DO NOT USE FOR FLIGHT

737

Quick Reference Handbook

Quick Action Index

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Annunciated Index — Chapter ANN
Lights List — Section Index

Normal Checklists — Chapter NC

PREFLIGHT

Oxygen . . . . Tested, 100%

NAVIGATION transfer
and DISPLAY switches . . . . NORMAL, AUTO

Window heat . . . . .ON

Flight instruments . . . . Heading ___, Altimeter ___

Parking brake . . . . .Set

Engine start levers . . . . CUTOFF

BEFORE START

Flight deck door . . . . Closed and locked

Fuel . . . . ___ LBS/KGS, PUMPS ON

Passenger signs . . . . ___

Windows . . . . Locked

MCP . . . . .V2___, HDG___, ALT___

Takeoff speeds . . . . V1___, VR___, V2___

CDU preflight . . . . Completed

Trim . . . . ___ UNITS, 0, 0

Taxi and takeoff briefing . . . . Completed

ANTI COLLISION light . . . . .ON

BEFORE TAXI

Generators . . . . ON

Probe heat . . . . .ON

Anti-ice . . . . ___

Isolation valve . . . . AUTO

[Without automatic ignition]
ENGINE START switches . . . . CONT

Recall . . . . Checked

Autobrake . . . . .RTO

Engine start levers . . . . IDLE detent

Flight controls . . . . Checked

Ground equipment . . . . Clear

BEFORE TAKEOFF

Flaps . . . . ___, green light

AFTER TAKEOFF

Engine bleeds . . . . .ON

Packs . . . . AUTO

Landing gear . . . . UP and OFF

Flaps . . . . .UP, no lights

DESCENT

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . .VREF___, Minimums___

Approach briefing . . . . Completed

APPROACH

Altimeters . . . . ___

LANDING

[Without automatic ignition]

ENGINE START switches . . . . CONT

Speedbrake . . . . .ARMED

Landing gear. . . . . Down

Flaps . . . . ___, green light

SHUTDOWN

Fuel pumps . . . . .OFF

Probe heat. . . . . .OFF

Hydraulic panel . . . . .Set

Flaps . . . . UP

Parking brake . . . . ___

Engine start levers . . . . CUTOFF

Weather radar . . . . .OFF

SECURE

IRSs . . . . .OFF

Emergency exit lights . . . . .OFF

WINDOW HEAT . . . . .OFF

Packs . . . . .OFF

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Checklist Introduction — Chapter CI

Table of Contents — Section 0

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Checklist Introduction — Chapter CI
Normal Checklists — Section 1

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.

Checklist Introduction Chapter CI
Non-Normal Checklists Section 2

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 memory 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

[Option - Single battery]
- Flight crew reset of a tripped circuit breaker in flight is not recommended. 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.

[Option - Dual battery]
- 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. Action is taken by the crewmember if the control is in the crewmember's area of responsibility. After moving the control, the crewmember taking the action also states the checklist response.

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.

■ ■ ■ ■

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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Non-Normal Checklists — Chapter NNC

Unannunciated Checklists — Section 0

Table of Contents

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ABORTED ENGINE START

[Without Automatic Ignition]

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

■■■■

ABORTED ENGINE START

[With Automatic Ignition]

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 . . . . AUTO

■■■■

If the ENGINE START switch is in AUTO:

After N2 decreases below 20%:

ENGINE START switch . . . . GRD

Motor the engine for 60 seconds.

ENGINE START switch . . . . AUTO

■■■■

Intentionally
Blank

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

[737 - 600/700]
RECIRCULATION FAN switch . . . . .OFF

[Eliminates possible source of smoke/fumes.]

[737 - 800/900]
RECIRCULATION FAN switches . . . . .OFF

[Eliminates possible source of smoke/fumes.]

[737 - 600/700]
If smoke/fumes stop:

Continue flight with the recirculation fan switch OFF.

[737 - 800/900]
If smoke/fumes stop:

Continue flight with the recirculation fan switches OFF.

Continued on next page

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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.

■■■■

CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION

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

- **The cabin altitude 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.

■■■■

CONFIGURATION WARNING

Condition: **An intermittent warning horn sounds when advancing thrust levers to takeoff, or a steady warning horn sounds inflight.**

Assure proper airplane configuration.

■■■■

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.

Continued on next page

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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

[Option - Ground Proximity Gear Inhibit switch]
GROUND PROXIMITY GEAR
INHIBIT switch . . . . GEAR INHIBIT

[Option - Without Ground Proximity Gear Inhibit switch]
GND PROX WARN C/B (P18–1) . . . . PULL

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.

Continued on next page

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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.

■■■■

ELECTRICAL SMOKE/FUMES/FIRE

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

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

CREW COMMUNICATIONS (if needed) . . . . ESTABLISH

[737 - 600/700]
RECIRCULATION FAN switch . . . . OFF

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

[737 - 800/900]
RECIRCULATION FAN switches . . . . 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.]

CAB/UTIL POWER switch . . . . OFF

IFE/PASS SEAT 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.

■■■■

ELEVATOR TAB LIMIT CYCLE OSCILLATION

Condition: **An elevator tab limit cycle oscillation (LCO) is encountered in flight.**

[An elevator tab LCO is characterized by a high frequency resonant vibration. This vibration originates, and is strongest, in the aft part of the airplane but can be felt throughout the entire structure. It may or may not be felt in the control wheel.]

AIRSPEED . . . . REDUCE TO 270 KIAS OR UNTIL THE VIBRATION CEASES, whichever is lower

Do not use speedbrakes or change aircraft configuration to reduce airspeed.

Remain at or below the indicated airspeed at which the vibration ceased, but do not exceed 270 knots.

Do not use speedbrakes for the remainder of the flight.

Note: Ground spoilers may be used for landing.

Consider landing at the nearest suitable airport.

■■■■

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 FT, 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.

■■■■

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/500 lbs 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

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.

■■■■

ENGINE IN-FLIGHT START

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

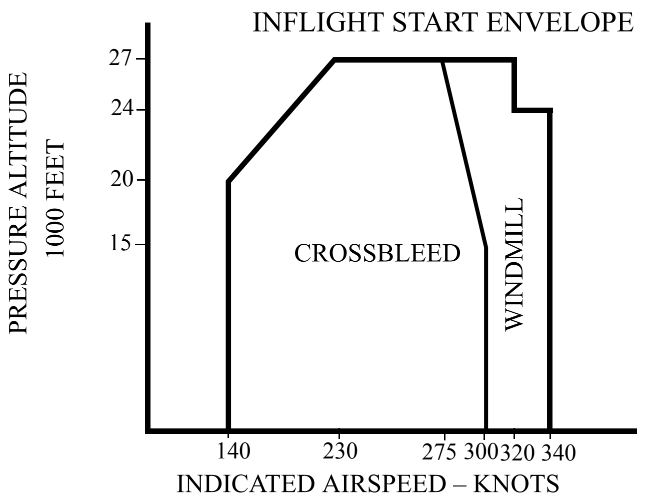
Note: Oil quantity indication as low as zero is normal if windmilling N2 RPM is below approximately 8%.

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.

Continued on next page

Continued from previous page

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

[Without automatic ignition]
ENGINE START switch . . . . OFF

[With automatic ignition]
ENGINE START switch . . . . AUTO

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

■■■■

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.

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.

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.

Continued on next page

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If controls are not normal: (continued)

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.

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

==> DESCENT

Recall . . . . Checked

Autobrake . . . . ___

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 . . . . ___

Continued on next page

Continued from previous page

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

==> LANDING

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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

Continued on next page

Continued from previous page

If neither restart is successful and N2 is below 11%: (continued)

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

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.

■■■■

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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 switch . . . . HIGH

[737 - 600/700]
RECIRC FAN switch . . . . OFF

[737 - 800/900]
RECIRC FAN switches . . . . 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.

Continued on next page

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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:

[Option - Airplanes equipped with #4 galley chiller]
CAB/UTIL POWER switch . . . . OFF

[Prevents galley chiller exhaust from carrying smoke/fumes into the cabin.]

AIRPLANE ALTITUDE . . . . . .LOWEST SAFE ALTITUDE, or 10,000 FT, WHICHEVER IS HIGHER

At 14,000 feet or below:

PRESSURIZATION MODE SELECTOR . . . . MAN

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.

If the trim wheel moves when released:

Stabilizer trim AUTOPILOT cutout switch . . . . CUTOUT

[Autopilot is not available.]

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.**

Continued on next page

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

Establish landing configuration early.

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

Autobrake . . . . ___

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 . . . . ___

Continued on next page

Continued from previous page

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

==> LANDING

[Without automatic ignition]

ENGINE START switches . . . . CONT

Speedbrake . . . . 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.

■■■■

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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.

■■■■

WINDOW DAMAGE

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

WINDOW HEAT switch (affected window) . . . . OFF
- **Limit maximum airspeed to 250 knots below 10,000 feet.**
- **Use crew and passenger oxygen, if needed.**

[Option - Window 3 not heated]
If window 1, 2, 4 (as installed) or 5 (as installed) is affected:

LAND ALT . . . . 10,000 FT

Reduce pressure differential by limiting flight altitude as indicated in the following tables.

Note: For MEA between 15,000 and 20,000 feet select a higher LAND ALT to maintain 2 psi differential. Above 20,000 feet, select MAN and maintain 2 psi differential.

Window 1, 2 or 5 (as installed):

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Inner	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■ ■ ■ ■

Window 4 (as installed): A failed middle pane usually appears shattered and transparency is virtually lost.

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If window 1, 2, 4 (as installed) or 5 (as installed) is affected: (continued)

Window 4 (as installed): A failed middle pane usually appears shattered and transparency is virtually lost. (continued)

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Middle	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

[Option - Window 3 not heated]
If Window 3 is affected:

LAND ALT . . . . 13,000 FT

Reduce pressure differential by limiting flight altitude as indicated in the following table.

Window 3:

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Inner	— No Restriction —	
Both	0 PSI	13,000 FT

■■■■

[Option - Window 3 heated]
LAND ALT . . . . 10,000 FT

[Option - Window 3 heated]
Reduce pressure differential by limiting flight altitude as indicated in the following tables.

Note: For MEA between 15,000 and 20,000 feet select a higher LAND ALT to maintain 2 psi differential. Above 20,000 feet, select MAN and maintain 2 psi differential.

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[Option - Window 3 heated]
Window 1, 2, 3 or 5 (as installed):

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Inner	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

[Option - Window 3 heated]
Window 4 (as installed): A failed middle pane usually appears shattered and transparency is virtually lost.

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Middle	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

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.

■■■■

[Option - Forward airstairs]

EQUIP/CARGO/AIRSTAIR

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

Proceed normally.

■■■■

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EQUIP/CARGO/AIRSTAIR (continued)

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

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

[Option]

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.**

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

- **Limit maximum airspeed to 250 knots below 10,000 feet.**
- **Use crew and passenger oxygen, if needed.**

[Option - Window 3 not heated]

If window 1, 2, 4 (as installed) or 5 (as installed) is affected:

LAND ALT . . . . 10,000 FT

Reduce pressure differential by limiting flight altitude as indicated in the following tables.

Note: For MEA between 15,000 and 20,000 feet select a higher LAND ALT to maintain 2 psi differential. Above 20,000 feet, select MAN and maintain 2 psi differential.

Window 1, 2 or 5 (as installed):

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Inner	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

Window 4 (as installed): A failed middle pane usually appears shattered and transparency is virtually lost.

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If window 1, 2, 4 (as installed) or 5 (as installed) is affected: (continued)

Window 4 (as installed): A failed middle pane usually appears shattered and transparency is virtually lost. (continued)

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Middle	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

[Option - Window 3 not heated]
If Window 3 is affected:

LAND ALT . . . . 13,000 FT

Reduce pressure differential by limiting flight altitude as indicated in the following table.

Window 3:

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Inner	— No Restriction —	
Both	0 PSI	13,000 FT

■■■■

[Option - Window 3 heated]
LAND ALT . . . . 10,000 FT

[Option - Window 3 heated]
Reduce pressure differential by limiting flight altitude as indicated in the following tables.

Note: For MEA between 15,000 and 20,000 feet select a higher LAND ALT to maintain 2 psi differential. Above 20,000 feet, select MAN and maintain 2 psi differential.

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[Option - Window 3 heated]

Window 1, 2, 3 or 5 (as installed):

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Inner	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

[Option - Window 3 heated]

Window 4 (as installed): A failed middle pane usually appears shattered and transparency is virtually lost.

CRACKED PANE	MAX DIFF PRESSURE	APPROX FLT ALT
Outer	— No Restriction —	
Middle	5 PSI	26,000 FT
Both	2 PSI	15,000 FT

■■■■

Non-Normal Checklists Chapter NNC
Air Systems Section 2

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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

[737 - 600/700]
RECIRCULATION FAN switch . . . . OFF

[Eliminates possible source of smoke/fumes.]

[737 - 800/900]
RECIRCULATION FAN switches . . . . OFF

[Eliminates possible source of smoke/fumes.]

[737 - 600/700]
If smoke/fumes stop:

Continue flight with the recirculation fan switch OFF.

[737 - 800/900]
If smoke/fumes stop:

Continue flight with the recirculation fan switches OFF.

Continued on next page

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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.

■■■■

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 cabin altitude 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

[737-600/700]

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 FT, 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.

■■■■

HIGH ALTITUDE LANDING INOPERATIVE

[Option]

Condition: **The High Altitude Landing INOP light illuminated indicates the high altitude landing system is inoperative.**

Note: Cabin altitude warning horn will activate if cabin altitude reaches 10,000 feet.

■■■■

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.

■■■■

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PACK

[737-800/900]

Condition: **A PACK light illuminated indicates both primary and standby pack controls have failed or the related pack valve is closed due to temperature exceeding limits.**

ALL TEMPERATURE SELECTORS . . . . WARMER TEMPERATURE

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

TRIP RESET switch . . . . PUSH

[If the PACK light illuminated as a result of the pack temperature exceeding limits, the light extinguishes if the pack temperature has cooled below limits.]

If one PACK light remains illuminated:

ISOLATION VALVE switch . . . . CLOSE

PACK switch . . . . OFF

■■■■

If both PACK lights remain illuminated:

Note: Both pack valves may have closed resulting in a gradual loss of cabin pressure and an eventual CABIN ALTITUDE warning.

Monitor cabin altitude during the remainder of the flight.

Continued on next page

Continued from previous page

If both PACK lights remain illuminated: (continued)

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.]

RIGHT RECIRCULATION FAN switch . . . . AUTO

LEFT RECIRCULATION FAN switch . . . . OFF

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

GALLEY POWER . . . . OFF

■■■■

PACK TRIP OFF

[737-600/700]

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

Continued on next page

Continued from previous page

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

If cabin altitude increases: (continued)

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

FLIGHT DECK AND CABIN WINDOW SHADES . . . . CLOSED

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

■■■■

ZONE TEMP

[737-800/900]

Condition: **A ZONE TEMP light illuminated indicates temperature in the related duct has exceeded limits or flight deck temperature control has been lost.**

TEMPERATURE SELECTOR . . . . .COOLER TEMPERATURE

[Prevents trim air modulating valve from returning to an overheat condition.]

TRIP RESET switch . . . . PUSH

[The ZONE TEMP light extinguishes if the duct temperature has cooled below limits.]

If duct temperature increases rapidly:

TRIM AIR switch . . . . .OFF

[Shuts off trim air]

■■■■

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Non-Normal Checklists — Chapter NNC

Anti-Ice, Rain — Section 3

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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.

■■■■

ICING

[Option]

Condition: **The ICING light illuminated indicates the ice detector is detecting ice.**

ENGINE ANTI–ICE switches . . . . ON

■■■■

ICE DETECTOR

[Option]

Condition: **The ICE DETECTOR light illuminated indicates the ice detector system has failed.**

Operate engine anti–ice system as needed.

■■■■

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 instruments indications.

■■■■

WINDOW HEAT OFF

[Option]

Condition: **A window heat OFF light illuminated indicates a system failure has occurred.**

WINDOW HEAT switch . . . . OFF

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

■■■■

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.

■■■■

Non-Normal Checklists — Chapter NNC
Automatic Flight — Section 4

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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.

■■■■

NO AUTOLAND

Condition: **Autoland not available.**

■■■■

NO LAND 3

Condition: **Autoland system does not have needed redundancy for LAND 3 operations.**

■■■■

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Non-Normal Checklists — Chapter NNC

Communications, Datalink — Section 5

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ACARS ELECTRICAL POWER LOSS

[Option - ACARS]

Condition: **ACARS AC power is lost.**

Note: The ACARS automatically reverts to VOX MODE (the DATA MODE is inoperative).

■■■■

ACARS MU FAIL OR DU FAIL

[Option - ACARS]

Condition: **The ACARS system is inoperative.**

Use normal ARINC voice procedures for reporting.

■■■■

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.**

[Option - Single battery]

Note: A fully charged battery provides a minimum of 30 minutes of standby power.

[Option - Dual battery]

Note: Fully charged batteries provides 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

[737 - 600/700]
RECIRCULATION FAN SWITCH . . . . OFF

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

[737 - 800/900]
RECIRCULATION FAN SWITCHES . . . . 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.]

CAB/UTIL POWER SWITCH . . . . OFF

IFE/PASS SEAT 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

Continued from previous page

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.]

[Option - Single battery]

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: A fully charged battery provides a minimum of 30 minutes of standby power.

■■■■

[Option - Dual battery]

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

[Without Automatic Ignition]

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

■■■■

ABORTED ENGINE START

[With Automatic Ignition]

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 . . . . AUTO

■■■■

If the ENGINE START switch is in AUTO:

After N2 decreases below 20%:

ENGINE START switch . . . . GRD

Motor the engine for 60 seconds.

ENGINE START switch . . . . AUTO

■■■■

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.]

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.

■■■■

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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 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.**

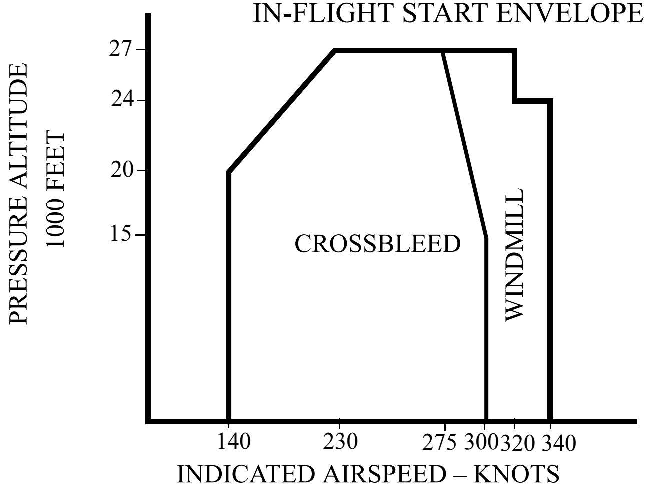
Note: Oil quantity indication as low as zero is normal if windmilling N2 RPM is below approximately 8%.

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

[Without automatic ignition]
ENGINE START switch . . . . .OFF

[With automatic ignition]
ENGINE START switch . . . . AUTO

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:

Continued on next page

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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

Continue to motor engine until tailpipe fire is reported extinguished.

Advise the tower.

If the engine is being motored:

Continue to motor until the tailpipe fire is extinguished.

[Without automatic ignition]
ENGINE START switch . . . . .OFF

[With automatic ignition]
ENGINE START switch . . . . AUTO

■■■■

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

Continued on next page

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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

(Airplanes without Fail Operational Autoland Capability)

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.

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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

Autobrake . . . . ___

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.

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

==> APPROACH

Altimeters . . . . ___

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

==> LANDING

[Without automatic ignition]
ENGINE START
switch (operating engine) . . . . CONT

Speedbrake . . . . .ARMED

Landing gear . . . . .DOWN

Flaps . . . . 15, green light

■■■■

ONE ENGINE INOPERATIVE LANDING

(Airplanes with Fail Operational Autoland Capability)

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

If landing using flaps 30 (performance permitting):

Use flaps 30 and VREF 30 for landing and flaps 15 for go-around.

If landing using flaps 15:

Use flaps 15 and VREF 15 for landing and flaps 1 for go-around.

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: Autoland operations are not authorized.

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 stays illuminated.

Left PACK switch . . . . AUTO

Engine No. 2 BLEED air switch . . . . OFF

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Note: Check authorized autoland weather minima.

If landing using flaps 15:

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Continued on next page

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If landing using flaps 15: (continued)

Go–around procedure . . . . Review

If landing with flaps 30, accomplish normal go-around procedure except:
- **Use flaps 15**
- **Maintain VREF 30 + 5 knots and limit bank angle to 15 degrees until initial maneuvering is complete and a safe altitude is reached.**

If landing with flaps 15, accomplish the 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 before flap retraction.**

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

==> APPROACH

Altimeters . . . . ___

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

==> LANDING

[Without automatic ignition]
ENGINE START switch (operating engine) . . . . CONT

Speedbrake . . . . ARMED

Landing gear. . . . . DOWN

Flaps . . . . ___ , 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.**

[Without automatic ignition]
ENGINE START SWITCH . . . . OFF

[With automatic ignition]
ENGINE START SWITCH . . . . AUTO

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

■■■■

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

Continued from previous page

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

[737 - 600/700]
RECIRCULATION FAN switch . . . . OFF

[Eliminates possible source of smoke/fumes.]

[737 - 800/900]
RECIRCULATION FAN switches . . . . OFF

[Eliminates possible source of smoke/fumes.]

[737 - 600/700]
If smoke/fumes stop:

Continue flight with the recirculation fan switch OFF.

[737 - 800/900]
If smoke/fumes stop:

Continue flight with the recirculation fan switches OFF.

Continued on next page

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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

[737-600/700/800]

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.

[737-600/700]
RECIRCULATION FAN switch . . . . OFF

[737-800]
RECIRCULATION FAN switches . . . . OFF

ONE PACK switch . . . . OFF

[Option - Airplanes equipped with #4 galley chiller]
CAB/UTIL POWER switch . . . . OFF

[Prevents galley chiller exhaust from carrying smoke/fumes into the cabin.]

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

[737-900]

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 switches . . . . OFF

OPERATING PACK switch(es) . . . . HIGH

[Option - Airplanes equipped with #4 galley chiller]
CAB/UTIL POWER switch . . . . OFF

[Prevents galley chiller exhaust from carrying smoke/fumes into the cabin.]

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

[737 - 600/700]
RECIRCULATION FAN switch . . . . OFF

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

[737 - 800/900]
RECIRCULATION FAN switches . . . . 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.

Continued on next page

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

BUS TRANSFER switch . . . . OFF

[Prevents unwanted transfer of power.]

CAB/UTIL POWER switch . . . . OFF

IFE/PASS SEAT 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.]

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

Continue to motor engine until tailpipe fire is reported extinguished.

Advise the tower.

If the engine is being motored:

Continue to motor until the tailpipe fire is extinguished.

[Without automatic ignition]
ENGINE START switch . . . . .OFF

[With automatic ignition]
ENGINE START switch . . . . AUTO

■■■■

LAVATORY SMOKE

[Option]

Condition: **The SMOKE light illuminated indicates smoke is detected in one or more lavatories.**

Verify that lavatory fire is contained.

■■■■

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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

[737 - 600/700]
RECIRC FAN switch . . . . OFF

[737 - 800/900]
RECIRC FAN switches . . . . 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.

Continued on next page

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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:

[Option - Airplanes equipped with #4 galley chiller]
CAB/UTIL POWER switch . . . . OFF

[Prevents galley chiller exhaust from carrying smoke/fumes into the cabin.]

AIRPLANE ALTITUDE . . . . . .LOWEST SAFE ALTITUDE, or 10,000 FT, WHICHEVER IS HIGHER

At 14,000 feet or below:

PRESSURIZATION MODE SELECTOR . . . . MAN

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.

■■■■

Non-Normal Checklists — Chapter NNC

Flight Controls — Section 9

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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 . . . . ___

Continued on next page

Continued from previous page

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

==> LANDING

ENGINE START switches . . . . CONT

Speedbrake . . . . 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.

■■■■

ELEVATOR TAB LIMIT CYCLE OSCILLATION

Condition: **An elevator tab limit cycle oscillation (LCO) is encountered in flight.**

[An elevator tab LCO is characterized by a high frequency resonant vibration. This vibration originates, and is strongest, in the aft part of the airplane but can be felt throughout the entire structure. It may or may not be felt in the control wheel.]

AIRSPEED . . . . REDUCE TO 270 KIAS OR UNTIL THE VIBRATION CEASES, whichever is lower

Do not use speedbrakes or change aircraft configuration to reduce airspeed.

Remain at or below the indicated airspeed at which the vibration ceased, but do not exceed 270 knots.

Do not use speedbrakes for the remainder of the flight.

Note: Ground spoilers may be used for landing.

Consider landing at the nearest suitable airport.

■■■■

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.

■■■■

FLAP LOAD RELIEF

[Option]

Condition: **The FLAP LOAD RELIEF light illuminated indicates that the flaps have retracted from 40 to 30 or the flaps have retracted from 30 to 25 due to excessive airspeed.**

Check flap position and maintain appropriate airspeed.

■■■■

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.

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.

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.

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If controls are not normal: (continued)

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.

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

==> DESCENT

Recall . . . . Checked

Autobrake . . . . ___

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 . . . . ___

Continued on next page

Continued from previous page

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

==> LANDING

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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

Continued on next page

Continued from previous page

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

Continued from previous page

---------------------------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

[Without automatic ignition]
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.

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

[Without Load Alleviation System]

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.

Continued on next page

Continued from previous page

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

Autobrake . . . . ___

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

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . 15, green light

■■■■

STANDBY RUDDER ON

[737 Modified rudder installed]

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.

■■■■

Intentionally
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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

Continued from previous page

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

Autobrake . . . . ___

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

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

==> APPROACH

Altimeters . . . . ___

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

==> LANDING

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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

Autobrake . . . . ___

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

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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:

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.

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Continued from previous page

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

==> DESCENT

Recall . . . . Checked

Autobrake . . . . ___

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

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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

■■■■

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 crosswind exceeds 30 knots.

■■■■

Non-Normal Checklists — Chapter NNC

Flight Instruments, Display — Section 10

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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 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

■■■■

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.

■■■■

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.

■■■■

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 DISAGREE

Condition: **FMC DISAGREE is displayed during approach due to an FMC miscompare.**

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.

■■■■

FMC FAIL

[Option - Single FMC]

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.]

Verify position relative to terrain using conventional navigation.

[EGPWS may use inaccurate GPS position data or an inappropriate value of RNP. This could result in a VSD terrain display that is incorrectly positioned relative to the airplane track.]

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 FAIL

[Option - Dual FMC]

Condition: **Illumination of the FMC alert light accompanied by:**

- **loss of FMC information on both CDUs and loss of FMC data on the captain's navigation display map mode indicates left FMC failure.**
- **illumination of the FMC message light, loss of FMC data on the first officer's navigation display map mode, and a SINGLE FMC OPERATION scratchpad message indicates right FMC failure.**
- **loss of FMC information on the CDU and loss of FMC data on both navigation display map modes indicates dual FMC failure.**

If only the left or right FMC has failed:

FMC source select switch . . . . .BOTH ON L or BOTH ON R

Select the operating FMC.

If DUAL FMC OP RESTORED message appears:

FMC source select switch . . . . .NORMAL

■■■■

Continued on next page

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If dual FMC failure has occurred:

Resume conventional navigation.

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

Verify position relative to terrain using conventional navigation.

[EGPWS may use inaccurate GPS position data or an inappropriate value of RNP. This could result in a VSD terrain display that is incorrectly positioned relative to the airplane track.]

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.

■■■■

GLS

[With GLS capability]

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

Do not fly a GLS approach.

ILS and non-ILS approaches may be flown.

■■■■

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 needed in-flight if ANP meets requirements for phase of flight.

■■■■

ILS

[With GLS capability]

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

Do not fly a ILS approach.

GLS and non-ILS approaches may be flown.

■■■■

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.

■■■■

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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.

■■■■

Continued on next page

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In flight:

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

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.

■■■■

[Without SB 737-22-1140 incorporated]
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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Intentionally
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CONFIG

Condition: **The fuel CONFIG indicator indicates fuel quantity in the center tank exceeds 726 kgs / 1600 lbs and both center fuel tank 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.

■■■■

CONFIG

Condition: **The fuel CONFIG indicator indicates fuel quantity in the center tank exceeds 726 kgs / 1600 lbs 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.

■■■■

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/500 lbs 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.

Continued on next page

Continued from previous 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

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

REMAINING CENTER TANK FUEL PUMP SWITCH . . . . OFF

■■■■

Continued on next page

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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 / 1000 lbs.**

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 / 2000 lbs.**

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.]

■■■■

Intentionally
Blank

Non-Normal Checklists Chapter NNC

Hydraulics Section 13

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Blank

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

Autobrake . . . . ___

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

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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

Autobrake . . . . 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.

Continued on next page

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

==> LANDING

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . DOWN

Flaps . . . . 15, green light

■■■■

Intentionally
Blank

MANUAL REVERSION

Condition: **Both system A & B hydraulic pump LOW PRESSURE lights illuminated accompanied by low system A & B pressure indicates loss of both system A & B. Other indications include:**

- **system A & B flight control LOW PRESSURE lights illuminated.**

SYSTEM A & B FLIGHT CONTROL switches . . . . STBY RUD

YAW DAMPER switch . . . . ON

SYSTEM A & B HYDRAULIC PUMP switches . . . . OFF

Note: Inoperative items:
- **ground spoilers**
- **all flight spoilers**
- **nose wheel steering**
- **autopilot A & 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 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.

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.

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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

Autobrake . . . . .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.**

Continued on next page

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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

[Without automatic ignition]
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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Non-Normal Checklists Chapter NNC

Landing Gear Section 14

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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.

■■■■

AUTO BRAKE DISARM

Condition: **The AUTO BRAKE DISARM light illuminated indicates the auto brake has disconnected after being set.**

On 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 TEMP

[Option - Brake Temperature Indicator]

Condition: **The BRAKE TEMP light illuminated indicates the temperature of one or more brakes is excessive.**

If in flight:

Observe gear EXTEND limit speed (270K/.82M)

LANDING GEAR LEVER . . . . DOWN

[Allows cooling air to flow around brakes.]

When BRAKE TEMP light is extinguished:

Wait 7 minutes.

[Ensures sufficient cooling time.]

LANDING GEAR LEVER (235 knots maximum) . . . . UP & OFF

■■■■

If on the ground:

Refer to BRAKE COOLING SCHEDULE in the ADVISORY INFORMATION section of the Performance – Inflight chapter for needed cooling time.

■■■■

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.

■■■■

Intentionally
Blank

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

Plan to land at the nearest suitable airport.

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

Autobrake. . . . . ___

Landing data . . . . .VREF ___, Minimums ___

Approach briefing . . . . Completed

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

==> APPROACH

Altimeters . . . . ___

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

==> LANDING

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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 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 SPEEDBRAKE C/B (P6-2) . . . . Pull

[Option - Ground Proximity Gear Inhibit switch]
GROUND PROXIMITY GEAR INHIBIT switch . . . . GEAR INHIBIT

[Option - Without Ground Proximity Gear Inhibit switch]
GND PROX WARN C/B (P18–1) . . . . Pull

Autobrake . . . . 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

- **Position fuel pump switches OFF just prior to flare.**
- **After stop, accomplish the EVACUATION checklist.**

Note: Do not raise the speed brakes unless stopping distance is critical.

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

==> LANDING

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . 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.

■■■■

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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.

■■■■

CONFIGURATION WARNING

Condition: **An intermittent warning horn sounds when advancing thrust levers to takeoff, or a steady warning horn sounds inflight.**

Assure proper airplane configuration.

■■■■

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 Master Caution system is reset:

Do not takeoff

Note: The PSEU light illuminates on the ground only.

■■■■

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Maneuvers — Chapter MAN
Non-Normal Maneuvers — Section 1

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.

Captain	First Officer
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.	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.
Field length permitting: Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.	Call out 60 knots. Communicate the reject decision to the control tower and cabin as soon as practical.
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.	

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 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.**

Intentionally
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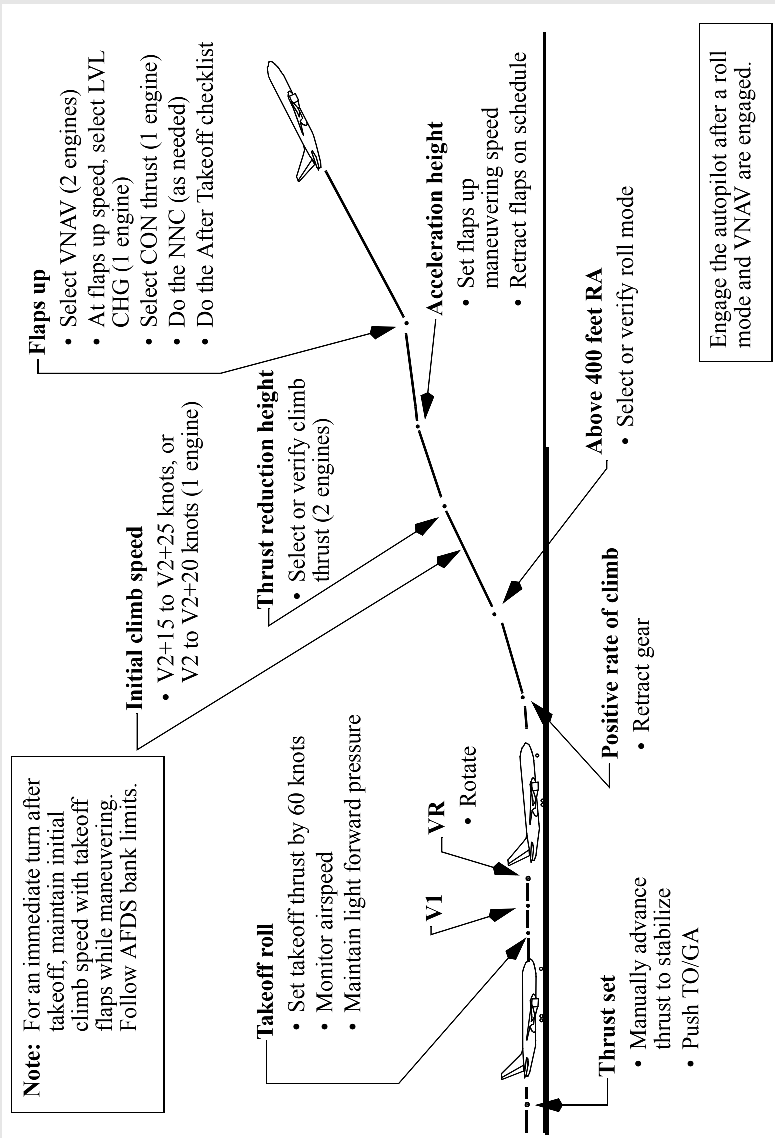
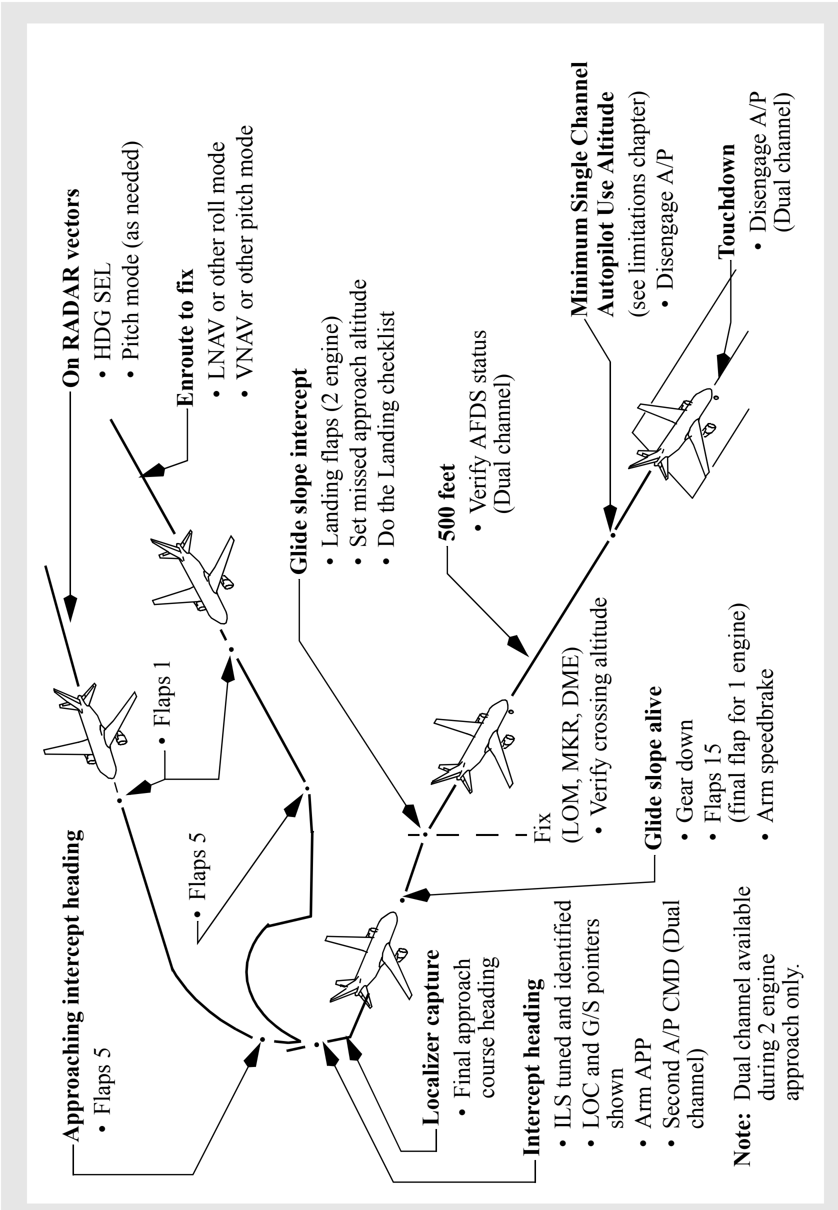
Takeoff

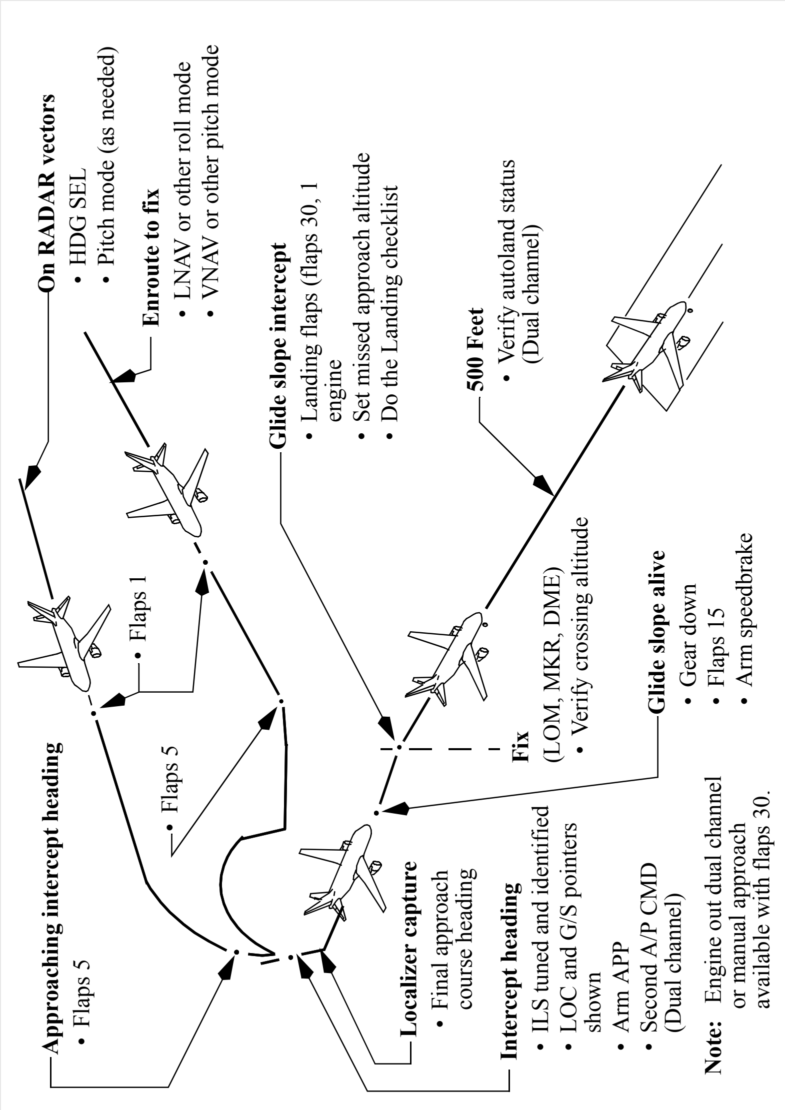

Note: For an immediate turn after takeoff, maintain initial climb speed with takeoff flaps while maneuvering. Follow AFDS bank limits.
Takeoff roll
• Set takeoff thrust by 60 knots
• Monitor airspeed
• Maintain light forward pressure
V1
VR
• Rotate
Thrust set
• Manually advance thrust to stabilize
• Push TO/GA
Positive rate of climb
• Retract gear
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 engines)
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 engines)
• At flaps up speed, select 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 are engaged.

DO NOT USE FOR FLIGHT

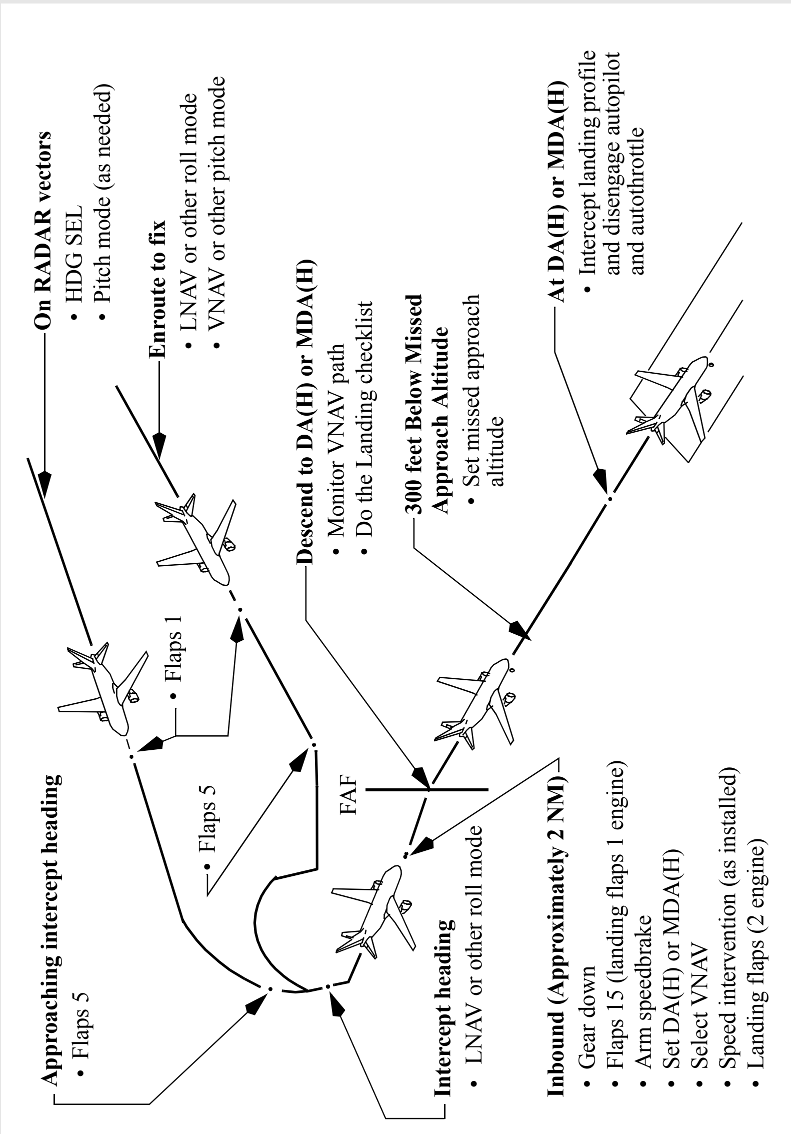
ILS Approach - Fail Passive



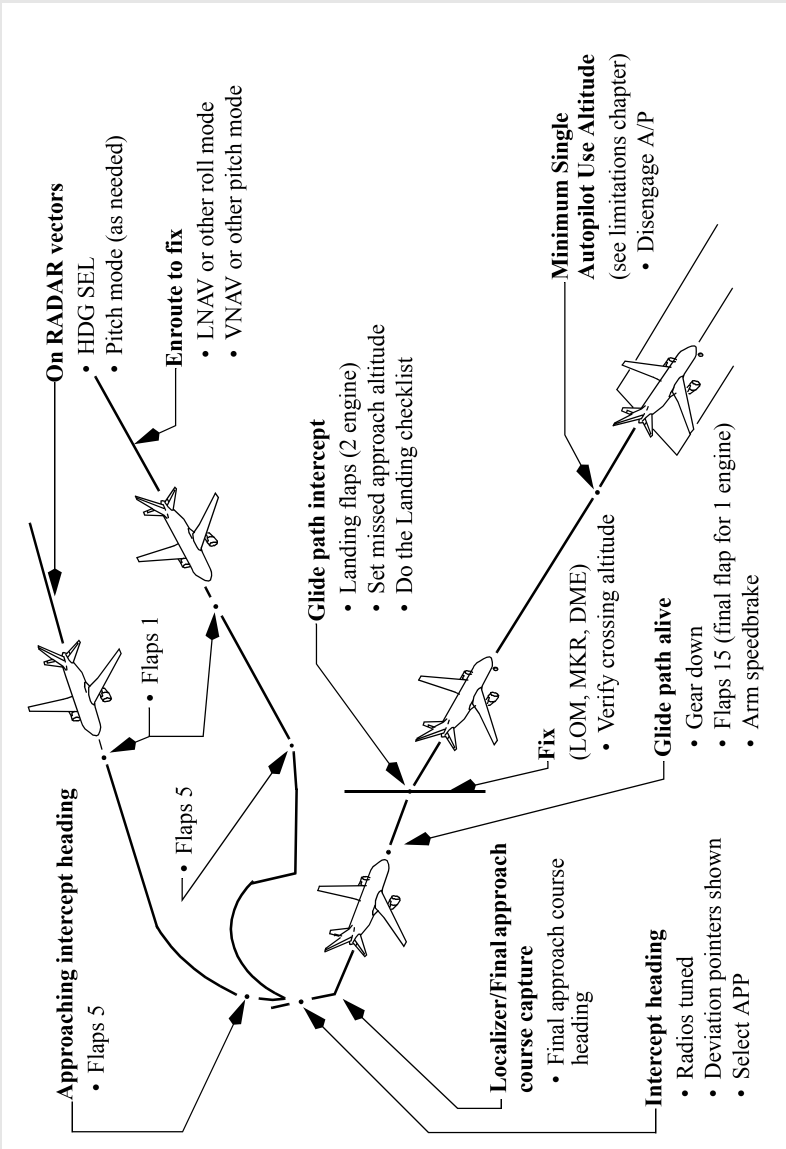
ILS Approach - Fail Operational



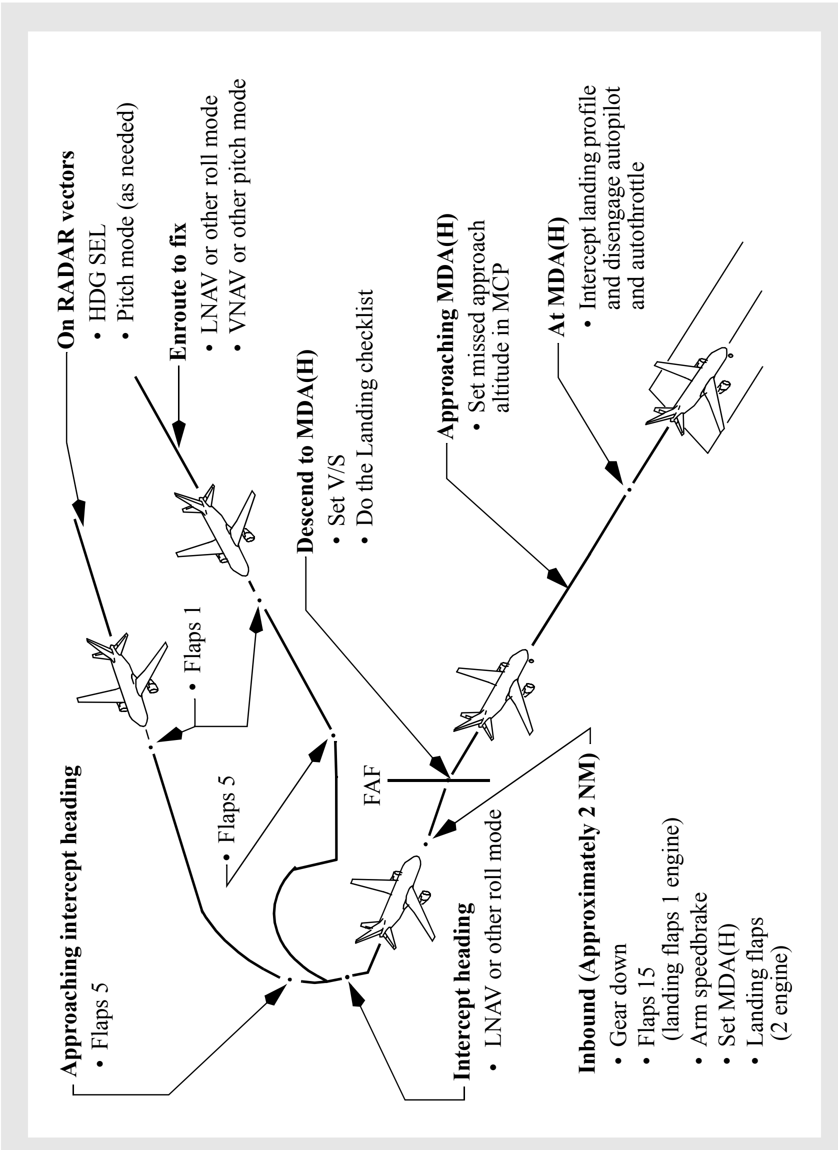
Instrument Approach Using VNAV



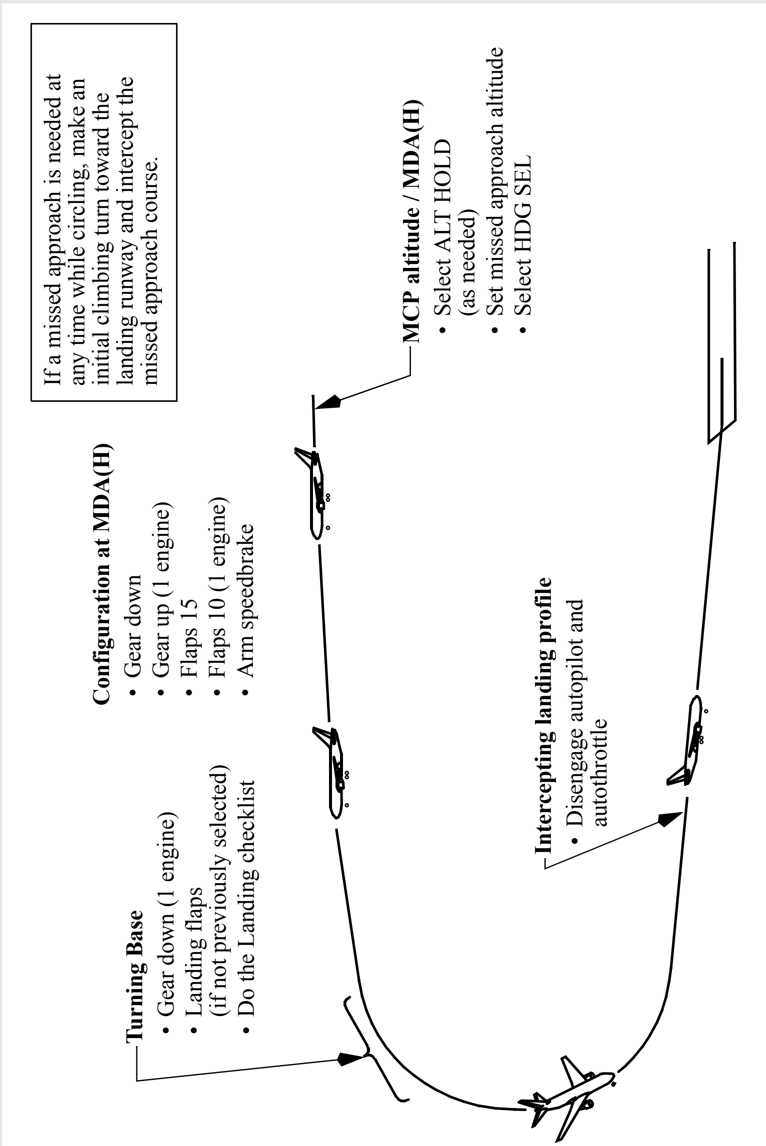
Instrument Approach Using IAN (As installed)



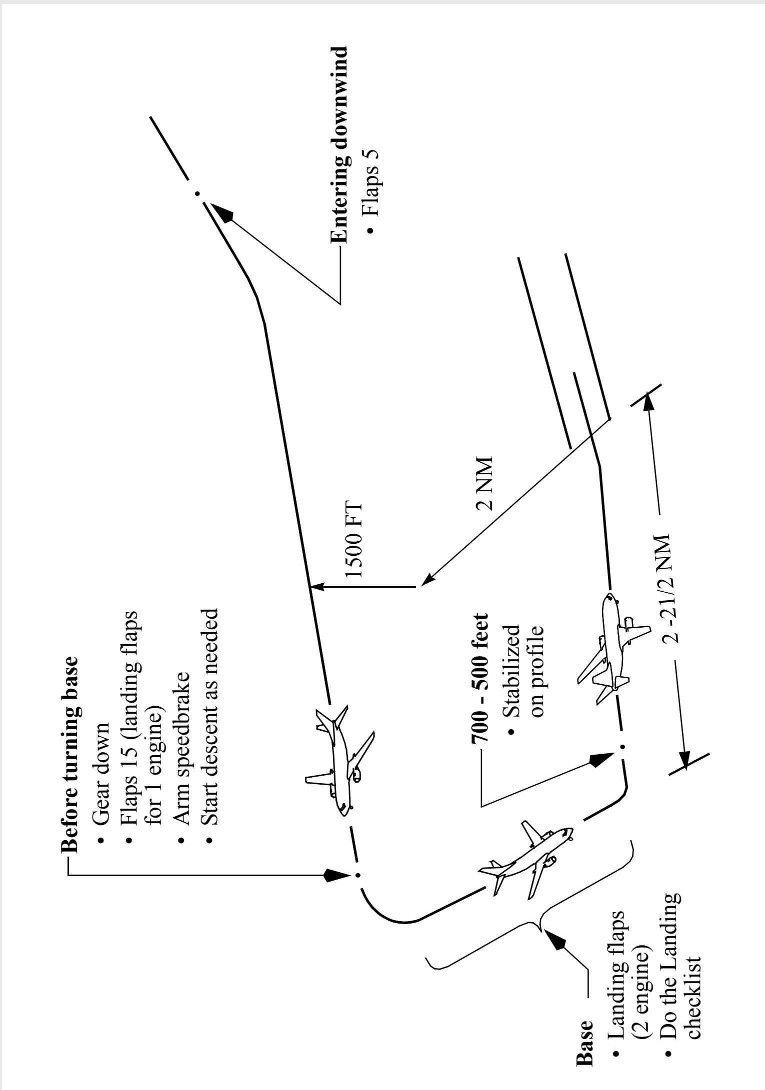
Instrument Approach Using V/S



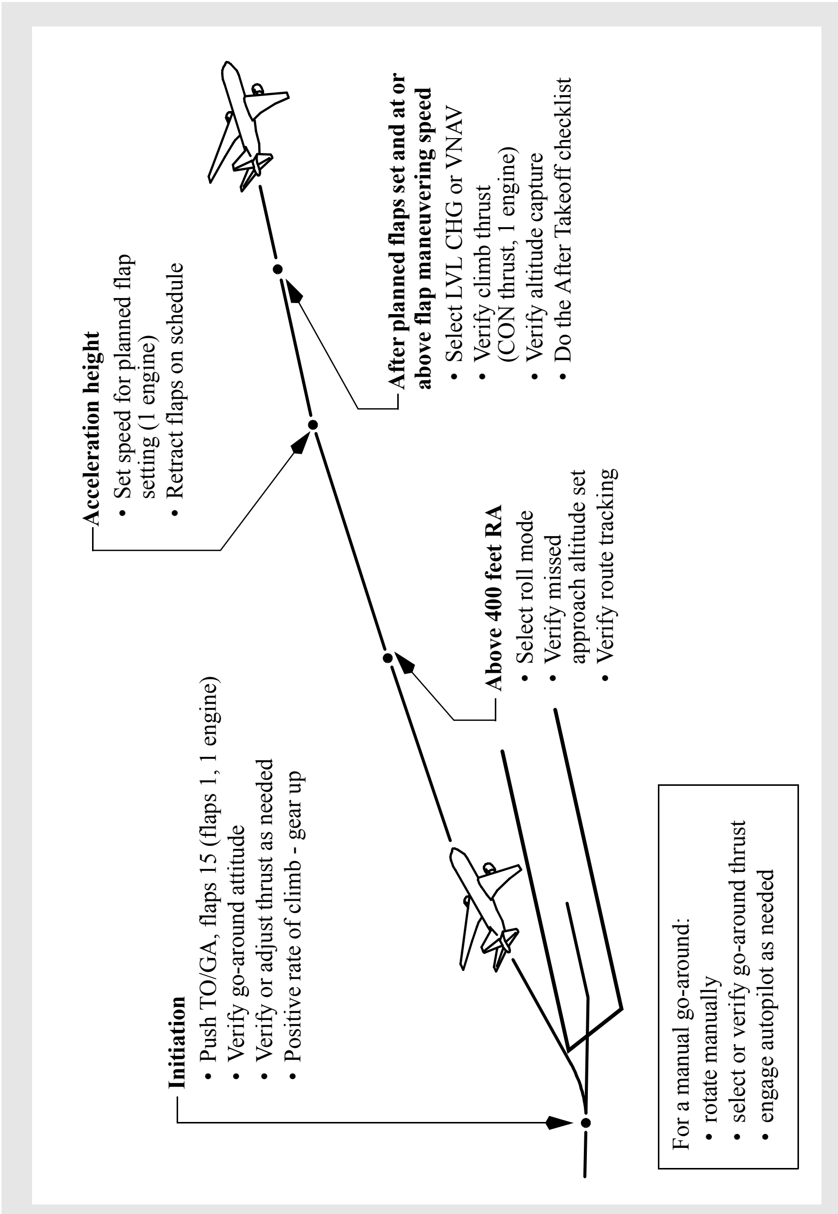
Circling Approach



Visual Traffic Pattern



Go–Around and Missed Approach



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Performance Inflight — Chapter PI
Table of Contents — Section 0

737-600 CFM56-7B22 KG FAA JAR CATD

737-700 CFM56-7B24 LB FAA CATB

737-800 CFM56-7B26 KG FAA CATC

737-900 CFM56-7B26 LB FAA CATG

Performance Inflight — Chapter PI
General — Section 10

Takeoff Speeds - Dry Runway
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
72	142	143	149	138	139	146									
68	137	138	145	134	134	142	129	129	135	126	126	133	125	125	132
64	133	134	141	129	130	138	124	125	132	121	122	129	120	121	128
60	127	128	136	124	125	134	119	120	128	117	117	125	116	116	124
56	122	122	132	118	119	129	114	114	123	112	112	121	111	111	120
52	116	117	127	112	113	124	108	109	119	106	107	117	105	106	115
48	110	111	122	106	107	119	103	103	114	101	101	112	100	101	111
44	104	105	117	100	101	114	97	97	110	95	96	108	94	95	107
40	98	99	112	94	95	109	91	92	105	90	90	103	89	90	102

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	5	6	7	8				4	5	6	7				-1	-1	-1	-1			
50	122	3	4	5	6	7	9	10	3	4	5	6	7	9	10	0	0	0	-1	-1	-1	-1
40	104	1	2	3	4	6	7	9	1	2	3	4	6	7	9	0	0	0	0	0	0	0
30	86	0	0	1	3	4	6	7	0	0	1	3	4	6	7	0	0	0	0	0	0	0
20	68	0	0	1	1	3	4	6	0	0	1	1	3	4	6	0	0	0	0	0	0	0
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	5	0	0	0	0	0	0	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	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
68	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
64	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
60	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
56	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
52	-2	-1	0	1	1	-2	-1	0	0	0	1	1	1
48	-1	-1	0	1	1	-2	-1	0	0	0	1	1	1
44	-1	0	0	1	1	-2	-1	0	0	0	1	1	1
40	0	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	100	98					
60	140	100	98	96	95			
50	122	102	100	97	95	93	91	89
40	104	107	105	101	98	94	91	89
30	86	110	110	106	102	98	94	91
20	68	110	110	108	106	103	98	94
-60	-76	112	111	109	107	105	102	99

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
72	136	143	149	131	139	146									
68	131	138	145	126	134	142	123	129	135	122	126	133	122	125	132
64	126	134	141	121	130	138	118	125	132	117	122	129	116	121	128
60	120	128	136	116	125	134	113	120	128	111	117	125	110	116	124
56	114	122	132	110	119	129	107	114	123	105	112	121	104	111	120
52	108	117	127	104	113	124	101	109	119	100	107	117	99	106	115
48	101	111	122	98	107	119	95	103	114	94	101	112	93	101	111
44	95	105	117	92	101	114	89	97	110	88	96	108	87	95	107
40	89	99	112	85	95	109	83	92	105	82	90	103	81	90	102

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	10						6	7						-1	-1					
60	140	7	7	9	10				4	5	6	7				-1	-1	-1	-1			
50	122	4	5	6	8	9	12	13	3	4	5	6	7	9	10	0	0	0	-1	-1	-1	-1
40	104	1	2	4	5	7	9	11	1	2	3	4	6	7	9	0	0	0	0	0	0	0
30	86	0	0	2	3	5	7	9	0	0	1	3	4	6	7	0	0	0	0	0	0	0
20	68	0	0	1	2	3	5	7	0	0	1	1	3	4	6	0	0	0	0	0	0	0
-60	-76	0	0	1	2	3	4	5	0	0	1	1	2	3	5	0	0	0	0	0	0	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
72	-4	-2	0	2	5	-4	-2	-1	0	1	1	2	3
68	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
64	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
60	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
56	-3	-2	0	2	3	-4	-3	-1	0	1	2	2	3
52	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
48	-3	-1	0	1	3	-4	-3	-1	0	1	2	3	3
44	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	4
40	-2	-1	0	1	2	-5	-3	-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	100	98					
60	140	100	98	96	95			
50	122	102	100	97	95	93	91	89
40	104	107	105	101	98	94	91	89
30	86	110	110	106	102	98	94	91
20	68	110	110	108	106	103	98	94
-60	-76	112	111	109	107	105	102	99

Max Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	200
2500	240
3000	280
3500	330
4000	350

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
300	-2	-3	-4			
200	-2	-3	-4			
100	-1	-2	-2			
0	0	0	0	0	0	0
-100	1	1	0	2	2	1
-200	1	1	0	3	3	2
-300	1	1	0	3	3	2

Use of clearway not permitted on wet runways.

Stab Trim Setting
Max Takeoff Thrust
Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)								
	13	15	16	18	21	24	27	30	33
70	8 1/2	8 1/2	8 1/4	7 1/4	6 1/2	6	5 1/4	4 1/2	4
60	8 1/2	8	7 1/2	6 3/4	6	5 1/4	4 3/4	4	3 1/2
50	7 3/4	7 1/4	6 3/4	6	5 1/4	4 3/4	4	3 1/2	2 3/4
40	6	5 1/2	5 1/2	5	4 1/4	3 3/4	3 1/4	2 3/4	2 1/4
36	5	4 3/4	4 3/4	4 1/2	4	3 1/2	3	2 3/4	2 1/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	13	15	16	18	21	24	27	29	32	33
70	8 1/2	8 1/2	8 1/4	7	6 1/4	5 1/2	4 3/4	4	3 1/4	3
60	8 1/2	7 3/4	7 1/4	6 1/4	5 1/2	4 3/4	4	3 1/2	2 3/4	2 1/2
50	7 3/4	6 3/4	6 1/4	5 1/4	4 3/4	4	3 1/4	2 3/4	2 1/4	2 1/4
40	5 1/2	5	4 3/4	4 1/4	3 1/2	3	3 1/2	2 1/4	2 1/4	2 1/4
36	4 1/4	4	4	3 3/4	3 1/4	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
70	144	146	152
66	139	141	147
62	135	137	143
58	130	132	138
54	125	127	133
50	120	122	128
46	115	117	122
42	110	112	117
38	104	106	111

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
30	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								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-9.0	-12.0	-14.9	-10.8	-13.7	-16.7	-14.6	-17.5	-20.5
75	-8.0	-10.9	-13.9	-9.4	-12.4	-15.3	-12.6	-15.5	-18.5
70	-7.0	-10.0	-12.9	-8.2	-11.1	-14.1	-10.7	-13.7	-16.6
65	-6.1	-9.1	-12.0	-7.1	-10.0	-13.0	-9.1	-12.1	-15.0
60	-5.3	-8.3	-11.2	-6.1	-9.0	-12.0	-7.7	-10.7	-13.6
55	-4.6	-7.6	-10.5	-5.2	-8.1	-11.1	-6.5	-9.4	-12.4
50	-4.0	-7.0	-9.9	-4.4	-7.4	-10.3	-5.5	-8.4	-11.4
45	-3.5	-6.4	-9.4	-3.8	-6.8	-9.7	-4.6	-7.6	-10.5
40	-3.0	-6.0	-8.9	-3.3	-6.2	-9.2	-4.0	-6.9	-9.9
35	-2.7	-5.6	-8.6	-2.9	-5.8	-8.8	-3.6	-6.5	-9.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1400	25.3			28.5			33.1		
1600	38.1			41.1			45.4	26.7	
1800	51.1	31.4		53.7	34.5		57.7	39.0	
2000	64.1	44.3		66.6	47.1	27.9	69.9	51.3	32.5
2200	77.2	57.2	37.5	79.6	59.8	40.5	82.2	63.5	44.8
2400		70.3	50.4		72.7	53.1		75.8	57.1
2600		83.5	63.5		85.8	65.9		88.0	69.4
2800			76.6			78.9			81.6
3000			89.8						

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 -40 m/+35 m 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-14	-9	-4	-6	-1	0	1	1	1
75	-16	-11	-6	-9	-4	0	1	1	1
70	-17	-12	-7	-11	-6	-1	0	1	1
65	-18	-13	-8	-14	-9	-4	-5	0	1
60	-19	-14	-9	-16	-11	-6	-8	-3	1
55	-20	-15	-10	-17	-12	-7	-11	-6	-1
50	-21	-16	-11	-19	-14	-9	-14	-9	-4
45	-22	-17	-12	-20	-15	-10	-16	-11	-6
40	-22	-17	-12	-21	-16	-11	-18	-13	-8
35	-23	-18	-13	-21	-16	-11	-19	-14	-9

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								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-10.7	-13.9	-17.1	-13.0	-16.1	-19.3	-17.4	-20.6	-23.8
75	-9.6	-12.7	-15.9	-11.3	-14.5	-17.7	-14.8	-17.9	-21.1
70	-8.5	-11.7	-14.8	-9.8	-13.0	-16.2	-12.5	-15.7	-18.8
65	-7.5	-10.7	-13.9	-8.5	-11.7	-14.9	-10.6	-13.7	-16.9
60	-6.6	-9.8	-13.0	-7.4	-10.6	-13.8	-9.0	-12.2	-15.4
55	-5.8	-9.0	-12.2	-6.5	-9.7	-12.8	-7.9	-11.0	-14.2
50	-5.1	-8.2	-11.4	-5.7	-8.9	-12.1	-7.1	-10.3	-13.4
45	-4.4	-7.6	-10.8	-5.2	-8.3	-11.5	-6.7	-9.8	-13.0
40	-3.9	-7.0	-10.2	-4.8	-8.0	-11.1	-6.6	-9.8	-13.0
35	-3.4	-6.5	-9.7	-4.6	-7.7	-10.9	-7.0	-10.1	-13.3

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1800				27.3			38.9		
2000	34.1			42.4			53.0	27.6	
2200	50.3			57.1	31.1		65.9	42.5	
2400	65.3	38.2		71.1	46.1		77.9	56.2	31.3
2600	79.4	54.1	25.7	84.7	60.6	34.8	89.2	68.9	46.0
2800		68.9	42.3		74.5	49.7		80.8	59.5
3000		82.8	57.8		88.0	64.1			71.9
3200			72.4			77.9			83.6
3400			86.1						

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 -50 m/+45 m 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-21	-16	-11	-10	-5	0	0	0	0
75	-21	-16	-11	-13	-8	-3	0	0	0
70	-22	-17	-12	-16	-11	-6	-1	0	0
65	-23	-18	-13	-19	-14	-9	-6	-1	0
60	-24	-19	-14	-21	-16	-11	-11	-6	-1
55	-25	-20	-15	-23	-18	-13	-15	-10	-5
50	-27	-22	-17	-24	-19	-14	-19	-14	-9
45	-28	-23	-18	-26	-21	-16	-21	-16	-11
40	-29	-24	-19	-27	-22	-17	-23	-18	-13
35	-30	-25	-20	-28	-23	-18	-25	-20	-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
80	-0.5	-0.5	-0.5	-5.0	-5.0	-5.0	-9.0	-9.0	-9.0
75	-0.8	-0.8	-0.8	-4.9	-4.9	-4.9	-8.4	-8.4	-8.4
70	-0.9	-0.9	-0.9	-4.7	-4.7	-4.7	-7.9	-7.9	-7.9
65	-1.0	-1.0	-1.0	-4.5	-4.5	-4.5	-7.3	-7.3	-7.3
60	-1.0	-1.0	-1.0	-4.1	-4.1	-4.1	-6.7	-6.7	-6.7
55	-0.8	-0.8	-0.8	-3.8	-3.8	-3.8	-6.1	-6.1	-6.1
50	-0.6	-0.6	-0.6	-3.3	-3.3	-3.3	-5.5	-5.5	-5.5
45	-0.2	-0.2	-0.2	-2.8	-2.8	-2.8	-4.9	-4.9	-4.9
40	0.0	0.0	0.0	-2.2	-2.2	-2.2	-4.3	-4.3	-4.3
35	0.0	0.0	0.0	-1.5	-1.5	-1.5	-3.6	-3.6	-3.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1000	28.0								
1200	44.7	28.2							
1400	63.0	44.9	28.3	31.4					
1600	83.9	63.2	45.0	45.0	26.3				
1800		84.1	63.4	59.7	39.9		29.3		
2000			84.3	75.7	54.1	34.8	39.8		
2200					69.6	48.7	50.4	31.1	
2400					86.6	63.7	61.3	41.6	
2600						80.1	72.5	52.3	32.9
2800							84.0	63.2	43.4
3000								74.4	54.1
3200								85.9	65.1
3400									76.4
3600									87.9

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 -30 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30 m/+25 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 m/+40 m 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
80	-6	-4	-3	-14	-13	-11	-26	-25	-23
75	-6	-5	-4	-15	-14	-13	-27	-25	-24
70	-7	-6	-5	-16	-15	-14	-28	-26	-25
65	-8	-6	-5	-18	-16	-15	-29	-28	-27
60	-8	-7	-6	-19	-17	-16	-31	-29	-28
55	-9	-8	-6	-20	-18	-17	-32	-31	-30
50	-10	-8	-7	-21	-19	-18	-34	-32	-31
45	-10	-9	-8	-22	-20	-19	-35	-34	-33
40	-10	-9	-8	-23	-22	-20	-37	-35	-34
35	-11	-10	-8	-24	-23	-21	-38	-37	-36

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
80	-1.2	-1.2	-1.2	-6.9	-6.9	-6.9	-11.7	-11.7	-11.7
75	-1.5	-1.5	-1.5	-6.6	-6.6	-6.6	-10.8	-10.8	-10.8
70	-1.7	-1.7	-1.7	-6.3	-6.3	-6.3	-9.9	-9.9	-9.9
65	-1.8	-1.8	-1.8	-5.9	-5.9	-5.9	-9.2	-9.2	-9.2
60	-1.8	-1.8	-1.8	-5.6	-5.6	-5.6	-8.5	-8.5	-8.5
55	-1.7	-1.7	-1.7	-5.2	-5.2	-5.2	-7.9	-7.9	-7.9
50	-1.6	-1.6	-1.6	-4.8	-4.8	-4.8	-7.4	-7.4	-7.4
45	-1.4	-1.4	-1.4	-4.4	-4.4	-4.4	-7.0	-7.0	-7.0
40	-1.1	-1.1	-1.1	-3.9	-3.9	-3.9	-6.7	-6.7	-6.7
35	-0.7	-0.7	-0.7	-3.5	-3.5	-3.5	-6.5	-6.5	-6.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1200	36.2								
1400	55.2	36.4							
1600	76.9	55.4	36.5						
1800		77.1	55.6	36.7					
2000			77.3	54.1	30.5				
2200				72.9	47.5				
2400					65.7	41.1			
2600					85.5	58.8			
2800						78.0	36.8		
3000							53.2		
3200							67.6	37.2	
3400							80.7	53.5	
3600								67.9	37.5
3800								80.9	53.8
4000									68.1
4200									81.1

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 -35 m/+30 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -35 m/+30 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -55 m/+50 m 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
80	-7	-5	-2	-18	-16	-13	-36	-34	-31
75	-8	-5	-3	-20	-17	-15	-37	-35	-32
70	-9	-6	-4	-21	-18	-16	-38	-36	-33
65	-10	-7	-5	-22	-20	-17	-40	-38	-35
60	-11	-8	-6	-24	-22	-19	-42	-40	-37
55	-12	-9	-7	-26	-24	-21	-45	-42	-40
50	-13	-11	-8	-28	-26	-23	-47	-45	-42
45	-14	-12	-9	-30	-28	-25	-50	-47	-45
40	-15	-13	-10	-32	-30	-27	-52	-49	-47
35	-17	-14	-12	-34	-32	-29	-54	-51	-49

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 bleed for packs on and 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	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3
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 (20K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
72	144	144	148												
68	140	140	145	136	136	142									
64	135	135	141	131	131	138	126	126	132	123	124	129			
60	129	130	136	126	126	134	121	121	127	118	119	125			
56	124	124	131	120	121	129	116	116	123	113	113	121	113	113	120
52	118	118	126	115	115	124	110	111	119	108	108	116	107	107	115
48	112	112	121	109	109	119	105	105	114	103	103	112	102	102	111
44	106	106	116	102	103	114	99	99	109	97	97	107	96	97	106
40	100	100	111	96	97	108	93	93	104	91	92	103	91	91	102

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						0	0					
60	140	5	6	5	6				5	6	6	6				0	0	0	0			
50	122	3	4	4	4	5	7	9	3	4	4	4	6	7	9	0	0	0	0	0	0	0
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	0	0	2	4	7	0	0	0	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	0	1	3	5	0	0	0	1	2	3	5	0	0	0	0	0	1	0
-60	-76	0	0	0	0	1	2	4	0	0	0	1	2	3	4	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
72	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
68	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
64	-2	-1	0	0	0	-1	0	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	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	95	93					
60	140	95	93	94	95			
50	122	97	95	94	95	93	90	86
40	104	102	99	99	98	94	90	86
30	86	105	105	104	103	98	93	88
20	68	105	105	104	103	100	97	92
-60	-76	107	106	105	104	102	99	97

Takeoff Speeds - Wet Runway (20K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
72	139	144	148												
68	134	140	145	130	136	142									
64	129	135	141	125	131	138	122	126	132	121	124	129			
60	123	130	136	119	126	134	116	121	127	115	119	125			
56	117	124	131	113	121	129	110	116	123	109	113	121	108	113	120
52	111	118	126	107	115	124	104	111	119	103	108	116	102	107	115
48	104	112	121	101	109	119	98	105	114	97	103	112	96	102	111
44	98	106	116	95	103	114	92	99	109	91	97	107	90	97	106
40	92	100	111	88	97	108	86	93	104	85	92	103	84	91	102

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	9	11						6	7						0	0					
60	140	7	8	7	8				5	6	6	6				0	0	0	0			
50	122	4	5	5	5	7	9	13	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	2	2	2	2	4	7	10	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	0	2	5	8	0	0	0	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	0	1	3	6	0	0	0	1	2	3	5	0	0	0	0	0	1	0
-60	-76	0	0	0	0	1	3	4	0	0	0	1	2	3	4	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
72	-5	-2	0	2	5	-3	-2	-1	0	0	1	2	2
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
64	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
60	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
56	-3	-2	0	2	4	-4	-2	-1	0	1	1	2	3
52	-3	-2	0	2	3	-4	-2	-1	0	1	2	2	3
48	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
44	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
40	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	3

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	95	93					
60	140	95	93	94	95			
50	122	97	95	94	95	93	90	86
40	104	102	99	99	98	94	90	86
30	86	105	105	104	103	98	93	88
20	68	105	105	104	103	100	97	92
-60	-76	107	106	105	104	102	99	97

Max Allowable Clearway (20K Derate)

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	250
3000	300
3500	340
4000	370

Clearway and Stopway V1 Adjustments (20K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
300	-2	-3	-3			
200	-2	-3	-3			
100	-1	-1	-1			
0	0	0	0	0	0	0
-100	1	1	0	2	2	0
-200	1	1	0	3	2	1
-300	1	1	0	3	2	1

Use of clearway not permitted on wet runways.

Stab Trim Setting (20K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)							
	12	14	16	18	24	28	31	33
70	8 1/2	8 1/2	8 1/4	7 3/4	6 1/4	5 1/2	4 3/4	4 1/4
60	8 1/2	8 1/4	7 3/4	7	5 3/4	4 3/4	4 1/4	3 3/4
50	8 1/4	7 3/4	7	6 1/4	5	4 1/4	3 3/4	3 1/4
40	6 3/4	6 1/4	5 3/4	5 1/4	4 1/4	3 1/2	3	2 1/2
36	5 3/4	5 1/2	5 1/4	4 3/4	3 3/4	3 1/4	2 3/4	2 1/2

Flaps 10, 15 and 20

WEIGHT (1000 KG)	C.G. (%MAC)							
	12	14	16	18	24	28	31	33
70	8 1/2	8 1/2	8 1/4	7 1/4	5 3/4	4 3/4	4	3 1/2
60	8 1/2	8 1/4	7 1/2	6 1/2	5	4	3 1/4	2 3/4
50	8 1/4	7 1/2	6 3/4	5 3/4	4 1/2	3 1/4	2 3/4	2 1/4
40	6 1/4	5 3/4	5	4 1/2	3 1/2	2 1/2	2 1/4	2 1/4
36	5	4 3/4	4 1/4	4	3	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-10.7	-12.5	-14.3	-13.0	-14.9	-16.7	-17.9	-19.7	-21.5
75	-9.0	-10.9	-12.7	-11.0	-12.8	-14.6	-14.9	-16.8	-18.6
70	-7.6	-9.4	-11.3	-9.1	-10.9	-12.7	-12.3	-14.1	-15.9
65	-6.4	-8.2	-10.0	-7.5	-9.4	-11.2	-10.1	-11.9	-13.7
60	-5.4	-7.2	-9.0	-6.2	-8.0	-9.9	-8.2	-10.0	-11.8
55	-4.5	-6.3	-8.2	-5.2	-7.0	-8.8	-6.6	-8.4	-10.3
50	-3.9	-5.7	-7.5	-4.4	-6.2	-8.0	-5.5	-7.3	-9.1
45	-3.5	-5.3	-7.1	-3.8	-5.6	-7.5	-4.6	-6.5	-8.3
40	-3.2	-5.0	-6.9	-3.5	-5.4	-7.2	-4.2	-6.0	-7.8
35	-3.2	-5.0	-6.8	-3.5	-5.3	-7.1	-4.1	-5.9	-7.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1200							26.7		
1400	32.4			34.8			38.7		
1600	45.5	25.6		47.7	28.2		51.1	32.4	
1800	58.9	38.6		61.0	40.9		64.0	44.5	26.1
2000	72.8	51.8	31.8	74.6	54.0	34.2	77.4	57.1	38.1
2200	87.1	65.5	44.9	88.7	67.4	47.1		70.3	50.5
2400		79.5	58.3		81.2	60.3		84.1	63.3
2600			72.1			73.9			76.8
2800			86.4			88.0			

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 m/+30 m 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-12	-10	-7	-2	0	0	0	0	0
75	-13	-11	-8	-5	-3	0	0	0	0
70	-14	-12	-9	-8	-5	-3	0	0	0
65	-15	-13	-10	-10	-8	-5	0	0	0
60	-16	-14	-11	-13	-10	-8	-4	-2	0
55	-17	-15	-12	-15	-12	-10	-8	-5	-3
50	-18	-16	-13	-16	-14	-11	-11	-8	-6
45	-19	-17	-14	-18	-15	-13	-13	-11	-8
40	-20	-18	-15	-19	-16	-14	-15	-13	-10
35	-21	-19	-16	-20	-17	-15	-17	-14	-12

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-12.7	-15.6	-18.6	-15.2	-18.1	-21.1	-20.1	-23.1	-26.0
75	-10.9	-13.8	-16.8	-12.9	-15.8	-18.8	-16.9	-19.8	-22.8
70	-9.3	-12.2	-15.2	-10.9	-13.8	-16.8	-14.1	-17.0	-20.0
65	-7.9	-10.8	-13.8	-9.1	-12.1	-15.0	-11.6	-14.6	-17.5
60	-6.7	-9.6	-12.6	-7.6	-10.6	-13.5	-9.6	-12.5	-15.5
55	-5.7	-8.7	-11.6	-6.4	-9.4	-12.3	-7.9	-10.9	-13.8
50	-5.0	-7.9	-10.9	-5.5	-8.5	-11.4	-6.6	-9.6	-12.5
45	-4.4	-7.4	-10.3	-4.8	-7.8	-10.7	-5.7	-8.7	-11.6
40	-4.1	-7.0	-10.0	-4.4	-7.4	-10.3	-5.2	-8.1	-11.1
35	-3.9	-6.9	-9.8	-4.3	-7.3	-10.2	-5.0	-8.0	-10.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1600							35.5		
1800	33.4			39.0			48.3	26.2	
2000	49.1			53.8	28.1		62.8	38.5	
2200	64.4	37.3		69.0	42.6		80.0	51.7	29.3
2400	79.4	52.9	25.4	84.9	57.5	31.7		66.8	41.6
2600		68.1	41.2		72.9	46.3		84.8	55.2
2800		83.0	56.7		88.9	61.3			70.9
3000			71.9			76.8			89.9
3200			86.6						

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -45 m/+40 m 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-18	-15	-13	-4	-2	0	0	0	0
75	-19	-16	-14	-8	-5	-3	0	0	0
70	-20	-17	-15	-11	-9	-6	0	0	0
65	-21	-18	-16	-14	-12	-9	0	0	0
60	-22	-19	-17	-17	-14	-12	-6	-3	-1
55	-23	-20	-18	-19	-17	-14	-11	-8	-6
50	-24	-21	-19	-21	-19	-16	-15	-12	-10
45	-25	-22	-20	-23	-20	-18	-18	-15	-13
40	-26	-23	-21	-24	-22	-19	-20	-18	-15
35	-27	-25	-22	-25	-23	-20	-23	-20	-18

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

20K 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
80	-0.8	-0.8	-0.8	-5.4	-5.4	-5.4	-9.8	-9.8	-9.8
75	-0.8	-0.8	-0.8	-5.0	-5.0	-5.0	-8.9	-8.9	-8.9
70	-0.8	-0.8	-0.8	-4.6	-4.6	-4.6	-8.0	-8.0	-8.0
65	-0.9	-0.9	-0.9	-4.3	-4.3	-4.3	-7.3	-7.3	-7.3
60	-0.9	-0.9	-0.9	-4.0	-4.0	-4.0	-6.6	-6.6	-6.6
55	-0.8	-0.8	-0.8	-3.7	-3.7	-3.7	-6.1	-6.1	-6.1
50	-0.8	-0.8	-0.8	-3.5	-3.5	-3.5	-5.6	-5.6	-5.6
45	-0.8	-0.8	-0.8	-3.2	-3.2	-3.2	-5.2	-5.2	-5.2
40	-0.7	-0.7	-0.7	-3.0	-3.0	-3.0	-4.9	-4.9	-4.9
35	-0.6	-0.6	-0.6	-2.9	-2.9	-2.9	-4.7	-4.7	-4.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1000	31.1								
1200	49.5	31.3							
1400	68.9	49.6	31.4	36.2					
1600	89.8	69.1	49.8	50.9	30.9				
1800		90.0	69.3	66.6	45.3	25.6	35.1		
2000				83.6	60.6	39.9	45.6	25.8	
2200					77.1	54.8	56.5	36.1	
2400						70.8	68.0	46.6	26.8
2600						88.2	80.0	57.6	37.1
2800								69.1	47.6
3000								81.2	58.7
3200									70.2
3400									82.3

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 m/+35 m 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 (20K 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
80	-12	-9	-7	-19	-17	-14	-32	-29	-27
75	-9	-6	-4	-16	-14	-11	-28	-25	-23
70	-7	-5	-2	-15	-13	-10	-26	-24	-21
65	-7	-4	-2	-15	-13	-10	-26	-24	-21
60	-7	-5	-2	-16	-14	-11	-27	-25	-22
55	-8	-6	-3	-18	-15	-13	-29	-27	-24
50	-9	-7	-4	-20	-17	-15	-32	-29	-27
45	-10	-8	-5	-21	-19	-16	-34	-31	-29
40	-11	-9	-6	-22	-20	-17	-35	-33	-30
35	-11	-8	-6	-23	-20	-18	-36	-33	-31

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

20K 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
80	-1.4	-1.4	-1.4	-7.2	-7.2	-7.2	-13.4	-13.4	-13.4
75	-1.5	-1.5	-1.5	-6.7	-6.7	-6.7	-11.7	-11.7	-11.7
70	-1.5	-1.5	-1.5	-6.2	-6.2	-6.2	-10.3	-10.3	-10.3
65	-1.5	-1.5	-1.5	-5.7	-5.7	-5.7	-9.1	-9.1	-9.1
60	-1.5	-1.5	-1.5	-5.3	-5.3	-5.3	-8.3	-8.3	-8.3
55	-1.5	-1.5	-1.5	-4.9	-4.9	-4.9	-7.7	-7.7	-7.7
50	-1.4	-1.4	-1.4	-4.6	-4.6	-4.6	-7.4	-7.4	-7.4
45	-1.4	-1.4	-1.4	-4.3	-4.3	-4.3	-7.4	-7.4	-7.4
40	-1.3	-1.3	-1.3	-4.0	-4.0	-4.0	-7.7	-7.7	-7.7
35	-1.2	-1.2	-1.2	-3.8	-3.8	-3.8	-8.2	-8.2	-8.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1200	41.6								
1400	62.4	41.8							
1600	84.3	62.6	41.9	28.1					
1800		84.5	62.8	46.2					
2000			84.7	64.9	39.4				
2200				84.6	57.9	32.7			
2400					77.2	50.9			
2600						69.9	37.4		
2800						89.8	52.3		
3000							66.8	35.4	
3200							80.9	50.4	
3400								64.9	33.3
3600								79.1	48.4
3800									63.0
4000									77.2

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30 m/+25 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -50 m/+45 m 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 (20K 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
80	-12	-10	-7	-23	-20	-18	-42	-39	-37
75	-10	-7	-5	-20	-18	-15	-38	-35	-33
70	-8	-6	-3	-19	-17	-14	-36	-34	-31
65	-8	-6	-3	-20	-17	-15	-36	-34	-31
60	-9	-6	-4	-21	-19	-16	-38	-36	-33
55	-10	-8	-5	-23	-20	-18	-41	-38	-36
50	-11	-9	-6	-25	-23	-20	-43	-41	-38
45	-13	-10	-8	-27	-25	-22	-46	-43	-41
40	-14	-11	-9	-29	-26	-24	-47	-45	-42
35	-14	-11	-9	-30	-27	-25	-48	-45	-43

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

Based on engine bleed for packs on and 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 (20K Derate)

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 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	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 (20K 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	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)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
68	140	140	144												
64	135	136	140	132	132	138									
60	130	131	136	127	127	133									
56	125	125	131	122	122	129	117	117	123	114	115	121	114	114	120
52	119	120	126	116	116	124	112	112	118	109	109	116	108	109	115
48	113	113	121	110	110	119	106	106	114	104	104	112	103	103	111
44	107	107	116	104	104	114	100	100	109	98	98	107	97	98	106
40	101	101	111	97	98	108	94	94	104	92	93	102	92	92	101

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						0	0					
60	140	4	5	5	6				4	5	6	6				0	0	0	0			
50	122	3	4	4	4	6	7	9	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	1	2	2	3	4	6	8	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	1	2	5	7	0	0	1	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	1	2	3	5	0	0	1	1	2	3	5	0	0	0	0	0	0	0
-60	-76	0	0	0	1	2	3	3	0	0	1	1	2	3	4	0	0	0	0	0	0	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	0	0	0	0	-1	0	0	0	0	0	0	0
68	-2	0	0	0	0	-1	0	0	0	0	0	0	0
64	-2	0	0	0	0	-1	0	0	0	0	0	0	0
60	-2	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	0	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	-1	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	92	90					
60	140	92	90	91	92			
50	122	94	92	91	92	90	86	82
40	104	99	97	96	94	91	86	82
30	86	102	101	100	99	95	90	84
20	68	102	102	101	99	97	94	89
-60	-76	103	103	102	100	98	96	94

Takeoff Speeds - Wet Runway (18.5K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
68	136	140	144												
64	131	136	140	126	132	138									
60	125	131	136	121	127	133									
56	119	125	131	115	122	129	113	117	123	111	115	121	111	114	120
52	113	120	126	109	116	124	106	112	118	105	109	116	105	109	115
48	107	113	121	103	110	119	100	106	114	99	104	112	98	103	111
44	100	107	116	97	104	114	94	100	109	93	98	107	92	98	106
40	94	101	111	90	98	108	88	94	104	87	93	102	86	92	101

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	9	10						6	7						0	0					
60	140	7	8	8	8				4	5	6	6				0	0	0	0			
50	122	4	5	5	5	7	10	14	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	2	3	3	3	5	7	11	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	1	3	5	8	0	0	1	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	1	2	3	6	0	0	1	1	2	3	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	0	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	-5	-2	0	2	5	-3	-2	-1	0	0	1	2	2
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
64	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
60	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
56	-3	-2	0	2	4	-4	-2	-1	0	1	1	2	3
52	-3	-2	0	2	3	-4	-2	-1	0	1	2	2	3
48	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
44	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
40	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	3

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	92	90					
60	140	92	90	91	92			
50	122	94	92	91	92	90	86	82
40	104	99	97	96	94	91	86	82
30	86	102	101	100	99	95	90	84
20	68	102	102	101	99	97	94	89
-60	-76	103	103	102	100	98	96	94

Max Allowable Clearway (18.5K Derate)

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	260
3000	300
3500	350
4000	400

Clearway and Stopway V1 Adjustments (18.5K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
300	-2	-3	-3			
200	-2	-3	-3			
100	-1	-1	-1			
0	0	0	0	0	0	0
-100	0	0	-1	2	2	1
-200	0	0	-1	2	2	1
-300	0	0	-1	2	2	1

Use of clearway not permitted on wet runways.

Stab Trim Setting (18.5K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)							
	12	14	16	18	24	28	31	33
70	8 1/2	8 1/2	8 1/4	7 3/4	6 1/2	5 1/2	5	4 1/2
60	8 1/2	8 1/2	7 3/4	7 1/4	5 3/4	5	4 1/2	4
50	8 1/4	8	7 1/4	6 3/4	5 1/4	4 1/2	4	3 1/2
40	7	6 3/4	6	5 1/2	4 1/2	3 3/4	3 1/4	2 3/4
36	6	6	5 1/2	5	4	3 1/2	3	2 1/2

Flaps 10, 15 and 20

WEIGHT (1000 KG)	C.G. (%MAC)								
	12	14	16	18	24	28	30	31	33
70	8 1/2	8 1/2	8 1/4	7 1/2	6	5	4 1/2	4 1/4	3 3/4
60	8 1/2	8 1/4	7 1/2	6 3/4	5 1/4	4 1/4	3 3/4	3 1/2	3
50	8 1/4	7 1/2	6 3/4	6	4 1/2	3 3/4	3 1/4	3	2 1/2
40	6 1/4	5 3/4	5 1/2	5	3 3/4	3	2 1/2	2 1/4	2 1/4
36	5 1/4	5	4 3/4	4 1/4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

18.5K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-11.4	-13.2	-15.1	-14.2	-16.0	-17.8	-19.8	-21.6	-23.4
75	-9.6	-11.4	-13.2	-11.8	-13.6	-15.4	-16.3	-18.2	-20.0
70	-8.0	-9.8	-11.6	-9.7	-11.5	-13.3	-13.3	-15.2	-17.0
65	-6.6	-8.4	-10.2	-7.9	-9.7	-11.5	-10.8	-12.6	-14.4
60	-5.4	-7.2	-9.0	-6.4	-8.2	-10.0	-8.6	-10.4	-12.2
55	-4.5	-6.3	-8.1	-5.2	-7.0	-8.8	-6.8	-8.7	-10.5
50	-3.8	-5.6	-7.4	-4.3	-6.1	-8.0	-5.5	-7.3	-9.1
45	-3.3	-5.2	-7.0	-3.7	-5.6	-7.4	-4.6	-6.4	-8.2
40	-3.1	-4.9	-6.7	-3.5	-5.3	-7.1	-4.1	-5.9	-7.8
35	-3.1	-4.9	-6.7	-3.5	-5.3	-7.1	-4.0	-5.9	-7.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1200				25.2			29.1		
1400	36.3			38.3			41.6		
1600	49.8	29.3		51.7	31.5		54.4	35.1	
1800	63.8	42.7		65.4	44.6		67.6	47.7	28.5
2000	78.3	56.4	35.6	79.6	58.2	37.7	81.3	60.7	41.0
2200		70.6	49.1		72.1	51.0		74.1	53.8
2400		85.4	63.1		86.5	64.8		87.9	67.0
2600			77.5			78.9			80.6

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 -35 m/+30 m 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-9	-6	-4	0	0	0	0	0	0
75	-10	-8	-5	-2	0	0	0	0	0
70	-12	-9	-7	-5	-3	0	0	0	0
65	-13	-11	-8	-8	-5	-3	0	0	0
60	-14	-12	-9	-10	-8	-5	-1	0	0
55	-16	-13	-11	-13	-10	-8	-5	-3	0
50	-17	-14	-12	-14	-12	-9	-9	-6	-4
45	-18	-15	-13	-16	-13	-11	-12	-9	-7
40	-19	-16	-14	-17	-15	-12	-14	-11	-9
35	-20	-17	-15	-18	-16	-13	-15	-13	-10

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								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-13.6	-16.1	-18.6	-16.4	-18.9	-21.4	-22.0	-24.5	-27.0
75	-11.5	-14.0	-16.5	-13.8	-16.3	-18.8	-18.4	-20.9	-23.3
70	-9.7	-12.2	-14.7	-11.5	-14.0	-16.5	-15.2	-17.6	-20.1
65	-8.1	-10.6	-13.1	-9.5	-12.0	-14.5	-12.4	-14.9	-17.4
60	-6.8	-9.3	-11.8	-7.9	-10.4	-12.9	-10.0	-12.5	-15.0
55	-5.7	-8.2	-10.7	-6.5	-9.0	-11.5	-8.1	-10.6	-13.1
50	-4.9	-7.4	-9.9	-5.5	-8.0	-10.5	-6.7	-9.2	-11.7
45	-4.3	-6.8	-9.3	-4.8	-7.3	-9.7	-5.6	-8.1	-10.6
40	-4.0	-6.5	-9.0	-4.3	-6.8	-9.3	-5.1	-7.5	-10.0
35	-3.9	-6.4	-8.9	-4.2	-6.7	-9.2	-4.9	-7.4	-9.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1400							27.2		
1600	25.4			30.9			39.7		
1800	41.1			45.5			53.4	33.1	
2000	56.8	32.8		60.8	37.8		69.6	46.0	26.6
2200	72.5	48.5		77.3	52.7	30.2		60.7	39.1
2400	88.4	64.3	40.3		68.5	44.8		78.7	52.7
2600		80.1	56.0		85.5	60.1			68.8
2800			71.8			76.4			89.2
3000			87.6						

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 -45 m/+40 m 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
80	-14	-11	-9	0	0	0	0	0	0
75	-15	-13	-10	-4	-2	0	0	0	0
70	-17	-14	-12	-8	-5	-3	0	0	0
65	-18	-16	-13	-11	-9	-6	0	0	0
60	-19	-17	-14	-14	-12	-9	-2	0	0
55	-21	-18	-16	-17	-14	-12	-7	-5	-2
50	-22	-19	-17	-19	-17	-14	-12	-9	-7
45	-23	-21	-18	-21	-18	-16	-16	-13	-11
40	-24	-22	-19	-22	-20	-17	-18	-16	-13
35	-25	-23	-20	-24	-21	-19	-21	-18	-16

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
80	-0.8	-0.8	-0.8	-5.8	-5.8	-5.8	-10.5	-10.5	-10.5
75	-0.8	-0.8	-0.8	-5.2	-5.2	-5.2	-9.2	-9.2	-9.2
70	-0.7	-0.7	-0.7	-4.6	-4.6	-4.6	-8.2	-8.2	-8.2
65	-0.7	-0.7	-0.7	-4.2	-4.2	-4.2	-7.2	-7.2	-7.2
60	-0.6	-0.6	-0.6	-3.8	-3.8	-3.8	-6.5	-6.5	-6.5
55	-0.6	-0.6	-0.6	-3.5	-3.5	-3.5	-5.9	-5.9	-5.9
50	-0.6	-0.6	-0.6	-3.3	-3.3	-3.3	-5.4	-5.4	-5.4
45	-0.7	-0.7	-0.7	-3.1	-3.1	-3.1	-5.2	-5.2	-5.2
40	-0.7	-0.7	-0.7	-3.0	-3.0	-3.0	-5.0	-5.0	-5.0
35	-0.7	-0.7	-0.7	-3.0	-3.0	-3.0	-5.1	-5.1	-5.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1000	33.6								
1200	52.6	35.2							
1400	72.4	54.2	36.8	39.4					
1600		74.1	55.9	54.6	36.2		27.7		
1800			75.8	70.8	51.1	33.0	38.2		
2000				88.4	67.2	47.8	48.9	30.3	
2200					84.4	63.5	60.2	40.8	
2400						80.5	72.2	51.7	32.9
2600							84.9	63.1	43.4
2800								75.3	54.5
3000								88.1	66.1
3200									78.4

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 -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 m/+35 m 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.**

DO NOT USE FOR FLIGHT

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
80	-10	-8	-7	-15	-14	-13	-26	-25	-23
75	-7	-6	-5	-14	-12	-11	-24	-22	-21
70	-6	-5	-4	-13	-12	-11	-23	-22	-21
65	-6	-5	-3	-14	-13	-11	-24	-22	-21
60	-6	-5	-4	-15	-14	-12	-25	-24	-22
55	-7	-6	-5	-16	-15	-14	-27	-26	-24
50	-8	-7	-6	-18	-17	-15	-29	-28	-27
45	-9	-8	-7	-20	-18	-17	-31	-30	-29
40	-10	-9	-8	-21	-20	-18	-33	-32	-31
35	-10	-9	-8	-22	-21	-20	-35	-34	-32

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
80	-2.0	-2.0	-2.0	-7.7	-7.7	-7.7	-15.3	-15.3	-15.3
75	-1.8	-1.8	-1.8	-6.9	-6.9	-6.9	-12.9	-12.9	-12.9
70	-1.6	-1.6	-1.6	-6.2	-6.2	-6.2	-10.9	-10.9	-10.9
65	-1.4	-1.4	-1.4	-5.6	-5.6	-5.6	-9.4	-9.4	-9.4
60	-1.3	-1.3	-1.3	-5.1	-5.1	-5.1	-8.2	-8.2	-8.2
55	-1.2	-1.2	-1.2	-4.7	-4.7	-4.7	-7.5	-7.5	-7.5
50	-1.2	-1.2	-1.2	-4.4	-4.4	-4.4	-7.1	-7.1	-7.1
45	-1.2	-1.2	-1.2	-4.2	-4.2	-4.2	-7.2	-7.2	-7.2
40	-1.3	-1.3	-1.3	-4.1	-4.1	-4.1	-7.7	-7.7	-7.7
35	-1.4	-1.4	-1.4	-4.0	-4.0	-4.0	-8.5	-8.5	-8.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1200	45.5	26.5							
1400	66.7	47.3	28.2						
1600	88.4	68.5	49.1	33.8					
1800			70.4	52.2	28.5				
2000				71.5	46.7				
2200					65.7	41.2			
2400					85.6	60.0	30.8		
2600						79.6	45.4		
2800							60.1	31.1	
3000							74.9	45.7	
3200							89.7	60.4	31.4
3400								75.1	46.0
3600								90.0	60.7
3800									75.4

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 -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 m/+40 m 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
80	-10	-7	-5	-18	-15	-13	-36	-33	-31
75	-8	-6	-3	-17	-14	-12	-33	-31	-28
70	-7	-5	-2	-17	-14	-12	-32	-30	-27
65	-7	-5	-2	-18	-15	-13	-33	-31	-28
60	-8	-5	-3	-19	-17	-14	-35	-33	-30
55	-9	-6	-4	-21	-18	-16	-38	-35	-33
50	-10	-8	-5	-23	-21	-18	-40	-38	-35
45	-11	-9	-6	-25	-23	-20	-43	-41	-38
40	-12	-10	-7	-27	-25	-22	-45	-43	-40
35	-13	-11	-8	-29	-26	-24	-46	-44	-41

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 bleed for packs on and 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 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 (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	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	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	88.4	88.6	88.5	88.2	88.9	91.3	92.9	94.3	94.4	92.7
55	89.2	89.4	89.3	89.1	89.3	90.6	92.3	93.6	93.7	92.0
50	90.0	90.1	90.1	89.9	90.2	90.7	91.6	92.9	93.0	91.3
45	90.7	90.8	90.9	90.7	91.1	91.6	91.6	92.2	92.3	90.6
40	91.5	91.6	91.6	91.4	92.0	92.4	92.4	91.5	91.6	89.9
35	92.0	92.3	92.3	92.2	92.8	93.2	93.2	92.3	91.6	90.0
30	91.3	93.0	93.0	92.9	93.6	94.0	93.9	93.1	92.5	91.0
25	90.5	93.0	93.8	93.6	94.3	94.8	94.6	93.9	93.3	92.0
20	89.8	92.3	94.5	94.3	95.1	95.5	95.3	94.6	94.1	92.9
15	89.1	91.5	93.9	95.1	95.8	96.2	96.0	95.4	94.9	93.9
10	88.3	90.8	93.1	95.3	96.7	96.9	96.6	96.1	95.7	94.8
5	87.5	90.0	92.4	94.5	97.7	97.8	97.3	96.9	96.5	95.7
0	86.8	89.2	91.6	93.7	97.1	98.9	98.3	97.8	97.4	96.6
-5	86.0	88.4	90.8	92.9	96.3	98.8	99.3	98.5	98.2	97.7
-10	85.2	87.6	89.9	92.1	95.5	98.0	99.6	99.4	99.1	98.6
-15	84.4	86.8	89.1	91.2	94.7	97.3	98.8	100.4	100.1	99.6
-20	83.6	86.0	88.3	90.4	93.9	96.5	98.0	100.1	100.6	100.2
-25	82.8	85.2	87.5	89.6	93.1	95.7	97.2	99.2	99.8	99.4
-30	82.0	84.3	86.6	88.7	92.3	94.9	96.4	98.4	98.9	98.6
-35	81.2	83.5	85.8	87.9	91.4	94.0	95.5	97.6	98.1	97.7
-40	80.4	82.6	84.9	87.0	90.6	93.2	94.7	96.7	97.2	96.9

%N1 Adjustments for Engine Bleed

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 and 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	88.5	89.3	89.4									
52	125	55	89.2	90.1	90.3	90.4	90.5							
47	116	50	90.0	90.9	91.0	91.2	91.3	91.4	91.4	91.3				
42	108	45	90.9	91.7	91.9	92.0	92.1	92.2	92.2	92.1	91.8	91.4		
37	99	40	91.8	92.6	92.7	92.8	92.9	93.0	93.0	92.9	92.6	92.2	92.1	92.0
32	90	35	91.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	93.0	92.9
27	81	30	91.2	93.4	94.1	94.5	94.6	94.6	94.6	94.5	94.1	93.8	93.8	93.7
22	72	25	90.5	92.6	93.3	94.0	94.7	95.5	95.4	95.3	95.0	94.6	94.5	94.5
17	63	20	89.7	91.9	92.6	93.3	94.0	94.7	95.2	95.8	96.0	95.7	95.3	95.3
12	54	15	89.0	91.1	91.8	92.5	93.2	93.9	94.5	95.0	95.6	96.2	96.8	96.5
7	45	10	88.3	90.4	91.0	91.7	92.4	93.2	93.7	94.2	94.8	95.4	96.1	96.7
2	36	5	87.5	89.6	90.3	90.9	91.6	92.4	92.9	93.4	94.0	94.6	95.3	95.9
-3	27	0	86.7	88.8	89.5	90.1	90.9	91.6	92.1	92.6	93.2	93.8	94.5	95.1
-8	18	-5	86.0	88.0	88.7	89.4	90.1	90.8	91.3	91.8	92.4	93.0	93.7	94.3
-13	9	-10	85.2	87.2	87.9	88.5	89.2	89.9	90.5	91.0	91.6	92.2	92.9	93.5
-17	1	-15	84.4	86.4	87.1	87.7	88.4	89.1	89.7	90.2	90.8	91.4	92.0	92.7
-22	-8	-20	83.6	85.6	86.3	86.9	87.6	88.3	88.8	89.3	90.0	90.5	91.2	91.9
-27	-17	-25	82.8	84.8	85.4	86.1	86.8	87.5	88.0	88.5	89.1	89.7	90.4	91.1
-32	-26	-30	82.0	84.0	84.6	85.2	85.9	86.6	87.1	87.6	88.3	88.9	89.5	90.2
-37	-35	-35	81.2	83.1	83.8	84.4	85.1	85.8	86.3	86.8	87.4	88.0	88.7	89.4
-42	-44	-40	80.3	82.3	82.9	83.5	84.2	84.9	85.4	85.9	86.5	87.1	87.8	88.5
-47	-53	-45	79.5	81.4	82.1	82.7	83.4	84.0	84.5	85.0	85.7	86.3	87.0	87.6
-52	-62	-50	78.6	80.6	81.2	81.8	82.5	83.1	83.6	84.1	84.8	85.4	86.1	86.8

%N1 Adjustments for Engine Bleed

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	0.7	0.7	0.7	0.8	0.8	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
40000	PITCH ATT	**4.5**	**4.0**	**4.0**	
	V/S (FT/MIN)	1800	1100	500	
30000	PITCH ATT	**4.5**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2700	2000	1500	1200
20000	PITCH ATT	**7.5**	**6.5**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3200	2600	2100
10000	PITCH ATT	**10.5**	**9.0**	**8.5**	**8.0**
	V/S (FT/MIN)	5400	4300	3400	2800
SEA LEVEL	PITCH ATT	**14.5**	**12.5**	**11.0**	**10.0**
	V/S (FT/MIN)	6600	5200	4300	3600

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
40000	PITCH ATT	**2.0**	**2.5**	**3.5**	
	%N1	82	85	90	
35000	PITCH ATT	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	82	84	87
30000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**
	%N1	80	81	82	84
25000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**
	%N1	76	77	78	80
20000	PITCH ATT	**1.0**	**1.5**	**2.5**	**3.0**
	%N1	72	74	75	76
15000	PITCH ATT	**1.0**	**1.5**	**2.5**	**3.0**
	%N1	69	70	71	73

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
40000	PITCH ATT	**-1.5**	**-0.5**	**0.0**	**0.5**
	V/S (FT/MIN)	-2800	-2500	-2500	-2800
30000	PITCH ATT	**-3.0**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN)	-3000	-2500	-2200	-2100
20000	PITCH ATT	**-3.0**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-2700	-2200	-2000	-1800
10000	PITCH ATT	**-3.0**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN	-2400	-2000	-1800	-1600
SEA LEVEL	PITCH ATT	**-3.5**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN)	-2200	-1800	-1600	-1500

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
10000	PITCH ATT	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	52	57	62	66
5000	PITCH ATT	**5.0**	**5.5**	**5.0**	**5.0**
	%N1	48	54	58	62

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
FLAPS 1 (GEAR UP) (VREF40 + 50)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	51	56	60	64
FLAPS 5 (GEAR UP) (VREF40 + 30)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	52	57	62	66
FLAPS 15 (GEAR DOWN) (VREF40 + 20)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	59	65	70	74

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		40	50	60	70
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**
	%N1	42	47	51	54
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.5**
	%N1	47	52	56	60
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	54	59	64	68

Intentionally
Blank

Performance Inflight
All Engine

Chapter PI
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°)
70	34300	-14	37700*	37700*	37700*	36400	35100
65	35800	-18	39200*	39200*	39200*	38000	36600
60	37500	-18	40700*	40700*	40700*	39700	38300
55	39300	-18	41000	41000	41000	41000	40100
50	41000	-18	41000	41000	41000	41000	41000
45	41000	-18	41000	41000	41000	41000	41000
40	41000	-18	41000	41000	41000	41000	41000
35	41000	-18	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°)
70	34300	-9	37000*	37000*	37000*	36400	35100
65	35800	-12	38300*	38300*	38300*	38000	36600
60	37500	-13	39800*	39800*	39800*	39700	38300
55	39300	-13	41000	41000	41000	41000	40100
50	41000	-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

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°)
70	34300	-3	35700*	35700*	35700*	35700*	35100
65	35800	-7	37200*	37200*	37200*	37200*	36600
60	37500	-7	38700*	38700*	38700*	38700*	38300
55	39300	-7	40200*	40200*	40200*	40200*	40100
50	41000	-7	41000	41000	41000	41000	41000
45	41000	-7	41000	41000	41000	41000	41000
40	41000	-7	41000	41000	41000	41000	41000
35	41000	-7	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
70	%N1	79.8	81.2	82.7	84.0	85.2	86.4	87.9	90.6		
	MACH	.674	.699	.726	.750	.768	.781	.788	.791		
	KIAS	293	292	292	290	284	277	268	257		
	FF/ENG	1309	1303	1307	1304	1285	1265	1261	1290		
65	%N1	78.2	79.5	81.0	82.5	83.8	85.0	86.2	88.2	92.1	
	MACH	.655	.677	.704	.731	.754	.771	.783	.790	.791	
	KIAS	284	282	282	281	279	273	265	256	245	
	FF/ENG	1223	1211	1214	1216	1210	1189	1172	1181	1226	
60	%N1	76.7	77.9	79.2	80.7	82.2	83.5	84.7	86.3	88.9	93.4
	MACH	.637	.657	.679	.707	.734	.757	.773	.784	.790	.791
	KIAS	276	273	271	271	271	268	262	254	245	234
	FF/ENG	1142	1126	1120	1124	1124	1115	1094	1090	1107	1162
55	%N1	75.0	76.2	77.4	78.7	80.3	81.7	83.1	84.6	86.7	89.5
	MACH	.618	.637	.657	.680	.708	.736	.758	.774	.785	.791
	KIAS	267	264	262	260	260	259	256	250	243	234
	FF/ENG	1067	1044	1035	1030	1033	1031	1022	1010	1012	1030
50	%N1	72.9	74.4	75.6	76.8	78.1	79.7	81.2	82.9	84.9	87.0
	MACH	.592	.616	.635	.656	.679	.707	.735	.758	.774	.785
	KIAS	256	255	253	251	249	249	248	245	239	232
	FF/ENG	983	968	953	945	939	940	938	935	931	933
45	%N1	70.6	72.1	73.5	74.8	76.0	77.3	78.9	80.8	82.9	84.9
	MACH	.564	.587	.611	.632	.652	.675	.704	.733	.756	.773
	KIAS	243	243	243	241	238	237	236	236	233	228
	FF/ENG	895	884	877	865	856	849	848	851	855	859
40	%N1	67.7	69.4	71.0	72.5	73.8	75.0	76.3	78.2	80.5	82.7
	MACH	.532	.555	.579	.604	.626	.647	.669	.697	.726	.752
	KIAS	228	229	229	229	228	226	224	223	223	221
	FF/ENG	805	797	793	788	788	776	768	767	776	782
35	%N1	64.5	66.1	67.9	69.5	71.1	72.5	73.8	75.4	77.5	79.9
	MACH	.498	.520	.543	.567	.592	.617	.638	.660	.685	.715
	KIAS	213	214	214	215	215	215	212	210	209	209
	FF/ENG	728	722	718	715	709	700	688	682	683	691

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
302	275	251	231	215	200	190	180	172	164	158
455	413	377	347	322	300	285	271	258	247	238
608	552	504	464	430	400	380	362	345	330	317
762	692	631	580	538	500	475	452	431	413	396
917	832	758	697	646	600	570	543	518	495	475
1073	973	886	814	754	700	665	633	604	577	554
1229	1114	1014	931	861	800	760	723	690	660	633
1386	1255	1142	1048	969	900	855	814	776	742	711
1543	1397	1270	1165	1078	1000	950	904	862	824	790
1701	1539	1398	1283	1186	1100	1045	995	948	907	869
1859	1681	1527	1400	1294	1200	1140	1085	1034	989	948
2018	1824	1656	1518	1402	1300	1235	1175	1120	1071	1027
2178	1968	1785	1636	1511	1400	1330	1265	1206	1153	1105
2339	2112	1915	1754	1619	1500	1425	1355	1292	1235	1184
2500	2257	2045	1872	1727	1600	1520	1446	1378	1317	1262
2662	2401	2175	1990	1836	1700	1615	1536	1464	1399	1341
2824	2546	2305	2109	1945	1800	1709	1626	1550	1481	1419
2988	2692	2436	2227	2053	1900	1804	1716	1635	1562	1497
3152	2839	2567	2346	2162	2000	1899	1806	1721	1644	1575

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	1.8	1:01	1.6	0:57	1.4	0:54	1.3	0:52
400	2.7	1:26	2.5	1:21	2.2	1:14	1.9	1:10	1.8	1:08
500	3.4	1:47	3.1	1:41	2.7	1:32	2.5	1:27	2.3	1:23
600	4.1	2:08	3.8	2:01	3.3	1:50	3.0	1:44	2.7	1:39
700	4.8	2:29	4.4	2:21	3.9	2:08	3.5	2:01	3.2	1:55
800	5.5	2:51	5.0	2:41	4.4	2:27	4.0	2:18	3.7	2:11
900	6.2	3:13	5.7	3:01	5.0	2:45	4.6	2:35	4.2	2:27
1000	6.8	3:34	6.3	3:22	5.6	3:03	5.1	2:52	4.7	2:43
1100	7.5	3:56	6.9	3:43	6.1	3:22	5.6	3:09	5.1	3:00
1200	8.2	4:19	7.6	4:03	6.7	3:41	6.1	3:27	5.6	3:16
1300	8.8	4:41	8.2	4:24	7.2	3:59	6.6	3:44	6.1	3:32
1400	9.5	5:03	8.8	4:45	7.8	4:18	7.1	4:02	6.5	3:49
1500	10.2	5:26	9.4	5:06	8.3	4:37	7.6	4:19	7.0	4:05
1600	10.8	5:49	10.0	5:28	8.9	4:57	8.1	4:37	7.5	4:21
1700	11.5	6:12	10.6	5:49	9.4	5:16	8.6	4:55	7.9	4:38
1800	12.1	6:35	11.2	6:11	9.9	5:35	9.1	5:13	8.4	4:55
1900	12.8	6:58	11.8	6:33	10.5	5:55	9.6	5:31	8.9	5:12
2000	13.4	7:22	12.4	6:55	11.0	6:15	10.1	5:49	9.3	5:28

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	-0.3	-0.1	0.0	0.2	0.3
4	-0.5	-0.3	0.0	0.4	0.7
6	-0.8	-0.4	0.0	0.5	1.1
8	-1.1	-0.6	0.0	0.7	1.5
10	-1.5	-0.7	0.0	0.9	1.9
12	-1.8	-0.8	0.0	1.1	2.3
14	-2.1	-1.0	0.0	1.3	2.6

Based on .78/280/250 descent.

Long Range Cruise Enroute Fuel and Time - High Altitudes

Ground to Air Miles Conversions

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
544	508	476	448	423	400	382	365	350	335	323
814	761	713	671	634	600	573	548	525	504	485
1086	1015	951	895	845	800	764	731	701	673	648
1358	1269	1189	1119	1056	1000	956	914	876	842	810
1631	1524	1427	1343	1268	1200	1147	1097	1052	1010	972
1904	1779	1665	1567	1479	1400	1338	1280	1227	1178	1133
2178	2034	1904	1791	1691	1600	1529	1462	1401	1345	1294
2453	2290	2143	2016	1903	1800	1720	1645	1576	1513	1455
2729	2547	2383	2241	2114	2000	1910	1827	1750	1680	1616
3006	2805	2624	2466	2327	2200	2101	2009	1925	1847	1777
3285	3064	2865	2692	2539	2400	2292	2191	2099	2014	1937
3564	3323	3106	2917	2751	2600	2482	2373	2273	2181	2097
3844	3582	3347	3143	2963	2800	2673	2555	2446	2347	2257
4125	3843	3589	3369	3176	3000	2863	2737	2620	2513	2417
4408	4104	3832	3596	3388	3200	3054	2918	2793	2679	2576
4691	4367	4076	3823	3601	3400	3244	3099	2966	2845	2735
4977	4631	4320	4051	3814	3600	3434	3281	3139	3010	2893
5264	4895	4565	4279	4027	3800	3624	3462	3312	3175	3052
5552	5161	4810	4507	4241	4000	3814	3643	3485	3340	3210
5842	5428	5056	4736	4454	4200	4005	3824	3657	3505	3368
6134	5696	5303	4965	4668	4400	4194	4004	3829	3670	3525
6427	5965	5551	5194	4882	4600	4384	4185	4001	3834	3683
6722	6235	5799	5424	5096	4800	4574	4365	4173	3998	3840
7019	6507	6049	5655	5311	5000	4764	4546	4345	4162	3997

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	1.7	1:07	1.7	1:05	1.6	1:04	1.6	1:03	1.5	1:01
600	2.7	1:38	2.6	1:36	2.5	1:34	2.4	1:32	2.3	1:29
800	3.6	2:10	3.5	2:07	3.4	2:04	3.3	2:00	3.2	1:57
1000	4.6	2:42	4.4	2:38	4.3	2:34	4.1	2:29	4.0	2:25
1200	5.5	3:14	5.3	3:09	5.1	3:04	5.0	2:59	4.8	2:54
1400	6.4	3:46	6.2	3:41	6.0	3:35	5.8	3:29	5.6	3:22
1600	7.3	4:19	7.1	4:13	6.9	4:06	6.6	3:58	6.4	3:51
1800	8.2	4:51	8.0	4:45	7.7	4:37	7.5	4:29	7.2	4:20
2000	9.1	5:24	8.8	5:17	8.6	5:08	8.3	4:59	8.0	4:49
2200	10.0	5:58	9.7	5:49	9.4	5:40	9.1	5:30	8.8	5:19
2400	10.9	6:31	10.6	6:22	10.2	6:12	9.9	6:00	9.6	5:48
2600	11.8	7:05	11.4	6:55	11.0	6:44	10.7	6:32	10.4	6:18
2800	12.7	7:40	12.3	7:28	11.9	7:16	11.5	7:03	11.1	6:49
3000	13.6	8:14	13.1	8:01	12.7	7:48	12.3	7:34	11.9	7:19
3200	14.4	8:50	13.9	8:35	13.5	8:21	13.0	8:06	12.6	7:50
3400	15.3	9:25	14.8	9:09	14.3	8:54	13.8	8:38	13.4	8:21
3600	16.1	10:01	15.6	9:44	15.1	9:27	14.6	9:11	14.1	8:52
3800	17.0	10:38	16.4	10:19	15.8	10:01	15.3	9:43	14.9	9:23
4000	17.8	11:15	17.2	10:54	16.6	10:35	16.1	10:16	15.6	9:55
4200	18.6	11:52	18.0	11:30	17.4	11:09	16.8	10:49	16.3	10:27
4400	19.4	12:30	18.8	12:06	18.1	11:44	17.5	11:22	17.0	10:59
4600	20.2	13:08	19.6	12:42	18.9	12:19	18.3	11:56	17.7	11:32
4800	21.0	13:47	20.3	13:20	19.6	12:54	19.0	12:30	18.4	12:04
5000	21.8	14:26	21.1	13:57	20.4	13:30	19.7	13:04	19.1	12:37

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
2	-0.3	-0.1	0.0	0.2	0.5
4	-0.6	-0.3	0.0	0.4	1.0
6	-1.0	-0.4	0.0	0.6	1.5
8	-1.4	-0.6	0.0	0.9	2.0
10	-1.7	-0.8	0.0	1.1	2.5
12	-2.2	-0.9	0.0	1.3	3.0
14	-2.6	-1.1	0.0	1.5	3.4
16	-3.0	-1.3	0.0	1.7	3.8
18	-3.5	-1.6	0.0	1.9	4.2
20	-4.0	-1.8	0.0	2.1	4.6
22	-4.5	-2.0	0.0	2.3	5.0

Based on .78/280/250 descent.

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)							
	70	65	60	55	50	45	40	35
41		63	24	4	0	8	23	43
39	50	19	3	0	7	20	37	56
37	13	2	0	7	19	34	51	67
35	1	1	8	19	33	48	63	76
33	2	9	20	32	46	60	72	82
31	11	21	33	46	58	70	79	86
29	24	35	46	58	68	78	85	89
27	37	48	58	68	76	83	88	90
25	50	59	68	76	82	87	89	89

The above wind factor tables are 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
41000	25	280	106	123	135
39000	25	280	101	117	129
37000	24	270	96	112	123
35000	23	270	92	107	118
33000	22	270	88	102	113
31000	22	260	84	97	107
29000	21	260	79	91	100
27000	20	250	74	85	94
25000	19	250	69	79	87
23000	18	240	64	74	81
21000	17	240	59	68	75
19000	16	230	55	63	68
17000	15	220	50	57	62
15000	14	210	45	51	56
10000	10	180	32	35	37
5000	7	140	18	20	21
1500	4	100	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
70	%N1	58.9	61.8	65.8	69.8	74.0	78.5	82.7	87.2	
	KIAS	229	229	230	231	233	234	237	240	
	FF/ENG	1250	1220	1210	1200	1180	1170	1200	1240	
65	%N1	57.2	59.8	64.1	67.8	72.2	76.5	80.8	85.2	
	KIAS	221	221	222	223	224	225	227	230	
	FF/ENG	1170	1140	1130	1110	1100	1080	1100	1130	
60	%N1	55.3	57.8	62.0	65.9	70.1	74.4	78.8	83.2	92.7
	KIAS	212	212	213	214	215	216	218	220	224
	FF/ENG	1090	1060	1050	1030	1020	990	1010	1030	1170
55	%N1	53.2	55.8	59.6	63.9	67.8	72.2	76.6	81.0	88.9
	KIAS	203	203	204	204	205	207	208	210	214
	FF/ENG	1010	990	970	950	940	910	920	940	1020
50	%N1	51.0	53.6	57.2	61.5	65.4	69.9	74.2	78.7	86.0
	KIAS	193	194	194	195	196	197	198	200	203
	FF/ENG	930	910	890	870	860	840	840	850	910
45	%N1	48.6	51.1	54.8	58.7	63.0	67.1	71.5	76.0	83.3
	KIAS	183	183	184	185	185	186	187	189	191
	FF/ENG	860	830	820	810	790	780	770	770	810
40	%N1	46.1	48.5	52.2	55.9	60.2	64.2	68.7	73.1	80.3
	KIAS	177	177	177	177	177	177	177	178	180
	FF/ENG	800	770	750	730	710	700	690	680	710
35	%N1	43.5	45.8	49.4	53.1	56.9	61.3	65.5	69.9	77.0
	KIAS	170	170	170	170	170	170	170	170	170
	FF/ENG	720	700	670	650	640	630	620	610	620

This table includes 5% additional fuel for holding in a racetrack pattern.

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	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	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	775	65/-45	15	-30	100	10	-5	15	-15	60	15	30
MAX AUTO	1005	65/-60	20	-40	130	0	0	20	-20	100	0	0
AUTOBRAKE 3	1375	105/-105	35	-65	215	0	0	35	-35	165	0	0
AUTOBRAKE 2	1745	150/-150	50	-85	300	20	-25	50	-50	170	50	50
AUTOBRAKE 1	1925	175/-175	60	-100	350	50	-60	55	-55	160	20	230

Good Reported Braking Action

MAX MANUAL	1240	90/-80	30	-55	210	30	-20	30	-25	100	70	160
MAX AUTO	1365	95/-90	30	-55	215	25	-15	30	-25	115	75	175
AUTOBRAKE 3	1585	125/-120	45	-70	255	10	0	45	-40	190	10	20
AUTOBRAKE 2	2010	175/-170	60	-95	345	25	-25	60	-55	200	60	60

Medium Reported Braking Action

MAX MANUAL	1670	140/-130	50	-90	340	70	-55	45	-40	130	190	485
MAX AUTO	1750	140/-130	50	-90	340	65	-45	45	-40	145	190	480
AUTOBRAKE 3	1785	140/-130	50	-90	345	50	-25	50	-45	190	140	445
AUTOBRAKE 2	2060	180/-175	60	-105	395	50	-45	60	-55	200	100	240

Poor Reported Braking Action

MAX MANUAL	2165	200/-180	70	-135	545	175	-110	55	-55	160	420	1205
MAX AUTO	2275	200/-180	70	-135	535	175	-105	55	-55	160	430	1215
AUTOBRAKE 3	2275	200/-180	70	-135	535	175	-100	55	-55	175	420	1210
AUTOBRAKE 2	2320	210/-200	70	-140	555	150	-95	60	-60	200	330	1095

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 50 m.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	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	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	750	55/-40	15	-30	95	5	-5	15	-15	55	10	25
MAX AUTO	955	60/-60	20	-35	125	0	0	20	-20	95	0	0
AUTOBRAKE 3	1290	95/-95	30	-60	210	0	0	35	-35	155	0	0
AUTOBRAKE 2	1635	135/-135	45	-85	285	20	-30	45	-45	150	45	45
AUTOBRAKE 1	1800	160/-160	55	-95	335	50	-50	50	-50	145	170	210

Good Reported Braking Action

MAX MANUAL	1200	85/-80	30	-55	205	30	-20	30	-25	100	65	145
MAX AUTO	1315	90/-85	30	-55	210	25	-15	30	-25	115	70	160
AUTOBRAKE 3	1490	110/-105	35	-65	245	10	-5	45	-40	180	10	20
AUTOBRAKE 2	1885	160/-155	55	-95	330	25	-30	55	-50	175	55	55

Medium Reported Braking Action

MAX MANUAL	1595	130/-120	50	-85	335	70	-50	45	-40	130	175	430
MAX AUTO	1665	130/-120	50	-85	330	65	-45	45	-40	145	170	420
AUTOBRAKE 3	1695	135/-125	50	-90	340	50	-30	45	-40	180	135	405
AUTOBRAKE 2	1935	165/-160	60	-100	380	50	-50	55	-50	175	95	215

Poor Reported Braking Action

MAX MANUAL	2045	185/-170	65	-130	525	170	-105	55	-50	150	370	1030
MAX AUTO	2145	180/-165	65	-130	525	170	-100	55	-50	150	375	1035
AUTOBRAKE 3	2145	185/-165	65	-130	525	165	-95	55	-50	170	370	1030
AUTOBRAKE 2	2180	190/-180	65	-135	545	145	-95	60	-55	175	395	940

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 50 m.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	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	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	750	55/-40	15	-30	100	10	-5	15	-15	60	10	25
MAX AUTO	930	55/-55	20	-35	125	0	0	20	-20	95	0	0
AUTOBRAKE 3	1255	90/-90	30	-60	205	0	0	30	-30	150	0	0
AUTOBRAKE 2	1590	130/-130	45	-80	285	20	-30	40	-40	145	35	35
AUTOBRAKE 1	1750	155/-150	55	-95	330	50	-50	45	-45	140	150	185

Good Reported Braking Action

MAX MANUAL	1185	85/-70	30	-55	205	30	-20	30	-25	100	65	140
MAX AUTO	1290	90/-85	30	-55	210	25	-15	30	-25	115	65	150
AUTOBRAKE 3	1445	105/-100	35	-65	245	10	-5	35	-30	175	10	20
AUTOBRAKE 2	1830	150/-145	55	-90	330	25	-30	50	-45	170	45	45

Medium Reported Braking Action

MAX MANUAL	1565	130/-120	45	-85	330	70	-50	45	-40	130	165	405
MAX AUTO	1635	130/-120	50	-85	330	65	-45	45	-40	145	165	395
AUTOBRAKE 3	1660	130/-120	50	-90	335	55	-30	45	-40	175	140	390
AUTOBRAKE 2	1875	150/-155	55	-100	375	50	-50	55	-50	170	85	205

Poor Reported Braking Action

MAX MANUAL	2005	180/-165	60	-130	525	165	-105	55	-50	150	345	945
MAX AUTO	2095	180/-165	60	-130	520	170	-100	55	-50	150	355	955
AUTOBRAKE 3	2095	180/-165	65	-130	520	165	-95	55	-50	165	345	945
AUTOBRAKE 2	2125	185/-175	65	-135	530	145	-95	55	-55	170	285	870

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 50 m.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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
ALL FLAPS UP	VREF40+55	1060	115/-70	30/TBS	-35	145	10	-10	70
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1300	95/-90	35/TBS	-65	265	35	-30	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	850	60/-50	20/TBS	-30	110	10	-10	75
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	825	55/-45	15/TBS	-30	110	10	-10	80
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	825	50/-45	15/TBS	-30	110	10	-10	85
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	895	55/-55	20/TBS	-35	130	10	-10	70
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1130	75/-75	30/TBS	-50	170	25	-25	115
LEADING EDGE FLAPS TRANSIT	VREF15+15	870	65/-45	20/TBS	-30	115	10	-10	60
ONE ENGINE INOPERATIVE	VREF15	780	60/-40	15/TBS	-30	105	10	-10	60
STABILIZER TRIM INOPERATIVE	VREF15	775	60/-40	15/TBS	-30	105	10	-10	60

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 (305 m 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 DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	750	55/-40	15/TBS	-30	95	5	-5	55
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	775	60/-40	15/TBS	-30	105	10	-10	60
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	905	75/-50	20/TBS	-30	115	10	-10	60
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	750	55/-40	15/TBS	-30	95	5	-5	55
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	775	60/-40	15/TBS	-30	105	10	-10	60
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	775	60/-40	15/TBS	-30	105	10	-10	60
TRAILING EDGE FLAPS UP	VREF40+40	960	90/-60	20/TBS	-35	120	10	-10	60

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 (305 m 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 (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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
ALL FLAPS UP	VREF40+55	1455	90/-90	40/TBS	-60	210	30	-25	80
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1435	115/-105	40/TBS	-80	320	55	-45	120
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1200	85/-85	30/TBS	-55	200	30	-25	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1155	80/-80	30/TBS	-55	195	30	-25	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1140	80/-80	30/TBS	-55	195	30	-25	115
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1105	75/-75	25/TBS	-50	185	25	-20	90
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1265	95/-90	35/TBS	-60	205	35	-30	130
LEADING EDGE FLAPS TRANSIT	VREF15+15	1225	80/-80	30/TBS	-55	195	25	-25	85
ONE ENGINE INOPERATIVE	VREF15	1105	75/-75	25/TBS	-50	190	25	-25	90
STABILIZER TRIM INOPERATIVE	VREF15	1065	70/-70	25/TBS	-50	180	25	-20	80

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 (305 m 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 (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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	1040	70/-70	25/TBS	-50	175	25	-20	85
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1065	70/-70	25/TBS	-50	180	25	-20	80
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1250	80/-80	30/TBS	-55	195	25	-25	80
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1040	70/-70	25/TBS	-50	175	25	-20	85
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1065	70/-70	25/TBS	-50	180	25	-20	80
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1065	70/-70	25/TBS	-50	180	25	-20	80
TRAILING EDGE FLAPS UP	VREF40+40	1310	80/-80	35/TBS	-55	200	25	-25	80

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 (305 m 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 (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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
ALL FLAPS UP	VREF40+55	2005	145/-150	65/TBS	-95	345	70	-60	110
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1790	155/-140	55/TBS	-115	490	120	-90	140
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1610	135/-130	50/TBS	-85	325	75	-60	145
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1530	130/-120	45/TBS	-85	320	70	-60	140
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1500	125/-120	45/TBS	-85	315	70	-60	140
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1480	120/-115	45/TBS	-80	310	60	-50	115
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1695	150/-140	55/TBS	-90	335	80	-65	165
LEADING EDGE FLAPS TRANSIT	VREF15+15	1640	130/-125	50/TBS	-85	320	65	-55	115
ONE ENGINE INOPERATIVE	VREF15	1555	125/-125	45/TBS	-85	325	75	-60	125
STABILIZER TRIM INOPERATIVE	VREF15	1430	115/-110	40/TBS	-80	300	55	-45	105

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 (305 m 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 (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1385	110/-105	40/TBS	-75	290	60	-45	110
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1430	115/-110	40/TBS	-80	300	55	-45	105
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1695	130/-125	50/TBS	-85	320	65	-55	110
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1385	110/-105	40/TBS	-75	290	60	-45	110
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1430	115/-110	40/TBS	-80	300	55	-45	105
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1430	115/-110	40/TBS	-80	300	55	-45	105
TRAILING EDGE FLAPS UP	VREF40+40	1785	135/-130	55/TBS	-85	330	65	-55	105

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 (305 m 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 (M): REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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	2610	220/-215	90/TBS	-140	545	160	-120	135
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2340	220/-205	75/TBS	-190	890	420	-200	150
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2055	195/-180	70/TBS	-130	510	160	-115	170
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1940	180/-170	65/TBS	-125	500	150	-110	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1890	175/-160	60/TBS	-120	495	150	-110	155
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1900	175/-160	60/TBS	-120	490	135	-100	140
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2160	210/-195	75/TBS	-135	525	175	-130	185
LEADING EDGE FLAPS TRANSIT	VREF15+15	2100	185/-175	70/TBS	-125	505	145	-105	135
ONE ENGINE INOPERATIVE	VREF15	2100	190/-180	65/TBS	-135	535	180	-130	155
STABILIZER TRIM INOPERATIVE	VREF15	1835	165/-155	60/TBS	-115	475	130	-95	130

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 (305 m 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 (M)							
		REFERENCE DISTANCE FOR 50000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 50000 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	1775	160/-150	55/TBS	-115	455	145	-95	130
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1835	165/-155	60/TBS	-115	475	130	-95	130
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2185	185/-180	75/TBS	-125	505	145	-105	130
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1775	160/-150	55/TBS	-115	455	145	-95	130
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1835	165/-155	60/TBS	-115	475	130	-95	130
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1835	165/-155	60/TBS	-115	475	130	-95	130
TRAILING EDGE FLAPS UP	VREF40+40	2310	195/-190	80/TBS	-130	515	145	-110	130

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 (305 m 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)	PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT		
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
70	0	13.0	14.9	17.0	19.6	22.8	26.4	27.1	31.6	36.8	35.5	41.5	48.2	44.8	52.1	60.4	54.2	62.7	72.5
	10	13.4	15.4	17.6	20.3	23.6	27.3	28.0	32.7	38.0	36.7	42.9	49.8	46.3	53.8	62.3	56.0	64.6	74.7
	15	13.6	15.6	17.9	20.6	24.0	27.8	28.5	33.3	38.7	37.4	43.6	50.6	47.0	54.6	63.2	56.8	65.6	75.7
	20	13.8	15.8	18.1	20.9	24.4	28.2	29.0	33.8	39.3	38.0	44.3	51.4	47.7	55.4	64.1	57.7	66.5	76.6
	30	14.1	16.2	18.6	21.4	25.0	28.9	29.7	34.7	40.3	39.0	45.4	52.7	49.0	56.9	65.8	59.2	68.2	78.5
	40	14.3	16.4	18.9	21.8	25.4	29.5	30.3	35.4	41.1	39.7	46.4	53.8	50.0	58.1	67.2	60.4	69.7	80.3
	50	14.4	16.6	19.0	22.0	25.7	29.8	30.6	35.8	41.7	40.3	47.1	54.7	50.8	59.1	68.5	61.5	71.1	82.1
60	0	11.6	13.2	15.0	17.3	20.1	23.1	23.7	27.7	32.2	31.0	36.2	42.1	38.9	45.4	52.8	47.5	55.2	64.0
	10	11.9	13.6	15.5	17.9	20.7	23.9	24.6	28.7	33.3	32.1	37.4	43.5	40.3	46.9	54.5	49.1	57.0	66.0
	15	12.1	13.8	15.7	18.2	21.1	24.3	25.0	29.2	33.8	32.6	38.1	44.2	41.0	47.7	55.3	49.9	57.8	66.9
	20	12.3	14.0	15.9	18.4	21.4	24.7	25.4	29.6	34.4	33.1	38.7	44.9	41.6	48.4	56.2	50.6	58.7	67.8
	30	12.5	14.3	16.3	18.9	21.9	25.3	26.0	30.4	35.3	34.0	39.7	46.1	42.7	49.7	57.6	52.0	60.2	69.6
	40	12.7	14.5	16.5	19.2	22.3	25.8	26.5	31.0	36.0	34.7	40.5	47.1	43.6	50.8	58.9	53.1	61.5	71.1
	50	12.7	14.6	16.7	19.3	22.5	26.1	26.8	31.3	36.4	35.1	41.1	47.8	44.2	51.6	59.9	53.9	62.6	72.5
50	0	10.2	11.5	13.0	15.0	17.3	19.9	20.4	23.7	27.5	26.4	30.9	35.8	33.0	38.6	44.9	40.3	47.0	54.6
	10	10.5	11.9	13.4	15.5	17.9	20.5	21.1	24.5	28.4	27.3	31.9	37.1	34.2	39.9	46.4	41.7	48.5	56.3
	15	10.6	12.0	13.6	15.7	18.2	20.9	21.4	25.0	28.9	27.8	32.5	37.7	34.8	40.6	47.1	42.4	49.3	57.2
	20	10.7	12.2	13.8	16.0	18.4	21.2	21.8	25.4	29.4	28.3	33.0	38.3	35.3	41.2	47.9	43.0	50.1	58.0
	30	10.9	12.4	14.0	16.3	18.9	21.7	22.3	26.0	30.2	29.0	33.9	39.3	36.3	42.3	49.1	44.2	51.4	59.5
	40	11.1	12.6	14.2	16.6	19.2	22.1	22.7	26.5	30.7	29.5	34.5	40.1	37.0	43.2	50.2	45.1	52.5	60.8
	50	11.1	12.6	14.3	16.7	19.3	22.3	22.9	26.8	31.1	29.9	34.9	40.7	37.4	43.8	51.0	45.7	53.3	61.9
40	0	8.8	9.9	11.1	12.7	14.5	16.6	17.0	19.7	22.7	21.8	25.4	29.5	27.0	31.6	36.7	32.6	38.0	44.2
	10	9.0	10.2	11.4	13.1	15.0	17.1	17.6	20.4	23.5	22.6	26.3	30.5	28.0	32.7	38.0	33.7	39.3	45.7
	15	9.1	10.3	11.5	13.3	15.2	17.4	17.9	20.7	23.9	23.0	26.8	31.0	28.5	33.2	38.6	34.3	40.0	46.5
	20	9.2	10.4	11.7	13.5	15.5	17.7	18.1	21.0	24.3	23.3	27.2	31.5	28.9	33.8	39.2	34.8	40.7	47.2
	30	9.4	10.6	11.9	13.7	15.8	18.1	18.6	21.6	24.9	23.9	27.9	32.4	29.7	34.7	40.3	35.8	41.7	48.5
	40	9.5	10.7	12.0	13.9	16.0	18.4	18.9	21.9	25.3	24.3	28.4	33.0	30.2	35.4	41.1	36.4	42.6	49.5
	50	9.5	10.7	12.1	14.0	16.2	18.5	19.0	22.1	25.6	24.6	28.7	33.4	30.6	35.8	41.6	36.9	43.2	50.2

***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.**

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE 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	6.8	16.4	25.9	35.1	44.4	54.2	64.5	75.2	86.4
	MAX AUTO	6.4	15.7	24.8	33.9	43.1	52.8	63.0	73.7	84.9
	AUTOBRAKE 3	5.9	14.5	22.7	30.6	38.8	47.8	57.7	68.2	79.7
	AUTOBRAKE 2	5.4	13.4	20.8	27.8	34.9	43.0	52.0	61.8	72.6
	AUTOBRAKE 1	4.9	12.3	19.1	25.3	31.6	38.5	46.2	54.5	63.6

Two Engine Reverse Thrust

		REFERENCE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.3	15.3	24.0	32.5	41.1	50.1	59.5	69.4	79.6
	MAX AUTO	4.9	12.9	21.0	29.0	37.4	46.4	56.1	66.4	77.3
	AUTOBRAKE 3	2.7	8.5	14.4	20.3	26.7	34.0	42.0	51.0	60.8
	AUTOBRAKE 2	1.1	5.2	9.3	13.3	17.8	23.2	29.6	36.8	45.0
	AUTOBRAKE 1	0.2	2.9	5.6	8.0	10.8	14.4	18.7	23.8	29.7

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	25	28	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.5	2.8	3.1	3.5	3.8	4.3	4.9	5.0 TO 7.5	7.5 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	20	30	40	50	60		

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

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 Bleed

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	97.3	98.2	99.1	99.9	100.7	101.5	100.4	99.3	98.1	96.8	95.6	94.4
200	.48	96.1	96.9	97.8	98.6	99.4	100.2	100.6	99.6	98.6	97.4	96.3	95.3
240	.57	94.5	95.3	96.1	96.9	97.8	98.6	99.3	99.7	98.7	97.6	96.7	95.8
280	.66	92.7	93.5	94.3	95.1	95.9	96.7	97.5	98.3	98.8	97.7	96.7	96.0
320	.75	90.2	91.1	91.9	92.7	93.5	94.4	95.2	95.9	96.7	97.5	96.9	96.2
360	.83	88.7	89.6	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	96.9
22000 FT PRESS ALT								TAT (°C)					
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	96.7	97.6	98.4	99.2	100.1	100.2	99.0	97.8	96.6	95.5	94.4	93.3
200	.46	95.5	96.4	97.2	98.0	98.8	99.6	99.3	98.1	97.0	96.0	95.0	94.0
240	.55	94.1	94.9	95.8	96.5	97.3	98.1	98.9	98.5	97.3	96.4	95.5	94.7
280	.63	92.5	93.3	94.1	94.9	95.7	96.4	97.2	97.9	97.6	96.7	95.8	95.1
320	.72	90.1	91.0	91.8	92.7	93.5	94.3	95.1	95.9	96.7	96.8	96.0	95.3
360	.80	88.4	89.2	90.1	90.9	91.7	92.6	93.4	94.2	95.0	95.8	96.3	95.8
20000 FT PRESS ALT								TAT (°C)					
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	95.3	96.1	97.0	97.8	98.6	99.4	98.8	97.4	96.2	95.2	94.2	93.2
200	.44	94.2	95.0	95.8	96.6	97.4	98.2	98.9	97.8	96.4	95.5	94.6	93.7
240	.53	92.8	93.6	94.4	95.2	96.0	96.8	97.5	98.2	97.0	95.9	95.1	94.3
280	.61	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.4	96.5	95.6	94.9
320	.69	89.1	90.0	90.8	91.6	92.5	93.3	94.1	94.9	95.7	96.5	95.8	95.1
360	.77	87.4	88.3	89.1	90.0	90.8	91.6	92.4	93.2	94.0	94.8	95.6	95.4

%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	94.5	95.3	96.1	96.9	97.7	98.4	97.3	95.9	94.9	94.0	93.0	92.1
200	.42	93.4	94.2	95.0	95.8	96.6	97.3	97.6	96.3	95.2	94.4	93.5	92.6
240	.51	91.9	92.7	93.5	94.3	95.1	95.9	96.7	96.7	95.6	94.7	94.0	93.2
280	.59	90.4	91.3	92.1	92.9	93.8	94.6	95.4	96.1	96.1	95.2	94.4	93.7
320	.67	88.9	89.7	90.5	91.4	92.2	93.0	93.8	94.6	95.4	95.5	94.8	94.1
360	.75	87.3	88.2	89.0	89.8	90.7	91.5	92.3	93.1	93.9	94.7	95.1	94.5
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	93.0	93.8	94.6	95.4	96.1	96.9	97.2	96.0	94.8	94.0	93.1	92.2
200	.41	91.6	92.4	93.2	94.0	94.8	95.6	96.4	96.1	95.0	94.1	93.3	92.5
240	.49	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	95.4	94.5	93.7	92.9
280	.57	89.0	89.9	90.7	91.5	92.4	93.2	94.0	94.8	95.6	94.9	94.1	93.4
320	.64	87.8	88.6	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1	94.5	93.8
360	.72	86.5	87.3	88.2	89.0	89.8	90.6	91.4	92.2	93.0	93.8	94.6	94.2
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	92.4	93.2	94.1	94.9	95.7	96.4	96.4	95.5	94.6	93.8	92.9	92.0
200	.39	91.0	91.9	92.7	93.5	94.3	95.1	95.9	95.1	94.2	93.4	92.6	91.8
240	.47	90.0	90.9	91.7	92.5	93.3	94.1	94.9	95.4	94.6	93.7	93.0	92.3
280	.54	88.9	89.8	90.6	91.4	92.3	93.1	93.9	94.7	94.9	94.1	93.4	92.7
320	.62	87.8	88.7	89.5	90.3	91.2	92.0	92.8	93.5	94.3	94.5	93.8	93.1
360	.69	86.7	87.5	88.3	89.1	90.0	90.8	91.5	92.3	93.1	93.9	94.2	93.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	91.8	92.6	93.4	94.2	95.0	95.8	95.5	94.8	94.0	93.2	92.4	91.5
200	.38	90.7	91.5	92.3	93.1	93.9	94.7	95.2	94.3	93.5	92.7	92.0	91.2
240	.45	89.8	90.7	91.5	92.3	93.1	93.9	94.7	94.7	93.8	93.1	92.4	91.6
280	.52	88.9	89.8	90.6	91.4	92.2	93.0	93.8	94.6	94.2	93.5	92.8	92.1
320	.60	87.9	88.8	89.6	90.4	91.2	92.0	92.8	93.6	94.3	93.9	93.2	92.5
360	.67	86.8	87.7	88.5	89.3	90.1	90.9	91.6	92.4	93.2	93.9	93.5	92.9

%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	90.5	91.4	92.2	93.0	93.8	94.6	95.4	94.7	94.1	93.3	92.5	91.7
200	.36	89.6	90.4	91.3	92.1	92.9	93.7	94.5	94.5	93.7	92.9	92.2	91.4
240	.43	88.9	89.7	90.6	91.4	92.2	93.0	93.8	94.5	94.0	93.1	92.4	91.7
280	.51	88.1	89.0	89.8	90.6	91.4	92.2	93.0	93.8	94.4	93.6	92.8	92.2
320	.58	87.2	88.0	88.8	89.6	90.4	91.2	92.0	92.8	93.5	93.9	93.2	92.5
360	.65	86.2	87.0	87.8	88.6	89.4	90.2	91.0	91.7	92.5	93.2	93.6	92.9
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	89.1	89.9	90.7	91.5	92.3	93.1	93.7	93.5	93.2	92.5	91.8	91.0
200	.33	88.7	89.5	90.3	91.1	91.8	92.6	93.4	93.3	92.9	92.3	91.6	90.8
240	.40	88.1	88.9	89.7	90.5	91.3	92.0	92.8	93.3	92.5	91.8	91.1	90.3
280	.46	87.5	88.3	89.1	89.8	90.6	91.4	92.2	92.9	92.9	92.1	91.4	90.7
320	.53	86.8	87.6	88.3	89.1	89.9	90.7	91.4	92.2	92.9	92.5	91.8	91.1
360	.59	86.0	86.7	87.5	88.3	89.1	89.8	90.6	91.3	92.0	92.8	92.2	91.5
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	88.8	89.6	90.4	91.2	91.9	92.7	93.1	92.9	92.6	91.8	91.1	90.3
200	.32	88.5	89.3	90.0	90.8	91.6	92.3	93.1	92.8	92.5	91.8	91.1	90.3
240	.38	87.9	88.7	89.5	90.3	91.0	91.8	92.5	92.6	91.8	91.0	90.3	89.6
280	.45	87.4	88.1	88.9	89.7	90.5	91.2	92.0	92.7	92.2	91.4	90.7	90.0
320	.51	86.7	87.5	88.3	89.0	89.8	90.5	91.3	92.0	92.5	91.8	91.1	90.4
360	.57	85.9	86.7	87.5	88.2	89.0	89.7	90.5	91.2	91.9	92.2	91.5	90.7
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	87.7	88.5	89.3	90.0	90.8	91.6	92.3	92.3	91.8	91.2	90.5	89.7
200	.31	87.4	88.2	89.0	89.7	90.5	91.3	92.0	92.4	92.0	91.5	90.8	90.0
240	.37	86.9	87.7	88.5	89.3	90.0	90.8	91.5	92.3	91.9	91.2	90.4	89.7
280	.43	86.4	87.2	87.9	88.7	89.5	90.2	90.9	91.7	92.1	91.4	90.7	89.9
320	.49	85.8	86.6	87.4	88.1	88.9	89.6	90.4	91.1	91.8	91.8	91.1	90.3
360	.55	85.1	85.9	86.7	87.4	88.1	88.9	89.6	90.3	91.1	91.8	91.4	90.7

%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
70	67	241	21800	20300	18100
65	62	233	24300	22900	21300
60	57	225	26500	25500	24300
55	53	215	28800	27800	26700
50	48	205	30900	30100	29100
45	43	195	33000	32300	31400
40	38	184	35400	34700	33800
35	33	172	38000	37300	36500

Includes APU fuel burn.

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	130	121	113	106	100	95	90	85	81	78
280	259	241	226	212	200	189	180	171	163	156
419	388	362	339	318	300	284	269	256	244	234
559	518	482	451	424	400	378	359	342	326	312
698	647	602	564	530	500	473	449	427	408	390
837	776	723	677	636	600	568	539	513	489	468
976	905	843	789	742	700	663	629	599	571	546
1115	1033	963	902	848	800	757	719	684	653	624
1253	1162	1083	1014	954	900	852	809	770	734	702
1392	1291	1203	1127	1060	1000	947	899	855	816	780
1531	1420	1324	1240	1166	1100	1041	989	941	898	858
1670	1549	1444	1352	1272	1200	1136	1079	1027	980	936
1809	1677	1564	1465	1377	1300	1231	1169	1112	1061	1015
1948	1806	1684	1577	1483	1400	1325	1258	1198	1143	1093
2087	1936	1805	1690	1589	1500	1420	1348	1283	1224	1171
2227	2065	1925	1803	1695	1600	1515	1438	1369	1306	1249

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)								
	35	40	45	50	55	60	65	70	
100	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0:17
200	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1	0:34
300	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	0:51
400	1.5	1.6	1.8	1.9	2.1	2.3	2.4	2.5	1:08
500	1.9	2.0	2.2	2.4	2.6	2.8	3.0	3.2	1:25
600	2.2	2.4	2.7	2.9	3.2	3.4	3.6	3.9	1:42
700	2.6	2.8	3.1	3.4	3.7	4.0	4.2	4.5	1:59
800	2.9	3.2	3.5	3.9	4.2	4.5	4.8	5.1	2:15
900	3.3	3.6	4.0	4.3	4.7	5.1	5.4	5.8	2:32
1000	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	2:49
1100	3.9	4.4	4.8	5.3	5.7	6.2	6.6	7.0	3:06
1200	4.3	4.7	5.2	5.7	6.2	6.7	7.2	7.6	3:23
1300	4.6	5.1	5.6	6.2	6.7	7.2	7.7	8.3	3:39
1400	4.9	5.5	6.0	6.6	7.2	7.8	8.3	8.9	3:56
1500	5.3	5.8	6.4	7.1	7.7	8.3	8.9	9.5	4:13
1600	5.6	6.2	6.8	7.5	8.2	8.8	9.4	10.1	4:30

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at Long Range Cruise 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
70	16400	13800	11300
65	20600	17200	14300
60	23800	21300	18200
55	26600	25100	22200
50	29200	28000	26300
45	31600	30800	29500
40	34000	33200	32100
35	36600	35900	34800

With engine anti-ice on, decrease altitude capability by 2000 ft.
With engine and wing anti-ice on, decrease altitude capability by 7000 ft.

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)											
		10	15	17	19	21	23	25	27	29	31	33	35
70	%N1	86.2	90.5	92.1	93.8								
	MACH	.510	.562	.582	.595								
	KIAS	282	284	283	278								
	FF/ENG	2470	2497	2499	2463								
65	%N1	84.1	88.4	90.2	91.9	93.7	96.2						
	MACH	.491	.542	.563	.584	.596	.612						
	KIAS	271	274	274	273	268	265						
	FF/ENG	2280	2305	2309	2310	2279	2303						
60	%N1	82.0	86.3	88.0	89.8	91.6	93.5	96.2					
	MACH	.471	.521	.543	.564	.585	.597	.614					
	KIAS	261	263	263	263	263	258	254					
	FF/ENG	2097	2115	2119	2121	2123	2098	2132					
55	%N1	79.7	83.9	85.7	87.4	89.2	91.1	93.1	95.9				
	MACH	.453	.498	.520	.541	.563	.585	.597	.614				
	KIAS	250	251	252	252	253	252	247	244				
	FF/ENG	1924	1926	1929	1931	1935	1940	1922	1958				
50	%N1	77.3	81.3	83.1	84.9	86.7	88.5	90.4	92.4	95.4			
	MACH	.434	.475	.495	.516	.538	.561	.583	.596	.613			
	KIAS	240	239	239	240	241	241	241	236	233			
	FF/ENG	1760	1740	1741	1743	1746	1750	1759	1750	1779			
45	%N1	74.9	78.6	80.2	82.0	83.8	85.6	87.5	89.4	91.5	94.4	98.2	
	MACH	.415	.452	.469	.489	.511	.533	.556	.578	.593	.610	.632	
	KIAS	229	227	227	227	228	229	229	229	225	222	220	
	FF/ENG	1602	1569	1560	1556	1559	1563	1569	1583	1578	1599	1673	
40	%N1	72.2	75.7	77.3	78.9	80.6	82.5	84.3	86.1	88.0	90.3	93.1	96.7
	MACH	.395	.429	.445	.462	.480	.502	.525	.548	.571	.589	.604	.626
	KIAS	218	215	215	214	214	215	216	216	216	214	210	208
	FF/ENG	1448	1407	1392	1381	1373	1377	1384	1394	1406	1409	1417	1475
35	%N1	69.1	72.7	74.1	75.6	77.3	79.0	80.7	82.5	84.4	86.3	88.6	91.3
	MACH	.375	.406	.420	.435	.452	.469	.490	.513	.536	.560	.584	.597
	KIAS	207	203	202	202	201	201	201	202	203	203	202	198
	FF/ENG	1302	1255	1236	1219	1205	1197	1200	1211	1219	1228	1241	1237

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
309	279	253	233	215	200	190	180	172	164	157
625	564	511	467	432	400	379	360	342	326	312
943	850	769	703	648	600	568	539	513	489	468
1263	1137	1027	939	865	800	757	718	683	651	623
1585	1425	1287	1175	1082	1000	947	897	853	813	777
1910	1716	1547	1412	1299	1200	1136	1076	1023	975	932
2237	2008	1810	1649	1517	1400	1324	1255	1193	1136	1087
2567	2302	2072	1887	1734	1600	1513	1434	1362	1297	1240
2899	2597	2336	2126	1952	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	1.2	0:46	1.1	0:43	1.0	0:41	0.9	0:39	0.8	0:38
400	2.6	1:30	2.3	1:25	2.1	1:20	2.0	1:15	1.8	1:12
600	3.8	2:14	3.5	2:07	3.3	2:00	3.0	1:52	2.8	1:46
800	5.1	2:59	4.7	2:50	4.4	2:39	4.1	2:29	3.8	2:21
1000	6.4	3:45	5.9	3:33	5.5	3:20	5.1	3:07	4.8	2:56
1200	7.7	4:31	7.1	4:16	6.6	4:01	6.1	3:45	5.7	3:31
1400	8.9	5:18	8.3	5:00	7.7	4:42	7.1	4:23	6.7	4:07
1600	10.1	6:05	9.4	5:45	8.7	5:24	8.1	5:02	7.6	4:43
1800	11.3	6:53	10.5	6:30	9.8	6:06	9.1	5:41	8.6	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	0.2	0.6
3	-0.5	-0.2	0.0	0.4	1.0
4	-0.6	-0.3	0.0	0.5	1.3
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	0.9	2.3
8	-1.3	-0.7	0.0	1.0	2.5
9	-1.5	-0.7	0.0	1.2	2.8
10	-1.7	-0.8	0.0	1.3	3.0
11	-1.8	-0.9	0.0	1.4	3.3
12	-2.0	-1.0	0.0	1.5	3.5

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
70	%N1	75.7	78.5	82.7	87.1	92.3			
	KIAS	229	229	230	231	233			
	FF/ENG	2240	2230	2230	2250	2290			
65	%N1	73.6	76.5	80.7	85.0	89.7	98.0		
	KIAS	221	221	222	223	224	225		
	FF/ENG	2080	2070	2060	2070	2090	2260		
60	%N1	71.3	74.4	78.4	82.8	87.4	94.0		
	KIAS	212	212	213	214	215	216		
	FF/ENG	1930	1910	1900	1900	1910	1990		
55	%N1	69.0	71.9	76.0	80.4	84.9	90.1		
	KIAS	203	203	204	204	205	207		
	FF/ENG	1770	1750	1740	1730	1730	1770		
50	%N1	66.5	69.2	73.6	77.7	82.2	87.0	95.2	
	KIAS	193	194	194	195	196	197	198	
	FF/ENG	1620	1600	1580	1570	1560	1580	1700	
45	%N1	63.7	66.5	70.6	74.9	79.3	84.0	89.7	
	KIAS	183	183	184	185	185	186	187	
	FF/ENG	1470	1450	1430	1420	1400	1400	1460	
40	%N1	60.5	63.6	67.5	71.9	76.1	80.7	85.6	94.4
	KIAS	177	177	177	177	177	177	177	178
	FF/ENG	1330	1310	1280	1270	1240	1240	1270	1370
35	%N1	57.3	60.1	64.3	68.4	72.9	77.3	81.9	87.7
	KIAS	170	170	170	170	170	170	170	170
	FF/ENG	1180	1160	1150	1130	1100	1090	1110	1140

This table includes 5% additional fuel for holding in a racetrack pattern.

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
70	23100	19900	16300
65	25900	24000	20200
60	28400	26900	25100
55	30700	29500	27900
50	32800	31800	30600
45	35000	34000	32900
40	37400	36400	35300
35	40100	39200	38100

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)										
		10	21	23	25	27	29	31	33	35	37	39
70	%N1	80.7	90.0	92.0								
	MACH	.440	.541	.557								
	KIAS	243	242	240								
	FF/ENG	1980	1970	1959								
65	%N1	78.7	88.1	89.7	91.9	94.8						
	MACH	.425	.524	.543	.560	.578						
	KIAS	235	234	233	231	229						
	FF/ENG	1835	1820	1814	1812	1845						
60	%N1	76.6	85.8	87.6	89.3	91.6	94.7					
	MACH	.409	.504	.525	.544	.562	.580					
	KIAS	226	225	225	224	222	220					
	FF/ENG	1694	1666	1667	1664	1669	1703					
55	%N1	74.4	83.4	85.2	87.0	88.7	91.1	94.4				
	MACH	.393	.484	.504	.525	.545	.562	.581				
	KIAS	217	216	216	216	215	213	211				
	FF/ENG	1554	1517	1515	1519	1522	1527	1561				
50	%N1	71.8	80.9	82.6	84.4	86.2	88.0	90.4	93.7			
	MACH	.376	.463	.482	.502	.523	.544	.561	.580			
	KIAS	207	206	206	206	206	205	203	201			
	FF/ENG	1417	1371	1368	1370	1377	1381	1383	1415			
45	%N1	69.0	78.1	79.8	81.5	83.3	85.1	86.9	89.3	92.7		
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578		
	KIAS	197	196	196	196	196	196	195	193	191		
	FF/ENG	1285	1229	1222	1224	1231	1236	1239	1240	1267		
40	%N1	66.1	74.9	76.7	78.4	80.1	81.9	83.8	85.6	87.8	91.6	
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573	
	KIAS	187	185	185	185	185	185	185	185	183	181	
	FF/ENG	1158	1094	1081	1081	1088	1091	1095	1097	1098	1122	
35	%N1	63.0	71.6	73.2	74.9	76.7	78.4	80.2	82.0	83.9	86.4	90.2
	MACH	.321	.392	.408	.425	.442	.461	.481	.503	.526	.547	.566
	KIAS	177	174	174	173	173	173	173	173	173	172	170
	FF/ENG	1034	964	949	944	949	950	952	953	955	962	982

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
343	302	267	240	219	200	187	176	166	157	150
694	610	538	483	438	400	376	353	333	316	300
1052	921	811	726	658	600	563	530	499	472	449
1416	1238	1087	971	879	800	750	705	664	629	598
1788	1559	1365	1217	1101	1000	937	880	829	785	746
2166	1884	1646	1465	1322	1200	1124	1056	994	940	893
2554	2215	1930	1714	1545	1400	1311	1230	1158	1095	1040
2950	2551	2217	1965	1768	1600	1497	1405	1322	1249	1186
3355	2893	2507	2217	1992	1800	1683	1578	1485	1402	1331

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	2.2	0:53	2.0	0:51	1.8	0:49	1.6	0:47	1.5	0:45
400	4.5	1:45	4.1	1:39	3.8	1:34	3.5	1:29	3.2	1:25
600	6.7	2:37	6.2	2:29	5.7	2:21	5.3	2:13	4.9	2:06
800	8.9	3:31	8.3	3:20	7.6	3:08	7.0	2:57	6.6	2:47
1000	11.0	4:27	10.3	4:12	9.5	3:57	8.8	3:43	8.2	3:29
1200	13.1	5:23	12.2	5:05	11.3	4:46	10.5	4:29	9.8	4:12
1400	15.2	6:21	14.1	5:59	13.1	5:37	12.1	5:16	11.4	4:56
1600	17.2	7:21	16.0	6:55	14.8	6:29	13.7	6:04	12.9	5:41
1800	19.1	8:22	17.8	7:52	16.5	7:22	15.3	6:53	14.4	6:26

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
2	-0.4	-0.2	0.0	0.2	0.5
4	-0.8	-0.4	0.0	0.5	1.0
6	-1.2	-0.6	0.0	0.7	1.5
8	-1.6	-0.8	0.0	0.9	2.0
10	-1.9	-1.0	0.0	1.2	2.5
12	-2.3	-1.2	0.0	1.4	3.0
14	-2.7	-1.4	0.0	1.7	3.5
16	-3.0	-1.6	0.0	1.9	3.9
18	-3.4	-1.8	0.0	2.2	4.4
20	-3.7	-2.0	0.0	2.4	4.9

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	22	240	89
39000	21	240	85
37000	21	240	80
35000	20	230	76
33000	19	230	72
31000	18	230	68
29000	17	220	64
27000	17	220	60
25000	16	210	56
23000	15	210	52
21000	14	200	48
19000	13	190	44
17000	12	190	40
15000	11	180	36
10000	9	150	26
5000	6	120	16
1500	4	100	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	40000
70	%N1	70.4	73.4	77.4	81.8	86.3	92.0			
	KIAS	213	213	213	213	213	213			
	FF/ENG	1860	1840	1830	1830	1830	1870			
65	%N1	68.6	71.5	75.7	79.9	84.4	89.3			
	KIAS	208	208	208	208	208	208			
	FF/ENG	1740	1720	1710	1700	1700	1720			
60	%N1	66.7	69.5	73.8	77.8	82.3	87.0	94.5		
	KIAS	203	203	203	203	203	203	203		
	FF/ENG	1630	1600	1590	1580	1570	1580	1670		
55	%N1	64.7	67.4	71.6	75.7	80.1	84.7	90.4		
	KIAS	196	196	196	196	196	196	196		
	FF/ENG	1510	1490	1470	1460	1440	1440	1490		
50	%N1	62.3	65.2	69.1	73.4	77.7	82.2	87.0		
	KIAS	190	190	190	190	190	190	190		
	FF/ENG	1400	1380	1350	1340	1320	1310	1340		
45	%N1	59.8	62.8	66.7	71.0	75.2	79.7	84.3	91.4	
	KIAS	183	183	183	183	183	183	183	183	
	FF/ENG	1280	1260	1240	1220	1200	1190	1210	1260	
40	%N1	57.4	60.1	64.3	68.3	72.7	77.0	81.5	86.7	
	KIAS	177	177	177	177	177	177	177	177	
	FF/ENG	1170	1160	1140	1120	1090	1070	1090	1100	
35	%N1	54.9	57.4	61.6	65.6	70.0	74.2	78.7	83.3	92.4
	KIAS	170	170	170	170	170	170	170	170	170
	FF/ENG	1070	1050	1030	1010	990	960	970	980	1060

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
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Performance Inflight — Chapter PI

Gear Down, Engine Inop — Section 15

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
70	66	212	3400	1300	
65	62	207	6600	4800	3000
60	57	202	9900	8000	6300
55	52	196	13000	11300	9500
50	48	190	16300	14800	13000
45	43	183	19500	18100	16500
40	38	176	22700	21600	20300
35	34	170	25700	25000	24100

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
60	4300	1300	
55	8700	6400	4000
50	12900	10700	8400
45	17000	15300	13100
40	21300	19800	18000
35	25000	23900	22600

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	21
60	%N1	90.2								
	MACH	.364								
	KIAS	220								
	FF/ENG	3193								
55	%N1	87.7	89.3	91.0						
	MACH	.351	.362	.374						
	KIAS	212	211	210						
	FF/ENG	2922	2910	2908						
50	%N1	85.2	86.7	88.2	90.0	91.7				
	MACH	.338	.348	.359	.371	.384				
	KIAS	204	203	202	201	200				
	FF/ENG	2665	2644	2630	2627	2634				
45	%N1	82.5	83.9	85.4	86.9	88.6	90.4	92.7		
	MACH	.325	.334	.344	.355	.367	.380	.393		
	KIAS	196	195	193	192	191	190	189		
	FF/ENG	2419	2391	2369	2354	2350	2352	2359		
40	%N1	79.6	81.0	82.4	83.8	85.3	87.0	88.8	90.8	94.1
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2188	2152	2122	2100	2085	2075	2068	2065	2101
35	%N1	76.5	77.8	79.1	80.4	81.9	83.4	85.0	87.0	88.9
	MACH	.296	.305	.313	.322	.331	.342	.353	.367	.383
	KIAS	179	178	176	174	172	171	170	170	170
	FF/ENG	1959	1929	1891	1861	1838	1818	1800	1802	1808

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	156	137	122	110	100	94	87	82	76	72
361	314	274	244	220	200	186	173	161	152	143
546	473	412	366	331	300	278	258	241	226	214
732	634	551	489	441	400	370	344	321	301	285
920	796	691	613	552	500	463	430	401	376	355
1109	958	832	737	663	600	555	515	480	450	425
1300	1122	973	861	774	700	648	601	560	525	495
1493	1287	1115	986	885	800	740	686	639	599	565
1687	1452	1256	1110	997	900	832	772	719	673	635
1883	1619	1399	1235	1108	1000	924	857	797	747	704

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	2.3	0:56	2.1	0:54	2.0	0:52	1.9	0:50
300	3.5	1:24	3.3	1:21	3.0	1:17	2.9	1:14
400	4.7	1:52	4.4	1:47	4.1	1:42	4.0	1:37
500	5.9	2:20	5.5	2:14	5.1	2:08	4.9	2:01
600	7.1	2:49	6.6	2:41	6.2	2:33	5.9	2:26
700	8.2	3:17	7.6	3:09	7.2	3:00	6.9	2:50
800	9.3	3:47	8.7	3:36	8.2	3:26	7.8	3:15
900	10.4	4:16	9.7	4:04	9.2	3:52	8.8	3:40
1000	11.5	4:46	10.8	4:33	10.1	4:19	9.7	4:05

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	3.5
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	4.7
12	-2.4	-1.2	0.0	2.4	5.1

Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
70	%N1	89.1					
	KIAS	213					
	FF/ENG	3570					
65	%N1	87.1	90.2				
	KIAS	208	208				
	FF/ENG	3310	3340				
60	%N1	84.8	87.9				
	KIAS	203	203				
	FF/ENG	3060	3070				
55	%N1	82.4	85.5	90.1			
	KIAS	196	196	196			
	FF/ENG	2820	2820	2840			
50	%N1	79.9	82.9	87.3	92.4		
	KIAS	190	190	190	190		
	FF/ENG	2580	2570	2580	2630		
45	%N1	77.3	80.2	84.6	89.3		
	KIAS	183	183	183	183		
	FF/ENG	2360	2340	2340	2360		
40	%N1	74.6	77.4	81.7	86.2	91.7	
	KIAS	177	177	177	177	177	
	FF/ENG	2140	2120	2110	2120	2140	
35	%N1	71.5	74.5	78.7	83.1	88.0	96.8
	KIAS	170	170	170	170	170	170
	FF/ENG	1930	1910	1890	1890	1900	2030

This table includes 5% additional fuel for holding in a racetrack pattern.

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 13 mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. Operation on runways with slush/standing water depths of more than 6 mm (0.25 inch) is not recommended at altitudes greater than 8,000 ft. 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. Adjust field length available for temperature by amount shown beneath V1(MCG) limit weight table.

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 7050 kg and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (M)	V1 ADJUSTMENT (KIAS)
2000	-16
2500	-14
3000	-12
3500	-11
4000	-10

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 2300 m.

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 1650 m.

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 15, 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.

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.

Performance Inflight — Chapter PI

General — Section 20

Takeoff Speeds - Dry Runway

Flaps 1 and 5

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
170	148	150	156	144	147	152
160	143	146	152	140	142	148
150	138	140	147	134	137	144
140	132	135	142	129	132	139
130	125	128	137	123	126	134
120	119	122	132	116	119	129
110	112	115	126	109	113	124
100	104	108	120	102	106	117
90	97	101	114	94	98	111

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	8	10			4	5	6	7			-1	-1	-1	-1		
120	49	3	5	6	8	9	11	2	3	5	6	7	9	-1	-1	-1	-1	-1	-1
100	38	1	2	4	6	8	9	1	2	3	5	6	8	0	0	0	0	-1	-1
80	27	0	0	2	4	6	7	0	0	2	3	5	6	0	0	0	0	0	0
60	16	0	0	1	2	4	6	0	0	1	2	3	5	0	0	0	0	1	1
-60	-51	0	0	1	2	3	5	0	0	1	2	3	4	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
170	-3	-1	0	2	3	-1	-1	0	0	0	1	1	1
160	-3	-1	0	2	2	-1	-1	0	0	0	1	1	1
150	-3	-1	0	2	2	-1	-1	0	0	0	1	1	1
140	-2	-1	0	1	2	-1	-1	0	0	0	1	1	1
130	-2	-1	0	1	2	-2	-1	0	0	0	1	1	2
120	-2	-1	0	1	2	-2	-1	0	0	0	1	1	2
110	-1	-1	0	1	1	-2	-1	-1	0	0	1	1	2
100	-1	-1	0	1	1	-2	-1	-1	0	1	1	1	2
90	-1	0	0	1	1	-2	-1	-1	0	1	1	2	2

***V1 not to exceed VR**

V1(MCG)

Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Takeoff Speeds - Dry Runway
Flaps 10, 15 and 25
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
170	138	140	145	136	136	141			
160	134	135	141	132	132	138	131	131	136
150	129	131	137	128	128	135	126	126	133
140	124	126	133	123	123	131	121	122	129
130	118	121	129	117	118	127	116	117	125
120	112	115	124	111	113	122	109	111	121
110	106	109	119	105	107	117	103	106	116
100	99	103	114	98	101	113	97	100	111
90	92	97	109	91	95	107	90	94	106

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	5	6	7	9			3	4	5	6			-2	-2	-2	-3		
120	49	3	4	5	7	8	10	2	3	4	5	6	6	-1	-1	-2	-2	-3	-3
100	38	1	2	3	5	6	8	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
80	27	0	0	2	3	5	6	0	0	1	2	3	4	0	0	0	-1	-1	-2
60	16	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-51	0	0	1	2	3	3	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
170	-3	-1	0	1	1	-1	-1	-1	0	0	1	1	1
160	-3	-1	0	1	2	-1	-1	-1	0	0	1	1	1
150	-3	-1	0	1	2	-1	-1	-1	0	0	1	1	1
140	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	1
130	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	1
120	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	1
110	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	2
100	-2	-1	0	1	2	-2	-1	-1	0	0	1	2	2
90	-1	-1	0	1	1	-2	-1	-1	0	0	1	2	2

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Takeoff Speeds - Wet Runway
Flaps 1 and 5
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
180	148	156	160	145	152	156
170	143	151	156	139	147	152
160	137	146	152	134	142	148
150	131	140	147	128	137	144
140	125	135	142	122	132	139
130	118	128	137	115	126	134
120	111	122	131	109	119	129
110	104	115	125	102	113	123
100	97	108	120	94	106	117
90	90	101	114	87	99	111

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	8	10			3	4	5	6			-2	-2	-2	-3		
120	49	4	4	6	8	9	11	2	3	4	5	5	6	-1	-1	-2	-2	-3	-3
100	38	1	2	4	5	7	9	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
80	27	0	0	2	3	5	7	0	0	2	2	3	4	0	0	-1	0	-1	-2
60	16	0	0	1	2	3	5	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-51	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
180	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	3
170	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	3
160	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
130	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
120	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
110	-2	-1	0	2	3	-4	-3	-1	0	1	2	3	4
100	-2	-1	0	2	3	-4	-3	-1	0	1	2	3	4
90	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Takeoff Speeds - Wet Runway

Flaps 10, 15 and 25

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
170	133	139	145	133	136	141			
160	128	135	141	128	132	138	126	131	136
150	123	131	137	122	128	135	121	126	133
140	117	126	133	117	123	131	115	122	129
130	111	121	129	111	118	127	109	117	125
120	105	115	124	104	113	122	103	111	121
110	99	109	119	98	107	117	97	106	116
100	92	103	114	92	101	112	91	100	111
90	86	97	109	85	95	107	84	94	106

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	9	10			3	4	5	6			-2	-2	-2	-3		
120	49	4	4	6	8	9	11	2	3	4	4	5	6	-1	-1	-2	-2	-3	-3
100	38	1	2	3	5	7	9	1	1	2	3	4	5	0	-1	-1	-2	-2	-2
80	27	0	0	1	3	4	6	0	0	1	2	3	4	0	0	0	-1	-1	-2
60	16	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-51	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
170	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
160	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
140	-4	-2	0	2	3	-4	-2	-1	0	1	1	2	3
130	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
120	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
110	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
100	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
90	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	3

***V1 not to exceed VR**

V1(MCG)

Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

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	-3	-3	-3			
600	-3	-3	-3			
400	-2	-2	-2			
200	-1	-1	-1			
0	0	0	0	0	0	0
-200	1	1	1	1	1	1
-400	1	1	1	2	2	1
-600	2	2	2	4	3	2
-800	2	2	2	4	3	2

Use of clearway not allowed on wet runways.

Stab Trim Setting

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	30	33
160-180	8 1/2	8 1/2	8 1/2	7 3/4	6 3/4	6	5 1/4	4 3/4	4 1/4
140	8 1/2	8 1/2	8	7 1/4	6 1/2	5 1/2	4 3/4	4 1/2	3 3/4
120	8 1/2	8	7 1/2	6 1/2	5 3/4	5	4 1/4	4	3 1/4
80-100	6 3/4	6 1/2	6	5 1/2	5	4 1/4	3 1/2	3 1/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	30	33
160-180	8 1/2	8 1/2	8 1/2	7 1/4	6 1/2	5 1/2	4 1/2	4 1/4	3 1/2
140	8 1/2	8 1/2	7 3/4	6 3/4	6	5	4 1/4	3 3/4	3
120	8 1/2	7 3/4	7	6	5 1/4	4 1/2	3 3/4	3 1/4	2 3/4
80-100	6 1/4	6	5 1/2	5	4 1/2	3 3/4	3	2 3/4	2 3/4

VREF

WEIGHT (1000 LB)	FLAPS		
	40	30	15
170	151	153	159
160	147	149	155
150	142	144	150
140	137	140	145
130	132	134	139
120	126	129	133
110	120	123	127
100	114	117	121
90	108	111	115

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-21.9	-27.4	-32.9	-26.4	-31.9	-37.4	-37.5	-43.0	-48.5
170	-19.3	-24.8	-30.3	-22.8	-28.3	-33.8	-31.1	-36.6	-42.1
160	-17.0	-22.5	-28.0	-19.7	-25.2	-30.7	-25.8	-31.3	-36.8
150	-15.0	-20.5	-26.0	-17.2	-22.7	-28.2	-21.7	-27.2	-32.7
140	-13.3	-18.8	-24.3	-15.1	-20.6	-26.1	-18.8	-24.3	-29.8
130	-11.9	-17.4	-22.9	-13.4	-18.9	-24.4	-16.6	-22.1	-27.6
120	-10.5	-16.0	-21.5	-11.7	-17.2	-22.7	-14.4	-19.9	-25.4
110	-9.1	-14.6	-20.1	-10.0	-15.5	-21.0	-12.2	-17.7	-23.2
100	-7.6	-13.1	-18.6	-8.2	-13.7	-19.2	-10.0	-15.5	-21.0
90	-6.2	-11.7	-17.2	-6.5	-12.0	-17.5	-7.8	-13.3	-18.8

V1(MCG) Limit Weight (1000 LB)

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							74.3		
5000	75.8			82.9			93.3		
5400	94.0			100.9			111.9		
5800	112.6			119.4	73.9		130.1	83.9	
6200	131.5	84.9		138.2	91.9		147.9	102.7	
6600	150.8	103.2		157.4	110.1		165.4	121.1	74.3
7000	170.6	122.0	75.8	177.0	128.7	82.9	182.6	139.1	93.3
7400	190.9	141.1	94.0	197.0	147.7	100.9	199.5	156.7	111.9
7800		160.7	112.6		167.1	119.4		174.0	130.1
8200		180.7	131.5		186.9	138.2		191.0	147.9
8600			150.8			157.4			165.4
9000			170.6			177.0			182.6
9400			190.9			197.0			199.5

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 -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
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-15	-12	-10	-8	-5	-3	-3	0	0
170	-16	-13	-11	-10	-7	-5	-3	-1	0
160	-17	-15	-12	-12	-10	-7	-4	-2	0
150	-18	-16	-13	-14	-11	-9	-6	-3	-1
140	-19	-16	-14	-15	-13	-10	-8	-5	-3
130	-20	-17	-15	-17	-14	-12	-10	-7	-5
120	-20	-18	-15	-18	-16	-13	-12	-10	-7
110	-21	-19	-16	-19	-17	-14	-15	-12	-10
100	-23	-20	-18	-21	-18	-16	-17	-14	-12
90	-24	-21	-19	-22	-20	-17	-19	-17	-14

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-26.4	-34.9	-43.4	-30.8	-39.3	-47.8	-39.8	-48.3	-56.8
170	-23.4	-31.9	-40.4	-27.0	-35.5	-44.0	-34.4	-42.9	-51.4
160	-20.7	-29.2	-37.7	-23.6	-32.1	-40.6	-29.6	-38.1	-46.6
150	-18.3	-26.8	-35.3	-20.6	-29.1	-37.6	-25.5	-34.0	-42.5
140	-16.2	-24.7	-33.2	-18.0	-26.5	-35.0	-22.0	-30.5	-39.0
130	-14.4	-22.9	-31.4	-15.9	-24.4	-32.9	-19.3	-27.8	-36.3
120	-12.9	-21.4	-29.9	-14.2	-22.7	-31.2	-17.2	-25.7	-34.2
110	-11.6	-20.1	-28.6	-12.8	-21.3	-29.8	-15.6	-24.1	-32.6
100	-10.4	-18.9	-27.4	-11.4	-19.9	-28.4	-14.1	-22.6	-31.1
90	-9.1	-17.6	-26.1	-10.1	-18.6	-27.1	-12.5	-21.0	-29.5

V1(MCG) Limit Weight (1000 LB)

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
5800							86.8		
6200				78.7			105.6		
6600	81.1			99.7			125.0	86.8	
7000	103.5			120.8	78.7		145.2	105.6	
7400	125.9	81.1		142.1	99.7		166.1	125.0	86.8
7800	148.3	103.5		163.6	120.8	78.7	188.0	145.2	105.6
8200	170.6	125.9	81.1	185.2	142.1	99.7		166.1	125.0
8600	192.9	148.3	103.5		163.6	120.8		188.0	145.2
9000		170.6	125.9		185.2	142.1			166.1
9400		192.9	148.3			163.6			188.0
9800			170.6			185.2			
10200			192.9						

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 -150 ft/+140 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 LB)	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
180	-21	-16	-11	-12	-7	-2	0	0	0
170	-22	-17	-12	-14	-9	-4	0	0	0
160	-23	-18	-13	-17	-12	-7	-3	0	0
150	-24	-19	-14	-19	-14	-9	-7	-2	0
140	-25	-20	-15	-21	-16	-11	-10	-5	0
130	-26	-21	-16	-22	-17	-12	-14	-9	-4
120	-27	-22	-17	-24	-19	-14	-17	-12	-7
110	-28	-23	-18	-25	-20	-15	-20	-15	-10
100	-29	-24	-19	-27	-22	-17	-22	-17	-12
90	-29	-24	-19	-28	-23	-18	-25	-20	-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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-2.5	-2.5	-2.5	-12.5	-12.5	-12.5	-21.5	-21.5	-21.5
170	-2.7	-2.7	-2.7	-12.2	-12.2	-12.2	-20.3	-20.3	-20.3
160	-2.8	-2.8	-2.8	-11.8	-11.8	-11.8	-19.1	-19.1	-19.1
150	-2.8	-2.8	-2.8	-11.2	-11.2	-11.2	-17.8	-17.8	-17.8
140	-2.7	-2.7	-2.7	-10.5	-10.5	-10.5	-16.5	-16.5	-16.5
130	-2.5	-2.5	-2.5	-9.6	-9.6	-9.6	-15.2	-15.2	-15.2
120	-2.2	-2.2	-2.2	-8.6	-8.6	-8.6	-13.9	-13.9	-13.9
110	-1.8	-1.8	-1.8	-7.4	-7.4	-7.4	-12.5	-12.5	-12.5
100	-1.3	-1.3	-1.3	-6.1	-6.1	-6.1	-11.0	-11.0	-11.0
90	-0.7	-0.7	-0.7	-4.6	-4.6	-4.6	-9.5	-9.5	-9.5

V1(MCG) Limit Weight (1000 LB)

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	92.1								
4200	120.6	81.6							
4600	150.0	109.8	71.1						
5000	180.2	138.9	99.2	89.7					
5400		168.8	127.9	111.0					
5800		199.5	157.5	133.2	89.7				
6200			187.9	156.3	111.0		77.2		
6600				180.6	133.2	89.7	91.6		
7000					156.3	111.0	106.4		
7400					180.6	133.2	121.7	79.0	
7800						156.3	137.4	93.4	
8200						180.6	153.6	108.3	
8600							170.3	123.6	80.7
9000							187.7	139.4	95.3
9400								155.6	110.2
9800								172.5	125.6
10200								189.9	141.4
10600									157.7
11000									174.6
11400									192.1

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 -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 -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
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-5	-3	0	-14	-12	-9	-25	-23	-20
170	-6	-4	-1	-15	-13	-10	-27	-24	-22
160	-7	-4	-2	-17	-14	-12	-28	-26	-23
150	-8	-5	-3	-18	-15	-13	-30	-27	-25
140	-8	-6	-3	-19	-16	-14	-31	-29	-26
130	-9	-7	-4	-20	-18	-15	-33	-30	-28
120	-10	-8	-5	-21	-19	-16	-34	-32	-29
110	-11	-9	-6	-23	-20	-18	-36	-34	-31
100	-13	-10	-8	-24	-22	-19	-38	-35	-33
90	-14	-12	-9	-26	-24	-21	-40	-37	-35

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-4.4	-4.4	-4.4	-17.0	-17.0	-17.0	-27.2	-27.2	-27.2
170	-4.6	-4.6	-4.6	-16.1	-16.1	-16.1	-25.3	-25.3	-25.3
160	-4.6	-4.6	-4.6	-15.2	-15.2	-15.2	-23.4	-23.4	-23.4
150	-4.6	-4.6	-4.6	-14.3	-14.3	-14.3	-21.7	-21.7	-21.7
140	-4.4	-4.4	-4.4	-13.4	-13.4	-13.4	-20.1	-20.1	-20.1
130	-4.2	-4.2	-4.2	-12.5	-12.5	-12.5	-18.6	-18.6	-18.6
120	-3.8	-3.8	-3.8	-11.5	-11.5	-11.5	-17.2	-17.2	-17.2
110	-3.3	-3.3	-3.3	-10.5	-10.5	-10.5	-15.9	-15.9	-15.9
100	-2.7	-2.7	-2.7	-9.5	-9.5	-9.5	-14.7	-14.7	-14.7
90	-2.0	-2.0	-2.0	-8.5	-8.5	-8.5	-13.5	-13.5	-13.5

V1(MCG) Limit Weight (1000 LB)

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
4200	99.2								
4600	130.9	91.4							
5000	163.1	122.9	83.6						
5400	195.8	155.0	115.0						
5800		187.6	146.9	75.4					
6200			179.4	102.1					
6600				129.6	82.0				
7000				157.8	108.9				
7400				186.8	136.5	88.7			
7800					164.9	115.7			
8200					194.2	143.6			
8600						172.2			
9000							85.2		
9400							105.5		
9800							125.9	75.1	
10200							146.4	95.4	
10600							167.0	115.7	
11000							187.7	136.2	85.2
11400								156.7	105.5
11800								177.4	125.9
12200								198.1	146.4
12600									167.0
13000									187.7

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/+90 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -90 ft/+90 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -170 ft/+160 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 LB)	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
180	-7	-4	-2	-18	-16	-13	-35	-33	-30
170	-8	-5	-3	-20	-17	-15	-37	-35	-32
160	-9	-6	-4	-21	-19	-16	-39	-37	-34
150	-10	-7	-5	-23	-20	-18	-41	-38	-36
140	-10	-8	-5	-24	-22	-19	-43	-40	-38
130	-11	-9	-6	-26	-23	-21	-44	-42	-39
120	-13	-10	-8	-27	-25	-22	-46	-44	-41
110	-14	-11	-9	-29	-26	-24	-48	-45	-43
100	-15	-13	-10	-31	-28	-26	-50	-47	-45
90	-17	-14	-12	-33	-30	-28	-52	-49	-47

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 (°F)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	87.6	88.0	88.9	89.4	89.8	90.4	91.0	91.7	92.4	92.9	93.4	93.5	93.6
160	88.5	89.0	89.3	89.2	89.1	89.7	90.3	91.0	91.7	92.2	92.6	92.8	92.9
150	89.4	89.9	90.3	90.2	90.1	90.1	90.0	90.3	91.0	91.4	91.9	92.0	92.1
140	90.3	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
130	91.1	91.7	92.1	92.1	92.0	92.0	92.0	92.0	92.0	91.9	91.8	91.4	90.9
120	92.0	92.6	93.0	93.0	93.0	92.9	92.9	92.9	92.9	92.8	92.7	92.4	92.0
110	92.9	93.5	93.9	93.9	93.8	93.8	93.8	93.7	93.7	93.6	93.6	93.4	93.1
100	93.8	94.3	94.8	94.7	94.7	94.7	94.6	94.6	94.5	94.4	94.4	94.3	94.2
90	94.2	95.3	95.7	95.7	95.7	95.6	95.6	95.5	95.4	95.4	95.3	95.2	95.2
80	93.3	94.5	95.6	96.1	96.5	96.5	96.4	96.4	96.3	96.2	96.2	96.1	96.1
70	92.5	93.7	94.8	95.3	95.8	96.4	97.1	97.4	97.3	97.2	97.1	97.1	97.0
60	91.6	92.8	93.9	94.4	95.0	95.6	96.2	96.9	97.6	98.3	98.5	98.4	98.3
50	90.8	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
40	89.9	91.1	92.2	92.7	93.2	93.8	94.4	95.1	95.8	96.6	97.4	98.3	99.2
30	89.1	90.2	91.3	91.8	92.3	92.9	93.6	94.2	94.9	95.7	96.5	97.4	98.3
20	88.2	89.3	90.4	90.9	91.4	92.0	92.7	93.4	94.0	94.8	95.6	96.6	97.5
10	87.3	88.4	89.5	90.0	90.5	91.1	91.7	92.4	93.1	93.9	94.7	95.7	96.6
0	86.4	87.5	88.6	89.1	89.6	90.2	90.8	91.5	92.2	93.0	93.8	94.8	95.8
-10	85.5	86.6	87.6	88.1	88.6	89.3	89.9	90.6	91.3	92.1	92.9	94.0	94.9
-20	84.6	85.7	86.7	87.2	87.7	88.3	89.0	89.7	90.4	91.2	92.0	93.1	94.0
-30	83.6	84.7	85.7	86.2	86.7	87.4	88.0	88.7	89.4	90.2	91.1	92.2	93.1
-40	82.7	83.8	84.8	85.3	85.8	86.4	87.0	87.8	88.5	89.3	90.1	91.2	92.2
-50	81.7	82.8	83.8	84.3	84.8	85.4	86.1	86.8	87.5	88.3	89.2	90.3	91.3
-60	80.8	81.8	82.8	83.3	83.8	84.4	85.1	85.8	86.5	87.3	88.2	89.4	90.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	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	0.8	0.9	1.0

Assumed Temperature Reduced Thrust

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°F)	PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
130	163	160	156	153								
120	163	160	156	153	149	146						
110	163	160	156	153	149	146	142	138	135			
100	158	158	156	153	149	146	142	138	135	131	128	
90	147	147	147	147	147	146	142	138	135	131	128	124
80	147	142	138	136	136	136	136	138	135	131	128	124
70	147	142	138	135	133	129	129	129	129	129	127	124
60	147	142	138	135	133	129	127	126	122	120	118	117
50 & BELOW	147	142	138	135	133	129	127	126	122	118	113	109

Maximum Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	88.0	88.9	89.4	89.8	90.4	91.0	91.7	92.4	92.9	93.4	93.5	93.6
160	89.0	89.3	89.2	89.1	89.7	90.3	91.0	91.7	92.2	92.6	92.8	92.9
150	89.9	90.3	90.2	90.1	90.1	90.0	90.3	91.0	91.4	91.9	92.0	92.1
140	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
130	91.7	92.1	92.1	92.0	92.0	92.0	92.0	92.0	91.9	91.8	91.4	90.9
120	92.6	93.0	93.0	93.0	92.9	92.9	92.9	92.9	92.8	92.7	92.4	92.0
110	93.5	93.9	93.9	93.8	93.8	93.8	93.7	93.7	93.6	93.6	93.4	93.1
100	94.3	94.8	94.7	94.7	94.7	94.6	94.6	94.5	94.4	94.4	94.3	94.2
90	95.3	95.7	95.7	95.7	95.6	95.6	95.5	95.4	95.4	95.3	95.2	95.2
80	94.5	95.6	96.1	96.5	96.5	96.4	96.4	96.3	96.2	96.2	96.1	96.1
70	93.7	94.8	95.3	95.8	96.4	97.1	97.4	97.3	97.2	97.1	97.1	97.0
60	92.8	93.9	94.4	95.0	95.6	96.2	96.9	97.6	98.3	98.5	98.4	98.3
50	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
MINIMUM ASSUMED TEMP (°F)	90	86	82	79	75	72	68	64	61	59	54	50

With engine bleed for packs off, increase %N1 by 1.0.

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°F)	OUTSIDE AIR TEMPERATURE (°F)													
	-40	0	20	30	40	50	60	70	80	90	100	110	120	130
200	12.1													
180	11.3	8.4												
160	11.9	8.6	6.7											
140	12.2	7.6	6.9	6.7	5.1									
120	10.7	8.3	5.9	5.8	5.2	5.1	3.5							
100	9.0	8.5	6.5	4.5	4.2	4.1	3.6	3.5	2.0					
80	7.0	7.0	6.8	6.6	4.8	2.8	3.5	2.9	2.2	2.2	2.3			
60		5.3	5.2	5.1	5.0	4.9	4.5	3.8	4.1	4.0	4.0	4.1	4.1	
40		3.4	3.5	3.5	3.4	3.4	3.3	3.2	3.1	3.0	3.0	2.9	2.8	2.8
20			1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4
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 (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
160	145	147	151	142	144	148	135	136	141	133	133	138			
150	140	141	147	136	138	143	130	132	137	129	129	134	129	128	133
140	134	136	142	131	133	139	125	126	132	124	124	130	122	123	129
130	128	130	137	125	127	134	119	121	128	118	119	125	116	117	124
120	121	123	131	118	121	129	113	115	123	112	113	121	111	112	120
110	114	116	126	111	114	123	107	109	118	106	107	116	105	106	115
100	106	109	120	104	107	117	100	103	113	99	101	111	98	100	110
90	99	102	114	96	100	111	93	96	108	92	95	106	91	94	105

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	8	9			4	5	6	7			-1	-1	-1	-1		
120	49	3	4	6	7	9	11	2	3	4	5	7	8	-1	-1	-1	-1	-1	-1
100	38	1	2	3	5	7	9	1	1	3	4	5	7	0	0	0	0	-1	-1
80	27	0	0	1	3	4	7	0	0	1	2	4	6	0	0	0	0	0	0
60	16	0	0	1	2	3	4	0	0	1	2	3	4	0	0	0	0	1	1
-60	-51	0	0	1	2	3	4	0	0	1	2	3	4	0	0	0	0	1	1

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
150	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
140	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
130	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	2
110	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	2
100	-1	-1	0	1	2	-2	-1	-1	0	1	1	1	2
90	-1	-1	0	1	2	-2	-1	-1	0	1	1	2	2

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	98						
140	60	98	96	95	93			
120	49	101	98	95	93	91	89	87
100	38	106	104	100	97	93	89	87
80	27	108	108	106	102	98	94	90
60	16	109	108	106	104	102	99	94
-60	-51	110	109	107	105	103	100	97

Takeoff Speeds - Wet Runway (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
160	140	147	151	136	144	148	130	136	141	131	133	138			
150	134	141	147	130	138	143	125	132	137	125	129	134	124	128	133
140	128	136	142	124	133	139	119	126	132	119	124	130	118	123	129
130	121	130	137	118	127	134	113	121	128	113	119	125	111	117	124
120	114	123	131	111	121	129	107	115	123	106	113	121	105	112	120
110	106	116	126	104	114	123	100	109	118	99	107	116	98	106	115
100	99	109	120	97	107	117	93	103	113	93	101	111	91	100	110
90	92	102	114	89	100	111	86	96	108	85	95	106	84	94	105

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	7	8	10	11			4	5	6	7			-1	-1	-1	-2		
120	49	4	5	7	8	10	13	2	3	4	6	7	8	-1	-1	-1	-1	-1	-1
100	38	1	2	4	6	8	10	1	1	3	4	5	7	0	0	0	0	-1	-1
80	27	0	0	1	3	5	7	0	0	1	2	4	6	0	0	0	0	0	0
60	16	0	0	1	2	3	5	0	0	1	2	3	4	0	0	0	0	0	0
-60	-51	0	0	1	2	3	5	0	0	1	2	3	4	0	0	0	0	0	0

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
130	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
120	-3	-2	0	2	3	-4	-2	-1	0	1	1	2	3
110	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
100	-3	-1	0	2	3	-4	-3	-1	0	1	2	3	4
90	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	4

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	98						
140	60	98	96	95	93			
120	49	101	98	95	93	91	89	87
100	38	106	104	100	97	93	89	87
80	27	108	108	106	102	98	94	90
60	16	109	108	106	104	102	99	94
-60	-51	110	109	107	105	103	100	97

Maximum Allowable Clearway (22K 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 (22K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
800	-5	-4	-4			
600	-5	-3	-3			
400	-4	-2	-2			
200	-3	-1	-1			
0	0	0	0	0	0	0
-200	1	1	1	1	1	1
-400	1	2	2	2	2	1
-600	2	2	2	4	3	2
-800	2	2	2	5	3	2

Use of clearway not allowed on wet runways.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160-180	8 1/2	8 1/2	8 1/2	7 3/4	7	6 1/4	5 1/2	4 3/4	4 1/2
140	8 1/2	8 1/2	8	7 1/4	6 1/2	5 3/4	5	4 1/2	4
120	8 1/2	8	7 1/2	6 3/4	6	5 1/4	4 1/2	4	3 1/2
80-100	7	6 3/4	6 1/2	6	5 1/4	4 1/2	4	3 1/2	3

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160-180	8 1/2	8 1/2	8 1/2	7 1/2	6 1/2	5 3/4	4 3/4	4 1/4	3 3/4
140	8 1/2	8 1/2	7 3/4	7	6 1/4	5 1/4	4 1/2	3 3/4	3 1/4
120	8 1/2	8	7 1/4	6 1/2	5 1/2	4 3/4	4	3 1/4	2 3/4
80-100	6 3/4	6 1/4	6	5 1/2	4 3/4	4	3 1/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-24.8	-29.3	-33.8	-30.1	-34.6	-39.1	-42.0	-46.5	-51.0
170	-20.9	-25.4	-29.9	-25.0	-29.5	-34.0	-34.5	-39.0	-43.5
160	-17.8	-22.3	-26.8	-20.9	-25.4	-29.9	-28.3	-32.8	-37.3
150	-15.4	-19.9	-24.4	-17.8	-22.3	-26.8	-23.2	-27.7	-32.2
140	-13.4	-17.9	-22.4	-15.5	-20.0	-24.5	-19.9	-24.4	-28.9
130	-11.8	-16.3	-20.8	-13.4	-17.9	-22.4	-17.0	-21.5	-26.0
120	-10.3	-14.8	-19.3	-11.6	-16.1	-20.6	-14.4	-18.9	-23.4
110	-9.1	-13.6	-18.1	-10.1	-14.6	-19.1	-12.1	-16.6	-21.1
100	-8.1	-12.6	-17.1	-8.8	-13.3	-17.8	-10.3	-14.8	-19.3
90	-7.4	-11.9	-16.4	-7.9	-12.4	-16.9	-8.7	-13.2	-17.7

V1(MCG) Limit Weight (1000 LB)

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				75.2			86.0		
5000	87.8			93.6			103.4		
5400	106.4			112.3			121.7	77.6	
5800	125.5	78.6		131.4	84.4		140.9	94.6	
6200	145.4	97.0		151.1	102.9		161.2	112.4	
6600	165.9	115.9		171.3	121.8	75.2	182.9	131.1	86.0
7000	187.2	135.4	87.8	192.1	141.2	93.6		150.9	103.4
7400		155.5	106.4		161.1	112.3		171.8	121.7
7800		176.5	125.5		181.6	131.4		194.3	140.9
8200		198.2	145.4			151.1			161.2
8600			165.9			171.3			182.9
9000			187.2			192.1			

1. **Enter Weight Adjustment table with slush/standing water depth and 22K 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 (22K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-13	-10	-8	-4	-2	0	0	0	0
170	-14	-12	-9	-7	-4	-2	0	0	0
160	-15	-13	-10	-9	-7	-4	-1	0	0
150	-16	-14	-11	-11	-9	-6	-3	-1	0
140	-17	-15	-12	-13	-11	-8	-5	-3	0
130	-18	-16	-13	-15	-13	-10	-8	-5	-3
120	-19	-17	-14	-17	-14	-12	-10	-8	-5
110	-20	-18	-15	-18	-15	-13	-13	-10	-8
100	-21	-19	-16	-19	-17	-14	-15	-13	-10
90	-22	-20	-17	-21	-18	-16	-17	-15	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-28.3	-34.8	-41.3	-32.9	-39.4	-45.9	-43.0	-49.5	-56.0
170	-24.8	-31.3	-37.8	-28.6	-35.1	-41.6	-36.9	-43.4	-49.9
160	-21.6	-28.1	-34.6	-24.8	-31.3	-37.8	-31.6	-38.1	-44.6
150	-18.9	-25.4	-31.9	-21.4	-27.9	-34.4	-26.9	-33.4	-39.9
140	-16.5	-23.0	-29.5	-18.6	-25.1	-31.6	-23.0	-29.5	-36.0
130	-14.5	-21.0	-27.5	-16.1	-22.6	-29.1	-19.8	-26.3	-32.8
120	-12.9	-19.4	-25.9	-14.2	-20.7	-27.2	-17.3	-23.8	-30.3
110	-11.6	-18.1	-24.6	-12.6	-19.1	-25.6	-15.3	-21.8	-28.3
100	-10.3	-16.8	-23.3	-11.0	-17.5	-24.0	-13.3	-19.8	-26.3
90	-9.0	-15.5	-22.0	-9.5	-16.0	-22.5	-11.4	-17.9	-24.4

V1(MCG) Limit Weight (1000 LB)

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
5400							81.4		
5800				77.2			100.5		
6200	82.6			98.0			120.1	79.1	
6600	104.6			119.2	74.6		140.4	98.1	
7000	127.0	79.9		141.0	95.4		161.3	117.6	76.7
7400	149.9	101.8		163.2	116.6	72.0	182.9	137.8	95.7
7800	173.4	124.1	77.2	186.1	138.2	92.8		158.6	115.2
8200	197.5	147.0	99.0		160.4	113.9		180.1	135.2
8600		170.5	121.3		183.2	135.5			156.0
9000		194.5	144.1			157.6			177.4
9400			167.5			180.3			199.6
9800			191.5						

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust 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 slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-18	-13	-8	-7	-2	0	0	0	0
170	-20	-15	-10	-10	-5	0	0	0	0
160	-21	-16	-11	-13	-8	-3	0	0	0
150	-22	-17	-12	-16	-11	-6	-2	0	0
140	-23	-18	-13	-18	-13	-8	-7	-2	0
130	-24	-19	-14	-20	-15	-10	-11	-6	-1
120	-25	-20	-15	-22	-17	-12	-14	-9	-4
110	-26	-21	-16	-23	-18	-13	-17	-12	-7
100	-27	-22	-17	-25	-20	-15	-20	-15	-10
90	-28	-23	-18	-26	-21	-16	-22	-17	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)
Maximum Reverse Thrust
Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-4.0	-4.0	-4.0	-14.3	-14.3	-14.3	-23.4	-23.4	-23.4
170	-3.4	-3.4	-3.4	-13.0	-13.0	-13.0	-21.2	-21.2	-21.2
160	-2.9	-2.9	-2.9	-11.9	-11.9	-11.9	-19.3	-19.3	-19.3
150	-2.6	-2.6	-2.6	-10.9	-10.9	-10.9	-17.6	-17.6	-17.6
140	-2.4	-2.4	-2.4	-10.1	-10.1	-10.1	-16.2	-16.2	-16.2
130	-2.4	-2.4	-2.4	-9.5	-9.5	-9.5	-15.1	-15.1	-15.1
120	-2.5	-2.5	-2.5	-9.0	-9.0	-9.0	-14.2	-14.2	-14.2
110	-2.7	-2.7	-2.7	-8.7	-8.7	-8.7	-13.6	-13.6	-13.6
100	-3.1	-3.1	-3.1	-8.6	-8.6	-8.6	-13.3	-13.3	-13.3
90	-3.6	-3.6	-3.6	-8.6	-8.6	-8.6	-13.2	-13.2	-13.2

V1(MCG) Limit Weight (1000 LB)

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	71.5								
3800	100.8								
4200	130.4	89.8							
4600	160.3	119.2	78.8	78.0					
5000	190.5	149.0	108.2	99.3					
5400		179.1	137.8	121.5	80.6				
5800			167.8	144.6	102.1		71.9		
6200			198.1	168.7	124.3	83.3	86.2		
6600				194.0	147.5	104.8	100.9		
7000					171.8	127.2	116.1	73.7	
7400					197.2	150.5	131.9	88.1	
7800						174.9	148.2	102.8	
8200							165.3	118.0	75.5
8600							183.2	133.9	89.9
9000								150.3	104.7
9400								167.5	120.0
9800								185.5	135.9
10200									152.4
10600									169.7
11000									187.8

1. **Enter Weight Adjustment table with reported braking action and 22K Derate 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 -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 (22K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-6	-4	-3	-13	-12	-11	-24	-23	-22
170	-6	-5	-3	-14	-13	-12	-25	-24	-22
160	-6	-5	-4	-15	-14	-13	-26	-25	-24
150	-7	-6	-4	-16	-15	-14	-27	-26	-25
140	-8	-6	-5	-17	-16	-15	-29	-28	-27
130	-9	-7	-6	-19	-17	-16	-31	-30	-28
120	-10	-8	-7	-20	-19	-17	-33	-31	-30
110	-11	-9	-8	-21	-20	-19	-34	-33	-32
100	-12	-10	-9	-23	-22	-20	-36	-35	-33
90	-13	-11	-10	-24	-23	-22	-37	-36	-35

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-5.8	-5.8	-5.8	-18.2	-18.2	-18.2	-28.9	-28.9	-28.9
170	-5.2	-5.2	-5.2	-16.6	-16.6	-16.6	-26.2	-26.2	-26.2
160	-4.7	-4.7	-4.7	-15.3	-15.3	-15.3	-23.8	-23.8	-23.8
150	-4.3	-4.3	-4.3	-14.1	-14.1	-14.1	-21.8	-21.8	-21.8
140	-4.1	-4.1	-4.1	-13.1	-13.1	-13.1	-20.0	-20.0	-20.0
130	-4.0	-4.0	-4.0	-12.3	-12.3	-12.3	-18.6	-18.6	-18.6
120	-4.0	-4.0	-4.0	-11.7	-11.7	-11.7	-17.4	-17.4	-17.4
110	-4.1	-4.1	-4.1	-11.3	-11.3	-11.3	-16.6	-16.6	-16.6
100	-4.4	-4.4	-4.4	-11.1	-11.1	-11.1	-16.1	-16.1	-16.1
90	-4.7	-4.7	-4.7	-11.2	-11.2	-11.2	-15.9	-15.9	-15.9

V1(MCG) Limit Weight (1000 LB)

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	78.4								
4200	111.1	70.2							
4600	143.6	103.0							
5000	175.8	135.5	94.8						
5400		167.8	127.4						
5800		199.8	159.7	92.2					
6200			191.8	119.8	71.9				
6600				148.1	99.0				
7000				177.1	126.8	78.7			
7400					155.3	105.9			
7800					184.5	133.8			
8200						162.5			
8600						192.0	87.9		
9000							106.9		
9400							126.6	76.3	
9800							147.1	95.0	
10200							168.3	114.2	
10600							190.5	134.2	83.2
11000								154.9	102.1
11400								176.6	121.6
11800								199.0	141.9
12200									162.9
12600									184.9

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -90 ft/+90 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -90 ft/+90 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -160 ft/+150 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 (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-7	-4	-2	-17	-14	-12	-33	-30	-28
170	-7	-5	-2	-18	-16	-13	-34	-32	-29
160	-8	-5	-3	-19	-17	-14	-36	-34	-31
150	-9	-6	-4	-21	-18	-16	-38	-35	-33
140	-9	-7	-4	-22	-20	-17	-40	-37	-35
130	-10	-8	-5	-24	-21	-19	-42	-39	-37
120	-12	-9	-7	-26	-23	-21	-44	-41	-39
110	-13	-10	-8	-27	-25	-22	-46	-43	-41
100	-14	-12	-9	-29	-27	-24	-48	-45	-43
90	-16	-13	-11	-31	-28	-26	-49	-47	-44

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)
Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	84.8	85.4	86.2	86.9	87.6	88.4	89.1	89.7	90.3	90.4	90.4	90.9	91.3
160	85.8	86.4	86.8	86.8	86.9	87.7	88.4	89.0	89.6	89.7	89.7	90.2	90.6
150	86.8	87.4	87.8	87.9	87.9	88.1	88.2	88.3	88.9	89.0	89.0	89.4	89.9
140	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
130	88.6	89.1	89.6	89.8	89.9	90.0	90.1	90.1	90.1	89.6	89.1	88.9	88.7
120	89.5	90.0	90.5	90.7	90.8	90.9	91.0	91.0	91.0	90.6	90.1	90.0	89.8
110	90.5	91.0	91.5	91.6	91.7	91.8	91.9	91.9	91.9	91.5	91.1	91.0	90.8
100	91.5	92.0	92.5	92.6	92.7	92.7	92.8	92.8	92.7	92.4	92.1	92.0	91.9
90	91.8	92.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	92.9	92.9
80	91.0	92.1	93.3	94.0	94.5	94.6	94.6	94.6	94.4	94.1	93.8	93.8	93.8
70	90.2	91.3	92.5	93.1	93.8	94.5	95.2	95.4	95.4	95.1	94.7	94.6	94.6
60	89.4	90.5	91.6	92.3	92.9	93.6	94.3	94.9	95.4	96.0	96.0	95.7	95.4
50	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
40	87.7	88.8	89.9	90.6	91.2	91.9	92.6	93.1	93.7	94.3	94.8	95.5	96.2
30	86.8	87.9	89.1	89.7	90.3	91.0	91.7	92.2	92.8	93.4	93.9	94.6	95.4
20	86.0	87.0	88.2	88.8	89.4	90.1	90.8	91.3	91.9	92.5	93.0	93.7	94.5
10	85.1	86.2	87.3	87.9	88.5	89.2	89.9	90.4	91.0	91.6	92.1	92.8	93.6
0	84.2	85.3	86.4	87.0	87.6	88.3	89.0	89.5	90.0	90.6	91.2	91.9	92.7
-10	83.3	84.4	85.5	86.1	86.7	87.4	88.1	88.6	89.1	89.7	90.3	91.0	91.7
-20	82.4	83.4	84.6	85.2	85.8	86.4	87.1	87.6	88.2	88.8	89.3	90.1	90.8
-30	81.5	82.5	83.6	84.2	84.8	85.5	86.2	86.7	87.2	87.8	88.4	89.1	89.9
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-50	79.6	80.6	81.7	82.3	82.9	83.6	84.2	84.7	85.2	85.9	86.5	87.2	87.9
-60	78.7	79.7	80.8	81.3	81.9	82.6	83.2	83.7	84.3	84.9	85.5	86.2	87.0

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	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 (22K Derate)

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
130	163	160	156	153								
120	163	160	156	153	149	146						
110	163	160	156	153	149	146	142	138	135			
100	156	156	156	153	149	146	142	138	135	131	128	
90	147	145	145	145	145	146	142	138	135	131	128	124
80	145	142	138	136	136	136	136	136	135	131	128	124
70	145	142	138	135	131	127	126	126	126	126	124	124
60	145	142	138	135	131	127	124	122	117	115	115	115
50 & BELOW	145	142	138	135	131	127	124	122	117	113	109	106

Maximum Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	85.4	86.2	86.9	87.6	88.4	89.1	89.7	90.3	90.4	90.4	90.9	91.3
160	86.4	86.8	86.8	86.9	87.7	88.4	89.0	89.6	89.7	89.7	90.2	90.6
150	87.4	87.8	87.9	87.9	88.1	88.2	88.3	88.9	89.0	89.0	89.4	89.9
140	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
130	89.1	89.6	89.8	89.9	90.0	90.1	90.1	90.1	89.6	89.1	88.9	88.7
120	90.0	90.5	90.7	90.8	90.9	91.0	91.0	91.0	90.6	90.1	90.0	89.8
110	91.0	91.5	91.6	91.7	91.8	91.9	91.9	91.9	91.5	91.1	91.0	90.8
100	92.0	92.5	92.6	92.7	92.7	92.8	92.8	92.7	92.4	92.1	92.0	91.9
90	92.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	92.9	92.9
80	92.1	93.3	94.0	94.5	94.6	94.6	94.6	94.4	94.1	93.8	93.8	93.8
70	91.3	92.5	93.1	93.8	94.5	95.2	95.4	95.4	95.1	94.7	94.6	94.6
60	90.5	91.6	92.3	92.9	93.6	94.3	94.9	95.4	96.0	96.0	95.7	95.4
50	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
MINIMUM ASSUMED TEMP (°F)	90	86	82	79	75	72	68	64	61	59	54	50

With engine bleed for packs off, increase %N1 by 0.9.

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°F)	OUTSIDE AIR TEMPERATURE (°F)													
	-40	0	20	30	40	50	60	70	80	90	100	110	120	130
200	11.6													
180	10.3	8.0												
160	11.0	8.2	6.3											
140	12.0	6.8	6.5	6.2	4.8									
120	10.5	7.5	5.1	5.0	4.8	4.7	3.2							
100	8.9	8.4	5.8	3.8	3.4	3.3	3.3	3.1	1.7					
80	7.2	6.9	6.6	6.0	4.1	2.1	2.1	2.3	1.9	2.0	1.8			
60		5.2	5.1	5.0	4.9	4.3	3.9	3.5	3.9	3.8	3.7	3.7	4.0	
40		3.5	3.4	3.4	3.4	3.3	3.2	3.2	3.1	3.0	2.9	2.8	2.8	2.7
20			1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	1.4
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 (20K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
160	147	148	151												
150	143	143	147	139	140	143									
140	137	137	142	133	135	139	127	128	132	126	126	130	124	124	129
130	130	131	137	127	129	134	122	122	127	120	120	125	119	119	124
120	124	125	131	121	122	128	116	116	122	114	114	120	113	113	119
110	116	118	125	114	116	123	109	110	117	108	109	116	107	107	114
100	109	111	119	106	109	117	102	104	112	102	103	111	100	101	109
90	101	104	113	99	102	111	96	98	107	94	96	105	93	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)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	5	6	7	9			4	5	5	5			-1	-1	-1	-1		
120	49	3	4	4	4	6	9	2	3	3	4	5	7	0	0	0	0	-1	-1
100	38	1	2	2	2	4	6	1	1	2	2	4	5	0	0	0	0	0	0
80	27	0	0	0	1	2	4	0	0	0	1	3	4	0	0	0	0	0	0
60	16	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1
-60	-51	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-3	-1	0	0	0	-1	-1	0	0	0	0	0	0
150	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
140	-2	-1	0	1	1	-1	-1	0	0	0	0	1	1
130	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
110	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
100	-1	0	0	1	2	-2	-1	0	0	1	1	1	2
90	-1	0	0	1	2	-2	-1	0	0	1	1	2	2

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	93						
140	60	93	91	92	93			
120	49	96	94	93	93	91	88	84
100	38	101	99	98	97	93	88	84
80	27	103	103	102	101	98	93	87
60	16	103	103	102	101	99	96	92
-60	-51	105	104	103	102	100	97	95

Takeoff Speeds - Wet Runway (20K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
160	143	148	151												
150	137	143	147	134	140	143									
140	131	137	142	128	135	139	122	128	132	122	126	130	123	124	129
130	124	131	137	121	129	134	116	122	127	116	120	125	115	119	124
120	117	125	131	114	122	128	110	116	122	109	114	120	108	113	119
110	110	118	125	107	116	123	103	110	117	103	109	116	101	107	114
100	102	111	119	100	109	117	96	104	112	96	103	111	94	102	109
90	94	104	113	92	102	111	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)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	7	8	8	9			4	5	5	6			-1	-1	-1	-1		
120	49	4	5	5	6	7	10	2	3	3	4	5	7	0	0	0	0	-1	-1
100	38	1	2	2	2	4	7	1	1	2	2	4	5	0	0	0	0	0	0
80	27	0	0	0	1	2	5	0	0	0	1	3	4	0	0	0	0	0	0
60	16	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1
-60	-51	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
130	-3	-2	0	2	4	-3	-2	-1	0	1	2	2	3
120	-3	-1	0	2	4	-3	-2	-1	0	1	2	2	3
110	-3	-1	0	2	3	-3	-2	-1	0	1	2	3	3
100	-2	-1	0	2	3	-4	-2	-1	0	1	2	3	4
90	-2	-1	0	2	3	-4	-2	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	93						
140	60	93	91	92	93			
120	49	96	94	93	93	91	88	84
100	38	101	99	98	97	93	88	84
80	27	103	103	102	101	98	93	87
60	16	103	103	102	101	99	96	92
-60	-51	105	104	103	102	100	97	95

Maximum Allowable Clearway (20K 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 (20K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
800	-4	-4	-4			
600	-3	-3	-3			
400	-4	-2	-2			
200	-3	-1	-2			
0	0	0	0	0	0	0
-200	1	1	0	1	1	1
-400	2	1	1	2	1	1
-600	2	1	1	2	1	1
-800	2	1	1	2	1	1

Use of clearway not allowed on wet runways.

Stab Trim Setting (20K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160 - 180	8 1/2	8 1/2	8 1/2	8	7	6 1/4	5 1/2	4 3/4	4 1/4
140	8 1/2	8 1/2	8	7 1/2	6 3/4	5 3/4	5	4 1/2	4
120	8 1/2	8	7 3/4	7	6 1/4	5 1/4	4 1/2	4	3 1/2
80 - 100	7 3/4	7 1/4	6 3/4	6 1/4	5 1/2	4 3/4	4	3 1/4	3

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160 - 180	8 1/2	8 1/2	8 1/2	7 3/4	6 3/4	6	5	4 1/2	4
140	8 1/2	8 1/2	8	7 1/4	6 1/4	5 1/2	4 3/4	4	3 1/2
120	8 1/2	8	7 1/2	6 3/4	6	5	4 1/4	3 1/2	3 1/4
80 - 100	7 1/4	7	6 1/2	6	5 1/4	4 1/2	3 1/2	3	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-25.5	-29.0	-32.5	-31.3	-34.8	-38.3	-48.1	-51.6	-55.1
170	-22.0	-25.5	-29.0	-26.8	-30.3	-33.8	-39.9	-43.4	-46.9
160	-18.9	-22.4	-25.9	-22.8	-26.3	-29.8	-32.6	-36.1	-39.6
150	-16.2	-19.7	-23.2	-19.3	-22.8	-26.3	-26.4	-29.9	-33.4
140	-13.7	-17.2	-20.7	-16.1	-19.6	-23.1	-21.6	-25.1	-28.6
130	-11.6	-15.1	-18.6	-13.5	-17.0	-20.5	-17.7	-21.2	-24.7
120	-10.0	-13.5	-17.0	-11.5	-15.0	-18.5	-14.7	-18.2	-21.7
110	-8.6	-12.1	-15.6	-9.9	-13.4	-16.9	-12.5	-16.0	-19.5
100	-8.0	-11.5	-15.0	-8.9	-12.4	-15.9	-10.9	-14.4	-17.9
90	-7.6	-11.1	-14.6	-8.3	-11.8	-15.3	-10.1	-13.6	-17.1

V1(MCG) Limit Weight (1000 LB)

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				74.0			82.1		
4600	88.5			93.2			100.5		
5000	108.0			112.6			119.5	72.9	
5400	128.2	78.8		132.6	83.6		139.0	91.3	
5800	149.0	98.2		153.3	102.8		159.2	109.9	
6200	170.6	118.0		174.7	122.5	74.0	180.2	129.2	82.1
6600	193.0	138.5	88.5	196.8	142.9	93.2		149.0	100.5
7000		159.7	108.0		163.9	112.6		169.6	119.5
7400		181.7	128.2		185.6	132.6		191.0	139.0
7800			149.0			153.3			159.2
8200			170.6			174.7			180.2
8600			193.0			196.8			

1. **Enter Weight Adjustment table with slush/standing water depth and 20K 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 (20K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-7	-2	0	0	0	0	0	0	0
170	-9	-4	0	0	0	0	0	0	0
160	-11	-6	-1	-4	0	0	0	0	0
150	-13	-8	-3	-7	-2	0	0	0	0
140	-14	-9	-4	-10	-5	0	0	0	0
130	-16	-11	-6	-12	-7	-2	-4	0	0
120	-17	-12	-7	-14	-9	-4	-7	-2	0
110	-18	-13	-8	-15	-10	-5	-10	-5	0
100	-19	-14	-9	-17	-12	-7	-13	-8	-3
90	-19	-14	-9	-18	-13	-8	-15	-10	-5

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-31.6	-37.6	-43.6	-37.7	-43.7	-49.7	-51.4	-57.4	-63.4
170	-27.2	-33.2	-39.2	-32.1	-38.1	-44.1	-43.1	-49.1	-55.1
160	-23.3	-29.3	-35.3	-27.3	-33.3	-39.3	-36.0	-42.0	-48.0
150	-19.9	-25.9	-31.9	-23.1	-29.1	-35.1	-29.9	-35.9	-41.9
140	-17.1	-23.1	-29.1	-19.6	-25.6	-31.6	-24.8	-30.8	-36.8
130	-14.9	-20.9	-26.9	-16.8	-22.8	-28.8	-20.9	-26.9	-32.9
120	-13.1	-19.1	-25.1	-14.6	-20.6	-26.6	-18.1	-24.1	-30.1
110	-11.8	-17.8	-23.8	-13.0	-19.0	-25.0	-16.0	-22.0	-28.0
100	-10.5	-16.5	-22.5	-11.4	-17.4	-23.4	-14.0	-20.0	-26.0
90	-9.2	-15.2	-21.2	-9.8	-15.8	-21.8	-12.1	-18.1	-24.1

V1(MCG) Limit Weight (1000 LB)

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							80.2		
5400				79.3			99.5		
5800	88.2			101.6			120.8	73.3	
6200	112.2			124.4	71.1		145.1	92.1	
6600	136.6	79.2		148.0	93.2		174.0	112.5	
7000	161.2	103.2		172.3	115.8			135.5	84.9
7400	186.2	127.4	70.3	197.5	139.1	84.8		162.4	104.6
7800		152.0	94.2		163.1	107.2		196.0	126.5
8200		176.8	118.3		188.0	130.3			151.8
8600			142.7			154.0			182.4
9000			167.4			178.6			
9400			192.5						

1. **Enter Weight Adjustment table with slush/standing water depth and 20K 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 (20K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-13	-11	-8	0	0	0	0	0	0
170	-15	-13	-10	-3	0	0	0	0	0
160	-17	-14	-12	-7	-4	-2	0	0	0
150	-18	-16	-13	-11	-8	-6	0	0	0
140	-20	-17	-15	-14	-11	-9	0	0	0
130	-21	-19	-16	-17	-14	-12	-5	-3	0
120	-22	-20	-17	-19	-16	-14	-10	-7	-5
110	-23	-21	-18	-21	-18	-16	-14	-11	-9
100	-24	-22	-19	-22	-20	-17	-17	-14	-12
90	-25	-23	-20	-23	-21	-18	-19	-17	-14

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-4.4	-4.4	-4.4	-14.2	-14.2	-14.2	-23.2	-23.2	-23.2
170	-3.5	-3.5	-3.5	-12.9	-12.9	-12.9	-21.1	-21.1	-21.1
160	-3.1	-3.1	-3.1	-11.7	-11.7	-11.7	-19.2	-19.2	-19.2
150	-2.5	-2.5	-2.5	-10.6	-10.6	-10.6	-17.5	-17.5	-17.5
140	-2.1	-2.1	-2.1	-9.6	-9.6	-9.6	-15.9	-15.9	-15.9
130	-1.8	-1.8	-1.8	-8.8	-8.8	-8.8	-14.6	-14.6	-14.6
120	-1.7	-1.7	-1.7	-8.2	-8.2	-8.2	-13.5	-13.5	-13.5
110	-1.7	-1.7	-1.7	-7.8	-7.8	-7.8	-12.7	-12.7	-12.7
100	-1.9	-1.9	-1.9	-7.5	-7.5	-7.5	-12.1	-12.1	-12.1
90	-2.2	-2.2	-2.2	-7.3	-7.3	-7.3	-11.7	-11.7	-11.7

V1(MCG) Limit Weight (1000 LB)

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	84.7								
3800	114.6								
4200	144.5	95.9							
4600	174.5	125.8	77.3	91.3					
5000		155.8	107.1	113.9					
5400		185.7	137.1	137.4	88.5				
5800			167.0	161.8	111.1		82.9		
6200			197.0	187.1	134.4	85.7	98.2		
6600					158.7	108.2	114.0		
7000					183.9	131.5	130.4	82.9	
7400						155.6	147.4	98.2	
7800						180.7	165.2	114.0	
8200							183.8	130.4	82.9
8600								147.4	98.2
9000								165.2	114.0
9400								183.8	130.4
9800									147.4
10200									165.2
10600									183.8

1. **Enter Weight Adjustment table with reported braking action and 20K 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 -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 (20K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-4	-3	-2	-12	-10	-9	-21	-20	-19
170	-5	-3	-2	-12	-11	-10	-21	-20	-19
160	-5	-4	-3	-13	-11	-10	-22	-21	-20
150	-6	-4	-3	-14	-12	-11	-24	-22	-21
140	-6	-5	-4	-15	-14	-12	-25	-24	-23
130	-7	-6	-5	-16	-15	-14	-27	-26	-25
120	-8	-7	-6	-18	-16	-15	-29	-28	-27
110	-9	-8	-7	-19	-18	-17	-31	-30	-29
100	-10	-9	-8	-21	-19	-18	-33	-32	-30
90	-11	-10	-9	-22	-21	-20	-35	-33	-32

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)
No Reverse Thrust
Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-6.9	-6.9	-6.9	-19.0	-19.0	-19.0	-30.0	-30.0	-30.0
170	-5.8	-5.8	-5.8	-17.0	-17.0	-17.0	-27.0	-27.0	-27.0
160	-4.9	-4.9	-4.9	-15.4	-15.4	-15.4	-24.4	-24.4	-24.4
150	-4.2	-4.2	-4.2	-13.9	-13.9	-13.9	-22.1	-22.1	-22.1
140	-3.7	-3.7	-3.7	-12.8	-12.8	-12.8	-20.1	-20.1	-20.1
130	-3.5	-3.5	-3.5	-11.9	-11.9	-11.9	-18.5	-18.5	-18.5
120	-3.5	-3.5	-3.5	-11.3	-11.3	-11.3	-17.1	-17.1	-17.1
110	-3.7	-3.7	-3.7	-10.9	-10.9	-10.9	-16.1	-16.1	-16.1
100	-4.2	-4.2	-4.2	-10.8	-10.8	-10.8	-15.4	-15.4	-15.4
90	-4.8	-4.8	-4.8	-10.9	-10.9	-10.9	-15.0	-15.0	-15.0

V1(MCG) Limit Weight (1000 LB)

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	96.4								
4200	129.1	83.9							
4600	161.2	116.9	71.4						
5000	192.6	149.2	104.6						
5400		180.9	137.2	88.4					
5800			169.1	116.9					
6200				145.8	92.0				
6600				175.0	120.5				
7000					149.4	95.5			
7400					178.7	124.1			
7800						153.1	73.5		
8200						182.4	93.6		
8600							114.3		
9000							135.4	76.0	
9400							157.2	96.2	
9800							179.6	116.9	
10200								138.1	78.5
10600								160.0	98.7
11000								182.5	119.5
11400									140.8
11800									162.7
12200									185.3

1. **Enter Weight Adjustment table with reported braking action and 20K Derate 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 (20K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-9	-7	-4	-19	-17	-14	-34	-31	-29
170	-8	-5	-3	-18	-15	-13	-32	-30	-27
160	-7	-5	-2	-17	-15	-12	-32	-30	-27
150	-7	-5	-2	-18	-15	-13	-33	-31	-28
140	-8	-5	-3	-19	-16	-14	-35	-33	-30
130	-9	-6	-4	-21	-18	-16	-37	-35	-32
120	-10	-8	-5	-23	-20	-18	-40	-37	-35
110	-11	-9	-6	-25	-22	-20	-42	-40	-37
100	-13	-10	-8	-27	-24	-22	-44	-42	-39
90	-14	-11	-9	-28	-25	-23	-45	-43	-40

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	81.0	81.1	81.7	84.2	86.0	87.4	89.0	89.9	90.8	90.6	90.4	90.0	89.6
160	82.0	82.2	82.3	84.1	85.4	86.7	88.3	89.2	90.1	89.9	89.6	89.3	88.9
150	83.0	83.3	83.6	85.1	86.3	87.1	88.1	88.5	89.4	89.2	88.9	88.6	88.2
140	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
130	84.9	85.4	85.9	87.1	88.2	89.1	90.1	90.2	90.4	89.7	88.9	88.0	87.0
120	86.0	86.5	87.0	88.0	89.0	90.0	91.0	91.1	91.2	90.5	89.8	88.9	87.9
110	87.1	87.5	88.0	89.1	90.0	91.0	91.9	91.9	92.0	91.3	90.7	89.8	88.8
100	88.0	88.5	89.0	90.1	91.0	92.0	92.9	92.8	92.7	92.1	91.5	90.6	89.7
90	88.5	89.6	90.0	91.1	92.0	92.9	93.9	93.7	93.6	93.0	92.4	91.4	90.5
80	87.7	88.8	90.0	91.0	92.1	92.9	94.0	94.4	94.5	93.9	93.3	92.3	91.4
70	86.9	88.0	89.2	90.2	91.2	92.1	93.2	93.6	94.1	94.7	94.1	93.2	92.4
60	86.1	87.2	88.3	89.3	90.4	91.3	92.3	92.7	93.2	93.8	94.2	94.1	93.3
50	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
40	84.5	85.6	86.7	87.7	88.7	89.6	90.6	91.0	91.5	92.1	92.5	92.8	93.4
30	83.7	84.8	85.8	86.8	87.8	88.7	89.7	90.1	90.6	91.2	91.6	91.9	92.5
20	82.8	83.9	85.0	85.9	87.0	87.8	88.8	89.2	89.7	90.3	90.7	91.0	91.6
10	82.0	83.1	84.1	85.1	86.1	86.9	87.9	88.3	88.8	89.4	89.8	90.1	90.7
0	81.1	82.2	83.2	84.2	85.2	86.0	87.0	87.4	87.9	88.5	88.9	89.2	89.8
-10	80.3	81.3	82.4	83.3	84.3	85.1	86.1	86.5	87.0	87.5	87.9	88.3	88.8
-20	79.4	80.4	81.5	82.4	83.4	84.2	85.2	85.6	86.0	86.6	87.0	87.3	87.9
-30	78.5	79.5	80.6	81.5	82.5	83.3	84.2	84.6	85.1	85.6	86.1	86.4	86.9
-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
-50	76.7	77.7	78.7	79.6	80.6	81.4	82.3	82.7	83.2	83.7	84.1	84.4	85.0
-60	75.8	76.8	77.8	78.7	79.6	80.4	81.4	81.7	82.2	82.7	83.1	83.5	84.0

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	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 (20K Derate)

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°F)	PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
130	163	160	156	153								
120	163	160	156	153	149	146						
110	162	160	156	153	149	146	142	138	135			
100	151	151	154	153	149	146	142	138	135	131	128	
90	142	142	144	145	145	145	142	138	135	131	128	124
80	142	138	140	140	140	140	138	138	135	131	128	124
70	142	138	140	140	140	140	138	136	127	127	127	124
60	142	138	140	140	140	140	138	136	127	120	117	115
50 & BELOW	142	138	140	140	140	140	138	136	127	120	113	104

Maximum Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	81.1	81.7	84.2	86.0	87.4	89.0	89.9	90.8	90.6	90.4	90.0	89.6
160	82.2	82.3	84.1	85.4	86.7	88.3	89.2	90.1	89.9	89.6	89.3	88.9
150	83.3	83.6	85.1	86.3	87.1	88.1	88.5	89.4	89.2	88.9	88.6	88.2
140	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
130	85.4	85.9	87.1	88.2	89.1	90.1	90.2	90.4	89.7	88.9	88.0	87.0
120	86.5	87.0	88.0	89.0	90.0	91.0	91.1	91.2	90.5	89.8	88.9	87.9
110	87.5	88.0	89.1	90.0	91.0	91.9	91.9	92.0	91.3	90.7	89.8	88.8
100	88.5	89.0	90.1	91.0	92.0	92.9	92.8	92.7	92.1	91.5	90.6	89.7
90	89.6	90.0	91.1	92.0	92.9	93.9	93.7	93.6	93.0	92.4	91.4	90.5
80	88.8	90.0	91.0	92.1	92.9	94.0	94.4	94.5	93.9	93.3	92.3	91.4
70	88.0	89.2	90.2	91.2	92.1	93.2	93.6	94.1	94.7	94.1	93.2	92.4
60	87.2	88.3	89.3	90.4	91.3	92.3	92.7	93.2	93.8	94.2	94.1	93.3
50	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 (°F)	90	86	86	86	84	81	78	78	71	64	57	50

With engine bleed for packs off, increase %N1 by 0.9.

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°F)	OUTSIDE AIR TEMPERATURE (°F)													
	-40	0	20	30	40	50	60	70	80	90	100	110	120	130
200	10.9													
180	10.3	6.2												
160	10.7	7.7	4.7											
140	11.6	6.8	6.1	4.6	3.2									
120	10.2	7.2	5.1	4.9	4.6	3.1	1.7							
100	8.6	8.1	5.5	3.7	3.4	3.3	3.0	1.6	0.2					
80	6.9	6.7	6.4	5.6	3.8	2.1	3.2	3.5	1.6	0.7	0.5			
60		5.0	4.9	4.9	4.7	3.9	4.0	4.0	4.0	2.7	2.4	2.6	3.8	
40		3.4	3.3	3.3	3.3	3.2	3.1	3.0	3.0	2.9	2.8	2.7	2.6	2.6
20			1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.3
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	89.4	89.7	89.7	89.8	89.6	91.4	93.0	94.4	94.5	92.8
55	90.2	90.5	90.5	90.7	90.0	90.8	92.4	93.7	93.8	92.1
50	90.9	91.2	91.3	91.5	91.0	90.8	91.7	93.0	93.1	91.4
45	91.6	91.9	92.1	92.3	91.9	91.7	91.7	92.3	92.4	90.7
40	92.4	92.6	92.9	93.1	92.7	92.5	92.5	91.6	91.7	90.0
35	92.9	93.3	93.6	93.8	93.6	93.3	93.3	92.4	91.7	90.1
30	92.2	94.1	94.3	94.6	94.4	94.1	94.0	93.2	92.6	91.1
25	91.5	94.1	95.0	95.2	95.2	94.8	94.7	94.0	93.4	92.1
20	90.7	93.3	95.8	96.0	95.9	95.6	95.4	94.7	94.2	93.0
15	90.0	92.5	95.2	96.8	96.7	96.3	96.1	95.5	95.0	94.0
10	89.2	91.8	94.4	97.1	97.6	97.0	96.7	96.2	95.8	94.9
5	88.4	91.0	93.6	96.3	98.5	97.9	97.4	97.0	96.6	95.8
0	87.7	90.2	92.8	95.5	97.9	99.0	98.4	97.8	97.5	96.7
-5	86.9	89.4	92.0	94.7	97.2	98.9	99.4	98.6	98.3	97.7
-10	86.1	88.6	91.2	93.9	96.4	98.1	99.7	99.5	99.2	98.7
-15	85.3	87.8	90.3	93.1	95.6	97.4	98.9	100.5	100.1	99.7
-20	84.5	87.0	89.5	92.3	94.8	96.6	98.1	100.2	100.7	100.3
-25	83.7	86.1	88.7	91.4	94.1	95.8	97.3	99.3	99.9	99.5
-30	82.9	85.3	87.8	90.6	93.3	95.0	96.5	98.5	99.0	98.7
-35	82.0	84.5	87.0	89.8	92.4	94.1	95.6	97.6	98.2	97.8
-40	81.2	83.6	86.1	88.9	91.6	93.3	94.8	96.8	97.3	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

%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	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	0.9
A/C HIGH	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

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 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1700	1100	500		
30000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2500	2000	1500	1200	900
20000	**PITCH ATT**	**7.5**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3300	2700	2200	1800
10000	**PITCH ATT**	**11.0**	**9.5**	**8.5**	**8.0**	**8.0**
	V/S (FT/MIN)	5600	4500	3700	3100	2600
SEA LEVEL	**PITCH ATT**	**14.5**	**12.5**	**11.5**	**10.5**	**10.0**
	V/S (FT/MIN)	6700	5400	4500	3800	3300

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	83	87	91		
35000	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	81	83	85	88	92
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	81	83	84	86
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	80	82
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	73	74	75	76	78
15000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	69	70	71	73	74

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**-1.5**	**-0.5**	**0.0**	**0.5**	**1.0**
	V/S (FT/MIN)	-2800	-2600	-2600	-2800	-3000
30000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	**0.0**
	V/S (FT/MIN)	-3100	-2700	-2400	-2200	-2100
20000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2900	-2400	-2200	-2000	-1900
10000	**PITCH ATT**	**-3.5**	**-2.5**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN	-2700	-2300	-2000	-1900	-1800
SEA LEVEL	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-2500	-2200	-1900	-1700	-1600

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	62	66	69
5000	**PITCH ATT**	**5.5**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	49	54	58	62	66

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 LB)				
		90	110	130	150	170
FLAPS 1 (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF 40 + 50)	%N1	52	56	60	64	67
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 30)	%N1	52	57	62	65	69
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 20)	%N1	60	65	70	74	78

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		90	110	130	150	170
FLAPS 15	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**	**4.0**
(VREF 15 + 10)	%N1	43	46	50	54	57
FLAPS 30	**PITCH ATT**	**1.5**	**2.0**	**2.0**	**2.0**	**2.5**
(VREF 30 + 10)	%N1	47	51	55	59	62
FLAPS 40	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF 40 + 10)	%N1	53	58	63	66	69

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 21

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust
ISA + 10°C and Below

WEIGHT (1000 LB)	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°)
170	31800	-9	35300*	35300*	35300*	34300	32900
160	33100	-12	36600*	36600*	36600*	35500	34200
150	34500	-15	37900*	37900*	37900*	36900	35500
140	36000	-19	39200*	39200*	39200*	38300	37000
130	37500	-19	40600*	40600*	40600*	39900	38500
120	39200	-19	41000	41000	41000	41000	40200
110	41000	-19	41000	41000	41000	41000	41000
100	41000	-19	41000	41000	41000	41000	41000
90	41000	-19	41000	41000	41000	41000	41000
80	41000	-19	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 LB)	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°)
170	31800	-4	34100*	34100*	34100*	34100*	32900
160	33100	-7	35700*	35700*	35700*	35500	34200
150	34500	-10	37000*	37000*	37000*	36900	35500
140	36000	-13	38300*	38300*	38300*	38300	37000
130	37500	-13	39700*	39700*	39700*	39700*	38500
120	39200	-13	41000	41000	41000	41000	40200
110	41000	-13	41000	41000	41000	41000	41000
100	41000	-13	41000	41000	41000	41000	41000
90	41000	-13	41000	41000	41000	41000	41000
80	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 LB)	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°)
170	31800	2	32300*	32300*	32300*	32300*	32300*
160	33100	-1	34200*	34200*	34200*	34200*	34200
150	34500	-4	35800*	35800*	35800*	35800*	35500
140	36000	-7	37200*	37200*	37200*	37200*	37000
130	37500	-8	38600*	38600*	38600*	38600*	38500
120	39200	-8	40000*	40000*	40000*	40000*	40000*
110	41000	-8	41000	41000	41000	41000	41000
100	41000	-8	41000	41000	41000	41000	41000
90	41000	-8	41000	41000	41000	41000	41000
80	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 LB)		PRESSURE ALTITUDE (1000 FT)									
		23	25	27	29	31	33	35	37	39	41
170	%N1	82.3	83.7	85.0	86.1	87.5	89.1	92.1			
	MACH	.701	.726	.748	.761	.775	.787	.790			
	KIAS	305	304	301	294	287	279	268			
	FF/ENG	3219	3203	3185	3142	3119	3139	3235			
160	%N1	80.8	82.4	83.7	84.9	86.2	87.6	89.6	94.1		
	MACH	.681	.709	.734	.752	.766	.779	.790	.787		
	KIAS	296	296	295	290	283	276	268	255		
	FF/ENG	3022	3021	3015	2987	2948	2932	2978	3139		
150	%N1	79.4	80.8	82.4	83.7	84.9	86.2	87.7	90.6		
	MACH	.664	.688	.716	.740	.756	.770	.783	.791		
	KIAS	288	287	287	285	280	273	266	256		
	FF/ENG	2842	2826	2838	2828	2790	2755	2753	2838		
140	%N1	78.0	79.3	80.8	82.3	83.6	84.8	86.1	88.2	92.2	
	MACH	.647	.669	.694	.722	.745	.760	.774	.786	.790	
	KIAS	280	278	278	278	275	269	262	255	244	
	FF/ENG	2665	2643	2648	2653	2638	2593	2565	2603	2715	
130	%N1	76.5	77.8	79.1	80.6	82.1	83.4	84.6	86.4	89.1	93.7
	MACH	.629	.650	.672	.699	.727	.748	.763	.777	.788	.789
	KIAS	272	270	269	268	268	264	258	251	244	233
	FF/ENG	2497	2466	2459	2467	2466	2443	2401	2403	2461	2593
120	%N1	74.9	76.2	77.5	78.8	80.3	81.8	83.1	84.7	86.9	90.0
	MACH	.610	.630	.652	.675	.703	.730	.751	.765	.779	.790
	KIAS	263	262	260	258	258	257	253	247	241	233
	FF/ENG	2337	2297	2281	2277	2282	2275	2250	2230	2248	2312
110	%N1	72.9	74.4	75.7	77.0	78.3	79.9	81.4	83.0	85.1	87.4
	MACH	.586	.610	.630	.652	.676	.705	.732	.752	.767	.780
	KIAS	253	253	251	249	248	248	247	242	236	230
	FF/ENG	2165	2137	2111	2099	2092	2095	2086	2073	2070	2090
100	%N1	70.7	72.3	73.8	75.1	76.4	77.8	79.4	81.2	83.3	85.3
	MACH	.559	.583	.608	.629	.651	.675	.704	.732	.752	.767
	KIAS	241	241	241	240	238	236	236	235	231	226
	FF/ENG	1986	1966	1951	1930	1917	1907	1908	1910	1911	1928
90	%N1	68.1	69.9	71.4	72.9	74.3	75.6	77.0	79.0	81.2	83.3
	MACH	.531	.554	.579	.603	.626	.648	.672	.701	.730	.751
	KIAS	228	229	229	229	228	226	225	225	224	220
	FF/ENG	1805	1789	1781	1770	1776	1757	1744	1750	1764	1767
80	%N1	65.2	66.9	68.7	70.3	71.9	73.3	74.6	76.4	78.7	80.9
	MACH	.500	.522	.546	.571	.596	.620	.642	.666	.694	.724
	KIAS	214	215	216	216	216	216	214	213	212	212
	FF/ENG	1653	1642	1636	1628	1615	1594	1575	1569	1580	1596

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversions

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
298	272	249	230	214	200	190	181	173	166	159
449	410	375	346	322	300	285	272	260	248	239
601	548	501	462	429	400	380	362	346	331	318
753	686	627	578	537	500	475	453	433	414	398
905	824	753	694	644	600	571	544	519	497	477
1058	963	879	810	752	700	666	634	606	580	557
1212	1102	1006	927	860	800	761	725	692	662	636
1366	1242	1133	1043	967	900	856	815	778	745	715
1521	1382	1260	1160	1075	1000	951	906	865	828	794
1676	1523	1388	1277	1183	1100	1046	997	951	910	874
1832	1663	1516	1394	1291	1200	1141	1087	1038	993	953
1988	1804	1644	1511	1399	1300	1237	1178	1124	1076	1032
2145	1946	1772	1628	1507	1400	1332	1269	1211	1158	1111
2303	2088	1900	1746	1615	1500	1426	1359	1297	1241	1190
2462	2231	2029	1863	1723	1600	1521	1449	1383	1323	1269
2621	2374	2158	1981	1832	1700	1616	1539	1469	1405	1348
2780	2517	2287	2099	1940	1800	1711	1629	1554	1487	1426
2941	2661	2417	2217	2048	1900	1806	1719	1640	1569	1505
3102	2805	2546	2334	2157	2000	1901	1810	1726	1651	1583

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.0	0:43	2.7	0:41	2.3	0:38	2.0	0:37	1.8	0:36
300	4.7	1:03	4.2	1:00	3.6	0:55	3.2	0:53	2.9	0:51
400	6.3	1:24	5.7	1:19	5.0	1:12	4.5	1:09	4.1	1:06
500	7.9	1:44	7.2	1:38	6.3	1:30	5.7	1:25	5.2	1:22
600	9.5	2:05	8.7	1:58	7.6	1:47	6.9	1:41	6.4	1:37
700	11.0	2:26	10.1	2:17	8.9	2:05	8.1	1:58	7.5	1:53
800	12.6	2:46	11.6	2:37	10.2	2:23	9.3	2:14	8.6	2:08
900	14.2	3:08	13.1	2:57	11.5	2:40	10.5	2:31	9.7	2:24
1000	15.7	3:29	14.5	3:16	12.8	2:58	11.7	2:48	10.8	2:40
1100	17.3	3:50	16.0	3:37	14.1	3:16	12.9	3:04	11.9	2:55
1200	18.8	4:12	17.4	3:57	15.4	3:34	14.0	3:21	13.0	3:11
1300	20.4	4:33	18.8	4:17	16.7	3:52	15.2	3:38	14.1	3:27
1400	21.9	4:55	20.2	4:37	18.0	4:11	16.4	3:55	15.2	3:43
1500	23.4	5:17	21.6	4:58	19.2	4:29	17.5	4:12	16.3	3:59
1600	24.9	5:39	23.1	5:19	20.5	4:48	18.7	4:29	17.4	4:15
1700	26.4	6:02	24.4	5:40	21.7	5:06	19.9	4:47	18.4	4:31
1800	27.9	6:24	25.8	6:00	23.0	5:25	21.0	5:04	19.5	4:48
1900	29.4	6:47	27.2	6:22	24.2	5:44	22.1	5:21	20.6	5:04
2000	30.8	7:10	28.6	6:43	25.4	6:03	23.3	5:39	21.6	5:20

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.6	-0.3	0.0	0.4	0.7
10	-1.2	-0.7	0.0	0.8	1.6
15	-1.8	-1.0	0.0	1.3	2.5
20	-2.4	-1.3	0.0	1.7	3.4
25	-3.0	-1.7	0.0	2.1	4.3
30	-3.7	-1.9	0.0	2.6	5.2
35	-4.3	-2.1	0.0	3.0	6.1

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
540	505	474	447	422	400	381	365	349	336	324
808	756	710	669	633	600	573	548	526	506	488
1076	1008	946	892	844	800	765	732	702	675	651
1346	1260	1183	1115	1055	1000	956	916	879	845	814
1616	1513	1420	1338	1266	1200	1148	1100	1055	1014	977
1887	1766	1657	1562	1477	1400	1339	1283	1231	1183	1140
2159	2020	1895	1785	1688	1600	1531	1466	1407	1352	1303
2432	2275	2133	2009	1900	1800	1722	1650	1583	1521	1465
2705	2530	2372	2234	2111	2000	1913	1833	1759	1690	1628
2978	2785	2611	2458	2323	2200	2105	2016	1934	1859	1791
3253	3041	2850	2683	2535	2400	2296	2199	2109	2028	1953
3528	3298	3090	2908	2747	2600	2487	2382	2285	2196	2115
3805	3555	3330	3133	2959	2800	2678	2565	2460	2364	2277
4083	3814	3571	3359	3171	3000	2869	2747	2635	2532	2439
4361	4072	3811	3584	3383	3200	3060	2930	2810	2700	2601
4641	4332	4053	3810	3595	3400	3251	3113	2985	2868	2762
4923	4592	4295	4036	3807	3600	3442	3295	3160	3036	2923
5205	4854	4537	4263	4020	3800	3633	3478	3335	3203	3084
5489	5116	4781	4490	4233	4000	3824	3660	3509	3371	3245
5774	5379	5025	4717	4446	4200	4014	3842	3683	3538	3405
6061	5644	5269	4945	4659	4400	4205	4024	3857	3705	3566
6349	5909	5515	5173	4872	4600	4396	4206	4031	3871	3726
6638	6176	5761	5402	5086	4800	4586	4388	4205	4038	3885
6929	6443	6007	5631	5300	5000	4777	4570	4379	4204	4045

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 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
400	4.3	1:03	4.1	1:01	3.9	1:00	3.8	0:59	3.7	1:00
600	6.4	1:34	6.2	1:32	5.9	1:29	5.7	1:28	5.6	1:28
800	8.5	2:06	8.2	2:03	8.0	1:59	7.7	1:57	7.5	1:56
1000	10.7	2:38	10.3	2:34	10.0	2:29	9.6	2:26	9.4	2:24
1200	12.8	3:09	12.4	3:04	12.0	2:59	11.6	2:55	11.3	2:52
1400	14.9	3:41	14.4	3:35	14.0	3:29	13.5	3:24	13.1	3:20
1600	17.0	4:13	16.5	4:06	16.0	3:59	15.5	3:52	15.0	3:48
1800	19.1	4:44	18.6	4:37	18.0	4:29	17.4	4:21	16.9	4:16
2000	21.3	5:16	20.6	5:08	20.0	4:58	19.4	4:50	18.8	4:44
2200	23.3	5:49	22.6	5:40	21.9	5:29	21.2	5:20	20.6	5:13
2400	25.3	6:22	24.6	6:12	23.8	6:01	23.1	5:50	22.4	5:42
2600	27.3	6:55	26.5	6:44	25.7	6:32	24.9	6:20	24.2	6:11
2800	29.4	7:28	28.5	7:16	27.6	7:03	26.8	6:50	26.0	6:39
3000	31.4	8:01	30.4	7:48	29.5	7:34	28.6	7:20	27.8	7:08
3200	33.4	8:36	32.3	8:21	31.4	8:06	30.4	7:52	29.6	7:38
3400	35.3	9:11	34.2	8:55	33.2	8:38	32.2	8:23	31.3	8:09
3600	37.3	9:45	36.1	9:28	35.0	9:11	34.0	8:54	33.0	8:39
3800	39.3	10:20	38.0	10:01	36.9	9:43	35.7	9:26	34.7	9:09
4000	41.2	10:55	39.9	10:35	38.7	10:16	37.5	9:57	36.5	9:39
4200	43.1	11:32	41.7	11:10	40.5	10:49	39.2	10:30	38.1	10:10
4400	45.0	12:08	43.6	11:45	42.2	11:23	40.9	11:02	39.8	10:42
4600	46.9	12:45	45.4	12:20	44.0	11:57	42.6	11:35	41.4	11:13
4800	48.8	13:22	47.2	12:56	45.7	12:31	44.3	12:08	43.1	11:45
5000	50.6	13:59	49.0	13:31	47.5	13:04	46.0	12:40	44.7	12:16

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.7	-0.5	0.0	0.8	2.6
10	-1.4	-0.8	0.0	1.5	4.3
15	-2.1	-1.1	0.0	2.1	5.8
20	-2.9	-1.4	0.0	2.7	7.2
25	-3.7	-1.8	0.0	3.3	8.5
30	-4.5	-2.2	0.0	3.8	9.6
35	-5.3	-2.6	0.0	4.3	10.6
40	-6.2	-3.0	0.0	4.7	11.5
45	-7.2	-3.4	0.0	5.1	12.2
50	-8.2	-3.9	0.0	5.4	12.7
55	-9.2	-4.4	0.0	5.8	13.2

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)									
	170	160	150	140	130	120	110	100	90	80
41				41	19	6	0	3	12	29
39			32	14	4	0	3	11	25	45
37	42	23	10	2	0	3	11	24	41	62
35	15	5	1	1	4	12	24	39	58	79
33	2	0	1	6	14	25	39	56	75	97
31	0	3	8	16	27	40	55	73	92	114
29	5	11	19	30	42	56	72	90	109	129
27	15	23	33	45	58	72	88	106	125	144
25	27	37	48	60	74	89	105	122	140	158

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 (LB)	DISTANCE (NM)			
			LANDING WEIGHT (1000 LB)			
			80	100	120	140
41000	25	710	97	113	126	135
39000	25	700	92	108	121	130
37000	24	690	88	103	115	124
35000	23	680	84	98	110	119
33000	23	670	80	94	106	114
31000	22	660	76	89	100	108
29000	21	650	72	84	94	101
27000	20	630	68	79	88	95
25000	19	610	63	74	82	88
23000	18	600	59	68	76	82
21000	17	580	55	63	70	75
19000	16	550	51	58	64	69
17000	15	530	46	53	59	63
15000	14	510	42	48	53	56
10000	10	420	30	33	36	38
5000	7	320	17	19	20	21
1500	4	240	9	9	9	9

Allowances for a straight-in approach are included.

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	41000
170	%N1	62.2	65.3	68.9	73.1	77.2	81.6	85.7	92.1	
	KIAS	242	243	243	245	246	248	251	246	
	FF/ENG	3080	3030	3010	2990	2940	2940	3010	3230	
160	%N1	60.6	63.6	67.4	71.5	75.6	80.0	84.1	89.1	
	KIAS	235	235	236	237	239	241	243	246	
	FF/ENG	2910	2870	2840	2820	2760	2750	2810	2950	
150	%N1	58.9	61.8	65.8	69.8	74.0	78.4	82.5	87.0	
	KIAS	227	228	228	229	231	233	235	238	
	FF/ENG	2750	2700	2670	2640	2600	2570	2620	2700	
140	%N1	57.3	59.9	64.2	67.9	72.3	76.6	80.8	85.2	
	KIAS	220	220	221	222	223	224	226	229	
	FF/ENG	2590	2540	2500	2470	2440	2380	2440	2480	
130	%N1	55.5	58.1	62.3	66.1	70.4	74.6	79.0	83.3	94.0
	KIAS	211	212	213	213	214	216	218	220	214
	FF/ENG	2420	2370	2340	2300	2270	2210	2250	2290	2600
120	%N1	53.6	56.2	60.1	64.3	68.3	72.6	77.0	81.3	89.3
	KIAS	202	204	204	205	206	207	209	211	214
	FF/ENG	2260	2210	2170	2140	2100	2050	2070	2100	2280
110	%N1	51.6	54.2	57.8	62.2	66.1	70.5	74.8	79.2	86.6
	KIAS	194	194	195	196	197	198	199	201	204
	FF/ENG	2110	2050	2010	1980	1940	1890	1890	1930	2050
100	%N1	49.5	51.9	55.6	59.6	63.8	68.1	72.3	76.9	84.0
	KIAS	185	185	186	187	187	188	190	191	194
	FF/ENG	1950	1890	1850	1840	1800	1770	1750	1750	1840
90	%N1	47.2	49.6	53.2	56.9	61.4	65.3	69.8	74.3	81.4
	KIAS	178	178	178	178	178	178	180	181	183
	FF/ENG	1840	1770	1720	1680	1640	1610	1590	1580	1640
80	%N1	44.8	47.1	50.6	54.3	58.4	62.6	67.0	71.3	78.5
	KIAS	172	172	172	172	172	172	172	172	172
	FF/ENG	1680	1620	1560	1520	1490	1460	1440	1410	1460

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Advisory Information — Section 22

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	2910	210/-140	60/90	-110	380	30	-30	60	-60	220	60	130
MAX AUTO	3650	190/-180	80/120	-140	460	0	0	80	-80	350	0	10
AUTOBRAKE 3	5090	310/-300	140/190	-230	760	0	0	140	-140	580	0	0
AUTOBRAKE 2	6570	440/-440	200/270	-310	1060	70	-90	190	-190	620	130	130
AUTOBRAKE 1	7340	530/-520	240/330	-370	1260	200	-220	210	-210	580	650	750

Good Reported Braking Action

MAX MANUAL	3950	220/-220	100/140	-180	630	90	-80	90	-60	300	210	480
MAX AUTO	4340	240/-240	110/150	-180	650	80	-70	100	-80	350	240	540
AUTOBRAKE 3	5100	310/-300	140/190	-230	780	20	-10	140	-140	580	10	50
AUTOBRAKE 2	6570	440/-440	200/270	-310	1060	70	-90	190	-190	620	130	130

Medium Reported Braking Action

MAX MANUAL	5430	350/-340	160/230	-290	1050	240	-190	140	-140	400	600	1490
MAX AUTO	5650	360/-350	170/230	-290	1040	210	-160	140	-140	460	600	1470
AUTOBRAKE 3	5760	370/-350	170/230	-290	1070	170	-110	150	-150	580	460	1380
AUTOBRAKE 2	6740	450/-450	210/270	-340	1210	150	-150	190	-190	620	260	680

Poor Reported Braking Action

MAX MANUAL	7130	510/-490	240/330	-440	1670	600	-390	190	-200	490	1330	3670
MAX AUTO	7440	510/-490	240/330	-430	1650	600	-390	190	-200	490	1340	3700
AUTOBRAKE 3	7440	510/-490	240/340	-430	1660	600	-360	190	-200	550	1330	3680
AUTOBRAKE 2	7610	540/-520	250/340	-450	1710	520	-350	210	-210	610	1030	3320

Reference distance is for sea level, standard day, no wind or slope, VREF15 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.
Actual (unfactored) distances are shown.
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

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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	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	2840	190/-130	60/80	-100	370	30	-30	60	-60	210	60	120
MAX AUTO	3480	170/-170	80/100	-130	450	0	0	80	-80	340	0	10
AUTOBRAKE 3	4820	290/-280	130/170	-220	740	0	-10	130	-130	550	0	0
AUTOBRAKE 2	6190	400/-400	180/250	-300	1030	80	-110	170	-170	550	130	130
AUTOBRAKE 1	6890	480/-480	220/300	-350	1210	190	-200	200	-190	540	570	710

Good Reported Braking Action

MAX MANUAL	3830	210/-210	100/130	-180	620	90	-80	90	-90	300	200	440
MAX AUTO	4190	230/-220	100/150	-180	640	70	-60	90	-100	350	220	490
AUTOBRAKE 3	4830	290/-280	130/170	-220	750	20	-10	130	-130	550	10	50
AUTOBRAKE 2	6190	400/-400	180/250	-300	1030	80	-110	170	-170	550	130	130

Medium Reported Braking Action

MAX MANUAL	5200	330/-320	150/220	-280	1030	240	-190	130	-140	400	540	1320
MAX AUTO	5400	340/-330	160/210	-280	1020	210	-160	130	-140	460	540	1300
AUTOBRAKE 3	5500	340/-330	160/210	-290	1050	170	-120	140	-140	550	440	1250
AUTOBRAKE 2	6350	410/-410	190/250	-330	1170	150	-170	170	-180	550	260	630

Poor Reported Braking Action

MAX MANUAL	6750	470/-460	220/310	-420	1630	570	-370	180	-190	470	1170	3140
MAX AUTO	7040	470/-450	220/310	-420	1620	580	-370	180	-180	480	1180	3170
AUTOBRAKE 3	7040	480/-460	220/310	-420	1620	560	-350	180	-190	520	1170	3150
AUTOBRAKE 2	7190	490/-480	230/320	-440	1670	500	-350	190	-200	550	940	2850

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.
Actual (unfactored) distances are shown.
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

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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	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	2820	170/-130	60/80	-100	370	40	-30	60	-60	220	60	120
MAX AUTO	3390	170/-160	80/100	-130	440	10	0	70	-70	340	0	20
AUTOBRAKE 3	4660	280/-270	130/170	-210	720	0	-10	120	-120	540	0	0
AUTOBRAKE 2	5980	380/-380	180/240	-290	1010	80	-100	170	-170	540	110	110
AUTOBRAKE 1	6670	460/-450	210/300	-340	1190	180	-190	190	-190	520	500	640

Good Reported Braking Action

MAX MANUAL	3780	210/-200	100/130	-170	620	90	-80	90	-90	310	190	420
MAX AUTO	4120	230/-220	100/150	-180	640	80	-60	90	-90	360	210	460
AUTOBRAKE 3	4670	280/-270	130/170	-210	740	20	-10	120	-120	540	10	50
AUTOBRAKE 2	5980	380/-380	180/280	-290	1010	80	-100	170	-170	540	110	110

Medium Reported Braking Action

MAX MANUAL	5100	330/-310	150/220	-280	1020	240	-190	130	-130	400	510	1230
MAX AUTO	5290	330/-320	150/220	-280	1020	210	-160	130	-130	460	500	1210
AUTOBRAKE 3	5370	340/-320	160/210	-280	1030	180	-120	140	-140	540	450	1200
AUTOBRAKE 2	6140	400/-390	180/260	-320	1150	160	-160	170	-170	540	240	600

Poor Reported Braking Action

MAX MANUAL	6590	460/-440	210/310	-420	1620	570	-370	170	-180	470	1090	2870
MAX AUTO	6870	460/-440	210/310	-410	1600	570	-360	170	-180	470	1100	2900
AUTOBRAKE 3	6870	470/-440	220/300	-420	1610	560	-350	170	-180	510	1090	2880
AUTOBRAKE 2	6990	480/-460	220/320	-430	1650	510	-340	190	-190	530	880	2620

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.
Actual (unfactored) distances are shown.
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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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
ALL FLAPS UP	VREF40+55	3760	340/-200	125/125	-135	605	45	-45	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4540	270/-270	120/160	-230	850	135	-115	365
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3070	160/-155	70/100	-115	405	40	-40	275
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3000	150/-150	65/100	-115	405	45	-40	290
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2990	150/-150	65/100	-115	405	45	-40	305
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3150	165/-165	70/90	-125	455	45	-40	245
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	3840	220/-225	100/140	-160	565	90	-80	395
LEADING EDGE FLAPS TRANSIT	VREF15+15	3120	195/-150	70/100	-115	405	40	-35	220
ONE ENGINE INOPERATIVE	VREF15	2790	180/-135	60/80	-105	385	35	-30	210
STABILIZER TRIM INOPERATIVE	VREF15	2760	170/-130	60/80	-105	375	30	-30	205

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	2710	190/-130	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3200	215/-145	75/100	-115	415	35	-35	215
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2710	190/-130	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAPS UP	VREF40+40	3400	255/-160	85/100	-125	445	40	-40	225

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	5070	265/-275	140/190	-200	710	105	-95	275
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5030	315/-315	140/190	-270	1035	195	-160	395
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4170	255/-255	115/150	-185	675	110	-100	385
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4040	240/-240	110/140	-185	665	110	-95	390
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3990	240/-240	105/150	-185	665	110	-95	405
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3840	225/-225	100/130	-175	630	90	-80	310
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4410	275/-275	125/170	-195	705	125	-110	450
LEADING EDGE FLAPS TRANSIT	VREF15+15	4240	240/-245	115/150	-185	660	95	-85	300
ONE ENGINE INOPERATIVE	VREF15	3850	225/-225	95/130	-175	645	95	-85	305
STABILIZER TRIM INOPERATIVE	VREF15	3710	215/-215	95/120	-170	615	80	-70	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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	3620	210/-210	100/130	-180	620	90	-80	300
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4340	230/-240	115/160	-185	660	90	-85	280
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	3620	210/-210	100/130	-180	620	90	-80	300
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAPS UP	VREF40+40	4580	240/-250	125/170	-190	675	95	-85	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 CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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
ALL FLAPS UP	VREF40+55	7100	440/-450	230/310	-320	1185	265	-225	385
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6310	445/-430	190/270	-400	1615	435	-320	455
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5650	405/-395	180/230	-295	1110	265	-220	500
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	5400	380/-370	170/230	-290	1090	255	-210	490
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5290	370/-360	165/250	-290	1080	255	-210	490
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5190	355/-350	155/220	-275	1050	220	-185	405
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5960	440/-425	195/270	-310	1150	295	-245	570
LEADING EDGE FLAPS TRANSIT	VREF15+15	5750	385/-380	180/240	-290	1090	235	-195	400
ONE ENGINE INOPERATIVE	VREF15	5440	370/-370	160/220	-295	1110	260	-215	430
STABILIZER TRIM INOPERATIVE	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4880	330/-320	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	5940	375/-375	185/260	-295	1100	230	-195	375
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4880	330/-320	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAPS UP	VREF40+40	6330	395/-400	200/270	-305	1125	240	-205	370

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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
ALL FLAPS UP	VREF40+55	9360	660/-655	335/470	-485	1875	610	-460	485
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8300	640/-615	260/400	-655	3000	1530	-725	505
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	7280	580/-550	255/330	-445	1750	580	-425	585
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6910	540/-515	235/340	-430	1715	555	-405	560
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	6710	520/-495	225/370	-425	1695	545	-395	550
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6710	515/-490	225/320	-415	1670	500	-365	490
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	7660	630/-590	275/400	-460	1805	635	-465	660
LEADING EDGE FLAPS TRANSIT	VREF15+15	7420	555/-535	250/360	-435	1725	520	-385	475
ONE ENGINE INOPERATIVE	VREF15	7410	560/-550	240/330	-465	1835	655	-470	540
STABILIZER TRIM INOPERATIVE	VREF15	6470	485/-465	210/300	-405	1630	465	-345	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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	6290	470/-460	220/310	-420	1630	570	-370	470
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	7710	550/-540	265/370	-440	1740	520	-390	455
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	6290	470/-460	220/310	-420	1630	570	-370	470
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAPS UP	VREF40+40	8280	585/-575	285/400	-455	1785	550	-410	455

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 LB)	OAT (°F)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
180	0	14.2	16.1	18.3	21.2	24.4	28.2	29.4	34.0	39.4	38.7	44.7	51.7	48.7	56.1	64.6	58.0	66.4	76.0
	20	14.7	16.7	19.0	22.0	25.4	29.3	30.5	35.3	40.9	40.1	46.4	53.6	50.5	58.2	66.9	60.1	68.8	78.7
	40	15.2	17.3	19.7	22.9	26.3	30.4	31.7	36.7	42.4	41.6	48.1	55.5	52.4	60.2	69.3	62.2	71.2	81.3
	60	15.7	17.9	20.4	23.7	27.3	31.5	32.9	38.0	44.0	43.1	49.8	57.5	54.3	62.3	71.6	64.4	73.6	84.0
	80	16.1	18.4	21.0	24.4	28.1	32.5	33.9	39.2	45.4	44.5	51.4	59.3	56.0	64.3	73.8	66.4	75.8	86.5
	100	16.4	18.7	21.4	24.8	28.7	33.2	34.6	40.1	46.4	45.5	52.6	60.7	57.3	65.8	75.6	68.0	77.7	88.7
	120	16.5	18.9	21.6	25.1	29.0	33.6	35.0	40.6	47.1	46.2	53.4	61.8	58.3	67.1	77.2	69.3	79.3	90.7
160	0	13.0	14.6	16.6	19.3	22.2	25.5	26.6	30.8	35.7	34.9	40.4	46.8	44.0	50.7	58.6	53.0	60.9	69.9
	20	13.5	15.2	17.3	20.1	23.0	26.5	27.7	32.0	37.1	36.2	41.9	48.5	45.6	52.6	60.7	54.9	63.1	72.4
	40	13.9	15.8	17.9	20.8	23.9	27.5	28.7	33.2	38.4	37.6	43.5	50.3	47.3	54.5	62.8	56.9	65.3	74.9
	60	14.4	16.3	18.5	21.5	24.8	28.5	29.8	34.4	39.9	39.0	45.1	52.1	49.0	56.5	65.0	58.9	67.5	77.3
	80	14.7	16.7	19.0	22.1	25.5	29.4	30.7	35.5	41.1	40.2	46.5	53.7	50.5	58.2	67.0	60.8	69.6	79.7
	100	15.0	17.0	19.4	22.6	26.0	30.0	31.3	36.3	42.0	41.1	47.5	55.0	51.7	59.6	68.7	62.2	71.3	81.7
	120	15.1	17.1	19.6	22.8	26.3	30.4	31.7	36.7	42.6	41.7	48.3	55.9	52.6	60.7	70.0	63.3	72.7	83.4
140	0	11.8	13.2	14.9	17.4	19.9	22.9	23.9	27.6	31.9	31.1	36.0	41.8	39.1	45.2	52.3	47.5	54.8	63.1
	20	12.3	13.8	15.5	18.1	20.7	23.8	24.8	28.6	33.1	32.3	37.4	43.3	40.6	46.9	54.2	49.3	56.8	65.4
	40	12.7	14.3	16.1	18.7	21.5	24.7	25.7	29.7	34.4	33.6	38.8	44.9	42.1	48.6	56.2	51.1	58.8	67.7
	60	13.1	14.7	16.6	19.4	22.2	25.6	26.7	30.8	35.6	34.8	40.2	46.6	43.7	50.4	58.2	53.0	60.9	70.0
	80	13.4	15.1	17.1	19.9	22.9	26.3	27.5	31.7	36.7	35.9	41.5	48.0	45.0	52.0	60.0	54.6	62.8	72.1
	100	13.6	15.3	17.4	20.3	23.3	26.9	28.0	32.4	37.5	36.6	42.4	49.1	46.1	53.2	61.4	55.9	64.3	73.9
	120	13.7	15.4	17.5	20.5	23.6	27.2	28.4	32.8	38.0	37.1	43.0	49.9	46.7	54.1	62.5	56.8	65.5	75.4
120	0	10.6	11.9	13.3	15.5	17.7	20.2	21.1	24.3	28.0	27.3	31.6	36.6	34.2	39.6	45.8	41.7	48.1	55.6
	20	11.1	12.3	13.8	16.1	18.4	21.0	21.9	25.2	29.1	28.4	32.8	38.0	35.5	41.1	47.5	43.2	49.9	57.6
	40	11.4	12.8	14.3	16.7	19.0	21.8	22.7	26.2	30.2	29.5	34.1	39.4	36.8	42.6	49.3	44.8	51.7	59.7
	60	11.8	13.1	14.8	17.3	19.7	22.6	23.5	27.1	31.3	30.5	35.3	40.9	38.2	44.2	51.1	46.5	53.6	61.8
	80	12.0	13.4	15.1	17.7	20.3	23.2	24.2	28.0	32.3	31.5	36.4	42.2	39.4	45.5	52.7	47.9	55.3	63.7
	100	12.2	13.7	15.4	18.0	20.6	23.7	24.7	28.5	33.0	32.1	37.2	43.1	40.3	46.6	53.9	49.0	56.6	65.3
	120	12.3	13.8	15.5	18.2	20.8	23.9	25.0	28.9	33.4	32.5	37.7	43.7	40.8	47.3	54.8	49.8	57.5	66.4
100	0	9.5	10.5	11.7	13.6	15.4	17.6	18.3	21.0	24.2	23.5	27.1	31.4	29.2	33.8	39.1	35.4	40.9	47.4
	20	9.9	10.9	12.1	14.2	16.0	18.3	19.0	21.8	25.1	24.4	28.2	32.6	30.3	35.1	40.6	36.7	42.5	49.1
	40	10.2	11.3	12.6	14.7	16.6	18.9	19.7	22.6	26.0	25.3	29.2	33.8	31.5	36.4	42.1	38.1	44.0	50.9
	60	10.5	11.6	12.9	15.1	17.2	19.6	20.4	23.4	27.0	26.2	30.3	35.1	32.6	37.7	43.7	39.5	45.6	52.8
	80	10.7	11.9	13.2	15.5	17.6	20.1	21.0	24.1	27.8	27.0	31.2	36.1	33.6	38.9	45.0	40.7	47.1	54.4
	100	10.8	12.0	13.4	15.8	17.9	20.5	21.4	24.6	28.4	27.6	31.9	36.9	34.3	39.8	46.1	41.6	48.2	55.7
	120	10.9	12.1	13.5	15.9	18.1	20.7	21.6	24.9	28.7	27.9	32.3	37.4	34.8	40.3	46.7	42.2	48.9	56.6

***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, 60°F.

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
	MAX AUTO	5.8	15.2	24.5	33.6	43.0	52.8	63.1	73.9	85.2
	AUTOBRAKE 3	5.4	14.1	22.4	30.4	38.6	47.8	57.9	68.9	80.8
	AUTOBRAKE 2	4.9	12.9	20.5	27.5	34.8	43.1	52.4	62.8	74.2
	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
	MAX AUTO	4.9	12.8	20.9	29.1	37.8	47.3	57.6	68.8	80.8
	AUTOBRAKE 3	2.8	8.7	14.8	21.0	27.8	35.6	44.5	54.5	65.5
	AUTOBRAKE 2	1.3	5.5	9.8	14.2	19.1	25.2	32.3	40.6	49.9
	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		10	20	30	40	50	60		

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

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	96.1	95.9	95.6	95.5	95.2	94.8	94.3	94.0	93.2
15	96.7	96.5	96.2	96.1	96.0	95.5	95.1	94.8	94.1
10	97.3	97.2	96.8	96.7	96.7	96.2	95.8	95.6	95.0
5	97.5	97.9	97.6	97.4	97.4	97.0	96.6	96.4	95.9
0	96.8	98.1	98.5	98.3	98.2	97.8	97.5	97.2	96.8
-5	96.0	97.3	98.5	99.2	99.1	98.6	98.3	98.1	97.8
-10	95.2	96.5	97.7	99.0	99.9	99.5	99.2	99.0	98.7
-15	94.4	95.8	96.9	98.2	99.5	100.4	100.1	99.9	99.7
-20	93.6	95.0	96.2	97.4	98.7	99.8	100.4	100.2	100.0
-25	92.8	94.2	95.4	96.6	97.9	99.0	99.6	99.4	99.2
-30	91.9	93.4	94.6	95.8	97.0	98.2	98.7	98.5	98.3
-35	91.1	92.6	93.7	94.9	96.2	97.3	97.9	97.7	97.5
-40	90.3	91.8	92.9	94.1	95.3	96.5	97.0	96.8	96.6

%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	97.0	97.9	98.7	99.6	98.9	98.1	96.9	95.6	94.0	92.5	91.1
200	.63	95.4	96.3	97.2	98.1	98.9	99.8	99.5	98.7	97.8	96.8	95.6	94.5
240	.74	94.4	95.3	96.2	97.1	98.0	98.8	99.7	100.1	99.3	98.5	97.7	96.7
280	.86	93.7	94.6	95.5	96.4	97.2	98.1	98.9	99.7	100.5	100.2	99.3	98.5
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	95.9	96.8	97.7	98.6	99.5	99.2	98.4	97.3	96.1	94.7	93.3	92.0
200	.60	95.5	96.4	97.3	98.2	99.1	100.0	99.9	98.9	98.0	97.0	95.8	94.7
240	.71	94.4	95.3	96.2	97.1	98.0	98.8	99.6	100.2	99.5	98.9	98.0	97.0
280	.82	93.2	94.0	94.9	95.8	96.6	97.5	98.3	99.1	99.9	99.7	98.9	98.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	96.8	97.7	98.5	99.4	100.2	99.3	98.5	97.3	96.0	94.6	93.2	92.0
200	.58	96.4	97.3	98.2	99.1	99.9	100.8	99.9	99.0	98.0	96.8	95.6	94.5
240	.68	95.3	96.2	97.1	97.9	98.8	99.6	100.4	100.2	99.6	98.7	97.7	96.7
280	.79	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	99.9	99.1	98.2	97.4
320	.89	93.0	93.9	94.7	95.6	96.4	97.2	98.1	98.9	99.7	100.4	100.0	99.2
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	96.7	97.6	98.5	99.4	100.3	100.4	99.5	98.5	97.3	95.9	94.5	93.2
200	.55	96.5	97.3	98.2	99.1	100.0	100.8	101.0	100.1	99.1	98.0	96.7	95.5
240	.66	95.0	95.9	96.8	97.6	98.5	99.3	100.2	100.7	99.9	99.1	98.1	97.1
280	.76	93.2	94.0	94.9	95.7	96.6	97.4	98.2	99.0	99.8	99.1	98.2	97.3
320	.85	91.8	92.6	93.5	94.3	95.1	95.9	96.7	97.5	98.3	99.1	99.3	98.4
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	97.5	98.4	99.3	100.1	101.0	100.5	99.6	98.5	97.2	95.7	94.4	93.1
200	.53	96.9	97.8	98.7	99.5	100.4	101.2	100.7	99.7	98.7	97.5	96.2	95.1
240	.63	95.7	96.5	97.4	98.2	99.1	99.9	100.7	100.4	99.5	98.6	97.5	96.6
280	.73	93.6	94.4	95.2	96.1	96.9	97.7	98.5	99.3	99.4	98.5	97.5	96.8
320	.82	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	97.8	97.0
360	.91	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.4

%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

270000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	97.3	98.2	99.1	100.0	100.8	101.5	100.6	99.6	98.4	97.0	95.7	94.4
200	.51	96.3	97.2	98.1	98.9	99.8	100.6	101.1	100.2	99.2	98.1	96.9	95.7
240	.60	95.0	95.9	96.7	97.6	98.4	99.2	100.1	100.7	99.7	98.7	97.7	96.8
280	.70	93.0	93.8	94.6	95.5	96.3	97.1	97.9	98.7	99.4	98.7	97.7	96.9
320	.79	90.9	91.7	92.6	93.4	94.2	95.0	95.7	96.5	97.3	98.0	97.9	97.2
360	.88	90.2	91.0	91.8	92.7	93.5	94.3	95.1	95.9	96.6	97.4	98.2	98.7
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.2	99.0	99.9	100.7	101.6	101.7	100.7	99.6	98.4	97.0	95.8	94.5
200	.49	96.8	97.7	98.5	99.4	100.2	101.0	100.9	99.9	98.9	97.7	96.6	95.5
240	.58	95.1	95.9	96.8	97.6	98.4	99.2	100.0	99.8	98.9	97.9	96.9	96.0
280	.67	93.2	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	97.9	96.9	96.2
320	.76	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	97.9	97.2	96.5
360	.85	89.6	90.5	91.3	92.1	93.0	93.8	94.6	95.4	96.2	97.0	97.7	97.5
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	97.7	98.5	99.4	100.3	101.1	101.9	100.8	99.7	98.5	97.2	96.0	94.7
200	.48	96.4	97.2	98.1	98.9	99.7	100.6	101.0	99.9	98.9	97.8	96.7	95.6
240	.57	94.7	95.6	96.4	97.2	98.0	98.8	99.6	99.9	99.0	97.9	97.0	96.1
280	.66	93.0	93.8	94.6	95.4	96.2	97.0	97.8	98.6	99.1	98.0	97.0	96.3
320	.75	90.6	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.1	97.8	97.2	96.5
360	.83	89.0	89.8	90.7	91.5	92.4	93.2	94.0	94.8	95.6	96.4	97.2	97.2
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	97.5	98.4	99.2	100.1	100.9	101.0	99.9	98.7	97.5	96.3	95.2	94.0
200	.46	96.3	97.1	98.0	98.8	99.6	100.4	100.1	98.9	97.8	96.8	95.8	94.8
240	.55	94.8	95.6	96.4	97.2	98.0	98.8	99.6	99.1	98.1	97.1	96.2	95.4
280	.63	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	98.4	97.4	96.6	95.8
320	.72	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.4	97.5	96.8	96.1
360	.80	89.0	89.9	90.7	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.0	96.4
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	96.5	97.4	98.2	99.0	99.8	100.6	100.2	98.9	97.7	96.6	95.5	94.4
200	.44	95.4	96.2	97.0	97.9	98.7	99.4	100.2	99.1	97.8	96.8	95.8	94.9
240	.53	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.3	98.2	97.1	96.2	95.4
280	.61	92.4	93.3	94.1	94.8	95.6	96.4	97.2	97.9	98.5	97.6	96.7	95.9
320	.69	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.6	96.9	96.2
360	.77	88.5	89.3	90.2	91.0	91.8	92.6	93.5	94.3	95.1	95.8	96.6	96.4

%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	96.0	96.8	97.6	98.4	99.2	100.0	98.9	97.5	96.5	95.5	94.5	93.5
200	.42	95.1	95.9	96.7	97.5	98.2	99.0	99.3	98.0	96.7	95.9	95.0	94.1
240	.51	93.7	94.5	95.2	96.0	96.8	97.6	98.3	98.2	97.1	96.2	95.4	94.6
280	.59	92.0	92.9	93.7	94.5	95.3	96.1	96.8	97.6	97.5	96.6	95.8	95.1
320	.67	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	96.9	96.2	95.5
360	.75	88.7	89.5	90.4	91.2	92.0	92.8	93.6	94.4	95.2	96.0	96.4	95.8
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	95.0	95.8	96.6	97.4	98.2	99.0	99.4	98.2	97.0	96.1	95.2	94.2
200	.41	93.9	94.7	95.5	96.3	97.1	97.8	98.6	98.2	97.0	96.0	95.2	94.4
240	.49	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	97.3	96.3	95.5	94.7
280	.57	91.0	91.8	92.6	93.5	94.3	95.1	95.9	96.6	97.4	96.7	95.8	95.1
320	.64	89.4	90.3	91.1	91.9	92.8	93.6	94.4	95.2	95.9	96.7	96.1	95.5
360	.72	88.0	88.9	89.7	90.6	91.4	92.2	93.0	93.8	94.6	95.4	96.2	95.8
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	94.9	95.7	96.5	97.3	98.0	98.8	99.2	98.2	97.3	96.4	95.5	94.6
200	.39	93.6	94.4	95.2	96.0	96.7	97.5	98.3	97.5	96.5	95.7	94.9	94.1
240	.47	92.1	92.9	93.8	94.6	95.4	96.2	96.9	97.4	96.5	95.6	94.8	94.1
280	.54	90.9	91.7	92.5	93.4	94.2	95.0	95.8	96.5	96.8	96.0	95.2	94.5
320	.62	89.6	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.2	95.5	94.8
360	.69	88.3	89.1	89.9	90.7	91.6	92.4	93.2	94.0	94.8	95.5	95.8	95.2
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	94.8	95.6	96.4	97.1	97.9	98.6	97.9	96.8	95.9	95.2	94.4	93.5
200	.38	92.7	93.5	94.3	95.1	95.9	96.7	97.1	96.1	95.1	94.4	93.6	92.8
240	.45	91.6	92.5	93.3	94.1	94.9	95.7	96.4	96.4	95.5	94.7	94.0	93.2
280	.52	90.6	91.4	92.2	93.0	93.8	94.6	95.4	96.2	95.9	95.1	94.4	93.7
320	.60	89.5	90.3	91.2	92.0	92.8	93.6	94.4	95.2	96.0	95.5	94.8	94.1
360	.67	88.3	89.1	90.0	90.8	91.6	92.4	93.2	93.9	94.7	95.5	95.1	94.4

%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	92.7	93.5	94.4	95.2	95.9	96.7	97.5	96.5	95.6	94.9	94.2	93.4
200	.36	91.3	92.1	93.0	93.8	94.6	95.4	96.1	96.1	95.2	94.4	93.7	92.9
240	.43	90.3	91.1	92.0	92.8	93.6	94.4	95.2	95.9	95.4	94.6	93.8	93.1
280	.51	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1	95.7	95.0	94.2	93.5
320	.58	88.6	89.4	90.2	91.0	91.8	92.6	93.4	94.2	95.0	95.4	94.7	93.9
360	.65	87.5	88.3	89.2	90.0	90.8	91.6	92.3	93.1	93.9	94.7	95.0	94.3
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	90.5	91.4	92.2	93.0	93.8	94.5	95.1	94.4	93.6	92.9	92.2	91.4
200	.33	90.0	90.8	91.6	92.4	93.2	93.9	94.7	94.4	93.7	93.0	92.3	91.5
240	.40	89.2	90.0	90.8	91.6	92.4	93.2	93.9	94.4	93.7	92.9	92.2	91.5
280	.46	88.5	89.3	90.1	90.9	91.7	92.5	93.3	94.0	94.0	93.2	92.5	91.8
320	.53	87.8	88.6	89.4	90.2	90.9	91.7	92.5	93.2	94.0	93.6	92.9	92.2
360	.59	86.9	87.7	88.5	89.3	90.1	90.8	91.6	92.3	93.1	93.8	93.3	92.6
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	90.5	91.3	92.1	92.8	93.6	94.4	94.6	93.9	93.2	92.4	91.6	90.7
200	.32	89.9	90.7	91.5	92.3	93.1	93.8	94.6	94.0	93.3	92.5	91.8	91.0
240	.38	88.8	89.6	90.4	91.2	92.0	92.7	93.5	93.5	92.8	92.0	91.3	90.6
280	.45	88.3	89.1	89.9	90.6	91.4	92.2	92.9	93.7	93.1	92.4	91.7	91.0
320	.51	87.6	88.4	89.2	90.0	90.7	91.5	92.2	93.0	93.5	92.8	92.0	91.3
360	.57	86.8	87.6	88.4	89.1	89.9	90.6	91.4	92.1	92.8	93.1	92.4	91.7
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	89.0	89.8	90.6	91.4	92.2	92.9	93.7	93.4	92.7	91.9	91.2	90.3
200	.31	88.7	89.5	90.3	91.0	91.8	92.6	93.3	93.7	93.0	92.2	91.5	90.7
240	.37	87.8	88.6	89.4	90.2	90.9	91.7	92.5	93.2	92.8	92.0	91.3	90.6
280	.43	87.3	88.1	88.8	89.6	90.4	91.1	91.9	92.6	93.1	92.3	91.6	90.9
320	.49	86.7	87.5	88.2	89.0	89.8	90.5	91.3	92.0	92.7	92.7	91.9	91.2
360	.55	85.9	86.7	87.5	88.2	89.0	89.7	90.5	91.2	91.9	92.6	92.3	91.6

%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 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	163	257	18500	17000	15200
160	153	250	20400	19100	17300
150	144	242	22400	21100	19600
140	134	235	24400	23300	21900
130	125	226	26400	25400	24200
120	115	218	28500	27600	26400
110	106	209	30500	29700	28700
100	96	199	32500	31800	30900
90	87	189	34600	33900	33000
80	77	178	36900	36200	35400

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 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	80	90	100	110	120	130	140	150	160	170	
100	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.1	0:17
200	1.7	1.8	1.9	2.0	2.0	2.2	2.3	2.5	2.5	2.6	0:34
300	2.6	2.8	3.0	3.2	3.3	3.5	3.8	4.0	4.1	4.3	0:50
400	3.5	3.7	4.0	4.3	4.6	4.9	5.2	5.6	5.8	6.1	1:07
500	4.3	4.7	5.1	5.4	5.8	6.2	6.6	7.0	7.4	7.8	1:24
600	5.1	5.6	6.1	6.5	7.0	7.5	8.0	8.4	8.9	9.4	1:41
700	5.9	6.5	7.0	7.6	8.1	8.7	9.3	9.9	10.4	11.0	1:58
800	6.7	7.4	8.0	8.7	9.3	9.9	10.6	11.2	11.9	12.5	2:14
900	7.5	8.3	9.0	9.7	10.4	11.2	11.9	12.6	13.3	14.1	2:31
1000	8.3	9.1	9.9	10.7	11.5	12.4	13.2	14.0	14.8	15.7	2:48
1100	9.1	10.0	10.9	11.8	12.7	13.6	14.5	15.4	16.2	17.2	3:05
1200	9.9	10.8	11.8	12.8	13.8	14.7	15.7	16.7	17.7	18.7	3:22
1300	10.7	11.7	12.8	13.8	14.8	15.9	17.0	18.1	19.1	20.3	3:39
1400	11.4	12.5	13.7	14.8	15.9	17.1	18.2	19.4	20.5	21.8	3:56
1500	12.2	13.4	14.6	15.8	17.0	18.2	19.5	20.7	21.9	23.3	4:13
1600	12.9	14.2	15.5	16.8	18.1	19.4	20.7	22.0	23.3	24.8	4:29
1700	13.7	15.0	16.4	17.8	19.1	20.5	21.9	23.3	24.7	26.3	4:46
1800	14.4	15.8	17.3	18.7	20.2	21.7	23.1	24.6	26.1	27.7	5:04

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 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	14000	11300	8300
160	16700	14200	11400
150	19300	16800	14400
140	21700	19400	17200
130	24000	22300	20000
120	26400	25000	22700
110	28900	27700	25800
100	31100	30200	28900
90	33300	32500	31400
80	35700	34800	33800

With engine anti-ice on, decrease altitude capability by 2000 ft.
With engine and wing anti-ice on, decrease altitude capability by 6400 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
170	%N1	89.2	93.3	95.0							
	MACH	.535	.585	.597							
	KIAS	297	296	291							
	FF/ENG	6118	6179	6101							
160	%N1	87.6	91.8	93.4	95.4						
	MACH	.519	.571	.588	.601						
	KIAS	288	288	286	281						
	FF/ENG	5729	5797	5767	5721						
150	%N1	85.8	90.0	91.7	93.5	95.6					
	MACH	.502	.554	.575	.590	.604					
	KIAS	278	280	280	276	272					
	FF/ENG	5342	5406	5415	5366	5363					
140	%N1	83.8	88.1	89.9	91.6	93.5	95.9				
	MACH	.485	.536	.557	.578	.593	.607				
	KIAS	268	270	271	270	266	262				
	FF/ENG	4957	5018	5028	5030	4984	5021				
130	%N1	81.8	86.1	87.9	89.7	91.5	93.4	96.1			
	MACH	.468	.517	.538	.559	.581	.594	.610			
	KIAS	259	260	261	261	261	256	253			
	FF/ENG	4593	4631	4640	4647	4655	4615	4684			
120	%N1	79.8	83.9	85.7	87.5	89.3	91.2	93.3	96.2		
	MACH	.451	.496	.517	.539	.560	.582	.595	.612		
	KIAS	249	250	250	251	251	251	246	243		
	FF/ENG	4245	4246	4256	4260	4271	4283	4258	4340		
110	%N1	77.5	81.5	83.3	85.1	86.9	88.7	90.7	92.9	96.0	
	MACH	.434	.474	.494	.516	.538	.560	.582	.595	.612	
	KIAS	240	238	239	240	241	241	241	236	233	
	FF/ENG	3911	3870	3872	3878	3886	3896	3921	3908	3990	
100	%N1	75.4	79.1	80.7	82.5	84.3	86.2	88.0	90.0	92.2	95.5
	MACH	.416	.454	.471	.491	.513	.535	.558	.580	.594	.611
	KIAS	230	228	228	228	229	230	230	230	226	222
	FF/ENG	3590	3522	3503	3497	3507	3515	3532	3567	3558	3633
90	%N1	73.0	76.4	78.1	79.7	81.5	83.3	85.2	87.0	89.0	91.4
	MACH	.399	.433	.449	.466	.485	.507	.530	.553	.576	.592
	KIAS	220	217	217	216	217	218	218	219	218	215
	FF/ENG	3279	3190	3161	3137	3128	3139	3154	3179	3211	3208
80	%N1	70.2	73.8	75.2	76.8	78.5	80.1	82.0	83.8	85.7	87.7
	MACH	.381	.412	.426	.442	.459	.477	.499	.522	.546	.569
	KIAS	210	207	206	205	204	204	205	206	206	206
	FF/ENG	2978	2878	2837	2803	2779	2764	2780	2803	2826	2849

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) (NM)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
308	279	253	233	215	200	190	180	172	164	157
621	561	509	467	431	400	379	360	343	327	314
938	846	767	702	648	600	569	540	514	491	470
1256	1132	1025	937	864	800	758	720	685	654	626
1576	1419	1283	1173	1081	1000	948	899	856	816	781
1899	1708	1543	1409	1298	1200	1137	1079	1026	979	937
2224	1999	1804	1646	1515	1400	1326	1258	1197	1142	1093
2551	2291	2065	1884	1733	1600	1516	1438	1368	1304	1248
2881	2584	2328	2122	1950	1800	1705	1618	1538	1467	1403

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	2.9	0:44	2.5	0:42	2.3	0:40	2.0	0:38	1.9	0:37
400	5.9	1:27	5.4	1:22	5.0	1:17	4.5	1:13	4.3	1:11
600	8.9	2:10	8.2	2:03	7.6	1:55	7.0	1:48	6.6	1:44
800	11.9	2:53	11.0	2:43	10.2	2:33	9.5	2:24	9.0	2:18
1000	14.8	3:37	13.7	3:25	12.8	3:12	11.9	3:00	11.3	2:52
1200	17.7	4:21	16.5	4:07	15.3	3:51	14.3	3:36	13.5	3:26
1400	20.6	5:06	19.2	4:49	17.8	4:30	16.6	4:13	15.8	4:00
1600	23.4	5:52	21.8	5:32	20.3	5:10	19.0	4:50	18.0	4:35
1800	26.3	6:38	24.5	6:15	22.8	5:51	21.3	5:27	20.2	5:10

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.7	-0.3	0.0	0.7	1.6
10	-1.4	-0.7	0.0	1.4	3.4
15	-2.1	-1.1	0.0	2.1	4.9
20	-2.8	-1.4	0.0	2.7	6.2
25	-3.5	-1.8	0.0	3.2	7.4
30	-4.2	-2.1	0.0	3.6	8.4
35	-4.9	-2.5	0.0	3.9	9.1

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
170	%N1	79.1	82.0	86.3	90.8			
	KIAS	242	243	243	245			
	FF/ENG	5600	5590	5620	5710			
160	%N1	77.5	80.2	84.6	89.0	95.1		
	KIAS	235	235	236	237	239		
	FF/ENG	5270	5250	5260	5330	5480		
150	%N1	75.7	78.5	82.8	87.1	92.3		
	KIAS	227	228	228	229	231		
	FF/ENG	4940	4920	4910	4960	5040		
140	%N1	73.8	76.6	80.8	85.2	89.9	98.2	
	KIAS	220	220	221	222	223	224	
	FF/ENG	4610	4590	4570	4600	4630	5010	
130	%N1	71.6	74.7	78.7	83.1	87.7	94.5	
	KIAS	211	212	213	213	214	216	
	FF/ENG	4290	4260	4230	4240	4260	4450	
120	%N1	69.4	72.4	76.5	80.9	85.4	90.8	
	KIAS	202	204	204	205	206	207	
	FF/ENG	3970	3930	3900	3890	3900	3980	
110	%N1	67.2	70.0	74.2	78.4	83.0	87.7	96.3
	KIAS	194	194	195	196	197	198	199
	FF/ENG	3670	3610	3580	3560	3540	3580	3890
100	%N1	64.7	67.4	71.7	75.8	80.3	85.0	91.4
	KIAS	185	185	186	187	187	188	190
	FF/ENG	3360	3300	3260	3230	3200	3220	3360
90	%N1	61.9	64.7	68.7	73.1	77.4	82.0	87.0
	KIAS	178	178	178	178	178	178	180
	FF/ENG	3060	3010	2950	2920	2870	2870	2940
80	%N1	58.9	61.7	65.7	70.0	74.3	78.8	83.6
	KIAS	172	172	172	172	172	172	172
	FF/ENG	2760	2710	2660	2620	2570	2540	2590

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down — Section 24

GEAR DOWN

Long Range Cruise Altitude Capability
Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	19100	16400	13600
160	21600	19100	16300
150	23900	21800	19000
140	26100	24500	22000
130	28400	26900	25200
120	30500	29300	27800
110	32400	31500	30200
100	34400	33500	32400
90	36600	35700	34600
80	39100	38100	37000

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
170	%N1	83.7									
	MACH	.460									
	KIAS	254									
	FF/ENG	4891									
160	%N1	82.0	91.4								
	MACH	.447	.548								
	KIAS	247	245								
	FF/ENG	4586	4570								
150	%N1	80.2	89.6	91.6	94.2						
	MACH	.434	.535	.552	.569						
	KIAS	240	239	237	235						
	FF/ENG	4287	4274	4260	4308						
140	%N1	78.3	87.8	89.5	91.6	94.6					
	MACH	.420	.518	.538	.555	.573					
	KIAS	232	232	231	229	227					
	FF/ENG	3996	3965	3962	3963	4033					
130	%N1	76.4	85.7	87.5	89.3	91.6	94.8				
	MACH	.406	.500	.521	.541	.558	.576				
	KIAS	224	223	224	223	221	218				
	FF/ENG	3709	3655	3656	3661	3676	3756				
120	%N1	74.4	83.5	85.3	87.1	88.9	91.4	94.8			
	MACH	.391	.482	.501	.523	.543	.560	.579			
	KIAS	216	215	215	215	214	212	210			
	FF/ENG	3427	3351	3349	3358	3372	3389	3475			
110	%N1	72.0	81.1	82.9	84.6	86.5	88.3	90.9	94.4		
	MACH	.375	.462	.481	.501	.523	.543	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	3149	3054	3049	3055	3072	3084	3100	3190		
100	%N1	69.5	78.5	80.3	82.1	83.8	85.7	87.6	90.3	93.8	
	MACH	.359	.442	.460	.479	.499	.521	.542	.560	.580	
	KIAS	198	197	197	197	196	197	196	194	192	
	FF/ENG	2881	2764	2753	2758	2773	2787	2796	2810	2896	
90	%N1	66.8	75.7	77.5	79.2	81.0	82.8	84.6	86.6	89.3	93.2
	MACH	.343	.421	.438	.456	.475	.496	.518	.540	.558	.578
	KIAS	189	187	187	187	187	187	187	186	184	182
	FF/ENG	2624	2486	2464	2465	2481	2491	2499	2508	2520	2610
80	%N1	64.0	72.7	74.4	76.2	77.9	79.6	81.4	83.3	85.3	88.2
	MACH	.326	.398	.415	.432	.450	.469	.490	.512	.534	.554
	KIAS	179	177	177	176	176	176	176	176	176	174
	FF/ENG	2373	2220	2189	2182	2196	2202	2208	2212	2220	2244

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 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	5.1	0:51	4.6	0:49	4.0	0:46	3.7	0:44	3.4	0:43
400	10.4	1:40	9.6	1:35	8.5	1:28	7.9	1:24	7.4	1:21
600	15.6	2:30	14.5	2:22	12.9	2:11	12.0	2:04	11.3	1:59
800	20.7	3:22	19.3	3:10	17.2	2:55	16.0	2:46	15.1	2:38
1000	25.7	4:14	23.9	4:00	21.4	3:40	20.0	3:27	18.8	3:17
1200	30.5	5:08	28.5	4:50	25.5	4:25	23.8	4:10	22.5	3:57
1400	35.3	6:03	32.9	5:42	29.5	5:12	27.6	4:53	26.1	4:38
1600	39.9	6:59	37.3	6:34	33.4	5:59	31.3	5:37	29.6	5:19
1800	44.5	7:57	41.5	7:28	37.3	6:47	34.9	6:22	33.0	6:01

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.8	-0.4	0.0	0.6	1.5
10	-1.7	-0.8	0.0	1.2	2.9
15	-2.5	-1.2	0.0	1.8	4.3
20	-3.4	-1.7	0.0	2.4	5.5
25	-4.2	-2.1	0.0	2.9	6.6
30	-5.1	-2.5	0.0	3.4	7.7
35	-5.9	-2.9	0.0	3.9	8.6
40	-6.8	-3.4	0.0	4.3	9.5
45	-7.6	-3.8	0.0	4.7	10.2

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
41000	21	590	88
39000	20	580	84
37000	20	570	79
35000	19	560	75
33000	18	550	71
31000	18	540	67
29000	17	530	63
27000	16	520	59
25000	15	500	55
23000	14	490	51
21000	14	470	47
19000	13	450	43
17000	12	440	39
15000	11	410	35
10000	9	360	25
5000	6	290	16
1500	4	230	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
170	%N1	73.5	76.4	80.5	84.8	89.5			
	KIAS	221	221	221	221	221			
	FF/ENG	4550	4520	4500	4520	4550			
160	%N1	71.9	74.9	78.9	83.3	87.9	94.4		
	KIAS	217	217	217	217	217	217		
	FF/ENG	4310	4280	4260	4260	4270	4430		
150	%N1	70.2	73.3	77.3	81.6	86.1	91.6		
	KIAS	212	212	212	212	212	212		
	FF/ENG	4070	4040	4010	4000	4000	4080		
140	%N1	68.6	71.4	75.6	79.8	84.3	89.2		
	KIAS	207	207	207	207	207	207		
	FF/ENG	3840	3790	3760	3740	3730	3780		
130	%N1	66.8	69.5	73.8	77.9	82.4	87.1	94.6	
	KIAS	202	202	202	202	202	202	202	
	FF/ENG	3600	3550	3510	3490	3470	3490	3700	
120	%N1	64.9	67.6	71.8	75.9	80.4	85.0	90.8	
	KIAS	196	196	196	196	196	196	196	
	FF/ENG	3370	3320	3270	3240	3210	3220	3320	
110	%N1	62.7	65.6	69.6	73.9	78.2	82.7	87.6	
	KIAS	190	190	190	190	190	190	190	
	FF/ENG	3130	3080	3030	3000	2960	2960	3020	
100	%N1	60.5	63.5	67.4	71.7	75.9	80.4	85.1	92.6
	KIAS	184	184	184	184	184	184	184	184
	FF/ENG	2910	2860	2810	2770	2720	2700	2750	2900
90	%N1	58.3	61.0	65.1	69.3	73.5	78.0	82.5	88.1
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	2680	2630	2590	2540	2490	2460	2490	2550
80	%N1	56.0	58.6	62.8	66.7	71.2	75.4	79.9	84.6
	KIAS	172	172	172	172	172	172	172	172
	FF/ENG	2460	2420	2380	2330	2280	2230	2260	2270

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
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Performance Inflight — Chapter PI
Gear Down, Engine Inop — Section 25

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
160	150	214	2600		
150	141	210	5600	3300	
140	132	205	8600	6600	4200
130	123	199	11400	9800	7600
120	114	194	14100	13000	11100
110	105	188	16700	15800	14600
100	95	183	19400	18300	17200
90	86	177	22000	21000	19900
80	76	171	24700	23800	22800

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
140	2300		
130	6500	3600	
120	10500	8100	5300
110	14000	12500	9800
100	17300	16300	15000
90	20600	19500	18300
80	23700	22700	21700

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		5	7	9	11	13	15	17	19	21	23
130	%N1	90.1	91.8								
	MACH	.361	.373								
	KIAS	218	217								
	FF/ENG	7007	7011								
120	%N1	87.8	89.4	91.2	93.0						
	MACH	.349	.360	.372	.385						
	KIAS	211	210	209	208						
	FF/ENG	6453	6432	6432	6452						
110	%N1	85.4	87.0	88.5	90.3	92.1	94.8				
	MACH	.337	.348	.359	.371	.383	.397				
	KIAS	204	203	201	200	200	199				
	FF/ENG	5926	5885	5860	5861	5882	5959				
100	%N1	83.0	84.4	85.9	87.5	89.2	91.1	93.7			
	MACH	.325	.335	.345	.356	.368	.381	.395			
	KIAS	197	195	194	193	192	191	190			
	FF/ENG	5423	5366	5324	5299	5299	5309	5350			
90	%N1	80.3	81.7	83.2	84.6	86.2	87.9	89.8	92.2	96.0	
	MACH	.313	.322	.331	.341	.352	.364	.377	.391	.406	
	KIAS	189	188	186	184	183	182	181	181	180	
	FF/ENG	4946	4872	4814	4772	4747	4736	4729	4743	4889	
80	%N1	77.5	78.8	80.2	81.6	83.1	84.7	86.4	88.4	90.5	94.2
	MACH	.300	.309	.317	.326	.336	.347	.359	.373	.388	.404
	KIAS	182	180	178	176	175	173	172	172	172	172
	FF/ENG	4485	4409	4333	4274	4231	4198	4170	4174	4196	4319

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	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	2.6	0:28	2.4	0:27	2.1	0:26
200	5.5	0:54	5.1	0:52	4.7	0:50
300	8.3	1:21	7.7	1:17	7.3	1:14
400	11.1	1:48	10.3	1:43	9.8	1:38
500	13.8	2:15	12.9	2:09	12.3	2:03
600	16.5	2:42	15.5	2:35	14.7	2:27
700	19.1	3:10	18.0	3:01	17.1	2:52
800	21.8	3:38	20.5	3:28	19.5	3:17
900	24.4	4:06	22.9	3:54	21.8	3:43
1000	26.9	4:35	25.3	4:22	24.1	4:08

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
2	-0.3	-0.2	0.0	0.3	0.6
6	-1.0	-0.5	0.0	1.0	2.0
10	-1.7	-0.8	0.0	1.8	3.5
14	-2.3	-1.2	0.0	2.5	4.9
18	-3.0	-1.5	0.0	3.2	6.3
22	-3.6	-1.8	0.0	3.8	7.6
26	-4.3	-2.1	0.0	4.4	9.0
30	-5.0	-2.5	0.0	5.0	10.3

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
160	%N1	90.8			
	KIAS	217			
	FF/ENG	8330			
150	%N1	88.9	92.1		
	KIAS	212	212		
	FF/ENG	7800	7880		
140	%N1	87.0	90.1		
	KIAS	207	207		
	FF/ENG	7280	7330		
130	%N1	84.9	87.9	92.7	
	KIAS	202	202	202	
	FF/ENG	6760	6790	6890	
120	%N1	82.7	85.7	90.3	
	KIAS	196	196	196	
	FF/ENG	6270	6270	6330	
110	%N1	80.4	83.4	87.8	93.1
	KIAS	190	190	190	190
	FF/ENG	5790	5770	5790	5920
100	%N1	78.0	80.9	85.3	90.1
	KIAS	184	184	184	184
	FF/ENG	5330	5300	5290	5370
90	%N1	75.6	78.3	82.7	87.3
	KIAS	178	178	178	178
	FF/ENG	4890	4840	4820	4850
80	%N1	72.9	75.8	79.9	84.4
	KIAS	172	172	172	172
	FF/ENG	4450	4410	4360	4370

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Text — Section 26

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. Operation on runways with slush/standing water depths of more than 0.25 inch (6 mm) is not recommended at altitudes greater than 8,000 ft. 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. Adjust field length available for temperature by amount shown beneath V1(MCG) limit weight table.

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 17500 lb 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	-18
8000	-15
10000	-12
12000	-10
14000	-9

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 7200 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 2200 lb 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 5200 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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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 (LB/HR)
39	100
35	100
31	110
25	130
20	150
15	160
10	180
5	200

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.

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.

Performance Inflight — Chapter PI

General — Section 30

Takeoff Speeds - Dry Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	169	171	175	161	163	168									
85	163	166	171	157	159	164	156	157	162						
80	158	160	167	152	154	160	151	152	158	148	149	155	145	146	153
75	153	155	162	147	148	156	146	147	154	142	144	151	140	141	149
70	147	149	158	141	143	152	140	141	150	137	138	147	135	136	145
65	141	143	153	135	137	147	134	136	146	131	133	143	129	130	140
60	135	136	148	129	131	143	128	129	141	125	126	138	123	124	136
55	128	129	143	123	124	137	122	123	136	119	120	133	117	118	131
50	121	122	137	116	117	132	115	116	130	112	113	128	110	111	126
45	113	114	131	109	110	126	108	108	125	105	106	122	103	104	120
40	105	106	125	101	102	120	100	101	119	98	99	117	96	97	115

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	6						4	5						-3	-3					
60	140	4	5	6	7				3	4	5	6				-2	-3	-3	-4			
50	122	2	3	4	5	6	7	9	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-6
40	104	1	1	3	4	5	6	7	1	1	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-5
30	86	0	0	1	2	4	5	6	0	0	1	3	4	5	6	0	0	-1	-2	-2	-3	-4
20	68	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	-1	-1	-2	-3	-3
-60	-76	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	-1	-1	-2	-2	-3

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-4	-2	0	1	1	-2	-2	-1	0	0	0	0	1
80	-3	-2	0	1	1	-2	-1	-1	0	0	0	1	1
70	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
60	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
50	-1	0	0	0	1	-2	-1	0	0	0	1	1	1
40	0	0	0	0	0	-2	-1	0	0	0	0	0	0

***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	95	93					
60	140	95	93	92	90			
50	122	97	95	92	90	88	86	83
40	104	101	99	96	93	89	86	83
30	86	104	103	100	96	92	88	85
20	68	104	104	101	98	94	90	87
-60	-76	106	105	102	99	95	92	89

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	164	171	175	156	164	168									
85	157	166	171	150	159	164	151	157	162						
80	151	160	167	145	154	160	145	152	158	141	149	155	140	146	153
75	145	155	162	139	148	156	139	147	154	136	144	151	134	141	149
70	139	149	158	133	143	152	133	141	150	130	138	147	128	136	145
65	133	143	153	127	137	148	127	136	146	124	133	143	122	130	140
60	126	136	148	121	131	143	120	129	141	117	126	138	115	124	136
55	119	129	143	114	124	137	113	123	136	111	120	133	109	118	131
50	111	122	137	107	117	132	106	116	130	104	113	128	102	111	126
45	104	114	131	99	110	126	99	108	125	96	106	122	95	104	120
40	96	106	125	92	102	120	91	101	119	89	99	117	87	97	115

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	7	8						4	5						-3	-4					
60	140	5	6	7	9				3	4	5	6				-2	-3	-3	-4			
50	122	3	4	5	6	8	9	12	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-6
40	104	1	2	3	4	6	7	9	1	1	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-5
30	86	0	0	1	3	4	6	7	0	0	1	3	4	5	6	0	0	-1	-2	-2	-3	-4
20	68	0	0	1	2	4	5	6	0	0	1	2	3	4	5	0	0	-1	-1	-2	-2	-3
-60	-76	0	0	1	2	4	5	7	0	0	1	2	3	4	5	0	0	-1	-1	-2	-2	-3

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-5	-3	0	3	6	-3	-2	-1	0	1	2	2	3
80	-5	-2	0	3	5	-4	-2	-1	0	1	2	2	3
70	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
60	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
50	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	4
40	-1	0	0	1	2	-5	-3	-1	0	1	3	4	5

***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	95	93					
60	140	95	93	92	90			
50	122	97	95	92	90	88	86	83
40	104	101	99	96	93	89	86	83
30	86	104	103	100	96	92	88	85
20	68	104	104	101	98	94	90	87
-60	-76	106	105	102	99	95	92	89

Maximum Allowable Clearway

FIELD LENGTH (M)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1200	150
1600	180
2000	210
2400	240
2800	270
3200	290

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
200	-5	-4	-3	-3				
100	-3	-2	-2	-2				
0	0	0	0	0	0	0	0	0
-100	1	1	1	1	2	2	2	1
-200	1	1	1	1	4	3	2	2
-300	1	1	1	1	6	5	3	2

Use of clearway not allowed on wet runway.

Stab Trim Setting

Max Takeoff Thrust

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	11	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/2	8 1/4	7	6 1/4	5 1/2	4 3/4	4 1/2	4 1/4	3 3/4
80	8 1/2	8 1/2	8 1/4	7 3/4	6 3/4	6	5 1/4	4 1/2	4 1/4	4	3 1/2
75	8 1/4	8	7 3/4	7 1/2	6 1/2	5 3/4	5	4 1/2	4	3 3/4	3 1/2
70	8	7 3/4	7 1/2	7 1/4	6 1/4	5 1/2	4 3/4	4 1/4	3 3/4	3 1/2	3 1/4
65	7 3/4	7 1/4	7	6 3/4	6	5 1/4	4 1/2	4	3 3/4	3 1/4	3
60	7 1/4	7	6 3/4	6 1/2	5 3/4	5	4 1/4	3 3/4	3 1/2	3 1/4	2 3/4
55	6 3/4	6 1/2	6 1/2	6 1/4	5 1/2	4 3/4	4 1/4	3 1/2	3 1/4	3	2 3/4
50	6 1/2	6	6	5 3/4	5	4 1/2	3 3/4	3 1/4	3	2 3/4	2 1/4
45	6	5 3/4	5 1/2	5 1/2	4 3/4	4	3 1/2	3	2 1/2	2 1/2	2 1/4
40	6	5 3/4	5 1/2	5 1/2	4 3/4	4	3 1/2	3	2 1/2	2 1/2	2 1/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	11	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/2	8 1/2	6 1/2	5 1/2	4 1/4	3 1/2	3	2 1/2	2 1/4
80	8 1/2	8 1/2	8 1/2	8 1/2	6	5	4	3 1/4	2 3/4	2 1/2	2 1/4
75	8 1/2	8 1/2	8 1/2	7 3/4	5 3/4	4 3/4	3 3/4	3	2 1/2	2 1/4	2 1/4
70	8 1/2	8 1/4	8 1/4	7 1/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/2	2 1/4	2 1/4
65	8 1/4	7 3/4	7 1/2	6 3/4	5 1/4	4 1/4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4
60	7 3/4	7	6 3/4	6 1/4	4 3/4	4	3	2 1/4	2 1/4	2 1/4	2 1/4
55	7	6 1/2	6 1/4	5 3/4	4 1/2	3 3/4	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4
50	6	5 3/4	5 1/2	5	4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4	2 1/4
45	5	4 3/4	4 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4
40	5	4 3/4	4 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
85	160	168	177
80	155	163	172
75	151	158	167
70	146	153	161
65	141	148	156
60	135	142	149
55	128	136	143
50	122	129	136
45	115	122	128
40	108	115	121

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
30	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								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
95	-12.7	-14.5	-16.3	-15.7	-17.5	-19.3	-22.0	-23.8	-25.6
90	-11.7	-13.5	-15.3	-14.2	-16.0	-17.9	-19.6	-21.4	-23.3
85	-10.7	-12.5	-14.3	-12.8	-14.6	-16.4	-17.4	-19.2	-21.0
80	-9.7	-11.5	-13.3	-11.5	-13.3	-15.1	-15.2	-17.0	-18.8
75	-8.7	-10.6	-12.4	-10.2	-12.0	-13.8	-13.2	-15.0	-16.9
70	-7.8	-9.6	-11.4	-8.9	-10.8	-12.6	-11.4	-13.2	-15.0
65	-6.9	-8.7	-10.5	-7.8	-9.6	-11.4	-9.7	-11.5	-13.3
60	-6.0	-7.8	-9.6	-6.7	-8.5	-10.3	-8.1	-9.9	-11.7
55	-5.2	-7.0	-8.8	-5.6	-7.5	-9.3	-6.7	-8.5	-10.3
50	-4.3	-6.1	-8.0	-4.7	-6.5	-8.3	-5.4	-7.2	-9.1
45	-3.5	-5.3	-7.2	-3.8	-5.6	-7.4	-4.3	-6.1	-7.9
40	-2.7	-4.6	-6.4	-2.9	-4.7	-6.5	-3.3	-5.1	-6.9

V1(MCG) Limit Weight (1000 KG)

AVAILABLE FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1200							33.0		
1400	41.6	30.0		45.3	33.8		51.6	40.2	
1600	61.6	49.2	37.4	65.2	52.9	41.1	70.9	59.0	47.4
1800	83.3	69.8	57.1	86.7	73.4	60.7	91.1	78.7	66.6
2000		92.3	78.4		95.4	81.8		99.0	86.6
2200			101.2			104.1			

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 2.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
85	-16	-12	-8	-10	-6	-2	0	0	0
80	-18	-14	-10	-12	-8	-4	0	0	0
75	-19	-15	-11	-13	-9	-5	0	0	0
70	-20	-16	-12	-15	-11	-7	-3	0	0
65	-21	-17	-13	-17	-13	-9	-7	-3	0
60	-22	-18	-14	-19	-15	-11	-11	-7	-3
55	-23	-19	-15	-21	-17	-13	-14	-10	-6
50	-24	-20	-16	-22	-18	-14	-17	-13	-9
45	-25	-21	-17	-23	-19	-15	-19	-15	-11
40	-25	-21	-17	-23	-19	-15	-20	-16	-12

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								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
95	-14.6	-17.3	-20.1	-17.7	-20.4	-23.1	-23.9	-26.6	-29.3
90	-13.6	-16.3	-19.1	-16.3	-19.0	-21.7	-21.7	-24.4	-27.1
85	-12.6	-15.4	-18.1	-14.9	-17.6	-20.3	-19.4	-22.1	-24.9
80	-11.7	-14.4	-17.1	-13.5	-16.2	-18.9	-17.2	-19.9	-22.6
75	-10.6	-13.3	-16.0	-12.0	-14.8	-17.5	-15.0	-17.8	-20.5
70	-9.5	-12.2	-14.9	-10.6	-13.4	-16.1	-13.1	-15.8	-18.5
65	-8.4	-11.1	-13.8	-9.3	-12.0	-14.7	-11.2	-13.9	-16.7
60	-7.3	-10.0	-12.8	-8.0	-10.7	-13.4	-9.5	-12.2	-15.0
55	-6.3	-9.0	-11.7	-6.8	-9.5	-12.3	-8.0	-10.7	-13.4
50	-5.4	-8.1	-10.9	-5.8	-8.5	-11.2	-6.6	-9.3	-12.0
45	-4.7	-7.4	-10.1	-4.9	-7.6	-10.4	-5.4	-8.1	-10.8
40	-4.0	-6.7	-9.5	-4.1	-6.9	-9.6	-4.2	-6.9	-9.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1600				33.0			47.3	32.2	
1800	46.7			55.9	38.2		69.2	52.4	36.8
2000	73.3	52.7	34.1	81.3	61.9	43.5	88.6	74.2	57.7
2200	100.9	79.9	59.0		87.1	68.0		92.8	79.0
2400			86.5			92.8			97.0

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 -40 m/+35 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for available field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
95	-20	-10	0	-11	-1	0	-4	0	0
90	-21	-11	-1	-13	-3	0	-2	0	0
85	-23	-13	-3	-14	-4	0	-1	0	0
80	-24	-14	-4	-16	-6	0	-1	0	0
75	-25	-15	-5	-18	-8	0	-3	0	0
70	-27	-17	-7	-21	-11	-1	-6	0	0
65	-28	-18	-8	-23	-13	-3	-10	0	0
60	-29	-19	-9	-25	-15	-5	-15	-5	0
55	-30	-20	-10	-27	-17	-7	-19	-9	0
50	-31	-21	-11	-29	-19	-9	-23	-13	-3
45	-32	-22	-12	-30	-20	-10	-25	-15	-5
40	-32	-22	-12	-30	-20	-10	-26	-16	-6

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 Adjustment (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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
95	-0.9	-0.9	-0.9	-6.5	-6.5	-6.5	-11.5	-11.5	-11.5
90	-1.1	-1.1	-1.1	-6.4	-6.4	-6.4	-11.1	-11.1	-11.1
85	-1.3	-1.3	-1.3	-6.3	-6.3	-6.3	-10.6	-10.6	-10.6
80	-1.4	-1.4	-1.4	-6.1	-6.1	-6.1	-10.1	-10.1	-10.1
75	-1.5	-1.5	-1.5	-5.9	-5.9	-5.9	-9.6	-9.6	-9.6
70	-1.6	-1.6	-1.6	-5.7	-5.7	-5.7	-9.0	-9.0	-9.0
65	-1.5	-1.5	-1.5	-5.4	-5.4	-5.4	-8.4	-8.4	-8.4
60	-1.5	-1.5	-1.5	-5.0	-5.0	-5.0	-7.6	-7.6	-7.6
55	-1.3	-1.3	-1.3	-4.5	-4.5	-4.5	-6.9	-6.9	-6.9
50	-1.1	-1.1	-1.1	-4.0	-4.0	-4.0	-6.1	-6.1	-6.1
45	-0.8	-0.8	-0.8	-3.4	-3.4	-3.4	-5.2	-5.2	-5.2
40	-0.5	-0.5	-0.5	-2.8	-2.8	-2.8	-4.3	-4.3	-4.3

V1(MCG) Limit Weight (1000 KG)

AVAILABLE FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1000	39.6								
1200	72.0	60.2	48.3						
1400	104.0	92.3	80.6	46.2	34.3				
1600				69.6	56.5	44.1			
1800				95.5	81.0	67.2	41.6	30.3	
2000						92.9	55.7	43.6	32.2
2200							71.2	57.8	45.6
2400							88.7	73.6	60.0
2600								91.4	76.1
2800									94.1

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Max allowable slippery runway limited weight is lesser of weights from 1 and 2.**

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
85	-6	-4	-2	-15	-13	-11	-27	-25	-23
80	-7	-5	-3	-17	-15	-13	-29	-27	-25
75	-8	-6	-4	-18	-16	-14	-31	-29	-27
70	-9	-7	-5	-20	-18	-16	-33	-31	-29
65	-9	-7	-5	-21	-19	-17	-35	-33	-31
60	-10	-8	-6	-22	-20	-18	-37	-35	-33
55	-11	-9	-7	-24	-22	-20	-38	-36	-34
50	-12	-10	-8	-25	-23	-21	-40	-38	-36
45	-13	-11	-9	-26	-24	-22	-41	-39	-37
40	-14	-12	-10	-27	-25	-23	-42	-40	-38

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
95	-1.7	-1.7	-1.7	-8.0	-8.0	-8.0	-13.4	-13.4	-13.4
90	-1.9	-1.9	-1.9	-7.9	-7.9	-7.9	-13.1	-13.1	-13.1
85	-2.1	-2.1	-2.1	-7.9	-7.9	-7.9	-12.8	-12.8	-12.8
80	-2.3	-2.3	-2.3	-7.9	-7.9	-7.9	-12.5	-12.5	-12.5
75	-2.4	-2.4	-2.4	-7.7	-7.7	-7.7	-11.9	-11.9	-11.9
70	-2.4	-2.4	-2.4	-7.3	-7.3	-7.3	-11.1	-11.1	-11.1
65	-2.4	-2.4	-2.4	-6.8	-6.8	-6.8	-10.1	-10.1	-10.1
60	-2.3	-2.3	-2.3	-6.3	-6.3	-6.3	-9.1	-9.1	-9.1
55	-2.1	-2.1	-2.1	-5.7	-5.7	-5.7	-8.4	-8.4	-8.4
50	-1.9	-1.9	-1.9	-5.1	-5.1	-5.1	-8.0	-8.0	-8.0
45	-1.6	-1.6	-1.6	-4.7	-4.7	-4.7	-8.1	-8.1	-8.1
40	-1.4	-1.4	-1.4	-4.3	-4.3	-4.3	-8.8	-8.8	-8.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1200	61.8	43.8							
1400	96.6	81.2	64.9						
1600			99.5	35.2					
1800				68.0	45.4				
2000				99.9	78.3	55.7			
2200						88.2			
2400							33.0		
2600							51.2	30.5	
2800							73.2	48.4	
3000							97.3	69.8	45.7
3200								93.9	66.5
3400									90.4

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 -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 m/+40 m 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
95	-5	0	0	-16	-11	-6	-32	-27	-22
90	-6	-1	0	-17	-12	-7	-35	-30	-25
85	-7	-2	0	-19	-14	-9	-37	-32	-27
80	-8	-3	0	-21	-16	-11	-39	-34	-29
75	-9	-4	0	-23	-18	-13	-42	-37	-32
70	-11	-6	-1	-25	-20	-15	-44	-39	-34
65	-12	-7	-2	-27	-22	-17	-47	-42	-37
60	-13	-8	-3	-29	-24	-19	-49	-44	-39
55	-14	-9	-4	-30	-25	-20	-51	-46	-41
50	-15	-10	-5	-32	-27	-22	-53	-48	-43
45	-16	-11	-6	-34	-29	-24	-55	-50	-45
40	-17	-12	-7	-35	-30	-25	-56	-51	-46

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	94.8	95.4	95.8	95.9	96.0	96.1	96.2	96.3	96.2	95.9	95.8	95.7	95.7
55	95.4	96.0	96.5	96.6	96.7	96.8	96.9	97.1	96.9	96.6	96.3	95.7	95.0
50	96.0	96.6	97.1	97.3	97.4	97.6	97.7	97.8	97.7	97.4	97.1	96.6	96.1
45	96.8	97.4	97.8	98.0	98.1	98.3	98.4	98.5	98.4	98.1	97.8	97.5	97.1
40	97.4	98.1	98.6	98.7	98.8	98.9	99.0	99.2	99.1	98.8	98.5	98.4	98.1
35	98.0	98.7	99.4	99.5	99.6	99.7	99.8	99.9	99.8	99.5	99.2	99.1	99.0
30	97.6	98.8	100.3	100.3	100.4	100.4	100.5	100.5	100.4	100.3	100.0	99.9	99.9
25	96.8	98.1	99.5	100.1	100.7	100.8	100.7	100.7	100.7	100.7	100.6	100.6	100.7
20	96.0	97.3	98.8	99.3	99.9	100.2	100.5	100.8	100.8	100.9	100.8	100.8	100.8
15	95.2	96.5	98.0	98.6	99.2	99.5	99.8	100.1	100.5	100.9	101.1	101.1	101.1
10	94.5	95.8	97.2	97.8	98.4	98.7	99.0	99.4	99.7	100.1	100.5	101.0	101.5
5	93.7	95.0	96.4	97.0	97.6	98.0	98.3	98.6	99.0	99.4	99.8	100.3	100.7
0	92.9	94.2	95.6	96.3	96.9	97.2	97.5	97.9	98.2	98.6	99.0	99.5	100.0
-5	92.0	93.4	94.8	95.5	96.1	96.4	96.7	97.1	97.5	97.9	98.3	98.7	99.2
-10	91.2	92.6	94.0	94.7	95.3	95.6	96.0	96.3	96.7	97.1	97.5	98.0	98.4
-15	90.4	91.7	93.2	93.9	94.5	94.8	95.2	95.6	95.9	96.3	96.7	97.2	97.6
-20	89.6	90.9	92.4	93.0	93.7	94.0	94.4	94.8	95.2	95.6	95.9	96.4	96.8
-25	88.7	90.1	91.6	92.2	92.9	93.2	93.6	94.0	94.4	94.8	95.2	95.6	96.0
-30	87.9	89.2	90.7	91.4	92.0	92.4	92.8	93.2	93.6	94.0	94.3	94.8	95.2
-35	87.0	88.4	89.9	90.5	91.2	91.6	91.9	92.4	92.8	93.1	93.5	94.0	94.4
-40	86.1	87.5	89.0	89.7	90.3	90.7	91.1	91.5	91.9	92.3	92.7	93.1	93.6
-45	85.3	86.6	88.2	88.8	89.5	89.9	90.3	90.7	91.1	91.5	91.9	92.3	92.7
-50	84.4	85.7	87.3	87.9	88.6	89.0	89.4	89.9	90.3	90.6	91.0	91.5	91.9

%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	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0

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	73	71	69	67	65	63	61	59	57	55		
35	71	71	69	67	65	63	61	59	57	55	53	
30	69	67	67	67	65	63	61	59	57	55	53	51
25	69	67	66	64	65	63	61	59	57	55	53	51
20	69	67	66	64	64	63	61	59	57	55	53	51
15	69	67	66	64	64	63	61	59	57	55	53	51
10 & BELOW	69	67	66	64	64	63	61	59	57	55	53	51

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	93.4	93.7	94.2	94.7	95.4	96.1	96.9	97.3	97.6	97.8	97.8	97.7
70	94.1	94.4	94.4	94.4	94.7	95.4	96.2	96.6	96.9	97.1	97.1	97.1
65	94.8	95.1	95.2	95.2	95.3	95.4	95.5	96.0	96.2	96.5	96.4	96.4
60	95.4	95.8	95.9	96.0	96.1	96.2	96.3	96.2	95.9	95.8	95.7	95.7
55	96.0	96.5	96.6	96.7	96.8	96.9	97.1	96.9	96.6	96.3	95.7	95.0
50	96.6	97.1	97.3	97.4	97.6	97.7	97.8	97.7	97.4	97.1	96.6	96.1
45	97.4	97.8	98.0	98.1	98.3	98.4	98.5	98.4	98.1	97.8	97.5	97.1
40	98.1	98.6	98.7	98.8	98.9	99.0	99.2	99.1	98.8	98.5	98.4	98.1
35	98.7	99.4	99.5	99.6	99.7	99.8	99.9	99.8	99.5	99.2	99.1	99.0
30	98.8	100.3	100.3	100.4	100.4	100.5	100.5	100.4	100.3	100.0	99.9	99.9
25	98.1	99.5	100.1	100.7	100.8	100.7	100.7	100.7	100.7	100.6	100.6	100.7
20	97.3	98.8	99.3	99.9	100.2	100.5	100.8	100.8	100.9	100.8	100.8	100.8
15	96.5	98.0	98.6	99.2	99.5	99.8	100.1	100.5	100.9	101.1	101.1	101.1
10	95.8	97.2	97.8	98.4	98.7	99.0	99.4	99.7	100.1	100.5	101.0	101.5
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 1.0.

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	14.9													
100	14.9	10.9												
90	14.0	11.7												
80	12.9	11.6	7.8											
70	11.2	10.7	8.6	7.8	6.3									
60	9.2	9.5	8.5	8.4	7.1	6.3	4.9							
50	7.8	7.8	7.5	7.1	6.9	7.0	5.6	4.9	3.4					
40		6.0	6.2	6.1	5.9	5.8	5.7	5.6	4.7	4.4	5.3			
30		4.6	4.6	4.6	4.6	4.5	4.4	4.3	4.3	4.2	4.1	4.0	3.9	
20			2.9	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.8	2.8	2.7	2.6
10			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4
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 (24K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	172	172	174												
85	166	167	170	159	160	163									
80	160	162	166	154	155	159									
75	155	156	161	149	150	155	148	148	153	145	145	150	142	142	148
70	149	150	157	143	144	151	142	143	149	139	140	146	137	137	144
65	143	144	152	137	138	147	136	137	145	133	134	142	131	131	139
60	137	138	147	131	132	142	130	131	140	127	128	137	125	125	135
55	130	131	142	124	125	136	123	124	135	121	121	132	118	119	130
50	122	123	136	118	118	131	116	117	129	114	115	127	112	112	125
45	115	116	130	110	111	125	109	110	124	107	107	121	105	105	119
40	107	108	124	103	103	119	102	102	118	99	100	116	97	98	114

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	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	4	4	5	6			3	4	5	6			-2	-3	-4	-4		
50	122	2	3	4	5	6	7	2	3	4	5	6	7	-2	-2	-3	-3	-4	-5
40	104	1	2	3	4	5	6	1	2	3	4	5	6	-1	-1	-2	-2	-3	-4
30	86	0	0	1	2	4	5	0	0	1	2	4	5	0	0	-1	-2	-2	-3
20	68	0	0	1	1	2	3	0	0	1	1	2	4	0	0	0	-1	-1	-2
-60	-76	0	0	1	1	2	3	0	0	1	1	2	3	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
84	-3	-2	0	1	1	-1	-1	0	0	0	1	1	1
76	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
68	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
60	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
52	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
44	0	0	0	0	1	-2	-1	0	0	0	0	1	1

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	89	87	85	84		
50	122	91	89	86	84	82	80
40	104	96	93	90	86	83	80
30	86	98	98	94	90	87	83
20	68	99	98	96	94	91	87
-60	-76	100	100	97	95	93	90

Takeoff Speeds - Wet Runway (24K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	167	172	174												
85	161	167	170	154	160	163									
80	155	162	166	148	155	159									
75	149	156	161	142	150	155	142	148	153	139	145	150	137	142	148
70	142	150	157	136	144	151	136	143	149	133	140	146	131	137	144
65	136	144	152	130	138	147	129	137	145	127	134	142	125	131	139
60	129	138	147	123	132	142	123	131	140	120	128	137	118	125	135
55	122	131	142	116	125	136	116	124	135	113	121	132	111	119	130
50	114	123	136	109	118	131	109	117	129	106	115	127	104	112	125
45	107	116	130	102	111	125	101	110	124	99	107	121	97	105	119
40	98	108	124	94	103	119	93	102	118	92	100	115	90	98	114

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	8	8						5	5						-3	-4					
60	140	5	6	8	9				3	4	5	6				-2	-3	-3	-4			
50	122	3	4	5	7	8	10	11	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-4	-5
40	104	1	2	3	5	6	7	9	1	2	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-4
30	86	0	0	1	3	4	6	7	0	0	1	3	4	5	6	0	0	-1	-1	-2	-3	-4
20	68	0	0	1	1	2	4	5	0	0	1	1	2	4	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	4	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
84	-5	-3	0	3	6	-3	-2	-1	0	1	1	2	2
76	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	3
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
60	-3	-1	0	2	3	-4	-2	-1	0	1	1	2	3
52	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	3
44	-2	-1	0	1	2	-5	-3	-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
60	140	89	87	85	84		
50	122	91	89	86	84	82	80
40	104	96	93	90	86	83	80
30	86	98	98	94	90	87	83
20	68	99	98	96	94	91	87
-60	-76	100	100	97	95	93	90

Maximum Allowable Clearway (24K Derate)

FIELD LENGTH (M)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1200	150
1600	180
2000	210
2400	240
2800	270
3200	290

Clearway and Stopway V1 Adjustments (24K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
200	-5	-4	-3	-3				
100	-3	-2	-2	-2				
0	0	0	0	0	0	0	0	0
-100	1	1	1	1	3	2	1	1
-200	1	1	1	1	6	4	2	1
-300	1	1	1	1	7	6	3	1

Use of clearway not allowed on wet runway.

Stab Trim Setting (24K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	8	10	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/4	7 1/2	6 1/2	5 3/4	5	4 1/2	4 1/4	3 3/4
80	8 1/2	8 1/4	8	7	6 1/4	5 1/2	4 3/4	4 1/2	4	3 3/4
75	8 1/4	8	7 3/4	6 3/4	6	5 1/4	4 1/2	4 1/4	4	3 1/2
70	8	7 3/4	7 1/2	6 1/2	5 3/4	5	4 1/2	4	3 3/4	3 1/4
65	7 3/4	7 1/2	7 1/4	6 1/4	5 1/2	4 3/4	4 1/4	4	3 1/2	3 1/4
60	7 1/2	7 1/4	7	6	5 1/2	4 3/4	4	3 3/4	3 1/4	3
55	7 1/4	7	6 3/4	5 3/4	5 1/4	4 1/2	3 3/4	3 1/2	3 1/4	2 3/4
50	6 3/4	6 1/2	6 1/4	5 1/2	4 3/4	4	3 1/2	3 1/4	2 3/4	2 1/2
45	6 1/2	6 1/4	6	5	4 1/2	3 3/4	3	2 3/4	2 1/2	2 1/4
40	6 1/2	6 1/4	6	5	4 1/2	3 3/4	3	2 3/4	2 1/2	2 1/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	8	10	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/2	6 3/4	5 1/2	4 1/2	3 3/4	3 1/4	2 3/4	2 1/2
80	8 1/2	8 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2	3 1/4	2 3/4	2 1/4
75	8 1/2	8 1/2	8 1/4	6 1/4	5 1/4	4 1/4	3 1/2	3	2 1/2	2 1/4
70	8 1/2	8 1/4	7 3/4	6	5	4	3 1/4	2 3/4	2 1/4	2 1/4
65	8 1/4	7 3/4	7 1/4	5 1/2	4 3/4	3 3/4	3	2 1/2	2 1/4	2 1/4
60	7 3/4	7 1/4	6 3/4	5 1/4	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4
55	7	6 3/4	6 1/4	5	4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4
50	6 1/2	6	5 3/4	4 1/2	3 3/4	3	2 1/4	2 1/4	2 1/4	2 1/4
45	5 3/4	5 1/2	5	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4
40	5 3/4	5 1/2	5	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (24K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
95	-12.8	-14.8	-16.8	-16.4	-18.4	-20.4	-25.3	-27.3	-29.3
90	-11.8	-13.8	-15.8	-14.8	-16.8	-18.8	-22.4	-24.4	-26.4
85	-10.9	-12.9	-14.9	-13.3	-15.3	-17.3	-19.5	-21.5	-23.5
80	-9.9	-11.9	-13.9	-11.9	-13.9	-15.9	-16.8	-18.8	-20.8
75	-9.0	-11.0	-13.0	-10.6	-12.6	-14.6	-14.4	-16.4	-18.4
70	-8.0	-10.0	-12.0	-9.3	-11.3	-13.3	-12.2	-14.2	-16.2
65	-7.1	-9.1	-11.1	-8.2	-10.2	-12.2	-10.2	-12.2	-14.2
60	-6.2	-8.2	-10.2	-7.1	-9.1	-11.1	-8.5	-10.5	-12.5
55	-5.4	-7.4	-9.4	-6.0	-8.0	-10.0	-7.1	-9.1	-11.1
50	-4.5	-6.5	-8.5	-4.9	-6.9	-8.9	-5.9	-7.9	-9.9
45	-3.6	-5.6	-7.6	-3.8	-5.8	-7.8	-4.9	-6.9	-8.9
40	-2.7	-4.7	-6.7	-2.7	-4.7	-6.7	-4.2	-6.2	-8.2

V1(MCG) Limit Weight (1000 KG)

AVAILABLE FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1200	30.2			33.6			39.3		
1400	50.4	37.9		53.6	41.2		58.9	46.7	35.3
1600	72.3	58.7	45.8	75.3	61.8	49.1	80.6	67.1	54.4
1800	96.2	81.4	67.3	99.0	84.4	70.3	104.3	89.8	75.6
2000			90.8			93.7			99.1

1. **Enter Weight Adjustment table with slush/standing water depth and 24K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 2.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
85	-14	-12	-10	-8	-6	-4	0	0	0
80	-15	-13	-11	-9	-7	-5	0	0	0
75	-17	-15	-13	-11	-9	-7	0	0	0
70	-18	-16	-14	-12	-10	-8	0	0	0
65	-19	-17	-15	-14	-12	-10	-3	-1	0
60	-20	-18	-16	-16	-14	-12	-7	-5	-3
55	-22	-20	-18	-19	-17	-15	-11	-9	-7
50	-22	-20	-18	-20	-18	-16	-14	-12	-10
45	-23	-21	-19	-21	-19	-17	-17	-15	-13
40	-23	-21	-19	-21	-19	-17	-18	-16	-14

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
95	-15.9	-19.1	-22.3	-19.6	-22.8	-25.9	-27.0	-30.1	-33.3
90	-14.6	-17.8	-21.0	-17.8	-20.9	-24.1	-24.1	-27.3	-30.5
85	-13.3	-16.5	-19.7	-15.9	-19.1	-22.3	-21.2	-24.4	-27.6
80	-12.1	-15.2	-18.4	-14.2	-17.4	-20.5	-18.5	-21.7	-24.9
75	-10.9	-14.0	-17.2	-12.5	-15.7	-18.9	-16.1	-19.3	-22.4
70	-9.7	-12.9	-16.1	-11.0	-14.2	-17.4	-13.8	-17.0	-20.2
65	-8.6	-11.8	-15.0	-9.6	-12.8	-16.0	-11.8	-15.0	-18.2
60	-7.6	-10.8	-13.9	-8.4	-11.5	-14.7	-10.1	-13.2	-16.4
55	-6.6	-9.8	-12.9	-7.2	-10.4	-13.5	-8.5	-11.7	-14.9
50	-5.7	-8.8	-12.0	-6.1	-9.3	-12.5	-7.1	-10.3	-13.5
45	-4.7	-7.9	-11.1	-5.1	-8.3	-11.4	-5.8	-9.0	-12.2
40	-3.8	-7.0	-10.1	-4.0	-7.2	-10.4	-4.5	-7.6	-10.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1400							36.6		
1600	37.6			45.5			58.9	39.9	
1800	65.4	42.0		72.4	49.7		87.6	63.0	43.4
2000	93.9	70.0	46.5	102.0	77.0	53.9		93.0	67.3
2200		98.5	74.5			81.7			98.4
2400			103.1						

1. **Enter Weight Adjustment table with slush/standing water depth and 24K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 m/+30 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for available 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 (24K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
95	-14	-12	-9	-2	0	0	0	0	0
90	-16	-14	-11	-5	-3	0	0	0	0
85	-19	-16	-14	-9	-6	-4	0	0	0
80	-21	-18	-16	-12	-9	-7	0	0	0
75	-22	-20	-17	-15	-12	-10	0	0	0
70	-24	-22	-19	-17	-15	-12	0	0	0
65	-25	-23	-20	-20	-17	-15	-4	-2	0
60	-27	-24	-22	-22	-20	-17	-11	-8	-6
55	-28	-25	-23	-24	-21	-19	-15	-13	-10
50	-29	-26	-24	-26	-23	-21	-19	-17	-14
45	-29	-27	-24	-27	-25	-22	-22	-20	-17
40	-30	-27	-25	-28	-26	-23	-24	-21	-19

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

24K 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
95	-0.4	-0.4	-0.4	-5.8	-5.8	-5.8	-10.8	-10.8	-10.8
90	-0.7	-0.7	-0.7	-5.9	-5.9	-5.9	-10.5	-10.5	-10.5
85	-1.0	-1.0	-1.0	-5.9	-5.9	-5.9	-10.2	-10.2	-10.2
80	-1.3	-1.3	-1.3	-5.9	-5.9	-5.9	-9.9	-9.9	-9.9
75	-1.4	-1.4	-1.4	-5.8	-5.8	-5.8	-9.5	-9.5	-9.5
70	-1.5	-1.5	-1.5	-5.6	-5.6	-5.6	-9.0	-9.0	-9.0
65	-1.6	-1.6	-1.6	-5.3	-5.3	-5.3	-8.4	-8.4	-8.4
60	-1.5	-1.5	-1.5	-5.0	-5.0	-5.0	-7.7	-7.7	-7.7
55	-1.4	-1.4	-1.4	-4.6	-4.6	-4.6	-7.0	-7.0	-7.0
50	-1.2	-1.2	-1.2	-4.1	-4.1	-4.1	-6.1	-6.1	-6.1
45	-0.9	-0.9	-0.9	-3.5	-3.5	-3.5	-5.2	-5.2	-5.2
40	-0.5	-0.5	-0.5	-2.9	-2.9	-2.9	-4.2	-4.2	-4.2

V1(MCG) Limit Weight (1000 KG)

AVAILABLE FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1000	47.2	32.6							
1200	79.8	66.2	52.2	31.0					
1400		97.6	84.4	53.9	38.4				
1600				78.8	61.9	45.9	33.7		
1800					87.5	70.1	47.5	34.1	
2000						96.4	62.7	47.9	34.4
2200							79.9	63.1	48.2
2400							99.3	80.4	63.5
2600								99.8	80.8
2800									100.2

1. **Enter Weight Adjustment table with reported braking action and 24K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Max allowable slippery runway limited weight is lesser of weights from 1 and 2.**

ADVISORY INFORMATION

Slippery Runway Takeoff (24K 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
85	-5	-4	-3	-14	-13	-12	-25	-24	-23
80	-6	-5	-4	-15	-14	-13	-26	-25	-24
75	-7	-6	-5	-16	-15	-14	-28	-27	-26
70	-8	-7	-6	-18	-17	-16	-30	-29	-28
65	-9	-8	-7	-19	-18	-17	-32	-31	-30
60	-9	-8	-7	-21	-20	-19	-34	-33	-32
55	-10	-9	-8	-22	-21	-20	-36	-35	-34
50	-11	-10	-9	-23	-22	-21	-37	-36	-35
45	-12	-11	-10	-24	-23	-22	-39	-38	-37
40	-12	-11	-10	-25	-24	-23	-39	-38	-37

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

24K 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
95	-1.4	-1.4	-1.4	-8.0	-8.0	-8.0	-14.2	-14.2	-14.2
90	-1.7	-1.7	-1.7	-7.9	-7.9	-7.9	-13.6	-13.6	-13.6
85	-1.9	-1.9	-1.9	-7.8	-7.8	-7.8	-13.1	-13.1	-13.1
80	-2.2	-2.2	-2.2	-7.7	-7.7	-7.7	-12.4	-12.4	-12.4
75	-2.3	-2.3	-2.3	-7.5	-7.5	-7.5	-11.8	-11.8	-11.8
70	-2.4	-2.4	-2.4	-7.2	-7.2	-7.2	-11.0	-11.0	-11.0
65	-2.4	-2.4	-2.4	-6.8	-6.8	-6.8	-10.3	-10.3	-10.3
60	-2.3	-2.3	-2.3	-6.4	-6.4	-6.4	-9.4	-9.4	-9.4
55	-2.1	-2.1	-2.1	-5.9	-5.9	-5.9	-8.5	-8.5	-8.5
50	-1.9	-1.9	-1.9	-5.3	-5.3	-5.3	-7.6	-7.6	-7.6
45	-1.7	-1.7	-1.7	-4.6	-4.6	-4.6	-6.6	-6.6	-6.6
40	-1.3	-1.3	-1.3	-3.9	-3.9	-3.9	-5.5	-5.5	-5.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1000	32.8								
1200	71.9	55.0	36.4						
1400		90.2	74.9						
1600				50.2					
1800				83.2	60.8	37.4			
2000					93.3	71.2			
2200						103.3			
2400							45.3		
2600							67.2	39.3	
2800							92.8	60.4	33.6
3000								84.8	53.9
3200									77.1
3400									103.8

1. **Enter Weight Adjustment table with reported braking action and 24K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 m/+40 m 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 (24K 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
95	-4	-2	0	-15	-13	-10	-31	-28	-26
90	-5	-3	0	-16	-14	-11	-32	-30	-27
85	-6	-4	-1	-17	-15	-12	-34	-31	-29
80	-7	-5	-2	-19	-16	-14	-36	-33	-31
75	-8	-6	-3	-20	-18	-15	-38	-35	-33
70	-9	-7	-4	-22	-20	-17	-40	-38	-35
65	-11	-8	-6	-24	-22	-19	-43	-41	-38
60	-12	-9	-7	-26	-24	-21	-46	-43	-41
55	-13	-10	-8	-28	-26	-23	-48	-46	-43
50	-14	-11	-9	-30	-28	-25	-50	-48	-45
45	-15	-12	-10	-31	-29	-26	-52	-49	-47
40	-15	-13	-10	-32	-30	-27	-53	-50	-48

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K 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	90.3	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
55	91.0	91.6	92.0	92.0	92.0	91.9	91.9	91.9	92.0	91.9	91.7	91.3	90.8
50	91.8	92.4	92.8	92.8	92.8	92.7	92.7	92.7	92.7	92.6	92.6	92.2	91.8
45	92.6	93.2	93.6	93.6	93.6	93.6	93.5	93.5	93.5	93.4	93.3	93.1	92.8
40	93.4	94.0	94.4	94.4	94.4	94.3	94.3	94.2	94.2	94.1	94.1	94.0	93.8
35	94.2	94.8	95.2	95.2	95.2	95.1	95.1	95.0	95.0	94.9	94.8	94.8	94.7
30	93.8	95.0	96.1	96.0	96.0	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
25	93.1	94.3	95.4	95.9	96.4	96.7	96.7	96.6	96.6	96.5	96.4	96.4	96.3
20	92.3	93.5	94.6	95.1	95.7	96.3	96.9	97.6	97.5	97.5	97.4	97.3	97.2
15	91.6	92.7	93.8	94.3	94.9	95.5	96.1	96.8	97.5	98.2	98.6	98.6	98.5
10	90.8	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
5	90.0	91.2	92.2	92.8	93.3	93.9	94.5	95.2	95.9	96.7	97.4	98.4	99.3
0	89.2	90.4	91.4	92.0	92.5	93.1	93.7	94.4	95.1	95.9	96.7	97.6	98.5
-5	88.4	89.6	90.6	91.2	91.7	92.3	92.9	93.6	94.3	95.1	95.9	96.8	97.7
-10	87.6	88.8	89.8	90.4	90.9	91.5	92.1	92.8	93.5	94.3	95.1	96.1	97.0
-15	86.8	88.0	89.0	89.5	90.0	90.6	91.3	92.0	92.7	93.5	94.3	95.3	96.2
-20	86.0	87.1	88.2	88.7	89.2	89.8	90.5	91.2	91.9	92.6	93.5	94.5	95.4
-25	85.2	86.3	87.3	87.9	88.4	89.0	89.6	90.3	91.0	91.8	92.6	93.7	94.6
-30	84.4	85.5	86.5	87.0	87.5	88.1	88.8	89.5	90.2	91.0	91.8	92.9	93.8
-35	83.5	84.6	85.6	86.2	86.6	87.3	87.9	88.6	89.3	90.1	91.0	92.1	93.0
-40	82.7	83.8	84.8	85.3	85.8	86.4	87.0	87.8	88.5	89.3	90.1	91.2	92.2
-45	81.8	82.9	83.9	84.4	84.9	85.5	86.2	86.9	87.6	88.4	89.3	90.4	91.4
-50	81.0	82.0	83.0	83.5	84.0	84.6	85.3	86.0	86.7	87.5	88.4	89.5	90.5

%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	0.8	0.9	1.0

Assumed Temperature Reduced Thrust (24K Derate)
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	73	71	69	67	65	63	61	59	57	55		
35	67	67	67	67	65	63	61	59	57	55	53	
30	64	61	62	61	61	61	61	59	57	55	53	51
25	64	61	59	57	56	56	57	57	57	55	53	51
20	64	61	59	57	56	54	53	53	53	53	52	51
15	64	61	59	57	56	54	53	52	50	49	48	47
10 & BELOW	64	61	59	57	56	54	53	52	50	48	45	43

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	88.3	88.6	89.1	89.6	90.2	90.8	91.5	92.2	92.7	93.1	93.3	93.4
70	89.1	89.5	89.4	89.3	89.6	90.1	90.8	91.6	92.0	92.5	92.6	92.7
65	90.0	90.4	90.3	90.2	90.2	90.1	90.2	90.9	91.4	91.8	91.9	92.1
60	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
55	91.6	92.0	92.0	92.0	91.9	91.9	91.9	92.0	91.9	91.7	91.3	90.8
50	92.4	92.8	92.8	92.8	92.7	92.7	92.7	92.7	92.6	92.6	92.2	91.8
45	93.2	93.6	93.6	93.6	93.6	93.5	93.5	93.5	93.4	93.3	93.1	92.8
40	94.0	94.4	94.4	94.4	94.3	94.3	94.2	94.2	94.1	94.1	94.0	93.8
35	94.8	95.2	95.2	95.2	95.1	95.1	95.0	95.0	94.9	94.8	94.8	94.7
30	95.0	96.1	96.0	96.0	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
25	94.3	95.4	95.9	96.4	96.7	96.7	96.6	96.6	96.5	96.4	96.4	96.3
20	93.5	94.6	95.1	95.7	96.3	96.9	97.6	97.5	97.5	97.4	97.3	97.2
15	92.7	93.8	94.3	94.9	95.5	96.1	96.8	97.5	98.2	98.6	98.6	98.5
10	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 1.0.

Assumed Temperature Reduced Thrust (24K 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	12.1													
100	11.3	8.5												
90	11.7	8.9												
80	12.5	8.0	5.5											
70	11.3	8.4	5.9	5.6	4.0									
60	9.7	9.2	4.8	4.7	4.4	4.2	2.6							
50	7.8	7.9	5.3	3.5	3.3	3.6	3.0	2.7	1.2					
40		6.4	6.0	5.5	3.7	3.2	3.7	3.0	2.8	3.0	3.7			
30		4.6	4.6	4.6	4.5	4.3	4.2	4.0	4.1	4.0	3.9	3.8	3.7	
20			3.1	3.1	3.1	3.0	2.9	2.9	2.8	2.7	2.7	2.6	2.6	2.5
10			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3
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 (22K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
80	162	163	165	156	156	159									
76	158	158	162	152	152	156									
72	153	154	158	147	147	152	146	146	150	142	142	147			
68	148	149	155	142	143	149	141	141	147	138	138	144			
64	143	144	151	138	138	145	136	137	143	134	134	140	131	131	138
60	138	139	147	132	133	141	131	132	139	128	129	136	126	126	134
56	132	133	142	127	128	137	126	126	135	123	124	132	121	121	130
52	127	127	138	122	122	132	121	121	131	118	118	128	116	116	126
48	121	121	133	116	116	128	115	115	126	112	113	124	110	110	122
44	115	115	128	110	111	123	109	109	122	107	107	119	105	105	117
40	108	108	123	104	104	118	103	103	117	100	101	115	98	99	113

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						5	5						-3	-3					
60	140	4	4	5	6				4	4	5	6				-2	-3	-3	-4			
50	122	2	3	4	5	6	7	8	2	3	4	5	6	7	8	-1	-2	-2	-3	-3	-4	-5
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	7	-1	-1	-1	-2	-3	-3	-4
30	86	0	0	1	2	3	5	6	0	0	1	2	3	5	6	0	0	-1	-1	-2	-3	-3
20	68	0	0	0	1	2	3	5	0	0	1	1	2	3	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	0	1	2	2	3	0	0	1	1	2	3	3	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
80	-3	-2	0	1	1	-1	-1	0	0	0	1	1	1
76	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
72	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
68	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
64	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
60	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
56	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
52	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
48	-1	0	0	0	1	-1	-1	0	0	0	1	1	1
44	0	0	0	0	1	-1	-1	0	0	0	1	1	1
40	0	0	0	0	1	-1	-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	87	85					
60	140	87	85	84	83			
50	122	89	87	84	83	81	79	77
40	104	94	91	88	85	82	79	77
30	86	96	96	93	89	86	82	79
20	68	97	96	94	93	90	86	82
-60	-76	98	98	96	94	91	89	87

Takeoff Speeds - Wet Runway (22K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
80	157	163	165	150	156	159									
76	152	158	162	146	152	156									
72	147	154	158	141	147	152	141	146	150	138	142	147			
68	142	149	155	136	143	149	136	141	147	133	138	144			
64	136	144	151	131	138	145	130	137	143	127	134	140	126	131	138
60	131	139	147	125	133	141	125	132	139	122	129	136	120	126	134
56	125	133	142	120	128	137	119	126	135	116	124	132	115	121	130
52	119	127	138	114	122	132	113	121	131	111	118	128	109	116	126
48	113	121	133	108	116	128	108	115	126	105	113	124	103	110	122
44	107	115	128	102	111	123	102	109	122	99	107	119	98	105	117
40	100	108	123	96	104	118	95	103	117	93	101	115	92	99	113

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	8	8						5	5						-3	-3					
60	140	6	6	7	9				4	4	5	6				-2	-3	-3	-4			
50	122	4	4	5	6	8	10	11	2	3	4	5	6	7	8	-1	-2	-2	-3	-3	-4	-5
40	104	1	2	3	4	6	8	9	1	2	3	4	5	6	7	-1	-1	-1	-2	-3	-3	-4
30	86	0	0	1	2	4	6	7	0	0	1	2	3	5	6	0	0	-1	-1	-2	-3	-3
20	68	0	0	0	1	2	4	5	0	0	1	1	2	3	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	0	1	2	3	4	0	0	1	1	2	3	3	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
80	-5	-3	0	3	5	-3	-2	-1	0	1	1	2	2
76	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	2
72	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	2
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
64	-3	-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	3	-4	-2	-1	0	1	2	2	3
52	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
48	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
44	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	3
40	-2	-1	0	1	2	-5	-3	-2	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	87	85					
60	140	87	85	84	83			
50	122	89	87	84	83	81	79	77
40	104	94	91	88	85	82	79	77
30	86	96	96	93	89	86	82	79
20	68	97	96	94	93	90	86	82
-60	-76	98	98	96	94	91	89	87

Maximum Allowable Clearway (22K Derate)

FIELD LENGTH (M)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1200	150
1600	180
2000	210
2400	240
2800	270
3200	290

Clearway and Stopway V1 Adjustments (22K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
200	-3	-3	-3	-2				
100	-2	-2	-2	-1				
0	0	0	0	0	0	0	0	0
-100	1	1	1	1	3	2	1	1
-200	1	1	1	1	7	4	1	1
-300	1	1	1	1	9	4	2	1

Use of clearway not allowed on wet runways.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	8	10	16	21	26	30	33	35	36
85	8 1/2	8 1/2	8 1/2	7 1/2	6 3/4	6	5 1/2	5	4 3/4	4 1/2
80	8 1/2	8 1/2	8 1/4	7 1/4	6 1/2	5 3/4	5	4 3/4	4 1/4	4 1/4
75	8 1/4	8	7 3/4	7	6 1/4	5 1/2	4 3/4	4 1/4	4	3 3/4
70	8	7 3/4	7 1/2	6 3/4	6	5 1/4	4 1/2	4 1/4	3 3/4	3 3/4
65	7 3/4	7 1/2	7 1/4	6 1/2	5 3/4	5	4 1/2	4	3 3/4	3 1/2
60	7 1/2	7 1/4	7	6 1/4	5 1/2	5	4 1/4	3 3/4	3 1/2	3 1/4
55	7 1/4	7 1/4	6 3/4	6	5 1/2	4 3/4	4	3 1/2	3 1/4	3 1/4
50	7	6 3/4	6 1/2	5 3/4	5	4 1/4	3 3/4	3 1/4	3	3
45	6 3/4	6 1/2	6 1/4	5 1/2	4 3/4	4	3 1/2	3	2 3/4	2 3/4
40	6 3/4	6 1/2	6 1/4	5 1/2	4 3/4	4	3 1/2	3	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. %MAC									
	6	8	10	16	21	26	30	33	35	36
85	8 1/2	8 1/2	8 1/2	6 3/4	5 1/2	4 1/2	3 3/4	3 1/4	2 3/4	2 1/2
80	8 1/2	8 1/2	8 1/2	6 3/4	5 3/4	4 3/4	3 3/4	3 1/4	2 3/4	2 1/2
75	8 1/2	8 1/2	8 1/4	6 1/2	5 1/2	4 1/2	3 1/2	3	2 1/2	2 1/2
70	8 1/2	8 1/4	7 3/4	6 1/4	5 1/4	4 1/4	3 1/4	2 3/4	2 1/4	2 1/4
65	8 1/4	7 3/4	7 1/4	5 3/4	4 3/4	3 3/4	3	2 1/2	2 1/4	2 1/4
60	7 3/4	7 1/4	6 3/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4
55	7	6 3/4	6 1/4	5 1/4	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4
50	6 1/2	6 1/4	5 3/4	4 3/4	4	3	2 1/4	2 1/4	2 1/4	2 1/4
45	6	5 3/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4
40	6	5 3/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
95	-12.9	-14.9	-16.9	-16.6	-18.6	-20.6	-31.8	-33.8	-35.8
90	-11.9	-13.9	-15.9	-15.2	-17.2	-19.2	-27.5	-29.5	-31.5
85	-10.9	-12.9	-14.9	-13.8	-15.8	-17.8	-23.3	-25.3	-27.3
80	-10.0	-12.0	-14.0	-12.3	-14.3	-16.3	-19.4	-21.4	-23.4
75	-9.0	-11.0	-13.0	-10.9	-12.9	-14.9	-16.0	-18.0	-20.0
70	-8.0	-10.0	-12.0	-9.5	-11.5	-13.5	-13.1	-15.1	-17.1
65	-7.1	-9.1	-11.1	-8.3	-10.3	-12.3	-10.7	-12.7	-14.7
60	-6.3	-8.3	-10.3	-7.2	-9.2	-11.2	-8.8	-10.8	-12.8
55	-5.5	-7.5	-9.5	-6.2	-8.2	-10.2	-7.4	-9.4	-11.4
50	-4.6	-6.6	-8.6	-5.1	-7.1	-9.1	-6.5	-8.5	-10.5
45	-3.8	-5.8	-7.8	-4.1	-6.1	-8.1	-6.1	-8.1	-10.1
40	-3.0	-5.0	-7.0	-3.0	-5.0	-7.0	-6.2	-8.2	-10.2

V1(MCG) Limit Weight (1000 KG)

AVAILABLE FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1200	36.2			39.2			44.3	32.5	
1400	57.9	44.4	31.6	60.6	47.4	34.7	65.4	52.2	40.0
1600	81.4	66.8	52.9	84.0	69.5	55.7	89.5	74.4	60.5
1800		91.1	76.0		93.7	78.6		99.5	83.9
2000			100.9			103.3			

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 2.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
85	-13	-11	-9	-7	-5	-3	0	0	0
80	-14	-12	-10	-7	-5	-3	0	0	0
75	-15	-13	-11	-8	-6	-4	0	0	0
70	-16	-14	-12	-10	-8	-6	0	0	0
65	-17	-15	-13	-12	-10	-8	-1	0	0
60	-19	-17	-15	-14	-12	-10	-5	-3	-1
55	-20	-18	-16	-17	-15	-13	-9	-7	-5
50	-21	-19	-17	-18	-16	-14	-12	-10	-8
45	-21	-19	-17	-19	-17	-15	-14	-12	-10
40	-21	-19	-17	-19	-17	-15	-16	-14	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
95	-16.1	-19.5	-22.9	-20.3	-23.7	-27.1	-33.9	-37.3	-40.7
90	-14.8	-18.2	-21.6	-18.4	-21.8	-25.2	-29.6	-33.0	-36.4
85	-13.4	-16.8	-20.2	-16.4	-19.8	-23.2	-25.2	-28.6	-32.0
80	-12.2	-15.6	-19.0	-14.6	-18.0	-21.4	-21.2	-24.6	-28.0
75	-10.9	-14.3	-17.7	-12.9	-16.3	-19.7	-17.7	-21.1	-24.5
70	-9.8	-13.2	-16.6	-11.3	-14.7	-18.1	-14.7	-18.1	-21.5
65	-8.7	-12.1	-15.5	-9.9	-13.3	-16.7	-12.2	-15.6	-19.0
60	-7.7	-11.1	-14.5	-8.6	-12.0	-15.4	-10.3	-13.7	-17.1
55	-6.8	-10.2	-13.6	-7.4	-10.8	-14.2	-8.8	-12.2	-15.6
50	-5.9	-9.3	-12.7	-6.4	-9.8	-13.2	-7.7	-11.1	-14.5
45	-5.0	-8.4	-11.8	-5.3	-8.7	-12.1	-6.7	-10.1	-13.5
40	-4.1	-7.5	-10.9	-4.3	-7.7	-11.1	-5.7	-9.1	-12.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1400				30.9			44.3		
1600	51.3			57.8	35.1		70.0	48.0	
1800	80.5	56.1	31.5	87.3	62.4	39.4	103.8	74.9	51.9
2000		85.2	60.8		92.3	67.0			80.1
2200			89.9			97.3			

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 m/+30 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for available field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
95	-9	-7	-4	0	0	0	0	0	0
90	-12	-10	-7	0	0	0	0	0	0
85	-15	-12	-10	-3	-1	0	0	0	0
80	-17	-15	-12	-7	-5	-2	0	0	0
75	-19	-17	-14	-11	-8	-6	0	0	0
70	-21	-19	-16	-14	-11	-9	0	0	0
65	-23	-21	-18	-17	-14	-12	0	0	0
60	-25	-22	-20	-19	-17	-14	-6	-4	-1
55	-26	-23	-21	-22	-19	-17	-12	-10	-7
50	-27	-24	-22	-24	-21	-19	-16	-14	-11
45	-28	-25	-23	-25	-23	-20	-20	-17	-15
40	-28	-26	-23	-27	-24	-22	-22	-19	-17

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

22K 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
95	0.0	0.0	0.0	-4.6	-4.6	-4.6	-10.0	-10.0	-10.0
90	0.0	0.0	0.0	-4.9	-4.9	-4.9	-9.8	-9.8	-9.8
85	-0.3	-0.3	-0.3	-5.1	-5.1	-5.1	-9.6	-9.6	-9.6
80	-0.7	-0.7	-0.7	-5.3	-5.3	-5.3	-9.4	-9.4	-9.4
75	-1.1	-1.1	-1.1	-5.3	-5.3	-5.3	-9.1	-9.1	-9.1
70	-1.3	-1.3	-1.3	-5.3	-5.3	-5.3	-8.7	-8.7	-8.7
65	-1.4	-1.4	-1.4	-5.1	-5.1	-5.1	-8.2	-8.2	-8.2
60	-1.4	-1.4	-1.4	-4.9	-4.9	-4.9	-7.7	-7.7	-7.7
55	-1.4	-1.4	-1.4	-4.6	-4.6	-4.6	-7.1	-7.1	-7.1
50	-1.2	-1.2	-1.2	-4.1	-4.1	-4.1	-6.4	-6.4	-6.4
45	-0.9	-0.9	-0.9	-3.6	-3.6	-3.6	-5.6	-5.6	-5.6
40	-0.5	-0.5	-0.5	-2.9	-2.9	-2.9	-4.7	-4.7	-4.7

V1(MCG) Limit Weight (1000 KG)

AVAILABLE FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1000	53.4	38.9							
1200	85.4	72.1	58.3	36.4					
1400		103.0	89.9	60.3	44.1				
1600				86.3	68.6	52.0	37.8		
1800					95.2	77.2	52.5	38.1	
2000						104.1	68.9	52.9	38.5
2200							87.9	69.3	53.2
2400								88.4	69.8
2600									88.9

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Max allowable slippery runway limited weight is lesser of weights from 1 and 2.**

ADVISORY INFORMATION

Slippery Runway Takeoff (22K 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
85	-5	-4	-3	-13	-12	-11	-24	-23	-22
80	-5	-4	-3	-14	-13	-12	-24	-23	-22
75	-6	-5	-4	-15	-14	-13	-25	-24	-23
70	-7	-6	-5	-16	-15	-14	-27	-26	-25
65	-8	-7	-6	-17	-16	-15	-29	-28	-27
60	-9	-8	-7	-19	-18	-17	-31	-30	-29
55	-10	-9	-8	-21	-20	-19	-33	-32	-31
50	-10	-9	-8	-22	-21	-20	-35	-34	-33
45	-11	-10	-9	-23	-22	-21	-37	-36	-35
40	-11	-10	-9	-23	-22	-21	-37	-36	-35

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

22K 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
95	0.0	0.0	0.0	-7.7	-7.7	-7.7	-12.0	-12.0	-12.0
90	0.0	0.0	0.0	-7.8	-7.8	-7.8	-11.7	-11.7	-11.7
85	-0.4	-0.4	-0.4	-7.8	-7.8	-7.8	-11.5	-11.5	-11.5
80	-0.9	-0.9	-0.9	-7.8	-7.8	-7.8	-11.2	-11.2	-11.2
75	-1.3	-1.3	-1.3	-7.6	-7.6	-7.6	-10.8	-10.8	-10.8
70	-1.6	-1.6	-1.6	-7.4	-7.4	-7.4	-10.3	-10.3	-10.3
65	-1.8	-1.8	-1.8	-7.1	-7.1	-7.1	-9.8	-9.8	-9.8
60	-1.9	-1.9	-1.9	-6.7	-6.7	-6.7	-9.1	-9.1	-9.1
55	-1.9	-1.9	-1.9	-6.2	-6.2	-6.2	-8.3	-8.3	-8.3
50	-1.8	-1.8	-1.8	-5.6	-5.6	-5.6	-7.5	-7.5	-7.5
45	-1.5	-1.5	-1.5	-4.9	-4.9	-4.9	-6.5	-6.5	-6.5
40	-1.2	-1.2	-1.2	-4.1	-4.1	-4.1	-5.5	-5.5	-5.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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
1000	41.9								
1200	78.9	60.2	39.1						
1400		94.1	76.7						
1600				62.1	35.7				
1800				94.5	70.0	44.1			
2000					102.0	77.8			
2200							35.6		
2400							57.1		
2600							82.0	48.8	
2800								72.2	40.9
3000								99.6	63.1
3200									89.2

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -40 m/+35 m 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 (22K 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
95	-5	-3	0	-17	-14	-12	-32	-30	-27
90	-6	-3	-1	-17	-14	-12	-32	-30	-27
85	-6	-4	-1	-17	-14	-12	-32	-30	-27
80	-7	-4	-2	-17	-15	-12	-33	-30	-28
75	-8	-5	-3	-18	-16	-13	-35	-32	-30
70	-9	-6	-4	-20	-18	-15	-37	-34	-32
65	-10	-7	-5	-22	-20	-17	-40	-37	-35
60	-11	-8	-6	-24	-22	-19	-43	-40	-38
55	-12	-9	-7	-26	-24	-21	-45	-43	-40
50	-13	-10	-8	-28	-26	-23	-48	-45	-43
45	-13	-11	-8	-30	-27	-25	-49	-47	-44
40	-14	-11	-9	-31	-28	-26	-50	-48	-45

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K 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	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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 (22K Derate)

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	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 0.9.

Assumed Temperature Reduced Thrust (22K 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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3
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	90.2	90.5	90.4	90.6	90.4	92.1	93.8	95.1	95.2	93.5
55	91.0	91.2	91.3	91.4	90.8	91.5	93.1	94.4	94.5	92.8
50	91.7	92.0	92.1	92.2	91.7	91.5	92.4	93.7	93.8	92.1
45	92.4	92.6	92.8	93.0	92.6	92.4	92.4	93.0	93.1	91.4
40	93.1	93.3	93.6	93.8	93.4	93.2	93.2	92.3	92.4	90.7
35	93.6	94.0	94.3	94.5	94.3	94.0	94.0	93.0	92.4	90.8
30	92.9	94.8	95.0	95.2	95.1	94.8	94.7	93.9	93.3	91.8
25	92.2	94.8	95.7	95.9	95.9	95.5	95.4	94.7	94.1	92.8
20	91.4	94.0	96.5	96.7	96.6	96.2	96.1	95.4	94.9	93.7
15	90.6	93.2	95.9	97.5	97.4	96.9	96.7	96.2	95.7	94.6
10	89.9	92.5	95.1	97.8	98.3	97.7	97.4	96.9	96.5	95.6
5	89.1	91.7	94.3	97.0	99.2	98.6	98.1	97.7	97.3	96.5
0	88.3	90.9	93.5	96.2	98.6	99.6	99.1	98.5	98.2	97.5
-5	87.6	90.1	92.7	95.4	97.8	99.6	100.0	99.2	99.0	98.4
-10	86.8	89.3	91.9	94.6	97.1	98.8	100.3	100.2	99.8	99.4
-15	86.0	88.5	91.0	93.8	96.3	98.0	99.6	101.1	100.8	100.4
-20	85.2	87.6	90.2	93.0	95.5	97.2	98.7	100.8	101.3	101.0
-25	84.3	86.8	89.4	92.2	94.7	96.4	97.9	100.0	100.5	100.1
-30	83.5	86.0	88.5	91.3	93.9	95.6	97.1	99.1	99.6	99.3
-35	82.7	85.1	87.7	90.5	93.1	94.8	96.3	98.3	98.8	98.4
-40	81.8	84.3	86.8	89.6	92.3	93.9	95.4	97.4	97.9	97.6

%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	95.0	96.2	96.8									
52	125	55	95.9	96.7	96.6	96.8	97.5							
47	116	50	96.6	97.6	97.8	97.8	97.7	97.5	98.2	98.8				
42	108	45	97.4	98.4	98.5	98.6	98.7	98.8	98.7	98.5	98.5	99.0		
37	99	40	98.0	99.1	99.2	99.3	99.4	99.5	99.6	99.5	99.1	98.9	98.8	99.1
32	90	35	98.1	99.9	100.0	100.1	100.1	100.3	100.3	100.2	99.9	99.6	99.6	99.5
27	81	30	97.3	99.8	100.4	100.7	100.7	100.7	100.7	100.7	100.6	100.4	100.4	100.3
22	72	25	96.6	99.1	99.7	100.2	100.6	100.9	100.9	100.9	100.9	100.9	100.9	100.8
17	63	20	95.8	98.3	98.9	99.5	99.8	100.2	100.5	100.9	101.0	101.1	101.0	101.0
12	54	15	95.0	97.5	98.1	98.7	99.1	99.4	99.8	100.1	100.5	100.9	101.3	101.2
7	45	10	94.2	96.8	97.4	98.0	98.3	98.7	99.0	99.4	99.8	100.2	100.5	100.9
2	36	5	93.4	96.0	96.6	97.2	97.6	97.9	98.3	98.7	99.0	99.4	99.8	100.2
-3	27	0	92.6	95.2	95.8	96.4	96.8	97.2	97.5	97.9	98.3	98.7	99.0	99.4
-8	18	-5	91.8	94.4	95.0	95.6	96.0	96.4	96.8	97.2	97.5	97.9	98.3	98.6
-13	9	-10	91.0	93.6	94.2	94.8	95.2	95.6	96.0	96.4	96.8	97.1	97.5	97.9
-17	1	-15	90.2	92.8	93.4	94.0	94.4	94.8	95.2	95.6	96.0	96.4	96.7	97.1
-22	-8	-20	89.3	92.0	92.6	93.2	93.6	94.0	94.4	94.8	95.2	95.6	95.9	96.3
-27	-17	-25	88.5	91.1	91.8	92.4	92.8	93.2	93.6	94.0	94.4	94.8	95.1	95.5
-32	-26	-30	87.6	90.3	90.9	91.6	92.0	92.4	92.8	93.3	93.6	94.0	94.3	94.7
-37	-35	-35	86.8	89.4	90.1	90.7	91.1	91.6	92.0	92.4	92.8	93.2	93.5	93.9
-42	-44	-40	85.9	88.6	89.2	89.9	90.3	90.7	91.2	91.6	92.0	92.4	92.7	93.0
-47	-53	-45	85.0	87.7	88.4	89.0	89.4	89.9	90.3	90.8	91.2	91.5	91.9	92.2
-52	-62	-50	84.1	86.8	87.5	88.2	88.6	89.0	89.5	90.0	90.3	90.7	91.0	91.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
A/C HIGH	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

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**			
	V/S (FT/MIN)	1700	1000			
30000	PITCH ATT	**4.0**	**3.5**	**3.5**	**3.5**	**4.0**
	V/S (FT/MIN)	2500	1900	1400	1100	800
20000	PITCH ATT	**7.0**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3200	2600	2100	1700
10000	PITCH ATT	**10.5**	**9.0**	**8.5**	**8.0**	**7.5**
	V/S (FT/MIN)	5600	4400	3600	3000	2500
SEA LEVEL	PITCH ATT	**14.0**	**12.0**	**11.0**	**10.0**	**9.5**
	V/S (FT/MIN)	6700	5300	4300	3600	3100

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	84	87	92		
35000	PITCH ATT	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	82	83	86	89	94
30000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	85	87
25000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	80	81	83
20000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	74	74	76	77	79
15000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	70	71	72	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**	**-1.0**	**-0.5**	**0.0**	**0.0**
	V/S (FT/MIN)	-2900	-2600	-2600	-2900	-3400
30000	PITCH ATT	**-2.0**	**-1.0**	**0.0**	**1.0**	**1.5**
	V/S (FT/MIN)	-2400	-2100	-1900	-1800	-1900
20000	PITCH ATT	**-2.0**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN)	-2200	-1900	-1700	-1700	-1700
10000	PITCH ATT	**-2.5**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN	-2000	-1700	-1500	-1500	-1500
SEA LEVEL	PITCH ATT	**-2.5**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN)	-1800	-1500	-1400	-1300	-1300

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	**5.0**	**5.0**	**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**	**4.5**	**5.0**	**5.5**	**5.5**	**6.0**
(VREF40 + 50)	%N1	52	57	61	65	69
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF40 + 30)	%N1	52	58	63	67	70
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF40 + 20)	%N1	60	66	71	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**	**2.0**	**2.0**	**2.0**	**2.5**	**2.5**
(VREF15 + 10)	%N1	44	49	53	56	59
FLAPS 30	**PITCH ATT**	**0.5**	**0.5**	**1.0**	**1.0**	**1.0**
(VREF30 + 10)	%N1	48	53	58	61	65
FLAPS 40	**PITCH ATT**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**0.0**
(VREF40 + 10)	%N1	53	59	64	68	71

Performance Inflight — Chapter PI
All Engine — Section 31

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°)
85	30300	-5	32800*	32800*	32800*	32100	30700
80	31600	-8	34400*	34400*	34400*	33400	32000
75	33000	-11	35900*	35900*	35900*	34800	33400
70	34500	-15	37300*	37300*	37300*	36200	34900
65	36000	-18	38700*	38700*	38700*	37800	36400
60	37700	-18	40200*	40200*	40200*	39400	38100
55	39500	-18	41000	41000	41000	41000	39900
50	41000	-18	41000	41000	41000	41000	41000
45	41000	-18	41000	41000	41000	41000	41000
40	41000	-18	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°)
85	30300	0	30600*	30600*	30600*	30600*	30600*
80	31600	-3	32900*	32900*	32900*	32900*	32000
75	33000	-6	34800*	34800*	34800*	34800	33400
70	34500	-9	36300*	36300*	36300*	36200	34900
65	36000	-13	37800*	37800*	37800*	37800	36400
60	37700	-13	39200*	39200*	39200*	39200*	38100
55	39500	-13	40800*	40800*	40800*	40800*	39900
50	41000	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	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°)
85	30300	6	27500*	27500*	27500*	27500*	27500*
80	31600	3	30000*	30000*	30000*	30000*	30000*
75	33000	0	32800*	32800*	32800*	32800*	32800*
70	34500	-3	34900*	34900*	34900*	34900*	34900
65	36000	-7	36500*	36500*	36500*	36500*	36400
60	37700	-7	38000*	38000*	38000*	38000*	38000*
55	39500	-7	39500*	39500*	39500*	39500*	39500*
50	41000	-7	41000	41000	41000	41000	41000
45	41000	-7	41000	41000	41000	41000	41000
40	41000	-7	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)								
		25	27	29	31	33	35	37	39	41
85	%N1	86.2	87.5	88.6	90.0	92.6				
	MACH	.752	.771	.782	.792	.794				
	KIAS	316	311	303	294	282				
	FF/ENG	1625	1616	1597	1596	1623				
80	%N1	84.8	86.3	87.4	88.7	90.4	94.1			
	MACH	.732	.759	.774	.785	.794	.792			
	KIAS	307	306	300	291	282	269			
	FF/ENG	1526	1530	1516	1499	1507	1562			
75	%N1	83.2	84.9	86.2	87.4	88.7	90.8			
	MACH	.707	.741	.764	.778	.789	.795			
	KIAS	296	298	295	288	280	270			
	FF/ENG	1419	1437	1436	1414	1405	1419			
70	%N1	81.5	83.2	84.8	86.1	87.2	88.7	91.8		
	MACH	.682	.714	.747	.768	.781	.791	.795		
	KIAS	284	287	288	285	277	269	258		
	FF/ENG	1316	1331	1347	1338	1315	1313	1344		
65	%N1	79.7	81.3	83.0	84.6	85.9	87.1	89.1	93.4	
	MACH	.658	.687	.721	.752	.771	.783	.793	.793	
	KIAS	274	275	277	278	273	266	257	246	
	FF/ENG	1216	1227	1243	1252	1239	1218	1231	1284	
60	%N1	78.1	79.4	81.0	82.7	84.3	85.6	87.2	89.9	
	MACH	.639	.660	.690	.725	.755	.773	.785	.794	
	KIAS	265	263	265	267	267	262	254	246	
	FF/ENG	1130	1126	1138	1151	1156	1140	1135	1155	
55	%N1	76.4	77.6	78.9	80.6	82.3	83.9	85.5	87.6	90.5
	MACH	.621	.639	.661	.692	.727	.757	.774	.786	.795
	KIAS	257	255	252	254	256	256	250	243	235
	FF/ENG	1050	1040	1037	1046	1057	1060	1054	1055	1076
50	%N1	74.6	75.8	77.0	78.3	80.0	81.8	83.7	85.8	87.9
	MACH	.602	.619	.638	.659	.691	.727	.757	.774	.786
	KIAS	249	246	243	241	242	245	244	239	232
	FF/ENG	976	959	951	946	952	962	971	972	973
45	%N1	72.3	73.8	75.0	76.2	77.5	79.2	81.3	83.8	85.8
	MACH	.575	.597	.616	.635	.656	.687	.723	.755	.773
	KIAS	238	237	234	232	229	230	232	232	228
	FF/ENG	895	885	871	862	854	858	872	888	901
40	%N1	69.7	71.2	72.7	74.0	75.3	76.5	78.5	81.0	83.5
	MACH	.545	.567	.590	.611	.630	.650	.679	.714	.749
	KIAS	224	224	224	222	219	217	217	219	220
	FF/ENG	809	820	811	797	784	774	778	795	813

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversions

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
303	275	251	231	215	200	190	180	172	164	158
457	415	378	348	322	300	285	271	258	247	236
611	554	505	464	430	400	380	362	345	329	315
766	695	632	581	538	500	475	452	431	411	394
922	835	760	698	646	600	570	542	517	494	473
1078	976	887	815	754	700	665	632	603	576	552
1235	1118	1015	932	862	800	760	722	688	658	630
1392	1259	1144	1049	970	900	854	812	774	739	709
1550	1402	1272	1167	1078	1000	949	902	859	821	787
1709	1545	1401	1285	1186	1100	1044	992	945	903	865
1869	1688	1531	1402	1295	1200	1139	1082	1031	984	943
2029	1832	1661	1521	1403	1300	1234	1173	1117	1067	1022
2190	1976	1790	1639	1512	1400	1328	1263	1203	1148	1100
2352	2121	1920	1757	1620	1500	1423	1352	1288	1230	1178
2514	2266	2050	1875	1729	1600	1518	1442	1373	1311	1256
2677	2411	2181	1994	1837	1700	1612	1532	1459	1393	1333
2841	2558	2312	2112	1946	1800	1707	1622	1544	1474	1411
3006	2705	2443	2232	2055	1900	1802	1712	1629	1555	1489
3172	2852	2576	2351	2164	2000	1896	1801	1715	1637	1567

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	1.4	0:44	1.2	0:42	1.0	0:39	0.9	0:38	0.8	0:36
300	2.1	1:05	1.9	1:02	1.6	0:57	1.5	0:54	1.3	0:53
400	2.8	1:26	2.6	1:22	2.2	1:15	2.0	1:11	1.8	1:09
500	3.6	1:48	3.2	1:42	2.8	1:34	2.5	1:29	2.3	1:25
600	4.3	2:09	3.9	2:02	3.4	1:52	3.1	1:46	2.8	1:41
700	5.0	2:31	4.6	2:22	4.0	2:10	3.6	2:03	3.3	1:58
800	5.7	2:52	5.2	2:43	4.6	2:29	4.2	2:20	3.8	2:14
900	6.4	3:14	5.9	3:03	5.2	2:48	4.7	2:38	4.3	2:31
1000	7.1	3:36	6.5	3:24	5.7	3:06	5.2	2:55	4.8	2:47
1100	7.8	3:59	7.2	3:45	6.3	3:25	5.8	3:13	5.3	3:04
1200	8.5	4:21	7.8	4:06	6.9	3:44	6.3	3:31	5.8	3:20
1300	9.2	4:44	8.5	4:27	7.5	4:04	6.8	3:49	6.3	3:37
1400	9.9	5:06	9.1	4:48	8.0	4:23	7.3	4:07	6.8	3:54
1500	10.5	5:29	9.7	5:10	8.6	4:42	7.8	4:25	7.2	4:11
1600	11.2	5:52	10.4	5:32	9.1	5:02	8.4	4:43	7.7	4:28
1700	11.9	6:16	11.0	5:53	9.7	5:21	8.9	5:01	8.2	4:45
1800	12.6	6:39	11.6	6:15	10.3	5:41	9.4	5:19	8.7	5:02
1900	13.2	7:03	12.2	6:37	10.8	6:01	9.9	5:38	9.1	5:19
2000	13.9	7:27	12.8	7:00	11.4	6:21	10.4	5:57	9.6	5:36

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)				
	40	50	60	70	80
2	-0.1	0.0	0.2	0.3	0.5
3	-0.2	0.0	0.3	0.5	0.8
4	-0.2	0.0	0.4	0.7	1.1
5	-0.3	0.0	0.5	0.9	1.4
6	-0.4	0.0	0.6	1.1	1.7
7	-0.5	0.0	0.7	1.3	2.0
8	-0.5	0.0	0.8	1.5	2.3
9	-0.6	0.0	0.8	1.7	2.6
10	-0.7	0.0	0.9	1.9	2.9
11	-0.7	0.0	1.0	2.1	3.2
12	-0.8	0.0	1.1	2.3	3.5
13	-0.8	0.0	1.2	2.5	3.8
14	-0.9	0.0	1.3	2.7	4.0

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
548	510	477	448	423	400	382	366	351	337	325
821	765	715	672	634	600	574	549	527	506	487
1094	1021	955	897	846	800	765	733	703	675	650
1369	1277	1194	1122	1058	1000	957	916	879	844	813
1645	1534	1434	1347	1270	1200	1148	1099	1054	1013	976
1921	1791	1674	1572	1482	1400	1339	1282	1230	1182	1139
2199	2049	1914	1797	1694	1600	1530	1465	1406	1351	1301
2476	2307	2154	2022	1906	1800	1721	1648	1581	1519	1463
2755	2565	2395	2248	2118	2000	1913	1831	1756	1688	1625
3034	2825	2636	2473	2330	2200	2103	2014	1931	1855	1786
3315	3085	2878	2700	2542	2400	2294	2196	2106	2023	1948
3597	3346	3121	2926	2755	2600	2485	2378	2280	2190	2108
3880	3608	3364	3153	2968	2800	2676	2560	2454	2357	2269
4165	3872	3608	3381	3181	3000	2866	2742	2628	2524	2429
4451	4135	3852	3608	3394	3200	3057	2924	2802	2690	2588
4739	4400	4097	3836	3607	3400	3247	3106	2975	2856	2747
5028	4666	4343	4064	3820	3600	3438	3287	3149	3022	2907
5318	4933	4589	4293	4034	3800	3628	3468	3321	3187	3065
5610	5202	4836	4523	4248	4000	3818	3649	3494	3352	3224
5903	5471	5084	4752	4462	4200	4008	3830	3666	3517	3382
6199	5741	5332	4982	4676	4400	4198	4011	3839	3682	3540
6496	6013	5582	5213	4890	4600	4388	4191	4011	3846	3698
6794	6286	5832	5443	5105	4800	4578	4372	4183	4011	3855
7095	6560	6083	5675	5320	5000	4768	4553	4355	4175	4012

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	1.8	1:08	1.7	1:07	1.7	1:05	1.6	1:03	1.6	1:01
600	2.8	1:40	2.7	1:38	2.6	1:36	2.5	1:32	2.4	1:29
800	3.8	2:13	3.6	2:10	3.5	2:07	3.4	2:02	3.3	1:58
1000	4.7	2:45	4.6	2:42	4.4	2:37	4.3	2:32	4.2	2:26
1200	5.7	3:18	5.5	3:14	5.3	3:09	5.1	3:02	5.0	2:55
1400	6.6	3:52	6.4	3:47	6.2	3:40	6.0	3:32	5.8	3:24
1600	7.6	4:25	7.3	4:19	7.1	4:12	6.9	4:03	6.7	3:53
1800	8.5	4:59	8.2	4:52	8.0	4:44	7.7	4:34	7.5	4:23
2000	9.4	5:32	9.1	5:25	8.9	5:16	8.6	5:05	8.3	4:52
2200	10.4	6:07	10.0	5:59	9.7	5:49	9.4	5:37	9.2	5:23
2400	11.3	6:41	10.9	6:32	10.6	6:22	10.3	6:09	10.0	5:53
2600	12.2	7:16	11.8	7:06	11.4	6:55	11.1	6:41	10.8	6:24
2800	13.1	7:52	12.7	7:40	12.3	7:28	11.9	7:14	11.6	6:55
3000	14.0	8:27	13.6	8:14	13.1	8:01	12.7	7:46	12.3	7:27
3200	14.9	9:04	14.4	8:49	14.0	8:35	13.5	8:19	13.1	7:59
3400	15.8	9:40	15.3	9:24	14.8	9:09	14.3	8:52	13.9	8:31
3600	16.7	10:17	16.1	10:00	15.6	9:43	15.1	9:25	14.6	9:03
3800	17.5	10:55	16.9	10:36	16.4	10:18	15.9	9:59	15.4	9:36
4000	18.4	11:32	17.8	11:12	17.2	10:53	16.6	10:33	16.2	10:08
4200	19.3	12:11	18.6	11:49	18.0	11:28	17.4	11:07	16.9	10:41
4400	20.1	12:50	19.4	12:26	18.8	12:04	18.2	11:41	17.6	11:15
4600	20.9	13:29	20.2	13:04	19.5	12:40	18.9	12:16	18.3	11:48
4800	21.8	14:09	21.0	13:42	20.3	13:17	19.6	12:51	19.1	12:22
5000	22.6	14:49	21.8	14:20	21.1	13:53	20.4	13:26	19.8	12:56

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
2	-0.1	0.0	0.3	0.8	1.9
4	-0.2	0.0	0.5	1.4	3.3
6	-0.4	0.0	0.7	2.1	4.5
8	-0.6	0.0	1.0	2.6	5.6
10	-0.7	0.0	1.2	3.2	6.6
12	-0.9	0.0	1.5	3.7	7.5
14	-1.1	0.0	1.7	4.1	8.2
16	-1.3	0.0	1.9	4.5	8.8
18	-1.5	0.0	2.1	4.9	9.3
20	-1.7	0.0	2.3	5.3	9.7
22	-1.9	0.0	2.5	5.6	9.9
24	-2.2	0.0	2.7	5.9	10.0

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)									
	85	80	75	70	65	60	55	50	45	40
41						12	2	0	6	18
39				24	10	2	0	5	16	32
37			18	7	1	1	5	15	29	48
35	25	12	4	0	1	6	15	27	44	65
33	7	2	0	2	7	16	27	42	61	82
31	1	0	3	9	17	28	42	58	77	99
29	1	5	11	19	30	43	58	75	94	116
27	7	14	22	32	44	58	74	91	111	132
25	17	25	35	47	60	74	90	107	126	147

The above wind factor tables are 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	101	118	130	137
39000	25	330	96	112	124	132
37000	24	330	92	107	119	127
35000	24	320	88	102	113	121
33000	23	320	84	98	109	116
31000	22	310	80	93	103	110
29000	21	310	75	87	96	103
27000	20	300	70	82	90	96
25000	19	290	66	76	84	90
23000	18	280	61	71	78	83
21000	17	270	57	65	72	76
19000	16	260	52	60	66	70
17000	15	250	48	55	60	63
15000	14	240	43	49	54	57
10000	10	200	30	34	36	38
5000	7	150	18	19	20	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
85	%N1	65.1	67.7	71.6	75.6	79.9	84.1	88.4		
	KIAS	252	253	254	255	257	259	263		
	FF/ENG	1540	1520	1510	1500	1480	1490	1540		
80	%N1	63.4	66.2	69.9	74.0	78.3	82.6	86.8	94.0	
	KIAS	244	245	246	247	249	251	254	250	
	FF/ENG	1460	1430	1420	1410	1390	1400	1430	1560	
75	%N1	61.6	64.7	68.3	72.5	76.5	81.0	85.1	90.2	
	KIAS	236	238	238	239	241	243	246	249	
	FF/ENG	1370	1350	1340	1330	1300	1300	1330	1400	
70	%N1	59.8	62.8	66.6	70.6	74.7	79.2	83.4	88.0	
	KIAS	229	229	230	231	233	234	236	240	
	FF/ENG	1290	1270	1250	1240	1220	1210	1230	1280	
65	%N1	58.1	60.7	64.9	68.6	72.9	77.3	81.5	85.9	
	KIAS	221	221	222	223	224	225	227	230	
	FF/ENG	1210	1190	1170	1150	1140	1120	1140	1170	
60	%N1	56.2	58.7	62.9	66.7	71.0	75.2	79.5	83.9	
	KIAS	211	212	213	214	215	216	218	220	
	FF/ENG	1130	1110	1090	1070	1050	1030	1050	1060	
55	%N1	54.2	56.7	60.5	64.6	68.7	73.0	77.4	81.7	89.8
	KIAS	202	203	203	204	205	207	208	210	214
	FF/ENG	1050	1030	1010	990	970	950	950	970	1050
50	%N1	52.0	54.5	58.1	62.4	66.2	70.7	75.0	79.4	86.9
	KIAS	192	193	194	195	195	197	198	200	203
	FF/ENG	970	950	920	910	890	870	880	890	940
45	%N1	49.6	52.1	55.7	59.6	63.8	68.0	72.2	76.8	84.0
	KIAS	185	185	185	185	185	186	187	189	192
	FF/ENG	900	870	840	840	820	810	790	800	840
40	%N1	47.1	49.5	53.0	56.7	61.1	65.0	69.4	73.9	81.1
	KIAS	178	178	178	178	178	178	178	178	180
	FF/ENG	840	810	780	760	740	730	720	710	740

This table includes additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Advisory Information — Section 32

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	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 ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	945	70/-55	20	-35	115	10	-10	20	-20	65	20	40
MAX AUTO	1225	70/-70	25	-45	145	5	-5	30	-30	105	0	0
AUTOBRAKE 3	1745	120/-115	45	-75	250	5	-5	45	-45	175	0	0
AUTOBRAKE 2	2240	170/-170	65	-100	340	35	-40	65	-65	185	75	75
AUTOBRAKE 1	2465	200/-195	80	-115	400	65	-70	70	-70	175	240	325

Good Reported Braking Action

MAX MANUAL	1310	85/-80	35	-55	200	30	-25	30	-30	90	70	165
MAX AUTO	1445	90/-85	35	-60	205	30	-25	35	-35	100	75	175
AUTOBRAKE 3	1750	120/-115	45	-75	250	10	-10	45	-45	175	5	15
AUTOBRAKE 2	2240	170/-170	65	-100	340	35	-40	65	-65	185	75	75

Medium Reported Braking Action

MAX MANUAL	1800	135/-130	55	-90	330	75	-60	45	-45	120	200	490
MAX AUTO	1885	135/-130	55	-90	330	80	-60	45	-50	125	205	500
AUTOBRAKE 3	1935	140/-135	55	-95	340	60	-40	50	-50	175	135	425
AUTOBRAKE 2	2290	175/-170	70	-110	385	60	-55	65	-65	185	115	245

Poor Reported Braking Action

MAX MANUAL	2360	220/-180	75	-135	520	190	-125	65	-65	150	430	1185
MAX AUTO	2450	190/-180	75	-135	520	190	-125	65	-65	150	430	1185
AUTOBRAKE 3	2450	190/-180	75	-135	520	185	-120	65	-65	160	430	1185
AUTOBRAKE 2	2545	200/-195	80	-145	540	170	-110	70	-70	185	350	1040

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	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 ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	900	60/-50	20	-35	110	10	-10	20	-20	65	15	35
MAX AUTO	1145	65/-60	25	-40	140	5	-5	25	-25	100	0	0
AUTOBRAKE 3	1610	105/-105	40	-70	235	5	-5	45	-45	165	0	0
AUTOBRAKE 2	2065	150/-150	60	-95	325	30	-35	55	-55	170	65	65
AUTOBRAKE 1	2270	175/-175	70	-110	385	60	-65	65	-65	160	200	280

Good Reported Braking Action

MAX MANUAL	1250	80/-75	30	-55	195	30	-25	30	-30	95	65	145
MAX AUTO	1370	80/-80	35	-55	200	30	-25	30	-30	100	70	160
AUTOBRAKE 3	1615	105/-105	40	-70	240	10	-10	45	-45	165	5	15
AUTOBRAKE 2	2065	150/-150	60	-95	325	30	-35	55	-55	170	65	65

Medium Reported Braking Action

MAX MANUAL	1695	120/-120	50	-90	320	75	-60	45	-45	120	175	425
MAX AUTO	1770	125/-120	50	-90	320	75	-60	45	-45	120	180	435
AUTOBRAKE 3	1810	125/-120	50	-90	330	60	-40	45	-50	165	130	385
AUTOBRAKE 2	2115	155/-155	60	-105	370	55	-55	55	-60	170	100	215

Poor Reported Braking Action

MAX MANUAL	2195	175/-165	70	-130	505	180	-115	60	-60	140	370	995
MAX AUTO	2280	175/-165	70	-130	505	180	-115	60	-60	140	370	1000
AUTOBRAKE 3	2280	175/-165	70	-130	505	180	-115	60	-60	150	375	1000
AUTOBRAKE 2	2360	185/-175	75	-135	520	160	-105	65	-65	170	305	880

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 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	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 ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	860	55/-45	15	-30	110	10	-10	15	-15	65	15	30
MAX AUTO	1070	60/-55	20	-40	135	5	-5	25	-25	95	0	0
AUTOBRAKE 3	1485	100/-95	35	-65	225	5	-5	40	-40	160	0	0
AUTOBRAKE 2	1910	140/-135	55	-90	315	25	-30	50	-50	175	35	35
AUTOBRAKE 1	2115	165/-160	65	-105	370	50	-60	60	-60	160	155	205

Good Reported Braking Action

MAX MANUAL	1195	75/-75	30	-55	190	30	-25	30	-30	95	60	135
MAX AUTO	1300	80/-75	30	-55	195	30	-25	30	-30	100	65	140
AUTOBRAKE 3	1490	100/-95	35	-65	230	10	-10	40	-40	160	5	15
AUTOBRAKE 2	1910	140/-135	55	-90	315	25	-30	50	-50	175	35	35

Medium Reported Braking Action

MAX MANUAL	1610	115/-110	45	-85	315	75	-55	40	-40	120	160	385
MAX AUTO	1675	115/-115	45	-85	315	75	-55	40	-40	120	160	385
AUTOBRAKE 3	1700	120/-115	45	-90	320	60	-40	45	-45	160	135	365
AUTOBRAKE 2	1960	145/-140	55	-100	355	50	-45	50	-55	175	75	185

Poor Reported Braking Action

MAX MANUAL	2080	165/-155	65	-130	495	175	-115	55	-55	140	335	885
MAX AUTO	2165	165/-155	65	-130	495	175	-115	55	-55	140	335	885
AUTOBRAKE 3	2165	165/-155	65	-130	495	175	-115	55	-55	145	335	890
AUTOBRAKE 2	2215	170/-165	65	-135	510	155	-100	60	-60	170	270	795

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 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M): REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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	1225	170/-70	45/TBS	-45	205	20	-20	105
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1515	90/-95	40/TBS	-75	270	45	-40	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1025	70/-55	25/TBS	-35	125	15	-15	85
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	990	65/-55	20/TBS	-35	125	15	-10	90
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	950	60/-50	20/TBS	-35	120	15	-10	90
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1065	55/-60	25/TBS	-40	140	15	-15	75
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1310	80/-80	35/TBS	-50	175	25	-25	125
LEADING EDGE FLAPS TRANSIT	VREF15+15	1060	75/-60	25/TBS	-35	125	10	-10	70
ONE ENGINE INOPERATIVE	VREF15	955	70/-55	20/TBS	-35	120	10	-10	65
STABILIZER TRIM INOPERATIVE	VREF15	945	70/-55	20/TBS	-35	120	10	-10	65

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 (305 m 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 DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/TBS	-35	110	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/TBS	-35	120	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1050	85/-60	25/TBS	-35	130	10	-10	70
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/TBS	-35	110	10	-10	65
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/TBS	-35	120	10	-10	65
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	945	70/-55	20/TBS	-35	120	10	-10	65
TRAILING EDGE FLAPS UP	VREF40+40	1110	110/-65	30/TBS	-40	165	15	-10	70

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 (305 m 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 (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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
ALL FLAPS UP	VREF40+55	1660	90/-95	45/TBS	-65	225	35	-30	85
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1685	110/-110	45/TBS	-85	330	65	-55	125
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1485	95/-100	40/TBS	-60	225	40	-35	130
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1410	90/-90	40/TBS	-60	220	40	-35	130
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1340	85/-85	35/TBS	-60	215	40	-35	130
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1350	85/-85	35/TBS	-60	205	30	-25	100
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1590	105/-110	45/TBS	-65	235	45	-40	150
LEADING EDGE FLAPS TRANSIT	VREF15+15	1475	90/-90	40/TBS	-60	215	35	-30	95
ONE ENGINE INOPERATIVE	VREF15	1350	80/-85	35/TBS	-60	210	35	-30	100
STABILIZER TRIM INOPERATIVE	VREF15	1295	80/-80	35/TBS	-55	200	30	-25	90

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 (305 m 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 (M): REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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	1250	80/-75	30/TBS	-55	195	30	-25	95
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/TBS	-55	200	30	-25	90
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1435	80/-85	40/TBS	-60	210	30	-25	90
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/TBS	-55	195	30	-25	95
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/TBS	-55	200	30	-25	90
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1295	80/-80	35/TBS	-55	200	30	-25	90
TRAILING EDGE FLAPS UP	VREF40+40	1510	80/-85	40/TBS	-60	215	30	-30	85

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 (305 m 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 (M): REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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	2340	150/-155	75/TBS	-100	375	85	-75	120
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2130	155/-155	65/TBS	-130	515	150	-105	145
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2030	155/-150	65/TBS	-100	365	95	-80	165
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1905	140/-140	60/TBS	-95	355	90	-75	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1795	130/-130	55/TBS	-95	345	85	-70	160
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1845	135/-130	55/TBS	-90	340	80	-65	130
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2160	165/-165	70/TBS	-105	380	110	-90	190
LEADING EDGE FLAPS TRANSIT	VREF15+15	2020	140/-140	60/TBS	-95	355	80	-70	125
ONE ENGINE INOPERATIVE	VREF15	1930	135/-140	55/TBS	-100	360	90	-75	135
STABILIZER TRIM INOPERATIVE	VREF15	1770	125/-125	50/TBS	-90	330	70	-60	120

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 (305 m 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 (M) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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	1695	120/-120	50/TBS	-90	320	75	-60	120
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/TBS	-90	330	70	-60	120
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1985	130/-135	60/TBS	-95	350	80	-65	120
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/TBS	-90	320	75	-60	120
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/TBS	-90	330	70	-60	120
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1770	125/-125	50/TBS	-90	330	70	-60	120
TRAILING EDGE FLAPS UP	VREF40+40	2110	135/-140	65/TBS	-100	360	80	-70	115

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 (305 m 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 (M) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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	3090	220/-225	110/TBS	-155	590	200	-150	150
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2815	225/-215	85/TBS	-210	955	515	-245	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2620	220/-210	90/TBS	-145	570	205	-150	190
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	2435	195/-190	80/TBS	-140	555	190	-140	180
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2285	180/-175	75/TBS	-135	540	185	-135	175
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	2390	190/-185	80/TBS	-135	540	170	-130	155
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2775	235/-225	100/TBS	-155	590	225	-165	215
LEADING EDGE FLAPS TRANSIT	VREF15+15	2615	200/-200	90/TBS	-140	555	180	-135	150
ONE ENGINE INOPERATIVE	VREF15	2635	205/-205	85/TBS	-155	595	225	-160	170
STABILIZER TRIM INOPERATIVE	VREF15	2295	180/-175	75/TBS	-135	525	160	-120	140

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 (305 m 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 (M) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 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	2195	175/-165	70/TBS	-130	505	180	-115	140
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/TBS	-135	525	160	-120	140
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2595	190/-190	85/TBS	-140	555	175	-130	145
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/TBS	-130	505	180	-115	140
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/TBS	-135	525	160	-120	140
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	2295	180/-175	75/TBS	-135	525	160	-120	140
TRAILING EDGE FLAPS UP	VREF40+40	2780	200/-200	95/TBS	-145	565	185	-140	145

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 (305 m 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
	0	15.1	16.9	19.1	22.3	25.3	29.0	30.7	35.1	40.4	40.1	46.0	53.1	50.4	57.8	66.7	60.5	69.2	79.9
	10	15.6	17.4	19.7	23.1	26.2	30.0	31.8	36.3	41.8	41.5	47.5	54.9	52.1	59.7	68.9	62.5	71.5	82.5
	15	15.8	17.7	20.0	23.4	26.6	30.4	32.3	36.9	42.5	42.2	48.3	55.8	53.0	60.7	70.1	63.5	72.7	83.8
80	20	16.0	17.9	20.2	23.8	27.0	30.9	32.8	37.4	43.1	42.9	49.1	56.7	53.8	61.7	71.1	64.5	73.8	85.0
	30	16.3	18.3	20.7	24.3	27.6	31.7	33.6	38.4	44.3	44.0	50.4	58.2	55.2	63.3	73.1	66.2	75.8	87.4
	40	16.5	18.5	21.0	24.7	28.1	32.2	34.2	39.1	45.1	44.8	51.4	59.4	56.3	64.6	74.6	67.6	77.5	89.3
	50	16.6	18.7	21.2	24.9	28.3	32.5	34.5	39.5	45.6	45.3	52.0	60.2	57.1	65.6	75.9	68.7	78.8	91.0
	0	13.7	15.3	17.2	20.1	22.7	26.0	27.5	31.4	36.1	35.8	41.0	47.3	44.9	51.4	59.4	54.3	62.2	71.8
	10	14.1	15.7	17.7	20.8	23.5	26.8	28.4	32.4	37.3	37.0	42.3	48.9	46.4	53.1	61.3	56.1	64.2	74.1
	15	14.3	16.0	17.9	21.1	23.9	27.3	28.9	32.9	37.9	37.6	43.1	49.7	47.1	54.0	62.4	57.0	65.3	75.3
70	20	14.5	16.2	18.2	21.4	24.2	27.7	29.3	33.5	38.5	38.2	43.7	50.5	47.9	54.9	63.3	57.9	66.3	76.5
	30	14.8	16.5	18.6	21.9	24.8	28.3	30.0	34.3	39.5	39.2	44.9	51.8	49.1	56.3	65.0	59.5	68.1	78.6
	40	15.0	16.7	18.8	22.2	25.2	28.8	30.6	34.9	40.2	39.9	45.7	52.8	50.1	57.4	66.4	60.7	69.6	80.3
	50	15.1	16.8	19.0	22.4	25.4	29.1	30.8	35.3	40.6	40.3	46.3	53.5	50.7	58.2	67.4	61.5	70.6	81.7
	0	12.4	13.7	15.3	17.9	20.2	22.9	24.3	27.6	31.7	31.4	35.9	41.4	39.2	44.9	51.8	47.6	54.6	63.1
	10	12.7	14.1	15.7	18.5	20.8	23.7	25.1	28.5	32.7	32.5	37.1	42.8	40.5	46.4	53.6	49.2	56.4	65.2
	15	12.9	14.3	16.0	18.8	21.1	24.1	25.5	29.0	33.3	33.0	37.7	43.5	41.2	47.2	54.5	50.1	57.4	66.2
60	20	13.0	14.4	16.2	19.0	21.4	24.4	25.9	29.4	33.8	33.5	38.3	44.2	41.9	47.9	55.3	50.9	58.3	67.3
	30	13.3	14.7	16.5	19.4	21.9	25.0	26.5	30.2	34.6	34.4	39.3	45.3	42.9	49.2	56.8	52.2	59.8	69.1
	40	13.4	14.9	16.7	19.7	22.3	25.4	26.9	30.7	35.3	35.0	40.0	46.2	43.7	50.1	57.9	53.2	61.0	70.5
	50	13.5	15.0	16.8	19.9	22.4	25.6	27.2	31.0	35.6	35.3	40.5	46.7	44.3	50.8	58.8	53.9	61.9	71.7
	0	11.0	12.1	13.4	15.7	17.6	19.9	21.1	23.9	27.3	27.0	30.8	35.4	33.5	38.3	44.2	40.6	46.5	53.7
	10	11.3	12.4	13.8	16.2	18.2	20.5	21.8	24.6	28.2	27.9	31.8	36.6	34.6	39.6	45.7	41.9	48.0	55.4
	15	11.5	12.6	14.0	16.4	18.4	20.9	22.1	25.0	28.6	28.4	32.3	37.2	35.2	40.3	46.4	42.6	48.8	56.4
50	20	11.6	12.7	14.1	16.6	18.7	21.1	22.4	25.4	29.1	28.8	32.8	37.8	35.8	40.9	47.2	43.3	49.6	57.3
	30	11.8	13.0	14.4	17.0	19.1	21.6	22.9	26.0	29.8	29.5	33.7	38.7	36.7	42.0	48.4	44.4	50.9	58.8
	40	11.9	13.1	14.6	17.2	19.4	21.9	23.3	26.4	30.3	30.0	34.3	39.4	37.3	42.7	49.3	45.3	51.9	60.0
	50	12.0	13.2	14.7	17.3	19.5	22.1	23.5	26.7	30.6	30.3	34.6	39.9	37.7	43.2	50.0	45.8	52.6	60.8
	0	9.7	10.5	11.6	13.5	15.0	16.9	17.8	20.1	22.8	22.6	25.6	29.4	27.7	31.6	36.3	33.1	37.8	43.6
	10	10.0	10.8	11.9	13.9	15.5	17.4	18.4	20.7	23.6	23.3	26.5	30.3	28.6	32.7	37.6	34.2	39.1	45.0
	15	10.1	11.0	12.0	14.1	15.7	17.7	18.7	21.0	23.9	23.7	26.9	30.8	29.1	33.2	38.2	34.7	39.7	45.8
40	20	10.2	11.1	12.2	14.3	15.9	17.9	18.9	21.3	24.3	24.1	27.3	31.3	29.6	33.7	38.8	35.3	40.3	46.5
	30	10.3	11.2	12.4	14.6	16.2	18.3	19.3	21.8	24.9	24.6	28.0	32.1	30.3	34.6	39.8	36.2	41.4	47.7
	40	10.4	11.4	12.5	14.7	16.4	18.5	19.6	22.2	25.3	25.0	28.4	32.6	30.8	35.2	40.5	36.8	42.1	48.6
	50	10.5	11.4	12.6	14.8	16.6	18.7	19.8	22.3	25.5	25.2	28.7	33.0	31.1	35.5	41.0	37.2	42.6	49.3

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	5.5	15.6	25.4	35.0	44.6	54.6	64.9	75.7	86.9
	MAX AUTO	5.0	14.7	24.1	33.3	42.7	52.5	62.9	73.7	85.1
	AUTOBRAKE 3	4.3	13.4	21.8	29.7	37.7	46.6	56.4	67.1	78.7
	AUTOBRAKE 2	3.7	12.1	19.7	26.4	33.2	41.0	49.8	59.6	70.4
	AUTOBRAKE 1	3.1	10.9	17.8	23.6	29.2	35.8	43.1	51.2	60.2

Two Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.1	14.5	23.6	32.5	41.3	50.5	60.0	69.9	80.0
	MAX AUTO	3.7	11.9	20.0	28.1	36.4	45.5	55.3	65.8	77.0
	AUTOBRAKE 3	1.4	7.3	12.9	18.4	24.3	31.2	39.1	47.9	57.7
	AUTOBRAKE 2		4.0	7.8	11.3	15.1	19.9	25.7	32.5	40.3
	AUTOBRAKE 1		2.1	4.6	6.6	8.7	11.6	15.3	19.7	25.0

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	25	28	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	3.9	4.4	4.9	5.0 TO 7.5	7.5 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	20	30	40	50	60		

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 33

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	96.8	96.6	96.3	96.1	95.9	95.4	95.0	94.7	93.9
15	97.4	97.2	96.9	96.8	96.6	96.2	95.7	95.5	94.8
10	98.0	97.8	97.5	97.4	97.4	96.9	96.5	96.3	95.7
5	98.3	98.6	98.3	98.1	98.1	97.7	97.3	97.1	96.6
0	97.5	98.7	99.2	99.0	98.9	98.5	98.2	98.0	97.5
-5	96.7	98.0	99.1	99.8	99.7	99.3	98.9	98.7	98.4
-10	96.0	97.2	98.4	99.6	100.5	100.2	99.8	99.6	99.4
-15	95.2	96.4	97.6	98.8	100.1	101.0	100.8	100.6	100.3
-20	94.4	95.6	96.8	98.0	99.3	100.5	101.1	100.8	100.6
-25	93.6	94.9	96.0	97.2	98.5	99.7	100.2	100.0	99.8
-30	92.8	94.1	95.2	96.4	97.7	98.8	99.4	99.2	99.0
-35	92.0	93.2	94.4	95.6	96.8	98.0	98.5	98.3	98.1
-40	91.2	92.4	93.5	94.7	96.0	97.1	97.6	97.4	97.2

%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	96.6	97.6	98.5	99.4	100.2	99.6	98.8	97.6	96.3	94.7	93.2	91.8
200	.63	96.0	96.9	97.8	98.7	99.6	100.4	100.1	99.3	98.4	97.5	96.3	95.2
240	.74	95.1	96.0	96.8	97.7	98.6	99.4	100.3	100.7	100.0	99.2	98.4	97.5
280	.86	94.3	95.2	96.1	97.0	97.8	98.7	99.5	100.4	101.2	100.9	100.0	99.1
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	96.5	97.4	98.3	99.2	100.1	99.8	99.0	98.0	96.8	95.4	94.0	92.7
200	.60	96.1	97.0	97.9	98.8	99.7	100.6	100.5	99.6	98.6	97.6	96.5	95.4
240	.71	95.0	95.9	96.8	97.7	98.6	99.4	100.3	100.8	100.2	99.5	98.6	97.7
280	.82	93.8	94.6	95.5	96.4	97.3	98.1	98.9	99.8	100.6	100.3	99.5	98.8
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	97.4	98.3	99.2	100.0	100.8	100.0	99.1	97.9	96.7	95.3	93.9	92.6
200	.58	97.0	97.9	98.8	99.7	100.6	101.4	100.6	99.6	98.6	97.5	96.3	95.1
240	.68	95.9	96.8	97.7	98.5	99.4	100.2	101.1	100.9	100.2	99.4	98.4	97.4
280	.79	94.3	95.1	96.0	96.8	97.7	98.5	99.3	100.2	100.5	99.7	98.9	98.1
320	.89	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	100.3	101.1	100.7	99.8
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	97.3	98.2	99.1	100.0	100.9	101.1	100.2	99.2	98.0	96.6	95.2	93.9
200	.55	97.1	98.0	98.9	99.7	100.6	101.5	101.6	100.7	99.7	98.6	97.4	96.2
240	.66	95.6	96.5	97.4	98.3	99.1	100.0	100.8	101.3	100.5	99.8	98.8	97.8
280	.76	93.8	94.7	95.5	96.4	97.2	98.0	98.8	99.7	100.5	99.8	98.9	98.0
320	.85	92.4	93.2	94.1	94.9	95.7	96.5	97.4	98.2	98.9	99.7	99.9	99.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	98.1	99.0	99.9	100.8	101.6	101.2	100.2	99.1	97.9	96.4	95.1	93.8
200	.53	97.5	98.4	99.3	100.2	101.0	101.9	101.3	100.4	99.3	98.2	96.9	95.8
240	.63	96.3	97.1	98.0	98.9	99.7	100.5	101.4	101.1	100.2	99.2	98.3	97.2
280	.73	94.2	95.0	95.9	96.7	97.5	98.3	99.1	99.9	100.1	99.1	98.2	97.5
320	.82	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	98.5	97.6
360	.91	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	100.0	100.1

%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	98.0	98.8	99.7	100.6	101.4	102.2	101.2	100.2	99.0	97.8	96.4	95.1
200	.51	96.9	97.8	98.7	99.6	100.4	101.2	101.8	100.8	99.9	98.8	97.6	96.4
240	.60	95.6	96.5	97.4	98.2	99.1	99.9	100.7	101.3	100.4	99.4	98.5	97.5
280	.70	93.6	94.4	95.3	96.1	96.9	97.7	98.5	99.3	100.1	99.4	98.4	97.6
320	.79	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.6	97.8
360	.88	91.0	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	98.1	98.8	99.4
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.8	99.7	100.5	101.4	102.2	102.4	101.4	100.3	99.1	97.7	96.5	95.2
200	.49	97.5	98.3	99.2	100.0	100.9	101.7	101.5	100.6	99.5	98.4	97.3	96.2
240	.58	95.7	96.5	97.4	98.2	99.0	99.9	100.7	100.5	99.5	98.6	97.6	96.7
280	.67	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.5	99.5	98.6	97.6	96.9
320	.76	91.7	92.6	93.4	94.2	95.0	95.8	96.5	97.3	98.0	98.6	97.8	97.2
360	.85	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.6	98.4	98.2
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	98.6	99.5	100.4	101.2	102.1	102.9	101.9	100.8	99.6	98.4	97.1	95.8
200	.48	97.5	98.4	99.2	100.1	100.9	101.8	102.2	101.1	100.1	99.0	97.8	96.7
240	.57	95.9	96.8	97.6	98.5	99.3	100.1	100.9	101.2	100.2	99.2	98.2	97.3
280	.66	94.2	95.1	95.9	96.7	97.5	98.3	99.1	99.9	100.4	99.4	98.3	97.5
320	.75	92.1	93.0	93.8	94.6	95.4	96.2	96.9	97.7	98.5	99.2	98.6	97.8
360	.83	90.6	91.4	92.2	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	99.1	100.0	100.9	101.7	102.5	102.8	101.8	100.7	99.5	98.2	97.0	95.8
200	.46	98.4	99.3	100.1	101.0	101.8	102.6	102.3	101.2	100.0	98.9	97.8	96.8
240	.55	97.2	98.1	98.9	99.7	100.5	101.3	102.1	101.6	100.5	99.4	98.5	97.5
280	.63	95.7	96.5	97.4	98.2	99.0	99.8	100.6	101.3	101.0	99.8	98.9	98.1
320	.72	93.9	94.7	95.5	96.3	97.1	97.9	98.6	99.4	100.1	100.2	99.3	98.6
360	.80	92.2	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	99.2	99.7	99.1
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	98.7	99.5	100.4	101.2	102.0	102.8	102.5	101.5	100.4	99.2	98.0	96.8
200	.44	98.3	99.2	100.0	100.9	101.7	102.5	103.3	102.3	101.1	100.0	98.9	97.8
240	.53	97.5	98.4	99.2	100.0	100.8	101.7	102.5	103.1	101.8	100.5	99.5	98.6
280	.61	96.2	97.0	97.8	98.7	99.5	100.3	101.1	101.8	102.5	101.3	100.1	99.3
320	.69	94.7	95.5	96.3	97.1	97.9	98.7	99.5	100.2	101.0	101.7	100.9	99.9
360	.77	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	100.0	100.7	100.4

%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	98.5	99.3	100.2	101.0	101.8	102.6	101.6	100.3	99.2	98.1	97.0	95.9
200	.42	98.7	99.6	100.4	101.2	102.0	102.8	103.1	101.7	100.4	99.3	98.3	97.3
240	.51	97.8	98.7	99.5	100.3	101.1	101.9	102.7	102.5	101.1	99.9	99.0	98.1
280	.59	96.3	97.1	97.9	98.7	99.5	100.3	101.0	101.8	101.6	100.5	99.6	98.8
320	.67	94.8	95.6	96.4	97.2	97.9	98.7	99.5	100.2	101.0	100.9	100.0	99.2
360	.75	93.0	93.8	94.6	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.2	99.6
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	97.1	98.0	98.8	99.6	100.4	101.2	101.6	100.3	99.1	98.1	97.1	96.1
200	.41	98.0	98.8	99.6	100.4	101.2	102.0	102.8	102.5	101.3	100.2	99.3	98.3
240	.49	97.1	97.9	98.7	99.5	100.3	101.1	101.9	102.7	101.8	100.5	99.6	98.7
280	.57	95.6	96.4	97.2	98.0	98.8	99.6	100.3	101.1	101.8	100.9	99.8	99.0
320	.64	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.2	99.4
360	.72	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.4	99.2	99.9	99.6
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	96.6	97.4	98.2	99.0	99.8	100.6	100.4	99.1	98.0	97.1	96.2	95.3
200	.39	97.1	97.9	98.7	99.5	100.3	101.1	101.8	101.5	101.0	100.1	99.3	98.4
240	.47	96.6	97.4	98.2	99.0	99.8	100.6	101.3	101.8	101.1	100.3	99.5	98.7
280	.54	95.5	96.3	97.1	97.8	98.6	99.4	100.1	100.9	101.0	100.1	99.2	98.5
320	.62	94.1	94.9	95.7	96.5	97.2	98.0	98.7	99.5	100.2	100.3	99.5	98.8
360	.69	92.2	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.6	99.0
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	96.3	97.0	97.8	98.6	99.4	100.1	99.3	98.1	97.1	96.3	95.4	94.5
200	.38	97.1	97.9	98.7	99.5	100.3	101.0	101.5	100.8	99.8	99.0	98.2	97.3
240	.45	96.5	97.3	98.0	98.8	99.6	100.3	101.1	101.0	100.1	99.4	98.6	97.9
280	.52	95.5	96.3	97.0	97.8	98.6	99.3	100.0	100.8	100.3	99.4	98.6	98.0
320	.60	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	99.7	98.9	98.2
360	.67	92.3	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	99.4	99.1	98.5

%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	95.2	96.0	96.8	97.6	98.3	99.1	99.8	98.6	97.4	96.6	95.8	94.9
200	.36	96.0	96.7	97.5	98.3	99.0	99.8	100.5	100.5	99.4	98.5	97.8	97.0
240	.43	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.1	99.2	98.4	97.7
280	.51	94.5	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.4	99.5	98.7	98.0
320	.58	93.0	93.9	94.7	95.5	96.2	97.0	97.8	98.6	99.3	99.7	99.0	98.2
360	.65	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	99.1	98.5
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	94.9	95.7	96.4	97.2	98.0	98.8	99.2	98.3	97.4	96.6	95.9	95.1
200	.33	94.7	95.5	96.3	97.1	97.8	98.6	99.4	98.9	98.0	97.3	96.6	95.8
240	.40	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.5	98.7	97.9	97.2	96.5
280	.46	93.3	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	98.2	97.5	96.8
320	.53	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	98.7	98.4	97.7	97.1
360	.59	91.5	92.3	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.0	97.3
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.9	97.1	96.4	95.6	94.8
200	.32	94.5	95.3	96.1	96.9	97.6	98.4	99.2	98.3	97.5	96.8	96.1	95.3
240	.38	94.1	94.9	95.6	96.4	97.2	98.0	98.7	98.8	98.0	97.2	96.6	95.9
280	.45	93.2	94.0	94.8	95.6	96.4	97.2	97.9	98.7	98.3	97.5	96.9	96.2
320	.51	92.5	93.3	94.1	94.9	95.7	96.4	97.2	98.0	98.5	97.8	97.1	96.5
360	.57	91.6	92.4	93.2	94.0	94.7	95.5	96.3	97.1	97.8	98.1	97.4	96.8
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	93.9	94.7	95.4	96.2	97.0	97.8	98.5	98.2	97.4	96.7	96.0	95.2
200	.31	93.5	94.3	95.1	95.9	96.7	97.4	98.2	98.5	97.8	97.0	96.3	95.6
240	.37	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	98.1	97.3	96.6	95.9
280	.43	92.3	93.2	93.9	94.7	95.5	96.3	97.1	97.8	98.3	97.6	96.9	96.2
320	.49	91.6	92.4	93.2	94.0	94.8	95.6	96.3	97.1	97.9	97.9	97.2	96.5
360	.55	90.7	91.5	92.3	93.1	93.9	94.7	95.4	96.2	96.9	97.7	97.3	96.6

%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
85	81	270	17500	16200	15000
80	77	262	19200	18000	16700
75	72	255	20800	19800	18500
70	67	246	22300	21300	20300
65	62	238	23900	23000	22000
60	57	228	25800	24800	23900
55	53	219	28100	27100	26000
50	48	209	30300	29500	28500
45	43	198	32500	31800	30900
40	38	187	34900	34100	33300

Includes APU fuel burn.

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
139	129	120	113	106	100	95	90	86	82	78
277	257	240	225	212	200	189	180	171	164	156
416	386	360	338	318	300	284	270	257	245	235
554	515	480	450	424	400	379	360	343	327	313
693	643	600	563	529	500	474	450	428	409	391
831	772	720	675	635	600	568	540	514	491	469
969	900	840	788	741	700	663	630	600	573	548
1108	1029	960	900	847	800	758	720	686	655	626
1246	1157	1080	1012	953	900	853	810	771	736	704
1385	1286	1200	1125	1059	1000	947	900	857	818	783
1523	1414	1320	1237	1165	1100	1042	990	943	900	861
1662	1543	1440	1350	1271	1200	1137	1080	1029	982	939
1800	1672	1560	1463	1376	1300	1232	1170	1114	1064	1017
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1095
2078	1929	1800	1688	1588	1500	1421	1350	1285	1227	1174
2217	2058	1921	1800	1694	1600	1516	1440	1371	1309	1252
2356	2187	2041	1913	1800	1700	1610	1530	1457	1390	1330
2496	2317	2161	2026	1906	1800	1705	1619	1542	1472	1408

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)										
	40	45	50	55	60	65	70	75	80	85	
100	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0:17
200	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	0:34
300	1.3	1.3	1.4	1.6	1.7	1.7	1.9	2.0	2.1	2.2	0:50
400	1.7	1.8	2.0	2.2	2.3	2.4	2.6	2.8	2.9	3.1	1:07
500	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	1:24
600	2.5	2.8	3.0	3.3	3.5	3.7	4.0	4.2	4.5	4.7	1:40
700	2.9	3.2	3.5	3.8	4.1	4.3	4.6	4.9	5.2	5.5	1:57
800	3.4	3.7	4.0	4.3	4.7	5.0	5.3	5.6	6.0	6.3	2:14
900	3.8	4.1	4.5	4.9	5.3	5.6	6.0	6.4	6.7	7.1	2:30
1000	4.2	4.6	5.0	5.4	5.8	6.2	6.6	7.0	7.5	7.9	2:47
1100	4.6	5.0	5.5	5.9	6.4	6.8	7.3	7.7	8.2	8.7	3:04
1200	5.0	5.4	5.9	6.5	6.9	7.4	7.9	8.4	8.9	9.4	3:21
1300	5.3	5.9	6.4	7.0	7.5	8.0	8.6	9.1	9.7	10.2	3:37
1400	5.7	6.3	6.9	7.5	8.1	8.6	9.2	9.8	10.4	11.0	3:54
1500	6.1	6.7	7.3	8.0	8.6	9.2	9.8	10.4	11.1	11.7	4:11
1600	6.5	7.2	7.8	8.5	9.1	9.8	10.4	11.1	11.8	12.5	4:28
1700	6.9	7.6	8.3	9.0	9.7	10.3	11.1	11.8	12.5	13.2	4:45
1800	7.2	8.0	8.7	9.5	10.2	10.9	11.7	12.4	13.2	13.9	5:02

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at Long Range Cruise 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
85	13800	11300	8900
80	16100	13700	11400
75	18100	16300	14000
70	20200	18500	16300
65	21800	20600	18600
60	23400	22300	20700
55	25300	24100	22700
50	28100	26700	24800
45	30700	29700	28100
40	33200	32300	31100

With engine anti-ice on, decrease altitude capability by 2100 ft.
With engine and wing anti-ice on, decrease altitude capability by 5700 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	14	18	22	25	27	29	31
85	%N1	92.5	95.7						
	MACH	.561	.593						
	KIAS	311	306						
	FF/ENG	3152	3144						
80	%N1	90.8	94.2	98.5					
	MACH	.545	.585	.612					
	KIAS	302	302	292					
	FF/ENG	2951	2983	2973					
75	%N1	89.0	92.4	96.2					
	MACH	.528	.569	.599					
	KIAS	293	293	286					
	FF/ENG	2751	2781	2756					
70	%N1	87.1	90.6	94.1					
	MACH	.510	.551	.589					
	KIAS	282	284	281					
	FF/ENG	2552	2581	2578					
65	%N1	85.1	88.5	92.0	96.3				
	MACH	.491	.532	.574	.604				
	KIAS	271	273	274	266				
	FF/ENG	2356	2381	2394	2388				
60	%N1	82.9	86.3	89.9	93.8				
	MACH	.471	.511	.553	.590				
	KIAS	261	262	263	260				
	FF/ENG	2168	2183	2196	2192				
55	%N1	80.7	83.9	87.5	91.2	94.5	97.7		
	MACH	.453	.488	.530	.574	.597	.614		
	KIAS	250	250	252	252	247	244		
	FF/ENG	1991	1987	1998	2009	2010	2060		
50	%N1	78.3	81.4	84.9	88.5	91.7	94.0	97.1	
	MACH	.434	.466	.505	.549	.583	.596	.613	
	KIAS	240	239	240	241	241	236	233	
	FF/ENG	1822	1803	1801	1811	1831	1829	1873	
45	%N1	75.9	78.8	82.0	85.7	88.4	90.6	93.2	96.2
	MACH	.415	.444	.478	.522	.556	.578	.593	.610
	KIAS	229	227	227	229	229	229	225	222
	FF/ENG	1661	1629	1608	1615	1627	1647	1649	1683
40	%N1	73.4	76.0	79.1	82.5	85.2	87.1	89.2	91.8
	MACH	.395	.422	.453	.491	.525	.548	.571	.589
	KIAS	218	216	215	215	216	216	216	214
	FF/ENG	1506	1466	1434	1422	1432	1445	1461	1470

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
309	279	253	233	215	200	190	180	172	164	157
625	564	511	467	432	400	379	360	342	326	312
943	850	769	703	648	600	568	540	513	489	468
1263	1137	1028	939	865	800	758	719	683	652	623
1586	1426	1287	1175	1082	1000	947	898	853	813	778
1912	1717	1548	1412	1299	1200	1136	1076	1023	975	932
2240	2009	1810	1649	1517	1400	1324	1255	1192	1136	1086
2570	2304	2074	1888	1735	1600	1513	1434	1362	1297	1240
2903	2600	2337	2127	1953	1800	1702	1613	1531	1458	1393

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	2.7	1:30	2.4	1:25	2.2	1:20	2.0	1:15	1.9	1:12
600	4.0	2:14	3.7	2:07	3.4	2:00	3.1	1:52	2.9	1:46
800	5.3	3:00	4.9	2:50	4.5	2:40	4.2	2:29	4.0	2:21
1000	6.7	3:45	6.1	3:33	5.7	3:20	5.3	3:07	5.0	2:56
1200	8.0	4:32	7.3	4:17	6.8	4:01	6.3	3:45	6.0	3:31
1400	9.3	5:18	8.6	5:01	7.9	4:42	7.4	4:23	7.0	4:07
1600	10.5	6:06	9.7	5:45	9.0	5:24	8.4	5:02	7.9	4:43
1800	11.8	6:54	10.9	6:31	10.1	6:07	9.4	5:42	8.9	5:20

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)								
	40	45	50	55	60	65	70	75	80
1	-0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5
2	-0.1	-0.1	0.0	0.1	0.3	0.5	0.7	0.9	1.2
3	-0.2	-0.1	0.0	0.2	0.4	0.7	1.0	1.4	1.8
4	-0.3	-0.2	0.0	0.3	0.6	1.0	1.4	1.9	2.4
5	-0.4	-0.2	0.0	0.3	0.7	1.2	1.8	2.4	3.0
6	-0.5	-0.2	0.0	0.4	0.9	1.4	2.1	2.8	3.6
7	-0.6	-0.3	0.0	0.4	1.0	1.6	2.4	3.2	4.2
8	-0.6	-0.3	0.0	0.5	1.1	1.9	2.7	3.6	4.7
9	-0.7	-0.4	0.0	0.6	1.2	2.0	3.0	4.0	5.2
10	-0.8	-0.4	0.0	0.6	1.4	2.2	3.2	4.4	5.6
11	-0.9	-0.4	0.0	0.7	1.5	2.4	3.5	4.7	6.1
12	-1.0	-0.5	0.0	0.7	1.6	2.6	3.7	5.0	6.5
13	-1.0	-0.5	0.0	0.8	1.7	2.7	3.9	5.3	6.9
14	-1.1	-0.6	0.0	0.8	1.8	2.8	4.1	5.6	7.2

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
85	%N1	82.0	84.9	89.2	94.1				
	KIAS	252	253	254	255				
	FF/ENG	2820	2830	2850	2920				
80	%N1	80.3	83.2	87.5	92.0				
	KIAS	244	245	246	247				
	FF/ENG	2650	2650	2660	2710				
75	%N1	78.6	81.4	85.6	90.1	96.9			
	KIAS	236	238	238	239	241			
	FF/ENG	2490	2480	2480	2520	2620			
70	%N1	76.7	79.4	83.7	88.1	93.6			
	KIAS	229	229	230	231	233			
	FF/ENG	2330	2310	2310	2330	2380			
65	%N1	74.7	77.5	81.6	85.9	90.7			
	KIAS	221	221	222	223	224			
	FF/ENG	2160	2150	2130	2150	2170			
60	%N1	72.5	75.4	79.4	83.7	88.3	95.6		
	KIAS	211	212	213	214	215	216		
	FF/ENG	2000	1980	1970	1970	1980	2080		
55	%N1	70.1	73.0	77.0	81.3	85.8	91.4		
	KIAS	202	203	203	204	205	207		
	FF/ENG	1850	1820	1800	1790	1790	1840		
50	%N1	67.7	70.4	74.5	78.7	83.2	87.9	96.7	
	KIAS	192	193	194	195	195	197	198	
	FF/ENG	1690	1660	1640	1630	1620	1630	1780	
45	%N1	64.9	67.6	71.7	75.8	80.3	84.9	91.2	
	KIAS	185	185	185	185	185	186	187	
	FF/ENG	1540	1510	1480	1470	1450	1450	1510	
40	%N1	61.8	64.6	68.5	72.8	77.0	81.6	86.5	96.3
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	1380	1360	1330	1310	1280	1280	1310	1440

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

ALTERNATE MODE EEC

Alternate Mode EEC Limit Weight

PERFORMANCE LIMIT	NORMAL MODE PERFORMANCE LIMIT WEIGHT (1000 KG)										
	44	48	52	56	60	64	68	72	76	80	84
FIELD	41.8	45.6	49.5	53.3	57.0	60.8	64.2	68.4	72.2	75.9	79.8
CLIMB	41.1	44.9	48.6	52.4	56.1	60.0	63.6	67.3	71.1	74.3	78.6
OBSTACLE	41.3	45.1	48.8	52.6	56.3	60.1	63.7	67.4	71.1	74.7	78.6

Alternate Mode EEC Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
DRY V1	+1
WET V1	+2
VR	+1
V2	0

Alternate Mode EEC Max Takeoff %N1

Based on engine bleeds for packs on, engine and wing anti-ice on or off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
60	140	92.6	93.6	93.7	93.8	93.9	94.0	94.1	94.0	93.7	93.6	93.5
55	131	93.2	94.3	94.4	94.5	94.6	94.7	94.9	94.7	94.4	94.1	93.7
50	122	93.8	95.0	95.1	95.2	95.4	95.5	95.6	95.5	95.2	94.9	94.4
45	113	94.5	95.7	95.8	95.9	96.1	96.2	96.3	96.2	95.9	95.6	95.3
40	104	95.2	96.4	96.5	96.6	96.7	96.8	97.0	96.8	96.6	96.3	96.2
35	95	95.7	97.2	97.3	97.4	97.5	97.6	97.7	97.6	97.3	97.0	96.9
30	86	95.4	97.7	98.0	98.2	98.1	98.3	98.2	98.2	98.0	97.8	97.7
25	77	94.6	97.3	97.9	98.3	98.3	98.5	98.5	98.5	98.5	98.3	98.3
20	68	93.8	96.6	97.1	97.7	98.0	98.3	98.5	98.6	98.7	98.6	98.6
15	59	93.0	95.8	96.4	97.0	97.3	97.6	97.9	98.3	98.7	98.8	98.8
10	50	92.3	95.0	95.6	96.2	96.5	96.8	97.2	97.5	97.9	98.3	98.8
5	41	91.5	94.2	94.8	95.4	95.8	96.1	96.4	96.8	97.2	97.6	98.1
0	32	90.7	93.4	94.1	94.7	95.0	95.3	95.7	96.0	96.4	96.8	97.3
-5	23	89.8	92.6	93.3	93.9	94.2	94.5	94.9	95.3	95.7	96.1	96.5
-10	14	89.0	91.8	92.5	93.1	93.4	93.7	94.1	94.5	94.9	95.3	95.8
-15	5	88.2	91.0	91.7	92.3	92.6	93.0	93.4	93.7	94.1	94.5	95.0
-20	-4	87.4	90.2	90.8	91.5	91.8	92.2	92.6	93.0	93.4	93.7	94.2
-25	-13	86.5	89.4	90.0	90.7	91.0	91.4	91.8	92.2	92.6	93.0	93.4
-30	-22	85.7	88.5	89.2	89.8	90.2	90.6	91.0	91.4	91.8	92.2	92.6
-35	-31	84.8	87.7	88.3	89.0	89.4	89.7	90.2	90.6	90.9	91.3	91.8
-40	-40	83.9	86.8	87.5	88.1	88.5	88.9	89.3	89.7	90.1	90.5	90.9
-45	-49	83.1	86.0	86.6	87.3	87.7	88.1	88.5	88.9	89.3	89.7	90.1
-50	-58	82.2	86.0	85.7	86.4	86.8	87.2	87.7	88.1	88.5	88.8	89.3
-55	-67	81.3	86.0	84.9	85.6	86.0	86.4	86.8	87.2	87.6	88.0	88.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)										
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
PACKS OFF	0.7	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down — Section 35

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
85	14600	11500	8500
80	17400	14600	11700
75	20300	17600	14900
70	22800	20500	17800
65	25400	23500	20900
60	27800	26300	24400
55	30200	29000	27300
50	32300	31300	30100
45	34500	33500	32400
40	36900	36000	34900

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
80	%N1	84.8									
	MACH	.468									
	KIAS	259									
	FF/ENG	2313									
70	%N1	81.1	90.4	92.6							
	MACH	.440	.541	.557							
	KIAS	243	242	240							
	FF/ENG	2010	2004	2002							
60	%N1	76.9	86.2	88.0	89.8	92.3	95.7				
	MACH	.409	.504	.525	.544	.562	.580				
	KIAS	226	225	225	224	222	220				
	FF/ENG	1722	1694	1696	1697	1709	1756				
50	%N1	72.3	81.2	83.0	84.8	86.6	88.5	91.1	94.7		
	MACH	.376	.463	.482	.502	.523	.544	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	1443	1395	1392	1394	1403	1409	1418	1461		
40	%N1	66.6	75.3	77.0	78.8	80.5	82.3	84.2	86.1	88.6	92.5
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573
	KIAS	187	185	185	185	185	185	185	185	183	181
	FF/ENG	1184	1114	1102	1102	1108	1112	1115	1119	1125	1160

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
327	291	260	236	217	200	188	177	167	159	152
657	585	524	475	435	400	377	356	337	320	305
992	882	788	714	653	600	565	534	505	480	458
1331	1182	1055	954	872	800	754	712	674	640	610
1676	1486	1323	1195	1091	1000	942	889	842	799	762
2026	1792	1593	1436	1310	1200	1130	1066	1009	958	913
2382	2103	1865	1680	1530	1400	1318	1244	1176	1116	1064
2744	2418	2140	1924	1751	1600	1506	1420	1342	1274	1214
3112	2737	2418	2171	1972	1800	1694	1597	1510	1432	1364

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	1:24	3.8	1:20	3.6	1:17
600	7.5	2:25	7.0	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	7.4	2:31
1000	12.3	4:05	11.5	3:51	10.3	3:31	9.7	3:18	9.2	3:08
1200	14.6	4:56	13.7	4:39	12.3	4:14	11.5	3:59	11.0	3:46
1400	16.9	5:49	15.8	5:28	14.2	4:59	13.3	4:40	12.7	4:24
1600	19.1	6:43	17.9	6:19	16.1	5:44	15.1	5:22	14.4	5:04
1800	21.3	7:39	19.9	7:11	18.0	6:30	16.9	6:05	16.1	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	-1.7	-0.9	0.0	1.5	3.4
12	-2.0	-1.0	0.0	1.8	4.0
14	-2.4	-1.2	0.0	2.0	4.5
16	-2.7	-1.4	0.0	2.2	4.9
18	-3.1	-1.5	0.0	2.4	5.3
20	-3.4	-1.7	0.0	2.5	5.7
22	-3.8	-1.9	0.0	2.6	6.0

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	20	270	88
39000	20	270	84
37000	19	260	79
35000	18	260	75
33000	18	250	71
31000	17	250	67
29000	16	240	63
27000	15	240	59
25000	15	230	55
23000	14	220	51
21000	13	220	47
19000	12	210	43
17000	11	200	39
15000	11	190	35
10000	8	170	25
5000	6	130	16
1500	4	110	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
80	%N1	74.8	77.5	81.8	86.1	90.8			
	KIAS	225	225	225	225	225			
	FF/ENG	2160	2150	2140	2160	2170			
75	%N1	73.1	76.0	80.0	84.4	89.0			
	KIAS	220	220	220	220	220			
	FF/ENG	2040	2030	2010	2020	2030			
70	%N1	71.3	74.3	78.2	82.5	87.1	93.1		
	KIAS	216	216	216	216	216	216		
	FF/ENG	1920	1900	1890	1890	1890	1940		
65	%N1	69.5	72.4	76.4	80.7	85.1	90.2		
	KIAS	211	211	211	211	211	211		
	FF/ENG	1800	1780	1770	1760	1750	1780		
60	%N1	67.5	70.3	74.5	78.6	83.1	87.7	95.7	
	KIAS	204	204	204	204	204	204	204	
	FF/ENG	1680	1660	1640	1630	1620	1630	1740	
55	%N1	65.5	68.2	72.4	76.4	80.9	85.5	91.6	
	KIAS	198	198	198	198	198	198	198	
	FF/ENG	1570	1540	1520	1500	1490	1490	1550	
50	%N1	63.3	66.0	70.0	74.2	78.5	83.0	87.9	
	KIAS	192	192	192	192	192	192	192	
	FF/ENG	1450	1430	1400	1380	1360	1360	1390	
45	%N1	60.8	63.7	67.6	71.8	76.0	80.5	85.1	92.6
	KIAS	185	185	185	185	185	185	185	185
	FF/ENG	1330	1310	1290	1270	1240	1230	1250	1320
40	%N1	58.2	61.0	65.0	69.1	73.4	77.7	82.2	87.7
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	1220	1200	1170	1150	1130	1110	1120	1140

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Gear Down, Engine Inop — Section 36

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
80	76	224	3000	1300	
75	71	219	5400	4000	2000
70	67	215	7800	6400	4600
65	62	210	10200	9000	7300
60	57	204	12500	11600	10200
55	53	198	15000	14100	13200
50	48	192	17500	16700	15900
45	43	185	20100	19300	18400
40	38	178	22600	21800	21000

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 + 10°C & BELOW
75	700		
70	3800	1600	
65	6800	5200	2600
60	10000	8400	6200
55	12700	11600	9800
50	15600	14800	13700
45	18700	17800	17000
40	21800	20900	20000

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 5	7	9	11	13	15	17	19	21
70	%N1	95.5								
	MACH	.389								
	KIAS	235								
	FF/ENG	3850								
65	%N1	93.1	95.0							
	MACH	.376	.389							
	KIAS	228	227							
	FF/ENG	3544	3556							
60	%N1	90.7	92.4	94.3	97.3					
	MACH	.364	.375	.388	.402					
	KIAS	220	219	218	218					
	FF/ENG	3250	3252	3263	3326					
55	%N1	88.2	89.8	91.6	93.5	96.4				
	MACH	.351	.362	.374	.387	.400				
	KIAS	212	211	210	209	209				
	FF/ENG	2973	2961	2961	2971	3027				
50	%N1	85.7	87.2	88.7	90.5	92.3	95.1	99.5		
	MACH	.338	.348	.359	.371	.384	.398	.412		
	KIAS	204	203	202	201	200	199	198		
	FF/ENG	2714	2691	2676	2674	2684	2722	2824		
45	%N1	83.1	84.4	85.9	87.4	89.1	90.9	93.5	97.7	
	MACH	.325	.334	.344	.355	.367	.380	.393	.408	
	KIAS	196	195	193	192	191	190	189	189	
	FF/ENG	2468	2437	2412	2396	2393	2396	2411	2489	
40	%N1	80.2	81.5	82.9	84.3	85.8	87.5	89.3	91.5	95.1
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2234	2196	2164	2139	2122	2113	2106	2107	2160

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
167	148	132	119	109	100	94	88	82	78	74
341	300	266	239	218	200	187	174	164	155	147
516	454	402	361	328	300	280	261	245	231	219
692	608	537	482	438	400	373	348	326	307	291
869	763	673	603	548	500	465	434	407	383	363
1048	919	809	725	658	600	558	521	488	459	434
1228	1076	947	847	768	700	651	607	568	535	506
1410	1234	1084	970	879	800	744	693	648	610	577
1593	1392	1222	1092	989	900	836	779	729	685	648
1778	1552	1361	1215	1100	1000	929	865	809	760	719

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	1.3	0:27	1.1	0:26	1.1	0:26
200	2.6	0:53	2.4	0:50	2.4	0:48
300	4.0	1:18	3.7	1:15	3.7	1:11
400	5.3	1:44	5.0	1:39	4.9	1:35
500	6.6	2:10	6.2	2:04	6.1	1:58
600	7.9	2:37	7.5	2:29	7.3	2:22
700	9.2	3:04	8.7	2:55	8.5	2:46
800	10.5	3:31	9.9	3:20	9.7	3:10
900	11.7	3:58	11.1	3:46	10.8	3:35
1000	13.0	4:25	12.2	4:12	11.9	4:00

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
1	-0.2	-0.1	0.0	0.1	0.3
2	-0.4	-0.2	0.0	0.3	0.6
3	-0.5	-0.3	0.0	0.5	1.0
4	-0.7	-0.4	0.0	0.7	1.3
5	-0.9	-0.5	0.0	0.9	1.7
6	-1.1	-0.6	0.0	1.1	2.0
7	-1.3	-0.7	0.0	1.2	2.4
8	-1.4	-0.7	0.0	1.4	2.7
9	-1.6	-0.8	0.0	1.6	3.1
10	-1.8	-0.9	0.0	1.8	3.4
11	-2.0	-1.0	0.0	1.9	3.8
12	-2.2	-1.1	0.0	2.1	4.1
13	-2.3	-1.2	0.0	2.2	4.5

Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
80	%N1	94.1			
	KIAS	225			
	FF/ENG	4240			
75	%N1	92.1	95.5		
	KIAS	220	220		
	FF/ENG	3960	4010		
70	%N1	90.0	93.3		
	KIAS	216	216		
	FF/ENG	3680	3730		
65	%N1	88.0	91.1	97.0	
	KIAS	211	211	211	
	FF/ENG	3430	3450	3560	
60	%N1	85.8	88.8	93.6	
	KIAS	204	204	204	
	FF/ENG	3170	3180	3230	
55	%N1	83.5	86.4	91.0	98.4
	KIAS	198	198	198	198
	FF/ENG	2920	2920	2940	3110
50	%N1	80.9	83.9	88.3	93.6
	KIAS	192	192	192	192
	FF/ENG	2670	2660	2670	2730
45	%N1	78.3	81.2	85.5	90.2
	KIAS	185	185	185	185
	FF/ENG	2440	2420	2420	2450
40	%N1	75.6	78.3	82.6	87.1
	KIAS	178	178	178	178
	FF/ENG	2210	2190	2170	2180

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Text — Section 37

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 13 mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. Operation on runways with slush/standing water depths of more than 6 mm (0.25 inch) is not recommended at altitudes greater than 8,000 ft. 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.

3. The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 1 and 2.

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 8500 kg and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (M)	V1 ADJUSTMENT (KIAS)
2000	-19
2500	-16
3000	-14
3500	-12
4000	-11

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 1800 m.

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 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 1050 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 1200 m.

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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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.

Alternate Mode EEC

Introduction

This section contains performance data for airplane operation with the Electronic Engine Control (EEC) in the alternate mode (ALTN EEC switch illuminated) for applicable thrust ratings. The data includes engine bleed effects for normal air conditioning operation i.e., two packs on at normal flow all engines operating.

Operation with derate and/or assumed temperature reduced thrust is not permitted with the EEC in alternate mode.

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in alternate mode is to reduce the normal mode (ON EEC switch illuminated) performance limited weights. The Limit Weight table provides takeoff field, climb, and obstacle limit weights. To determine limit weights for operations with the EEC in alternate mode, enter the table with the limit weights for normal mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

Takeoff Speed Adjustment

Takeoff speeds for the reduced weight should be increased by the amount shown in the Takeoff Speeds Adjustment table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does not incorporate alternate mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

The alternate mode EEC thrust schedule provides equal or greater thrust than the normal mode thrust for the same thrust lever position. Thrust limit protection is not provided in alternate mode EEC and maximum rated thrust may be reached at thrust lever position less than full forward. As a result, thrust overboost may occur if the target alternate mode EEC Max Takeoff %N1 settings are not observed.

To find alternate mode EEC Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter the Alternate Mode EEC Max Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. For packs off apply the %N1 adjustment provided below the table. No %N1 adjustment is required for engine or wing anti-ice.

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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Performance Inflight — Chapter PI

General — Section 40

Takeoff Speeds - Dry Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
190	171	173	179	163	166	172	163	164	168						
180	166	168	175	158	161	168	158	159	164	154	156	161	152	152	158
170	161	163	171	153	156	164	153	154	161	149	151	157	147	148	154
160	155	158	166	148	150	160	148	149	157	144	146	153	142	143	150
150	150	152	162	143	145	155	142	144	152	139	140	149	136	137	146
140	144	146	157	137	139	151	136	138	148	133	135	145	131	132	142
130	138	139	152	131	133	146	130	131	143	127	128	140	125	126	138
120	131	132	146	125	126	141	124	125	138	121	122	135	119	120	133
110	124	125	141	118	119	135	117	118	133	114	116	130	112	113	128
100	117	118	135	112	112	129	111	111	128	108	109	125	106	106	122

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	6						5	6						-2	-3					
60	140	4	5	6	7				3	4	5	6				-2	-2	-2	-3			
50	122	2	3	4	5	6	8	9	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	8	-1	-1	-1	-2	-2	-3	-3
30	86	0	0	1	3	4	5	6	0	0	1	3	4	5	7	0	0	-1	-1	-2	-2	-3
20	68	0	0	1	2	3	4	5	0	0	1	2	3	4	6	0	0	0	-1	-1	-2	-2
-60	-76	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-4	-2	0	1	0	-2	-1	-1	0	0	0	1	1
170	-3	-2	0	1	1	-2	-1	-1	0	0	1	1	1
150	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
130	-1	-1	0	1	1	-2	-1	-1	0	0	1	1	1
110	-1	0	0	0	1	-2	-1	0	0	0	0	1	1
100	0	0	0	0	0	-2	-1	0	0	0	0	0	0

***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	89	88			
50	122	95	93	90	88	86	83	81
40	104	99	97	94	90	87	83	81
30	86	102	101	98	94	90	86	83
20	68	102	102	99	95	92	88	84
-60	-76	104	103	100	96	93	90	87

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
190	165	173	179	157	166	172	158	164	168						
180	159	168	175	151	161	168	152	159	164	148	156	161	145	152	158
170	154	163	171	146	156	164	146	154	161	142	151	157	140	148	154
160	148	158	166	140	150	160	140	149	157	136	146	153	134	143	150
150	141	152	162	134	145	155	134	144	152	131	140	149	128	137	146
140	135	146	157	128	139	151	128	138	148	125	135	145	123	132	142
130	128	139	152	122	133	146	121	131	143	119	128	140	116	126	138
120	121	132	146	115	126	141	115	125	138	112	122	135	110	120	133
110	114	125	141	108	119	135	108	118	133	105	116	130	103	113	128
100	107	118	135	101	112	129	101	111	128	98	109	125	96	106	122

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	8	9						5	6						-2	-3					
60	140	6	7	8	10				3	4	5	6				-2	-2	-2	-3			
50	122	4	4	6	7	9	11	13	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	3	5	6	8	10	1	2	3	4	5	6	8	-1	-1	-1	-2	-2	-3	-3
30	86	0	0	2	3	5	6	8	0	0	1	3	4	5	7	0	0	-1	-1	-2	-2	-3
20	68	0	0	1	2	4	6	7	0	0	1	2	3	4	6	0	0	0	-1	-1	-2	-2
-60	-76	0	0	1	2	4	6	7	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-5	-3	0	3	6	-4	-2	-1	0	1	2	2	3
180	-5	-2	0	3	6	-4	-2	-1	0	1	1	2	3
170	-5	-2	0	3	5	-4	-2	-1	0	1	1	2	3
160	-4	-2	0	2	5	-4	-2	-1	0	1	1	2	3
150	-4	-2	0	2	4	-4	-2	-1	0	1	2	2	3
140	-4	-2	0	2	4	-4	-3	-1	0	1	2	2	3
130	-3	-2	0	2	3	-4	-3	-1	0	1	2	2	3
120	-3	-1	0	2	3	-4	-3	-1	0	1	2	3	3
110	-2	-1	0	1	3	-5	-3	-1	0	1	2	3	4
100	-2	-1	0	1	2	-5	-3	-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	89	88			
50	122	95	93	90	88	86	83	81
40	104	99	97	94	90	87	83	81
30	86	102	101	98	94	90	86	83
20	68	102	102	99	95	92	88	84
-60	-76	104	103	100	96	93	90	87

Maximum Allowable Clearway

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	530
6000	650
8000	770
10000	900
12000	1020

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
800	-5	-4	-4	-3				
600	-5	-4	-3	-3				
400	-3	-3	-2	-2				
200	-2	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	1	1	1	0	2	1	1	0
-400	1	1	1	0	4	3	2	1
-600	0	1	1	0	6	4	3	1
-800	0	1	1	0	7	6	4	2

Use of clearway not allowed on wet runway.

Stab Trim Setting
Max Takeoff Thrust
Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	8	12	16	20	24	28	31	33	35	36
180	8 1/4	8	7 1/2	6 3/4	6 1/4	5 1/2	5	4 1/2	4 1/4	4	3 3/4
160	7 3/4	7 1/2	7	6 1/4	5 3/4	5 1/4	4 1/2	4 1/4	3 3/4	3 1/2	3 1/2
140	7 1/4	7	6 1/4	5 3/4	5 1/4	4 3/4	4	3 3/4	3 1/2	3 1/4	3
120	6 1/2	6 1/4	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	3	2 3/4	2 3/4
100	5 3/4	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
70	5 3/4	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)											
	6	8	12	16	20	24	25	28	31	33	35	36
180	8	7 1/2	6 3/4	6 1/4	5 1/2	4 3/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4
160	7 1/4	7	6 1/4	5 3/4	5	4 1/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4
140	6 3/4	6 1/2	5 3/4	5 1/4	4 1/2	4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
120	6	5 3/4	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
100	5 1/2	5 1/4	4 1/2	4	3 1/2	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
70	5 1/2	5 1/4	4 1/2	4	3 1/2	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4

VREF

WEIGHT (1000 LB)	FLAPS		
	40	30	15
180	155	166	177
170	151	161	171
160	146	156	166
150	141	151	161
140	139	149	159
130	134	144	153
120	129	138	147
110	123	132	140
100	117	126	134
90	111	119	127

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
30	VREF40 + 10

ADVISORY INFORMATION

Slush/Standing Water Takeoff

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-23.8	-28.8	-33.8	-29.3	-34.3	-39.3	-40.3	-45.3	-50.3
180	-22.1	-27.1	-32.1	-26.7	-31.7	-36.7	-36.0	-41.0	-46.0
170	-20.4	-25.4	-30.4	-24.0	-29.0	-34.0	-31.9	-36.9	-41.9
160	-18.5	-23.5	-28.5	-21.5	-26.5	-31.5	-28.0	-33.0	-38.0
150	-16.5	-21.5	-26.5	-18.9	-23.9	-28.9	-24.3	-29.3	-34.3
140	-14.5	-19.5	-24.5	-16.5	-21.5	-26.5	-20.8	-25.8	-30.8
130	-12.3	-17.3	-22.3	-14.0	-19.0	-24.0	-17.5	-22.5	-27.5
120	-10.0	-15.0	-20.0	-11.7	-16.7	-21.7	-14.4	-19.4	-24.4
110	-7.7	-12.7	-17.7	-9.3	-14.3	-19.3	-11.4	-16.4	-21.4
100	-5.3	-10.3	-15.3	-7.0	-12.0	-17.0	-8.5	-13.5	-18.5
90	-3.0	-8.0	-13.0	-4.7	-9.7	-14.7	-5.5	-10.5	-15.5

V1(MCG) Limit Weight (1000 LB)

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				76.3			90.1		
4600	93.6			101.7	70.0		115.2	84.0	
5000	120.2	87.2		128.2	95.2		141.3	108.9	77.9
5400	148.3	113.5	80.8	156.1	121.4	88.8	168.3	134.7	102.6
5800	177.9	141.1	106.8	185.6	149.0	114.8	196.4	161.4	128.1
6200	209.1	170.3	134.1		178.0	142.0		189.3	154.6
6600		201.3	162.9		208.5	170.6			182.2
7000			193.4			200.8			

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 -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 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 LB)	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
190	-17	-12	-7	-11	-6	-1	-2	0	0
180	-18	-13	-8	-12	-7	-2	-2	0	0
170	-19	-14	-9	-13	-8	-3	-2	0	0
160	-20	-15	-10	-15	-10	-5	-3	0	0
150	-22	-17	-12	-16	-11	-6	-5	0	0
140	-23	-18	-13	-18	-13	-8	-7	-2	0
130	-24	-19	-14	-20	-15	-10	-10	-5	0
120	-25	-20	-15	-22	-17	-12	-14	-9	-4
110	-26	-21	-16	-23	-18	-13	-18	-13	-8
100	-26	-21	-16	-24	-19	-14	-20	-15	-10
90	-26	-21	-16	-24	-19	-14	-21	-16	-11

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-29.4	-35.9	-42.4	-34.6	-41.1	-47.6	-45.8	-52.3	-58.8
180	-26.9	-33.4	-39.9	-31.4	-37.9	-44.4	-40.9	-47.4	-53.9
170	-24.6	-31.1	-37.6	-28.3	-34.8	-41.3	-36.3	-42.8	-49.3
160	-22.2	-28.7	-35.2	-25.4	-31.9	-38.4	-31.9	-38.4	-44.9
150	-19.9	-26.4	-32.9	-22.5	-29.0	-35.5	-27.8	-34.3	-40.8
140	-17.6	-24.1	-30.6	-19.7	-26.2	-32.7	-24.0	-30.5	-37.0
130	-15.4	-21.9	-28.4	-17.0	-23.5	-30.0	-20.5	-27.0	-33.5
120	-13.1	-19.6	-26.1	-14.4	-20.9	-27.4	-17.3	-23.8	-30.3
110	-11.0	-17.5	-24.0	-11.9	-18.4	-24.9	-14.3	-20.8	-27.3
100	-8.8	-15.3	-21.8	-9.5	-16.0	-22.5	-11.7	-18.2	-24.7
90	-6.6	-13.1	-19.6	-7.2	-13.7	-20.2	-9.3	-15.8	-22.3

V1(MCG) Limit Weight (1000 LB)

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							88.2		
5400				84.9			117.5	80.9	
5800	96.5			117.8	76.8		146.9	110.2	73.5
6200	132.5	87.7		151.7	109.5		176.2	139.5	102.9
6600	169.4	123.4	78.9	186.7	143.1	101.2	205.5	168.8	132.2
7000	207.5	160.1	114.4		177.8	134.6		198.2	161.5
7400		197.9	150.8			169.0			190.8
7800			188.4			204.6			

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 -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 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 LB)	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
190	-23	-16	-8	-15	-7	0	-2	0	0
180	-25	-17	-10	-16	-9	-1	-2	0	0
170	-26	-19	-11	-18	-11	-3	-3	0	0
160	-27	-20	-12	-20	-13	-5	-5	0	0
150	-29	-21	-14	-22	-15	-7	-7	0	0
140	-30	-22	-15	-24	-17	-9	-10	-3	0
130	-31	-24	-16	-26	-19	-11	-14	-7	0
120	-32	-25	-17	-29	-21	-14	-19	-12	-4
110	-33	-26	-18	-30	-23	-15	-24	-16	-9
100	-33	-26	-18	-31	-24	-16	-26	-19	-11
90	-33	-26	-18	-31	-24	-16	-27	-20	-12

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 Adjustment (1000 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-1.8	-1.8	-1.8	-13.0	-13.0	-13.0	-22.8	-22.8	-22.8
180	-2.5	-2.5	-2.5	-13.0	-13.0	-13.0	-22.1	-22.1	-22.1
170	-3.1	-3.1	-3.1	-12.8	-12.8	-12.8	-21.3	-21.3	-21.3
160	-3.4	-3.4	-3.4	-12.5	-12.5	-12.5	-20.3	-20.3	-20.3
150	-3.6	-3.6	-3.6	-12.0	-12.0	-12.0	-19.1	-19.1	-19.1
140	-3.5	-3.5	-3.5	-11.4	-11.4	-11.4	-17.9	-17.9	-17.9
130	-3.3	-3.3	-3.3	-10.6	-10.6	-10.6	-16.4	-16.4	-16.4
120	-2.9	-2.9	-2.9	-9.6	-9.6	-9.6	-14.9	-14.9	-14.9
110	-2.5	-2.5	-2.5	-8.7	-8.7	-8.7	-13.3	-13.3	-13.3
100	-2.1	-2.1	-2.1	-7.7	-7.7	-7.7	-11.7	-11.7	-11.7
90	-1.6	-1.6	-1.6	-6.7	-6.7	-6.7	-10.2	-10.2	-10.2

V1(MCG) Limit Weight (1000 LB)

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	99.9								
3800	143.8	111.0	77.5						
4200	186.8	154.7	122.0	72.7					
4600		197.4	165.4	102.3					
5000			208.0	133.1	98.5				
5400				165.9	129.2	94.8			
5800				201.1	161.7	125.3	87.1		
6200					196.6	157.5	105.3	73.7	
6600						192.1	124.5	91.6	
7000							145.0	110.0	78.2
7400							167.1	129.5	96.1
7800							191.1	150.4	114.8
8200								172.9	134.6
8600								197.5	155.8
9000									178.8
9400									203.9

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 LB)	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
190	-6	-3	-1	-15	-13	-10	-27	-25	-22
180	-7	-4	-2	-17	-14	-12	-29	-27	-24
170	-8	-5	-3	-18	-16	-13	-31	-28	-26
160	-8	-6	-3	-20	-17	-15	-33	-30	-28
150	-9	-7	-4	-21	-19	-16	-35	-32	-30
140	-10	-8	-5	-23	-20	-18	-37	-34	-32
130	-11	-9	-6	-24	-21	-19	-39	-36	-34
120	-12	-10	-7	-25	-23	-20	-40	-38	-35
110	-13	-10	-8	-27	-24	-22	-42	-39	-37
100	-14	-11	-9	-28	-25	-23	-43	-40	-38
90	-15	-12	-10	-29	-26	-24	-44	-41	-39

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 Adjustment (1000 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-3.7	-3.7	-3.7	-17.2	-17.2	-17.2	-28.7	-28.7	-28.7
180	-4.3	-4.3	-4.3	-16.9	-16.9	-16.9	-27.7	-27.7	-27.7
170	-4.8	-4.8	-4.8	-16.5	-16.5	-16.5	-26.5	-26.5	-26.5
160	-5.1	-5.1	-5.1	-15.9	-15.9	-15.9	-25.2	-25.2	-25.2
150	-5.2	-5.2	-5.2	-15.3	-15.3	-15.3	-23.8	-23.8	-23.8
140	-5.2	-5.2	-5.2	-14.5	-14.5	-14.5	-22.2	-22.2	-22.2
130	-5.0	-5.0	-5.0	-13.6	-13.6	-13.6	-20.6	-20.6	-20.6
120	-4.6	-4.6	-4.6	-12.6	-12.6	-12.6	-18.8	-18.8	-18.8
110	-4.2	-4.2	-4.2	-11.5	-11.5	-11.5	-17.0	-17.0	-17.0
100	-3.8	-3.8	-3.8	-10.5	-10.5	-10.5	-15.3	-15.3	-15.3
90	-3.4	-3.4	-3.4	-9.5	-9.5	-9.5	-13.5	-13.5	-13.5

V1(MCG) Limit Weight (1000 LB)

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	118.4	78.2							
4200	167.8	131.2	91.8						
4600		179.5	143.7						
5000			191.0						
5400				93.8					
5800				138.3	88.1				
6200				182.0	132.8	82.5			
6600					176.6	127.2			
7000						171.2			
8200							90.7		
8600							117.9	70.7	
9000							147.1	97.3	
9400							178.5	125.0	77.4
9800								154.7	104.1
10200								186.8	132.3
10600									162.5
11000									195.3

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 -160 ft/+150 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 LB)	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
190	-7	-2	0	-20	-15	-10	-37	-32	-27
180	-8	-3	0	-21	-16	-11	-40	-35	-30
170	-9	-4	0	-23	-18	-13	-42	-37	-32
160	-10	-5	0	-25	-20	-15	-45	-40	-35
150	-12	-7	-2	-27	-22	-17	-47	-42	-37
140	-13	-8	-3	-29	-24	-19	-50	-45	-40
130	-14	-9	-4	-31	-26	-21	-52	-47	-42
120	-15	-10	-5	-32	-27	-22	-54	-49	-44
110	-16	-11	-6	-34	-29	-24	-56	-51	-46
100	-17	-12	-7	-36	-31	-26	-57	-52	-47
90	-18	-13	-8	-37	-32	-27	-58	-53	-48

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	94.8	95.4	95.8	95.9	96.0	96.1	96.2	96.3	96.2	95.9	95.8	95.7	95.7
55	95.4	96.0	96.5	96.6	96.7	96.8	96.9	97.1	96.9	96.6	96.3	95.7	95.0
50	96.0	96.6	97.1	97.3	97.4	97.6	97.7	97.8	97.7	97.4	97.1	96.6	96.1
45	96.8	97.4	97.8	98.0	98.1	98.3	98.4	98.5	98.4	98.1	97.8	97.5	97.1
40	97.4	98.1	98.6	98.7	98.8	98.9	99.0	99.2	99.1	98.8	98.5	98.4	98.1
35	98.0	98.7	99.4	99.5	99.6	99.7	99.8	99.9	99.8	99.5	99.2	99.1	99.0
30	97.6	98.8	100.3	100.3	100.4	100.4	100.5	100.5	100.4	100.3	100.0	99.9	99.9
25	96.8	98.1	99.5	100.1	100.7	100.8	100.7	100.7	100.7	100.7	100.6	100.6	100.7
20	96.0	97.3	98.8	99.3	99.9	100.2	100.5	100.8	100.8	100.9	100.8	100.8	100.8
15	95.2	96.5	98.0	98.6	99.2	99.5	99.8	100.1	100.5	100.9	101.1	101.1	101.1
10	94.5	95.8	97.2	97.8	98.4	98.7	99.0	99.4	99.7	100.1	100.5	101.0	101.5
5	93.7	95.0	96.4	97.0	97.6	98.0	98.3	98.6	99.0	99.4	99.8	100.3	100.7
0	92.9	94.2	95.6	96.3	96.9	97.2	97.5	97.9	98.2	98.6	99.0	99.5	100.0
-5	92.0	93.4	94.8	95.5	96.1	96.4	96.7	97.1	97.5	97.9	98.3	98.7	99.2
-10	91.2	92.6	94.0	94.7	95.3	95.6	96.0	96.3	96.7	97.1	97.5	98.0	98.4
-15	90.4	91.7	93.2	93.9	94.5	94.8	95.2	95.6	95.9	96.3	96.7	97.2	97.6
-20	89.6	90.9	92.4	93.0	93.7	94.0	94.4	94.8	95.2	95.6	95.9	96.4	96.8
-25	88.7	90.1	91.6	92.2	92.9	93.2	93.6	94.0	94.4	94.8	95.2	95.6	96.0
-30	87.9	89.2	90.7	91.4	92.0	92.4	92.8	93.2	93.6	94.0	94.3	94.8	95.2
-35	87.0	88.4	89.9	90.5	91.2	91.6	91.9	92.4	92.8	93.1	93.5	94.0	94.4
-40	86.1	87.5	89.0	89.7	90.3	90.7	91.1	91.5	91.9	92.3	92.7	93.1	93.6
-45	85.3	86.6	88.2	88.8	89.5	89.9	90.3	90.7	91.1	91.5	91.9	92.3	92.7
-50	84.4	85.7	87.3	87.9	88.6	89.0	89.4	89.9	90.3	90.6	91.0	91.5	91.9

%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	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0

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
54	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	73	71	69	67	65	63	61	59	57	55		
35	71	71	69	67	65	63	61	59	57	55	53	
30	69	67	67	67	65	63	61	59	57	55	53	51
25	69	67	66	64	65	63	61	59	57	55	53	51
20	69	67	66	64	64	63	61	59	57	55	53	51
15	69	67	66	64	64	63	61	59	57	55	53	51
10 & BELOW	69	67	66	64	64	63	61	59	57	55	53	51

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	93.4	93.7	94.2	94.7	95.4	96.1	96.9	97.3	97.6	97.8	97.8	97.7
70	94.1	94.4	94.4	94.4	94.7	95.4	96.2	96.6	96.9	97.1	97.1	97.1
65	94.8	95.1	95.2	95.2	95.3	95.4	95.5	96.0	96.2	96.5	96.4	96.4
60	95.4	95.8	95.9	96.0	96.1	96.2	96.3	96.2	95.9	95.8	95.7	95.7
55	96.0	96.5	96.6	96.7	96.8	96.9	97.1	96.9	96.6	96.3	95.7	95.0
50	96.6	97.1	97.3	97.4	97.6	97.7	97.8	97.7	97.4	97.1	96.6	96.1
45	97.4	97.8	98.0	98.1	98.3	98.4	98.5	98.4	98.1	97.8	97.5	97.1
40	98.1	98.6	98.7	98.8	98.9	99.0	99.2	99.1	98.8	98.5	98.4	98.1
35	98.7	99.4	99.5	99.6	99.7	99.8	99.9	99.8	99.5	99.2	99.1	99.0
30	98.8	100.3	100.3	100.4	100.4	100.5	100.5	100.4	100.3	100.0	99.9	99.9
25	98.1	99.5	100.1	100.7	100.8	100.7	100.7	100.7	100.7	100.6	100.6	100.7
20	97.3	98.8	99.3	99.9	100.2	100.5	100.8	100.8	100.9	100.8	100.8	100.8
15	96.5	98.0	98.6	99.2	99.5	99.8	100.1	100.5	100.9	101.1	101.1	101.1
10	95.8	97.2	97.8	98.4	98.7	99.0	99.4	99.7	100.1	100.5	101.0	101.5
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 1.0.

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	14.9													
100	14.9	10.9												
90	14.0	11.7												
80	12.9	11.6	7.8											
70	11.2	10.7	8.6	7.8	6.3									
60	9.2	9.5	8.5	8.4	7.1	6.3	4.9							
50	7.8	7.8	7.5	7.1	6.9	7.0	5.6	4.9	3.4					
40		6.0	6.2	6.1	5.9	5.8	5.7	5.6	4.7	4.4	5.3			
30		4.6	4.6	4.6	4.6	4.5	4.4	4.3	4.3	4.2	4.1	4.0	3.9	
20			2.9	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.8	2.8	2.7	2.6
10			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4
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 (24K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
190	174	174	178	165	167	171									
180	168	170	174	161	162	167									
170	163	164	170	156	157	163	155	155	160						
160	158	159	166	151	152	159	150	150	156	146	147	152	144	144	149
150	152	153	161	145	146	155	144	145	152	141	142	148	138	139	145
140	146	147	156	139	141	150	138	139	147	135	136	144	133	133	141
130	140	141	151	133	134	145	132	133	143	129	130	139	127	127	137
120	133	134	146	127	128	140	126	127	138	123	124	135	121	121	132
110	126	127	140	120	121	134	119	120	132	116	117	129	114	115	127
100	119	119	134	113	114	128	112	113	127	110	110	124	107	108	122
90	111	112	128	106	106	123	105	105	121	103	103	118	100	101	116

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	6						5	6						-2	-3					
60	140	4	5	6	7				4	4	6	7				-2	-2	-2	-3			
50	122	3	3	4	5	6	8	9	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	8	0	-1	-1	-2	-2	-3	-3
30	86	0	0	1	3	4	5	6	0	0	1	3	4	5	6	0	0	-1	-1	-2	-2	-2
20	68	0	0	1	1	2	4	5	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-4	-2	0	0	0	-2	-1	-1	0	0	0	0	0
180	-4	-2	0	0	0	-2	-1	-1	0	0	0	0	1
170	-3	-2	0	0	1	-2	-1	-1	0	0	0	1	1
160	-2	-1	0	1	1	-2	-1	0	0	0	1	1	1
150	-2	-1	0	1	1	-2	-1	0	0	0	1	1	1
140	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
130	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
110	-1	0	0	1	1	-1	-1	0	0	0	0	0	1
100	0	0	0	0	0	-1	-1	0	0	0	0	0	0
90	0	0	0	0	0	-1	-1	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	88	86					
60	140	88	86	84	83			
50	122	90	88	84	83	81	79	77
40	104	94	92	89	85	82	79	77
30	86	97	97	93	89	86	82	79
20	68	98	97	95	93	90	86	82
-60	-76	99	99	96	94	91	89	86

Takeoff Speeds - Wet Runway (24K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
190	169	175	178	160	167	171									
180	163	170	174	155	162	167									
170	157	164	170	149	157	163	149	155	160						
160	151	159	166	143	152	159	143	150	156	140	147	152	138	144	149
150	145	153	161	137	146	155	137	145	152	134	142	148	132	139	145
140	138	147	156	131	141	150	131	139	147	128	136	144	126	133	141
130	131	141	151	125	134	145	124	133	143	122	130	139	119	127	137
120	124	134	146	118	128	140	118	127	138	115	124	135	113	121	132
110	117	127	140	111	121	134	111	120	132	108	117	129	106	115	127
100	109	119	134	104	114	128	103	113	127	101	110	124	99	108	122
90	102	112	128	96	106	123	96	105	121	94	103	118	92	101	116

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	8	9						5	6						-2	-3					
60	140	6	7	8	10				4	4	6	7				-2	-2	-2	-3			
50	122	4	5	6	8	9	11	13	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	4	5	7	8	10	1	2	3	4	5	6	8	0	-1	-1	-2	-2	-3	-3
30	86	0	0	2	3	5	6	8	0	0	1	3	4	5	6	0	0	-1	-1	-2	-2	-2
20	68	0	0	1	2	3	4	6	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	1	2	2	4	5	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-6	-3	0	3	6	-3	-2	-1	0	0	1	2	2
180	-5	-3	0	3	5	-3	-2	-1	0	0	1	2	2
170	-5	-3	0	3	5	-3	-2	-1	0	1	1	2	2
160	-5	-2	0	2	5	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
140	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
130	-3	-2	0	2	4	-4	-2	-1	0	1	2	2	3
120	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
110	-3	-1	0	1	3	-4	-3	-1	0	1	2	3	3
100	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	4
90	-2	-1	0	1	2	-5	-3	-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	88	86					
60	140	88	86	84	83			
50	122	90	88	84	83	81	79	77
40	104	94	92	89	85	82	79	77
30	86	97	97	93	89	86	82	79
20	68	98	97	95	93	90	86	82
-60	-76	99	99	96	94	91	89	86

Maximum Allowable Clearway (24K Derate)

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	650
8000	800
10000	950
12000	1050

Clearway and Stopway V1 Adjustments (24K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
800	-5	-4	-4	-3				
600	-5	-4	-3	-2				
400	-4	-3	-2	-2				
200	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	0	0	1	1	2	1	1	1
-400	0	0	1	1	4	3	2	1
-600	0	0	1	1	6	3	3	2
-800	0	0	1	1	7	4	3	2

Use of clearway not allowed on wet runway.

Stab Trim Setting (24K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)									
	6	8	12	16	20	24	28	30	33	36
180	8 1/2	8 1/4	7 1/2	7	6 1/4	5 1/2	5	4 3/4	4 1/4	3 3/4
160	8	7 3/4	7	6 1/2	6	5 1/4	4 3/4	4 1/2	4	3 1/2
140	7 1/2	7 1/4	6 3/4	6	5 1/2	5	4 1/4	4	3 3/4	3 1/4
120	7	6 3/4	6	5 1/2	5	4 1/2	4	3 3/4	3 1/4	3
100	6 1/4	6	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4
70	6 1/4	6	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	8	12	16	20	24	27	30	33	35	36
180	8	7 3/4	7	6 1/4	5 3/4	5	4 1/2	4	3 1/2	3 1/4	3
160	7 1/2	7 1/4	6 1/2	6	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4
140	7	6 1/2	6	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4
120	6 1/4	6	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
100	5 3/4	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
70	5 3/4	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (24K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-25.2	-29.7	-34.2	-31.1	-35.6	-40.1	-44.6	-49.1	-53.6
180	-23.2	-27.7	-32.2	-28.2	-32.7	-37.2	-39.5	-44.0	-48.5
170	-21.2	-25.7	-30.2	-25.4	-29.9	-34.4	-34.8	-39.3	-43.8
160	-19.1	-23.6	-28.1	-22.6	-27.1	-31.6	-30.3	-34.8	-39.3
150	-17.1	-21.6	-26.1	-20.0	-24.5	-29.0	-26.2	-30.7	-35.2
140	-15.1	-19.6	-24.1	-17.4	-21.9	-26.4	-22.3	-26.8	-31.3
130	-13.1	-17.6	-22.1	-14.9	-19.4	-23.9	-18.8	-23.3	-27.8
120	-11.1	-15.6	-20.1	-12.5	-17.0	-21.5	-15.6	-20.1	-24.6
110	-9.0	-13.5	-18.0	-10.1	-14.6	-19.1	-12.6	-17.1	-21.6
100	-7.0	-11.5	-16.0	-7.8	-12.3	-16.8	-9.6	-14.1	-18.6
90	-5.0	-9.5	-14.0	-5.4	-9.9	-14.4	-6.7	-11.2	-15.7

V1(MCG) Limit Weight (1000 LB)

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							79.1		
4200	85.4			92.5			104.6	72.9	
4600	113.1	78.7		120.0	85.9		131.6	98.1	
5000	142.3	106.0	72.0	149.1	113.0	79.3	160.5	124.7	91.7
5400	173.3	134.8	99.1	180.0	141.6	106.1	191.7	153.1	117.9
5800	206.1	165.3	127.5		172.1	134.3		183.6	145.8
6200		197.9	157.5		204.4	164.3			175.8
6600			189.6			196.2			207.8

1. **Enter Weight Adjustment table with slush/standing water depth and 24K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -90 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 (24K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-14	-9	-4	-8	-3	0	0	0	0
180	-15	-10	-5	-9	-4	0	0	0	0
170	-17	-12	-7	-10	-5	0	0	0	0
160	-18	-13	-8	-12	-7	-2	0	0	0
150	-19	-14	-9	-13	-8	-3	0	0	0
140	-20	-15	-10	-15	-10	-5	-2	0	0
130	-21	-16	-11	-17	-12	-7	-7	-2	0
120	-23	-18	-13	-19	-14	-9	-11	-6	-1
110	-24	-19	-14	-21	-16	-11	-14	-9	-4
100	-24	-19	-14	-22	-17	-12	-17	-12	-7
90	-24	-19	-14	-22	-17	-12	-18	-13	-8

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-30.9	-36.9	-42.9	-37.2	-43.2	-49.2	-51.3	-57.3	-63.3
180	-28.2	-34.2	-40.2	-33.5	-39.5	-45.5	-45.2	-51.2	-57.2
170	-25.6	-31.6	-37.6	-30.0	-36.0	-42.0	-39.6	-45.6	-51.6
160	-23.1	-29.1	-35.1	-26.7	-32.7	-38.7	-34.5	-40.5	-46.5
150	-20.7	-26.7	-32.7	-23.6	-29.6	-35.6	-29.8	-35.8	-41.8
140	-18.4	-24.4	-30.4	-20.7	-26.7	-32.7	-25.5	-31.5	-37.5
130	-16.1	-22.1	-28.1	-17.9	-23.9	-29.9	-21.8	-27.8	-33.8
120	-13.8	-19.8	-25.8	-15.3	-21.3	-27.3	-18.4	-24.4	-30.4
110	-11.7	-17.7	-23.7	-12.8	-18.8	-24.8	-15.4	-21.4	-27.4
100	-9.5	-15.5	-21.5	-10.4	-16.4	-22.4	-12.5	-18.5	-24.5
90	-7.3	-13.3	-19.3	-7.9	-13.9	-19.9	-9.5	-15.5	-21.5

V1(MCG) Limit Weight (1000 LB)

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							82.1		
5000				83.3			112.0		
5400	99.4			117.7			143.8	93.2	
5800	137.4	76.2		153.7	96.0		178.0	123.7	74.9
6200	176.6	113.5		191.7	131.0	74.9		156.4	104.4
6600		151.9	90.0		167.7	108.9		191.5	135.7
7000		191.7	127.7		206.3	144.5			169.2
7400			166.7			182.0			205.2
7800			206.9						

1. **Enter Weight Adjustment table with slush/standing water depth and 24K 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 (24K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-21	-16	-11	-15	-10	-5	0	0	0
180	-21	-16	-11	-14	-9	-4	0	0	0
170	-22	-17	-12	-14	-9	-4	0	0	0
160	-24	-19	-14	-15	-10	-5	0	0	0
150	-25	-20	-15	-17	-12	-7	-1	0	0
140	-27	-22	-17	-20	-15	-10	-5	0	0
130	-29	-24	-19	-23	-18	-13	-10	-5	0
120	-30	-25	-20	-25	-20	-15	-15	-10	-5
110	-31	-26	-21	-27	-22	-17	-19	-14	-9
100	-31	-26	-21	-29	-24	-19	-23	-18	-13
90	-31	-26	-21	-29	-24	-19	-25	-20	-15

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-1.6	-1.6	-1.6	-12.5	-12.5	-12.5	-22.5	-22.5	-22.5
180	-2.4	-2.4	-2.4	-12.7	-12.7	-12.7	-21.9	-21.9	-21.9
170	-3.0	-3.0	-3.0	-12.7	-12.7	-12.7	-21.1	-21.1	-21.1
160	-3.4	-3.4	-3.4	-12.4	-12.4	-12.4	-20.2	-20.2	-20.2
150	-3.6	-3.6	-3.6	-12.0	-12.0	-12.0	-19.2	-19.2	-19.2
140	-3.6	-3.6	-3.6	-11.4	-11.4	-11.4	-17.9	-17.9	-17.9
130	-3.4	-3.4	-3.4	-10.6	-10.6	-10.6	-16.6	-16.6	-16.6
120	-3.0	-3.0	-3.0	-9.7	-9.7	-9.7	-15.0	-15.0	-15.0
110	-2.6	-2.6	-2.6	-8.7	-8.7	-8.7	-13.5	-13.5	-13.5
100	-2.1	-2.1	-2.1	-7.7	-7.7	-7.7	-11.9	-11.9	-11.9
90	-1.7	-1.7	-1.7	-6.7	-6.7	-6.7	-10.4	-10.4	-10.4

V1(MCG) Limit Weight (1000 LB)

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
3000	71.4								
3400	117.4	77.2							
3800	161.1	123.0	83.0						
4200	202.6	166.4	128.5	88.1					
4600		207.7	171.7	119.4	80.4				
5000				152.2	111.4	72.7			
5400				186.8	143.8	103.5	81.0		
5800					178.0	135.6	99.6		
6200						169.3	119.2	81.0	
6600						204.9	140.2	99.6	
7000							163.0	119.2	81.0
7400							188.0	140.2	99.6
7800								163.0	119.2
8200								188.0	140.2
8600									163.0
9000									188.0

1. **Enter Weight Adjustment table with reported braking action and 24K 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 (24K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-5	-2	0	-13	-11	-8	-24	-22	-19
180	-6	-3	-1	-15	-12	-10	-26	-23	-21
170	-7	-4	-2	-16	-13	-11	-27	-25	-22
160	-8	-5	-3	-17	-15	-12	-29	-27	-24
150	-8	-6	-3	-19	-16	-14	-31	-29	-26
140	-9	-7	-4	-20	-18	-15	-33	-31	-28
130	-10	-8	-5	-22	-19	-17	-35	-33	-30
120	-11	-9	-6	-23	-21	-18	-37	-35	-32
110	-12	-9	-7	-25	-22	-20	-39	-36	-34
100	-13	-10	-8	-26	-23	-21	-40	-38	-35
90	-13	-11	-8	-26	-24	-21	-41	-39	-36

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K Derate)

No Reverse Thrust

Weight Adjustment (1000 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-3.8	-3.8	-3.8	-17.0	-17.0	-17.0	-29.2	-29.2	-29.2
180	-4.5	-4.5	-4.5	-16.9	-16.9	-16.9	-27.9	-27.9	-27.9
170	-4.9	-4.9	-4.9	-16.6	-16.6	-16.6	-26.5	-26.5	-26.5
160	-5.2	-5.2	-5.2	-16.1	-16.1	-16.1	-25.0	-25.0	-25.0
150	-5.2	-5.2	-5.2	-15.3	-15.3	-15.3	-23.4	-23.4	-23.4
140	-5.0	-5.0	-5.0	-14.4	-14.4	-14.4	-21.6	-21.6	-21.6
130	-4.6	-4.6	-4.6	-13.2	-13.2	-13.2	-19.7	-19.7	-19.7
120	-4.0	-4.0	-4.0	-11.9	-11.9	-11.9	-17.7	-17.7	-17.7
110	-3.3	-3.3	-3.3	-10.5	-10.5	-10.5	-15.7	-15.7	-15.7
100	-2.6	-2.6	-2.6	-9.1	-9.1	-9.1	-13.7	-13.7	-13.7
90	-2.0	-2.0	-2.0	-7.7	-7.7	-7.7	-11.7	-11.7	-11.7

V1(MCG) Limit Weight (1000 LB)

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	89.0								
3800	141.8	96.0							
4200	187.9	147.8	102.9						
4600		193.3	153.8						
5000			198.7	81.7					
5400				127.7					
5800				171.9	110.7				
6200					155.5	93.4			
6600					198.6	138.9			
7000						182.6			
7800							95.0		
8200							123.1		
8600							153.9	85.0	
9000							188.3	112.3	
9400								142.0	75.0
9800								174.9	101.9
10200									130.5
10600									162.1
11000									197.7

1. **Enter Weight Adjustment table with reported braking action and 24K Derate 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 (24K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-6	-4	-1	-17	-15	-12	-33	-31	-28
180	-7	-5	-2	-18	-16	-13	-35	-33	-30
170	-8	-6	-3	-20	-18	-15	-38	-35	-33
160	-9	-7	-4	-22	-19	-17	-40	-38	-35
150	-10	-8	-5	-24	-21	-19	-43	-40	-38
140	-11	-9	-6	-26	-23	-21	-45	-43	-40
130	-13	-10	-8	-28	-25	-23	-48	-46	-43
120	-14	-11	-9	-30	-27	-25	-50	-48	-45
110	-15	-12	-10	-32	-29	-27	-53	-50	-48
100	-16	-13	-11	-33	-31	-28	-54	-52	-49
90	-17	-14	-12	-34	-32	-29	-55	-53	-50

1. **Obtain V1, VR and V2 for the actual weight using the 24K 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 (24K 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	90.3	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
55	91.0	91.6	92.0	92.0	92.0	91.9	91.9	91.9	92.0	91.9	91.7	91.3	90.8
50	91.8	92.4	92.8	92.8	92.8	92.7	92.7	92.7	92.7	92.6	92.6	92.2	91.8
45	92.6	93.2	93.6	93.6	93.6	93.6	93.5	93.5	93.5	93.4	93.3	93.1	92.8
40	93.4	94.0	94.4	94.4	94.4	94.3	94.3	94.2	94.2	94.1	94.1	94.0	93.8
35	94.2	94.8	95.2	95.2	95.2	95.1	95.1	95.0	95.0	94.9	94.8	94.8	94.7
30	93.8	95.0	96.1	96.0	96.0	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
25	93.1	94.3	95.4	95.9	96.4	96.7	96.7	96.6	96.6	96.5	96.4	96.4	96.3
20	92.3	93.5	94.6	95.1	95.7	96.3	96.9	97.6	97.5	97.5	97.4	97.3	97.2
15	91.6	92.7	93.8	94.3	94.9	95.5	96.1	96.8	97.5	98.2	98.6	98.6	98.5
10	90.8	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
5	90.0	91.2	92.2	92.8	93.3	93.9	94.5	95.2	95.9	96.7	97.4	98.4	99.3
0	89.2	90.4	91.4	92.0	92.5	93.1	93.7	94.4	95.1	95.9	96.7	97.6	98.5
-5	88.4	89.6	90.6	91.2	91.7	92.3	92.9	93.6	94.3	95.1	95.9	96.8	97.7
-10	87.6	88.8	89.8	90.4	90.9	91.5	92.1	92.8	93.5	94.3	95.1	96.1	97.0
-15	86.8	88.0	89.0	89.5	90.0	90.6	91.3	92.0	92.7	93.5	94.3	95.3	96.2
-20	86.0	87.1	88.2	88.7	89.2	89.8	90.5	91.2	91.9	92.6	93.5	94.5	95.4
-25	85.2	86.3	87.3	87.9	88.4	89.0	89.6	90.3	91.0	91.8	92.6	93.7	94.6
-30	84.4	85.5	86.5	87.0	87.5	88.1	88.8	89.5	90.2	91.0	91.8	92.9	93.8
-35	83.5	84.6	85.6	86.2	86.6	87.3	87.9	88.6	89.3	90.1	91.0	92.1	93.0
-40	82.7	83.8	84.8	85.3	85.8	86.4	87.0	87.8	88.5	89.3	90.1	91.2	92.2
-45	81.8	82.9	83.9	84.4	84.9	85.5	86.2	86.9	87.6	88.4	89.3	90.4	91.4
-50	81.0	82.0	83.0	83.5	84.0	84.6	85.3	86.0	86.7	87.5	88.4	89.5	90.5

%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	0.8	0.9	1.0

Assumed Temperature Reduced Thrust (24K Derate)

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
54	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	73	71	69	67	65	63	61	59	57	55		
35	67	67	67	67	65	63	61	59	57	55	53	
30	64	61	62	61	61	63	61	59	57	55	53	51
25	64	61	59	57	56	56	57	57	57	55	53	51
20	64	61	59	57	56	54	53	53	53	53	52	50
15	64	61	59	57	56	54	53	52	50	49	48	47
10 & BELOW	64	61	59	57	56	54	53	52	50	48	45	43

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	88.3	88.6	89.1	89.6	90.2	90.8	91.5	92.2	92.7	93.1	93.3	93.4
70	89.1	89.5	89.4	89.3	89.6	90.1	90.8	91.6	92.0	92.5	92.6	92.7
65	90.0	90.4	90.3	90.2	90.2	90.1	90.2	90.9	91.4	91.8	91.9	92.1
60	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
55	91.6	92.0	92.0	92.0	91.9	91.9	91.9	92.0	91.9	91.7	91.3	90.8
50	92.4	92.8	92.8	92.8	92.7	92.7	92.7	92.7	92.6	92.6	92.2	91.8
45	93.2	93.6	93.6	93.6	93.6	93.5	93.5	93.5	93.4	93.3	93.1	92.8
40	94.0	94.4	94.4	94.4	94.3	94.3	94.2	94.2	94.1	94.1	94.0	93.8
35	94.8	95.2	95.2	95.2	95.1	95.1	95.0	95.0	94.9	94.8	94.8	94.7
30	95.0	96.1	96.0	96.0	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
25	94.3	95.4	95.9	96.4	96.7	96.7	96.6	96.6	96.5	96.4	96.4	96.3
20	93.5	94.6	95.1	95.7	96.3	96.9	97.6	97.5	97.5	97.4	97.3	97.2
15	92.7	93.8	94.3	94.9	95.5	96.1	96.8	97.5	98.2	98.6	98.6	98.5
10	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 1.0.

Assumed Temperature Reduced Thrust (24K 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	12.1													
100	11.3	8.5												
90	11.7	8.9												
80	12.5	8.0	5.5											
70	11.3	8.4	5.9	5.6	4.0									
60	9.7	9.2	4.8	4.7	4.4	4.2	2.6							
50	7.8	7.9	5.3	3.5	3.3	3.6	3.0	2.7	1.2					
40		6.4	6.0	5.5	3.7	3.2	3.7	3.0	2.8	3.0	3.7			
30		4.6	4.6	4.6	4.5	4.3	4.2	4.0	4.1	4.0	3.9	3.8	3.7	
20			3.1	3.1	3.1	3.0	2.9	2.9	2.8	2.7	2.7	2.6	2.6	2.5
10			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3
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 (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
180	170	171	174												
170	165	165	170	158	158	163									
160	159	160	165	152	153	158	151	151	155						
150	154	154	161	147	147	154	146	146	151	143	143	148	140	140	145
140	148	148	156	141	142	150	140	140	147	137	137	144	134	134	141
130	141	142	151	134	135	144	133	134	142	130	131	139	128	128	136
120	134	135	145	128	129	139	127	127	137	124	125	134	122	122	131
110	127	128	139	121	122	134	120	121	132	118	118	129	115	116	126
100	120	120	133	114	115	128	113	114	126	111	111	123	109	109	121
90	112	113	127	107	107	122	106	106	120	104	104	118	102	102	115

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	6						5	6						-2	-2					
60	140	4	4	5	6				4	4	5	6				-2	-2	-2	-3			
50	122	2	3	4	5	6	7	8	2	3	4	5	6	7	9	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	7	0	-1	-1	-1	-2	-2	-3
30	86	0	0	1	2	4	5	6	0	0	1	2	4	5	6	0	0	0	-1	-1	-2	-2
20	68	0	0	0	1	2	4	5	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	2	3	3	0	0	1	1	2	3	3	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-4	-2	0	0	0	-1	-1	0	0	0	0	0	0
180	-4	-2	0	0	0	-1	-1	0	0	0	0	0	0
170	-3	-2	0	0	0	-1	-1	0	0	0	0	0	0
160	-3	-1	0	0	0	-1	-1	0	0	0	0	0	0
150	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
140	-2	-1	0	1	1	-1	-1	0	0	0	0	1	1
130	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-1	0	0	0	1	-1	-1	0	0	0	0	0	1
110	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
100	0	0	0	0	0	-1	-1	0	0	0	0	0	0
90	0	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	85	83					
60	140	85	83	82	80			
50	122	87	85	82	80	78	76	74
40	104	91	89	86	83	79	76	74
30	86	94	94	90	87	83	79	76
20	68	94	94	92	90	87	83	80
-60	-76	96	95	93	92	89	87	84

Takeoff Speeds - Wet Runway (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
180	166	171	174												
170	160	165	170	152	158	163									
160	153	160	165	146	153	158	146	151	155						
150	147	154	161	140	147	154	139	146	151	136	143	148	134	140	145
140	141	148	156	133	142	150	133	140	147	130	137	144	128	134	141
130	133	142	151	127	135	144	126	134	142	124	131	139	121	128	136
120	126	135	145	120	129	139	120	127	137	117	125	134	115	122	131
110	119	128	139	113	122	134	113	121	132	110	118	129	108	116	126
100	112	120	133	106	115	128	106	114	126	103	111	123	101	109	121
90	104	112	127	99	107	122	98	106	120	96	104	118	94	102	115

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	8	9						5	6						-2	-2					
60	140	6	7	8	9				4	4	5	6				-2	-2	-2	-3			
50	122	4	4	6	7	8	10	12	2	3	4	5	6	8	9	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	3	5	6	8	10	1	2	3	4	5	6	7	0	-1	-1	-1	-2	-2	-3
30	86	0	0	1	3	4	6	7	0	0	1	2	4	5	6	0	0	0	-1	-1	-2	-2
20	68	0	0	0	1	2	4	6	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
180	-6	-3	0	3	5	-3	-2	-1	0	0	1	1	2
170	-5	-3	0	3	5	-3	-2	-1	0	0	1	2	2
160	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	2
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
130	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
120	-3	-2	0	2	3	-4	-2	-1	0	1	1	2	3
110	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
100	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
90	-2	-1	0	1	2	-5	-3	-2	0	1	2	3	3

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	85	83					
60	140	85	83	82	80			
50	122	87	85	82	80	78	76	74
40	104	91	89	86	83	79	76	74
30	86	94	94	90	87	83	79	76
20	68	94	94	92	90	87	83	80
-60	-76	96	95	93	92	89	87	84

Maximum Allowable Clearway (22K Derate)

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	300
8000	400
10000	450
12000	550
14000	600

Clearway and Stopway V1 Adjustments (22K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
800	-5	-4	-3	-3				
600	-5	-4	-3	-2				
400	-3	-2	-2	-2				
200	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	0	0	1	0	2	1	1	1
-400	0	0	1	0	4	2	2	1
-600	0	0	1	0	5	3	2	2
-800	0	0	1	0	6	3	3	2

Use of clearway not allowed on wet runway.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	7	8	12	16	20	24	28	32	35	36
180	8 1/2	8 1/2	8 1/4	7 3/4	7	6 1/2	5 3/4	5 1/4	4 1/2	4	4
160	8 1/4	8	8	7 1/4	6 3/4	6	5 1/2	4 3/4	4 1/4	3 3/4	3 1/2
140	7 3/4	7 1/2	7 1/2	6 3/4	6 1/4	5 3/4	5	4 1/2	4	3 1/2	3 1/2
120	7 1/4	7	7	6 1/2	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	3
100	6 1/2	6 1/4	6 1/4	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4
70	6 1/2	6 1/4	6 1/4	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	8	12	16	20	24	26	29	31	34	36
180	8	7 3/4	7 1/4	6 1/2	5 3/4	5 1/4	5	4 1/2	4	3 1/2	3 1/4
160	7 3/4	7 1/2	6 3/4	6	5 1/2	4 3/4	4 1/2	4	3 3/4	3 1/4	3
140	7	6 3/4	6 1/4	5 1/2	5	4 1/4	4	3 1/2	3 1/4	2 3/4	2 3/4
120	6 1/2	6 1/4	5 1/2	5	4 1/2	3 3/4	3 1/2	3	2 3/4	2 3/4	2 3/4
100	6	5 3/4	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
70	6	5 3/4	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-25.5	-30.5	-35.5	-31.7	-36.7	-41.7	-49.6	-54.6	-59.6
180	-23.5	-28.5	-33.5	-28.9	-33.9	-38.9	-43.5	-48.5	-53.5
170	-21.5	-26.5	-31.5	-26.1	-31.1	-36.1	-37.9	-42.9	-47.9
160	-19.5	-24.5	-29.5	-23.4	-28.4	-33.4	-32.7	-37.7	-42.7
150	-17.5	-22.5	-27.5	-20.7	-25.7	-30.7	-27.9	-32.9	-37.9
140	-15.5	-20.5	-25.5	-18.1	-23.1	-28.1	-23.7	-28.7	-33.7
130	-13.5	-18.5	-23.5	-15.6	-20.6	-25.6	-19.8	-24.8	-29.8
120	-11.5	-16.5	-21.5	-13.1	-18.1	-23.1	-16.5	-21.5	-26.5
110	-9.5	-14.5	-19.5	-10.7	-15.7	-20.7	-13.4	-18.4	-23.4
100	-7.5	-12.5	-17.5	-8.2	-13.2	-18.2	-10.4	-15.4	-20.4
90	-5.5	-10.5	-15.5	-5.8	-10.8	-15.8	-7.4	-12.4	-17.4

V1(MCG) Limit Weight (1000 LB)

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	71.4			78.2			89.5		
4200	99.9			106.2	71.4		116.8	82.9	
4600	129.7	92.6		135.7	99.1		145.7	109.9	76.4
5000	161.3	122.1	85.5	167.1	128.2	92.1	176.5	138.3	103.0
5400	194.8	153.2	114.6	200.5	159.1	120.8	209.1	168.6	131.1
5800		186.2	145.2		192.0	151.2		200.9	160.8
6200			177.8			183.5			192.7

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -90 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.**

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-12	-10	-7	-7	-4	-2	0	0	0
180	-13	-11	-8	-7	-5	-2	0	0	0
170	-14	-12	-9	-8	-5	-3	0	0	0
160	-15	-13	-10	-9	-7	-4	0	0	0
150	-17	-14	-12	-11	-8	-6	0	0	0
140	-18	-15	-13	-12	-10	-7	0	0	0
130	-19	-17	-14	-15	-12	-10	-4	-1	0
120	-21	-18	-16	-17	-14	-12	-8	-5	-3
110	-22	-19	-17	-19	-17	-14	-12	-9	-7
100	-22	-20	-17	-20	-18	-15	-15	-12	-10
90	-22	-20	-17	-20	-18	-15	-16	-14	-11

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-31.4	-37.4	-43.4	-38.2	-44.2	-50.2	-50.8	-56.8	-62.8
180	-28.8	-34.8	-40.8	-34.5	-40.5	-46.5	-45.6	-51.6	-57.6
170	-26.2	-32.2	-38.2	-31.0	-37.0	-43.0	-40.6	-46.6	-52.6
160	-23.7	-29.7	-35.7	-27.7	-33.7	-39.7	-35.9	-41.9	-47.9
150	-21.3	-27.3	-33.3	-24.5	-30.5	-36.5	-31.4	-37.4	-43.4
140	-18.9	-24.9	-30.9	-21.5	-27.5	-33.5	-27.1	-33.1	-39.1
130	-16.6	-22.6	-28.6	-18.6	-24.6	-30.6	-23.1	-29.1	-35.1
120	-14.3	-20.3	-26.3	-15.9	-21.9	-27.9	-19.4	-25.4	-31.4
110	-12.1	-18.1	-24.1	-13.3	-19.3	-25.3	-15.8	-21.8	-27.8
100	-9.9	-15.9	-21.9	-10.7	-16.7	-22.7	-12.2	-18.2	-24.2
90	-7.7	-13.7	-19.7	-8.1	-14.1	-20.1	-8.6	-14.6	-20.6

V1(MCG) Limit Weight (1000 LB)

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				72.2			100.0		
5000	91.2			108.4			132.5	80.5	
5400	131.1			145.7	85.7		167.0	112.0	
5800	171.6	106.1		184.4	122.2		203.7	145.2	92.1
6200		146.2	81.3		160.0	99.2		180.6	124.2
6600		187.1	121.0		199.3	136.2			158.2
7000			161.4			174.6			194.4
7400			202.6						

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust 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 slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-21	-16	-11	-14	-9	-4	0	0	0
180	-20	-15	-10	-12	-7	-2	0	0	0
170	-20	-15	-10	-12	-7	-2	0	0	0
160	-21	-16	-11	-12	-7	-2	0	0	0
150	-22	-17	-12	-14	-9	-4	0	0	0
140	-24	-19	-14	-17	-12	-7	-2	0	0
130	-26	-21	-16	-20	-15	-10	-6	-1	0
120	-28	-23	-18	-22	-17	-12	-11	-6	-1
110	-29	-24	-19	-25	-20	-15	-16	-11	-6
100	-30	-25	-20	-26	-21	-16	-20	-15	-10
90	-29	-24	-19	-27	-22	-17	-22	-17	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-1.5	-1.5	-1.5	-12.3	-12.3	-12.3	-22.4	-22.4	-22.4
180	-2.3	-2.3	-2.3	-12.5	-12.5	-12.5	-21.7	-21.7	-21.7
170	-2.9	-2.9	-2.9	-12.4	-12.4	-12.4	-20.9	-20.9	-20.9
160	-3.3	-3.3	-3.3	-12.2	-12.2	-12.2	-20.0	-20.0	-20.0
150	-3.5	-3.5	-3.5	-11.8	-11.8	-11.8	-19.0	-19.0	-19.0
140	-3.5	-3.5	-3.5	-11.3	-11.3	-11.3	-17.8	-17.8	-17.8
130	-3.4	-3.4	-3.4	-10.5	-10.5	-10.5	-16.5	-16.5	-16.5
120	-3.0	-3.0	-3.0	-9.7	-9.7	-9.7	-15.1	-15.1	-15.1
110	-2.6	-2.6	-2.6	-8.8	-8.8	-8.8	-13.7	-13.7	-13.7
100	-2.2	-2.2	-2.2	-7.9	-7.9	-7.9	-12.2	-12.2	-12.2
90	-1.8	-1.8	-1.8	-6.9	-6.9	-6.9	-10.8	-10.8	-10.8

V1(MCG) Limit Weight (1000 LB)

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
3000	85.2								
3400	130.7	91.0							
3800	173.5	136.2	96.9						
4200		178.6	141.7	100.8					
4600			183.8	133.5	92.9				
5000				167.7	125.2	85.0	71.2		
5400				203.8	159.0	116.9	90.4		
5800					194.6	150.4	110.1	71.2	
6200						185.5	131.2	90.4	
6600							154.1	110.1	71.2
7000							179.3	131.2	90.4
7400							207.3	154.1	110.1
7800								179.3	131.2
8200								207.3	154.1
8600									179.3
9000									207.3

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -70 ft/+60 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -70 ft/+60 ft for every 5°C above/below 4°C.
   Adjust "Poor" 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 slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (22K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-4	-2	0	-13	-10	-8	-23	-20	-18
180	-5	-3	0	-13	-11	-8	-23	-21	-18
170	-6	-3	-1	-14	-12	-9	-25	-22	-20
160	-7	-4	-2	-15	-13	-10	-26	-24	-21
150	-8	-5	-3	-17	-14	-12	-28	-26	-23
140	-9	-6	-4	-19	-16	-14	-30	-28	-25
130	-9	-7	-4	-20	-18	-15	-33	-30	-28
120	-10	-8	-5	-22	-19	-17	-35	-32	-30
110	-11	-8	-6	-23	-20	-18	-37	-34	-32
100	-12	-9	-7	-24	-21	-19	-38	-36	-33
90	-12	-9	-7	-25	-22	-20	-39	-37	-34

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustment (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-3.2	-3.2	-3.2	-16.2	-16.2	-16.2	-28.6	-28.6	-28.6
180	-4.1	-4.1	-4.1	-16.3	-16.3	-16.3	-27.6	-27.6	-27.6
170	-4.6	-4.6	-4.6	-16.1	-16.1	-16.1	-26.4	-26.4	-26.4
160	-5.0	-5.0	-5.0	-15.8	-15.8	-15.8	-25.0	-25.0	-25.0
150	-5.1	-5.1	-5.1	-15.2	-15.2	-15.2	-23.5	-23.5	-23.5
140	-5.0	-5.0	-5.0	-14.3	-14.3	-14.3	-21.8	-21.8	-21.8
130	-4.6	-4.6	-4.6	-13.3	-13.3	-13.3	-20.0	-20.0	-20.0
120	-4.1	-4.1	-4.1	-12.0	-12.0	-12.0	-18.0	-18.0	-18.0
110	-3.4	-3.4	-3.4	-10.7	-10.7	-10.7	-16.0	-16.0	-16.0
100	-2.8	-2.8	-2.8	-9.4	-9.4	-9.4	-13.9	-13.9	-13.9
90	-2.2	-2.2	-2.2	-8.1	-8.1	-8.1	-11.9	-11.9	-11.9

V1(MCG) Limit Weight (1000 LB)

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	108.4								
3800	158.0	115.0							
4200	201.4	163.7	121.5						
4600		206.6	169.3						
5000				108.3					
5400				153.6	90.6				
5800				196.5	137.0	72.8			
6200					180.7	119.9			
6600						164.6			
7000						206.9			
7400							91.3		
7800							120.3		
8200							152.1	80.9	
8600							187.9	109.1	
9000								139.8	70.4
9400								173.9	98.3
9800									128.0
10200									160.7
10600									197.6

1. **Enter Weight Adjustment table with reported braking action and 22K 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 -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 (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-6	-3	-1	-16	-14	-11	-31	-29	-26
180	-6	-4	-1	-17	-14	-12	-32	-30	-27
170	-7	-5	-2	-18	-16	-13	-34	-32	-29
160	-8	-6	-3	-20	-17	-15	-36	-34	-31
150	-9	-7	-4	-22	-19	-17	-39	-37	-34
140	-10	-8	-5	-24	-21	-19	-42	-39	-37
130	-11	-9	-6	-26	-23	-21	-45	-42	-40
120	-13	-10	-8	-28	-25	-23	-47	-45	-42
110	-13	-11	-8	-29	-27	-24	-50	-47	-45
100	-14	-12	-9	-31	-29	-26	-52	-49	-47
90	-15	-13	-10	-32	-30	-27	-53	-50	-48

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K 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	87.7	88.3	87.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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 (22K Derate)

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
54	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 0.9.

Assumed Temperature Reduced Thrust (22K 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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3
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	90.2	90.5	90.4	90.6	90.4	92.1	93.8	95.1	95.2	93.5
55	91.0	91.2	91.3	91.4	90.8	91.5	93.1	94.4	94.5	92.8
50	91.7	92.0	92.1	92.2	91.7	91.5	92.4	93.7	93.8	92.1
45	92.4	92.6	92.8	93.0	92.6	92.4	92.4	93.0	93.1	91.4
40	93.1	93.3	93.6	93.8	93.4	93.2	93.2	92.3	92.4	90.7
35	93.6	94.0	94.3	94.5	94.3	94.0	94.0	93.0	92.4	90.8
30	92.9	94.8	95.0	95.2	95.1	94.8	94.7	93.9	93.3	91.8
25	92.2	94.8	95.7	95.9	95.9	95.5	95.4	94.7	94.1	92.8
20	91.4	94.0	96.5	96.7	96.6	96.2	96.1	95.4	94.9	93.7
15	90.6	93.2	95.9	97.5	97.4	96.9	96.7	96.2	95.7	94.6
10	89.9	92.5	95.1	97.8	98.3	97.7	97.4	96.9	96.5	95.6
5	89.1	91.7	94.3	97.0	99.2	98.6	98.1	97.7	97.3	96.5
0	88.3	90.9	93.5	96.2	98.6	99.6	99.1	98.5	98.2	97.5
-5	87.6	90.1	92.7	95.4	97.8	99.6	100.0	99.2	99.0	98.4
-10	86.8	89.3	91.9	94.6	97.1	98.8	100.3	100.2	99.8	99.4
-15	86.0	88.5	91.0	93.8	96.3	98.0	99.6	101.1	100.8	100.4
-20	85.2	87.6	90.2	93.0	95.5	97.2	98.7	100.8	101.3	101.0
-25	84.3	86.8	89.4	92.2	94.7	96.4	97.9	100.0	100.5	100.1
-30	83.5	86.0	88.5	91.3	93.9	95.6	97.1	99.1	99.6	99.3
-35	82.7	85.1	87.7	90.5	93.1	94.8	96.3	98.3	98.8	98.4
-40	81.8	84.3	86.8	89.6	92.3	93.9	95.4	97.4	97.9	97.6

%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	95.0	96.2	96.8									
52	125	55	95.9	96.7	96.6	96.8	97.5							
47	116	50	96.6	97.6	97.8	97.8	97.7	97.5	98.2	98.8				
42	108	45	97.4	98.4	98.5	98.6	98.7	98.8	98.7	98.5	98.5	99.0		
37	99	40	98.0	99.1	99.2	99.3	99.4	99.5	99.6	99.5	99.1	98.9	98.8	99.1
32	90	35	98.1	99.9	100.0	100.1	100.1	100.3	100.3	100.2	99.9	99.6	99.6	99.5
27	81	30	97.3	99.8	100.4	100.7	100.7	100.7	100.7	100.7	100.6	100.4	100.4	100.3
22	72	25	96.6	99.1	99.7	100.2	100.6	100.9	100.9	100.9	100.9	100.9	100.9	100.8
17	63	20	95.8	98.3	98.9	99.5	99.8	100.2	100.5	100.9	101.0	101.1	101.0	101.0
12	54	15	95.0	97.5	98.1	98.7	99.1	99.4	99.8	100.1	100.5	100.9	101.3	101.2
7	45	10	94.2	96.8	97.4	98.0	98.3	98.7	99.0	99.4	99.8	100.2	100.5	100.9
2	36	5	93.4	96.0	96.6	97.2	97.6	97.9	98.3	98.7	99.0	99.4	99.8	100.2
-3	27	0	92.6	95.2	95.8	96.4	96.8	97.2	97.5	97.9	98.3	98.7	99.0	99.4
-8	18	-5	91.8	94.4	95.0	95.6	96.0	96.4	96.8	97.2	97.5	97.9	98.3	98.6
-13	9	-10	91.0	93.6	94.2	94.8	95.2	95.6	96.0	96.4	96.8	97.1	97.5	97.9
-17	1	-15	90.2	92.8	93.4	94.0	94.4	94.8	95.2	95.6	96.0	96.4	96.7	97.1
-22	-8	-20	89.3	92.0	92.6	93.2	93.6	94.0	94.4	94.8	95.2	95.6	95.9	96.3
-27	-17	-25	88.5	91.1	91.8	92.4	92.8	93.2	93.6	94.0	94.4	94.8	95.1	95.5
-32	-26	-30	87.6	90.3	90.9	91.6	92.0	92.4	92.8	93.3	93.6	94.0	94.3	94.7
-37	-35	-35	86.8	89.4	90.1	90.7	91.1	91.6	92.0	92.4	92.8	93.2	93.5	93.9
-42	-44	-40	85.9	88.6	89.2	89.9	90.3	90.7	91.2	91.6	92.0	92.4	92.7	93.0
-47	-53	-45	85.0	87.7	88.4	89.0	89.4	89.9	90.3	90.8	91.2	91.5	91.9	92.2
-52	-62	-50	84.1	86.8	87.5	88.2	88.6	89.0	89.5	90.0	90.3	90.7	91.0	91.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
A/C HIGH	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

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 LB)					
		80	100	120	140	160	180
40000	PITCH ATT	**4.0**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1900	1300	700	200		
30000	PITCH ATT	**4.0**	**4.0**	**3.5**	**3.5**	**3.5**	**4.0**
	V/S (FT/MIN)	2800	2100	1600	1300	1000	700
20000	PITCH ATT	**7.5**	**6.5**	**6.0**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4600	3600	2900	2400	1900	1600
10000	PITCH ATT	**11.5**	**10.0**	**9.0**	**8.0**	**8.0**	**7.5**
	V/S (FT/MIN)	6100	4900	4000	3300	2800	2400
SEA LEVEL	PITCH ATT	**15.5**	**13.0**	**11.5**	**10.5**	**10.0**	**9.5**
	V/S (FT/MIN)	7400	5900	4800	4000	3400	3000

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
40000	PITCH ATT	**1.5**	**2.0**	**3.0**			
	%N1	83	85	88			
35000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	
	%N1	81	83	84	86	90	
30000	PITCH ATT	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	84	86	88
25000	PITCH ATT	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	80	82	84
20000	PITCH ATT	**0.5**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	74	74	75	77	78	80
15000	PITCH ATT	**0.5**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	70	71	72	73	74	76

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
40000	PITCH ATT	**-2.5**	**-1.0**	**-0.5**	**0.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3000	-2600	-2500	-2600	-2900	-3500
30000	PITCH ATT	**-4.0**	**-2.5**	**-1.5**	**-1.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3400	-2800	-2500	-2300	-2100	-2100
20000	PITCH ATT	**-4.0**	**-2.5**	**-1.5**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-3100	-2600	-2200	-2000	-1900	-1800
10000	PITCH ATT	**-4.0**	**-3.0**	**-1.5**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN	-2800	-2300	-2000	-1800	-1700	-1600
SEA LEVEL	PITCH ATT	**-4.5**	**-3.0**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2600	-2100	-1800	-1700	-1500	-1500

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
10000	PITCH ATT	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	52	56	60	64	68	71
5000	PITCH ATT	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	48	53	56	60	64	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 LB)					
		80	100	120	140	160	180
FLAPS 1 (GEAR UP)	**PITCH ATT**	**3.5**	**4.0**	**4.0**	**4.5**	**5.0**	**5.5**
(VREF40 + 50)	%N1	50	55	59	63	67	70
FLAPS 5 (GEAR UP)	**PITCH ATT**	**4.0**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(VREF40 + 30)	%N1	50	55	60	64	68	71
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**4.0**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(VREF40 + 20)	%N1	58	68	68	73	76	80

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
FLAPS 15	**PITCH ATT**	**0.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
(VREF15 + 10)	%N1	42	46	50	54	57	59
FLAPS 30	**PITCH ATT**	**-1.0**	**-1.0**	**-1.0**	**-0.5**	**0.0**	**0.0**
(VREF30 + 10)	%N1	46	51	55	59	62	65
FLAPS 40	**PITCH ATT**	**-1.5**	**-1.5**	**-1.5**	**-1.5**	**-1.5**	**-1.5**
(VREF40 + 10)	%N1	51	56	61	65	68	71

Performance Inflight — Chapter PI
All Engine — Section 41

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust

ISA + 10°C and Below

WEIGHT (1000 LB)	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°)
190	30000	-5	31900*	31900*	31900*	31500	30100
180	31200	-7	33500*	33500*	33500*	32600	31300
170	32400	-10	35000*	35000*	35000*	33900	32500
160	33700	-13	36300*	36300*	36300*	35100	33800
150	35100	-16	37600*	37600*	37600*	36500	35100
140	36500	-18	38900*	38900*	38900*	37900	36600
130	38100	-18	40300*	40300*	40300*	39500	38100
120	39700	-18	41000	41000	41000	41000	39800
110	41000	-18	41000	41000	41000	41000	41000
100	41000	-18	41000	41000	41000	41000	41000
90	41000	-18	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 LB)	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°)
190	30000	1	29300*	29300*	29300*	29300*	29300*
180	31200	-2	31500*	31500*	31500*	31500*	31300
170	32400	-4	33600*	33600*	33600*	33600*	32500
160	33700	-7	35300*	35300*	35300*	35100	33800
150	35100	-10	36700*	36700*	36700*	36500	35100
140	36500	-13	38000*	38000*	38000*	37900	36600
130	38100	-13	39300*	39300*	39300*	39300*	38100
120	39700	-13	40700*	40700*	40700*	40700*	39800
110	41000	-13	41000	41000	41000	41000	41000
100	41000	-13	41000	41000	41000	41000	41000
90	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 LB)	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°)
190	30000	7	26000*	26000*	26000*	26000*	26000*
180	31200	4	28200*	28200*	28200*	28200*	28200*
170	32400	1	30600*	30600*	30600*	30600*	30600*
160	33700	-2	33200*	33200*	33200*	33200*	33200*
150	35100	-5	35200*	35200*	35200*	35200*	35100
140	36500	-7	36600*	36600*	36600*	36600*	36600
130	38100	-7	38000*	38000*	38000*	38000*	38000*
120	39700	-7	39400*	39400*	39400*	39400*	39400*
110	41000	-7	40900*	40900*	40900*	40900*	40900*
100	41000	-7	41000	41000	41000	41000	41000
90	41000	-7	41000	41000	41000	41000	41000

***Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		23	25	27	29	31	33	35	37	39	41
180	%N1	84.6	85.9	87.1	88.3	89.5	91.5				
	MACH	.723	.744	.762	.778	.790	.796				
	KIAS	315	312	307	301	293	283				
	FF/ENG	3555	3520	3493	3465	3440	3458				
170	%N1	83.3	84.7	86.0	87.2	88.3	89.8	92.7			
	MACH	.704	.730	.751	.768	.783	.793	.796			
	KIAS	307	306	302	297	290	282	270			
	FF/ENG	3359	3343	3323	3294	3258	3252	3312			
160	%N1	81.8	83.4	84.7	86.0	87.2	88.4	90.2			
	MACH	.683	.713	.737	.756	.773	.787	.795			
	KIAS	297	298	296	292	287	280	270			
	FF/ENG	3150	3154	3147	3126	3088	3059	3064			
150	%N1	80.4	81.9	83.4	84.7	86.0	87.1	88.5	91.1		
	MACH	.664	.691	.720	.743	.762	.778	.790	.796		
	KIAS	288	288	289	286	282	276	268	258		
	FF/ENG	2954	2949	2965	2952	2923	2884	2866	2909		
140	%N1	78.9	80.3	81.8	83.3	84.6	85.9	87.0	89.0	92.9	
	MACH	.645	.669	.698	.726	.748	.766	.782	.793	.796	
	KIAS	280	279	279	280	276	271	265	257	246	
	FF/ENG	2761	2751	2765	2775	2754	2719	2684	2699	2786	
130	%N1	77.3	78.7	80.1	81.6	83.1	84.4	85.7	87.3	89.9	
	MACH	.626	.649	.673	.703	.730	.752	.770	.785	.794	
	KIAS	271	270	269	270	269	266	261	254	246	
	FF/ENG	2578	2558	2563	2579	2578	2554	2517	2513	2543	
120	%N1	75.6	77.0	78.3	79.8	81.3	82.8	84.1	85.7	87.8	90.6
	MACH	.607	.628	.651	.676	.707	.733	.754	.773	.787	.795
	KIAS	262	261	259	259	260	259	255	250	243	235
	FF/ENG	2407	2373	2369	2375	2387	2378	2355	2342	2350	2384
110	%N1	73.7	75.2	76.5	77.9	79.3	80.9	82.4	84.1	86.1	88.3
	MACH	.584	.607	.628	.651	.677	.709	.735	.756	.774	.788
	KIAS	252	251	250	249	248	249	248	244	239	233
	FF/ENG	2232	2202	2183	2182	2183	2191	2181	2174	2176	2185
100	%N1	71.6	73.1	74.6	75.9	77.3	78.7	80.4	82.2	84.4	86.4
	MACH	.559	.582	.605	.627	.650	.677	.708	.735	.756	.774
	KIAS	241	240	240	239	238	237	238	237	233	228
	FF/ENG	2058	2028	2011	1997	1992	1990	1995	1999	2006	2007
90	%N1	69.2	70.8	72.2	73.7	75.1	76.5	78.0	80.0	82.2	84.4
	MACH	.533	.555	.577	.601	.623	.647	.673	.705	.733	.755
	KIAS	229	229	228	228	227	226	225	226	225	222
	FF/ENG	1883	1856	1840	1826	1811	1827	1820	1833	1850	1858

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversions

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
291	267	246	229	214	200	190	181	173	166	159
438	402	370	344	321	300	285	272	260	249	240
585	537	494	458	427	400	381	363	347	333	320
732	672	618	573	534	500	476	454	434	416	400
880	807	742	688	641	600	572	545	521	500	480
1028	942	866	803	749	700	667	636	608	583	561
1177	1078	991	918	856	800	762	727	695	667	641
1326	1215	1116	1034	963	900	858	818	783	750	720
1476	1351	1241	1149	1070	1000	953	909	869	833	800
1626	1488	1367	1265	1178	1100	1048	1000	956	916	880
1777	1625	1492	1380	1285	1200	1143	1091	1043	999	960
1928	1763	1618	1496	1392	1300	1239	1182	1130	1082	1040
2080	1901	1744	1612	1500	1400	1334	1273	1217	1165	1119
2232	2040	1870	1729	1608	1500	1429	1363	1303	1248	1199
2385	2178	1997	1845	1715	1600	1524	1454	1390	1331	1278
2539	2318	2123	1961	1823	1700	1619	1545	1476	1414	1358
2693	2457	2250	2077	1931	1800	1714	1635	1563	1496	1437
2847	2597	2377	2194	2038	1900	1809	1726	1649	1579	1516
3002	2737	2504	2311	2146	2000	1905	1816	1735	1662	1595

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.3	0:41	2.9	0:40	2.5	0:37	2.2	0:36	2.0	0:35
300	5.0	1:01	4.5	0:58	3.9	0:54	3.5	0:52	3.2	0:50
400	6.7	1:20	6.1	1:16	5.3	1:11	4.8	1:08	4.5	1:05
500	8.5	1:39	7.7	1:34	6.8	1:27	6.1	1:23	5.7	1:20
600	10.2	1:59	9.3	1:53	8.2	1:44	7.4	1:39	6.9	1:35
700	11.9	2:19	10.9	2:11	9.6	2:01	8.7	1:55	8.2	1:50
800	13.6	2:38	12.5	2:30	11.0	2:18	10.0	2:11	9.4	2:05
900	15.2	2:58	14.1	2:49	12.4	2:35	11.3	2:27	10.6	2:20
1000	16.9	3:19	15.6	3:08	13.8	2:52	12.6	2:43	11.8	2:35
1100	18.6	3:39	17.2	3:27	15.2	3:10	13.8	3:00	13.0	2:50
1200	20.2	3:59	18.7	3:46	16.5	3:27	15.1	3:16	14.2	3:06
1300	21.9	4:20	20.2	4:05	17.9	3:45	16.3	3:32	15.3	3:21
1400	23.5	4:40	21.8	4:24	19.3	4:02	17.6	3:49	16.5	3:37
1500	25.2	5:01	23.3	4:44	20.6	4:20	18.8	4:05	17.7	3:52
1600	26.8	5:22	24.8	5:04	22.0	4:38	20.1	4:22	18.9	4:08
1700	28.4	5:43	26.3	5:23	23.3	4:55	21.3	4:39	20.0	4:24
1800	30.0	6:04	27.8	5:43	24.7	5:13	22.5	4:55	21.2	4:39
1900	31.6	6:26	29.3	6:03	26.0	5:32	23.8	5:12	22.3	4:55
2000	33.2	6:47	30.7	6:23	27.3	5:50	25.0	5:29	23.5	5:11

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.2	-0.1	0.0	0.1	0.2
4	-0.4	-0.2	0.0	0.2	0.5
6	-0.7	-0.3	0.0	0.4	0.8
8	-0.9	-0.5	0.0	0.6	1.2
10	-1.2	-0.6	0.0	0.7	1.5
12	-1.4	-0.7	0.0	0.9	1.8
14	-1.7	-0.8	0.0	1.1	2.2
16	-1.9	-0.9	0.0	1.3	2.5
18	-2.2	-1.1	0.0	1.4	2.8
20	-2.4	-1.2	0.0	1.6	3.2
22	-2.7	-1.3	0.0	1.8	3.5
24	-2.9	-1.5	0.0	2.0	3.8
26	-3.1	-1.6	0.0	2.1	4.2
28	-3.4	-1.7	0.0	2.3	4.5
30	-3.6	-1.8	0.0	2.5	4.9
32	-3.8	-2.0	0.0	2.7	5.2
34	-4.0	-2.1	0.0	2.9	5.6

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
534	501	471	445	421	400	383	367	352	338	325
800	750	706	667	632	600	574	550	528	508	489
1066	1000	941	889	842	800	766	734	704	678	653
1332	1250	1176	1111	1053	1000	957	918	881	848	817
1599	1501	1411	1333	1264	1200	1149	1102	1058	1018	981
1867	1752	1647	1556	1474	1400	1341	1286	1235	1188	1145
2136	2004	1884	1779	1685	1600	1533	1470	1411	1358	1309
2406	2256	2121	2002	1897	1800	1724	1653	1588	1528	1473
2676	2509	2359	2226	2108	2000	1916	1837	1764	1698	1637
2947	2763	2596	2450	2319	2200	2107	2021	1941	1868	1801
3219	3017	2834	2673	2530	2400	2299	2204	2117	2038	1965
3492	3271	3072	2897	2742	2600	2490	2388	2294	2207	2129
3765	3527	3311	3122	2953	2800	2682	2572	2470	2377	2292
4040	3783	3550	3346	3165	3000	2873	2756	2647	2546	2455
4316	4039	3790	3571	3377	3200	3065	2940	2823	2716	2618
4592	4297	4030	3796	3589	3400	3257	3123	3000	2886	2781
4869	4554	4270	4021	3801	3600	3448	3306	3175	3055	2944
5148	4813	4511	4247	4013	3800	3639	3489	3351	3223	3107
5427	5072	4752	4473	4225	4000	3830	3672	3526	3392	3270
5708	5333	4994	4699	4438	4200	4022	3856	3703	3561	3432
5990	5594	5237	4926	4650	4400	4213	4039	3878	3730	3595
6274	5856	5480	5153	4863	4600	4405	4223	4054	3899	3757
6558	6119	5724	5380	5076	4800	4596	4405	4229	4067	3920
6844	6383	5968	5608	5289	5000	4786	4588	4404	4236	4082

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 & ABOVE	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
400	4.4	1:04	4.2	1:02	4.1	1:01	3.9	1:01	3.8	1:00
600	6.8	1:33	6.6	1:31	6.3	1:29	6.1	1:28	6.0	1:27
800	9.2	2:03	8.9	2:00	8.6	1:57	8.3	1:56	8.1	1:54
1000	11.6	2:33	11.2	2:28	10.9	2:25	10.5	2:23	10.3	2:21
1200	13.9	3:03	13.5	2:58	13.1	2:53	12.7	2:51	12.4	2:48
1400	16.3	3:34	15.8	3:27	15.3	3:22	14.8	3:18	14.5	3:15
1600	18.6	4:04	18.0	3:57	17.4	3:50	16.9	3:46	16.5	3:43
1800	20.8	4:35	20.2	4:27	19.6	4:19	19.0	4:14	18.6	4:10
2000	23.1	5:07	22.4	4:57	21.7	4:48	21.1	4:43	20.6	4:38
2200	25.3	5:38	24.6	5:27	23.8	5:18	23.1	5:11	22.6	5:05
2400	27.5	6:10	26.7	5:58	25.9	5:47	25.2	5:40	24.6	5:33
2600	29.7	6:42	28.9	6:29	28.0	6:17	27.2	6:09	26.5	6:01
2800	31.9	7:15	31.0	7:01	30.0	6:48	29.2	6:38	28.5	6:29
3000	34.0	7:47	33.1	7:32	32.1	7:18	31.1	7:07	30.4	6:57
3200	36.1	8:20	35.1	8:04	34.1	7:49	33.1	7:37	32.3	7:26
3400	38.2	8:53	37.1	8:36	36.0	8:20	35.0	8:06	34.2	7:55
3600	40.3	9:27	39.2	9:09	38.0	8:51	36.9	8:37	36.0	8:24
3800	42.4	10:01	41.1	9:42	40.0	9:23	38.8	9:07	37.9	8:53
4000	44.4	10:35	43.1	10:14	41.9	9:55	40.7	9:38	39.7	9:22
4200	46.4	11:10	45.1	10:48	43.8	10:27	42.6	10:09	41.5	9:52
4400	48.5	11:45	47.1	11:22	45.7	11:00	44.4	10:40	43.3	10:22
4600	50.5	12:20	49.0	11:56	47.6	11:33	46.2	11:12	45.1	10:52
4800	52.5	12:56	50.9	12:30	49.5	12:06	48.0	11:44	46.8	11:23
5000	54.5	13:32	52.9	13:04	51.3	12:39	49.9	12:16	48.6	11:53

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
5	-0.7	-0.4	0.0	2.0	4.7
10	-1.4	-0.8	0.0	3.1	7.8
15	-2.1	-1.2	0.0	4.1	10.6
20	-2.8	-1.6	0.0	5.0	12.9
25	-3.6	-2.0	0.0	5.7	14.8
30	-4.3	-2.4	0.0	6.4	16.3
35	-5.1	-2.7	0.0	6.8	17.3
40	-5.8	-3.1	0.0	7.2	18.0
45	-6.6	-3.4	0.0	7.4	18.2
50	-7.4	-3.7	0.0	7.5	18.0
55	-8.2	-4.0	0.0	7.4	17.3

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)								
	180	170	160	150	140	130	120	110	100
41						16	3	0	7
39				31	11	1	1	7	19
37			20	6	0	1	8	19	32
35	28	11	3	0	3	10	20	32	46
33	5	0	1	5	12	22	34	46	58
31	0	2	8	15	25	35	47	58	68
29	5	11	19	28	38	48	58	68	76
27	15	23	31	41	50	59	68	76	83
25	27	35	44	53	61	69	76	82	87

The above wind factor tables are 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 (LB)	DISTANCE (NM)				
			LANDING WEIGHT (1000 LB)				
			90	110	130	150	170
41000	26	760	101	116	127	134	137
39000	25	750	96	110	121	129	132
37000	24	740	92	105	115	123	127
35000	24	730	87	100	110	118	122
33000	23	720	84	96	106	113	117
31000	22	710	79	91	100	107	111
29000	21	690	75	86	94	100	104
27000	20	680	70	80	88	93	97
25000	19	660	65	75	82	87	90
23000	18	640	61	69	76	81	83
21000	17	620	56	64	70	74	77
19000	16	590	52	59	64	68	70
17000	15	570	48	54	58	61	63
15000	14	540	43	48	52	55	57
10000	10	450	30	33	35	37	37
5000	7	350	18	19	20	20	21
1500	4	270	9	9	9	9	9

Allowances for a straight-in approach are included.

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	41000
190	%N1	65.6	68.0	72.0	76.0	80.4	84.8	89.3		
	KIAS	254	254	255	257	259	261	264		
	FF/ENG	3450	3400	3380	3360	3340	3380	3520		
180	%N1	64.1	66.8	70.5	74.6	79.0	83.4	87.7		
	KIAS	247	247	249	250	252	254	257		
	FF/ENG	3280	3230	3200	3190	3150	3180	3290		
170	%N1	62.5	65.5	69.0	73.2	77.5	81.9	86.2	92.5	
	KIAS	240	241	242	243	244	246	249	252	
	FF/ENG	3120	3060	3030	3010	2960	2980	3070	3320	
160	%N1	60.9	63.9	67.5	71.7	75.8	80.3	84.6	89.8	
	KIAS	232	233	234	235	237	239	241	244	
	FF/ENG	2960	2900	2860	2840	2790	2790	2870	3020	
150	%N1	59.3	62.1	66.0	69.9	74.1	78.6	83.0	87.8	
	KIAS	225	226	227	228	229	231	233	236	
	FF/ENG	2790	2740	2700	2670	2620	2600	2670	2770	
140	%N1	57.7	60.3	64.4	68.1	72.4	76.9	81.2	85.8	
	KIAS	218	218	219	220	221	223	225	227	
	FF/ENG	2630	2580	2530	2490	2460	2410	2470	2540	
130	%N1	56.0	58.5	62.6	66.3	70.6	74.9	79.3	83.8	94.2
	KIAS	209	210	211	212	213	214	216	218	222
	FF/ENG	2470	2420	2370	2330	2290	2240	2280	2330	2680
120	%N1	54.2	56.6	60.4	64.5	68.5	72.8	77.3	81.8	90.1
	KIAS	201	202	202	203	204	205	207	209	212
	FF/ENG	2310	2250	2210	2160	2120	2070	2100	2140	2350
110	%N1	52.2	54.6	58.2	62.5	66.2	70.7	75.1	79.6	87.3
	KIAS	193	193	194	194	195	196	198	200	203
	FF/ENG	2160	2090	2050	2000	1960	1910	1940	1970	2110
100	%N1	50.1	52.5	56.1	60.0	64.0	68.3	72.5	77.2	84.6
	KIAS	187	187	187	187	187	187	188	190	192
	FF/ENG	2010	1940	1890	1880	1830	1790	1770	1780	1890
90	%N1	48.0	50.4	53.9	57.5	61.8	65.6	70.0	74.6	81.9
	KIAS	181	181	181	181	181	181	181	181	182
	FF/ENG	1900	1840	1770	1720	1680	1640	1620	1610	1680

This table includes 5% additional fuel for holding in a racetrack pattern.

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 15

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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	3170	210/-170	70	-110	390	40	-30	70	-70	220	70	150
MAX AUTO	4180	220/-220	100	-150	500	0	0	100	-100	390	0	10
AUTOBRAKE 3	5980	370/-370	160	-250	840	10	-10	170	-170	620	20	20
AUTOBRAKE 2	7610	520/-520	230	-340	1140	150	-170	220	-220	550	410	430
AUTOBRAKE 1	8290	600/-600	280	-390	1320	250	-260	240	-240	540	880	1360

Good Reported Braking Action

MAX MANUAL	4400	260/-250	120	-190	660	100	-90	110	-70	300	250	570
MAX AUTO	4880	280/-270	120	-200	690	90	-70	120	-100	380	280	640
AUTOBRAKE 3	5990	370/-370	160	-250	850	20	-20	170	-170	620	30	60
AUTOBRAKE 2	7610	520/-520	230	-340	1140	150	-170	220	-220	550	410	430

Medium Reported Braking Action

MAX MANUAL	6030	400/-390	180	-300	1100	260	-210	160	-160	400	680	1680
MAX AUTO	6350	410/-400	190	-300	1100	230	-180	160	-170	460	700	1710
AUTOBRAKE 3	6570	430/-420	190	-320	1140	180	-130	180	-180	620	460	1390
AUTOBRAKE 2	7770	530/-530	240	-360	1280	230	-220	220	-220	550	540	970

Poor Reported Braking Action

MAX MANUAL	7850	570/-550	260	-460	1730	630	-420	220	-220	480	1460	4000
MAX AUTO	8170	570/-550	260	-450	1710	620	-400	210	-220	500	1450	4010
AUTOBRAKE 3	8170	580/-550	260	-450	1720	580	-360	220	-230	600	1450	4020
AUTOBRAKE 2	8570	610/-600	280	-470	1780	590	-400	240	-240	550	1310	3530

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

BRAKING CONFIGURATION	REF DIST 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT ABOVE SEA LEVEL	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	TEMP ADJ PER 10°C ABV ISA	TEMP ADJ PER 10°C BLW ISA	VREF ADJ PER 10 KTS ABOVE VREF30	REVERSE THRUST ADJ ONE REV	REVERSE THRUST ADJ NO REV
MAX MANUAL	2990	180/-150	60	-110	370	30	-30	60	-60	220	60	130
MAX AUTO	3850	200/-200	90	-140	470	0	0	90	-90	370	0	0
AUTOBRAKE 3	5430	330/-330	150	-230	790	10	-10	150	-150	560	20	20
AUTOBRAKE 2	6910	450/-450	210	-320	1080	140	-150	190	-190	520	330	330
AUTOBRAKE 1	7530	530/-520	240	-370	1260	230	-230	220	-210	510	690	1110

Good Reported Braking Action

MAX MANUAL	4150	240/-230	110	-180	650	100	-90	100	-100	310	220	510
MAX AUTO	4580	250/-250	110	-190	670	80	-70	110	-110	360	250	570
AUTOBRAKE 3	5440	330/-330	150	-240	800	20	-20	150	-150	560	30	60
AUTOBRAKE 2	6910	450/-450	210	-320	1080	140	-150	190	-190	520	330	330

Medium Reported Braking Action

MAX MANUAL	5620	370/-360	170	-290	1060	250	-200	150	-150	390	600	1450
MAX AUTO	5900	380/-370	170	-290	1060	220	-170	150	-150	450	600	1460
AUTOBRAKE 3	6040	390/-380	170	-300	1100	180	-130	160	-160	560	430	1270
AUTOBRAKE 2	7070	470/-470	210	-340	1220	220	-200	190	-200	520	450	830

Poor Reported Braking Action

MAX MANUAL	7250	520/-500	240	-440	1670	590	-390	200	-200	460	1250	3340
MAX AUTO	7540	510/-500	240	-430	1660	580	-370	200	-200	490	1240	3350
AUTOBRAKE 3	7540	520/-500	240	-440	1670	560	-360	200	-200	540	1270	3390
AUTOBRAKE 2	7840	550/-530	250	-450	1710	560	-370	210	-220	520	1120	2980

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 speed-brakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2820	160/-130	60	-100	360	30	-30	60	-60	220	50	110
MAX AUTO	3530	170/-180	80	-130	450	0	0	80	-80	350	0	0
AUTOBRAKE 3	4900	290/-290	130	-220	750	10	-10	130	-130	540	10	10
AUTOBRAKE 2	6280	400/-400	180	-300	1030	100	-120	170	-170	520	180	180
AUTOBRAKE 1	6940	470/-470	220	-350	1210	190	-210	200	-190	510	550	800

Good Reported Braking Action

MAX MANUAL	3920	220/-210	100	-180	630	100	-80	90	-90	310	200	450
MAX AUTO	4280	230/-230	110	-180	650	80	-70	100	-100	360	220	490
AUTOBRAKE 3	4910	290/-290	130	-220	760	20	-20	130	-130	540	20	60
AUTOBRAKE 2	6280	400/-400	180	-300	1030	100	-120	170	-170	520	180	180

Medium Reported Braking Action

MAX MANUAL	5270	340/-330	150	-280	1040	240	-190	140	-140	400	530	1270
MAX AUTO	5490	340/-340	160	-280	1030	210	-160	140	-140	460	530	1270
AUTOBRAKE 3	5580	350/-340	160	-290	1060	180	-130	150	-150	540	430	1210
AUTOBRAKE 2	6440	410/-410	190	-330	1170	190	-180	180	-180	520	300	660

Poor Reported Braking Action

MAX MANUAL	6790	470/-460	220	-420	1630	570	-380	180	-190	460	1110	2940
MAX AUTO	7070	470/-460	220	-420	1620	580	-360	180	-190	480	1120	2960
AUTOBRAKE 3	7070	480/-470	220	-420	1620	550	-350	180	-190	510	1130	2970
AUTOBRAKE 2	7250	500/-480	230	-440	1670	530	-360	190	-200	520	940	2650

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 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	3970	530/-210	150/TBS	-150	690	80	-60	360
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4960	260/-280	130/TBS	-240	890	150	-130	380
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3480	210/-170	80/TBS	-120	430	50	-40	290
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3310	180/-160	80/TBS	-120	420	50	-40	300
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3120	160/-150	70/TBS	-110	400	50	-40	310
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3580	170/-180	90/TBS	-130	470	60	-50	260
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4460	220/-250	120/TBS	-170	590	100	-80	430
LEADING EDGE FLAPS TRANSIT	VREF15+15	3550	230/-180	90/TBS	-120	430	50	-40	230
ONE ENGINE INOPERATIVE	VREF15	3200	210/-170	70/TBS	-110	410	40	-30	220
STABILIZER TRIM INOPERATIVE	VREF15	3160	210/-160	70/TBS	-110	400	40	-30	210

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 DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2990	180/-150	60/TBS	-110	370	30	-30	220
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3160	210/-160	70/TBS	-110	400	40	-30	210
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3410	260/-180	90/TBS	-120	440	40	-30	230
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2990	180/-150	60/TBS	-110	370	30	-30	220
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3160	210/-160	70/TBS	-110	400	40	-30	210
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	3160	210/-160	70/TBS	-110	400	40	-30	210
TRAILING EDGE FLAPS UP	VREF40+40	3600	340/-190	110/TBS	-120	560	50	-40	240

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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	5470	270/-280	160/TBS	-210	750	120	-100	290
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5520	300/-330	150/TBS	-280	1080	220	-180	420
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5040	270/-300	140/TBS	-210	750	150	-120	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4720	250/-280	130/TBS	-200	730	140	-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4410	230/-250	120/TBS	-190	700	140	-110	430
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4550	240/-260	120/TBS	-190	690	110	-90	330
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5400	300/-330	160/TBS	-220	780	170	-140	510
LEADING EDGE FLAPS TRANSIT	VREF15+15	4950	250/-280	140/TBS	-200	720	120	-100	320
ONE ENGINE INOPERATIVE	VREF15	4550	240/-260	120/TBS	-190	700	120	-100	320
STABILIZER TRIM INOPERATIVE	VREF15	4360	230/-250	120/TBS	-180	670	100	-80	300

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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	4150	240/-230	110/TBS	-180	650	100	-90	310
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4360	230/-250	120/TBS	-180	670	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4710	240/-250	130/TBS	-190	700	110	-90	290
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4150	240/-230	110/TBS	-180	650	100	-90	310
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4360	230/-250	120/TBS	-180	670	100	-80	300
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	4360	230/-250	120/TBS	-180	670	100	-80	300
TRAILING EDGE FLAPS UP	VREF40+40	4940	250/-260	140/TBS	-200	710	110	-90	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

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	7720	450/-460	250/TBS	-340	1240	330	-250	410
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6950	430/-450	210/TBS	-420	1690	500	-350	480
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6840	440/-460	220/TBS	-330	1210	360	-260	540
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6340	390/-420	200/TBS	-320	1180	340	-250	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5880	360/-380	180/TBS	-300	1140	320	-230	520
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6190	380/-400	190/TBS	-300	1140	290	-210	430
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	7300	480/-510	250/TBS	-350	1270	410	-300	630
LEADING EDGE FLAPS TRANSIT	VREF15+15	6760	410/-430	210/TBS	-320	1180	300	-230	420
ONE ENGINE INOPERATIVE	VREF15	6480	390/-420	200/TBS	-320	1200	350	-250	450
STABILIZER TRIM INOPERATIVE	VREF15	5930	360/-380	180/TBS	-290	1110	270	-200	390

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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	5620	370/-360	170/TBS	-290	1060	250	-200	390
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5930	360/-380	180/TBS	-290	1110	270	-200	390
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6490	390/-390	200/TBS	-310	1150	290	-210	390
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5620	370/-360	170/TBS	-290	1060	250	-200	390
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5930	360/-380	180/TBS	-290	1110	270	-200	390
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	5930	360/-380	180/TBS	-290	1110	270	-200	390
TRAILING EDGE FLAPS UP	VREF40+40	6890	400/-410	220/TBS	-320	1180	300	-220	390

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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	10230	670/-670	370/TBS	-510	1970	830	-510	510
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	9150	630/-640	290/TBS	-690	3140	1940	-800	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8780	630/-640	320/TBS	-490	1890	850	-500	620
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	8080	560/-570	280/TBS	-470	1840	800	-460	600
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7480	510/-520	250/TBS	-450	1780	770	-440	580
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7990	550/-560	270/TBS	-450	1790	720	-420	510
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	9330	690/-690	350/TBS	-510	1960	940	-550	710
LEADING EDGE FLAPS TRANSIT	VREF15+15	8710	590/-600	300/TBS	-470	1840	740	-440	500
ONE ENGINE INOPERATIVE	VREF15	8810	590/-620	290/TBS	-510	1970	960	-540	550
STABILIZER TRIM INOPERATIVE	VREF15	7660	520/-530	260/TBS	-440	1750	670	-390	470

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 DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	7250	520/-500	240/TBS	-440	1670	590	-390	460
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	7660	520/-530	260/TBS	-440	1750	670	-390	470
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	8460	570/-560	290/TBS	-460	1820	720	-430	480
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	7250	520/-500	240/TBS	-440	1670	590	-390	460
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	7660	520/-530	260/TBS	-440	1750	670	-390	470
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	7660	520/-530	260/TBS	-440	1750	670	-390	470
TRAILING EDGE FLAPS UP	VREF40+40	9060	600/-590	310/TBS	-480	1870	750	-450	480

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 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
180	0	15.8	17.8	20.3	22.9	26.2	30.3	31.2	35.9	41.6	40.3	46.4	53.9	50.1	57.8	67.0	59.9	69.0	79.8
	10	16.2	18.3	20.9	23.7	27.1	31.3	32.2	37.1	43.0	41.6	48.0	55.8	51.8	59.7	69.2	61.9	71.3	82.3
	20	16.7	18.9	21.6	24.4	28.0	32.3	33.3	38.3	44.5	43.0	49.6	57.6	53.5	61.6	71.4	63.8	73.4	84.8
	30	17.1	19.3	22.1	25.0	28.7	33.1	34.1	39.3	45.6	44.2	50.9	59.1	54.9	63.3	73.3	65.6	75.5	87.1
	40	17.3	19.6	22.4	25.4	29.2	33.8	34.8	40.1	46.6	45.1	52.0	60.4	56.1	64.8	75.1	67.1	77.3	89.3
	50	17.4	19.8	22.6	25.7	29.5	34.2	35.2	40.6	47.3	45.7	52.8	61.5	57.0	65.9	76.6	68.4	78.9	91.4
160	0	14.4	16.2	18.4	20.8	23.8	27.4	28.2	32.4	37.5	36.3	41.8	48.6	45.1	52.0	60.4	54.2	62.5	72.4
	10	14.9	16.7	19.0	21.5	24.6	28.3	29.1	33.5	38.8	37.5	43.3	50.2	46.6	53.8	62.4	56.0	64.6	74.8
	20	15.3	17.2	19.6	22.2	25.3	29.2	30.1	34.6	40.1	38.8	44.7	51.9	48.1	55.5	64.3	57.8	66.6	77.0
	30	15.6	17.6	20.0	22.7	26.0	30.0	30.9	35.5	41.2	39.8	45.9	53.3	49.4	57.0	66.1	59.4	68.4	79.1
	40	15.8	17.8	20.3	23.1	26.4	30.5	31.4	36.2	42.0	40.6	46.8	54.4	50.5	58.3	67.6	60.7	70.0	81.1
	50	15.9	18.0	20.5	23.3	26.7	30.8	31.8	36.6	42.6	41.1	47.5	55.3	51.2	59.2	68.9	61.8	71.4	82.8
140	0	13.1	14.7	16.6	18.8	21.3	24.5	25.2	28.9	33.4	32.3	37.2	43.2	40.0	46.1	53.6	48.2	55.6	64.6
	10	13.5	15.1	17.1	19.4	22.0	25.3	26.1	29.9	34.6	33.4	38.5	44.6	41.3	47.7	55.4	49.9	57.5	66.7
	20	13.9	15.5	17.6	20.0	22.7	26.1	26.9	30.9	35.7	34.5	39.7	46.1	42.7	49.2	57.1	51.5	59.4	68.8
	30	14.2	15.9	18.0	20.4	23.3	26.8	27.6	31.6	36.7	35.4	40.8	47.4	43.8	50.6	58.7	52.9	61.0	70.7
	40	14.3	16.1	18.2	20.7	23.6	27.2	28.0	32.2	37.4	36.1	41.6	48.3	44.7	51.6	60.0	54.0	62.4	72.3
	50	14.4	16.2	18.4	20.9	23.9	27.5	28.3	32.6	37.8	36.5	42.1	49.1	45.4	52.4	61.0	54.9	63.5	73.8
120	0	11.8	13.1	14.7	16.7	18.9	21.6	22.2	25.4	29.3	28.3	32.5	37.7	34.8	40.1	46.6	42.0	48.4	56.2
	10	12.2	13.5	15.2	17.2	19.5	22.3	23.0	26.2	30.3	29.2	33.6	39.0	36.0	41.5	48.2	43.4	50.1	58.1
	20	12.5	13.9	15.6	17.7	20.1	23.0	23.7	27.1	31.3	30.2	34.7	40.3	37.2	42.9	49.8	44.8	51.7	60.0
	30	12.7	14.1	15.9	18.1	20.6	23.6	24.3	27.8	32.1	31.0	35.6	41.3	38.2	44.0	51.1	46.0	53.1	61.6
	40	12.9	14.3	16.2	18.4	20.9	23.9	24.7	28.3	32.7	31.5	36.3	42.1	38.9	44.9	52.2	47.0	54.2	63.0
	50	12.9	14.4	16.3	18.5	21.0	24.2	24.9	28.5	33.1	31.9	36.7	42.7	39.4	45.5	53.0	47.7	55.1	64.1
100	0	10.5	11.6	12.9	14.6	16.4	18.7	19.2	21.9	25.1	24.2	27.8	32.1	29.6	34.1	39.5	35.4	40.8	47.4
	10	10.8	11.9	13.3	15.1	17.0	19.3	19.9	22.6	26.0	25.0	28.7	33.2	30.6	35.2	40.9	36.6	42.2	49.0
	20	11.1	12.2	13.6	15.5	17.4	19.9	20.5	23.3	26.8	25.9	29.6	34.3	31.6	36.4	42.2	37.8	43.6	50.6
	30	11.3	12.4	13.9	15.8	17.8	20.3	20.9	23.9	27.5	26.5	30.4	35.2	32.4	37.4	43.3	38.8	44.8	52.0
	40	11.4	12.6	14.1	16.0	18.1	20.6	21.3	24.3	28.0	27.0	30.9	35.9	33.0	38.1	44.2	39.6	45.7	53.1
	50	11.5	12.7	14.2	16.2	18.2	20.8	21.4	24.5	28.3	27.2	31.3	36.3	33.4	38.5	44.8	40.1	46.3	54.0
90	0	9.9	10.8	12.0	13.6	15.2	17.2	17.7	20.1	23.0	22.2	25.4	29.3	27.0	31.0	35.9	32.0	36.9	42.8
	10	10.2	11.1	12.3	14.0	15.7	17.8	18.3	20.8	23.8	22.9	26.2	30.3	27.9	32.1	37.1	33.1	38.1	44.3
	20	10.4	11.4	12.6	14.4	16.1	18.3	18.8	21.4	24.6	23.7	27.1	31.3	28.8	33.1	38.4	34.2	39.4	45.7
	30	10.6	11.6	12.9	14.7	16.5	18.7	19.3	21.9	25.2	24.3	27.8	32.1	29.6	34.0	39.4	35.1	40.5	47.0
	40	10.7	11.7	13.0	14.9	16.7	19.0	19.6	22.3	25.6	24.7	28.2	32.7	30.1	34.6	40.2	35.8	41.3	47.9
	50	10.7	11.8	13.1	15.0	16.8	19.1	19.7	22.4	25.8	24.9	28.5	33.0	30.4	35.0	40.7	36.2	41.8	48.6

***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	5.9	15.9	25.9	35.7	45.7	55.8	66.2	76.8	87.5
	MAX AUTO	5.3	14.8	24.3	33.8	43.5	53.6	63.9	74.6	85.7
	AUTOBRAKE 3	4.7	13.4	21.8	29.8	38.1	47.3	57.2	68.0	79.6
	AUTOBRAKE 2	4.0	11.9	19.3	26.1	33.1	41.0	50.0	59.9	70.8
	AUTOBRAKE 1	3.3	10.4	16.8	22.5	28.3	34.9	42.2	50.4	59.3

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.6	14.9	24.1	33.2	42.5	51.9	61.6	71.6	81.8
	MAX AUTO	4.0	12.1	20.3	28.7	37.4	46.9	56.9	67.6	78.8
	AUTOBRAKE 3	1.7	7.3	13.0	18.8	25.2	32.4	40.5	49.6	59.6
	AUTOBRAKE 2	0.1	3.9	7.7	11.5	15.7	20.8	27.0	34.1	42.1
	AUTOBRAKE 1		1.9	4.4	6.5	8.9	12.1	16.1	20.9	26.5

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	26	29	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	4.0	4.4	4.9	5.0 TO 7.8	7.8 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	20	30	40	50	60		

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

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	96.8	96.6	96.3	96.1	95.9	95.4	95.0	94.7	93.9
15	97.4	97.2	96.9	96.8	96.6	96.2	95.7	95.5	94.8
10	98.0	97.8	97.5	97.4	97.4	96.9	96.5	96.3	95.7
5	98.3	98.6	98.3	98.1	98.1	97.7	97.3	97.1	96.6
0	97.5	98.7	99.2	99.0	98.9	98.5	98.2	98.0	97.5
-5	96.7	98.0	99.1	99.8	99.7	99.3	98.9	98.7	98.4
-10	96.0	97.2	98.4	99.6	100.5	100.2	99.8	99.6	99.4
-15	95.2	96.4	97.6	98.8	100.1	101.0	100.8	100.6	100.3
-20	94.4	95.6	96.8	98.0	99.3	100.5	101.1	100.8	100.6
-25	93.6	94.9	96.0	97.2	98.5	99.7	100.2	100.0	99.8
-30	92.8	94.1	95.2	96.4	97.7	98.8	99.4	99.2	99.0
-35	92.0	93.2	94.4	95.6	96.8	98.0	98.5	98.3	98.1
-40	91.2	92.4	93.5	94.7	96.0	97.1	97.6	97.4	97.2

%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	96.6	97.6	98.5	99.4	100.2	99.6	98.8	97.6	96.3	94.7	93.2	91.8
200	.63	96.0	96.9	97.8	98.7	99.6	100.4	100.1	99.3	98.4	97.5	96.3	95.2
240	.74	95.1	96.0	96.8	97.7	98.6	99.4	100.3	100.7	100.0	99.2	98.4	97.5
280	.86	94.3	95.2	96.1	97.0	97.8	98.7	99.5	100.4	101.2	100.9	100.0	99.1

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	96.5	97.4	98.3	99.2	100.1	99.8	99.0	98.0	96.8	95.4	94.0	92.7
200	.60	96.1	97.0	97.9	98.8	99.7	100.6	100.5	99.6	98.6	97.6	96.5	95.4
240	.71	95.0	95.9	96.8	97.7	98.6	99.4	100.3	100.8	100.2	99.5	98.6	97.7
280	.82	93.8	94.6	95.5	96.4	97.3	98.1	98.9	99.8	100.6	100.3	99.5	98.8

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	97.4	98.3	99.2	100.0	100.8	100.0	99.1	97.9	96.7	95.3	93.9	92.6
200	.58	97.0	97.9	98.8	99.7	100.6	101.4	100.6	99.6	98.6	97.5	96.3	95.1
240	.68	95.9	96.8	97.7	98.5	99.4	100.2	101.1	100.9	100.2	99.4	98.4	97.4
280	.79	94.3	95.1	96.0	96.8	97.7	98.5	99.3	100.2	100.5	99.7	98.9	98.1
320	.89	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	100.3	101.1	100.7	99.8

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	97.3	98.2	99.1	100.0	100.9	101.1	100.2	99.2	98.0	96.6	95.2	93.9
200	.55	97.1	98.0	98.9	99.7	100.6	101.5	101.6	100.7	99.7	98.6	97.4	96.2
240	.66	95.6	96.5	97.4	98.3	99.1	100.0	100.8	101.3	100.5	99.8	98.8	97.8
280	.76	93.8	94.7	95.5	96.4	97.2	98.0	98.8	99.7	100.5	99.8	98.9	98.0
320	.85	92.4	93.2	94.1	94.9	95.7	96.5	97.4	98.2	98.9	99.7	99.9	99.1

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	98.1	99.0	99.9	100.8	101.6	101.2	100.2	99.1	97.9	96.4	95.1	93.8
200	.53	97.5	98.4	99.3	100.2	101.0	101.9	101.3	100.4	99.3	98.2	96.9	95.8
240	.63	96.3	97.1	98.0	98.9	99.7	100.5	101.4	101.1	100.2	99.2	98.3	97.2
280	.73	94.2	95.0	95.9	96.7	97.5	98.3	99.1	99.9	100.1	99.1	98.2	97.5
320	.82	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	98.5	97.6
360	.91	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	100.0	100.1

%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	98.0	98.8	99.7	100.6	101.4	102.2	101.2	100.2	99.0	97.8	96.4	95.1
200	.51	96.9	97.8	98.7	99.6	100.4	101.2	101.8	100.8	99.9	98.8	97.6	96.4
240	.60	95.6	96.5	97.4	98.2	99.1	99.9	100.7	101.3	100.4	99.4	98.5	97.5
280	.70	93.6	94.4	95.3	96.1	96.9	97.7	98.5	99.3	100.1	99.4	98.4	97.6
320	.79	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.6	97.8
360	.88	91.0	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	98.1	98.8	99.4
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.8	99.7	100.5	101.4	102.2	102.4	101.4	100.3	99.1	97.7	96.5	95.2
200	.49	97.5	98.3	99.2	100.0	100.9	101.7	101.5	100.6	99.5	98.4	97.3	96.2
240	.58	95.7	96.5	97.4	98.2	99.0	99.9	100.7	100.5	99.5	98.6	97.6	96.7
280	.67	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.5	99.5	98.6	97.6	96.9
320	.76	91.7	92.6	93.4	94.2	95.0	95.8	96.5	97.3	98.0	98.6	97.8	97.2
360	.85	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.6	98.4	98.2
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	98.6	99.5	100.4	101.2	102.1	102.9	101.9	100.8	99.6	98.4	97.1	95.8
200	.48	97.5	98.4	99.2	100.1	100.9	101.8	102.2	101.1	100.1	99.0	97.8	96.7
240	.57	95.9	96.8	97.6	98.5	99.3	100.1	100.9	101.2	100.2	99.2	98.2	97.3
280	.66	94.2	95.1	95.9	96.7	97.5	98.3	99.1	99.9	100.4	99.4	98.3	97.5
320	.75	92.1	93.0	93.8	94.6	95.4	96.2	96.9	97.7	98.5	99.2	98.6	97.8
360	.83	90.6	91.4	92.2	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	99.1	100.0	100.9	101.7	102.5	102.8	101.8	100.7	99.5	98.2	97.0	95.8
200	.46	98.4	99.3	100.1	101.0	101.8	102.6	102.3	101.2	100.0	98.9	97.8	96.8
240	.55	97.2	98.1	98.9	99.7	100.5	101.3	102.1	101.6	100.5	99.4	98.5	97.5
280	.63	95.7	96.5	97.4	98.2	99.0	99.8	100.6	101.3	101.0	99.8	98.9	98.1
320	.72	93.9	94.7	95.5	96.3	97.1	97.9	98.6	99.4	100.1	100.2	99.3	98.6
360	.80	92.2	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	99.2	99.7	99.1
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	98.7	99.5	100.4	101.2	102.0	102.8	102.5	101.5	100.4	99.2	98.0	96.8
200	.44	98.3	99.2	100.0	100.9	101.7	102.5	103.3	102.3	101.1	100.0	98.9	97.8
240	.53	97.5	98.4	99.2	100.0	100.8	101.7	102.5	103.1	101.8	100.5	99.5	98.6
280	.61	96.2	97.0	97.8	98.7	99.5	100.3	101.1	101.8	102.5	101.3	100.1	99.3
320	.69	94.7	95.5	96.3	97.1	97.9	98.7	99.5	100.2	101.0	101.7	100.9	99.9
360	.77	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	100.0	100.7	100.4

%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	98.5	99.3	100.2	101.0	101.8	102.6	101.6	100.3	99.2	98.1	97.0	95.9
200	.42	98.7	99.6	100.4	101.2	102.0	102.8	103.1	101.7	100.4	99.3	98.3	97.3
240	.51	97.8	98.7	99.5	100.3	101.1	101.9	102.7	102.5	101.1	99.9	99.0	98.1
280	.59	96.3	97.1	97.9	98.7	99.5	100.3	101.0	101.8	101.6	100.5	99.6	98.8
320	.67	94.8	95.6	96.4	97.2	97.9	98.7	99.5	100.2	101.0	100.9	100.0	99.2
360	.75	93.0	93.8	94.6	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.2	99.6
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	97.1	98.0	98.8	99.6	100.4	101.2	101.6	100.3	99.1	98.1	97.1	96.1
200	.41	98.0	98.8	99.6	100.4	101.2	102.0	102.8	102.5	101.3	100.2	99.3	98.3
240	.49	97.1	97.9	98.7	99.5	100.3	101.1	101.9	102.7	101.8	100.5	99.6	98.7
280	.57	95.6	96.4	97.2	98.0	98.8	99.6	100.3	101.1	101.8	100.9	99.8	99.0
320	.64	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.2	99.4
360	.72	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.4	99.2	99.9	99.6
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	96.6	97.4	98.2	99.0	99.8	100.6	100.4	99.1	98.0	97.1	96.2	95.3
200	.39	97.1	97.9	98.7	99.5	100.3	101.1	101.8	101.5	101.0	100.1	99.3	98.4
240	.47	96.6	97.4	98.2	99.0	99.8	100.6	101.3	101.8	101.1	100.3	99.5	98.7
280	.54	95.5	96.3	97.1	97.8	98.6	99.4	100.1	100.9	101.0	100.1	99.2	98.5
320	.62	94.1	94.9	95.7	96.5	97.2	98.0	98.7	99.5	100.2	100.3	99.5	98.8
360	.69	92.2	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.6	99.0
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	96.3	97.0	97.8	98.6	99.4	100.1	99.3	98.1	97.1	96.3	95.4	94.5
200	.38	97.1	97.9	98.7	99.5	100.3	101.0	101.5	100.8	99.8	99.0	98.2	97.3
240	.45	96.5	97.3	98.0	98.8	99.6	100.3	101.1	101.0	100.1	99.4	98.6	97.9
280	.52	95.5	96.3	97.0	97.8	98.6	99.3	100.0	100.8	100.3	99.4	98.6	98.0
320	.60	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	99.7	98.9	98.2
360	.67	92.3	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	99.4	99.1	98.5

%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	95.2	96.0	96.8	97.6	98.3	99.1	99.8	98.6	97.4	96.6	95.8	94.9
200	.36	96.0	96.7	97.5	98.3	99.0	99.8	100.5	100.5	99.4	98.5	97.8	97.0
240	.43	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.1	99.2	98.4	97.7
280	.51	94.5	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.4	99.5	98.7	98.0
320	.58	93.0	93.9	94.7	95.5	96.2	97.0	97.8	98.6	99.3	99.7	99.0	98.2
360	.65	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	99.1	98.5
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	94.9	95.7	96.4	97.2	98.0	98.8	99.2	98.3	97.4	96.6	95.9	95.1
200	.33	94.7	95.5	96.3	97.1	97.8	98.6	99.4	98.9	98.0	97.3	96.6	95.8
240	.40	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.5	98.7	97.9	97.2	96.5
280	.46	93.3	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	98.2	97.5	96.8
320	.53	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	98.7	98.4	97.7	97.1
360	.59	91.5	92.3	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.0	97.3
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.9	97.1	96.4	95.6	94.8
200	.32	94.5	95.3	96.1	96.9	97.6	98.4	99.2	98.3	97.5	96.8	96.1	95.3
240	.38	94.1	94.9	95.6	96.4	97.2	98.0	98.7	98.8	98.0	97.2	96.6	95.9
280	.45	93.2	94.0	94.8	95.6	96.4	97.2	97.9	98.7	98.3	97.5	96.9	96.2
320	.51	92.5	93.3	94.1	94.9	95.7	96.4	97.2	98.0	98.5	97.8	97.1	96.5
360	.57	91.6	92.4	93.2	94.0	94.7	95.5	96.3	97.1	97.8	98.1	97.4	96.8
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	93.9	94.7	95.4	96.2	97.0	97.8	98.5	98.2	97.4	96.7	96.0	95.2
200	.31	93.5	94.3	95.1	95.9	96.7	97.4	98.2	98.5	97.8	97.0	96.3	95.6
240	.37	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	98.1	97.3	96.6	95.9
280	.43	92.3	93.2	93.9	94.7	95.5	96.3	97.1	97.8	98.3	97.6	96.9	96.2
320	.49	91.6	92.4	93.2	94.0	94.8	95.6	96.3	97.1	97.9	97.9	97.2	96.5
360	.55	90.7	91.5	92.3	93.1	93.9	94.7	95.4	96.2	96.9	97.7	97.3	96.6

%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 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	173	258	18300	17100	15900
170	164	251	19900	18700	17500
160	154	244	21200	20300	19100
150	145	236	22700	21700	20700
140	135	229	24200	23300	22400
130	125	220	26000	25000	24100
120	115	212	28000	27100	26100
110	106	203	30000	29200	28200
100	96	194	32000	31300	30400
90	87	184	34200	33500	32600

Includes APU fuel burn.

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	130	121	113	106	100	95	90	85	81	78
280	259	241	226	212	200	189	179	171	163	155
420	389	362	339	318	300	284	269	256	244	233
560	519	483	452	424	400	378	359	341	326	311
700	648	604	565	530	500	473	449	427	407	389
840	778	724	677	636	600	568	538	512	488	467
980	907	845	790	742	700	662	628	598	570	544
1120	1037	965	903	848	800	757	718	683	651	622
1260	1167	1086	1016	955	900	851	808	768	733	700
1400	1296	1207	1129	1061	1000	946	897	854	814	778
1540	1426	1327	1242	1167	1100	1041	987	939	895	856
1680	1555	1448	1355	1273	1200	1135	1077	1024	977	933
1820	1685	1569	1468	1379	1300	1230	1167	1110	1058	1011
1960	1815	1690	1581	1485	1400	1324	1256	1195	1139	1089
2101	1945	1811	1694	1591	1500	1419	1346	1280	1221	1166
2241	2075	1932	1807	1697	1600	1513	1436	1366	1302	1244
2382	2205	2053	1920	1803	1700	1608	1525	1451	1383	1322
2523	2335	2174	2033	1909	1800	1702	1615	1536	1464	1399

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	90	100	110	120	130	140	150	160	170	180	
100	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.2	0:17
200	1.8	1.9	2.0	2.2	2.3	2.4	2.6	2.7	2.8	3.0	0:34
300	2.9	3.1	3.3	3.5	3.7	3.9	4.2	4.4	4.6	4.9	0:52
400	3.9	4.2	4.5	4.8	5.1	5.4	5.8	6.1	6.4	6.8	1:09
500	4.8	5.2	5.6	6.1	6.4	6.8	7.3	7.7	8.1	8.6	1:26
600	5.8	6.3	6.8	7.3	7.7	8.2	8.8	9.3	9.8	10.3	1:43
700	6.7	7.3	7.9	8.5	9.0	9.6	10.2	10.8	11.4	12.1	2:00
800	7.6	8.3	9.0	9.7	10.3	11.0	11.7	12.4	13.0	13.8	2:17
900	8.6	9.3	10.1	10.9	11.6	12.3	13.1	13.9	14.6	15.5	2:34
1000	9.5	10.3	11.1	12.0	12.8	13.7	14.5	15.4	16.2	17.1	2:51
1100	10.4	11.3	12.2	13.2	14.1	15.0	15.9	16.9	17.8	18.8	3:09
1200	11.3	12.3	13.3	14.3	15.3	16.3	17.3	18.4	19.4	20.5	3:26
1300	12.1	13.2	14.3	15.5	16.5	17.6	18.7	19.8	20.9	22.1	3:43
1400	13.0	14.2	15.4	16.6	17.7	18.9	20.1	21.3	22.4	23.7	4:00
1500	13.9	15.1	16.4	17.7	18.9	20.2	21.5	22.7	24.0	25.3	4:17
1600	14.7	16.1	17.4	18.8	20.1	21.4	22.8	24.2	25.5	27.0	4:35
1700	15.6	17.0	18.4	19.9	21.3	22.7	24.2	25.6	27.0	28.5	4:52
1800	16.4	17.9	19.4	21.0	22.4	24.0	25.5	27.0	28.5	30.1	5:09

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at long range cruise speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
190	13600	11200	8300
180	15600	13600	10800
170	17400	15700	13300
160	19300	17600	15700
150	20900	19600	17700
140	22300	21200	19800
130	23900	22800	21500
120	25800	24500	23300
110	28300	26900	25200
100	30600	29600	28100
90	32700	31900	30800

With engine anti-ice on, decrease altitude capability by 1100 ft.
With engine and wing anti-ice on, decrease altitude capability by 5100 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT) 10	15	17	19	21	23	25	27	29	31	33
180	%N1	91.5	95.3	97.7								
	MACH	.542	.578	.593								
	KIAS	301	292	288								
	FF/ENG	6644	6551	6590								
170	%N1	90.1	93.7	95.7	98.5							
	MACH	.531	.569	.582	.597							
	KIAS	294	287	283	280							
	FF/ENG	6299	6201	6169	6249							
160	%N1	88.6	92.2	93.9	96.1							
	MACH	.519	.557	.572	.586							
	KIAS	287	281	278	274							
	FF/ENG	5951	5852	5803	5796							
150	%N1	87.1	90.6	92.1	94.0	96.5						
	MACH	.505	.545	.561	.575	.590						
	KIAS	280	275	272	269	265						
	FF/ENG	5602	5508	5455	5411	5446						
140	%N1	85.4	89.0	90.5	92.0	94.1	96.9					
	MACH	.492	.531	.547	.563	.577	.593					
	KIAS	272	268	266	263	259	256					
	FF/ENG	5256	5166	5114	5062	5034	5109					
130	%N1	83.6	87.2	88.7	90.2	91.9	94.1	97.1				
	MACH	.477	.517	.533	.549	.565	.579	.595				
	KIAS	264	260	258	256	253	250	246				
	FF/ENG	4911	4821	4774	4721	4681	4669	4772				
120	%N1	81.7	85.3	86.8	88.3	89.8	91.6	94.0	97.1			
	MACH	.461	.500	.517	.533	.550	.566	.580	.597			
	KIAS	255	252	250	249	246	244	240	237			
	FF/ENG	4565	4474	4430	4382	4337	4307	4313	4423			
110	%N1	79.7	83.2	84.7	86.2	87.8	89.3	91.2	93.7	96.9		
	MACH	.445	.483	.499	.516	.533	.549	.566	.580	.597		
	KIAS	246	243	242	240	238	236	234	230	227		
	FF/ENG	4223	4130	4085	4040	4000	3959	3945	3960	4067		
100	%N1	77.4	81.0	82.5	84.0	85.5	87.1	88.6	90.5	93.2	96.3	
	MACH	.428	.464	.480	.497	.514	.531	.548	.564	.579	.596	
	KIAS	237	233	232	231	230	228	226	223	220	217	
	FF/ENG	3890	3786	3743	3698	3660	3623	3595	3592	3604	3705	
90	%N1	75.2	78.6	80.0	81.5	83.0	84.6	86.1	87.6	89.5	92.3	95.4
	MACH	.410	.445	.460	.476	.492	.509	.527	.544	.561	.577	.594
	KIAS	227	223	222	221	220	218	217	215	213	209	206
	FF/ENG	3566	3446	3402	3358	3320	3286	3259	3244	3239	3246	3334

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
296	270	248	230	214	200	190	180	172	164	157
596	544	498	461	429	400	379	360	343	327	314
898	819	750	692	644	600	569	540	514	491	470
1201	1095	1002	924	858	800	758	720	685	654	626
1506	1372	1255	1157	1074	1000	948	899	856	816	781
1813	1650	1508	1390	1289	1200	1137	1079	1026	979	937
2122	1930	1762	1623	1505	1400	1326	1259	1197	1141	1092
2433	2211	2017	1856	1720	1600	1516	1438	1368	1304	1247
2745	2493	2272	2090	1936	1800	1704	1617	1537	1466	1402

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.1	0:42	2.8	0:41	2.5	0:39	2.2	0:38	2.1	0:37
400	6.4	1:22	5.9	1:19	5.4	1:16	4.9	1:13	4.8	1:11
600	9.7	2:03	8.9	1:57	8.2	1:52	7.6	1:48	7.4	1:44
800	12.9	2:44	11.9	2:36	11.0	2:29	10.3	2:23	10.0	2:18
1000	16.1	3:25	14.9	3:15	13.8	3:06	12.9	2:58	12.5	2:52
1200	19.3	4:07	17.9	3:55	16.6	3:43	15.5	3:34	15.0	3:27
1400	22.4	4:49	20.8	4:35	19.3	4:21	18.0	4:10	17.5	4:01
1600	25.5	5:32	23.7	5:15	22.0	5:00	20.6	4:46	19.9	4:36
1800	28.5	6:15	26.5	5:56	24.7	5:38	23.0	5:23	22.2	5:11

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.2	-0.1	0.0	0.2	0.5
4	-0.5	-0.3	0.0	0.6	1.2
6	-0.8	-0.4	0.0	0.9	1.9
8	-1.1	-0.5	0.0	1.2	2.6
10	-1.3	-0.7	0.0	1.6	3.3
12	-1.6	-0.8	0.0	1.9	4.0
14	-1.9	-1.0	0.0	2.2	4.6
16	-2.2	-1.1	0.0	2.5	5.3
18	-2.5	-1.2	0.0	2.7	5.9
20	-2.7	-1.4	0.0	3.0	6.5
22	-3.0	-1.5	0.0	3.3	7.1
24	-3.3	-1.7	0.0	3.5	7.7
26	-3.6	-1.8	0.0	3.8	8.2
28	-3.9	-1.9	0.0	4.0	8.8
30	-4.1	-2.1	0.0	4.2	9.3

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
190	%N1	82.6	85.4	89.7	94.9			
	KIAS	254	254	255	257			
	FF/ENG	6340	6340	6390	6580			
180	%N1	81.0	83.9	88.1	92.8			
	KIAS	247	247	249	250			
	FF/ENG	6000	5990	6020	6140			
170	%N1	79.4	82.3	86.5	91.0	98.7		
	KIAS	240	241	242	243	244		
	FF/ENG	5670	5640	5650	5740	6100		
160	%N1	77.8	80.6	84.8	89.2	95.5		
	KIAS	232	233	234	235	237		
	FF/ENG	5340	5310	5300	5360	5540		
150	%N1	76.2	78.8	83.0	87.3	92.6		
	KIAS	225	226	227	228	229		
	FF/ENG	5020	4980	4950	4990	5080		
140	%N1	74.3	77.0	81.1	85.4	90.1		
	KIAS	218	218	219	220	221		
	FF/ENG	4690	4650	4610	4620	4660		
130	%N1	72.2	75.1	79.0	83.3	87.9	95.0	
	KIAS	209	210	211	212	213	214	
	FF/ENG	4370	4320	4280	4270	4280	4500	
120	%N1	70.1	73.0	76.9	81.1	85.6	91.1	
	KIAS	201	202	202	203	204	205	
	FF/ENG	4060	4000	3960	3930	3920	4020	
110	%N1	67.8	70.5	74.7	78.8	83.2	88.0	96.9
	KIAS	193	193	194	194	195	196	198
	FF/ENG	3750	3680	3640	3600	3570	3610	3950
100	%N1	65.5	68.1	72.2	76.2	80.6	85.2	92.0
	KIAS	187	187	187	187	187	187	188
	FF/ENG	3450	3380	3320	3280	3230	3240	3400
90	%N1	62.9	65.6	69.5	73.6	77.9	82.3	87.3
	KIAS	181	181	181	181	181	181	181
	FF/ENG	3160	3100	3030	2980	2920	2910	2980

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

ALTERNATE MODE EEC

Alternate Mode EEC Limit Weight

PERFORMANCE LIMIT	NORMAL MODE PERFORMANCE LIMIT WEIGHT (1000 LB)									
	100	110	120	130	140	150	160	170	180	190
FIELD	95.6	105.0	114.5	123.2	132.6	142.1	151.5	160.9	170.4	180.2
CLIMB	93.2	102.5	111.8	121.1	130.7	140.1	149.2	158.7	168.1	177.3
OBSTACLE	93.4	102.6	111.8	121.2	130.8	140.3	149.6	159.2	168.6	177.9

Alternate Mode EEC Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
DRY V1	+1
WET V1	+2
VR	+1
V2	0

Alternate Mode EEC Max Takeoff %N1

Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT		AIRPORT PRESSURE ALTITUDE (FT)												
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	140	92.6	93.2	93.6	93.7	93.8	93.9	94.0	94.1	94.0	93.7	93.6	93.5	93.5
55	131	93.2	93.8	94.3	94.4	94.5	94.6	94.7	94.9	94.7	94.4	94.1	93.5	92.8
50	122	93.8	94.4	94.9	95.1	95.2	95.4	95.5	95.6	95.5	95.2	94.9	94.4	93.9
45	113	94.6	95.2	95.6	95.8	95.9	96.1	96.2	96.3	96.2	95.9	95.6	95.3	94.9
40	104	95.2	95.9	96.4	96.5	96.6	96.7	96.8	97.0	96.9	96.6	96.3	96.2	95.9
35	95	95.8	96.5	97.2	97.3	97.4	97.5	97.6	97.7	97.6	97.3	97.0	96.9	96.8
30	86	95.4	96.6	98.1	98.1	98.2	98.2	98.3	98.3	98.2	98.1	97.8	97.7	97.7
25	77	94.6	95.9	97.3	97.9	98.5	98.6	98.5	98.5	98.5	98.5	98.4	98.4	98.5
20	68	93.8	95.1	96.6	97.1	97.7	98.0	98.3	98.6	98.6	98.7	98.6	98.6	98.6
15	59	93.0	94.3	95.8	96.4	97.0	97.3	97.6	97.9	98.3	98.7	98.9	98.9	98.9
10	50	92.3	93.6	95.0	95.6	96.2	96.5	96.8	97.2	97.5	97.9	98.3	98.8	99.3
5	41	91.5	92.8	94.2	94.8	95.4	95.8	96.1	96.4	96.8	97.2	97.6	98.1	98.5
0	32	90.7	92.0	93.4	94.1	94.7	95.0	95.3	95.7	96.0	96.4	96.8	97.3	97.8
-5	23	89.8	91.2	92.6	93.3	93.9	94.2	94.5	94.9	95.3	95.7	96.1	96.5	97.0
-10	14	89.0	90.4	91.8	92.5	93.1	93.4	93.8	94.1	94.5	94.9	95.3	95.8	96.2
-15	5	88.2	89.5	91.0	91.7	92.3	92.6	93.0	93.4	93.7	94.1	94.5	95.0	95.4
-20	-4	87.4	88.7	90.2	90.8	91.5	91.8	92.2	92.6	93.0	93.4	93.7	94.2	94.6
-25	-13	86.5	87.9	89.4	90.0	90.7	91.0	91.4	91.8	92.2	92.6	93.0	93.4	93.8
-30	-22	85.7	87.0	88.5	89.2	89.8	90.2	90.6	91.0	91.4	91.8	92.1	92.6	93.0
-35	-31	84.8	86.2	87.7	88.3	89.0	89.4	89.7	90.2	90.6	90.9	91.3	91.8	92.2
-40	-40	83.9	85.3	86.8	87.5	88.1	88.5	88.9	89.3	89.7	90.1	90.5	90.9	91.4
-45	-49	83.1	84.4	86.0	86.6	87.3	87.7	88.1	88.5	88.9	89.3	89.7	90.1	90.5
-50	-58	82.2	83.5	85.1	85.7	86.4	86.8	87.2	87.7	88.1	88.4	88.8	89.3	89.7

%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	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Intentionally
Blank

GEAR DOWN

Long Range Cruise Altitude Capability

Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	16100	13300	10100
170	18700	16000	13200
160	21200	18700	16000
150	23600	21300	18600
140	25900	24200	21600
130	28100	26600	24800
120	30200	29100	27400
110	32200	31200	29900
100	34200	33200	32100
90	36400	35400	34300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
180	%N1	85.5									
	MACH	.473									
	KIAS	262									
	FF/ENG	5250									
170	%N1	84.0									
	MACH	.460									
	KIAS	254									
	FF/ENG	4943									
160	%N1	82.3	91.7								
	MACH	.447	.548								
	KIAS	247	245								
	FF/ENG	4639	4619								
150	%N1	80.5	89.9	91.9							
	MACH	.434	.535	.552							
	KIAS	240	239	237							
	FF/ENG	4341	4320	4308							
140	%N1	78.7	88.0	89.8	92.0	95.0					
	MACH	.420	.518	.538	.555	.573					
	KIAS	232	232	231	229	227					
	FF/ENG	4052	4008	4006	4011	4089					
130	%N1	76.7	85.9	87.7	89.6	91.9	95.2				
	MACH	.406	.500	.521	.541	.558	.576				
	KIAS	224	223	224	223	221	218				
	FF/ENG	3766	3695	3698	3705	3721	3810				
120	%N1	74.8	83.7	85.5	87.3	89.2	91.7	95.2			
	MACH	.391	.482	.501	.523	.543	.560	.579			
	KIAS	216	215	215	215	214	212	210			
	FF/ENG	3485	3390	3387	3397	3414	3432	3528			
110	%N1	72.5	81.4	83.1	84.9	86.7	88.7	91.3	94.9		
	MACH	.375	.462	.481	.501	.523	.543	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	3209	3092	3085	3090	3109	3124	3142	3241		
100	%N1	70.0	78.9	80.6	82.3	84.1	85.9	87.9	90.7	94.2	
	MACH	.359	.442	.460	.479	.499	.521	.542	.560	.580	
	KIAS	198	197	197	197	196	197	196	194	192	
	FF/ENG	2942	2803	2790	2793	2806	2821	2834	2850	2945	
90	%N1	67.4	76.1	77.8	79.5	81.3	83.0	84.9	87.0	89.7	93.7
	MACH	.343	.421	.438	.456	.475	.496	.518	.540	.558	.578
	KIAS	189	187	187	187	187	187	187	186	184	182
	FF/ENG	2685	2525	2502	2501	2515	2522	2532	2543	2557	2656

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
325	290	260	236	217	200	188	178	168	160	153
657	585	524	475	435	400	377	357	338	321	307
995	884	789	714	653	600	566	535	507	482	460
1337	1186	1056	955	872	800	755	713	676	642	613
1685	1491	1326	1196	1091	1000	943	891	844	802	765
2038	1801	1598	1440	1311	1200	1131	1068	1011	961	917
2398	2114	1872	1683	1532	1400	1319	1245	1179	1120	1068
2765	2432	2149	1929	1753	1600	1507	1422	1346	1278	1218
3139	2754	2428	2176	1974	1800	1694	1598	1512	1435	1368

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	5.4	0:49	4.9	0:47	4.2	0:44	3.9	0:42	3.6	0:41
400	11.0	1:37	10.2	1:32	9.0	1:25	8.4	1:21	7.9	1:18
600	16.5	2:26	15.3	2:18	13.7	2:07	12.7	2:00	12.1	1:54
800	21.9	3:16	20.4	3:05	18.2	2:49	17.0	2:39	16.2	2:31
1000	27.2	4:07	25.3	3:53	22.7	3:32	21.2	3:20	20.2	3:09
1200	32.3	4:59	30.1	4:41	27.0	4:16	25.3	4:01	24.1	3:47
1400	37.3	5:53	34.8	5:31	31.3	5:01	29.3	4:42	27.9	4:26
1600	42.2	6:47	39.4	6:23	35.4	5:47	33.2	5:25	31.6	5:06
1800	47.1	7:43	43.9	7:15	39.5	6:34	37.1	6:08	35.3	5:46

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
5	-0.7	-0.4	0.0	0.7	1.6
10	-1.5	-0.8	0.0	1.4	3.2
15	-2.3	-1.2	0.0	2.1	4.7
20	-3.1	-1.5	0.0	2.7	6.1
25	-3.8	-1.9	0.0	3.3	7.4
30	-4.6	-2.3	0.0	3.8	8.5
35	-5.4	-2.7	0.0	4.2	9.5
40	-6.1	-3.1	0.0	4.6	10.4
45	-6.9	-3.5	0.0	5.0	11.1
50	-7.7	-3.8	0.0	5.3	11.8

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
41000	20	600	87
39000	20	590	83
37000	19	580	79
35000	18	570	74
33000	18	560	70
31000	17	540	66
29000	16	530	62
27000	15	520	58
25000	15	510	54
23000	14	490	50
21000	13	480	46
19000	12	460	42
17000	11	440	39
15000	11	420	35
10000	8	360	25
5000	6	300	16
1500	4	240	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
190	%N1	77.0	79.8	84.1	88.5				
	KIAS	230	230	230	230				
	FF/ENG	5180	5150	5150	5210				
180	%N1	75.6	78.3	82.6	86.9	92.0			
	KIAS	225	225	225	225	225			
	FF/ENG	4910	4880	4870	4900	4970			
170	%N1	74.0	76.8	81.0	85.3	90.0			
	KIAS	221	221	221	221	221			
	FF/ENG	4650	4610	4590	4610	4640			
160	%N1	72.4	75.3	79.3	83.6	88.3			
	KIAS	216	216	216	216	216			
	FF/ENG	4390	4350	4320	4330	4340			
150	%N1	70.6	73.6	77.6	81.9	86.4	92.1		
	KIAS	211	211	211	211	211	211		
	FF/ENG	4140	4090	4060	4050	4050	4150		
140	%N1	69.2	72.0	76.1	80.3	84.7	89.6		
	KIAS	209	209	209	209	209	209		
	FF/ENG	3930	3880	3840	3820	3800	3850		
130	%N1	67.4	70.1	74.3	78.4	82.8	87.5	95.3	
	KIAS	204	204	204	204	204	204	204	
	FF/ENG	3690	3630	3590	3560	3540	3560	3800	
120	%N1	65.6	68.2	72.4	76.4	80.8	85.4	91.5	
	KIAS	199	199	199	199	199	199	199	
	FF/ENG	3460	3400	3340	3310	3270	3280	3400	
110	%N1	63.6	66.3	70.3	74.4	78.7	83.1	88.1	
	KIAS	193	193	193	193	193	193	193	
	FF/ENG	3230	3170	3110	3070	3020	3020	3080	
100	%N1	61.4	64.3	68.1	72.3	76.4	80.9	85.5	93.4
	KIAS	187	187	187	187	187	187	187	187
	FF/ENG	3000	2950	2890	2840	2780	2760	2810	2990
90	%N1	59.2	62.0	65.9	70.0	74.2	78.6	83.1	89.0
	KIAS	181	181	181	181	181	181	181	181
	FF/ENG	2780	2730	2680	2620	2560	2520	2560	2620

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
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GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	170	223	2000		
170	161	218	4300	2600	
160	152	214	6500	5100	3000
150	142	210	8600	7200	5300
140	133	207	10700	9500	7700
130	124	202	12900	11900	10400
120	114	197	15100	14300	13300
110	105	191	17400	16600	15800
100	95	186	19700	18800	18000
90	86	180	21900	21000	20200

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
160	1800		
150	4700	2600	
140	7500	5800	3200
130	10300	8900	6500
120	12800	11800	9900
110	15500	14700	13500
100	18300	17400	16600
90	21000	20200	19300

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT) 5	7	9	11	13	15	17	19	21
150	%N1	94.7								
	MACH	.384								
	KIAS	232								
	FF/ENG	8277								
140	%N1	92.6	94.4	97.0						
	MACH	.372	.385	.398						
	KIAS	225	225	224						
	FF/ENG	7681	7688	7778						
130	%N1	90.5	92.1	94.0	96.7					
	MACH	.361	.373	.385	.399					
	KIAS	218	217	217	216					
	FF/ENG	7104	7094	7101	7204					
120	%N1	88.2	89.8	91.5	93.3	96.1				
	MACH	.349	.360	.372	.385	.399				
	KIAS	211	210	209	208	208				
	FF/ENG	6559	6523	6509	6521	6625				
110	%N1	86.0	87.4	89.0	90.7	92.5	95.3			
	MACH	.337	.348	.359	.371	.383	.397			
	KIAS	204	203	201	200	200	199			
	FF/ENG	6045	5985	5946	5934	5947	6029			
100	%N1	83.6	85.0	86.4	87.9	89.6	91.4	94.2	98.5	
	MACH	.325	.335	.345	.356	.368	.381	.395	.409	
	KIAS	197	195	194	193	192	191	190	189	
	FF/ENG	5552	5479	5419	5380	5368	5369	5413	5600	
90	%N1	81.1	82.4	83.8	85.2	86.7	88.3	90.1	92.8	96.9
	MACH	.313	.322	.331	.341	.352	.364	.377	.392	.408
	KIAS	189	188	186	184	183	182	181	181	181
	FF/ENG	5082	4994	4922	4863	4824	4803	4785	4815	5003

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
173	152	134	120	109	100	93	88	83	78	75
354	309	271	242	220	200	187	174	164	155	147
536	467	409	365	330	300	280	262	246	232	220
720	627	548	488	441	400	373	349	328	308	292
906	787	687	611	551	500	466	435	408	385	365
1093	948	826	734	662	600	559	522	489	461	437
1282	1111	967	858	773	700	652	609	570	537	508
1472	1274	1107	982	884	800	744	695	651	612	580
1664	1438	1248	1106	995	900	838	782	732	688	651
1858	1603	1390	1230	1106	1000	930	868	812	764	723

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	2.8	0:27	2.5	0:26	2.3	0:26
200	5.8	0:53	5.4	0:51	5.2	0:49
300	8.8	1:19	8.2	1:15	8.0	1:12
400	11.7	1:45	11.0	1:40	10.7	1:35
500	14.6	2:11	13.7	2:05	13.4	1:59
600	17.5	2:38	16.4	2:30	16.0	2:23
700	20.3	3:05	19.1	2:56	18.6	2:47
800	23.1	3:32	21.7	3:22	21.1	3:12
900	25.9	4:00	24.3	3:48	23.5	3:36
1000	28.6	4:27	26.9	4:14	26.0	4:01

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time
Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.3	-0.2	0.0	0.3	0.5
4	-0.6	-0.3	0.0	0.6	1.2
6	-0.9	-0.5	0.0	0.9	1.8
8	-1.2	-0.6	0.0	1.3	2.5
10	-1.5	-0.8	0.0	1.6	3.1
12	-1.8	-0.9	0.0	1.9	3.8
14	-2.1	-1.1	0.0	2.3	4.4
16	-2.4	-1.2	0.0	2.6	5.1
18	-2.7	-1.4	0.0	2.9	5.7
20	-3.0	-1.5	0.0	3.2	6.4
22	-3.3	-1.7	0.0	3.6	7.0
24	-3.6	-1.8	0.0	3.9	7.7
26	-3.9	-2.0	0.0	4.2	8.4
28	-4.2	-2.1	0.0	4.6	9.0
30	-4.5	-2.2	0.0	4.9	9.7
32	-4.8	-2.4	0.0	5.2	10.4

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
170	%N1	93.2			
	KIAS	221			
	FF/ENG	9060			
160	%N1	91.3	94.6		
	KIAS	216	216		
	FF/ENG	8480	8580		
150	%N1	89.4	92.6		
	KIAS	211	211		
	FF/ENG	7920	7990		
140	%N1	87.7	90.7	96.3	
	KIAS	209	209	209	
	FF/ENG	7460	7500	7690	
130	%N1	85.6	88.6	93.3	
	KIAS	204	204	204	
	FF/ENG	6940	6950	7050	
120	%N1	83.5	86.4	90.9	98.2
	KIAS	199	199	199	199
	FF/ENG	6430	6430	6480	6820
110	%N1	81.2	84.2	88.5	93.9
	KIAS	193	193	193	193
	FF/ENG	5960	5930	5950	6070
100	%N1	78.9	81.9	86.1	90.8
	KIAS	187	187	187	187
	FF/ENG	5510	5460	5450	5510
90	%N1	76.6	79.4	83.6	88.1
	KIAS	181	181	181	181
	FF/ENG	5070	5020	4980	5000

This table includes 5% additional fuel for holding in a racetrack pattern.

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Performance Inflight — Chapter PI
Text — Section 47

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. Operation on runways with slush/standing water depths of more than 0.25 inch (6 mm) is not recommended at altitudes greater than 8,000 ft. 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.

3. The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 1 and 2.

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 18100 lb 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	-22
8000	-18
10000	-15
12000	-13
14000	-11

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 5800 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 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 2300 lb 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 4000 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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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 (LB/HR)
39	100
35	100
31	110
25	130
20	150
15	160
10	180
5	200

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.

Alternate Mode EEC

Introduction

This section contains performance data for airplane operation with the Electronic Engine Control (EEC) in the alternate mode (ALTN EEC switch illuminated) for applicable thrust ratings. The data includes engine bleed effects for normal air conditioning operation i.e., two packs on at normal flow all engines operating.

Operation with derate and/or assumed temperature reduced thrust is not permitted with the EEC in alternate mode.

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in alternate mode is to reduce the normal mode (ON EEC switch illuminated) performance limited weights. The Limit Weight table provides takeoff field, climb, and obstacle limit weights. To determine limit weights for operations with the EEC in alternate mode, enter the table with the limit weights for normal mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

Takeoff Speed Adjustment

Takeoff speeds for the reduced weight should be increased by the amount shown in the Takeoff Speeds Adjustment table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does not incorporate alternate mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

The alternate mode EEC thrust schedule provides equal or greater thrust than the normal mode thrust for the same thrust lever position. Thrust limit protection is not provided in alternate mode EEC and maximum rated thrust may be reached at thrust lever position less than full forward. As a result, thrust overboost may occur if the target alternate mode EEC Max Takeoff %N1 settings are not observed.

To find alternate mode EEC Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter the Alternate Mode EEC Max Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. For packs off apply the %N1 adjustment provided below the table. No %N1 adjustment is required for engine or wing anti-ice.

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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Non-Normal Checklists — Chapter NNC
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A

B

C

D

E

Y

Z

EVACUATION

Condition: **Evacuation is needed.**

Parking brake . . . . .Set

Speedbrake lever . . . . .DOWN

[Prevents possible interference or injury to passengers evacuating through the overwing escape hatches.]

FLAP lever 40

[Aids in evacuating passengers over the wing.]

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.

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