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SECTION 5

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 Archer II 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.

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5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

The first step in planning the 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 licensed at the factory has been enter 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 the 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	1412 lbs.
(2)	Occupants (2 x 170 lbs.)	340 lbs.
(3)	Baggage and Cargo	360 lbs.
(4)	Fuel (6 lb/gal x 48)	288 lbs.
(5)	Takeoff Weight	2400 lbs.
(6)	Landing Weight (a)(5) minus (g)(1), (2400 lbs. minus 135 lbs.)	2265 lbs.

Our takeoff weight is below the maximum of 2550 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 graph (Figure 5-5 or 5-7), 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 the example flight are listed below. The takeoff and landing distances required for the example flight have fallen well below the available runway lengths.

		Departure Airport	Destination Airport
(1)	Pressure Altitude	2000 ft.	2300 ft.
(2)	Temperature	70°F	70°F
(3)	Wind Component	8 KTS	5 KTS
(4)	Runway Length Available	7000 ft.	4500 ft.
(5)	Runway Required	1860 ft.*	1290**

NOTE

The remainder of the performance charts used in this flight plan example assume 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 flight planning is to determine the necessary climb segment components.

The desired cruise altitude and corresponding cruise temperature values are the first variables to be considered in determining the climb components from the Time, Distance, and Fuel to Climb graph (Figure 5-11). After the time, distance and fuel for the cruise altitude and temperature values have been established, apply the existing conditions at the departure field to graph (Figure 5-11) Now, subtract the values obtained from the graph for the field of departure conditions from those for the cruise elevation.

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

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

(1)	Cruise Altitude	6000 ft.
(2)	Cruise Altitude Temperature	55°F
(3)	Time to Climb (12.5 min. minus 4.5 min.)	8 min.***
(4)	Distance to Climb (20.5 miles minus 7.5 miles)	13 miles***
(5)	Fuel to Climb (3 gal. minus 1 gal.)	2 gal.***

* reference Figure 5-5
** reference Figure 5-29
*** reference Figure 5-11

(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 altitude and temperature we determine the basic time, distance and fuel for descent (Figure 5-25). These figures must be adjusted for the field elevation and temperature at the destination airport. To find the necessary adjustment values, use the existing altitude and temperature conditions at the destination airport as variables to find the time, distance and fuel values from the graph (Figure 5-25). Now, subtract the values obtained from the field conditions from the values obtained from the cruise conditions to find the true time, distance and fuel 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 (17 min. minus 10.5 min.)	6.5 min.*
(2) Distance to Descend (40.5 miles minus 25.5 miles)	15 miles*
(3) Fuel to Descend (1.7 gal. minus 1 gal.)	.7 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 when selecting the cruise power setting. The established 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 5-15 or 5-17).

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	360 miles
(2) Cruise Distance (e)(1) minus (c)(4) minus (d)(2), (360 miles minus 13 miles minus 15 miles)	332 miles
(3) Cruise Power	65% rated power
(4) Cruise Speed	127 MPH TAS**
(5) Cruise Fuel Consumption	7.6 GPH
(6) Cruise Time (e)(2) divided by (e)(4), (332 miles divided by 127 MPH)	2.62 hrs.
(7) Cruise Fuel (e)(5) multiplied by (c)(6), (7.6 GPH multiplied by 2.62 hrs.)	19.8 gal.

* reference Figure 5-25
** reference Figure 5-17

(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), (.13 hrs. plus .11 hrs. plus 2.62 hrs.) 2.86 hrs.

(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 gal. plus .7 gal. plus 19.8 gal.) 22.5 gal.
(22.5 gal. multiplied by 6 lb/gal.) 135 lbs.

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5.7 PERFORMANCE GRAPHS

LIST OF FIGURES

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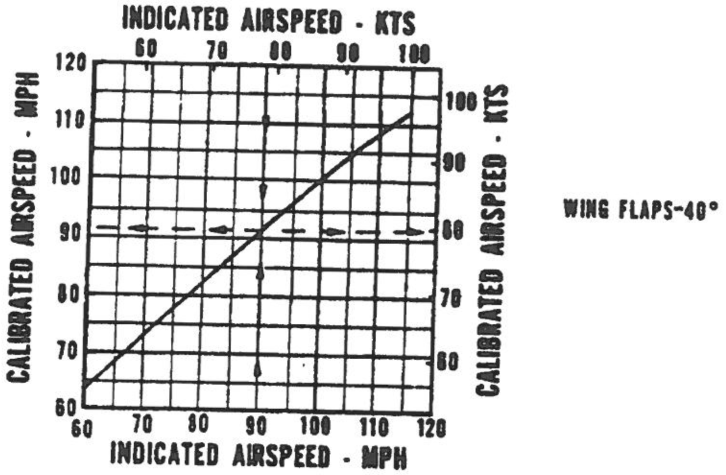
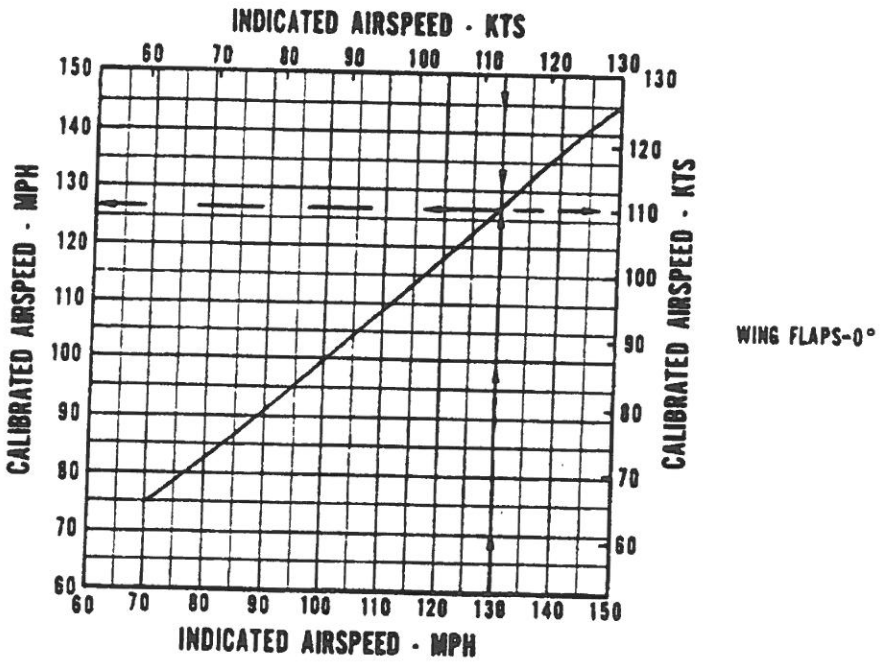
PA-28-181

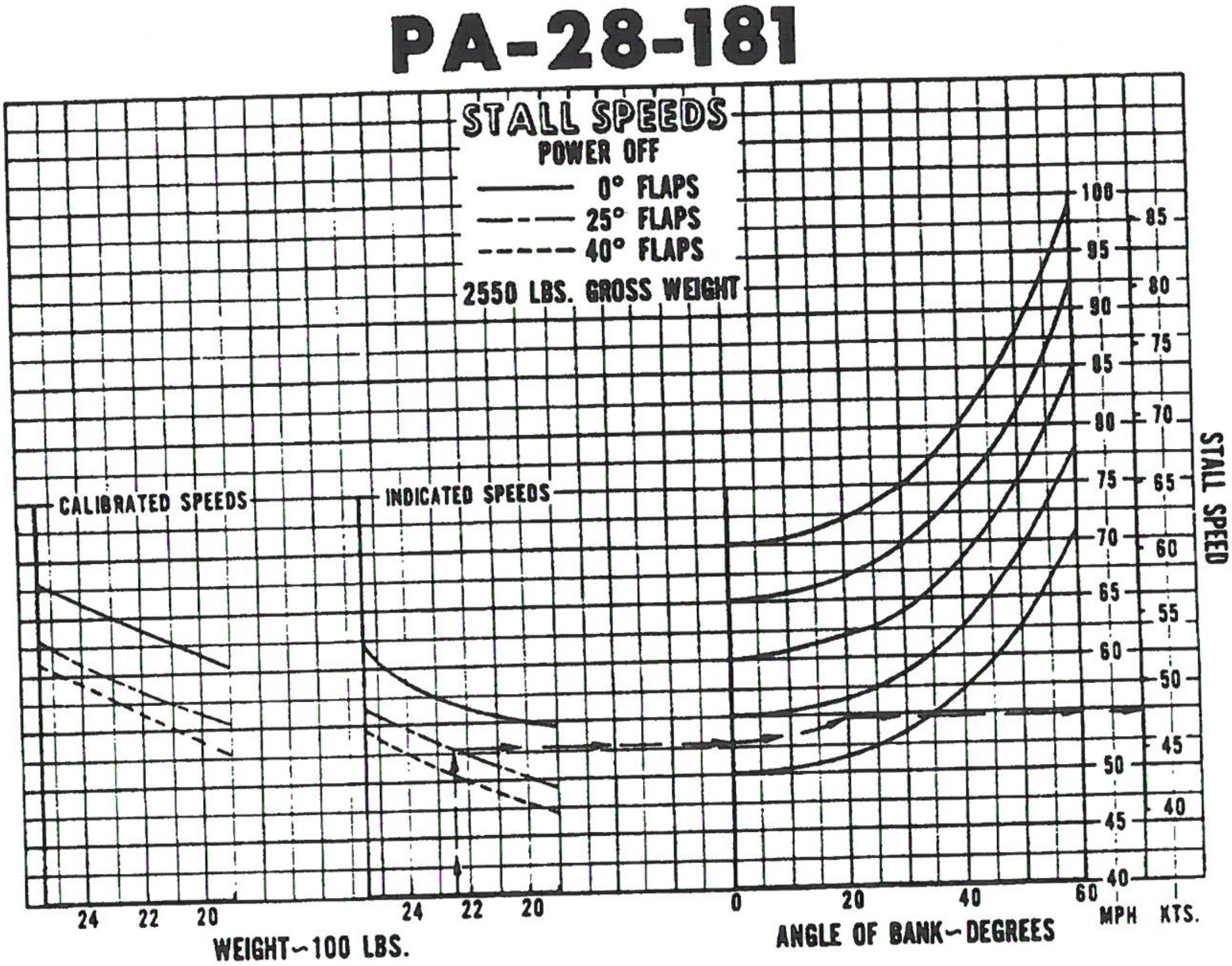
AIRSPEED SYSTEM CALIBRATION

2250 LBS GROSS WEIGHT

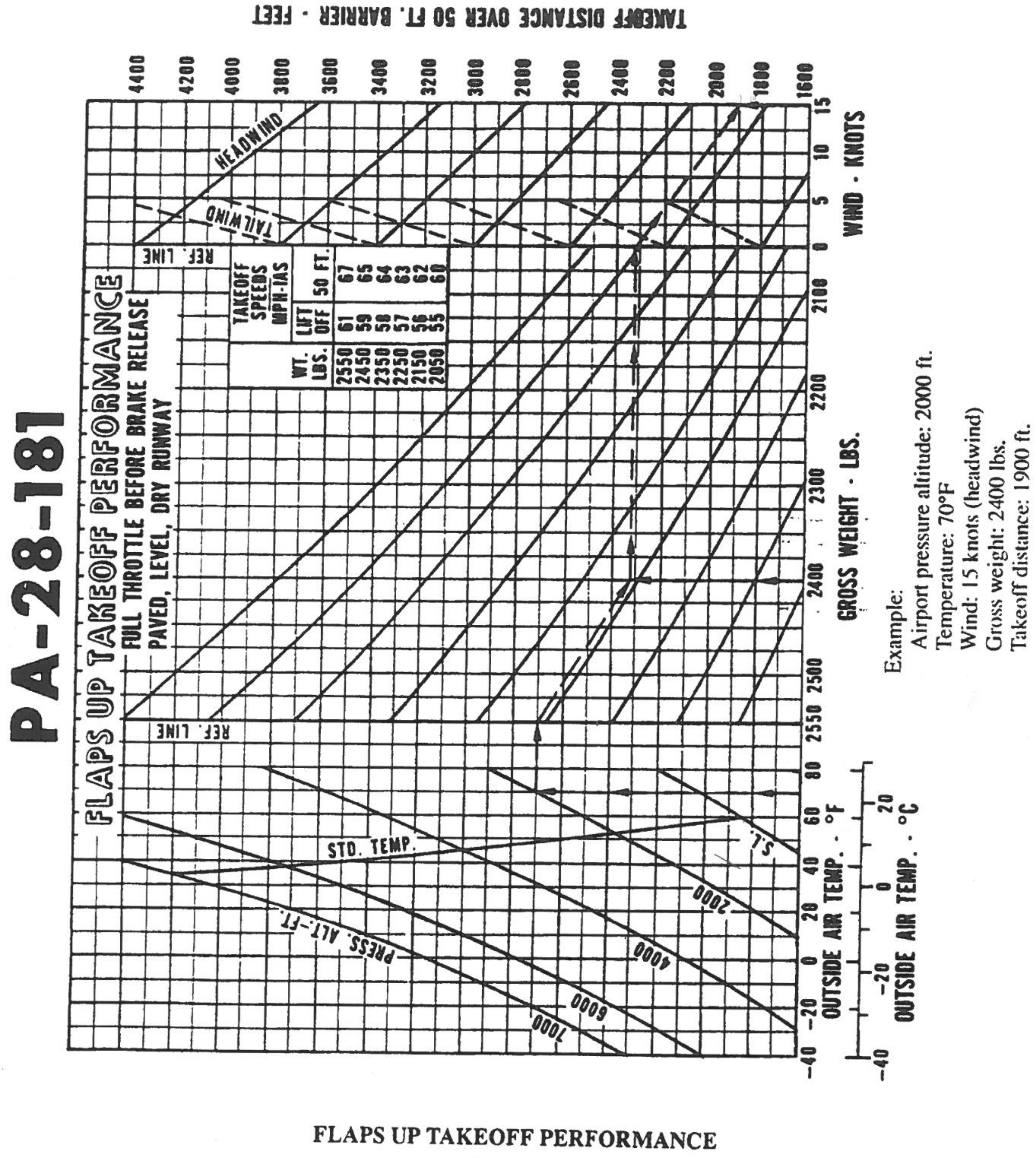




AIRSPEED SYSTEM CALIBRATION
Figure 5-1

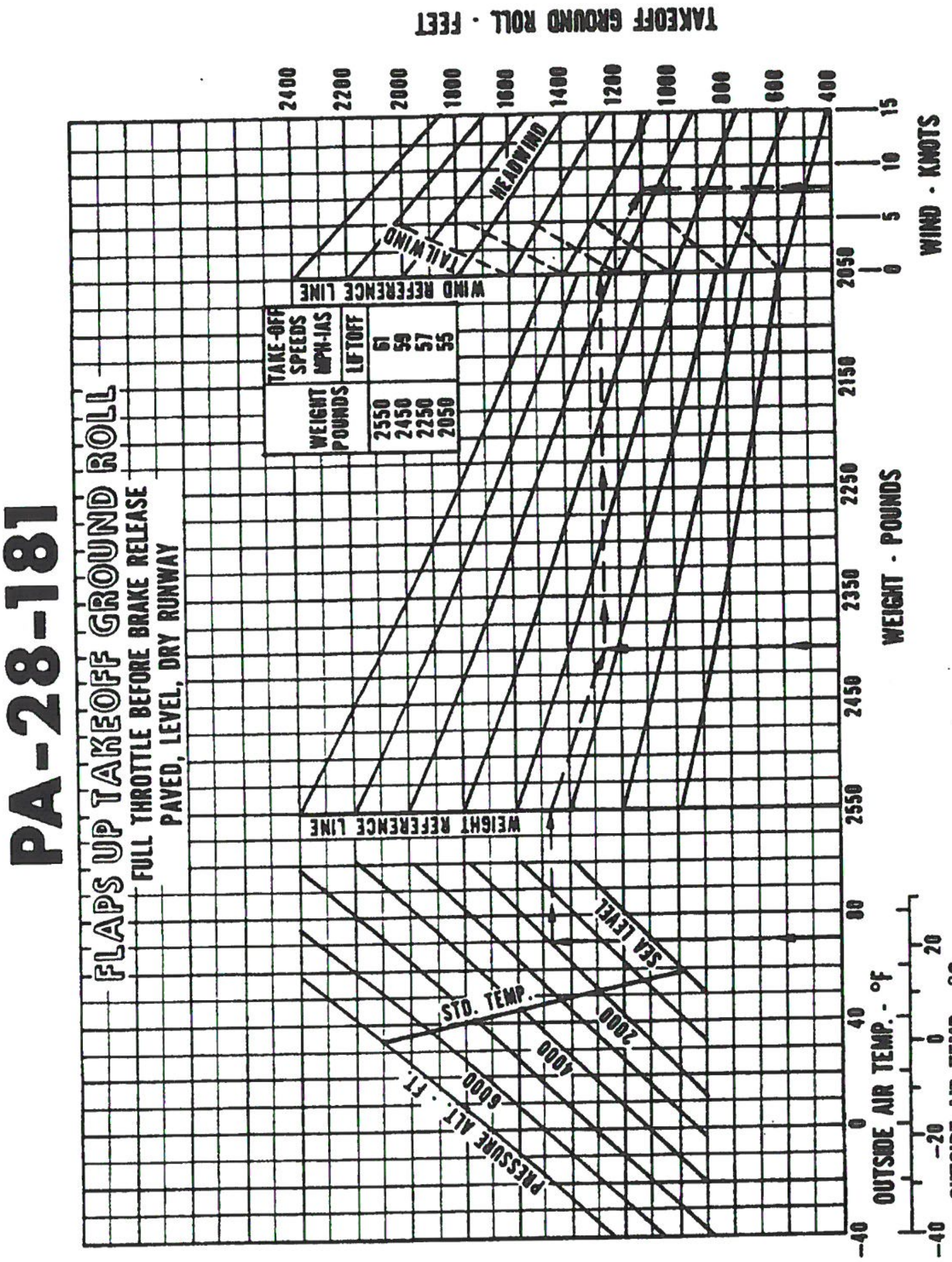


STALL SPEEDS
Figure 5-3



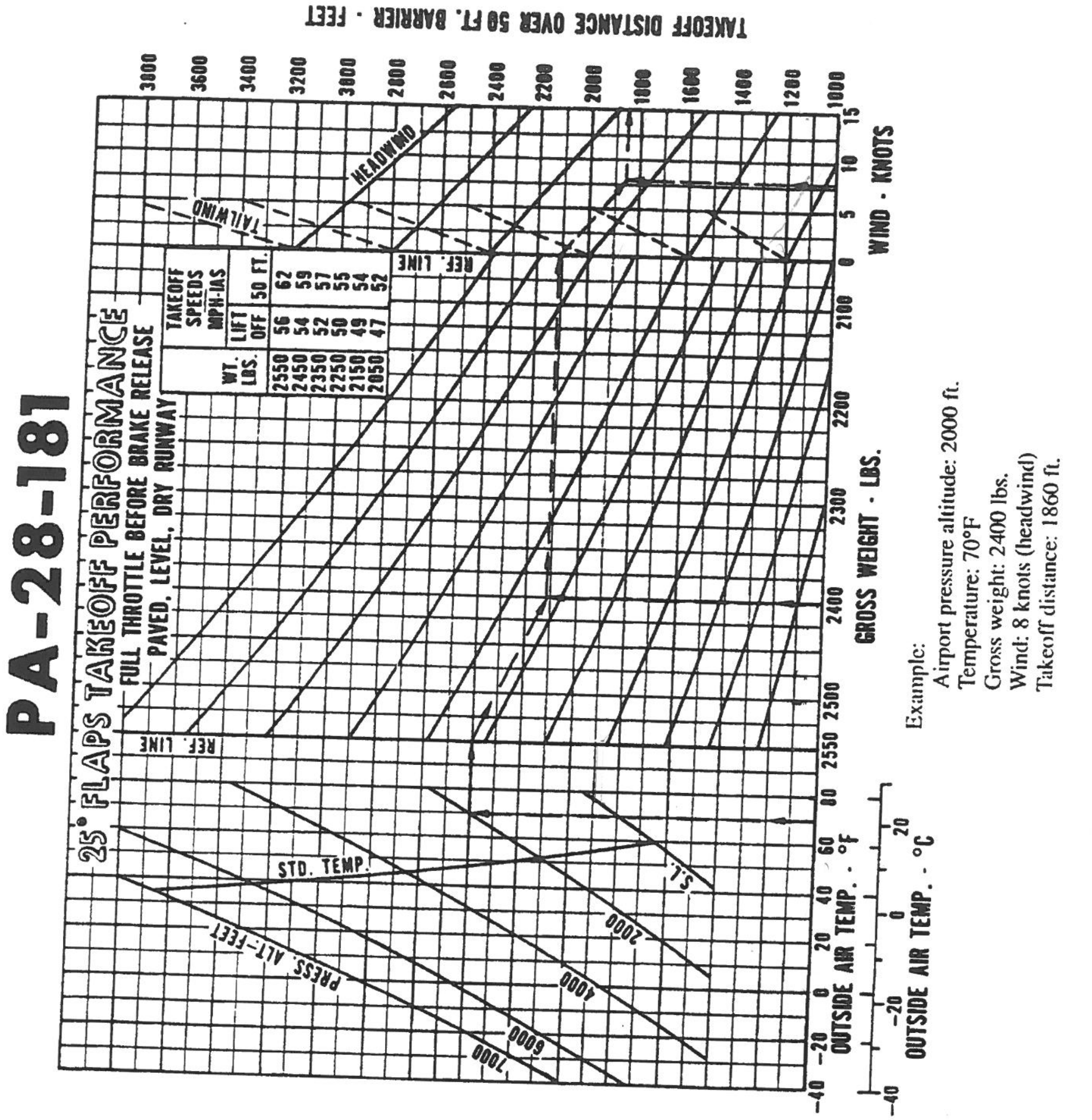
FLAPS UP TAKEOFF PERFORMANCE

Figure 5-5



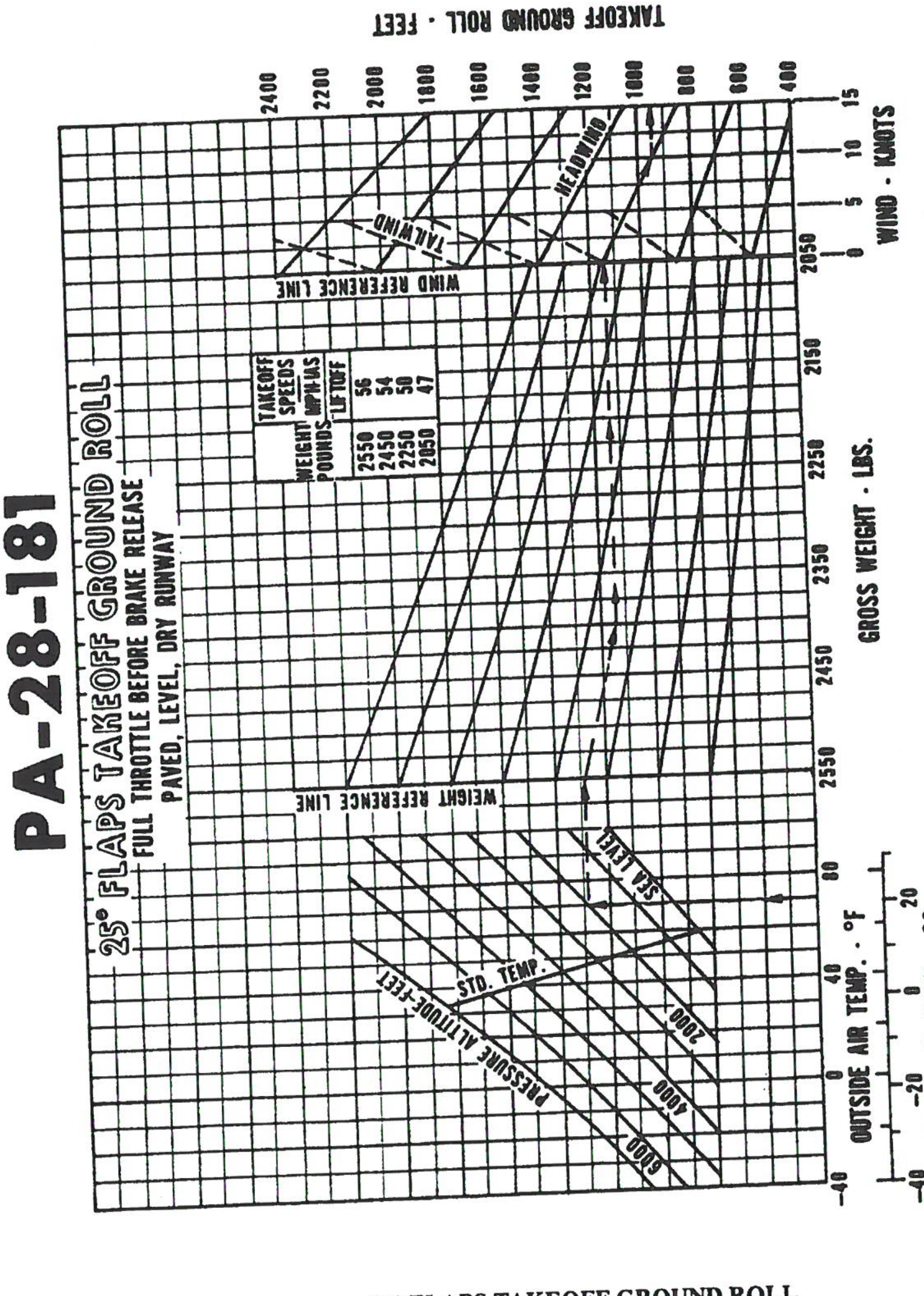
Example:
Airport pressure altitude: 2000 ft.
Temperature: 70°F
Gross weight: 2400 lbs.
Wind: 8 knots (headwind)
Takeoff ground roll: 1100 ft.

FLAPS UP TAKEOFF GROUND ROLL
Figure 5-6



25° FLAPS TAKEOFF PERFORMANCE

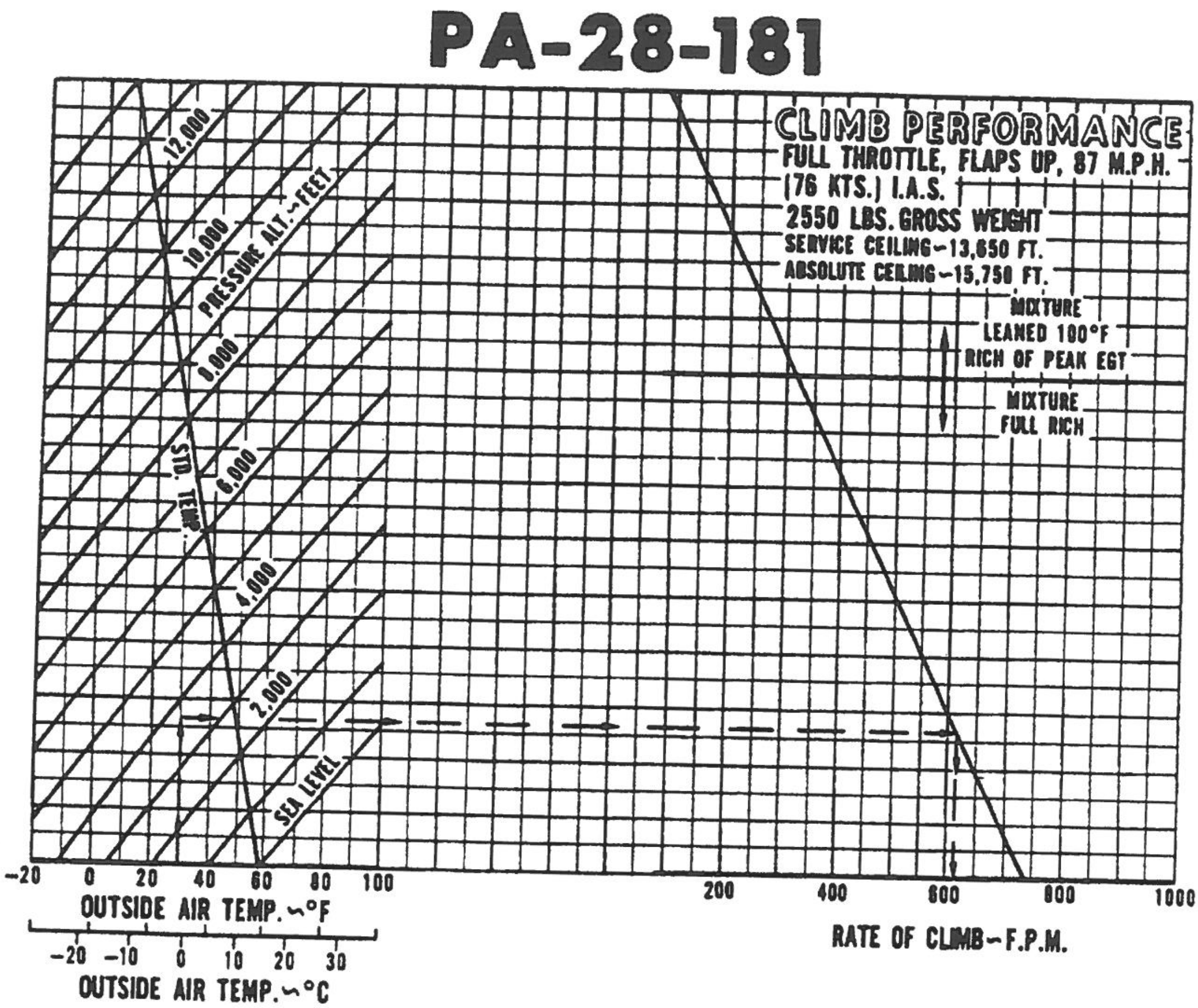
Figure 5-7



Example:
Airport pressure altitude: 2000 ft.
Temperature: 70°F
Gross weight: 2400 lbs.
Wind: 10 knots (headwind)
Takeoff ground roll: 950 ft.

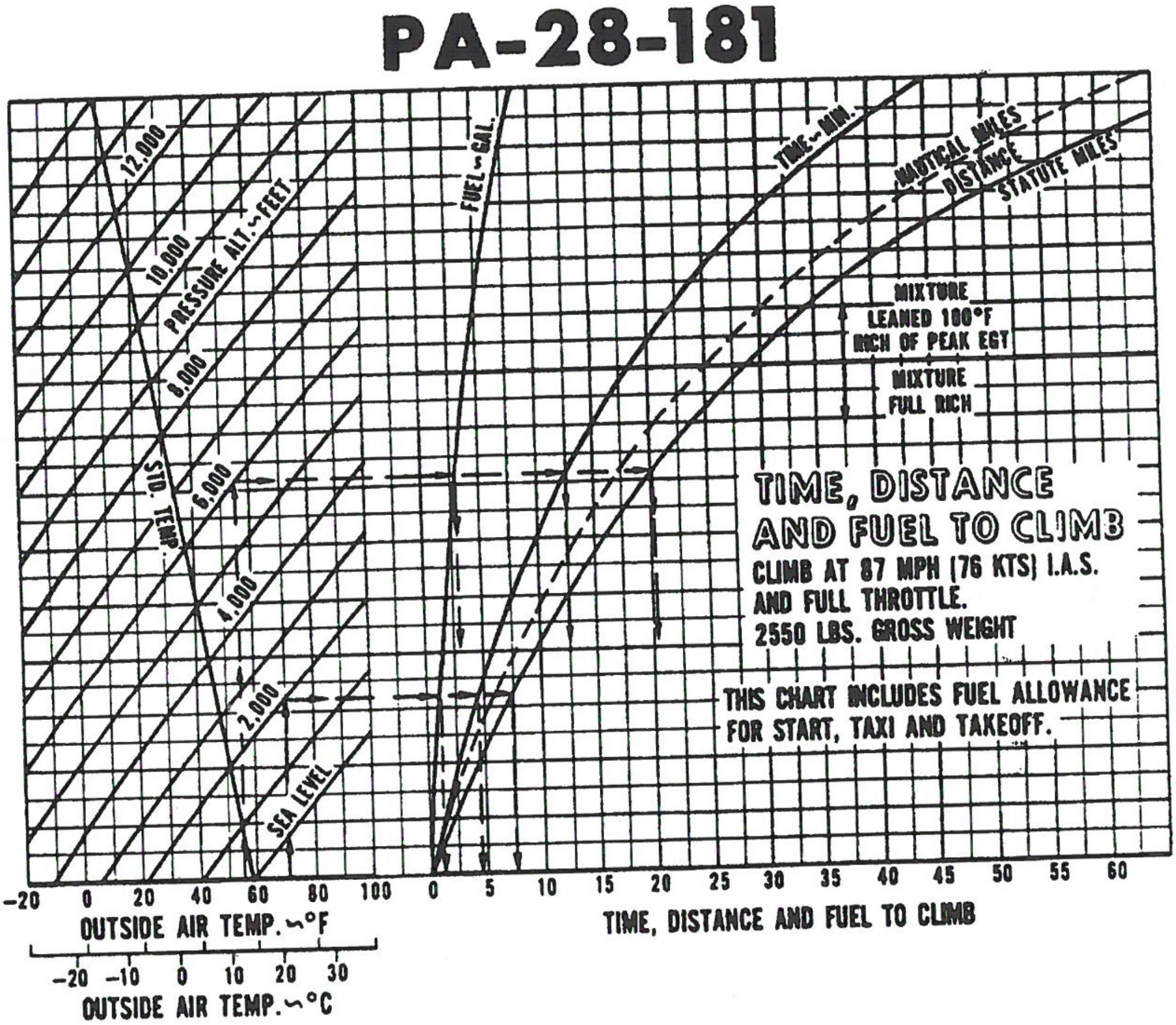
25° FLAPS TAKEOFF GROUND ROLL

Figure 5-8



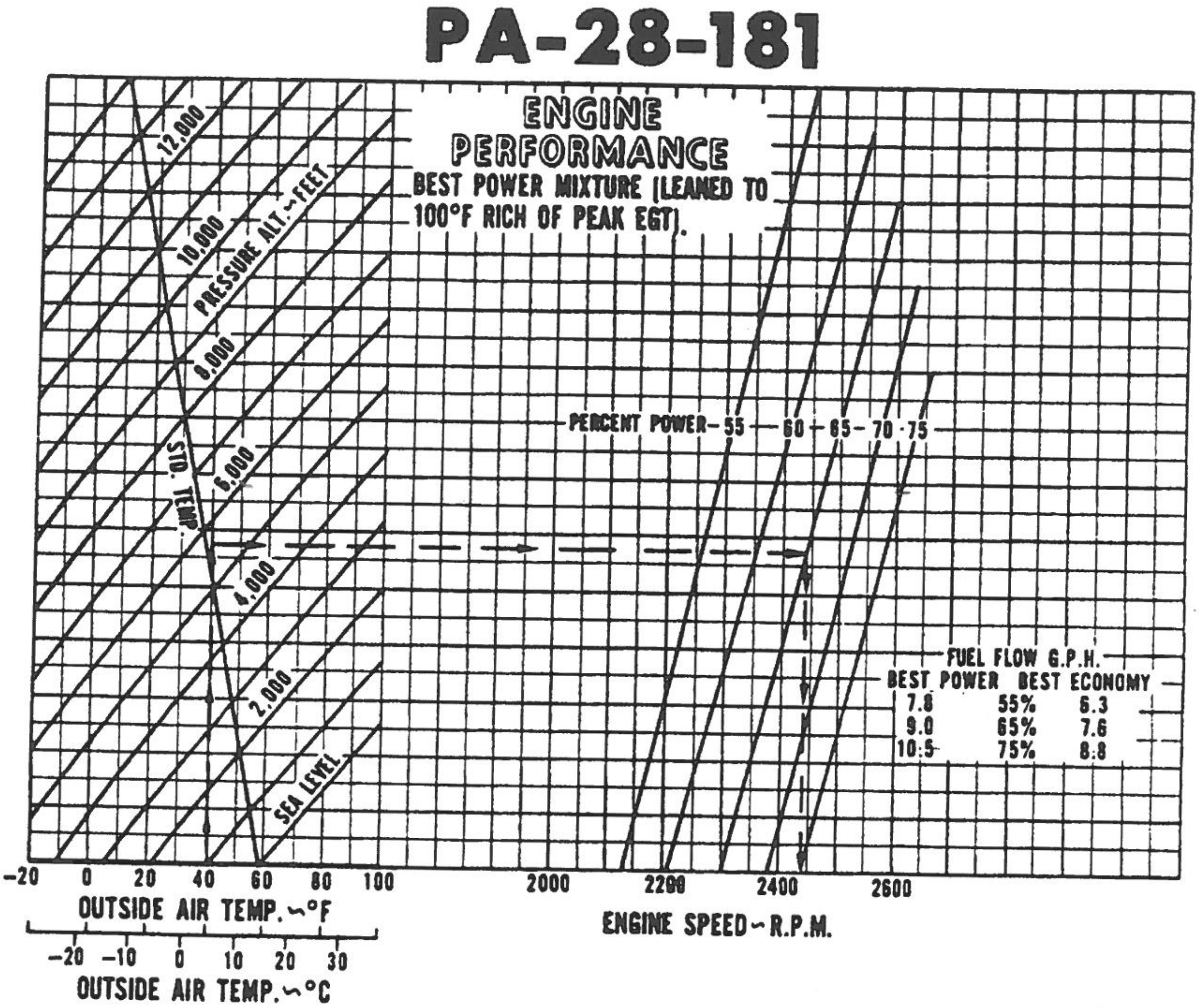
CLIMB PERFORMANCE

Figure 5-9



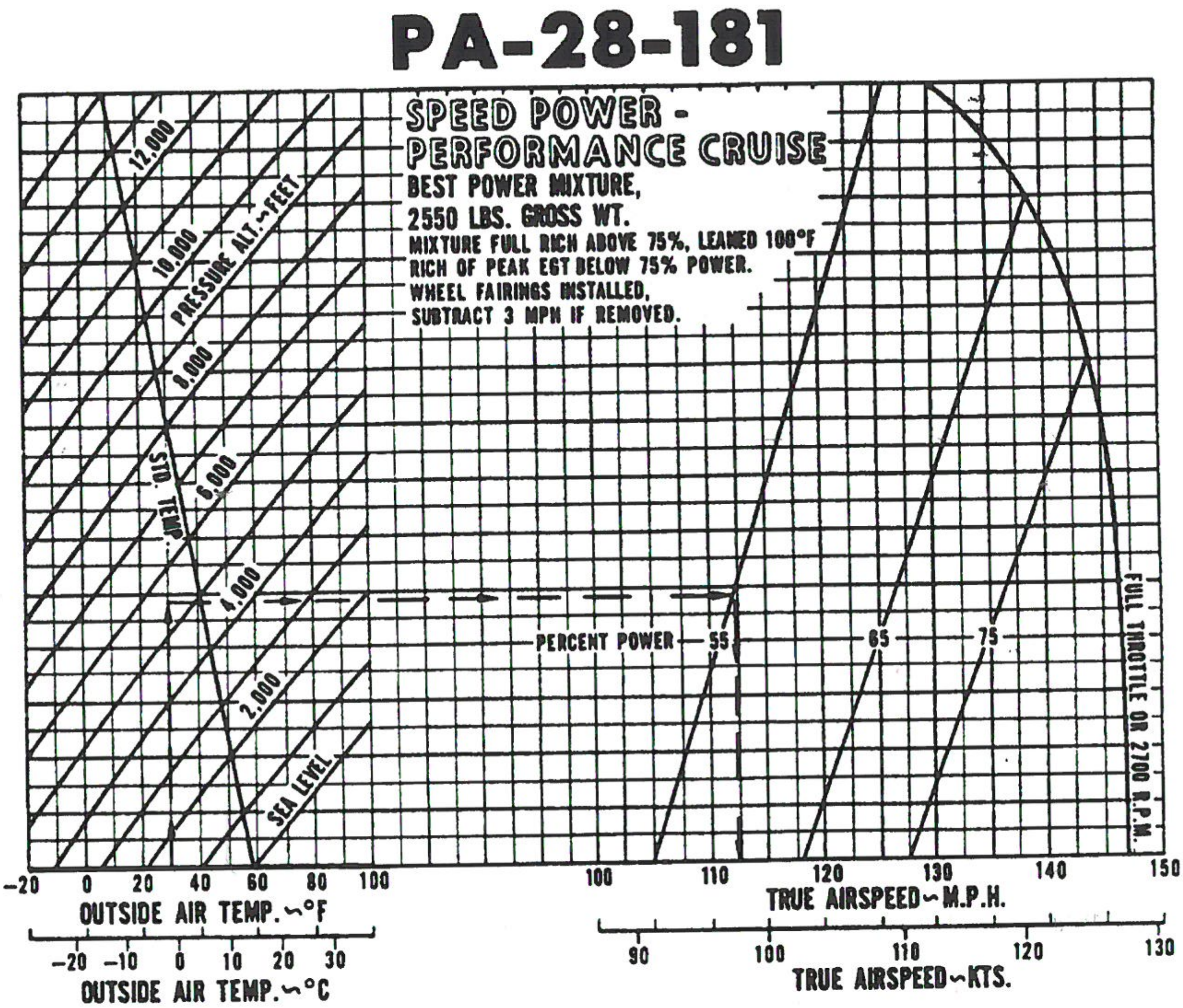
TIME, DISTANCE AND FUEL TO CLIMB

Figure 5-11



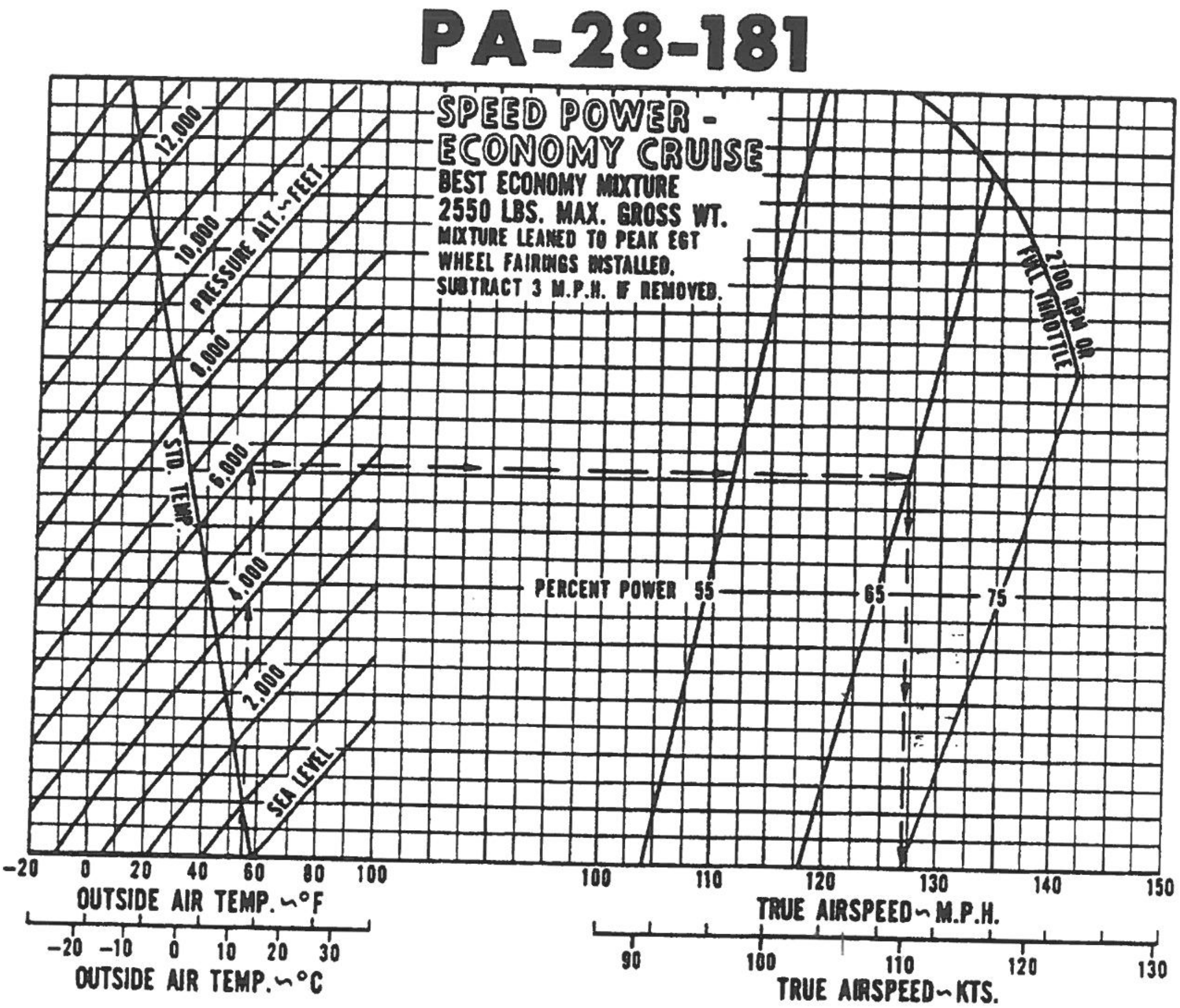
ENGINE PERFORMANCE

Figure 5-13



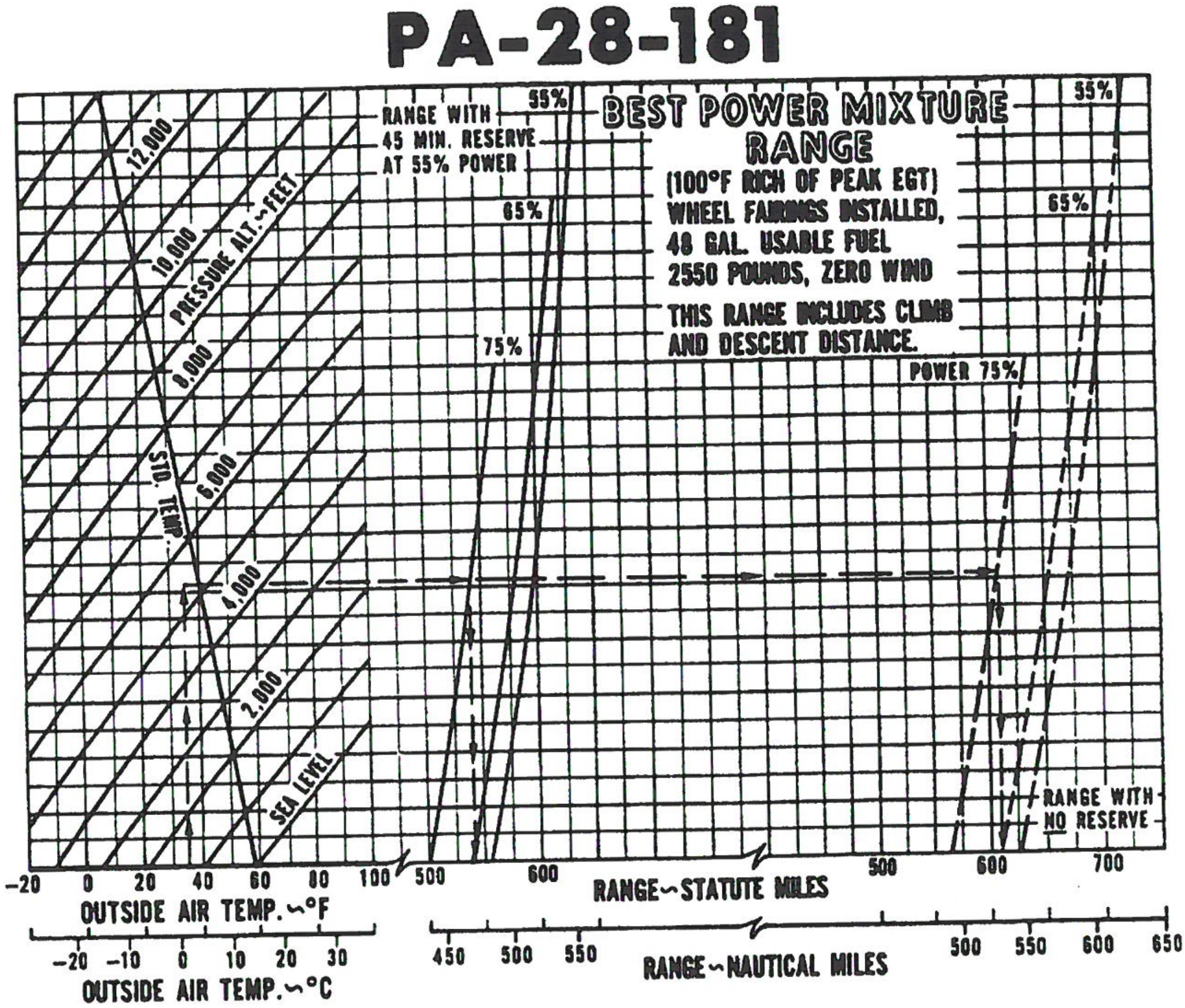
SPEED POWER - PERFORMANCE CRUISE

Figure 5-15



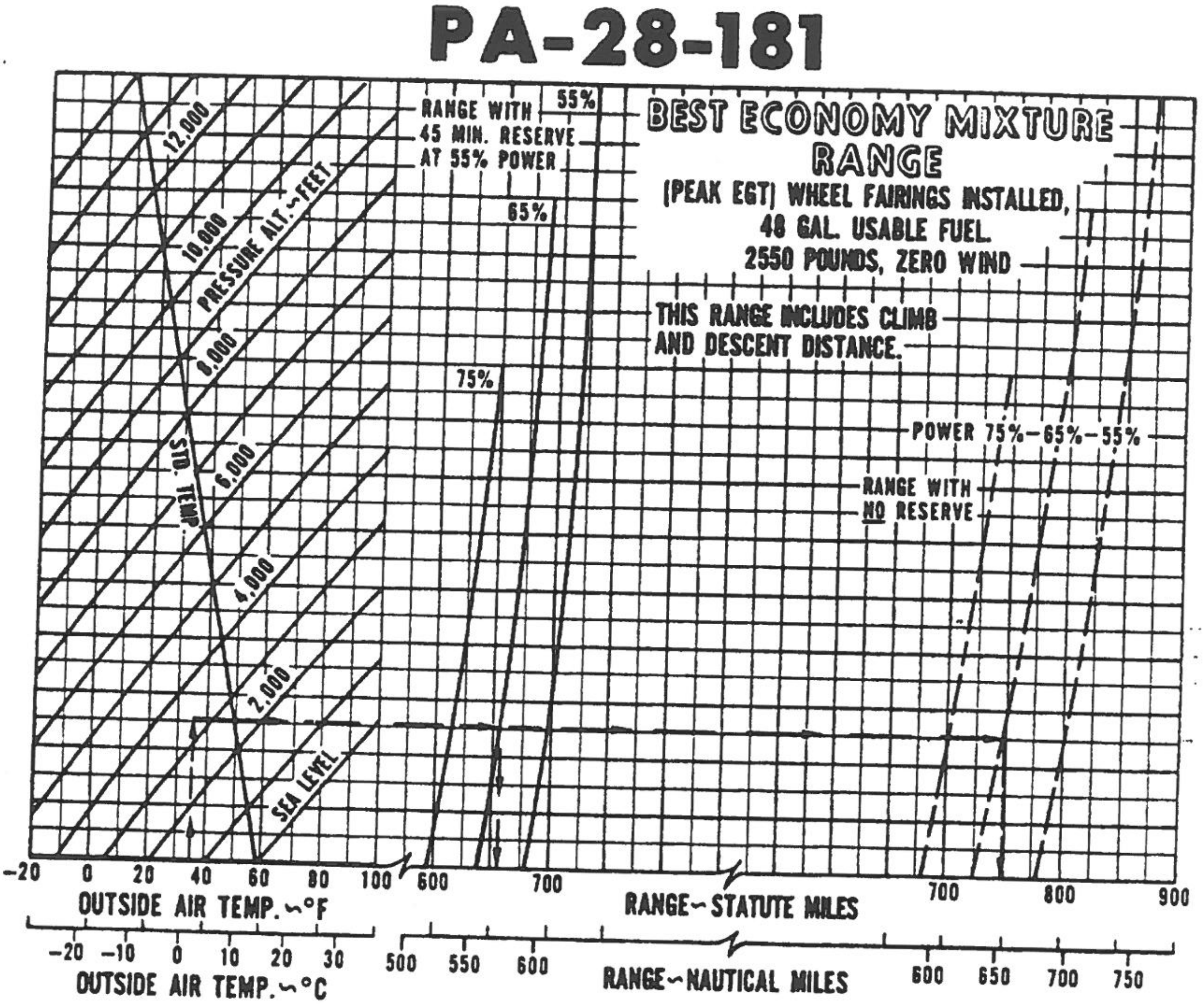
SPEED POWER - ECONOMY CRUISE

Figure 5-17



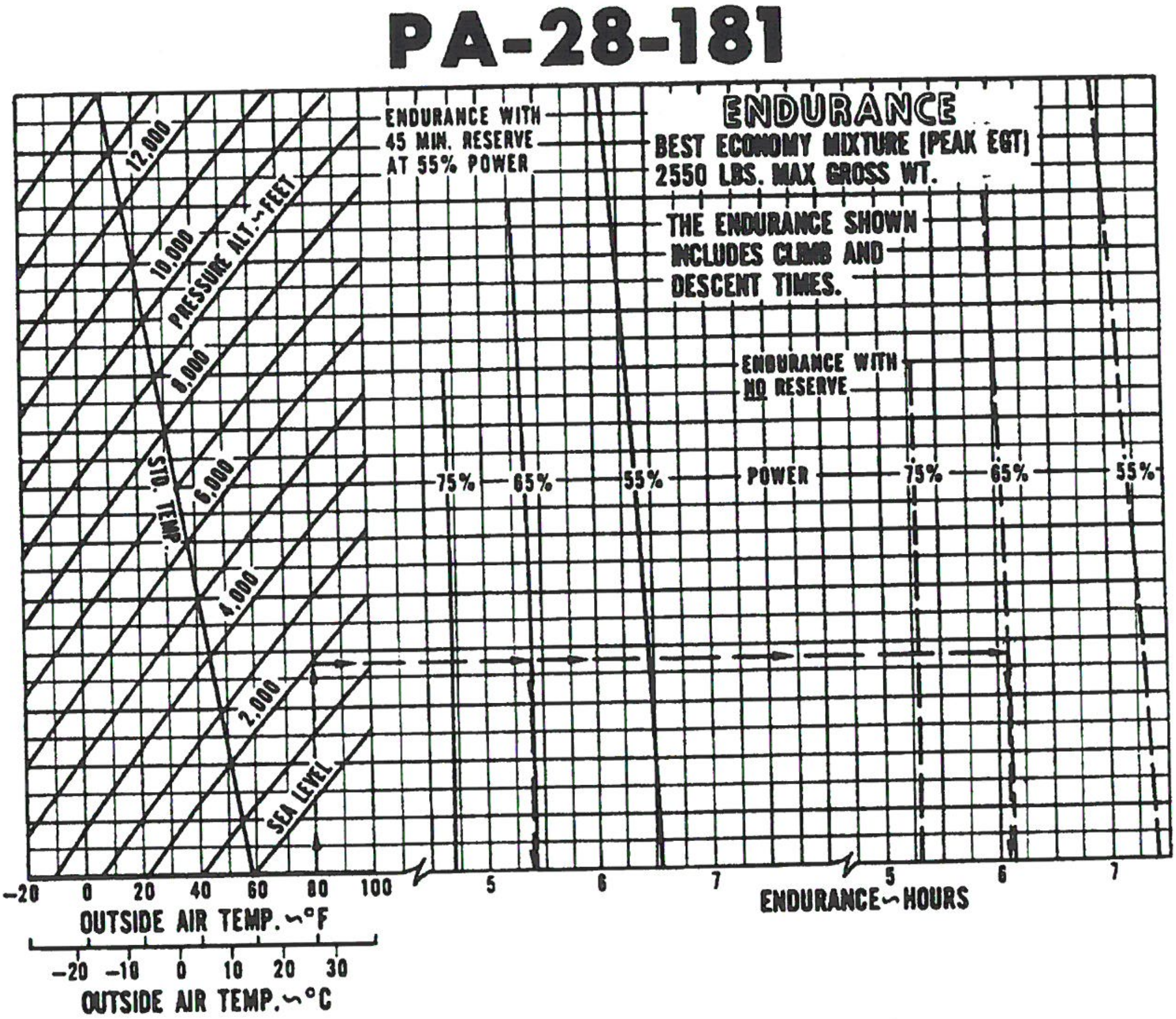
BEST POWER MIXTURE - RANGE

Figure 5-19



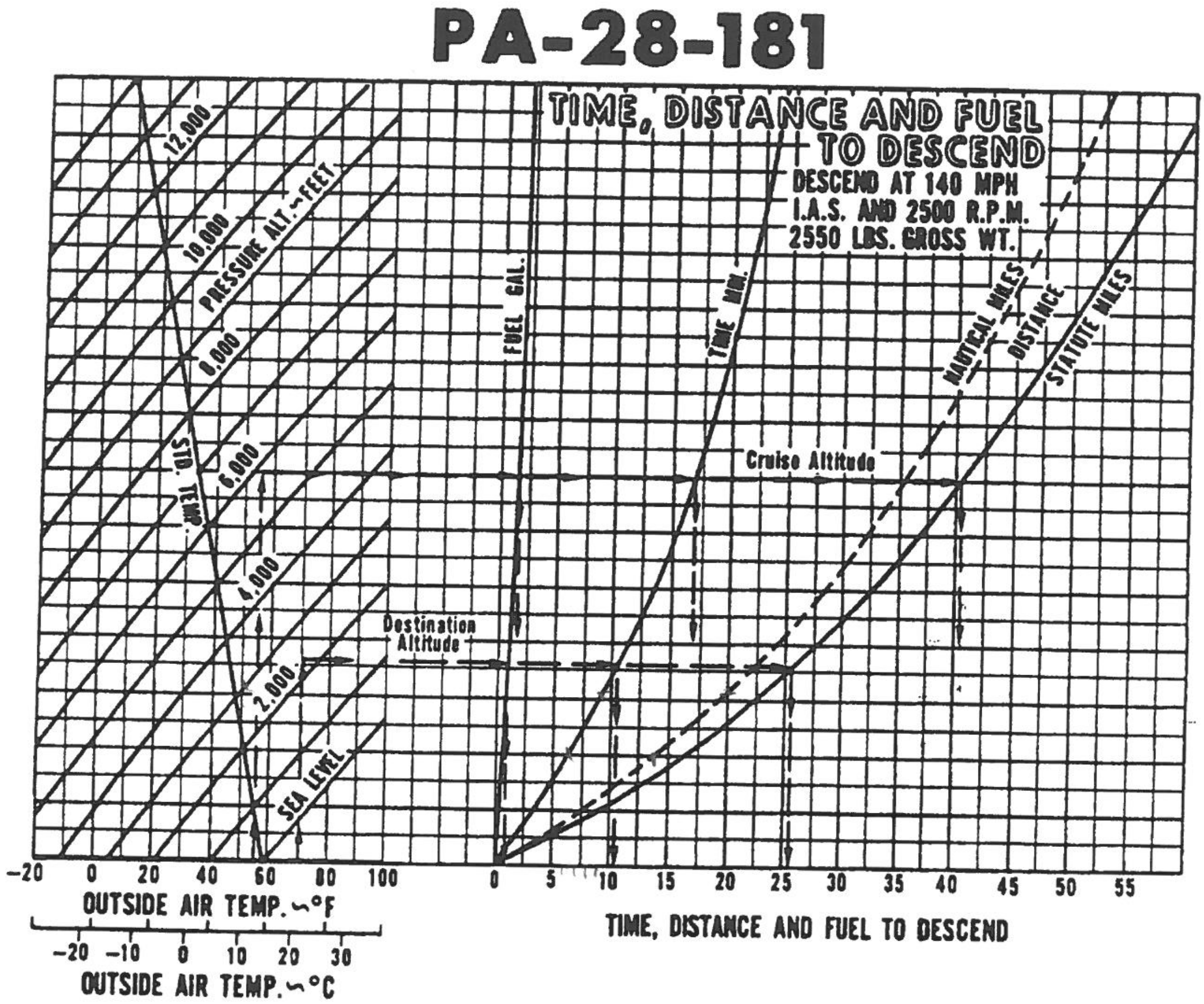
BEST ECONOMY MIXTURE - RANGE

Figure 5-21



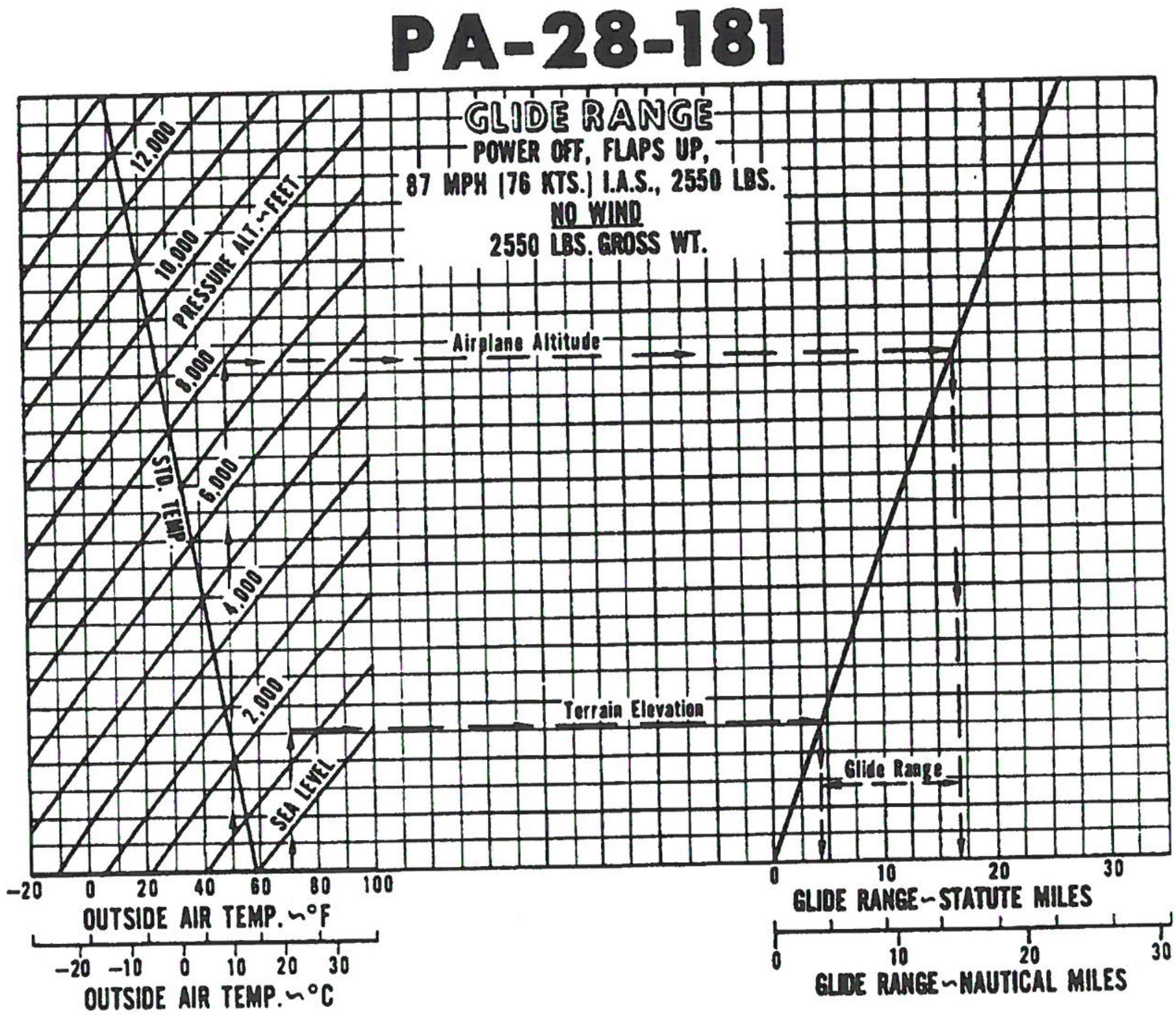
ENDURANCE

Figure 5-23



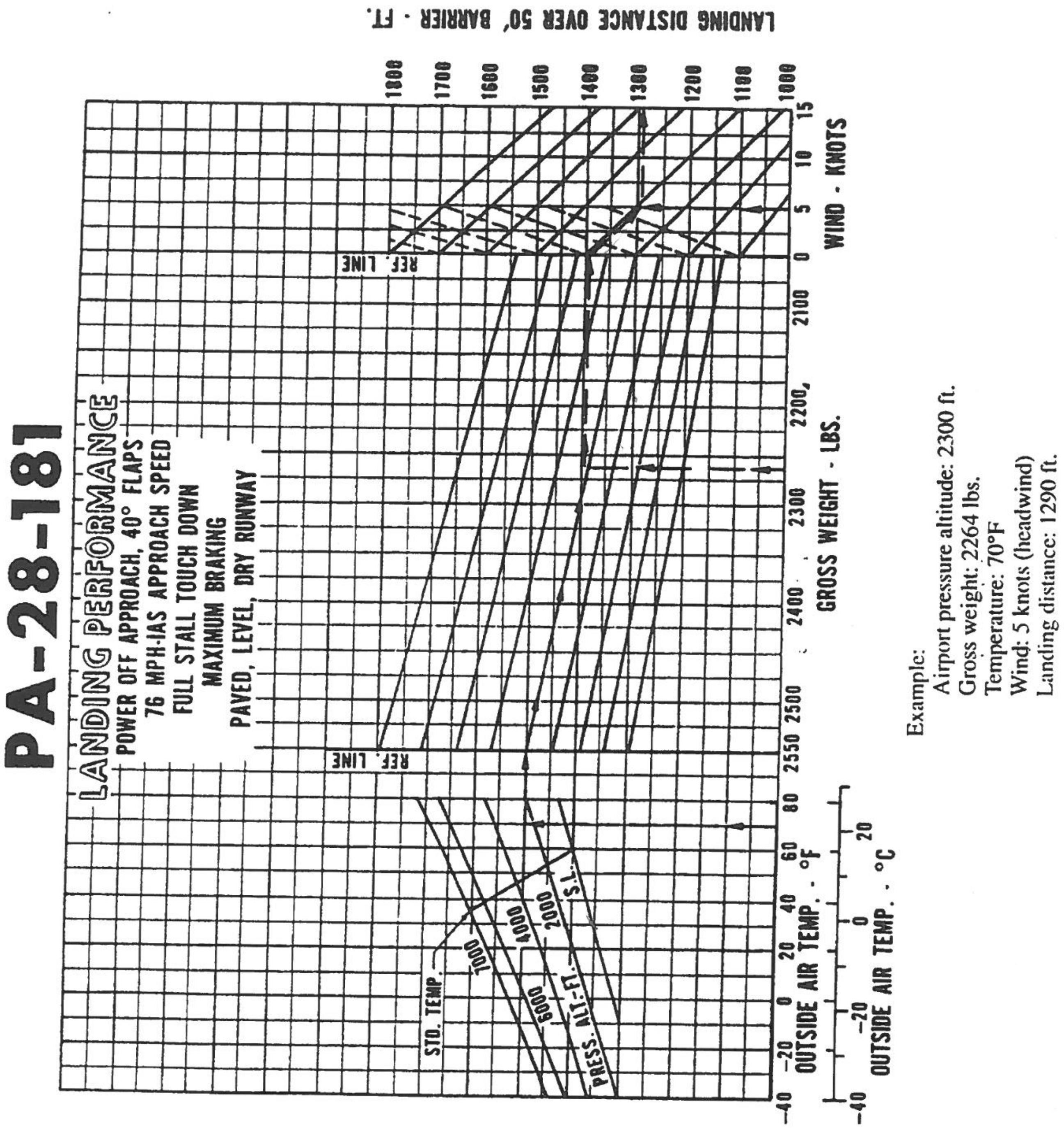
TIME, DISTANCE AND FUEL TO DESCEND

Figure 5-25



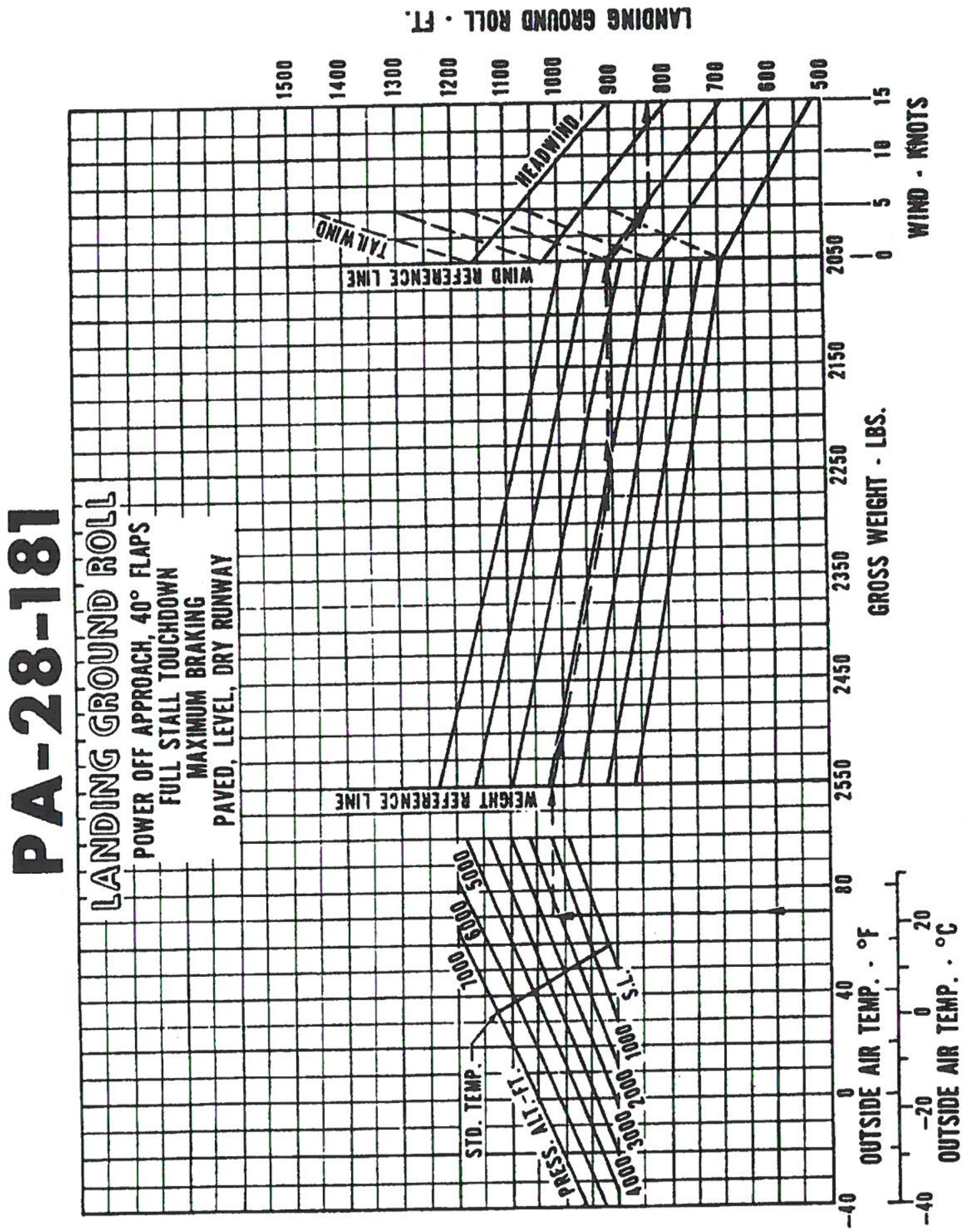
GLIDE RANGE

Figure 5-27



LANDING PERFORMANCE

Figure 5-29



Example:
Airport pressure altitude: 2300 ft.
Temperature: 70°F
Gross weight: 2264 lbs.
Wind: 5 knots (headwind)
Ground roll: 825 ft.

LANDING GROUND ROLL

Figure 5-30