

MODEL: T-29C/D NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE
5,000 FEET

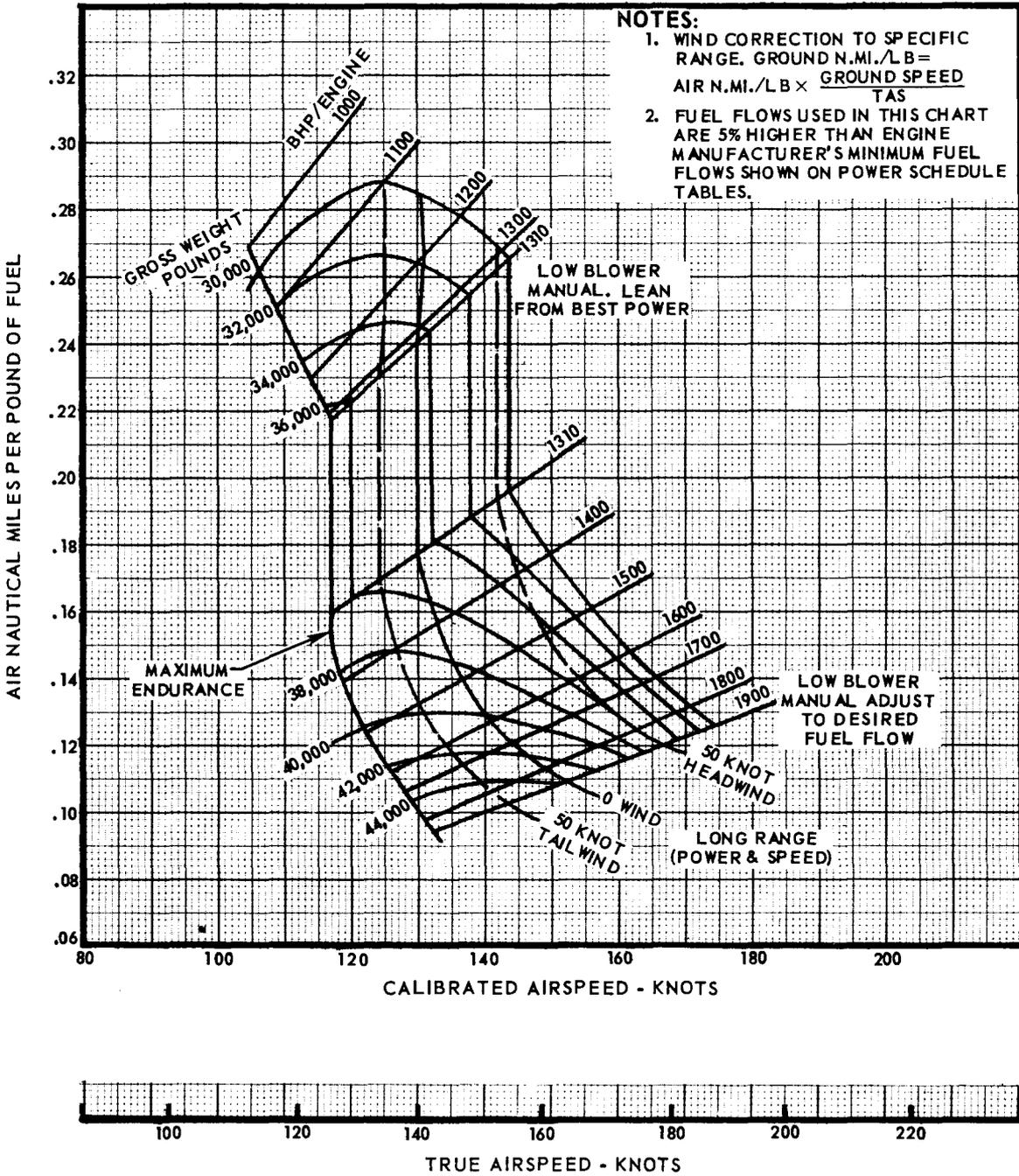
DATE: 15 MARCH 1955

DATA BASIS: FLIGHT TEST

PROPELLER FEATHERED

STANDARD ATMOSPHERE

ENGINES: R2800-99W



45964B

Figure 2A5-10

NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE

10,000 FEET

MODEL: T-29C/D

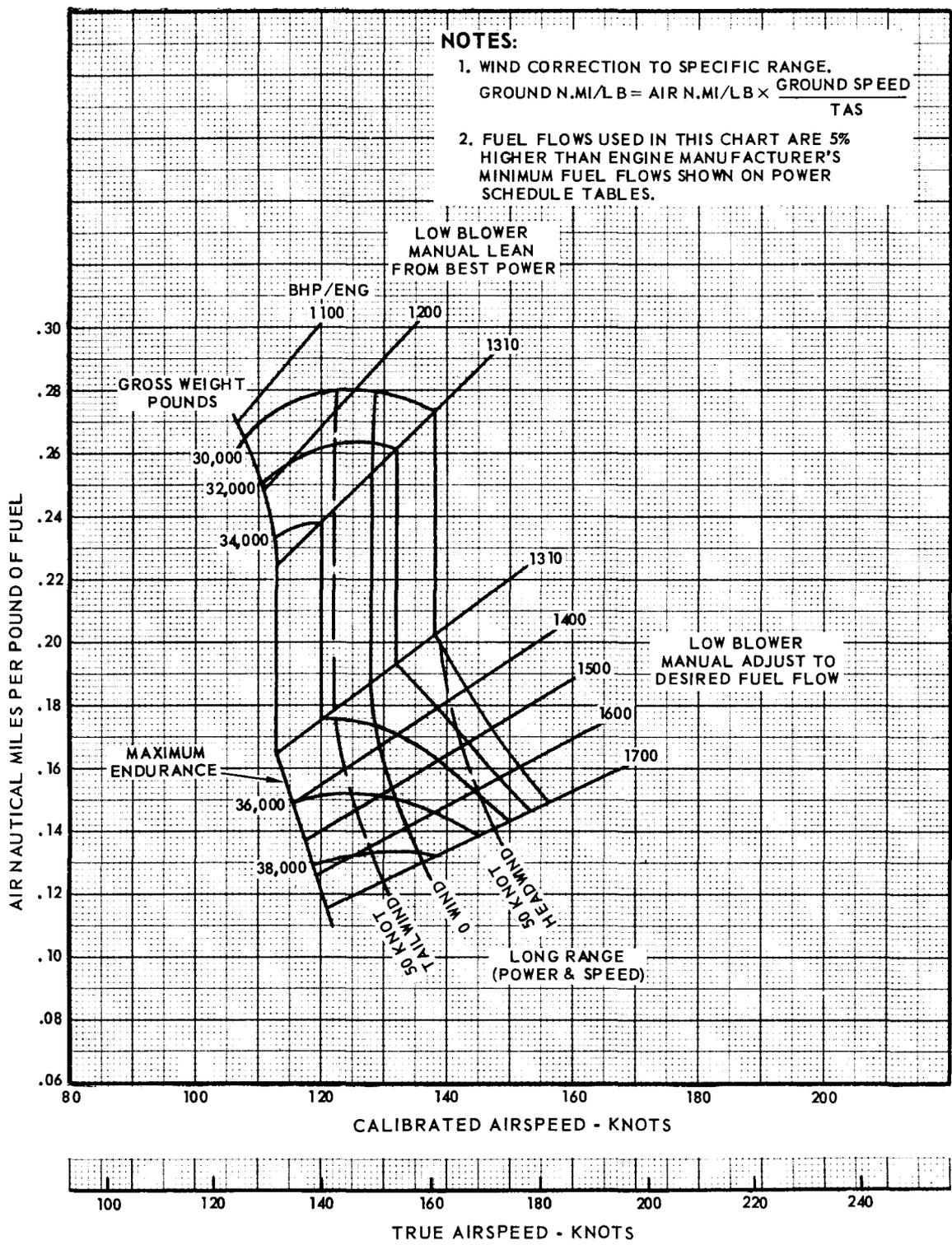
DATE: 15 MARCH 1955

DATA BASIS: FLIGHT TEST

PROPELLER FEATHERED

STANDARD ATMOSPHERE

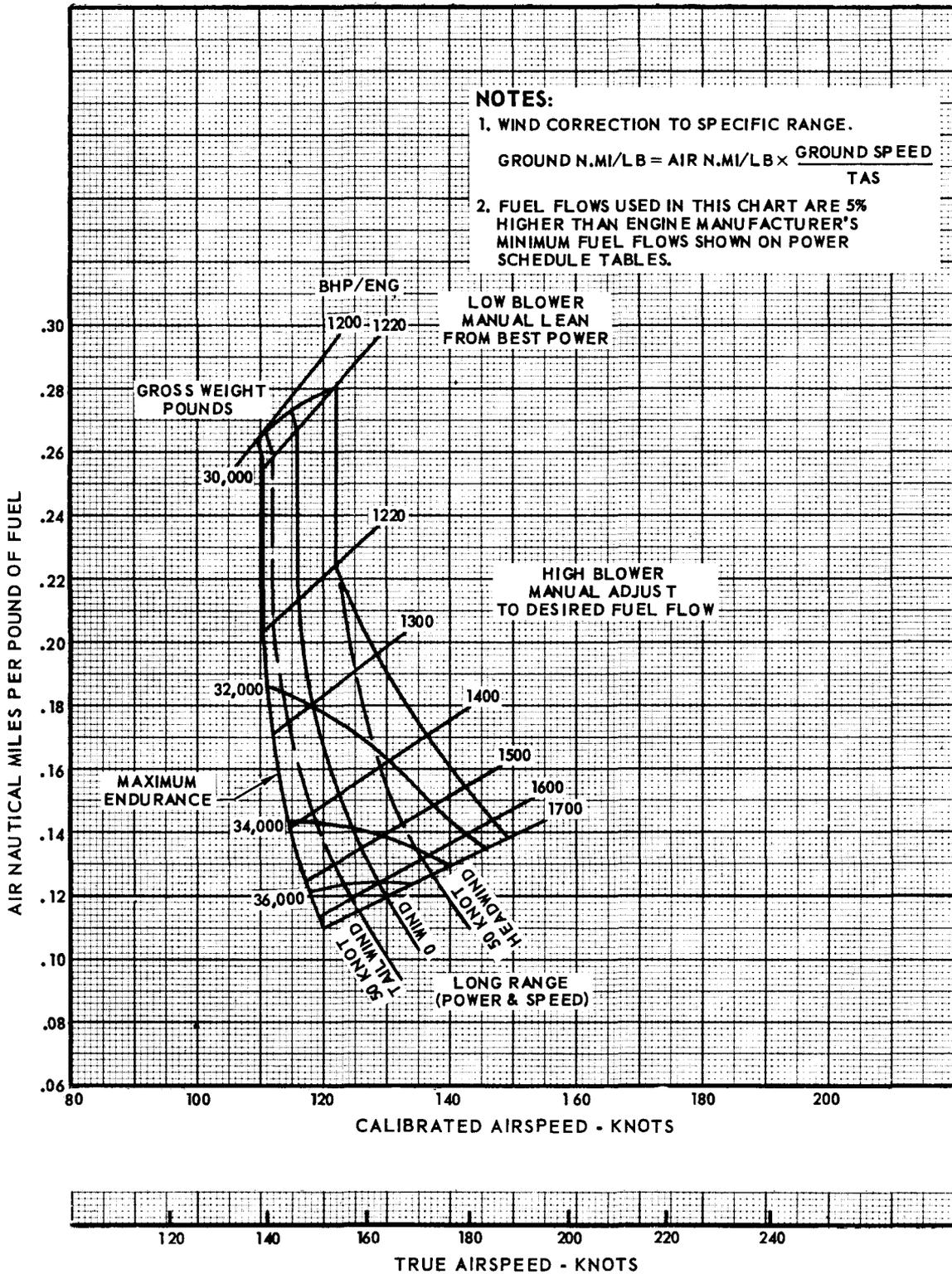
ENGINES: R2800-99W



45,965B

Figure 2A5-11

MODEL: T-29C/D **NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE**
 DATE: 15 MARCH 1955 **15,000 FEET**
 DATA BASIS: FLIGHT TEST **PROPELLER FEATHERED** **STANDARD ATMOSPHERE** **ENGINES: R2800-99W**



45,966B

Figure 2A5-12

PART 6 — APPROACH AND LANDING

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The symbol * indicates an illustration

APPROACH AND LANDING

Extending the flaps decreases the landing speed and decreases the required landing field length. Wing flaps should not be extended to the landing position until the landing is assured. In normal flight planning, the greater of the available landing wing flap settings (39°, 28°, 20°, 15° and 0°) should be considered first. Specifically note that for each of the landing flap settings there is a corresponding approach flap setting. The selection of the landing flap setting should be based on the ability of the corresponding approach flap setting to assure adequate single-engine climb performance in the approach configuration in the event of a go-around or the need to lengthen the approach flight path. The recommended approach speeds are based on 130% of power-off stall speeds; touchdown at 120% of stall speed.

Note

The approach speeds shown on the charts are indicated airspeeds. Because of position error in the pitot system at the low speeds being used, the indicated approach speeds do not bear a direct relationship to the indicated stall speeds as shown in the Power-Off Stall Speed Chart in Section VI. To correctly calculate the approach and touchdown speeds, it is necessary to convert the indicated stall speed to calibrated airspeed. Using

the Airspeed Calibration Chart, multiply by 1.2 or 1.3, and then reconvert the resultant speed to indicated airspeed.

Benefits derived from the brakes are maximum at the lower speeds and minimum at the higher speeds or just after touchdown. Unnecessary use of the brakes greatly reduces their life. Therefore, the landing distance required, as determined from the Appendix data, should be compared to the available runway length. Only in cases where the landing distance required equals the available field length should a minimum roll landing be made. When the available runway length is greater than the calculated minimum landing distance, as determined from the charts, the airplane can be stopped with less than maximum braking.

DISCUSSION OF CHARTS

Note

See landing pattern diagram, Section II.

APPROACH AND LANDING SPEEDS CHART

The recommended airspeeds for maneuver (1.4V_S), approach (1.3V_S), and touchdown (1.2V_S) with landing gear down may be determined from the Approach and Landing Speeds Chart (figure 2A6-1). The chart is presented for the gross weight and flap setting operating range of the airplane. Power-off stall speeds are included on the chart.

EXAMPLE

Given:

Gross weight = 38,000 pounds

Flap setting - Approach = 12°

Flap setting - Touchdown = 28°

Enter chart at gross weight of 38,000 pounds (A) and read up to flap deflection of 12° (B). Read across to 1.3 stall speed line (approach) (C), and read up to find IAS of 116 knots (D). For 28° flap deflection enter at gross weight of 38,000 pounds (A) and read up to 28° flap deflection (E). Read across to the 1.2 stall speed line (touchdown) (F), and read up for 100 knots IAS (G).

LANDING GROUND ROLL

Landing ground roll is defined as the distance from touchdown to a stop using normal pilot techniques specified in Section II with brakes only (both propellers windmilling). For a minimum roll landing, it is important to initiate wing flap retraction as soon as possible after the airplane is firmly on the ground. Retracting the wing flaps decreases the wing lift and allows more weight to be applied to the main wheels, thus increasing the braking efficiency and shortening the landing roll. Reverse propeller thrust is recommended since it will appreciably shorten the landing roll. The landing ground roll charts (figure 2A6-2 through 2A6-6) present the landing ground roll distance for gross weight, density altitude, and wind. The charts also present total landing distance over a 50-foot obstacle.

EXAMPLE

Given:

Density altitude = 1800 feet

Gross weight = 36,000 pounds

Headwind = 5 knots

Flap setting = 28°

Select chart for 28° landing flap (figure 2A6-3). Enter chart at density altitude of 1800 feet (A). Read across to gross weight of 36,000 pounds (B) and read down to wind velocity baseline. Parallel wind guideline to 5 knots headwind (C) and read down to read ground roll distance of 3100 feet (D) and landing distance of 3780 feet (E).

Effects of Unusual Runway Conditions on Landing Ground Roll

The landing ground roll charts (figures 2A6-2 through 2A6-6) are based on landing on a dry, hard surface. The landing ground roll can be corrected for other surface conditions by multiplying the ground roll distance by the stopping factor from the Stopping Capability Chart (figure 2A6-7). To use the chart, obtain the latest runway condition reading (RCR) from the base weather station.

Note

If no RCR is available, use 12 for a wet runway and 5 for an icy runway.

EXAMPLE

Given:

RCR = 14

Ground roll distance = 3100 feet

Enter the Stopping Capability Chart (figure 2A6-7) with RCR of 14 (A). Move horizontally to curve (B), then vertically to obtain stopping factor of 1.27 (C). Multiply the dry hard surface runway ground roll (3100) by the stopping distance factor (1.27) to determine the ground roll on a slippery runway (3100 X 1.27 = 3937 feet).

Effects of Unusual Runway Conditions on Landing Distance Over 50-Foot Obstacle

To correct the landing distance over a 50-foot obstacle, do not apply the stopping distance factor to the total distance. The flight distance from 50 feet to touchdown is unaffected by RCR. The corrected ground roll distance is added to the uncorrected flight distance.

EXAMPLE

Given:

Ground roll distance = 3100 feet

Corrected ground roll distance = 3937 feet

Landing distance over 50-foot obstacle = 3780 feet

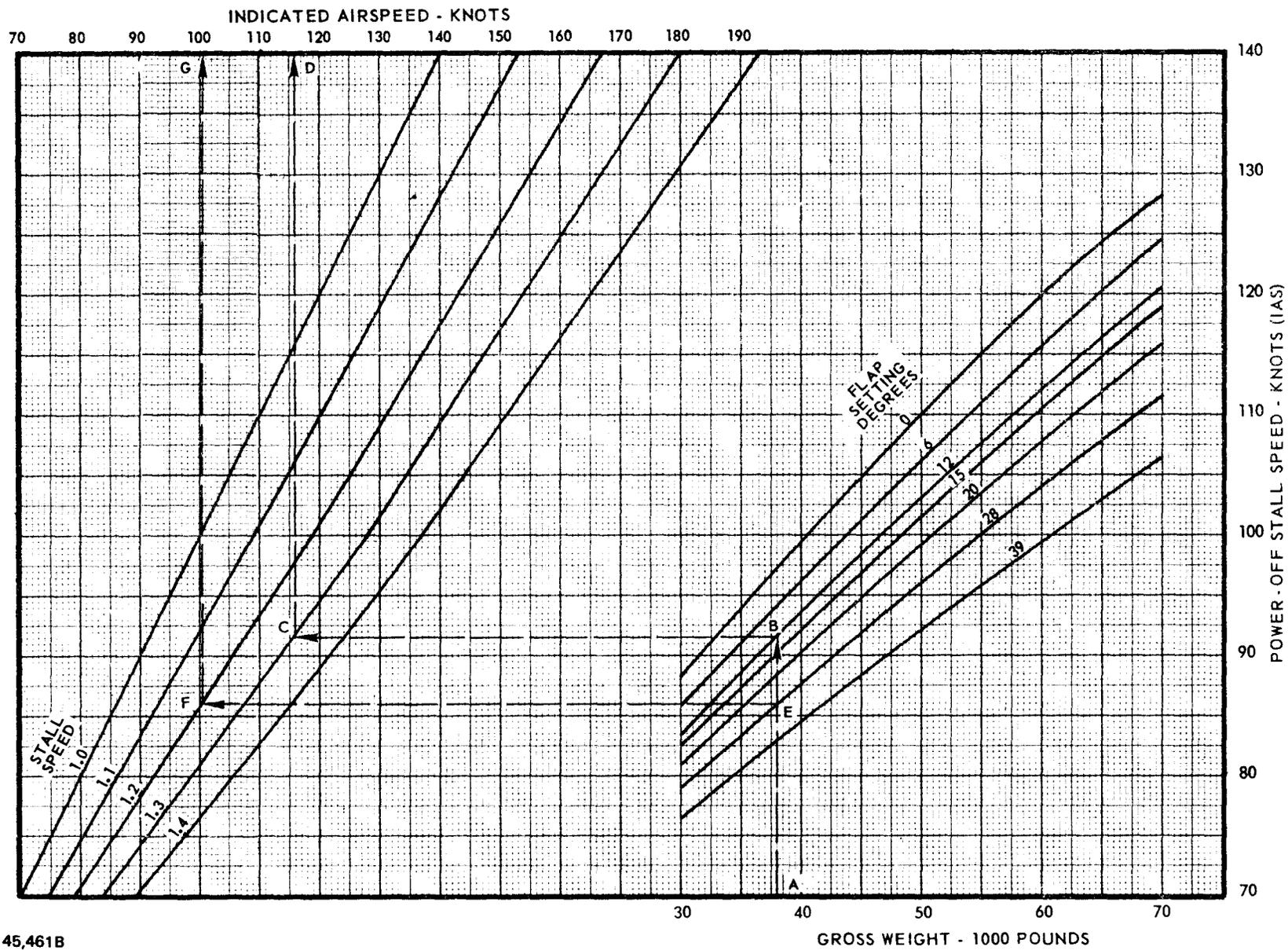
Subtract the ground roll distance (3100 feet) from the landing distance over 50-foot obstacle (3780 feet) to determine flight distance (680 feet). Add this flight distance to the corrected ground roll distance (3937 feet) for total corrected landing distance over 50-foot obstacle (680 feet + 3937 feet = 4617 feet).

MODEL: T-29 C/D
DATE: 15 JULY 1955
DATA BASIS: FLIGHT TEST

APPROACH AND LANDING SPEEDS

LANDING GEAR DOWN 0° BANK

ENGINES: R2800-99W



45,461B

GROSS WEIGHT - 1000 POUNDS

Figure 2A6-1

Change 3

2A6-3

MODEL: T-29C/D

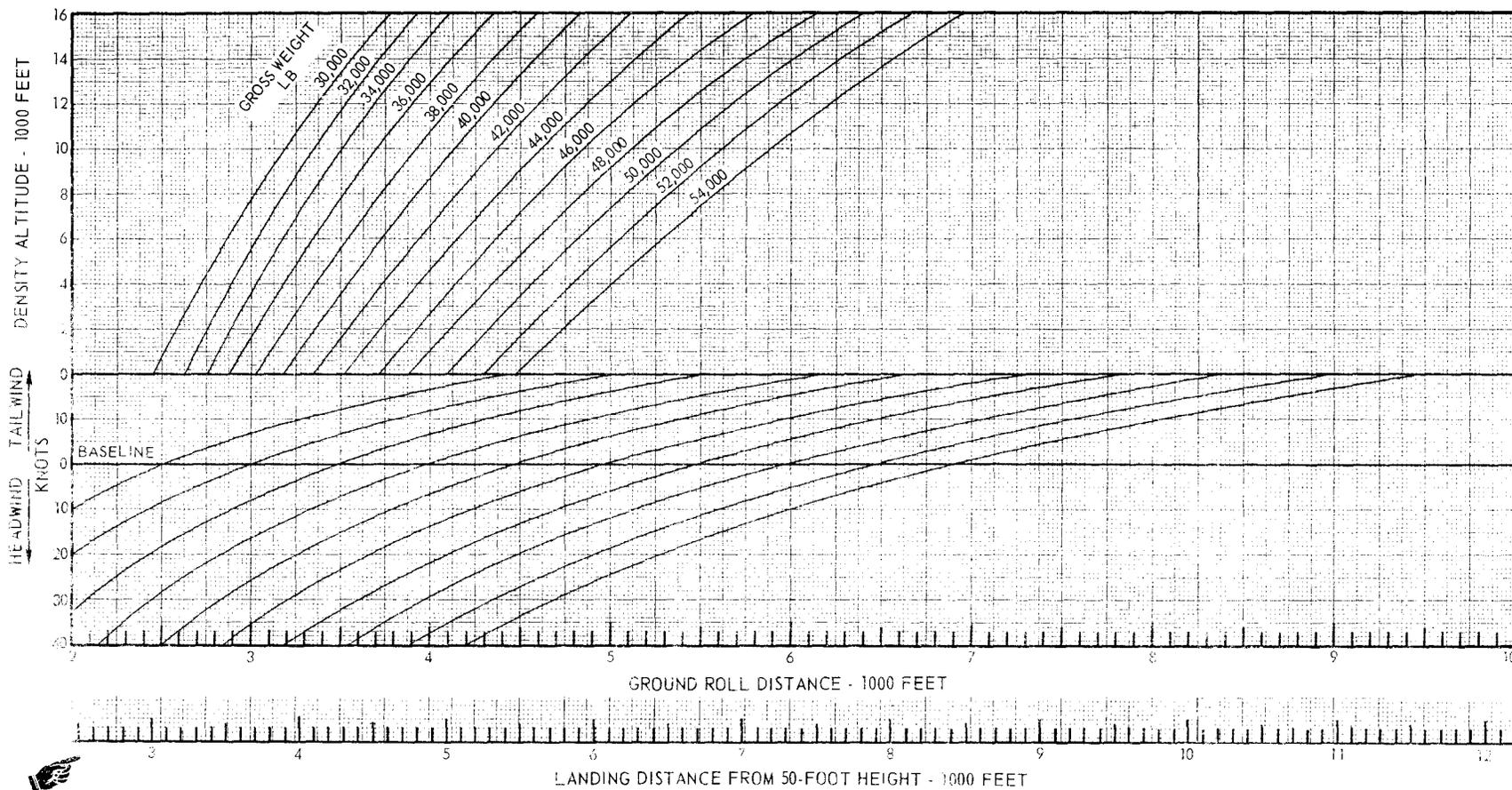
DATE: 15 MARCH 1955

DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (39° FLAP)

APPROACH FLAP - 20° BRAKES ONLY

ENGINES: R2800-99W



NOTES:

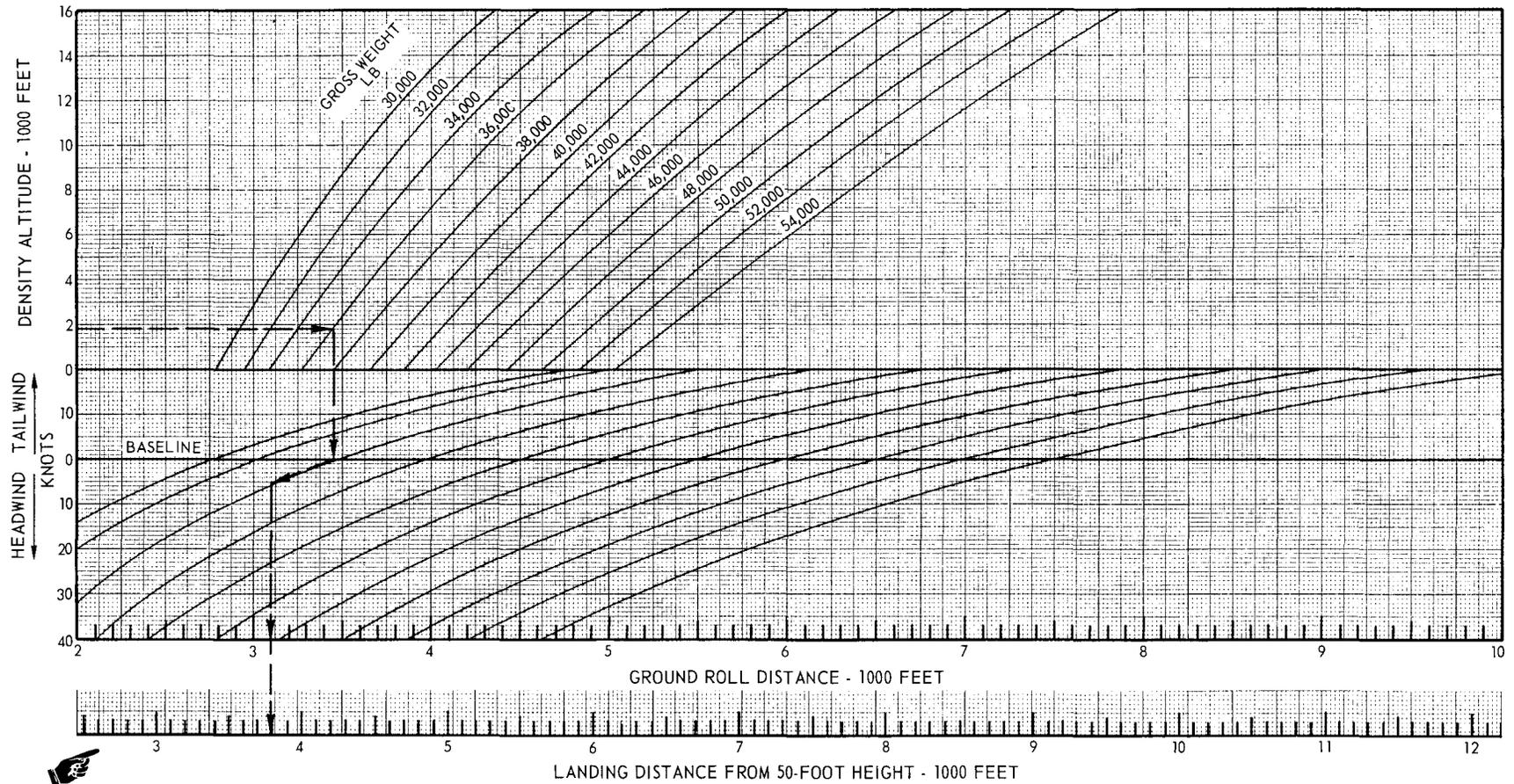
- (1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.
- (2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.
- (3) DO NOT EXTEND FLAPS MORE THAN 20° UNTIL LANDING IS ASSURED.
- (4) TOUCHDOWN AT 1.2 POWER OFF STALL SPEED.
- (5) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.
- (6) 100% WIND ACCOUNTABILITY

45,453D

MODEL: T-29C/D
 DATE: 15 MARCH 1955
 DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (28° FLAP)
 APPROACH FLAP - 12° BRAKES ONLY

ENGINES: R2800-99W



NOTES:

- (1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.
- (2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.
- (3) DO NOT EXTEND FLAPS MORE THAN 12° UNTIL LANDING IS ASSURED.
- (4) TOUCHDOWN AT 1.2 POWER OFF STALL SPEED.
- (5) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.
- (6) 100% WIND ACCOUNTABILITY.

45,455D

Figure 2A6-3

Change 2 2A6-5

T. O. 1T-29A-1

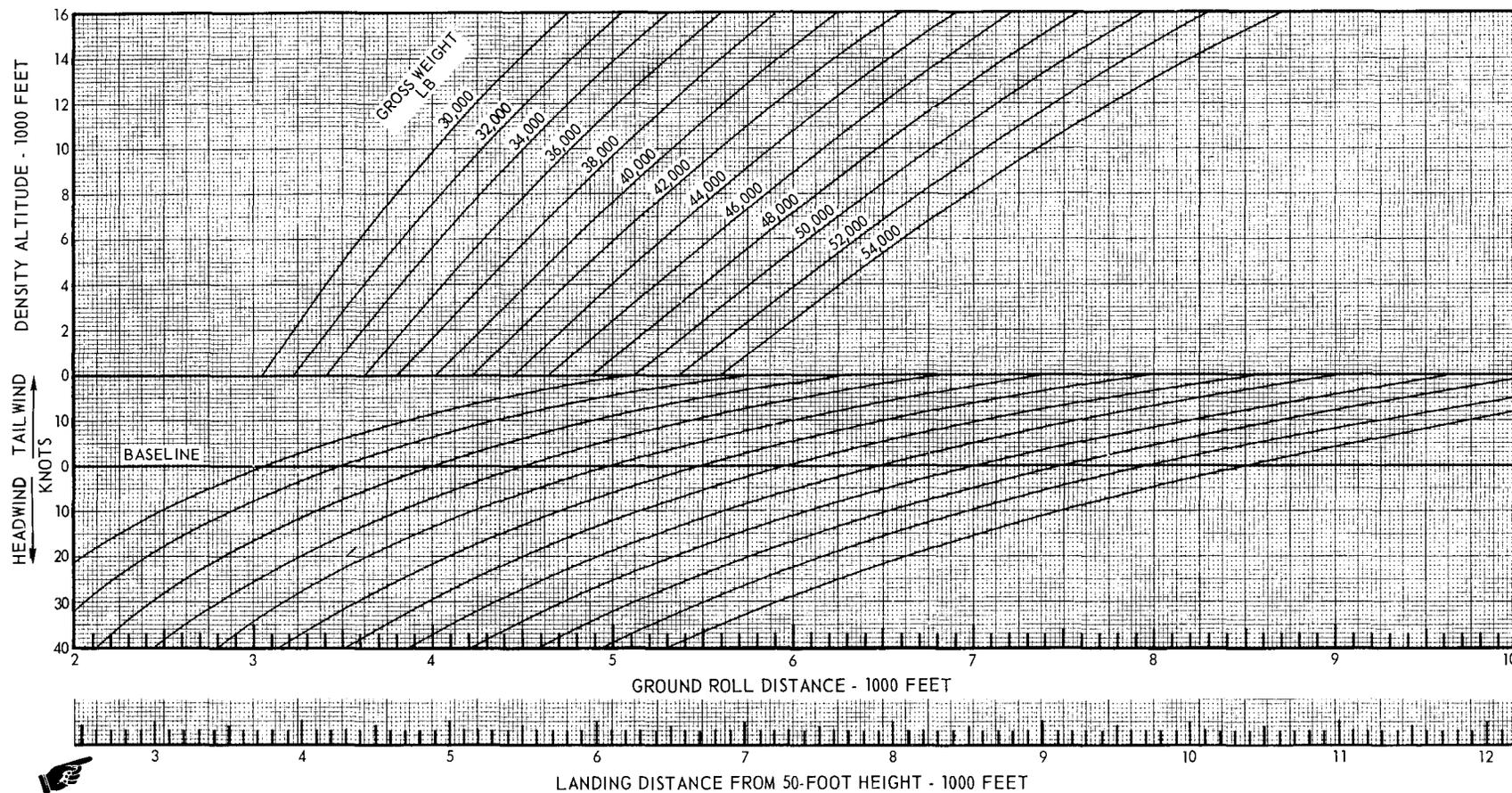
Appendix II
 Part 6

MODEL: T-29C/D
 DATE: 15 MARCH 1955
 DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (20° FLAP)

APPROACH FLAP 6° BRAKES ONLY

ENGINES: R2800-99W



NOTES:

- (1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.
- (2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED
- (3) DO NOT EXTEND FLAPS MORE THAN 6° UNTIL LANDING IS ASSURED.
- (4) TOUCHDOWN AT 1.2 POWER OFF STALL SPEED.
- (5) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.
- (6) 100% WIND ACCOUNTABILITY.

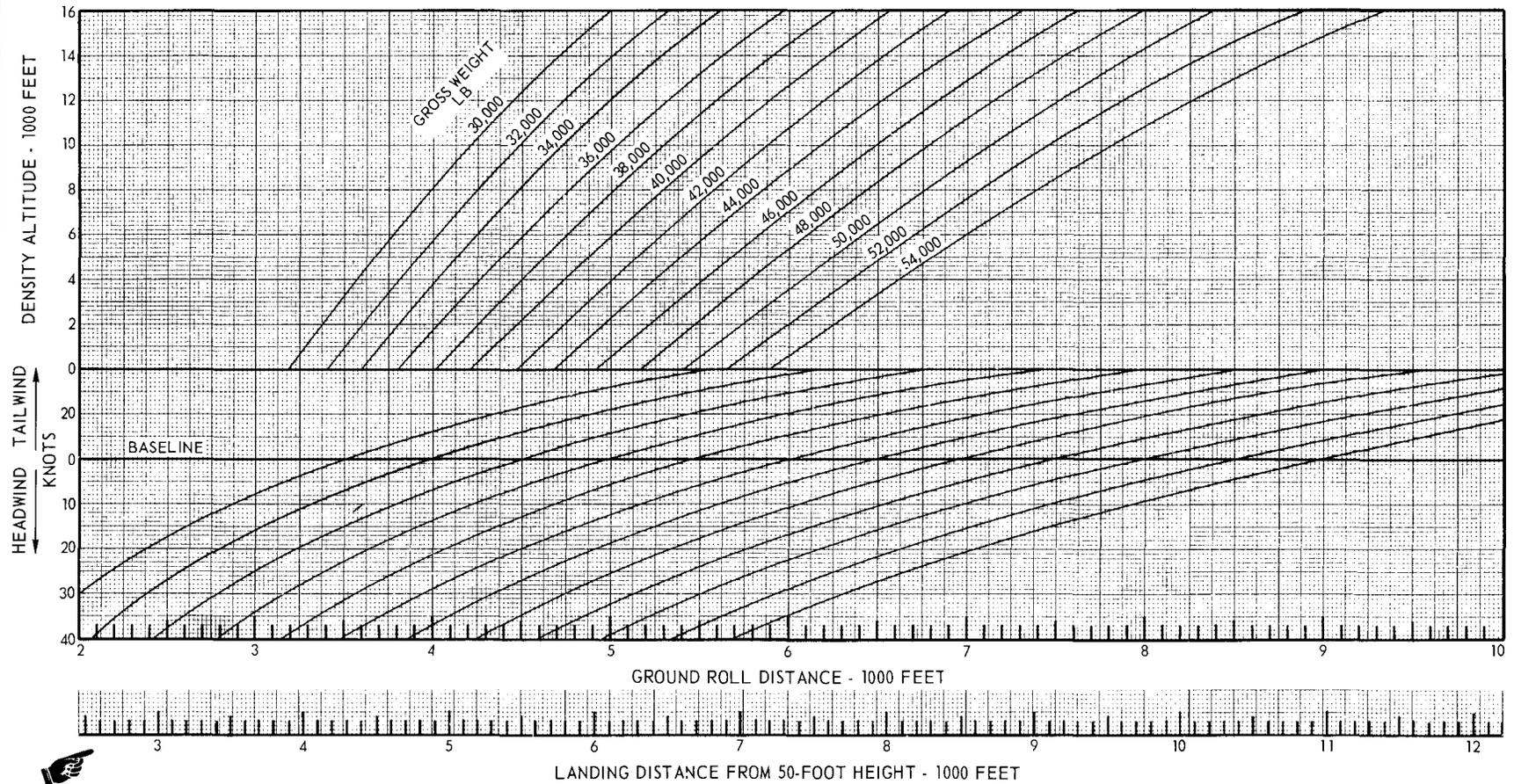
45,976C

Figure 2A6-4

MODEL: T-29C/D
 DATE: 15 MARCH 1955
 DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (15° FLAP)
 APPROACH FLAP - 0° BRAKES ONLY

ENGINES: R2800-99W



NOTES:

- (1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLERS WINDMILLING. MAXIMUM REVERSE WILL REDUCE GROUND ROLL BY 45%.
- (2) DISTANCES ARE BASED ON DRY HARD SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.
- (3) DO NOT EXTEND FLAPS MORE THAN 0° UNTIL LANDING IS ASSURED.
- (4) TOUCHDOWN AT 1.2 POWER OFF STALL SPEED.
- (5) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.
- (6) 100% WIND ACCOUNTABILITY.

45,457D

Figure 2A6-5

Change 2 2A6-7

T. O. 1T-29A-1

Appendix II
 Part 6

MODEL: T-29C/D

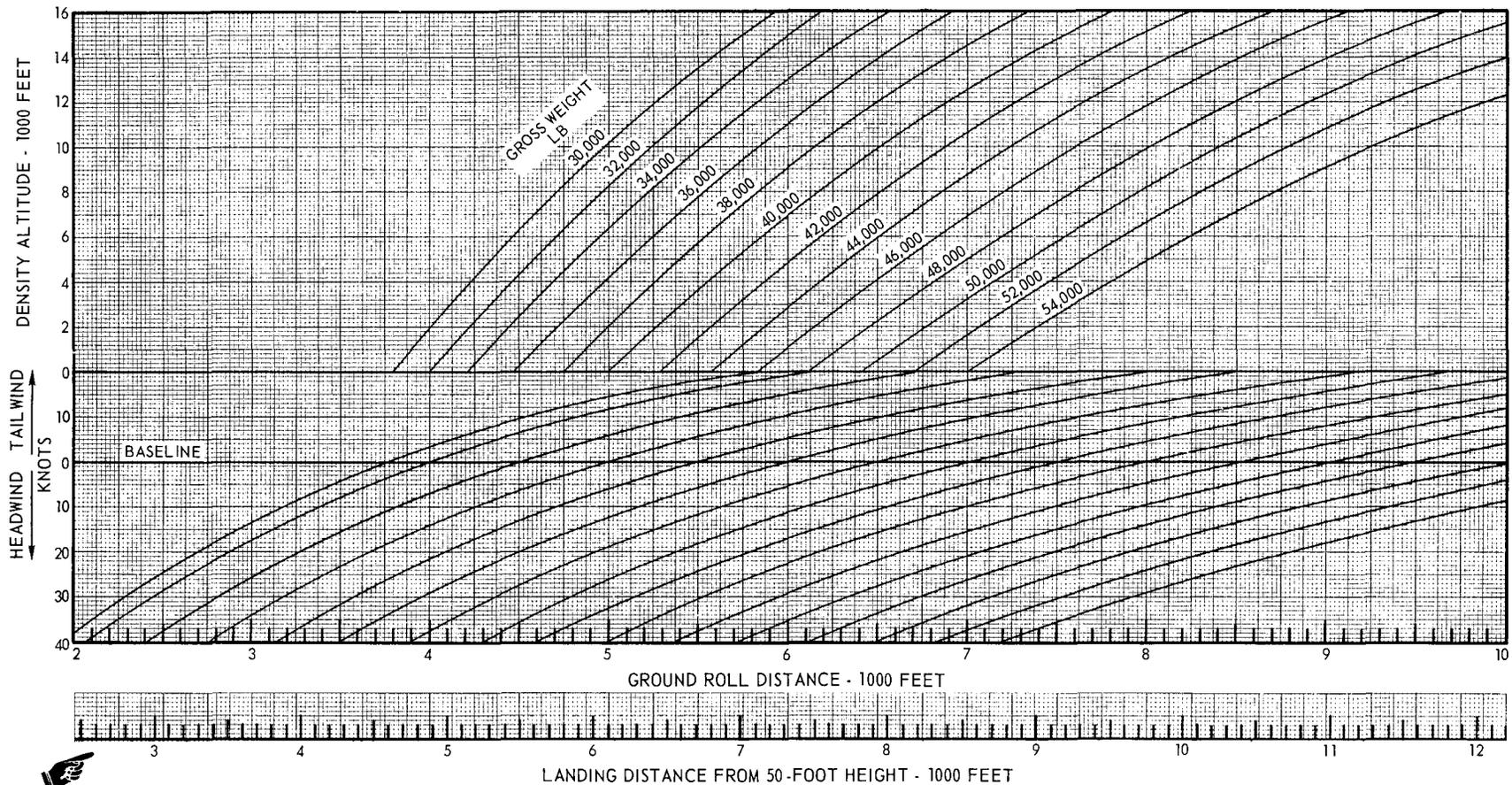
DATE: 15 MARCH 1955

DATA BASIS: FLIGHT TEST

LANDING GROUND ROLL (0° FLAP)

APPROACH FLAP - 0° BRAKES ONLY

ENGINES: R2800-99W



NOTES:

- (1) GROUND ROLL IS FOR BRAKES ONLY, WITH PROPELLER WINDMILLING. MAXIMUM REVERSE WILL REDUCE THE GROUND ROLL BY 45%.
- (2) DISTANCES ARE BASED ON HARD DRY SURFACED RUNWAY WITH FLAP RETRACTION INITIATED AT 0.9 STALL SPEED.
- (3) TOUCHDOWN AT 1.2 POWER OFF STALL SPEED.
- (4) MULTIPLY GROUND ROLL DISTANCE BY STOPPING FACTOR FROM STOPPING CAPABILITY CHART.
- (5) 100% WIND ACCOUNTABILITY.

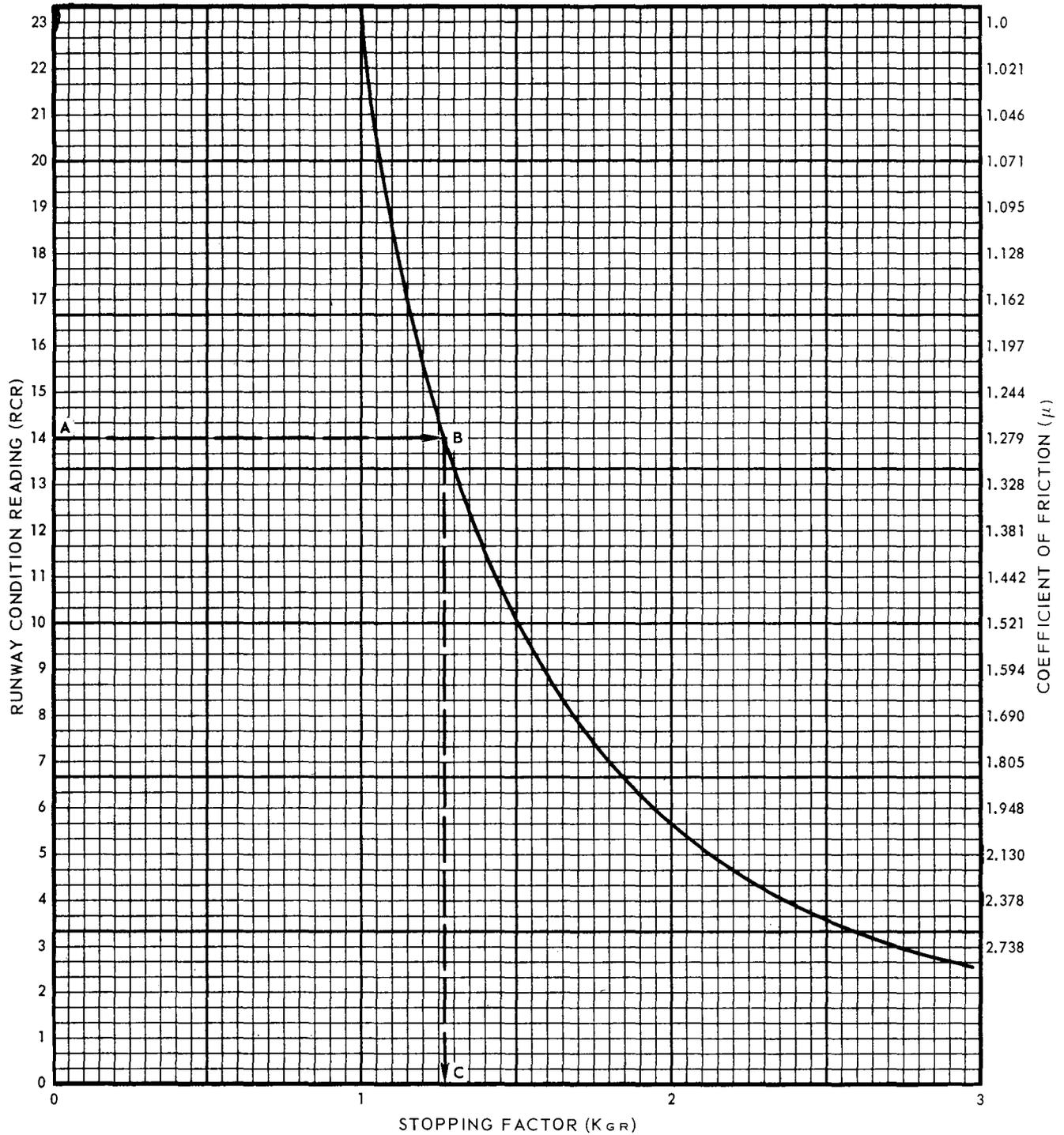
45,459D

Figure 2A6-6

MODEL: T-29 C/D
DATE: 5 DECEMBER 1967
DATA BASIS: ESTIMATED

STOPPING CAPABILITY CHART

ENGINES: R2800-99W



10,784 A

Figure 2A6-7

PART 7 – MISSION PLANNING



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MISSION PLANNING 2A7-1

MISSION PLANNING

Completion of the Takeoff and Landing Data (TOLD) card (AFTO Form 377) is required for all flights. AFTO Form 377 is available through normal forms distribution channels or may be locally reproduced in emergency situations under provisions of AFM 7-1. Fill out the TOLD card using the operating data in the Appendix or using the precomputed data. To be prepared for an emergency landing immediately after takeoff, complete both the TAKEOFF and LANDING IMMEDIATELY AFTER TAKEOFF portions of the TOLD card using takeoff gross weight. The LANDING portion of the card may be completed at this time or prior to landing at destination.

Note

Acceleration time/distance check data must be computed only when refusal speed is less than takeoff speed.

Adequate planning is an essential part of the successful performance of any mission. The scope of this discussion is limited to considering aircraft performance and associated planning procedures. The procedures suggested by the sample flight problem facilitate safe operation of the aircraft in all phases of the mission. A thorough knowledge of these procedures will provide quicker action in the event of an emergency and will aid in making sound decisions.

CONDITIONS - TAKEOFF - T-29/C-131			
FIELD ELEVATION		GROSS WEIGHT	
RUNWAY LENGTH		WIND COMPONENT	
OAT	CAT	DEW POINT	
°C	°C	°F	
PRESSURE ALTITUDE		DENSITY ALTITUDE	
RCR		SMOE	
TAKEOFF			
MANIFOLD PRESSURE			
EXPECTED TPSI/BMEP			
MINIMUM TPSI/BMEP			
TAKEOFF FLAP SETTING			
TAKEOFF SPEED (1.2)			
CRITICAL FIELD LENGTH			
REFUSAL SPEED			
TAKEOFF GROUND RUN			
SPEED/TIME CHECK		/	
DISTANCE/SPEED CHECK		/	
SINGLE-ENGINE CLIMB SPEED (1.2 Clean)			
SINGLE-ENGINE ABSOLUTE CEILING (METO)			
LANDING IMMEDIATELY AFTER TAKEOFF			
APPROACH FLAPS		APPROACH SPEED (1.3) KIAS	
GO-AROUND SPEED (1.2 - Approach Flaps)		KIAS	
GO-AROUND SPEED (1.2 - Clean)		KIAS	
LANDING FLAPS		°	
LANDING APPROACH SPEED (1.3)		KIAS	
LANDING GROUND ROLL DISTANCE		/	

AFTO FORM 377 JAN 70 T-29/C-131 TOLD CARD

CONDITIONS - LANDING			
FIELD ELEVATION		GROSS WEIGHT	
RUNWAY LENGTH		WIND COMPONENT	
OAT	RCR	DEW POINT	
°C	°C	°F	
PRESSURE ALTITUDE		DENSITY ALTITUDE	
LANDING			
APPROACH FLAPS		APPROACH SPEED (1.3) KIAS	
GO-AROUND SPEED (1.2 - Approach Flaps)		KIAS	
GO-AROUND SPEED (1.2 - Clean)		KIAS	
LANDING FLAPS		°	
LANDING APPROACH SPEED (1.3)		KIAS	
LANDING GROUND ROLL/DISTANCE			

T-29 C-131 Takeoff and Landing Data (TOLD) Card

Complete the TOLD card in accordance with the following instructions.

CONDITIONS—TAKEOFF

FIELD ELEVATION. Enter the field elevation.

GROSS WEIGHT. Enter the gross weight at takeoff.

RUNWAY LENGTH. Enter the length of the runway that is available for takeoff.

HEADWIND COMPONENT. Figure 2A3-2, determine the headwind component.

OAT, CAT, DEW POINT. Obtain the outside air temperature (degrees C) and dew point (degrees F) for takeoff time. Carburetor air temperature will be outside air temperature plus one degree C.

PRESSURE ALTITUDE. Obtain the field pressure altitude for takeoff time.

DENSITY ALTITUDE. Figure 2A1-1, determine the density altitude.

TAKEOFF

MANIFOLD PRESSURE, EXPECTED T PSI, MINIMUM T PSI. Figures 2A2-1 or 2A2-3, determine the manifold pressure to be expected, the expected torque pressure, and the minimum torque pressure. Figures 2A2-2, 2A2-4, or 2A2-5 may be used if dry data is desired.

TAKEOFF FLAP SETTING. Figure 2A3-3, enter at the desired minimum rate of climb and determine the takeoff flap setting. Utilize minimum T PSI (wet) in computations if ADI is available, or use minimum T PSI (dry) if a takeoff without ADI is planned. The approach flap setting may also be determined for landing immediately after takeoff.

TAKEOFF SPEED (1.2). Figure 2A3-7, determine the takeoff speed based on the flap setting to be used. Also determine the single-engine climb speed (clean) and the go-around speed using the 1.2 power-off stall speed line for approach flaps.

CRITICAL FIELD LENGTH. Based on the takeoff flap setting to be used (figures 2A3-8, 2A3-11, 2A3-14, and 2A3-17) determine the critical field length for a dry runway. If necessary, correct the critical field length with RCR correction determined from figure 2A3-20.

REFUSAL SPEED. Based on the takeoff flap setting to be used (figures 2A3-9, 2A3-12, 2A3-15, and 2A3-18) determine the refusal speed for a dry runway. If necessary, correct the refusal speed with the RCR correction determined from figure 2A3-20.

TAKEOFF GROUND RUN. Based on the takeoff flap setting to be used (figures 2A3-10, 2A3-13, 2A3-16, and 2A3-19) determine the takeoff ground roll.

Note

When refusal speed is greater than take-off speed, use computed takeoff speed and distance for acceleration time/distance check.

ACCELERATION TIME/DISTANCE CHECK. Figure 2A3-6, determine the speed/time data or the distance/speed data for an acceleration check.

SINGLE-ENGINE CLIMB SPEED (1.2 CLEAN). Figure 2A3-7, determine the single-engine climb speed if not previously accomplished.

SINGLE-ENGINE ABSOLUTE CEILING (METO). Figures 2A4-5 or 2A4-6, determine the absolute ceiling with METO power operation.

LANDING IMMEDIATELY AFTER TAKEOFF

Note

The information for this section will be based on takeoff gross weight.

APPROACH FLAPS. Figure 2A3-3, determine the approach flap setting for landing if not previously accomplished. The landing flap setting may be entered in the LANDING FLAPS space at this time.

APPROACH SPEED (1.3). Figure 2A6-1, determine the 1.3 stall speed for the approach flap setting. The 1.3 stall speed for the landing flap setting may also be determined at this time and entered in LANDING APPROACH SPEED (1.3).

GO-AROUND SPEED (1.2 APPROACH). Figure 2A3-7, determine the go-around speed if not previously accomplished.

LANDING FLAPS. Landing flaps are generally based on the amount of approach flaps used. Consult figures 2A6-2 through 2A6-6 for normal flap pairings.

LANDING APPROACH SPEED (1.3). Figure 2A6-1, determine the approach speed for the landing flap setting if not previously accomplished.

LANDING GROUND ROLL/DISTANCE. Based on the landing flap setting to be used (figures 2A6-2 through 2A6-6) determine the landing ground roll. Determine the landing distance (landing over a 50-foot obstacle). If applicable, correct the ground roll or the ground roll portion of the landing distance over a 50-foot obstacle by applying the RCR stopping factor determined from figure 2A6-7.

CONDITIONS—LANDING AND LANDING

Note

The landing portion of the card may be completed prior to takeoff if weather at destination is available. All items in this section will be completed as previously discussed for like entries.

Sample Flight Problem

To illustrate the use of the charts in this Appendix, a sample flight problem is presented and solved in the following paragraphs.

Note

This example presents a radius navigational training mission. Refer to MISSION PLANNING, Appendix I, for a transport mission sample problem.

Weather, Field and Trip Information

Field elevation pressure altitude	5000 ft
Outside air temperature	10 °C
Dew point	35 °F
Headwind	10 knots
Runway length	7500 ft
Runway slope	1% up
Takeoff gross weight	43,500 lb
Fuel load	8650 lb

Determine Density Altitude

Using: (Density Altitude Chart, figure 2A1-1)

Enter chart at OAT	10 °C
Proceed vertically to pressure altitude line	5000 ft
Proceed horizontally to density altitude scale	
Read density altitude	5600 ft

Determine Ramp Weight

Ramp weight represents a weight greater than maximum takeoff weight. The difference is the fuel that is used for starting, runup, taxiing, and takeoff. Allow 300 pounds of fuel for initial starting, runup, taxiing, and takeoff, and 150 pounds for thru-flight enroute stops. These figures are based on operational experience.

Using: Initial starting, runup, taxiing, and takeoff fuel

	300 lb
Takeoff gross weight	43,500 lb
Ramp weight	43,800 lb

Note

Due to the many and varied operational requirements, these figures may not meet all situations. Therefore, it may be necessary to modify these standard fuel allowances.

TAKEOFF

Determine the Minimum Performance Torque Pressure

Note

If the actual carburetor temperature rise of the airplane is unknown, use OAT plus 1°C; it is sufficiently accurate for pre-flight planning. A correction should be made when the actual CAT is known.

Using: (Maximum Wet Power Available, figure 2A2-1)

Enter chart with airplane pressure altitude	5000 ft
Proceed vertically to CAT	11 °C
Read MAP	55.5 in. Hg
Proceed horizontally to base line dew point chart, then parallel guide line to dew point (corrected for altitude)	35 °F

Then, proceed horizontally to read:

Expected TPSI	125 psi
Minimum performance TPSI	119 psi

Also note:

Brake horsepower	2100 bhp
Engine speed	2800 rpm
Blower speed	LOW
Water injection	ON
Mixture position	AUTO RICH

In preflight planning, do not exceed the minimum performance TPSI limit shown. In operation, do not exceed the TPSI limit of 141 psi with wet power or 130 psi with dry power. In the event that minimum performance TPSI is unobtainable before reaching refusal speed, the takeoff should be aborted.

Determine the Takeoff Flap Setting

For the purpose of this sample problem the desired minimum initial rate of climb is considered to be 200 fpm.

Using: (Takeoff Gross Weight Limited by Climb, figure 2A3-3)

Enter lower left-hand portion of chart with density altitude	5600 ft
--	---------

Proceed horizontally to desired minimum initial rate of climb 200 fpm

Parallel guide lines to base line at sea level density altitude, then proceed vertically to minimum performance torque pressure 119 psi

Parallel guide lines to base line at 141 psi then proceed vertically to takeoff weight 43,500 lb

Read takeoff flap setting 0°

Note

- For practical operation, limit the final selection of takeoff flap setting to either 12°, 6°, or 0°. Intermediate positions should be used only when one of these flap settings will not provide the required initial rate of climb and runway length combination.
- If the takeoff flap setting should come out as less than zero, with the particular takeoff atmospheric conditions available, off-load as necessary to reduce the takeoff weight to that which allows the desired initial rate of climb. Or, if under similar conditions, the takeoff weight cannot be reduced, work backwards from the weight and minimum flap setting to determine the expected initial rate of climb and thereby judge the desirability of taking off.

Determine Takeoff Speed

Using: (Takeoff and Minimum Control Speeds, figure 2A3-7)

Enter chart at gross weight 43,500 lb

Proceed vertically to 0° flap curve, then proceed horizontally to IAS scale and read 125 knots

Determine Critical Field Length

Using: (Critical Field Length, 0° Flap, figure 2A3-17 and Effect of Runway Conditions, figure 2A3-20)

Enter figure 2A3-17 with density altitude 5600 ft

Parallel guide lines to minimum performance torque pressure 119 psi

Proceed horizontally to takeoff weight 43,500 lb

Proceed vertically to zero runway slope parallel guide lines to actual runway slope 1% up

Proceed vertically to base line at zero headwind, parallel guide lines to reported headwind 10 knots

Proceed vertically to critical field length (for dry, hard surface runway) 7050 ft

Note

This field length is that required to accelerate to the critical engine failure speed, two engines operating, have an engine fail, propeller auto-feather and either (a) proceed to takeoff or (b) stop. Since the critical field length (dry, hard surface runway) is less than that available, a safe takeoff is possible. For unusual runway conditions, proceed as follows:

Enter Effects of Runway Surface Condition Chart (figure 2A3-20 with RCR obtained from base weather 12

Proceed horizontally to takeoff weight on critical field length portion of chart 43,500 lb

Proceed vertically to KCFL factor 1.23

Corrected critical field length = KCFL X critical field length from figure 2A3-17 8672 ft

Note

Since critical field length for a wet runway is greater than that available, a takeoff should not be made.

Determine Refusal Speed

Using: (Refusal Speed, 0° Flap, figure 2A3-18 and Effect of Runway Conditions, figure 2A3-20)

Enter chart with available runway length 7500 ft

Proceed horizontally to reported headwind 10 knots

Parallel guide line to base line, then proceed horizontally to torque pressure 119 psi

Parallel guide line to base line, then proceed horizontally to density altitude 5600 ft

Parallel guide line to base line, then proceed horizontally to intersection of vertical line from gross weight 43,500 lb

Refusal speed (IAS) (dry, hard surface runway) 118 knots

Note

If the refusal speed should be greater than the takeoff speed and since refusal speed is limited to takeoff speed, then only takeoff speed would need to be monitored.

To correct refusal speed for unusual runway conditions, enter Effects of Runway Condition chart (figure 2A3-20) with RCR obtained from base weather 12

Proceed horizontally to takeoff weight on refusal speed portion of chart 43, 500 lb

Proceed vertically to K_{RS} factor .938

Corrected refusal speed = $K_{RS} \times$ refusal speed from figure 2A3-18 111 knots

Determine Takeoff Ground Run

Using: (Takeoff Ground Run—0° Flap, figure 2A3-19)

Enter chart with density altitude 5600 ft

Parallel guide lines to minimum performance torque pressure 119 psi

Proceed horizontally to takeoff weight 43, 500 lb

Proceed vertically to base line at zero runway slope, then parallel guide lines to actual runway slope 1% up

Proceed vertically to base line at zero headwind, then parallel guide lines to reported headwind 10 knots

Proceed vertically to ground run distance 4100 ft

Determine Acceleration Check Speed/Distance/Time

Using: (Velocity During Takeoff Ground Run, figure 2A3-6)

Enter chart with 100% wind takeoff ground run 4100 ft

And takeoff speed corrected for wind (125 - 10) 115 knots

Draw acceleration curve through the point of intersection and parallel to the guide lines

Re-enter the chart at refusal speed corrected for wind. (If unusual runway conditions exist enter at RCR corrected refusal speed corrected for wind.) (118-10) 108 knots

Proceed vertically to new acceleration check curve and then horizontally to refusal distance 3450 ft

Re-enter chart at the 1000 ft marker that is 500 to 1500 ft before the refusal distance 2000 ft

Proceed horizontally to new acceleration curve and read sea level acceleration time 28 seconds

Proceed vertically to IAS scale and read uncorrected acceleration speed 88 knots

Correct acceleration speed by adding wind (88 + 10) 98 knots

Find acceleration time for 5600 ft density altitude ($28 \div 1/\sqrt{\sigma}$) 26 seconds

Find acceleration check time at the even 10 knot speed increment from 5 to 15 knots below refusal speed

Determine desired check speed (118 - 8) IAS 110 knots

Correct check speed for wind (110 - 10) 100 knots

Enter chart at 100 on IAS scale and read vertically to new acceleration curve and read acceleration time 33 seconds

Summary of Preflight Takeoff Data

Engine speed	2800
MAP	55.5 in. Hg
Minimum performance TPSI	119 psi
Blower speed	LOW
Mixture position	AUTO RICH
Flap setting	0°
Takeoff speed (IAS)	125 knots
Acceleration check distance/speed	2000 ft/98 knots

Acceleration check speed/time 110 knots/33 seconds

Takeoff ground run 4100 ft

CLIMB TO 10,000 FEET

Determine Climb Distance and Fuel

Using: (Operational Climb—Distance and Fuel, 1500 BHP, figure 2A4-2)

Note airspeed (IAS) 140 knots

Enter chart at weight at start of climb 43,500 lb

Proceed vertically to density altitude at start of climb 5600 ft

Read:

Distance 16 n mi

Fuel 180 lb

Parallel guide lines to density altitude at end of climb 10,000 ft

Read:

Distance 34 n mi

Fuel 350 lb

Subtract start-of-climb index from end-of-climb index

Find:

Distance from 5000 to 10,000 ft 18 n mi

Fuel consumed from 5000 ft to 10,000 ft 170 lb

Subtract from weight at start of climb and determine:

Weight at end of climb 43,330 lb

Note

The airplane lift and drag depend primarily upon the density of the air, while the engine power depends upon the pressure of the air, until full throttle is reached. The altimeter reads pressure altitude. To determine the climb performance under non-standard conditions, then one must determine the fuel, distance and time to climb using density altitudes and obtain the standard power for that altitude by adjusting the manifold pressures as required.

Determine Power Settings at Start of Climb

Using: (Climb Power Schedule—1500 bhp, figure 2A2-7)

Enter table at pressure altitude 5000 ft

Proceed horizontally and interpolate for CAT (+5°) to find MAP 40.3 in. Hg

Read:

Blower LOW

Engine speed 2300 rpm

Torque pressure 103 psi

Also note:

Mixture AUTO RICH

Determine Power Settings at End of Climb

Re-enter table at pressure altitude 10,000 ft

Proceed horizontally to CAT (-5°)

Read:

MAP (interpolated) 38.8 in. Hg

Blower LOW

Engine speed 2300 rpm

Torque pressure 103 psi

Also note:

Mixture AUTO RICH

CRUISE AT 10,000 FEET

Determine Distance and Fuel Used in 2-Hour Cruise

Using: (Long Range Prediction—Time, figure 2A5-8)

Enter chart at weight at start of cruise 43,330 lb

Proceed vertically to cruise density altitude 10,000 ft

Read time at start of cruise 10.7 hr

Add required cruise time 2 hours, find time at end of cruise 12.7 hr

Proceed along density altitude line to time at end of cruise 12.7 hours, and read weight at end of cruise 41,600 lb

Subtract weight at end of cruise from weight at start of cruise to find approximate fuel used in 2 hour cruise 1730 lb

Using: (Long Range Prediction—Distance, figure 2A5-7)

Enter chart at weight at end of cruise 41,600 lb

Proceed vertically to density altitude line 10,000 ft

Read distance at end of cruise 2400 n mi

Proceed along density altitude line to weight at start of cruise 43,330 lb

Read distance at start of cruise 2025 n mi

Subtract from distance at end of cruise to determine distance traveled in 2-hour cruise 375 n mi

Determine Airspeed and Power Settings for Cruise

Using: (Nautical Miles per Pound of Fuel—10,000 feet, figure 2A5-3)

Enter at weight at start of cruise 43,330 lb

Follow weight line to intersection of long range line and read bhp at start of cruise 1050 bhp

Proceed vertically to calibrated airspeed 161 knots

Re-enter at weight at end of cruise 41,600 lb

Follow weight line to intersection of long range line and read bhp at end of cruise 1020 bhp

Proceed vertically to calibrated airspeed 160 knots

Using: (Power Schedule—1050 bhp, figure 2A2-17)

Enter table with pressure altitude 10,000 ft

Proceed horizontally to CAT -5 °C

Read:
MAP (interpolated) 32.2 in. Hg
Blower LOW

Engine speed 1950 rpm

Torque pressure 86 psi

Using: (Power Schedule—1000 bhp, figure 2A2-16)

Enter table with pressure altitude 10,000 ft

Proceed horizontally to CAT -5 °C

Read MAP 31.6 in. Hg

Blower LOW

Engine speed 1900 rpm

Determine MAP for 1020 bhp, 1900 rpm at end of cruise by using the following ratio:

$$\frac{31.6 \text{ in. Hg}}{1000 \text{ bhp}} = \frac{\text{MAP}}{1020 \text{ bhp}}$$

$$\text{MAP} = \frac{31.6 \times 1020}{1000} = 32.2 \text{ in. Hg}$$

Determine torque pressure for 1020 bhp by using the formula:

$$\text{BHP} = \text{TPSI} \times .00632 \times \text{RPM}$$

$$\text{Torque pressure} = \frac{1020}{.00632 \times 1900} = 85 \text{ psi}$$

Also note:

Mixture MANUAL LEAN

Note

For 1000 bhp, the engine speed given by figure 2A2-16 is 1900 rpm. As greater economy results from lower engine speeds, a reduction in rpm during the cruise is recommended.

CLIMB TO 20,000 FEET

Determine Climb Distance and Fuel (From 10,000 ft. to 20,000 ft.)

Using: (Operational Climb Distance and Fuel—1500 bhp, figure 2A4-2)

Note airspeed (IAS) 140 knots

Enter chart at weight at start of climb 41,600 lb

Proceed vertically to altitude at start of climb 10,000 ft

Read:
Distance 30 n mi
Fuel 300 lb

Parallel guide lines to altitude
at end of climb 20,000 ft

Read:

Distance 92 n mi

Fuel 990 lb

Subtract start-of-climb index
from end-of-climb index

Find:

Distance from 10,000 ft to
20,000 ft 60 n mi

Fuel consumed from 10,000 ft
to 20,000 ft 690 lb

Subtract from weight at start of
climb to determine:

Weight at end of climb 40,910 lb

Determine Power Settings for Climb

Note

Power setting at start of climb will be
the same as the power setting at end of
first segment climb to 10,000 feet.

Using: (Climb Power Schedule—1500 bhp,
figure 2A2-7)

Enter table at pressure
altitude 20,000 ft

Proceed horizontally to CAT -25°C

Read:

MAP (interpolated) 40.5 in. Hg

Blower HIGH

Engine speed 2500 rpm

Torque pressure 95 psi

Also note:

Mixture AUTO RICH

Using normal climb procedure adjust MAP until low
blower critical altitude is reached, then shift to
high blower and continue climb procedure.

CRUISE AT 20,000 FEET

**Determine Distance, Fuel Used and
Airspeed for 1-Hour Cruise**

Using: (Nautical Miles per Pound of Fuel—20,000
feet, figure 2A5-5)

Note

This portion of the mission is flown at
maximum cruise power. Since it is de-
sired to cruise for one hour, a suffi-
ciently accurate estimate may be made of
the fuel flow by reading nautical miles
per pound value and a true airspeed
value at an assumed average weight and
dividing the true airspeed by the nautical
miles per pound ($n \text{ mi/hr} \div n \text{ mi/lb} =$
 lb/hr).

Weight at start of cruise 40,910 lb

Assuming a fuel flow of 1070
lb/hr, then average weight for
cruise (40,910 - 535) 40,375 lb

At average cruise weight and
at maximum cruise rpm of 2300
(1150 bhp) read Nautical Miles
per Pound of Fuel .216 n mi/lb

Calibrated airspeed 163 knots

True airspeed 222 knots

Then fuel used ($222 \div .216 \times$
1 hr) 1025 lb

Note

The fuel used figure of 1025 pounds is
close enough to the assumed value of
1070 pounds. If it were substantially
different another estimate should be
made.

Weight at end of 1-hour cruise
(40,910 - 1070) 39,840 lb

Distance in 1-hour cruise
(222 knots X 1 hr) 222 n mi

Determine Power Setting for Cruise

Using: (Power Schedule—1150 bhp/eng,
figure 2A2-19)

Enter table at pressure
altitude 20,000 ft

Proceed horizontally to CAT -25°C

Read:

MAP (interpolated) 33.5 in. Hg

Blower HIGH

Engine speed 2300 rpm

Torque pressure 80 psi

Also note:

Mixture MANUAL LEAN

RETURN TO BASE

The return to home base is accomplished at air-speeds for long range at 20,000 feet altitude.

Determine Distance and Fuel Used in 3-Hour Cruise

Using: (Long Range Prediction—Time, figure 2A5-8)

Enter chart at weight at start of cruise 39,840 lb

Proceed vertically to cruise density altitude 20,000 ft

Read time at start of cruise 2 hr

Add required cruise time (3 hours), find time at end of cruise 5 hr

Proceed along density altitude line to time at end of cruise and read weight at end of cruise 37,100 lb

Subtract weight at end of cruise from weight at start of cruise to find approximate fuel used in 3-hour cruise 2740 lb

Using: (Long Range Prediction—Distance, figure 2A5-7)

Enter chart at weight at end of cruise 37,100 lb

Proceed vertically to density altitude line 20,000 ft

Read distance at end of cruise 1100 n mi

Proceed along density altitude line to weight at start of cruise 39,840 lb

Read distance at start of cruise 450 n mi

Subtract from distance at end of cruise to determine distance traveled in 3 hours 650 n mi

Determine Airspeed and Power Settings for Cruise

Using: (Nautical Miles per Pound of Fuel—20,000 feet, figure 2A5-5)

Enter at weight at start of cruise 39,840 lb

Follow weight line to intersection of long range line and read bhp at start of cruise 1075 bhp

Proceed vertically to calibrated airspeed 155 knots

Re-enter at weight at end of cruise 37,100 lb

Follow weight line to intersection of long range line and read bhp at end of cruise 1000 bhp

Proceed vertically to calibrated airspeed 153 knots

Using: (Power Schedule—1100 bhp, figure 2A2-18)

Enter table with pressure altitude 20,000 ft

Proceed horizontally to CAT -25°C

Read:

MAP (interpolated) 32 in. Hg

Blower HIGH

Engine speed 2200 rpm

Determine MAP for 1075 bhp at start of cruise by calculation as before:

$$\text{MAP} = \frac{32 \times 1075}{1100} = 31.2 \text{ in. Hg}$$

Determine torque pressure as before:

$$\text{Torque pressure} = \frac{1075}{.00632 \times 2200} = 77 \text{ psi}$$

Using: (Power Schedule—1000 bhp, figure 2A2-16)

Enter table with pressure altitude 20,000 ft

Proceed horizontally to CAT -25°C

Read:

MAP (interpolated) 29.8 in. Hg

Blower HIGH

Engine speed 2100 rpm

Torque pressure 76 psi

Also note:

Mixture MANUAL LEAN

RESERVE FUEL CONSIDERATIONS

The reserve fuel allowance should include fuel for holding at destination and the possibility of being diverted to an alternate base and some additional fuel for other contingencies. For the purpose of this example the reserve fuel allowance has been chosen to be that required for 30 minutes holding at air-speeds for long range at sea level and 5% of initial fuel load for contingencies.

Determine Reserve Fuel Allowance

Subtract total fuel load from the takeoff weight (43,500 - 8650) 34,850 lb

Calculate 5% of initial fuel load (8650 X .05) 430 lb

Add zero fuel weight (34,850 + 430) 35,280 lb

Using: (Nautical Miles per Pound of Fuel—Sea Level, figure 2A5-1)

Enter chart with weight of 35,280 lb

Follow weight line to intersection of long range line, then proceed horizontally to nautical miles per pound of fuel scale and read 0.231 n mi/lb

Proceed vertically to true airspeed 162 knots

Divide airspeed by n mi/lb (162 ÷ 0.231) 704 lb/hr

Allowance for 30 minutes holding (704 X 0.5) 352 lb

Note

This method is slightly conservative but sufficiently accurate for estimating purposes. A more accurate procedure would require using values based on an average weight as was done previously in cruise at long range.

The total of all fuel used thus far after takeoff, plus the reserve allowance is 7182 pounds. Thus, the total fuel load of 8650 pounds is ample for the mission with an added 1468 pounds for unaccounted emergencies, deviations from course, and other variations from flight plan.

LANDING

Landing Conditions

Field elevation pressure altitude 3000 ft

Outside air temperature 25 °C

Dew point 55 °F

Headwind 15 knots

Runway length 7500 ft

Landing weight (takeoff weight less fuel for mission, except total reserve)(43,500 - 6400) 37,100 lb

Determine Power Settings for Emergency Go-Around (if Necessary)

Using: (Maximum Wet Power Available, figure 2A2-1)

Enter chart with pressure altitude 3000 ft

Proceed vertically to CAT 25 °C

Read MAP Approx. 59 in. Hg

Proceed horizontally to dew point chart base line then parallel guide line to reported dew point corrected for altitude 55 °C

Then horizontally to minimum performance TPSI 120 psi

Also note:

Engine speed 2800 rpm

Blower speed LOW

Mixture position AUTO RICH

Determine Density Altitude at Destination

Using: (Density Altitude Chart, figure 2A1-1)

Density altitude 4800 ft

Determine the Approach and Landing Flap Positions

Note

Each approach flap setting has a corresponding landing flap setting. The approach flap setting is felt to be the more important of the two based on the possibility of a single-engine go-around.

Using: (Takeoff Gross Weight Limited by Climb, figure 2A3-3)

Use same procedure as that outlined in determining maximum allowable takeoff flap setting with 300 fpm desired rate of climb. Final selection of approach flap setting 6 °

Determine Approach and Go-Around Speeds

Using: (Approach and Landing Speed Chart, figure 2A6-1)

Enter chart with gross weight 37,100 lb

Proceed vertically to approach flap line 6 °

Proceed horizontally to approach speed line (1.3 stall) then vertically to read approach speed (IAS) 118 knots

Repeat procedure for 20° flap to find landing approach speed (IAS) 110 knots

and landing speed (1.2 stall) 102 knots

Using: (Takeoff and Minimum Control Speeds, figure 2A3-7)

Enter chart with gross weight 37, 100 lb

Proceed vertically to 1.2 stall speed line for 6° approach flap setting and then horizontally to read climb speed for go-around 111 knots

Determine Landing Ground Roll

Using: (Landing Ground Roll—20° flap, figure 2A6-4 and Stopping Capability, figure 2A6-7)

Enter chart with density altitude 4800 ft

Proceed horizontally to gross weight curve 37, 100 lb

Proceed vertically to base line at 0 headwind and parallel guide lines to reported headwind 15 knots

Proceed vertically to landing ground roll (dry, hard surface runway) 3250 ft

Landing distance from 50 ft altitude 3960 ft

To correct landing ground roll for unusual runway conditions, enter the Stopping Capability Chart (figure 2A6-7) with RCR (obtained from base weather) 12

Proceed vertically to curve then horizontally to the left to obtain stopping factor 1.38

Corrected landing ground roll = stopping factor X landing ground roll from figure 2A6-4 4485 ft

Summary of Approach and Landing Data

Engine speed 2800 rpm

Minimum performance TPSI 120 psi

MAP Approx. 59 in. Hg

Blower speed LOW

Mixture position AUTO RICH

Approach flap setting 6°

Approach speed (IAS) 118 knots

Landing flap setting 20°

Approach speed (IAS) 110 knots

Go-around speed with approach flaps (IAS) 111 knots







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