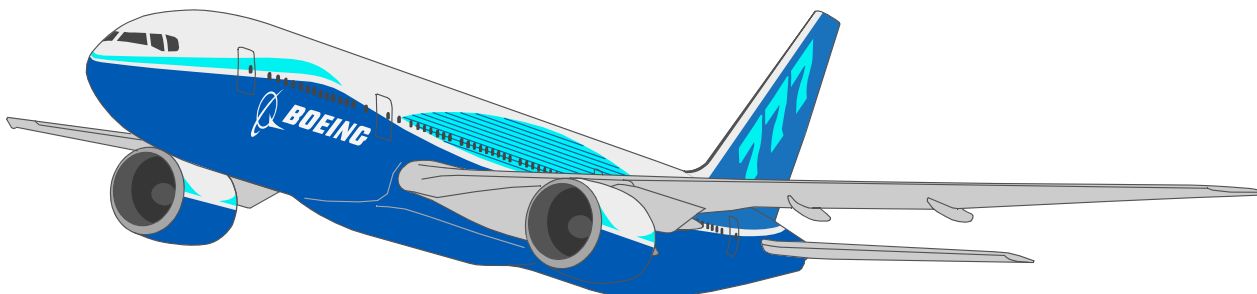




## FLIGHT PLANNING AND PERFORMANCE MANUAL



**777-200ER**

**PW4090**

**FAA**

**LB/°C/FT**

### **OPTIONS**

**Crew Oxygen / 1 Bottle**

**Derate TO1-10%**

**Derate TO2-20%**

**Gear Down Dispatch**

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**PUBLISHED BY  
FLIGHT OPERATIONS ENGINEERING  
BOEING COMMERCIAL AIRPLANE GROUP  
SEATTLE, WASHINGTON U.S.A**

**BOEING DOCUMENT NUMBER: D632W005-WY019**

**Revision Number: 14**

**Revision Date: December 10, 2010**

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## **General**

This Flight Planning and Performance Manual has been prepared by Boeing Commercial Airplanes, Commercial Aviation Services. The purpose of this manual is to provide a complete operational performance data reference including dispatch and inflight performance data applicable to a specific airframe, engine rating, and regulatory agency as identified on the cover page of the document.

This manual is suitable for use for any airplane configuration that meets the criteria identified on the cover page of the document.

Owners/operators are solely responsible for ensuring the performance documentation they are using is complete and matches the current configuration identified on the cover page of the document. This includes the accuracy and validity of all information furnished by the owner/operator or any other party.

The manual is periodically revised to incorporate pertinent flight planning and performance information. Items of a more critical nature will be incorporated in Flight Planning and Performance Manual Bulletins and will be distributed in a timely manner. In all cases, such revisions and changes must remain compatible with the approved AFM with which the operator must comply. In the event of conflict with the AFM, the AFM shall supersede.

This manual assumes the user is familiar with basic jet airplane performance and regulatory requirements common to airplanes of this type.

Any questions about the content or use of this manual can be directed to:

Commercial Aviation Services  
Boeing Commercial Airplanes  
P.O. Box 3707, M/C 20-88  
Seattle, Washington 98124-2207 USA

Attention: Manager, Performance Data Flight Operations Engineering

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**Revision Transmittal Letter**

To: All holders of Flight Planning and Performance Manual, Boeing Document Number D632W005-WY019.

Subject: Flight Planning and Performance Manual Revision

This revision reflects the most current information available to The Boeing Company 45 days before the subject revision date. The following revision highlights explain changes in this revision. General information below explains the use of revision bars to identify new or revised information.

**Revision Record**

No.	Revision Date	Date Filed
Init	December 7, 2001	
02	December 16, 2002	
04	December 15, 2003	
06	December 13, 2004	
08	December 12, 2005	
10	December 11, 2006	
12	December 19, 2008	
14	December 10, 2010	

No.	Revision Date	Date Filed
01	June 17, 2002	
03	June 16, 2003	
05	June 14, 2004	
07	June 13, 2005	
09	June 12, 2006	
11	December 20, 2007	
13	December 11, 2009	

**General**

The Boeing Company issues Flight Planning and Performance Manual revisions to provide new or revised information. Formal revisions also incorporate appropriate information from previously issued Flight Planning and Performance Manual bulletins.

The revision date is the approximate date the manual is mailed to the customer.

Formal revisions include a new Revision Record, Revision Highlights, and a current List of Effective Pages. Use the information on the new Revision Record and List of Effective Pages to verify the Flight Planning and Performance Manual content.

Pages containing revised material have revision bars associated with the changed text or illustration.

The Revision Record should be completed by the person incorporating the revision into the manual.

**Filing Instructions**

Consult the List of Effective Pages (0.3.1). Pages identified with an asterisk (\*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages marked DELETED; there are no replacement pages for deleted pages.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. The List of Effective Pages determines the correct content of the manual.

**Revision Highlights**

This section (0.2) replaces the existing section 0.2 in your manual.

This manual is published from a database; the text and illustrations are marked with configuration information. Occasionally, because the editors rearrange the database markers, or mark items with configuration information due to the addition of new database content, some customers may receive revision bars on content that appears to be unchanged. Pages may also be republished without revision bars due to slight changes in the flow of the document.

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## **General**

The Boeing Company issues Flight Planning and Performance Manual Bulletins to provide important information prior to the next formal revision of the Flight Planning and Performance Manual.

Bulletins are dated and numbered sequentially. When appropriate, the next formal Flight Planning and Performance Manual revision will include an updated bulletin record page to reflect current bulletin status.

Bulletin status is defined as follows:

- **In Effect (IE)** – the bulletin contains pertinent information not otherwise covered in the Flight Planning and Performance Manual. The bulletin remains active and should be retained in the manual
- **Incorporated (INC)** – the bulletin operating information has been incorporated into the Flight Planning and Performance Manual. The bulletin remains active and should be retained in the manual
- **Cancelled (CANC)** – the bulletin is no longer active and should be removed from the Flight Planning and Performance Manual. All bulletins previously cancelled are no longer listed in the Bulletin Record.

The person filing a new or revised bulletin should amend the Bulletin Record as instructed in the Administrative Information section of the bulletin. When a bulletin includes replacement pages for the Flight Planning and Performance Manual, the included pages should be filed as instructed in the Flight Planning and Performance Manual Information section of the bulletin.



# TAKEOFF AND LANDING

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## Introduction

This chapter contains data to determine takeoff and landing performance limitations, based on engine bleed effects for normal air conditioning operation and anti-ice off, i.e., two packs at normal flow, one pack bleed from each engine.

The data is presented in simplified form and is therefore conservative. In the event of any conflict between data presented in this section and those contained in the Approved Airplane Flight Manual, the Flight Manual shall always take precedence.

## Takeoff

The maximum brake release weight is the least of the field length, climb, obstacle, tire speed, brake energy and structural limit weights.

### Altimeter Setting To Station Pressure

The determination of thrust setting and takeoff/landing performance generally requires station pressure altitude. If station pressure or station pressure altitude are not available, enter the chart with altimeter setting (QNH) and read the pressure altitude correction. Apply this correction to the station elevation to obtain station pressure altitude.

For boundary QNH values, read the midpoint between tabulated corrections to elevation, e.g., for QNH of 29.66 inches (1004 mb), the elevation correction is 250 ft.

If station pressure (QFE) is required, use conversion scale on left of chart for station pressure altitude versus QFE.

Alternatively, station pressure altitude may be determined by setting the cockpit altimeter to 29.92 inches (1013.2 mb); the altimeter will then read station pressure altitude.

### Wind Component

The Wind Component chart provides crosswind and head/tail wind components, appropriate to the runway headings, reported wind velocity and direction. To use the chart, find the intersection between reported wind velocity in knots (circular lines) and the angle in degrees between reported wind direction and the runway (radial lines). Then read head/tail wind component to the left and crosswind component from the bottom scale.

### Field Length Limit

Maximum field length limited brake release weights are presented for the certified takeoff flap settings. The field length available is the amount of paved surface

which may be used to accelerate to the decision speed and stop at the end of the runway or climb to 35 ft. These field limited weights do not account for clearway or stopway.

The reference takeoff condition for a given flap position is zero slope and wind. To determine the field length limit brake release weight, enter the appropriate chart for the desired flap position at the left portion of the chart with OAT, move vertically to airport pressure altitude and project a line horizontally to the field length reference line. Enter the right hand portion of the chart with field length available, correct for slope and wind, then continue vertically to intersect the OAT/altitude line projected along the guidelines from the field length reference line. At this intersection, read the field length limit weight to the right. Adjust the field length limit weight according to the notes below the chart to account for the appropriate engine bleed configuration.

### Climb Limit

Maximum climb limited brake release weights are presented for the certified takeoff flap settings. The weights are limited by second segment climb performance and do not account for obstacles.

To determine the climb limit weight, enter the appropriate flap position chart with OAT, move vertically to airport pressure altitude and read the climb limit weight to the left. Adjust the climb limit weight according to the notes below the chart to account for the appropriate engine bleed configuration.

### Obstacle Limit

Obstacle clearance charts are provided for each certified takeoff flap setting. The charts are intended for use only when an airport analysis is not available. Detailed analysis for the specific case from the Airplane Flight Manual may result in a less restrictive weight. The data is not valid for takeoffs using improved climb technique.

To determine the obstacle limit weight, enter with obstacle height (measured from the lowest point on the runway) and move horizontally to the obstacle distance from brake release. Move vertically to the OAT reference line and follow the guidelines to correct for OAT as necessary. Repeat this procedure to correct for airport pressure altitude and wind, then continue vertically to read obstacle limit weight. Adjust the obstacle limit weight according to the notes below the chart to account for the appropriate engine bleed configuration.

### Tire Speed Limit

Maximum tire speed limited weights for 235MPH tires are not limiting. Therefore, no data is presented.

### Brake Energy Limit

For normal takeoffs V1 will not generally be limited by maximum brake energy. Brake energy speed limits should be checked at hot/high airports, or when operating with tailwinds and/or improved climb where higher V1's are involved.

To determine if brake energy speed, VMBE, is limiting enter the upper portion of the chart with brake release weight and airport pressure altitude. If inside the shaded area making a normal takeoff with no tailwind, brake energy will not be limiting and VMBE does not need to be checked. If outside the shaded area making a normal takeoff, brake energy may be limiting and VMBE must be checked. Always check VMBE when operating with a tailwind or when using improved climb performance. To check VMBE, move horizontally at the airport pressure altitude to the airport OAT, proceed vertically downwards to the brake release weight and read VMBE to the right. Adjust VMBE for slope, wind and brake configuration. If V1 exceeds VMBE for a normal takeoff, decrease brake release weight as indicated for each knot that V1 exceeds VMBE and determine normal takeoff speeds, V1, VR and V2 for the lower brake release weight. If V1 exceeds VMBE for improved climb takeoff, decrease the climb weight improvement by the amount indicated for each knot that V1 exceeds VMBE and determine new V1, VR and V2 increments for the lower climb weight improvement.

### Improved Climb Performance

If the maximum brake release weight is limited by climb, the climb performance limited weight may be increased by use of improved climb technique. This increase in climb weight is obtained by utilizing the excess runway available to accelerate to higher takeoff speeds thereby achieving higher gradient capability.

Charts are provided for determining the climb weight improvement available in terms of the difference between the climb limit weight and field limit weight. For a given climb weight improvement the associated takeoff speed increments to be added to the normal V1, VR and V2's are also shown. 235 MPH tire speed data with improved climb is not limiting. Therefore, no data is presented.

To determine the maximum allowable climb weight improvement and associated takeoff speed increments, enter the appropriate chart for the desired flap position and runway condition at the left horizontal scale with the weight difference (field limit minus climb limit),

move vertically to intersect the line for the appropriate normal climb limit weight, and read climb weight improvement to the left and normal takeoff speed increments to the right adjusting for normal climb limit weight. The horizontal lines indicate the maximum climb weight improvement for normal climb limited weights. These values are based on the maximum allowable improved climb for each flap position. The improved climb weight is the normal climb weight plus the climb weight improvement. Apply the associated takeoff speed increments to the normal speeds for the improved climb weight. Brake Energy Limits should be checked.

### Slush/Standing Water

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/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 colder 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. 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. Determine the dry field/obstacle limit weight for the takeoff flap setting.
2. 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.
3. Adjust field length available for temperature by amount shown on chart.
4. 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.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

1. Determine takeoff speeds V1, VR and V2 for actual brake release weight using the Takeoff Speeds table in this section.
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 reversers operating and 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.

### Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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 may 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 the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

If takeoffs are scheduled using these simplified speeds in conjunction with airport analyses that include clearway and/or stopway credits, adjustments to V1 speed are required.

Adjust V1 by the amount shown in the Clearway/Stopway table. The adjusted V1 must not exceed VR.

The maximum allowable clearway limits shown on the takeoff speeds page are provided for guidance when more precise data is unavailable.

### Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Min VR respectively. To find V1(MCG) and Min VR, enter the V1(MCG) and Min VR table with 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No weight adjustment is required provided that the field length available exceeds the minimum field length required shown on the Field Length Limit charts.

### Brakes Deactivated

When operating with brakes deactivated, the field and brake energy limit weights and the V1 and VMBE must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 7900 lb and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 16600 lb and the V1 associated with the reduced weight by three 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 corrected for wind and slope exceeds approximately 4900 ft for one brake deactivated or 5100 ft for two brakes deactivated.

For brake(s) deactivated, reduce VMBE by the amount shown on the Brake Energy Limit VMBE Chart. If the resulting VMBE is less than V1 the brake release weight must be reduced according to the instructions on the brake energy limit chart. The resulting V1 must not be less than minimum V1(MCG). Determine VR and V2 for the actual weight.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

### Takeoff EPR

To find Max Takeoff EPR based on normal engine bleed for air conditioning (2 bleeds/2 packs) enter Max Takeoff EPR Table with airport pressure altitude and airport OAT and read EPR. For packs off or wing anti-ice operation, apply the EPR correction shown below the table. No takeoff EPR correction is required for engine 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 reduced thrust is not allowed on runways contaminated with water, ice, slush or snow. Use of assumed temperature reduced thrust is not recommended if potential windshear conditions exist. The assumed temperature reduced takeoff EPR is read from the Max Takeoff EPR table at the assumed temperature. The minimum allowable EPR for reduced thrust, based on 25% takeoff thrust reduction, is read by entering table with the maximum allowable EPR for the actual OAT. It is not recommended to set takeoff EPR lower than the scheduled Climb EPR.

### Stab Trim Setting

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.

### Takeoff Derates

This section contains tabulated takeoff weight penalties, thrust setting, takeoff speeds and stabilizer trim setting for takeoff at derated engine ratings. Derate 1 (TO1) and Derate 2 (TO2).

### Takeoff Performance (TO1 and TO2)

Takeoff limit weights are provided for Derate 1 (TO1) and Derate 2 (TO2) operation. Weights are shown for takeoff field, takeoff climb and takeoff obstacle

weights. Each full rated thrust limiting weight must be adjusted for derate operation and then the most restrictive weight used for planning.

### Slush/Standing Water

Slush/standing water runway limit weight and V1 speed adjustments are provided for Derate 1 (TO1) and Derate 2 (TO2) operation. The procedures for determining contaminated runway limit weight and speeds are the same as those discussed for full rated thrust. Adjustments are applied to the derated thrust dry runway limits.

### Slippery Runway

Slippery runway limit weight and V1 speed adjustments are provided for Derate 1 (TO1) and Derate 2 (TO2) operation. The procedures for determining slippery runway limit weight and speeds are the same as those discussed for full rated thrust. Adjustments are applied to the derated thrust dry runway limits.

### Takeoff Speeds

Balanced takeoff speeds V1, VR and V2 reflecting the FMC display are presented for TO1 or TO2 derated thrust. Speeds may require correction for the effects of minimum control speeds.

### Minimum Control Speeds, Stab Trim

Tables of minimum control speed V1(MCG) and stabilizer trim setting are provided for TO1 or TO2 thrust levels as appropriate.

### Assumed Temperature Reduced Thrust

Use of assumed temperature reduced thrust with takeoff derates is permitted subject to the conditions described previously.

### Brakes Deactivated

Takeoff field length/obstacle weight and V1 speed adjustments are the same as those shown previously in this chapter for full rated takeoff.

### Landing

Charts are provided for determining the maximum landing weight as limited by field length or climb requirements for flap positions 25 and 30. Maximum performance landing weight is the smaller of the field length limit weight and climb limit weight; do not exceed maximum structural landing weight.

### Landing Field Length Limit

To determine the field length limit landing weight, enter the field limit chart with field length available, correct for runway condition and wind. Proceed vertically to the airport pressure altitude and read the field length

limit weight at the right. Adjust the field length limit weight according to the notes below the chart to account for the appropriate brake configuration.

### Landing Climb Limit Weight

To determine climb limit weight, enter the climb limit chart with airport OAT, move vertically to airport pressure altitude and read the climb limit weight to the left. Adjust the climb limit weight according to the notes below the chart to account for the appropriate engine bleed configuration. When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, make the appropriate ice correction as shown on the chart.

### Go-Around Climb Gradient

To determine go-around climb gradient, enter the chart with airport OAT and pressure altitude and then proceed vertically to find airplane weight. Continue down the chart to the proper airspeed in terms of deviation from VREF, following the reference lines as appropriate. Read the go-around climb gradient directly from the chart and then apply the necessary corrections for A/C and icing conditions as noted. Note that data is for one engine inoperative.

### Quick Turnaround Limit

Maximum quick turnaround weights are presented for flap positions 25 and 30. If landing weight exceeds the maximum quick turnaround weight for the airport OAT and pressure altitude shown in the table, adjusted for slope and wind, wait the specified time and check that the wheel thermal plugs have not melted before executing a subsequent takeoff. For brakes deactivated, reduce the maximum quick turnaround weight by the amount shown on the chart. As an alternate procedure, if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking, then no waiting period is required.

### Recommended Brake Cooling Schedule

The Recommended Brake Cooling Schedule chart is advisory information intended to assist the operator in avoiding problems associated with hot brakes. The Maximum Quick Turnaround Weight table takes precedence over the brake cooling schedule in case of conflict.

For normal operations most landings are at weights below the quick turnaround limit. Application of the recommended cooling procedures shown will avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff. The chart shows the brake energy per brake added by a single stop. If operating with one brake

deactivated increase the brake energy per brake by 10 percent. If operating with two brakes deactivated increase the brake energy per brake by 20 percent. Total brake energy is assumed to be equally distributed among the operating brakes. Total brake energy is the sum of the residual energy from previous stops plus the energy added.

To determine the brake energy added by a single stop enter the top of the chart with weight, proceed horizontally to the brakes on indicated airspeed, corrected for wind, then vertically downwards correcting for airport pressure altitude and OAT. If the ground speed at brakes on is known from the ADI or IRU displays, use ground speed and ignore wind, airport pressure altitude and OAT corrections.

The chart is based on a rejected takeoff with maximum manual braking effort. Make the corrections shown for braking during normal landing using either maximum manual braking effort or a preselected autobrake setting. Increase the brake energy per brake by one million foot pounds for every mile of taxi distance. Continue vertically downwards at the brake energy per brake to determine the recommended cooling procedures.

In general, the brakes on indicated airspeed during landing will be 5-7 knots lower than approach speed when recommended braking procedures are followed due to deceleration in the flare to touchdown. To conservatively account for wind gusts, adjust the brakes on speed by subtracting one-half the headwind or adding 1.5 times the tailwind.

If brake temperature monitor indication on EICAS is available, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine the recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

### CAT III Automatic Landing

The following advisory information is presented to assist operators in determining landing field length corrections with CAT III Autoland. This guidance information may be used to comply with FAA Advisory Circular 120-28D.

If anti-skid systems are operative and the landing runway surface braking action is expected to be medium or better, CAT III Autoland field lengths can be

obtained by entering the Landing Field Length Limit chart, for the selected flap, with field length available divided by 1.15. If either of these conditions are not met, then CAT III Autoland field lengths can be obtained by entering the Landing Field Length Limits chart with field length available divided by 1.3 unless it has been demonstrated to the regulatory authority that a factor less than 1.3 is acceptable.

### **Normal Configuration Landing Distance**

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

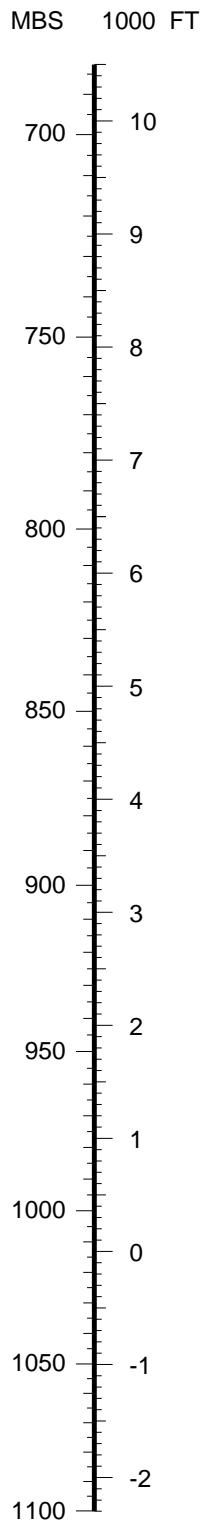
To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

## Altimeter Setting to Station Pressure

### QFE Station Pressure

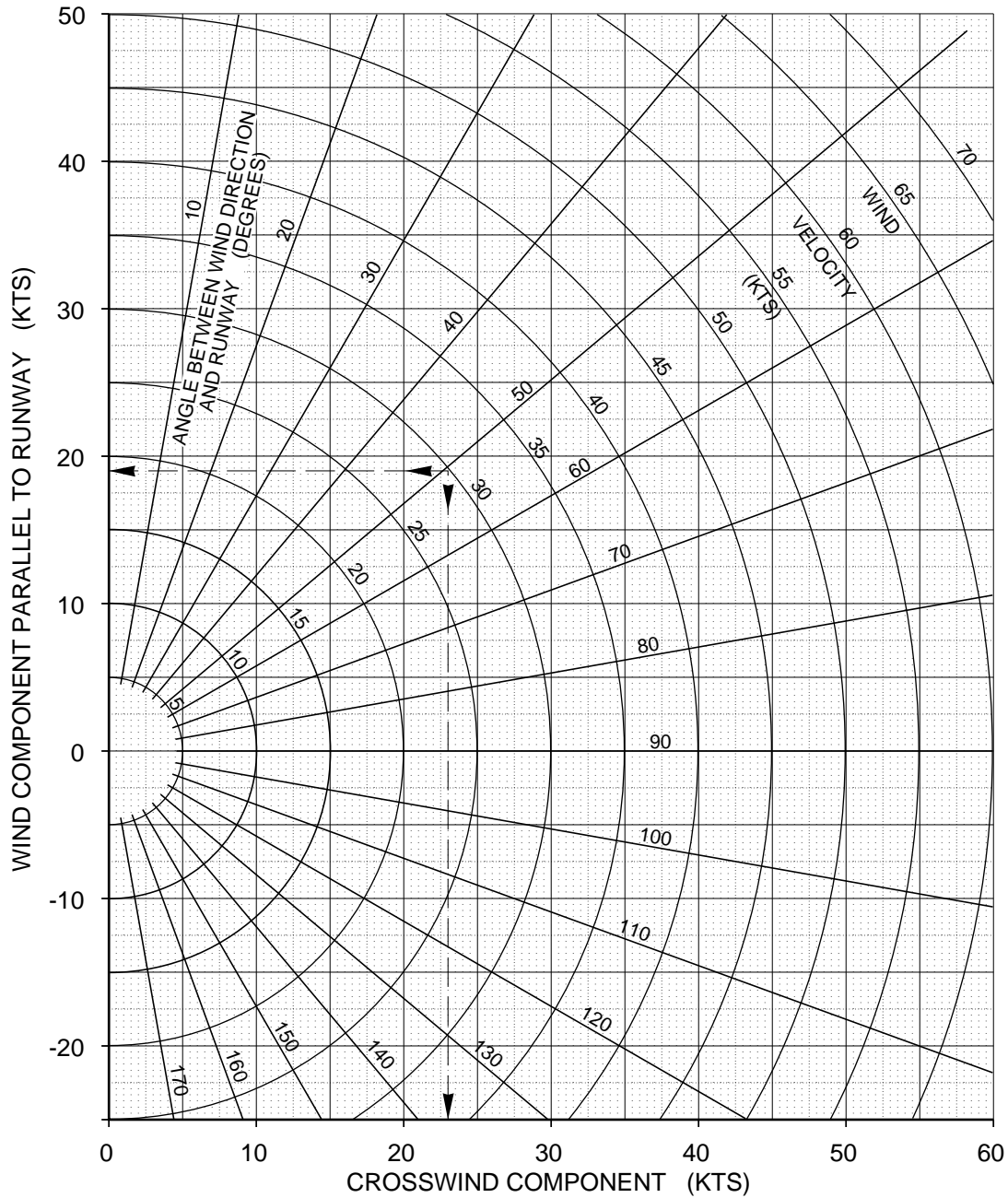


### QNH to Pressure Altitude

QNH (IN. HG.)	CORRECTION TO ELEVATION FOR PRESS ALT (FT)		QNH (MILLIBARS)
	to		
28.81	to 28.91	1000	976 to 979
28.91	to 29.02	900	979 to 983
29.02	to 29.12	800	983 to 986
29.12	to 29.23	700	986 to 990
29.23	to 29.34	600	990 to 994
29.34	to 29.44	500	994 to 997
29.44	to 29.55	400	997 to 1001
29.55	to 29.66	300	1001 to 1004
29.66	to 29.76	200	1004 to 1008
29.76	to 29.87	100	1008 to 1012
29.87	to 29.97	0	1012 to 1015
29.97	to 30.08	-100	1015 to 1019
30.08	to 30.19	-200	1019 to 1022
30.19	to 30.30	-300	1022 to 1026
30.30	to 30.41	-400	1026 to 1030
30.41	to 30.52	-500	1030 to 1034
30.52	to 30.63	-600	1034 to 1037
30.63	to 30.74	-700	1037 to 1041
30.74	to 30.85	-800	1041 to 1045
30.85	to 30.96	-900	1045 to 1048
30.96	to 31.07	-1000	1048 to 1052

Example: Elevation = 2500 FT  
 QNH = 29.48 IN. HG.  
 Correction = 400 FT  
 Press Alt = 2900 FT

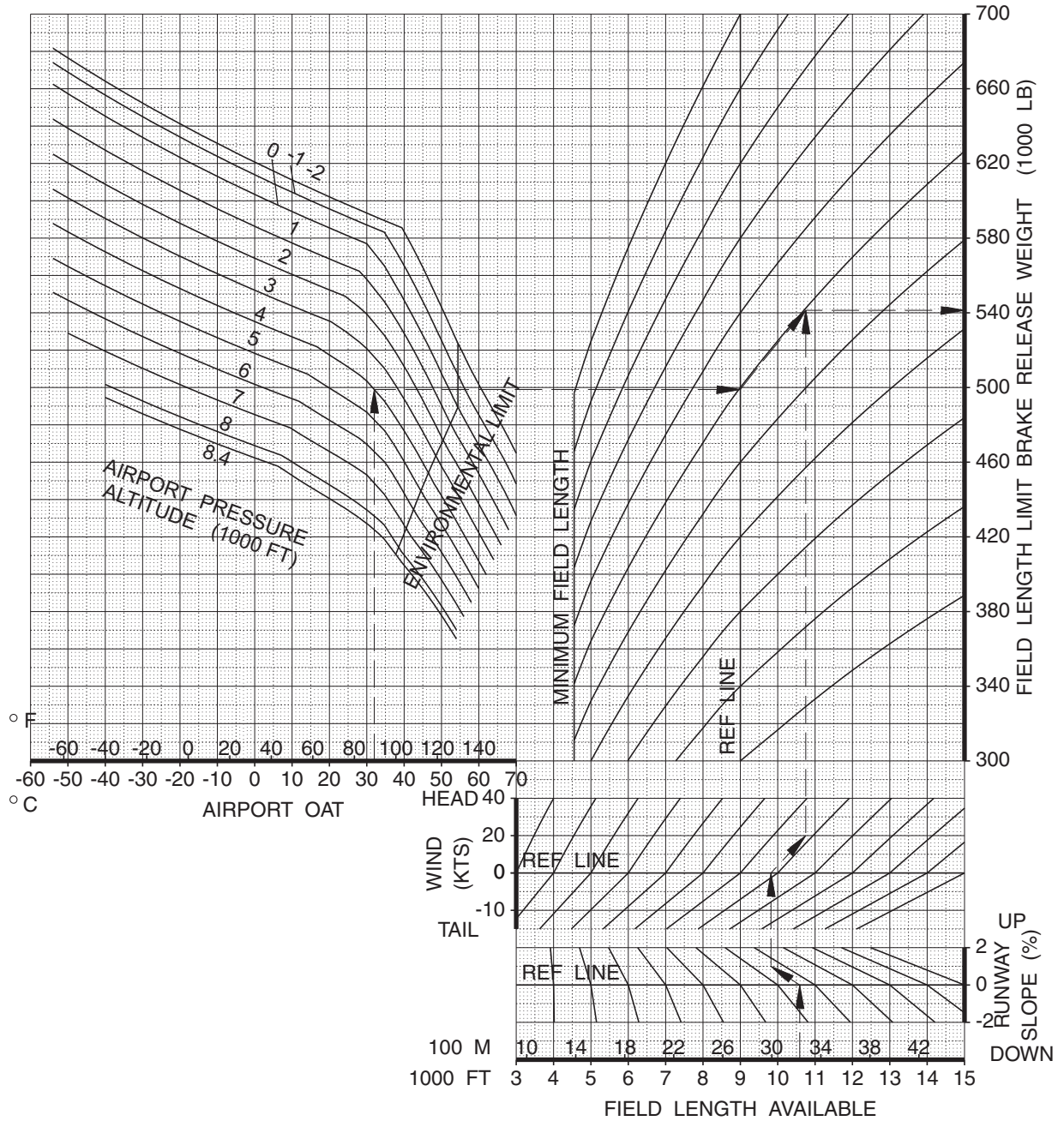
## Wind Component



## Takeoff Field Limit

### Flaps 5

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

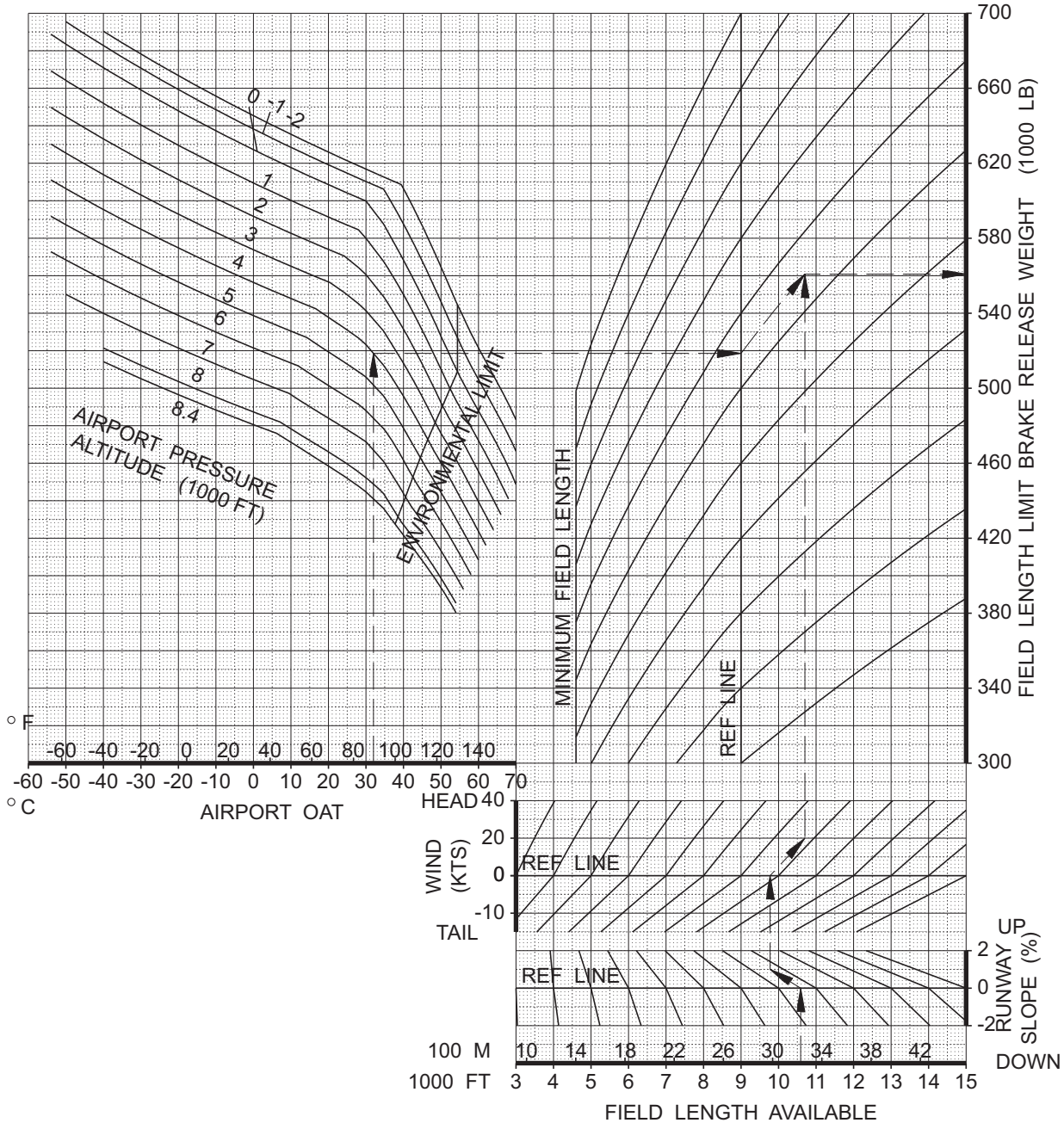


With engine bleed for packs off, increase weight by 1400 lb.  
 With engine anti-ice on, decrease weight by 100 lb.  
 With engine and wing anti-ice on, decrease weight by 2300 lb.

## Takeoff Field Limit

### Flaps 15

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

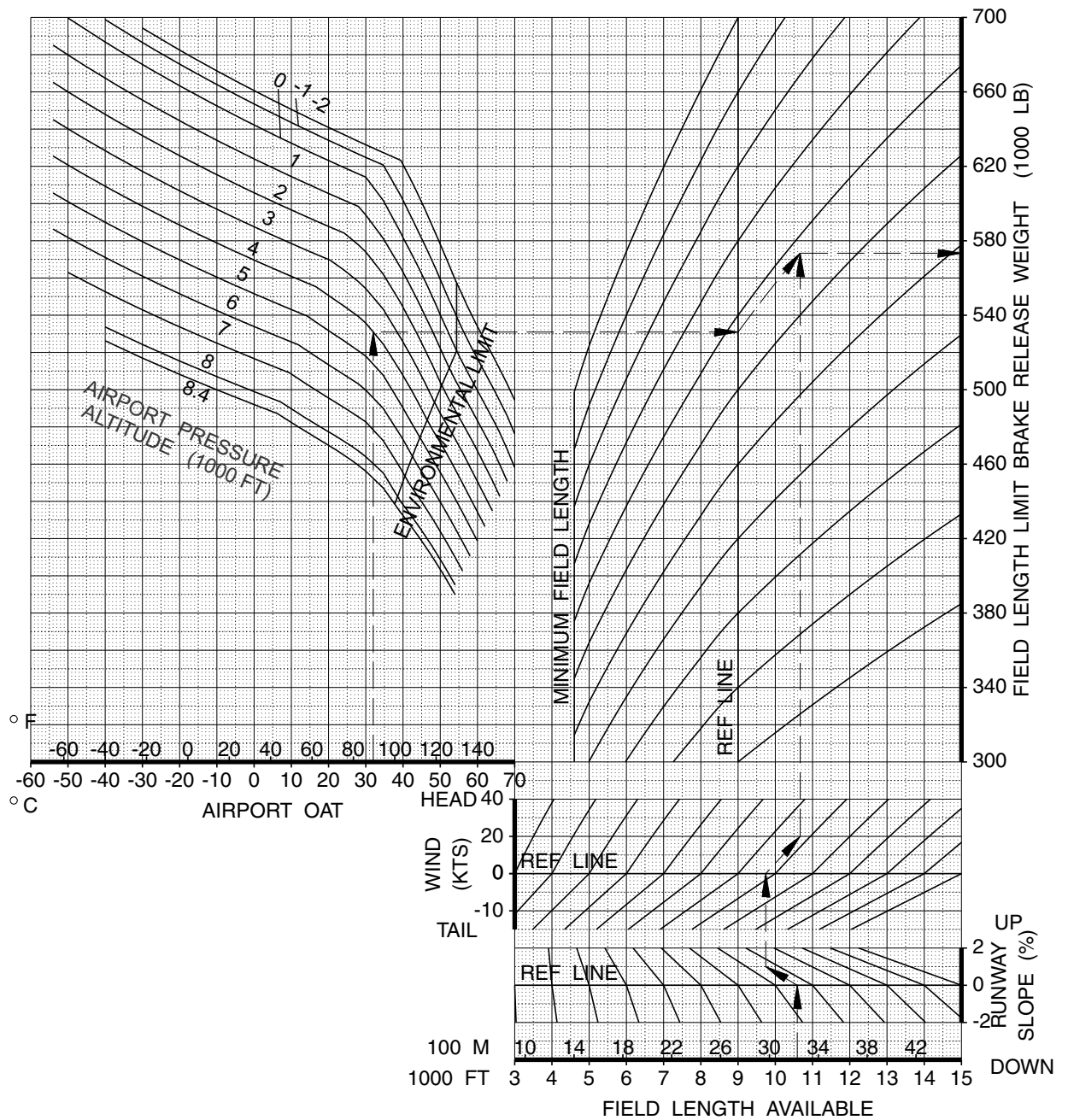


With engine bleed for packs off, increase weight by 1400 lb.  
 With engine anti-ice on, decrease weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 2300 lb.

## Takeoff Field Limit

### Flaps 20

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

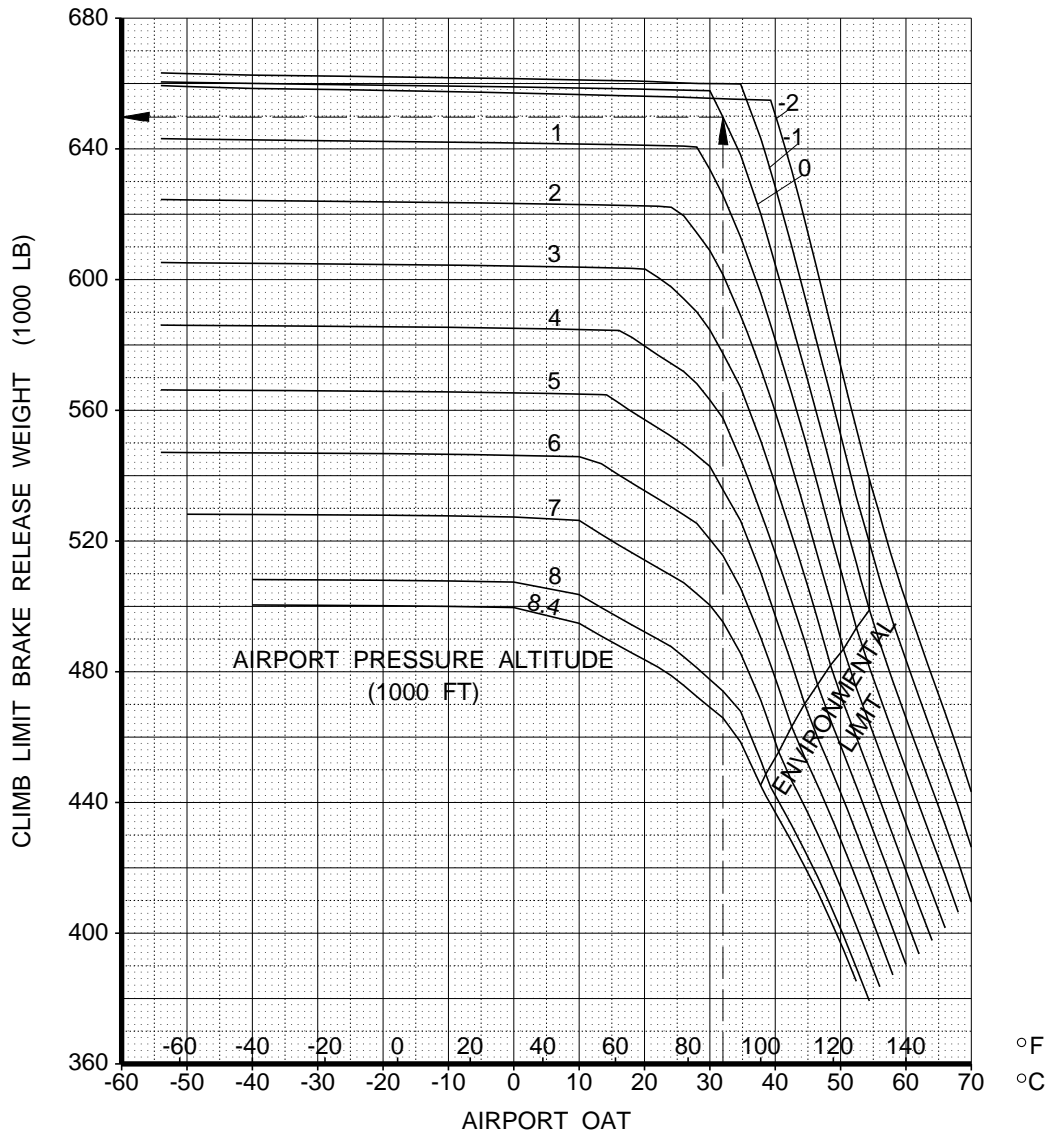


With engine bleed for packs off, increase weight by 1200 lb.  
 With engine anti-ice on, decrease weight by 400 lb.  
 With engine and wing anti-ice on, decrease weight by 2300 lb.

## Takeoff Climb Limit

Flaps 5

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

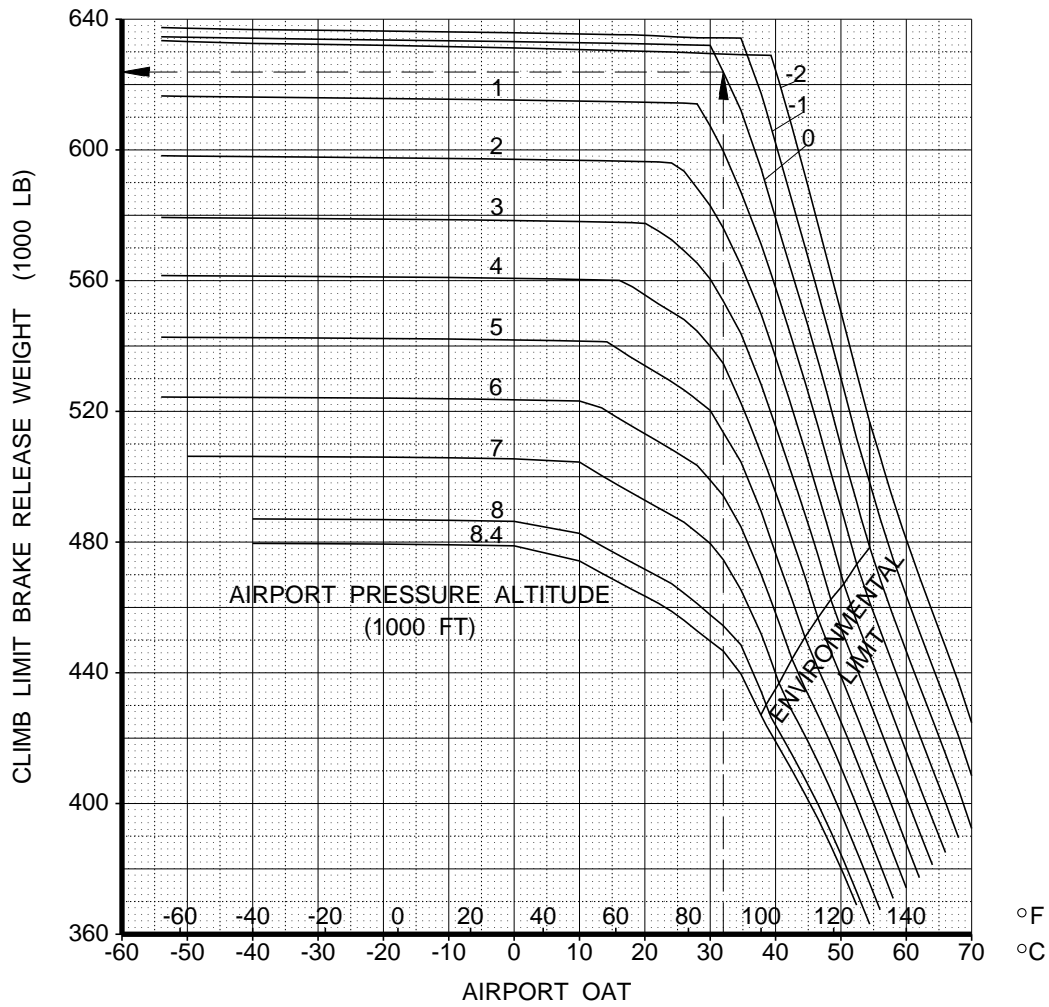


With engine bleed for packs off, increase weight by 4410 lb.  
 With engine anti-ice on, decrease weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 4400 lb.

## Takeoff Climb Limit

### Flaps 15

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

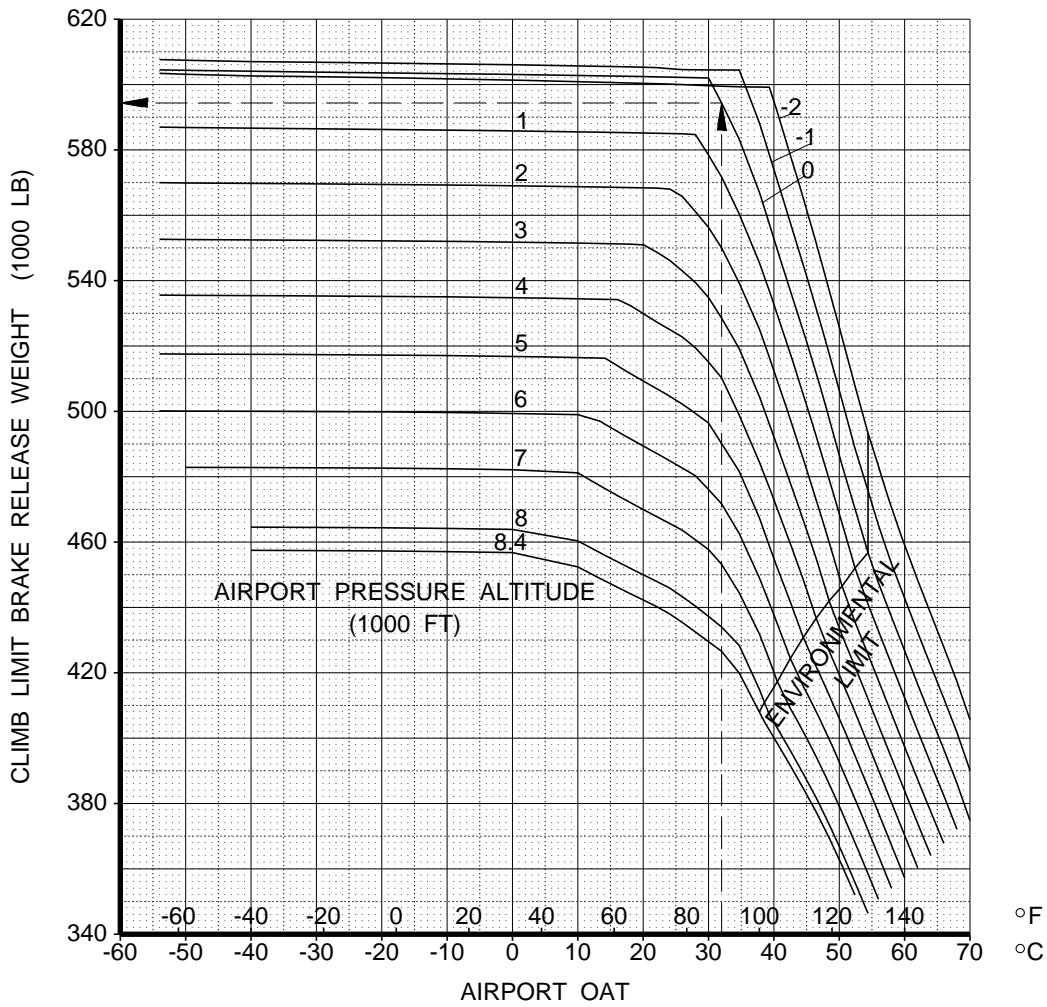


With engine bleed for packs off, increase weight by 4410 lb.  
 With engine anti-ice on, decrease weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 4250 lb.

## Takeoff Climb Limit

Flaps 20

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

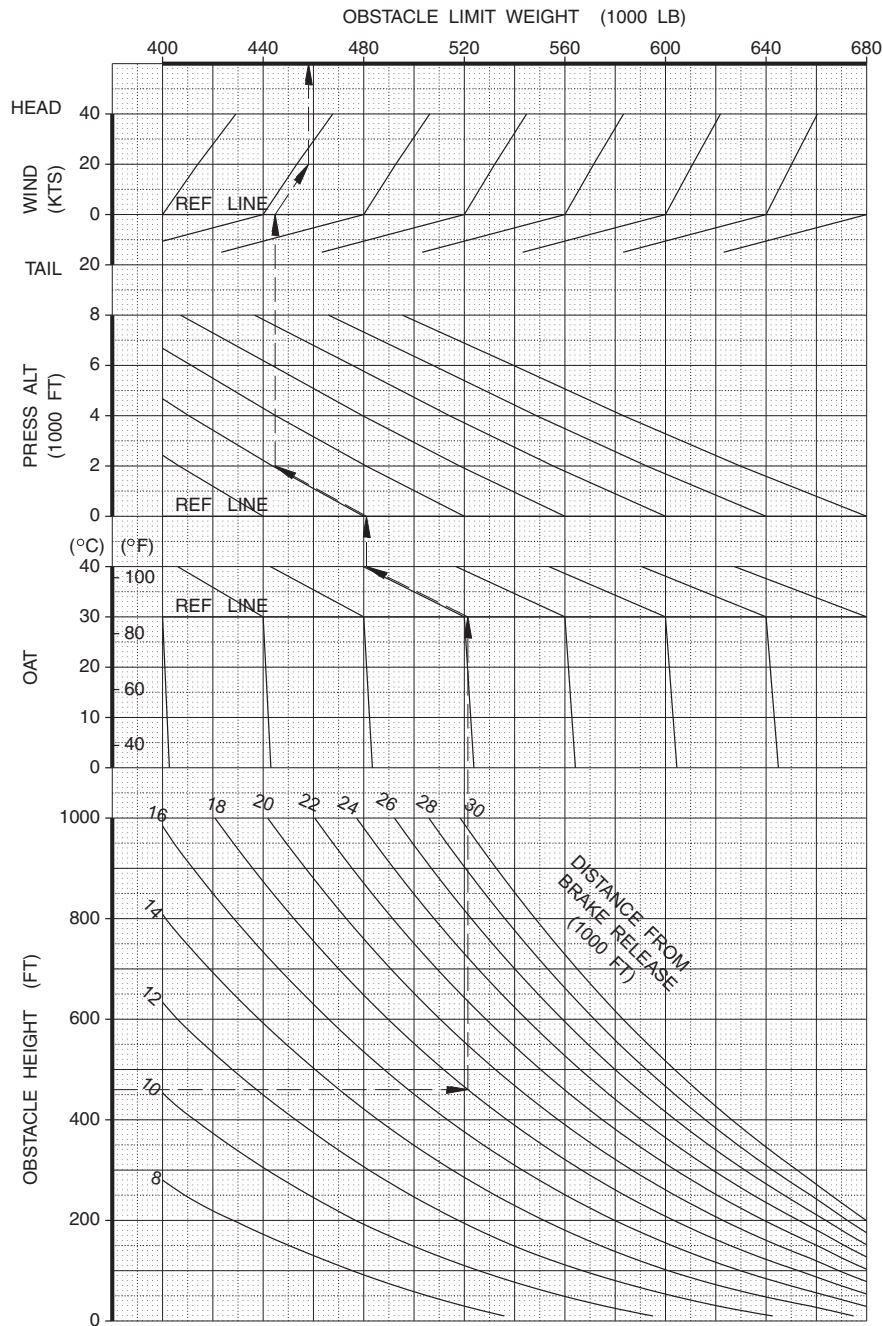


With engine bleed for packs off, increase weight by 4410 lb.  
With engine anti-ice on, decrease weight by 400 lb.  
With engine and wing anti-ice on, decrease weight by 4250 lb.

## Obstacle Limit

### Flaps 5

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

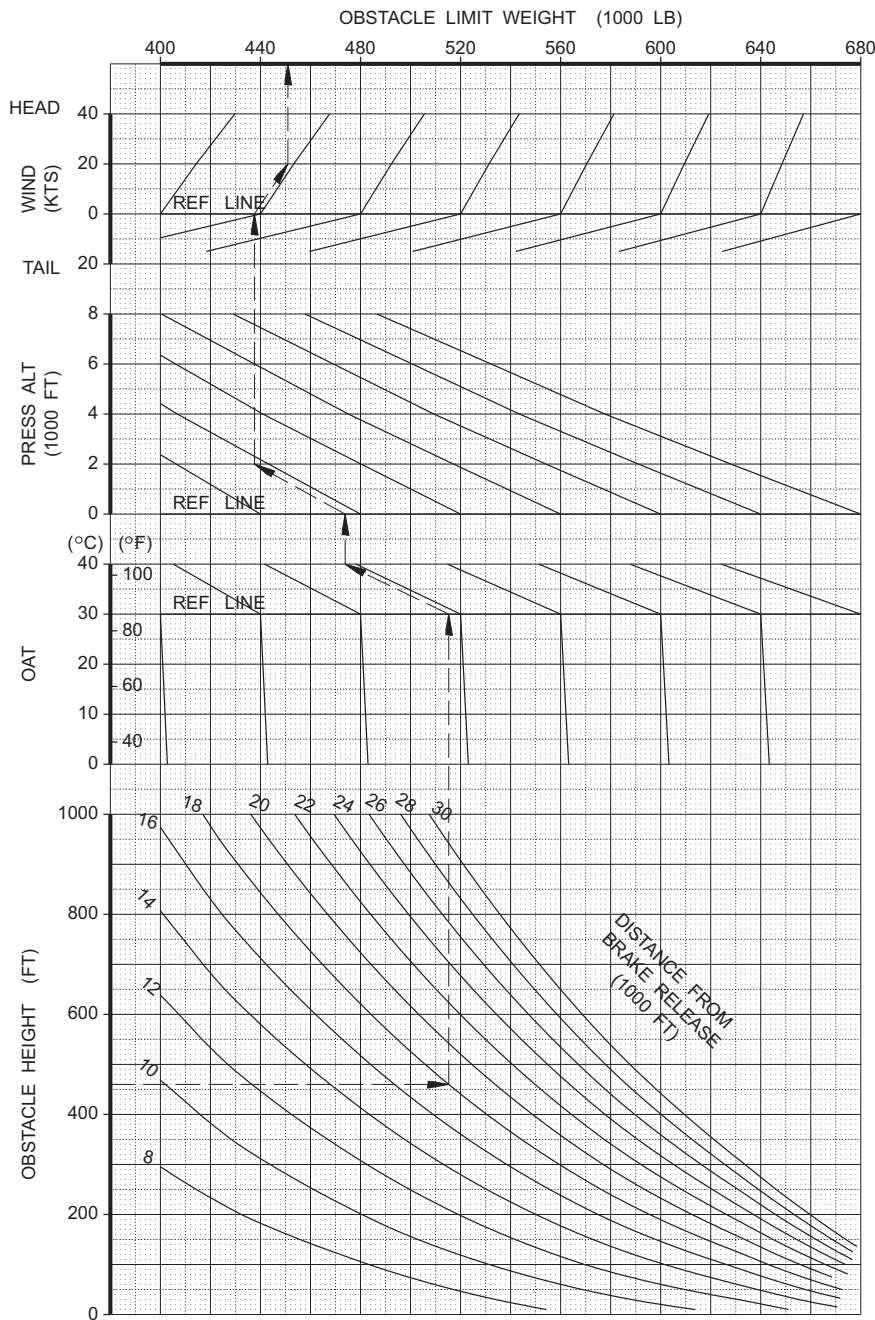


Obstacle height must be calculated from the lowest point of the runway to conservatively account for runway slope.  
 With engine bleed for packs off, increase weight by 2100 lb.  
 With engine anti-ice on, decrease weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 2900 lb.

## Obstacle Limit

### Flaps 15

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

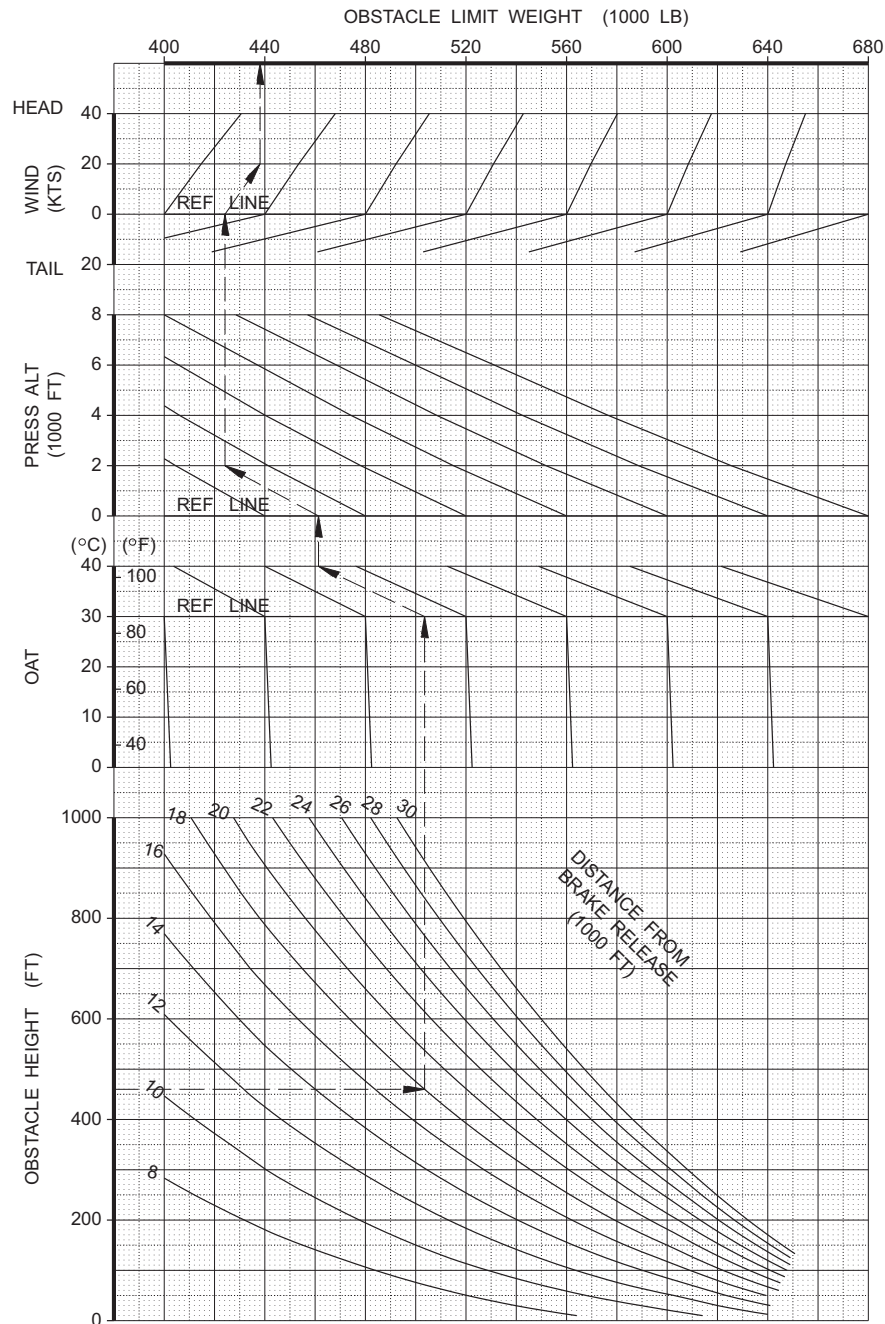


Obstacle height must be calculated from the lowest point of the runway to conservatively account for runway slope.  
 With engine bleed for packs off, increase weight by 2100 lb.  
 With engine anti-ice on, decrease weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 2900 lb.

## Obstacle Limit

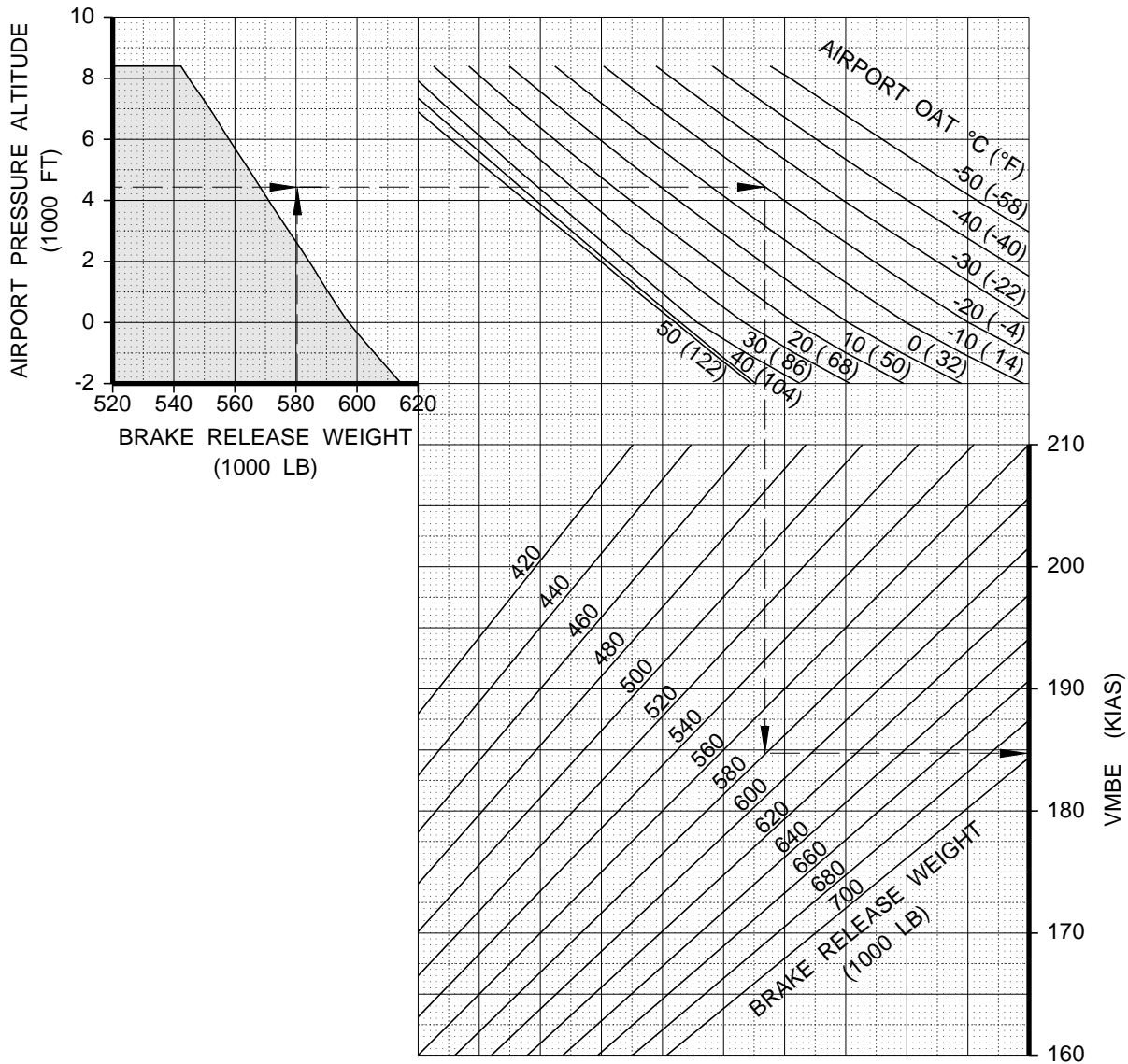
### Flaps 20

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



Obstacle height must be calculated from the lowest point of the runway to conservatively account for runway slope.  
 With engine bleed for packs off, increase weight by 2100 lb.  
 With engine anti-ice on, decrease weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 2900 lb.

## Brake Energy Limit VMBE



Check VMBE when outside shaded area, operating with tailwind, or when using improved climb.

Increase VMBE by 2 knots per 1% uphill runway slope. Decrease VMBE by 6 knots per 1% downhill runway slope.  
 Increase VMBE by 4 knots per 10 knots headwind. Decrease VMBE by 22 knots per 10 knots tailwind.  
 Decrease VMBE by 11 knots for one brake deactivated and 22 knots for two brakes deactivated.

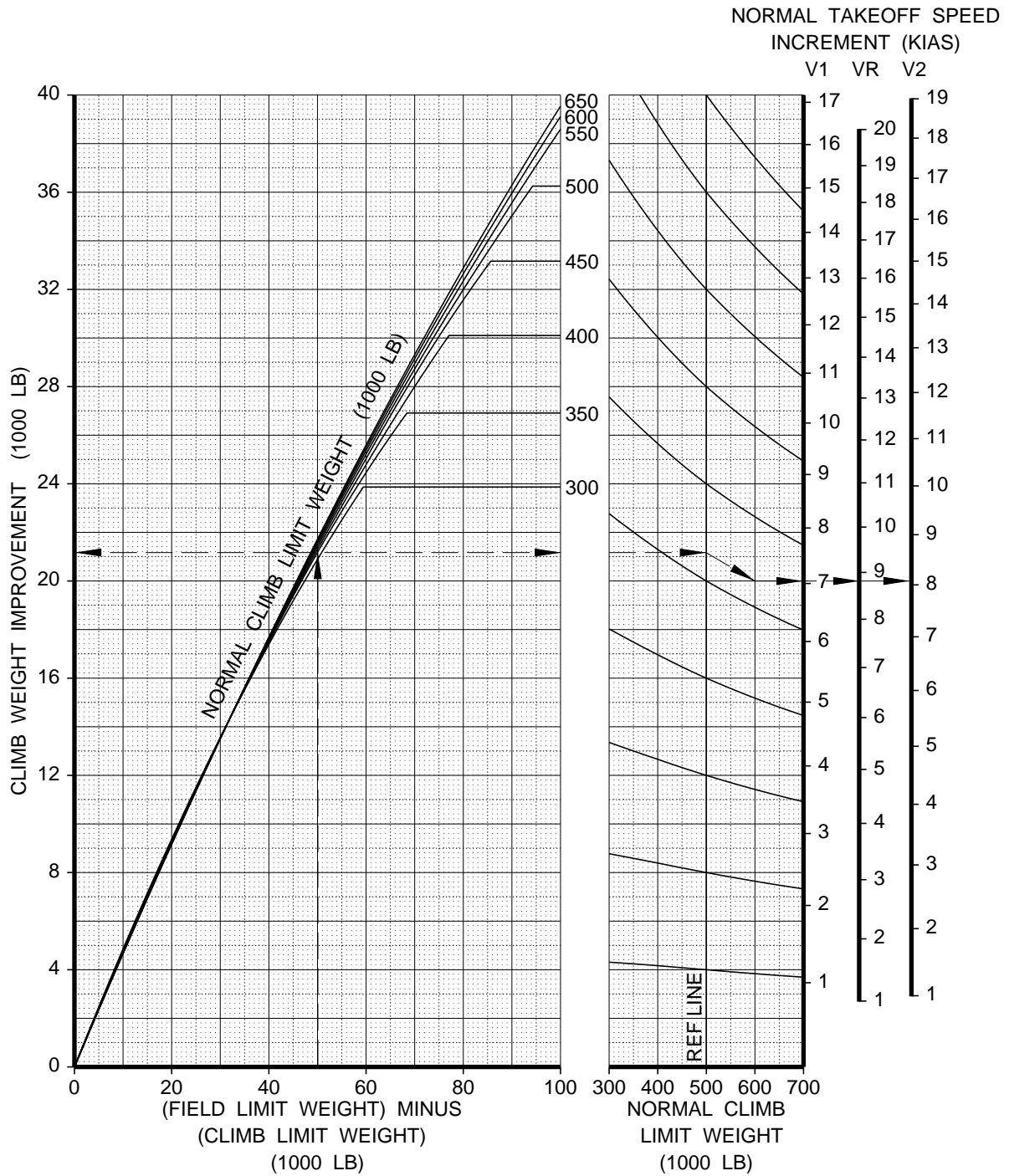
**Normal takeoff:**

Decrease brake release weight by 3750 lb for each knot V1 exceeds VMBE.  
 Determine normal V1, VR, V2 speeds for lower brake release weight.

**Improved climb takeoff:**

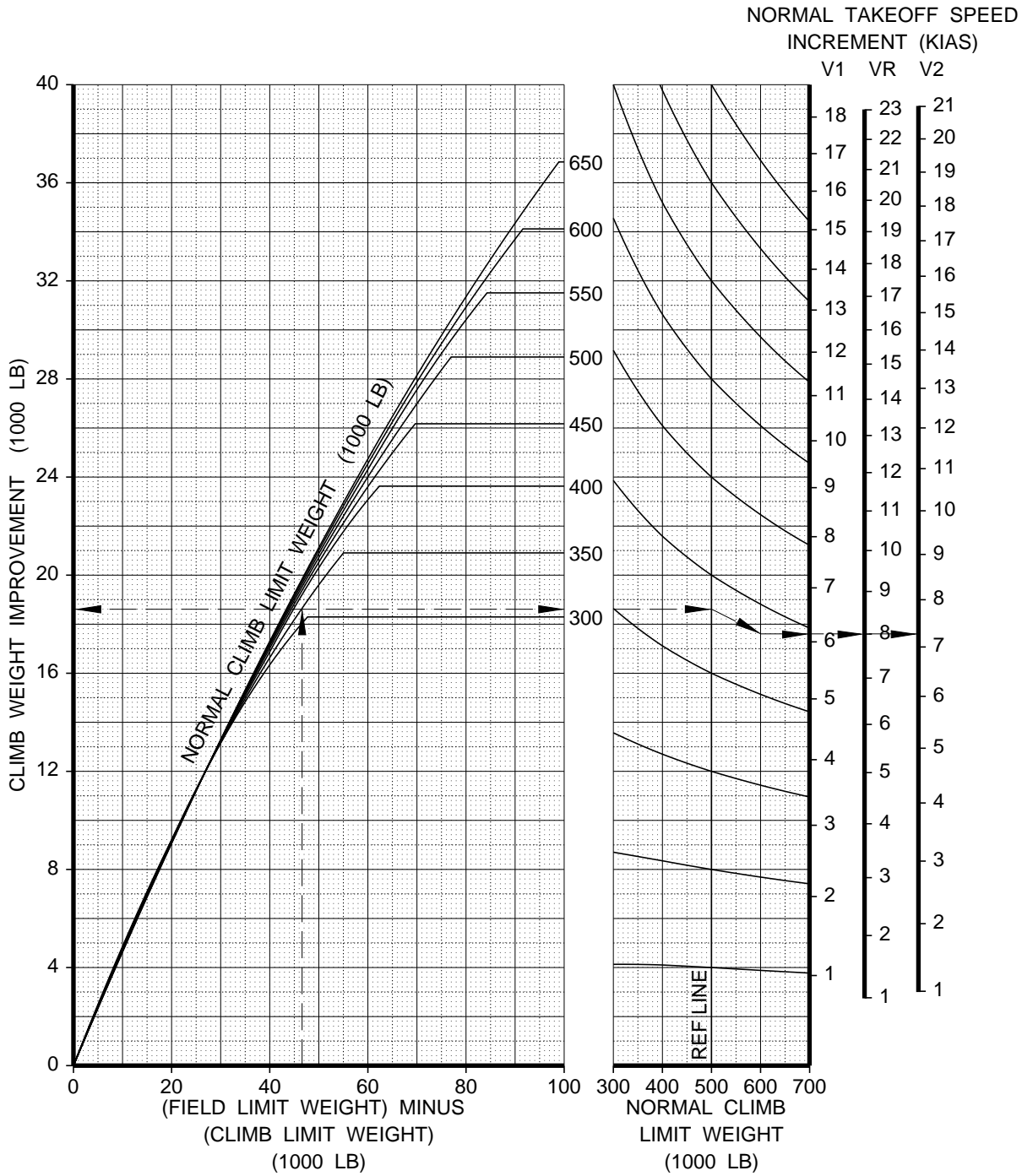
Decrease climb weight improvement by 1400 lb for each knot V1 exceeds VMBE.  
 Determine V1, VR, V2 speed increments for the lower climb weight improvement.

## Improved Climb Field Length Limit Flaps 5



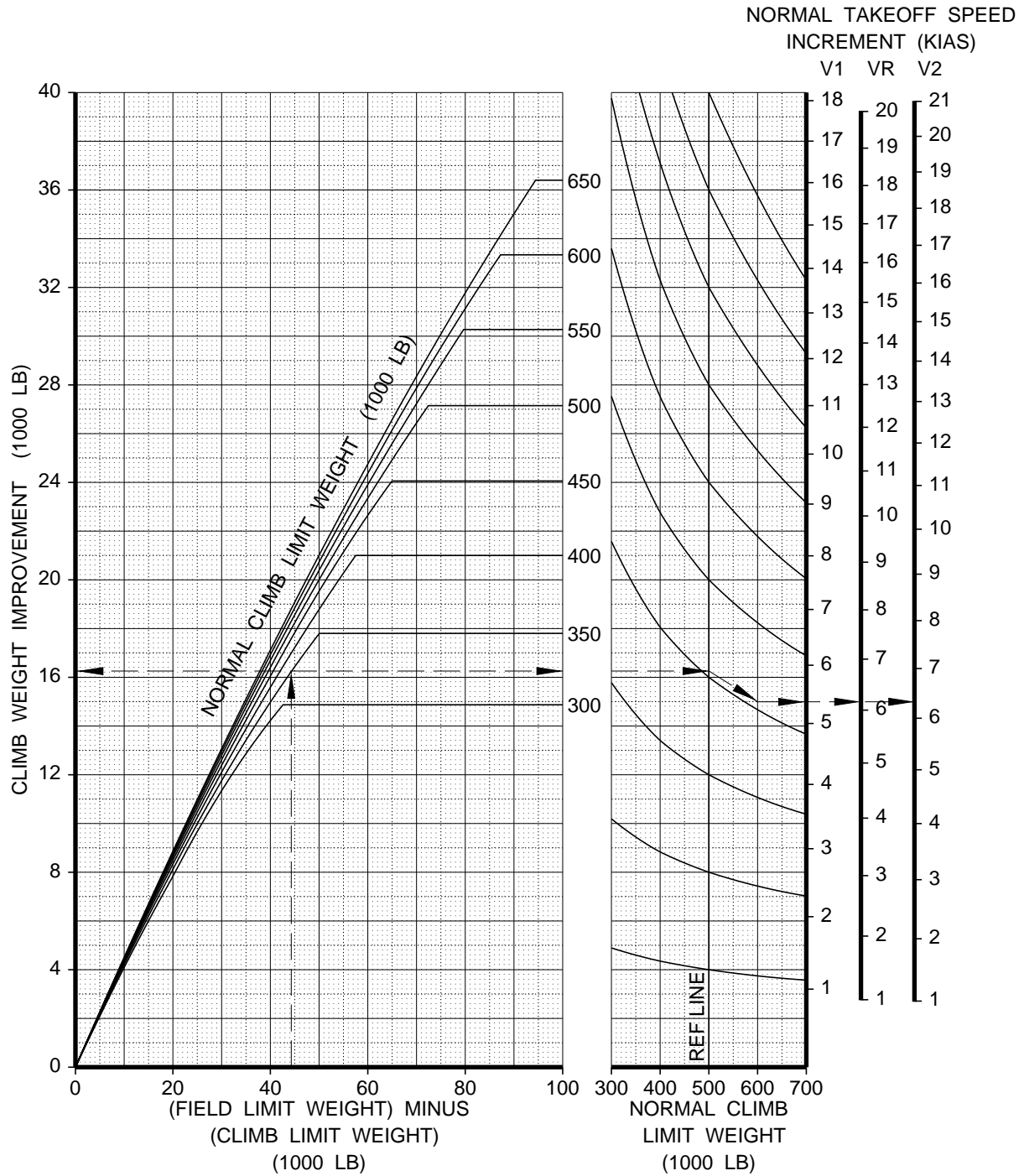
235 mph tire speeds are not limiting.

**Improved Climb Field Length Limit  
Flaps 15**



235 mph tire speeds are not limiting.

## Improved Climb Field Length Limit Flaps 20



235 mph tire speeds are not limiting.

ADVISORY INFORMATION

**Slush/Standing Water Takeoff  
Maximum Reverse Thrust  
Weight Adjustment (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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-71.7	-83.3	-94.9	-84.2	-95.8	-107.4	-111.5	-123.1	-134.7
660	-68.4	-80.0	-91.6	-79.3	-90.9	-102.5	-102.9	-114.5	-126.1
620	-64.4	-76.0	-87.6	-73.8	-85.4	-97.0	-94.0	-105.6	-117.2
580	-59.7	-71.3	-82.9	-67.7	-79.3	-90.9	-84.7	-96.3	-107.9
540	-54.3	-65.9	-77.5	-61.0	-72.6	-84.2	-75.1	-86.7	-98.3
500	-48.3	-59.9	-71.5	-53.7	-65.3	-76.9	-65.1	-76.7	-88.3
460	-41.6	-53.2	-64.8	-45.8	-57.4	-69.0	-54.8	-66.4	-78.0
420	-34.3	-45.9	-57.5	-37.4	-49.0	-60.6	-44.1	-55.7	-67.3
380	-26.3	-37.9	-49.5	-28.3	-39.9	-51.5	-33.1	-44.7	-56.3
340	-17.7	-29.3	-40.9	-18.7	-30.3	-41.9	-21.8	-33.4	-45.0
300	-8.9	-20.5	-32.1	-9.0	-20.6	-32.2	-10.4	-22.0	-33.6

**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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5800							225.3		
6200				221.3			283.7		
6600	245.2			280.5			342.2	248.6	
7000	304.2			339.6	245.0		401.1	307.1	
7400	363.4	268.8		399.4	304.1		461.8	365.6	272.0
7800	424.0	327.8	233.3	461.3	363.3	268.6	524.5	425.2	330.5
8200	487.3	387.4	292.4	525.8	423.8	327.8	589.4	486.7	389.2
8600	553.8	449.0	351.5	593.1	486.8	387.3	656.7	550.2	449.5
9000	623.8	513.5	411.7	663.8	552.3	448.7	726.3	616.0	511.8
9400	698.0	581.3	474.4	737.6	621.0	512.7		684.3	576.2
9800	774.6	653.0	540.2		693.1	579.4		754.4	643.0
10200		728.6	609.5		767.3	649.4			712.3
10600			682.8			722.8			
11000			759.3						

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 -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 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-19	-15	-11	-14	-10	-6	-4	0	0
620	-21	-17	-13	-16	-12	-8	-5	-1	0
580	-22	-18	-14	-18	-14	-10	-7	-3	0
540	-24	-20	-16	-20	-16	-12	-10	-6	-2
500	-26	-22	-18	-22	-18	-14	-14	-10	-6
460	-27	-23	-19	-24	-20	-16	-17	-13	-9
420	-28	-24	-20	-25	-21	-17	-20	-16	-12
380	-28	-24	-20	-26	-22	-18	-21	-17	-13
340	-27	-23	-19	-25	-21	-17	-21	-17	-13
300	-26	-22	-18	-24	-20	-16	-21	-17	-13

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

ADVISORY INFORMATION

**Slush/Standing Water Takeoff  
 No Reverse Thrust  
 Weight Adjustment (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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-100.8	-114.8	-128.8	-115.0	-129.0	-143.0	-145.0	-159.0	-173.0
660	-94.6	-108.6	-122.6	-106.6	-120.6	-134.6	-132.2	-146.2	-160.2
620	-88.0	-102.0	-116.0	-98.0	-112.0	-126.0	-119.6	-133.6	-147.6
580	-81.2	-95.2	-109.2	-89.4	-103.4	-117.4	-107.2	-121.2	-135.2
540	-74.0	-88.0	-102.0	-80.7	-94.7	-108.7	-95.1	-109.1	-123.1
500	-66.4	-80.4	-94.4	-71.9	-85.9	-99.9	-83.2	-97.2	-111.2
460	-58.6	-72.6	-86.6	-63.0	-77.0	-91.0	-71.5	-85.5	-99.5
420	-50.4	-64.4	-78.4	-54.0	-68.0	-82.0	-60.1	-74.1	-88.1
380	-41.9	-55.9	-69.9	-44.9	-58.9	-72.9	-48.9	-62.9	-76.9
340	-33.1	-47.1	-61.1	-35.7	-49.7	-63.7	-37.9	-51.9	-65.9
300	-24.2	-38.2	-52.2	-26.6	-40.6	-54.6	-27.0	-41.0	-55.0

**VMCG 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
8600							232.0		
9000							297.6		
9400							363.2	251.7	
9800				238.5			431.6	317.3	
10200				311.0			505.3	383.3	271.4
10600	262.7			383.9	260.3		585.8	453.1	337.0
11000	337.2			462.7	332.7		675.2	528.7	403.7
11400	414.3	284.8		550.9	406.7	282.0	772.7	611.5	475.2
11800	499.5	360.0	233.4	653.0	488.0	354.5		704.3	552.7
12200	599.3	438.6	307.1	772.0	579.8	430.2			638.1
12600	717.6	527.8	383.0		687.5	514.3			733.6
13000		632.2	463.9			610.0			
13400		759.8	557.6			723.7			
13800			667.1						

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water adjustment.
2. Adjust field length available by -240 ft/+230 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-32	-26	-20	-25	-19	-13	-8	-2	0
620	-34	-28	-22	-27	-21	-15	-11	-5	0
580	-36	-30	-24	-30	-24	-18	-15	-9	-3
540	-39	-33	-27	-34	-28	-22	-20	-14	-8
500	-41	-35	-29	-37	-31	-25	-26	-20	-14
460	-44	-38	-32	-40	-34	-28	-31	-25	-19
420	-45	-39	-33	-43	-37	-31	-36	-30	-24
380	-47	-41	-35	-44	-38	-32	-39	-33	-27
340	-47	-41	-35	-45	-39	-33	-41	-35	-29
300	-47	-41	-35	-45	-39	-33	-42	-36	-30

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.



Flight Planning and Performance Manual

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		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	0.0	-3.6	-7.2	-31.7	-35.3	-38.9	-68.2	-71.8	-75.4
660	0.0	-3.6	-7.2	-35.2	-38.8	-42.4	-68.3	-71.9	-75.5
620	0.0	-3.6	-7.2	-37.3	-40.9	-44.5	-67.3	-70.9	-74.5
580	-3.2	-6.8	-10.4	-38.2	-41.8	-45.4	-65.1	-68.7	-72.3
540	-5.6	-9.2	-12.8	-37.8	-41.4	-45.0	-61.8	-65.4	-69.0
500	-7.0	-10.6	-14.2	-36.1	-39.7	-43.3	-57.3	-60.9	-64.5
460	-7.1	-10.7	-14.3	-33.1	-36.7	-40.3	-51.7	-55.3	-58.9
420	-6.2	-9.8	-13.4	-28.8	-32.4	-36.0	-44.9	-48.5	-52.1
380	-4.1	-7.7	-11.3	-23.3	-26.9	-30.5	-36.9	-40.5	-44.1
340	-0.9	-4.5	-8.1	-16.5	-20.1	-23.7	-27.8	-31.4	-35.0

**V1(MCG) Limit Weight (1000 LB)**

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4600	232.9								
5000	372.2	246.8	121.4						
5400	504.0	385.9	260.8						
5800	625.6	516.5	399.5						
6200	739.6	637.2	529.0						
6600		750.8	648.9	346.3					
7000			762.1	434.3	320.3				
7400				525.0	407.6	294.2			
7800				618.9	497.5	381.2			
8200				716.2	590.4	470.2			
8600					686.7	562.2	345.3		
9000						657.4	396.4		
9400							449.7	345.3	
9800							505.5	396.4	
10200							564.2	449.7	345.3
10600							626.4	505.5	396.4
11000							692.8	564.2	449.7
11400								626.4	505.5
11800								692.8	564.2
12200									626.4
12600									692.8

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 -120 ft/+110 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.



Flight Planning and Performance Manual

ADVISORY INFORMATION

**Slippery Runway Takeoff**

**Maximum Reverse Thrust**

**V1 Adjustment (KIAS)**

WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
640	-5	-3	-1	-15	-13	-11	-29	-27	-25
600	-6	-4	-2	-18	-16	-14	-32	-30	-28
560	-8	-6	-4	-20	-18	-16	-35	-33	-31
520	-9	-7	-5	-22	-20	-18	-38	-36	-34
480	-10	-8	-6	-24	-22	-20	-40	-38	-36
440	-11	-9	-7	-26	-24	-22	-43	-41	-39
400	-12	-10	-8	-27	-25	-23	-45	-43	-41
360	-12	-10	-8	-28	-26	-24	-46	-44	-42
320	-13	-11	-9	-29	-27	-25	-47	-45	-43

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.



Flight Planning and Performance Manual

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		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-3.0	-6.2	-9.4	-55.6	-58.8	-62.0	-98.0	-101.2	-104.4
660	-9.3	-12.5	-15.7	-57.9	-61.1	-64.3	-95.2	-98.4	-101.6
620	-14.3	-17.5	-20.7	-59.0	-62.2	-65.4	-91.5	-94.7	-97.9
580	-18.0	-21.2	-24.4	-58.7	-61.9	-65.1	-86.8	-90.0	-93.2
540	-20.5	-23.7	-26.9	-57.3	-60.5	-63.7	-81.3	-84.5	-87.7
500	-21.7	-24.9	-28.1	-54.6	-57.8	-61.0	-74.8	-78.0	-81.2
460	-21.5	-24.7	-27.9	-50.6	-53.8	-57.0	-67.5	-70.7	-73.9
420	-20.1	-23.3	-26.5	-45.4	-48.6	-51.8	-59.2	-62.4	-65.6
380	-17.5	-20.7	-23.9	-38.9	-42.1	-45.3	-50.0	-53.2	-56.4
340	-13.6	-16.8	-20.0	-31.3	-34.5	-37.7	-39.9	-43.1	-46.3
300	-9.5	-12.7	-15.9	-23.4	-26.6	-29.8	-29.7	-32.9	-36.1

**V1(MCG) Limit Weight (1000 LB)**

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
6200	510.0								
6600	685.2	485.7							
7000		670.9	458.9						
7400			656.1						
9000				398.9					
9400				610.3	316.7				
9800				775.4	554.1	232.4			
10200					727.3	492.6			
10600						678.9			
13000							284.6		
13400							381.8		
13800							484.5	284.6	
14200							596.3	381.8	
14600							719.8	484.5	284.6
15000								596.3	381.8
15400								719.8	484.5
15800									596.3
16200									719.8

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 -150 ft/+140 ft for every 5°C above/below 4°C.  
Adjust "Poor" field length available by -230 ft/+220 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.

**V1 Adjustment (KIAS)**

WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-7	-1	0	-22	-16	-10	-44	-38	-32
620	-9	-3	0	-25	-19	-13	-48	-42	-36
580	-11	-5	0	-28	-22	-16	-52	-46	-40
540	-13	-7	-1	-32	-26	-20	-57	-51	-45
500	-15	-9	-3	-35	-29	-23	-62	-56	-50
460	-17	-11	-5	-39	-33	-27	-66	-60	-54
420	-20	-14	-8	-42	-36	-30	-71	-65	-59
380	-21	-15	-9	-45	-39	-33	-76	-70	-64
340	-23	-17	-11	-48	-42	-36	-81	-75	-69
300	-25	-19	-13	-51	-45	-39	-86	-80	-74

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.



Flight Planning and Performance Manual

**Takeoff Speeds**

**V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 LB)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
660	163	170	175	156	162	168	151	157	163
640	160	167	172	153	159	165	149	154	161
620	157	164	170	150	156	163	146	151	158
600	154	161	167	147	154	160	143	149	156
580	150	158	165	144	151	158	140	146	154
560	147	155	162	141	148	155	137	143	151
540	144	152	160	138	145	153	133	140	149
520	141	148	157	134	142	150	130	137	146
500	137	145	154	131	138	148	127	134	143
480	134	142	151	128	135	145	124	131	141
460	130	138	148	124	132	142	120	127	138
440	125	135	145	120	128	139	116	124	135
420	121	131	142	115	125	136	112	121	133
400	117	127	139	111	121	134	107	117	130
380	112	123	136	107	118	130	103	114	127
360	107	119	133	102	114	127	99	110	124
340	102	115	129	98	110	124	94	106	121
320	97	111	126	93	106	121	90	102	117

Check V1(MCG), Minimum VR and Minimum V2.

**V1, VR, V2 Adjustments\***

TEMP		V1						VR						V2					
		PRESSURE ALTITUDE (FT)						PRESSURE ALTITUDE (FT)						PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000	-2000	0	2000	4000	6000	8000	-2000	0	2000	4000	6000	8000
60	140	9	11	13	15			4	5	5	6			-2	-2	-3	-3		
50	122	4	6	9	11	13	15	2	3	4	5	6	6	-1	-1	-2	-2	-3	-3
40	104	0	3	5	7	10	12	0	1	2	3	4	5	0	-1	-1	-2	-2	-3
30	86	0	0	3	5	7	10	0	0	1	2	3	5	0	0	-1	-1	-2	-2
20	68	0	0	2	4	6	9	0	0	1	2	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	6	8	0	0	1	2	3	4	0	0	0	-1	-1	-2

**Slope and Wind V1 Adjustments\***

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)					
	-2	-1	0	1	2	-15	-10	-5	0	20	40
680	-5	-2	0	3	5	-3	-1	-1	0	1	2
640	-5	-2	0	2	4	-2	-1	0	0	1	2
600	-4	-2	0	2	4	-2	-1	0	0	1	2
560	-4	-2	0	2	4	-2	-1	0	0	1	2
520	-3	-1	0	2	3	-2	-1	0	0	1	2
480	-3	-1	0	2	3	-1	-1	0	0	1	2
440	-3	-1	0	2	3	-1	-1	0	0	1	2
400	-3	-1	0	2	3	-1	-1	0	0	1	2
360	-3	-1	0	2	3	-2	-1	0	0	1	2
320	-3	-1	0	2	3	-2	-1	0	0	1	2

**Max Allowable Clearway for V1 Adjustment**

FIELD LENGTH (FT)	4000	6000	8000	10000	12000	14000
MAX ALLOWABLE CLEARWAY (FT)	400	600	800	900	1100	1300

**Clearway and Stopway V1 Adjustments\***

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

\*V1 not to exceed VR

## Takeoff Speeds

### V1(MCG), Minimum VR

#### Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	108	115	104	111	103	109	101	108				
50	122	111	118	107	114	103	110	101	108	99	106	98	104
40	104	117	123	113	119	109	115	105	111	101	107	98	104
30	86	117	124	117	124	113	119	109	115	104	111	100	107
20	68	118	124	117	124	114	120	110	117	106	112	101	108
-60	-76	119	124	118	124	115	121	111	117	107	113	104	110

### Minimum V2

#### Max Takeoff Thrust

FLAPS	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
5	121	120	118	117	115	113
15	119	118	116	115	113	111
20	119	116	114	111	109	107

## Takeoff EPR

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

#### Max Takeoff Thrust

REPORTED OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
70	158	1.222	1.220	1.218	1.218	1.216	1.215	1.213	1.211	1.209	1.206	1.206
60	140	1.274	1.274	1.273	1.275	1.275	1.274	1.275	1.274	1.273	1.272	1.273
50	122	1.338	1.337	1.334	1.333	1.333	1.334	1.336	1.337	1.337	1.338	1.340
45	113	1.376	1.374	1.373	1.372	1.370	1.368	1.367	1.368	1.370	1.371	1.374
40	104	1.414	1.413	1.414	1.414	1.412	1.411	1.408	1.408	1.406	1.404	1.407
35	95	1.419	1.465	1.460	1.461	1.458	1.455	1.463	1.457	1.453	1.451	1.447
30	86	1.419	1.503	1.499	1.498	1.493	1.492	1.491	1.489	1.489	1.480	1.477
25	77	1.419	1.503	1.512	1.518	1.513	1.510	1.507	1.505	1.503	1.497	1.494
20	68	1.419	1.503	1.512	1.521	1.528	1.524	1.522	1.520	1.518	1.511	1.509
15	59	1.419	1.503	1.512	1.521	1.528	1.535	1.537	1.535	1.533	1.526	1.524
10	50	1.419	1.503	1.512	1.521	1.528	1.535	1.540	1.541	1.539	1.531	1.529
5	41	1.419	1.503	1.512	1.521	1.528	1.535	1.540	1.541	1.539	1.531	1.529
3 & BELOW	37 & BELOW	1.419	1.503	1.512	1.521	1.528	1.535	1.540	1.541	1.539	1.531	1.529

### EPR Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400	
PACKS OFF	0.013	0.013	0.014	0.014	0.015	0.016	0.016	0.017	0.017	0.018	0.018	0.018
WING ANTI-ICE ON	-0.006	-0.006	-0.006	-0.007	-0.007	-0.008	-0.008	-0.008	-0.008	-0.009	-0.009	-0.009

### Minimum Allowable EPR for Reduced Thrust

#### Based on 25% thrust reduction

MAX TAKEOFF EPR FOR ACTUAL OAT	MIN TAKEOFF EPR ALLOWED
1.100	1.100
1.150	1.100
1.200	1.128
1.250	1.160
1.300	1.192
1.350	1.224
1.400	1.252
1.450	1.272
1.500	1.292
1.550	1.310
1.600	1.329



Flight Planning and Performance Manual

**Stab Trim Setting**  
**Max Takeoff Thrust**  
**Flaps 5**

WEIGHT (1000 LB)	C.G. (%MAC)								
	14	18	22	26	30	34	38	42	44
660	8 1/2	8	7	6	5 1/4	4 1/4	4		
620	8 1/2	8	7	6	5 1/4	4 1/4	4		
580	8 1/2	8	7	6	5 1/4	4 1/4	3 3/4	2 1/2	1 3/4
540	8 1/2	8	7	6	5	4	3 1/4	2 1/4	1 1/2
500	8 1/2	8	7	6	4 3/4	3 3/4	2 3/4	1 3/4	1 1/4
460	8 1/2	8	7	5 3/4	4 3/4	3 1/2	2 1/2	1 1/2	1
420	8 1/2	8	6 3/4	5 1/2	4 1/2	3 1/4	2 1/4	1 1/4	1
380	8 1/2	7 3/4	6 1/2	5 1/4	4	2 3/4	2	1 1/4	1
340	8	7	6	4 3/4	3 1/2	2 1/2	1 1/2	1	1
300	6 1/2	5 1/2	4 3/4	3 3/4	3	2	1 1/4	1	1

**Flaps 15 and 20**

WEIGHT (1000 LB)	C.G. (%MAC)								
	14	18	22	26	30	34	38	42	44
660	9 3/4	8 3/4	7 3/4	6 3/4	5 1/2	4 1/2	4		
620	9 3/4	8 3/4	7 3/4	6 3/4	5 1/2	4 1/2	4		
580	10	8 3/4	7 3/4	6 1/2	5 1/4	4 1/4	3 3/4	2 1/2	1 3/4
540	10	8 3/4	7 1/2	6 1/2	5 1/4	4	3 1/4	2 1/4	1 1/2
500	10	8 3/4	7 1/2	6 1/2	5 1/4	3 3/4	2 3/4	1 3/4	1 1/4
460	10	8 3/4	7 1/2	6 1/4	5	3 1/2	2 1/2	1 1/2	1
420	10	8 3/4	7 1/4	6	4 3/4	3 1/4	2 1/4	1 1/4	1
380	10	8 1/2	7	5 3/4	4 1/4	2 3/4	2	1 1/4	1
340	9	8	6 1/2	5	3 3/4	2 1/2	1 1/2	1	1
300	7 1/2	6 1/2	5 1/4	4 1/4	3 1/4	2	1 1/4	1	1

Intentionally  
Blank



Flight Planning and Performance Manual

**TO1 Takeoff Weights**

**10% Thrust Reduction**

**Takeoff Field Limit**

FULL RATED LIMIT WEIGHT (1000 LB)	720	680	640	600	560	520	480	440	400	360
TO1 LIMIT WEIGHT (1000 LB)	663.0	626.6	590.1	553.8	517.4	480.9	444.4	407.9	371.5	335.0

If the takeoff is limited by minimum control speeds, V1 may be increased to be equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 4250 ft for normal operations, 4450 ft with one brake deactivated and 4700 ft with two brakes deactivated.

**Takeoff Climb Limit**

FULL RATED LIMIT WEIGHT (1000 LB)	720	680	640	600	560	520	480	440	400	360
TO1 LIMIT WEIGHT (1000 LB)	630.6	596.1	561.6	527.2	492.7	458.1	423.6	389.1	354.5	320.0

**Takeoff Obstacle Limit**

FULL RATED LIMIT WEIGHT (1000 LB)	720	680	640	600	560	520	480	440	400	360
TO1 LIMIT WEIGHT (1000 LB)	632.5	598.2	563.9	529.7	495.4	461.1	426.9	392.6	358.3	324.0

ADVISORY INFORMATION

**TO1 Slush/Standing Water Takeoff**

**10% Thrust Reduction**

**Maximum Reverse Thrust**

**Weight Adjustment (1000 LB)**

TO1 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-69.7	-81.3	-92.9	-82.9	-94.5	-106.1	-112.1	-123.7	-135.3
660	-66.7	-78.3	-89.9	-78.3	-89.9	-101.5	-103.8	-115.4	-127.0
620	-63.4	-75.0	-86.6	-73.5	-85.1	-96.7	-95.4	-107.0	-118.6
580	-59.4	-71.0	-82.6	-68.1	-79.7	-91.3	-86.6	-98.2	-109.8
540	-54.8	-66.4	-78.0	-62.0	-73.6	-85.2	-77.4	-89.0	-100.6
500	-49.4	-61.0	-72.6	-55.3	-66.9	-78.5	-67.8	-79.4	-91.0
460	-43.3	-54.9	-66.5	-47.9	-59.5	-71.1	-57.8	-69.4	-81.0
420	-36.4	-48.0	-59.6	-39.9	-51.5	-63.1	-47.5	-59.1	-70.7
380	-28.8	-40.4	-52.0	-31.3	-42.9	-54.5	-36.8	-48.4	-60.0
340	-20.5	-32.1	-43.7	-22.0	-33.6	-45.2	-25.6	-37.2	-48.8
300	-11.8	-23.4	-35.0	-12.2	-23.8	-35.4	-14.2	-25.8	-37.4

**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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5400							224.0		
5800				225.2			287.5		
6200	254.3			289.6			351.2	249.4	
6600	318.8			354.3	250.9		416.0	313.0	
7000	384.0	280.1		420.4	315.5		483.2	376.8	274.8
7400	451.8	344.8	241.4	489.6	380.4	276.7	553.0	442.6	338.4
7800	523.3	410.7	305.9	562.3	447.7	341.3	625.9	510.8	402.8
8200	599.1	479.9	370.8	639.0	518.2	406.9	702.1	581.8	469.5
8600	680.1	553.0	438.0	720.2	592.4	475.5	779.9	655.9	538.8
9000	765.3	630.9	508.7		670.9	547.4		733.2	611.1
9400		714.0	583.6		753.1	623.3			686.6
9800			663.5			703.7			764.4
10200			748.2						

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust 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 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-17	-13	-9	-11	-7	-3	0	0	0
620	-18	-14	-10	-13	-9	-5	-2	0	0
580	-20	-16	-12	-15	-11	-7	-4	0	0
540	-22	-18	-14	-18	-14	-10	-7	-3	0
500	-24	-20	-16	-20	-16	-12	-11	-7	-3
460	-25	-21	-17	-22	-18	-14	-14	-10	-6
420	-26	-22	-18	-23	-19	-15	-17	-13	-9
380	-26	-22	-18	-24	-20	-16	-19	-15	-11
340	-25	-21	-17	-23	-19	-15	-19	-15	-11
300	-24	-20	-16	-22	-18	-14	-19	-15	-11

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

ADVISORY INFORMATION

**TO1 Slush/Standing Water Takeoff**

**10% Thrust Reduction**

**No Reverse Thrust**

**Weight Adjustment (1000 LB)**

TO1 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-99.5	-113.5	-127.5	-115.2	-129.2	-143.2	-147.9	-161.9	-175.9
660	-93.5	-107.5	-121.5	-106.9	-120.9	-134.9	-135.2	-149.2	-163.2
620	-87.6	-101.6	-115.6	-98.7	-112.7	-126.7	-122.6	-136.6	-150.6
580	-81.2	-95.2	-109.2	-90.4	-104.4	-118.4	-110.2	-124.2	-138.2
540	-74.5	-88.5	-102.5	-81.9	-95.9	-109.9	-98.1	-112.1	-126.1
500	-67.4	-81.4	-95.4	-73.4	-87.4	-101.4	-86.2	-100.2	-114.2
460	-59.9	-73.9	-87.9	-64.7	-78.7	-92.7	-74.5	-88.5	-102.5
420	-52.1	-66.1	-80.1	-55.9	-69.9	-83.9	-63.1	-77.1	-91.1
380	-43.9	-57.9	-71.9	-47.0	-61.0	-75.0	-51.8	-65.8	-79.8
340	-35.3	-49.3	-63.3	-38.0	-52.0	-66.0	-40.8	-54.8	-68.8
300	-26.4	-40.4	-54.4	-28.8	-42.8	-56.8	-29.9	-43.9	-57.9

**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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
8200							275.0		
8600							348.5	224.4	
9000				232.6			425.9	296.9	
9400				317.3			512.0	370.9	246.0
9800	283.4			405.4	257.8		609.9	450.7	318.9
10200	375.7	221.9		505.9	343.0		724.3	539.9	394.0
10600	477.8	310.5		626.8	433.9	283.2		642.2	476.4
11000	604.3	404.6	248.0	777.6	539.4	369.1		760.7	569.1
11400	769.9	512.7	338.1		668.9	463.7			676.4
11800		648.2	434.8			575.2			
12200			550.3			714.9			
12600			696.2						

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -240 ft/+230 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-26	-20	-14	-18	-12	-6	0	0	0
620	-28	-22	-16	-21	-15	-9	-3	0	0
580	-31	-25	-19	-24	-18	-12	-7	-1	0
540	-33	-27	-21	-28	-22	-16	-13	-7	-1
500	-36	-30	-24	-31	-25	-19	-19	-13	-7
460	-39	-33	-27	-35	-29	-23	-25	-19	-13
420	-41	-35	-29	-38	-32	-26	-30	-24	-18
380	-42	-36	-30	-39	-33	-27	-34	-28	-22
340	-42	-36	-30	-40	-34	-28	-36	-30	-24
300	-43	-37	-31	-40	-34	-28	-38	-32	-26

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

ADVISORY INFORMATION

**TO1 Slippery Runway Takeoff**  
**10% Thrust Reduction**  
**Maximum Reverse Thrust**  
**Weight Adjustment (1000 LB)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	0.0	-3.6	-7.2	-26.2	-29.8	-33.4	-63.8	-67.4	-71.0
660	0.0	-3.6	-7.2	-30.1	-33.7	-37.3	-64.3	-67.9	-71.5
620	0.0	-3.6	-7.2	-33.4	-37.0	-40.6	-64.4	-68.0	-71.6
580	-0.4	-4.0	-7.6	-35.4	-39.0	-42.6	-63.2	-66.8	-70.4
540	-3.6	-7.2	-10.8	-36.0	-39.6	-43.2	-60.8	-64.4	-68.0
500	-5.8	-9.4	-13.0	-35.3	-38.9	-42.5	-57.2	-60.8	-64.4
460	-6.7	-10.3	-13.9	-33.2	-36.8	-40.4	-52.3	-55.9	-59.5
420	-6.5	-10.1	-13.7	-29.7	-33.3	-36.9	-46.2	-49.8	-53.4
380	-5.0	-8.6	-12.2	-24.9	-28.5	-32.1	-38.9	-42.5	-46.1
340	-2.4	-6.0	-9.6	-18.7	-22.3	-25.9	-30.3	-33.9	-37.5

**V1(MCG) Limit Weight (1000 LB)**

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4400	256.4								
4800	402.9	271.1							
5200	539.2	417.1	285.8						
5600	665.0	552.3	431.2						
6000		677.1	565.2	294.1					
6400			689.1	386.2	266.5				
6800				480.7	358.4				
7200				578.6	452.0	330.8			
7600				680.4	548.9	423.6			
8000					649.4	519.5	329.9		
8400					753.4	618.9	383.8		
8800						722.1	439.8	329.9	
9200							498.6	383.8	
9600							560.8	439.8	329.9
10000							626.8	498.6	383.8
10400							697.5	560.8	439.8
10800								626.8	498.6
11200								697.5	560.8
11600									626.8
12000									697.5

1. Enter Weight Adjustment table with reported braking action and TO1 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 -120 ft/+110 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.



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ADVISORY INFORMATION

**TO1 Slippery Runway Takeoff**

**10% Thrust Reduction**

**Maximum Reverse Thrust**

**V1 Adjustment (KIAS)**

WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
640	-1	1	3	-10	-8	-6	-21	-19	-17
600	-2	0	2	-11	-9	-7	-24	-22	-20
560	-3	-1	1	-13	-11	-9	-27	-25	-23
520	-4	-2	0	-15	-13	-11	-30	-28	-26
480	-5	-3	-1	-17	-15	-13	-32	-30	-28
440	-6	-4	-2	-19	-17	-15	-34	-32	-30
400	-7	-5	-3	-20	-18	-16	-36	-34	-32
360	-7	-5	-3	-21	-19	-17	-38	-36	-34
320	-7	-5	-3	-21	-19	-17	-38	-36	-34

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

ADVISORY INFORMATION

**TO1 Slippery Runway Takeoff**

**10% Thrust Reduction**

**No Reverse Thrust**

**Weight Adjustment (1000 LB)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	0.0	0.0	-2.5	-49.6	-52.8	-56.0	-94.7	-97.9	-101.1
660	-2.9	-6.1	-9.3	-52.4	-55.6	-58.8	-92.2	-95.4	-98.6
620	-9.2	-12.4	-15.6	-54.6	-57.8	-61.0	-89.3	-92.5	-95.7
580	-14.0	-17.2	-20.4	-55.5	-58.7	-61.9	-85.5	-88.7	-91.9
540	-17.5	-20.7	-23.9	-55.1	-58.3	-61.5	-80.6	-83.8	-87.0
500	-19.7	-22.9	-26.1	-53.3	-56.5	-59.7	-74.9	-78.1	-81.3
460	-20.4	-23.6	-26.8	-50.2	-53.4	-56.6	-68.1	-71.3	-74.5
420	-19.9	-23.1	-26.3	-45.7	-48.9	-52.1	-60.4	-63.6	-66.8
380	-17.9	-21.1	-24.3	-40.0	-43.2	-46.4	-51.7	-54.9	-58.1
340	-14.6	-17.8	-21.0	-32.9	-36.1	-39.3	-42.0	-45.2	-48.4
300	-10.5	-13.7	-16.9	-25.0	-28.2	-31.4	-31.8	-35.0	-38.2

**V1(MCG) Limit Weight (1000 LB)**

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5800	514.2								
6200	698.0	488.6							
6600		683.0	460.0						
7000			667.5						
8200				246.9					
8600				518.5					
9000				710.0	448.1				
9400					657.6	367.2			
9800						601.4			
10200						778.8			
12200							298.3		
12600							402.5		
13000							514.3	298.3	
13400							637.0	402.5	
13800							772.0	514.3	298.3
14200								637.0	402.5
14600								772.0	514.3
15000									637.0
15400									772.0

1. Enter Weight Adjustment table with reported braking action and TO1 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 -150 ft/+140 ft for every 5°C above/below 4°C.  
Adjust "Poor" field length available by -230 ft/+220 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.



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ADVISORY INFORMATION

**TO1 Slippery Runway Takeoff**  
**10% Thrust Reduction**  
**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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-8	-2	0	-20	-14	-8	-39	-33	-27
620	-9	-3	0	-22	-16	-10	-43	-37	-31
580	-11	-5	0	-25	-19	-13	-47	-41	-35
540	-13	-7	-1	-28	-22	-16	-51	-45	-39
500	-14	-8	-2	-31	-25	-19	-56	-50	-44
460	-16	-10	-4	-35	-29	-23	-61	-55	-49
420	-18	-12	-6	-38	-32	-26	-66	-60	-54
380	-20	-14	-8	-41	-35	-29	-71	-65	-59
340	-21	-15	-9	-43	-37	-31	-75	-69	-63
300	-23	-17	-11	-46	-40	-34	-80	-74	-68

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.



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**TO1 Takeoff Speeds**  
**10% Thrust Reduction**  
**V1, VR, V2**

WEIGHT (1000 LB)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
640	164	168	172						
620	161	165	169						
600	158	162	167	151	155	160			
580	155	159	164	148	152	157	144	147	153
560	151	156	161	145	149	155	141	144	150
540	148	153	159	142	146	152	138	142	148
520	145	150	156	138	143	149	134	138	145
500	141	147	153	135	140	147	131	135	143
480	137	143	150	131	137	144	127	132	140
460	134	140	147	127	133	141	124	129	137
440	130	136	144	123	130	138	120	126	135
420	125	133	141	119	126	136	115	122	132
400	121	129	138	115	123	133	111	119	129
380	116	125	135	110	119	130	107	115	126
360	111	121	132	105	116	126	102	112	123
340	106	117	128	101	112	123	97	108	120
320	101	113	125	96	108	120	92	104	117

Check V1(MCG), Minimum VR and Minimum V2.

**V1, VR, V2 Adjustments\***

TEMP		V1						VR						V2					
		PRESSURE ALTITUDE (FT)						PRESSURE ALTITUDE (FT)						PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000	-2000	0	2000	4000	6000	8000	-2000	0	2000	4000	6000	8000
60	140	9	11	13	15			3	4	5	6			-2	-2	-3	-3		
50	122	4	7	9	11	13	15	2	3	4	5	5	6	-1	-1	-2	-2	-3	-3
40	104	0	3	5	8	10	12	0	1	2	3	4	5	0	-1	-1	-2	-2	-2
30	86	0	0	3	5	8	10	0	0	1	2	3	4	0	0	-1	-1	-2	-2
20	68	0	0	2	4	6	9	0	0	1	2	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	6	9	0	0	1	2	3	4	0	0	0	-1	-1	-2

**Slope and Wind V1 Adjustments\***

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)					
	-2	-1	0	1	2	-15	-10	-5	0	20	40
640	-4	-2	0	2	4	-1	-1	0	0	1	2
600	-4	-2	0	2	4	-1	-1	0	0	1	2
560	-3	-1	0	2	4	-1	-1	0	0	1	2
520	-3	-1	0	2	4	-1	-1	0	0	1	2
480	-3	-1	0	2	3	-1	-1	0	0	1	2
440	-3	-1	0	2	3	-1	-1	0	0	1	2
400	-2	-1	0	2	3	-1	-1	0	0	1	2
360	-2	-1	0	2	3	-1	-1	0	0	1	2
320	-2	-1	0	2	3	-1	-1	0	0	2	2

\*V1 not to exceed VR.

**Max Allowable Clearway for V1 Adjustment**

FIELD LENGTH (FT)	4000	6000	8000	10000	12000	14000
MAX ALLOWABLE CLEARWAY (FT)	400	600	800	1000	1200	1400

**Clearway and Stopway V1 Adjustments\***

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

\*V1 not to exceed VR

## TO1 Takeoff Speeds

### 10% Thrust Reduction

#### TO1 V1(MCG), Minimum VR

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	103	110	100	106	98	104	96	103				
50	122	106	112	102	108	98	105	96	103	95	101	93	99
40	104	111	118	107	114	103	110	100	106	96	102	93	99
30	86	112	118	112	118	107	114	103	110	99	106	95	102
20	68	112	118	112	118	108	115	105	111	101	107	97	103
-60	-76	113	118	113	118	109	115	106	112	102	108	99	105

## TO1 Minimum V2

FLAPS	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
5	121	120	118	117	115	113
15	119	118	116	115	113	111
20	119	116	114	111	109	107

## TO1 Takeoff EPR

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

### 10% Thrust Reduction

REPORTED OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
70	158	1.186	1.185	1.183	1.183	1.183	1.180	1.179	1.177	1.174	1.172	1.172
60	140	1.232	1.232	1.231	1.232	1.232	1.232	1.232	1.231	1.230	1.229	1.230
50	122	1.283	1.282	1.280	1.279	1.279	1.279	1.281	1.281	1.282	1.282	1.283
45	113	1.311	1.310	1.309	1.308	1.307	1.305	1.304	1.305	1.306	1.307	1.308
40	104	1.337	1.337	1.337	1.336	1.335	1.334	1.332	1.332	1.330	1.329	1.331
35	95	1.340	1.369	1.366	1.366	1.365	1.362	1.367	1.363	1.360	1.359	1.356
30	86	1.340	1.393	1.390	1.389	1.386	1.385	1.384	1.383	1.382	1.377	1.374
25	77	1.340	1.393	1.398	1.401	1.398	1.396	1.394	1.393	1.391	1.387	1.385
20	68	1.340	1.393	1.398	1.403	1.407	1.405	1.403	1.401	1.400	1.396	1.394
15	59	1.340	1.393	1.398	1.403	1.407	1.411	1.412	1.411	1.409	1.405	1.403
10	50	1.340	1.393	1.398	1.403	1.407	1.411	1.414	1.414	1.413	1.408	1.406
5	41	1.340	1.393	1.398	1.403	1.407	1.411	1.414	1.414	1.413	1.408	1.406
3 & BELOW	37 & BELOW	1.340	1.393	1.398	1.403	1.407	1.411	1.414	1.414	1.413	1.408	1.406

## EPR Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400	
PACKS OFF	0.013	0.013	0.014	0.014	0.015	0.016	0.016	0.017	0.017	0.018	0.018	0.018
WING ANTI-ICE ON	-0.006	-0.006	-0.006	-0.007	-0.007	-0.008	-0.008	-0.008	-0.008	-0.009	-0.009	-0.009

## Minimum Allowable EPR for Reduced Thrust

### Based on 25% thrust reduction

MAX TAKEOFF EPR FOR ACTUAL OAT	MIN TAKEOFF EPR ALLOWED
1.100	1.100
1.500	1.100
1.200	1.129
1.250	1.159
1.300	1.192
1.350	1.223
1.400	1.251
1.450	1.273
1.500	1.292
1.550	1.310
1.600	1.329



Flight Planning and Performance Manual

**TO1 Stab Trim Setting**  
**10% Thrust Reduction**  
**Flaps 5**

WEIGHT (1000 LB)	C.G. (%MAC)								
	14	18	22	26	30	34	38	42	44
660	8 1/2	8	7	6	5 1/4	4 1/4	4		
620	8 1/2	8	7	6	5 1/4	4 1/4	4		
580	8 1/2	8	7	6	5 1/4	4 1/4	3 3/4	2 1/2	1 3/4
540	8 1/2	8	7	6	5	4	3 1/4	2 1/4	1 1/2
500	8 1/2	8	7	6	4 3/4	3 3/4	2 3/4	1 3/4	1 1/4
460	8 1/2	8	7	5 3/4	4 3/4	3 1/2	2 1/2	1 1/2	1
420	8 1/2	8	6 3/4	5 1/2	4 1/2	3 1/4	2 1/4	1 1/4	1
380	8 1/2	7 3/4	6 1/2	5 1/4	4	2 3/4	2	1 1/4	1
340	8	7	6	4 3/4	3 1/2	2 1/2	1 1/2	1	1
300	6 1/2	5 1/2	4 3/4	3 3/4	3	2	1 1/4	1	1

**Flaps 15 and 20**

WEIGHT (1000 LB)	C.G. (%MAC)								
	14	18	22	26	30	34	38	42	44
660	9 3/4	8 3/4	7 3/4	6 3/4	5 1/2	4 1/2	4		
620	9 3/4	8 3/4	7 3/4	6 3/4	5 1/2	4 1/2	4		
580	10	8 3/4	7 3/4	6 1/2	5 1/4	4 1/4	3 3/4	2 1/2	1 3/4
540	10	8 3/4	7 1/2	6 1/2	5 1/4	4	3 1/4	2 1/4	1 1/2
500	10	8 3/4	7 1/2	6 1/2	5 1/4	3 3/4	2 3/4	1 3/4	1 1/4
460	10	8 3/4	7 1/2	6 1/4	5	3 1/2	2 1/2	1 1/2	1
420	10	8 3/4	7 1/4	6	4 3/4	3 1/4	2 1/4	1 1/4	1
380	10	8 1/2	7	5 3/4	4 1/4	2 3/4	2	1 1/4	1
340	9	8	6 1/2	5	3 3/4	2 1/2	1 1/2	1	1
300	7 1/2	6 1/2	5 1/4	4 1/4	3 1/4	2	1 1/4	1	1



Flight Planning and Performance Manual

**TO2 Takeoff Weights**

**20% Thrust Reduction**

**Takeoff Field Limit**

FULL RATED LIMIT WEIGHT (1000 LB)	720	680	640	600	560	520	480	440	400	360
TO2 LIMIT WEIGHT (1000 LB)	606.2	573.4	540.6	507.9	475.1	442.3	409.5	377.6	343.8	311.0

If the takeoff is limited by minimum control speeds, V1 may be increased to be equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 3900 ft for normal operations, 4050 ft with one brake deactivated and 4300 ft with two brakes deactivated.

**Takeoff Climb Limit**

FULL RATED LIMITE WEIGHT (1000 LB)	720	680	640	600	560	520	480	440	400	360
TO2 LIMIT WEIGHT (1000 LB)	557.7	527.0	496.3	465.7	435.0	404.3	373.7	343.0	312.3	281.7

**Takeoff Obstacle Limit**

FULL RATED LIMIT WEIGHT (1000 LB)	720	680	640	600	560	520	480	440	400	360
TO2 LIMIT WEIGHT (1000 LB)	558.0	528.0	498.0	468.0	438.0	408.0	378.0	348.0	318.0	288.0

ADVISORY INFORMATION

**TO2 Slush/Standing Water Takeoff**

**20% Thrust Reduction**

**Maximum Reverse Thrust**

**Weight Adjustment (1000 LB)**

TO2 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-65.5	-77.1	-88.7	-79.3	-90.9	-102.5	-110.0	-121.6	-133.2
660	-62.4	-74.0	-85.6	-74.6	-86.2	-97.8	-101.7	-113.3	-124.9
620	-59.4	-71.0	-82.6	-70.2	-81.8	-93.4	-93.8	-105.4	-117.0
580	-56.8	-68.4	-80.0	-66.1	-77.7	-89.3	-86.3	-97.9	-109.5
540	-53.6	-65.2	-76.8	-61.5	-73.1	-84.7	-78.4	-90.0	-101.6
500	-49.5	-61.1	-72.7	-56.0	-67.6	-79.2	-69.9	-81.5	-93.1
460	-44.5	-56.1	-67.7	-49.8	-61.4	-73.0	-60.9	-72.5	-84.1
420	-38.6	-50.2	-61.8	-42.7	-54.3	-65.9	-51.4	-63.0	-74.6
380	-31.9	-43.5	-55.1	-34.8	-46.4	-58.0	-41.3	-52.9	-64.5
340	-24.3	-35.9	-47.5	-26.2	-37.8	-49.4	-30.7	-42.3	-53.9
300	-15.7	-27.3	-38.9	-16.6	-28.2	-39.8	-19.4	-31.0	-42.6

**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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5400				222.6			285.0		
5800	262.7			298.0			359.5	239.9	
6200	337.0			372.5	253.0		434.6	315.0	
6600	411.5	292.6		448.5	328.0		511.6	389.4	270.1
7000	488.8	366.7	247.7	527.3	402.7	283.1	590.9	465.2	344.7
7400	569.9	442.1	322.2	609.4	479.7	357.7	672.8	543.1	419.4
7800	655.4	520.8	396.4	695.5	559.7	433.1	756.6	623.4	496.1
8200	745.2	603.5	473.1		643.4	511.3		706.4	574.9
8600		690.9	553.4		730.8	592.7			656.3
9000			637.9			678.0			740.0
9400			727.2			765.9			

1. Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust 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 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-12	-8	-4	-6	-2	0	0	0	0
620	-14	-10	-6	-8	-4	0	0	0	0
580	-16	-12	-8	-10	-6	-2	0	0	0
540	-18	-14	-10	-13	-9	-5	-1	0	0
500	-20	-16	-12	-15	-11	-7	-5	-1	0
460	-21	-17	-13	-18	-14	-10	-9	-5	-1
420	-22	-18	-14	-19	-15	-11	-12	-8	-4
380	-22	-18	-14	-19	-15	-11	-14	-10	-6
340	-21	-17	-13	-19	-15	-11	-14	-10	-6
300	-20	-16	-12	-18	-14	-10	-14	-10	-6

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

ADVISORY INFORMATION

**TO2 Slush/Standing Water Takeoff**

**20% Thrust Reduction**

**No Reverse Thrust**

**Weight Adjustment (1000 LB)**

TO2 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-98.6	-112.6	-126.6	-116.0	-130.0	-144.0	-151.6	-165.6	-179.6
660	-92.6	-106.6	-120.6	-107.7	-121.7	-135.7	-138.9	-152.9	-166.9
620	-86.7	-100.7	-114.7	-99.4	-113.4	-127.4	-126.2	-140.2	-154.2
580	-80.8	-94.8	-108.8	-91.3	-105.3	-119.3	-113.7	-127.7	-141.7
540	-74.6	-88.6	-102.6	-83.0	-97.0	-111.0	-101.3	-115.3	-129.3
500	-67.9	-81.9	-95.9	-74.6	-88.6	-102.6	-89.3	-103.3	-117.3
460	-60.8	-74.8	-88.8	-66.1	-80.1	-94.1	-77.4	-91.4	-105.4
420	-53.3	-67.3	-81.3	-57.4	-71.4	-85.4	-65.8	-79.8	-93.8
380	-45.4	-59.4	-73.4	-48.6	-62.6	-76.6	-54.5	-68.5	-82.5
340	-37.0	-51.0	-65.0	-39.7	-53.7	-67.7	-43.4	-57.4	-71.4
300	-28.3	-42.3	-56.3	-30.6	-44.6	-58.6	-32.5	-46.5	-60.5

**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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
7400							245.7		
7800							331.7		
8200				229.8			423.2	271.2	
8600				332.4			528.3	358.1	
9000	319.9			444.0	260.1		653.8	453.0	296.9
9400	440.1	243.0		581.6	364.0			563.4	385.3
9800	593.8	354.4		765.8	481.8	290.9		697.1	484.3
10200		481.3	275.4		631.0	397.0			600.5
10600		650.0	390.1			522.4			742.5
11000			526.5			685.8			
11400			713.7						

1. Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -240 ft/+230 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)		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-19	-13	-7	-9	-3	0	0	0	0
620	-21	-15	-9	-12	-6	0	0	0	0
580	-24	-18	-12	-16	-10	-4	0	0	0
540	-27	-21	-15	-20	-14	-8	-3	0	0
500	-30	-24	-18	-25	-19	-13	-10	-4	0
460	-33	-27	-21	-29	-23	-17	-17	-11	-5
420	-36	-30	-24	-32	-26	-20	-23	-17	-11
380	-37	-31	-25	-34	-28	-22	-27	-21	-15
340	-38	-32	-26	-35	-29	-23	-30	-24	-18
300	-38	-32	-26	-35	-29	-23	-32	-26	-20

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

ADVISORY INFORMATION

**TO2 Slippery Runway Takeoff**  
**20% Thrust Reduction**  
**Maximum Reverse Thrust**  
**Weight Adjustment (1000 LB)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	0.0	-3.6	-7.2	-19.7	-23.3	-26.9	-58.0	-61.6	-65.2
660	0.0	-3.6	-7.2	-23.6	-27.2	-30.8	-58.6	-62.2	-65.8
620	0.0	-3.6	-7.2	-27.5	-31.1	-34.7	-59.3	-62.9	-66.5
580	0.0	-3.6	-7.2	-31.0	-34.6	-38.2	-59.6	-63.2	-66.8
540	-0.7	-4.3	-7.9	-33.0	-36.6	-40.2	-58.6	-62.2	-65.8
500	-3.8	-7.4	-11.0	-33.6	-37.2	-40.8	-56.3	-59.9	-63.5
460	-5.7	-9.3	-12.9	-32.7	-36.3	-39.9	-52.6	-56.2	-59.8
420	-6.4	-10.0	-13.6	-30.3	-33.9	-37.5	-47.6	-51.2	-54.8
380	-5.7	-9.3	-12.9	-26.5	-30.1	-33.7	-41.2	-44.8	-48.4
340	-3.8	-7.4	-11.0	-21.2	-24.8	-28.4	-33.5	-37.1	-40.7

**V1(MCG) Limit Weight (1000 LB)**

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4400	354.0								
4800	502.9	369.6	228.8						
5200	639.1	517.0	385.0						
5600	766.7	652.1	531.0	280.4					
6000			665.0	378.3					
6400				478.8	348.9				
6800				583.1	448.2	319.5			
7200				691.9	551.4	418.0			
7600					658.8	520.0	339.4		
8000						626.1	397.2		
8400						736.4	457.9	339.4	
8800							521.9	397.2	
9200							589.9	457.9	339.4
9600							662.9	521.9	397.2
10000								589.9	457.9
10400								662.9	521.9
10800									589.9
11200									662.9

1. Enter Weight Adjustment table with reported braking action and TO2 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 -120 ft/+110 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.

**V1 Adjustment (KIAS)**

WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
640	4	6	8	-4	-2	0	-14	-12	-10
600	3	5	7	-5	-3	-1	-16	-14	-12
560	2	4	6	-7	-5	-3	-19	-17	-15
520	1	3	5	-8	-6	-4	-21	-19	-17
480	0	2	4	-10	-8	-6	-23	-21	-19
440	0	2	4	-11	-9	-7	-25	-23	-21
400	-1	1	3	-12	-10	-8	-27	-25	-23
360	-1	1	3	-13	-11	-9	-28	-26	-24
320	-1	1	3	-13	-11	-9	-29	-27	-25

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.



Flight Planning and Performance Manual

ADVISORY INFORMATION

**TO2 Slippery Runway Takeoff**

**20% Thrust Reduction**

**No Reverse Thrust**

**Weight Adjustment (1000 LB)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	0.0	0.0	0.0	-42.7	-45.9	-49.1	-90.4	-93.6	-96.8
660	0.0	0.0	-1.8	-45.5	-48.7	-51.9	-87.9	-91.1	-94.3
620	-2.2	-5.4	-8.6	-48.3	-51.5	-54.7	-85.5	-88.7	-91.9
580	-8.5	-11.7	-14.9	-50.6	-53.8	-57.0	-82.8	-86.0	-89.2
540	-13.3	-16.5	-19.7	-51.6	-54.8	-58.0	-79.1	-82.3	-85.5
500	-16.7	-19.9	-23.1	-51.1	-54.3	-57.5	-74.3	-77.5	-80.7
460	-18.6	-21.8	-25.0	-49.1	-52.3	-55.5	-68.5	-71.7	-74.9
420	-19.1	-22.3	-25.5	-45.7	-48.9	-52.1	-61.5	-64.7	-67.9
380	-18.0	-21.2	-24.4	-40.9	-44.1	-47.3	-53.6	-56.8	-60.0
340	-15.5	-18.7	-21.9	-34.7	-37.9	-41.1	-44.6	-47.8	-51.0
300	-11.7	-14.9	-18.1	-27.1	-30.3	-33.5	-34.6	-37.8	-41.0

**V1(MCG) Limit Weight (1000 LB)**

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5400	505.2								
5800	705.0	476.2							
6200		688.9	443.3						
6600			672.3						
7800				383.1					
8200				627.2	286.4				
8600					563.5				
9000					760.0	493.0			
9400						704.3			
11400							313.8		
11800							426.8		
12200							549.5	313.8	
12600							686.0	426.8	
13000								549.5	313.8
13400								686.0	426.8
13800									549.5
14200									686.0

1. Enter Weight Adjustment table with reported braking action and TO2 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 -150 ft/+140 ft for every 5°C above/below 4°C.  
 Adjust "Poor" field length available by -230 ft/+220 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.



Flight Planning and Performance Manual

ADVISORY INFORMATION

**TO2 Slippery Runway Takeoff**  
**20% Thrust Reduction**  
**No Reverse Thrust**  
**V1 Adjustment (KIAS)**

WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)			PRESSURE ALTITUDE (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-7	-1	0	-17	-11	-5	-33	-27	-21
620	-8	-2	0	-19	-13	-7	-37	-31	-25
580	-9	-3	0	-21	-15	-9	-41	-35	-29
540	-11	-5	0	-24	-18	-12	-44	-38	-32
500	-12	-6	0	-27	-21	-15	-49	-43	-37
460	-14	-8	-2	-29	-23	-17	-53	-47	-41
420	-15	-9	-3	-32	-26	-20	-58	-52	-46
380	-16	-10	-4	-35	-29	-23	-62	-56	-50
340	-18	-12	-6	-37	-31	-25	-67	-61	-55
300	-19	-13	-7	-39	-33	-27	-72	-66	-60

- 1 Obtain V1, VR and V2 for the actual weight.
- 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). V1 not to exceed VR.

## TO2 Takeoff Speeds

### 20% Thrust Reduction

#### V1, VR, V2

WEIGHT (1000 LB)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
540	152	155	158	146	148	151			
520	149	152	155	143	145	149			
500	146	148	152	140	142	146			
480	142	145	149	136	138	143	132	134	139
460	138	141	146	132	135	140	128	131	136
440	134	138	143	128	132	138	124	127	134
420	130	134	141	124	128	135	120	124	131
400	126	131	137	120	125	132	116	121	128
380	121	127	134	115	121	129	112	117	125
360	116	123	131	111	117	126	107	113	122
340	111	119	127	106	114	122	102	110	119
320	106	115	124	101	110	119	97	106	116

Check V1(MCG), Minimum VR and Minimum V2.

#### V1, VR, V2 Adjustments\*

TEMP		V1						VR						V2					
		PRESSURE ALTITUDE (FT)						PRESSURE ALTITUDE (FT)						PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000	-2000	0	2000	4000	6000	8000	-2000	0	2000	4000	6000	8000
60	140	8	10	12	14	14	14	3	4	5	5	6	6	-2	-2	-2	-3	-2	-3
50	122	4	6	8	10	12	14	1	2	3	4	5	6	-1	-1	-2	-2	-2	-3
40	104	0	2	5	7	9	11	0	1	2	3	4	5	0	-1	-1	-1	-2	-2
30	86	0	0	2	5	7	9	0	0	1	2	3	4	0	0	-1	-1	-1	-2
20	68	0	0	2	4	6	8	0	0	1	2	2	3	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	5	8	0	0	1	2	2	3	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	20	40
560	-3	-1	0	2	2	-1	-1	-1	0	1	1
520	-3	-1	0	2	2	-1	-1	0	0	1	2
480	-3	-1	0	2	2	-1	-1	0	0	1	2
440	-3	-1	0	2	2	-1	-1	0	0	1	2
400	-3	-1	0	2	3	-1	-1	0	0	1	2
360	-2	-1	0	2	3	-1	-1	0	0	1	2
320	-2	-1	0	2	3	-1	-1	0	0	1	2

\*V1 not to exceed VR.

#### Max Allowable Clearway for V1 Adjustment

FIELD LENGTH (FT)	4000	6000	8000	10000	12000	14000
MAX ALLOWABLE CLEARWAY (FT)	500	700	900	1100	1300	1500

#### Clearway and Stopway V1 Adjustments\*

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

\*V1 not to exceed VR

#### TO2 V1(MCG), Minimum VR

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	98	105	95	101	93	100	92	98	90	96	88	94
50	122	101	107	97	104	94	100	92	98	90	96	88	94
40	104	105	112	102	108	98	104	94	101	91	97	88	94
30	86	106	112	106	112	102	108	98	104	94	101	91	97
20	68	106	112	106	112	103	109	99	106	95	102	92	98
-60	-76	107	113	107	112	104	109	100	106	97	103	94	100

**TO2 Takeoff Speeds**  
**20% Thrust Reduction**  
**TO2 Minimum V2**

FLAPS	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
5	121	120	118	117	115	113
15	119	118	116	115	113	111
20	119	116	114	111	109	107

**TO2 Takeoff EPR**

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off  
**20% Thrust Reduction**

REPORTED OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
70	158	1.153	1.151	1.150	1.150	1.148	1.147	1.146	1.144	1.142	1.140	1.140
60	140	1.190	1.191	1.190	1.191	1.190	1.190	1.190	1.190	1.189	1.188	1.188
50	122	1.235	1.234	1.232	1.231	1.231	1.231	1.232	1.233	1.233	1.233	1.234
45	113	1.257	1.256	1.255	1.255	1.253	1.252	1.251	1.252	1.252	1.253	1.254
40	104	1.277	1.276	1.277	1.276	1.275	1.274	1.272	1.272	1.270	1.270	1.271
35	95	1.279	1.300	1.298	1.298	1.296	1.294	1.298	1.294	1.292	1.291	1.289
30	86	1.279	1.317	1.315	1.315	1.312	1.311	1.310	1.309	1.309	1.304	1.303
25	77	1.279	1.317	1.321	1.324	1.321	1.319	1.318	1.316	1.315	1.312	1.310
20	68	1.279	1.317	1.321	1.325	1.327	1.326	1.324	1.324	1.322	1.318	1.317
15	59	1.279	1.317	1.321	1.325	1.327	1.330	1.331	1.330	1.329	1.325	1.324
10	50	1.279	1.317	1.321	1.325	1.327	1.330	1.332	1.332	1.331	1.327	1.326
5	41	1.279	1.317	1.321	1.325	1.327	1.330	1.332	1.332	1.331	1.327	1.326
3 & BELOW	37 & BELOW	1.279	1.317	1.321	1.325	1.327	1.330	1.332	1.332	1.331	1.327	1.326

**EPR Adjustments for Engine Bleeds**

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)										
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
PACKS OFF	0.013	0.013	0.014	0.014	0.015	0.016	0.016	0.017	0.018	0.018	0.018
WING ANTI-ICE ON	-0.006	-0.006	-0.006	-0.007	-0.007	-0.008	-0.008	-0.008	-0.009	-0.009	-0.009

**Minimum Allowable EPR for Reduced Thrust**  
**Based on 25% thrust reduction**

MAX TAKEOFF EPR FOR ACTUAL OAT	MIN TAKEOFF EPR ALLOWED
1.100	1.100
1.500	1.100
1.200	1.129
1.250	1.159
1.300	1.192
1.350	1.223
1.400	1.251
1.450	1.273
1.500	1.292
1.550	1.310
1.600	1.329



Flight Planning and Performance Manual

**TO2 Stab Trim Setting**  
**20% Thrust Reduction**  
**Flaps 5**

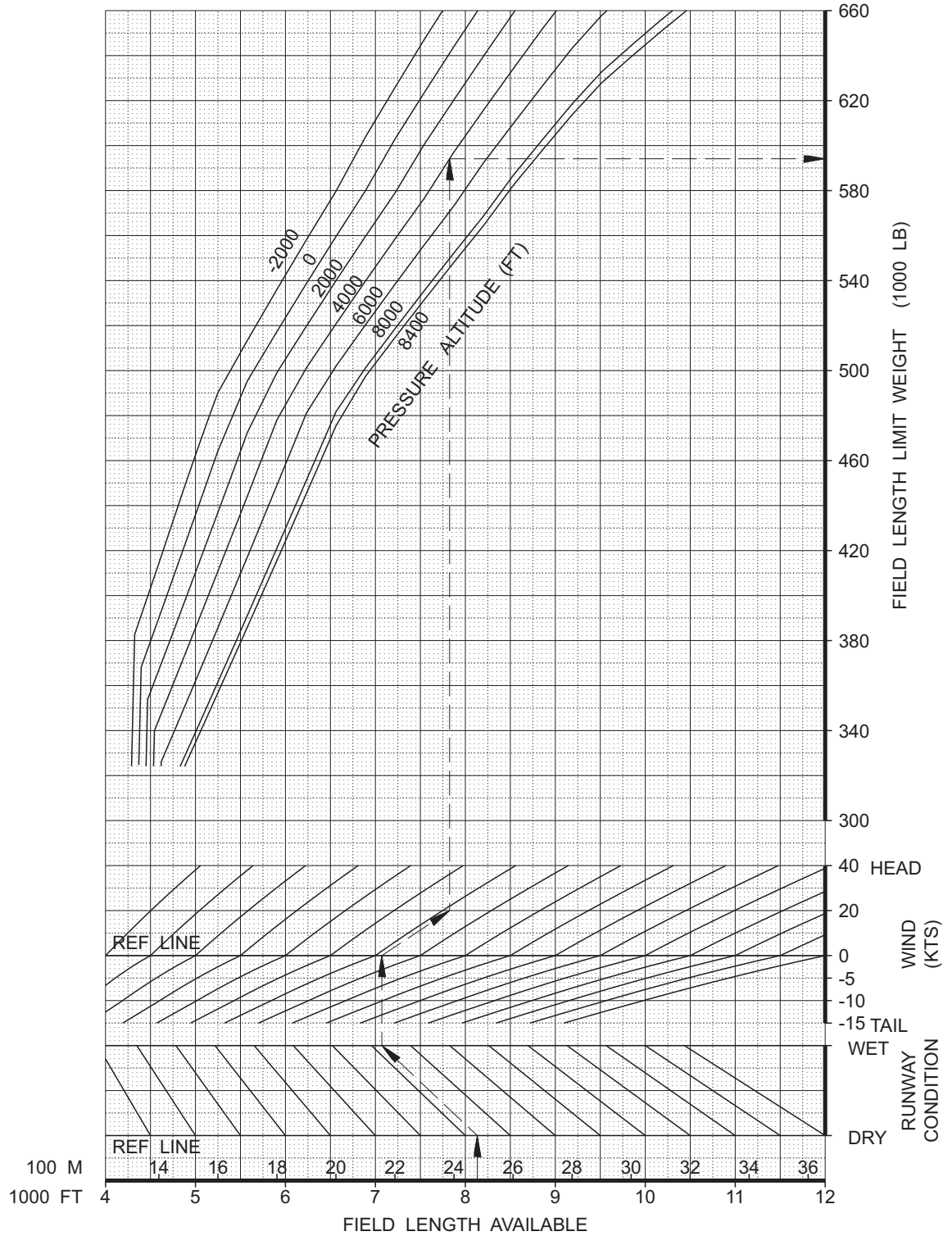
WEIGHT (1000 LB)	C.G. (%MAC)								
	14	18	22	26	30	34	38	42	44
660	9	8 1/2	7 3/4	6 3/4	5 3/4	5	3 3/4	2 3/4	2 1/4
620	9	8 1/2	7 1/2	6 3/4	5 3/4	4 3/4	3 3/4	2 3/4	2 1/4
580	9	8 1/2	7 1/2	6 1/2	5 3/4	4 3/4	3 3/4	2 1/2	2
540	9	8 1/2	7 1/2	6 1/2	5 1/2	4 1/2	3 1/2	2 1/2	2
500	9	8 1/2	7 1/2	6 1/2	5 1/2	4 1/4	3 1/4	2 1/4	1 3/4
460	9	8 1/2	7 1/2	6 1/4	5 1/4	4	3	2	1 1/2
420	9	8 1/2	7 1/4	6 1/4	5	3 3/4	2 3/4	1 3/4	1 1/4
380	9	8 1/4	7	6	4 3/4	3 1/2	2 1/2	1 3/4	1 1/4
340	9	7 1/2	6 1/4	5	4	2 3/4	2	1 1/4	1
300	7	6 1/4	5 1/4	4 1/4	3 1/2	2 1/2	1 3/4	1 1/4	1

**Flaps 15 and 20**

WEIGHT (1000 LB)	C.G. (%MAC)								
	14	18	22	26	30	34	38	42	44
660	10 1/4	9 1/4	8	7	6 1/4	5	3 3/4	2 3/4	2 1/4
620	10 1/4	9 1/4	8	7	6	4 3/4	3 3/4	2 3/4	2 1/4
580	10 1/2	9 1/4	8	7	5 3/4	4 3/4	3 3/4	2 1/2	2 1/4
540	10 1/2	9 1/4	8	7	5 3/4	4 1/2	3 1/2	2 1/2	2
500	10 1/2	9 1/4	8	7	5 3/4	4 1/4	3 1/4	2 1/4	1 3/4
460	10 1/2	9 1/4	8	6 3/4	5 1/2	4	3	2	1 1/2
420	10 1/2	9 1/4	8	6 1/2	5 1/4	3 3/4	2 3/4	1 3/4	1 1/4
380	10 1/2	9	7 3/4	6 1/4	4 3/4	3 1/4	2 1/2	1 1/2	1 1/4
340	9 1/2	8 1/4	7	5 1/2	4 1/4	3	2	1 1/4	1
300	8	7	5 3/4	4 3/4	3 3/4	2 1/2	1 3/4	1 1/4	1

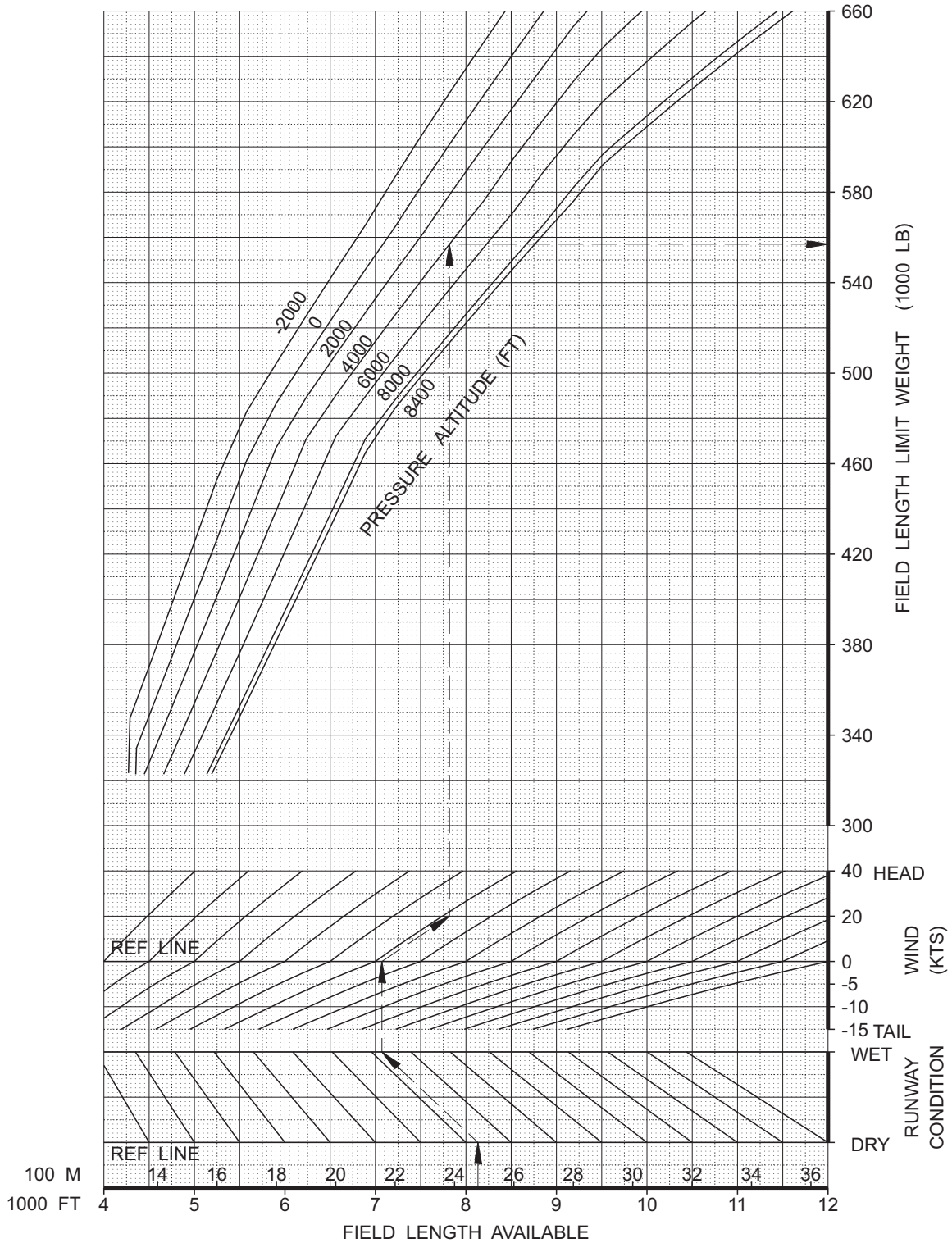
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**Landing Field Length Limit**  
**Flaps 30**  
 Based on automatic speedbrakes



With manual speedbrakes, decrease weight by 66100 lb  
 With 1 brake deactivated, decrease weight by 83600 lb.  
 With 2 brakes deactivated, decrease weight by 85400 lb.

**Landing Field Length Limit**  
**Flaps 25**  
Based on automatic speedbrakes

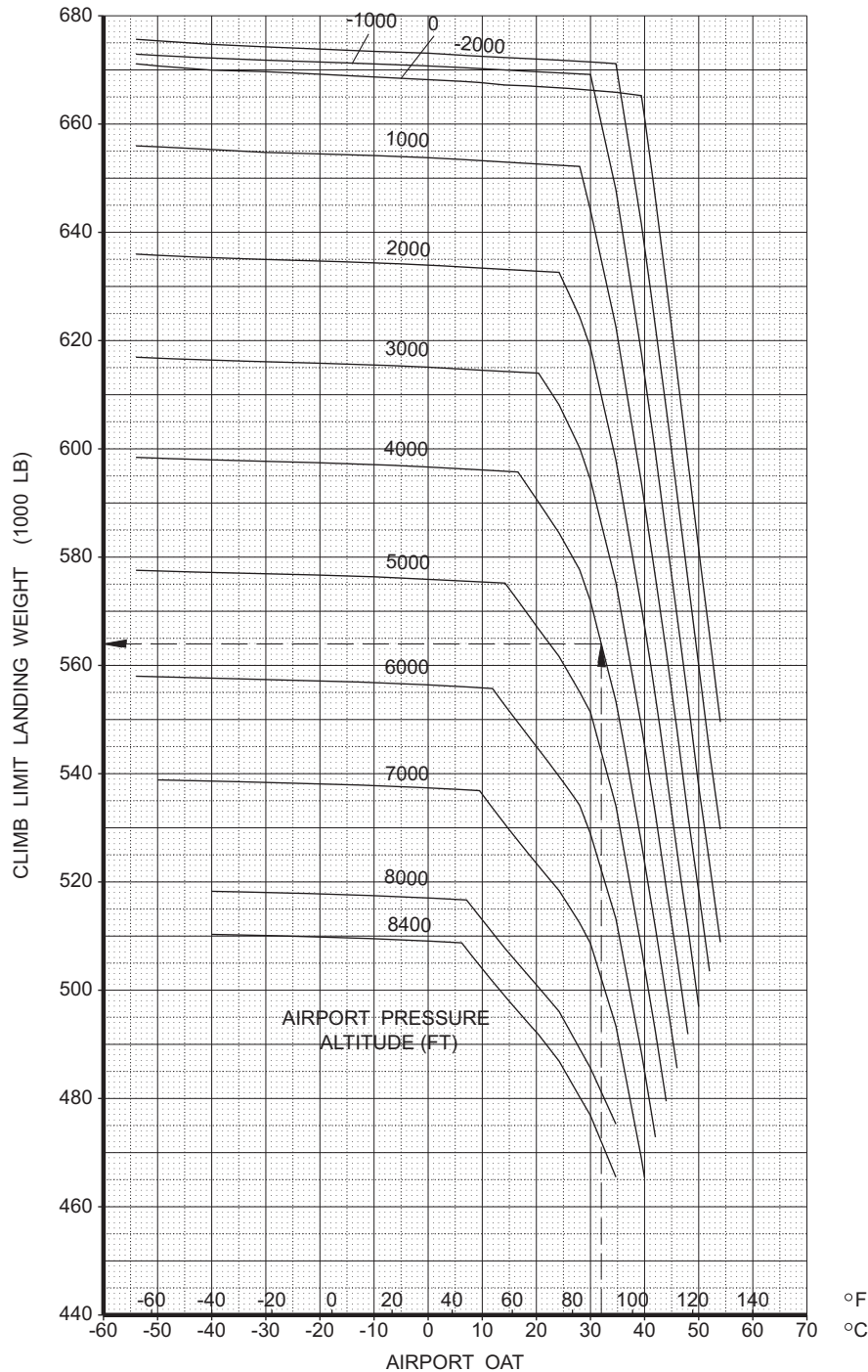


With manual speedbrakes, decrease weight by 38000 lb.  
With 1 brake deactivated, decrease weight by 35300 lb.  
With 2 brakes deactivated, decrease weight by 71700 lb.

### Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

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



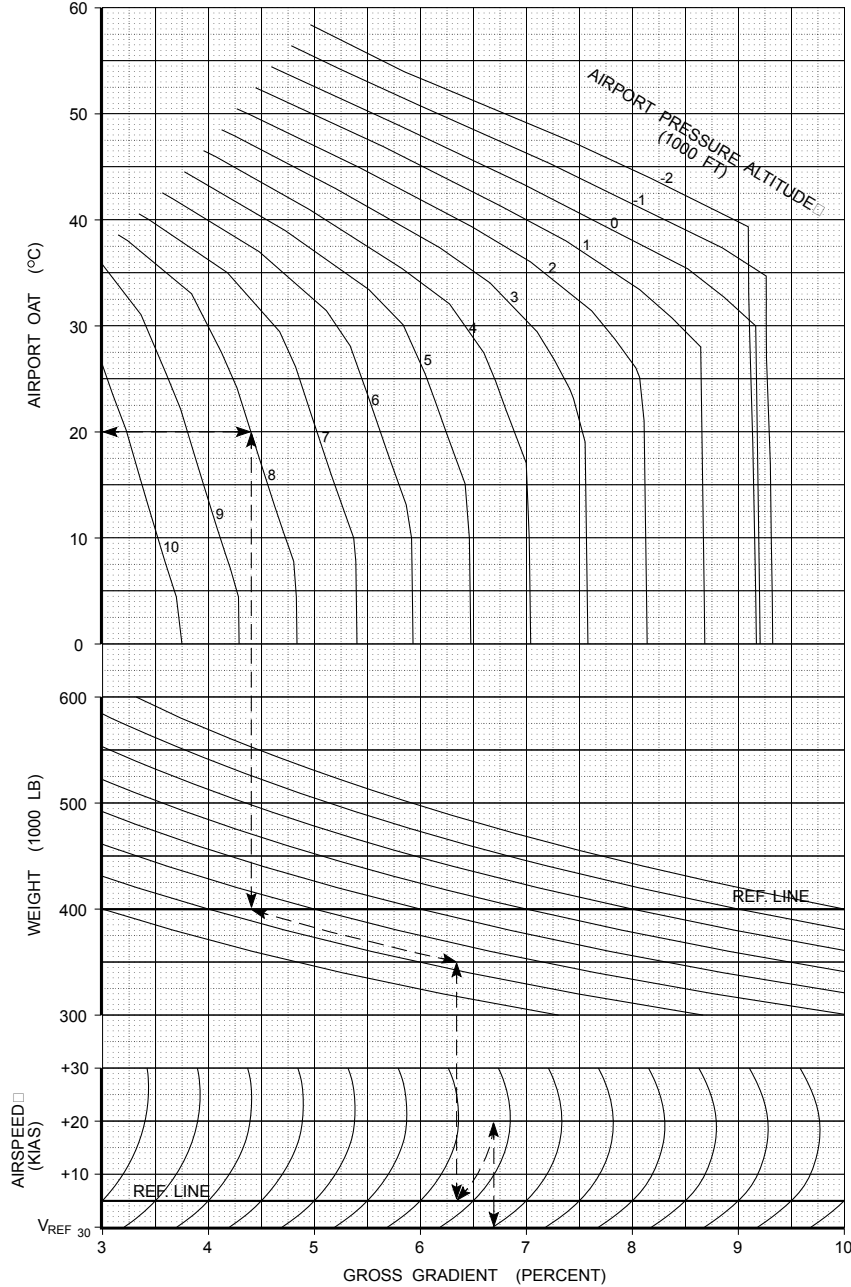
With engine bleed for packs off, increase weight by 5000 lb.  
 With engine anti-ice on, decrease weight by 600 lb.  
 With engine and wing anti-ice on, decrease weight by 4400 lb.  
 When operating in icing conditions during any part of the flight with the forecast landing temperature below 10°C, decrease weight by 43900 lb.

**ENGINE INOP**  
**ADVISORY INFORMATION**  
**GO-AROUND THRUST**

**Go-Around Climb Gradient**

**Flaps 20, Gear Up**

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



With engine bleed for packs off, increase gradient by 0.1%.  
 With engine and wing anti-ice on, decrease gradient by 0.1%.  
 When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease gradient by 0.6%.



Flight Planning and Performance Manual

**Quick Turnaround Limit**  
**Flaps 30 Limit Weight (1000 LB)**

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
54	129	539.3	528.9	518.7									
50	122	542.9	532.4	522.1	512.0	501.9							
45	113	547.5	536.9	526.5	516.3	506.1	496.2	486.4					
40	104	552.2	541.5	531.0	520.7	510.5	500.4	490.5	481.0	471.8	462.7		
35	95	557.0	546.2	535.6	525.2	514.9	504.7	494.7	484.9	475.6	466.5	457.4	453.7
30	86	562.1	551.0	540.3	529.8	519.5	509.2	499.1	489.1	479.6	470.3	461.2	457.6
25	77	567.3	556.1	545.2	534.6	524.1	513.8	503.5	493.5	483.7	474.3	465.1	461.4
20	68	572.5	561.2	550.2	539.4	528.9	518.5	508.2	498.0	488.0	478.4	469.1	465.4
15	59	577.8	566.6	555.4	544.4	533.8	523.3	512.9	502.6	492.5	482.6	473.2	469.4
10	50	585.0	572.0	560.7	549.6	538.8	528.2	517.8	507.4	497.1	487.0	477.4	473.6
5	41	590.9	577.5	566.3	555.0	544.0	533.3	522.7	512.3	501.9	491.6	481.8	477.9
0	32	596.9	584.9	571.9	560.5	549.4	538.5	527.8	517.3	506.8	496.4	486.3	482.4
-5	23	603.2	591.0	577.6	566.3	554.9	543.9	533.1	522.4	511.9	501.4	491.1	487.0
-10	14	609.6	597.3	585.1	572.1	560.7	549.4	538.5	527.7	517.1	506.5	496.0	491.9
-15	5	616.3	603.8	591.5	578.0	566.7	555.2	544.1	533.2	522.4	511.8	501.2	496.9
-20	-4	623.3	610.5	598.0	585.9	572.7	561.2	549.9	538.8	527.9	517.2	506.5	502.2
-30	-22	637.9	624.8	611.9	599.3	587.0	573.7	562.2	550.7	539.5	528.4	517.6	513.3
-40	-40	653.2	639.9	626.8	613.8	601.1	588.7	575.2	563.5	551.9	540.5	529.4	524.9
-50	-58	668.8	655.7	642.4	629.2	616.2	603.4	590.8	577.1	565.4	553.6	541.8	536.8
-54	-65	675.4	662.2	648.9	635.6	622.5	609.5	596.7	584.3	571.0	558.9	546.8	541.5

**Flaps 25 Limit Weight (1000 LB)**

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
54	129	510.8	501.0	491.2									
50	122	514.2	504.3	494.5	484.9	475.5							
45	113	518.5	508.6	498.7	489.0	479.5	470.3	461.4					
40	104	522.9	512.9	503.0	493.2	483.5	474.1	465.1	456.3	447.7	439.0		
35	95	527.4	517.3	507.3	497.4	487.7	478.2	469.0	460.1	451.3	442.6	433.9	430.4
30	86	532.1	521.8	511.8	501.9	492.0	482.4	472.9	463.9	455.0	446.3	437.6	434.0
25	77	536.9	526.5	516.3	506.4	496.4	486.7	477.1	467.8	458.9	450.1	441.3	437.7
20	68	541.8	531.3	521.0	511.0	501.0	491.1	481.4	471.9	462.8	453.9	445.1	441.5
15	59	546.9	536.3	525.9	515.7	505.6	495.6	485.8	476.2	466.9	457.9	449.0	445.4
10	50	552.2	541.4	530.8	520.5	510.4	500.4	490.4	480.6	471.1	462.0	453.0	449.4
5	41	557.7	546.7	535.9	525.5	515.3	505.2	495.1	485.2	475.5	466.2	457.1	453.4
0	32	563.1	552.1	541.2	530.7	520.3	510.1	500.0	489.9	480.1	470.5	461.3	457.6
-5	23	568.7	557.8	546.7	536.0	525.5	515.1	505.0	494.8	484.8	475.0	465.6	461.9
-10	14	574.5	563.4	552.4	541.5	530.8	520.3	510.1	499.9	489.7	479.8	470.1	466.4
-15	5	581.9	569.2	558.2	547.2	536.3	525.7	515.3	505.1	494.8	484.7	474.8	471.0
-20	-4	588.4	575.2	564.1	553.1	542.0	531.3	520.7	510.4	500.1	489.8	479.8	475.8
-30	-22	602.0	589.7	576.5	565.3	554.2	543.0	532.1	521.5	511.0	500.6	490.2	486.1
-40	-40	616.6	603.9	591.6	578.2	566.9	555.7	544.4	533.4	522.6	512.0	501.5	497.2
-50	-58	631.7	619.0	606.3	593.9	581.2	568.9	557.6	546.3	535.1	524.2	513.2	508.6
-54	-65	638.1	625.2	612.5	599.9	587.6	574.4	563.0	551.7	540.4	529.1	517.9	513.1

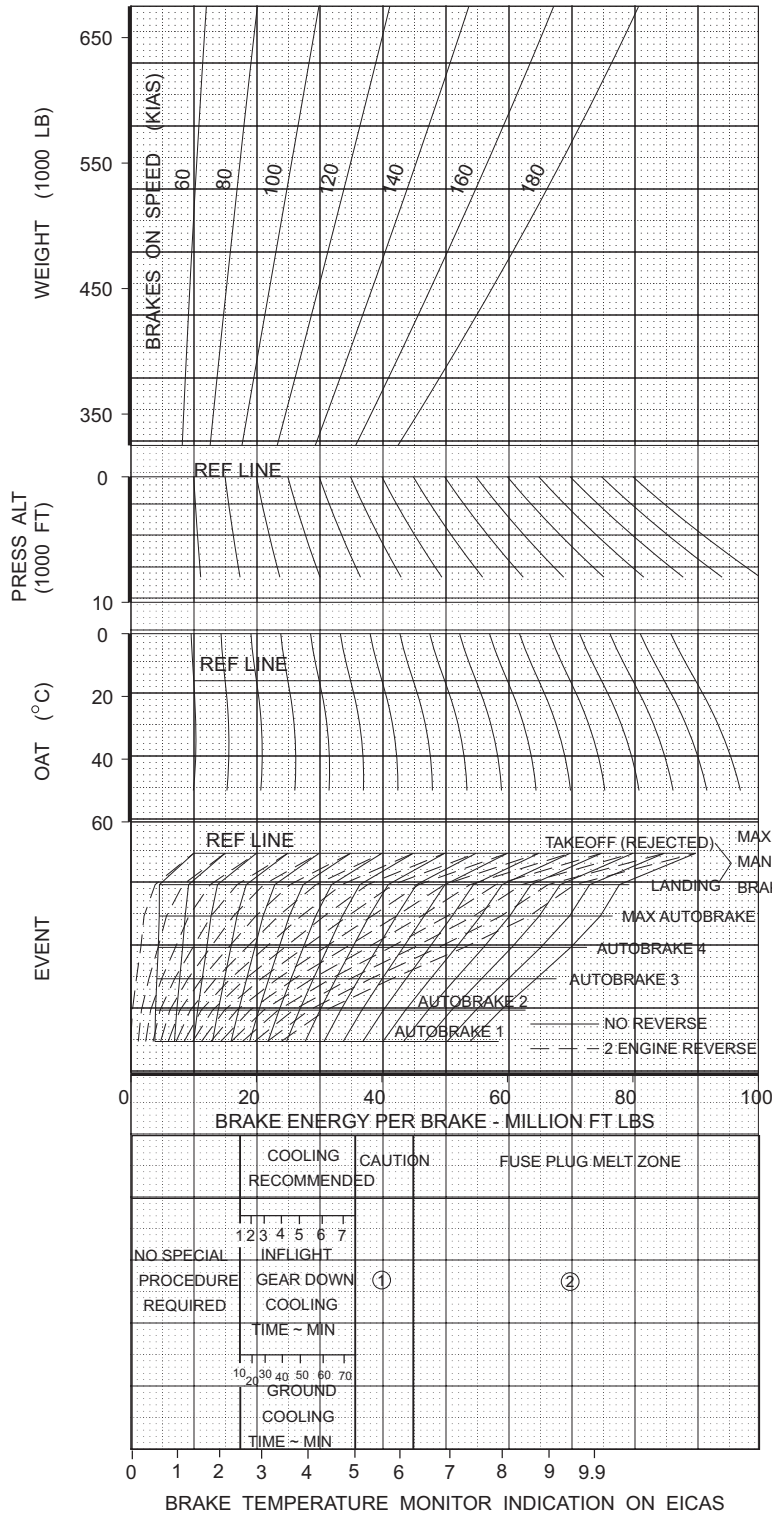
Increase weight by 4800 lb per 1% uphill slope. Decrease weight by 11200 lb per 1% downhill slope.  
 Increase weight by 13000 lb per 10 knots headwind. Decrease weight by 77500 lb per 10 knots tailwind.  
 Decrease weight by 28800 lb when one brake is deactivated. Decrease weight by 59900 lb when two brakes are deactivated.

After landing at weights exceeding those shown above, adjust for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule



GUIDANCE INFORMATION ONLY

OBSERVE MAXIMUM QUICK TURNAROUND LIMITATION

TO CORRECT FOR WIND, ENTER CHART WITH BRAKES ON SPEED MINUS ONE HALF THE HEADWIND OR PLUS 1.5 TIMES THE TAILWIND.

CHART 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

FOR ONE BRAKE DEACTIVATED INCREASE BRAKE ENERGY PER BRAKE BY 10 PERCENT

FOR TWO BRAKES DEACTIVATED INCREASE BRAKE ENERGY PER BRAKE BY 20 PERCENT

IF GROUND SPEED IS USED FOR BRAKES ON SPEED, IGNORE WIND, ALTITUDE, AND OAT EFFECTS

① WHEEL FUSE PLUGS MAY MELT. DELAY TAKEOFF AND INSPECT AFTER ONE HOUR. IF OVERHEAT OCCURS AFTER TAKEOFF, EXTEND GEAR SOON FOR AT LEAST 8 MINUTES.

② CLEAR RUNWAY IMMEDIATELY. UNLESS REQUIRED, DO NOT SET PARKING BRAKE. DO NOT APPROACH GEAR OR ATTEMPT 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 INDICATION MAY BE USED 12 TO 15 MINUTES AFTER AIRPLANE HAS COME TO A COMPLETE STOP, OR INFLIGHT WITH GEAR RETRACTED TO DETERMINE RECOMMENDED COOLING SCHEDULE.

ADVISORY INFORMATION

Normal Configuration Landing Distance  
 Flaps 30

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENT (FT)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
	440000 LB LANDING WT	PER 10000 LB ABOVE/BELOW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

Dry Runway

MAX MANUAL	2870	+70/-30	60	-120/+410	+30/-30	+60/-60	110	50	120
AUTOBRAKE MAX	3860	+60/-40	90	-170/+570	0/0	+90/-90	210	0	0
AUTOBRAKE 4	4760	+80/-50	120	-230/+800	0/-20	+130/-130	260	0	0
AUTOBRAKE 3	5690	+100/-70	150	-290/+1000	+30/-40	+160/-160	300	0	0
AUTOBRAKE 2	6260	+120/-90	190	-330/+1150	+80/-120	+180/-170	280	120	120
AUTOBRAKE 1	6670	+130/-110	210	-370/+1280	+140/-170	+190/-190	280	430	460

Good Reported Braking Action

MAX MANUAL	3920	+60/-50	100	-190/+690	+100/-80	+90/-90	160	210	490
AUTOBRAKE MAX	4200	+70/-50	110	-200/+720	+80/-60	+100/-100	200	220	500
AUTOBRAKE 4	4780	+80/-50	120	-230/+820	+30/-20	+130/-130	260	20	80
AUTOBRAKE 3	5690	+100/-70	150	-290/+1000	+30/-40	+160/-160	300	0	0
AUTOBRAKE 2	6260	+120/-90	190	-330/+1150	+80/-120	+180/-170	280	120	120
AUTOBRAKE 1	6670	+130/-110	210	-370/+1280	+140/-170	+190/-190	280	430	460

Medium Reported Braking Action

MAX MANUAL	5250	+100/-80	160	-300/+1130	+240/-190	+140/-130	200	570	1420
AUTOBRAKE MAX	5290	+100/-70	160	-310/+1140	+230/-160	+140/-140	240	540	1390
AUTOBRAKE 4	5400	+100/-70	160	-310/+1150	+220/-150	+140/-140	250	540	1410
AUTOBRAKE 3	5960	+100/-80	170	-340/+1230	+160/-110	+160/-160	300	260	950
AUTOBRAKE 2	6410	+120/-100	190	-360/+1300	+180/-170	+180/-180	280	260	700
AUTOBRAKE 1	6740	+130/-110	210	-380/+1370	+220/-210	+190/-190	280	500	790

Poor Reported Braking Action

MAX MANUAL	6710	+140/-110	220	-450/+1770	+550/-360	+180/-180	230	1200	3320
AUTOBRAKE MAX	6730	+140/-110	220	-450/+1770	+560/-370	+180/-180	240	1210	3330
AUTOBRAKE 4	6770	+140/-110	220	-450/+1780	+550/-370	+190/-180	230	1220	3360
AUTOBRAKE 3	6920	+140/-110	220	-460/+1800	+520/-320	+190/-190	290	1110	3260
AUTOBRAKE 2	7160	+150/-120	230	-470/+1830	+510/-340	+200/-190	270	960	3000
AUTOBRAKE 1	7340	+150/-120	240	-480/+1860	+510/-350	+200/-200	280	1070	2850

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 190 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 160 ft.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENT (FT)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
	440000 LB LANDING WT	PER 10000 LB ABOVE/BELOW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV

Dry Runway

MAX MANUAL	3000	+80/-40	60	-120/+420	+40/-30	+60/-60	110	60	140
AUTOBRAKE MAX	4120	+60/-60	100	-180/+600	0/0	+100/-100	210	0	0
AUTOBRAKE 4	5130	+80/-80	140	-240/+830	+10/-20	+140/-140	270	0	0
AUTOBRAKE 3	6130	+110/-110	170	-300/+1040	+40/-70	+170/-170	290	10	10
AUTOBRAKE 2	6680	+130/-130	210	-350/+1190	+110/-140	+190/-190	280	240	240
AUTOBRAKE 1	7060	+150/-140	230	-380/+1320	+170/-190	+210/-200	280	590	680

Good Reported Braking Action

MAX MANUAL	4120	+70/-70	110	-200/+710	+100/-90	+100/-100	160	250	570
AUTOBRAKE MAX	4430	+70/-70	110	-210/+740	+80/-50	+110/-110	210	240	580
AUTOBRAKE 4	5140	+90/-80	140	-250/+850	+30/-20	+140/-140	270	20	80
AUTOBRAKE 3	6130	+110/-110	170	-300/+1040	+40/-70	+170/-170	290	10	10
AUTOBRAKE 2	6680	+130/-130	210	-350/+1190	+110/-140	+190/-190	280	240	240
AUTOBRAKE 1	7060	+150/-140	230	-380/+1320	+170/-190	+210/-200	280	590	680

Medium Reported Braking Action

MAX MANUAL	5510	+110/-100	170	-310/+1150	+240/-190	+140/-140	200	650	1660
AUTOBRAKE MAX	5570	+110/-100	170	-310/+1160	+230/-170	+150/-140	240	630	1620
AUTOBRAKE 4	5730	+110/-100	170	-320/+1180	+200/-150	+150/-150	260	550	1590
AUTOBRAKE 3	6410	+110/-110	180	-350/+1270	+160/-140	+180/-170	290	270	1040
AUTOBRAKE 2	6830	+130/-130	210	-370/+1340	+210/-190	+190/-190	280	370	860
AUTOBRAKE 1	7140	+150/-150	230	-390/+1400	+250/-230	+210/-200	280	670	1030

Poor Reported Braking Action

MAX MANUAL	7010	+150/-140	230	-460/+1800	+550/-370	+190/-180	230	1350	3850
AUTOBRAKE MAX	7030	+150/-140	240	-460/+1800	+560/-370	+190/-190	240	1360	3860
AUTOBRAKE 4	7080	+150/-140	240	-460/+1800	+560/-370	+190/-190	240	1370	3890
AUTOBRAKE 3	7320	+150/-140	230	-470/+1830	+510/-330	+200/-200	280	1170	3700
AUTOBRAKE 2	7550	+160/-150	250	-480/+1860	+520/-350	+210/-200	270	1110	3450
AUTOBRAKE 1	7740	+160/-160	260	-490/+1900	+520/-370	+220/-210	280	1240	3320

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 200 ft.

For autobrake 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).



Flight Planning and Performance Manual

ADVISORY INFORMATION

Normal Configuration Landing Distance  
 Flaps 20

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENT (FT)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
	440000 LB LANDING WT	PER 10000 LB ABOVE/BELOW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

Dry Runway

MAX MANUAL	3120	+80/-40	70	-120/+430	+40/-30	+70/-70	120	70	160
AUTOBRAKE MAX	4320	+70/-70	100	-180/+610	0/0	+110/-110	210	0	0
AUTOBRAKE 4	5410	+90/-100	140	-250/+860	0/-10	+150/-150	290	0	0
AUTOBRAKE 3	6520	+110/-120	180	-320/+1080	+30/-70	+180/-180	310	10	10
AUTOBRAKE 2	7130	+140/-150	220	-360/+1230	+100/-150	+210/-200	300	220	220
AUTOBRAKE 1	7560	+160/-160	250	-400/+1370	+170/-200	+220/-220	300	620	670

Good Reported Braking Action

MAX MANUAL	4330	+70/-70	120	-210/+730	+110/-90	+110/-110	170	280	650
AUTOBRAKE MAX	4630	+80/-80	120	-220/+760	+80/-60	+120/-110	220	270	660
AUTOBRAKE 4	5430	+90/-100	140	-260/+880	+20/-20	+150/-150	290	20	90
AUTOBRAKE 3	6520	+110/-120	180	-320/+1080	+30/-70	+180/-180	310	10	10
AUTOBRAKE 2	7130	+140/-150	220	-360/+1230	+100/-150	+210/-200	300	220	220
AUTOBRAKE 1	7560	+160/-160	250	-400/+1370	+170/-200	+220/-220	300	620	670

Medium Reported Braking Action

MAX MANUAL	5840	+110/-110	180	-320/+1190	+260/-210	+160/-150	210	740	1920
AUTOBRAKE MAX	5880	+120/-110	180	-320/+1190	+250/-180	+160/-150	240	710	1870
AUTOBRAKE 4	6060	+110/-110	180	-330/+1210	+220/-150	+160/-160	280	650	1850
AUTOBRAKE 3	6800	+120/-130	190	-360/+1310	+160/-140	+190/-190	310	300	1230
AUTOBRAKE 2	7290	+140/-150	230	-390/+1380	+200/-190	+210/-210	300	360	960
AUTOBRAKE 1	7640	+160/-170	250	-410/+1450	+250/-240	+230/-220	300	700	1070

Poor Reported Braking Action

MAX MANUAL	7470	+160/-160	260	-480/+1850	+590/-400	+210/-200	250	1550	4500
AUTOBRAKE MAX	7490	+160/-160	260	-480/+1850	+600/-400	+210/-200	250	1550	4510
AUTOBRAKE 4	7540	+170/-160	260	-480/+1860	+590/-400	+210/-200	260	1560	4540
AUTOBRAKE 3	7790	+160/-160	250	-490/+1880	+540/-360	+220/-210	300	1360	4360
AUTOBRAKE 2	8050	+170/-170	270	-500/+1920	+550/-370	+230/-220	290	1230	4080
AUTOBRAKE 1	8260	+180/-180	280	-510/+1960	+560/-390	+240/-230	300	1360	3850

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 210 ft.

For autobrake 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).

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# FLIGHT PLANNING

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## Introduction

This chapter contains flight planning data to determine trip fuel/time, reserve fuel and enroute terrain clearance capability. The data includes engine bleed effects for normal air conditioning operation, i.e. two packs at normal flow, one pack bleeding each engine.

## Simplified Flight Planning

### Flight Planning Allowances

Simplified Flight Planning charts enable rapid determination of estimated trip time and fuel from brake release to landing. Additional flight planning information including maneuver allowances is summarized below.

### Ground Operations

Fuel can be saved by minimizing APU utilization. Average APU fuel flow rate for normal operation is 535 lb per hour on the ground.

Taxi fuel allowance is approximately 57 lb per minute.

### 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 PENALTY (LB/HR)				
	GROSS WEIGHT (1000 LB)				
	700	600	500	400	300
43				360	310
39			420	360	310
35		470	420	380	300
31	520	500	450	370	310
25	510	490	440	380	340
20	520	520	460	410	360
15	520	520	480	440	400
10	540	520	510	490	440
5	590	590	570	530	480

### Climb

Trip Fuel and Time charts are based on 310/.84 climb speed. Local ATC may require that 250 KIAS not be exceeded below 10000 ft. Approximately 115 lb of additional fuel is burned when this restriction is imposed.

## Altitude Selection

Best fuel mileage for a given speed schedule is achieved at optimum altitude. Fuel mileage penalties for operation at off-optimum altitudes are shown in the following table.

OFF-OPTIMUM CONDITION	FUEL MILEAGE PENALTY %		
	LRC	.84M	CI 180
2000 FT ABOVE	2	3	2
OPTIMUM ALTITUDE	0	0	0
2000 FT BELOW	1	1	2
4000 FT BELOW	3	5	5
6000 FT BELOW	6	8	9
8000 FT BELOW	9	13	13
10000 FT BELOW	12	17	18
12000 FT BELOW	15	21	21

## Cruise

Long Range cruise is recommended as an approximation for minimum trip fuel. Long Range Cruise is the speed which gives 99% of the maximum fuel mileage at zero wind. For cruise within 2000 ft of optimum altitude LRC may be approximated by a constant .84M or Cost Index 180.

Increase total fuel flow during cruise approximately 230 lb/hr for engine anti-ice on or 350 lb/hr for engine and wing anti-ice on.

Every 1000 lb reduction in landing weight decreases trip fuel at optimum altitude by approximately 0.16%.

## Descent

Optimum descent speeds for minimum trip fuel are a function of weight. Trip Fuel and Time charts are based on .84/310/250 descent speed, and include straight in approach allowances only. Each additional minute of flaps down maneuvering consumes approximately 240 lb of additional fuel with the gear retracted and 280 lb with the gear extended.

## Missed Approach

Approximately 925 lb of additional fuel is burned during the missed approach maneuver, based on applying go-around power from the final approach configuration, retracting flaps and gear while climbing to 1500 ft and accelerating to 250 KIAS.

## Optimum Altitude/Short Trip Cruise Altitude

Optimum altitude for best fuel mileage is presented for LRC/.84M speed schedule. Fuel mileage penalties for flying off-optimum altitude are tabulated under Altitude Selection.

### Short Trip Cruise Altitude

Short range operation may be limited by the distance required to perform the climb and descent. The Short Trip Cruise Altitude chart shows the maximum altitude at which it is possible to cruise for at least one minute in level flight.

### Trip Fuel and Time

Trip Fuel and Time charts are provided for Long Range Cruise and .84M at constant altitude to determine trip fuel and time from brake release to touchdown. A similar chart for a cost index of 180 (which approximates Long Range Cruise) is also shown. APU usage, taxi, inflight flaps down maneuvering (other than straight in approach) and reserve fuel should be added to the fuel obtained from the trip fuel and time charts to obtain the total fuel required. These fuel allowances are presented under Flight Planning Allowances. Additional fuel for extended inflight traffic delays should be determined from the holding table.

To determine trip fuel and time enter with trip ground distance, adjust for the anticipated wind condition, and proceed vertically to cruise pressure altitude. Trip fuel is read to the right from the lower set of altitude lines by going to the reference landing weight and adjusting to the planned landing weight using the guidelines. Trip time is read to the left from the upper altitude lines, adjusting for ISA deviation as necessary.

For winds greater than those shown, enter chart directly with adjusted ground distance and ignore wind correction guidelines. Adjusted ground distance is ground distance multiplied by the ratio  $\text{Average TAS}/(\text{Average TAS} + \text{Wind Component})$ , where headwind is negative and tailwind is positive.

### Step Climb Fuel and Time

Best fuel mileage is obtained if the flight is planned at optimum altitude for the cruise weight and speed schedule. Since optimum altitude continually increases as the airplane weight decreases, a step climb procedure bracketing optimum altitude is necessary.

The Step Climb Planning charts provide trip fuel and time for Long Range Cruise, .84M or Cost Index 180 from brake release to touchdown, similar to the constant altitude Trip Fuel and Time charts. The charts are based on 4000 ft step climbs to 2000 ft above optimum altitude.

### Short Trip Fuel and Time

Short Trip Fuel and Time charts include fuel and time for climb to cruise altitude, cruise, descent and straight in approach. The charts are based on the altitude that

yields the minimum fuel for trip distances up to 500 nm. For distances greater than 500 nm, or other altitudes, use the Trip Fuel and Time charts.

To determine fuel and time, enter with ground distance, adjusted for wind and proceed vertically to the planned landing weight. Trip fuel is read to the right from the lower set of landing weight curves. Trip time is read to the left from the upper curve and is valid for all landing weights.

### Holding Planning

These tables provide total fuel flow information necessary for planning holding and reserve fuel requirements. The tables are based on the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting.

The fuel flow is based upon flight in a racetrack holding pattern. For holding in straight and level flight reduce table values by 5%.

### Fuel Tankering

The Fuel Tankering table below is provided for LRC/.84M cruise schedule based on a step climb procedure to bracket optimum altitude. When a fuel price differential exists between two stations, this table may be used to determine if fuel may be economically transported for a subsequent flight sector.

Enter the table with the trip distance to read the break-even fuel price ratio. As noted, the break-even fuel price is the fuel price at departure multiplied by the break-even fuel price ratio. To justify tanker operation, economically, the fuel price at destination must be greater than the break-even fuel price.

TRIP DISTANCE (NM)	BREAK-EVEN PRICE RATIO
200	1.012
400	1.024
600	1.036
800	1.047
1000	1.059
2000	1.121
3000	1.188
4000	1.259
5000	1.335
6000	1.415

### Oxygen Requirements

#### Passenger Oxygen System - Chemical

This airplane is equipped with a 12 minute or optional 22 minute chemical passenger oxygen system. The altitude envelopes provided show the maximum altitude that the airplane may be flown during a cabin depressurization event and still support the physiological requirements of the passengers using the oxygen system installed. The envelopes are intended to assist in terrain clearance planning.

The maximum altitude envelopes assume an immediate descent is made to 10000 ft or the lowest safe altitude, whichever is higher. Should the presence of terrain necessitate a level-off at an altitude higher than 10000 ft, the required terrain clearance descent profile should at no time exceed the maximum altitude capability of the passenger oxygen system shown by the envelope. Once terrain is cleared, the descent to 10000 ft should be completed.

### Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Flight Crew System oxygen table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

An additional quantity of oxygen is required when flight altitudes above 41000 ft are planned. Regulations require that one active duty pilot must don the oxygen mask and breathe diluted oxygen for the duration of the flight above 41000 ft. The additional quantity of oxygen required is 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system), or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

### Driftdown

#### Net Level Off Weight

This chart is used to determine the maximum weight for terrain clearance based on the Approved Flight Manual net engine inoperative performance at speed for optimum climb gradient. Regulations require terrain clearance flight planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%.

The net level off pressure altitude must clear the terrain by 1000 ft. To determine the maximum weight for terrain clearance, enter with net level off pressure altitude, proceed to the ISA deviation and read weight. Adjust weight for anti-ice operation with the weight adjustment shown on the chart.

### Driftdown Profiles Net Flight Path

These charts are provided to determine the time, fuel and distance from engine failure at any point during driftdown for legal enroute terrain clearance. Data is based on net performance, max continuous thrust following engine failure and level flight deceleration to optimum driftdown speed (speed for optimum climb gradient).

To determine driftdown time, fuel and distance, enter with pressure altitude for terrain clearance (terrain height plus 2000 ft), move horizontally to equivalent weight at engine failure (corrected for ISA deviation and anti-ice operation as indicated) and read fuel burned from point of engine failure by interpolating between dashed lines. Read time and ground distance from point of engine failure by moving vertically downward from equivalent weight, adjusting distance for wind.

### Driftdown/LRC Cruise Range Capability

This chart shows the range capability from the start of driftdown/cruise based on level off following driftdown and targeting the one engine inoperative Long Range Cruise speed.

To determine fuel required, enter with the desired ground distance, correct for the anticipated wind, and proceed vertically to the start of driftdown weight and read the fuel required to the right. The time required is read to the left from the single weight line on top. The chart may be used in reverse to determine the range capability knowing the fuel remaining from the start of driftdown.

### ETOPS

Regulations require that flight conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for extended range operation with two engine airplanes. If the airplane meets these requirements, the approved Airplane Flight Manual (AFM) will contain a statement to this effect.

This section provides the planning and inflight performance information necessary to conduct operations under these regulations. Information is presented for several different driftdown/cruise speed schedules. The information is based on drifting down using Max Continuous thrust at the Mach number shown until reaching the corresponding airspeed and maintaining that airspeed throughout the remainder of the driftdown and level cruise. Based on route requirements, operators may select any one of these

speeds for their operation, or may elect to use an entirely different speed which is not contained in this section.

### Flight Planning

The following information is shown for flight planning purposes and is intended for use mainly by ground personnel.

Data is included for five basic schedules (Long Range Cruise, .84/260, .84/280, .84/300 and .84/320) throughout this section to allow the operator to evaluate the effect of using speeds up to 320 KIAS (VMO -10).

### Area of Operation (Diversion Distance)

The maximum diversion distance used to establish the Area of Operation may be obtained from this chart. The Area of Operation is defined as the region within which the operator is authorized to conduct extended range operation. The distance to the diversion airport from any point along the intended route must be covered within the approved time using the single engine cruise speed (assuming still air and ISA conditions) selected by the operator.

Enter the chart with the appropriate weight using the speed schedule and time selected and read the maximum diversion distance.

### Critical Fuel Reserves

ETOPS Regulations require reserve planning to include a "Critical Fuel Scenario" calculation. The information shown is the fuel required to satisfy flight profiles as described on the charts. This information is shown for All-Engines operation at Long Range Cruise, as well as Engine-Inop operation at Long Range Cruise, 260, 280, 300 and 320 KIAS. There are two separate Engine-Inop scenarios; one assumes a loss of pressurization and subsequent cruise at 10000 ft, the other assumes only an engine failure with the airplane drifting down to an applicable level-off altitude for the remainder of the diversion. The ETOPS Critical Fuel required is the greater of All-Engine fuel or Engine-Inop fuel for the speed schedule selected. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by critical fuel reserves exceeds the amount of fuel normally expected, fuel load must be adjusted accordingly.

To determine the fuel required, enter the appropriate chart with desired diversion distance, adjust for forecast wind (factored if applicable), proceed vertically to the weight at critical point and read the fuel required to the right. If the operator is using a wind forecasting model acceptable to the FAA (such as the World Area Forecast System, WAFS), regulations allow the wind factor

applied in this step to be 5% of the forecast wind (increase headwinds, decrease tailwinds), as indicated in the note at the bottom of the chart. If the operator is not using an acceptable wind forecasting model, the calculated diversion fuel is to be increased by 5% instead of factoring the forecast wind values.

Adjustments for non-standard conditions are shown at the bottom of the page.

The data does not include an allowance for performance deterioration. However, regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for in-service deterioration.

### Net Level Off Weight

These charts are used to determine the maximum weight for terrain clearance based on net engine inoperative performance for the speed schedules shown and is for planning purposes only. Regulations require terrain clearance flight planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%.

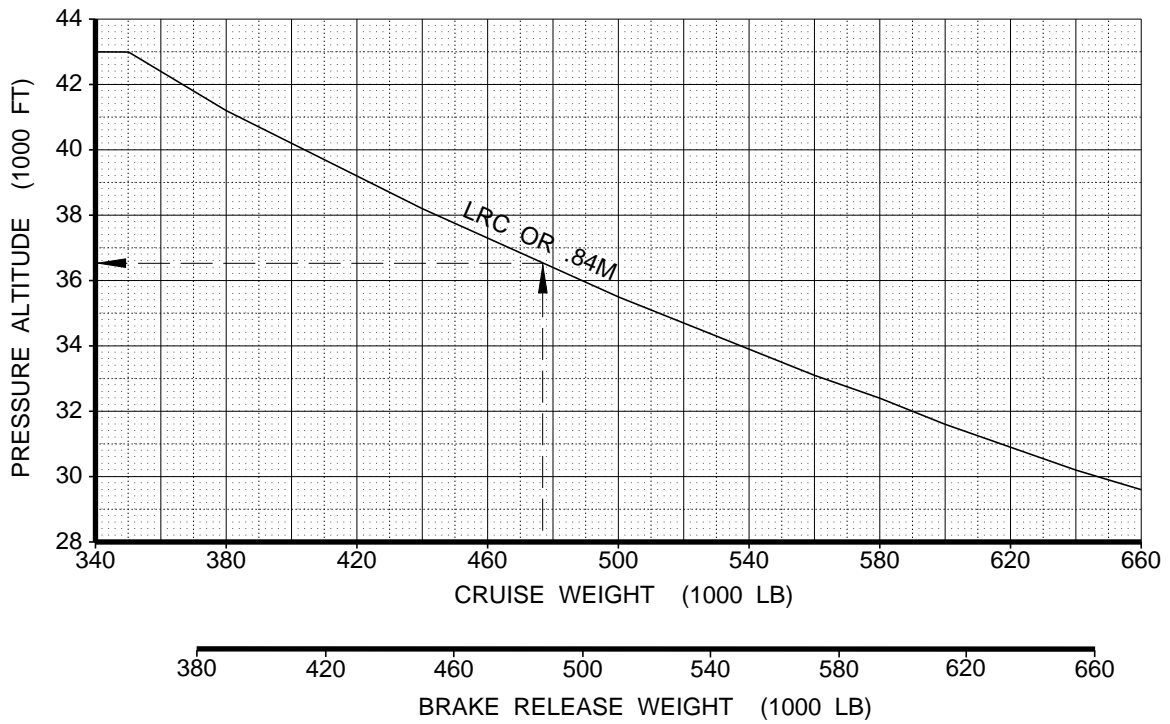
Net level off weight is determined by entering the appropriate chart at the left with the desired level off pressure altitude, correcting for anti-ice as shown, proceeding across to the correct ISA deviation line and reading the allowable weight at the bottom. The net level off altitude may be obtained by entering the chart with weight and proceeding up to the correct ISA deviation line and reading across to the altitude on the left.

### Driftdown/Cruise Range Capability

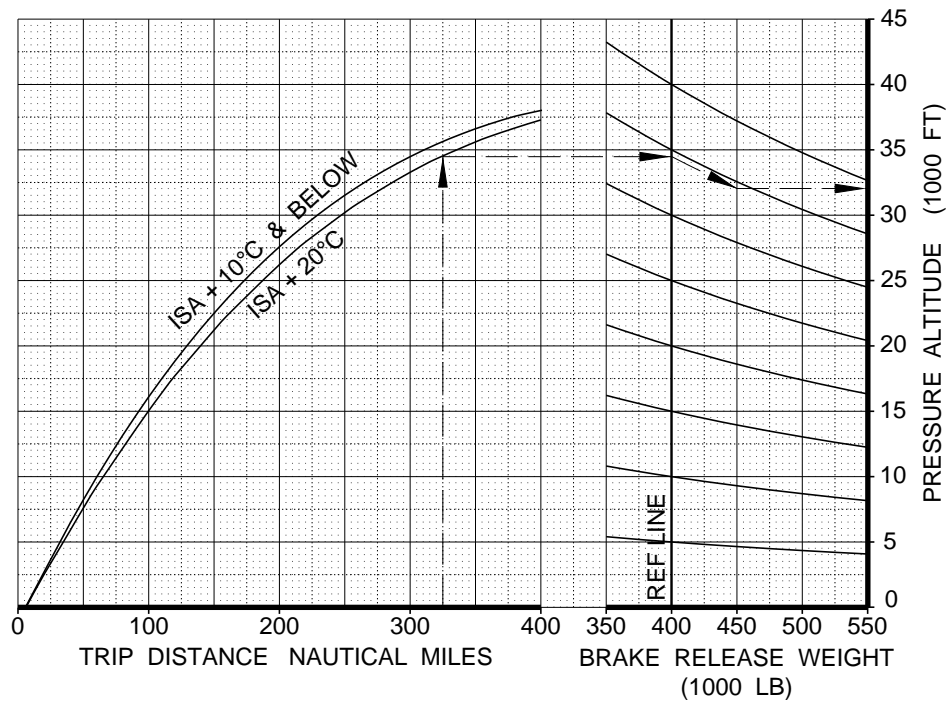
These charts show range capability from the start of driftdown/cruise when the driftdown/cruise procedure outlined in this section is followed. Charts are shown for each of the speed schedules discussed previously.

To determine the fuel required, enter with the desired ground distance, adjust for the anticipated wind, and proceed vertically to the start of driftdown weight and read the fuel required to the right. The time required is read to the left from the single weight line on top. The chart may be used in reverse to determine the range capability knowing the fuel remaining from the start of driftdown.

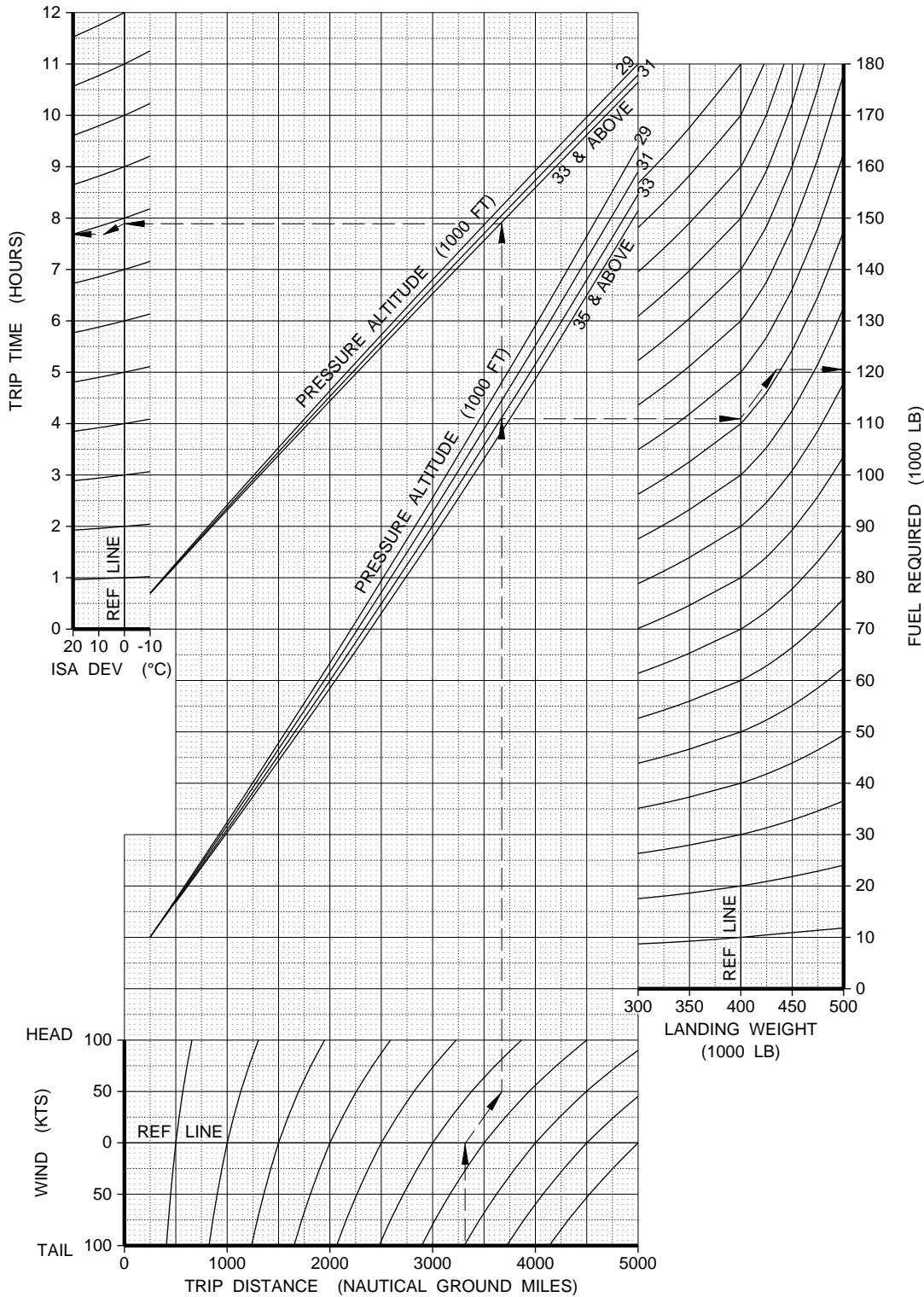
### Optimum Altitude



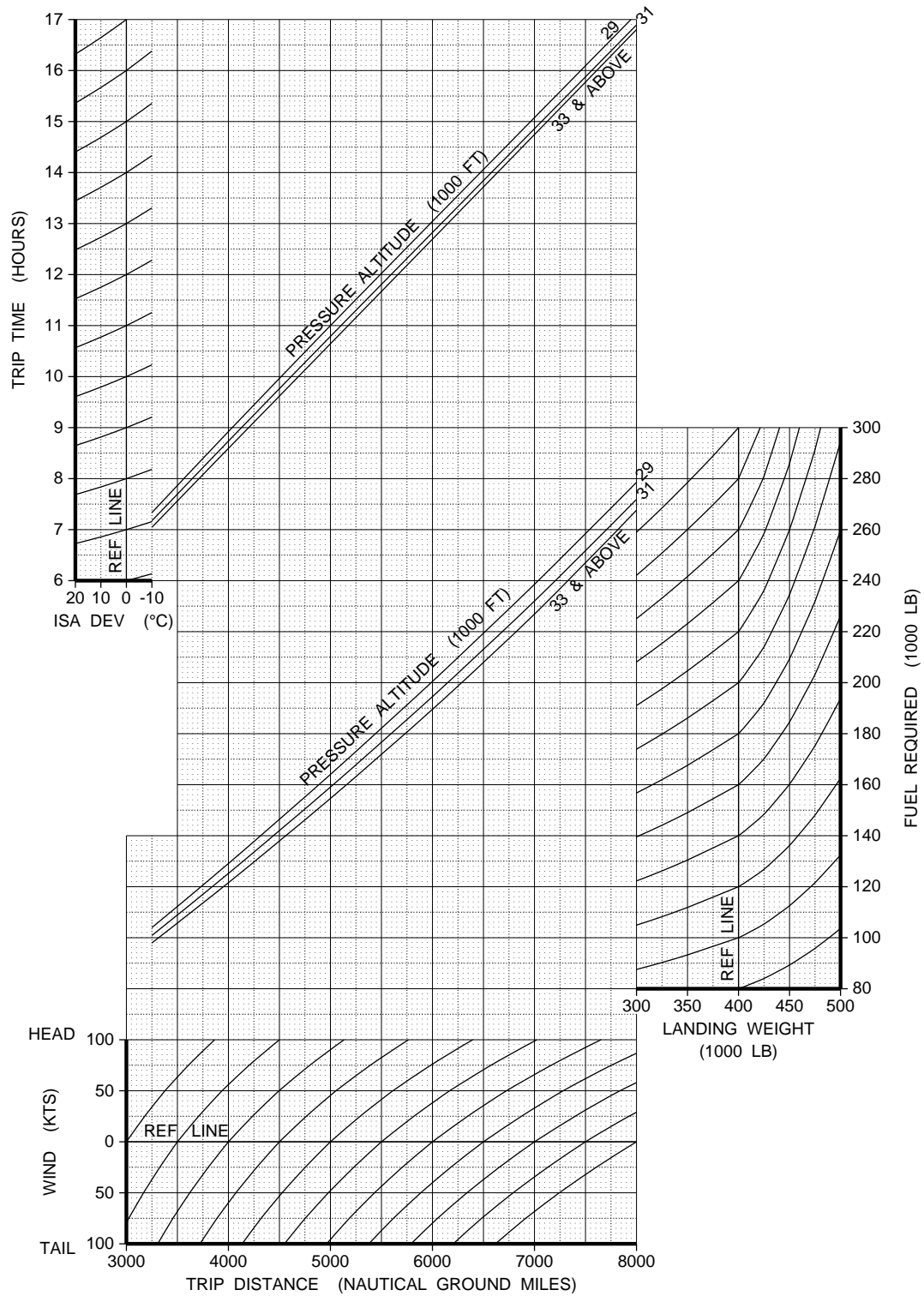
### Short Trip Cruise Altitude



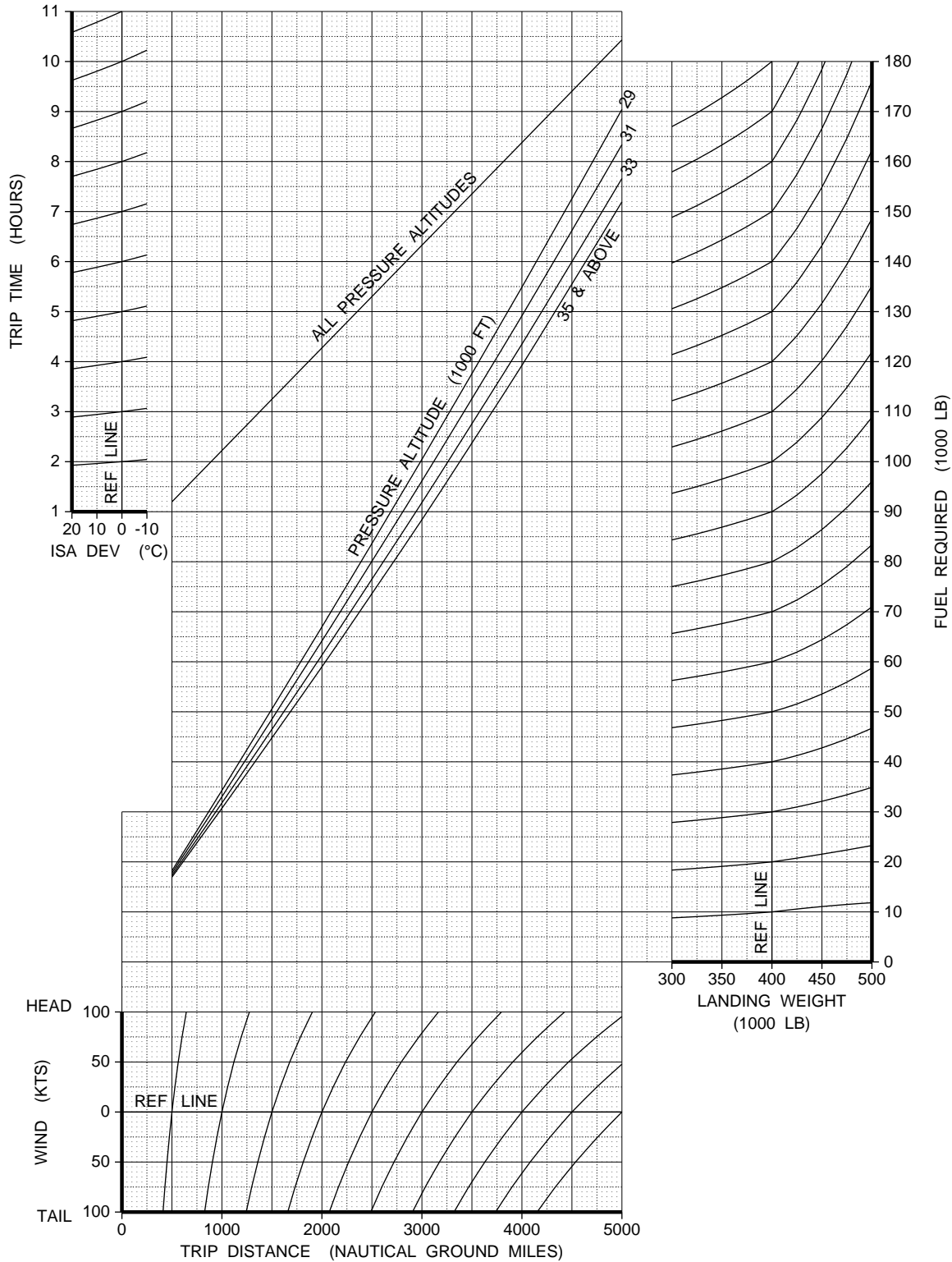
**Long Range Cruise Trip Fuel and Time**  
0 to 5000 NM Trip Distance  
Based on .31/.84 climb and .84/.31/250 descent



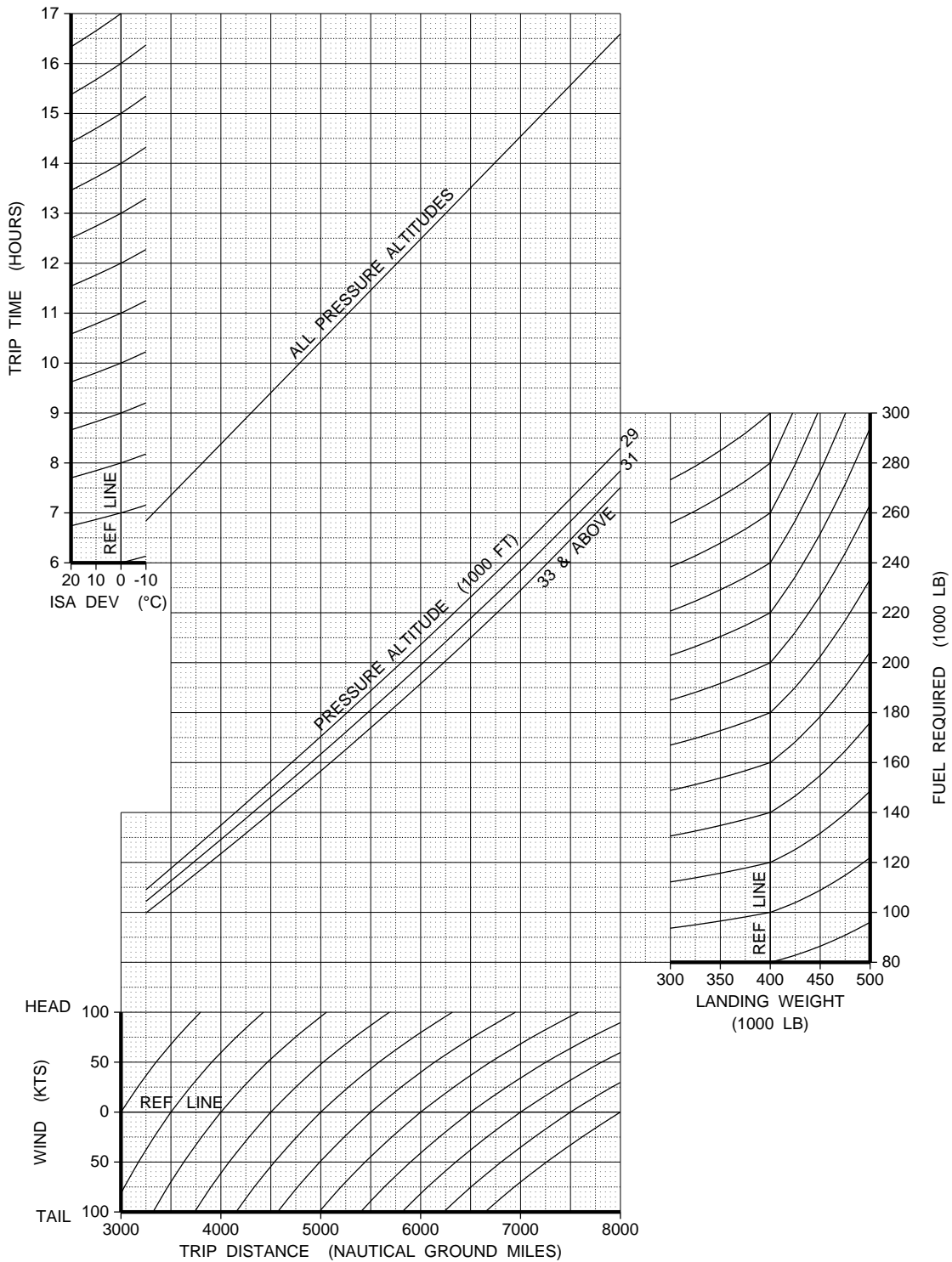
**Long Range Cruise Trip Fuel and Time**  
**3000 to 8000 Trip Distance**  
 Based on 310/.84 climb and .84/310/250 descent



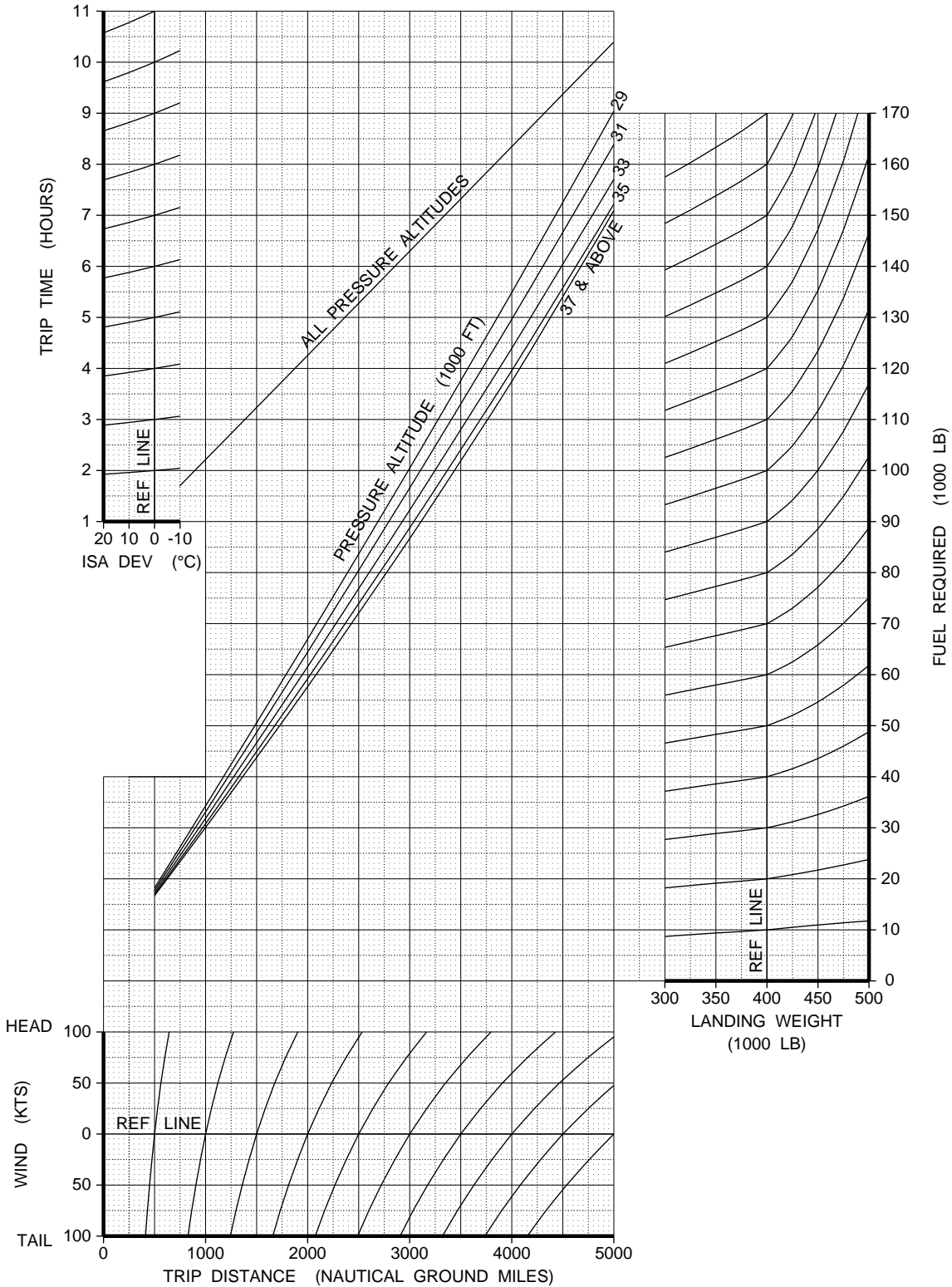
**.84M Trip Fuel and Time**  
**0 to 5000 Trip Distance**  
Based on 310/.84 Climb and .84/310/250 descent



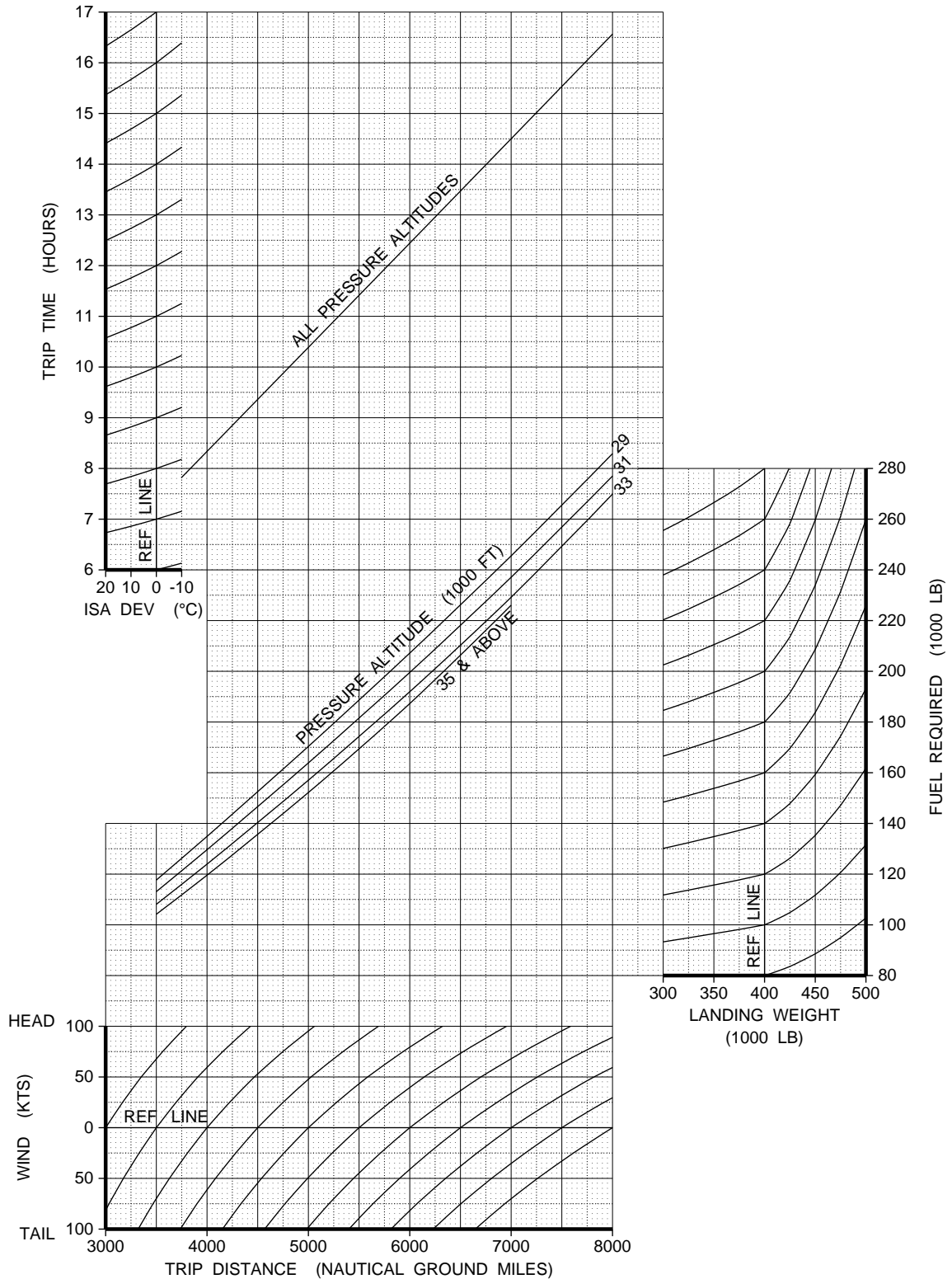
**.84M Trip Fuel and Time**  
**3000 to 8000 NM Trip Distance**  
 Based on .310/.84 Climb and .84/310/250 Descent



**Cost Index 180 Trip Fuel and Time**  
**0 to 5000 NM Trip Distance**

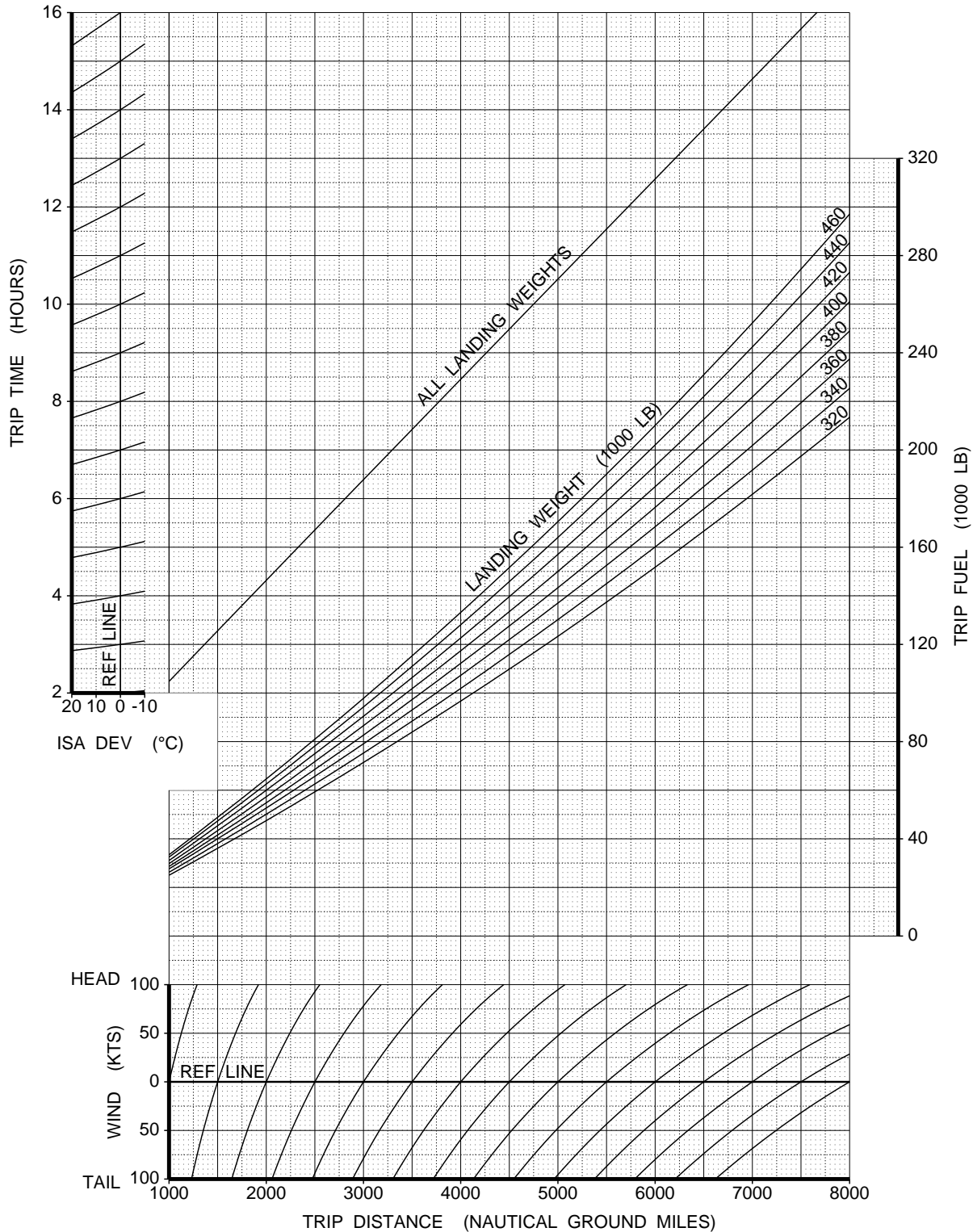


### Cost Index 180 Trip Fuel and Time 3000 to 8000 NM Trip Distance



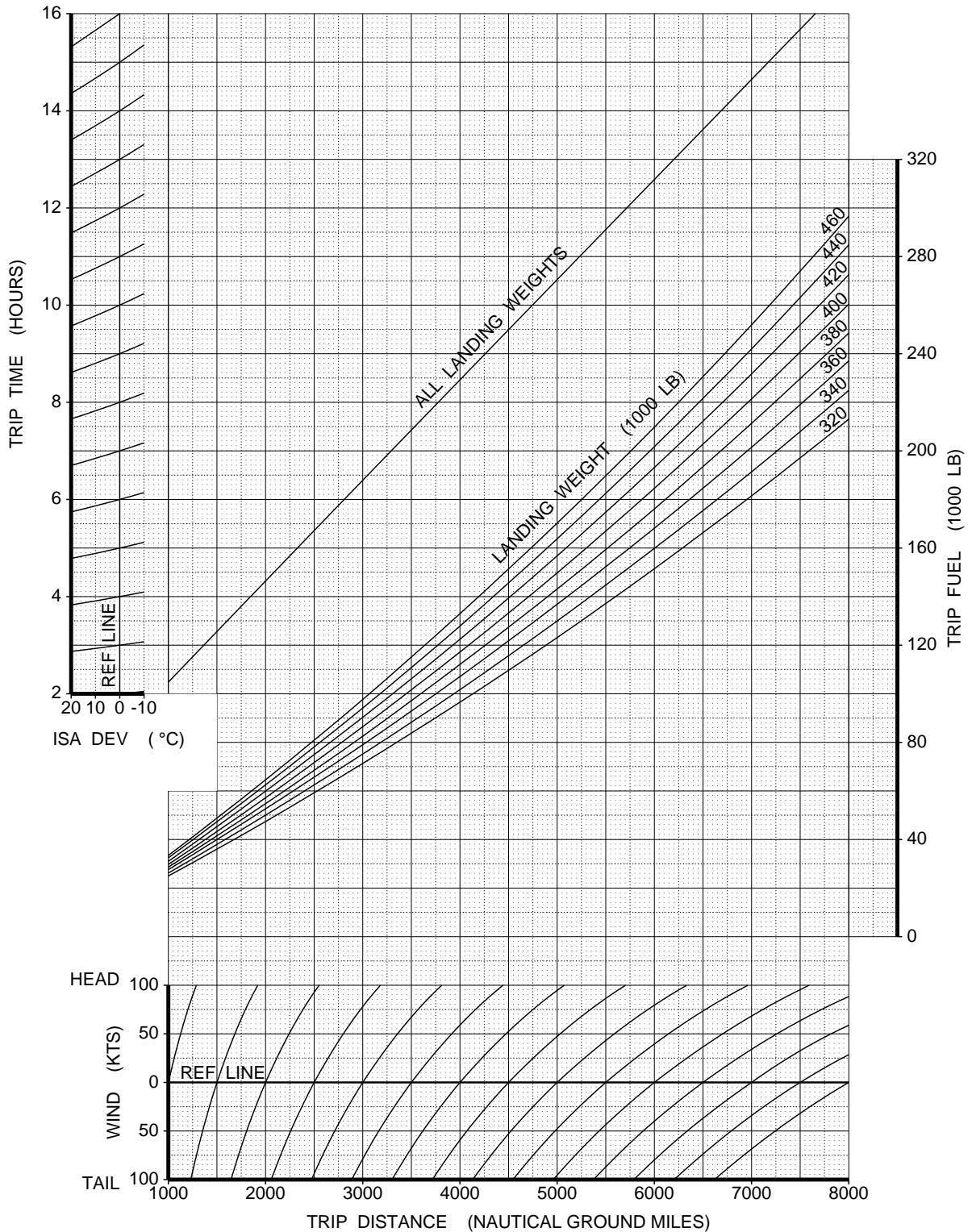
### Long Range Cruise Step Climb Trip Fuel and Time

Based on .310/.84 climb and .84/.310/250 descent

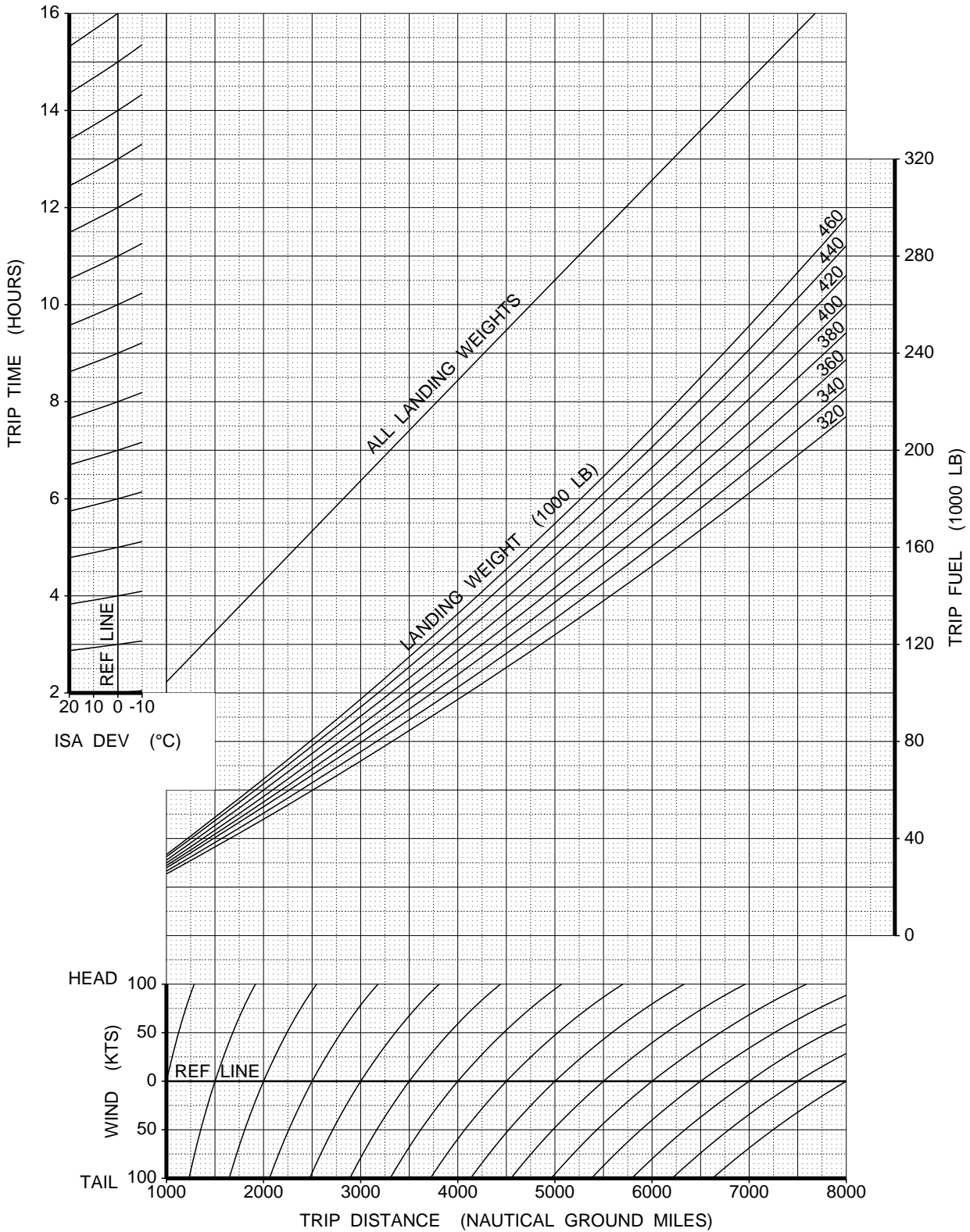


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**.84M Step Climb Trip Fuel and Time**  
 Based on .310/.84 climb and .84/.310/250 descent



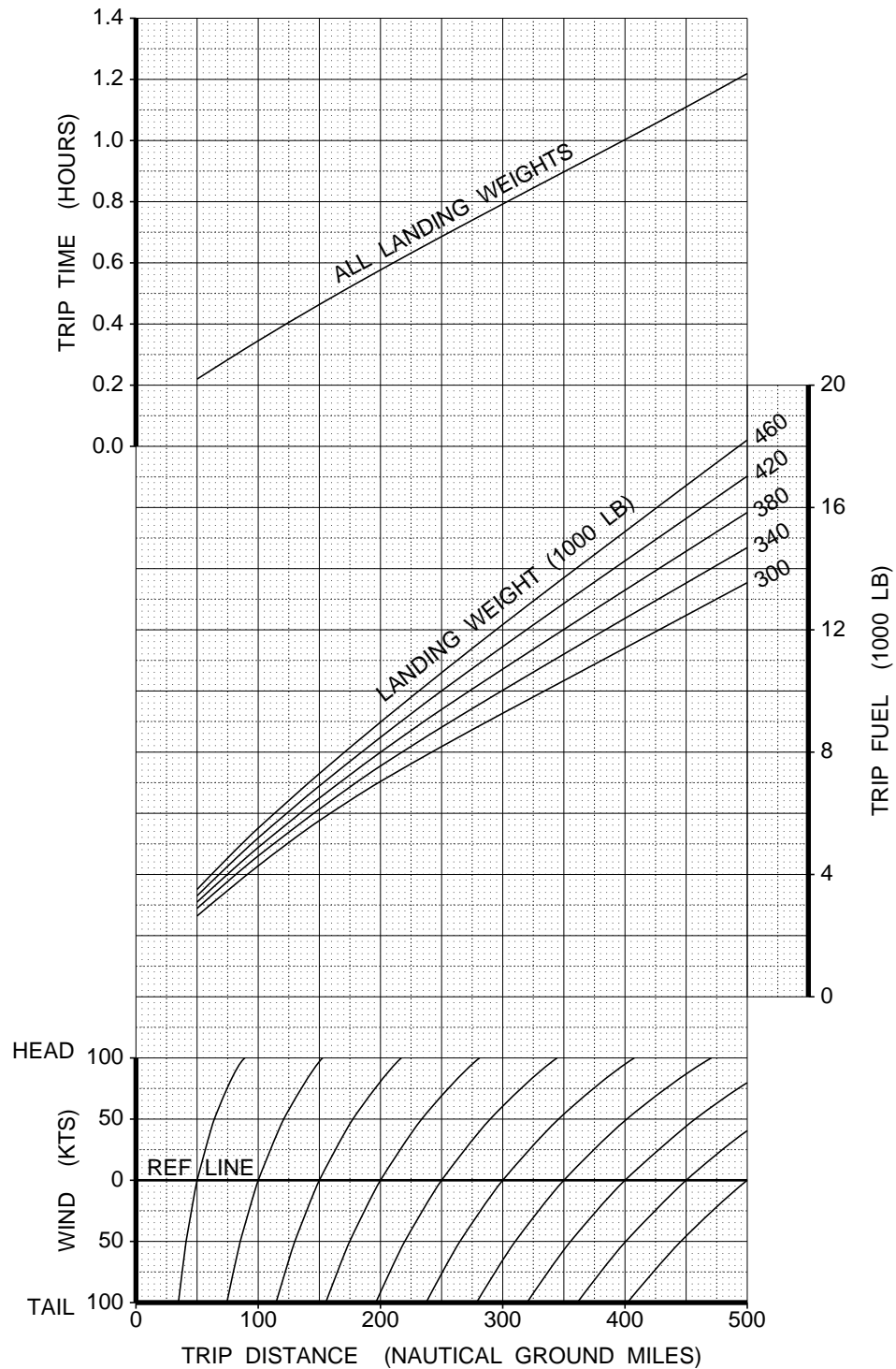
### Cost Index 180 Step Climb Trip Fuel and Time



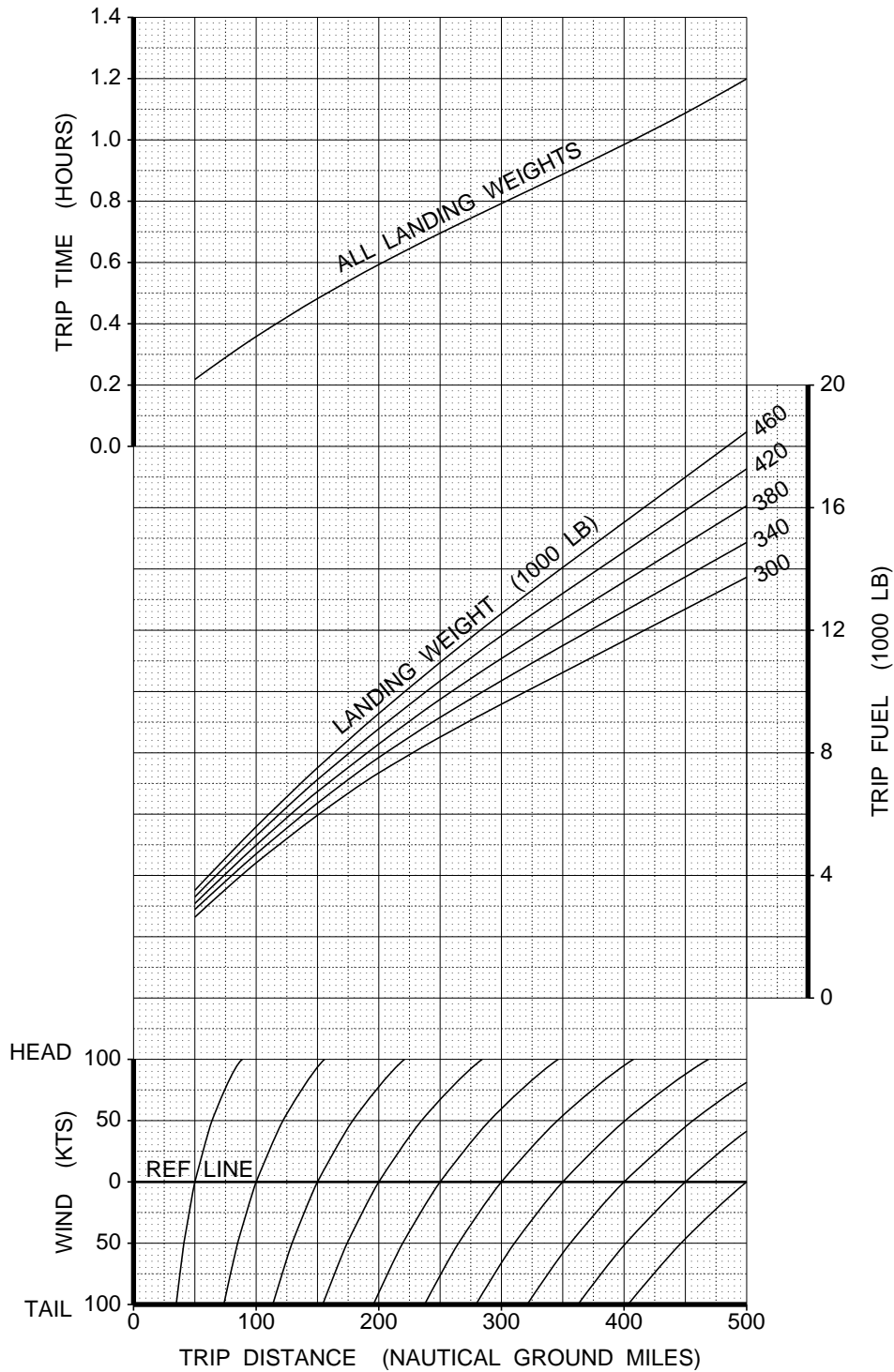
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### Long Range Cruise Short Trip Fuel and Time

Based on .310/.84 climb and .84/.310/250 descent at short trip cruise altitude



### Cost Index 180 Short Trip Fuel and Time





Flight Planning and Performance Manual

**Holding Planning**

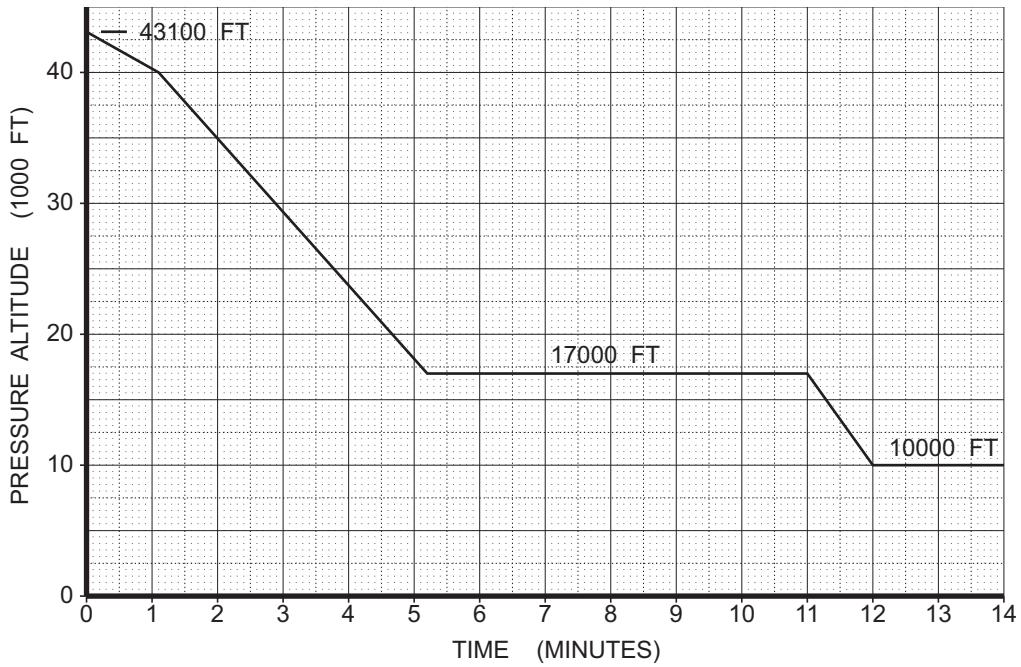
**Flaps Up**

PRESSURE ALTITUDE (FT)	TOTAL FUEL FLOW (LB/HR)									
	WEIGHT (1000 LB)									
	660	620	580	540	500	460	420	380	340	300
43000							14110	11840	10280	9020
40000						14510	12810	11240	9840	8780
35000		20580	18030	16310	14740	13280	11920	10690	9710	8490
30000	20160	18500	17000	15580	14260	12980	11730	10570	9370	8560
25000	19270	17890	16560	15270	13910	12810	11540	10390	9460	8690
20000	18890	17440	15990	14920	13690	12600	11590	10620	9730	8990
15000	18480	17240	16300	15160	14040	12950	11870	10820	9900	9180
10000	18770	17600	16690	15580	14470	13300	12170	11110	10190	9470
5000	19020	17890	17000	15800	14630	13530	12460	11410	10490	9790
1500	19350	18110	17190	16050	14930	13820	12730	11670	10770	10090

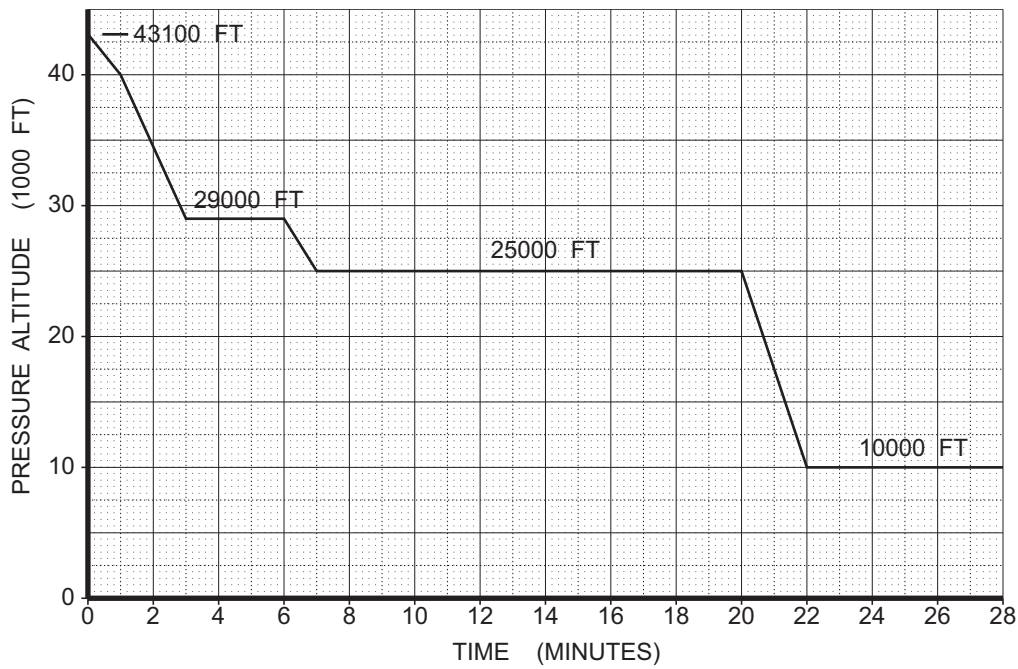
**Flaps 1**

PRESSURE ALTITUDE (FT)	TOTAL FUEL FLOW (KG/HR)									
	WEIGHT (1000 LB)									
	660	620	580	540	500	460	420	380	340	300
20000	19230	17760	16360	15390	14240	13140	12050	11020	10080	9310
15000	19030	17780	16820	15640	14520	13390	12260	11170	10190	9370
10000	19510	18280	17250	16040	14850	13670	12520	11410	10410	9630
5000	19660	18410	17440	16230	15050	13880	12730	11590	10580	9820
1500	19890	18630	17680	16490	15300	14100	12930	11790	10800	10060

**Oxygen Requirements**  
**Passenger Oxygen System - Chemical**  
**Maximum Altitude Envelope**  
**Based on 12 Minute System**



The passenger oxygen system will provide sufficient supplemental breathing oxygen for altitudes at or below this envelope.  
**Based on 22 Minute System**



The passenger oxygen system will provide sufficient supplemental breathing oxygen for altitudes at or below this envelope.



Flight Planning and Performance Manual

**Oxygen Requirements**

**Flight Crew System**

**Required Pressure (PSI) for 114/115 Cubic Ft. Cylinder**

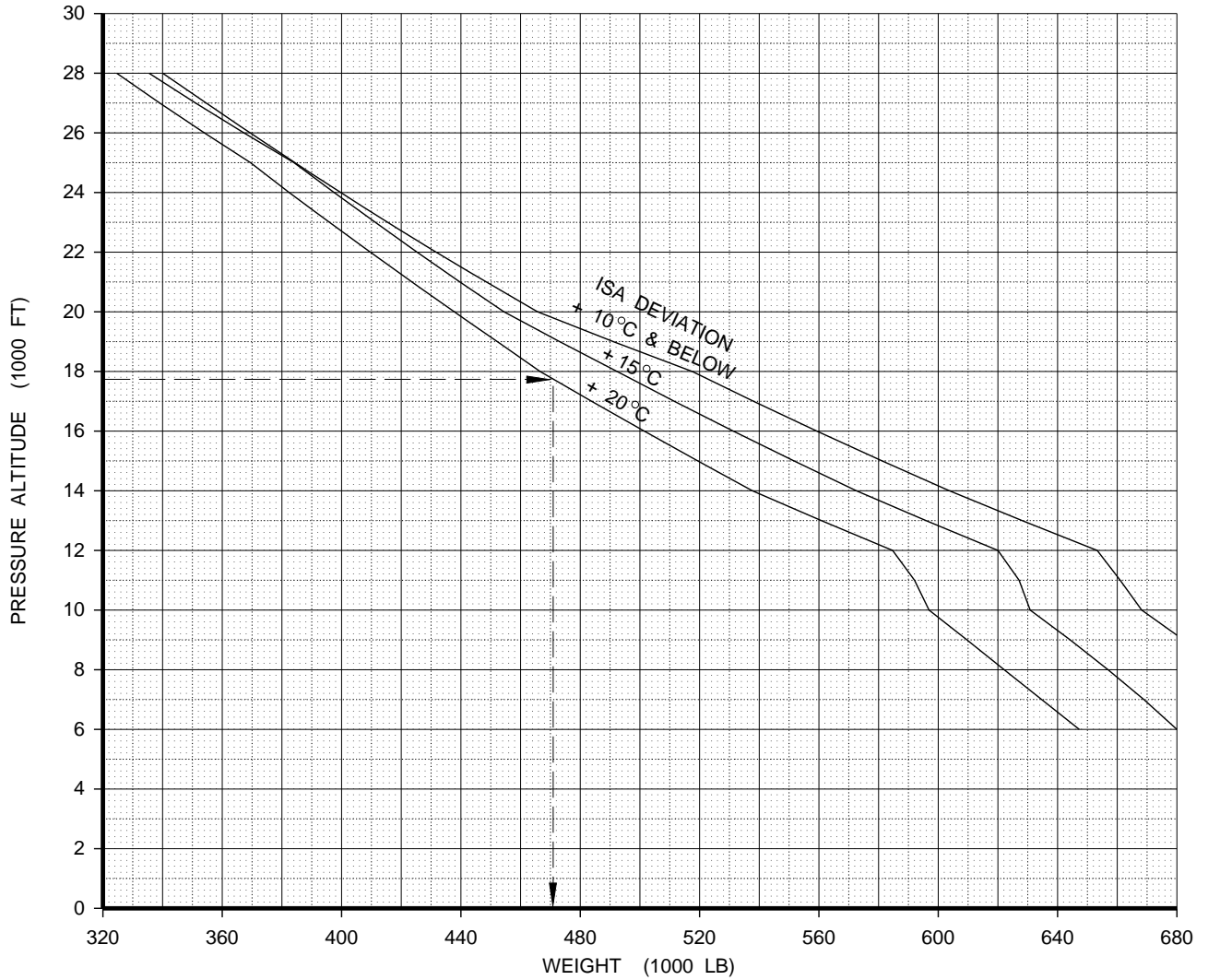
BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°F	°C	2	3	4
122	50	530	735	945
113	45	520	725	930
104	40	510	715	915
95	35	505	700	900
86	30	495	690	885
77	25	485	680	870
68	20	480	670	860
59	15	470	655	840
50	10	460	645	830
41	5	455	635	815
32	0	445	620	800
23	-5	440	610	785
14	-10	430	600	770

For more extensive than normal crew usage, add 1.2 psi/person/minute.

Intentionally  
Blank

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Net Level Off Weight**

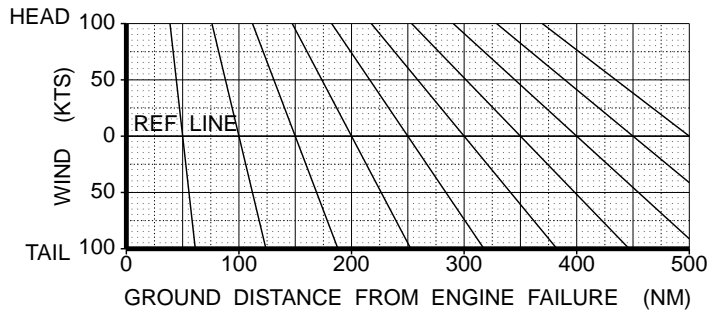
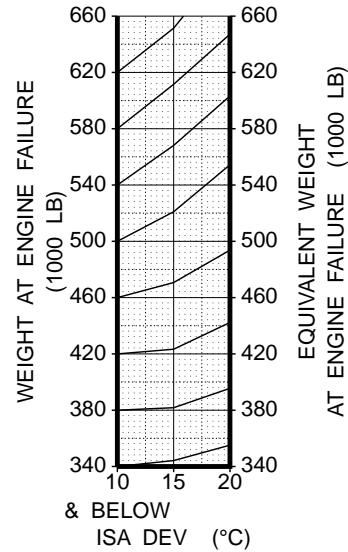
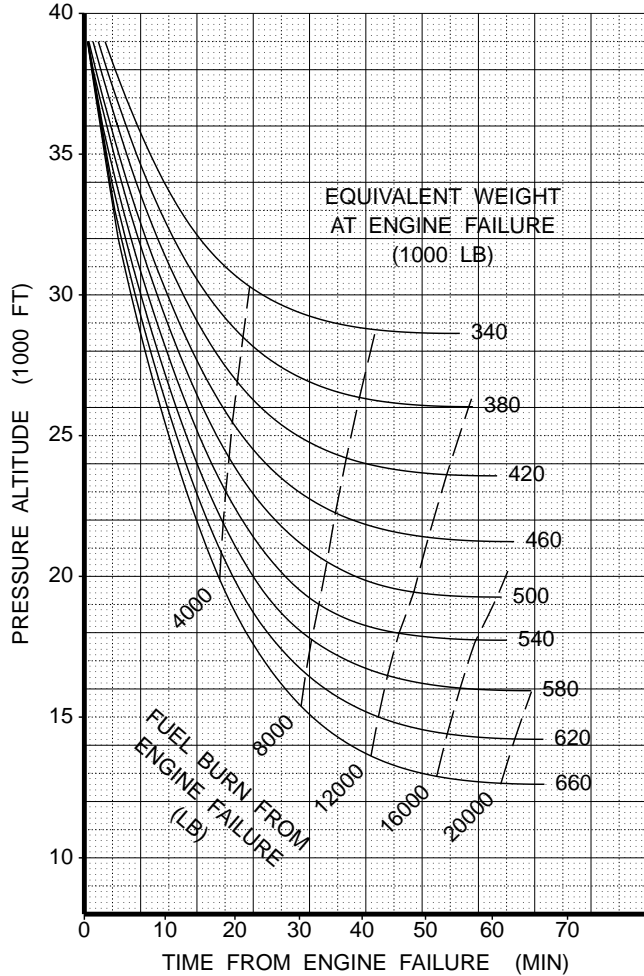


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
	8	10	12	14	16	18	20	22	24	26
ENGINE ONLY	-9.4	-7.8	-5.6	-4.3	-4.9	-6.0	-7.1	-6.9	-6.8	-6.3
ENGINE AND WING	-15.9	-13.2	-10.2	-8.5	-9.1	-10.2	-11.9	-11.4	-11.1	-10.1

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Driftdown Profiles Net Flight Path**  
**39000 FT and Above**

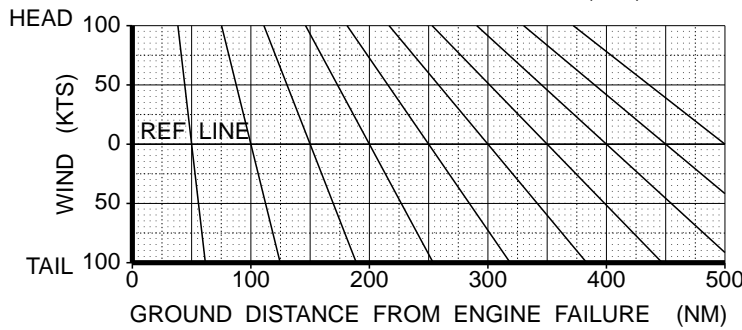
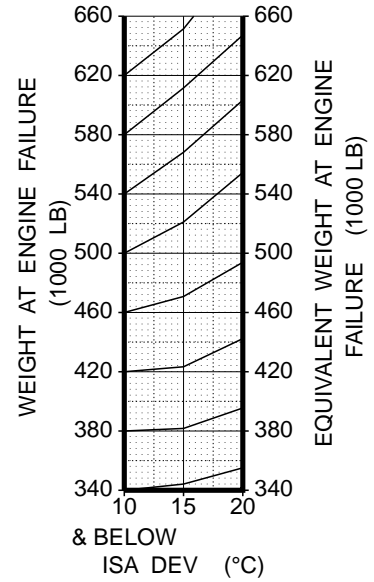
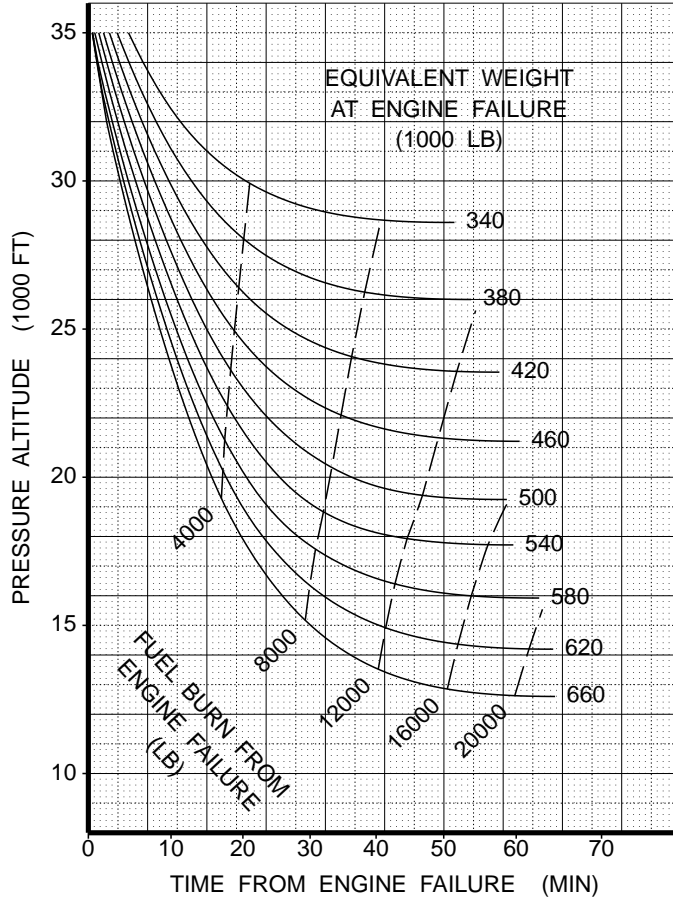


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
	8	10	12	14	16	18	20	22	24	26
ENGINE ONLY	9.4	7.8	5.6	4.3	4.9	6.0	7.1	6.9	6.8	6.3
ENGINE AND WING	15.9	13.2	10.2	8.5	9.1	10.2	11.9	11.4	11.1	10.1

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Driftdown Profiles Net Flight Path**  
**35000 FT to 37000 FT**

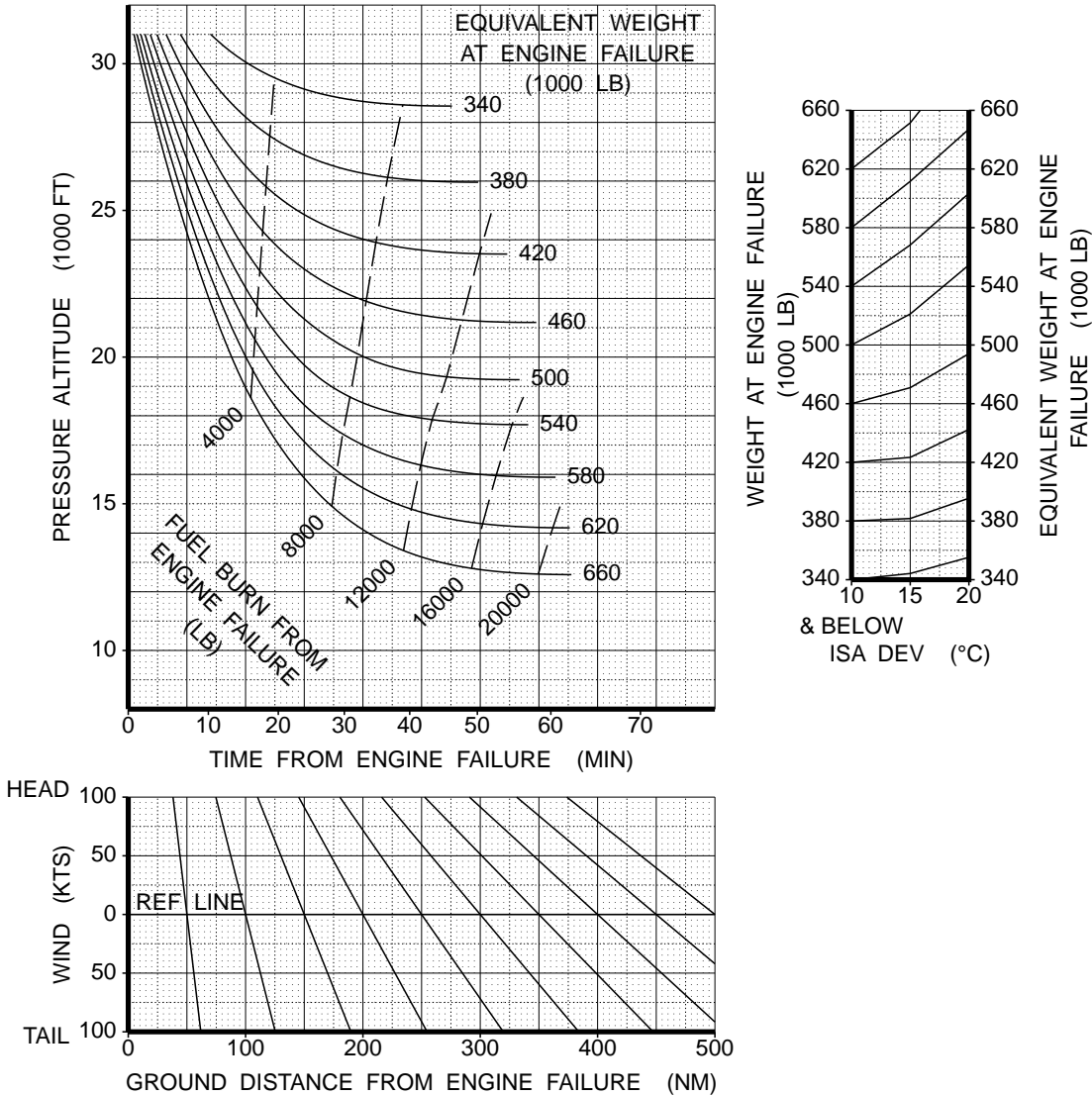


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
	8	10	12	14	16	18	20	22	24	26
ENGINE ONLY	9.4	7.8	5.6	4.3	4.9	6.0	7.1	6.9	6.8	6.3
ENGINE AND WING	15.9	13.2	10.2	8.5	9.1	10.2	11.9	11.4	11.1	10.1

**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Driftdown Profiles Net Flight Path**  
31000 FT to 33000 FT

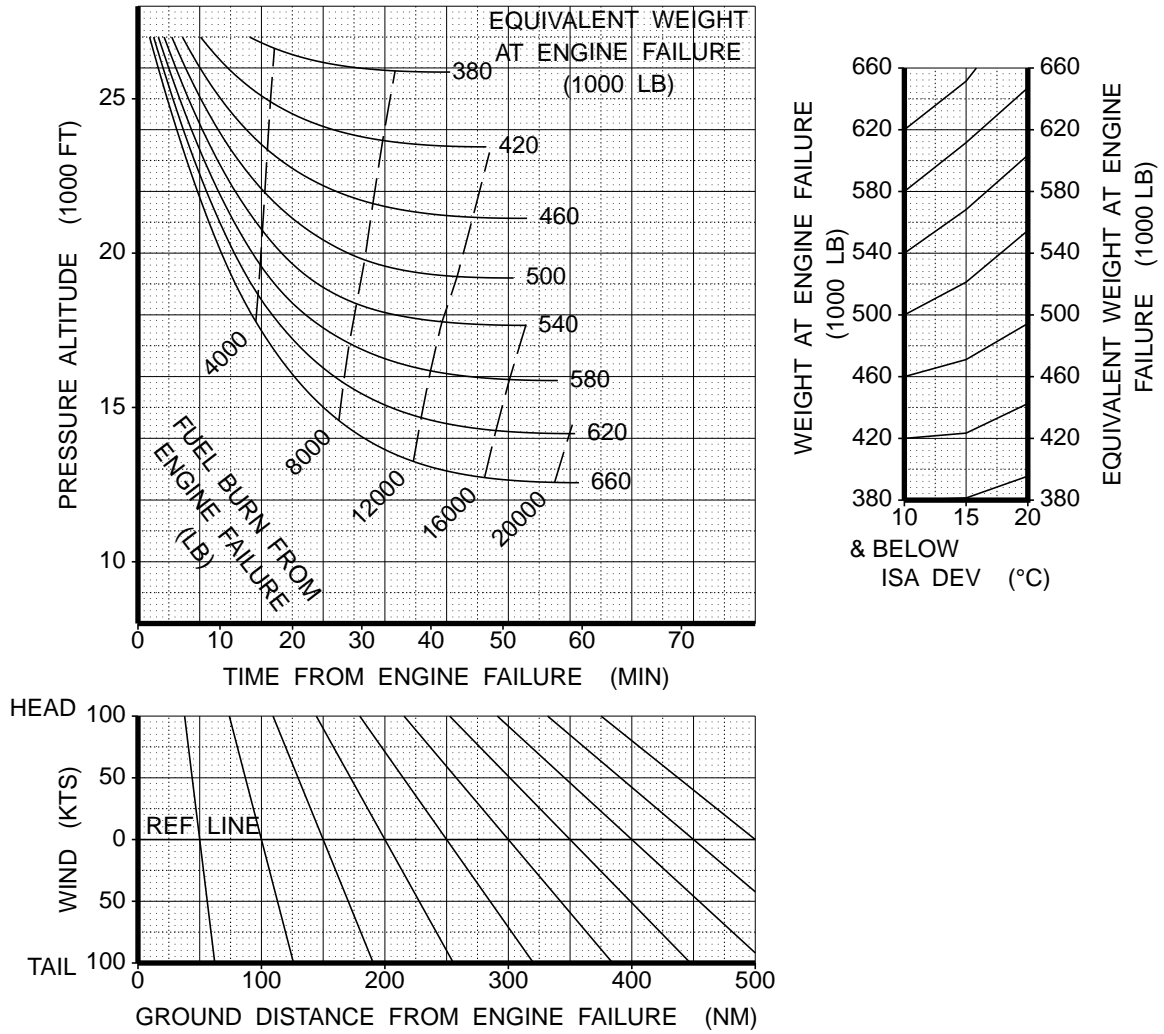


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
	8	10	12	14	16	18	20	22	24	26
ENGINE ONLY	9.4	7.8	5.6	4.3	4.9	6.0	7.1	6.9	6.8	6.3
ENGINE AND WING	15.9	13.2	10.2	8.5	9.1	10.2	11.9	11.4	11.1	10.1

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Driftdown Profiles Net Flight Path**  
**27000 FT to 29000 FT**



**Anti-Ice Adjustments**

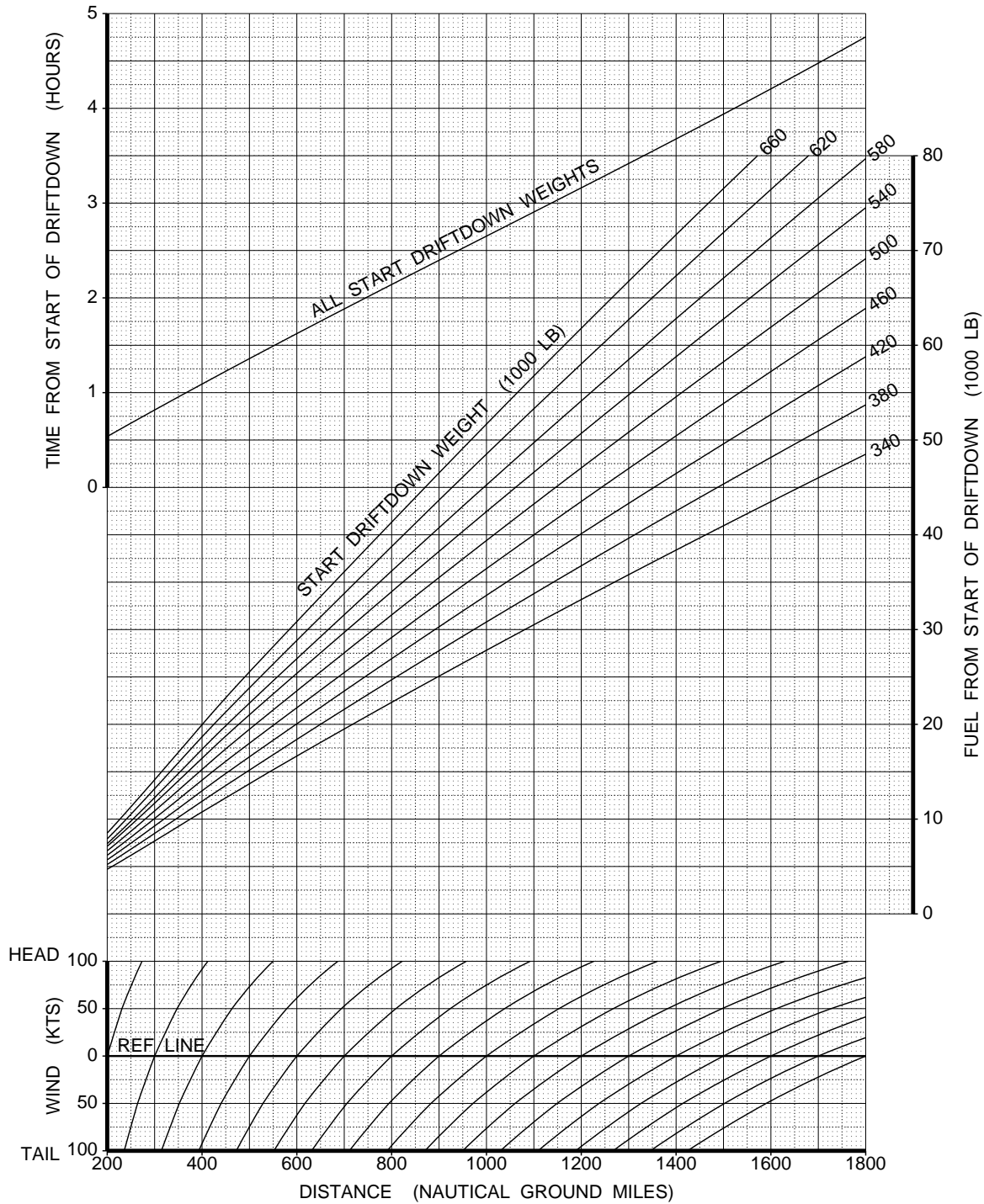
ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
	8	10	12	14	16	18	20	22	24	26
ENGINE ONLY	9.4	7.8	5.6	4.3	4.9	6.0	7.1	6.9	6.8	6.3
ENGINE AND WING	15.9	13.2	10.2	8.5	9.1	10.2	11.9	11.4	11.1	10.1

**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Driftdown/LRC Cruise Range Capability**

Includes APU fuel burn

Driftdown at optimum speed and cruise at Long Range Cruise speed.





Flight Planning and Performance Manual

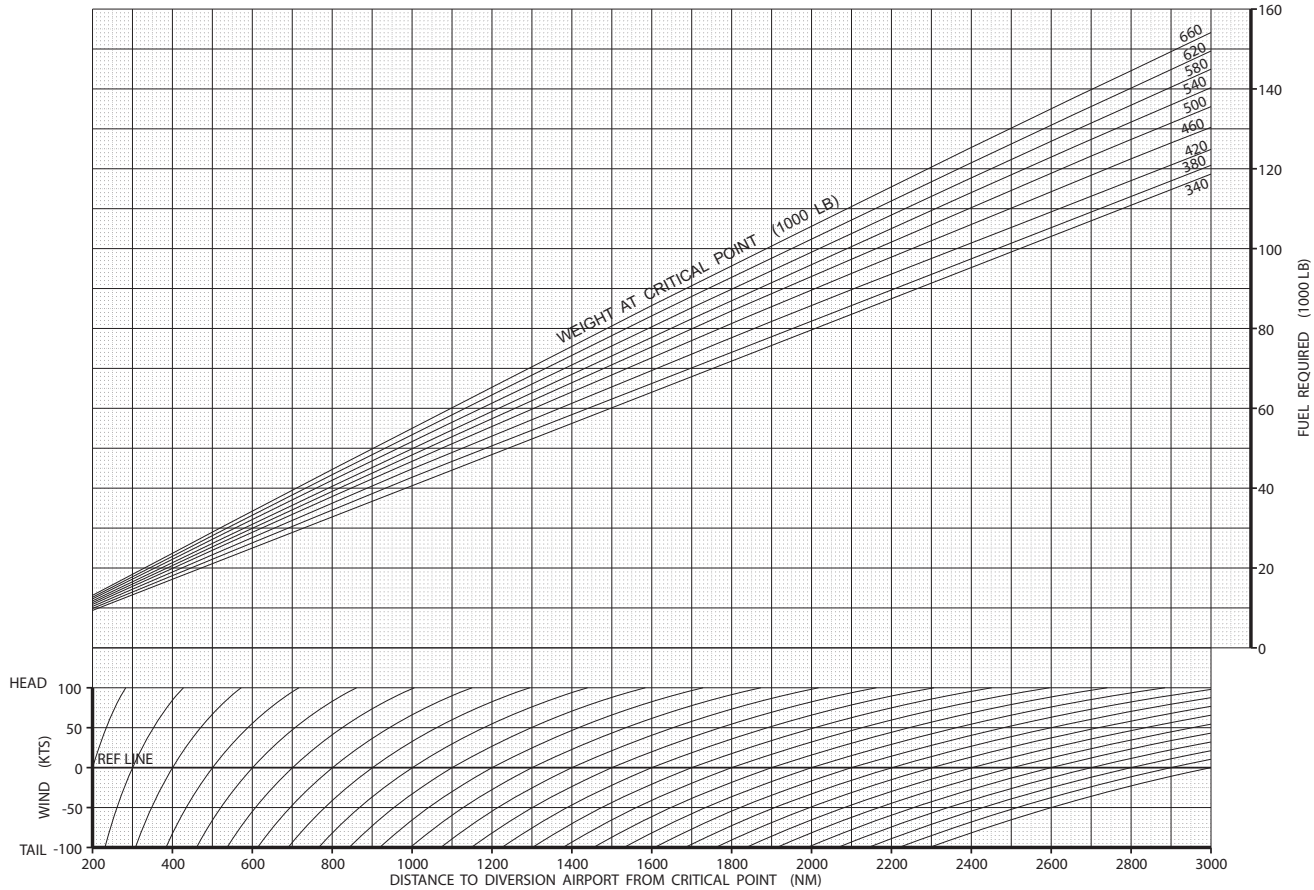
**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

Area of Operation

SPEED (M/KIAS)	WEIGHT AT DIVERSION (1000 LB)	DIVERSION DISTANCE (NM)										
		TIME (MINUTES)										
		60	75	90	120	138	180	207	240	270	300	330
.82/260	660	358	443	528	698	800	1037	1190	1376	1546	1716	1885
	620	366	452	538	711	815	1056	1212	1402	1575	1747	1920
	580	374	462	550	727	832	1079	1238	1432	1609	1785	1962
	540	381	471	561	742	850	1103	1266	1465	1645	1826	2007
	500	390	482	575	760	871	1130	1297	1500	1686	1871	2056
	460	400	495	590	780	894	1160	1331	1539	1729	1919	2109
	420	410	508	605	801	918	1191	1367	1582	1778	1973	2168
	380	420	521	621	822	943	1225	1406	1627	1828	2029	2231
340	428	531	635	842	966	1255	1441	1669	1875	2082	2289	
.84/280	660	381	472	562	744	853	1107	1271	1471	1652	1834	2016
	620	387	480	572	757	867	1126	1292	1495	1679	1864	2048
	580	395	489	583	770	883	1145	1314	1520	1708	1895	2083
	540	401	497	593	784	899	1167	1339	1549	1741	1932	2123
	500	410	507	605	800	917	1191	1366	1581	1776	1971	2166
	460	418	518	617	816	936	1214	1393	1612	1811	2010	2209
	420	426	528	629	832	954	1238	1421	1644	1847	2050	2253
	380	434	538	642	849	974	1264	1451	1679	1887	2094	2302
340	440	546	652	863	990	1286	1477	1709	1921	2132	2343	
.84/300	660	401	497	593	785	900	1169	1342	1553	1745	1937	2130
	620	408	505	603	798	915	1188	1363	1578	1773	1968	2163
	580	414	513	611	809	927	1204	1382	1599	1796	1994	2191
	540	419	519	619	819	939	1219	1399	1619	1819	2019	2219
	500	426	527	629	832	954	1238	1421	1645	1848	2051	2254
	460	432	535	638	845	968	1257	1443	1670	1876	2082	2288
	420	438	543	647	857	982	1275	1464	1694	1903	2113	2322
	380	443	549	656	868	995	1292	1483	1717	1929	2141	2353
340	448	556	663	878	1007	1308	1501	1737	1952	2167	2382	
.84/320	660	419	519	619	820	940	1221	1401	1622	1822	2023	2223
	620	424	526	628	831	953	1238	1421	1645	1848	2052	2255
	580	430	533	636	843	966	1255	1441	1668	1874	2080	2286
	540	434	538	642	850	975	1267	1454	1683	1892	2100	2308
	500	438	543	649	859	985	1279	1469	1700	1910	2120	2331
	460	443	549	655	868	995	1292	1483	1717	1929	2141	2353
	420	448	555	662	877	1006	1306	1499	1736	1950	2165	2380
	380	452	561	669	886	1017	1321	1516	1755	1972	2189	2406
340	456	565	675	894	1026	1332	1530	1771	1990	2209	2428	
LRC	660	421	522	621	819	936	1208	1380	1588	1776	1963	2148
	620	423	523	622	819	935	1205	1377	1584	1771	1956	2140
	580	422	521	620	815	932	1200	1370	1576	1762	1946	2129
	540	417	514	612	805	920	1185	1353	1557	1741	1924	2105
	500	416	513	610	803	917	1181	1348	1551	1734	1916	2096
	460	415	512	609	800	914	1176	1343	1545	1727	1908	2087
	420	416	513	610	801	914	1176	1343	1544	1726	1906	2084
	380	417	515	612	804	919	1181	1348	1549	1730	1910	2088
340	415	513	611	803	917	1179	1345	1545	1726	1905	2082	

**ALL ENGINES**

**Decompression Critical Fuel Reserves - LRC Cruise**



Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land.  
Allowance for performance deterioration not included.

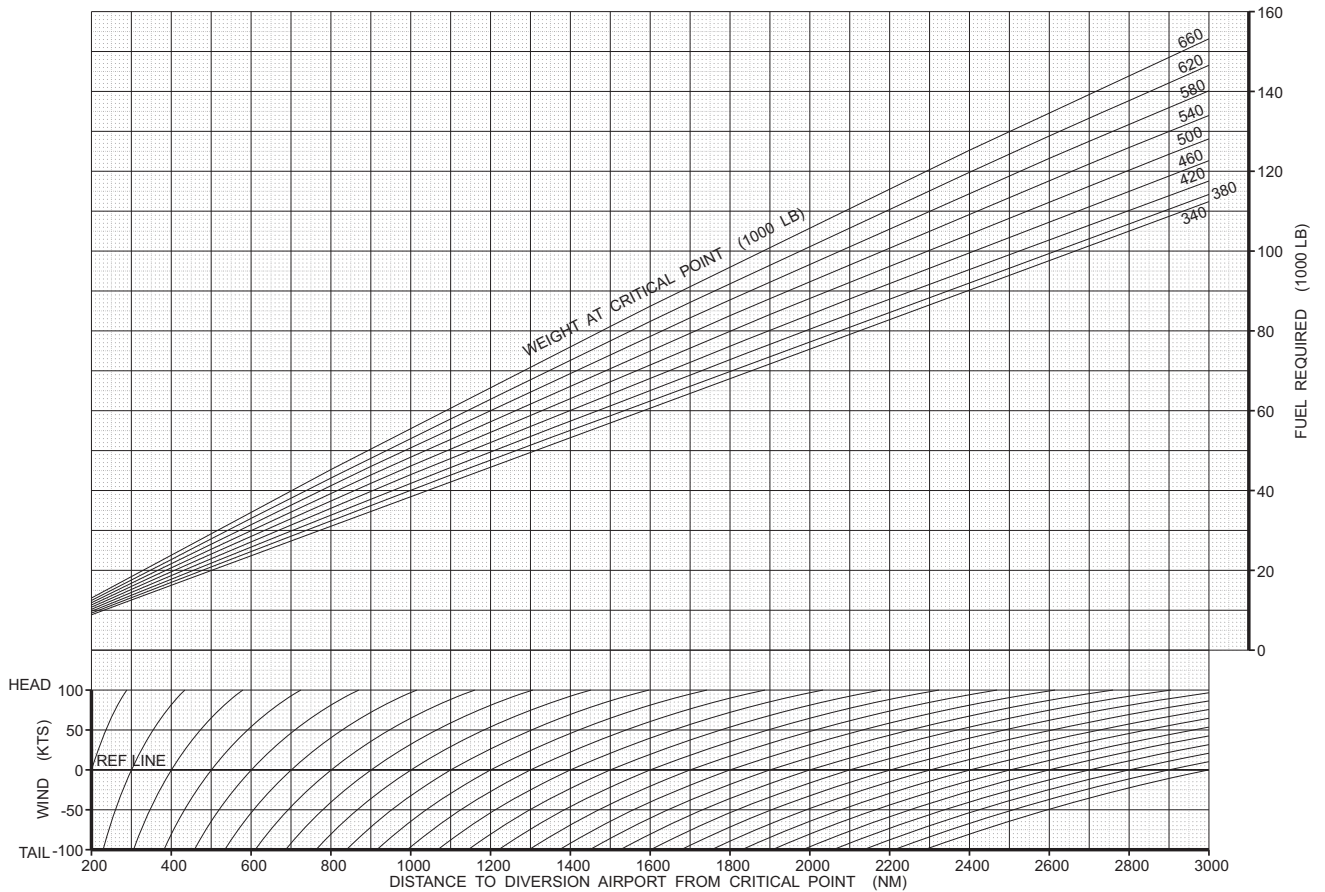
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (5%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Decompression Critical Fuel Reserves - LRC Cruise**



Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

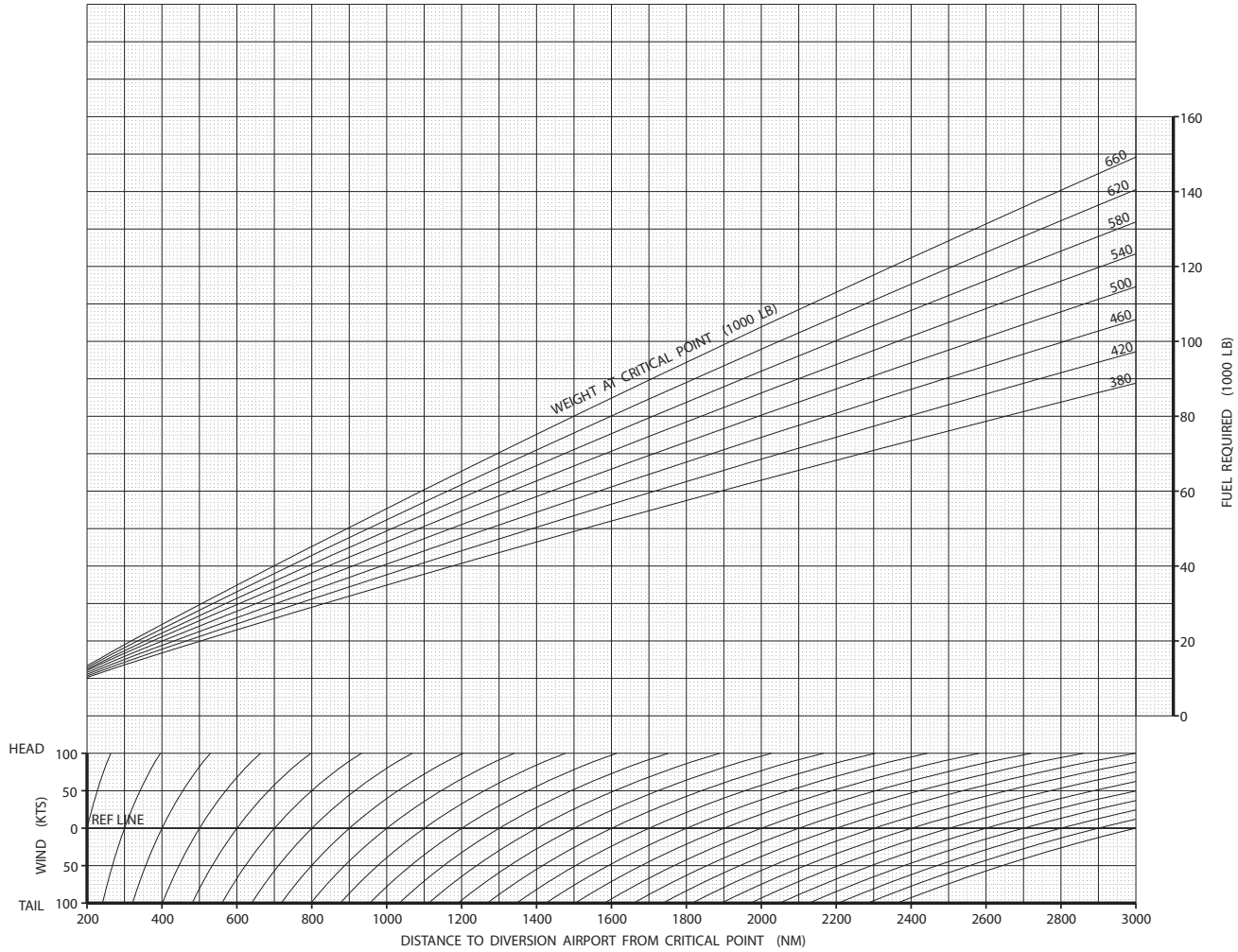
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise**



Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

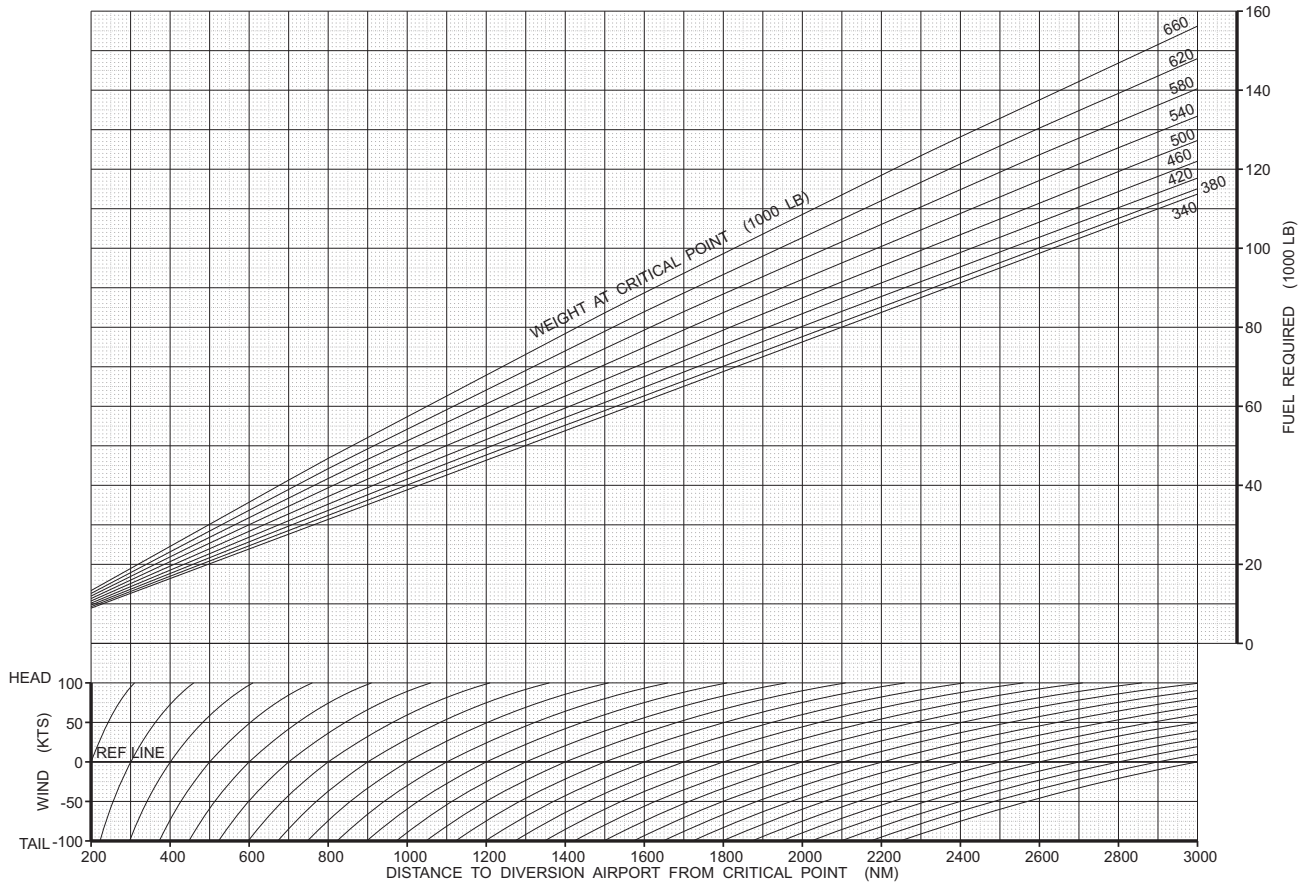
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Decompression Critical Fuel Reserves - 260 KIAS Cruise**



Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

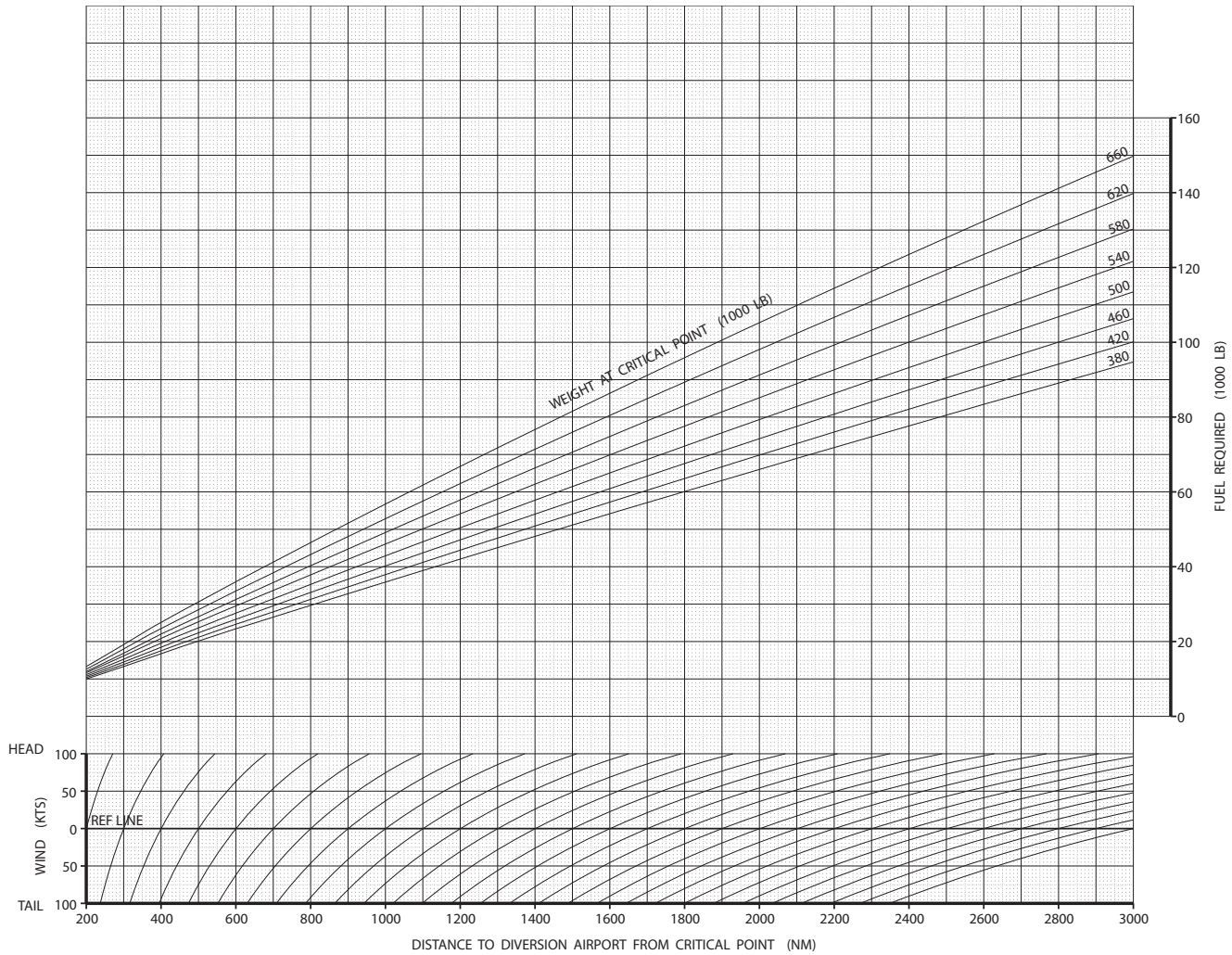
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (7%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Driftdown Critical Fuel Reserves - .82M/260 KIAS Driftdown/Cruise**



Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

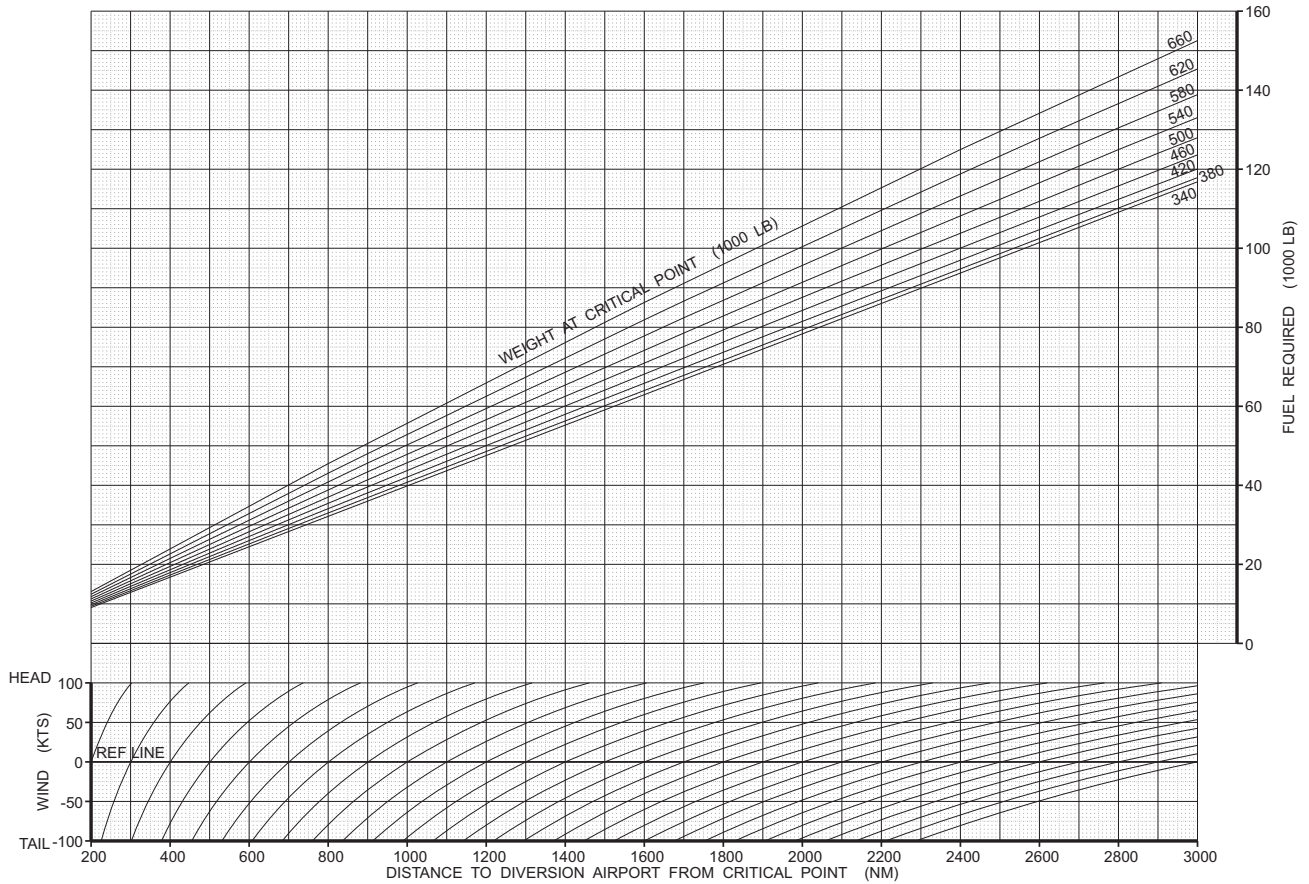
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Decompression Critical Fuel Reserves - 280 KIAS Cruise**



Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

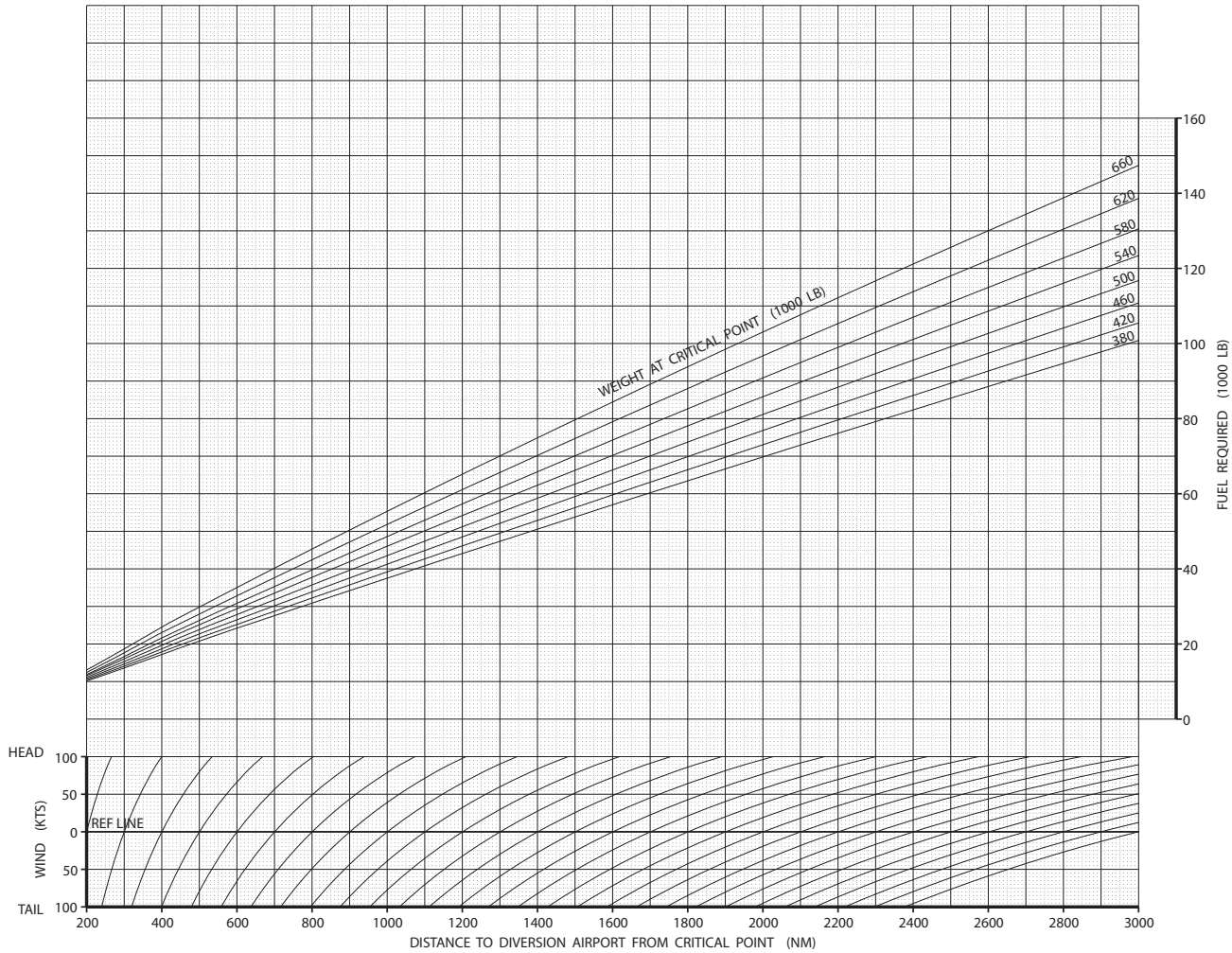
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (7%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Driftdown Critical Fuel Reserves - .84M/280 KIAS Driftdown/Cruise**



Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

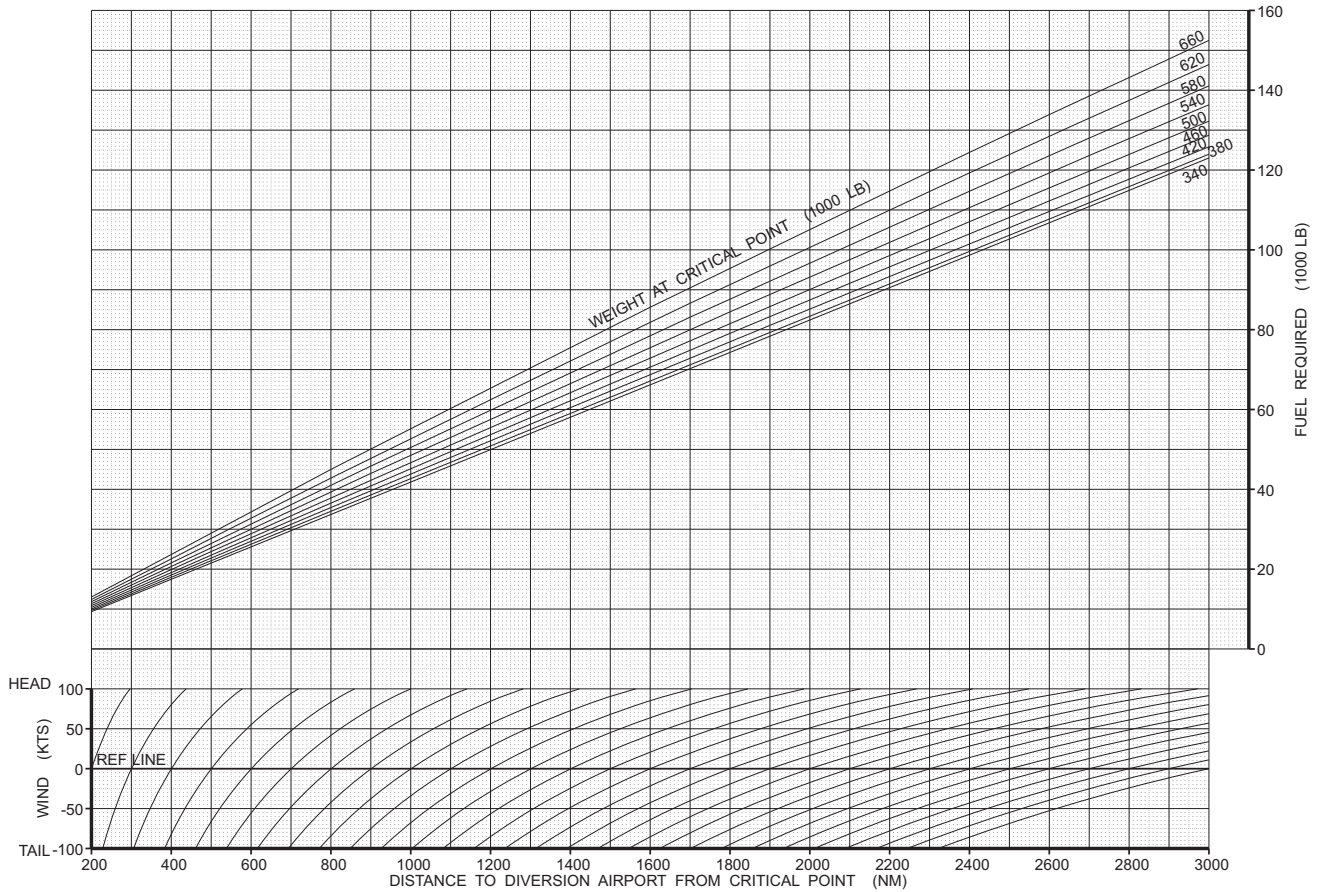
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Decompression Critical Fuel Reserves - 300 KIAS Cruise**



Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

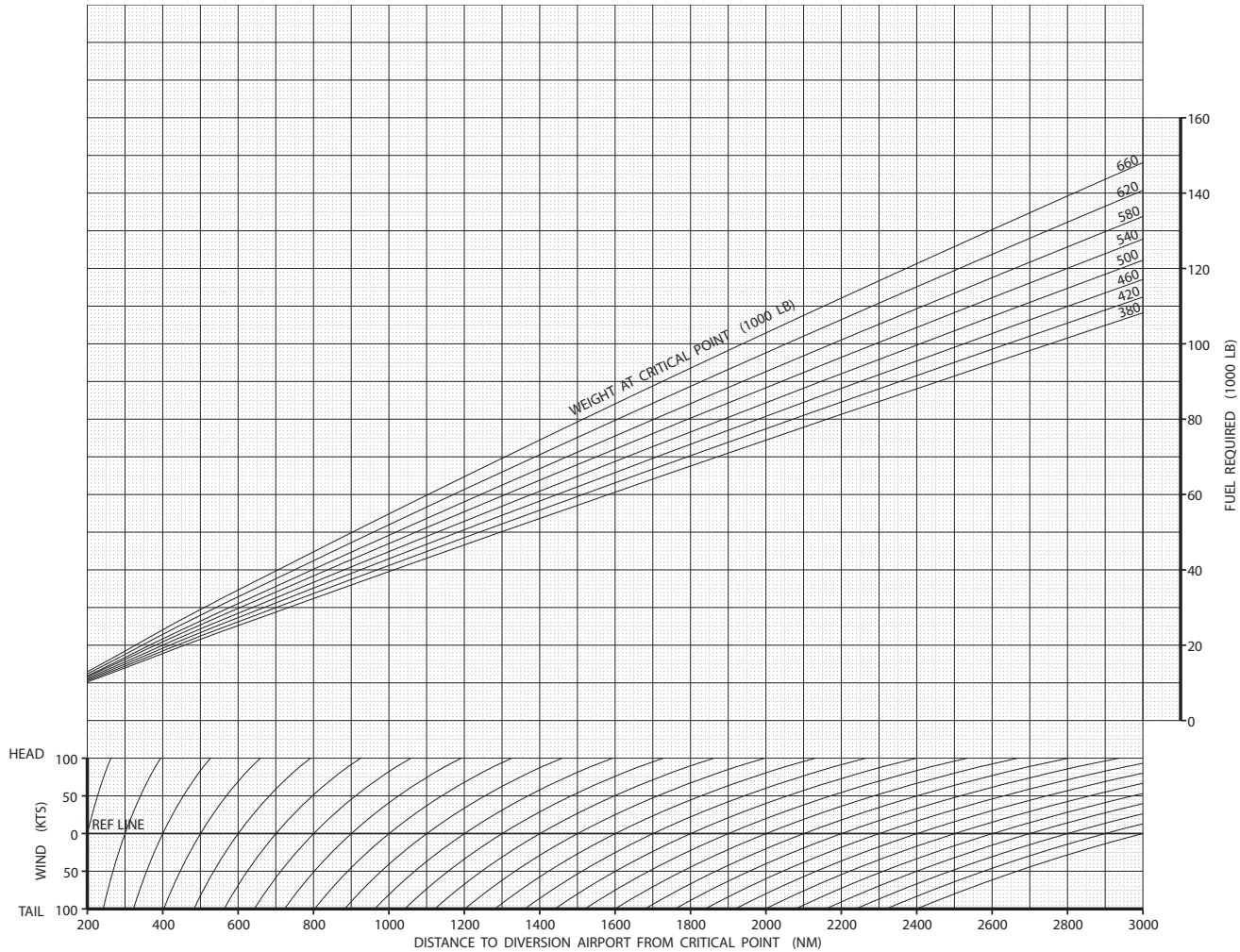
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Driftdown Critical Fuel Reserves - .84M/300 KIAS Driftdown/Cruise**



Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

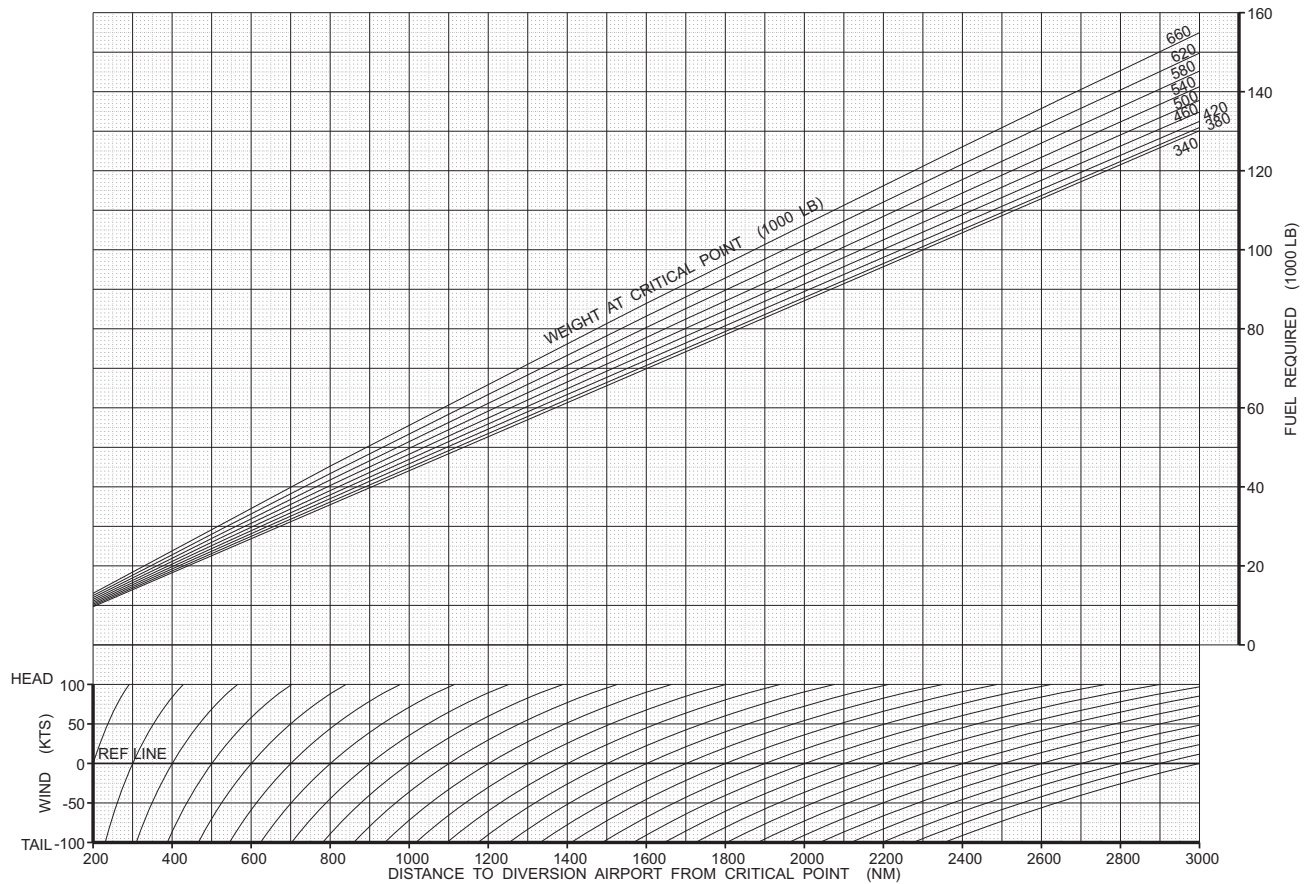
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (11%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Decompression Critical Fuel Reserves - 320 KIAS Cruise**



Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

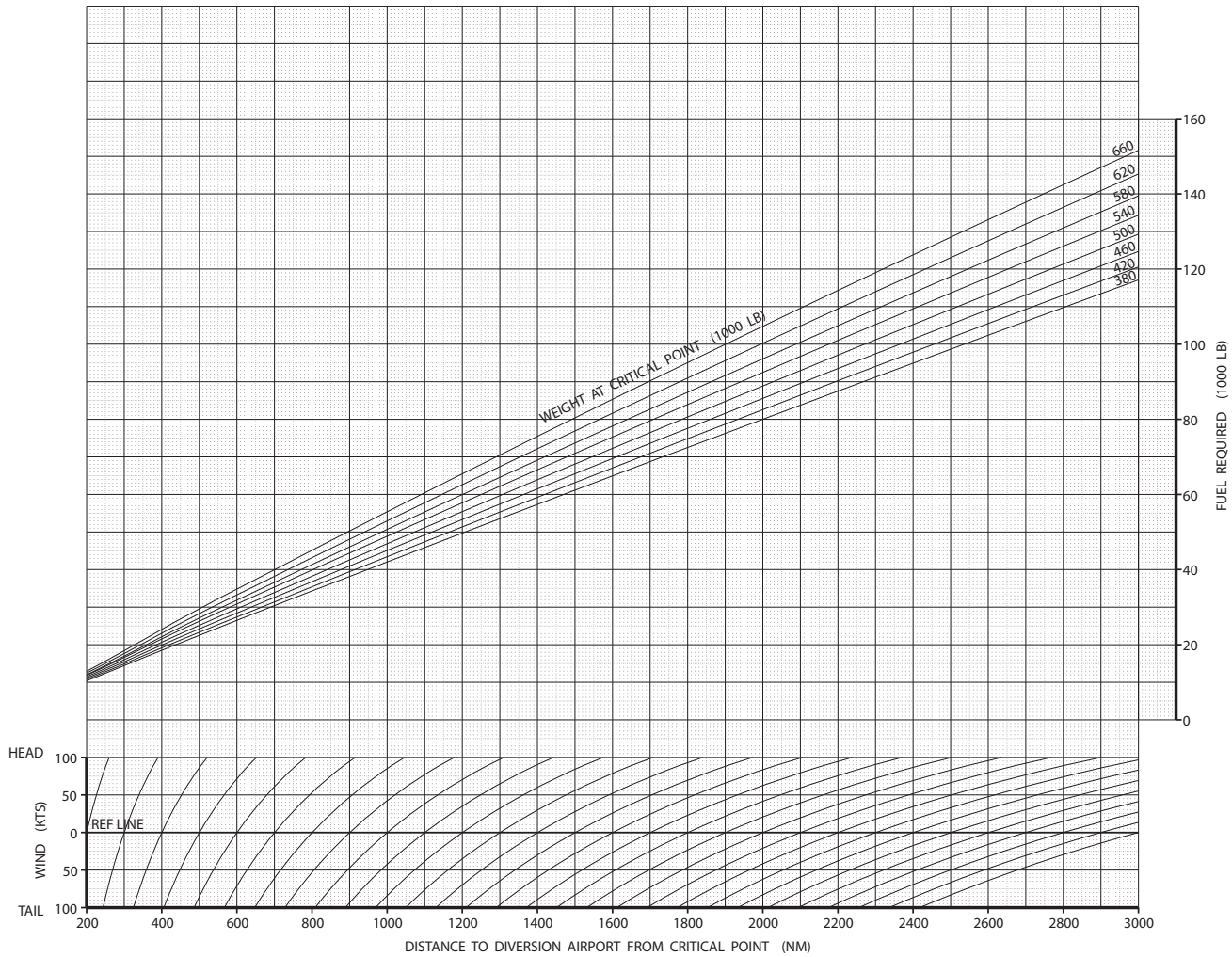
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Driftdown Critical Fuel Reserves - .84M/320 KIAS Driftdown/Cruise**



Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

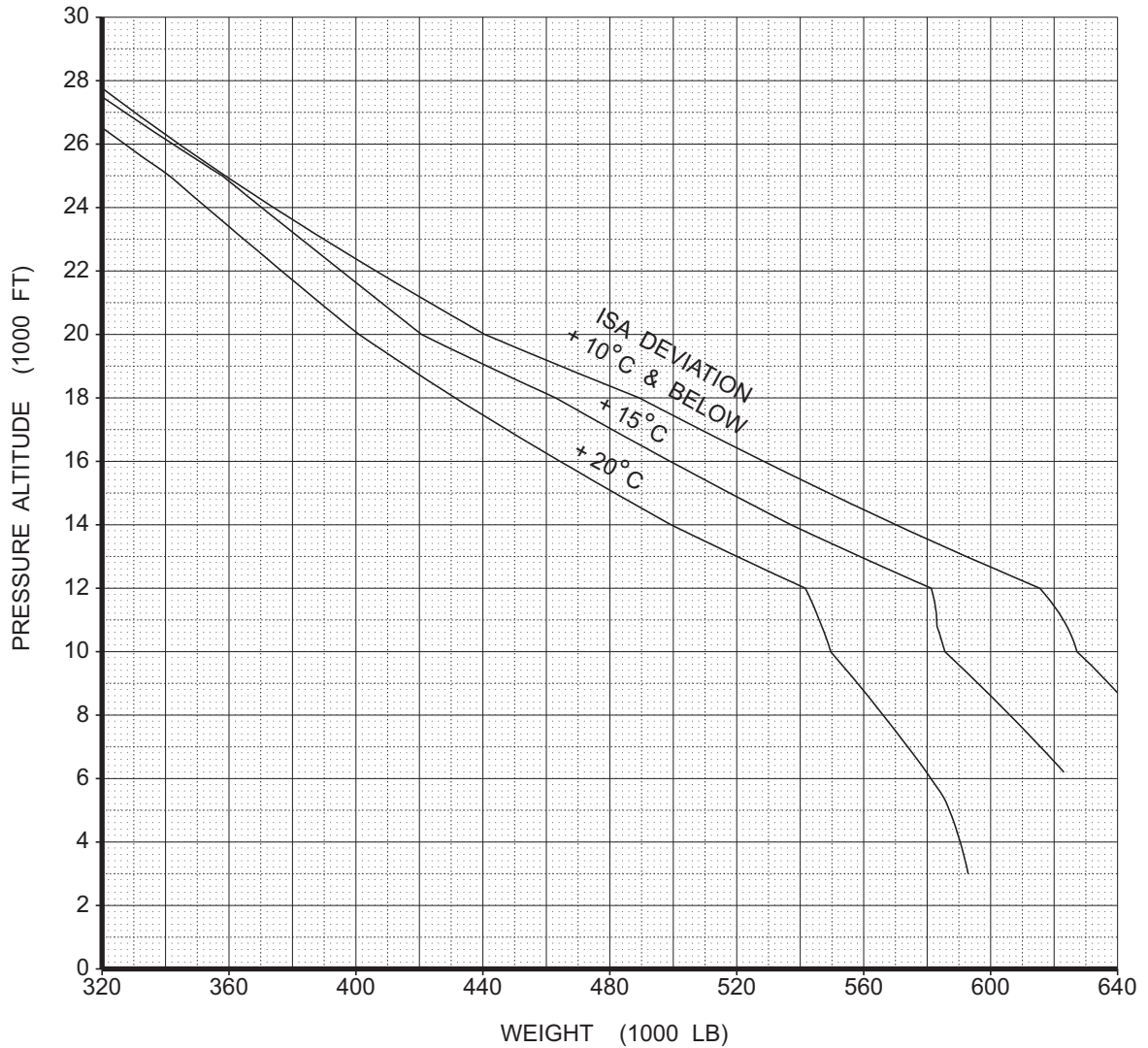
**Adjustments:**

- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required by 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (11%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Net Level Off Weight**

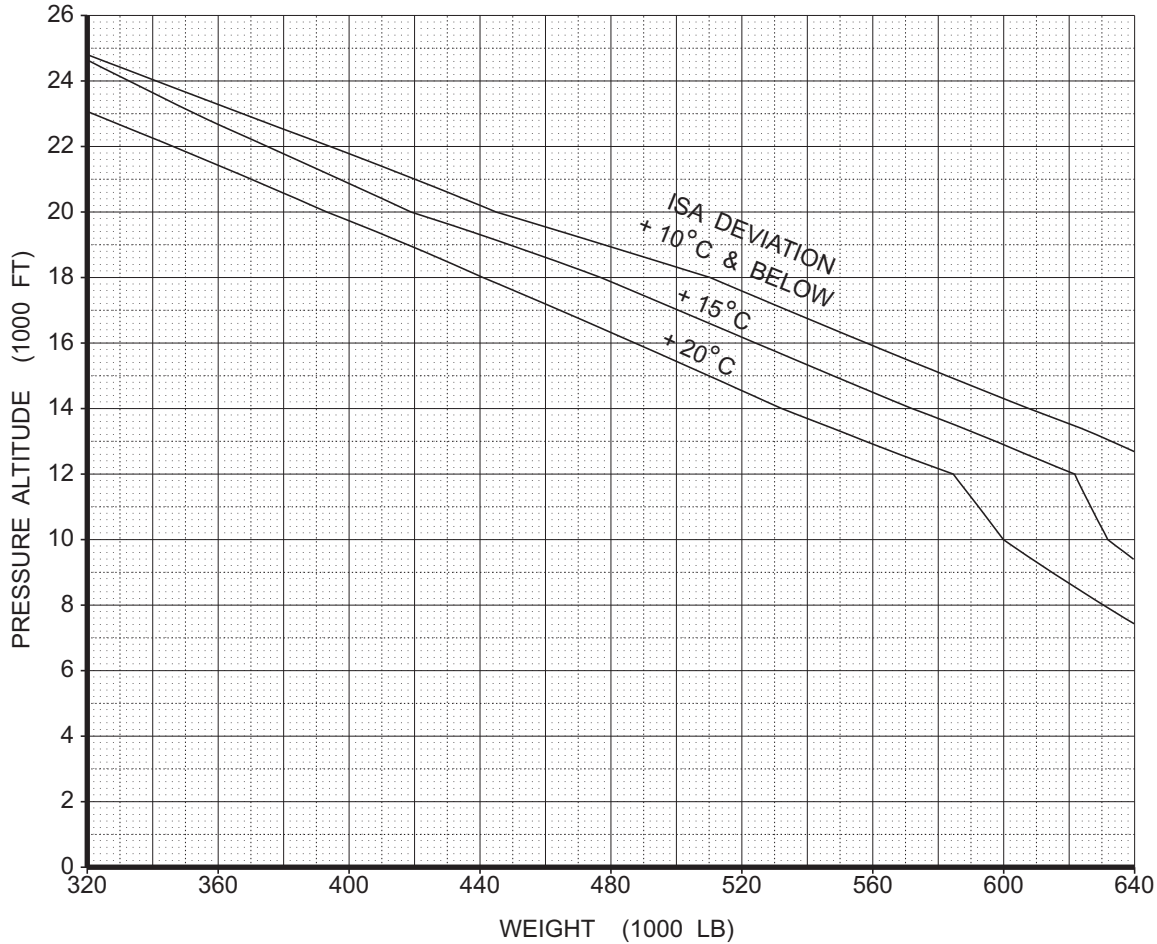


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)								
	PRESSURE ALTITUDE (1000 FT)								
	10	12	14	16	18	20	22	24	26
ENGINE ONLY	-2.6	-2.7	-1.7	-2.4	-4.8	-6.6	-7.8	-7.3	-6.6
ENGINE AND WING	-9.1	-7.1	-5.7	-6.3	-8.9	-12.1	-12.8	-12.7	-11.4

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**260 KIAS Net Level Off Weight**

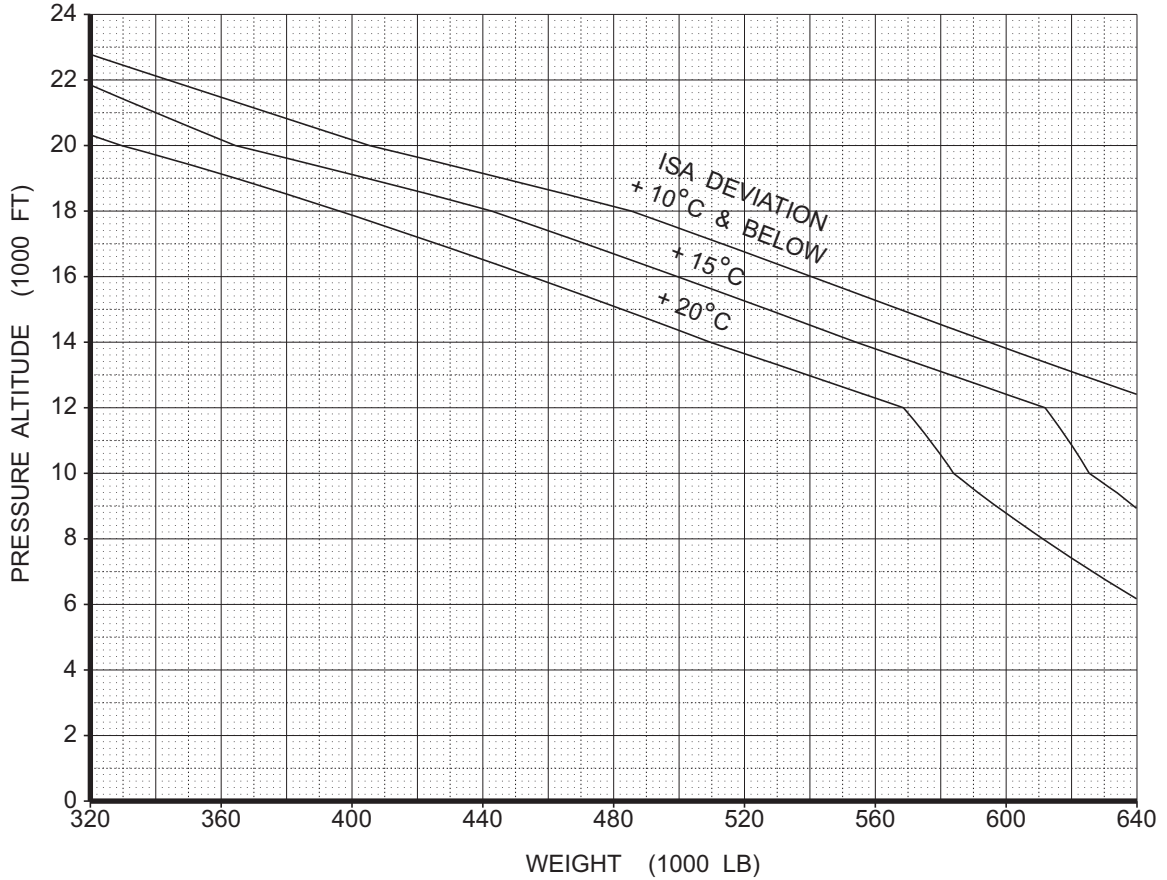


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)					
	PRESSURE ALTITUDE (1000 FT)					
	14	16	18	20	22	24
ENGINE ONLY	-3.2	-6.3	-7.2	-8.6	-11.5	-11.5
ENGINE AND WING	-7.6	-11.3	-12.5	-15.7	-20.5	-20.1

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**280 KIAS Net Level Off Weight**

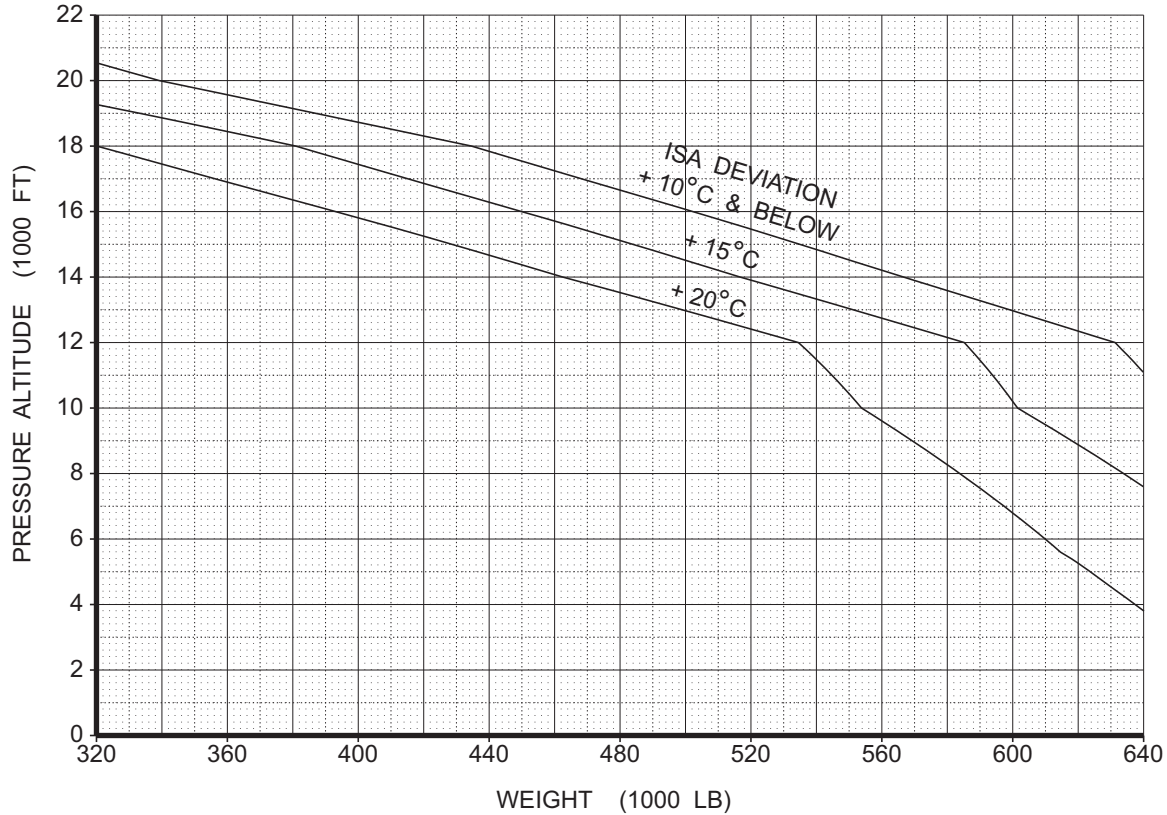


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)				
	PRESSURE ALTITUDE (1000 FT)				
	14	16	18	20	22
ENGINE ONLY	-3.0	-4.0	-8.4	-10.9	-11.7
ENGINE AND WING	-8.2	-9.7	-15.3	-21.0	-20.8

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**300 KIAS Net Level Off Weight**

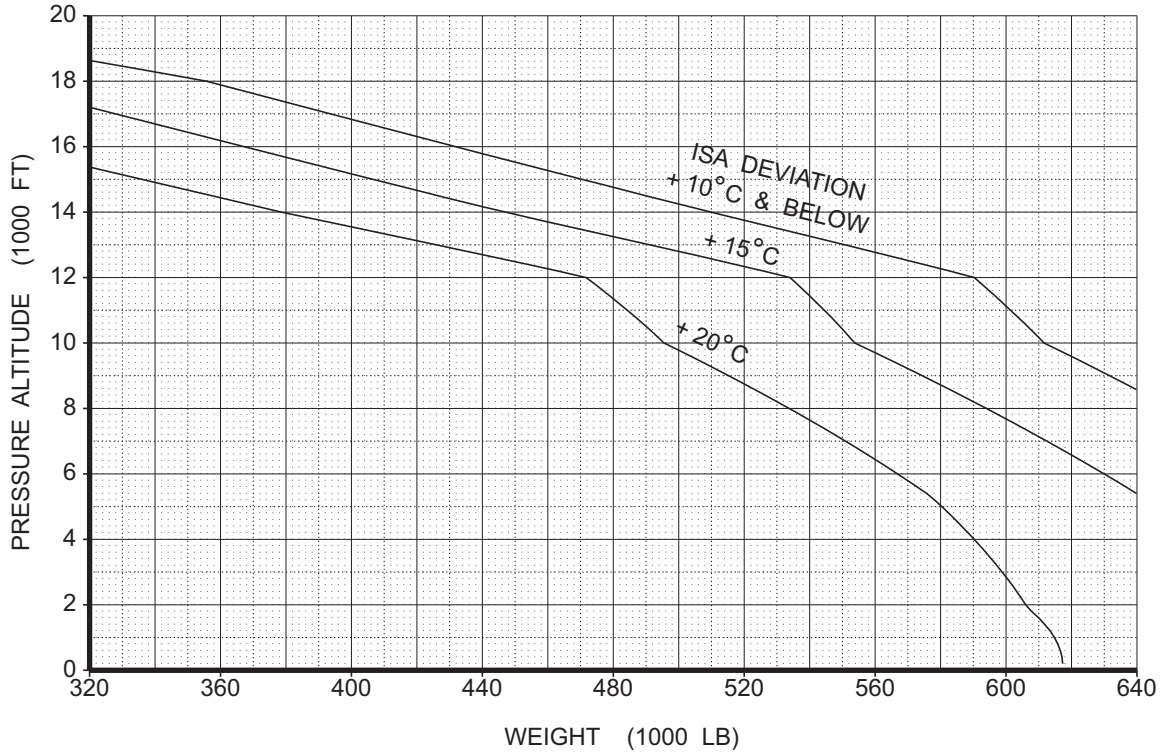


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)				
	PRESSURE ALTITUDE (1000 FT)				
	12	14	16	18	20
ENGINE ONLY	-4.4	-2.9	-4.3	-10.1	-11.8
ENGINE AND WING	-10.6	-9.4	-11.6	-19.0	-22.0

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Net Level Off Weight**

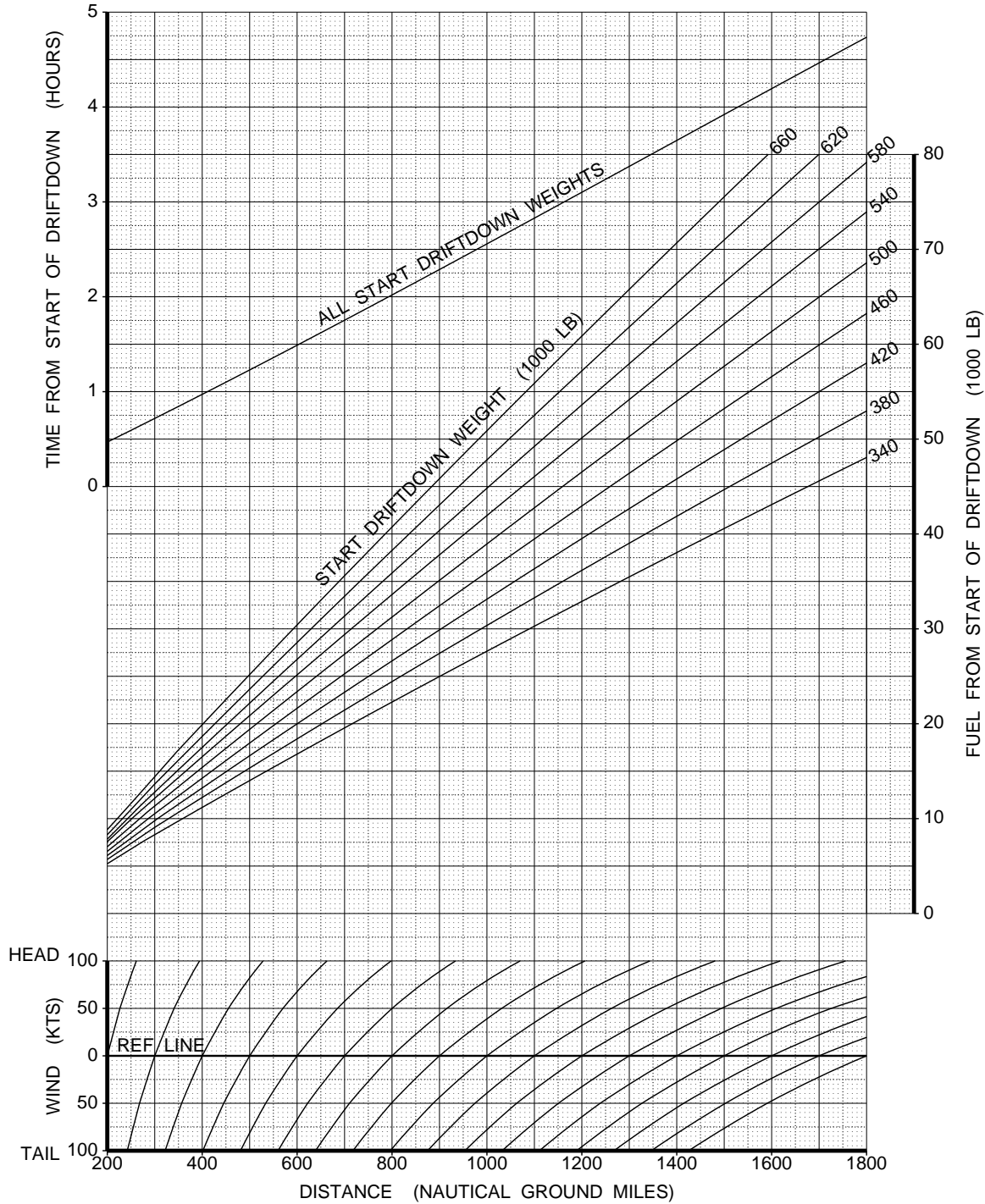


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)				
	PRESSURE ALTITUDE (1000 FT)				
	10	12	14	16	18
ENGINE ONLY	-3.3	-4.5	-3.0	-4.4	-5.5
ENGINE AND WING	-11.8	-12.4	-11.2	-13.5	-15.9

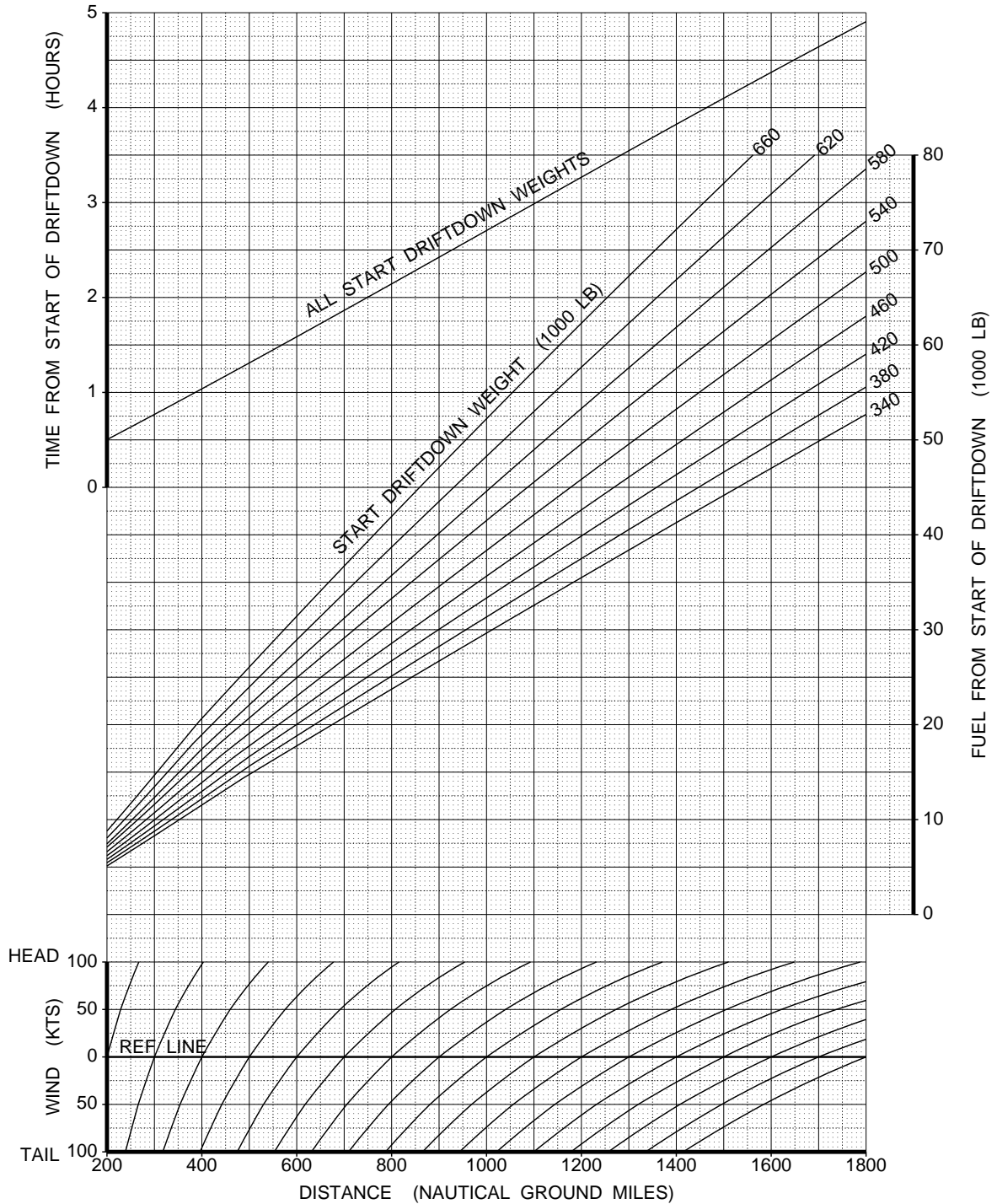
**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Long Range Cruise Driftdown/Cruise Range Capability**  
Includes APU fuel burn



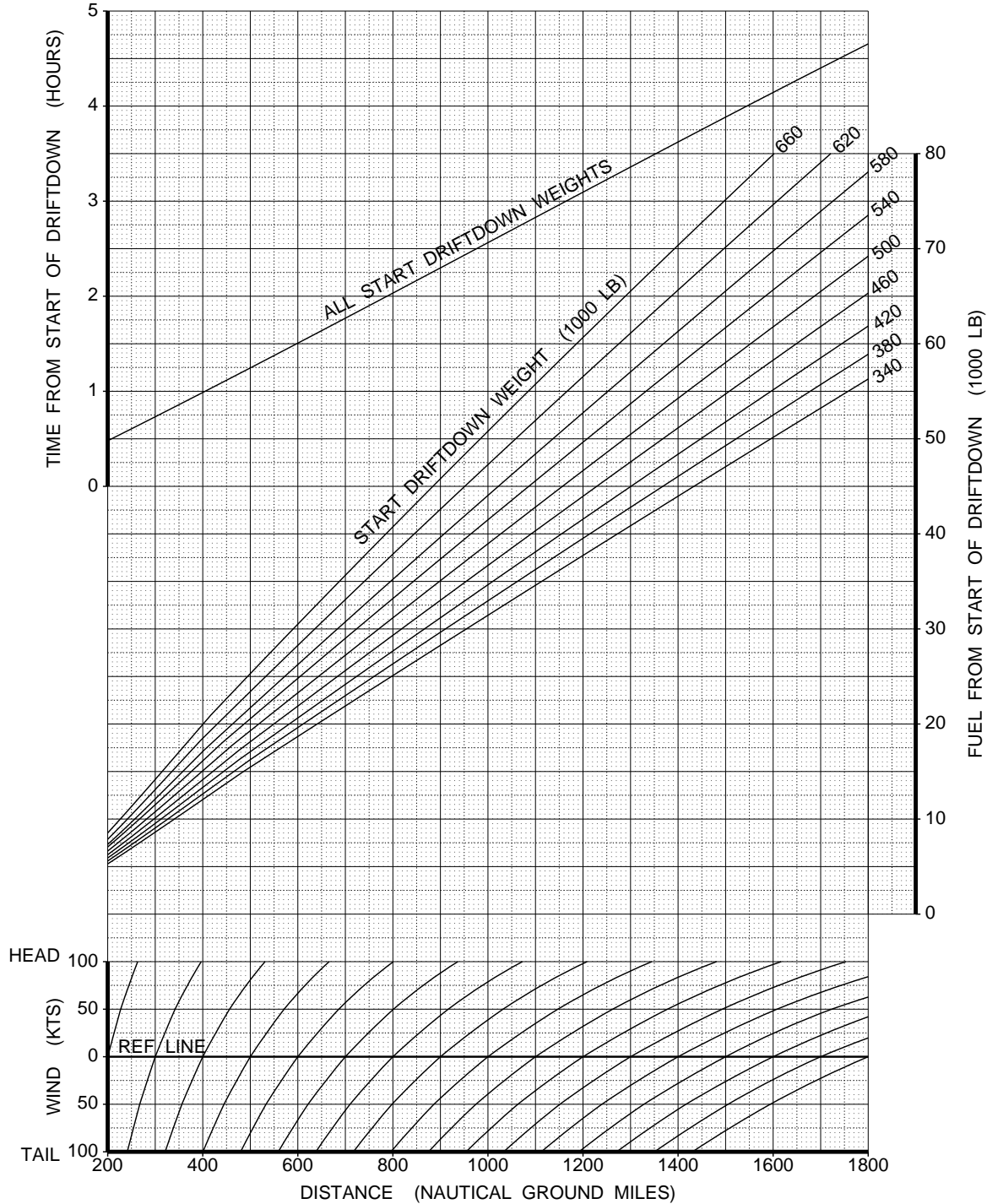
**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**.84M/260 KIAS Driftdown/Cruise Range Capability**  
 Includes APU fuel burn



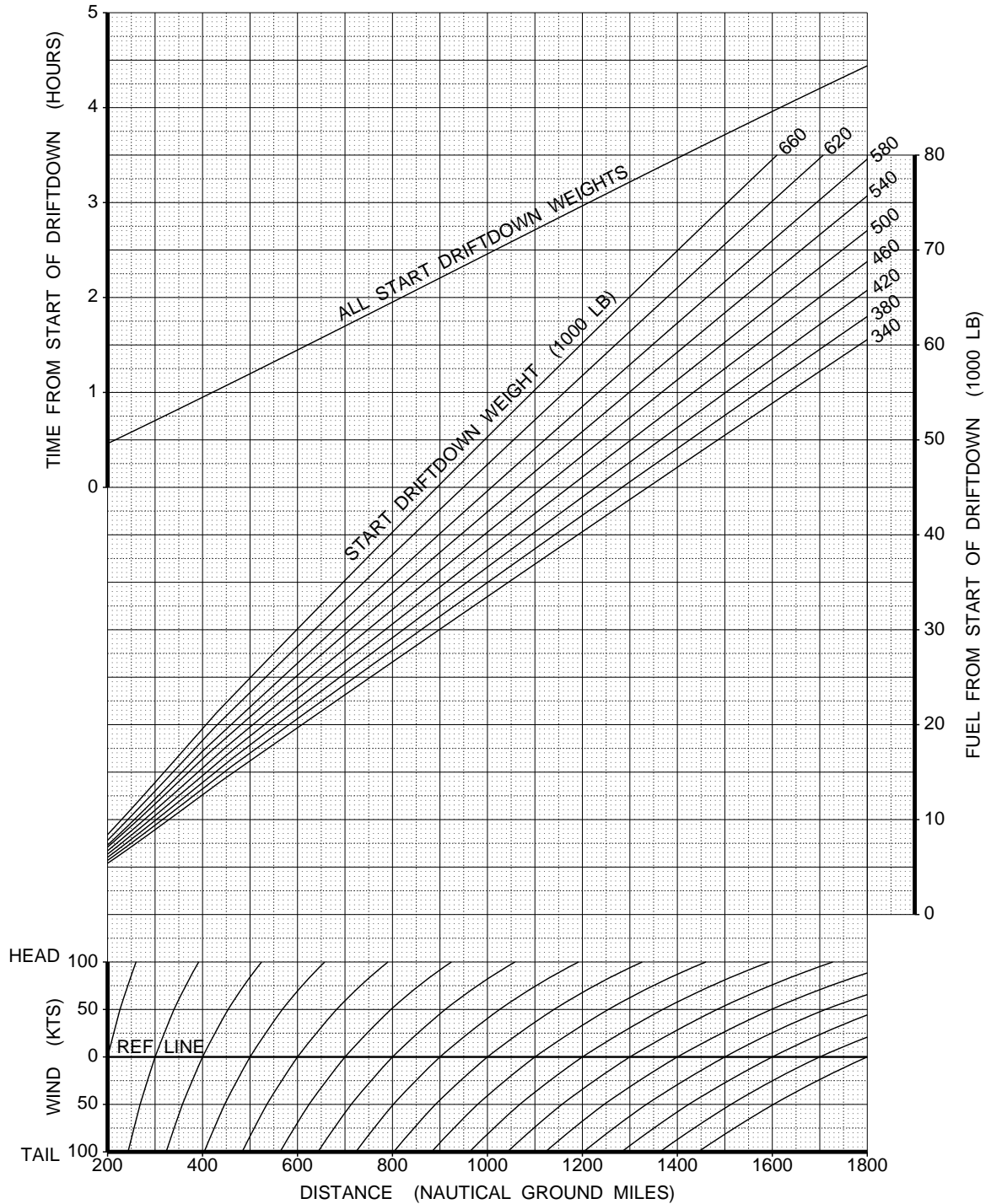
**ENGINE INOP**  
MAX CONTINUOUS THRUST

**.84M/280 KIAS Driftdown/Cruise Range Capability**  
Includes APU fuel burn



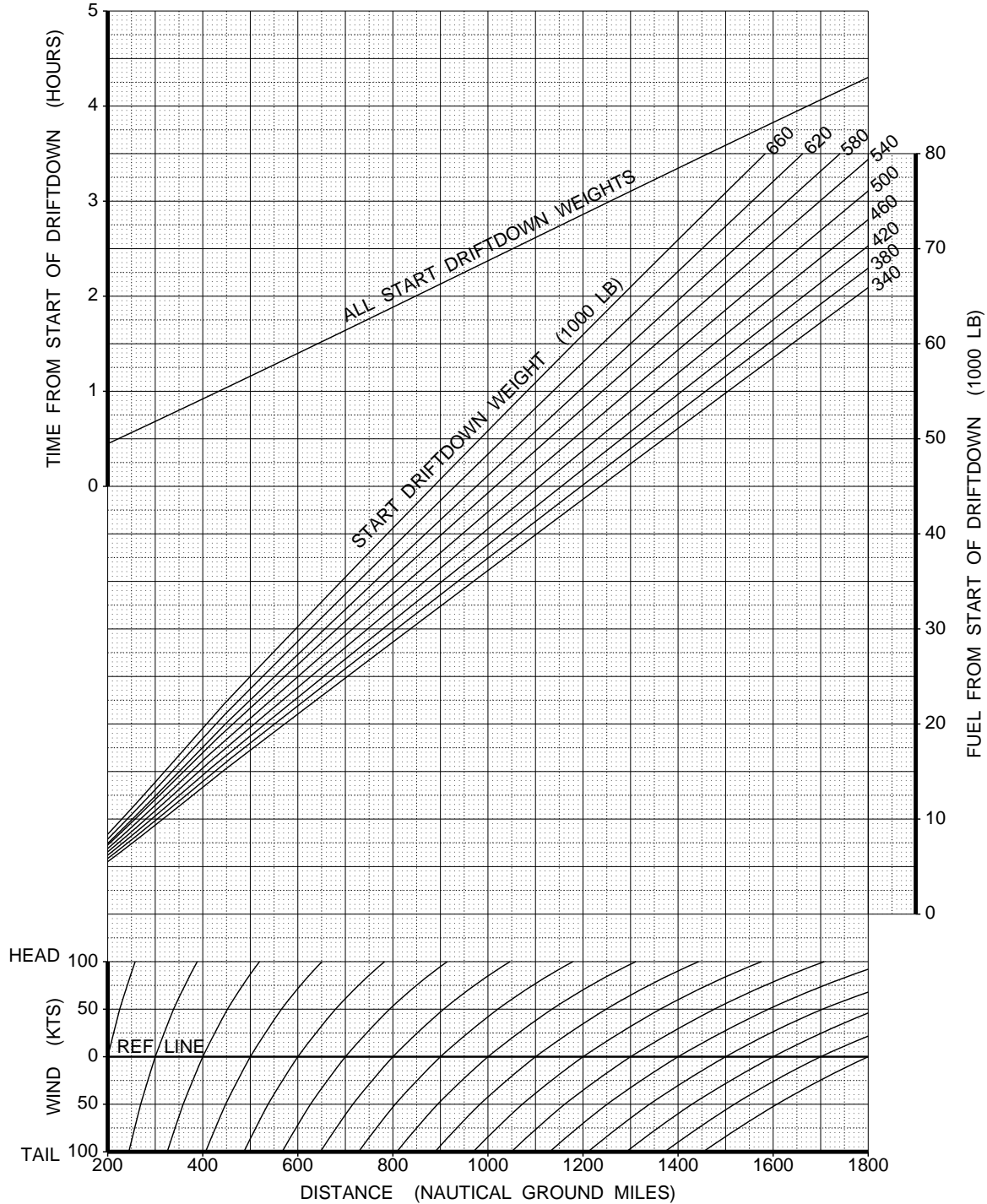
**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**.84M/300 KIAS Driftdown/Cruise Range Capability**  
 Includes APU fuel burn



**ENGINE INOP**  
MAX CONTINUOUS THRUST

**.84M/320 KIAS Driftdown/Cruise Range Capability**  
Includes APU fuel burn





# ENROUTE

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## Introduction

This chapter contains inflight data for use as general reference in airplane performance monitoring, flight planning studies and as a supplement to information provided in the Operations Manual.

## 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. Note that these tables consider 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 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

### Enroute Climb

The Enroute Climb tables are based on 310/.84 climb speed. Local ATC may require that 250 KIAS not be exceeded below 10000 ft. See Flight Planning Allowances in Chapter 2 for additional fuel burn when this restriction is imposed.

### Long Range Cruise Enroute Fuel and Time

These charts are provided to determine if the fuel remaining is sufficient to complete the trip at Long Range Cruise and to approximate the time remaining. The charts also enable rapid determination of fuel and time required to proceed to an alternate airfield.

Fuel and time are read in a similar manner to the Long Range Cruise trip fuel and time charts in Chapter 2 with distance to destination replacing total trip distance; i.e., climb phase is excluded.

### Cruise Tables

Cruise tables are provided for Long Range Cruise and .84M speed schedules with both engines operating assuming normal engine bleed for air conditioning (2 bleeds/2 packs on). These tables are similar to the cruise control tables presented in the Performance Inflight chapter of QRH and are expanded to include true airspeed and Max Cruise thrust setting information.

To account for APU fuel burn, refer to the APU Operation During Flight table in the chapter 2 text.

## Wind-Altitude Trade

Wind is a factor which may justify operations considerably above or 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 the applicable 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. Tables are provided for Long Range Cruise and .84M. 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 three descent speed schedules. This data includes the effect of a 250 KIAS speed restriction below 10000 ft and includes a straight in approach with flaps down at the outer marker.

## Holding

EPR, indicated airspeed and fuel flow information are tabulated for holding at flaps up and flaps 1 based on the recommended holding speeds. Small variations in airspeed will not appreciably affect the overall endurance time. The fuel flow is based on a racetrack holding pattern. For holding in straight and level flight, these values may be reduced by 5%.

## Engine Inoperative

### Altitude Capability

The Engine Inoperative Altitude Capability tables are based on the thrust limited capability with 100 ft/min residual rate of climb. For the engine inoperative case, buffet capability is not considered limiting. Tables are shown for Long Range Cruise and constant speeds of 260, 280, 300, and 320 KIAS for both Max Continuous and Max Cruise Thrust. Adjust the table values for thermal anti-ice operation as shown below the tables.

### Cruise Tables

Cruise tabulations for engine inoperative are based on use of Max Continuous Thrust. A heavy line is shown to denote the approximate Max Cruise thrust limits. Tables are provided for Long Range Cruise and constant speeds of 260, 280, 300 and 320 KIAS. The fuel flow values in these tables reflect only the engine fuel burn. To conservatively account for APU fuel burn, refer to the APU Operation During Flight table in the chapter 2 text.

### **Diversion Fuel and Time**

These charts enable rapid determination of fuel and time required to proceed to an alternate airfield (or continue to destination) with one engine inoperative. Data are shown for Long Range Cruise and constant speeds of 260, 280, 300 and 320 KIAS. The fuel required is based on cruise plus descent with straight in approach to touchdown. Diversion fuel and time are determined in a manner similar to the All Engine Long Range Cruise Enroute Fuel and Time chart.

### **Holding**

EPR required, ISA and fuel flow are shown for one engine inoperative holding based on the recommended speeds described earlier in this chapter. The fuel flow is based on a racetrack holding pattern and may be reduced by 5% for holding in straight and level flight.

## Long Range Cruise Maximum Operating Altitude

### Max Climb 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°)
660	29600	0	33100*	33100*	33100*	33100*	32000
640	30200	-1	33900*	33900*	33900*	33900*	32600
620	30900	-3	34700*	34700*	34700*	34700	33300
600	31600	-4	35400*	35400*	35400*	35400	34000
580	32400	-6	36100*	36100*	36100*	36100	34700
560	33100	-8	36700*	36700*	36700*	36700*	35500
540	33900	-9	37500*	37500*	37500*	37500*	36200
520	34700	-11	38200*	38200*	38200*	38200*	37000
500	35500	-13	39100*	39100*	39100*	39100*	37800
480	36400	-14	39900*	39900*	39900*	39900*	38700
460	37300	-14	40800*	40800*	40800*	40800*	39600
440	38200	-14	41700*	41700*	41700*	41700*	40500
420	39200	-14	42600*	42600*	42600*	42600*	41500
400	40200	-14	43100	43100	43100	43100	42500
380	41200	-14	43100	43100	43100	43100	43100
360	42400	-14	43100	43100	43100	43100	43100
340	43100	-14	43100	43100	43100	43100	43100

### 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°)
660	29600	6	32200*	32200*	32200*	32200*	32000
640	30200	5	33000*	33000*	33000*	33000*	32600
620	30900	3	33800*	33800*	33800*	33800*	33300
600	31600	1	34700*	34700*	34700*	34700*	34000
580	32400	0	35500*	35500*	35500*	35500*	34700
560	33100	-2	36100*	36100*	36100*	36100*	35500
540	33900	-4	36800*	36800*	36800*	36800*	36200
520	34700	-6	37600*	37600*	37600*	37600*	37000
500	35500	-7	38500*	38500*	38500*	38500*	37800
480	36400	-9	39300*	39300*	39300*	39300*	38700
460	37300	-9	40200*	40200*	40200*	40200*	39600
440	38200	-9	41100*	41100*	41100*	41100*	40500
420	39200	-9	42000*	42000*	42000*	42000*	41500
400	40200	-9	43000*	43000*	43000*	43000*	42500
380	41200	-9	43100	43100	43100	43100	43100
360	42400	-9	43100	43100	43100	43100	43100
340	43100	-9	43100	43100	43100	43100	43100

### 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°)
660	29600	12	30800*	30800*	30800*	30800*	30800*
640	30200	10	31700*	31700*	31700*	31700*	31700*
620	30900	9	32700*	32700*	32700*	32700*	32700*
600	31600	7	33600*	33600*	33600*	33600*	33600*
580	32400	5	34500*	34500*	34500*	34500*	34500*
560	33100	4	35400*	35400*	35400*	35400*	35400*
540	33900	2	36100*	36100*	36100*	36100*	36100*
520	34700	0	36800*	36800*	36800*	36800*	36800*
500	35500	-2	37600*	37600*	37600*	37600*	37600*
480	36400	-3	38400*	38400*	38400*	38400*	38400*
460	37300	-3	39300*	39300*	39300*	39300*	39300*
440	38200	-3	40200*	40200*	40200*	40200*	40200*
420	39200	-3	41100*	41100*	41100*	41100*	41100*
400	40200	-3	42100*	42100*	42100*	42100*	42100*
380	41200	-3	43100	43100	43100	43100	43100
360	42400	-3	43100	43100	43100	43100	43100
340	43100	-3	43100	43100	43100	43100	43100

\*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.





Flight Planning and Performance Manual

**310/.84 Enroute Climb**  
**ISA and Below - Low Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)								
		480	460	440	420	400	380	360	340	320
43000	TIME/FUEL				24/10800	21/9800	19/8900	17/8200	16/7600	15/7000
	DIST/SPD				169/448	148/445	132/444	120/442	110/441	100/440
42000	TIME/FUEL		30/13000	24/11200	21/10100	19/9300	18/8600	16/7900	15/7300	14/6800
	DIST/SPD		212/452	169/446	148/444	134/442	122/441	111/439	102/439	94/438
41000	TIME/FUEL	29/13200	24/11500	22/10500	20/9600	18/8900	17/8300	15/7700	14/7100	13/6600
	DIST/SPD	204/449	168/444	148/442	134/440	123/439	113/438	104/437	96/436	88/435
40000	TIME/FUEL	24/11800	22/10800	20/10000	18/9200	17/8600	16/8000	15/7400	13/6900	12/6400
	DIST/SPD	166/442	148/440	135/438	124/437	114/436	105/435	97/434	90/433	83/432
39000	TIME/FUEL	22/11100	20/10300	19/9600	17/8900	16/8300	15/7700	14/7200	13/6700	12/6200
	DIST/SPD	148/437	135/436	124/435	115/434	106/433	98/432	91/431	85/431	78/430
38000	TIME/FUEL	20/10600	19/9900	17/9200	16/8600	15/8000	14/7500	13/7000	12/6500	11/6000
	DIST/SPD	135/433	124/432	115/431	107/431	99/430	92/429	86/428	80/428	74/427
37000	TIME/FUEL	19/10200	18/9500	17/8900	15/8300	14/7800	13/7300	13/6800	12/6300	11/5900
	DIST/SPD	124/430	116/429	108/428	100/427	93/427	87/426	81/426	75/425	70/424
36000	TIME/FUEL	18/9800	17/9200	16/8600	15/8100	14/7500	13/7100	12/6600	11/6100	10/5700
	DIST/SPD	116/427	108/426	101/425	94/424	88/424	82/423	77/423	71/422	66/422
35000	TIME/FUEL	17/9500	16/8900	15/8400	14/7800	13/7300	12/6900	11/6400	11/6000	10/5600
	DIST/SPD	109/424	102/423	96/422	89/422	84/421	78/421	73/420	68/420	63/419
34000	TIME/FUEL	16/9200	15/8600	14/8100	14/7600	13/7100	12/6700	11/6300	10/5800	10/5400
	DIST/SPD	103/421	97/420	91/419	85/419	80/418	74/418	69/417	65/417	60/416
33000	TIME/FUEL	16/8900	15/8400	14/7900	13/7400	12/7000	11/6500	11/6100	10/5700	9/5300
	DIST/SPD	98/417	92/417	86/416	81/416	76/415	71/415	66/414	62/414	57/413
32000	TIME/FUEL	15/8700	14/8200	13/7700	13/7200	12/6800	11/6300	10/5900	10/5500	9/5100
	DIST/SPD	93/414	87/413	82/413	77/413	72/412	67/412	63/411	59/411	55/410
31000	TIME/FUEL	14/8400	14/7900	13/7400	12/7000	11/6500	10/6100	10/5700	9/5300	8/5000
	DIST/SPD	87/410	82/409	77/409	72/408	68/408	63/408	59/407	55/407	52/406
30000	TIME/FUEL	14/8000	13/7600	12/7100	11/6700	11/6300	10/5900	9/5500	9/5100	8/4800
	DIST/SPD	81/405	76/404	71/404	67/404	63/403	59/403	55/402	52/402	48/402
29000	TIME/FUEL	13/7700	12/7200	11/6800	11/6400	10/6000	9/5700	9/5300	8/4900	8/4600
	DIST/SPD	75/400	70/400	66/399	62/399	59/399	55/398	51/398	48/398	45/397
28000	TIME/FUEL	12/7400	11/7000	11/6600	10/6200	10/5800	9/5400	8/5100	8/4800	7/4400
	DIST/SPD	69/396	65/395	62/395	58/395	55/394	51/394	48/394	45/393	42/393
27000	TIME/FUEL	12/7100	11/6700	10/6300	10/5900	9/5600	9/5200	8/4900	7/4600	7/4300
	DIST/SPD	65/391	61/391	57/391	54/390	51/390	48/390	45/389	42/389	39/389
26000	TIME/FUEL	11/6800	10/6400	10/6000	9/5700	9/5400	8/5000	8/4700	7/4400	7/4100
	DIST/SPD	60/387	57/387	53/387	50/386	47/386	44/386	42/385	39/385	36/385
25000	TIME/FUEL	10/6500	10/6100	9/5800	9/5500	8/5100	8/4800	7/4500	7/4200	6/3900
	DIST/SPD	56/383	53/383	50/383	47/383	44/382	41/382	39/382	36/381	34/381
24000	TIME/FUEL	10/6200	9/5900	9/5600	8/5200	8/4900	7/4600	7/4300	6/4000	6/3800
	DIST/SPD	52/380	49/379	46/379	44/379	41/378	39/378	36/378	34/377	32/377
23000	TIME/FUEL	9/6000	9/5600	8/5300	8/5000	7/4700	7/4400	6/4200	6/3900	6/3600
	DIST/SPD	48/376	45/376	43/375	40/375	38/375	36/374	34/374	31/374	29/373
22000	TIME/FUEL	9/5700	8/5400	8/5100	7/4800	7/4500	7/4300	6/4000	6/3700	5/3500
	DIST/SPD	44/372	42/372	40/372	37/371	35/371	33/371	31/370	29/370	27/370
21000	TIME/FUEL	8/5500	8/5200	7/4900	7/4600	7/4300	6/4100	6/3800	5/3600	5/3300
	DIST/SPD	41/369	39/368	37/368	35/368	33/368	31/367	29/367	27/367	25/366
20000	TIME/FUEL	8/5200	7/4900	7/4700	7/4400	6/4100	6/3900	5/3600	5/3400	5/3200
	DIST/SPD	38/365	36/365	34/365	32/364	30/364	28/364	27/363	25/363	23/363
18000	TIME/FUEL	7/4700	7/4500	6/4200	6/4000	6/3800	5/3500	5/3300	5/3100	4/2900
	DIST/SPD	32/358	30/358	29/358	27/358	25/357	24/357	22/357	21/356	20/356
16000	TIME/FUEL	6/4300	6/4100	6/3800	5/3600	5/3400	5/3200	4/3000	4/2800	4/2600
	DIST/SPD	27/352	25/352	24/352	23/351	21/351	20/351	19/350	18/350	16/349
14000	TIME/FUEL	5/3800	5/3600	5/3400	5/3200	4/3100	4/2900	4/2700	4/2500	3/2300
	DIST/SPD	22/346	21/346	20/346	19/345	18/345	17/345	16/344	15/344	14/343
10000	TIME/FUEL	4/3000	4/2800	4/2700	3/2500	3/2400	3/2200	3/2100	3/1900	2/1800
	DIST/SPD	14/335	13/335	12/334	12/334	11/334	10/334	10/333	9/333	9/332
1500	TIME/FUEL	2/1300	2/1200	1/1100	1/1000	1/1000	1/900	1/800	1/800	1/700

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	FUEL ADJUSTMENT (LB)	-300	-700	-1000	-1300	-1700	-2000

Shaded area approximates optimum altitude at LRC/.84.



Flight Planning and Performance Manual

**310/.84 Enroute Climb**  
**ISA + 10°C - High Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)												
		660	640	620	600	580	560	540	520	500	480			
43000	TIME/FUEL													
43000	DIST/SPD													
42000	TIME/FUEL													
42000	DIST/SPD													
41000	TIME/FUEL													30/13900
41000	DIST/SPD													217/459
40000	TIME/FUEL											29/14000	25/12400	
40000	DIST/SPD											208/456	175/452	
39000	TIME/FUEL									28/14100	25/12700	23/11600		
39000	DIST/SPD									200/453	173/449	156/447		
38000	TIME/FUEL								28/14200	25/12900	23/11900	21/11100		
38000	DIST/SPD								193/449	171/446	155/444	142/443		
37000	TIME/FUEL						31/16100	27/14300	25/13200	23/12200	21/11400	20/10600		
37000	DIST/SPD						221/451	188/446	168/443	154/442	142/440	131/439		
36000	TIME/FUEL				30/16000	27/14500	25/13400	23/12500	21/11700	20/10900	18/10200			
36000	DIST/SPD				208/446	183/443	166/441	153/439	141/438	131/437	122/436			
35000	TIME/FUEL		34/18300	30/16200	27/14800	25/13700	23/12800	21/12000	20/11200	19/10500	18/9900			
35000	DIST/SPD		240/448	204/443	182/440	166/438	153/437	142/435	132/434	123/433	115/433			
34000	TIME/FUEL	34/18200	30/16400	27/15100	25/14100	23/13100	22/12300	20/11600	19/10900	18/10200	17/9600			
34000	DIST/SPD	231/444	202/440	182/437	167/435	154/434	143/433	133/432	124/431	116/430	109/429			
33000	TIME/FUEL	30/16800	27/15500	25/14400	24/13500	22/12600	21/11900	19/11200	18/10500	17/9900	16/9300			
33000	DIST/SPD	201/437	182/434	167/433	154/431	143/430	134/429	125/428	117/427	110/427	103/426			
32000	TIME/FUEL	28/15900	26/14800	24/13800	22/12900	21/12200	20/11500	19/10800	17/10200	16/9600	15/9000			
32000	DIST/SPD	183/431	168/429	155/428	144/427	135/426	126/425	118/424	111/424	104/423	97/423			
31000	TIME/FUEL	26/15000	24/14000	22/13100	21/12400	20/11700	19/11000	18/10400	17/9800	16/9200	15/8700			
31000	DIST/SPD	166/425	154/424	143/423	134/422	125/421	117/420	110/420	103/419	97/419	91/418			
30000	TIME/FUEL	24/14100	22/13300	21/12500	20/11800	19/11100	18/10500	17/9900	16/9400	15/8800	14/8300			
30000	DIST/SPD	151/419	140/418	131/417	122/416	115/416	108/415	101/415	95/414	90/414	85/413			
29000	TIME/FUEL	22/13400	21/12600	20/11900	19/11200	18/10600	17/10000	16/9500	15/9000	14/8500	13/8000			
29000	DIST/SPD	137/414	128/413	120/412	113/411	106/411	100/410	94/410	88/409	83/409	78/408			
28000	TIME/FUEL	21/12700	20/11900	18/11300	17/10700	16/10100	16/9600	15/9100	14/8600	13/8100	12/7700			
28000	DIST/SPD	125/408	117/408	110/407	104/406	98/406	92/405	87/405	82/404	77/404	73/404			
27000	TIME/FUEL	19/12000	18/11400	17/10700	16/10200	16/9600	15/9100	14/8700	13/8200	12/7800	12/7400			
27000	DIST/SPD	115/403	108/403	101/402	96/402	90/401	85/401	80/400	76/400	72/400	68/399			
26000	TIME/FUEL	18/11400	17/10800	16/10200	15/9700	15/9200	14/8700	13/8300	12/7900	12/7500	11/7000			
26000	DIST/SPD	105/398	99/398	93/397	88/397	83/397	79/396	74/396	70/396	66/395	63/395			
25000	TIME/FUEL	17/10900	16/10300	15/9800	15/9300	14/8800	13/8400	12/7900	12/7500	11/7100	11/6800			
25000	DIST/SPD	97/394	91/394	86/393	81/393	77/392	73/392	69/392	65/391	62/391	58/391			
24000	TIME/FUEL	16/10300	15/9800	14/9300	14/8800	13/8400	12/8000	12/7600	11/7200	11/6800	10/6500			
24000	DIST/SPD	89/390	84/389	79/389	75/389	71/388	67/388	64/388	60/387	57/387	54/387			
23000	TIME/FUEL	15/9800	14/9300	14/8900	13/8400	12/8000	12/7600	11/7300	11/6900	10/6500	9/6200			
23000	DIST/SPD	82/386	77/385	73/385	69/385	66/384	62/384	59/384	56/384	53/383	50/383			
22000	TIME/FUEL	14/9300	13/8900	13/8500	12/8000	12/7700	11/7300	11/6900	10/6600	9/6300	9/5900			
22000	DIST/SPD	75/381	71/381	67/381	64/381	61/380	57/380	54/380	52/380	49/379	46/379			
21000	TIME/FUEL	13/8900	13/8400	12/8000	11/7700	11/7300	10/7000	10/6600	9/6300	9/6000	8/5700			
21000	DIST/SPD	69/378	65/377	62/377	59/377	56/377	53/376	50/376	48/376	45/376	43/376			
20000	TIME/FUEL	12/8400	12/8000	11/7700	11/7300	10/7000	10/6600	9/6300	9/6000	8/5700	8/5400			
20000	DIST/SPD	63/374	60/373	57/373	54/373	51/373	49/373	46/373	44/372	42/372	39/372			
18000	TIME/FUEL	11/7600	10/7200	10/6900	9/6600	9/6300	9/6000	8/5700	8/5400	7/5200	7/4900			
18000	DIST/SPD	52/366	50/366	47/366	45/366	43/366	41/366	39/365	37/365	35/365	33/365			
16000	TIME/FUEL	9/6800	9/6500	9/6200	8/5900	8/5700	8/5400	7/5200	7/4900	7/4700	6/4400			
16000	DIST/SPD	43/360	41/360	39/359	37/359	36/359	34/359	32/359	31/359	29/359	28/358			
14000	TIME/FUEL	8/6000	8/5800	8/5500	7/5300	7/5100	7/4800	6/4600	6/4400	6/4200	6/4000			
14000	DIST/SPD	35/354	34/353	32/353	31/353	29/353	28/353	27/353	25/353	24/352	23/352			
10000	TIME/FUEL	6/4600	6/4400	6/4300	5/4100	5/3900	5/3700	5/3600	5/3400	4/3200	4/3100			
10000	DIST/SPD	22/342	21/342	20/342	19/342	18/342	17/342	17/341	16/341	15/341	14/341			
1500	TIME/FUEL	2/1900	2/1800	2/1700	2/1700	2/1600	2/1500	2/1500	2/1400	2/1300	2/1300			

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	FUEL ADJUSTMENT (LB)	-500	-1100	-1600	-2200	-2800	-3300

Shaded area approximates optimum altitude at LRC/.84.



Flight Planning and Performance Manual

**310/.84 Enroute Climb**  
**ISA + 10°C - Low Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)								
		480	460	440	420	400	380	360	340	320
43000	TIME/FUEL				25/11400	22/10200	20/9400	18/8600	16/7900	15/7300
	DIST/SPD				179/458	156/455	140/453	127/452	115/451	106/450
42000	TIME/FUEL		31/13700	25/11700	22/10600	20/9700	18/9000	17/8300	15/7700	14/7100
	DIST/SPD		225/462	178/456	157/453	141/452	128/450	117/449	108/448	99/447
41000	TIME/FUEL	30/13900	25/12100	22/11000	20/10100	19/9300	17/8700	16/8000	15/7400	13/6900
	DIST/SPD	217/459	177/454	157/451	142/450	129/448	119/447	109/446	101/445	93/444
40000	TIME/FUEL	25/12400	22/11300	20/10400	19/9700	17/9000	16/8400	15/7800	14/7200	13/6700
	DIST/SPD	175/452	156/449	142/448	130/446	120/445	111/444	102/443	95/443	87/442
39000	TIME/FUEL	23/11600	21/10800	19/10000	18/9300	16/8700	15/8100	14/7500	13/7000	12/6500
	DIST/SPD	156/447	142/445	131/444	121/443	112/442	104/441	96/440	89/440	82/439
38000	TIME/FUEL	21/11100	19/10300	18/9600	17/9000	16/8400	14/7800	13/7300	13/6800	12/6300
	DIST/SPD	142/443	131/442	121/441	113/440	105/439	97/438	90/438	84/437	78/436
37000	TIME/FUEL	20/10600	18/9900	17/9300	16/8700	15/8100	14/7600	13/7100	12/6600	11/6100
	DIST/SPD	131/439	122/438	113/437	106/437	98/436	92/435	85/435	79/434	74/433
36000	TIME/FUEL	18/10200	17/9600	16/9000	15/8400	14/7900	13/7400	12/6900	11/6400	11/6000
	DIST/SPD	122/436	114/435	106/434	99/433	93/433	86/432	81/432	75/431	70/431
35000	TIME/FUEL	18/9900	16/9300	15/8700	14/8200	14/7700	13/7200	12/6700	11/6200	10/5800
	DIST/SPD	115/433	108/432	101/431	94/431	88/430	82/429	77/429	71/428	66/428
34000	TIME/FUEL	17/9600	16/9000	15/8500	14/8000	13/7500	12/7000	11/6500	11/6100	10/5700
	DIST/SPD	109/429	102/429	95/428	89/428	84/427	78/427	73/426	68/426	63/425
33000	TIME/FUEL	16/9300	15/8800	14/8200	13/7700	13/7300	12/6800	11/6400	10/5900	9/5500
	DIST/SPD	103/426	96/425	91/425	85/424	79/424	74/423	69/423	65/423	60/422
32000	TIME/FUEL	15/9000	15/8500	14/8000	13/7500	12/7100	11/6600	11/6200	10/5800	9/5400
	DIST/SPD	97/423	92/422	86/422	81/421	76/421	71/420	66/420	62/419	57/419
31000	TIME/FUEL	15/8700	14/8200	13/7700	12/7300	11/6800	11/6400	10/6000	9/5600	9/5200
	DIST/SPD	91/418	86/418	81/417	76/417	71/416	66/416	62/415	58/415	54/415
30000	TIME/FUEL	14/8300	13/7900	12/7400	12/7000	11/6500	10/6100	10/5700	9/5400	8/5000
	DIST/SPD	85/413	80/413	75/412	70/412	66/411	62/411	58/411	54/410	50/410
29000	TIME/FUEL	13/8000	12/7500	12/7100	11/6700	10/6300	10/5900	9/5500	8/5100	8/4800
	DIST/SPD	78/408	74/408	70/407	65/407	61/407	58/406	54/406	50/406	47/405
28000	TIME/FUEL	12/7700	12/7200	11/6800	10/6400	10/6000	9/5700	9/5300	8/4900	7/4600
	DIST/SPD	73/404	69/403	65/403	61/403	57/402	54/402	50/402	47/401	44/401
27000	TIME/FUEL	12/7400	11/6900	10/6500	10/6200	9/5800	9/5400	8/5100	8/4800	7/4400
	DIST/SPD	68/399	64/399	60/399	57/398	53/398	50/398	47/397	44/397	41/396
26000	TIME/FUEL	11/7000	11/6700	10/6300	9/5900	9/5600	8/5200	8/4900	7/4600	7/4200
	DIST/SPD	63/395	59/395	56/394	53/394	50/394	47/393	44/393	41/393	38/392
25000	TIME/FUEL	11/6800	10/6400	9/6000	9/5700	8/5300	8/5000	7/4700	7/4400	6/4100
	DIST/SPD	58/391	55/391	52/390	49/390	46/390	43/389	41/389	38/389	35/388
24000	TIME/FUEL	10/6500	9/6100	9/5800	8/5400	8/5100	7/4800	7/4500	6/4200	6/3900
	DIST/SPD	54/387	51/387	48/386	46/386	43/386	40/385	38/385	35/385	33/384
23000	TIME/FUEL	9/6200	9/5900	8/5500	8/5200	8/4900	7/4600	7/4300	6/4000	6/3700
	DIST/SPD	50/383	47/383	45/383	42/382	40/382	37/382	35/381	33/381	31/381
22000	TIME/FUEL	9/5900	8/5600	8/5300	8/5000	7/4700	7/4400	6/4100	6/3900	5/3600
	DIST/SPD	46/379	44/379	41/379	39/379	37/378	35/378	33/378	30/377	28/377
21000	TIME/FUEL	8/5700	8/5400	8/5100	7/4800	7/4500	6/4200	6/3900	6/3700	5/3400
	DIST/SPD	43/376	41/375	38/375	36/375	34/375	32/374	30/374	28/374	26/373
20000	TIME/FUEL	8/5400	8/5100	7/4800	7/4600	6/4300	6/4000	6/3800	5/3500	5/3300
	DIST/SPD	39/372	37/372	35/371	33/371	31/371	30/371	28/370	26/370	24/369
18000	TIME/FUEL	7/4900	7/4600	6/4400	6/4100	6/3900	5/3700	5/3400	5/3200	4/3000
	DIST/SPD	33/365	31/365	30/365	28/364	27/364	25/364	23/363	22/363	21/362
16000	TIME/FUEL	6/4400	6/4200	6/4000	5/3700	5/3500	5/3300	4/3100	4/2900	4/2700
	DIST/SPD	28/358	26/358	25/358	24/358	22/358	21/357	20/357	18/356	17/356
14000	TIME/FUEL	6/4000	5/3700	5/3500	5/3300	4/3100	4/3000	4/2800	4/2600	3/2400
	DIST/SPD	23/352	22/352	20/352	19/352	18/351	17/351	16/351	15/350	14/350
10000	TIME/FUEL	4/3100	4/2900	4/2700	3/2600	3/2400	3/2300	3/2100	3/2000	2/1800
	DIST/SPD	14/341	14/341	13/340	12/340	11/340	11/340	10/339	10/339	9/338
1500	TIME/FUEL	2/1300	2/1200	1/1100	1/1000	1/1000	1/900	1/800	1/800	1/700

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
	FUEL ADJUSTMENT (LB)	-300	-700	-1000	-1400	-1700	-2100

Shaded area approximates optimum altitude at LRC/.84.

**310/.84 Enroute Climb**  
**ISA + 15°C - High Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)												
		660	640	620	600	580	560	540	520	500	480			
43000	TIME/FUEL													
	DIST/SPD													
42000	TIME/FUEL													
	DIST/SPD													
41000	TIME/FUEL													
	DIST/SPD													
40000	TIME/FUEL												28/13200	
	DIST/SPD												199/460	
39000	TIME/FUEL										33/15400	27/13400	24/12200	
	DIST/SPD									237/462	195/457	172/455		
38000	TIME/FUEL									31/15400	27/13700	24/12500	22/11600	
	DIST/SPD									225/459	191/455	171/452	155/450	
37000	TIME/FUEL									30/15400	27/13900	24/12800	22/11900	21/11100
	DIST/SPD									215/455	187/452	169/449	154/448	142/446
36000	TIME/FUEL					35/17600	30/15400	27/14100	24/13100	23/12200	21/11300	19/10600	18/10300	
	DIST/SPD					247/457	207/452	184/449	167/447	154/445	142/444	132/443		
35000	TIME/FUEL			33/17500	29/15700	27/14400	25/13400	23/12500	21/11700	20/10900	18/10300	17/9600	16/9300	
	DIST/SPD			236/453	204/449	183/446	167/444	154/443	143/441	132/440	123/439			
34000	TIME/FUEL		33/17700	30/16100	27/14800	25/13700	23/12800	21/12000	20/11200	19/10600	18/9900	17/9600	16/9300	
	DIST/SPD		231/450	204/446	183/443	168/442	154/440	143/439	133/438	124/437	116/436			
33000	TIME/FUEL	33/17900	30/16400	27/15100	25/14000	23/13100	22/12300	20/11600	19/10900	18/10200	17/9600	16/9300	15/8900	
	DIST/SPD	227/446	202/443	183/440	167/439	155/437	143/436	134/435	125/434	117/433	109/432			
32000	TIME/FUEL	30/16700	27/15400	25/14400	24/13400	22/12600	21/11800	19/11100	18/10500	17/9900	16/9300	15/8900	14/8500	
	DIST/SPD	201/439	183/437	168/435	155/434	144/433	134/432	125/431	117/430	110/429	103/428			
31000	TIME/FUEL	27/15600	25/14500	23/13600	22/12800	21/12000	19/11300	18/10700	17/10100	16/9500	15/8900	14/8500	13/8200	
	DIST/SPD	178/432	164/430	152/429	141/428	132/427	123/426	115/425	108/425	102/424	95/423			
30000	TIME/FUEL	25/14600	23/13700	22/12800	20/12100	19/11400	18/10800	17/10200	16/9600	15/9100	14/8500	13/8200	12/7800	
	DIST/SPD	159/425	147/424	137/423	128/422	120/421	112/420	106/420	99/419	93/418	88/418			
29000	TIME/FUEL	23/13700	21/12900	20/12200	19/11500	18/10800	17/10200	16/9700	15/9200	14/8700	13/8200	12/7800	11/7500	
	DIST/SPD	143/418	133/418	125/417	117/416	110/415	103/415	97/414	91/414	86/413	81/413			
28000	TIME/FUEL	21/13000	20/12200	19/11500	18/10900	17/10300	16/9800	15/9300	14/8800	13/8300	12/7800	11/7500	10/7200	
	DIST/SPD	130/413	121/412	114/411	107/411	100/410	95/410	89/409	84/409	79/408	75/408			
27000	TIME/FUEL	20/12300	19/11600	18/11000	17/10400	16/9800	15/9300	14/8800	13/8400	13/7900	12/7500	11/7200	10/6900	
	DIST/SPD	118/407	111/407	104/406	98/406	92/405	87/405	82/404	78/404	73/403	69/403			
26000	TIME/FUEL	18/11600	17/11000	16/10400	16/9900	15/9400	14/8900	13/8500	13/8000	12/7600	11/7200	10/6900	9/6600	
	DIST/SPD	108/402	102/402	96/401	90/401	85/400	81/400	76/400	72/399	68/399	64/399			
25000	TIME/FUEL	17/11100	16/10500	15/10000	15/9500	14/9000	13/8500	13/8100	12/7700	11/7300	11/6900	10/6600	9/6300	
	DIST/SPD	99/398	93/397	88/397	83/396	79/396	74/396	70/395	67/395	63/395	60/395			
24000	TIME/FUEL	16/10500	15/10000	15/9500	14/9000	13/8600	13/8100	12/7700	11/7300	11/7000	10/6600	9/6300	8/5900	
	DIST/SPD	91/393	86/393	81/393	77/392	73/392	69/392	65/391	62/391	58/391	55/391			
23000	TIME/FUEL	15/10000	14/9500	14/9000	13/8600	12/8200	12/7800	11/7400	11/7000	10/6700	10/6300	9/6000	8/5500	
	DIST/SPD	84/389	79/389	75/388	71/388	67/388	64/388	60/387	57/387	54/387	51/387			
22000	TIME/FUEL	14/9500	14/9000	13/8600	12/8200	12/7800	11/7400	11/7100	10/6700	10/6400	9/6000	8/5500	7/5000	
	DIST/SPD	77/385	73/385	69/384	65/384	62/384	59/384	56/383	53/383	50/383	47/383			
21000	TIME/FUEL	13/9000	13/8600	12/8200	12/7800	11/7400	11/7100	10/6700	10/6400	9/6100	9/5800	8/5500	7/5000	
	DIST/SPD	70/381	67/381	63/381	60/380	57/380	54/380	51/380	49/379	46/379	44/379			
20000	TIME/FUEL	12/8600	12/8200	11/7800	11/7400	10/7100	10/6700	9/6400	9/6100	9/5800	8/5500	7/5000	6/4500	
	DIST/SPD	64/377	61/377	58/377	55/377	52/376	50/376	47/376	45/376	42/376	40/375			
18000	TIME/FUEL	11/7700	10/7400	10/7000	10/6700	9/6400	9/6100	8/5800	8/5500	8/5300	7/5000	6/4500	5/4000	
	DIST/SPD	53/370	51/370	48/369	46/369	44/369	42/369	40/369	38/369	36/368	34/368			
16000	TIME/FUEL	10/6900	9/6600	9/6300	8/6000	8/5700	8/5500	7/5200	7/5000	7/4700	6/4500	5/4000	4/3100	
	DIST/SPD	44/363	42/363	40/363	38/363	36/362	35/362	33/362	31/362	30/362	28/362			
14000	TIME/FUEL	8/6100	8/5900	8/5600	7/5400	7/5100	7/4900	6/4700	6/4500	6/4200	6/4000	5/3100	4/2100	
	DIST/SPD	36/357	34/357	33/356	31/356	30/356	28/356	27/356	26/356	24/356	23/355			
10000	TIME/FUEL	6/4700	6/4500	6/4300	5/4100	5/3900	5/3800	5/3600	5/3400	4/3300	4/3100	3/2100	2/1100	
	DIST/SPD	22/345	21/345	20/345	19/345	19/345	18/344	17/344	16/344	15/344	15/344			
1500	TIME/FUEL	2/1900	2/1800	2/1700	2/1700	2/1600	2/1500	2/1500	2/1400	2/1300	2/1300			

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
	FUEL ADJUSTMENT (LB)	-500	-1100	-1700	-2200	-2800	-3400

Shaded area approximates optimum altitude at LRC/.84.



Flight Planning and Performance Manual

**310/.84 Enroute Climb**  
**ISA + 15°C - Low Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)								
		480	460	440	420	400	380	360	340	320
43000	TIME/FUEL				28/12200	24/10800	21/9800	19/9000	17/8200	16/7600
	DIST/SPD				207/467	174/463	154/461	139/459	126/458	114/457
42000	TIME/FUEL			28/12600	24/11200	22/10200	20/9400	18/8600	16/8000	15/7300
	DIST/SPD			205/465	175/461	155/459	140/457	128/456	117/455	107/454
41000	TIME/FUEL		28/12900	24/11600	22/10600	20/9700	18/9000	17/8300	15/7700	14/7100
	DIST/SPD		203/463	174/459	156/457	141/456	129/454	118/453	109/452	100/451
40000	TIME/FUEL	28/13200	24/11900	22/10900	20/10100	19/9300	17/8700	16/8000	15/7500	13/6900
	DIST/SPD	199/460	173/457	156/455	142/453	130/452	120/451	110/450	102/449	94/449
39000	TIME/FUEL	24/12200	22/11300	20/10400	19/9700	17/9000	16/8400	15/7800	14/7200	13/6700
	DIST/SPD	172/455	156/453	142/451	131/450	121/449	112/448	103/447	95/446	88/446
38000	TIME/FUEL	22/11600	21/10700	19/10000	18/9300	16/8700	15/8100	14/7500	13/7000	12/6500
	DIST/SPD	155/450	142/449	131/448	121/447	113/446	104/445	97/444	90/444	83/443
37000	TIME/FUEL	21/11100	19/10300	18/9600	17/9000	16/8400	14/7800	13/7300	12/6800	12/6300
	DIST/SPD	142/446	132/445	122/444	113/443	105/443	98/442	91/441	85/441	78/440
36000	TIME/FUEL	19/10600	18/9900	17/9300	16/8700	15/8100	14/7600	13/7100	12/6600	11/6100
	DIST/SPD	132/443	122/442	114/441	106/440	99/439	92/439	86/438	80/438	74/437
35000	TIME/FUEL	18/10300	17/9600	16/9000	15/8400	14/7900	13/7400	12/6900	11/6400	11/6000
	DIST/SPD	123/439	115/439	107/438	100/437	94/436	87/436	81/435	76/435	70/434
34000	TIME/FUEL	18/9900	16/9300	15/8700	14/8200	14/7700	13/7200	12/6700	11/6300	10/5800
	DIST/SPD	116/436	108/435	101/434	95/434	89/433	83/433	77/432	72/432	67/431
33000	TIME/FUEL	17/9600	16/9000	15/8500	14/8000	13/7500	12/7000	11/6500	11/6100	10/5700
	DIST/SPD	109/432	102/432	96/431	90/430	84/430	78/429	73/429	68/428	63/428
32000	TIME/FUEL	16/9300	15/8800	14/8200	13/7700	12/7200	12/6800	11/6300	10/5900	9/5500
	DIST/SPD	103/428	96/428	90/427	85/427	79/426	74/426	69/425	65/425	60/424
31000	TIME/FUEL	15/8900	14/8400	13/7900	13/7400	12/7000	11/6500	10/6100	10/5700	9/5300
	DIST/SPD	95/423	90/423	84/422	79/422	74/421	69/421	65/421	60/420	56/420
30000	TIME/FUEL	14/8500	13/8100	13/7600	12/7100	11/6700	10/6300	10/5900	9/5500	8/5100
	DIST/SPD	88/418	83/417	78/417	73/417	68/416	64/416	60/415	56/415	52/414
29000	TIME/FUEL	13/8200	13/7700	12/7300	11/6800	10/6400	10/6000	9/5600	9/5300	8/4900
	DIST/SPD	81/413	76/412	72/412	67/412	63/411	59/411	56/410	52/410	48/410
28000	TIME/FUEL	13/7800	12/7400	11/7000	11/6600	10/6200	9/5800	9/5400	8/5000	8/4700
	DIST/SPD	75/408	71/407	66/407	63/407	59/406	55/406	52/406	48/405	45/405
27000	TIME/FUEL	12/7500	11/7100	11/6700	10/6300	9/5900	9/5500	8/5200	8/4800	7/4500
	DIST/SPD	69/403	65/403	62/402	58/402	55/402	51/401	48/401	45/401	42/400
26000	TIME/FUEL	11/7200	11/6800	10/6400	9/6000	9/5700	8/5300	8/5000	7/4700	7/4300
	DIST/SPD	64/399	61/398	57/398	54/398	51/398	48/397	45/397	42/396	39/396
25000	TIME/FUEL	11/6900	10/6500	10/6100	9/5800	8/5400	8/5100	7/4800	7/4500	6/4200
	DIST/SPD	60/395	56/394	53/394	50/394	47/393	44/393	42/393	39/392	36/392
24000	TIME/FUEL	10/6600	10/6200	9/5900	9/5500	8/5200	8/4900	7/4600	7/4300	6/4000
	DIST/SPD	55/391	52/390	49/390	47/390	44/389	41/389	39/389	36/388	34/388
23000	TIME/FUEL	10/6300	9/6000	9/5600	8/5300	8/5000	7/4700	7/4400	6/4100	6/3800
	DIST/SPD	51/387	48/386	46/386	43/386	41/386	38/385	36/385	34/385	31/384
22000	TIME/FUEL	9/6000	9/5700	8/5400	8/5100	7/4800	7/4500	6/4200	6/3900	5/3600
	DIST/SPD	47/383	45/383	42/382	40/382	38/382	35/381	33/381	31/381	29/380
21000	TIME/FUEL	9/5800	8/5400	8/5100	7/4900	7/4600	6/4300	6/4000	6/3800	5/3500
	DIST/SPD	44/379	41/379	39/379	37/378	35/378	33/378	31/377	29/377	27/377
20000	TIME/FUEL	8/5500	8/5200	7/4900	7/4600	6/4400	6/4100	6/3800	5/3600	5/3300
	DIST/SPD	40/375	38/375	36/375	34/375	32/374	30/374	28/374	27/373	25/373
18000	TIME/FUEL	7/5000	7/4700	6/4500	6/4200	6/4000	5/3700	5/3500	5/3200	4/3000
	DIST/SPD	34/368	32/368	30/368	29/368	27/367	26/367	24/367	22/366	21/366
16000	TIME/FUEL	6/4500	6/4300	6/4000	5/3800	5/3600	5/3300	4/3100	4/2900	4/2700
	DIST/SPD	28/362	27/361	25/361	24/361	23/361	21/360	20/360	19/360	18/359
14000	TIME/FUEL	6/4000	5/3800	5/3600	5/3400	4/3200	4/3000	4/2800	4/2600	3/2400
	DIST/SPD	23/355	22/355	21/355	20/355	19/354	18/354	17/354	16/353	14/353
10000	TIME/FUEL	4/3100	4/2900	4/2800	4/2600	3/2500	3/2300	3/2200	3/2000	2/1900
	DIST/SPD	15/344	14/344	13/343	12/343	12/343	11/343	10/342	10/342	9/341
1500	TIME/FUEL	2/1300	2/1200	1/1100	1/1000	1/1000	1/900	1/800	1/800	1/700

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
	FUEL ADJUSTMENT (LB)	-400	-700	-1100	-1400	-1800	-2200

Shaded area approximates optimum altitude at LRC/.84.

**310/.84 Enroute Climb**  
**ISA + 20°C - High Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)												
		660	640	620	600	580	560	540	520	500	480			
43000	TIME/FUEL													
43000	DIST/SPD													
42000	TIME/FUEL													
42000	DIST/SPD													
41000	TIME/FUEL													
41000	DIST/SPD													
40000	TIME/FUEL												34/14800	
40000	DIST/SPD												252/469	
39000	TIME/FUEL											33/15000	29/13300	
39000	DIST/SPD											244/466	208/462	
38000	TIME/FUEL									32/15200	28/13600	28/13600	26/12500	
38000	DIST/SPD									236/463	205/459	205/459	183/457	
37000	TIME/FUEL									32/15400	28/13900	26/12800	24/11800	
37000	DIST/SPD									230/460	202/457	183/455	167/453	
36000	TIME/FUEL						36/17500	32/15600	28/14200	26/13100	24/12200	22/11300		
36000	DIST/SPD						263/461	225/457	200/454	182/452	166/450	153/449		
35000	TIME/FUEL				36/17700	32/15900	29/14600	26/13500	24/12500	23/11700	21/10900			
35000	DIST/SPD				257/458	224/454	201/452	183/450	168/448	155/447	143/446			
34000	TIME/FUEL		42/20700	36/18000	32/16300	29/15000	27/13900	25/12900	23/12000	21/11300	20/10500			
34000	DIST/SPD		307/461	255/455	224/451	201/449	183/447	169/445	156/444	144/443	134/442			
33000	TIME/FUEL	41/20900	36/18400	32/16700	29/15400	27/14200	25/13200	23/12400	22/11600	20/10900	19/10200			
33000	DIST/SPD	298/457	253/452	224/448	202/446	184/444	169/443	157/441	145/440	135/439	126/438			
32000	TIME/FUEL	36/18800	32/17100	30/15700	27/14600	25/13600	24/12700	22/11900	21/11200	19/10500	18/9800			
32000	DIST/SPD	252/448	224/445	203/443	185/441	170/439	157/438	146/437	136/436	127/435	119/434			
31000	TIME/FUEL	32/17300	29/15900	27/14800	25/13800	23/12900	22/12100	21/11400	19/10700	18/10000	17/9400			
31000	DIST/SPD	219/440	199/438	181/436	167/434	155/433	144/432	134/431	125/431	117/430	110/429			
30000	TIME/FUEL	29/16000	27/14900	25/13900	23/13000	22/12200	20/11500	19/10800	18/10200	17/9600	16/9000			
30000	DIST/SPD	192/432	176/430	163/429	151/428	140/427	131/426	122/425	115/425	107/424	101/423			
29000	TIME/FUEL	26/14900	25/13900	23/13100	22/12300	20/11600	19/10900	18/10300	17/9700	16/9100	15/8600			
29000	DIST/SPD	171/425	158/424	147/423	137/422	128/421	119/420	112/420	105/419	99/419	93/418			
28000	TIME/FUEL	24/14000	23/13100	21/12400	20/11600	19/11000	18/10400	17/9800	16/9200	15/8700	14/8200			
28000	DIST/SPD	154/419	143/418	133/417	125/416	117/416	109/415	103/415	97/414	91/414	85/413			
27000	TIME/FUEL	23/13200	21/12400	20/11700	19/11000	18/10400	17/9900	16/9300	15/8800	14/8300	13/7900			
27000	DIST/SPD	139/413	130/413	121/412	114/411	107/411	100/410	94/410	89/409	84/409	79/408			
26000	TIME/FUEL	21/12500	20/11800	19/11100	17/10500	17/9900	16/9400	15/8900	14/8400	13/8000	12/7500			
26000	DIST/SPD	127/408	118/407	111/407	104/406	98/406	92/405	87/405	82/404	77/404	73/404			
25000	TIME/FUEL	19/11800	18/11100	17/10500	16/10000	16/9500	15/9000	14/8500	13/8000	12/7600	12/7200			
25000	DIST/SPD	115/403	108/402	101/402	96/401	90/401	85/401	80/400	76/400	71/400	67/399			
24000	TIME/FUEL	18/11200	17/10600	16/10000	15/9500	15/9000	14/8500	13/8100	12/7700	12/7300	11/6900			
24000	DIST/SPD	105/398	99/398	93/397	88/397	83/397	78/396	74/396	70/396	66/395	62/395			
23000	TIME/FUEL	17/10600	16/10000	15/9500	14/9000	14/8600	13/8100	12/7700	12/7300	11/6900	10/6600			
23000	DIST/SPD	96/394	90/393	85/393	80/393	76/392	72/392	68/392	64/391	61/391	57/391			
22000	TIME/FUEL	16/10000	15/9500	14/9000	13/8600	13/8200	12/7700	12/7400	11/7000	10/6600	10/6300			
22000	DIST/SPD	87/389	82/389	78/389	73/388	70/388	66/388	62/387	59/387	56/387	53/387			
21000	TIME/FUEL	15/9500	14/9000	13/8600	13/8200	12/7800	11/7400	11/7000	10/6700	10/6300	9/6000			
21000	DIST/SPD	79/385	75/385	71/384	67/384	64/384	60/384	57/383	54/383	51/383	49/383			
20000	TIME/FUEL	14/9000	13/8500	12/8100	12/7700	11/7400	11/7000	10/6700	10/6300	9/6000	9/5700			
20000	DIST/SPD	72/381	68/381	65/380	61/380	58/380	55/380	52/380	50/379	47/379	45/379			
18000	TIME/FUEL	12/8100	11/7700	11/7300	10/7000	10/6600	9/6300	9/6000	9/5700	8/5400	8/5200			
18000	DIST/SPD	60/373	57/373	54/373	51/373	49/373	46/372	44/372	42/372	40/372	38/372			
16000	TIME/FUEL	10/7200	10/6900	9/6500	9/6200	9/6000	8/5700	8/5400	8/5200	7/4900	7/4600			
16000	DIST/SPD	49/366	47/366	45/366	42/366	40/366	38/366	37/366	35/365	33/365	31/365			
14000	TIME/FUEL	9/6400	9/6100	8/5800	8/5600	8/5300	7/5100	7/4800	7/4600	6/4400	6/4100			
14000	DIST/SPD	40/360	38/360	37/360	35/360	33/359	32/359	30/359	29/359	27/359	26/359			
10000	TIME/FUEL	7/4800	6/4600	6/4400	6/4200	6/4100	5/3900	5/3700	5/3500	5/3400	4/3200			
10000	DIST/SPD	25/348	24/348	23/348	22/348	21/348	20/348	19/348	18/347	17/347	16/347			
1500	TIME/FUEL	2/1900	2/1800	2/1700	2/1700	2/1600	2/1500	2/1500	2/1400	2/1300	2/1300			

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	FUEL ADJUSTMENT (LB)	-600	-1200	-1700	-2300	-3000	-3600

Shaded area approximates optimum altitude at LRC/.84.



Flight Planning and Performance Manual

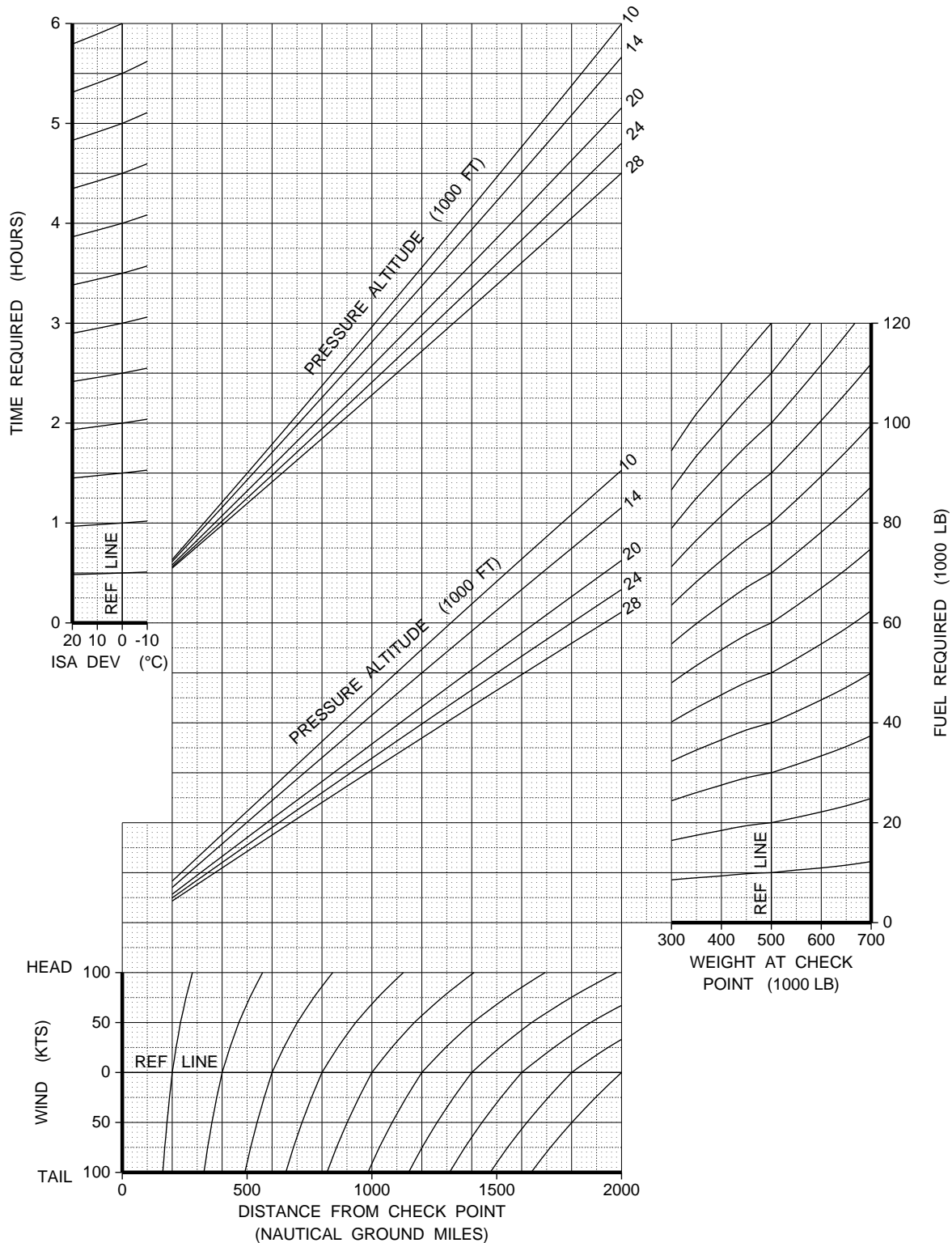
**310/.84 Enroute Climb**  
**ISA + 20°C - Low Weights**

PRESSURE ALTITUDE (FT)	UNITS MIN/LB NM/KTAS	BRAKE RELEASE WEIGHT (1000 LB)								
		480	460	440	420	400	380	360	340	320
43000	TIME/FUEL					28/11800	25/10500	22/9600	20/8800	18/8000
	DIST/SPD					211/470	182/468	162/466	145/464	132/463
42000	TIME/FUEL			35/14400	28/12200	25/11000	22/10000	20/9200	18/8400	17/7700
	DIST/SPD			268/474	212/469	183/466	164/464	148/462	134/461	122/460
41000	TIME/FUEL		35/14700	29/12600	25/11400	23/10400	21/9600	19/8800	17/8100	16/7500
	DIST/SPD		261/472	211/467	184/464	165/462	150/460	136/459	125/458	114/457
40000	TIME/FUEL	34/14800	29/13000	25/11800	23/10800	21/9900	19/9200	18/8500	16/7900	15/7300
	DIST/SPD	252/469	210/465	184/462	166/460	151/458	138/457	127/456	116/455	107/454
39000	TIME/FUEL	29/13300	26/12100	23/11200	21/10300	20/9600	18/8900	17/8200	15/7600	14/7000
	DIST/SPD	208/462	184/460	166/458	152/456	139/455	128/454	118/453	109/452	100/452
38000	TIME/FUEL	26/12500	24/11500	22/10700	20/9900	18/9200	17/8600	16/7900	15/7400	14/6800
	DIST/SPD	183/457	167/455	153/454	140/453	130/452	120/451	111/450	102/449	95/449
37000	TIME/FUEL	24/11800	22/11000	20/10200	19/9500	17/8900	16/8300	15/7700	14/7100	13/6600
	DIST/SPD	167/453	153/452	141/450	131/449	121/449	112/448	104/447	96/446	89/446
36000	TIME/FUEL	22/11300	21/10600	19/9900	18/9200	17/8600	15/8000	14/7500	13/6900	12/6400
	DIST/SPD	153/449	142/448	131/447	122/446	113/445	105/445	98/444	91/443	84/443
35000	TIME/FUEL	21/10900	19/10200	18/9500	17/8900	16/8300	15/7800	14/7200	13/6700	12/6300
	DIST/SPD	143/446	133/445	124/444	115/443	107/442	100/442	93/441	86/440	80/440
34000	TIME/FUEL	20/10500	19/9900	17/9200	16/8600	15/8100	14/7600	13/7000	12/6600	11/6100
	DIST/SPD	134/442	125/441	117/440	109/440	101/439	94/438	88/438	82/437	76/437
33000	TIME/FUEL	19/10200	18/9500	17/8900	15/8400	14/7800	13/7300	13/6800	12/6400	11/5900
	DIST/SPD	126/438	118/438	110/437	103/436	96/436	89/435	83/434	77/434	72/433
32000	TIME/FUEL	18/9800	17/9200	16/8700	15/8100	14/7600	13/7100	12/6600	11/6200	10/5700
	DIST/SPD	119/434	111/434	104/433	97/432	90/432	84/431	79/431	73/430	68/430
31000	TIME/FUEL	17/9400	16/8900	15/8300	14/7800	13/7300	12/6900	11/6400	11/6000	10/5500
	DIST/SPD	110/429	103/429	96/428	90/427	84/427	79/427	73/426	68/426	64/425
30000	TIME/FUEL	16/9000	15/8500	14/8000	13/7500	12/7000	12/6600	11/6100	10/5700	9/5300
	DIST/SPD	101/423	94/423	89/422	83/422	78/422	73/421	68/421	63/420	59/420
29000	TIME/FUEL	15/8600	14/8100	13/7600	12/7200	12/6700	11/6300	10/5900	9/5500	9/5100
	DIST/SPD	93/418	87/418	82/417	77/417	72/416	67/416	63/416	59/415	55/415
28000	TIME/FUEL	14/8200	13/7700	12/7300	12/6900	11/6400	10/6000	10/5600	9/5300	8/4900
	DIST/SPD	85/413	80/413	76/412	71/412	67/412	62/411	58/411	54/410	51/410
27000	TIME/FUEL	13/7900	12/7400	12/7000	11/6600	10/6200	10/5800	9/5400	8/5000	8/4700
	DIST/SPD	79/408	74/408	70/408	66/407	62/407	58/407	54/406	51/406	47/405
26000	TIME/FUEL	12/7500	12/7100	11/6700	10/6300	10/5900	9/5500	9/5200	8/4800	7/4500
	DIST/SPD	73/404	69/403	65/403	61/403	57/402	54/402	50/402	47/401	44/401
25000	TIME/FUEL	12/7200	11/6800	10/6400	10/6000	9/5700	9/5300	8/5000	8/4600	7/4300
	DIST/SPD	67/399	64/399	60/399	56/398	53/398	50/398	47/397	44/397	41/397
24000	TIME/FUEL	11/6900	10/6500	10/6100	9/5800	9/5400	8/5100	8/4800	7/4400	7/4100
	DIST/SPD	62/395	59/395	55/394	52/394	49/394	46/394	43/393	40/393	38/392
23000	TIME/FUEL	10/6600	10/6200	9/5800	9/5500	8/5200	8/4900	7/4500	7/4200	6/3900
	DIST/SPD	57/391	54/391	51/390	48/390	45/390	43/389	40/389	37/389	35/388
22000	TIME/FUEL	10/6300	9/5900	9/5600	8/5300	8/4900	7/4600	7/4300	6/4100	6/3800
	DIST/SPD	53/387	50/387	47/386	44/386	42/386	39/385	37/385	34/385	32/384
21000	TIME/FUEL	9/6000	9/5600	8/5300	8/5000	7/4700	7/4400	6/4200	6/3900	6/3600
	DIST/SPD	49/383	46/383	43/382	41/382	39/382	36/382	34/381	32/381	30/381
20000	TIME/FUEL	9/5700	8/5400	8/5100	7/4800	7/4500	6/4200	6/4000	6/3700	5/3400
	DIST/SPD	45/379	42/379	40/379	38/378	35/378	33/378	31/377	29/377	27/377
18000	TIME/FUEL	8/5200	7/4900	7/4600	6/4300	6/4100	6/3800	5/3600	5/3400	5/3100
	DIST/SPD	38/372	36/372	34/371	32/371	30/371	28/371	26/370	25/370	23/370
16000	TIME/FUEL	7/4600	6/4400	6/4100	6/3900	5/3700	5/3500	5/3200	4/3000	4/2800
	DIST/SPD	31/365	30/365	28/365	26/364	25/364	24/364	22/364	21/363	19/363
14000	TIME/FUEL	6/4100	6/3900	5/3700	5/3500	5/3300	4/3100	4/2900	4/2700	4/2500
	DIST/SPD	26/359	24/359	23/358	22/358	21/358	19/358	18/357	17/357	16/357
10000	TIME/FUEL	4/3200	4/3000	4/2800	4/2700	3/2500	3/2400	3/2200	3/2100	3/1900
	DIST/SPD	16/347	15/347	14/347	14/347	13/346	12/346	11/346	11/345	10/345
1500	TIME/FUEL	2/1300	2/1200	1/1100	1/1000	1/1000	1/900	1/800	1/800	1/700

FUEL ADJUSTMENT FOR HIGH ELEVATION AIRPORTS EFFECT ON TIME AND DISTANCE IS NEGLIGIBLE	AIRPORT ELEVATION (FT)	2000	4000	6000	8000	10000	12000
	FUEL ADJUSTMENT (LB)	-400	-700	-1100	-1500	-1900	-2200

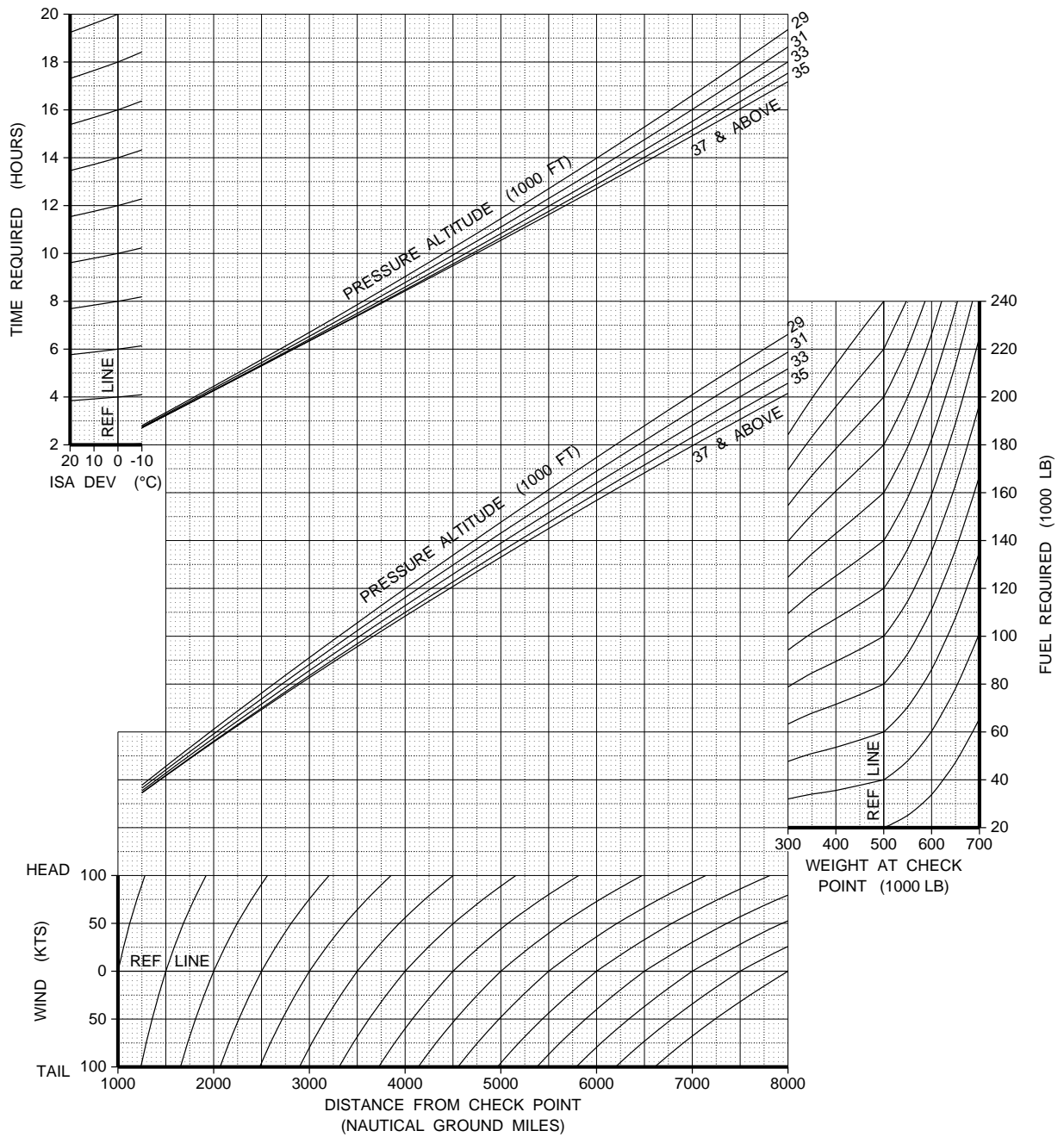
Shaded area approximates optimum altitude at LRC/.84.

**Long Range Cruise Enroute Fuel and Time**  
0 to 2000 NM Distance  
Based on .84/310/250 descent



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**Long Range Cruise Enroute Fuel and Time**  
**1000 to 8000 NM Distance**  
 Based on .84/310/250 descent



**Long Range Cruise Table**  
**43000 FT to 37000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
43	EPR										
	MAX TAT										
42	KIAS										
	MACH										
41	FF/ENG										
	KTAS										
40 (-26)	EPR										1.398
	MAX TAT										-12
39 (-26)	KIAS										254
	MACH										.834
38 (-26)	FF/ENG										7705
	KTAS										478
37 (-26)	EPR									1.384	1.318
	MAX TAT									-10	-2
36 (-26)	KIAS									260	261
	MACH									.835	.838
35 (-26)	FF/ENG									7940	7376
	KTAS									479	481
34 (-26)	EPR								1.367	1.306	1.258
	MAX TAT								-8	-1	5
33 (-26)	KIAS								266	267	268
	MACH								.835	.838	.840
32 (-26)	FF/ENG								8163	7623	7204
	KTAS								479	481	482
31 (-26)	EPR							1.412	1.349	1.293	1.249
	MAX TAT							-14	-6	1	5
30 (-26)	KIAS							272	273	274	274
	MACH							.833	.836	.839	.841
29 (-26)	FF/ENG							8998	8374	7865	7464
	KTAS							478	480	481	482

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	37	38	39	40
LIMIT EPR	1.419	1.420	1.421	1.420
MAX TAT (°C)	-14	-14	-14	-14

Decrease limit EPR by 0.088 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.019.  
With engine and wing anti-ice on, decrease limit EPR by 0.038.



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**Long Range Cruise Table**  
**43000 FT to 37000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
43 (-26)	EPR				1.422	1.340	1.274	1.223	1.181	1.146	1.117
	MAX TAT				-16	-5	3				
	KIAS				236	238	239	239	239	239	236
	MACH				.833	.837	.840	.841	.841	.840	.833
	FF/ENG				6897	6289	5831	5481	5195	4933	4675
	KTAS				478	480	482	483	483	482	478
42 (-26)	EPR			1.418	1.339	1.276	1.226	1.185	1.151	1.122	1.099
	MAX TAT			-15	-5	3					
	KIAS			242	243	244	245	245	244	243	239
	MACH			.833	.837	.840	.841	.841	.840	.835	.823
	FF/ENG			7185	6579	6116	5760	5470	5206	4948	4680
	KTAS			478	480	482	483	483	482	479	472
41 (-26)	EPR		1.409	1.335	1.274	1.226	1.187	1.154	1.126	1.102	1.083
	MAX TAT		-14	-4	3						
	KIAS		248	249	250	250	251	250	249	246	241
	MACH		.833	.837	.840	.841	.842	.841	.837	.827	.812
	FF/ENG		7454	6856	6396	6038	5745	5478	5221	4958	4684
	KTAS		478	480	482	482	483	482	480	474	466
40 (-27)	EPR	1.398	1.327	1.271	1.225	1.188	1.155	1.128	1.105	1.086	1.068
	MAX TAT	-12	-3	3							
	KIAS	254	255	256	256	256	256	255	252	248	242
	MACH	.834	.838	.840	.841	.842	.841	.837	.829	.816	.799
	FF/ENG	7705	7121	6671	6314	6019	5751	5493	5235	4963	4686
	KTAS	478	480	482	482	483	482	480	476	468	458
39 (-27)	EPR	1.318	1.265	1.222	1.186	1.155	1.129	1.107	1.088	1.071	1.054
	MAX TAT	-2	4								
	KIAS	261	262	262	262	262	261	259	254	249	243
	MACH	.838	.840	.841	.842	.841	.838	.831	.819	.804	.787
	FF/ENG	7376	6940	6587	6293	6023	5765	5510	5240	4965	4688
	KTAS	481	482	482	483	482	481	477	470	461	451
38 (-27)	EPR	1.258	1.217	1.184	1.154	1.129	1.107	1.089	1.073	1.057	1.042
	MAX TAT	5									
	KIAS	268	268	269	268	267	265	261	256	251	244
	MACH	.840	.841	.842	.841	.838	.832	.821	.807	.791	.773
	FF/ENG	7204	6858	6566	6296	6038	5784	5516	5244	4966	4684
	KTAS	482	483	483	482	481	477	471	463	454	444
37 (-27)	EPR	1.211	1.179	1.152	1.127	1.107	1.089	1.074	1.059	1.044	1.030
	MAX TAT										
	KIAS	275	275	275	274	272	268	263	258	252	245
	MACH	.841	.842	.841	.838	.833	.822	.809	.794	.778	.758
	FF/ENG	7127	6838	6570	6312	6059	5792	5522	5243	4965	4667
	KTAS	483	483	482	481	478	472	464	456	446	435

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Shaded area approximates optimum altitude.

**Max Cruise EPR**

PRESS ALT (1000 FT)	37	38	39	40	41	42	43
LIMIT EPR	1.419	1.420	1.421	1.420	1.420	1.420	1.419
MAX TAT (°C)	-14	-14	-14	-14	-14	-14	-14

Decrease limit EPR by 0.087 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.021.  
 With engine and wing anti-ice on, decrease limit EPR by 0.042.

**Long Range Cruise Table**  
**36000 FT to 30000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
36 (-26)	EPR					1.387	1.328	1.279	1.238	1.204	1.174
	MAX TAT					-11	-4	2	6		
	KIAS					278	280	280	281	281	281
	MACH					.834	.837	.839	.841	.841	.841
	FF/ENG KTAS					9168 479	8581 480	8107 482	7726 482	7400 483	7114 483
35 (-24)	EPR			1.423	1.363	1.309	1.265	1.228	1.197	1.169	1.144
	MAX TAT			-14	-6	1	6	10			
	KIAS			284	285	286	287	287	288	288	287
	MACH			.832	.836	.838	.840	.841	.841	.841	.841
	FF/ENG KTAS			10053 480	9398 482	8845 483	8404 484	8035 485	7720 485	7432 485	7167 485
34 (-21)	EPR		1.394	1.339	1.291	1.252	1.218	1.189	1.163	1.140	1.120
	MAX TAT		-9	-2	3	8	11				
	KIAS		291	292	293	294	294	294	294	294	293
	MACH		.834	.837	.839	.840	.841	.842	.841	.840	.837
	FF/ENG KTAS		10240 483	9630 484	9120 486	8707 487	8350 487	8045 487	7757 487	7492 487	7231 485
33 (-19)	EPR	1.365	1.315	1.273	1.238	1.207	1.180	1.156	1.135	1.116	1.100
	MAX TAT	-4	1	6	10	13					
	KIAS	299	299	300	301	301	301	301	300	299	297
	MACH	.835	.838	.840	.841	.841	.842	.841	.840	.837	.831
	FF/ENG KTAS	10440 486	9871 487	9404 488	9014 489	8672 489	8373 489	8088 489	7822 489	7560 487	7298 483
32 (-17)	EPR	1.293	1.256	1.224	1.197	1.172	1.150	1.130	1.113	1.097	1.083
	MAX TAT	5	8	12	15						
	KIAS	307	307	307	308	308	307	307	305	303	300
	MACH	.839	.840	.841	.841	.841	.841	.839	.836	.830	.822
	FF/ENG KTAS	10125 490	9697 491	9325 491	9001 492	8704 492	8424 491	8155 490	7893 488	7628 485	7349 480
31 (-15)	EPR	1.240	1.211	1.186	1.163	1.143	1.125	1.108	1.094	1.081	1.070
	MAX TAT	11	14	16	18						
	KIAS	314	314	314	314	314	313	312	309	306	302
	MACH	.841	.841	.842	.841	.841	.839	.835	.829	.820	.811
	FF/ENG KTAS	10001 493	9646 494	9337 494	9039 494	8764 493	8494 492	8231 490	7960 486	7676 481	7388 476
30 (-13)	EPR	1.199	1.176	1.155	1.136	1.119	1.104	1.090	1.078	1.068	1.057
	MAX TAT	16	18	20							
	KIAS	321	321	321	321	320	318	315	312	308	303
	MACH	.841	.842	.841	.840	.838	.834	.827	.819	.809	.799
	FF/ENG KTAS	9982 496	9676 496	9383 496	9109 495	8837 494	8571 491	8294 488	8006 483	7714 477	7417 471

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
Shaded area approximates optimum altitude.

**Max Cruise EPR**

PRESS ALT (1000 FT)	30	31	32	33	34	35	36
LIMIT EPR	1.357	1.378	1.387	1.397	1.407	1.418	1.418
MAX TAT (°C)	-1	-3	-5	-7	-10	-12	-14

Decrease limit EPR by 0.094 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.019.  
With engine and wing anti-ice on, decrease limit EPR by 0.034.



Flight Planning and Performance Manual

**Long Range Cruise Table**  
**36000 FT to 30000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
36 (-28)	EPR	1.174	1.148	1.125	1.106	1.089	1.074	1.060	1.046	1.032	1.018
	MAX TAT										
	KIAS	281	281	280	278	274	270	265	259	252	244
	MACH	.841	.841	.838	.833	.823	.811	.797	.782	.763	.742
	FF/ENG	7114	6847	6590	6337	6071	5802	5521	5246	4953	4643
	KTAS	483	482	481	478	472	465	457	449	438	426
35 (-26)	EPR	1.144	1.123	1.104	1.088	1.074	1.061	1.047	1.034	1.020	1.008
	MAX TAT										
	KIAS	287	286	284	281	276	271	266	260	252	244
	MACH	.841	.838	.832	.823	.812	.798	.784	.767	.747	.725
	FF/ENG	7167	6908	6653	6384	6114	5832	5554	5265	4958	4643
	KTAS	485	483	480	475	468	460	452	442	431	418
34 (-25)	EPR	1.120	1.102	1.087	1.073	1.061	1.048	1.036	1.022	1.010	1.000
	MAX TAT										
	KIAS	293	291	287	283	278	273	267	260	252	243
	MACH	.837	.832	.823	.812	.799	.786	.771	.752	.731	.708
	FF/ENG	7231	6973	6702	6429	6140	5862	5578	5273	4958	4645
	KTAS	485	482	477	470	463	455	446	435	423	410
33 (-22)	EPR	1.100	1.085	1.072	1.061	1.048	1.037	1.024	1.012	1.002	0.994
	MAX TAT										
	KIAS	297	293	289	284	280	274	267	260	251	242
	MACH	.831	.823	.812	.800	.787	.773	.755	.736	.714	.690
	FF/ENG	7298	7024	6747	6449	6172	5893	5589	5274	4960	4743
	KTAS	483	478	472	465	458	449	439	428	415	401
32 (-22)	EPR	1.083	1.071	1.060	1.048	1.037	1.025	1.013	1.003	0.995	0.988
	MAX TAT										
	KIAS	300	295	291	286	281	274	267	259	250	241
	MACH	.822	.811	.800	.788	.774	.758	.739	.719	.697	.674
	FF/ENG	7349	7066	6768	6491	6211	5906	5590	5276	4960	4747
	KTAS	480	474	467	460	452	443	432	420	407	393
31 (-21)	EPR	1.070	1.059	1.048	1.037	1.026	1.014	1.004	0.996	0.989	0.984
	MAX TAT										
	KIAS	302	297	293	287	281	274	266	258	249	240
	MACH	.811	.799	.788	.775	.759	.742	.723	.702	.680	.658
	FF/ENG	7388	7092	6813	6530	6225	5908	5593	5277	5063	4752
	KTAS	476	469	462	455	446	435	424	412	399	386
30 (-20)	EPR	1.057	1.047	1.037	1.026	1.015	1.005	0.997	0.990	0.985	0.980
	MAX TAT										
	KIAS	303	299	294	288	281	273	265	257	248	240
	MACH	.799	.788	.775	.760	.744	.726	.707	.685	.664	.642
	FF/ENG	7417	7137	6850	6543	6226	5910	5594	5274	5067	4758
	KTAS	471	464	457	448	439	428	416	404	391	379

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	30	31	32	33	34	35	36
LIMIT EPR	1.357	1.378	1.388	1.397	1.407	1.418	1.418
MAX TAT (°C)	-1	-3	-5	-7	-10	-12	-14

Decrease limit EPR by 0.094 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.019.  
 With engine and wing anti-ice on, decrease limit EPR by 0.034.

**Long Range Cruise Table**  
**29000 FT to 23000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
29 (-11)	EPR	1.161	1.143	1.127	1.113	1.099	1.087	1.076	1.065	1.055	1.045
	MAX TAT	20	22								
	KIAS	325	325	325	325	324	321	318	314	309	305
	MACH	.834	.834	.834	.834	.832	.825	.817	.808	.797	.787
	FF/ENG	9851	9585	9347	9135	8913	8629	8339	8043	7745	7461
KTAS	494	494	494	494	493	489	484	478	472	466	
28 (-10)	EPR	1.136	1.122	1.108	1.095	1.083	1.073	1.063	1.053	1.044	1.035
	MAX TAT	23									
	KIAS	325	325	325	325	325	324	320	315	311	306
	MACH	.818	.818	.818	.818	.818	.815	.806	.796	.786	.774
	FF/ENG	9726	9488	9272	9074	8889	8675	8375	8076	7787	7489
KTAS	486	486	486	486	486	484	479	473	467	460	
27 (-9)	EPR	1.119	1.105	1.093	1.081	1.070	1.060	1.051	1.042	1.033	1.023
	MAX TAT										
	KIAS	325	325	325	325	325	325	321	317	312	306
	MACH	.802	.802	.802	.802	.802	.802	.794	.785	.773	.760
	FF/ENG	9655	9433	9226	9035	8856	8690	8408	8114	7811	7500
KTAS	479	479	479	479	479	479	474	468	461	454	
26 (-8)	EPR	1.102	1.089	1.078	1.068	1.058	1.049	1.040	1.031	1.022	1.013
	MAX TAT										
	KIAS	325	325	325	325	325	325	323	318	312	306
	MACH	.787	.787	.787	.787	.787	.787	.783	.772	.759	.745
	FF/ENG	9605	9391	9193	9008	8831	8665	8444	8137	7824	7506
KTAS	472	472	472	472	472	469	463	455	447	442	
25 (-7)	EPR	1.086	1.075	1.065	1.055	1.046	1.038	1.029	1.020	1.012	1.004
	MAX TAT										
	KIAS	325	325	325	325	325	325	324	318	312	306
	MACH	.772	.772	.772	.772	.772	.772	.770	.757	.744	.730
	FF/ENG	9579	9370	9175	8993	8821	8659	8468	8153	7832	7511
KTAS	465	465	465	465	465	465	463	456	448	439	
24 (-6)	EPR	1.072	1.062	1.053	1.044	1.035	1.027	1.019	1.010	1.003	0.997
	MAX TAT										
	KIAS	325	325	325	325	325	325	324	318	312	305
	MACH	.758	.758	.758	.758	.758	.758	.756	.743	.729	.714
	FF/ENG	9561	9359	9170	8993	8826	8667	8485	8161	7837	7514
KTAS	458	458	458	458	458	458	457	449	441	432	
23 (-4)	EPR	1.060	1.051	1.042	1.033	1.024	1.016	1.009	1.002	0.996	0.991
	MAX TAT										
	KIAS	325	325	325	325	325	325	324	318	311	304
	MACH	.743	.743	.743	.743	.743	.743	.741	.728	.714	.698
	FF/ENG	9549	9354	9170	8995	8829	8674	8491	8164	7839	7509
KTAS	451	451	451	451	451	451	450	442	433	424	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	23	24	25	26	27	28	29
LIMIT EPR	1.282	1.295	1.309	1.310	1.311	1.331	1.341
MAX TAT (°C)	12	11	10	9	8	2	1

Decrease limit EPR by 0.105 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.022.  
With engine and wing anti-ice on, decrease limit EPR by 0.037.



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**Long Range Cruise Table**  
**29000 FT to 23000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
29 (-19)	EPR	1.045	1.036	1.025	1.015	1.005	0.998	0.991	0.986	0.981	0.977
	MAX TAT										
	KIAS	305	300	294	287	280	273	264	256	248	239
	MACH	.787	.775	.761	.745	.728	.710	.690	.669	.649	.628
	FF/ENG	7461	7169	6861	6544	6228	5912	5590	5384	5072	4765
KTAS	466	459	450	441	431	420	408	396	384	372	
28 (-18)	EPR	1.035	1.024	1.014	1.005	0.998	0.992	0.986	0.981	0.978	0.975
	MAX TAT										
	KIAS	306	300	294	287	280	272	263	255	247	239
	MACH	.774	.761	.746	.730	.712	.693	.674	.654	.634	.614
	FF/ENG	7489	7180	6863	6547	6230	5908	5590	5389	5080	4776
KTAS	460	452	443	434	423	412	400	389	377	365	
27 (-16)	EPR	1.023	1.014	1.005	0.998	0.992	0.987	0.982	0.978	0.975	0.974
	MAX TAT										
	KIAS	306	300	293	286	279	271	263	255	247	239
	MACH	.760	.746	.730	.714	.696	.677	.658	.639	.620	.601
	FF/ENG	7500	7183	6866	6549	6227	5906	5708	5397	5092	4793
KTAS	454	445	436	426	415	404	393	382	370	359	
26 (-15)	EPR	1.013	1.005	0.998	0.992	0.987	0.982	0.978	0.976	0.974	0.972
	MAX TAT										
	KIAS	306	300	293	285	277	270	262	254	246	239
	MACH	.745	.730	.715	.697	.679	.662	.644	.625	.607	.589
	FF/ENG	7506	7188	6869	6546	6224	5910	5715	5409	5107	4814
KTAS	447	438	428	418	407	397	386	375	364	353	
25 (-14)	EPR	1.004	0.998	0.992	0.987	0.982	0.979	0.976	0.974	0.973	0.971
	MAX TAT										
	KIAS	306	299	292	284	277	269	261	254	246	239
	MACH	.730	.715	.698	.681	.664	.647	.630	.612	.595	.578
	FF/ENG	7511	7191	6866	6542	6226	6033	5725	5422	5125	4837
KTAS	439	430	420	410	400	389	379	368	358	348	
24 (-13)	EPR	0.997	0.991	0.987	0.982	0.979	0.976	0.974	0.973	0.971	0.970
	MAX TAT										
	KIAS	305	298	291	283	276	268	261	253	246	239
	MACH	.714	.699	.682	.666	.649	.633	.616	.600	.583	.567
	FF/ENG	7514	7187	6861	6544	6231	6043	5738	5438	5147	4861
KTAS	432	422	412	403	393	383	372	362	353	343	
23 (-11)	EPR	0.991	0.986	0.982	0.979	0.976	0.974	0.973	0.971	0.970	0.970
	MAX TAT										
	KIAS	304	297	290	282	275	268	261	253	246	239
	MACH	.698	.683	.667	.651	.636	.620	.604	.588	.572	.556
	FF/ENG	7509	7181	6861	6545	6356	6047	5745	5450	5162	4874
KTAS	424	414	405	395	386	376	366	357	347	338	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	23	24	25	26	27	28	29
LIMIT EPR	1.282	1.295	1.309	1.310	1.311	1.331	1.341
MAX TAT (°C)	12	11	10	9	8	2	1

Decrease limit EPR by 0.105 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.

**Long Range Cruise Table**  
**22000 FT to 16000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
22 (-3)	EPR	1.049	1.040	1.031	1.023	1.015	1.007	1.001	0.995	0.990	0.986
	MAX TAT										
	KIAS	325	325	325	325	325	325	323	317	310	303
	MACH	.730	.730	.730	.730	.730	.730	.726	.712	.698	.683
	FF/ENG	9542	9350	9169	8997	8836	8687	8494	8167	7835	7503
KTAS	445	445	445	445	445	445	442	434	425	416	
21 (-2)	EPR	1.038	1.030	1.021	1.014	1.006	1.000	0.994	0.989	0.985	0.982
	MAX TAT										
	KIAS	325	325	325	325	325	325	322	316	309	302
	MACH	.716	.716	.716	.716	.716	.716	.711	.697	.682	.668
	FF/ENG	9532	9344	9168	9004	8850	8708	8494	8160	7827	7501
KTAS	438	438	438	438	438	438	435	426	417	409	
20 (-1)	EPR	1.028	1.020	1.013	1.006	1.000	0.994	0.989	0.985	0.981	0.978
	MAX TAT										
	KIAS	325	325	325	325	325	325	321	314	308	301
	MACH	.703	.703	.703	.703	.703	.703	.695	.681	.667	.653
	FF/ENG	9522	9342	9174	9018	8871	8734	8485	8152	7826	7502
KTAS	432	432	432	432	432	432	427	418	410	401	
19 (0)	EPR	1.020	1.012	1.006	0.999	0.994	0.988	0.984	0.981	0.978	0.975
	MAX TAT										
	KIAS	325	325	325	325	325	325	320	314	307	300
	MACH	.690	.690	.690	.690	.690	.690	.680	.667	.653	.640
	FF/ENG	9525	9354	9193	9042	8898	8763	8481	8156	7834	7514
KTAS	425	425	425	425	425	425	419	411	403	395	
18 (2)	EPR	1.012	1.006	1.000	0.994	0.988	0.983	0.980	0.977	0.975	0.973
	MAX TAT										
	KIAS	325	325	325	325	325	325	319	313	306	300
	MACH	.677	.677	.677	.677	.677	.677	.665	.652	.640	.627
	FF/ENG	9547	9381	9224	9076	8937	8805	8496	8174	7855	7671
KTAS	419	419	419	419	419	419	412	404	396	388	
17 (3)	EPR	1.006	1.000	0.995	0.989	0.984	0.979	0.977	0.974	0.973	0.971
	MAX TAT										
	KIAS	325	325	325	325	325	325	318	312	306	299
	MACH	.665	.665	.665	.665	.665	.664	.651	.639	.627	.614
	FF/ENG	9586	9424	9271	9128	8991	8845	8523	8206	7895	7715
KTAS	413	413	413	413	413	413	405	397	390	382	
16 (4)	EPR	1.001	0.995	0.990	0.985	0.980	0.976	0.974	0.972	0.971	0.971
	MAX TAT										
	KIAS	325	325	325	325	325	324	318	311	305	299
	MACH	.652	.652	.652	.652	.652	.650	.638	.626	.614	.602
	FF/ENG	9641	9483	9334	9192	9057	8887	8572	8261	7950	7767
KTAS	407	407	407	407	407	406	398	391	383	376	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	16	17	18	19	20	21	22
LIMIT EPR	1.236	1.239	1.242	1.245	1.249	1.259	1.270
MAX TAT (°C)	20	19	18	17	15	14	13

Decrease limit EPR by 0.063 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.020.  
With engine and wing anti-ice on, decrease limit EPR by 0.034.



Flight Planning and Performance Manual

**Long Range Cruise Table**  
**22000 FT to 16000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
22 (-10)	EPR	0.986	0.982	0.979	0.976	0.974	0.972	0.971	0.970	0.969	0.969
	MAX TAT										
	KIAS	303	296	289	282	275	268	261	254	247	239
	MACH	.683	.668	.653	.637	.622	.607	.592	.577	.562	.546
	FF/ENG	7503	7179	6858	6665	6352	6045	5745	5456	5169	4882
KTAS	416	407	398	388	379	370	361	352	342	332	
21 (-9)	EPR	0.982	0.978	0.976	0.974	0.972	0.971	0.970	0.969	0.969	0.968
	MAX TAT										
	KIAS	302	295	288	281	274	267	261	254	247	240
	MACH	.668	.653	.639	.624	.609	.595	.581	.566	.551	.535
	FF/ENG	7501	7177	6983	6668	6359	6056	5763	5474	5184	4898
KTAS	409	400	391	382	373	364	355	346	337	328	
20 (-7)	EPR	0.978	0.975	0.973	0.972	0.971	0.970	0.969	0.969	0.968	0.968
	MAX TAT										
	KIAS	301	294	288	281	274	267	261	254	247	240
	MACH	.653	.640	.625	.611	.597	.584	.570	.556	.541	.525
	FF/ENG	7502	7309	6994	6684	6380	6083	5788	5494	5202	4913
KTAS	401	393	384	376	367	359	350	341	332	323	
19 (-6)	EPR	0.975	0.973	0.972	0.971	0.970	0.969	0.969	0.968	0.968	0.968
	MAX TAT										
	KIAS	300	294	287	281	274	268	261	254	247	240
	MACH	.640	.626	.613	.599	.586	.573	.559	.545	.531	.515
	FF/ENG	7514	7328	7019	6715	6414	6115	5815	5516	5221	4931
KTAS	395	386	378	370	361	353	345	336	327	318	
18 (-4)	EPR	0.973	0.972	0.971	0.970	0.969	0.968	0.968	0.968	0.968	0.968
	MAX TAT										
	KIAS	300	293	287	281	274	268	261	255	247	240
	MACH	.627	.614	.601	.588	.576	.563	.549	.535	.521	.506
	FF/ENG	7671	7363	7058	6755	6453	6149	5845	5545	5249	4961
KTAS	388	380	372	364	356	348	340	331	322	313	
17 (-3)	EPR	0.971	0.971	0.970	0.969	0.968	0.968	0.967	0.967	0.967	0.968
	MAX TAT										
	KIAS	299	293	287	281	275	268	262	255	248	240
	MACH	.614	.602	.589	.577	.565	.552	.539	.525	.511	.496
	FF/ENG	7715	7408	7103	6800	6496	6190	5888	5590	5296	5012
KTAS	382	374	366	359	351	343	335	327	318	308	
16 (-1)	EPR	0.971	0.970	0.969	0.968	0.968	0.967	0.967	0.967	0.967	0.968
	MAX TAT										
	KIAS	299	293	287	281	275	268	262	255	248	240
	MACH	.602	.590	.579	.567	.555	.542	.529	.516	.502	.487
	FF/ENG	7767	7460	7159	6859	6556	6256	5960	5665	5373	5084
KTAS	376	368	361	354	346	338	330	322	313	304	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	16	17	18	19	20	21	22
LIMIT EPR	1.236	1.239	1.242	1.245	1.249	1.259	1.270
MAX TAT (°C)	20	19	18	17	15	14	13

Decrease limit EPR by 0.063 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.020.  
 With engine and wing anti-ice on, decrease limit EPR by 0.034.

**Long Range Cruise Table**  
**15000 FT to 6000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
15 (6)	EPR	0.996	0.991	0.986	0.981	0.977	0.973	0.972	0.971	0.970	0.969
	MAX TAT										
	KIAS	325	325	325	325	325	323	317	311	305	299
	MACH	.641	.641	.641	.641	.641	.637	.625	.614	.602	.591
	FF/ENG	9696	9541	9396	9262	9133	8945	8634	8320	8007	7825
KTAS	401	401	401	401	401	399	392	384	377	370	
14 (7)	EPR	0.992	0.987	0.983	0.978	0.974	0.971	0.971	0.970	0.969	0.968
	MAX TAT										
	KIAS	325	325	325	325	325	322	316	311	305	299
	MACH	.629	.629	.629	.629	.629	.624	.613	.602	.591	.581
	FF/ENG	9745	9601	9465	9337	9212	9006	8693	8378	8069	7894
KTAS	396	396	396	396	396	392	386	379	372	365	
13 (8)	EPR	0.989	0.984	0.980	0.976	0.972	0.970	0.970	0.969	0.968	0.968
	MAX TAT										
	KIAS	325	325	325	325	325	322	316	311	305	299
	MACH	.618	.618	.618	.618	.618	.612	.601	.591	.581	.570
	FF/ENG	9814	9676	9546	9420	9295	9071	8757	8445	8140	7969
KTAS	390	390	390	390	390	386	380	373	367	360	
12 (10)	EPR	0.986	0.982	0.978	0.975	0.971	0.970	0.969	0.968	0.967	0.967
	MAX TAT										
	KIAS	325	325	325	325	325	322	316	311	305	300
	MACH	.607	.607	.607	.607	.607	.601	.591	.581	.571	.561
	FF/ENG	9899	9766	9635	9507	9378	9139	8824	8515	8211	8038
KTAS	384	384	384	384	384	381	374	368	362	355	
10 (13)	EPR	0.982	0.978	0.975	0.972	0.969	0.967	0.967	0.967	0.966	0.966
	MAX TAT										
	KIAS	325	325	325	325	325	322	317	311	306	300
	MACH	.585	.585	.585	.585	.585	.580	.571	.561	.551	.541
	FF/ENG	10063	9915	9772	9631	9495	9251	8939	8627	8317	8012
KTAS	374	374	374	374	374	370	364	358	352	346	
8 (16)	EPR	0.979	0.976	0.973	0.970	0.968	0.966	0.966	0.966	0.966	0.966
	MAX TAT										
	KIAS	325	325	325	325	325	322	317	312	306	301
	MACH	.565	.565	.565	.565	.565	.560	.551	.542	.533	.523
	FF/ENG	10085	9935	9793	9658	9526	9303	8985	8674	8367	8060
KTAS	363	363	363	363	363	360	354	349	342	336	
6 (19)	EPR	0.977	0.974	0.972	0.969	0.967	0.965	0.965	0.965	0.965	0.966
	MAX TAT										
	KIAS	325	325	325	325	325	323	318	312	307	301
	MACH	.545	.545	.545	.545	.545	.542	.533	.524	.514	.505
	FF/ENG	10071	9923	9781	9645	9513	9309	8998	8692	8386	8081
KTAS	353	353	353	353	353	351	345	339	333	327	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	6	8	10	12	13	14	15
LIMIT EPR	1.195	1.203	1.212	1.220	1.224	1.228	1.232
MAX TAT (°C)	34	31	29	26	24	23	22

Decrease limit EPR by 0.049 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.015.  
With engine and wing anti-ice on, decrease limit EPR by 0.025.



Flight Planning and Performance Manual

**Long Range Cruise Table**  
**15000 FT to 6000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
15 (0)	EPR	0.969	0.969	0.968	0.968	0.967	0.967	0.967	0.967	0.967	0.967
	MAX TAT										
	KIAS	299	293	287	281	275	269	262	255	248	240
	MACH	.591	.580	.569	.557	.545	.533	.520	.506	.492	.478
	FF/ENG	7825	7525	7228	6930	6633	6338	6044	5748	5450	5149
KTAS	370	363	356	349	341	334	326	317	308	299	
14 (2)	EPR	0.968	0.968	0.967	0.967	0.967	0.967	0.967	0.967	0.967	0.968
	MAX TAT										
	KIAS	299	293	288	281	275	269	262	255	248	240
	MACH	.581	.570	.559	.547	.535	.523	.510	.497	.483	.469
	FF/ENG	7894	7597	7299	7002	6708	6413	6114	5812	5504	5194
KTAS	365	358	351	344	337	329	321	313	304	295	
13 (3)	EPR	0.968	0.967	0.967	0.967	0.966	0.967	0.967	0.967	0.968	0.969
	MAX TAT										
	KIAS	299	294	288	282	275	269	262	255	248	240
	MACH	.570	.560	.549	.537	.526	.514	.501	.488	.474	.460
	FF/ENG	7969	7669	7370	7074	6777	6476	6169	5858	5544	5228
KTAS	360	353	346	339	332	324	316	308	299	290	
12 (5)	EPR	0.967	0.967	0.966	0.966	0.966	0.967	0.967	0.967	0.968	0.970
	MAX TAT										
	KIAS	300	294	288	282	276	269	262	255	248	240
	MACH	.561	.550	.539	.528	.516	.504	.492	.479	.465	.451
	FF/ENG	8038	7735	7436	7137	6832	6522	6208	5892	5575	5256
KTAS	355	348	342	335	327	320	312	303	295	286	
10 (8)	EPR	0.966	0.966	0.966	0.966	0.966	0.967	0.967	0.968	0.970	0.971
	MAX TAT										
	KIAS	300	294	288	282	276	269	262	255	248	240
	MACH	.541	.531	.520	.509	.498	.486	.474	.461	.448	.434
	FF/ENG	8012	7842	7534	7219	6902	6585	6269	5950	5627	5296
KTAS	346	339	332	325	318	311	303	295	286	277	
8 (11)	EPR	0.966	0.966	0.966	0.966	0.967	0.967	0.969	0.970	0.971	0.973
	MAX TAT										
	KIAS	301	295	289	282	276	269	262	255	247	240
	MACH	.523	.513	.502	.492	.481	.469	.457	.445	.432	.418
	FF/ENG	8060	7883	7570	7258	6948	6637	6321	5998	5663	5324
KTAS	336	330	323	316	309	302	294	286	277	269	
6 (15)	EPR	0.966	0.966	0.966	0.967	0.968	0.969	0.970	0.971	0.973	0.974
	MAX TAT										
	KIAS	301	295	289	282	276	269	262	255	247	239
	MACH	.505	.495	.485	.475	.464	.452	.440	.428	.416	.403
	FF/ENG	8081	7912	7611	7310	7006	6694	6369	6032	5692	5360
KTAS	327	321	314	307	300	293	285	277	269	261	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	6	8	10	12	13	14	15
LIMIT EPR	1.195	1.203	1.212	1.220	1.224	1.228	1.232
MAX TAT (°C)	34	31	29	26	24	23	22

Decrease limit EPR by 0.049 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.025.



Flight Planning and Performance Manual

**.84M Cruise Table**  
**43000 FT to 30000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)																			
			660	640	620	600	580	560	540	520	500	480										
43																						
42																						
41																						
40	256 -26 482	EPR MAX TAT FF/ENG																			1.415 -15 7920	
39	262 -26 482	EPR MAX TAT FF/ENG																			1.398 -12 8131 7440	
38	268 -26 482	EPR MAX TAT FF/ENG											1.379 -9 8324	1.310 -1 7674							1.257 5 7196	
37	274 -26 482	EPR MAX TAT FF/ENG										1.358 -7 8503	1.296 0 7900	1.248 5 7450							1.209 7097	
36	281 -26 482	EPR MAX TAT FF/ENG						1.403 -13 9408	1.335 -4 8679	1.280 2 8126	1.237 7 7705	1.202 7 7368	1.172 7 7084								1.172 7084	
35	287 -23 484	EPR MAX TAT FF/ENG					1.375 -7 9579	1.314 0 8915	1.266 6 8406	1.227 6 8008	1.195 6 7684	1.167 6 7403	1.144 6 7154									1.144 7154
34	294 -21 486	EPR MAX TAT FF/ENG			1.347 -3 9761	1.294 3 9161	1.251 8 8695	1.216 12 8318	1.187 12 8008	1.161 12 7729	1.140 12 7484	1.121 12 7272										1.121 7272
33	300 -19 489	EPR MAX TAT FF/ENG	1.377 -6 10647	1.320 1 9960	1.274 6 9419	1.237 10 8990	1.205 13 8635	1.179 13 8335	1.155 13 8062	1.135 13 7821	1.118 13 7612	1.102 13 7426										1.102 7426
32	307 -17 491	EPR MAX TAT FF/ENG	1.296 4 10175	1.256 8 9690	1.223 12 9292	1.195 15 8960	1.170 15 8667	1.149 15 8401	1.130 15 8166	1.114 15 7960	1.099 15 7776	1.086 15 7609										1.086 7609
31	314 -14 493	EPR MAX TAT FF/ENG	1.239 11 9977	1.209 14 9607	1.184 16 9294	1.162 19 9005	1.142 19 8747	1.125 19 8519	1.110 19 8316	1.096 19 8135	1.084 19 7968	1.072 19 7815										1.072 7815
30	321 -12 495	EPR MAX TAT FF/ENG	1.197 16 9938	1.174 18 9633	1.154 20 9353	1.136 20 9102	1.120 20 8880	1.106 20 8681	1.093 20 8501	1.081 20 8335	1.070 20 8182	1.060 20 8041										1.060 8041

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
Shaded area approximates optimum altitude.

**Max Cruise EPR**

PRESS ALT (1000 FT)	30	31	32	33	34	35	36	37	38	39	40
LIMIT EPR	1.358	1.379	1.388	1.398	1.408	1.419	1.419	1.420	1.421	1.422	1.421
MAX TAT (°C)	-1	-3	-5	-8	-10	-12	-14	-15	-15	-15	-15

Decrease limit EPR by 0.090 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.019.  
With engine and wing anti-ice on, decrease limit EPR by 0.038.



Flight Planning and Performance Manual

**.84M Cruise Table**  
**43000 FT to 30000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			480	460	440	420	400	380	360	340	320	300
43	239	EPR					1.347	1.274	1.221	1.179	1.146	1.120
	-26	MAX TAT					-6	3				
	482	FF/ENG					6362	5830	5457	5175	4938	4745
42	244	EPR				1.346	1.276	1.224	1.183	1.150	1.124	1.102
	-26	MAX TAT				-6	3					
	482	FF/ENG				6657	6118	5737	5447	5202	5000	4833
41	250	EPR			1.342	1.275	1.225	1.185	1.153	1.127	1.106	1.087
	-26	MAX TAT			-5	3						
	482	FF/ENG			6934	6399	6015	5720	5468	5260	5086	4937
40	256	EPR	1.415	1.334	1.271	1.223	1.186	1.155	1.129	1.108	1.089	1.073
	-26	MAX TAT	-15	-4	3							
	482	FF/ENG	7920	7194	6672	6290	5993	5737	5524	5345	5190	5057
39	262	EPR	1.323	1.265	1.220	1.185	1.155	1.130	1.109	1.091	1.075	1.061
	-26	MAX TAT	-3	4								
	482	FF/ENG	7440	6937	6561	6265	6008	5791	5608	5450	5312	5194
38	268	EPR	1.257	1.215	1.182	1.153	1.130	1.110	1.092	1.076	1.062	1.050
	-26	MAX TAT	5									
	482	FF/ENG	7196	6830	6537	6280	6062	5877	5716	5574	5452	5343
37	274	EPR	1.209	1.178	1.151	1.128	1.109	1.092	1.077	1.063	1.051	1.040
	-26	MAX TAT										
	482	FF/ENG	7097	6809	6554	6336	6150	5987	5843	5718	5605	5503
36	281	EPR	1.172	1.147	1.126	1.108	1.092	1.077	1.064	1.052	1.041	1.032
	-26	MAX TAT										
	482	FF/ENG	7084	6832	6617	6430	6267	6121	5994	5878	5773	5678
35	287	EPR	1.144	1.124	1.107	1.091	1.077	1.064	1.052	1.042	1.033	1.025
	-23	MAX TAT										
	484	FF/ENG	7154	6940	6753	6588	6441	6310	6192	6083	5984	5896
34	294	EPR	1.121	1.105	1.090	1.076	1.064	1.053	1.043	1.033	1.026	1.019
	-21	MAX TAT										
	486	FF/ENG	7272	7085	6919	6769	6637	6516	6404	6302	6210	6128
33	300	EPR	1.102	1.088	1.075	1.063	1.053	1.043	1.034	1.026	1.019	1.013
	-19	MAX TAT										
	489	FF/ENG	7426	7259	7108	6973	6851	6736	6630	6536	6450	6373
32	307	EPR	1.086	1.074	1.062	1.052	1.043	1.034	1.026	1.020	1.014	1.008
	-17	MAX TAT										
	491	FF/ENG	7609	7457	7319	7193	7075	6967	6870	6782	6702	6630
31	314	EPR	1.072	1.061	1.051	1.042	1.034	1.027	1.020	1.014	1.009	1.004
	-14	MAX TAT										
	493	FF/ENG	7815	7675	7546	7425	7314	7214	7124	7043	6969	6902
30	321	EPR	1.060	1.050	1.041	1.033	1.026	1.020	1.014	1.009	1.004	1.000
	-12	MAX TAT										
	495	FF/ENG	8041	7910	7786	7673	7572	7480	7396	7320	7251	7189

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Shaded area approximates optimum altitude.

**Max Cruise EPR**

PRESS ALT (1000 FT)	30	31	32	33	34	35	36	37	38	39	40	41	42	43
LIMIT EPR	1.358	1.379	1.388	1.398	1.408	1.419	1.419	1.420	1.421	1.422	1.421	1.421	1.420	1.420
MAX TAT (°C)	-1	-3	-5	-8	-10	-12	-14	-15	-15	-15	-15	-15	-15	-15

Decrease limit EPR by 0.090 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.021.  
 With engine and wing anti-ice on, decrease limit EPR by 0.042.



Flight Planning and Performance Manual

**Wind-Altitude Trade**

**LRC**

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)									
	660	620	580	540	500	460	420	380	340	300
43						116	48	11	0	8
41					104	45	12	0	5	22
39				87	39	10	0	3	17	39
37			69	30	8	0	3	15	34	57
35	95	51	21	5	0	3	14	31	52	74
33	35	13	2	0	4	15	30	49	69	90
31	7	0	0	6	16	30	47	66	85	103
29	0	1	8	18	32	47	64	81	98	114
27	4	11	21	34	48	64	80	95	110	124
25	15	25	37	50	65	79	93	107	120	131

**.84M**

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)									
	660	620	580	540	500	460	420	380	340	300
43							56	13	0	13
41						53	14	0	8	36
39				101	45	12	0	6	28	65
37			80	36	9	0	5	24	55	97
35		59	25	6	0	6	23	51	87	131
33	41	16	2	0	7	24	49	81	120	164
31	8	0	1	10	26	49	79	113	153	196

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 positive or negative.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Example: LRC at 33000 ft, 460000 lb, present wind -20 knots (headwind)

To find break-even wind for

- A) Climb to 37000 ft
- B) Descent to 29000 ft

- A) Wind factors from LRC table at 460000 lb are 15 (33000 ft) and 0 (37000 ft). Difference is -15 so break-even wind is -20 plus -15, i.e. -35 knots (headwind).
- B) Similarly, wind factors are 15 (33000 ft) and 47 (29000 ft). Difference is +32 so break-even wind is -20 plus (+32), i.e. +12 knots (tailwind).



Flight Planning and Performance Manual

**Descent**  
**.84/280/250**

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)		
			LANDING WEIGHT (1000 LB)		
			340	400	460
43000	29	1550	142	153	160
41000	28	1520	136	147	154
39000	27	1500	130	141	148
37000	27	1480	124	135	142
35000	26	1450	119	129	135
33000	25	1420	112	121	128
31000	24	1390	105	114	120
29000	23	1350	99	107	112
27000	22	1310	92	100	105
25000	20	1260	86	92	97
23000	19	1210	79	85	90
21000	18	1160	73	78	82
19000	17	1110	67	72	75
17000	16	1050	61	65	68
15000	15	1000	55	59	61
10000	11	830	38	40	41
5000	7	650	22	23	23
1500	4	520	11	11	11

**.84/250**

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)		
			LANDING WEIGHT (1000 LB)		
			340	400	460
43000	32	1700	158	167	170
41000	31	1670	152	161	164
39000	30	1640	144	152	156
37000	29	1600	135	143	147
35000	28	1560	127	135	139
33000	27	1530	120	127	131
31000	25	1490	112	119	122
29000	24	1440	105	111	114
27000	23	1390	97	104	106
25000	22	1330	90	96	98
23000	20	1260	82	88	90
21000	19	1200	75	80	82
19000	17	1140	68	72	74
17000	16	1070	61	65	67
15000	15	1000	54	57	59
10000	11	830	38	40	41
5000	7	650	22	23	23
1500	4	520	11	11	11



Flight Planning and Performance Manual

**Descent**  
**.84/310/250**

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)		
			LANDING WEIGHT (1000 LB)		
			340	400	460
43000	26	1430	130	141	149
41000	26	1410	124	135	144
39000	25	1380	118	129	138
37000	24	1360	112	123	132
35000	23	1340	108	118	126
33000	23	1320	104	114	121
31000	22	1300	99	109	116
29000	21	1270	93	102	109
27000	20	1240	88	96	102
25000	19	1200	82	90	95
23000	18	1160	77	83	88
21000	17	1120	71	77	82
19000	17	1080	66	71	75
17000	16	1040	61	65	69
15000	15	1000	56	60	62
10000	11	830	38	40	41
5000	7	650	22	23	23
1500	4	520	11	11	11

Allowances for a straight-in approach are included.



Flight Planning and Performance Manual

**Holding  
 Flaps Up**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)									
		660	620	580	540	500	460	420	380	340	300
43000	EPR							1.412	1.267	1.182	1.126
	KIAS							232	232	225	210
	FF/ENG							7050	5920	5140	4510
40000	EPR						1.320	1.219	1.162	1.115	1.077
	KIAS						249	249	237	223	208
	FF/ENG						7260	6400	5620	4920	4390
35000	EPR		1.413	1.303	1.223	1.173	1.135	1.101	1.072	1.047	1.030
	KIAS		279	279	279	271	259	246	233	219	203
	FF/ENG		10290	9020	8160	7370	6640	5960	5350	4860	4240
30000	EPR	1.196	1.162	1.133	1.105	1.081	1.060	1.041	1.038	1.031	1.005
	KIAS	310	300	289	278	267	255	243	221	203	203
	FF/ENG	10080	9250	8500	7790	7130	6490	5860	5290	4690	4280
25000	EPR	1.097	1.078	1.061	1.045	1.037	1.037	1.036	1.030	1.011	0.995
	KIAS	306	296	285	275	259	238	220	205	203	203
	FF/ENG	9630	8940	8280	7630	6960	6400	5770	5190	4730	4340
20000	EPR	1.041	1.036	1.036	1.036	1.035	1.034	1.024	1.014	1.001	0.989
	KIAS	302	287	269	252	235	220	212	205	203	203
	FF/ENG	9440	8720	7990	7460	6840	6300	5800	5310	4860	4490
15000	EPR	1.036	1.035	1.034	1.030	1.024	1.019	1.012	1.005	0.996	0.988
	KIAS	277	262	248	237	227	219	212	205	203	203
	FF/ENG	9240	8620	8150	7580	7020	6470	5930	5410	4950	4590
10000	EPR	1.030	1.025	1.021	1.017	1.013	1.010	1.005	1.000	0.994	0.987
	KIAS	261	253	245	236	227	218	212	205	203	203
	FF/ENG	9390	8800	8350	7790	7230	6650	6080	5560	5100	4730
5000	EPR	1.018	1.015	1.012	1.009	1.007	1.005	1.001	0.997	0.992	0.986
	KIAS	260	252	244	235	226	218	212	205	203	203
	FF/ENG	9510	8940	8500	7900	7320	6770	6230	5700	5240	4900
1500	EPR	1.012	1.010	1.008	1.006	1.004	1.002	0.998	0.995	0.991	0.986
	KIAS	259	251	243	234	226	218	212	205	203	203
	FF/ENG	9680	9050	8590	8020	7470	6910	6370	5830	5380	5040

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

**Flaps 1**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)									
		660	620	580	540	500	460	420	380	340	300
20000	EPR	1.169	1.147	1.125	1.105	1.087	1.071	1.056	1.043	1.027	1.014
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	9610	8880	8180	7700	7120	6570	6030	5510	5040	4660
15000	EPR	1.115	1.098	1.082	1.069	1.058	1.046	1.036	1.027	1.016	1.007
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	9520	8890	8410	7820	7260	6690	6130	5590	5090	4680
10000	EPR	1.078	1.067	1.056	1.047	1.038	1.030	1.023	1.017	1.009	1.002
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	9750	9140	8630	8020	7430	6830	6260	5700	5200	4810
5000	EPR	1.054	1.046	1.037	1.031	1.025	1.020	1.015	1.010	1.004	0.998
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	9830	9200	8720	8110	7520	6940	6360	5790	5290	4910
1500	EPR	1.041	1.035	1.029	1.024	1.019	1.014	1.010	1.006	1.001	0.996
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	9950	9310	8840	8240	7650	7050	6470	5890	5400	5030

These tables include 5% additional fuel for holding in a racetrack pattern.

Intentionally  
Blank

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

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

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	13600	12100	8100
640	14200	12900	10200
620	15000	13700	12400
600	15900	14600	13200
580	16800	15500	14000
560	17700	16500	15000
540	18500	17400	15900
520	19300	18300	17000
500	20100	19100	18000
480	21100	20000	19000
460	22100	21300	20100
440	23200	22600	21500
420	24300	24100	22800
400	25500	25400	24200
380	26900	26600	25500
360	28300	27800	26800
340	29700	29100	28200
320	31200	30500	29600

With engine anti-ice on, decrease altitude capability by 500 ft.  
 With engine and wing anti-ice on, decrease altitude capability by 1300 ft.

**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
660	3200	3100	
640	4200	4000	1300
620	5100	4900	2200
600	7100	6900	3100
580	9100	8900	5000
560	11000	10800	7300
540	12800	12700	9500
520	14700	14600	11700
500	16500	16300	13700
480	18100	18000	15700
460	19600	19500	17700
440	21000	20900	19600
420	22400	22300	21100
400	23800	23700	22600
380	25200	25100	24100
360	26600	26300	25500
340	27900	27600	26800
320	29400	28900	28200

With engine anti-ice on, decrease altitude capability by 1400 ft.  
 With engine and wing anti-ice on, decrease altitude capability by 2500 ft.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**260 KIAS Altitude Capability**

**Max Continuous Thrust, 100 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	15800	14300	12600
640	16600	15100	13400
620	17400	15900	14200
600	18100	16700	15000
580	18700	17600	15900
560	19300	18300	16800
540	20000	19000	17600
520	20800	19700	18500
500	21600	20600	19400
480	22400	21500	20200
460	23100	22500	21200
440	23900	23400	22000
420	24700	24500	22900
400	25500	25400	23700
380	26400	26100	24600
360	27300	26900	25300
340	28200	27600	26000
320	29200	28400	26700

With engine anti-ice on, decrease altitude capability by 600 ft.

With engine and wing anti-ice on, decrease altitude capability by 1000 ft.

**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
660	7900	7800	5400
640	9400	9300	6900
620	10800	10700	8300
600	12100	12000	9700
580	13400	13300	11200
560	14700	14600	12600
540	16000	15900	14000
520	17300	17200	15400
500	18500	18400	16700
480	19600	19500	18000
460	20600	20500	19200
440	21500	21400	20200
420	22400	22300	21100
400	23300	23200	22000
380	24300	24200	22800
360	25200	25100	23600
340	26000	25800	24300
320	26800	26500	25100

With engine anti-ice on, decrease altitude capability by 1200 ft.

With engine and wing anti-ice on, decrease altitude capability by 1800 ft.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**280 KIAS Altitude Capability**

**Max Continuous Thrust, 100 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	15600	14000	12400
640	16300	14800	13100
620	17100	15500	13800
600	17800	16200	14500
580	18400	17000	15300
560	18900	17700	16100
540	19400	18300	16800
520	19900	18900	17500
500	20600	19400	18200
480	21200	19900	18800
460	21900	20700	19500
440	22500	21500	20000
420	23200	22300	20700
400	23800	23200	21400
380	24400	24000	22100
360	25000	24900	22700
340	25800	25500	23400
320	26500	26100	24000

With engine anti-ice on, decrease altitude capability by 600 ft.

With engine and wing anti-ice on, decrease altitude capability by 1100 ft.

**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
660	7200	7100	4500
640	8500	8400	5800
620	9800	9700	7200
600	11100	11000	8500
580	12400	12200	9800
560	13600	13400	11200
540	14700	14600	12500
520	15800	15700	13700
500	16800	16700	14800
480	17800	17600	15900
460	18700	18600	16900
440	19500	19400	17800
420	20300	20200	18700
400	21000	20900	19500
380	21800	21700	20200
360	22500	22400	20800
340	23300	23200	21400
320	24200	24000	22000

With engine anti-ice on, decrease altitude capability by 1100 ft.

With engine and wing anti-ice on, decrease altitude capability by 1900 ft.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**300 KIAS Altitude Capability**

**Max Continuous Thrust, 100 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	15100	13400	11600
640	15700	14000	12500
620	16300	14700	13100
600	16900	15300	13600
580	17500	15900	14200
560	18100	16500	14800
540	18500	17100	15400
520	18900	17700	16000
500	19300	18200	16600
480	19700	18600	17100
460	20200	19000	17700
440	20700	19400	18200
420	21200	19800	18600
400	21700	20200	19000
380	22300	20900	19400
360	22800	21600	19800
340	23300	22300	20200
320	23700	23000	20700

With engine anti-ice on, decrease altitude capability by 600 ft.

With engine and wing anti-ice on, decrease altitude capability by 1200 ft.

**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
660	5900	5700	3100
640	7100	7000	4200
620	8300	8200	5300
600	9500	9300	6600
580	10500	10400	7800
560	11600	11400	9000
540	12500	12400	10000
520	13500	13300	11100
500	14400	14200	12000
480	15200	15100	13000
460	16000	15900	13800
440	16700	16600	14600
420	17400	17200	15400
400	18000	17900	16100
380	18600	18500	16800
360	19300	19100	17400
340	19900	19700	18000
320	20400	20300	18500

With engine anti-ice on, decrease altitude capability by 1200 ft.

With engine and wing anti-ice on, decrease altitude capability by 1800 ft.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Altitude Capability**

**Max Continuous Thrust, 100 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	13900	12400	8800
640	14400	12900	9900
620	14900	13400	11700
600	15500	13800	12400
580	16000	14300	12800
560	16500	14800	13200
540	17000	15300	13700
520	17500	15800	14100
500	18000	16300	14500
480	18300	16700	15000
460	18600	17200	15400
440	19000	17700	15900
420	19300	18100	16300
400	19600	18400	16800
380	19900	18700	17200
360	20300	19000	17600
340	20700	19300	18000
320	21100	19500	18300

With engine anti-ice on, decrease altitude capability by 400 ft.

With engine and wing anti-ice on, decrease altitude capability by 800 ft.

**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
660	3800	3700	1000
640	4800	4700	1900
620	5900	5700	2900
600	6900	6700	3900
580	7800	7700	4800
560	8700	8500	5700
540	9500	9400	6700
520	10300	10200	7500
500	11100	10900	8400
480	11800	11700	9100
460	12500	12400	9900
440	13200	13100	10600
420	13900	13700	11300
400	14500	14300	12000
380	15100	14900	12600
360	15600	15500	13200
340	16100	16000	13800
320	16600	16500	14300

With engine anti-ice on, decrease altitude capability by 1200 ft.

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



**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**30000 FT to 25000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
30	EPR										
	MAX TAT										
29	KIAS										
	MACH										
28	FF/ENG										
	KTAS	<b>PERFORMANCE THRUST LIMITED</b>									
27	EPR										
	MAX TAT										
26	KIAS										
	MACH										
25	FF/ENG										
	KTAS										



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**30000 FT to 25000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
30 (-27)	EPR								1.439	1.361	1.305
	MAX TAT								-6	0	
	KIAS								241	230	221
	MACH								.646	.617	.595
	FF/ENG								10920	9608	8637
	KTAS								381	364	351
29 (-25)	EPR							1.456	1.376	1.318	1.275
	MAX TAT								-6	0	
	KIAS								249	237	221
	MACH								.653	.624	.584
	FF/ENG								11799	10365	9320
	KTAS								387	369	345
28 (-23)	EPR						1.469	1.389	1.329	1.285	1.252
	MAX TAT							-5	0	7	
	KIAS							257	245	235	223
	MACH							.659	.629	.606	.588
	FF/ENG							12680	11136	10028	9123
	KTAS							392	374	360	350
27 (-22)	EPR						1.400	1.339	1.295	1.261	1.232
	MAX TAT							1	7		
	KIAS							252	243	235	229
	MACH							.634	.611	.592	.579
	FF/ENG							11910	10748	9783	9074
	KTAS							378	365	353	346
26 (-20)	EPR					1.408	1.348	1.302	1.268	1.240	1.215
	MAX TAT						2	7			
	KIAS						259	249	241	236	226
	MACH						.637	.614	.596	.582	.572
	FF/ENG						12676	11467	10468	9687	9114
	KTAS						382	368	357	349	343
25 (-18)	EPR				1.413	1.354	1.309	1.274	1.246	1.222	1.199
	MAX TAT					3	8				
	KIAS					266	256	248	242	237	228
	MACH					.640	.617	.599	.585	.575	.564
	FF/ENG					13427	12178	11162	10326	9711	9149
	KTAS					385	372	361	352	346	340

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	25	26	27	28	29	30
LIMIT EPR	1.439	1.445	1.450	1.454	1.500	1.510
MAX TAT (°C)	2	0	-2	-3	-12	-15

Decrease limit EPR by 0.095 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**24000 FT to 19000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
24	EPR										
	MAX TAT										
23	KIAS										
	MACH										
22 (-8)	FF/ENG										
	KTAS										1.415
21 (-7)											4
											284
20 (-5)											.642
											15575
19 (-4)											391
											1.412
18											1.361
											6
17											11
											289
16											.641
											.622
15											16246
											14942
14											392
											380
13											1.407
											7
12											1.359
											11
11											17
											278
10											.640
											.621
9											16890
											15603
8											14546
											372
7											1.401
											11
6											14
											299
5											291
											.637
4											.620
											.605
3											17509
											16248
2											15203
											14321
1											393
											383
0											373
											365

Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22
LIMIT EPR	1.443	1.429	1.433	1.438
MAX TAT (°C)	9	7	4	2

Decrease limit EPR by 0.083 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.020.  
With engine and wing anti-ice on, decrease limit EPR by 0.034.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**24000 FT to 19000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHTY (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
24 (-16)	EPR			1.416	1.359	1.314	1.279	1.251	1.227	1.205	1.186
	MAX TAT			4	8	14					
	KIAS			272	262	254	248	243	239	234	229
	MACH			.641	.620	.602	.587	.577	.567	.556	.545
	FF/ENG			14156	12876	11854	10998	10323	9734	9188	8661
	KTAS			388	375	364	355	349	343	336	329
23 (-14)	EPR		1.417	1.361	1.317	1.283	1.256	1.232	1.211	1.191	1.173
	MAX TAT		4	9	14						
	KIAS		278	269	261	254	249	245	241	236	231
	MACH		.642	.621	.603	.589	.579	.570	.559	.549	.537
	FF/ENG		14872	13572	12536	11669	10960	10347	9782	9244	8720
	KTAS		390	377	366	357	351	346	339	333	326
22 (-12)	EPR	1.415	1.362	1.319	1.286	1.259	1.236	1.215	1.196	1.178	1.162
	MAX TAT	4	10	15							
	KIAS	284	274	267	260	255	251	247	242	237	232
	MACH	.642	.622	.605	.591	.580	.572	.562	.552	.541	.530
	FF/ENG	15575	14266	13212	12327	11606	10987	10403	9848	9309	8786
	KTAS	391	379	369	360	354	348	342	336	330	323
21 (-11)	EPR	1.361	1.320	1.288	1.261	1.239	1.219	1.200	1.183	1.166	1.152
	MAX TAT	11	16	21							
	KIAS	280	272	266	261	257	253	248	244	239	234
	MACH	.622	.605	.592	.581	.573	.564	.554	.544	.533	.522
	FF/ENG	14942	13882	12991	12260	11636	11040	10467	9913	9374	8853
	KTAS	380	370	362	356	351	345	339	333	326	320
20 (-9)	EPR	1.320	1.289	1.263	1.241	1.222	1.203	1.186	1.171	1.156	1.142
	MAX TAT	17	21								
	KIAS	278	272	267	263	259	255	250	245	240	235
	MACH	.606	.592	.582	.574	.566	.556	.547	.537	.526	.515
	FF/ENG	14546	13657	12921	12294	11695	11104	10532	9976	9439	8911
	KTAS	372	364	358	353	348	342	336	330	323	316
19 (-7)	EPR	1.288	1.264	1.243	1.224	1.206	1.189	1.174	1.160	1.146	1.133
	MAX TAT	22									
	KIAS	277	272	269	265	261	256	251	247	242	236
	MACH	.593	.583	.575	.567	.558	.549	.539	.529	.519	.507
	FF/ENG	14321	13586	12958	12359	11754	11167	10596	10042	9502	8958
	KTAS	365	359	355	350	344	339	333	326	320	313

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22	23	24
LIMIT EPR	1.443	1.429	1.433	1.438	1.443	1.437
MAX TAT (°C)	9	7	4	2	0	2

Decrease limit EPR by 0.084 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**18000 FT to 13000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
18 (-2)	EPR					1.446	1.393	1.351	1.316	1.287	1.264
	MAX TAT					6	14	17	20	23	26
	KIAS					314	304	296	289	283	278
	MACH					.655	.635	.619	.605	.592	.583
	FF/ENG					19686	18110	16880	15852	14980	14249
	KTAS					405	393	383	374	367	361
17 (0)	EPR				1.434	1.385	1.345	1.312	1.286	1.263	1.243
	MAX TAT				13	16	19	22	25	28	
	KIAS				318	308	301	294	288	283	280
	MACH				.650	.632	.617	.603	.592	.583	.576
	FF/ENG				20200	18696	17500	16492	15631	14904	14277
	KTAS				404	393	383	375	368	362	358
16 (2)	EPR			1.420	1.376	1.338	1.309	1.283	1.262	1.243	1.226
	MAX TAT			16	19	22	24	27	29		
	KIAS			321	313	305	299	293	289	285	282
	MACH			.646	.629	.615	.602	.591	.583	.576	.569
	FF/ENG			20701	19270	18107	17120	16268	15548	14922	14326
	KTAS			403	392	384	376	369	364	359	355
15 (4)	EPR	1.430	1.406	1.366	1.332	1.304	1.280	1.260	1.242	1.226	1.210
	MAX TAT	16	18	21	24	27	29	31			
	KIAS	325	325	317	310	304	298	294	291	287	284
	MACH	.641	.641	.625	.612	.600	.590	.582	.576	.569	.562
	FF/ENG	21796	21176	19834	18707	17746	16905	16193	15567	14972	14366
	KTAS	401	401	392	383	376	370	365	361	356	352
14 (5)	EPR	1.385	1.356	1.325	1.299	1.277	1.257	1.240	1.225	1.210	1.196
	MAX TAT	21	23	26	29	31	33	35			
	KIAS	325	321	314	309	304	300	296	293	289	285
	MACH	.629	.622	.609	.598	.589	.581	.575	.569	.562	.554
	FF/ENG	21297	20400	19319	18385	17558	16855	16228	15628	15020	14429
	KTAS	396	391	383	376	370	366	362	358	353	349
13 (7)	EPR	1.346	1.318	1.294	1.273	1.255	1.239	1.224	1.209	1.196	1.183
	MAX TAT	26	29	32	34	36					
	KIAS	325	319	313	309	305	302	298	295	291	287
	MACH	.618	.606	.596	.587	.580	.575	.568	.562	.555	.547
	FF/ENG	20963	19948	19037	18226	17530	16900	16291	15677	15082	14498
	KTAS	390	383	376	371	366	363	359	354	350	345

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	13	14	15	16	17	18
LIMIT EPR	1.439	1.433	1.430	1.435	1.440	1.445
MAX TAT (°C)	20	19	17	16	14	12

Decrease limit EPR by 0.09% per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.014.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**18000 FT to 13000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
18 (-6)	EPR	1.264	1.243	1.225	1.208	1.192	1.177	1.163	1.150	1.137	1.125
	MAX TAT	26									
	KIAS	278	274	271	266	262	258	253	248	243	237
	MACH	.583	.575	.568	.560	.551	.542	.532	.522	.512	.500
	FF/ENG	14249	13621	13023	12411	11813	11230	10663	10111	9563	9005
	KTAS	361	356	352	346	341	335	329	323	317	310
17 (-4)	EPR	1.243	1.226	1.209	1.194	1.179	1.166	1.153	1.141	1.129	1.117
	MAX TAT										
	KIAS	280	276	272	268	264	259	254	249	244	238
	MACH	.576	.569	.561	.552	.544	.534	.525	.515	.504	.493
	FF/ENG	14277	13681	13067	12465	11876	11302	10743	10191	9629	9078
	KTAS	358	353	348	343	338	332	326	320	313	306
16 (-2)	EPR	1.226	1.210	1.195	1.181	1.168	1.155	1.144	1.132	1.121	1.110
	MAX TAT										
	KIAS	282	278	274	270	265	261	256	251	245	239
	MACH	.569	.561	.553	.545	.536	.527	.518	.508	.497	.485
	FF/ENG	14326	13716	13119	12535	11961	11401	10849	10291	9727	9194
	KTAS	355	350	345	340	335	329	323	317	310	303
15 (-1)	EPR	1.210	1.196	1.182	1.169	1.157	1.146	1.135	1.124	1.113	1.103
	MAX TAT										
	KIAS	284	280	276	271	267	262	257	252	246	240
	MACH	.562	.554	.546	.538	.529	.520	.511	.500	.490	.478
	FF/ENG	14366	13775	13196	12626	12066	11515	10961	10392	9841	9322
	KTAS	352	347	342	337	331	326	320	313	307	299
14 (1)	EPR	1.196	1.183	1.171	1.159	1.148	1.137	1.127	1.116	1.106	1.096
	MAX TAT										
	KIAS	285	281	277	273	268	264	258	253	247	241
	MACH	.554	.547	.539	.531	.522	.513	.503	.493	.482	.470
	FF/ENG	14429	13850	13278	12714	12160	11607	11038	10478	9952	9437
	KTAS	349	344	339	334	328	323	317	310	303	296
13 (3)	EPR	1.183	1.172	1.160	1.149	1.139	1.129	1.119	1.109	1.099	1.090
	MAX TAT										
	KIAS	287	283	279	274	270	265	260	254	248	242
	MACH	.547	.540	.532	.524	.515	.506	.496	.486	.475	.462
	FF/ENG	14498	13921	13351	12791	12235	11667	11101	10573	10067	9546
	KTAS	345	341	336	331	325	319	313	307	300	292

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	13	14	15	16	17	18
LIMIT EPR	1.439	1.433	1.430	1.435	1.440	1.445
MAX TAT (°C)	20	19	17	16	14	12

Decrease limit EPR by 0.096 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.014.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**12000 FT to 7000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
12 (8)	EPR	1.310	1.288	1.269	1.252	1.236	1.222	1.208	1.195	1.183	1.172
	MAX TAT	32	34	37	39						
	KIAS	323	318	314	310	307	304	300	296	293	289
	MACH	.603	.594	.586	.579	.574	.568	.561	.554	.547	.540
	FF/ENG	20585	19694	18904	18213	17579	16959	16336	15735	15145	14560
	KTAS	382	376	371	367	364	360	356	351	347	342
11 (10)	EPR	1.282	1.264	1.248	1.234	1.220	1.207	1.195	1.183	1.172	1.161
	MAX TAT	34	37	39	41						
	KIAS	323	319	315	312	309	305	302	298	294	290
	MACH	.591	.584	.578	.573	.567	.561	.554	.547	.541	.533
	FF/ENG	20353	19585	18900	18261	17629	16999	16390	15793	15199	14614
	KTAS	376	372	368	364	361	357	352	348	344	339
10 (12)	EPR	1.260	1.245	1.231	1.218	1.205	1.193	1.182	1.172	1.161	1.152
	MAX TAT	37	39	41	43						
	KIAS	324	320	318	314	311	307	304	300	296	292
	MACH	.583	.577	.572	.566	.560	.554	.547	.541	.534	.526
	FF/ENG	20263	19585	18942	18299	17664	17049	16446	15846	15254	14673
	KTAS	372	368	365	361	357	353	349	345	341	336
9 (13)	EPR	1.240	1.228	1.215	1.203	1.192	1.181	1.171	1.161	1.152	1.143
	MAX TAT	39	41	43							
	KIAS	325	323	319	316	313	309	305	301	297	293
	MACH	.575	.571	.565	.559	.553	.547	.540	.534	.527	.520
	FF/ENG	20220	19619	18967	18329	17709	17101	16496	15899	15314	14739
	KTAS	368	366	362	358	354	350	346	342	338	333
8 (15)	EPR	1.223	1.213	1.201	1.190	1.180	1.170	1.161	1.152	1.143	1.135
	MAX TAT	42	44	46							
	KIAS	325	325	321	318	314	311	307	303	299	295
	MACH	.565	.564	.558	.552	.546	.540	.534	.527	.520	.513
	FF/ENG	20065	19633	18991	18367	17753	17143	16544	15955	15376	14803
	KTAS	363	363	359	355	351	347	343	339	335	330
7 (17)	EPR	1.207	1.198	1.188	1.179	1.169	1.160	1.151	1.143	1.135	1.127
	MAX TAT	45	46	48							
	KIAS	325	325	323	320	316	312	308	305	300	296
	MACH	.555	.555	.551	.546	.539	.533	.527	.520	.513	.506
	FF/ENG	19930	19548	19027	18408	17794	17192	16601	16018	15444	14878
	KTAS	358	358	356	352	348	344	340	336	331	327

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	7	8	9	10	11	12
LIMIT EPR	1.341	1.355	1.371	1.388	1.418	1.448
MAX TAT (°C)	29	27	26	24	23	21

Decrease limit EPR by 0.078 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.025.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Long Range Cruise Table**  
**12000 FT to 7000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
12 (5)	EPR	1.172	1.161	1.151	1.141	1.131	1.121	1.112	1.102	1.093	1.084
	MAX TAT										
	KIAS	289	284	280	276	271	266	261	255	249	242
	MACH	.540	.533	.525	.517	.508	.499	.489	.479	.467	.455
	FF/ENG	14560	13982	13414	12853	12286	11715	11184	10688	10183	9657
	KTAS	342	338	333	327	322	316	310	303	296	288
11 (6)	EPR	1.161	1.151	1.142	1.132	1.123	1.114	1.105	1.096	1.087	1.078
	MAX TAT										
	KIAS	290	286	282	277	272	267	262	256	249	242
	MACH	.533	.526	.518	.510	.501	.492	.482	.471	.460	.447
	FF/ENG	14614	14039	13472	12904	12329	11792	11302	10811	10299	9762
	KTAS	339	334	330	324	319	313	307	300	292	284
10 (8)	EPR	1.152	1.143	1.133	1.124	1.116	1.107	1.098	1.090	1.081	1.073
	MAX TAT										
	KIAS	292	288	283	278	273	268	263	257	250	243
	MACH	.526	.519	.511	.503	.494	.485	.475	.464	.452	.439
	FF/ENG	14673	14101	13532	12956	12410	11915	11433	10930	10407	9851
	KTAS	336	331	326	321	315	310	303	296	288	280
9 (10)	EPR	1.143	1.134	1.126	1.117	1.109	1.100	1.092	1.084	1.076	1.068
	MAX TAT										
	KIAS	293	289	284	280	275	269	263	257	250	243
	MACH	.520	.512	.504	.496	.487	.478	.468	.456	.444	.431
	FF/ENG	14739	14168	13593	13041	12532	12047	11548	11031	10490	9922
	KTAS	333	328	323	318	312	306	300	292	285	276
8 (11)	EPR	1.135	1.126	1.118	1.110	1.102	1.094	1.086	1.078	1.071	1.064
	MAX TAT										
	KIAS	295	290	286	281	276	270	264	257	250	243
	MACH	.513	.505	.497	.489	.480	.471	.460	.449	.437	.424
	FF/ENG	14803	14233	13677	13153	12655	12155	11640	11107	10558	9977
	KTAS	330	325	320	314	309	303	296	289	281	273
7 (13)	EPR	1.127	1.119	1.111	1.103	1.096	1.088	1.080	1.073	1.066	1.060
	MAX TAT										
	KIAS	296	292	287	282	277	271	264	258	251	243
	MACH	.506	.498	.491	.482	.473	.463	.452	.441	.429	.416
	FF/ENG	14878	14322	13784	13267	12762	12246	11716	11180	10622	10018
	KTAS	327	322	317	311	305	299	292	285	277	269

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	7	8	9	10	11	12
LIMIT EPR	1.341	1.355	1.371	1.388	1.418	1.448
MAX TAT (°C)	29	27	26	24	23	21

Decrease limit EPR by 0.078 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.025.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**260 KIAS Cruise Table**  
**29000 FT to 19000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			660	640	620	600	580	560	540	520	500	480
29												
28												
27												
26												
25												
24												
23	260 -13 366	EPR MAX TAT FF/ENG									1.449 -2 14844	1.410 4 14141
22	260 -12 360	EPR MAX TAT FF/ENG								1.439 1 15226	1.401 6 14500	1.367 10 13867
21	260 -10 354	EPR MAX TAT FF/ENG							1.429 3 15610	1.393 8 14870	1.360 12 14222	1.329 15 13638
20	260 -9 349	EPR MAX TAT FF/ENG					1.461 -4 16829	1.421 5 15994	1.386 9 15253	1.353 13 14596	1.324 17 14002	1.299 21 13468
19	260 -7 344	EPR MAX TAT FF/ENG				1.451 5 17208	1.413 9 16379	1.379 12 15645	1.347 15 14985	1.320 18 14389	1.295 22 13845	1.273 13343

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22	23
LIMIT EPR	1.479	1.460	1.460	1.458	1.456
MAX TAT (°C)	4	2	1	-1	-2

Decrease limit EPR by 0.081 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.021.  
With engine and wing anti-ice on, decrease limit EPR by 0.035.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**260 KIAS Cruise Table**  
**29000 FT to 19000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			480	460	440	420	400	380	360	340	320	300
29	260	EPR							1.496	1.465	1.434	1.403
	-21	MAX TAT							-10	-5	-2	0
	402	FF/ENG							12791	12259	11789	11372
28	260	EPR						1.479	1.445	1.412	1.382	1.355
	-20	MAX TAT						-7	-3	0	2	5
	396	FF/ENG						12930	12385	11907	11480	11101
27	260	EPR					1.463	1.427	1.394	1.364	1.337	1.312
	-19	MAX TAT					-4	-1	2	5	7	9
	389	FF/ENG					13104	12549	12059	11624	11241	10890
26	260	EPR				1.447	1.410	1.378	1.348	1.321	1.298	1.279
	-17	MAX TAT				-1	2	4	7	10	13	
	383	FF/ENG				13318	12749	12245	11805	11406	11027	10676
25	260	EPR			1.433	1.397	1.365	1.335	1.309	1.287	1.268	1.252
	-16	MAX TAT			1	4	7	10	13			
	377	FF/ENG			13561	12976	12464	12011	11586	11188	10833	10531
24	260	EPR		1.420	1.385	1.353	1.324	1.300	1.279	1.260	1.244	1.229
	-14	MAX TAT		3	6	9	12	15				
	371	FF/ENG		13829	13230	12710	12239	11801	11402	11045	10724	10442
23	260	EPR	1.410	1.376	1.344	1.316	1.292	1.272	1.253	1.237	1.222	1.210
	-13	MAX TAT	4	8	11	15	18					
	366	FF/ENG	14141	13528	12991	12499	12052	11643	11266	10927	10633	10386
22	260	EPR	1.367	1.336	1.309	1.286	1.265	1.247	1.231	1.217	1.204	1.193
	-12	MAX TAT	10	13	17							
	360	FF/ENG	13867	13303	12790	12326	11901	11515	11170	10871	10610	10382
21	260	EPR	1.329	1.303	1.281	1.260	1.242	1.226	1.212	1.199	1.188	1.178
	-10	MAX TAT	15	19								
	354	FF/ENG	13638	13113	12636	12198	11802	11448	11134	10855	10606	10386
20	260	EPR	1.299	1.277	1.256	1.238	1.223	1.208	1.195	1.184	1.174	1.165
	-9	MAX TAT	21									
	349	FF/ENG	13468	12978	12529	12120	11753	11422	11121	10851	10611	10400
19	260	EPR	1.273	1.253	1.236	1.220	1.205	1.192	1.181	1.171	1.162	1.154
	-7	MAX TAT										
	344	FF/ENG	13343	12881	12458	12073	11720	11397	11106	10846	10615	10412

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22	23	24	25	26	27	28	29
LIMIT EPR	1.479	1.460	1.460	1.458	1.456	1.445	1.442	1.444	1.448	1.454	1.504
MAX TAT (°C)	4	2	1	-1	-2	1	1	0	-1	-2	-10

Decrease limit EPR by 0.085 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**260 KIAS Cruise Table**  
**18000 FT to 8000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			660	640	620	600	580	560	540	520	500	480
18	260	EPR		1.480	1.440	1.405	1.372	1.342	1.316	1.292	1.271	1.251
	-6	MAX TAT		5	8	11	14	17	20	23		
	338	FF/ENG		18499	17587	16765	16038	15382	14786	14234	13722	13245
17	260	EPR	1.470	1.431	1.397	1.366	1.338	1.313	1.290	1.269	1.250	1.233
	-4	MAX TAT	8	11	13	16	19	22	25			
	333	FF/ENG	18898	17971	17149	16425	15771	15180	14623	14104	13616	13160
16	260	EPR	1.423	1.390	1.360	1.333	1.309	1.288	1.268	1.249	1.232	1.216
	-3	MAX TAT	13	16	18	21	24	26				
	328	FF/ENG	18350	17516	16788	16140	15552	15000	14480	13988	13524	13090
15	260	EPR	1.384	1.354	1.329	1.306	1.286	1.266	1.248	1.232	1.216	1.201
	-1	MAX TAT	18	20	23	25	28					
	323	FF/ENG	17895	17160	16515	15928	15380	14864	14373	13908	13467	13052
14	260	EPR	1.350	1.325	1.303	1.283	1.265	1.248	1.232	1.216	1.202	1.188
	1	MAX TAT	22	25	27	29						
	318	FF/ENG	17603	16947	16347	15794	15274	14782	14310	13860	13432	13028
13	260	EPR	1.322	1.300	1.281	1.263	1.247	1.231	1.216	1.202	1.189	1.176
	2	MAX TAT	27	30	32							
	314	FF/ENG	17435	16812	16242	15709	15208	14729	14270	13829	13407	13007
12	260	EPR	1.298	1.279	1.262	1.246	1.231	1.216	1.202	1.189	1.177	1.165
	4	MAX TAT	33									
	309	FF/ENG	17316	16719	16167	15651	15162	14696	14246	13808	13387	12988
11	260	EPR	1.277	1.260	1.245	1.230	1.216	1.202	1.189	1.177	1.166	1.155
	5	MAX TAT	35									
	305	FF/ENG	17220	16641	16105	15605	15133	14676	14227	13792	13375	12981
10	260	EPR	1.259	1.244	1.229	1.215	1.202	1.190	1.178	1.166	1.156	1.145
	7	MAX TAT	37									
	300	FF/ENG	17129	16570	16057	15577	15114	14659	14216	13787	13378	12984
9	260	EPR	1.243	1.228	1.215	1.202	1.190	1.178	1.167	1.157	1.146	1.136
	9	MAX TAT										
	296	FF/ENG	17054	16522	16028	15556	15096	14648	14213	13791	13380	12978
8	260	EPR	1.228	1.214	1.202	1.190	1.179	1.168	1.157	1.147	1.137	1.127
	10	MAX TAT										
	291	FF/ENG	17006	16490	16001	15533	15080	14640	14210	13784	13365	12984

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	9	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.380	1.398	1.418	1.453	1.492	1.497	1.497	1.496	1.496	1.496	1.496
MAX TAT (°C)	21	19	17	16	14	13	11	10	8	7	5

Decrease limit EPR by 0.086 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.



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**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**260 KIAS Cruise Table**  
**18000 FT to 8000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			480	460	440	420	400	380	360	340	320	300
18	260	EPR	1.251	1.234	1.218	1.203	1.190	1.179	1.168	1.159	1.150	1.143
	-6	MAX TAT										
	338	FF/ENG	13245	12806	12399	12025	11682	11370	11090	10839	10616	10421
17	260	EPR	1.233	1.217	1.202	1.189	1.177	1.166	1.156	1.148	1.140	1.134
	-4	MAX TAT										
	333	FF/ENG	13160	12735	12342	11980	11651	11352	11081	10839	10624	10435
16	260	EPR	1.216	1.202	1.188	1.176	1.165	1.155	1.146	1.138	1.131	1.125
	-3	MAX TAT										
	328	FF/ENG	13090	12685	12308	11964	11648	11359	11099	10865	10655	10469
15	260	EPR	1.201	1.188	1.176	1.164	1.154	1.145	1.137	1.129	1.122	1.116
	-1	MAX TAT										
	323	FF/ENG	13052	12663	12302	11969	11662	11384	11130	10899	10692	10509
14	260	EPR	1.188	1.176	1.164	1.154	1.144	1.136	1.128	1.120	1.114	1.109
	1	MAX TAT										
	318	FF/ENG	13028	12648	12293	11965	11665	11389	11135	10906	10707	10537
13	260	EPR	1.176	1.164	1.154	1.144	1.135	1.127	1.119	1.113	1.107	1.102
	2	MAX TAT										
	314	FF/ENG	13007	12629	12278	11953	11651	11372	11123	10910	10731	10578
12	260	EPR	1.165	1.154	1.144	1.135	1.126	1.118	1.111	1.105	1.100	1.095
	4	MAX TAT										
	309	FF/ENG	12988	12614	12263	11933	11629	11364	11141	10952	10788	10643
11	260	EPR	1.155	1.145	1.135	1.126	1.118	1.110	1.104	1.098	1.093	1.088
	5	MAX TAT										
	305	FF/ENG	12981	12607	12248	11922	11643	11410	11208	11028	10865	10720
10	260	EPR	1.145	1.135	1.126	1.118	1.110	1.103	1.097	1.091	1.087	1.082
	7	MAX TAT										
	300	FF/ENG	12984	12601	12253	11961	11714	11495	11293	11113	10952	10809
9	260	EPR	1.136	1.127	1.118	1.110	1.103	1.096	1.090	1.085	1.081	1.077
	9	MAX TAT										
	296	FF/ENG	12978	12612	12303	12037	11796	11573	11371	11192	11032	10889
8	260	EPR	1.127	1.118	1.110	1.103	1.096	1.090	1.084	1.079	1.075	1.072
	10	MAX TAT										
	291	FF/ENG	12984	12658	12370	12102	11854	11631	11430	11252	11095	10956

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	9	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.380	1.398	1.418	1.453	1.492	1.497	1.497	1.496	1.496	1.496	1.496
MAX TAT (°C)	21	19	17	16	14	13	11	10	8	7	5

Decrease limit EPR by 0.086 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**280 KIAS Cruise Table**  
**29000 FT to 19000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)										
			660	640	620	600	580	560	540	520	500	480	
29													
28													
27													
26													
25													
24													
23													
22	280 -9 386	EPR MAX TAT FF/ENG										1.437 1 15844	1.405 6 15246
21	280 -8 380	EPR MAX TAT FF/ENG								1.419 4 16085	1.389 8 15475	1.361 11 14936	
20	280 -6 375	EPR MAX TAT FF/ENG						1.438 4 17040	1.405 7 16347	1.375 10 15733	1.348 13 15187	1.323 16 14690	
19	280 -5 369	EPR MAX TAT FF/ENG				1.460 5 18108	1.424 8 17328	1.392 11 16630	1.363 14 16015	1.337 16 15462	1.313 19 14961	1.292 21 14507	

Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22
LIMIT EPR	1.464	1.443	1.442	1.441
MAX TAT (°C)	6	5	3	2

Decrease limit EPR by 0.082 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.020.  
With engine and wing anti-ice on, decrease limit EPR by 0.034.



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**MAX CONTINUOUS THRUST**

**280 KIAS Cruise Table**  
**29000 FT to 19000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)											
			480	460	440	420	400	380	360	340	320	300		
29														
28	280 -17 424	EPR MAX TAT FF/ENG											1.483 -10 13669	1.459 -1 13241
27	280 -16 417	EPR MAX TAT FF/ENG										1.457 0 13677	1.432 2 13249	1.407 3 12862
26	280 -14 411	EPR MAX TAT FF/ENG							1.459 -5 14174	1.432 2 13713	1.406 4 13296	1.381 6 12910	1.358 7 12558	
25	280 -13 404	EPR MAX TAT FF/ENG						1.436 3 14252	1.408 5 13789	1.382 6 13371	1.358 8 12992	1.336 10 12647	1.314 12 12331	
24	280 -12 398	EPR MAX TAT FF/ENG			1.443 -2 14882	1.413 5 14364	1.386 7 13898	1.361 8 13479	1.337 10 13105	1.315 12 12761	1.296 14 12435	1.280 16 12135		
23	280 -10 392	EPR MAX TAT FF/ENG		1.423 3 15042	1.394 6 14516	1.367 9 14046	1.342 11 13628	1.318 13 13246	1.299 15 12890	1.282 17 12564	1.266 19 12263	1.253 21 11989		
22	280 -9 386	EPR MAX TAT FF/ENG	1.405 6 15246	1.376 8 14711	1.350 11 14236	1.325 13 13805	1.304 16 13406	1.285 18 13040	1.269 20 12706	1.255 22 12401	1.242 24 12123	1.230 26 11874		
21	280 -8 380	EPR MAX TAT FF/ENG	1.361 11 14936	1.335 13 14451	1.312 16 14004	1.292 18 13596	1.274 21 13225	1.259 23 12885	1.244 25 12577	1.232 27 12299	1.220 29 12050	1.211 31 11828		
20	280 -6 375	EPR MAX TAT FF/ENG	1.323 16 14690	1.301 19 14238	1.282 21 13826	1.265 24 13449	1.250 27 13107	1.236 29 12796	1.223 31 12515	1.212 33 12265	1.203 35 12040	1.194 37 11839		
19	280 -5 369	EPR MAX TAT FF/ENG	1.292 21 14507	1.274 24 14090	1.257 26 13709	1.242 28 13362	1.228 30 13048	1.216 32 12763	1.206 34 12504	1.196 36 12269	1.187 38 12058	1.180 40 11869		

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22	23	24	25	26	27	28
LIMIT EPR	1.464	1.443	1.442	1.441	1.442	1.432	1.428	1.433	1.441	1.444
MAX TAT (°C)	6	5	3	2	1	4	4	3	2	1

Decrease limit EPR by 0.088 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**280 KIAS Cruise Table**  
**18000 FT to 8000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			660	640	620	600	580	560	540	520	500	480
18	280	EPR		1.482	1.446	1.411	1.381	1.352	1.327	1.304	1.284	1.266
	-3	MAX TAT		7	9	12	14	17	19	21	24	26
	363	FF/ENG		19280	18416	17633	16939	16322	15764	15262	14801	14379
17	280	EPR	1.468	1.432	1.400	1.370	1.343	1.318	1.297	1.277	1.260	1.244
	-2	MAX TAT	9	12	14	17	19	21	24	26	28	
	358	FF/ENG	19598	18736	17958	17270	16650	16091	15582	15112	14682	14284
16	280	EPR	1.420	1.390	1.361	1.335	1.311	1.290	1.272	1.254	1.239	1.225
	0	MAX TAT	14	16	19	21	24	26	28	30		
	353	FF/ENG	19061	18290	17605	16984	16424	15906	15428	14986	14577	14200
15	280	EPR	1.380	1.352	1.327	1.305	1.285	1.267	1.250	1.235	1.221	1.208
	1	MAX TAT	19	21	24	26	28	30				
	347	FF/ENG	18619	17942	17327	16767	16243	15758	15305	14886	14496	14133
14	280	EPR	1.344	1.321	1.300	1.281	1.263	1.246	1.231	1.218	1.205	1.193
	3	MAX TAT	23	26	28	30	32					
	342	FF/ENG	18314	17708	17143	16613	16118	15654	15222	14817	14440	14091
13	280	EPR	1.315	1.295	1.276	1.259	1.243	1.229	1.215	1.202	1.191	1.180
	4	MAX TAT	29	31	33							
	337	FF/ENG	18125	17552	17014	16505	16027	15578	15156	14763	14395	14051
12	280	EPR	1.291	1.273	1.256	1.241	1.227	1.213	1.200	1.189	1.178	1.168
	6	MAX TAT	34	36								
	332	FF/ENG	17984	17435	16913	16418	15950	15512	15099	14711	14346	14005
11	280	EPR	1.269	1.254	1.239	1.225	1.211	1.199	1.187	1.176	1.166	1.157
	7	MAX TAT	36									
	328	FF/ENG	17868	17333	16824	16340	15885	15456	15046	14657	14294	13955
10	280	EPR	1.251	1.237	1.223	1.210	1.198	1.186	1.175	1.165	1.156	1.148
	9	MAX TAT	38									
	323	FF/ENG	17760	17240	16748	16281	15835	15406	14998	14612	14253	13921
9	280	EPR	1.235	1.222	1.209	1.197	1.185	1.175	1.165	1.155	1.147	1.138
	10	MAX TAT	41									
	318	FF/ENG	17663	17168	16693	16235	15790	15365	14962	14583	14229	13900
8	280	EPR	1.220	1.208	1.196	1.185	1.174	1.164	1.155	1.146	1.137	1.129
	12	MAX TAT										
	314	FF/ENG	17592	17112	16644	16187	15748	15330	14934	14560	14210	13885

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	9	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.385	1.407	1.427	1.458	1.490	1.487	1.484	1.483	1.483	1.483	1.483
MAX TAT (°C)	23	21	19	18	16	15	13	12	10	9	7

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.



**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**280 KIAS Cruise Table**  
**18000 FT to 8000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			480	460	440	420	400	380	360	340	320	300
18	280	EPR	1.266	1.250	1.235	1.222	1.210	1.199	1.189	1.181	1.174	1.167
	-3	MAX TAT	26	28								
	363	FF/ENG	14379	13992	13638	13315	13020	12747	12498	12274	12076	11899
17	280	EPR	1.244	1.229	1.216	1.204	1.194	1.184	1.175	1.168	1.161	1.155
	-2	MAX TAT										
	358	FF/ENG	14284	13920	13583	13270	12983	12721	12484	12273	12087	11921
16	280	EPR	1.225	1.212	1.200	1.189	1.179	1.171	1.163	1.156	1.150	1.145
	0	MAX TAT										
	353	FF/ENG	14200	13848	13523	13224	12951	12703	12480	12282	12108	11953
15	280	EPR	1.208	1.196	1.185	1.176	1.167	1.159	1.152	1.146	1.140	1.135
	1	MAX TAT										
	347	FF/ENG	14133	13798	13488	13203	12945	12710	12497	12309	12145	11998
14	280	EPR	1.193	1.182	1.173	1.164	1.155	1.148	1.142	1.136	1.131	1.127
	3	MAX TAT										
	342	FF/ENG	14091	13766	13467	13192	12941	12712	12507	12326	12167	12024
13	280	EPR	1.180	1.170	1.161	1.153	1.145	1.139	1.133	1.127	1.122	1.118
	4	MAX TAT										
	337	FF/ENG	14051	13734	13439	13168	12922	12699	12497	12318	12160	12017
12	280	EPR	1.168	1.159	1.150	1.143	1.136	1.130	1.124	1.119	1.114	1.110
	6	MAX TAT										
	332	FF/ENG	14005	13690	13399	13132	12889	12667	12464	12284	12129	11990
11	280	EPR	1.157	1.149	1.141	1.134	1.127	1.121	1.116	1.111	1.107	1.103
	7	MAX TAT										
	328	FF/ENG	13955	13644	13357	13092	12847	12624	12426	12257	12115	11992
10	280	EPR	1.148	1.140	1.132	1.125	1.119	1.113	1.108	1.104	1.100	1.097
	9	MAX TAT										
	323	FF/ENG	13921	13613	13326	13059	12821	12614	12437	12288	12161	12047
9	280	EPR	1.138	1.131	1.124	1.117	1.111	1.106	1.101	1.097	1.094	1.090
	10	MAX TAT										
	318	FF/ENG	13900	13592	13311	13062	12847	12662	12499	12357	12232	12116
8	280	EPR	1.129	1.122	1.116	1.110	1.104	1.099	1.095	1.091	1.088	1.084
	12	MAX TAT										
	314	FF/ENG	13885	13590	13331	13104	12903	12724	12562	12418	12292	12177

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	9	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.385	1.407	1.427	1.458	1.490	1.487	1.484	1.483	1.483	1.483	1.483
MAX TAT (°C)	23	21	19	18	16	15	13	12	10	9	7

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.



**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**300 KIAS Cruise Table**  
**29000 FT to 19000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)										
			660	640	620	600	580	560	540	520	500	480	
29													
28													
27													
26													
25													
24													
23													
22													
21													1.421 5 16779
20	300 -4 400	EPR MAX TAT FF/ENG								1.424 -1 17431	1.398 8 16894	1.374 10 16406	
19	300 -2 394	EPR MAX TAT FF/ENG						1.430 9 18176	1.403 11 17581	1.378 13 17043	1.354 15 16560	1.332 17 16121	

Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21
LIMIT EPR	1.442	1.423	1.423
MAX TAT (°C)	9	7	6

Decrease limit EPR by 0.082 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.018.  
With engine and wing anti-ice on, decrease limit EPR by 0.031.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**300 KIAS Cruise Table**  
**29000 FT to 19000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)											
			480	460	440	420	400	380	360	340	320	300		
29														
28														
27														
26														
25	300 -10 432	EPR MAX TAT FF/ENG												1.419 6 14619
24	300 -9 425	EPR MAX TAT FF/ENG								1.429 -4 15303	1.407 7 14915	1.387 8 14573	1.369 9 14266	
23	300 -7 419	EPR MAX TAT FF/ENG					1.424 3 15729	1.401 7 15314	1.379 9 14927	1.359 10 14576	1.341 12 14268	1.325 13 13993		
22	300 -6 412	EPR MAX TAT FF/ENG			1.421 4 16212	1.397 7 15768	1.375 10 15360	1.354 11 14983	1.334 13 14636	1.316 14 14320	1.300 15 14034	1.287 17 13774		
21	300 -5 406	EPR MAX TAT FF/ENG	1.421 5 16779	1.396 8 16292	1.373 10 15846	1.352 12 15444	1.331 13 15075	1.312 15 14730	1.296 17 14405	1.282 18 14108	1.269 20 13841	1.258 21 13601		
20	300 -4 400	EPR MAX TAT FF/ENG	1.374 10 16406	1.352 12 15966	1.330 14 15564	1.311 16 15191	1.295 18 14845	1.280 19 14522	1.266 21 14224	1.254 23 13953	1.244 24 13711	1.234 26 13494		
19	300 -2 394	EPR MAX TAT FF/ENG	1.332 17 16121	1.312 18 15714	1.295 20 15339	1.280 22 14995	1.266 23 14676	1.254 25 14382	1.242 26 14113	1.232 28 13870	1.222 29 13653	1.214 13460		

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22	23	24	25
LIMIT EPR	1.442	1.423	1.423	1.424	1.426	1.415	1.425
MAX TAT (°C)	9	7	6	5	3	7	5

Decrease limit EPR by 0.087 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.023.  
 With engine and wing anti-ice on, decrease limit EPR by 0.038.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**300 KIAS Cruise Table**  
**18000 FT to 8000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			660	640	620	600	580	560	540	520	500	480
18	300	EPR				1.439	1.410	1.384	1.360	1.337	1.316	1.298
	-1	MAX TAT				11	13	15	17	19	20	22
	388	FF/ENG				19012	18354	17760	17229	16748	16305	15900
17	300	EPR		1.451	1.420	1.393	1.368	1.344	1.322	1.303	1.286	1.270
	1	MAX TAT		11	13	15	17	19	21	23	25	27
	383	FF/ENG		19944	19217	18560	17974	17446	16963	16522	16118	15743
16	300	EPR	1.433	1.404	1.378	1.353	1.330	1.310	1.292	1.276	1.261	1.247
	2	MAX TAT	14	16	18	20	22	24	26	28	30	31
	377	FF/ENG	20177	19447	18797	18215	17683	17202	16760	16350	15971	15623
15	300	EPR	1.389	1.364	1.340	1.318	1.299	1.282	1.266	1.252	1.239	1.227
	3	MAX TAT	19	21	23	25	27	29	31	32	34	
	371	FF/ENG	19699	19058	18477	17949	17467	17018	16603	16218	15861	15534
14	300	EPR	1.351	1.328	1.308	1.290	1.273	1.258	1.244	1.231	1.220	1.209
	5	MAX TAT	24	26	28	30	32	33	35			
	366	FF/ENG	19357	18780	18254	17764	17308	16885	16490	16125	15787	15473
13	300	EPR	1.318	1.299	1.282	1.266	1.251	1.237	1.225	1.214	1.203	1.193
	6	MAX TAT	29	31	33	35	36					
	361	FF/ENG	19127	18593	18092	17626	17190	16783	16405	16053	15728	15428
12	300	EPR	1.291	1.275	1.259	1.245	1.232	1.220	1.208	1.198	1.188	1.180
	8	MAX TAT	34	36	38							
	356	FF/ENG	18957	18445	17964	17512	17090	16696	16330	15991	15677	15385
11	300	EPR	1.268	1.253	1.240	1.227	1.215	1.204	1.194	1.184	1.176	1.167
	9	MAX TAT	36	38	40							
	350	FF/ENG	18814	18316	17847	17407	16996	16616	16262	15930	15620	15333
10	300	EPR	1.248	1.235	1.223	1.211	1.200	1.190	1.181	1.172	1.164	1.156
	11	MAX TAT	38	40								
	345	FF/ENG	18677	18192	17736	17312	16916	16544	16195	15866	15561	15278
9	300	EPR	1.232	1.219	1.208	1.197	1.187	1.177	1.169	1.161	1.153	1.146
	12	MAX TAT	41	43								
	340	FF/ENG	18546	18079	17642	17230	16841	16471	16126	15804	15503	15224
8	300	EPR	1.216	1.205	1.194	1.184	1.175	1.166	1.158	1.150	1.144	1.137
	14	MAX TAT	43									
	336	FF/ENG	18437	17987	17560	17151	16764	16401	16061	15743	15447	15175

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	8	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.377	1.394	1.410	1.440	1.473	1.470	1.467	1.467	1.466	1.463	1.462
MAX TAT (°C)	25	23	21	20	19	17	16	14	13	11	10

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**300 KIAS Cruise Table**  
**18000 FT to 8000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			480	460	440	420	400	380	360	340	320	300
18	300	EPR	1.298	1.282	1.267	1.254	1.242	1.231	1.221	1.212	1.204	1.197
	-1	MAX TAT	22	24	25	27	28	29	30			
	388	FF/ENG	15900	15527	15183	14866	14576	14311	14071	13855	13661	13486
17	300	EPR	1.270	1.256	1.244	1.232	1.221	1.212	1.204	1.196	1.189	1.183
	1	MAX TAT	27	28	30	31						
	383	FF/ENG	15743	15398	15082	14791	14529	14290	14070	13868	13684	13518
16	300	EPR	1.247	1.235	1.223	1.213	1.204	1.196	1.188	1.181	1.175	1.170
	2	MAX TAT	31	33								
	377	FF/ENG	15623	15302	15009	14740	14492	14265	14057	13868	13697	13544
15	300	EPR	1.227	1.216	1.206	1.197	1.189	1.181	1.175	1.169	1.163	1.159
	3	MAX TAT										
	371	FF/ENG	15534	15233	14954	14697	14463	14251	14059	13883	13725	13585
14	300	EPR	1.209	1.199	1.190	1.182	1.175	1.168	1.163	1.157	1.152	1.148
	5	MAX TAT										
	366	FF/ENG	15473	15185	14921	14678	14456	14256	14076	13912	13764	13632
13	300	EPR	1.193	1.185	1.177	1.169	1.163	1.157	1.152	1.147	1.142	1.139
	6	MAX TAT										
	361	FF/ENG	15428	15152	14897	14663	14450	14260	14089	13931	13789	13662
12	300	EPR	1.180	1.172	1.164	1.158	1.152	1.146	1.142	1.137	1.133	1.130
	8	MAX TAT										
	356	FF/ENG	15385	15115	14866	14639	14433	14248	14081	13928	13791	13668
11	300	EPR	1.167	1.160	1.153	1.147	1.142	1.137	1.133	1.129	1.125	1.122
	9	MAX TAT										
	350	FF/ENG	15333	15068	14824	14600	14397	14217	14055	13906	13772	13651
10	300	EPR	1.156	1.150	1.143	1.138	1.133	1.128	1.124	1.120	1.117	1.114
	11	MAX TAT										
	345	FF/ENG	15278	15017	14776	14557	14359	14183	14025	13877	13743	13624
9	300	EPR	1.146	1.140	1.134	1.129	1.124	1.120	1.116	1.112	1.109	1.106
	12	MAX TAT										
	340	FF/ENG	15224	14968	14733	14519	14325	14152	13997	13855	13728	13616
8	300	EPR	1.137	1.131	1.126	1.121	1.116	1.112	1.109	1.105	1.102	1.099
	14	MAX TAT										
	336	FF/ENG	15175	14925	14697	14490	14305	14142	13998	13865	13748	13642

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	8	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.377	1.394	1.410	1.440	1.473	1.470	1.467	1.467	1.466	1.463	1.462
MAX TAT (°C)	25	23	21	20	19	17	16	14	13	11	10

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Cruise Table**  
**29000 FT to 19000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			660	640	620	600	580	560	540	520	500	480
29												
28												
27												
26												
25												
24												
23												
22												
21												
20												
19	320 0 419	EPR MAX TAT FF/ENG										1.401 12 18267

Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19
LIMIT EPR	1.418
MAX TAT (°C)	11

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.016.  
With engine and wing anti-ice on, decrease limit EPR by 0.028.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Cruise Table**  
**29000 FT to 19000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS	WEIGHT (1000 LB)										
		480	460	440	420	400	380	360	340	320	300	
29												
28												
27												
26												
25												
24												
23												
22	320 -3 438	EPR MAX TAT FF/ENG									1.400 7 16512	1.386 9 16252
21	320 -2 432	EPR MAX TAT FF/ENG						1.400 8 17072	1.383 10 16732	1.367 11 16422	1.353 12 16146	1.340 14 15911
20	320 -1 425	EPR MAX TAT FF/ENG				1.389 10 17423	1.371 11 17042	1.354 13 16697	1.338 14 16390	1.323 15 16111	1.310 16 15862	1.299 17 15646
19	320 0 419	EPR MAX TAT FF/ENG	1.401 12 18267	1.382 13 17839	1.363 15 17439	1.345 16 17068	1.328 17 16727	1.312 19 16415	1.298 20 16130	1.286 21 15869	1.276 22 15635	1.267 23 15433

Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	19	20	21	22
LIMIT EPR	1.418	1.400	1.402	1.402
MAX TAT (°C)	11	10	9	8

Decrease limit EPR by 0.083 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.019.  
 With engine and wing anti-ice on, decrease limit EPR by 0.033.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Cruise Table**  
**18000 FT to 8000 FT - High Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS		WEIGHT (1000 LB)									
			660	640	620	600	580	560	540	520	500	480
18	320	EPR							1.418	1.396	1.376	1.357
	2	MAX TAT							13	15	16	18
	413	FF/ENG							19261	18763	18306	17888
17	320	EPR					1.416	1.393	1.373	1.353	1.334	1.316
	3	MAX TAT					14	16	18	19	21	22
	407	FF/ENG					19865	19330	18841	18395	17986	17604
16	320	EPR			1.416	1.393	1.372	1.351	1.332	1.314	1.298	1.284
	4	MAX TAT			16	17	19	21	22	24	25	27
	401	FF/ENG			20551	19971	19443	18964	18523	18112	17733	17382
15	320	EPR	1.419	1.395	1.373	1.352	1.331	1.314	1.298	1.283	1.270	1.258
	6	MAX TAT	17	19	20	22	24	25	27	28	30	31
	395	FF/ENG	21300	20676	20110	19594	19119	18679	18275	17900	17548	17220
14	320	EPR	1.376	1.354	1.334	1.315	1.299	1.284	1.271	1.258	1.247	1.236
	7	MAX TAT	22	24	25	27	28	30	32	33	34	35
	390	FF/ENG	20842	20297	19792	19323	18891	18488	18110	17757	17429	17123
13	320	EPR	1.338	1.319	1.302	1.287	1.273	1.260	1.247	1.236	1.226	1.217
	9	MAX TAT	27	29	30	32	34	35	37	38	39	39
	384	FF/ENG	20537	20039	19576	19142	18734	18352	17994	17660	17350	17063
12	320	EPR	1.307	1.290	1.276	1.262	1.250	1.238	1.227	1.218	1.209	1.201
	10	MAX TAT	32	34	36	38	39	41				
	379	FF/ENG	20323	19855	19415	19000	18609	18242	17901	17583	17289	17017
11	320	EPR	1.280	1.266	1.253	1.241	1.229	1.219	1.210	1.201	1.193	1.186
	12	MAX TAT	35	37	38	40	42					
	373	FF/ENG	20149	19699	19274	18872	18495	18144	17818	17517	17238	16981
10	320	EPR	1.257	1.244	1.233	1.222	1.212	1.203	1.194	1.187	1.179	1.173
	13	MAX TAT	37	39	40	42	44					
	368	FF/ENG	19989	19551	19138	18751	18390	18056	17746	17459	17191	16943
9	320	EPR	1.237	1.226	1.216	1.206	1.197	1.189	1.181	1.174	1.167	1.161
	14	MAX TAT	40	42	43	45						
	363	FF/ENG	19832	19407	19011	18642	18297	17976	17676	17396	17134	16893
8	320	EPR	1.220	1.210	1.200	1.192	1.183	1.176	1.169	1.162	1.156	1.150
	16	MAX TAT	43	44	46							
	358	FF/ENG	19683	19277	18897	18541	18206	17891	17595	17321	17067	16831

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

**Max Continuous EPR**

PRESS ALT (1000 FT)	8	9	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.360	1.376	1.391	1.421	1.454	1.448	1.441	1.438	1.437	1.436	1.437
MAX TAT (°C)	27	25	24	22	21	19	18	17	15	14	13

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.



Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Cruise Table**  
**18000 FT to 8000 FT - Low Weights**

PRESS ALT (1000 FT)	KIAS STD TAT KTAS	WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
18	320 EPR	1.357	1.339	1.321	1.305	1.291	1.279	1.268	1.258	1.249	1.242
	2 MAX TAT	18	19	21	22	23	24	25	26	27	28
	413 FF/ENG	17888	17505	17145	16803	16486	16198	15935	15695	15479	15291
17	320 EPR	1.316	1.301	1.287	1.274	1.263	1.252	1.243	1.234	1.227	1.220
	3 MAX TAT	22	24	25	26	27	28	29	30	31	32
	407 FF/ENG	17604	17247	16915	16603	16314	16048	15807	15587	15392	15222
16	320 EPR	1.284	1.271	1.260	1.249	1.239	1.230	1.222	1.214	1.208	1.202
	4 MAX TAT	27	28	29	30	31	32	33	34	35	36
	401 FF/ENG	17382	17054	16746	16459	16194	15954	15736	15541	15367	15214
15	320 EPR	1.258	1.247	1.237	1.227	1.219	1.211	1.204	1.198	1.192	1.187
	6 MAX TAT	31	32	33	34	35	36	37			
	395 FF/ENG	17220	16915	16633	16372	16134	15917	15720	15541	15379	15235
14	320 EPR	1.236	1.226	1.217	1.209	1.202	1.195	1.189	1.183	1.178	1.173
	7 MAX TAT	35	36	38	39						
	390 FF/ENG	17123	16841	16581	16341	16121	15919	15735	15569	15419	15285
13	320 EPR	1.217	1.208	1.201	1.193	1.187	1.181	1.175	1.170	1.166	1.162
	9 MAX TAT										
	384 FF/ENG	17063	16798	16554	16330	16125	15938	15768	15613	15473	15345
12	320 EPR	1.201	1.193	1.186	1.180	1.174	1.169	1.164	1.160	1.156	1.152
	10 MAX TAT										
	379 FF/ENG	17017	16768	16540	16332	16139	15962	15801	15655	15521	15400
11	320 EPR	1.186	1.179	1.173	1.167	1.162	1.157	1.153	1.149	1.146	1.142
	12 MAX TAT										
	373 FF/ENG	16981	16744	16527	16328	16145	15976	15824	15686	15559	15441
10	320 EPR	1.173	1.167	1.161	1.156	1.151	1.147	1.143	1.140	1.136	1.133
	13 MAX TAT										
	368 FF/ENG	16943	16713	16505	16315	16140	15979	15832	15699	15574	15458
9	320 EPR	1.161	1.155	1.150	1.146	1.142	1.138	1.134	1.131	1.128	1.125
	14 MAX TAT										
	363 FF/ENG	16893	16672	16471	16287	16117	15959	15817	15687	15566	15452
8	320 EPR	1.150	1.145	1.141	1.137	1.133	1.129	1.126	1.123	1.120	1.117
	16 MAX TAT										
	358 FF/ENG	16831	16614	16418	16239	16074	15922	15784	15659	15543	15432

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.  
 Heavy line approximates max cruise thrust limit.

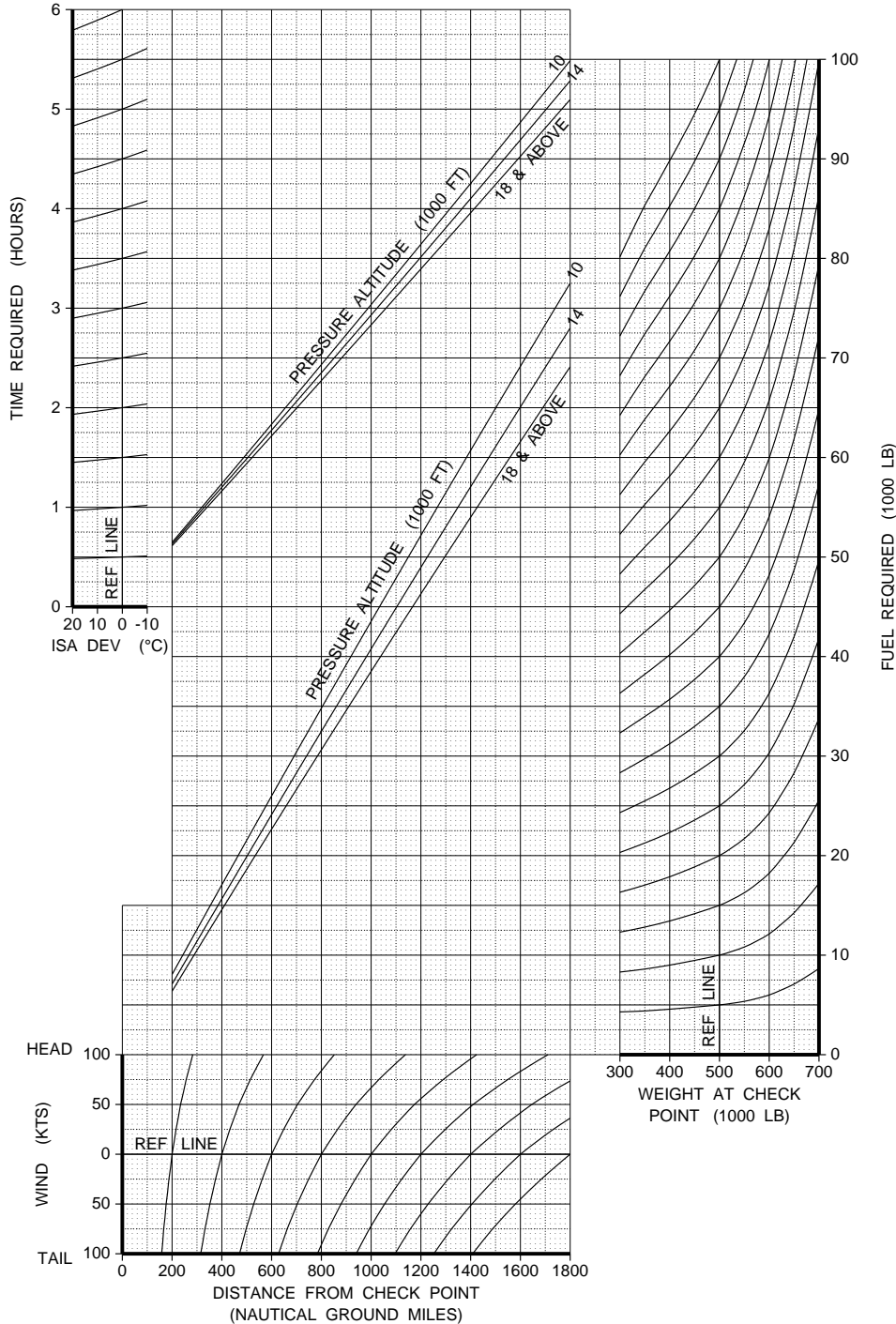
**Max Continuous EPR**

PRESS ALT (1000 FT)	8	9	10	11	12	13	14	15	16	17	18
LIMIT EPR	1.360	1.376	1.391	1.421	1.454	1.448	1.441	1.438	1.437	1.436	1.437
MAX TAT (°C)	27	25	24	22	21	19	18	17	15	14	13

Decrease limit EPR by 0.089 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

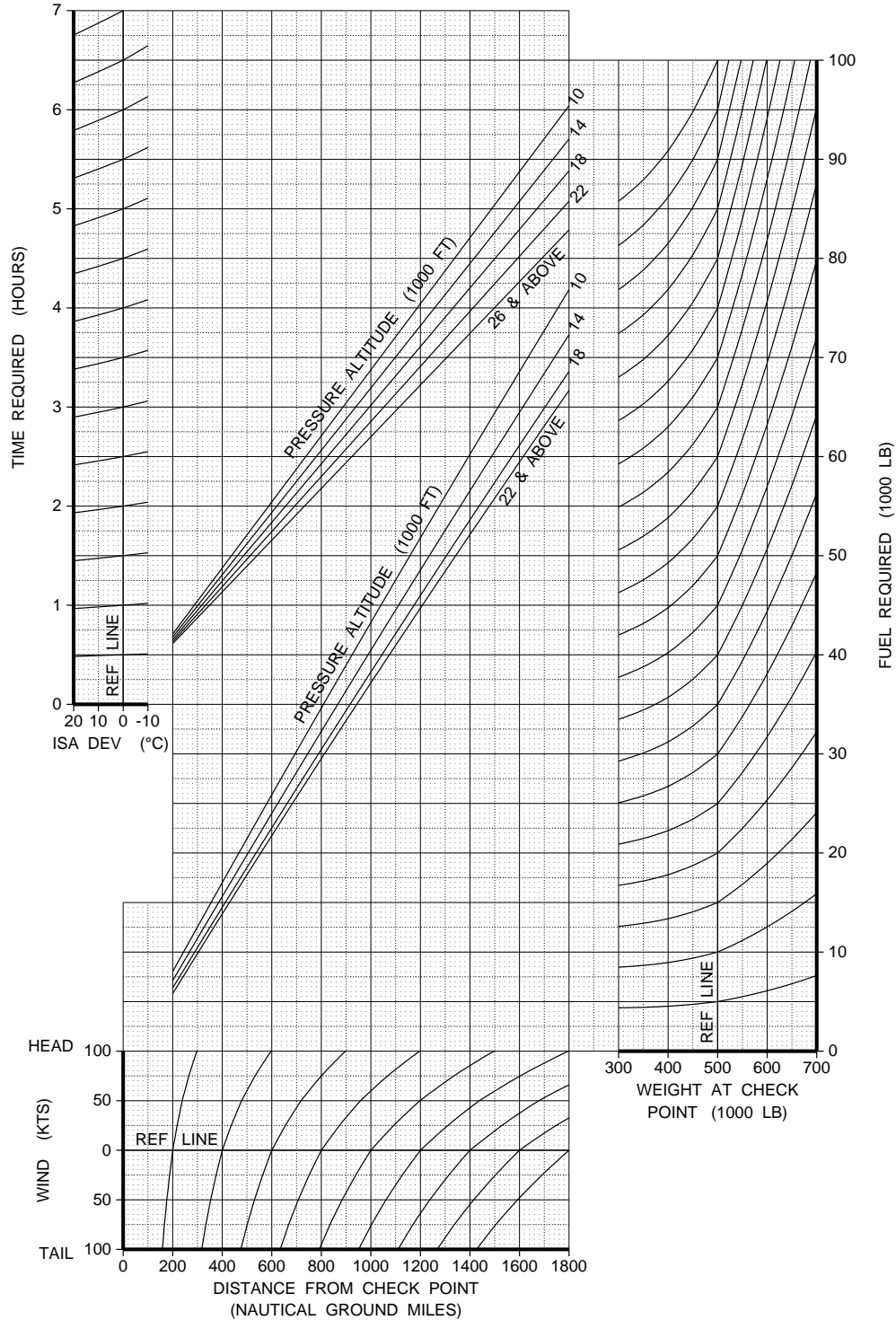
**Long Range Cruise Diversion Fuel and Time**  
Based on 310/250 descent and includes APU fuel burn



## ENGINE INOP MAX CONTINUOUS THRUST

### 260 KIAS Diversion Fuel and Time

Based on 260/250 descent and includes APU fuel burn

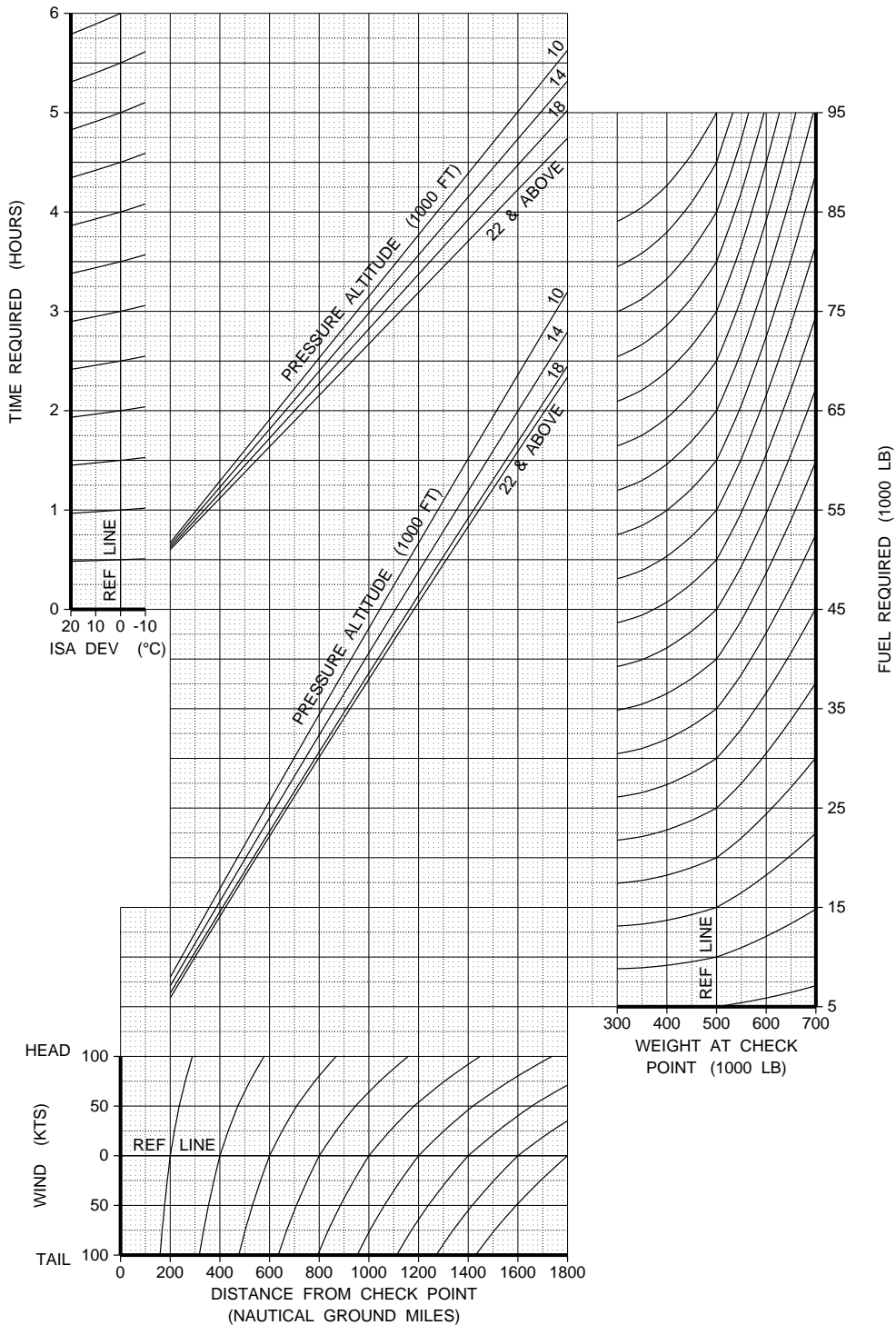


# ENGINE INOP

## MAX CONTINUOUS THRUST

### 280 KIAS Diversion Fuel and Time

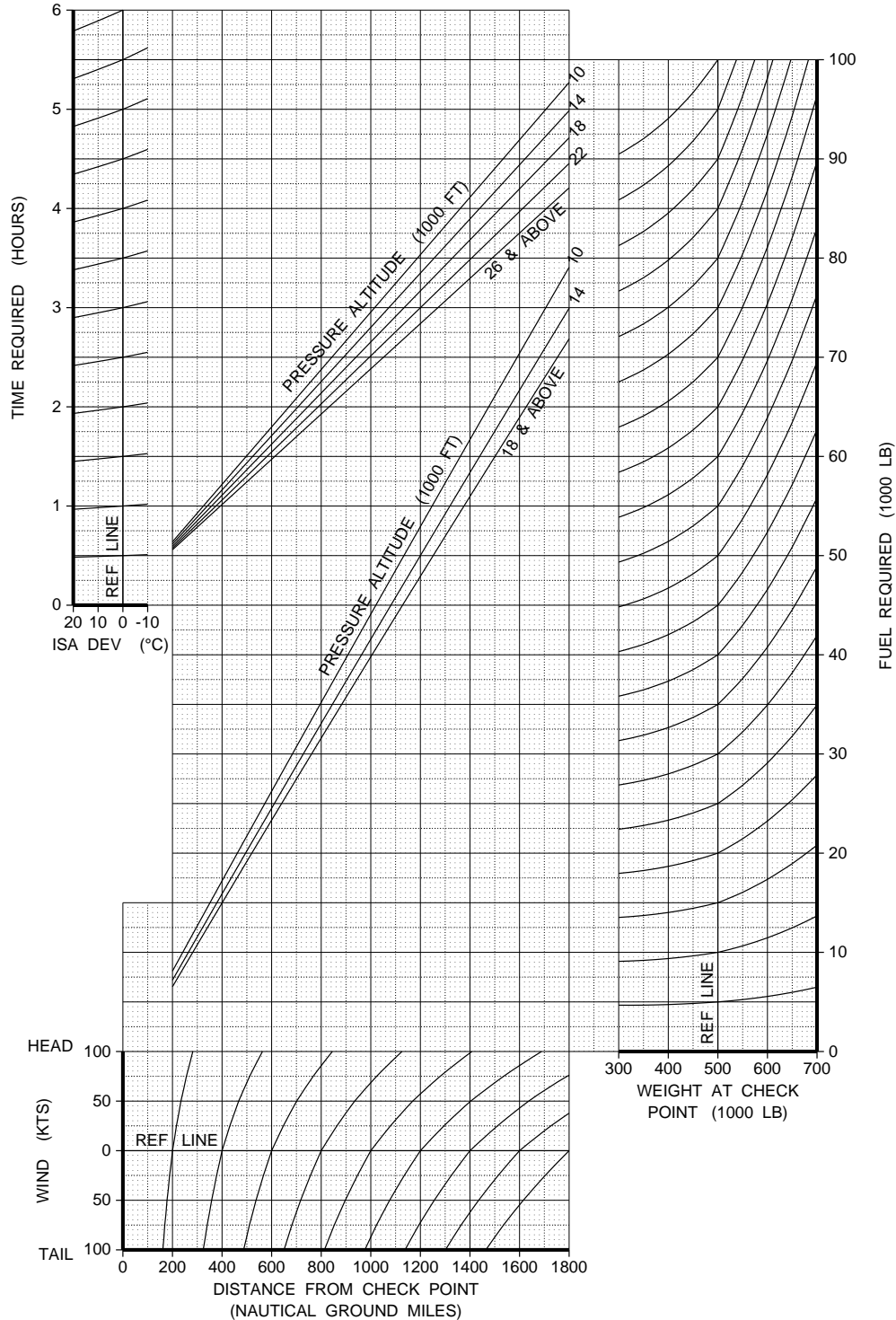
Based on 280/250 descent and includes APU fuel burn



## ENGINE INOP MAX CONTINUOUS THRUST

### 300 KIAS Diversion Fuel and Time

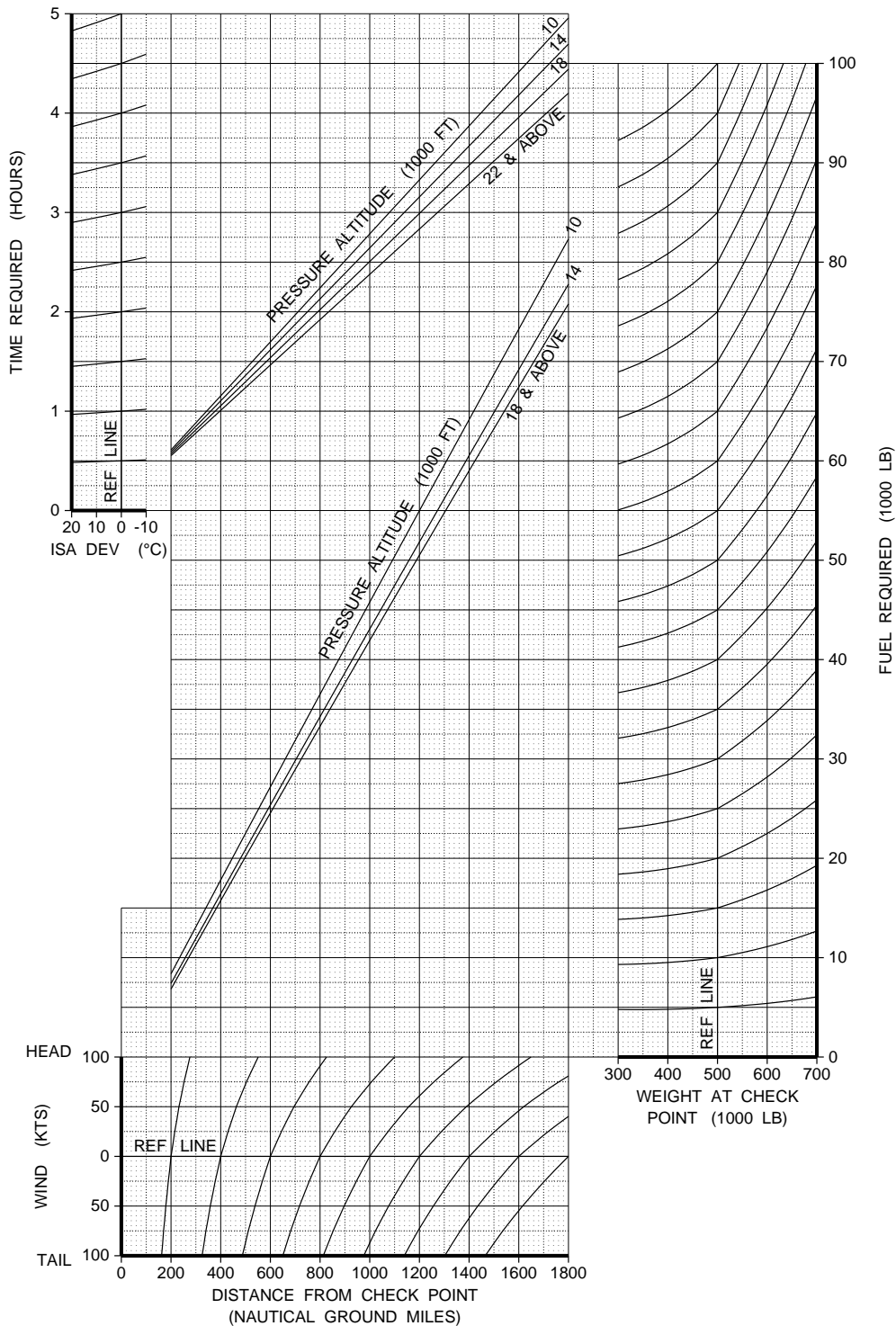
Based on 300/250 descent and includes APU fuel burn



**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**320 KIAS Diversion Fuel and Time**

Based on 320/250 descent and includes APU fuel burn





Flight Planning and Performance Manual

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Holding**  
**Flaps Up**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)									
		660	620	580	540	500	460	420	380	340	300
30000	EPR								1.488	1.365	1.283
	KIAS								221	203	203
	FF/ENG								11550	9430	8270
25000	EPR						1.443	1.351	1.287	1.235	1.189
	KIAS						238	220	205	203	203
	FF/ENG						13720	11590	9990	8960	8110
20000	EPR				1.384	1.322	1.277	1.236	1.200	1.165	1.133
	KIAS				252	235	220	212	205	203	203
	FF/ENG				15680	13750	12120	10850	9760	8870	8070
15000	EPR	1.379	1.328	1.290	1.256	1.226	1.198	1.170	1.143	1.117	1.093
	KIAS	277	262	248	237	228	219	212	205	203	203
	FF/ENG	19400	17410	15740	14340	13090	11920	10850	9810	8970	8370
10000	EPR	1.258	1.232	1.209	1.186	1.165	1.144	1.122	1.103	1.084	1.068
	KIAS	261	253	245	236	227	218	212	205	203	203
	FF/ENG	18010	16690	15460	14290	13120	12010	11030	10110	9320	8740
5000	EPR	1.190	1.172	1.154	1.137	1.120	1.104	1.089	1.076	1.062	1.048
	KIAS	260	252	244	235	226	218	212	205	203	203
	FF/ENG	17800	16580	15390	14240	13170	12200	11260	10290	9460	8750
1500	EPR	1.154	1.139	1.124	1.110	1.097	1.085	1.073	1.061	1.049	1.039
	KIAS	259	251	243	234	226	218	212	205	203	203
	FF/ENG	17960	16750	15660	14580	13520	12470	11460	10490	9660	9140

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

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# NON-STANDARD CONFIGURATION

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## Gear Down

### Introduction

This section contains performance data for airplane operation with landing gear extended for all phases of flight. The data includes engine bleed effects for normal air conditioning operation, i.e., two packs on at normal flow with all engines operating, and one pack at normal flow with engine inoperative.

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, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. 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 the VNAV during descent under these circumstances is not recommended.

### Planning

#### Takeoff/Landing Climb Limit

Runway limited takeoff and landing weights are unchanged from those shown in Chapter 1. The climb limited takeoff and landing weights are tabulated in this section as a function of airport OAT and pressure altitude, with adjustments for packs off and anti-ice operation. The landing climb limit weight is further restricted when operating in icing conditions during any part of the flight when the forecast landing temperature is below 10°C.

Maximum allowable takeoff and landing weights are the lesser of the normal runway limit weight and the corresponding climb limit weight with gear down.

Takeoff and landing speeds are unchanged from those shown in Chapter 1.

#### Obstacle Limit

Obstacle clearance charts are provided for each certified takeoff flap setting based on normal air conditioning operation. The charts are intended for use only when an airport analysis is not available. Detailed analysis for the specific case from the Airplane Flight Manual may result in a less restrictive weight and can account for air conditioning packs off. The data is not valid for takeoffs using improved climb technique.

To determine the obstacle limit weight, enter with obstacle height (measured from the lowest point on the runway) and move horizontally to the obstacle distance from brake release. Move vertically to the OAT reference line and follow the guidelines to correct for OAT as necessary. Repeat this procedure to correct for airport pressure altitude and wind, then continue vertically to read obstacle limit weight.

#### Net Level Off Weight

This chart is used to determine the dispatch maximum weight for terrain clearance based on the Approved Flight Manual net engine inoperative, gear down performance at speed for optimum climb gradient. Refer to Chapter 2 text for description of net level off weight chart.

#### Driftdown Profiles Net Flight Path

These charts are provided to determine the time, fuel and distance from engine failure at any point during driftdown for enroute terrain clearance. Data is based on gear down net performance, Max Continuous thrust following engine failure and level flight deceleration to optimum driftdown speed (speed for optimum climb gradient). Refer to Chapter 2 for description of chart usage.

#### Long Range Cruise Trip Fuel and Time

A Long Range Cruise Trip Fuel and Time chart is provided at constant altitude to determine trip fuel and time from brake release to touchdown. Refer to Chapter 2 text for description of chart usage.

### All Engines

#### Long Range Cruise Altitude Capability

Long Range Cruise altitude capability is provided at Max Climb thrust with 300 ft/min residual rate of climb.

#### 220 KIAS Max Climb EPR

Max Climb EPR based on normal air conditioning bleed is shown for a 220 KIAS climb schedule which approximates economy climb and turbulent air penetration speed, VREF 30+80 KIAS, with the landing gear extended. Max Climb EPR may be read directly from the table for the desired pressure altitude and TAT.

#### Long Range Cruise Table

LRC cruise tabulations are provided in the same format as the gear up cruise control tables in Chapter 3.

### Long Range Cruise Enroute Fuel and Time

Chart is provided to determine fuel and time required to proceed to an alternate airfield or to complete the scheduled trip at Long Range Cruise. The chart is used in a similar manner to the Trip Fuel and Time chart with distance to destination replacing total trip distance.

### Descent

Time, distance and fuel information is shown based on flight idle thrust at VREF 30+80 KIAS and straight in approach.

### Holding

EPR required, ISA and fuel flow with gear down are shown as described in Chapter 3 with a minimum maneuver speed of VREF30+80 KIAS for Flaps Up and VREF30+60 for Flaps 1.

### Engine Inoperative

#### Driftdown/LRC Cruise Range Capability

Engine inoperative range capability is provided to determine the fuel and time required for a specified distance when the recommended driftdown procedure is followed.

#### Long Range Cruise Altitude Capability

Altitude capability is provided in the same format as the gear up data shown in Chapter 3 for Max Climb Thrust and Long Range Cruise speed with 300 ft/min residual rate of climb.

#### Long Range Cruise Diversion Fuel and Time

This chart enables rapid determination of fuel and time required to proceed to an alternate airfield (or continue to destination) at Long Range Cruise with an engine inoperative. Diversion fuel and time are determined in a manner similar to the enroute fuel and time.

#### Long Range Cruise Tables

Long Range Cruise tabulations for engine inoperative are based on use of Max Continuous thrust limits.

#### Holding

Engine inoperative holding data is provided at VREF30+80 KIAS.

### Alternate Mode EEC

#### Introduction

This section contains performance data for airplane operation with the Electronic Engine Controls (EEC) in the ALTERNATE mode. The data includes engine bleed

effects for normal air conditioning operation, i.e., two packs on at normal flow all engines operating, and one pack at normal flow with engine inoperative.

#### Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the PRIMARY mode (normal) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, net level off and landing climb weights. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with the limit weights for PRIMARY mode EEC operation as determined in Chapter 1, and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. The ALTERNATE Mode EEC Landing Climb limit must be compared to the Landing Field Length limit from Chapter 1 and the more limiting of the two must be used as the landing limit weight. 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 Adjustments Table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does incorporate ALTERNATE Mode EEC performance in its takeoff speeds calculations.

#### Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

#### Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule with anti-ice off. Enter the table with pressure altitude and TAT to read Max Climb %N1. Apply bleed adjustments as required.

### **Max Cruise %N1**

Maximum Cruise %N1 is presented for .84M, which approximates Long Range Cruise speed. Enter the table with pressure altitude and TAT to read Max Cruise %N1. Appropriate bleed adjustments are shown.

### **Go-Around %N1**

Go-Around power setting for ALTERNATE MODE EEC operation is presented for normal engine bleed for packs on. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

### **Initial Max Continuous %N1**

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Appropriate bleed adjustments are shown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

### **Max Continuous %N1**

Max Continuous %N1 settings are presented as a function of pressure altitude and TAT for engine inoperative speeds of 320, 280, 240, and 200 KIAS. Power settings may be interpolated for intermediate airspeeds. Apply bleed adjustments as required.

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**GEAR DOWN**

**Takeoff Climb Limit**

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

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 LB)											
		AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
54	129	408.3	388.2	372.8	364.6	361.6	358.6	354.8	346.4	337.9	329.4	320.9	
52	126	416.1	396.4	382.7	366.9	361.6	358.5	354.7	346.3	337.8	329.3	320.8	
50	122	424.0	404.7	392.5	377.9	363.9	358.5	354.6	346.2	337.6	329.2	320.7	
48	118	432.2	413.1	402.5	388.8	374.7	360.8	354.6	346.1	337.5	329.1	320.6	
46	115	440.8	421.8	412.1	399.8	385.5	371.0	356.8	346.0	337.5	329.0	320.5	
44	111	449.1	430.6	421.0	411.0	395.6	380.8	366.2	348.1	337.4	328.9	320.4	
42	108	458.0	439.2	429.9	421.2	405.8	390.4	375.7	356.9	339.5	328.8	320.3	
40	104	467.1	448.2	438.5	430.7	415.6	400.1	384.9	365.7	347.6	330.8	320.2	
38	100	477.7	457.1	447.6	440.2	424.8	409.6	393.9	374.3	355.8	338.4	322.2	
36	97	489.7	467.3	456.4	449.1	434.1	418.7	402.9	382.6	363.8	346.0	329.2	322.7
34	93	501.6	478.5	466.5	457.9	442.4	427.7	411.8	391.6	371.5	353.2	336.1	329.4
32	90	514.3	489.5	477.5	466.2	450.5	435.6	420.5	401.0	380.6	360.4	342.8	336.1
30	86	523.3	501.1	486.8	473.6	457.9	443.1	427.9	410.0	390.2	369.5	349.3	342.4
28	82	526.2	512.3	496.2	480.7	464.5	449.7	434.9	417.2	399.5	379.4	358.2	349.3
26	79	526.3	517.9	505.1	488.5	470.8	455.4	440.8	424.2	406.7	388.9	368.4	359.9
24	75	526.4	518.0	509.4	495.7	477.6	460.9	445.7	429.6	413.5	395.8	377.9	369.8
22	72	526.4	518.0	509.4	499.1	484.0	466.8	450.4	434.0	418.7	402.7	384.7	377.5
20	68	526.5	518.1	509.5	499.1	487.0	472.5	455.4	438.2	422.5	407.4	391.4	384.1
18	64	526.6	518.2	509.5	499.1	487.0	475.1	460.3	442.5	426.0	410.6	395.7	389.9
16	61	526.6	518.2	509.6	499.1	487.0	475.1	462.5	446.7	429.8	413.8	398.7	392.7
14	57	526.6	518.2	509.6	499.1	487.0	475.1	462.5	448.6	433.5	417.2	401.6	395.6
12	54	526.7	518.2	509.6	499.1	487.0	475.1	462.4	448.5	435.0	420.3	404.5	398.4
10	50	526.7	518.3	509.6	499.1	486.9	475.0	462.4	448.5	435.0	421.6	407.2	401.0
-40	-40	526.5	517.9	509.0	497.2	485.0	473.0	459.9	446.0	432.4	419.1	405.8	400.9

With engine bleed for packs off, decrease weight by 1200 lb.  
 With engine anti-ice on, decrease weight by 16900 lb.  
 With engine and wing anti-ice on, decrease weight by 23100 lb.

**Landing Climb Limit**

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

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)											
		AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
54	129	474.8	457.9	440.0									
52	126	488.9	470.1	452.4	435.4								
50	122	502.6	484.2	464.6	447.9	429.7							
48	118	516.5	497.8	478.8	460.3	442.6	425.8						
46	115	530.5	511.3	492.0	473.8	454.5	437.7	420.5					
44	111	543.1	524.2	504.7	486.2	467.1	449.0	431.9	415.3				
42	108	556.0	536.4	517.1	498.0	478.9	460.3	442.5	426.0	409.3			
40	104	568.1	548.5	528.6	509.4	490.0	470.9	452.6	436.0	419.5	402.7		
38	100	572.0	560.1	540.2	520.0	500.6	481.3	462.4	446.3	429.2	412.7	396.5	
36	97	572.1	570.4	550.7	529.9	510.2	491.1	472.0	455.9	438.1	421.8	405.7	398.1
34	93	572.2	576.6	559.5	538.8	518.4	499.7	480.6	463.4	445.9	428.5	413.3	405.2
32	90	572.3	576.6	567.2	546.5	526.3	506.1	488.6	469.8	451.9	434.8	416.4	409.3
30	86	572.5	576.7	574.5	553.3	532.5	512.4	493.6	475.9	456.5	439.3	419.6	412.2
28	82	572.7	576.7	574.6	559.7	537.1	517.0	498.3	478.9	460.8	442.3	422.7	415.1
26	79	572.8	576.8	574.7	559.8	541.6	520.4	501.6	481.9	463.1	445.3	425.6	418.0
24	75	572.9	577.0	574.8	559.9	543.8	523.6	503.9	484.3	465.3	447.3	428.4	420.8
22	72	573.0	577.2	574.9	560.0	543.8	526.0	506.1	486.5	467.5	449.3	430.4	423.0
20	68	573.1	577.2	575.0	560.1	543.9	528.0	508.5	488.7	469.6	451.2	432.3	424.9
18	64	573.2	577.3	575.1	560.1	544.0	528.0	510.9	491.0	471.7	453.2	434.2	426.7
16	61	573.3	577.4	575.2	560.2	544.1	528.1	512.5	493.3	473.9	455.2	436.1	428.6
14	57	573.4	577.5	575.3	560.3	544.2	528.2	512.6	495.3	476.2	457.4	438.0	430.5
12	54	573.5	577.6	575.4	560.4	544.3	528.3	512.7	495.4	478.4	459.5	440.1	432.5
10	50	573.7	577.7	575.5	560.5	544.3	528.4	512.7	495.5	478.7	461.7	442.1	434.5
-40	-40	575.6	579.4	577.1	562.1	545.8	529.8	514.2	496.9	480.1	463.7	446.4	439.7

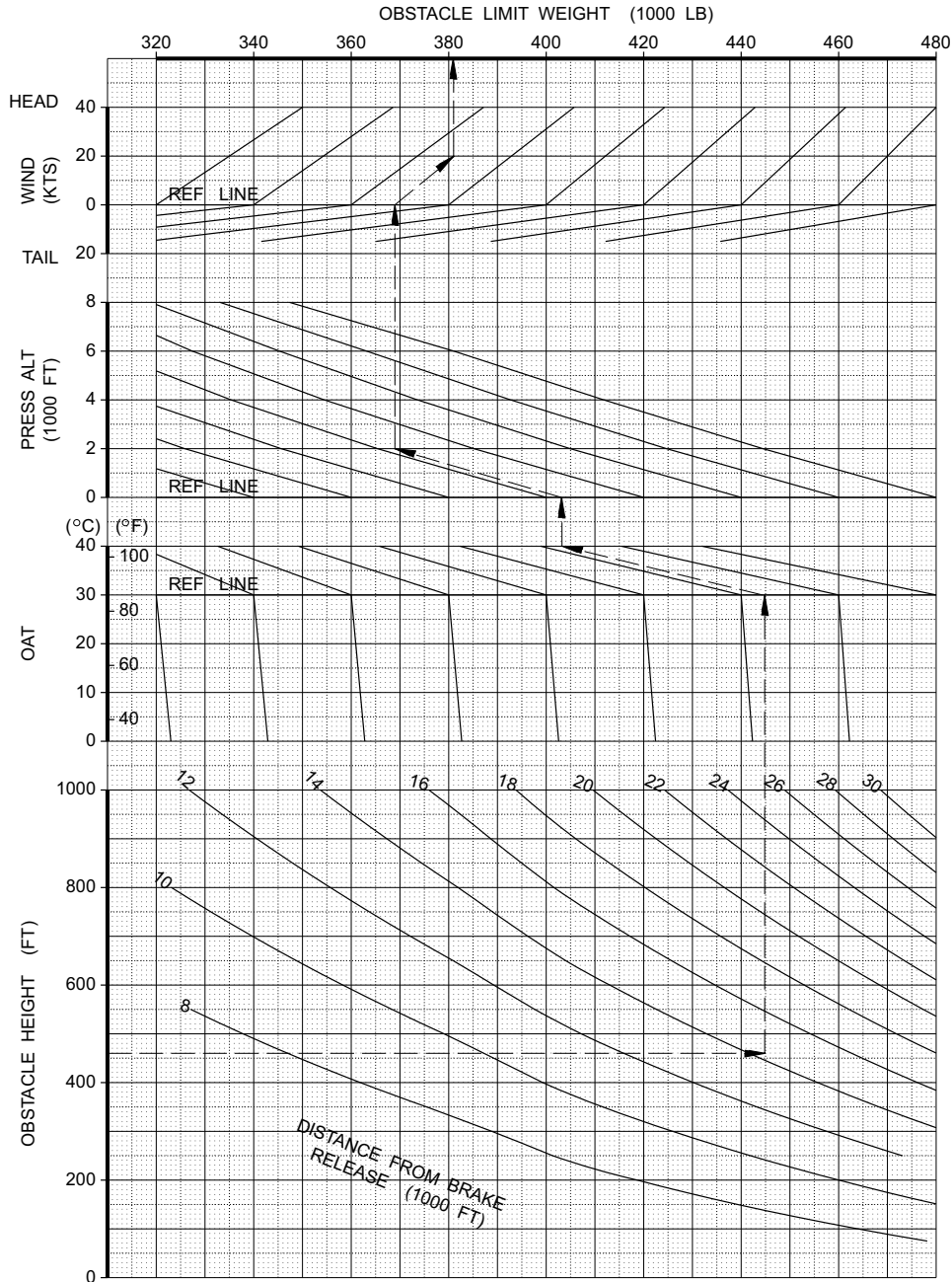
With engine bleeds for packs off, increase weight by 4200 lb.  
 With engine anti-ice on, decrease allowable weight by 500 lb.  
 With engine and wing anti-ice on, decrease weight by 3800 lb.  
 When operating in icing conditions during any part of the flight when forecast landing temperature is below 10°C, decrease weight by 56200 lb.

**GEAR DOWN**

**Obstacle Limit**

Flaps 5

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



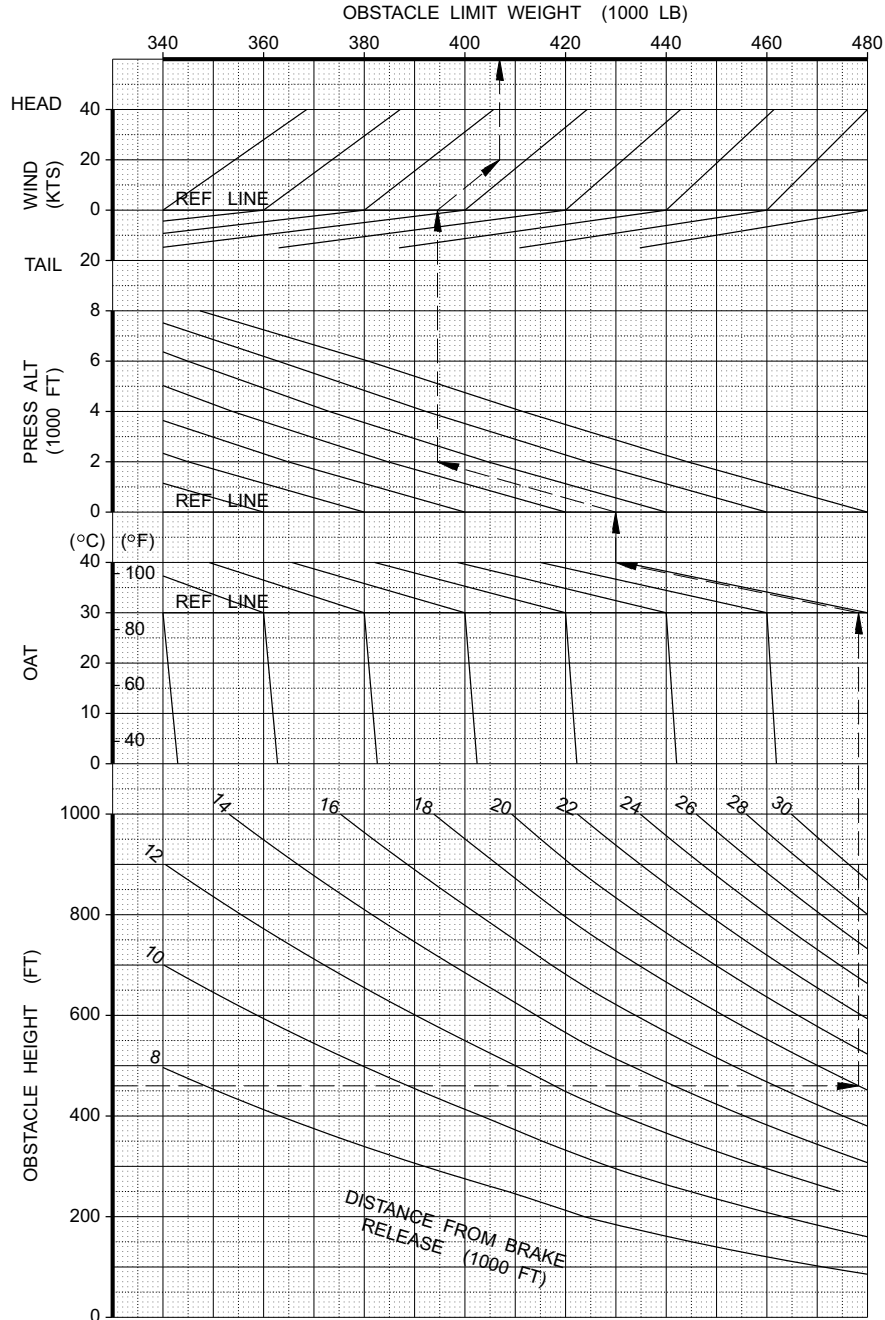
Obstacle height must be calculated from the lowest point of the runway to conservatively account for runway slope.  
 With engine bleed for packs off, increase weight by 200 lb.  
 With engine anti-ice on, decrease weight by 15700 lb.  
 With engine and wing anti-ice on, decrease weight by 21500 lb.

**GEAR DOWN**

**Obstacle Limit**

Flaps 15

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



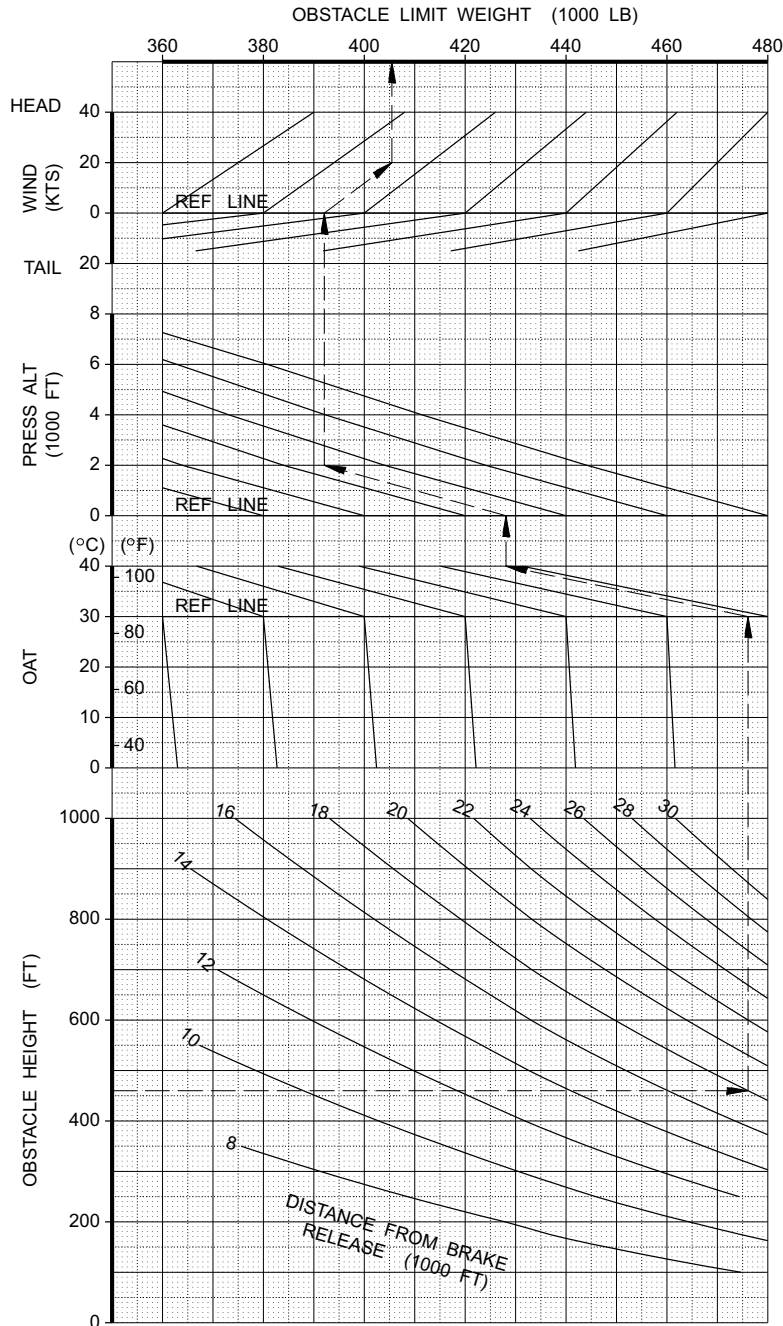
Obstacle height must be calculated from the lowest point of the runway to conservatively account for runway slope.  
 With engine bleed for packs off, increase weight by 200 lb.  
 With engine anti-ice on, decrease weight by 15700 lb.  
 With engine and wing anti-ice on, decrease weight by 21500 lb.

**GEAR DOWN**

**Obstacle Limit**

Flaps 20

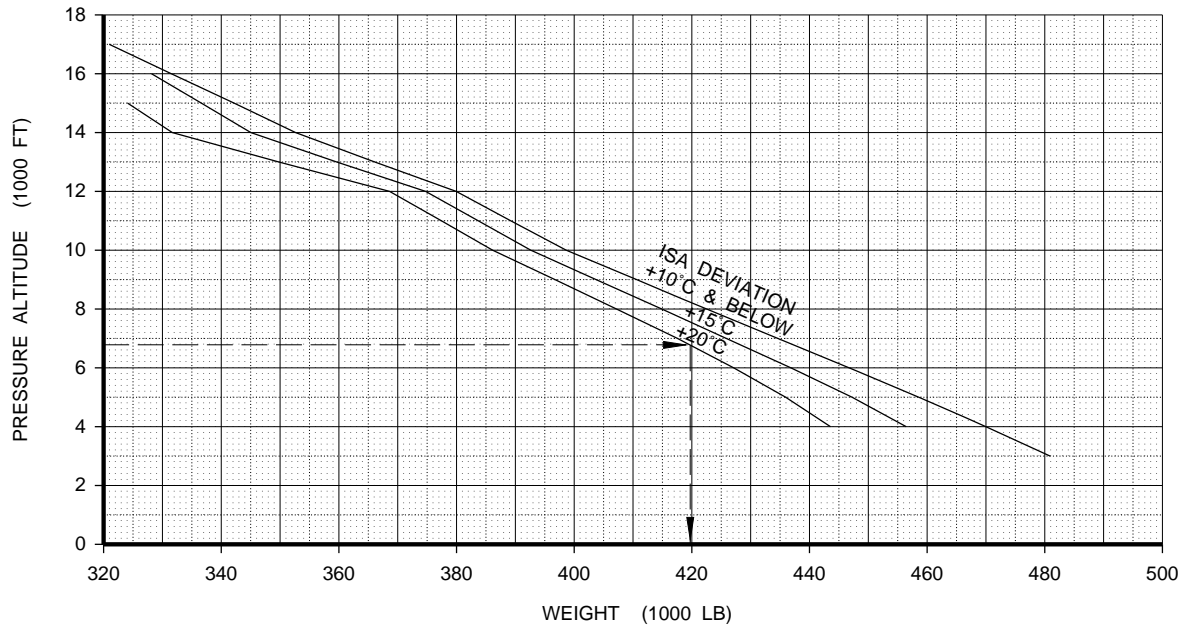
Based on engine bleed for packs on, engine anti-ice off and wing anti-ice off or auto



Obstacle height must be calculated from the lowest point of the runway to conservatively account for runway slope.  
 With engine bleed for packs off, increase weight by 200 lb.  
 With engine anti-ice on, decrease weight by 15700 lb.  
 With engine and wing anti-ice on, decrease weight by 21500 lb.

**GEAR DOWN**  
**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Net Level Off Weight**

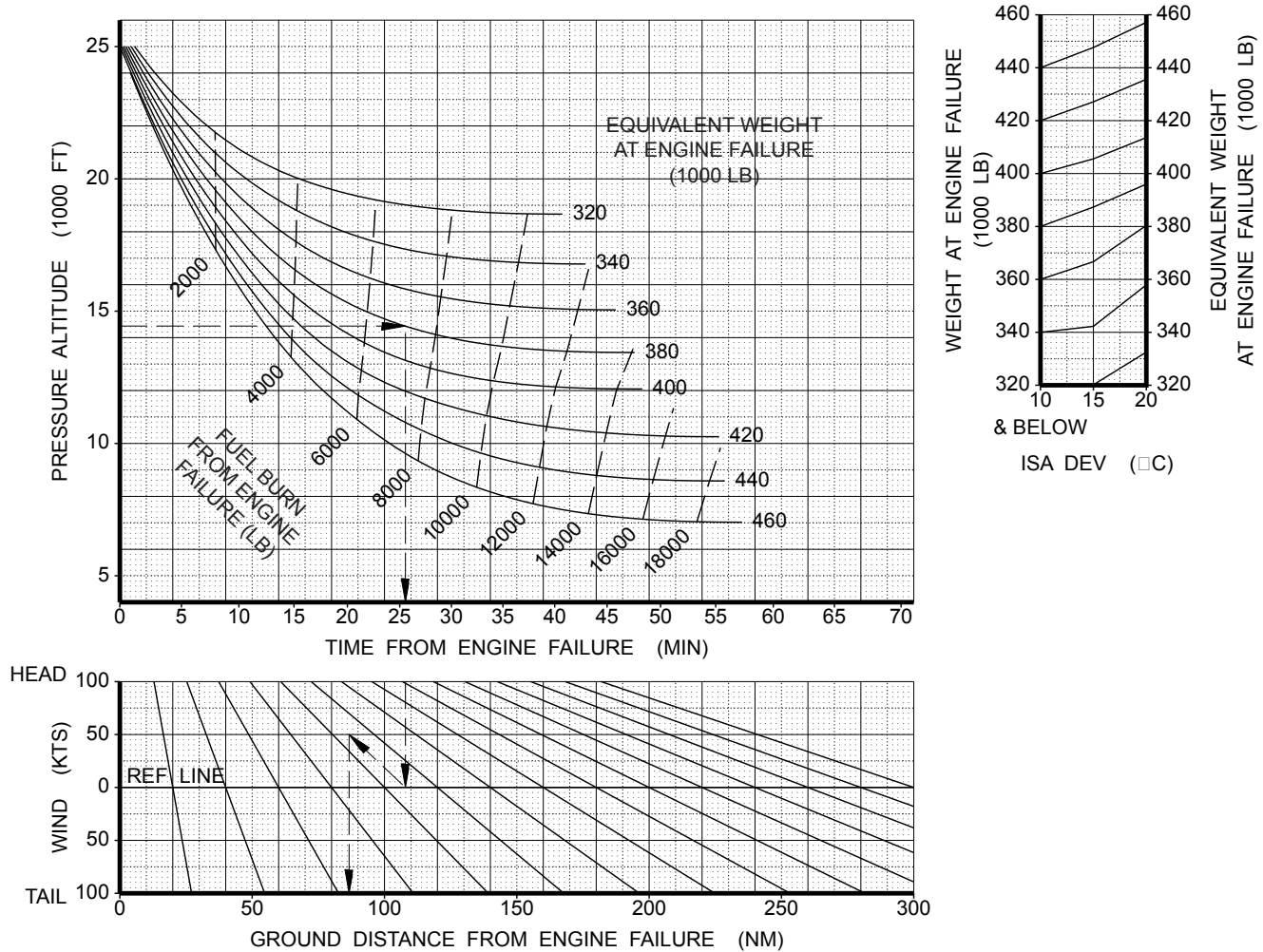


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)				
	PRESSURE ALTITUDE (1000 FT)				
	8	10	12	14	16
ENGINE ONLY	-7.3	-6.3	-5.0	-4.0	-3.5
ENGINE AND WING	-11.1	-9.9	-8.1	-7.5	-6.1

**GEAR DOWN**  
**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Driftdown Profiles Net Flight Path**  
25000 FT and Above

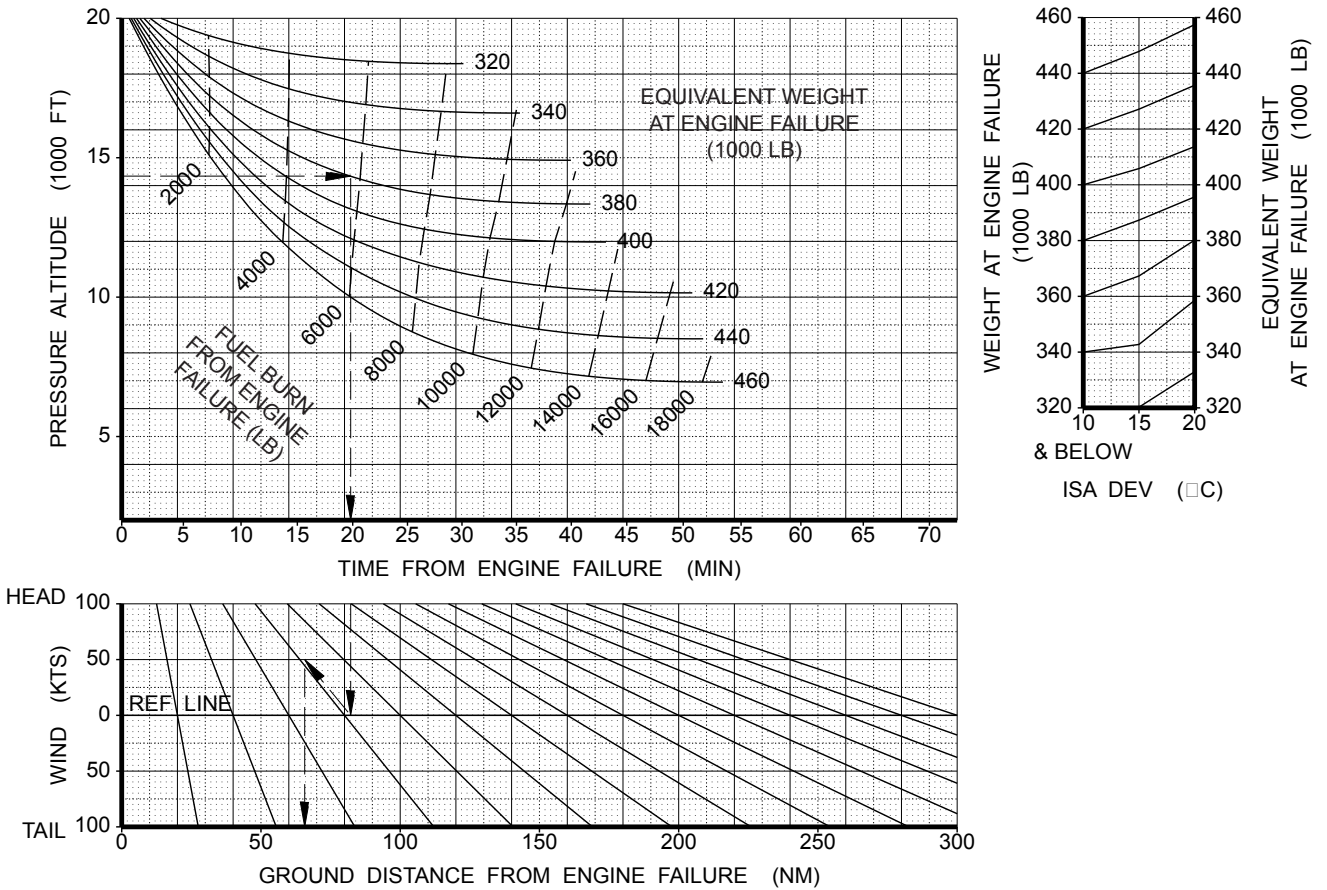


**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)				
	PRESSURE ALTITUDE (1000 FT)				
	8	10	12	14	16
ENGINE ONLY	7.3	6.3	5.0	4.0	3.5
ENGINE AND WING	11.1	9.9	8.1	7.5	6.1

**GEAR DOWN**  
**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Driftdown Profiles Net Flight Path**  
 Below 25000 FT



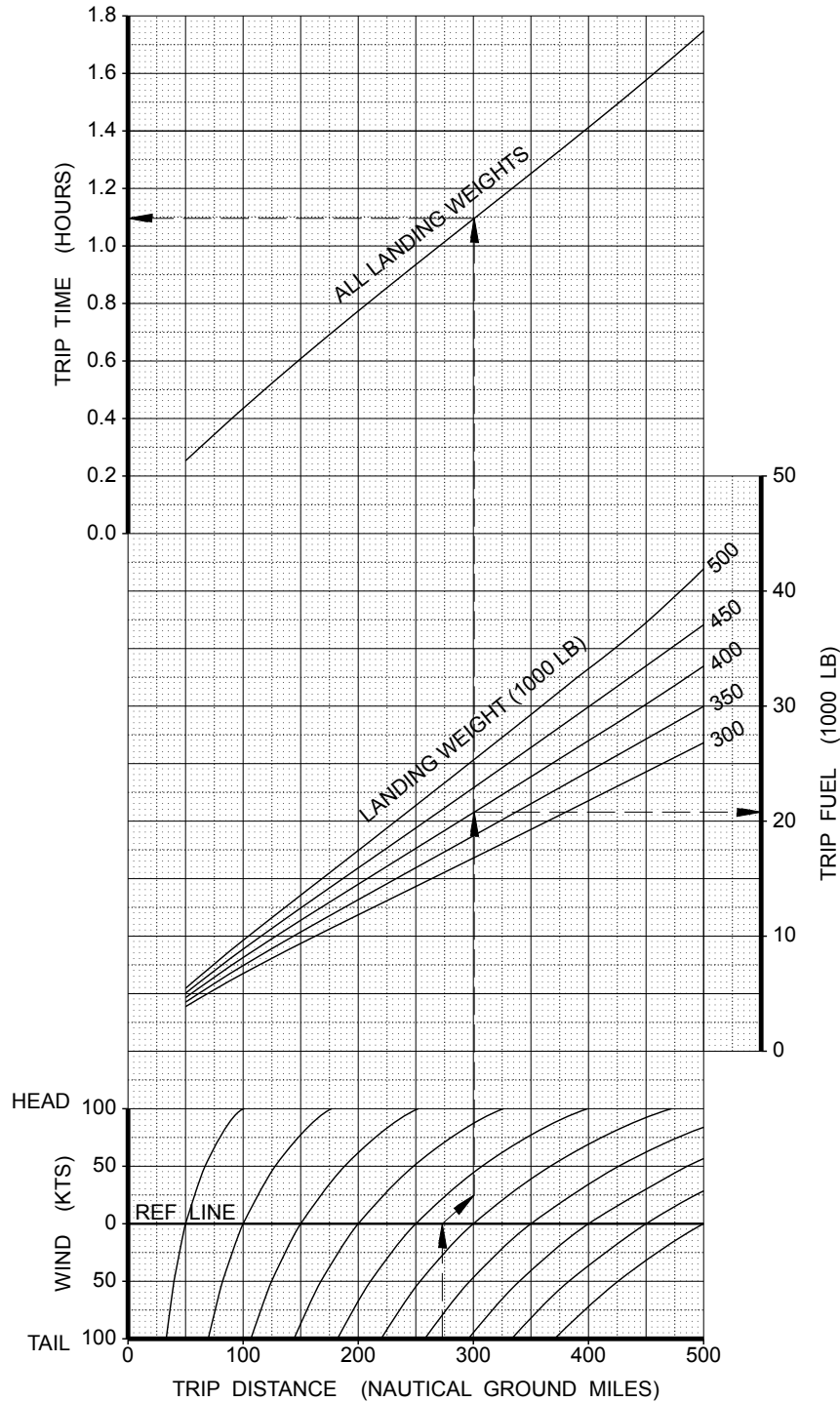
**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)				
	PRESSURE ALTITUDE (1000 FT)				
	8	10	12	14	16
ENGINE ONLY	7.3	6.3	5.0	4.0	3.5
ENGINE AND WING	11.1	9.9	8.1	7.5	6.1

# GEAR DOWN

## Long Range Cruise Trip Fuel and Time

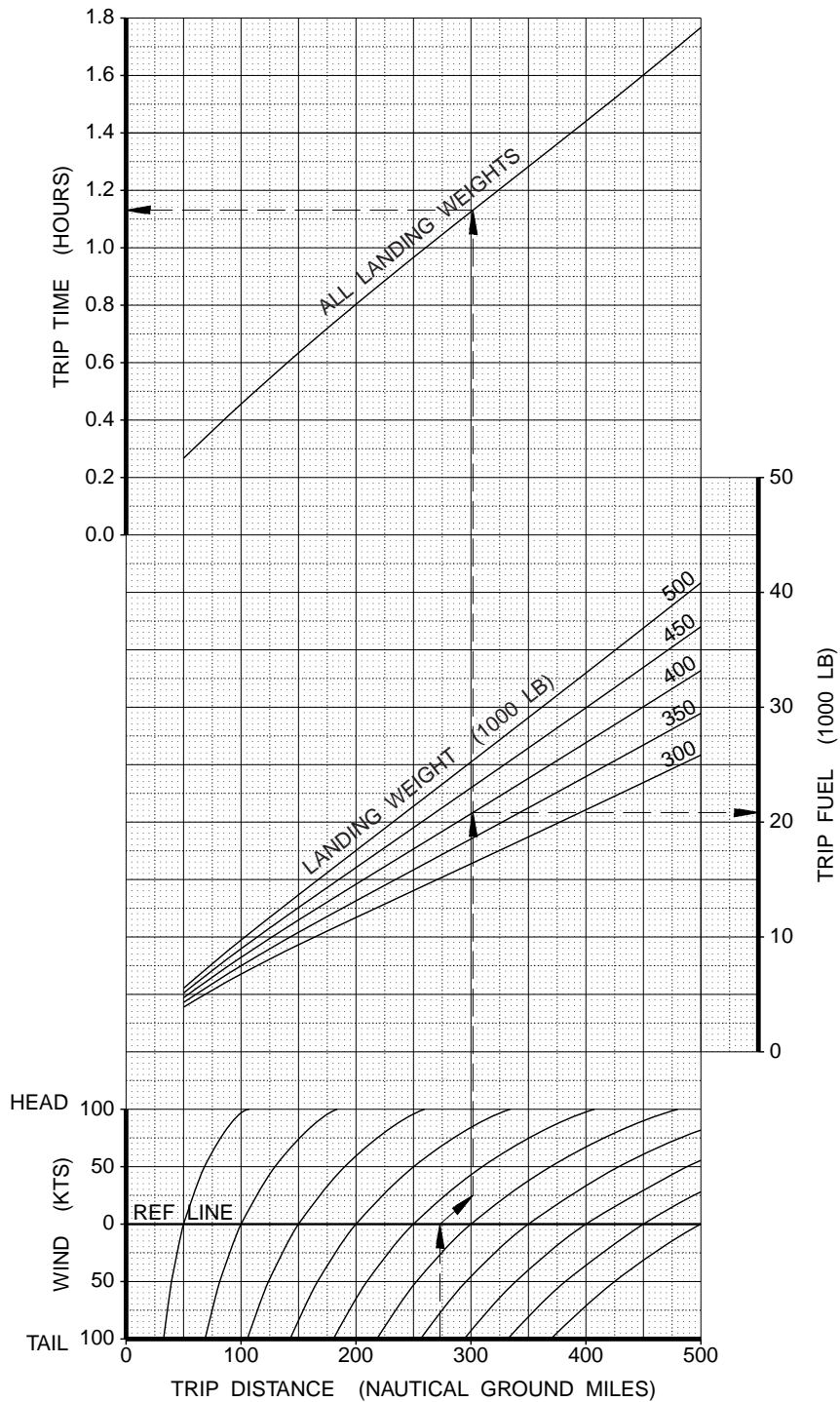
Based on VREF30+80 climb and descent at short trip cruise altitude.



**GEAR DOWN**

**Long Range Cruise Short Trip Fuel and Time**

Based on VREF30+60 climb and descent at short trip cruise altitude



Intentionally  
Blank

**GEAR DOWN**

**Long Range Cruise Altitude Capability**  
**Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	13700	13600	11100
640	15100	15000	12700
620	16600	16500	14300
600	18000	17900	15900
580	19500	19400	17400
560	20700	20600	18900
540	21800	21800	20300
520	23000	22900	21500
500	24100	24100	22700
480	25300	25200	23900
460	26300	26100	25200
440	27300	27100	26200
420	28400	28100	27300
400	29600	29200	28400
380	30700	30300	29500
360	31600	31300	30700
340	32300	32000	31600
320	33100	32800	32500

**220 KIAS Max Climb EPR**

Based on engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	0	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35
55	1.204	1.203	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
50	1.221	1.215	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
45	1.239	1.232	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
40	1.258	1.250	1.242	1.239	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
35	1.271	1.270	1.260	1.260	1.257	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
30	1.271	1.293	1.284	1.283	1.282	1.278	1.273	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
25	1.271	1.303	1.311	1.309	1.307	1.304	1.301	1.299	1.284	1.281	1.282	1.274	1.265	1.252	1.238	1.219
20	1.271	1.303	1.339	1.337	1.335	1.334	1.331	1.329	1.316	1.300	1.291	1.274	1.265	1.252	1.238	1.219
15	1.271	1.303	1.343	1.361	1.367	1.368	1.365	1.363	1.348	1.333	1.325	1.299	1.271	1.252	1.238	1.219
10	1.271	1.303	1.343	1.361	1.385	1.404	1.403	1.402	1.386	1.369	1.360	1.334	1.308	1.277	1.243	1.219
5	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.444	1.429	1.410	1.400	1.372	1.345	1.317	1.288	1.253
0	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.471	1.455	1.447	1.413	1.385	1.359	1.332	1.306
-5	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.456	1.426	1.402	1.380	1.359
-10	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.464	1.441	1.426	1.407
-15	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.495	1.475	1.463	1.450
-20	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.495	1.499	1.493	1.484

**Anti-Ice Adjustments**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-0.016	-0.015	-0.015	-0.009	-0.017	-0.023	-0.019	-0.016
ENGINE & WING*	-0.022	-0.023	-0.020	-0.020	-0.030	-0.038	-0.034	-0.032
ENGINE & WING**	-0.029	-0.031	-0.030	-0.030	-0.043	-0.053	-0.048	-0.048

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, single bleed source and both packs off.



Flight Planning and Performance Manual

**GEAR DOWN**

**Long Range Cruise Table**  
**35000 FT to 30000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
32	EPR MAX TAT KIAS MACH FF/ENG KTAS										
31	EPR MAX TAT KIAS MACH FF/ENG KTAS										
30	EPR MAX TAT KIAS MACH FF/ENG KTAS										
29	EPR MAX TAT KIAS MACH FF/ENG KTAS	<b>PERFORMANCE THRUST LIMITED</b>									
28	EPR MAX TAT KIAS MACH FF/ENG KTAS										
27	EPR MAX TAT KIAS MACH FF/ENG KTAS										
26	EPR MAX TAT KIAS MACH FF/ENG KTAS										



Flight Planning and Performance Manual

**GEAR DOWN**

**Long Range Cruise Table**  
**35000 FT to 30000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
32 (-35)	EPR								1.395	1.347	1.307
	MAX TAT								-23	-12	
	KIAS								200	196	192
	MACH								.564	.554	.544
	FF/ENG KTAS								8570 329	7957 324	7390 318
31 (-33)	EPR							1.397	1.350	1.311	1.278
	MAX TAT							-17	-9		
	KIAS							203	200	196	192
	MACH							.561	.552	.543	.533
	FF/ENG KTAS							8976 329	8353 324	7776 318	7257 313
30 (-31)	EPR						1.396	1.352	1.314	1.282	1.254
	MAX TAT						-15	-7	-1		
	KIAS						207	203	200	196	192
	MACH						.558	.549	.540	.531	.522
	FF/ENG KTAS						9389 329	8759 324	8172 318	7642 313	7175 307
29 (-29)	EPR					1.395	1.352	1.316	1.285	1.257	1.233
	MAX TAT					-13	-6	1			
	KIAS					210	207	203	200	196	192
	MACH					.555	.547	.538	.529	.520	.511
	FF/ENG KTAS					9804 328	9171 323	8573 318	8034 313	7563 308	7134 302
28 (-28)	EPR				1.391	1.351	1.316	1.286	1.259	1.236	1.215
	MAX TAT				-10	-4	2				
	KIAS				213	210	207	203	200	196	192
	MACH				.551	.543	.535	.527	.518	.509	.500
	FF/ENG KTAS				10219 328	9584 323	8977 318	8430 313	7957 308	7521 303	7110 297
27 (-26)	EPR			1.387	1.348	1.315	1.287	1.261	1.239	1.218	1.198
	MAX TAT			-7	-1	4					
	KIAS			216	213	210	207	203	200	196	192
	MACH			.547	.540	.532	.524	.516	.507	.499	.489
	FF/ENG KTAS			10630 327	9994 322	9382 318	8832 313	8356 308	7911 303	7493 298	7093 292
26 (-24)	EPR		1.382	1.345	1.314	1.287	1.262	1.240	1.220	1.201	1.184
	MAX TAT		-4	1	6						
	KIAS		219	216	213	210	207	203	200	196	192
	MACH		.544	.536	.529	.521	.513	.505	.497	.488	.479
	FF/ENG KTAS		11041 326	10399 321	9787 317	9238 312	8757 308	8304 303	7878 298	7470 293	7076 287

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	26	27	28	29	30	31	32
LIMIT EPR	1.407	1.405	1.404	1.415	1.417	1.419	1.402
MAX TAT (°C)	-8	-10	-11	-18	-20	-22	-23

Decrease limit EPR by 0.064 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.



Flight Planning and Performance Manual

**GEAR DOWN**

**Long Range Cruise Table**  
**29000 FT to 24000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)										
		660	640	620	600	580	560	540	520	500	480	
25 (-21)	EPR											1.376
	MAX TAT											-2
	KIAS											222
	MACH											.540
	FF/ENG KTAS											11443 325
24 (-19)	EPR									1.369		1.337
	MAX TAT									0		5
	KIAS									225		222
	MACH									.536		.529
	FF/ENG KTAS									11842 324		11207 320
23 (-17)	EPR								1.363	1.334		1.308
	MAX TAT								2	6		11
	KIAS								229	226		224
	MACH								.532	.527		.521
	FF/ENG KTAS								12267 323	11678 320		11124 316
22 (-15)	EPR							1.358	1.331	1.307		1.284
	MAX TAT							3	8	12		
	KIAS							233	231	228		226
	MACH							.532	.527	.521		.515
	FF/ENG KTAS							12786 324	12194 321	11637 318		11091 314
21 (-13)	EPR							1.354	1.328	1.305		1.263
	MAX TAT							5	9	13		17
	KIAS							237	235	233		227
	MACH							.531	.526	.521		.508
	FF/ENG KTAS							13305 325	12716 322	12155 319	11606 315	11065 311
20 (-11)	EPR					1.349	1.324	1.302	1.282	1.263		1.245
	MAX TAT					7	11	14	18			
	KIAS					242	240	237	235	232		229
	MACH					.530	.525	.520	.514	.508		.501
	FF/ENG KTAS					13827 325	13242 323	12679 319	12127 316	11585 312		11058 308
19 (-9)	EPR				1.343	1.320	1.299	1.280	1.262	1.245		1.229
	MAX TAT				7	11	15	19				
	KIAS				246	244	242	239	236	233		230
	MACH				.529	.524	.519	.514	.508	.501		.494
	FF/ENG KTAS				14350 326	13768 323	13203 320	12650 317	12108 313	11576 309		11062 305

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	19	20	21	22	23	24	25
LIMIT EPR	1.351	1.365	1.374	1.383	1.392	1.400	1.408
MAX TAT (°C)	6	4	2	0	-2	-4	-6

Decrease limit EPR by 0.067 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.022.  
With engine and wing anti-ice on, decrease limit EPR by 0.037.



Flight Planning and Performance Manual

**GEAR DOWN**

**Long Range Cruise Table**  
**29000 FT to 24000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
25 (-22)	EPR	1.376	1.341	1.311	1.286	1.262	1.241	1.222	1.203	1.186	1.171
	MAX TAT	-2	3	8							
	KIAS	222	219	216	213	210	207	203	200	196	192
	MACH	.540	.533	.525	.518	.511	.503	.495	.487	.478	.469
	FF/ENG KTAS	11443 325	10804 321	10195 316	9649 312	9157 307	8696 303	8265 298	7850 293	7449 288	7058 283
24 (-21)	EPR	1.337	1.309	1.284	1.261	1.241	1.223	1.205	1.188	1.173	1.159
	MAX TAT	5	10								
	KIAS	222	219	216	213	210	207	203	200	196	192
	MACH	.529	.522	.515	.508	.500	.493	.485	.477	.468	.460
	FF/ENG KTAS	11207 320	10619 315	10069 311	9557 307	9088 302	8656 298	8236 293	7828 288	7431 283	7042 278
23 (-19)	EPR	1.308	1.285	1.263	1.243	1.224	1.206	1.190	1.175	1.161	1.148
	MAX TAT	11									
	KIAS	224	221	218	214	211	207	203	200	196	192
	MACH	.521	.515	.508	.500	.492	.483	.475	.467	.459	.451
	FF/ENG KTAS	11124 316	10583 313	10053 308	9553 304	9086 299	8620 293	8207 288	7805 284	7412 279	7019 273
22 (-17)	EPR	1.284	1.263	1.244	1.226	1.209	1.192	1.177	1.163	1.150	1.137
	MAX TAT										
	KIAS	226	223	219	216	212	207	203	200	196	192
	MACH	.515	.508	.501	.493	.484	.475	.466	.458	.450	.441
	FF/ENG KTAS	11091 314	10555 310	10045 305	9570 300	9095 295	8628 289	8178 284	7783 279	7394 274	7008 269
21 (-16)	EPR	1.263	1.245	1.228	1.211	1.195	1.180	1.165	1.152	1.139	1.127
	MAX TAT										
	KIAS	227	224	220	217	212	208	204	200	196	192
	MACH	.508	.501	.494	.485	.477	.467	.458	.449	.441	.433
	FF/ENG KTAS	11065 311	10547 307	10060 302	9578 297	9103 292	8641 286	8189 280	7763 275	7378 270	7147 265
20 (-14)	EPR	1.245	1.228	1.212	1.197	1.182	1.168	1.155	1.141	1.129	1.118
	MAX TAT										
	KIAS	229	225	221	217	213	209	205	200	196	192
	MACH	.501	.494	.486	.478	.469	.460	.450	.440	.432	.424
	FF/ENG KTAS	11058 308	10558 304	10064 299	9581 294	9111 288	8655 283	8202 277	7747 270	7505 265	7163 260
19 (-12)	EPR	1.229	1.213	1.198	1.184	1.171	1.158	1.145	1.132	1.120	1.110
	MAX TAT										
	KIAS	230	226	222	218	214	210	205	200	196	192
	MACH	.494	.487	.479	.470	.462	.452	.443	.432	.423	.416
	FF/ENG KTAS	11062 305	10557 300	10066 295	9589 290	9126 285	8670 279	8212 273	7762 267	7510 261	7175 256

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	19	20	21	22	23	24	25
LIMIT EPR	1.351	1.365	1.374	1.383	1.392	1.400	1.408
MAX TAT (°C)	6	4	2	0	-2	-4	-6

Decrease limit EPR by 0.067 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.022.  
 With engine and wing anti-ice on, decrease limit EPR by 0.037.



Flight Planning and Performance Manual

**GEAR DOWN**

**Long Range Cruise Table**  
**23000 FT to 18000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
18 (-8)	EPR			1.337	1.316	1.296	1.277	1.260	1.244	1.228	1.213
	MAX TAT			8	12	16	19	23			
	KIAS			251	249	246	244	241	238	234	231
	MACH			.528	.523	.518	.513	.507	.501	.494	.487
	FF/ENG KTAS			14866 327	14287 324	13722 321	13172 318	12632 314	12095 310	11572 306	11058 302
17 (-6)	EPR			1.311	1.292	1.274	1.258	1.242	1.228	1.213	1.199
	MAX TAT			13	16	20	23				
	KIAS			253	251	248	245	242	239	236	232
	MACH			.522	.517	.512	.506	.500	.494	.487	.479
	FF/ENG KTAS			14794 324	14232 322	13688 318	13149 315	12613 311	12088 307	11571 303	11070 298
16 (-4)	EPR		1.305	1.288	1.271	1.255	1.241	1.226	1.213	1.199	1.187
	MAX TAT		14	17	20	24					
	KIAS		257	255	252	250	247	243	240	236	233
	MACH		.521	.516	.511	.506	.500	.493	.487	.479	.472
	FF/ENG KTAS		15282 325	14730 322	14192 319	13659 315	13129 312	12612 308	12100 304	11600 299	11113 295
15 (-2)	EPR	1.300	1.283	1.267	1.252	1.239	1.225	1.212	1.199	1.187	1.175
	MAX TAT	15	18	21	24	27					
	KIAS	262	259	257	254	251	248	245	241	237	234
	MACH	.519	.515	.510	.504	.499	.493	.486	.479	.472	.465
	FF/ENG KTAS	15777 325	15235 322	14701 319	14173 316	13653 312	13143 309	12637 305	12137 300	11651 296	11174 291
14 (0)	EPR	1.278	1.263	1.249	1.236	1.223	1.210	1.198	1.186	1.175	1.165
	MAX TAT	19	22	25	28						
	KIAS	264	261	258	255	252	249	246	242	238	235
	MACH	.513	.508	.503	.498	.492	.485	.479	.472	.465	.458
	FF/ENG KTAS	15766 323	15230 320	14703 316	14185 313	13677 309	13172 305	12673 301	12185 297	11706 292	11233 288
13 (1)	EPR	1.259	1.246	1.233	1.221	1.209	1.197	1.186	1.175	1.165	1.155
	MAX TAT	23	26	29	32						
	KIAS	265	263	260	257	253	250	246	243	239	235
	MACH	.507	.502	.496	.491	.485	.478	.472	.465	.458	.451
	FF/ENG KTAS	15774 320	15243 317	14724 313	14215 310	13709 306	13209 302	12719 298	12237 293	11762 289	11288 284
12 (3)	EPR	1.243	1.230	1.218	1.207	1.195	1.185	1.175	1.165	1.155	1.145
	MAX TAT	26	29	32							
	KIAS	267	264	261	258	254	251	247	244	240	236
	MACH	.500	.495	.489	.484	.477	.471	.465	.458	.451	.444
	FF/ENG KTAS	15788 317	15266 314	14754 310	14247 306	13745 302	13252 298	12768 294	12291 290	11814 286	11335 281

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	12	13	14	15	16	17	18
LIMIT EPR	1.279	1.287	1.295	1.304	1.315	1.327	1.338
MAX TAT (°C)	19	17	16	14	12	10	8

Decrease limit EPR by 0.057 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.014.  
With engine and wing anti-ice on, decrease limit EPR by 0.026.

**GEAR DOWN**

**Long Range Cruise Table  
 23000 FT to 18000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
18 (-10)	EPR	1.213	1.199	1.185	1.173	1.160	1.148	1.135	1.123	1.112	1.102
	MAX TAT										
	KIAS	231	227	223	219	215	211	206	201	196	192
	MACH	.487	.479	.471	.463	.454	.445	.435	.425	.415	.407
	FF/ENG KTAS	11058 302	10561 297	10078 292	9609 287	9150 281	8688 276	8230 270	7920 263	7520 257	7181 252
17 (-9)	EPR	1.199	1.186	1.174	1.162	1.150	1.138	1.126	1.115	1.104	1.095
	MAX TAT										
	KIAS	232	228	224	220	216	211	206	201	196	192
	MACH	.479	.472	.464	.456	.447	.438	.428	.417	.407	.399
	FF/ENG KTAS	11070 298	10584 293	10111 288	9648 283	9184 278	8720 272	8269 266	7962 259	7541 253	7203 248
16 (-7)	EPR	1.187	1.175	1.163	1.152	1.140	1.129	1.118	1.107	1.097	1.088
	MAX TAT										
	KIAS	233	229	225	221	216	212	207	202	196	192
	MACH	.472	.465	.457	.448	.440	.430	.420	.410	.399	.392
	FF/ENG KTAS	11113 295	10638 290	10171 285	9705 280	9236 274	8776 269	8332 262	8023 256	7587 249	7253 244
15 (-5)	EPR	1.175	1.164	1.153	1.142	1.131	1.120	1.110	1.100	1.090	1.082
	MAX TAT										
	KIAS	234	230	226	221	217	212	207	202	196	192
	MACH	.465	.457	.449	.441	.432	.423	.413	.403	.392	.384
	FF/ENG KTAS	11174 291	10704 287	10235 282	9763 276	9295 271	8845 265	8404 259	8091 252	7660 246	7312 241
14 (-4)	EPR	1.165	1.154	1.144	1.133	1.123	1.112	1.103	1.093	1.084	1.077
	MAX TAT										
	KIAS	235	231	226	222	217	213	207	202	197	192
	MACH	.458	.450	.442	.434	.425	.416	.406	.396	.385	.377
	FF/ENG KTAS	11233 288	10762 283	10287 278	9815 273	9362 267	8919 261	8476 255	8167 249	7738 242	7373 237
13 (-2)	EPR	1.155	1.144	1.134	1.124	1.115	1.105	1.096	1.087	1.079	1.072
	MAX TAT										
	KIAS	235	231	227	223	218	213	208	203	197	192
	MACH	.451	.443	.435	.427	.418	.408	.399	.389	.379	.370
	FF/ENG KTAS	11288 284	10811 280	10338 275	9885 269	9443 264	8997 258	8557 252	8251 245	7821 239	7430 233
12 (0)	EPR	1.145	1.135	1.126	1.116	1.107	1.098	1.090	1.082	1.074	1.068
	MAX TAT										
	KIAS	236	232	228	223	218	213	208	203	197	192
	MACH	.444	.436	.428	.419	.410	.401	.392	.382	.372	.363
	FF/ENG KTAS	11335 281	10860 276	10409 271	9970 266	9525 260	9080 254	8645 248	8336 242	7895 236	7476 230

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	12	13	14	15	16	17	18
LIMIT EPR	1.279	1.287	1.295	1.304	1.315	1.327	1.338
MAX TAT (°C)	19	17	16	14	12	10	8

Decrease limit EPR by 0.057 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.014.  
 With engine and wing anti-ice on, decrease limit EPR by 0.026.



Flight Planning and Performance Manual

**GEAR DOWN**

**Long Range Cruise Table  
17000 FT to 12000 FT - High Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		660	640	620	600	580	560	540	520	500	480
11 (5)	EPR	1.227	1.215	1.204	1.194	1.184	1.174	1.164	1.155	1.145	1.136
	MAX TAT	30	33	36							
	KIAS	268	265	262	259	255	252	248	245	241	237
	MACH	.494	.488	.482	.476	.470	.464	.458	.451	.444	.437
	FF/ENG	15810	15295	14785	14281	13786	13299	12820	12341	11859	11383
KTAS	314	310	307	303	299	295	291	287	282	278	
10 (7)	EPR	1.213	1.202	1.192	1.182	1.173	1.164	1.155	1.145	1.136	1.127
	MAX TAT	33	36								
	KIAS	269	266	263	260	256	253	249	245	241	237
	MACH	.487	.481	.475	.469	.463	.457	.451	.444	.437	.429
	FF/ENG	15836	15323	14816	14319	13831	13349	12868	12383	11905	11454
KTAS	311	307	303	300	296	292	288	283	279	274	
9 (8)	EPR	1.199	1.190	1.180	1.171	1.163	1.154	1.145	1.136	1.128	1.119
	MAX TAT	37									
	KIAS	270	267	264	261	257	254	250	246	242	238
	MACH	.479	.474	.468	.463	.457	.450	.444	.437	.430	.422
	FF/ENG	15830	15347	14848	14358	13874	13391	12902	12420	11966	11527
KTAS	307	304	300	296	292	288	284	280	275	271	
8 (10)	EPR	1.186	1.179	1.170	1.162	1.153	1.145	1.136	1.128	1.120	1.112
	MAX TAT	41									
	KIAS	270	268	265	261	258	254	251	247	242	238
	MACH	.470	.467	.462	.456	.450	.443	.437	.430	.423	.415
	FF/ENG	15767	15371	14879	14393	13906	13413	12927	12469	12026	11574
KTAS	302	300	297	293	289	285	281	277	272	267	
7 (12)	EPR	1.175	1.168	1.160	1.152	1.144	1.136	1.128	1.120	1.112	1.105
	MAX TAT										
	KIAS	270	269	266	262	259	255	251	247	243	238
	MACH	.462	.460	.455	.449	.443	.437	.430	.423	.416	.408
	FF/ENG	15714	15400	14911	14421	13923	13434	12971	12522	12066	11607
KTAS	298	297	294	290	286	282	277	273	268	264	
6 (13)	EPR	1.164	1.159	1.151	1.143	1.135	1.128	1.120	1.112	1.105	1.098
	MAX TAT										
	KIAS	270	270	267	263	259	256	252	247	243	239
	MACH	.454	.454	.448	.442	.436	.430	.423	.416	.409	.402
	FF/ENG	15679	15437	14943	14442	13950	13483	13028	12567	12105	11656
KTAS	294	294	290	286	282	278	274	270	265	260	
5 (15)	EPR	1.154	1.149	1.142	1.134	1.127	1.120	1.112	1.105	1.098	1.092
	MAX TAT										
	KIAS	270	270	267	264	260	256	252	248	244	239
	MACH	.446	.446	.441	.435	.429	.423	.416	.409	.402	.395
	FF/ENG	15662	15421	14978	14485	14016	13557	13093	12627	12175	11741
KTAS	290	290	287	283	279	275	271	266	261	257	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

PRESS ALT (1000 FT)	5	6	7	8	9	10	11
LIMIT EPR	1.237	1.242	1.248	1.248	1.259	1.265	1.272
MAX TAT (°C)	31	29	27	28	24	23	21

Decrease limit EPR by 0.047 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.015.  
With engine and wing anti-ice on, decrease limit EPR by 0.025.

**GEAR DOWN**

**Long Range Cruise Table  
 17000 FT to 12000 FT - Low Weights**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
11 (2)	EPR	1.136	1.127	1.118	1.109	1.100	1.092	1.084	1.077	1.070	1.063
	MAX TAT										
	KIAS	237	232	228	223	218	214	208	203	198	192
	MACH	.437	.429	.421	.412	.403	.394	.385	.376	.366	.356
	FF/ENG	11383	10933	10496	10051	9605	9166	8733	8411	7955	7515
KTAS	278	273	268	262	257	251	245	239	233	226	
10 (3)	EPR	1.127	1.119	1.110	1.102	1.094	1.086	1.079	1.072	1.066	1.059
	MAX TAT										
	KIAS	237	233	228	224	219	214	209	204	198	192
	MACH	.429	.422	.414	.405	.397	.388	.379	.369	.359	.349
	FF/ENG	11454	11018	10573	10124	9682	9248	8809	8471	8006	7552
KTAS	274	269	264	259	253	247	242	236	229	223	
9 (5)	EPR	1.119	1.111	1.103	1.095	1.088	1.081	1.074	1.068	1.061	1.055
	MAX TAT										
	KIAS	238	233	229	224	219	214	209	204	198	193
	MACH	.422	.415	.407	.398	.390	.381	.372	.363	.353	.343
	FF/ENG	11527	11080	10629	10185	9752	9317	8864	8516	8053	7603
KTAS	271	266	260	255	250	244	238	232	226	220	
8 (7)	EPR	1.112	1.104	1.096	1.089	1.082	1.076	1.070	1.064	1.057	1.051
	MAX TAT										
	KIAS	238	234	229	224	220	215	209	204	199	193
	MACH	.415	.408	.400	.392	.383	.375	.366	.357	.347	.337
	FF/ENG	11574	11119	10675	10244	9815	9369	8903	8557	8099	7652
KTAS	267	262	257	252	247	241	235	229	223	217	
7 (9)	EPR	1.105	1.097	1.090	1.084	1.078	1.071	1.066	1.060	1.054	1.048
	MAX TAT										
	KIAS	238	234	229	225	220	215	210	204	199	193
	MACH	.408	.401	.393	.385	.377	.368	.360	.351	.341	.332
	FF/ENG	11607	11161	10732	10310	9870	9407	8935	8469	8146	7702
KTAS	264	259	254	249	243	238	232	226	220	214	
6 (11)	EPR	1.098	1.091	1.085	1.079	1.073	1.067	1.061	1.056	1.050	1.045
	MAX TAT										
	KIAS	239	234	230	225	220	215	210	205	199	194
	MACH	.402	.394	.387	.379	.371	.362	.354	.345	.336	.327
	FF/ENG	11656	11226	10809	10376	9916	9442	8971	8511	8198	7755
KTAS	260	255	250	245	240	235	229	223	217	211	
5 (12)	EPR	1.092	1.086	1.080	1.074	1.069	1.063	1.058	1.052	1.047	1.042
	MAX TAT										
	KIAS	239	235	230	225	221	216	210	205	200	194
	MACH	.395	.388	.380	.373	.365	.356	.348	.339	.330	.321
	FF/ENG	11741	11324	10894	10437	9962	9487	9020	8564	8257	7816
KTAS	257	252	247	242	237	232	226	220	215	209	

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Cruise EPR**

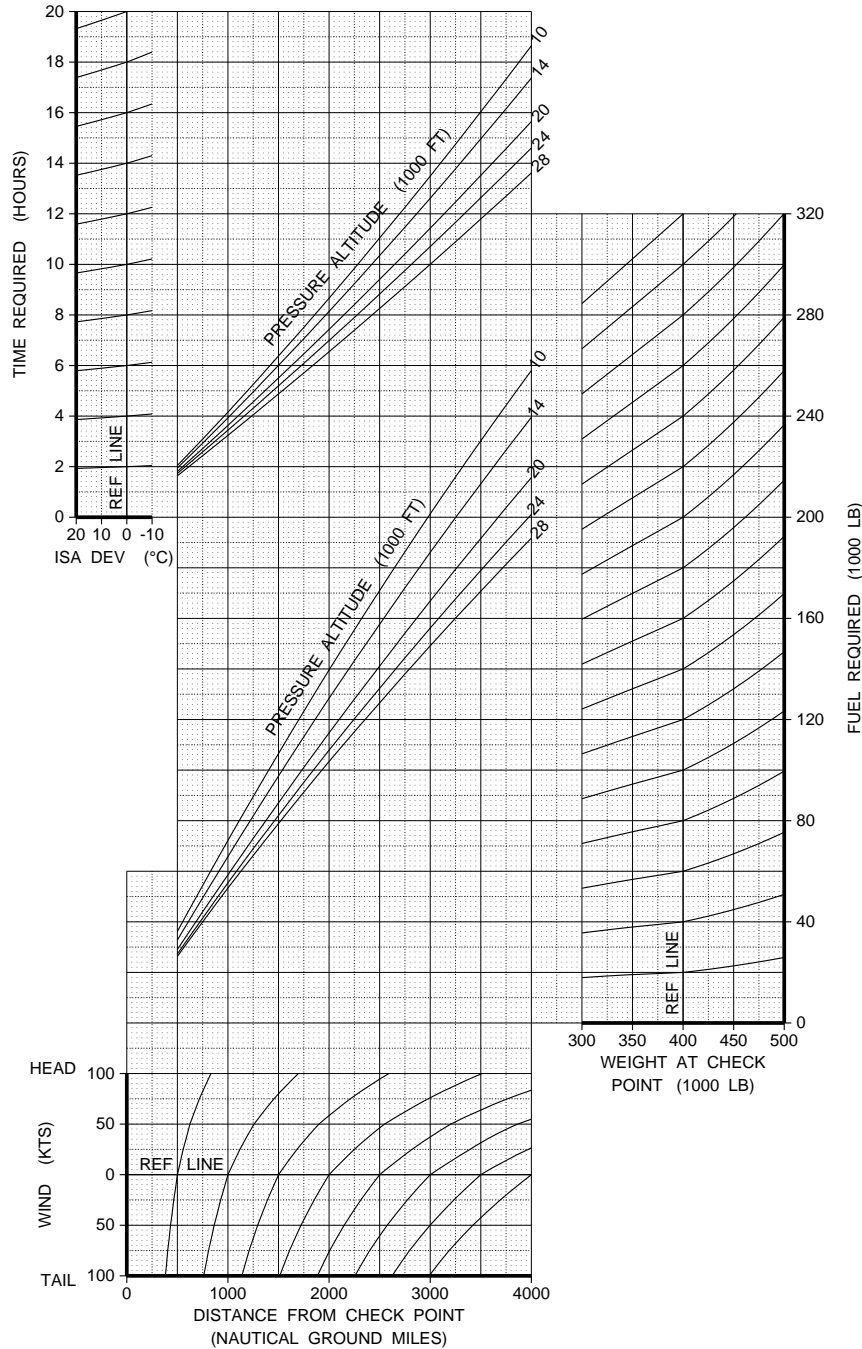
PRESS ALT (1000 FT)	5	6	7	8	9	10	11
LIMIT EPR	1.237	1.242	1.248	1.248	1.259	1.265	1.272
MAX TAT (°C)	29	28	26	24	23	21	19

Decrease limit EPR by 0.047 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.025.

**GEAR DOWN**

**Long Range Cruise Enroute Fuel and Time**

Based on VREF30+80 descent





Flight Planning and Performance Manual

**GEAR DOWN**

**Descent**

Based on VREF30 + 80

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
31000	17	1110	69
29000	16	1080	64
27000	15	1050	60
25000	14	1010	56
23000	14	970	52
21000	13	940	48
19000	12	900	44
17000	11	860	40
15000	10	820	36
10000	8	710	27
5000	6	600	17
1500	4	520	11

Allowances for a straight-in approach are included.

**Holding**

**Flaps Up**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)									
		660	620	580	540	500	460	420	380	340	300
30000	EPR								1.391	1.326	1.286
	KIAS								205	203	203
	FF/ENG								9750	8840	8260
25000	EPR						1.338	1.283	1.239	1.209	1.188
	KIAS						218	212	205	203	203
	FF/ENG						11240	10040	9050	8440	8050
20000	EPR			1.336	1.291	1.253	1.220	1.191	1.165	1.145	1.131
	KIAS			235	230	224	218	212	205	203	203
	FF/ENG			13990	12750	11620	10630	9720	8870	8330	8120
15000	EPR	1.280	1.251	1.224	1.199	1.176	1.155	1.134	1.115	1.101	1.091
	KIAS	244	239	235	230	224	218	212	205	203	203
	FF/ENG	15260	14210	13260	12300	11400	10540	9690	8910	8570	8280
10000	EPR	1.197	1.178	1.160	1.142	1.125	1.109	1.095	1.082	1.072	1.065
	KIAS	244	239	235	230	224	218	212	205	203	203
	FF/ENG	14940	14040	13180	12310	11500	10730	9980	9240	8870	8570
5000	EPR	1.143	1.128	1.115	1.102	1.090	1.079	1.069	1.059	1.051	1.046
	KIAS	244	239	235	230	224	218	212	205	203	203
	FF/ENG	14810	13980	13210	12440	11700	10930	10130	9360	8880	8740
1500	EPR	1.114	1.103	1.092	1.082	1.073	1.064	1.055	1.047	1.041	1.037
	KIAS	244	239	235	230	224	218	212	205	203	203
	FF/ENG	15100	14300	13540	12720	11900	11090	10310	9540	9060	8920

**Flaps 1**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)									
		660	620	580	540	500	460	420	380	340	300
20000	EPR		1.376	1.325	1.283	1.248	1.216	1.186	1.159	1.138	1.123
	KIAS		219	215	210	204	198	192	185	183	183
	FF/ENG		14290	13030	11850	10800	9870	8990	8170	7750	7400
15000	EPR	1.278	1.249	1.222	1.197	1.174	1.152	1.131	1.111	1.097	1.086
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	14430	13420	12510	11590	10700	9810	8980	8360	7860	7530
10000	EPR	1.197	1.178	1.159	1.141	1.124	1.108	1.093	1.080	1.069	1.062
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	14210	13300	12440	11600	10810	10040	9270	8620	8090	7760
5000	EPR	1.142	1.128	1.114	1.101	1.090	1.078	1.068	1.057	1.049	1.044
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	14050	13250	12510	11750	10950	10140	9350	8740	8230	7900
1500	EPR	1.114	1.102	1.092	1.082	1.072	1.063	1.054	1.046	1.040	1.035
	KIAS	224	219	215	210	204	198	192	185	183	183
	FF/ENG	14330	13530	12730	11900	11090	10290	9500	8880	8360	8030

These tables include 5% additional fuel for holding in a racetrack pattern.

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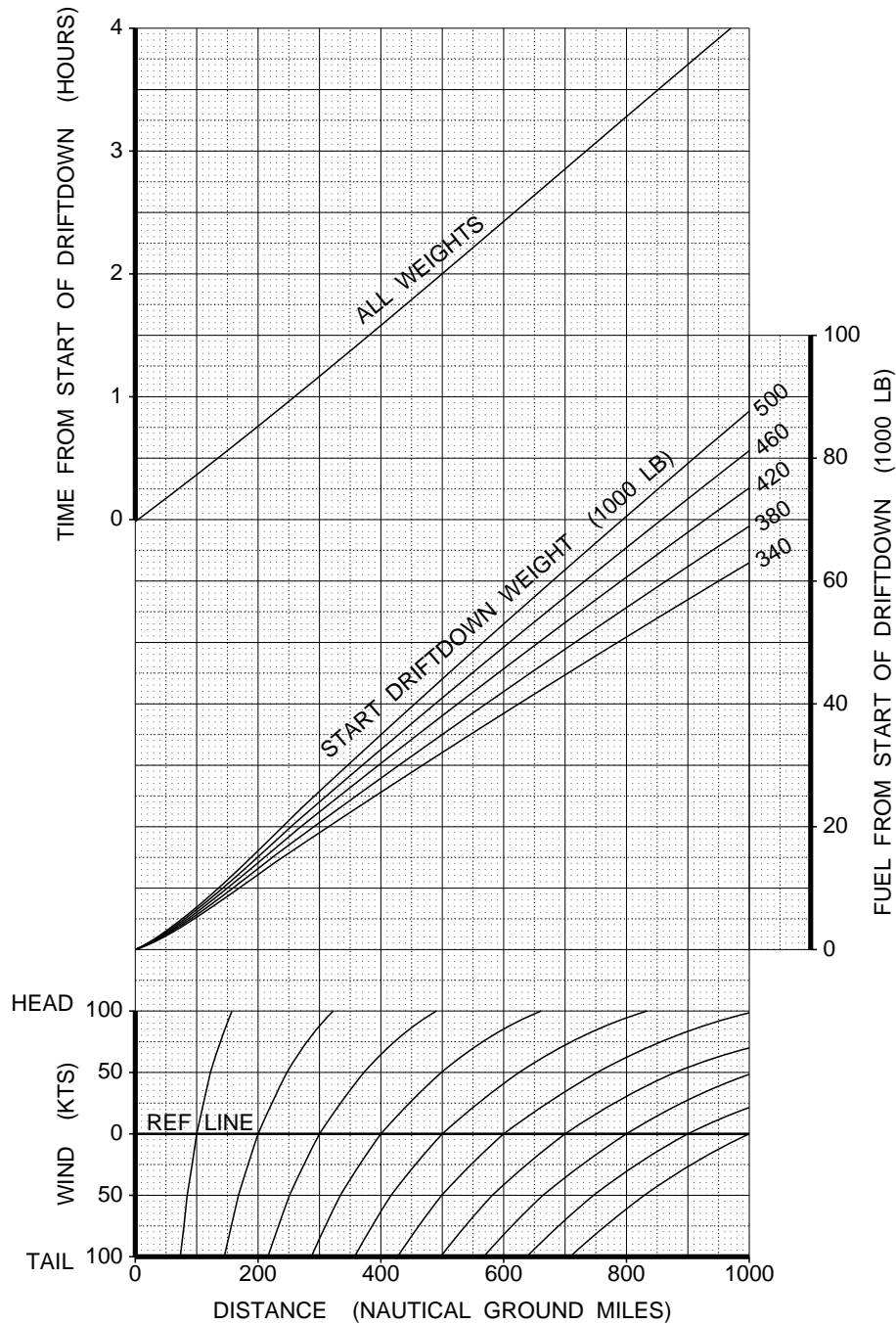
**GEAR DOWN**

**ENGINE INOP**

MAX CONTINUOUS THRUST

**Driftdown/LRC Cruise Range Capability**

Includes APU fuel burn





**GEAR DOWN**

**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
500	2700		
480	4200	2700	
460	5700	4600	1400
440	7000	6200	5200
420	8300	7600	6800
400	9700	9100	8300
380	11600	10700	9800
360	12900	12400	11800
340	14100	13300	12700
320	15500	14600	13500

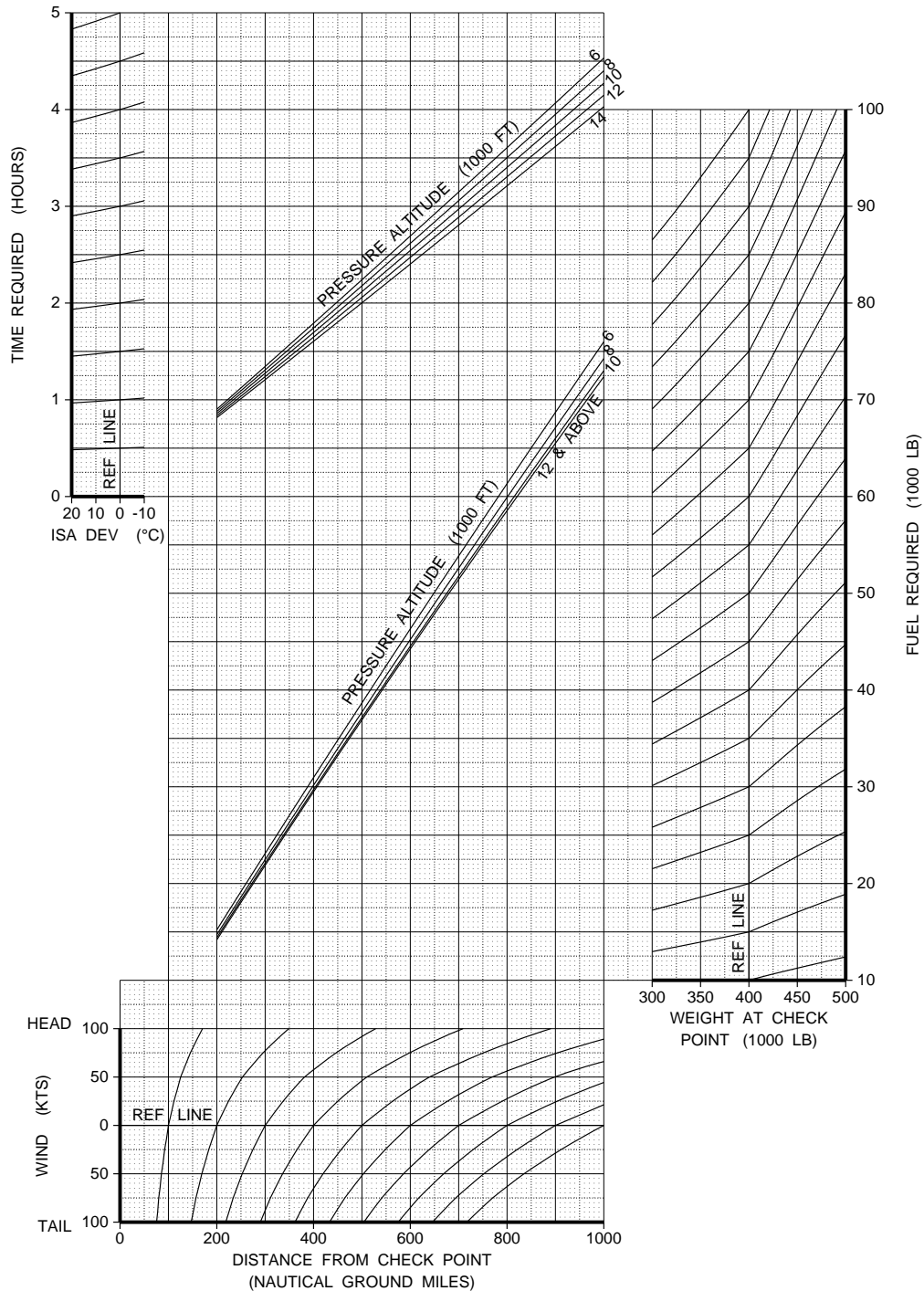
**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Diversion Fuel and Time**

Based on VREF30 + 80 descent and includes APU fuel burn





**GEAR DOWN**  
**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Long Range Cruise Table**  
**20000 FT to 15000 FT**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
20	EPR										
	MAX TAT										
19	KIAS										
	MACH										
18 (-12)	FF/ENG										
	KTAS										1.462
17 (-11)											3
											192
16 (-9)											.407
											15859
15 (-7)											252
											1.417
14											8
											192
13											.399
											15434
12											248
											1.424
11											7
											13
10											196
											192
9											.392
											16323
8											15102
											244
7											1.430
											1.388
6											5
											12
5											17
											192
4											.384
											17203
3											15959
											14866
2											250
											245
1											241

Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	15	16	17	18
LIMIT EPR	1.443	1.451	1.450	1.456
MAX TAT (°C)	4	2	4	4

Decrease limit EPR by 0.068 per 10°C TAT hotter than table value.  
With engine anti-ice on, decrease limit EPR by 0.014.  
With engine and wing anti-ice on, decrease limit EPR by 0.026.



Flight Planning and Performance Manual

**GEAR DOWN**  
**ENGINE INOP**  
 MAX CONTINUOUS THRUST

**Long Range Cruise Table**  
**14000 FT to 5000 FT**

PRESS ALT (1000 FT) (STD TAT)		WEIGHT (1000 LB)									
		480	460	440	420	400	380	360	340	320	300
14 (-5)	EPR							1.434	1.392	1.357	1.325
	MAX TAT							5	11	16	22
	KIAS							203	200	196	192
	MACH							.398	.391	.384	.377
	FF/ENG KTAS							18073 250	16828 246	15710 241	14706 237
13 (-3)	EPR							1.396	1.361	1.330	1.303
	MAX TAT							14	20	25	
	KIAS							203	200	196	192
	MACH							.390	.383	.377	.370
	FF/ENG KTAS							17705 246	16568 242	15527 238	14575 233
11 (1)	EPR					1.399	1.366	1.337	1.311	1.288	1.266
	MAX TAT					15	23	27			
	KIAS					210	207	203	200	196	192
	MACH					.388	.382	.376	.369	.363	.356
	FF/ENG KTAS					19442 247	18291 243	17185 239	16180 235	15282 231	14446 226
9 (4)	EPR				1.367	1.340	1.316	1.294	1.273	1.254	1.235
	MAX TAT				21	27	31	34			
	KIAS				213	210	207	203	200	196	192
	MACH				.379	.374	.368	.362	.356	.349	.343
	FF/ENG KTAS				19949 243	18820 239	17781 236	16854 232	15999 228	15169 224	14368 220
7 (8)	EPR		1.365	1.340	1.317	1.297	1.277	1.260	1.242	1.225	1.208
	MAX TAT		20	29	33	36					
	KIAS		219	216	213	210	207	203	200	196	192
	MACH		.376	.371	.365	.360	.354	.349	.343	.336	.330
	FF/ENG KTAS		21551 243	20407 239	19359 236	18411 232	17531 229	16685 225	15863 221	15071 217	14299 213
5 (12)	EPR	1.337	1.316	1.297	1.279	1.262	1.246	1.230	1.215	1.199	1.184
	MAX TAT	27	34	38	41						
	KIAS	222	219	216	213	210	207	203	200	196	192
	MACH	.367	.362	.357	.352	.347	.342	.336	.330	.324	.318
	FF/ENG KTAS	22003 239	20951 236	19984 232	19093 229	18239 226	17405 222	16599 218	15811 215	15036 211	14272 207

Max TAT not shown where EPR can be set in ISA + 30°C conditions.  
 Increase/decrease fuel flow 3% per 10°C above/below standard TAT.  
 Increase/decrease KTAS by 1 knot per 1°C above/below standard TAT.

**Max Continuous EPR**

PRESS ALT (1000 FT)	5	7	9	11	13	14
LIMIT EPR	1.355	1.370	1.356	1.378	1.433	1.435
MAX TAT (°C)	23	19	26	22	8	6

Decrease limit EPR by 0.059 per 10°C TAT hotter than table value.  
 With engine anti-ice on, decrease limit EPR by 0.015.  
 With engine and wing anti-ice on, decrease limit EPR by 0.025.



**GEAR DOWN**  
**ENGINE INOP**  
MAX CONTINUOUS THRUST

**Holding  
Flaps Up**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)						
		540	500	460	420	380	340	300
15000	EPR							1.408
	KIAS							203
	FF/ENG							17520
10000	EPR				1.392	1.334	1.302	1.280
	KIAS				212	205	203	203
	FF/ENG				21040	18670	17380	16580
5000	EPR			1.313	1.276	1.243	1.222	1.207
	KIAS			218	212	205	203	203
	FF/ENG			21770	19850	18090	17050	16340
1500	EPR	1.316	1.283	1.253	1.225	1.198	1.180	1.167
	KIAS	230	224	218	212	205	203	203
	FF/ENG	25350	23400	21600	19890	18230	17180	16500

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



Flight Planning and Performance Manual

**ALTERNATE MODE EEC**

**Limit Weight**

PERFORMANCE LIMIT	ALTERNATE MODE EEC LIMIT WEIGHT (1000 LB)							
	PRIMARY MODE PERFORMANCE LIMIT WEIGHT (1000 LB)							
	350	400	450	500	550	600	650	700
FIELD	318.5	364.6	410.8	456.9	503.1	549.2	595.4	641.5
CLIMB	300.8	346.9	393.0	439.1	485.2	531.2	577.3	623.4
OBSTACLE	308.7	352.1	395.5	438.9	482.4	525.8	569.2	612.6
NET LEVEL OFF WEIGHT	313.1	356.2	399.4	442.5	485.6	528.7	571.9	615.0
LANDING CLIMB			388.1	433.4	478.7	524.1	569.4	614.7

**Takeoff Speed Adjustment**

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

**Max Takeoff %N1**

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

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	131	88.6	88.5	88.5	88.7	88.7	88.8	88.9	89.0	89.0	89.0	89.3	89.5
50	122	90.3	90.3	90.1	90.1	90.1	90.2	90.3	90.5	90.5	90.6	90.9	91.2
45	113	92.2	92.2	92.1	92.0	92.0	91.9	91.8	91.9	92.0	92.2	92.6	92.9
40	104	94.1	94.1	94.2	94.2	94.1	94.0	93.8	93.9	93.7	93.7	94.1	94.6
35	95	94.4	96.8	96.4	96.5	96.4	96.2	96.7	96.3	96.1	96.0	95.6	96.0
30	86	94.3	98.5	98.2	98.2	97.8	97.8	97.8	97.6	97.6	97.1	96.6	96.3
25	77	93.7	98.5	98.8	98.8	98.4	98.2	98.0	97.9	97.8	97.4	96.9	96.5
20	68	92.9	98.4	98.8	98.8	98.8	98.4	98.2	98.1	98.0	97.5	97.1	96.6
15	59	92.1	97.6	98.2	98.8	98.6	98.5	98.4	98.3	98.2	97.7	97.3	96.8
10	50	91.3	96.7	97.3	97.9	98.4	98.5	98.5	98.4	98.4	97.9	97.5	97.0
5	41	90.5	95.9	96.5	97.1	97.5	98.0	98.4	98.4	98.4	98.1	97.7	97.2
0	32	89.7	95.0	95.6	96.2	96.7	97.1	97.5	97.9	98.2	98.1	97.7	97.3
-10	14	88.0	93.2	93.8	94.4	94.9	95.3	95.7	96.0	96.4	96.5	96.5	96.6
-20	-4	86.4	91.5	92.0	92.6	93.0	93.5	93.9	94.2	94.6	94.6	94.7	94.7
-30	-22	84.6	89.6	90.2	90.7	91.2	91.6	92.0	92.3	92.7	92.7	92.8	92.8
-40	-40	82.9	87.8	88.3	88.9	89.3	89.7	90.1	90.4	90.8	90.8	90.8	90.9
-50	-58	81.1	85.9	86.4	86.9	87.4	87.8	88.1	88.4	88.8	88.8	88.9	88.9

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	
PACKS OFF	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1
WING ANTI-ICE ON	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6



Flight Planning and Performance Manual

**ALTERNATE MODE EEC**

**Max Climb %N1**

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

TAT (°C)	PRESSURE ALTITUDE (FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	85.1	85.5	87.4	89.5	90.9	89.6	90.6	93.8	94.5	95.1
50	86.3	86.6	87.1	88.1	89.6	88.3	89.3	92.4	93.0	93.6
40	86.6	87.6	88.0	88.6	88.5	86.9	87.9	91.0	91.6	92.2
30	85.2	87.5	89.4	89.9	89.4	87.8	87.0	89.5	90.1	90.7
20	83.7	86.0	88.6	91.4	91.0	90.4	89.9	88.8	88.6	89.2
15	83.0	85.3	87.8	90.7	92.2	92.0	91.3	90.0	89.6	90.0
10	82.3	84.5	87.1	89.9	91.7	94.0	92.7	91.1	90.6	90.9
5	81.6	83.8	86.3	89.1	90.8	94.3	93.8	92.3	91.7	91.8
0	80.8	83.0	85.5	88.3	90.0	93.5	95.0	93.3	92.7	92.6
-5	80.1	82.3	84.7	87.5	89.2	92.6	94.8	94.4	93.7	93.6
-10	79.3	81.5	83.9	86.6	88.4	91.8	93.9	95.2	94.6	94.5
-15	78.6	80.7	83.1	85.8	87.5	90.9	93.0	94.9	95.0	95.0
-20	77.8	79.9	82.3	85.0	86.7	90.0	92.1	94.0	94.1	94.0
-25	77.0	79.1	81.5	84.1	85.8	89.1	91.2	93.1	93.2	93.1
-30	76.3	78.3	80.7	83.3	84.9	88.2	90.3	92.1	92.2	92.2
-35	75.5	77.5	79.8	82.4	84.1	87.3	89.3	91.2	91.3	91.2
-40	74.7	76.7	79.0	81.5	83.2	86.4	88.4	90.2	90.3	90.2

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ANTI-ICE ON	-1.0	-0.9	-0.8	-0.4	-0.7	-0.8	-0.8	-0.7	-0.8	-0.9
ENGINE & WING ANTI-ICE ON	-1.4	-1.3	-1.3	-1.0	-1.3	-1.4	-1.5	-1.3	-1.6	-1.7

**Max Cruise %N1**

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

TAT (°C)	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
25	87.0	86.7	86.9	86.7	86.3	86.9	87.1	87.3	87.6	87.9
20	88.2	88.0	88.1	87.6	87.3	86.9	86.3	86.5	86.9	87.2
15	89.4	89.3	89.3	88.6	88.1	87.7	87.1	87.3	87.5	87.7
10	91.0	90.4	90.2	89.6	89.1	88.6	87.9	88.1	88.3	88.4
5	91.1	91.6	91.1	90.5	90.0	89.6	88.8	89.0	89.0	89.1
0	90.3	91.1	91.8	91.3	90.7	90.3	89.7	89.8	89.8	89.8
-5	89.5	90.3	91.0	91.4	91.4	91.0	90.4	90.5	90.4	90.4
-10	88.6	89.4	90.1	90.5	91.3	91.5	90.9	91.0	91.0	90.9
-15	87.8	88.6	89.2	89.7	90.4	91.2	91.3	91.4	91.3	91.3
-20	86.9	87.7	88.4	88.8	89.5	90.3	90.4	90.5	90.4	90.4
-25	86.1	86.8	87.5	87.9	88.6	89.4	89.5	89.6	89.5	89.5
-30	85.2	85.9	86.6	87.0	87.7	88.5	88.6	88.7	88.6	88.6
-35	84.3	85.1	85.7	86.1	86.8	87.6	87.7	87.7	87.7	87.7

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
ENGINE ANTI-ICE ON	-0.7	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6
ENGINE & WING ANTI-ICE ON	-1.1	-1.1	-1.0	-1.0	-1.0	-1.0	-1.0	-1.1	-1.2	-1.3



Flight Planning and Performance Manual

**ALTERNATE MODE EEC**

**Go-Around %N1**

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

AIRPORT OAT		TAT (°C)	PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	55	90.4	90.2	90.2	90.0	90.2	90.3	90.5	90.7	90.8	91.0	91.3	91.4
46	115	50	92.1	92.1	92.0	91.8	91.8	91.7	91.7	91.9	92.1	92.4	92.7	92.9
41	106	45	94.0	94.0	94.0	93.9	93.8	93.7	93.7	93.6	93.4	93.7	94.1	94.4
36	97	40	94.7	96.2	96.0	96.0	95.9	95.7	96.0	95.8	95.8	95.7	95.4	95.7
31	88	35	94.6	97.8	97.7	97.7	97.5	97.7	97.6	97.5	97.5	97.0	96.7	96.4
26	79	30	94.1	98.1	98.6	98.7	98.4	98.5	98.3	98.2	98.1	97.5	97.0	96.6
21	70	25	93.4	98.0	98.5	98.8	98.9	98.7	98.5	98.4	98.2	97.8	97.4	96.9
16	61	20	92.6	97.3	98.1	98.8	98.8	98.9	98.8	98.6	98.5	98.0	97.5	97.1
11	52	15	91.8	96.4	97.3	98.1	98.7	98.9	98.9	98.9	98.7	98.2	97.8	97.3
7	45	10	91.0	95.6	96.4	97.3	97.9	98.6	98.8	98.8	98.8	98.5	98.0	97.5
2	36	5	90.2	94.7	95.6	96.4	97.1	97.7	98.1	98.5	98.8	98.4	98.1	97.7
-3	27	0	89.4	93.9	94.7	95.5	96.2	96.9	97.2	97.6	98.0	98.0	98.0	97.7
-13	9	-10	87.7	92.1	93.0	93.8	94.4	95.1	95.4	95.8	96.2	96.2	96.3	96.3
-23	-9	-20	86.0	90.4	91.2	92.0	92.6	93.3	93.6	94.0	94.4	94.4	94.4	94.5
-33	-27	-30	84.3	88.6	89.4	90.1	90.8	91.4	91.7	92.1	92.5	92.5	92.5	92.6
-43	-45	-40	82.6	86.7	87.5	88.3	88.9	89.5	89.8	90.2	90.6	90.6	90.6	90.7
-53	-63	-50	80.8	84.9	85.6	86.4	86.9	87.6	87.9	88.2	88.6	88.6	88.7	88.7

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE ( FT)												
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	
PACKS OFF	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1
WING ANTI-ICE ON	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6



**ALTERNATE MODE EEC**  
**ENGINE INOP**

**Initial Max Continuous %N1**

Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	91.4	90.5	89.8	89.3	88.9	88.2	88.4	88.8	89.2
15	92.9	91.9	91.1	90.5	90.0	89.3	89.5	89.8	90.1
10	94.1	93.2	92.3	91.7	91.1	90.4	90.6	90.8	90.9
5	93.3	94.2	93.4	92.8	92.3	91.5	91.7	91.7	91.8
0	92.4	94.1	94.6	93.9	93.3	92.5	92.7	92.7	92.7
-5	91.6	93.2	94.9	94.9	94.4	93.6	93.7	93.7	93.6
-10	90.7	92.3	94.0	95.0	95.2	94.5	94.7	94.6	94.5
-15	89.9	91.5	93.1	94.0	95.0	95.0	95.1	95.0	95.0
-20	89.0	90.6	92.2	93.1	94.0	94.1	94.1	94.1	94.0
-25	88.1	89.7	91.3	92.2	93.1	93.2	93.2	93.2	93.1
-30	87.2	88.8	90.4	91.3	92.2	92.2	92.3	92.2	92.2
-35	86.3	87.8	89.5	90.3	91.2	91.3	91.3	91.3	91.2
-40	85.4	86.9	88.5	89.4	90.2	90.3	90.3	90.3	90.3

**%N1 Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
ENGINE ONLY	-0.7	-0.9	-0.8	-0.7	-0.6	-0.6	-0.6	-0.7	-0.7
ENGINE & WING*	-1.2	-1.4	-1.4	-1.2	-0.2	-0.2	-0.2	-1.4	-1.4
ENGINE & WING**	-1.7	-1.9	-1.9	-1.8	-1.7	-1.8	-1.9	-2.1	-2.2

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off.



Flight Planning and Performance Manual

**ALTERNATE MODE EEC**  
**ENGINE INOP**

**Max Continuous %N1**

Based on engine bleed for packs on and anti-ice off  
 320 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	92.3	93.5	94.8	93.0	91.7	90.6	89.3									
25	91.5	95.2	96.6	94.7	93.3	92.3	90.2	90.0	89.5	89.1						
20	90.8	95.0	98.1	96.6	95.0	93.9	91.6	91.4	91.0	90.7	90.6	90.2				
15	90.0	94.2	97.3	96.9	96.8	95.7	93.1	93.1	92.8	92.5	92.2	91.7	91.3	91.3	91.6	92.0
10	89.2	93.4	96.5	96.0	96.0	96.1	94.8	94.2	94.2	94.4	93.6	93.0	92.5	92.2	92.5	92.9
5	88.4	92.6	95.6	95.2	95.1	95.3	93.9	94.0	93.8	93.7	94.7	94.1	93.5	93.1	93.4	93.7
0	87.6	91.7	94.7	94.3	94.2	94.4	93.1	93.2	93.0	92.8	93.8	94.6	94.6	93.9	94.3	94.6
-5	86.8	90.9	93.9	93.5	93.4	93.6	92.2	92.3	92.1	92.0	92.9	93.7	94.5	94.4	94.9	95.1
-10	86.0	90.0	93.0	92.6	92.5	92.7	91.4	91.5	91.3	91.1	92.1	92.8	93.6	93.5	94.1	94.2
-15	85.2	89.2	92.1	91.7	91.6	91.8	90.5	90.6	90.4	90.2	91.2	91.9	92.7	92.6	93.2	93.3
-20	84.3	88.3	91.2	90.8	90.7	90.9	89.6	89.7	89.5	89.4	90.3	91.0	91.8	91.7	92.3	92.4
-25	83.5	87.4	90.3	89.9	89.8	90.0	88.7	88.8	88.6	88.5	89.4	90.1	90.9	90.8	91.4	91.4
-30	82.7	86.6	89.4	89.0	88.9	89.1	87.8	87.9	87.7	87.6	88.5	89.2	89.9	89.9	90.5	90.5
-35	81.8	85.7	88.5	88.1	88.0	88.2	86.9	87.0	86.8	86.7	87.6	88.3	89.0	88.9	89.5	89.6
-40	80.9	84.8	87.5	87.1	87.1	87.2	86.0	86.1	85.9	85.7	86.7	87.4	88.1	88.0	88.6	88.6

**280 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	91.2	91.9	93.0	91.3	90.5	89.7	89.8									
25	91.3	93.6	94.7	92.9	91.9	90.9	90.6	90.0	89.6	89.3						
20	90.5	95.5	96.8	94.9	93.5	92.4	91.6	90.9	90.3	90.0	89.2	88.4				
15	89.7	95.0	98.2	97.0	95.5	94.2	92.6	92.0	91.4	91.2	90.5	89.7	89.7	90.4	90.0	89.5
10	88.9	94.2	97.3	97.2	97.3	96.1	93.5	93.3	92.7	92.5	92.1	91.6	91.4	91.6	91.2	90.5
5	88.1	93.4	96.5	96.3	96.4	96.7	95.1	94.3	94.7	94.6	93.7	93.2	92.9	92.8	92.3	91.6
0	87.3	92.5	95.6	95.4	95.6	95.8	94.4	94.4	94.6	94.9	96.2	94.9	94.3	93.9	93.3	92.6
-5	86.5	91.7	94.7	94.5	94.7	94.9	93.6	93.6	93.8	94.0	95.8	96.4	95.5	94.9	94.4	93.6
-10	85.7	90.8	93.8	93.7	93.8	94.1	92.7	92.7	92.9	93.2	94.9	95.5	96.0	95.7	95.3	94.5
-15	84.9	90.0	92.9	92.8	92.9	93.2	91.8	91.8	92.0	92.3	94.0	94.6	95.1	95.2	95.4	94.6
-20	84.1	89.1	92.0	91.9	92.0	92.2	90.9	90.9	91.2	91.4	93.1	93.7	94.2	94.3	94.5	93.6
-25	83.3	88.2	91.1	91.0	91.1	91.3	90.0	90.0	90.2	90.5	92.2	92.8	93.2	93.3	93.6	92.7
-30	82.4	87.3	90.2	90.0	90.2	90.4	89.1	89.1	89.3	89.5	91.3	91.8	92.3	92.4	92.6	91.8
-35	81.6	86.4	89.3	89.1	89.2	89.5	88.2	88.2	88.4	88.6	90.3	90.9	91.3	91.4	91.7	90.8
-40	80.7	85.5	88.3	88.2	88.3	88.5	87.2	87.2	87.5	87.7	89.4	89.9	90.4	90.5	90.7	89.9

**%N1 Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.6	-0.5	-0.5	-0.4	-0.4	-0.5	-0.6	-0.7	-0.8	-0.8	-0.7	-0.9	-0.8	-0.7	-0.6	-0.6
ENGINE & WING*	-0.9	-0.9	-0.9	-0.8	-0.8	-0.9	-1.1	-1.2	-1.3	-1.3	-1.2	-1.4	-1.4	-1.2	-1.2	-1.2
ENGINE & WING**	-1.2	-1.2	-1.2	-1.2	-1.2	-1.4	-1.5	-1.7	-1.9	-1.9	-1.7	-1.9	-1.9	-1.8	-1.7	-1.8

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off.



**ALTERNATE MODE EEC**  
**ENGINE INOP**

**Max Continuous %N1**

Based on engine bleed for packs on and anti-ice off

**240 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	90.5	90.6	91.4	89.3	89.1	89.0	89.1									
25	90.5	91.6	92.8	90.6	90.2	89.8	90.0	89.6	89.3	89.4						
20	89.8	92.4	94.1	92.1	91.5	90.7	90.8	90.5	90.2	90.1	89.2	88.0				
15	89.1	92.9	95.3	94.0	93.3	92.2	91.8	91.4	91.0	90.9	90.2	88.8	87.1	86.0	86.5	88.0
10	88.3	92.1	95.5	95.9	95.2	94.0	92.9	92.5	92.0	91.8	91.0	89.9	88.6	87.5	86.9	88.2
5	87.5	91.3	94.6	95.5	96.5	95.9	94.1	93.7	93.2	93.0	92.0	91.1	90.1	89.2	88.8	89.7
0	86.7	90.4	93.8	94.6	95.6	96.2	94.7	94.4	94.5	94.3	93.1	92.3	91.8	90.9	90.5	91.0
-5	85.9	89.6	92.9	93.7	94.7	95.3	93.9	94.2	94.3	94.4	94.2	93.5	93.4	92.5	91.8	92.1
-10	85.1	88.8	92.1	92.9	93.8	94.4	93.0	93.4	93.5	93.6	94.1	94.5	94.4	93.8	93.2	93.3
-15	84.3	87.9	91.2	92.0	92.9	93.5	92.1	92.5	92.6	92.7	93.2	94.2	95.0	94.7	94.1	94.1
-20	83.5	87.1	90.3	91.1	92.0	92.6	91.2	91.6	91.7	91.8	92.3	93.2	94.4	94.8	94.7	94.7
-25	82.7	86.2	89.4	90.2	91.1	91.7	90.3	90.7	90.8	90.9	91.3	92.3	93.4	93.8	94.0	94.1
-30	81.8	85.3	88.5	89.3	90.2	90.8	89.4	89.7	89.9	89.9	90.4	91.4	92.5	92.9	93.0	93.1
-35	81.0	84.4	87.6	88.3	89.3	89.8	88.5	88.8	89.0	89.0	89.5	90.4	91.5	91.9	92.1	92.2
-40	80.1	83.6	86.6	87.4	88.3	88.9	87.6	87.9	88.0	88.1	88.5	89.5	90.6	91.0	91.1	91.2

**200 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	89.8	89.6	89.9	88.2	88.3	88.3	89.4									
25	90.1	90.8	91.6	88.9	89.1	89.1	89.2	89.3	89.9	90.2						
20	90.1	91.4	92.6	89.6	89.9	89.9	90.0	89.6	89.2	89.4	89.5	89.5				
15	89.4	91.4	92.8	90.6	91.0	90.9	90.9	90.5	90.1	89.9	89.0	88.7	88.7	89.2	89.7	88.8
10	88.6	91.0	92.8	91.7	92.2	92.2	92.2	91.6	91.0	90.8	89.9	89.0	88.0	88.4	88.9	88.0
5	87.8	90.2	92.1	92.5	93.0	93.7	93.4	92.8	92.2	91.9	90.8	89.9	89.0	88.4	88.1	87.2
0	87.0	89.4	91.3	91.7	92.8	93.8	94.7	94.1	93.5	93.2	91.9	90.9	90.0	89.2	88.7	88.0
-5	86.2	88.6	90.4	90.8	91.9	93.1	94.2	94.5	94.7	94.5	93.1	91.9	90.9	90.0	89.4	89.1
-10	85.4	87.7	89.6	90.0	91.1	92.3	93.3	93.9	94.3	94.6	94.1	92.8	91.8	90.8	90.1	90.0
-15	84.6	86.9	88.7	89.1	90.2	91.4	92.4	93.0	93.5	93.7	93.9	93.4	92.4	91.5	90.7	90.8
-20	83.8	86.0	87.9	88.2	89.3	90.5	91.5	92.1	92.6	92.8	93.0	93.0	92.7	91.7	91.1	91.4
-25	82.9	85.2	87.0	87.4	88.4	89.6	90.6	91.1	91.6	91.9	92.1	92.1	92.2	91.8	91.1	91.6
-30	82.1	84.3	86.1	86.5	87.5	88.7	89.7	90.2	90.7	91.0	91.2	91.2	91.2	90.8	90.7	91.3
-35	81.2	83.5	85.2	85.6	86.6	87.8	88.8	89.3	89.8	89.8	90.0	90.2	90.2	90.3	89.9	90.4
-40	80.4	82.6	84.3	84.7	85.7	86.8	87.8	88.3	88.8	89.1	89.3	89.3	89.3	89.0	88.8	89.4

**%N1 Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.6	-0.5	-0.5	-0.4	-0.4	-0.5	-0.6	-0.7	-0.8	-0.8	-0.7	-0.9	-0.8	-0.7	-0.6	-0.6
ENGINE & WING*	-0.9	-0.9	-0.9	-0.8	-0.8	-0.9	-1.1	-1.2	-1.3	-1.3	-1.2	-1.4	-1.4	-1.2	-1.2	-1.2
ENGINE & WING**	-1.2	-1.2	-1.2	-1.2	-1.2	-1.4	-1.5	-1.7	-1.9	-1.9	-1.7	-1.9	-1.9	-1.8	-1.7	-1.8

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off.