25	22	32	44	57	71	87	105	124	143	164	186

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); This difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

Descent
.78/280/250

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)			
			LANDING WEIGHT (1000 KG)			
			40	50	60	70
41000	26	340	104	120	132	139
39000	25	330	99	115	127	134
37000	25	330	94	110	121	129
35000	24	320	90	105	116	123
33000	23	320	86	101	111	118
31000	22	310	82	95	105	112
29000	21	310	77	89	99	105
27000	20	300	72	84	92	98
25000	19	290	68	78	86	91
23000	18	280	63	73	80	84
21000	17	270	58	67	74	78
19000	16	260	54	62	67	71
17000	15	250	49	56	61	64
15000	14	240	45	51	55	58
10000	10	200	31	35	37	38
5000	7	150	18	19	21	21
1500	4	110	9	9	9	9

Allowances for a straight-in approach are included.

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	41000
80	%N1	63.2	66.1	69.8	74.0	78.2	82.5	86.6	93.7	
	KIAS	247	247	248	250	251	253	256	259	
	FF/ENG	1440	1420	1410	1410	1380	1390	1420	1580	
75	%N1	61.4	64.5	68.2	72.4	76.5	80.9	85.0	90.2	
	KIAS	239	240	240	242	243	245	248	251	
	FF/ENG	1360	1340	1330	1320	1290	1290	1320	1400	
70	%N1	59.6	62.6	66.5	70.5	74.7	79.1	83.2	87.9	
	KIAS	231	231	232	233	235	236	239	242	
	FF/ENG	1280	1260	1240	1230	1210	1200	1230	1270	
65	%N1	57.9	60.5	64.8	68.5	72.8	77.2	81.4	85.8	
	KIAS	223	223	223	224	226	227	229	232	
	FF/ENG	1200	1180	1160	1150	1130	1110	1130	1160	
60	%N1	56.0	58.5	62.8	66.5	70.9	75.1	79.4	83.7	94.2
	KIAS	214	214	215	215	217	218	220	222	226
	FF/ENG	1120	1090	1080	1060	1050	1020	1040	1060	1230
55	%N1	53.9	56.5	60.3	64.5	68.6	72.9	77.3	81.6	89.6
	KIAS	204	205	206	206	207	208	210	212	215
	FF/ENG	1040	1010	1000	980	960	940	950	960	1050
50	%N1	51.7	54.2	57.9	62.3	66.1	70.6	74.9	79.3	86.6
	KIAS	195	195	196	197	197	198	200	201	204
	FF/ENG	960	930	910	900	880	860	860	880	930
45	%N1	49.3	51.8	55.4	59.4	63.6	67.9	72.1	76.7	83.8
	KIAS	185	185	186	186	187	188	189	191	193
	FF/ENG	880	850	830	830	810	800	790	790	830
40	%N1	46.7	49.1	52.8	56.5	60.9	64.8	69.3	73.8	80.9
	KIAS	177	177	177	177	177	177	178	179	181
	FF/ENG	820	790	770	750	730	720	710	700	730
35	%N1	44.1	46.4	49.9	53.6	57.5	61.8	66.1	70.4	77.6
	KIAS	171	171	171	171	171	171	171	171	171
	FF/ENG	740	720	690	670	650	640	630	620	640

This table includes 5% additional fuel for holding in a racetrack pattern.

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2885	210/-140	60/80	-100	370	30	-30	60	-60	210	60	120
MAX AUTO	3520	190/-185	80/100	-130	450	0	0	80	-80	340	0	10
AUTOBRAKE 3	4890	320/-305	130/170	-220	740	0	-10	130	-130	550	0	0
AUTOBRAKE 2	6285	445/-440	180/250	-300	1030	80	-110	170	-170	550	130	130
AUTOBRAKE 1	7000	530/-525	220/300	-350	1210	190	-200	200	-190	540	570	710

Good Reported Braking Action

MAX MANUAL	4465	270/-265	115/150	-205	715	105	-90	105	-100	345	230	510
MAX AUTO	4880	295/-275	115/175	-205	740	85	-65	105	-110	405	255	565
AUTOBRAKE 3	5635	370/-350	150/200	-250	865	25	-10	150	-145	635	15	60
AUTOBRAKE 2	7225	510/-505	210/290	-345	1185	95	-125	200	-195	635	150	150

Medium Reported Braking Action

MAX MANUAL	6070	420/-405	175/255	-320	1185	280	-215	150	-160	460	625	1520
MAX AUTO	6300	435/-415	185/245	-320	1175	245	-180	150	-160	530	625	1495
AUTOBRAKE 3	6415	435/-415	185/245	-330	1210	200	-135	165	-160	635	510	1440
AUTOBRAKE 2	7410	520/-515	220/290	-375	1350	175	-195	200	-205	635	300	725

Poor Reported Braking Action

MAX MANUAL	7890	600/-580	255/360	-480	1875	660	-425	210	-215	545	1350	3615
MAX AUTO	8220	600/-570	255/360	-480	1865	670	-425	210	-205	555	1360	3650
AUTOBRAKE 3	8220	610/-580	255/360	-480	1865	645	-400	210	-215	600	1350	3625
AUTOBRAKE 2	8400	625/-605	265/370	-505	1925	575	-400	220	-225	635	1085	3280

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 170 ft.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

Intentionally
Blank

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2860	190/-140	60/80	-100	370	40	-30	60	-60	220	60	120
MAX AUTO	3430	190/-175	80/100	-130	440	10	0	70	-70	340	0	20
AUTOBRAKE 3	4725	310/-295	130/170	-210	720	0	-10	120	-120	540	0	0
AUTOBRAKE 2	6070	420/-415	180/240	-290	1010	80	-100	170	-170	540	110	110
AUTOBRAKE 1	6780	510/-495	210/300	-340	1190	180	-190	190	-190	520	500	640

Good Reported Braking Action

MAX MANUAL	4405	270/-250	115/150	-195	715	105	-90	105	-100	360	220	485
MAX AUTO	4800	295/-275	115/175	-205	740	95	-65	105	-100	415	245	530
AUTOBRAKE 3	5445	355/-340	150/200	-240	855	25	-10	140	-135	625	15	60
AUTOBRAKE 2	6980	485/-480	210/325	-330	1165	95	-110	200	-195	625	130	130

Medium Reported Braking Action

MAX MANUAL	5955	420/-390	175/255	-320	1175	280	-215	150	-145	460	590	1415
MAX AUTO	6175	420/-405	175/255	-320	1175	245	-180	150	-145	530	575	1395
AUTOBRAKE 3	6270	435/-405	185/245	-320	1185	210	-135	165	-160	625	520	1380
AUTOBRAKE 2	7170	510/-490	210/300	-365	1325	185	-180	200	-195	625	280	690

Poor Reported Braking Action

MAX MANUAL	7700	585/-555	245/360	-480	1865	660	-425	200	-205	545	1255	3305
MAX AUTO	8025	585/-555	245/360	-470	1840	660	-410	200	-205	545	1265	3335
AUTOBRAKE 3	8025	600/-555	255/345	-480	1855	645	-400	200	-205	590	1255	3315
AUTOBRAKE 2	8165	610/-580	255/370	-490	1900	590	-390	220	-215	610	1015	3015

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 170 ft.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPROACH SPEED PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	3750	420/-240	140/140	-130	610	50	-40	300
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4580	300/-290	120/170	-220	860	140	-110	370
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2940	225/-160	70/90	-110	380	40	-30	270
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	2880	190/-140	70/90	-90	380	40	-30	270
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2880	190/-140	70/90	-90	380	40	-30	280
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3170	190/-180	70/90	-130	460	50	-30	250
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4250	250/-240	100/150	-180	610	100	-95	460
LEADING EDGE FLAPS TRANSIT	VREF15+15	3070	225/-160	70/90	-110	400	40	-30	220
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2740	200/-140	50/90	-90	370	40	-30	200
ONE ENGINE INOPERATIVE (FLAPS 30)	VREF30	2660	185/-130	50/85	-95	365	35	-30	215
STABILIZER TRIM INOPERATIVE	VREF15	2730	200/-140	50/65	-90	370	40	-30	200

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2750	210/-140	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2730	200/-140	50/65	-90	370	40	-30	200
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3190	270/-190	70/100	-110	400	40	-30	220
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2750	210/-140	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2730	200/-140	50/65	-90	370	40	-30	200
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	2730	200/-140	50/65	-90	370	40	-30	200
TRAILING EDGE FLAPS UP	VREF40+40	3380	320/-210	90/90	-110	450	40	-30	230

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	5110	300/-290	150/200	-190	710	100	-90	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5070	355/-340	150/200	-260	1040	200	-160	400
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4200	280/-270	120/150	-180	680	120	-90	380
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4070	270/-260	120/150	-180	680	120	-90	400
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4020	270/-260	100/150	-180	680	120	-90	420
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3880	250/-240	100/140	-180	630	90	-80	320
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4960	320/-310	140/170	-210	760	150	-130	530
LEADING EDGE FLAPS TRANSIT	VREF15+15	4270	270/-260	120/150	-180	660	100	-80	300
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3880	250/-240	100/140	-180	640	100	-80	320
ONE ENGINE INOPERATIVE (FLAPS 30)	VREF30	3750	230/-220	90/140	-180	640	90	-80	320
STABILIZER TRIM INOPERATIVE	VREF15	3750	230/-220	100/120	-160	610	90	-60	280

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	3650	240/-230	100/140	-180	620	90	-80	300
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3740	230/-220	100/120	-160	610	90	-60	280
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4370	250/-260	120/170	-180	660	90	-80	280
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	3650	240/-230	100/140	-180	620	90	-80	300
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3740	230/-220	100/120	-160	610	90	-60	280
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	3740	230/-220	100/120	-160	610	90	-60	280
TRAILING EDGE FLAPS UP	VREF40+40	4610	270/-270	140/170	-190	680	100	-80	270

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	7160	500/-490	230/320	-320	1190	270	-220	380
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6370	500/-470	200/270	-390	1610	450	-320	460
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5710	455/-440	190/230	-290	1120	270	-210	500
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	5450	430/-410	230/230	-290	1090	270	-210	500
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5340	420/-390	250/250	-290	1090	270	-210	500
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5240	405/-390	220/220	-270	1050	220	-180	420
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	6830	500/-470	200/270	-340	1210	350	-290	640
LEADING EDGE FLAPS TRANSIT	VREF15+15	5800	430/-420	190/250	-290	1090	230	-190	400
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	5480	420/-410	170/220	-290	1120	270	-210	430
ONE ENGINE INOPERATIVE (FLAPS 30)	VREF30	5220	380/-370	150/200	-270	1090	250	-190	430
STABILIZER TRIM INOPERATIVE	VREF15	5060	380/-360	220/220	-260	1020	200	-160	380

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4930	370/-350	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5060	380/-360	150/220	-260	1020	200	-160	380
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	5990	420/-410	190/270	-290	1100	230	-190	380
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4930	370/-350	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5060	380/-360	150/220	-260	1020	200	-160	380
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	5060	380/-360	150/220	-260	1020	200	-160	380
TRAILING EDGE FLAPS UP	VREF40+40	6390	455/-440	200/270	-310	1140	250	-190	380

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT): REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS: HEAD WIND	WIND ADJ PER 10 KTS: TAIL WIND	SLOPE ADJ PER 1%: DOWN HILL	SLOPE ADJ PER 1%: UP HILL	APPROACH SPEED: PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	9450	730/-720	330/480	-490	1880	610	-450	500
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8390	710/-670	270/400	-650	3010	1530	-720	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	7350	640/-600	270/330	-440	1760	580	-420	600
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6980	600/-570	230/350	-420	1730	560	-410	560
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	6780	585/-540	230/380	-420	1690	550	-390	560
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6780	585/-540	230/330	-410	1680	500	-360	500
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	8780	710/-670	280/390	-490	1860	690	-520	730
LEADING EDGE FLAPS TRANSIT	VREF15+15	7500	610/-590	250/370	-440	1730	530	-370	480
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	7490	635/-600	250/330	-450	1840	660	-470	550
ONE ENGINE INOPERATIVE (FLAPS 30)	VREF30	7030	580/-550	220/320	-440	1790	610	-440	510
STABILIZER TRIM INOPERATIVE	VREF15	6530	550/-500	220/300	-410	1630	460	-340	450

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 55000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 55000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPROACH SPEED PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	6355	520/-500	220/320	-420	1630	570	-370	470
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	6530	550/-500	220/300	-410	1630	460	-340	450
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	7780	610/-590	270/380	-440	1740	530	-390	460
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	6355	520/-500	220/320	-420	1630	570	-370	470
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	6530	550/-500	220/300	-410	1630	460	-340	450
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	6530	550/-500	220/300	-410	1630	460	-340	450
TRAILING EDGE FLAPS UP	VREF40+40	8350	640/-630	280/400	-450	1790	560	-410	460

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy Per Brake (Millions of Foot Pounds)

		WIND CORRECTED BRAKES ON SPEED (KIAS)*																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
80	0	14.8	16.8	19.1	22.2	25.5	29.4	30.7	35.5	41.1	40.3	46.6	53.8	50.7	58.4	67.2	60.5	69.2	79.2
	10	15.2	17.3	19.7	22.9	26.4	30.4	31.7	36.7	42.5	41.6	48.1	55.6	52.4	60.2	69.3	62.4	71.3	81.5
	15	15.5	17.6	20.0	23.2	26.8	30.9	32.2	37.3	43.2	42.3	48.9	56.4	53.2	61.2	70.3	63.3	72.4	82.7
	20	15.7	17.8	20.3	23.6	27.2	31.4	32.7	37.9	43.8	43.0	49.6	57.3	54.0	62.1	71.3	64.3	73.4	83.8
	30	16.0	18.2	20.8	24.1	27.8	32.1	33.5	38.8	44.9	44.0	50.9	58.8	55.4	63.7	73.2	65.9	75.3	86.0
	40	16.2	18.4	21.1	24.5	28.3	32.7	34.1	39.5	45.8	44.9	51.9	59.9	56.5	65.0	74.7	67.3	76.9	87.9
	50	16.3	18.6	21.2	24.7	28.5	33.0	34.5	40.0	46.3	45.4	52.6	60.8	57.3	66.0	76.0	68.4	78.3	89.6
70	0	13.4	15.1	17.2	19.9	22.9	26.3	27.5	31.8	36.7	35.9	41.6	48.1	45.2	52.1	60.1	54.5	62.6	71.9
	10	13.8	15.6	17.7	20.6	23.6	27.2	28.4	32.8	38.0	37.1	42.9	49.7	46.7	53.8	62.0	56.3	64.6	74.1
	15	14.0	15.8	17.9	20.9	24.0	27.7	28.8	33.3	38.6	37.7	43.6	50.5	47.4	54.7	63.0	57.2	65.6	75.2
	20	14.2	16.0	18.2	21.2	24.4	28.1	29.3	33.9	39.2	38.3	44.3	51.2	48.1	55.5	63.9	58.0	66.6	76.3
	30	14.4	16.3	18.6	21.7	24.9	28.7	30.0	34.7	40.2	39.3	45.4	52.5	49.4	56.9	65.6	59.5	68.3	78.2
	40	14.6	16.6	18.8	22.0	25.3	29.2	30.5	35.3	40.9	40.0	46.3	53.6	50.3	58.0	66.9	60.7	69.7	79.9
	50	14.7	16.7	19.0	22.2	25.5	29.5	30.8	35.7	41.4	40.4	46.8	54.3	51.0	58.9	68.0	61.6	70.8	81.4
60	0	12.0	13.5	15.2	17.7	20.3	23.2	24.2	28.0	32.3	31.5	36.5	42.2	39.5	45.7	52.8	48.1	55.4	63.8
	10	12.4	13.9	15.7	18.3	20.9	24.0	25.0	28.9	33.4	32.6	37.7	43.6	40.8	47.2	54.5	49.6	57.1	65.8
	15	12.5	14.1	15.9	18.5	21.2	24.4	25.4	29.3	33.9	33.1	38.3	44.3	41.5	47.9	55.4	50.4	58.0	66.8
	20	12.7	14.2	16.1	18.8	21.5	24.7	25.8	29.8	34.4	33.6	38.9	45.0	42.1	48.7	56.2	51.2	58.9	67.8
	30	12.9	14.5	16.4	19.2	22.0	25.3	26.4	30.5	35.3	34.4	39.8	46.1	43.2	49.9	57.6	52.5	60.4	69.5
	40	13.1	14.7	16.6	19.5	22.3	25.7	26.8	31.0	35.9	35.0	40.6	47.0	44.0	50.9	58.8	53.5	61.6	71.0
	50	13.1	14.8	16.7	19.6	22.5	25.9	27.1	31.3	36.3	35.4	41.0	47.6	44.5	51.5	59.6	54.2	62.6	72.1
50	0	10.7	11.9	13.3	15.5	17.6	20.1	21.0	24.1	27.8	27.1	31.3	36.2	33.7	39.0	45.2	41.0	47.4	54.7
	10	11.0	12.2	13.7	16.0	18.2	20.8	21.6	24.9	28.7	28.0	32.3	37.4	34.8	40.3	46.7	42.4	48.9	56.5
	15	11.1	12.4	13.8	16.2	18.4	21.1	22.0	25.3	29.2	28.4	32.8	38.0	35.4	41.0	47.4	43.0	49.7	57.4
	20	11.2	12.5	14.0	16.4	18.7	21.4	22.3	25.7	29.6	28.8	33.3	38.6	36.0	41.6	48.1	43.7	50.5	58.2
	30	11.4	12.7	14.3	16.7	19.1	21.9	22.8	26.3	30.3	29.5	34.1	39.5	36.8	42.6	49.4	44.8	51.7	59.7
	40	11.5	12.9	14.5	17.0	19.4	22.2	23.1	26.7	30.8	30.0	34.7	40.2	37.5	43.4	50.3	45.6	52.8	60.9
	50	11.6	13.0	14.5	17.1	19.5	22.4	23.3	26.9	31.1	30.3	35.1	40.7	37.9	44.0	51.0	46.2	53.5	61.9
40	0	9.4	10.3	11.4	13.3	15.0	17.0	17.7	20.2	23.2	22.5	26.0	30.0	27.8	32.2	37.2	33.4	38.6	44.7
	10	9.6	10.6	11.7	13.7	15.4	17.5	18.2	20.9	24.0	23.3	26.8	31.0	28.7	33.2	38.5	34.5	39.9	46.2
	15	9.7	10.7	11.9	13.8	15.6	17.8	18.5	21.2	24.3	23.7	27.3	31.5	29.2	33.8	39.1	35.1	40.6	46.9
	20	9.8	10.8	12.0	14.0	15.8	18.0	18.8	21.5	24.7	24.0	27.7	32.0	29.6	34.3	39.7	35.6	41.2	47.7
	30	10.0	11.0	12.2	14.3	16.2	18.4	19.2	22.0	25.3	24.6	28.3	32.7	30.4	35.1	40.7	36.5	42.2	48.9
	40	10.0	11.1	12.4	14.5	16.4	18.6	19.4	22.3	25.7	24.9	28.8	33.3	30.9	35.8	41.4	37.1	43.0	49.8
	50	10.1	11.2	12.4	14.6	16.5	18.8	19.6	22.5	25.9	25.2	29.1	33.6	31.2	36.1	41.9	37.5	43.5	50.5

***To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.**
If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.3	16.0	25.5	34.8	44.3	54.2	64.5	75.4	86.7
LANDING	MAX AUTO	5.8	15.2	24.5	33.6	43.0	52.8	63.1	73.9	85.2
LANDING	AUTOBRAKE 3	5.4	14.1	22.4	30.4	38.6	47.8	57.9	68.9	80.8
LANDING	AUTOBRAKE 2	4.9	12.9	20.5	27.5	34.8	43.1	52.4	62.8	74.2
LANDING	AUTOBRAKE 1	4.4	11.9	18.8	25.0	31.4	38.6	46.7	55.7	65.5

Two Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.2	15.0	23.8	32.3	41.1	50.6	60.7	71.5	83.0
LANDING	MAX AUTO	4.9	12.8	20.9	29.1	37.8	47.3	57.6	68.8	80.8
LANDING	AUTOBRAKE 3	2.8	8.7	14.8	21.0	27.8	35.6	44.5	54.5	65.5
LANDING	AUTOBRAKE 2	1.3	5.5	9.8	14.2	19.1	25.2	32.3	40.6	49.9
LANDING	AUTOBRAKE 1	0.2	3.1	6.0	8.7	11.9	16.0	21.1	27.1	34.0

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	22	25	28	31	32 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	3.8	4.3	4.9	5.0 TO 7.4	7.4 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND	NO SPECIAL PROCEDURE REQUIRED	10	20	30	40	50	60	CAUTION	FUSE PLUG MELT ZONE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds per brake for each taxi mile.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 7 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on CDS systems page may be used 10 to 15 minutes after airplane has come to a complete stop or inflight with gear retracted to determine recommended cooling schedule.

Intentionally
Blank

Performance Inflight — Chapter PI
Engine Inoperative — Section 13

ENGINE INOP

Initial Max Continuous %N1
Based on .79M, A/C high and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
20	96.0	95.8	95.6	95.4	95.1	94.7	94.2	93.9	93.1
15	96.6	96.4	96.1	96.0	95.9	95.4	95.0	94.7	94.0
10	97.2	97.1	96.7	96.6	96.6	96.2	95.7	95.5	94.9
5	97.4	97.8	97.5	97.3	97.3	96.9	96.5	96.3	95.8
0	96.7	98.0	98.4	98.2	98.1	97.7	97.4	97.1	96.7
-5	95.9	97.2	98.4	99.1	99.0	98.5	98.2	98.0	97.7
-10	95.1	96.4	97.6	98.9	99.8	99.4	99.1	98.9	98.6
-15	94.3	95.7	96.9	98.1	99.4	100.3	100.0	99.8	99.6
-20	93.5	94.9	96.1	97.3	98.6	99.8	100.3	100.1	99.9
-25	92.7	94.1	95.3	96.5	97.8	98.9	99.5	99.3	99.1
-30	91.8	93.3	94.5	95.7	96.9	98.1	98.6	98.4	98.2
-35	91.0	92.5	93.6	94.8	96.1	97.2	97.8	97.6	97.4
-40	90.1	91.7	92.8	94.0	95.3	96.4	96.9	96.7	96.5

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
ENGINE ANTI-ICE	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE	-4.2	-4.4	-4.5	-4.7	-5.0	-4.8	-4.8	-4.8	-4.8

ENGINE INOP

Max Continuous %N1
37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.51	96.0	96.9	97.8	98.7	99.5	98.9	98.0	96.8	95.5	93.9	92.4	91.1
200	.63	95.3	96.2	97.1	98.0	98.8	99.7	99.4	98.6	97.7	96.7	95.5	94.4
240	.74	94.4	95.3	96.1	97.0	97.9	98.7	99.6	100.0	99.2	98.4	97.6	96.6
280	.86	93.6	94.5	95.4	96.3	97.1	98.0	98.8	99.6	100.4	100.1	99.2	98.4

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	95.8	96.7	97.6	98.5	99.4	99.1	98.3	97.2	96.0	94.6	93.2	92.0
200	.60	95.4	96.4	97.2	98.1	99.0	99.9	99.8	98.8	97.9	96.9	95.7	94.6
240	.71	94.3	95.2	96.1	97.0	97.9	98.7	99.6	100.1	99.4	98.8	97.9	96.9
280	.82	93.1	94.0	94.8	95.7	96.5	97.4	98.2	99.0	99.8	99.6	98.8	98.0

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	96.7	97.6	98.4	99.3	100.1	99.3	98.4	97.2	95.9	94.5	93.1	91.9
200	.58	96.3	97.2	98.1	99.0	99.8	100.7	99.8	98.9	97.9	96.7	95.5	94.4
240	.68	95.2	96.1	97.0	97.8	98.7	99.5	100.4	100.1	99.5	98.6	97.6	96.6
280	.79	93.6	94.4	95.3	96.1	97.0	97.8	98.6	99.4	99.8	99.0	98.1	97.3
320	.89	92.9	93.8	94.7	95.5	96.3	97.2	98.0	98.8	99.6	100.3	100.0	99.1

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	96.7	97.5	98.4	99.3	100.2	100.3	99.5	98.4	97.2	95.8	94.4	93.1
200	.55	96.4	97.3	98.1	99.0	99.9	100.7	100.9	100.0	99.0	97.9	96.6	95.4
240	.66	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.6	99.8	99.0	98.0	97.0
280	.76	93.1	94.0	94.8	95.6	96.5	97.3	98.1	98.9	99.7	99.0	98.1	97.2
320	.85	91.7	92.5	93.4	94.2	95.0	95.8	96.6	97.4	98.2	99.0	99.2	98.3

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	97.4	98.3	99.2	100.0	100.9	100.5	99.5	98.4	97.1	95.6	94.3	93.0
200	.53	96.8	97.7	98.6	99.4	100.3	101.1	100.6	99.6	98.6	97.4	96.2	95.0
240	.63	95.6	96.4	97.3	98.1	99.0	99.8	100.6	100.3	99.4	98.5	97.4	96.5
280	.73	93.5	94.3	95.2	96.0	96.8	97.6	98.4	99.2	99.3	98.4	97.4	96.7
320	.82	91.3	92.2	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	97.7	96.9
360	.91	91.3	92.2	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	99.3

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	29	31	33	35	37
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-4.1	-4.3	-4.5	-4.7	-4.7

ENGINE INOP

Max Continuous %N1
27000 FT to 20000 FT Pressure Altitudes

27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	97.3	98.1	99.0	99.9	100.7	101.5	100.5	99.5	98.3	96.9	95.6	94.3
200	.51	96.2	97.1	98.0	98.8	99.7	100.5	101.0	100.1	99.1	98.0	96.8	95.6
240	.60	94.9	95.8	96.7	97.5	98.3	99.2	100.0	100.6	99.6	98.6	97.6	96.7
280	.70	92.9	93.7	94.6	95.4	96.2	97.0	97.8	98.6	99.4	98.6	97.6	96.8
320	.79	90.8	91.6	92.5	93.3	94.1	94.9	95.6	96.4	97.2	97.9	97.8	97.1
360	.88	90.0	90.9	91.7	92.5	93.4	94.2	95.0	95.7	96.5	97.3	98.0	98.6

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.1	98.9	99.8	100.7	101.5	101.6	100.6	99.5	98.3	96.9	95.7	94.4
200	.49	96.7	97.6	98.5	99.3	100.1	100.9	100.8	99.8	98.8	97.6	96.5	95.4
240	.58	95.0	95.8	96.7	97.5	98.3	99.1	99.9	99.7	98.8	97.8	96.8	95.9
280	.67	93.1	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.8	96.8	96.1
320	.76	90.8	91.7	92.5	93.3	94.1	94.9	95.7	96.5	97.2	97.8	97.1	96.4
360	.85	89.5	90.3	91.2	92.0	92.9	93.7	94.5	95.3	96.1	96.9	97.6	97.4

24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	96.9	97.8	98.6	99.5	100.3	101.1	100.0	98.9	97.7	96.4	95.2	94.0
200	.48	95.7	96.6	97.4	98.2	99.0	99.9	100.3	99.3	98.2	97.1	96.0	94.9
240	.57	94.1	94.9	95.7	96.5	97.3	98.1	98.9	99.3	98.3	97.2	96.3	95.4
280	.66	92.3	93.1	94.0	94.8	95.5	96.3	97.1	97.9	98.4	97.3	96.3	95.6
320	.75	89.8	90.7	91.5	92.4	93.2	94.0	94.8	95.6	96.4	97.2	96.6	95.9
360	.83	88.3	89.2	90.0	90.9	91.7	92.5	93.4	94.2	95.0	95.8	96.5	96.6

22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	95.5	96.3	97.1	97.9	98.7	98.9	97.7	96.3	95.3	94.2	93.1	92.0
200	.46	94.4	95.2	96.0	96.8	97.6	98.4	98.1	97.0	95.9	94.9	93.9	92.9
240	.55	92.9	93.7	94.5	95.3	96.1	96.9	97.6	97.2	96.1	95.2	94.4	93.5
280	.63	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	96.3	95.4	94.6	93.9
320	.72	89.0	89.9	90.7	91.5	92.4	93.2	94.0	94.8	95.6	95.7	95.0	94.2
360	.80	87.3	88.2	89.0	89.9	90.7	91.5	92.3	93.1	93.9	94.7	95.3	94.7

20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	93.2	94.0	94.8	95.6	96.4	97.1	96.5	95.0	93.9	93.0	92.1	91.1
200	.44	92.1	92.9	93.7	94.5	95.3	96.1	96.9	95.7	94.5	93.6	92.7	91.9
240	.53	90.4	91.3	92.1	92.9	93.7	94.5	95.3	96.0	95.0	94.1	93.3	92.5
280	.61	88.8	89.6	90.5	91.3	92.1	92.9	93.8	94.6	95.2	94.4	93.5	92.8
320	.69	87.1	88.0	88.9	89.7	90.5	91.4	92.2	93.0	93.8	94.6	93.9	93.2
360	.77	85.8	86.6	87.5	88.3	89.1	89.9	90.8	91.6	92.4	93.1	93.9	93.7

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	20	22	24	25	27
ENGINE ANTI-ICE ON	-0.9	-0.9	-1.0	-1.0	-1.0
ENGINE & WING ANTI-ICE ON	-3.6	-3.8	-3.8	-3.9	-4.0

ENGINE INOP

Max Continuous %N1
18000 FT to 12000 FT Pressure Altitudes

18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.34	90.6	91.5	92.3	93.1	93.9	94.7	93.7	92.6	91.7	90.8	89.9	89.0
200	.42	89.8	90.7	91.5	92.3	93.2	94.0	94.3	93.3	92.3	91.4	90.6	89.7
240	.51	88.7	89.5	90.4	91.2	92.0	92.9	93.7	93.7	92.9	92.0	91.2	90.4
280	.59	87.4	88.3	89.1	89.9	90.8	91.6	92.4	93.2	93.2	92.4	91.6	90.9
320	.67	86.1	86.9	87.8	88.6	89.4	90.2	91.0	91.8	92.6	92.7	92.0	91.3
360	.75	84.8	85.7	86.5	87.3	88.1	88.9	89.7	90.5	91.3	92.1	92.4	91.8
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	88.2	89.1	89.9	90.7	91.6	92.4	92.8	91.9	91.0	90.1	89.3	88.4
200	.41	87.2	88.0	88.9	89.7	90.5	91.4	92.2	92.0	91.1	90.3	89.5	88.6
240	.49	86.3	87.2	88.0	88.8	89.6	90.4	91.2	92.0	91.5	90.7	90.0	89.2
280	.57	85.3	86.2	87.0	87.8	88.6	89.4	90.2	91.0	91.8	91.1	90.4	89.6
320	.64	84.3	85.1	85.9	86.7	87.5	88.3	89.1	89.9	90.7	91.5	90.9	90.1
360	.72	83.1	84.0	84.8	85.6	86.4	87.2	87.9	88.7	89.5	90.2	91.0	90.6
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	88.3	89.2	90.0	90.8	91.6	92.5	92.4	91.5	90.7	89.9	89.0	88.2
200	.39	86.8	87.6	88.4	89.2	90.1	90.9	91.6	91.0	90.1	89.3	88.5	87.7
240	.47	85.8	86.6	87.4	88.2	89.0	89.8	90.6	91.1	90.3	89.5	88.8	88.0
280	.54	84.9	85.7	86.5	87.3	88.1	88.9	89.7	90.5	90.7	90.0	89.2	88.5
320	.62	83.9	84.7	85.5	86.3	87.1	87.9	88.7	89.5	90.2	90.4	89.7	88.9
360	.69	82.9	83.7	84.5	85.3	86.1	86.8	87.6	88.4	89.1	89.9	90.1	89.4
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	87.8	88.6	89.4	90.2	91.0	91.8	91.3	90.4	89.6	88.8	88.0	87.1
200	.38	86.4	87.2	88.0	88.8	89.6	90.4	90.8	90.0	89.2	88.4	87.6	86.8
240	.45	85.6	86.4	87.2	88.0	88.8	89.6	90.4	90.3	89.6	88.8	88.0	87.2
280	.52	84.9	85.7	86.5	87.3	88.0	88.8	89.6	90.3	90.0	89.2	88.5	87.7
320	.60	84.0	84.8	85.6	86.4	87.1	87.9	88.7	89.4	90.2	89.7	89.0	88.2
360	.67	83.0	83.8	84.6	85.4	86.1	86.9	87.7	88.4	89.1	89.9	89.4	88.7

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	12	14	16	18
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9
ENGINE & WING ANTI-ICE ON	-3.2	-3.4	-3.4	-3.5

ENGINE INOP

Max Continuous %N1
10000 FT to 1000 FT Pressure Altitudes

10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.29	86.4	87.2	88.0	88.8	89.6	90.4	91.1	90.3	89.4	88.6	87.8	86.9
200	.36	85.3	86.1	86.9	87.7	88.5	89.3	90.1	90.0	89.2	88.4	87.6	86.8
240	.43	84.7	85.5	86.3	87.1	87.8	88.6	89.4	90.1	89.6	88.8	88.0	87.2
280	.51	84.0	84.8	85.6	86.4	87.2	87.9	88.7	89.4	90.0	89.3	88.5	87.7
320	.58	83.2	84.0	84.8	85.6	86.3	87.1	87.8	88.6	89.3	89.7	88.9	88.2
360	.65	82.3	83.1	83.9	84.7	85.4	86.2	86.9	87.7	88.4	89.1	89.4	88.7

5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	85.0	85.7	86.5	87.3	88.0	88.8	89.3	88.4	87.6	86.8	86.0	85.1
200	.33	84.5	85.2	86.0	86.8	87.5	88.3	89.0	88.6	87.8	87.0	86.2	85.4
240	.40	83.8	84.6	85.3	86.1	86.8	87.6	88.3	88.8	88.0	87.2	86.4	85.6
280	.46	83.3	84.0	84.8	85.5	86.3	87.0	87.7	88.5	88.4	87.6	86.9	86.1
320	.53	82.6	83.4	84.1	84.9	85.6	86.3	87.1	87.8	88.5	88.1	87.3	86.6
360	.59	81.9	82.7	83.4	84.2	84.9	85.6	86.3	87.1	87.8	88.5	87.8	87.0

3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	84.3	85.1	85.8	86.6	87.3	88.0	88.1	87.3	86.5	85.7	84.8	84.0
200	.32	84.0	84.7	85.5	86.2	87.0	87.7	88.4	87.6	86.8	86.1	85.2	84.4
240	.38	83.5	84.3	85.0	85.8	86.5	87.2	87.9	88.0	87.2	86.4	85.6	84.8
280	.45	83.1	83.8	84.5	85.3	86.0	86.7	87.4	88.2	87.6	86.8	86.1	85.3
320	.51	82.5	83.2	83.9	84.7	85.4	86.1	86.8	87.5	88.0	87.3	86.5	85.8
360	.57	81.8	82.6	83.3	84.0	84.7	85.4	86.2	86.9	87.5	87.7	86.9	86.1

1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	83.0	83.8	84.5	85.3	86.0	86.7	87.4	87.1	86.3	85.5	84.7	83.8
200	.31	82.8	83.6	84.3	85.0	85.7	86.5	87.2	87.5	86.7	85.9	85.1	84.3
240	.37	82.5	83.2	84.0	84.7	85.4	86.2	86.9	87.6	87.1	86.3	85.5	84.7
280	.43	82.1	82.8	83.6	84.3	85.0	85.7	86.4	87.2	87.6	86.7	85.9	85.2
320	.49	81.5	82.3	83.0	83.7	84.4	85.2	85.9	86.6	87.2	87.2	86.4	85.6
360	.55	81.0	81.7	82.4	83.1	83.8	84.5	85.2	85.9	86.6	87.3	86.8	86.0

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	1	3	5	10
ENGINE ANTI-ICE ON	-0.6	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-2.9	-3.0	-3.1	-3.2

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	75	259	10400	7800	5100
75	70	251	13600	10900	8200
70	66	244	19600	14600	11600
65	62	236	23200	21100	17000
60	57	228	26000	24900	22900
55	53	219	28300	27300	26200
50	48	209	30500	29700	28600
45	43	198	32700	31900	31000
40	38	187	35000	34300	33400
35	33	175	37600	36900	36100
30	29	161	40700	39900	39100

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
140	129	120	113	106	100	95	90	85	82	78
279	259	241	226	212	200	189	180	171	163	156
418	388	361	338	318	300	284	270	256	245	234
558	517	482	451	424	400	379	359	342	326	312
697	646	602	564	530	500	473	449	428	408	390
836	775	722	676	636	600	568	539	513	490	468
975	904	843	789	742	700	663	629	599	571	546
1114	1033	963	902	848	800	757	719	684	653	624
1253	1162	1083	1014	954	900	852	809	770	734	702
1392	1291	1204	1127	1060	1000	947	899	855	816	780
1532	1420	1324	1240	1166	1100	1041	989	941	898	858
1671	1550	1444	1353	1272	1200	1136	1078	1026	979	936
1811	1679	1565	1465	1378	1300	1231	1168	1112	1061	1014
1951	1809	1686	1578	1484	1400	1325	1258	1197	1142	1092
2091	1938	1806	1691	1590	1500	1420	1348	1283	1223	1169
2231	2068	1927	1804	1696	1600	1514	1437	1368	1305	1247
2372	2198	2048	1917	1802	1700	1609	1527	1453	1386	1325
2513	2329	2169	2030	1908	1800	1703	1617	1538	1467	1402

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)									TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)									
	30	35	40	45	50	55	60	65	70	
100	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0:17
200	0.7	0.7	0.8	0.8	0.9	1.0	1.0	1.1	1.1	0:34
300	1.0	1.2	1.2	1.3	1.4	1.5	1.7	1.8	1.8	0:51
400	1.4	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.5	1:08
500	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.2	1:25
600	2.0	2.3	2.5	2.7	3.0	3.2	3.5	3.7	3.9	1:42
700	2.3	2.6	2.9	3.2	3.4	3.8	4.0	4.3	4.6	1:59
800	2.6	3.0	3.3	3.6	3.9	4.3	4.6	4.9	5.3	2:16
900	3.0	3.3	3.7	4.0	4.4	4.8	5.2	5.5	5.9	2:33
1000	3.3	3.7	4.1	4.5	4.9	5.3	5.7	6.1	6.6	2:50
1100	3.6	4.0	4.5	4.9	5.4	5.8	6.3	6.7	7.2	3:07
1200	3.9	4.4	4.8	5.3	5.8	6.3	6.8	7.3	7.9	3:24
1300	4.2	4.7	5.2	5.8	6.3	6.8	7.3	7.9	8.5	3:41
1400	4.5	5.0	5.6	6.2	6.7	7.3	7.9	8.5	9.1	3:58
1500	4.8	5.4	6.0	6.6	7.2	7.8	8.4	9.1	9.8	4:15
1600	5.1	5.7	6.3	7.0	7.6	8.3	8.9	9.6	10.4	4:33
1700	5.3	6.0	6.7	7.4	8.1	8.8	9.5	10.2	11.0	4:50
1800	5.6	6.4	7.1	7.8	8.5	9.3	10.0	10.8	11.6	5:07

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	2700		
75	6000	2900	
70	9300	6700	3400
65	12700	10100	7400
60	20500	13700	11200
55	26100	23700	14900
50	28900	27600	25800
45	31300	30400	29100
40	33700	32900	31800
35	36300	35600	34500
30	39400	38500	37500

With engine anti-ice on, decrease altitude capability by 5900 ft.
With engine and wing anti-ice on, decrease altitude capability by 13000 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
70	%N1	86.6									
	MACH	.510									
	KIAS	282									
	FF/ENG	2499									
65	%N1	84.5	88.8								
	MACH	.491	.542								
	KIAS	271	274								
	FF/ENG	2306	2334								
60	%N1	82.3	86.6	88.4	90.1	92.0	94.0	96.8			
	MACH	.471	.521	.543	.564	.585	.597	.614			
	KIAS	261	263	263	263	263	258	254			
	FF/ENG	2120	2141	2145	2148	2152	2131	2175			
55	%N1	80.0	84.2	86.0	87.8	89.6	91.5	93.6	96.6		
	MACH	.453	.498	.520	.541	.563	.585	.597	.614		
	KIAS	250	251	252	252	253	252	247	244		
	FF/ENG	1945	1948	1952	1954	1959	1966	1953	1997		
50	%N1	77.6	81.6	83.4	85.2	87.0	88.8	90.8	92.9	96.1	
	MACH	.434	.475	.495	.516	.538	.561	.583	.596	.613	
	KIAS	240	239	239	240	241	241	241	236	233	
	FF/ENG	1777	1759	1760	1763	1767	1771	1783	1776	1815	
45	%N1	75.2	78.9	80.5	82.3	84.1	86.0	87.8	89.8	92.0	95.2
	MACH	.415	.452	.469	.489	.511	.533	.556	.578	.593	.610
	KIAS	229	227	227	227	228	229	229	229	225	222
	FF/ENG	1617	1585	1576	1573	1577	1581	1588	1604	1601	1630
40	%N1	72.5	76.0	77.6	79.2	80.9	82.8	84.6	86.5	88.4	90.8
	MACH	.395	.429	.445	.462	.480	.502	.525	.548	.571	.589
	KIAS	218	215	215	214	214	215	216	216	216	214
	FF/ENG	1462	1421	1406	1395	1388	1393	1400	1411	1424	1428
35	%N1	69.4	73.0	74.4	75.9	77.6	79.2	81.0	82.8	84.7	86.6
	MACH	.375	.406	.420	.435	.452	.469	.490	.513	.536	.560
	KIAS	207	203	202	202	201	201	201	202	203	203
	FF/ENG	1314	1266	1247	1230	1217	1209	1212	1224	1233	1243
30	%N1	66.2	69.5	71.0	72.4	73.8	75.4	77.1	78.7	80.6	82.5
	MACH	.355	.382	.394	.407	.422	.438	.455	.474	.496	.520
	KIAS	196	191	190	189	188	187	186	186	187	187
	FF/ENG	1173	1117	1097	1078	1059	1042	1037	1040	1048	1055

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
314	283	256	234	216	200	190	180	172	164	157
634	570	514	470	433	400	379	360	343	327	313
957	859	775	706	650	600	569	540	513	489	468
1283	1150	1036	943	867	800	758	719	684	652	623
1611	1443	1298	1181	1085	1000	947	898	853	814	778
1942	1737	1561	1419	1302	1200	1135	1076	1023	975	933
2276	2034	1825	1658	1520	1400	1324	1255	1193	1136	1087
2612	2332	2090	1897	1739	1600	1513	1434	1362	1297	1240
2951	2631	2356	2137	1957	1800	1702	1613	1531	1459	1394

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.3	0:46	1.1	0:43	1.0	0:41	0.9	0:39	0.8	0:38
400	2.6	1:30	2.4	1:25	2.2	1:20	2.0	1:15	1.8	1:12
600	3.9	2:14	3.6	2:07	3.3	2:00	3.0	1:52	2.9	1:46
800	5.2	2:59	4.8	2:50	4.4	2:39	4.1	2:29	3.9	2:21
1000	6.5	3:45	6.0	3:33	5.5	3:20	5.2	3:07	4.8	2:56
1200	7.8	4:31	7.2	4:16	6.7	4:01	6.2	3:45	5.8	3:31
1400	9.0	5:18	8.3	5:00	7.7	4:42	7.2	4:23	6.8	4:07
1600	10.2	6:05	9.5	5:45	8.8	5:24	8.2	5:02	7.7	4:43
1800	11.5	6:53	10.7	6:30	9.9	6:06	9.2	5:41	8.7	5:19

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
1	-0.1	-0.1	0.0	0.1	0.3
2	-0.3	-0.2	0.0	0.3	0.7
3	-0.5	-0.2	0.0	0.4	1.0
4	-0.6	-0.3	0.0	0.6	1.4
5	-0.8	-0.4	0.0	0.7	1.7
6	-1.0	-0.5	0.0	0.8	2.0
7	-1.1	-0.6	0.0	1.0	2.3
8	-1.3	-0.6	0.0	1.1	2.6
9	-1.4	-0.7	0.0	1.2	2.9
10	-1.6	-0.8	0.0	1.3	3.2
11	-1.8	-0.9	0.0	1.4	3.4
12	-1.9	-1.0	0.0	1.5	3.6
13	-2.1	-1.0	0.0	1.6	3.8
14	-2.3	-1.1	0.0	1.7	4.0

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
80	%N1	80.1	83.1	87.4	91.9					
	KIAS	247	247	248	250					
	FF/ENG	2640	2640	2650	2700					
75	%N1	78.3	81.2	85.5	90.0					
	KIAS	239	240	240	242					
	FF/ENG	2470	2460	2470	2510					
70	%N1	76.5	79.2	83.6	88.0	93.4				
	KIAS	231	231	232	233	235				
	FF/ENG	2310	2300	2300	2320	2370				
65	%N1	74.4	77.2	81.5	85.8	90.6				
	KIAS	223	223	223	224	226				
	FF/ENG	2140	2130	2120	2140	2160				
60	%N1	72.1	75.1	79.2	83.6	88.2	95.3			
	KIAS	214	214	215	215	217	218			
	FF/ENG	1980	1960	1950	1960	1970	2070			
55	%N1	69.7	72.7	76.8	81.1	85.7	91.2			
	KIAS	204	205	206	206	207	208			
	FF/ENG	1820	1800	1790	1790	1790	1830			
50	%N1	67.2	70.0	74.3	78.5	83.0	87.8	96.4		
	KIAS	195	195	196	197	197	198	200		
	FF/ENG	1670	1640	1630	1620	1610	1630	1770		
45	%N1	64.5	67.2	71.4	75.6	80.1	84.8	91.0		
	KIAS	185	185	186	186	187	188	189		
	FF/ENG	1510	1490	1470	1460	1440	1450	1510		
40	%N1	61.3	64.2	68.2	72.6	76.9	81.5	86.4	96.0	
	KIAS	177	177	177	177	177	177	178	179	
	FF/ENG	1360	1340	1310	1300	1280	1280	1300	1430	
45	%N1	58.0	60.8	64.9	69.0	73.4	77.9	82.6	88.8	
	KIAS	171	171	171	171	171	171	171	171	
	FF/ENG	1210	1190	1170	1150	1130	1110	1130	1170	
30	%N1	54.8	57.3	61.4	65.4	70.0	74.1	78.7	83.5	93.6
	KIAS	164	164	164	164	164	164	164	164	164
	FF/ENG	1070	1050	1030	1010	990	970	980	990	1090

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down — Section 14

GEAR DOWN

Long Range Cruise Altitude Capability
Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	7700	4600	900
75	11000	8100	5100
70	14400	11600	8600
65	25400	19300	12400
60	27900	26400	23300
55	30200	29100	27400
50	32400	31400	30200
45	34600	33600	32500
40	37000	36100	35000
35	39700	38800	37800

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
75	%N1	82.9									
	MACH	.454									
	KIAS	251									
	FF/ENG	2154									
70	%N1	81.0	90.4								
	MACH	.440	.541								
	KIAS	243	242								
	FF/ENG	2003	1998								
65	%N1	79.0	88.4	90.1	92.5						
	MACH	.425	.524	.543	.560						
	KIAS	235	234	233	231						
	FF/ENG	1856	1845	1841	1846						
60	%N1	76.8	86.2	88.0	89.8	92.2	95.6				
	MACH	.409	.504	.525	.544	.562	.580				
	KIAS	226	225	225	224	222	220				
	FF/ENG	1712	1689	1690	1691	1701	1746				
55	%N1	74.6	83.8	85.5	87.3	89.2	91.8	95.2			
	MACH	.393	.484	.504	.525	.545	.562	.581			
	KIAS	217	216	216	216	215	213	211			
	FF/ENG	1570	1537	1536	1540	1546	1556	1600			
50	%N1	72.1	81.2	82.9	84.7	86.5	88.4	91.0	94.5		
	MACH	.376	.463	.482	.502	.523	.544	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	1431	1388	1386	1389	1397	1402	1409	1451		
45	%N1	69.3	78.3	80.1	81.8	83.6	85.4	87.4	90.0	93.5	
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578	
	KIAS	197	196	196	196	196	196	195	193	191	
	FF/ENG	1297	1244	1238	1240	1247	1253	1258	1263	1299	
40	%N1	66.3	75.2	76.9	78.7	80.4	82.2	84.1	86.0	88.5	92.3
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573
	KIAS	187	185	185	185	185	185	185	185	183	181
	FF/ENG	1169	1106	1095	1095	1102	1106	1109	1113	1118	1151
35	%N1	63.2	71.9	73.5	75.2	77.0	78.7	80.5	82.3	84.3	86.9
	MACH	.321	.392	.408	.425	.442	.461	.481	.503	.526	.547
	KIAS	177	174	174	173	173	173	173	173	173	172
	FF/ENG	1044	974	959	955	961	962	965	966	969	978

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
324	290	260	236	217	200	188	178	168	160	153
655	584	523	474	435	400	377	357	338	321	307
990	881	787	713	653	600	566	535	507	483	461
1330	1181	1054	953	871	800	755	713	676	642	613
1676	1486	1323	1195	1091	1000	943	891	844	803	766
2027	1793	1594	1437	1310	1200	1131	1069	1013	962	918
2385	2106	1868	1681	1531	1400	1319	1246	1180	1121	1069
2749	2422	2143	1926	1751	1600	1507	1423	1347	1279	1220
3120	2742	2421	2172	1973	1800	1695	1600	1514	1437	1370

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	2.4	0:49	2.2	0:47	1.9	0:44	1.8	0:42	1.6	0:41
400	5.0	1:36	4.6	1:31	4.1	1:25	3.8	1:20	3.6	1:17
600	7.4	2:25	6.9	2:17	6.2	2:06	5.8	1:59	5.5	1:54
800	9.9	3:14	9.2	3:03	8.3	2:48	7.7	2:38	7.3	2:31
1000	12.2	4:05	11.4	3:51	10.3	3:31	9.6	3:18	9.2	3:08
1200	14.5	4:56	13.6	4:39	12.2	4:14	11.5	3:59	10.9	3:46
1400	16.8	5:49	15.7	5:28	14.2	4:59	13.3	4:40	12.7	4:24
1600	19.0	6:43	17.8	6:19	16.1	5:44	15.1	5:22	14.3	5:04
1800	21.2	7:39	19.8	7:10	17.9	6:30	16.8	6:05	16.0	5:43

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
2	-0.3	-0.2	0.0	0.3	0.7
4	-0.7	-0.3	0.0	0.7	1.5
6	-1.0	-0.5	0.0	1.0	2.2
8	-1.4	-0.7	0.0	1.2	2.8
10	-1.8	-0.9	0.0	1.5	3.4
12	-2.1	-1.1	0.0	1.8	4.0
14	-2.5	-1.2	0.0	2.0	4.5
16	-2.8	-1.4	0.0	2.2	4.9
18	-3.2	-1.6	0.0	2.3	5.3
20	-3.6	-1.8	0.0	2.5	5.7
22	-3.9	-1.9	0.0	2.6	6.0

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	21	270	88
39000	20	260	84
37000	20	260	79
35000	19	260	75
33000	18	250	71
31000	18	250	67
29000	17	240	63
27000	16	230	59
25000	15	230	55
23000	14	220	51
21000	14	210	47
19000	13	210	43
17000	12	200	39
15000	11	190	35
10000	9	160	25
5000	6	130	16
1500	4	100	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
80	%N1	74.5	77.3	81.5	85.8	90.5				
	KIAS	224	224	224	224	224				
	FF/ENG	2140	2130	2120	2130	2150				
75	%N1	72.8	75.7	79.8	84.1	88.7				
	KIAS	219	219	219	219	219				
	FF/ENG	2010	2000	1990	2000	2000				
70	%N1	71.0	74.0	78.0	82.3	86.9	92.7			
	KIAS	214	214	214	214	214	214			
	FF/ENG	1890	1880	1870	1870	1870	1920			
65	%N1	69.1	72.1	76.2	80.5	84.9	89.9			
	KIAS	209	209	209	209	209	209			
	FF/ENG	1780	1760	1740	1740	1730	1760			
60	%N1	67.2	70.0	74.2	78.3	82.8	87.5	95.4		
	KIAS	203	203	203	203	203	203	203		
	FF/ENG	1660	1630	1620	1610	1600	1610	1720		
55	%N1	65.1	67.9	72.1	76.2	80.6	85.2	91.2		
	KIAS	197	197	197	197	197	197	197		
	FF/ENG	1540	1520	1500	1480	1470	1480	1530		
50	%N1	62.8	65.6	69.7	73.9	78.2	82.8	87.7		
	KIAS	190	190	190	190	190	190	190		
	FF/ENG	1420	1400	1380	1360	1340	1340	1370		
45	%N1	60.3	63.3	67.2	71.5	75.7	80.2	84.9	92.3	
	KIAS	184	184	184	184	184	184	184	184	
	FF/ENG	1310	1290	1270	1250	1220	1220	1240	1300	
40	%N1	57.9	60.6	64.7	68.8	73.1	77.5	82.0	87.4	
	KIAS	177	177	177	177	177	177	177	177	
	FF/ENG	1200	1180	1160	1140	1110	1090	1110	1130	
35	%N1	55.3	57.9	62.0	66.0	70.5	74.7	79.1	83.8	93.3
	KIAS	170	170	170	170	170	170	170	170	170
	FF/ENG	1090	1070	1050	1030	1000	980	990	1000	1090

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
60	56	201	2800		
55	52	196	7100	4500	1900
50	47	190	11400	8800	6400
45	42	183	16200	13500	10900
40	38	177	21400	19800	17300
35	34	170	25400	24600	23400

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
50	5300	400	
45	11300	8000	4200
40	18700	14700	11400
35	24400	22900	20400

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		5	7	9	11	13	15	17	19	21	23
50	%N1	85.5	87.0								
	MACH	.338	.348								
	KIAS	204	203								
	FF/ENG	2694	2675								
45	%N1	82.8	84.2	85.7	87.3	89.0					
	MACH	.325	.334	.344	.355	.367					
	KIAS	196	195	193	192	191					
	FF/ENG	2442	2416	2396	2384	2383					
40	%N1	79.8	81.2	82.6	84.1	85.6	87.3	89.2	91.4	94.9	
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402	
	KIAS	188	186	184	183	182	181	180	179	179	
	FF/ENG	2206	2171	2143	2123	2110	2103	2098	2099	2150	
35	%N1	76.7	78.0	79.3	80.7	82.1	83.7	85.5	87.5	89.4	92.7
	MACH	.296	.305	.313	.322	.331	.342	.354	.369	.384	.400
	KIAS	179	178	176	174	172	171	170	170	170	170
	FF/ENG	1973	1943	1906	1877	1856	1838	1828	1832	1839	1872

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
178	155	135	121	110	100	93	87	81	77	73
361	314	274	244	220	200	186	174	163	154	146
546	473	412	366	331	300	279	260	244	230	218
732	634	551	489	441	400	372	347	325	306	290
920	796	692	613	552	500	465	434	407	383	362
1109	958	832	737	663	600	558	520	487	458	434
1300	1122	973	861	774	700	651	607	568	534	505
1493	1287	1115	986	885	800	744	693	648	610	577
1688	1453	1257	1110	997	900	836	779	729	685	648
1884	1620	1400	1235	1108	1000	929	865	809	760	719

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	6		10		14		18	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	1.1	0:29	1.0	0:28	0.9	0:27	0.8	0:26
200	2.4	0:56	2.2	0:54	2.0	0:52	1.9	0:50
300	3.6	1:24	3.3	1:21	3.1	1:17	3.0	1:14
400	4.8	1:52	4.4	1:47	4.2	1:42	4.1	1:37
500	6.0	2:20	5.6	2:14	5.2	2:08	5.1	2:02
600	7.1	2:49	6.7	2:41	6.3	2:34	6.1	2:26
700	8.3	3:18	7.7	3:09	7.3	3:00	7.1	2:50
800	9.4	3:47	8.8	3:37	8.3	3:26	8.0	3:15
900	10.5	4:16	9.9	4:05	9.3	3:52	9.0	3:40
1000	11.7	4:46	10.9	4:33	10.3	4:19	9.9	4:06

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
1	-0.2	-0.1	0.0	0.2	0.4
2	-0.4	-0.2	0.0	0.4	0.9
3	-0.6	-0.3	0.0	0.7	1.3
4	-0.8	-0.4	0.0	0.9	1.8
5	-1.0	-0.5	0.0	1.1	2.3
6	-1.2	-0.6	0.0	1.3	2.7
7	-1.4	-0.7	0.0	1.5	3.1
8	-1.6	-0.8	0.0	1.7	3.6
9	-1.8	-0.9	0.0	1.9	4.0
10	-2.0	-1.0	0.0	2.1	4.4
11	-2.2	-1.1	0.0	2.3	4.8
12	-2.4	-1.2	0.0	2.5	5.2

Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
60	%N1	85.4			
	KIAS	203			
	FF/ENG	3120			
55	%N1	83.0	86.0		
	KIAS	197	197		
	FF/ENG	2870	2870		
50	%N1	80.4	83.5	87.9	
	KIAS	190	190	190	
	FF/ENG	2630	2620	2630	
45	%N1	77.8	80.7	85.1	89.9
	KIAS	184	184	184	184
	FF/ENG	2400	2380	2380	2410
40	%N1	75.1	77.9	82.2	86.7
	KIAS	177	177	177	177
	FF/ENG	2180	2160	2150	2160
35	%N1	72.1	75.0	79.1	83.6
	KIAS	170	170	170	170
	FF/ENG	1960	1940	1920	1920

This table includes 5% additional fuel for holding in a racetrack pattern.

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Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the approved Airplane Flight Manual, the Flight Manual shall always take precedence.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions provided that adjustments are made to V1 for clearway, stopway, anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations or brake energy limits. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method will not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from either the dry or wet table by entering with takeoff flap setting and brake release weight. Use the tables provided to adjust takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind adjustments to V1 are obtained by entering the Slope and Wind V1 Adjustment table.

V1(MCG)

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). The V1(MCG) presented in this manual is conservative for all weight and bleed configurations.

To find V1(MCG) enter the V1(MCG) table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than V1(MCG), set VR equal to V1(MCG), and determine a new V2 by adding the difference between the normal VR and V1(MCG) to the normal V2. No takeoff weight adjustment is necessary provided that the actual field length exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Clearway and Stopway V1 Adjustments

Maximum allowable clearway limits are provided for guidance when more precise data is not available. Use of clearway is not allowed on wet runways.

Takeoff speed adjustments are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the table. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

Stab Trim

To find takeoff stabilizer trim setting, enter Stab Trim Setting table with anticipated brake release weight and center of gravity (C.G. % MAC) and read required stabilizer trim units.

VREF

This table contains flaps 40, 30 and 15 reference speeds for a given weight.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

Slush/Standing Water Takeoff

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in field/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical cold weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 0.5 inches (13 mm) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight determination:

1. Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.

2. Enter the V1(MCG) Limit Weight table with the available field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

2. Adjust field length available for temperature by amount shown beneath V1(MCG) limit weight table.

3. The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 1 and 2.

3. Enter the V1(MCG) Limit Weight table with the adjusted field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

4. The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 1 and 3.

Takeoff speed determination:

1. Determine takeoff speeds V1, VR and V2 for actual brake release weight using the Dry Runway Takeoff Speeds table for the appropriate flap setting and thrust rating.

2. If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set V1=V1(MCG).

Slippery Runway Takeoff

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. The performance level used to calculate the “good” data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate the “poor” data reflects a runway covered with wet ice. Performance is based on a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Anti-Skid Inoperative

When operating with anti-skid inoperative, the field limit weight and V1 must be reduced to account for the effect on accelerate-stop performance. Anti-skid inoperative is only allowed on a dry runway. A simplified method which conservatively accounts for the effects of anti-skid inoperative is to reduce the normal dry field/obstacle limited weight by 7000 kg and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (FT)	V1 ADJUSTMENT (KIAS)
6000	-16
8000	-13
10000	-11
12000	-9
14000	-8

If the resulting V1 is less than V1(MCG), takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate-stop distance adjusted for wind and slope exceeds approximately 6600 ft.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Thrust Reverser Inoperative

When dispatching on a wet runway with both thrust reversers operative, an operative anti-skid system, and all brakes operating, regulations allow deceleration credit for one thrust reverser in the engine failure case and two thrust reversers in the all engine stop case.

When dispatching on a wet runway with one thrust reverser inoperative, the field/obstacle limited weight and V1 speed must be reduced to account for the effect on accelerate-stop performance. A simplified method, which conservatively accounts for this, is to reduce the normal wet runway/field/obstacle limited weight by 1000 kg and the V1 associated with the reduced weight by 2 knots.

If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate-stop distance available adjusted for wind and slope exceeds approximately 4600 ft.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Takeoff %N1

To find Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

Assumed Temperature Reduced Thrust

Regulations permit the use of up to 25% takeoff thrust reduction for operation with assumed temperature reduced thrust. Use of assumed temperature reduced thrust is not allowed with anti-skid inoperative or on runways contaminated with standing water, ice, slush, or snow. Use of assumed temperature reduced thrust is not recommended if potential windshear conditions exist.

To find the maximum allowable assumed temperature enter the Maximum Assumed Temperature table with airport pressure altitude and OAT. Compare this temperature to that at which the airplane is performance limited as determined from available takeoff performance data. Next, enter the Maximum Takeoff %N1 table with airport pressure altitude and the lower of the two temperatures previously determined, to obtain a maximum takeoff %N1. Do not use an assumed temperature less than the minimum assumed temperature shown. Enter the %N1 Adjustment table with OAT and the difference between the assumed and actual OAT to obtain a %N1 adjustment. Subtract the %N1 adjustment from the maximum takeoff %N1 found previously to determine the assumed temperature reduced thrust %N1.

Max Climb %N1

This table shows Max Climb %N1 for a 280/.78 climb speed schedule, normal engine bleed for packs on or off and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Go-around %N1

To find Max Go-around %N1 based on normal engine bleed for packs on (AUTO) and anti-ice on or off, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs OFF or HIGH operation, apply the %N1 adjustment shown below the table.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Pitch attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome or turbulent air may also cause unreliable airspeed/Mach indications. The cruise table in this section may also be used for turbulent air penetration.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed indications may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. This table considers both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 100 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 15° may cause the airplane to lose speed and/or altitude. The altitudes shown in the table are limited to the maximum certified altitude of 41000 ft.

Long Range Cruise Control

These tables provide target %N1, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude .79M approximates the Long Range Cruise Mach schedule.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .78/280/250 descent. Tables are presented for low altitudes and high altitudes.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent

Time, fuel, and distance for descent are shown for a .78/280/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance, time and fuel. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing flaps at the outer marker.

Holding

Target %N1, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 30 and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking actions, which are commonly referred to as slippery runway conditions. Landing distances for slippery runways are 115% of the actual landing distances.

If the surface is affected by water, snow or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding the problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff. Notes providing adjustments for wind are included below the table.

To determine the energy per brake absorbed during landing, enter the appropriate Adjusted Brake Energy Per Brake table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing.

The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, use the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted to determine recommended cooling schedule.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise speed of .79M to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with one A/C pack operating and all anti-ice bleeds off. Enter the table with pressure altitude, TAT, and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/LRC Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to Long Range Cruise speed. Cruise is continued at level off altitude and Long Range Cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and adjust for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Enroute Fuel and Time table.

Long Range Cruise Altitude Capability

The table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW (KG/HR)
39	45
35	45
31	50
25	60
20	65
15	75
10	85
5	95

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .78/280/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel adjustments table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel required and time for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative landing is planned. The tables show gear down rate of climb available for Flaps 15 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

Introduction

No takeoff speed adjustments or other performance adjustments are required of Electronic Engine Control (EEC) in the alternate mode (ALTN EEC switch illuminated) for the CFM56-7B18, -7B20, -7B22 and -7B24 engine thrust ratings.

Operation with derate and/or assumed temperature reduced thrust is not permitted with the EEC in alternate mode.

Gear Down

This section contains performance for airplane operation with the landing gear extended. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, compute overly shallow descent paths and display non-conservative predictions of fuel burn, estimated time of arrival (ETA), and maximum altitude. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

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Evacuation Checklist is on the reverse side of this page.

EVACUATION

Condition: **Evacuation is needed.**

Parking brake . . . . Set

Speedbrake lever . . . . DOWN

FLAP lever 40

Pressurization mode selector . . . . MAN

Outflow valve switch . . . . OPEN

Hold until the outflow valve is fully open.

If time allows, verify that the flaps are 40 before the engine start levers are moved to CUTOFF.

Engine start levers (both) . . . . CUTOFF

Advise the cabin to evacuate.

Advise the tower.

Engine and APU fire switches (all) . . . . .Override and pull

If an engine or APU fire light is illuminated:

Related fire switch. Rotate and hold

Rotate to the stop and hold for 1 second.

■ ■ ■ ■