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PERFORMANCE

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SECTION 5
PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information applicable to the Cherokee Lance is provided by this section.

Performance information associated with those optional systems and equipment which require handbook supplements is provided by Section 9 (Supplements).

5.3 INTRODUCTION TO PERFORMANCE AND FLIGHT PLANNING

The performance information presented in this section is based on measured Flight Test Data corrected to I.C.A.O. standard day conditions and analytically expanded for the various parameters of weight, altitude, temperature, etc.

The performance charts are unfactored and do not make any allowance for varying degrees of pilot proficiency or mechanical deterioration of the aircraft. This performance, however, can be duplicated by following the stated procedures in a properly maintained airplane.

Effects of conditions not considered on the charts must be evaluated by the pilot, such as the effect of soft or grass runway surface on takeoff and landing performance, or the effect of winds aloft on cruise and range performance. Endurance can be grossly affected by improper leaning procedures, and inflight fuel flow and quantity checks are recommended.

REMEMBER! To get chart performance, follow the chart procedures.

The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using the performance charts in this section. Each chart includes its own example to show how it is used.

5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

The first step in planning our flight is to calculate the airplane weight and center of gravity by utilizing the information provided by Section 6 (Weight and Balance) of this handbook.

The basic empty weight for the airplane as delivered from the factory has been entered in Figure 6-5. If any alterations to the airplane have been made effecting weight and balance, reference to the aircraft logbook and Weight and Balance Record (Figure 6-7) should be made to determine the current basic empty weight of the airplane.

Make use of the Weight and Balance Loading Form (Figure 6-11) and the C.G. Range and Weight graph (Figure 6-15) to determine the total weight of the airplane and the center of gravity position.

After proper utilization of the information provided we have found the following weights for consideration in our flight planning example.

The landing weight cannot be determined until the weight of the fuel to be used has been established [refer to item (g)(1)].

(1) Basic Empty Weight	2100 lbs.
(2) Occupants (6 x 170 lbs)	1020 lbs.
(3) Baggage and Cargo	60 lbs.
(4) Fuel (6 lb/gal x 50)	300 lbs.
(5) Takeoff Weight	3480 lbs.
(6) Landing Weight (a)(5) minus (g)(1), (3480 lbs. minus 90 lbs.)	3390 lbs.

Our takeoff weight is below the maximum of 3600 lbs. and our weight and balance calculations have determined our C.G. position within the approved limits.

(b) Takeoff and Landing

Now that we have determined our aircraft loading, we must consider all aspects of our takeoff and landing.

All of the existing conditions at the departure and destination airport must be acquired, evaluated and maintained throughout the flight.

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Performance and Takeoff Ground Roll graph (Figures 5-7, 5-9, 5-11 and 5-13) to determine the length of runway necessary for the takeoff and/or the barrier distance.

The landing distance calculations are performed in the same manner using the existing conditions at the destination airport and, when established, the landing weight.

The conditions and calculations for our example flight are listed below. The takeoff and landing distances required for our example flight have fallen well below the available runway lengths.

	Departure Airport	Destination Airport
(1) Pressure Altitude	1200 ft.	400 ft.
(2) Temperature	60°F	75°F
(3) Wind Component	10 KTS	0 KTS
(4) Runway Length Available	3000 ft.	4600 ft.
(5) Runway Required	2240 ft.*	1680 ft.**

NOTE

The remainder of the performance charts used in this flight plan example assume a no wind condition. The effect of winds aloft must be considered by the pilot when computing climb, cruise and descent performance.

(c) Climb

The next step in our flight plan is to determine the necessary climb segment components.

The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the Fuel, Distance, and Time to Climb graph (Figure 5-19). After the fuel, distance and time for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to graph (Figure 5-19). Now, subtract the values obtained from the graph for the field of departure conditions from those for the cruise pressure altitude.

The remaining values are the true fuel, distance and time components for the climb segment of the flight plan corrected for field pressure altitude and temperature.

The following values were determined from the above instructions in our flight planning example.

(1) Cruise Pressure Altitude	6000 ft.
(2) Cruise OAT	42°F
(3) Time to Climb (8 min. minus 1.5 min.)	6.5 min.***
(4) Distance to Climb (14 nautical miles minus 3 nautical miles)	11 nautical miles ***
(5) Fuel to Climb (3.2 gal. minus 0.4 gal.)	2.8 gal.***

*reference Figure 5-13

**reference Figure 5-35

***reference Figure 5-19

(d) Descent

The descent data will be determined prior to the cruise data to provide the descent distance for establishing the total cruise distance.

Utilizing the cruise pressure altitude and OAT we determine the basic fuel, distance and time for descent (Figure 5-31). These figures must be adjusted for the field pressure altitude and temperature at the destination airport. To find the necessary adjustment values, use the existing pressure altitude and temperature conditions at the destination airport as variables to find the fuel, distance and time values from the graph (Figure 5-31). Now, subtract the values obtained from the field conditions from the values obtained from the cruise conditions to find the true fuel, distance and time values needed for the flight plan.

The values obtained by proper utilization of the graphs for the descent segment of our example are shown below.

(1) Time to Descend (12.5 min. minus 2.5 min.)	10 min.*
(2) Distance to Descend (33 nautical miles minus 7 nautical miles)	26 nautical miles*
(3) Fuel to Descend (4 gal. minus 1 gal.)	3 gal.*

(e) Cruise

Using the total distance to be traveled during the flight, subtract the previously calculated distance to climb and distance to descend to establish the total cruise distance. Refer to the appropriate Avco Lycoming Operator's Manual and the Power Setting Table (Figure 5-21) when selecting the cruise power setting. The established pressure altitude and temperature values and the selected cruise power should now be utilized to determine the true airspeed from the appropriate Speed Power graph (Figure 5-23 or 5-25).

Calculate the cruise fuel flow for the cruise power setting from the information provided by the Avco Lycoming Operator's Manual.

The cruise time is found by dividing the cruise distance by the cruise speed and the cruise fuel is found by multiplying the cruise fuel flow by the cruise time.

The cruise calculations established for the cruise segment of our flight planning example are as follows:

(1) Total Distance	130 nautical miles
(2) Cruise Distance	
(e)(1) minus (c)(4) minus (d)(2), (130 nautical miles minus 11 nautical miles minus 26 nautical miles)	93 nautical miles
(3) Cruise Power	65% rated power
(4) Cruise Speed	142 KTS TAS**
(5) Cruise Fuel	13.8 GPH
(6) Cruise Time	
(e)(2) divided by (e)(4), (93 nautical miles divided by 142 KTS)	.66 hrs. (40 min.)
(7) Cruise Fuel	
(e)(5) multiplied by (e)(6), (13.8 GPH multiplied by .66 hrs.)	9.11 gal.

*reference Figure 5-31

**reference Figure 5-25

(f) Total Flight Time

The total flight time is determined by adding the time to climb, the time to descend and the cruise time. Remember! The time values taken from the climb and descent graphs are in minutes and must be converted to hours before adding them to the cruise time.

The following flight time is required for our flight planning example.

(1) Total Flight Time

(c)(3) plus (d)(1) plus (e)(6), (.11 hrs. plus .17 hrs. plus .66 hrs.)	56.5 min.
(6.5 min. plus 10 min. plus 40 min.)	

(g) Total Fuel Required

Determine the total fuel required by adding the fuel to climb, the fuel to descend and the cruise fuel. When the total fuel (in gallons) is determined, multiply this value by 6 lb/gal to determine the total fuel weight used for the flight.

The total fuel calculations for our example flight plan are shown below.

(1) Total Fuel Required

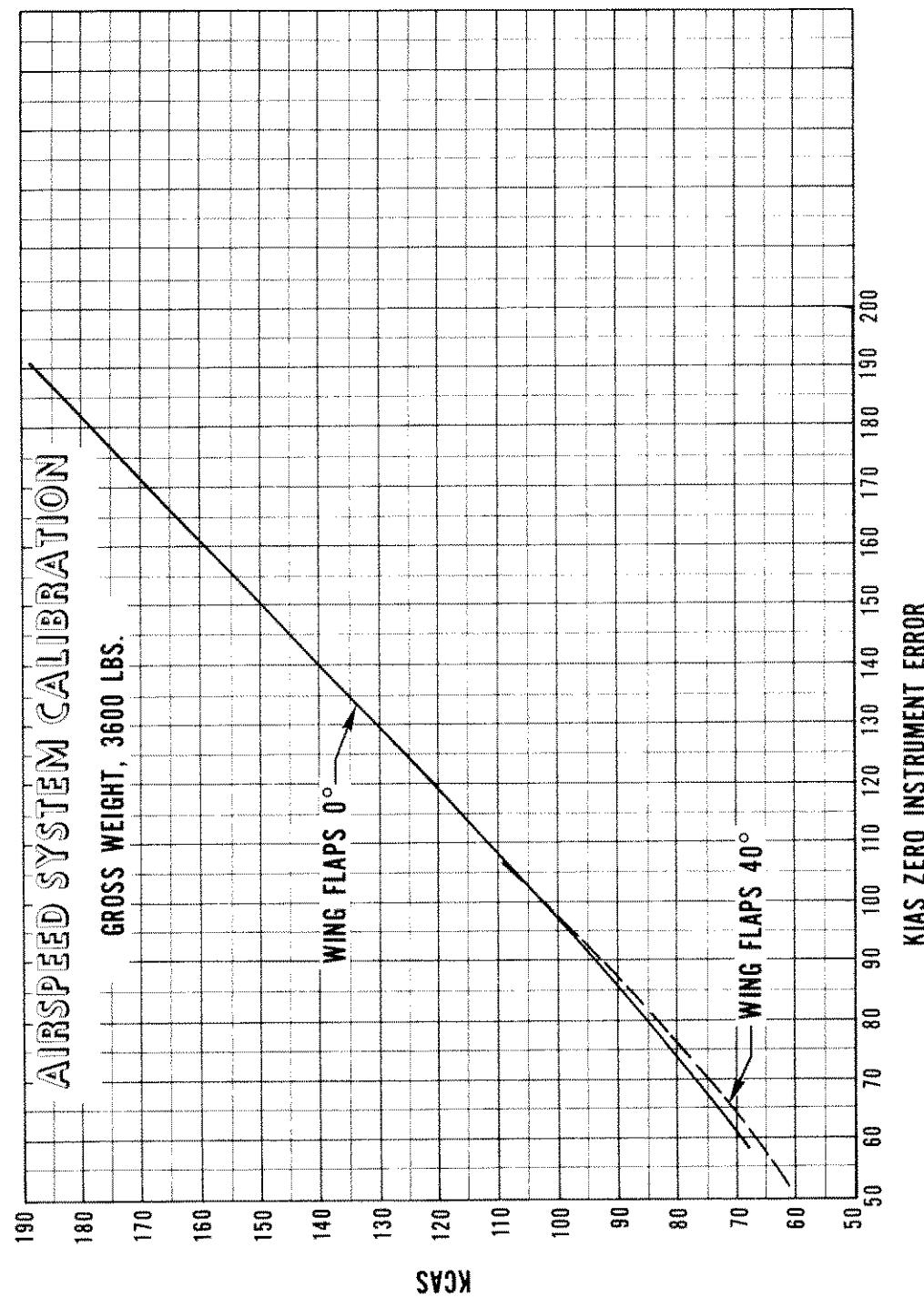
(c)(5) plus (d)(3) plus (e)(7), (2.8 gal. plus 3.0 gal. plus 9.11 gal.)	14.91 gal.
14.91 gal. multiplied by 6 lb/gal.)	90 lbs.

5.7 PERFORMANCE GRAPHS

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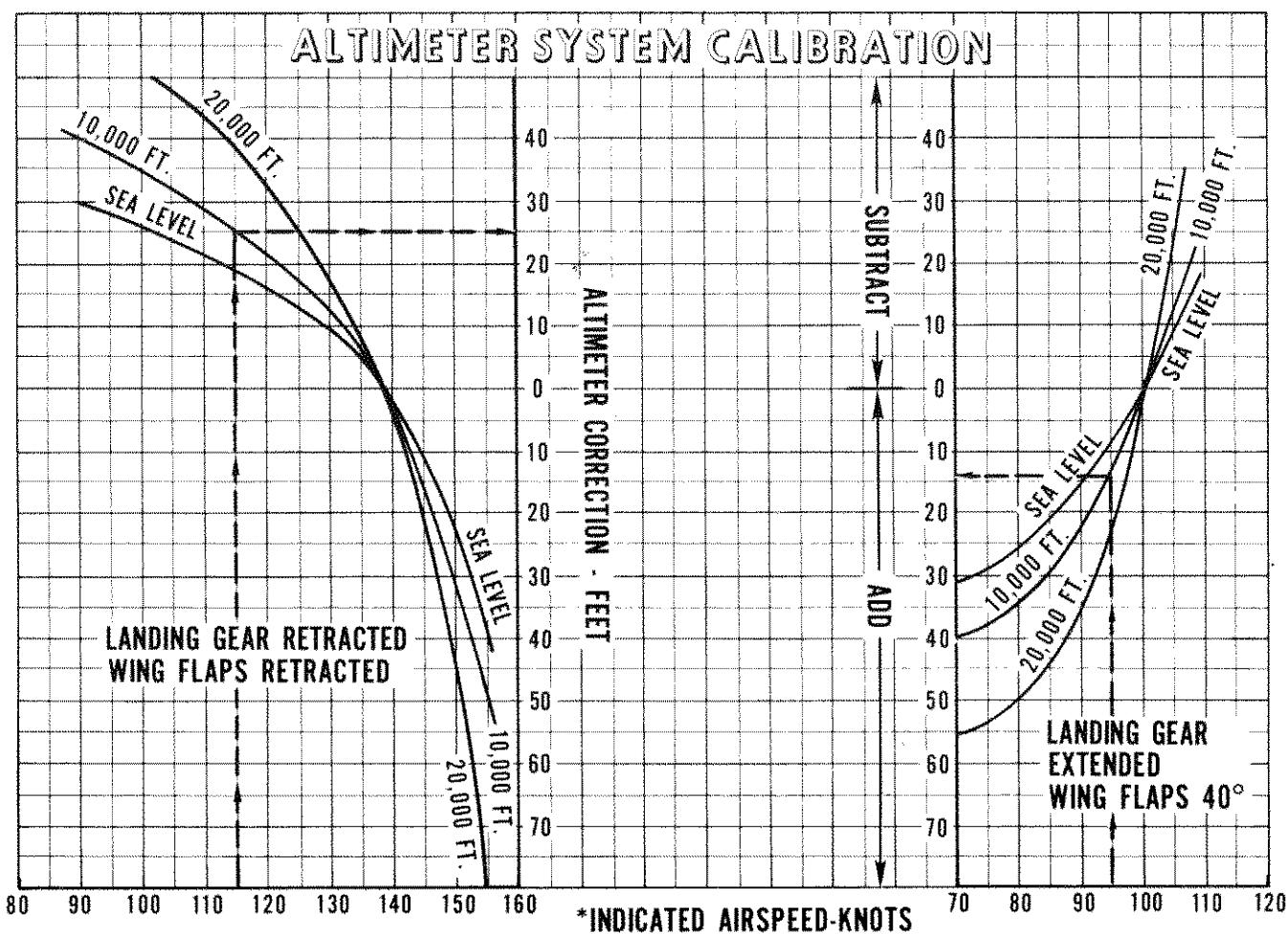
PA-32R-300



AIRSPEED SYSTEM CALIBRATION

Figure 5-1

PA-32R-300



*INDICATED AIRSPEED WITH NO INDICATOR ERROR.

Example:

Landing gear and flaps retracted
Indicated airspeed: 115 KIAS
Pressure altitude: 10,000 ft.
Altimeter correction: Subtract 25 ft.

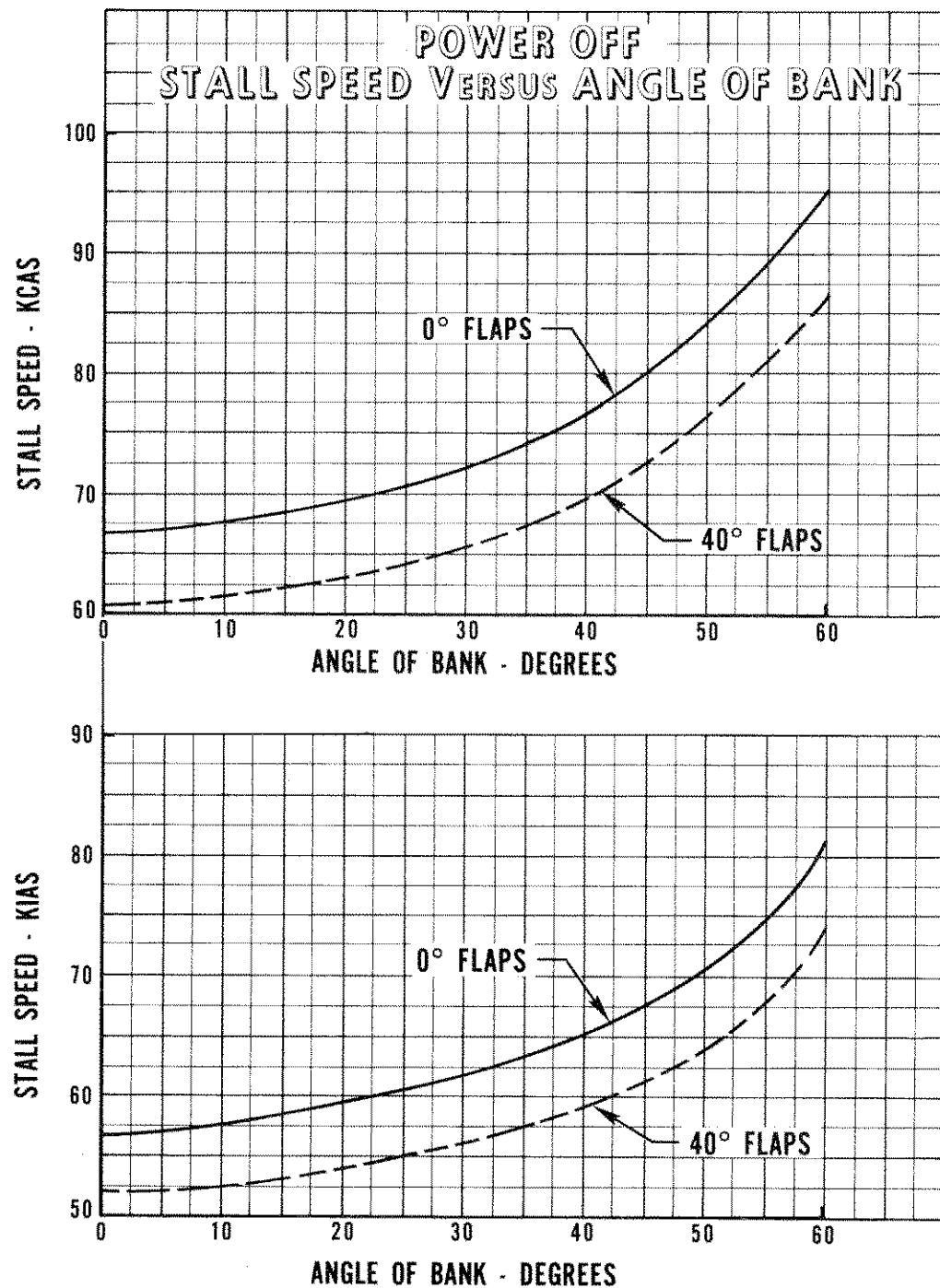
Example:

Landing gear extended, wing flaps 40°
Indicated airspeed: 95 KIAS
Pressure altitude: 10,000 ft.
Altimeter correction: Add 14 ft.

ALTIMETER SYSTEM CALIBRATION

Figure 5-3

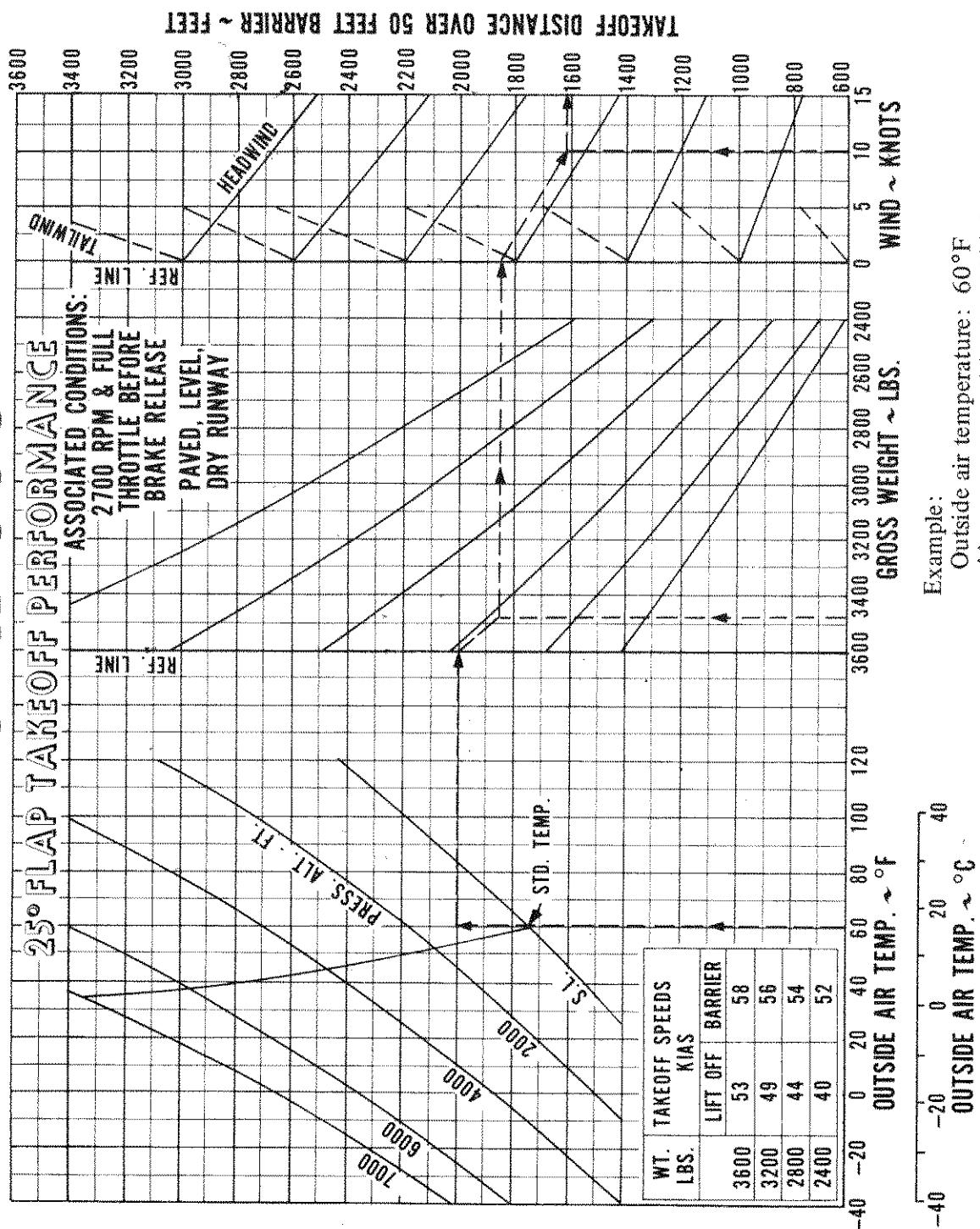
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STALL SPEEDS

Figure 5-5

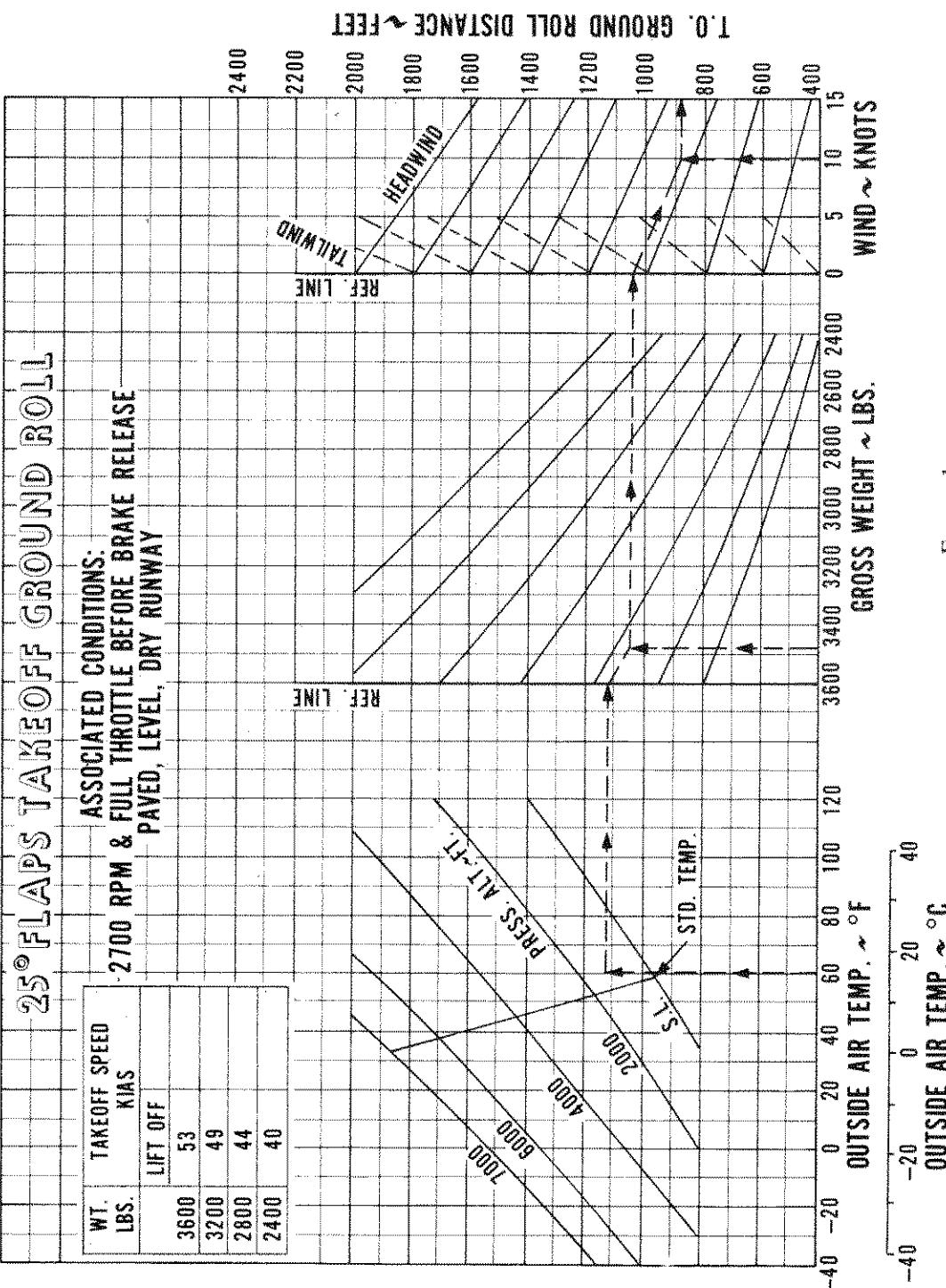
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25° FLAPS TAKEOFF PERFORMANCE

Figure 5-7

PA-32R-300



Example:

Outside air temperature: 60°F

Airport pressure altitude: 1200 ft.

Gross weight: 3480 lbs.

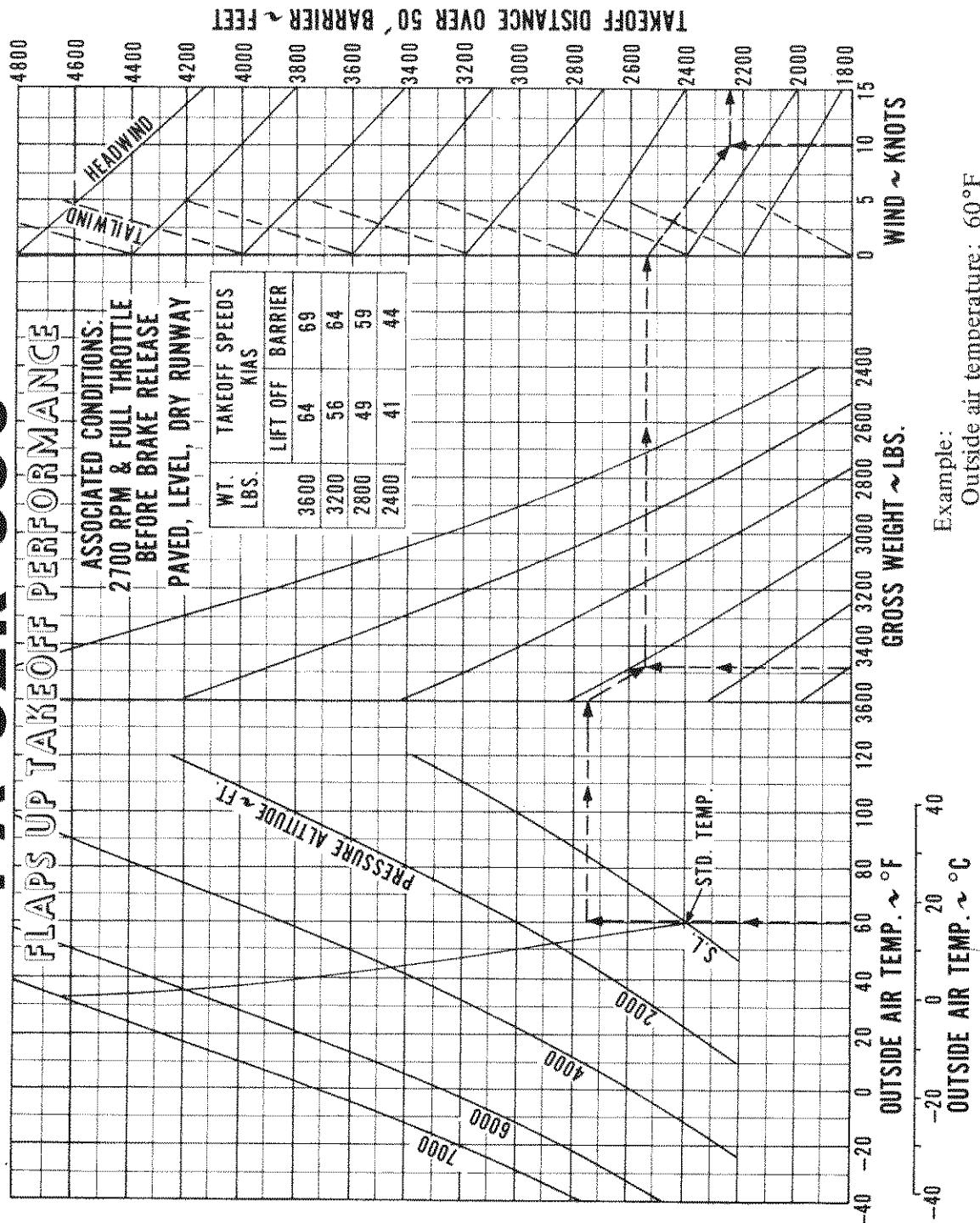
Wind component: 10 knots headwind

Takeoff ground roll distance: 880 ft.

25° FLAPS TAKEOFF GROUND ROLL

Figure 5-9

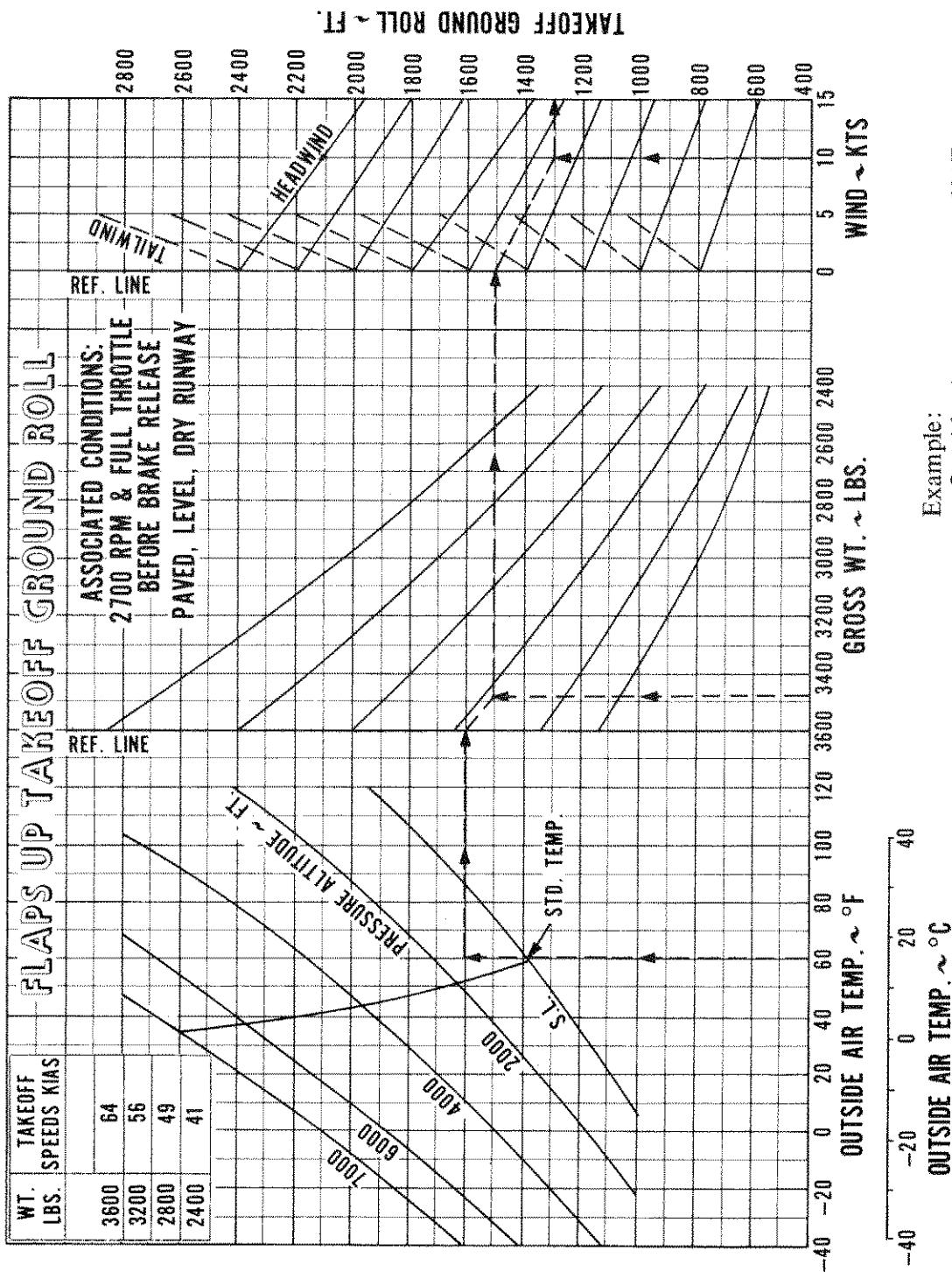
PA-32R-300



FLAPS UP TAKEOFF PERFORMANCE

Figure 5-11

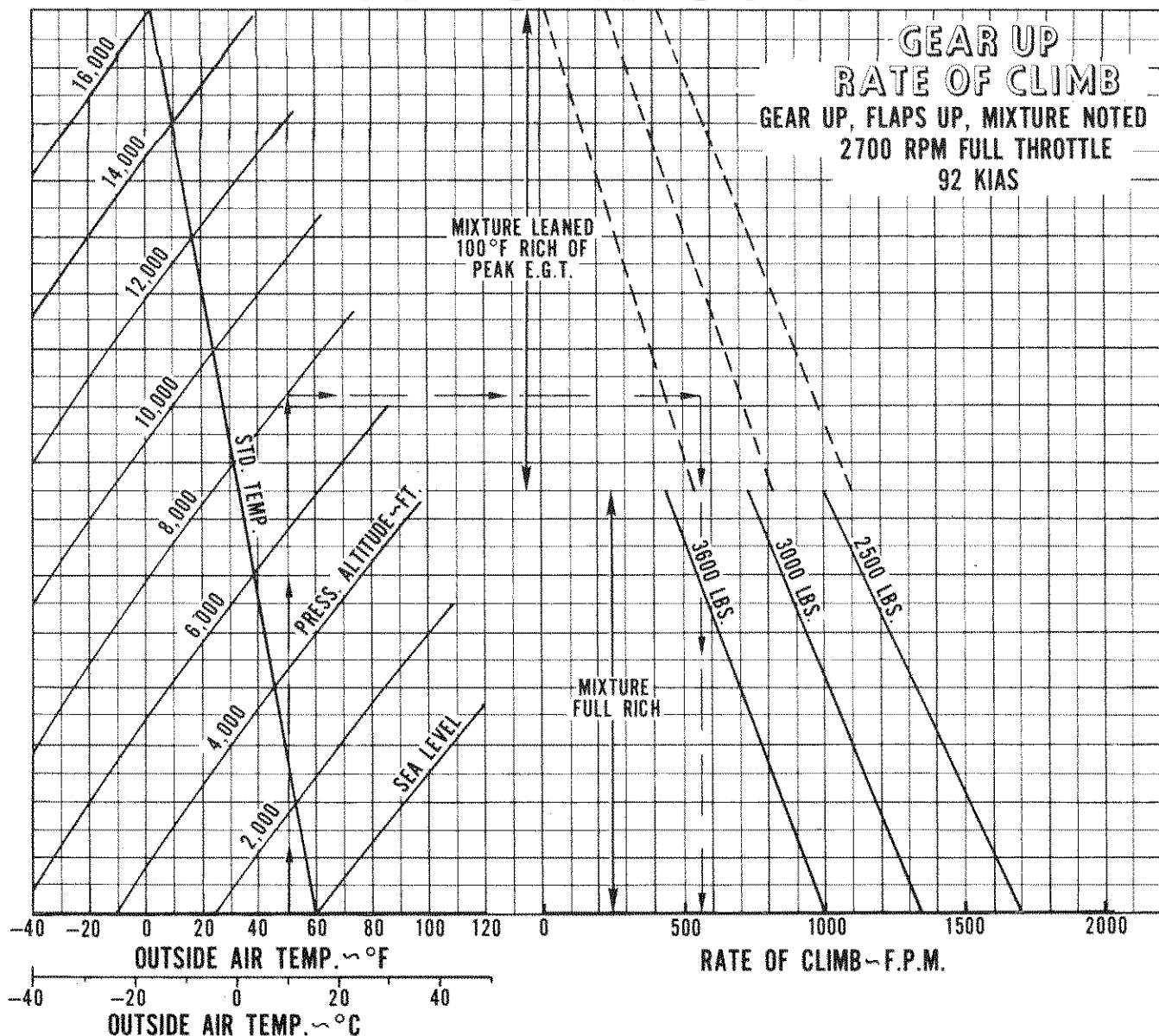
PA-32R-300



FLAPS UP TAKEOFF GROUND ROLL

Figure 5-13

PA-32R-300



Example:

Climb pressure altitude: 8000 ft.

Outside air temperature: 50°F

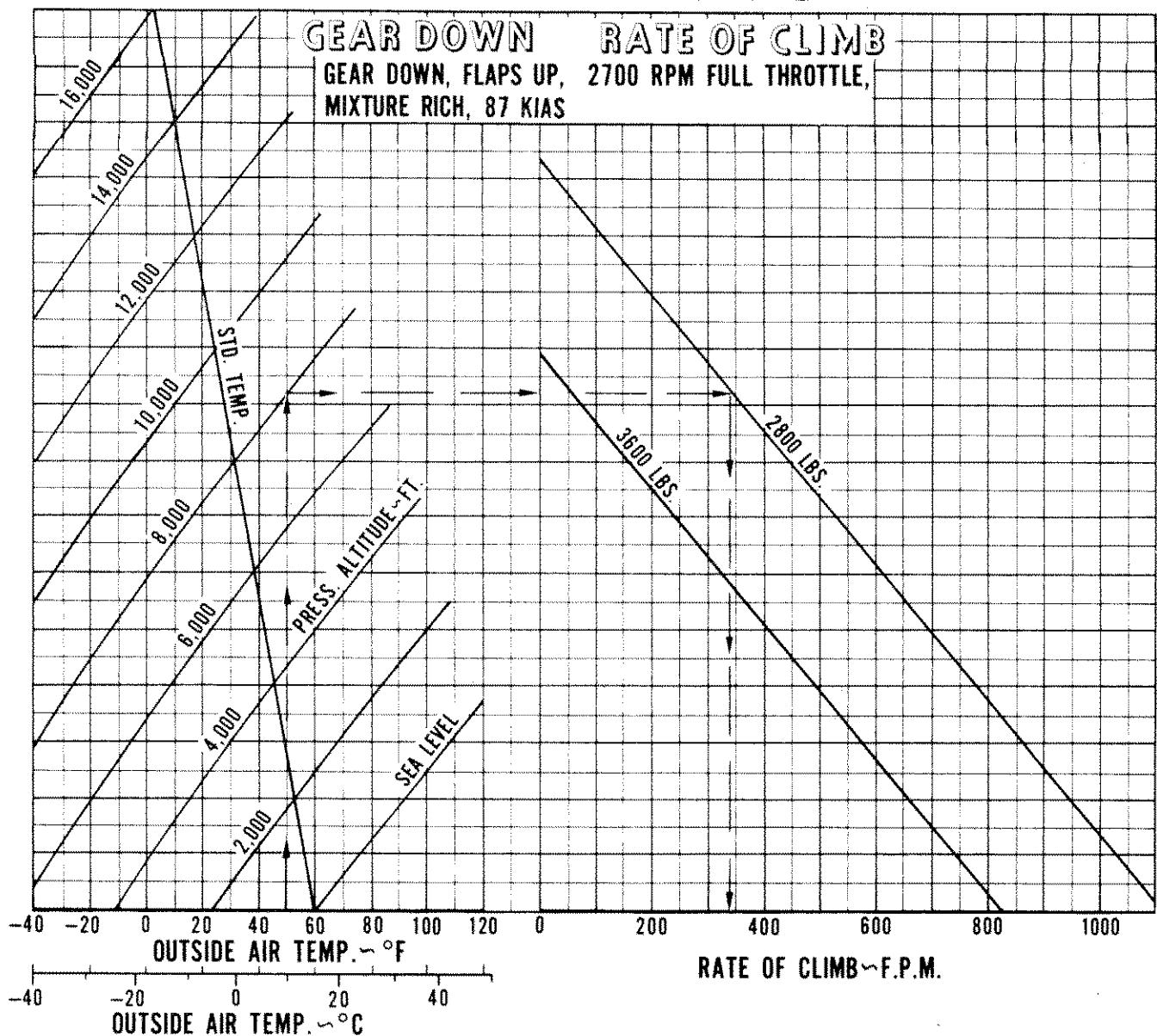
Gross weight: 3400 lbs.

Rate of climb: 570 F.P.M.

GEAR UP RATE OF CLIMB

Figure 5-15

PA-32R-300



Example:

Climb pressure altitude: 8000 ft.
Outside air temperature: 50°F
Gross weight: 2800 lbs.
Rate of climb: 340 F.P.M.

GEAR DOWN RATE OF CLIMB

Figure 5-17

PA-32R-300

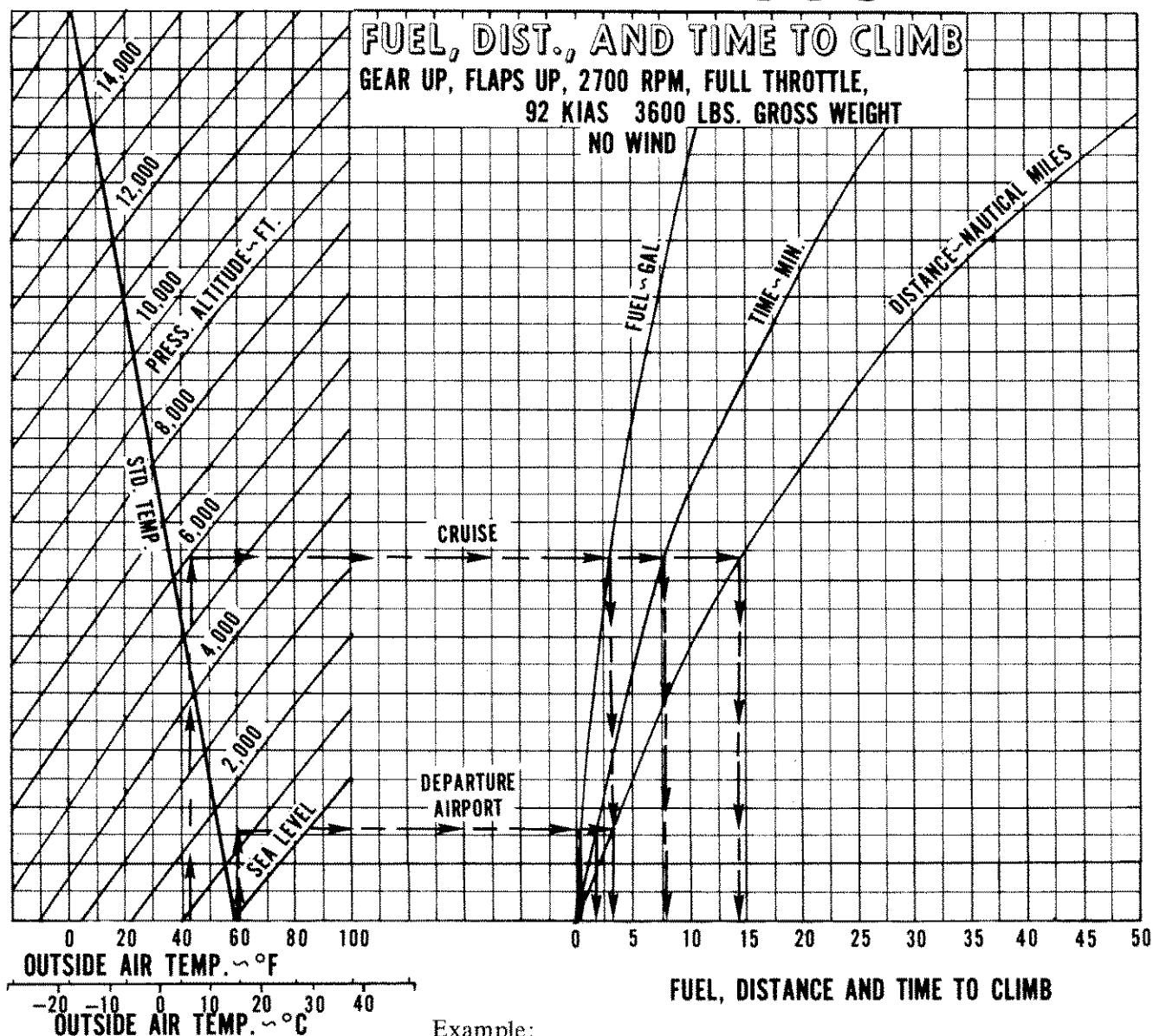


Figure 5-19

POWER SETTING TABLE - LYCOMING MODEL IO-540-K, -L, -M SERIES, 300 HP ENGINE

Press. Alt Feet	Std Alt Temp °F	135 HP - 45% RATED RPM AND MAN. PRESS.			165 HP - 55% Rated RPM AND MAN. PRESS.			195 HP - 65% Rated RPM AND MAN. PRESS.			225 HP - 75% Rated RPM AND MAN. PRESS.		
		2100	2200	2300	2400	2100	2200	2300	2400	2100	2200	2300	2400
SL	59	19.0	18.5	18.0	17.6	22.5	21.8	21.2	20.7	25.6	24.7	23.8	23.2
1,000	55	18.8	18.3	17.8	17.4	22.3	21.6	21.0	20.5	25.3	24.4	23.5	22.9
2,000	52	18.6	18.1	17.6	17.2	22.1	21.4	20.7	20.2	25.1	24.2	23.3	22.7
3,000	48	18.4	17.9	17.4	17.0	21.9	21.2	20.5	20.0	24.8	23.9	23.0	22.5
4,000	45	18.25	17.75	17.2	16.8	21.7	21.0	20.3	19.8	24.6	23.7	22.8	22.2
5,000	41	18.1	17.6	17.0	16.6	21.5	20.8	20.1	19.6	24.3	23.5	22.5	22.0
6,000	38	17.9	17.4	16.8	16.4	21.3	20.6	19.8	19.3	24.0	23.2	22.3	21.7
7,000	34	17.7	17.2	16.6	16.25	21.0	20.4	19.6	19.1	23.7	22.9	22.0	21.5
8,000	31	17.5	17.0	16.5	16.1	20.8	20.2	19.4	18.9	—	22.5	21.8	21.2
9,000	27	17.3	16.8	16.3	15.9	20.6	20.0	19.2	18.6	—	21.5	21.0	—
10,000	23	17.1	16.6	16.1	15.75	20.4	19.8	19.0	18.4	—	21.2	20.7	—
11,000	19	16.9	16.4	15.9	15.6	20.2	19.6	18.7	18.2	—	—	—	20.4
12,000	16	16.75	16.25	15.75	15.4	20.0	19.4	18.5	18.0	—	—	—	—
13,000	12	16.6	16.0	15.6	15.2	—	19.2	18.3	17.7	—	—	—	—
14,000	9	16.4	15.8	15.4	15.0	—	—	18.0	17.3	—	—	—	—
15,000	5	16.2	15.7	15.2	14.8	—	—	—	16.9	—	—	—	—

POWER SETTING TABLE

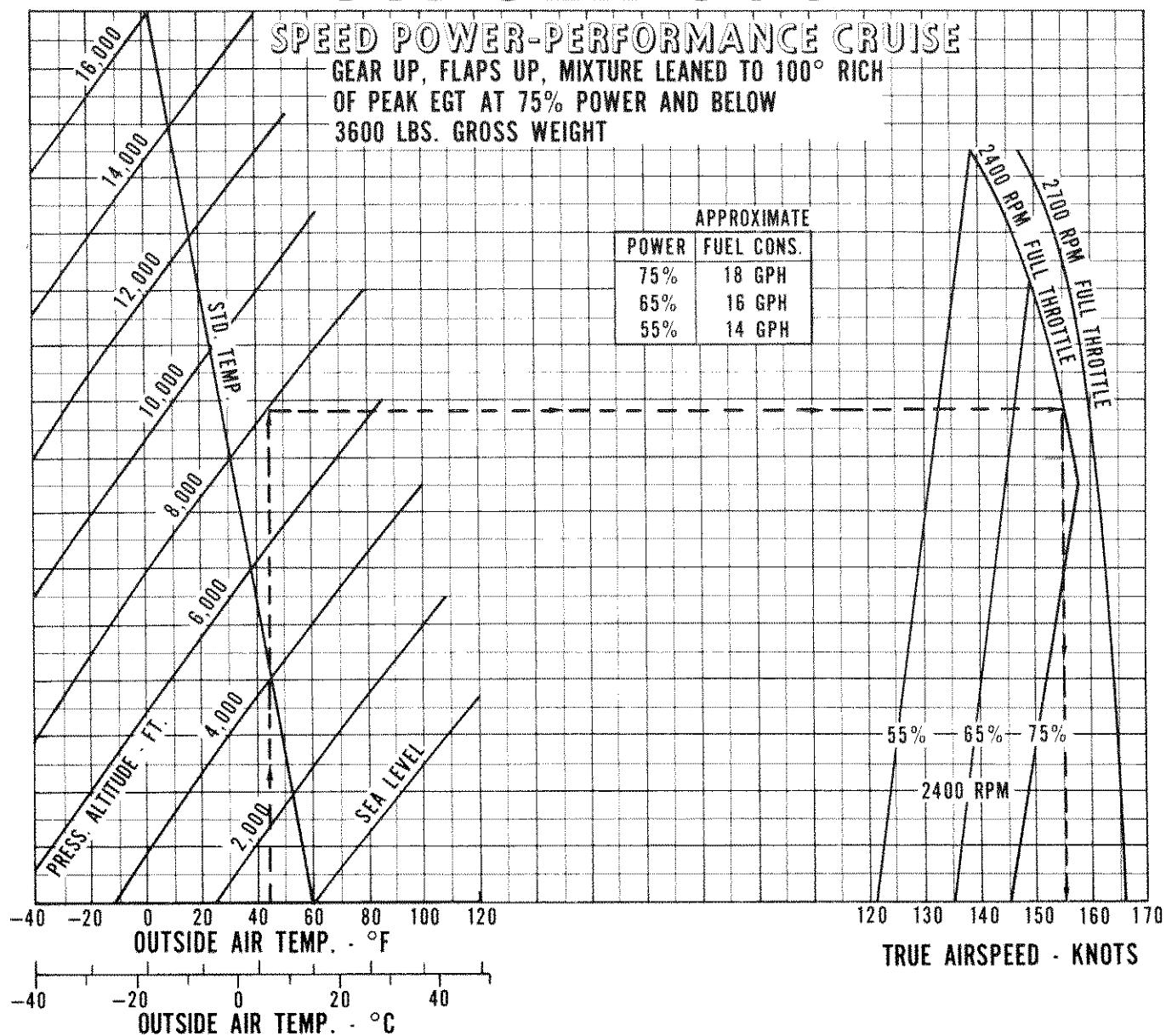
Figure 5-21

ISSUED: AUGUST 20, 1976

REPORT: VB-840

To maintain constant power, correct manifold pressure approximately 0.18" Hg for each 10°F variation in induction air temperature from standard altitude temperature. Add manifold pressure for air temperature above standard; subtract for temperature below standard.

PA-32R-300



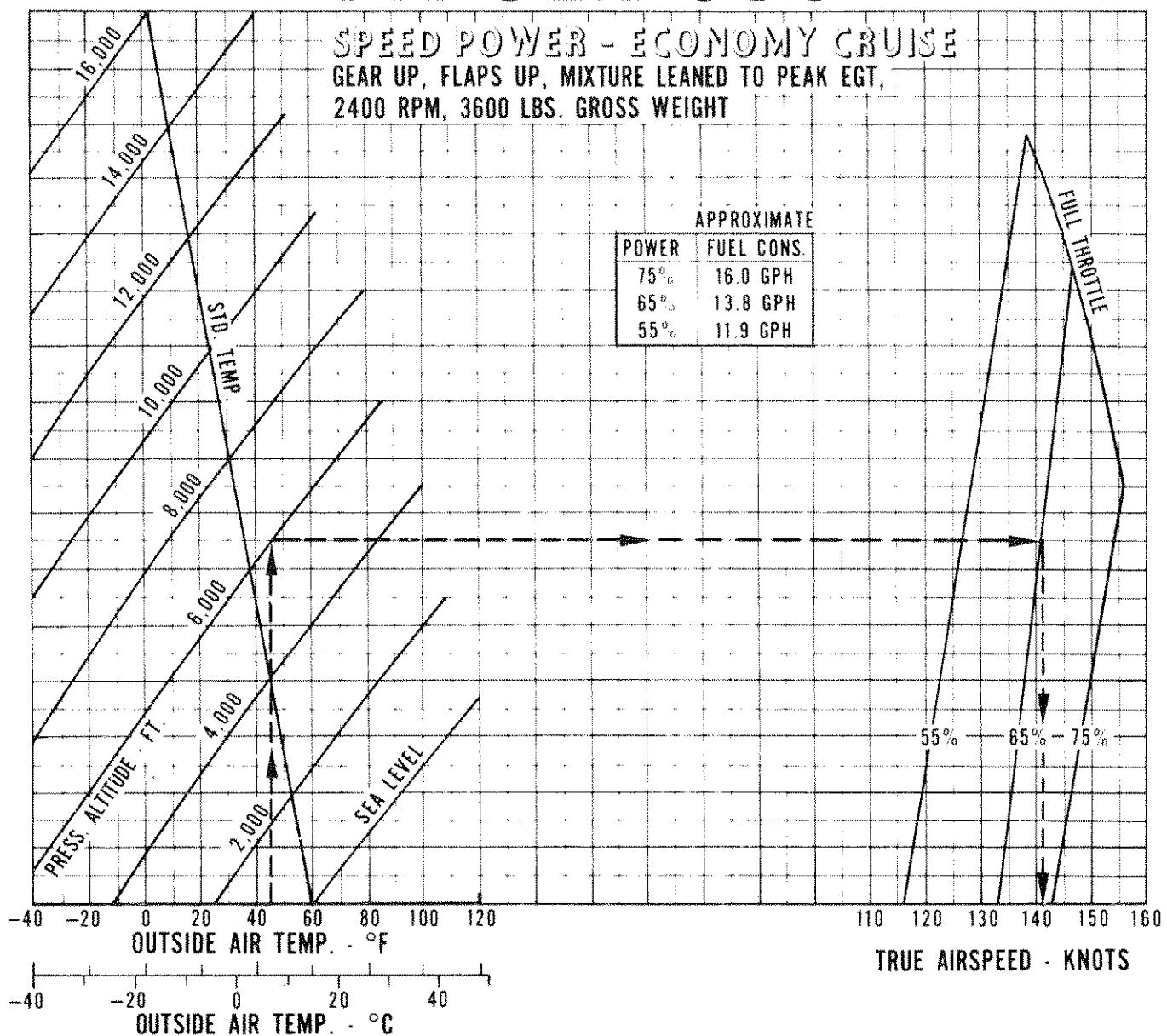
Example:

Cruise pressure altitude: 8000 ft.
Cruise OAT: 42°F
Power: Full throttle, 2400 RPM
True airspeed: 155 knots

SPEED POWER - PERFORMANCE CRUISE

Figure 5-23

PA-32R-300



Example:

Cruise pressure altitude: 6000 ft.

Cruise OAT: 42°F

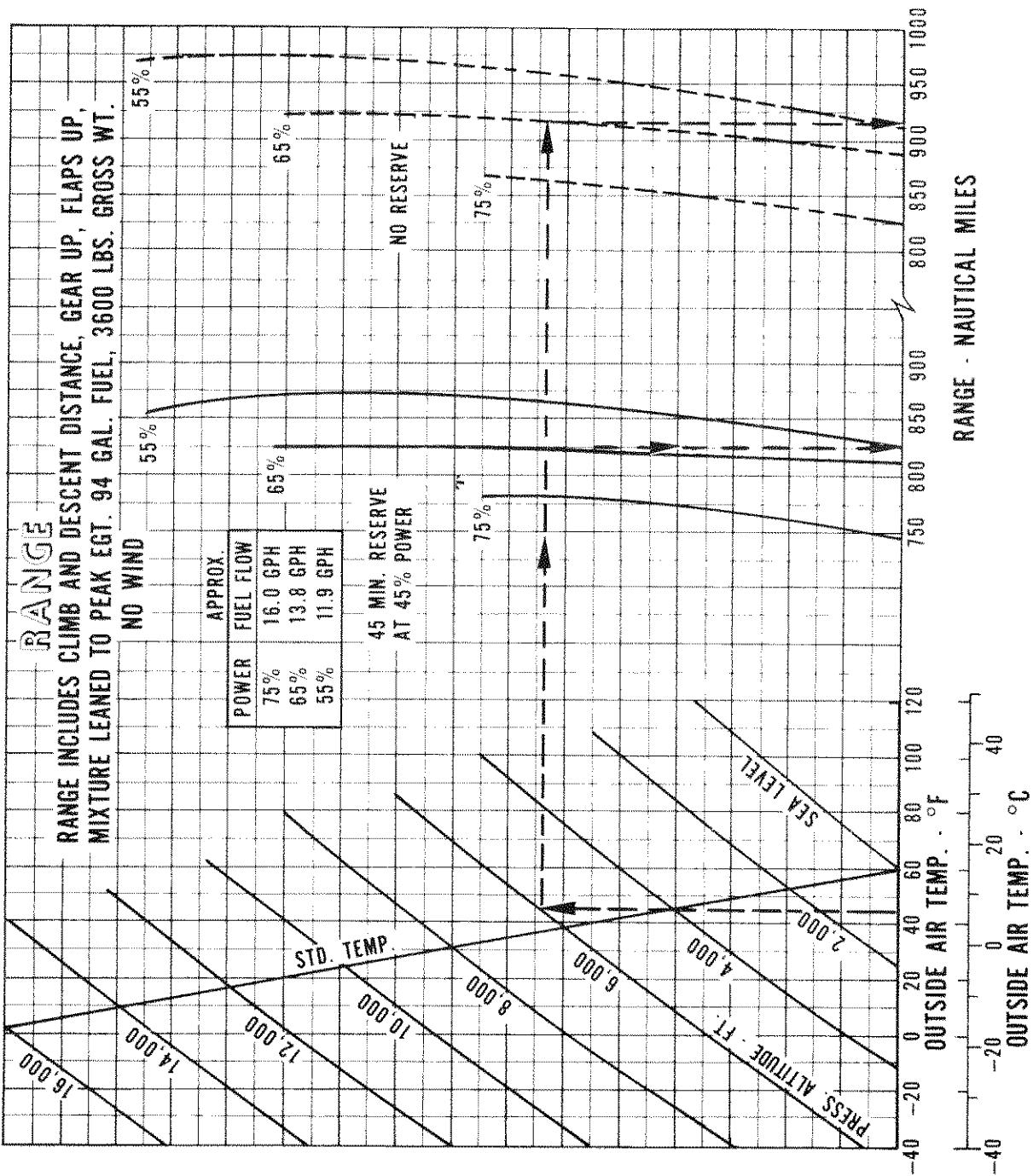
Power: 65%

True airspeed: 142 knots

SPEED POWER - ECONOMY CRUISE

Figure 5-25

PA-32R-300



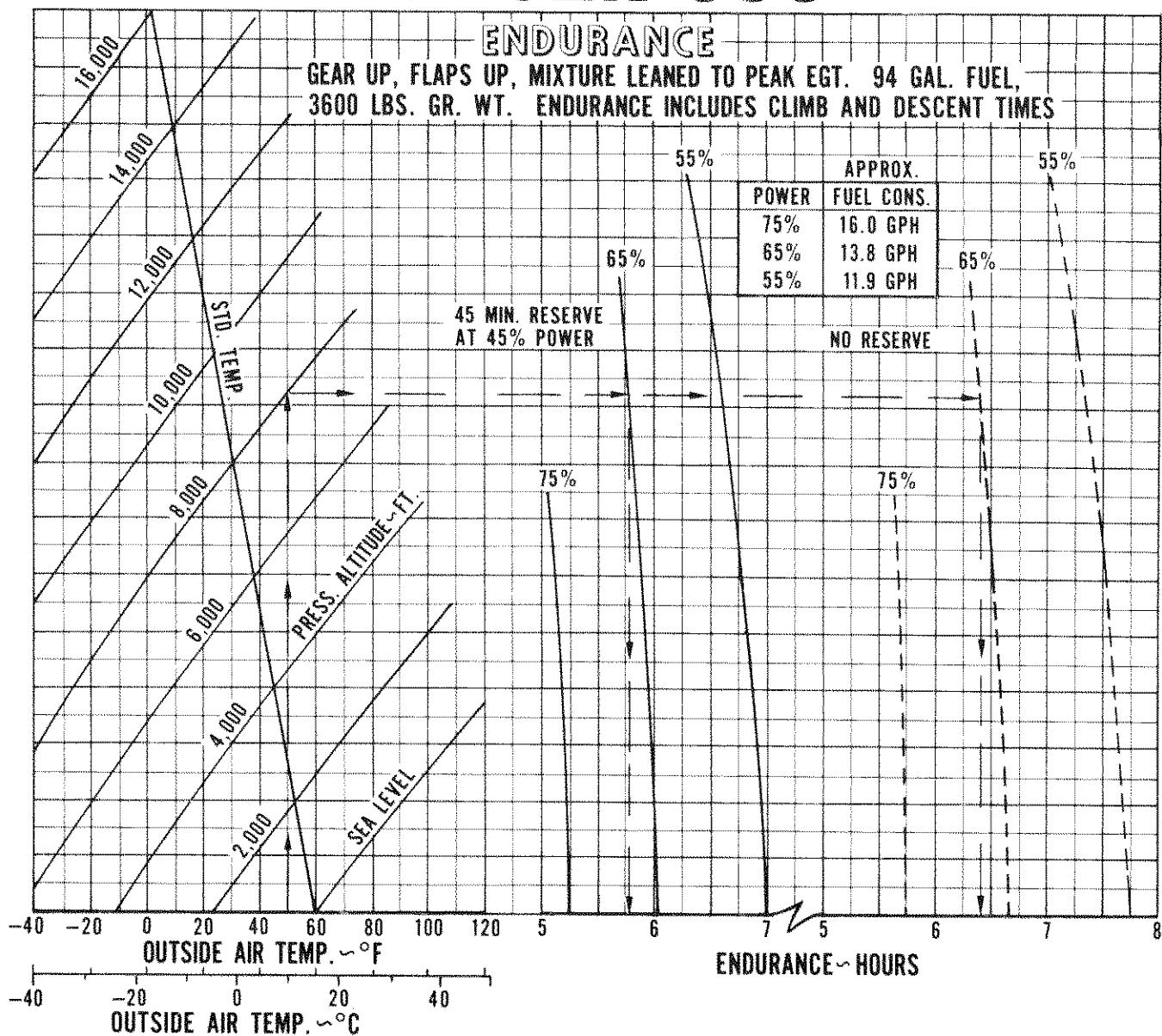
Example:

Cruise pressure altitude: 6000 ft.
Cruise OAT: 42°F
Power: 65%
Range (with reserve): 825 nautical miles
Range (no reserve): 915 nautical miles

RANGE

Figure 5-27

PA-32R-300



Example:

Cruise pressure altitude: 8000 ft.

Cruise OAT: 50°F

Power: 65%

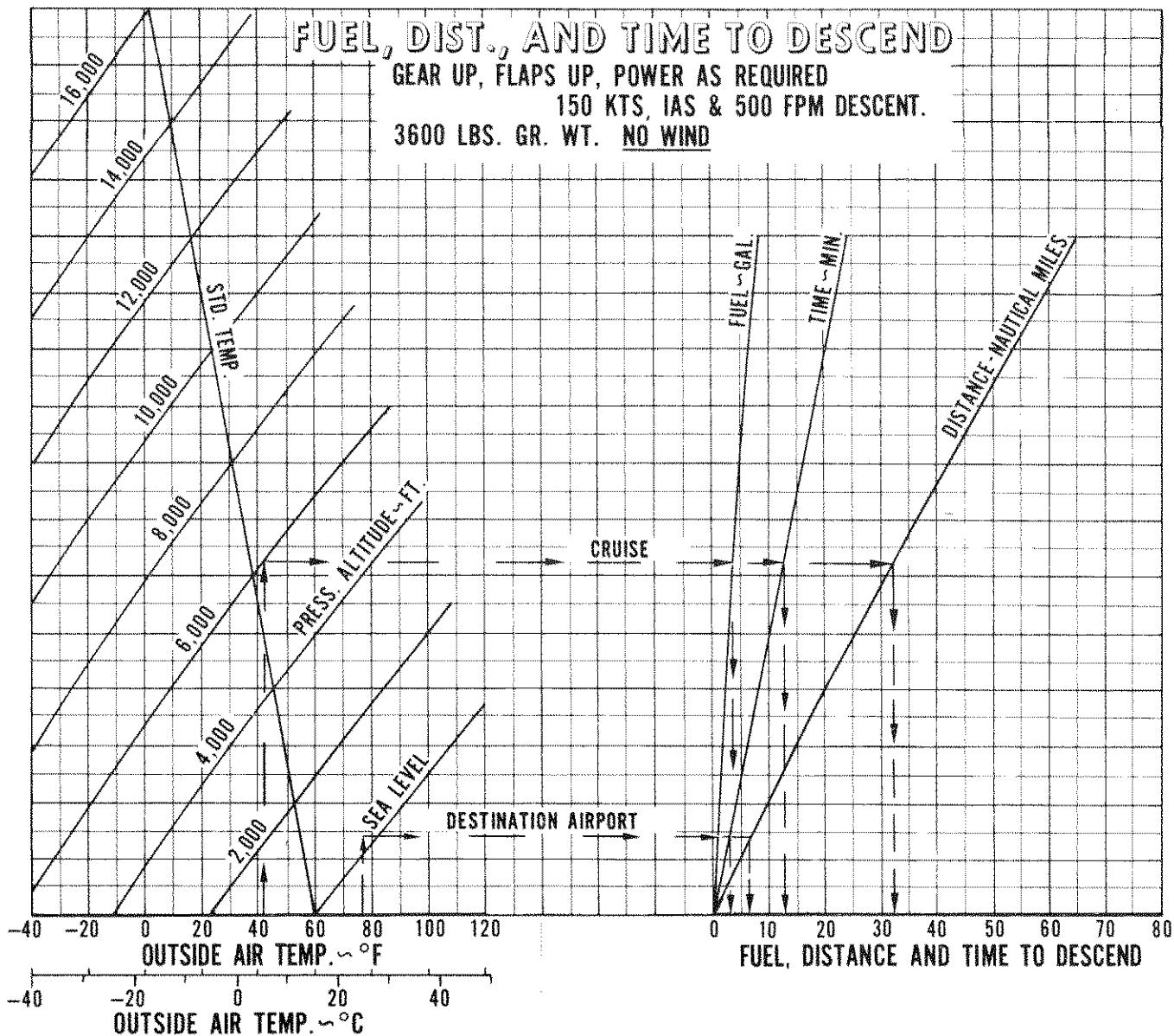
Endurance (with reserve): 5.8 hours

Endurance (no reserve): 6.4 hours

ENDURANCE

Figure 5-29

PA-32R-300



Example:

Cruise pressure altitude: 6000 ft.

Cruise OAT: 42°F

Destination airport pressure altitude: 400 ft.

Destination airport temperature: 75°F

Fuel to descend (4 gal. minus 1 gal.) = 3 gal.

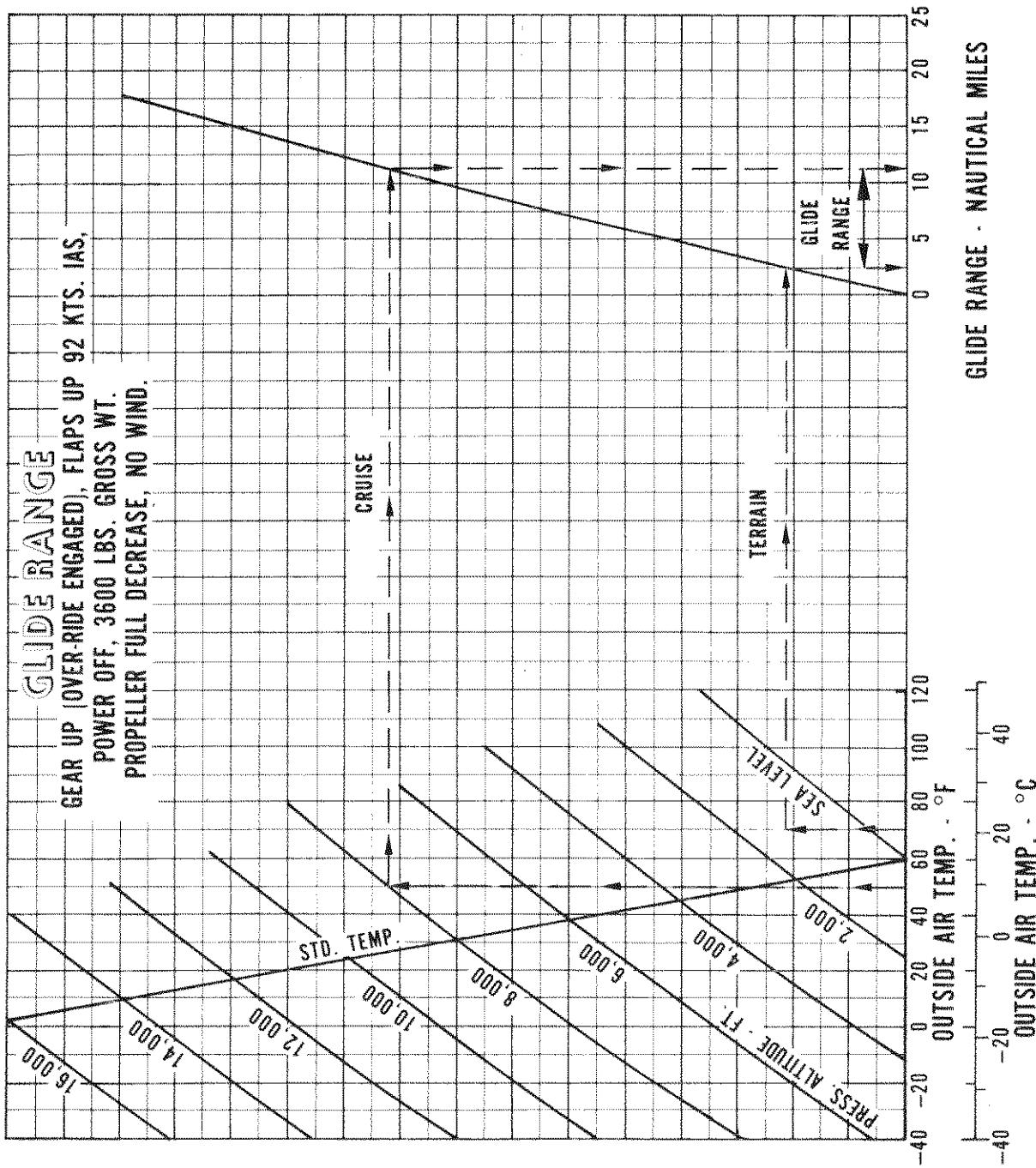
Time to descend (12.5 min. minus 2.5 min.) = 10 min.

Distance to descend (33 nautical miles minus 7 nautical miles) = 26 nautical miles

FUEL, DISTANCE AND TIME TO DESCEND

Figure 5-31

PA-32R-300



Example:

Cruise pressure altitude: 8000 ft.

Cruise OAT: 50°F

Terrain pressure altitude: 1200 ft.

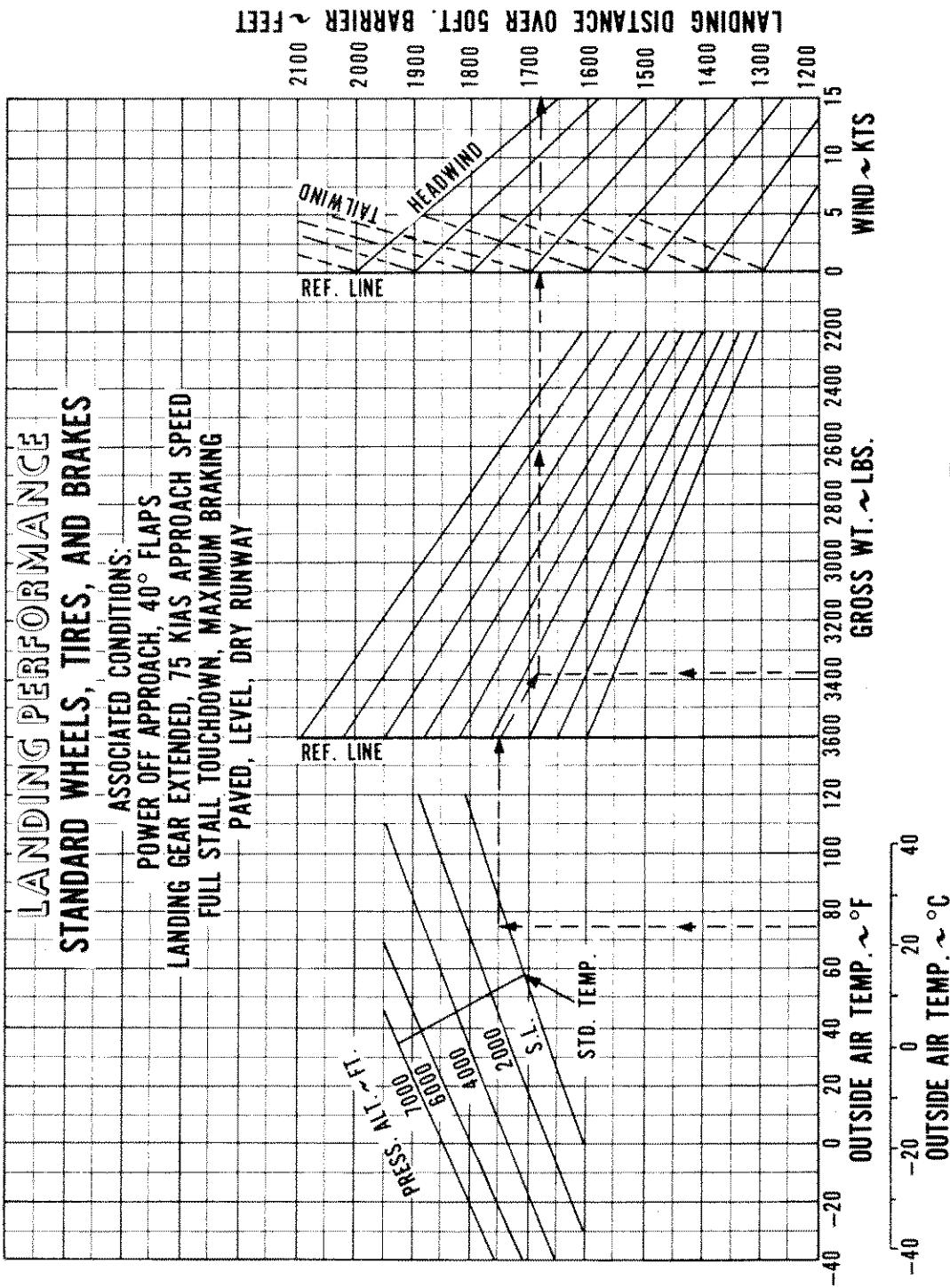
Terrain temperature: 70°F

Glide Range: (11 nautical miles minus 2.5 nautical miles) = 8.5 nautical miles

GLIDE RANGE

Figure 5-33

PA-32R-300



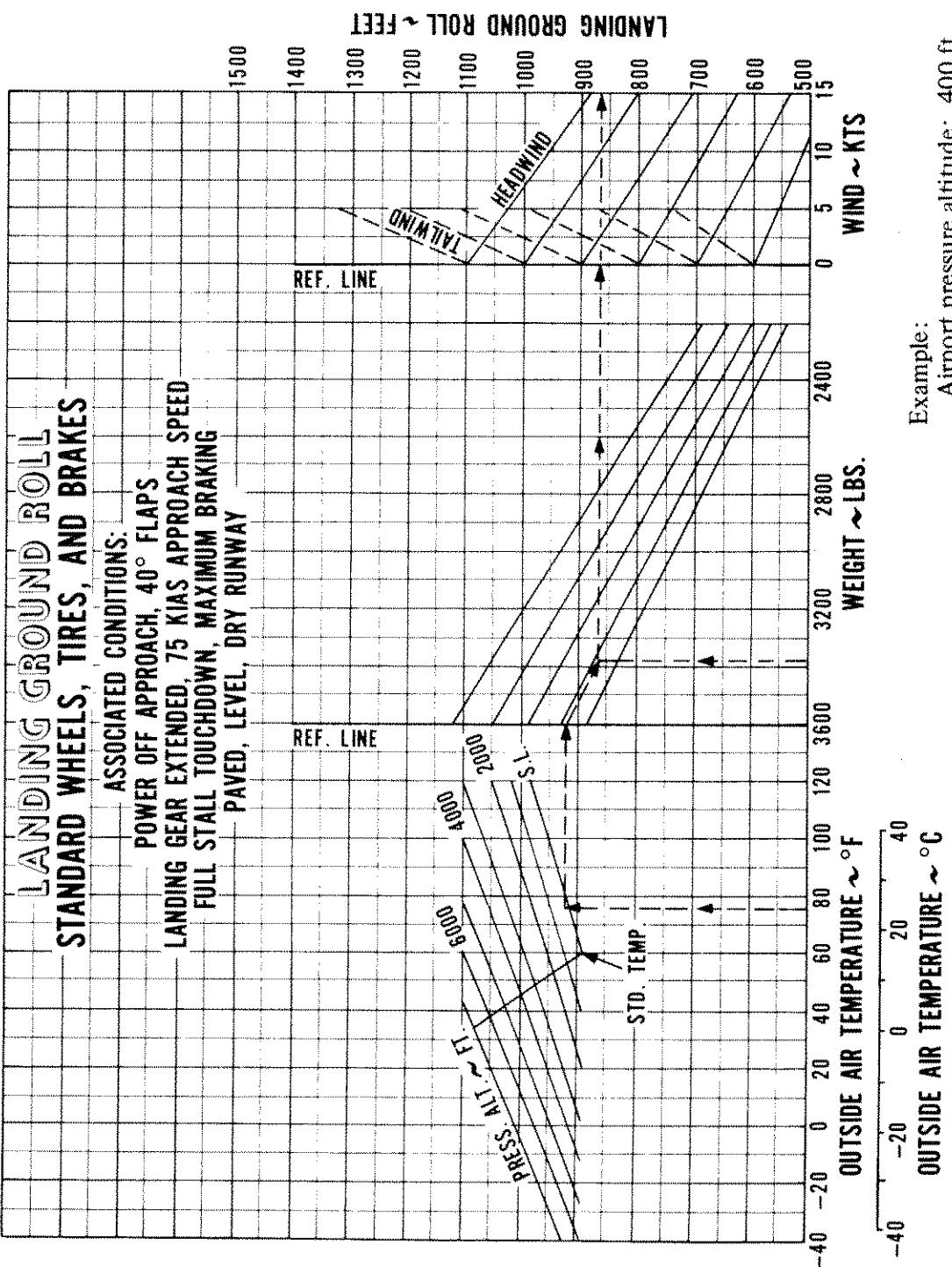
Example:

Airport pressure altitude: 400 ft.
Temperature: 75°F
Gross weight: 3390 lbs.
Wind component: 0 knots
Landing distance over 50' barrier: 1680 ft.

LANDING PERFORMANCE

Figure 5-35

PA-32R-300



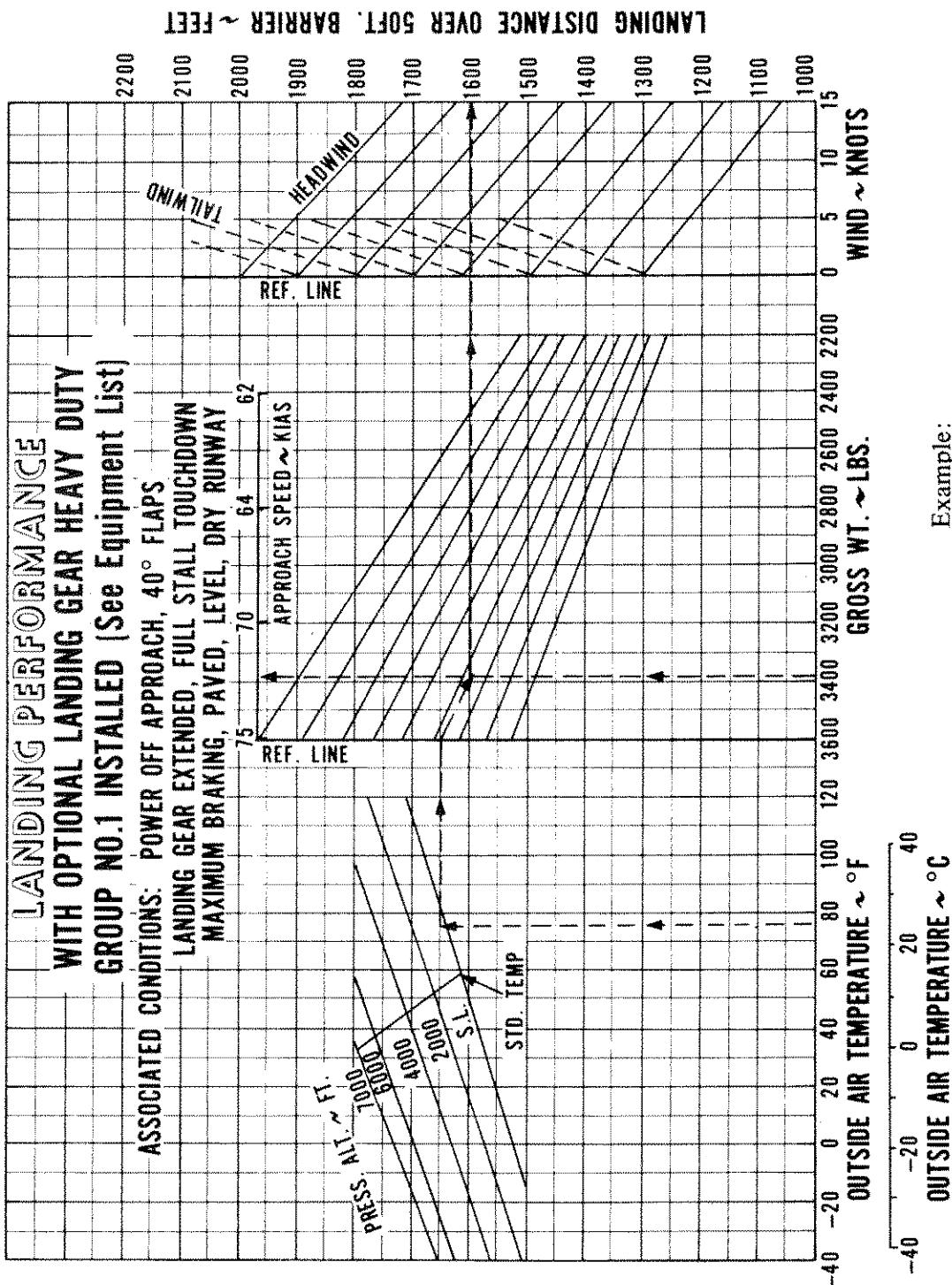
LANDING GROUND ROLL

Figure 5-37

PA-32R-300

LANDING PERFORMANCE WITH OPTIONAL LANDING GEAR HEAVY DUTY GROUP NO.1 INSTALLED [See Equipment List]

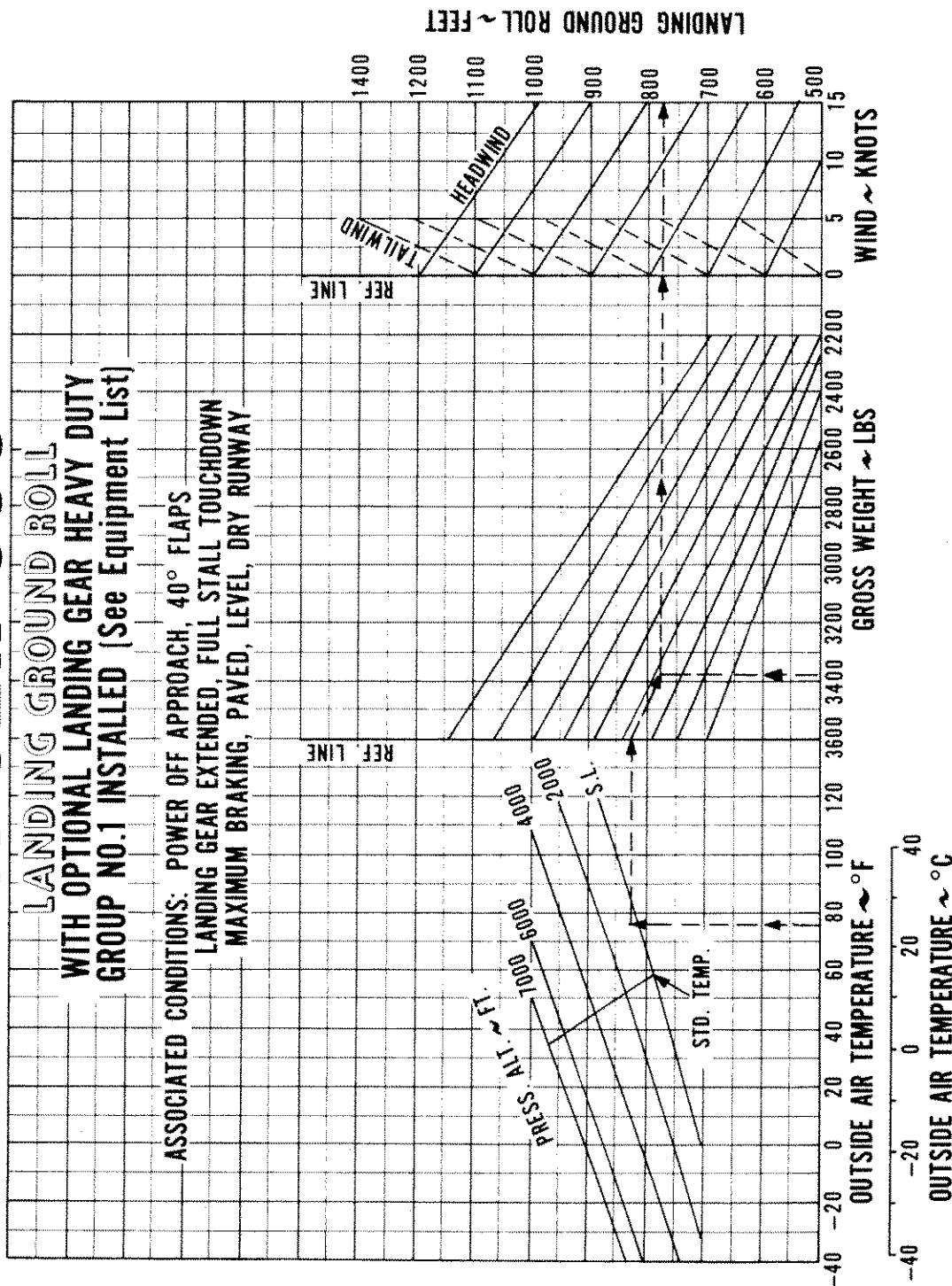
ASSOCIATED CONDITIONS: POWER OFF APPROACH, 40° FLAPS
LANDING GEAR EXTENDED, FULL STALL TOUCHDOWN
MAXIMUM BRAKING, PAVED, LEVEL, DRY RUNWAY



LANDING PERFORMANCE (HEAVY DUTY GROUP)

Figure 5-39

PA-32R-300



Example:
Airport pressure altitude: 400 ft.
Temperature: 75°F
Gross weight: 3390 lbs.
Ground roll: 780 ft.

LANDING GROUND ROLL (HEAVY DUTY GROUP)

Figure 5-41