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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 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	1400 lbs.
(2) Occupants (2 x 170 lbs)	340 lbs.
(3) Baggage and Cargo	360 lbs.
(4) Fuel (6 lb/gal x 50)	300 lbs.
(5) Takeoff Weight	2400 lbs.
(6) Landing Weight	
(a)(5) minus (g)(1), (2400 lbs. minus 136 lbs.)	2264 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 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	2000 ft.	2300 ft.
(2) Temperature	70°F	70°F
(3) Wind Component	10 KTS	5 KTS
(4) Runway Length Available	7000 ft.	4500 ft.
(5) Runway Required	950 ft.*	825**

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 Time, Distance, and Fuel to Climb graph (Figure 5-15). After the time, distance and fuel for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to the graph (Figure 5-15). 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	55°F
(3) Time to Climb (12.5 min. minus 4.5 min.)	8 min.***
(4) Distance to Climb (17.5 minus 6.5 nautical miles)	11 nautical miles***
(5) Fuel to Climb (3 gal. minus 1 gal.)	2 gal.***

*reference Figure 5-11

**reference Figure 5-35

***reference Figure 5-15

(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 time, distance and fuel for descent (Figure 5-29). 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 time, distance and fuel values from the graph (Figure 5-29). 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 (35 minus 22 nautical miles) | 13 nautical 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 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 5-19 or 5-21).

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 | 314 nautical miles |
| (2) Cruise Distance | |
| (e)(1) minus (c)(4) minus (d)(2), (314 minus 11 minus 13) | 290 nautical miles |
| (3) Cruise Power | 65% rated power |
| (4) Cruise Speed | 110 KTS TAS** |
| (5) Cruise Fuel | 7.6 GPH |
| (6) Cruise Time | |
| (e)(2) divided by (e)(4), (290 nautical miles divided by 110 KTS) | 2.64 hrs. |
| (7) Cruise Fuel | |
| (e)(5) multiplied by (e)(6), (7.6 GPH multiplied by 2.64 hrs.) | 20 gal. |

*reference Figure 5-29

**reference Figure 5-21

(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 2.64 hrs.) 2.88 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 20 gal.) 22.7 gal.
(22.7 gal. multiplied by 6 lb/gal.) 136 lbs.

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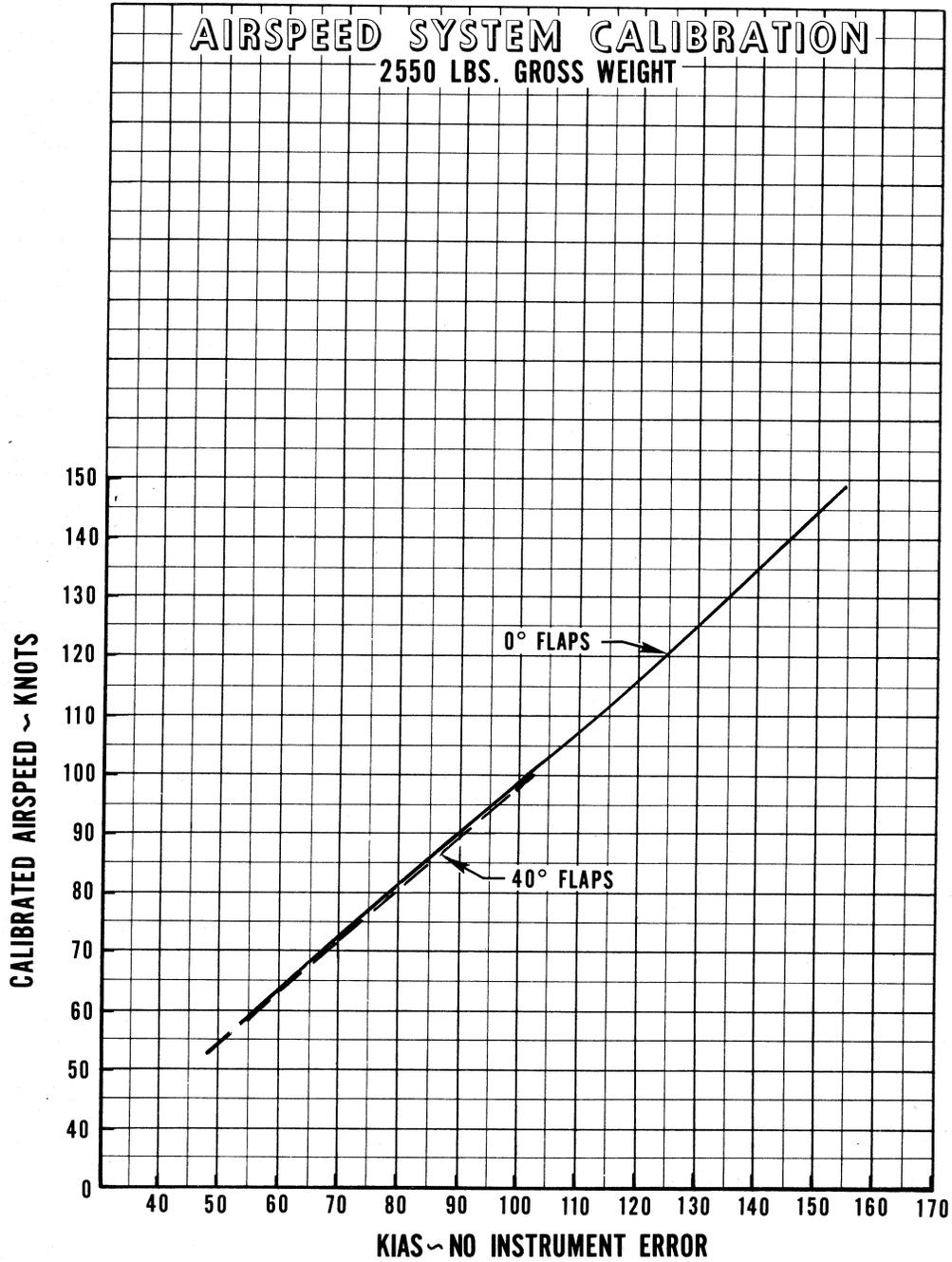
5.7 PERFORMANCE GRAPHS

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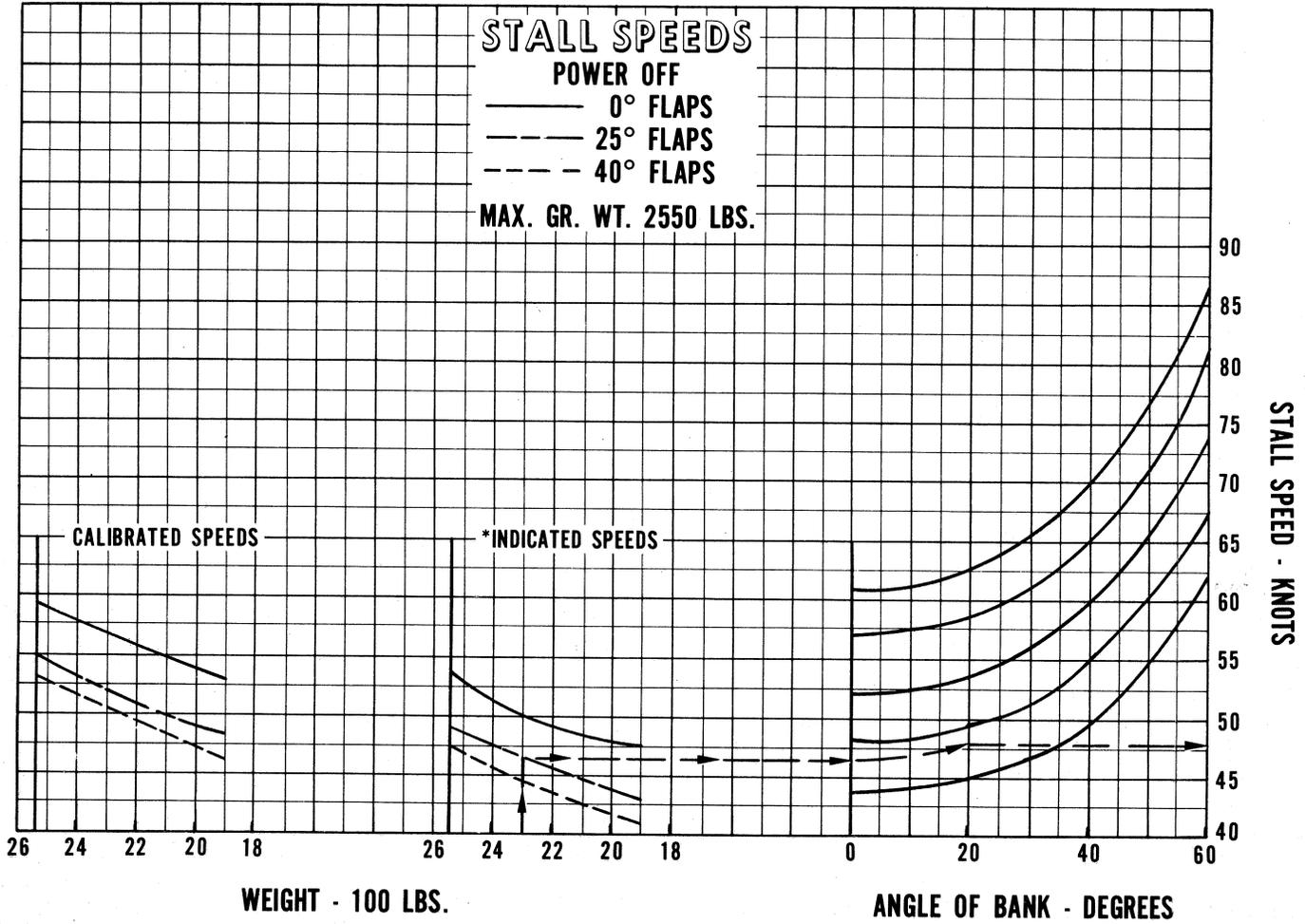
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AIRSPEED SYSTEM CALIBRATION

Figure 5-1

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Example:

Gross weight: 2300 lbs.

Angle of bank: 20°

Flap position: 25°

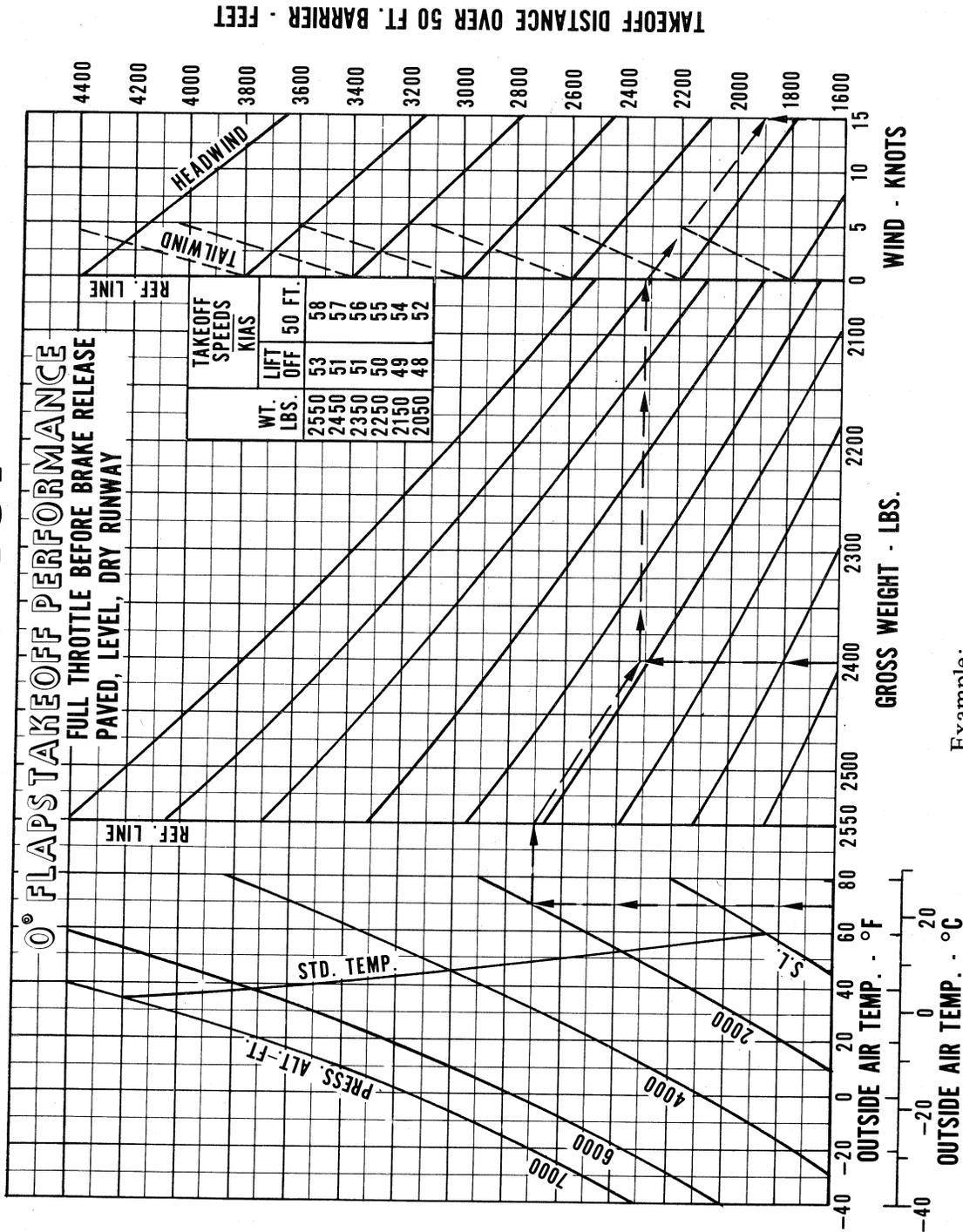
Stall speed: 46 knots (*indicated airspeed)

*INDICATED AIRSPEED, NO INDICATOR ERROR

STALL SPEEDS

Figure 5-3

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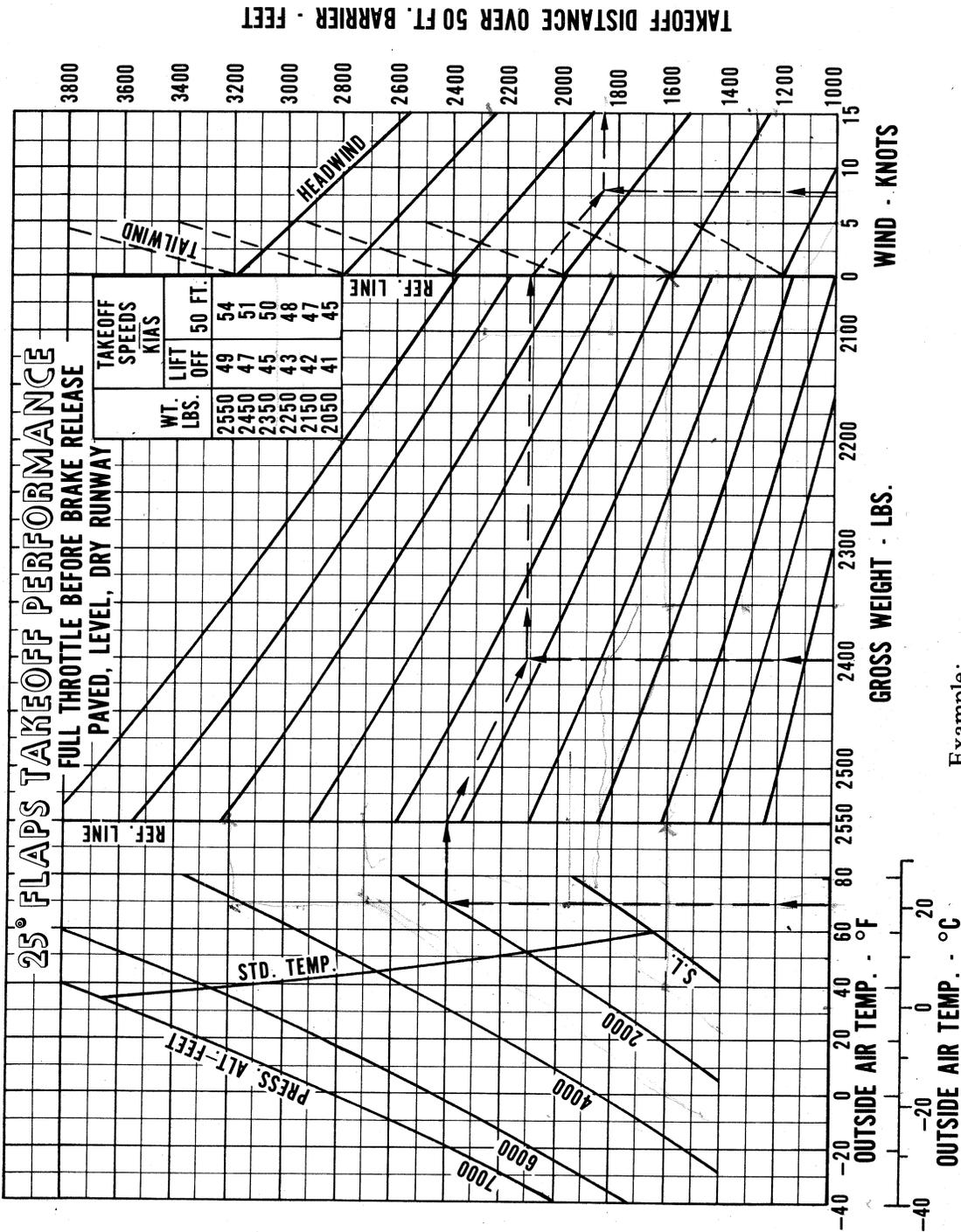


Example:
Departure airport pressure altitude: 2000 ft.
Temperature: 70°F
Wind: 15 KT. (headwind)
Gross weight: 2400 lbs.
Takeoff distance: 1900 ft.

FLAPS UP TAKEOFF PERFORMANCE

Figure 5-5

PA-28-181

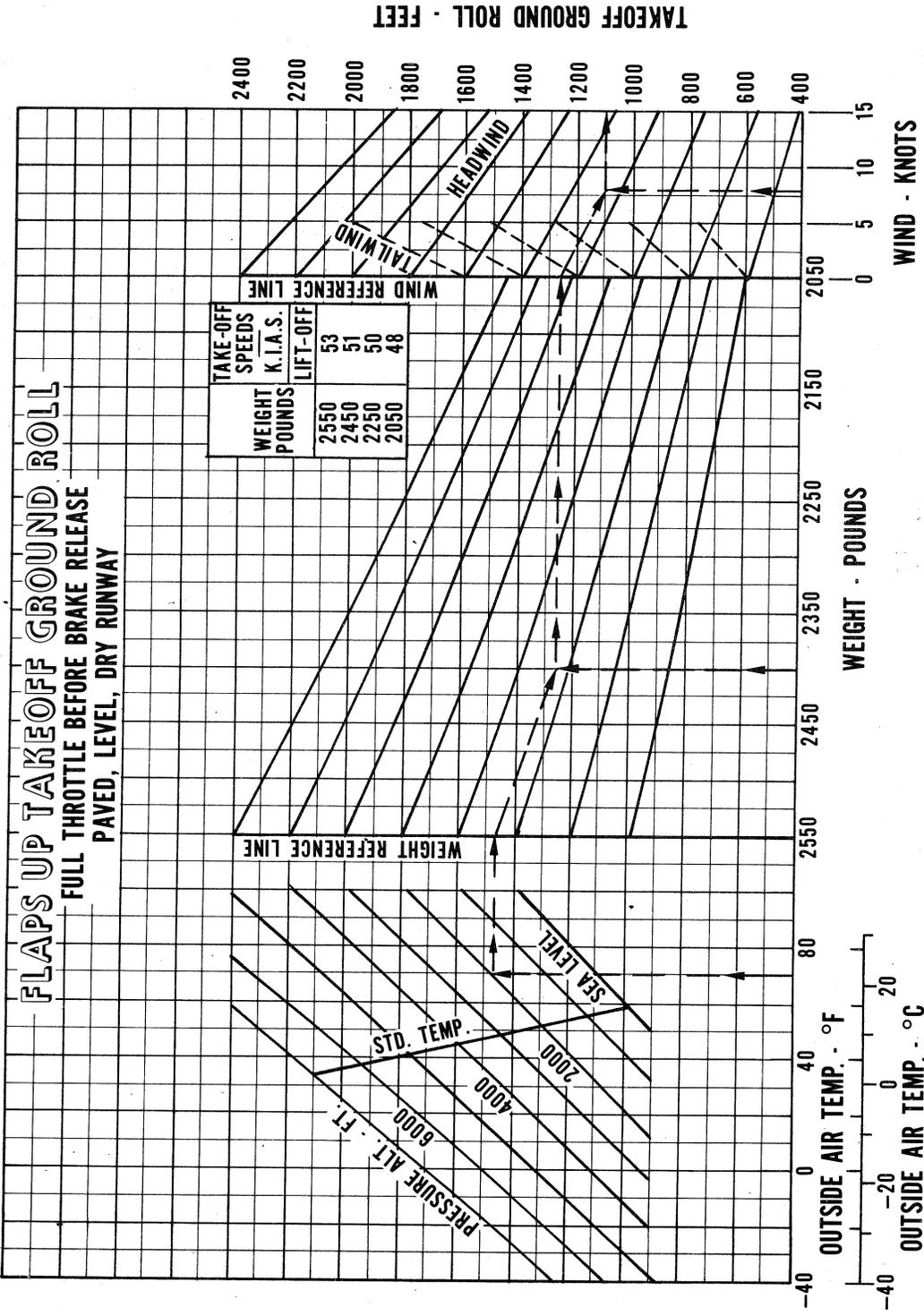


Example:
 Departure airport pressure altitude: 2000 ft.
 Temperature: 70°F
 Gross weight: 2400 lbs.
 Wind: 8 knots (headwind)
 Takeoff distance: 1860 ft.

25° FLAPS TAKEOFF PERFORMANCE

Figure 5-7

PA-28-181



FLAPS UP TAKEOFF GROUND ROLL

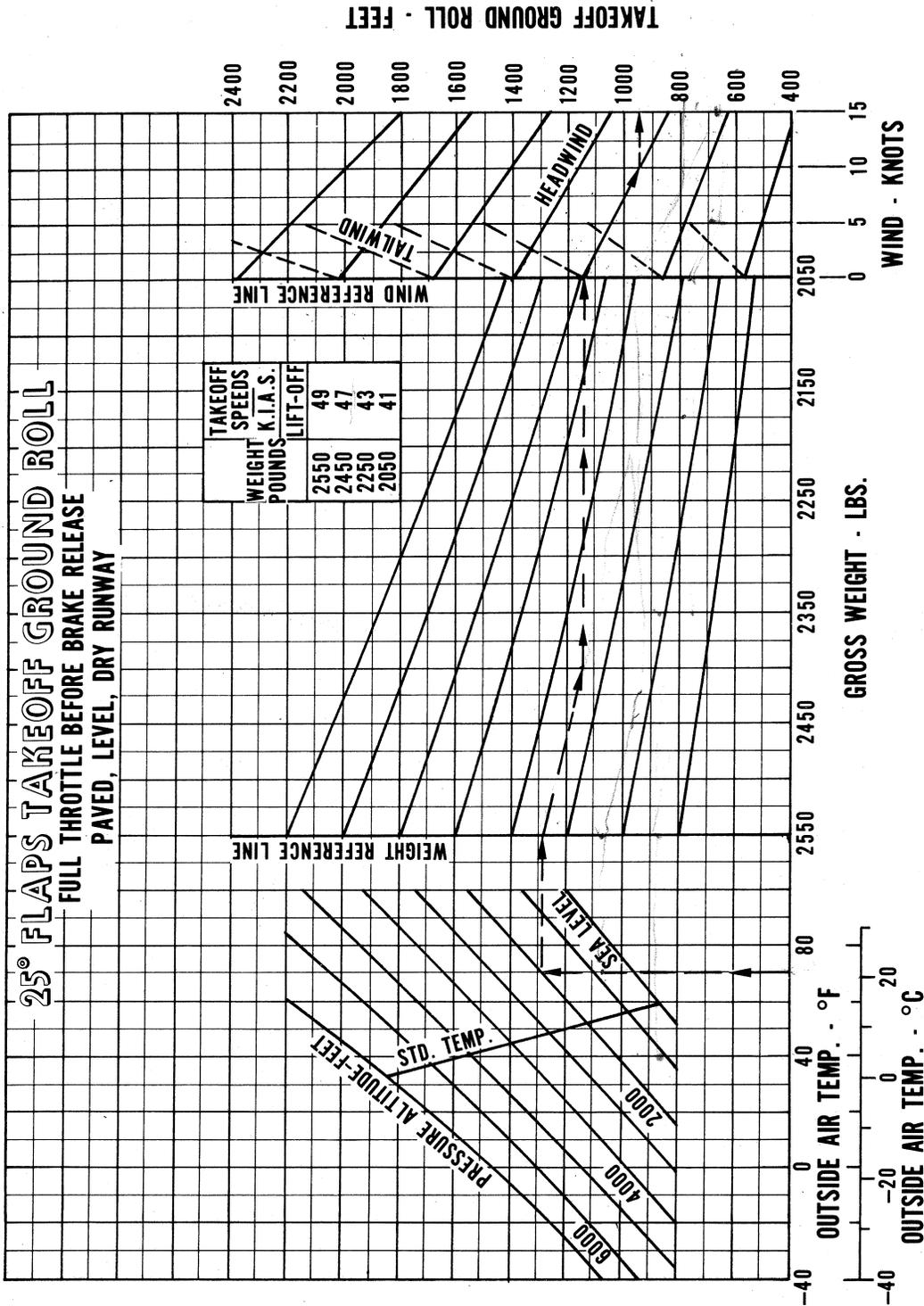
Figure 5-9

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

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25° FLAPS TAKEOFF GROUND ROLL

FULL THROTTLE BEFORE BRAKE RELEASE
PAVED, LEVEL, DRY RUNWAY

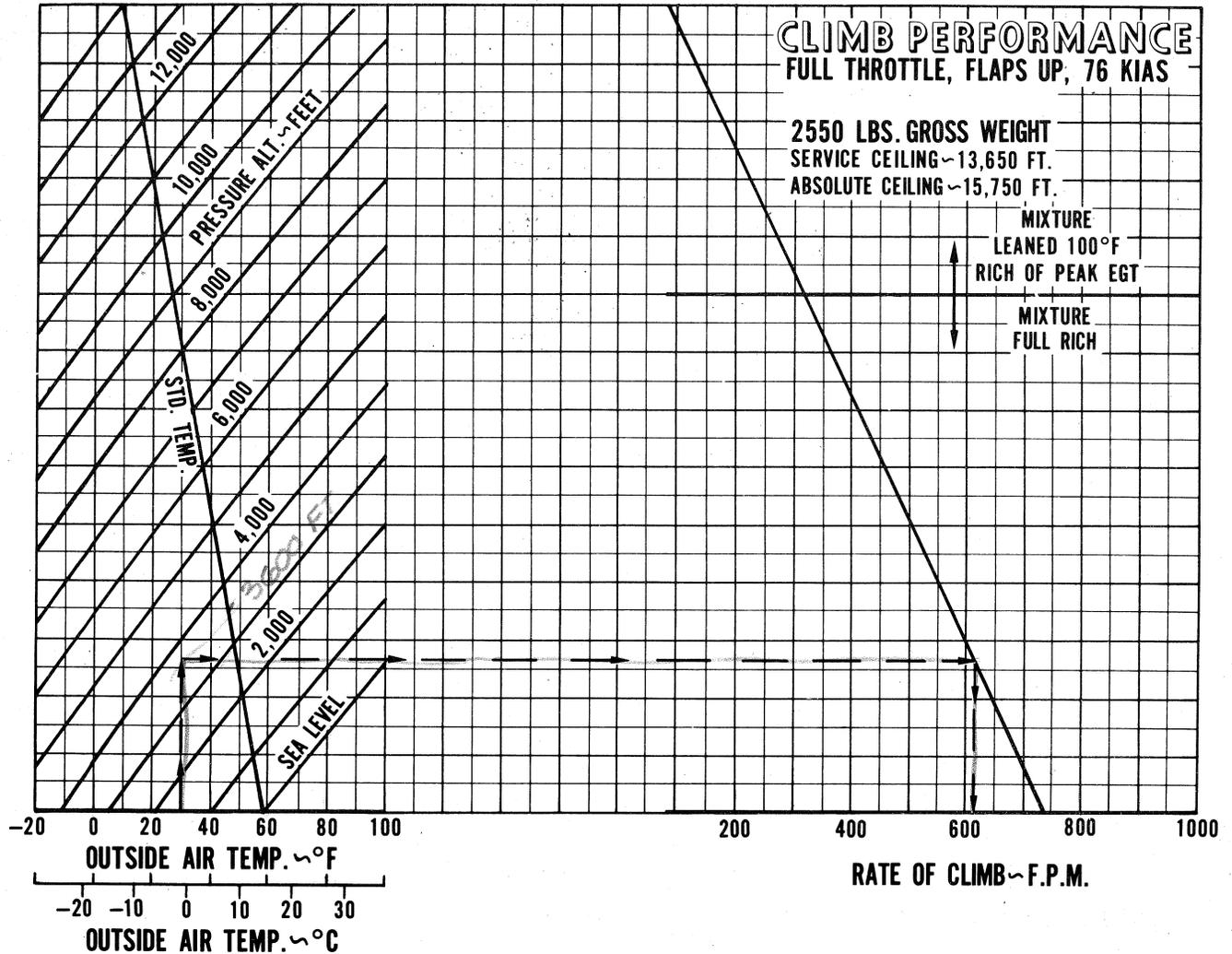


Example:
 Departure airport pressure altitude: 2000 ft.
 Temperature: 70°F
 Gross weight: 2400 lbs.
 Wind: 10 knots (headwind)
 Takeoff ground roll: 950 ft.

25° FLAPS TAKEOFF GROUND ROLL

Figure 5-11

PA-28-181



Example:

Climb pressure altitude: 3600 ft.

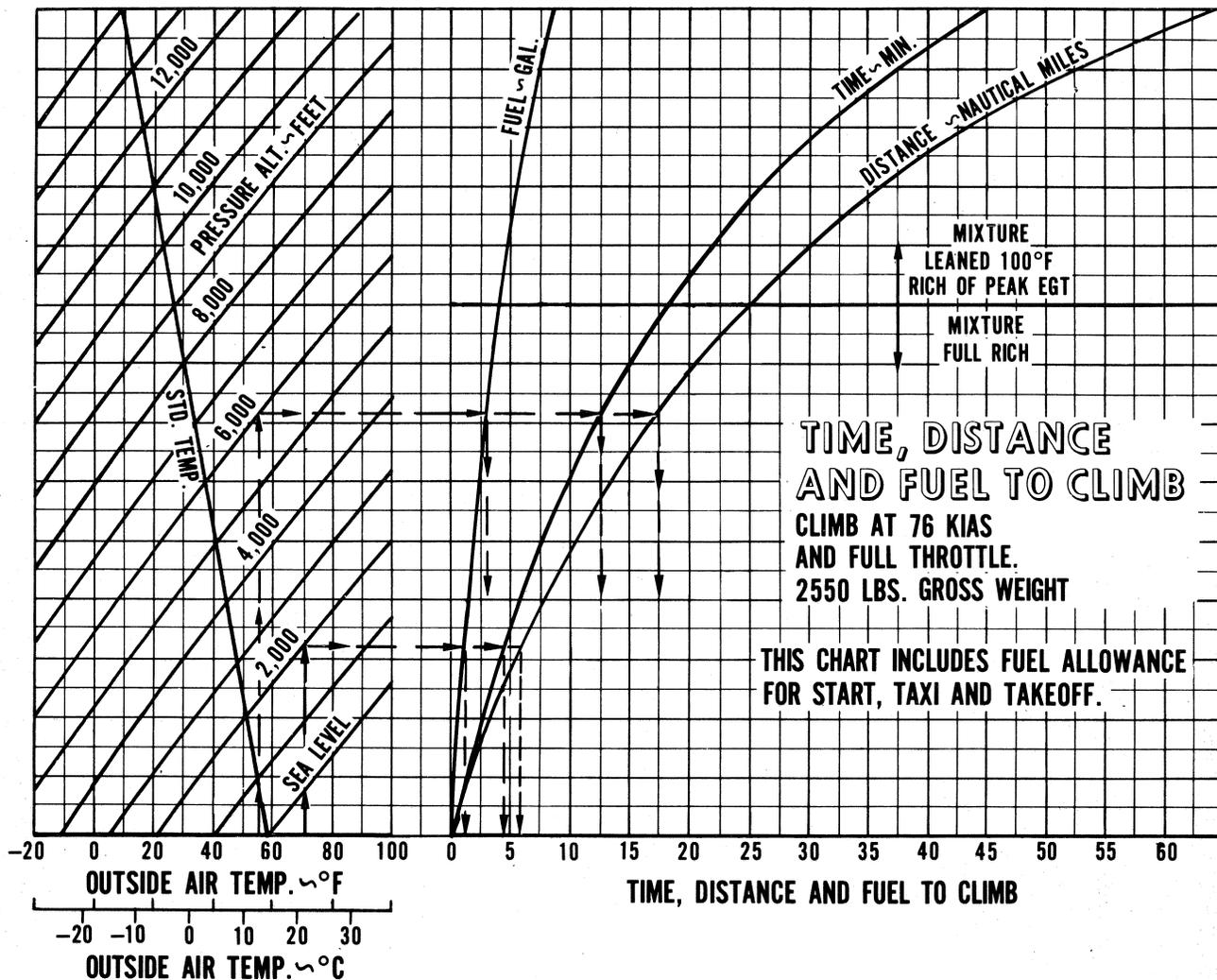
OAT: 30°F

Rate of climb: 620 F.P.M.

CLIMB PERFORMANCE

Figure 5-13

PA-28-181



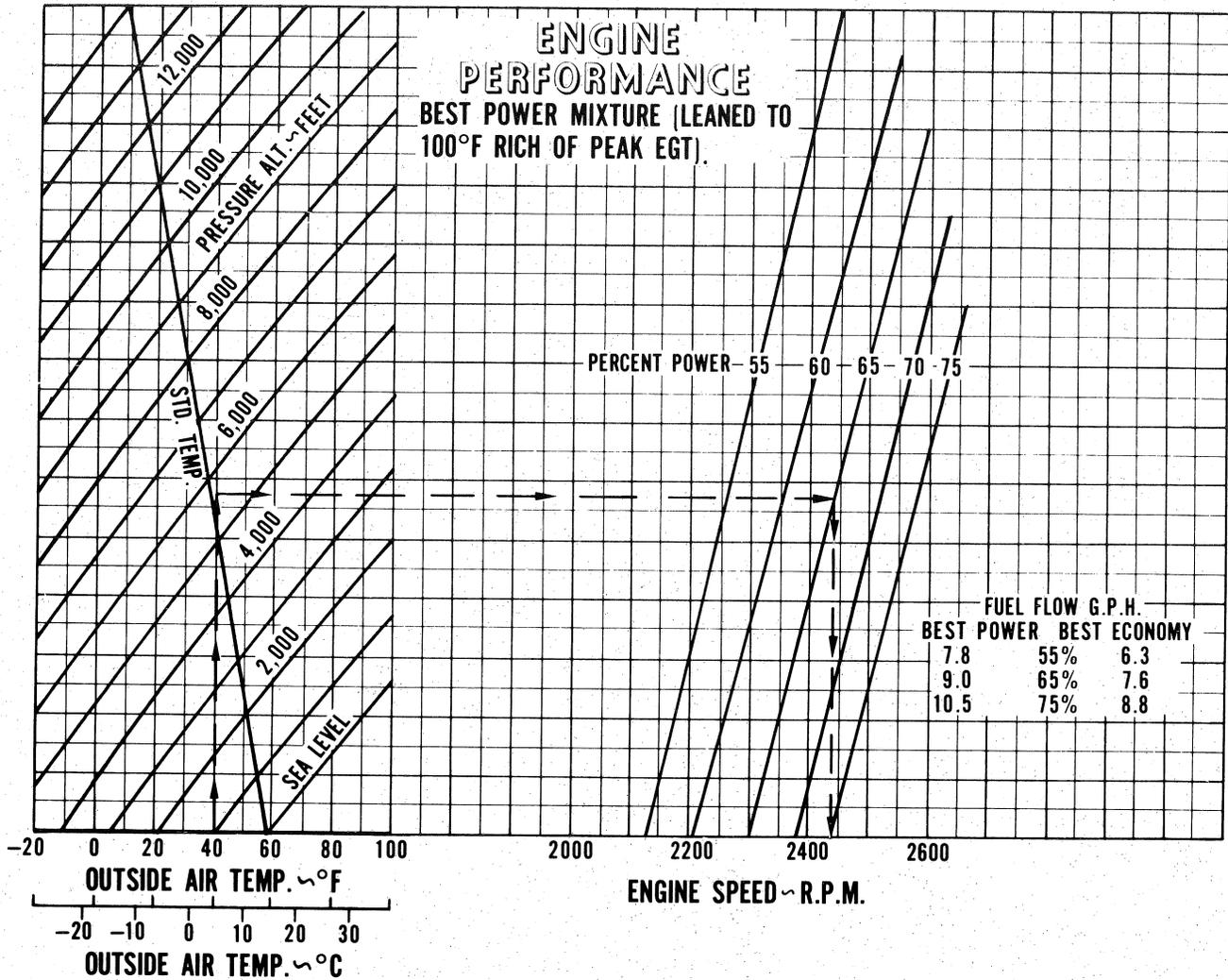
Example:

- Departure airport pressure altitude: 2000 ft.
- Departure airport temperature: 70°F
- Cruise pressure altitude: 6000 ft.
- Cruise OAT: 55°F
- Time to climb: 12.5 min. minus 4.5 min. = 8 min.
- Distance to climb: 17.5 miles minus 6.5 miles = 11 nautical miles
- Fuel to climb: 3 gal. minus 1 gal. = 2 gal.

TIME, DISTANCE AND FUEL TO CLIMB

Figure 5-15

PA-28-181



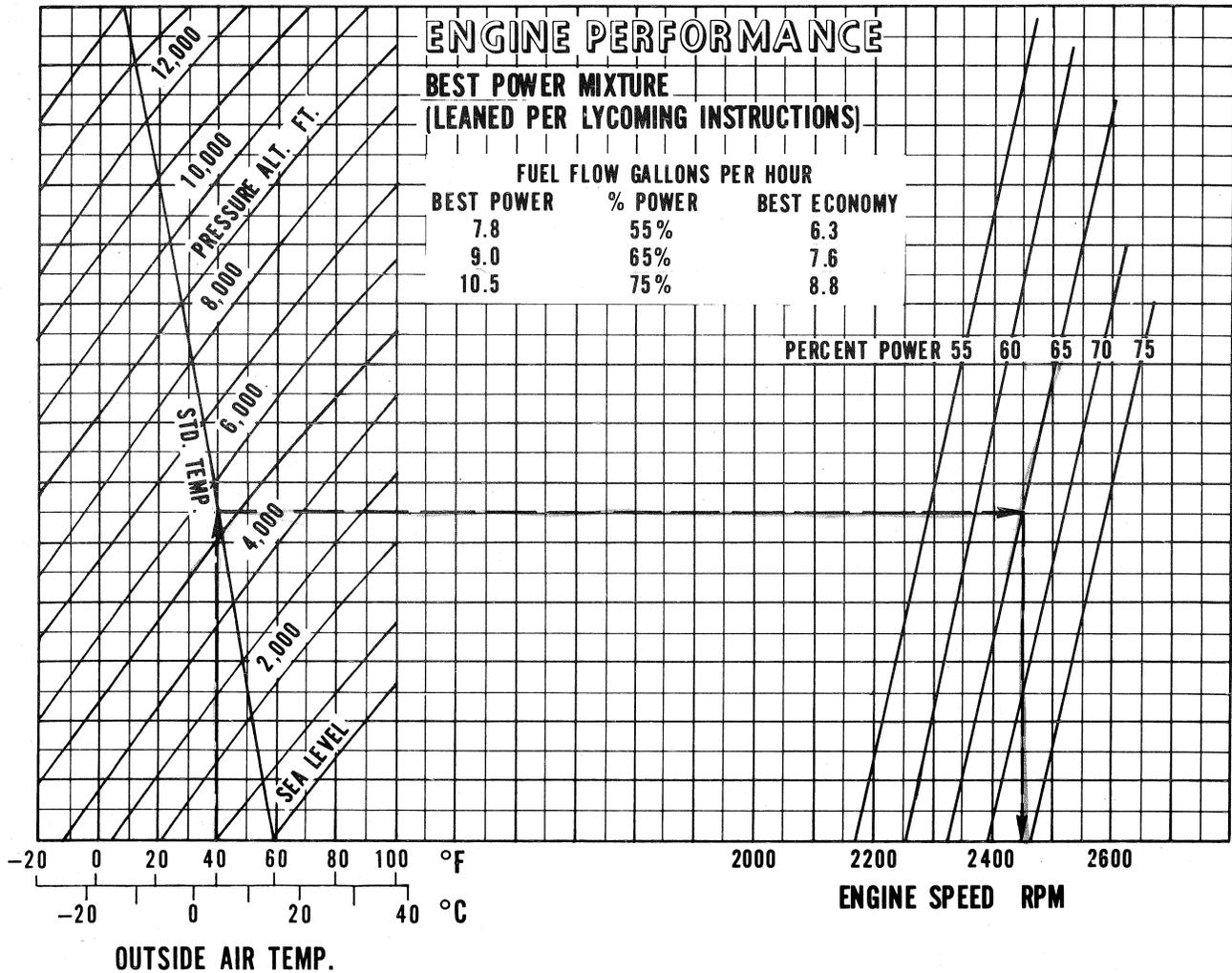
Example:

Cruise pressure altitude: 5500 ft.
Cruise OAT: 40°F
Percent power: 65%
Engine RPM: 2440 RPM

ENGINE PERFORMANCE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-17

PA-28-181

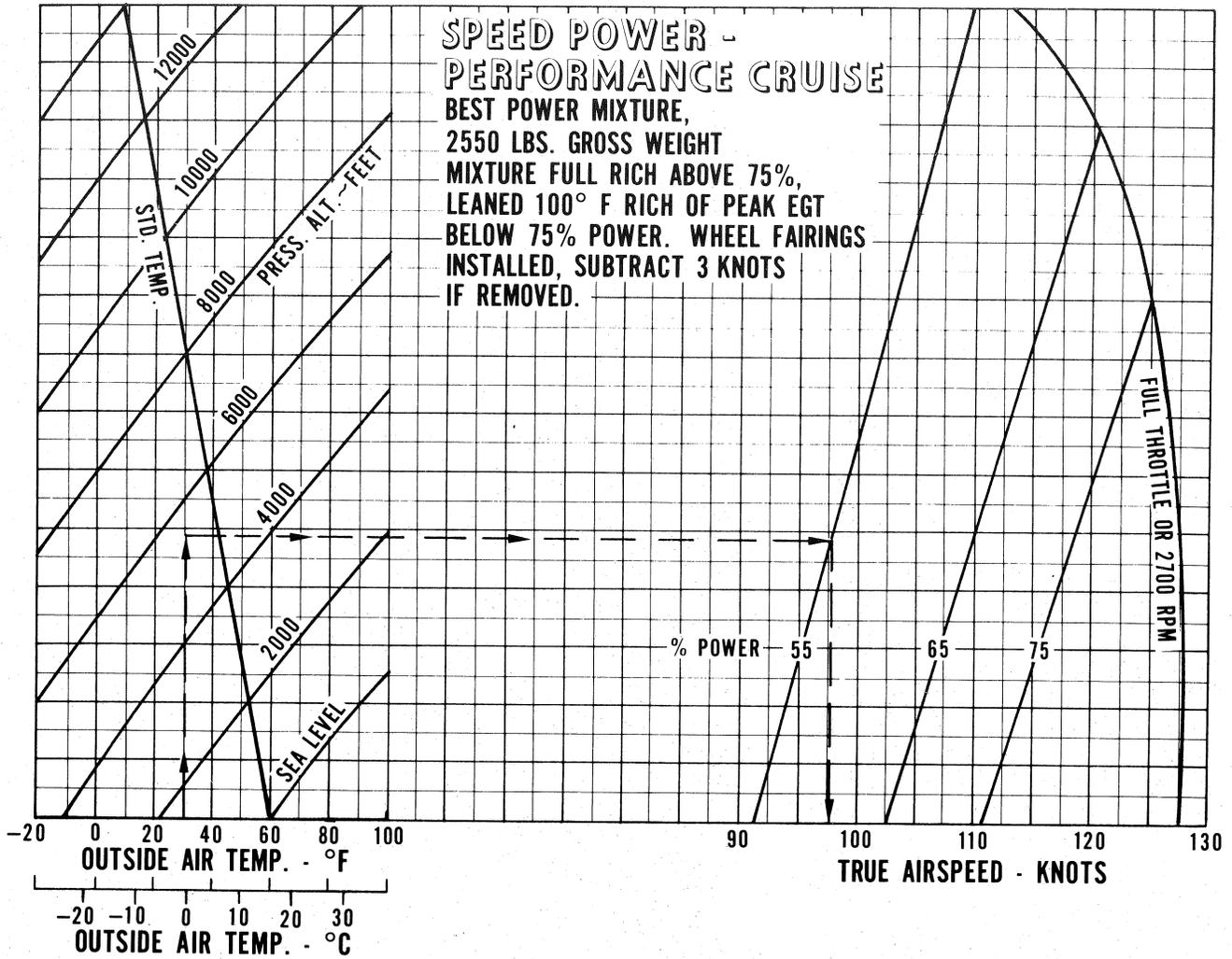


Example:
 Cruise pressure altitude: 5500 ft.
 Cruise OAT: 40°F
 Percent power: 65%
 Engine RPM: 2450 RPM

ENGINE PERFORMANCE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-18

PA-28-181



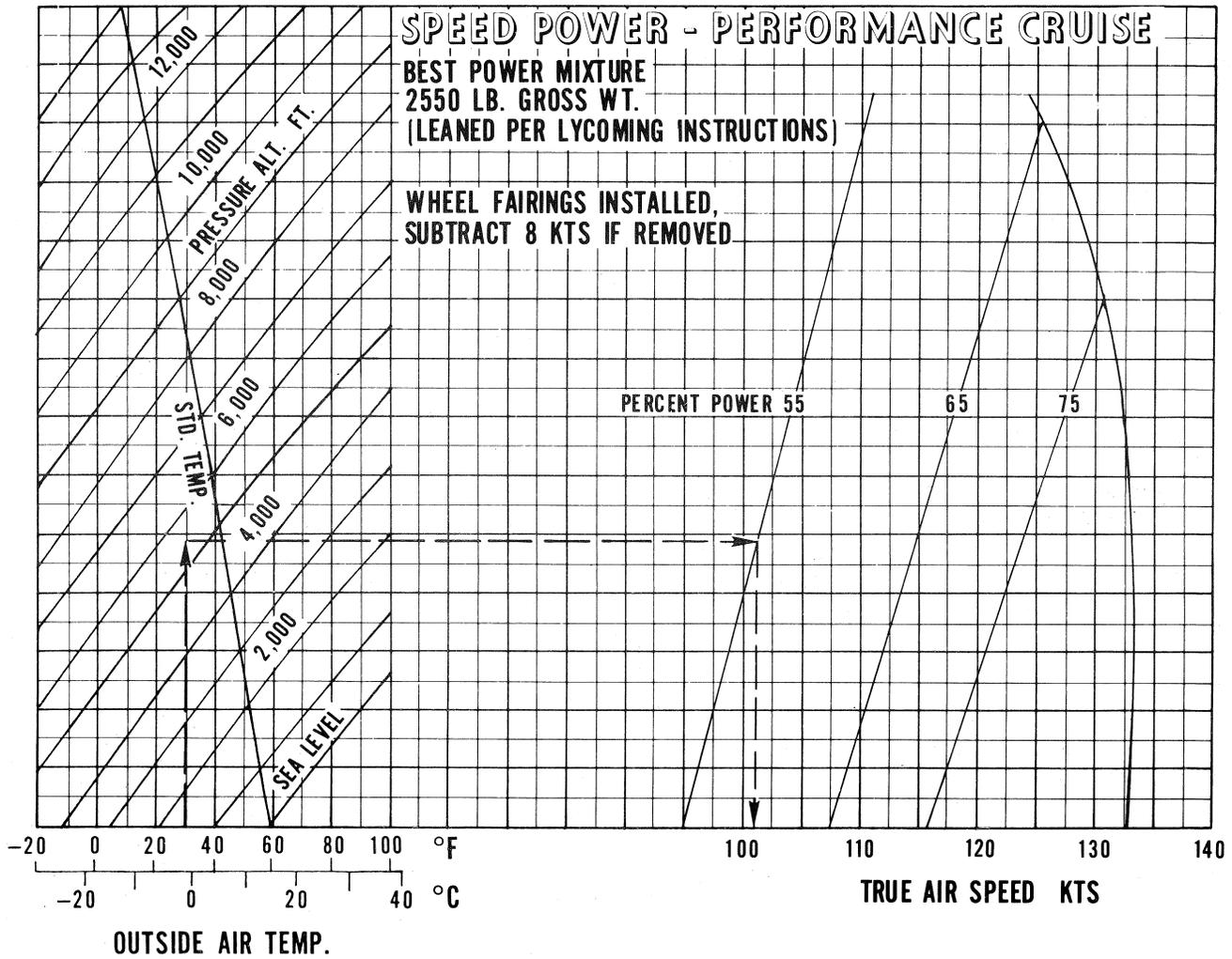
Example:

Cruise pressure altitude: 5500 ft.
 Cruise OAT: 30°F
 Power: 55%
 True airspeed: 97.5 knots

SPEED POWER - PERFORMANCE CRUISE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-19

PA-28-181

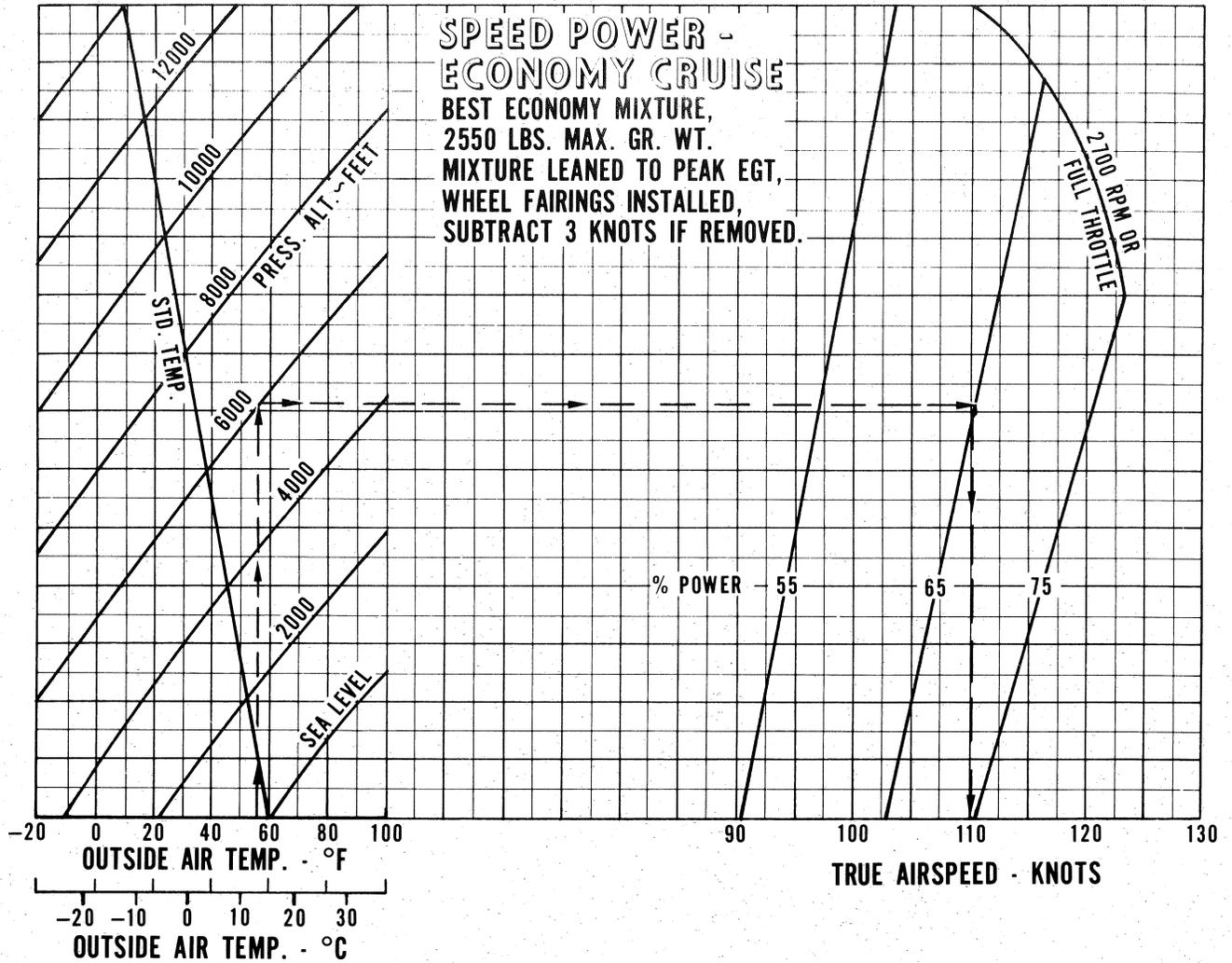


Example:
Cruise pressure altitude: 5500 ft.
Cruise OAT: 30° F
Power setting: 55%
True airspeed: 101 knots

SPEED POWER - PERFORMANCE CRUISE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-20

PA-28-181



Example:

Cruise pressure altitude: 6000 ft.

Cruise OAT: 55°F

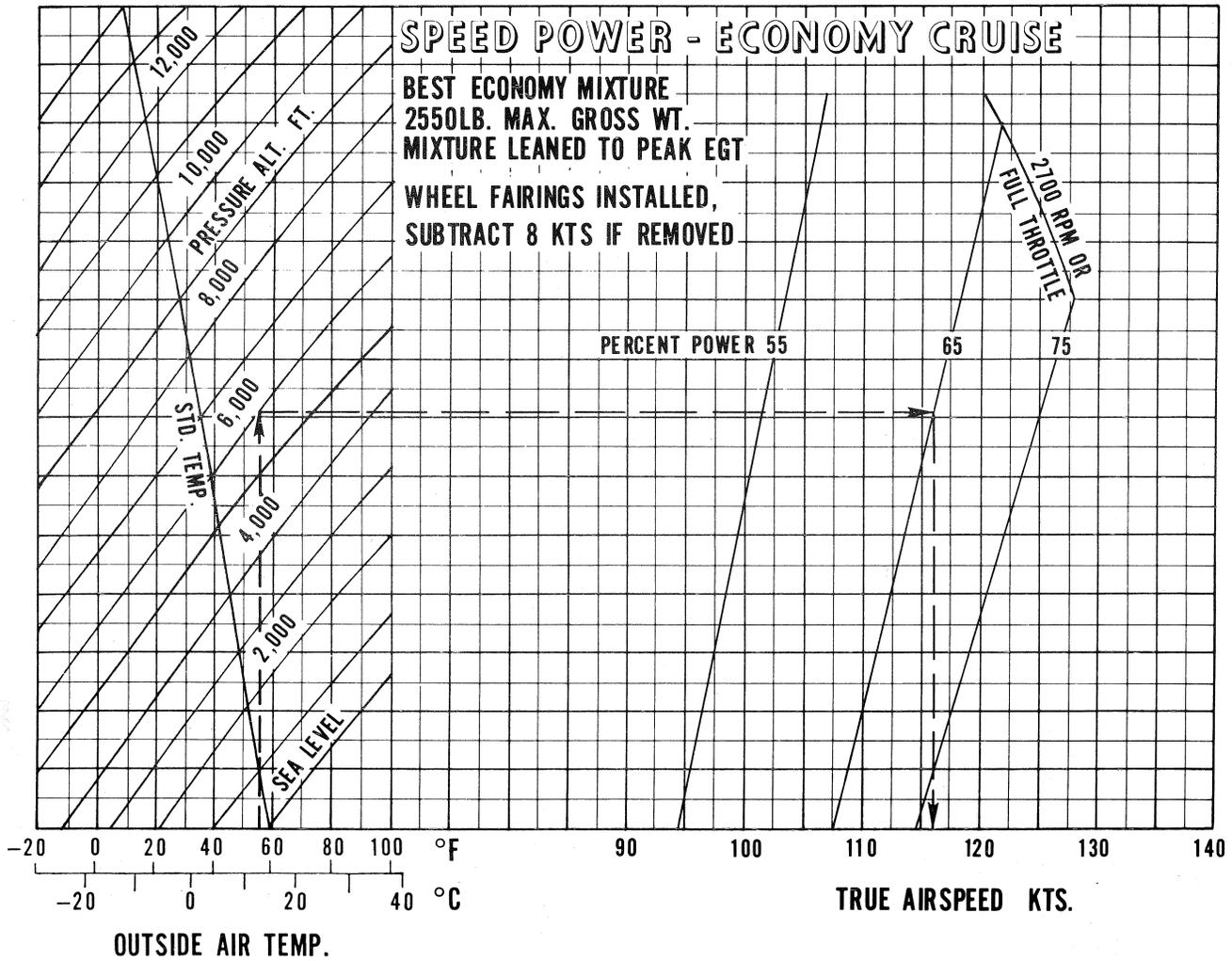
Power: 65%

True airspeed: 110 knots

SPEED POWER - ECONOMY CRUISE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-21

PA-28-181

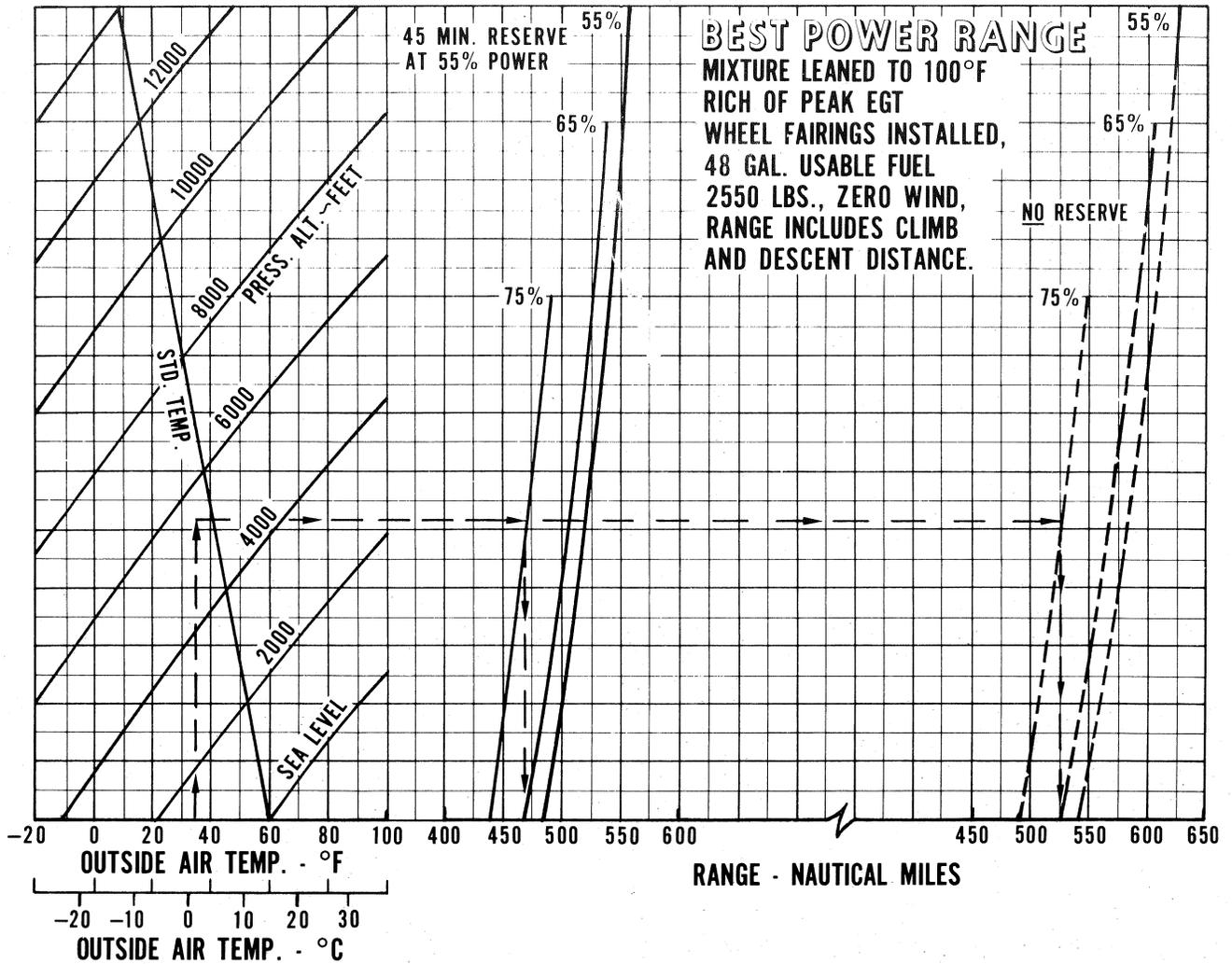


Example:
Cruise pressure altitude: 6000 ft.
Cruise OAT: 55° F
Power setting: 65%
True airspeed: 116 knots

SPEED POWER - ECONOMY CRUISE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-22

PA-28-181



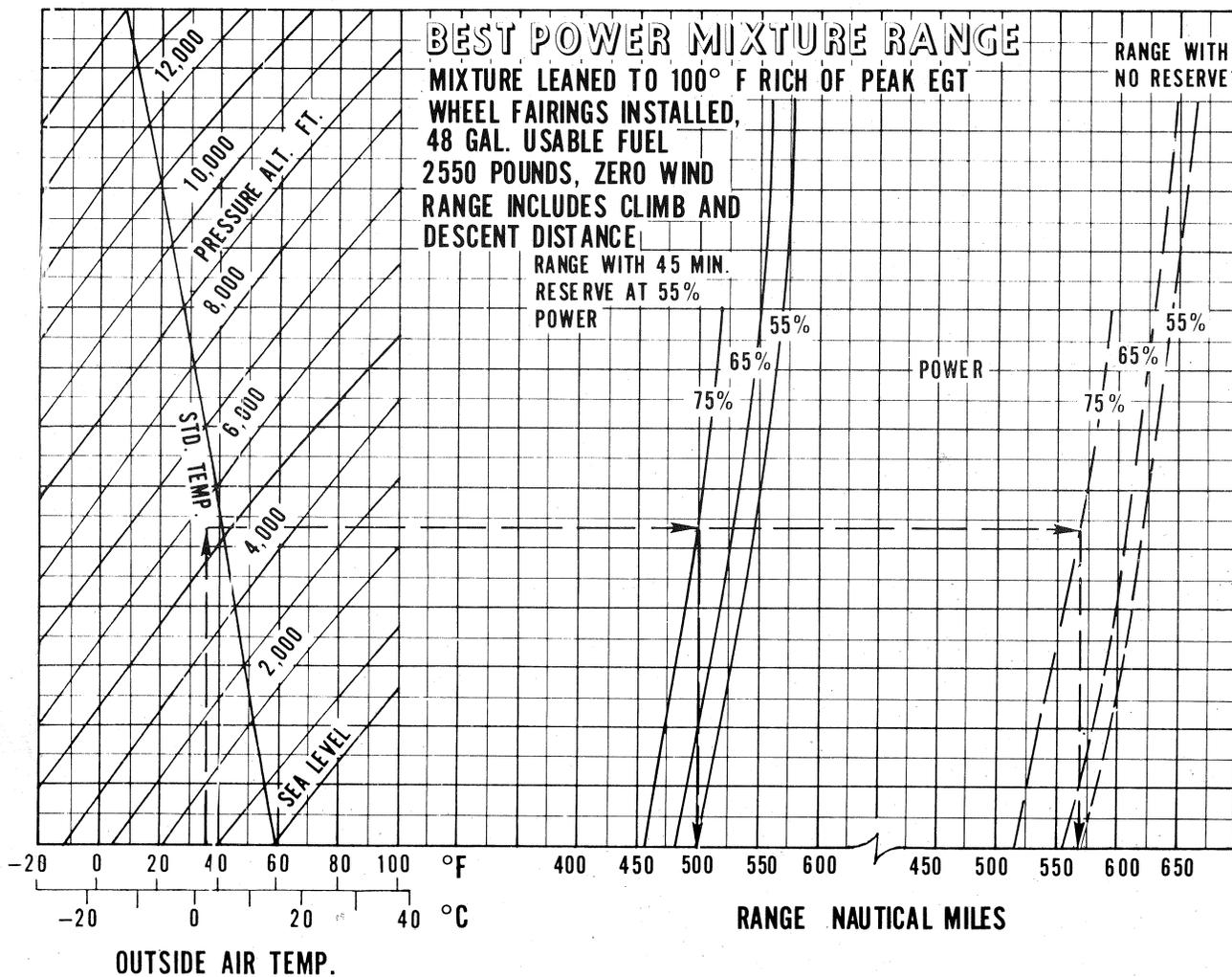
Example:

- Cruise pressure altitude: 5500 ft.
- Cruise OAT: 35°F
- Power setting: 75%
- Range (with reserve): 470 nautical miles
- Range (no reserve): 525 nautical miles

BEST POWER MIXTURE RANGE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-23

PA-28-181



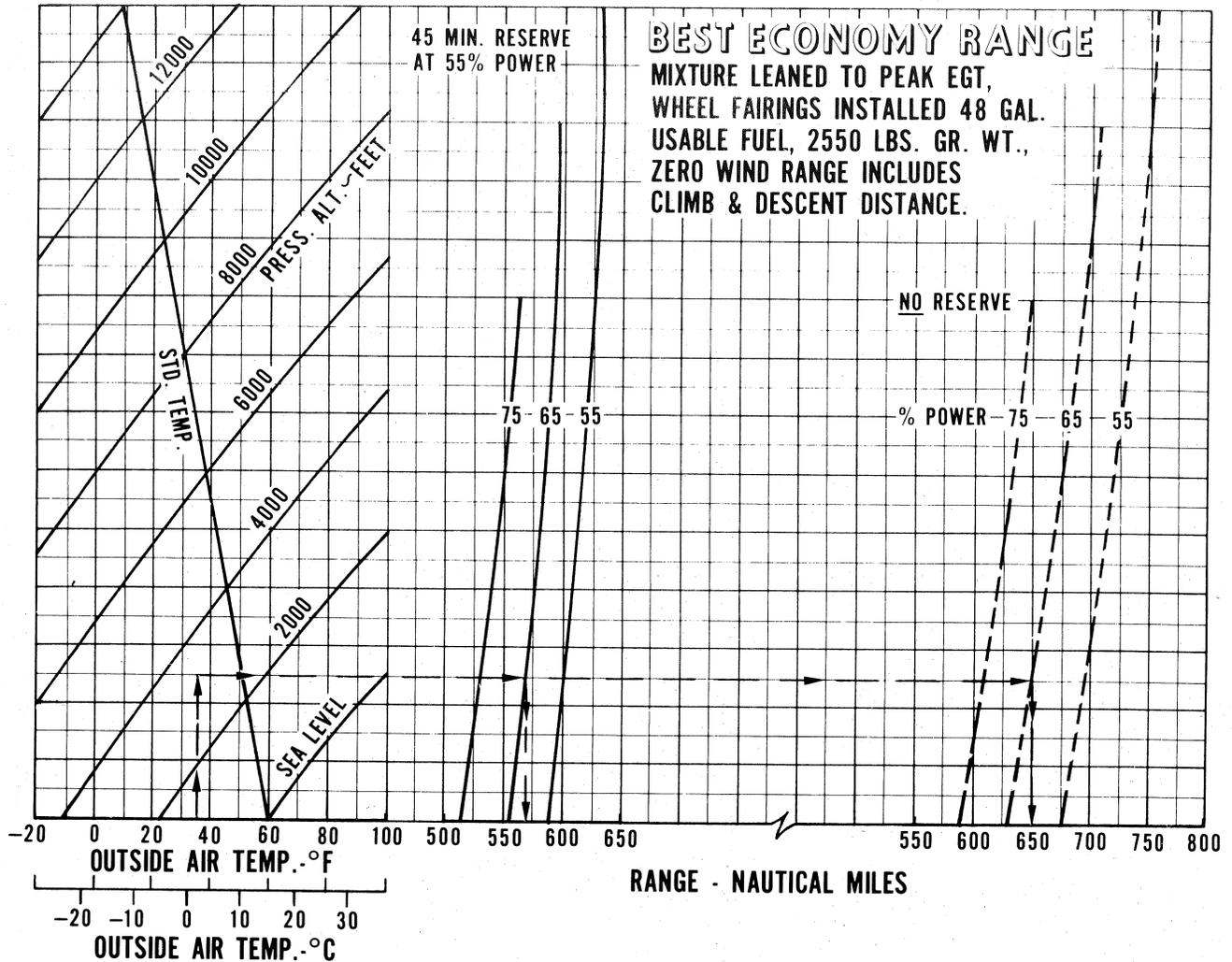
Example:

- Cruise pressure altitude: 5500 ft.
- Cruise OAT: 35° F
- Power setting: 75%
- Range (with reserve): 500 nautical miles
- Range (no reserve): 570 nautical miles

BEST POWER MIXTURE RANGE (SERIAL NOS. 28-789001 AND UP)

Figure 5-24

PA-28-181



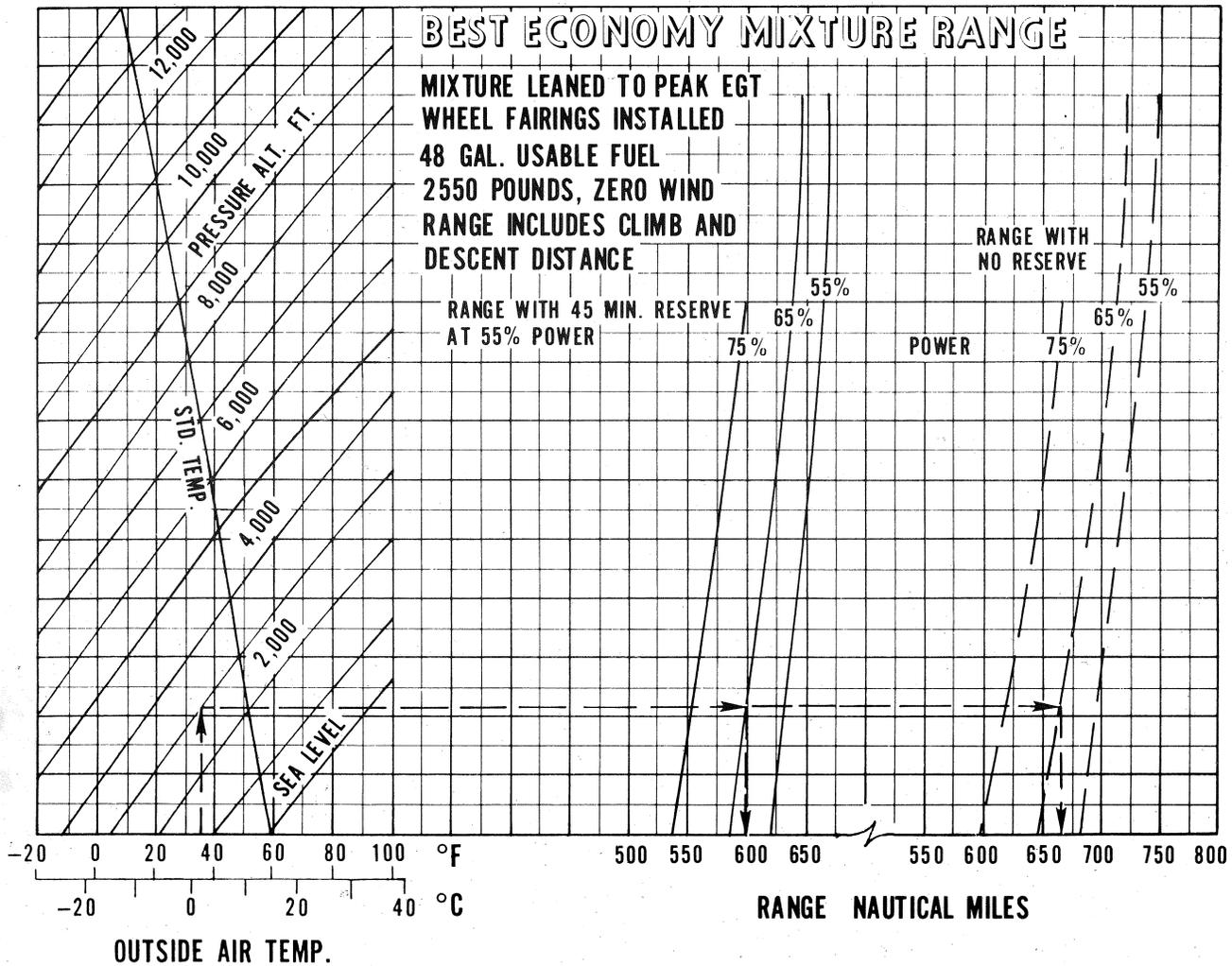
Example:

- Cruise pressure altitude: 3000 ft.
- Cruise OAT: 35°F
- Power setting: 65%
- Range (with reserve): 570 nautical miles
- Range (no reserve): 650 nautical miles

BEST ECONOMY MIXTURE RANGE (SERIAL NOS. 28-7790001 THROUGH 7790607)

Figure 5-25

PA-28-181



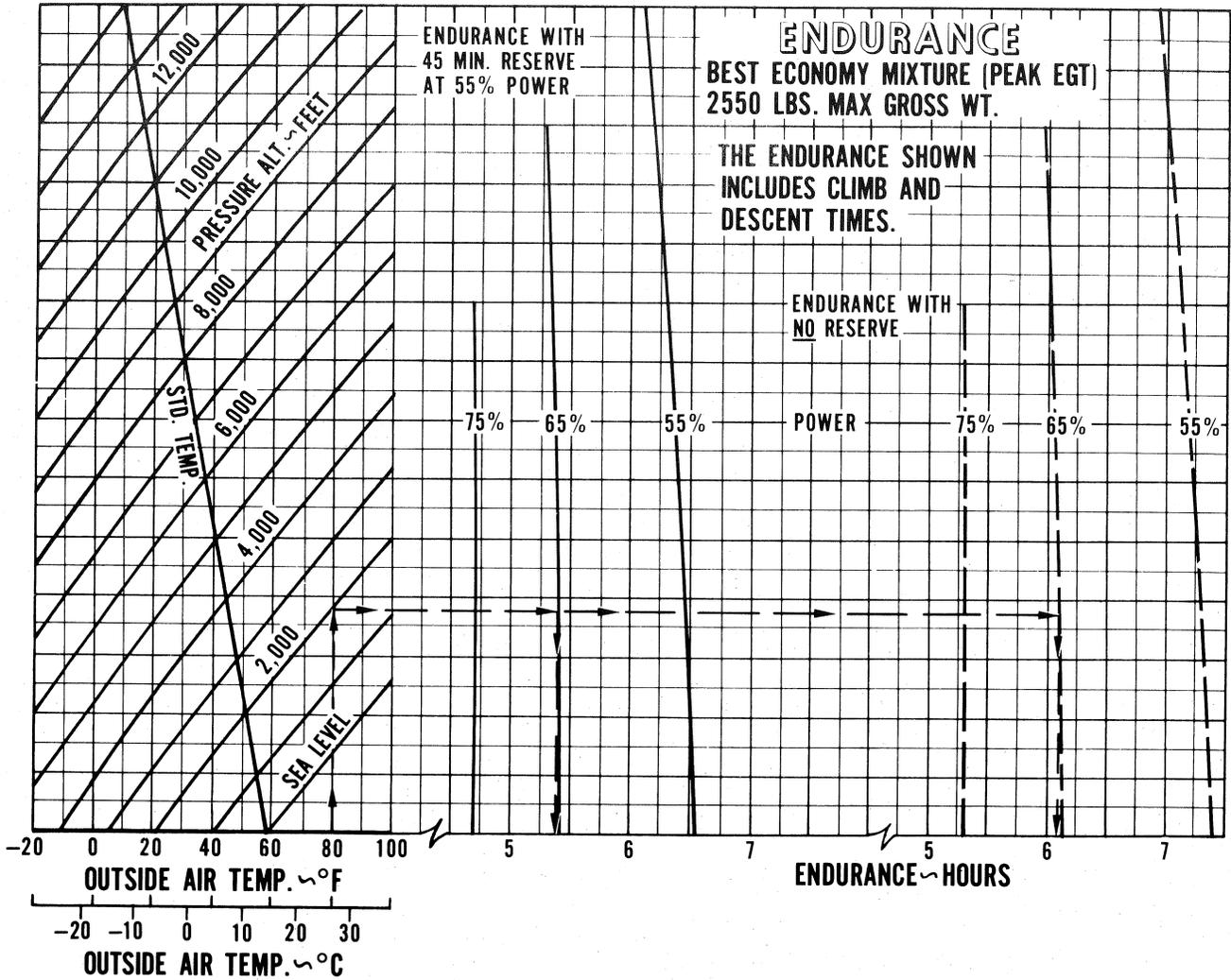
Example:

- Cruise pressure altitude: 3000 ft.
- Cruise OAT: 35°F
- Power setting: 65%
- Range (with reserve): 600 nautical miles
- Range (no reserve): 660 nautical miles

BEST ECONOMY MIXTURE RANGE (SERIAL NOS. 28-7890001 AND UP)

Figure 5-26

PA-28-181



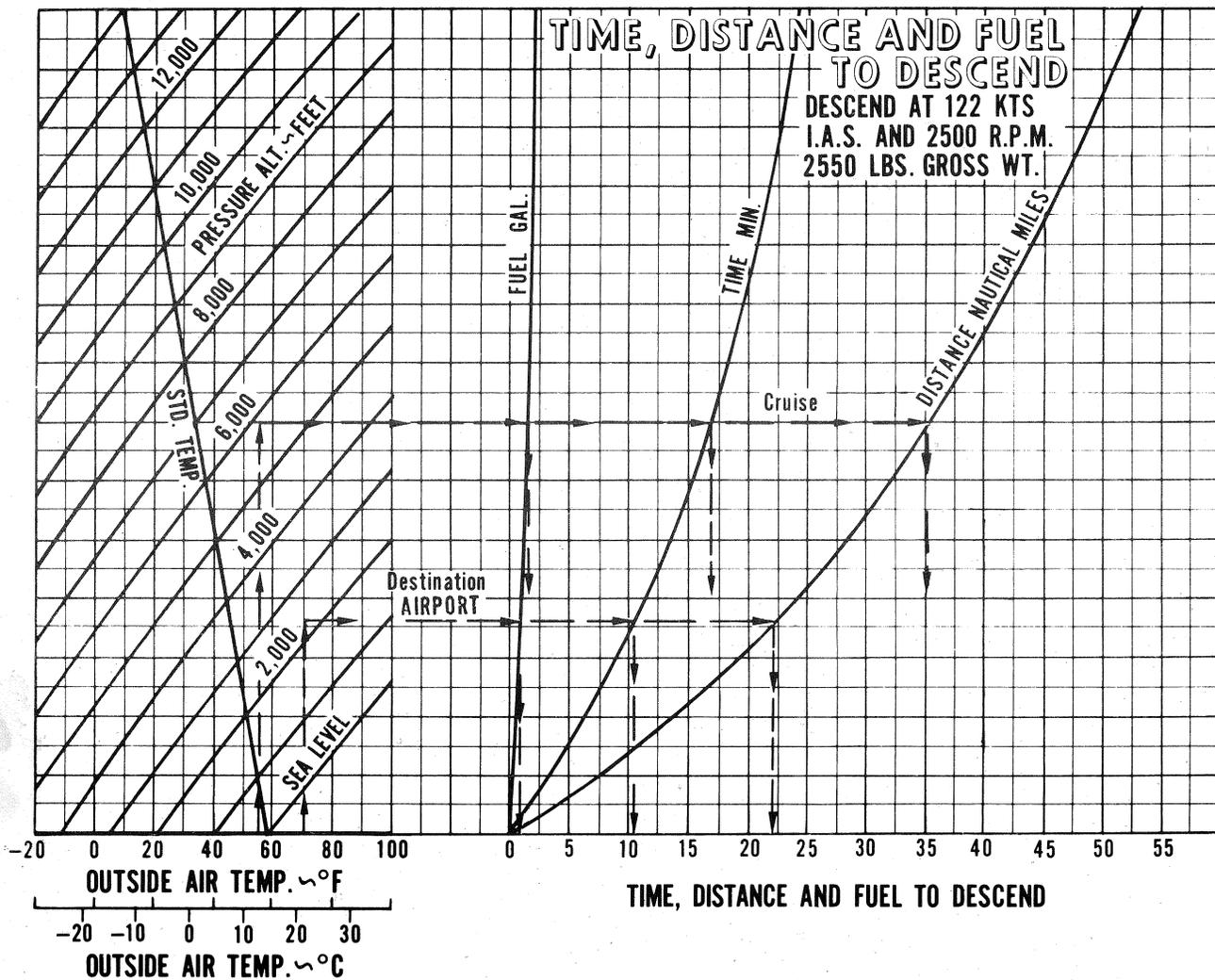
Example:

- Cruise pressure altitude: 2000 ft.
- Cruise OAT: 80°F
- Power setting: 65%
- Endurance (with reserve): 5.37 hrs.
- Endurance (no reserve): 6.1 hrs.

ENDURANCE

Figure 5-27

PA-28-181



Example:

Cruise pressure altitude: 6000 ft.

Cruise OAT: 55°F

Destination airport pressure altitude: 2300 ft.

Destination airport temperature: 70°F

Fuel to descend: (1.7 gal. minus 1 gal.) = .7 gal.

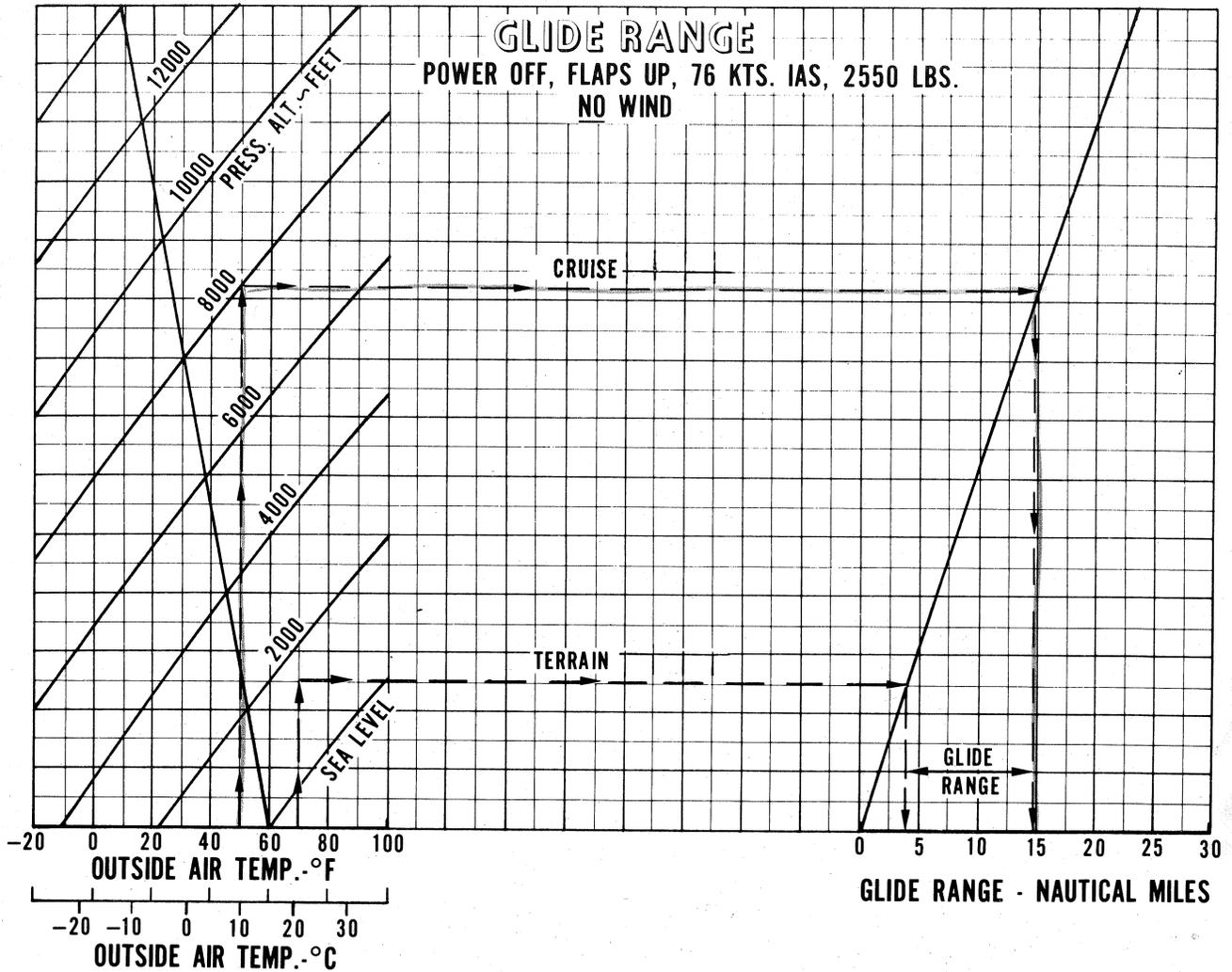
Time to descend: (17 min. minus 10.5 min.) = 6.5 min.

Distance to descend (35 miles minus 22 miles) = 13 nautical miles

TIME, DISTANCE AND FUEL TO DESCEND

Figure 5-29

PA-28-181



Example:

Cruise pressure altitude: 8000 ft.

Cruise OAT: 50°F

Terrain pressure altitude: 1500 ft.

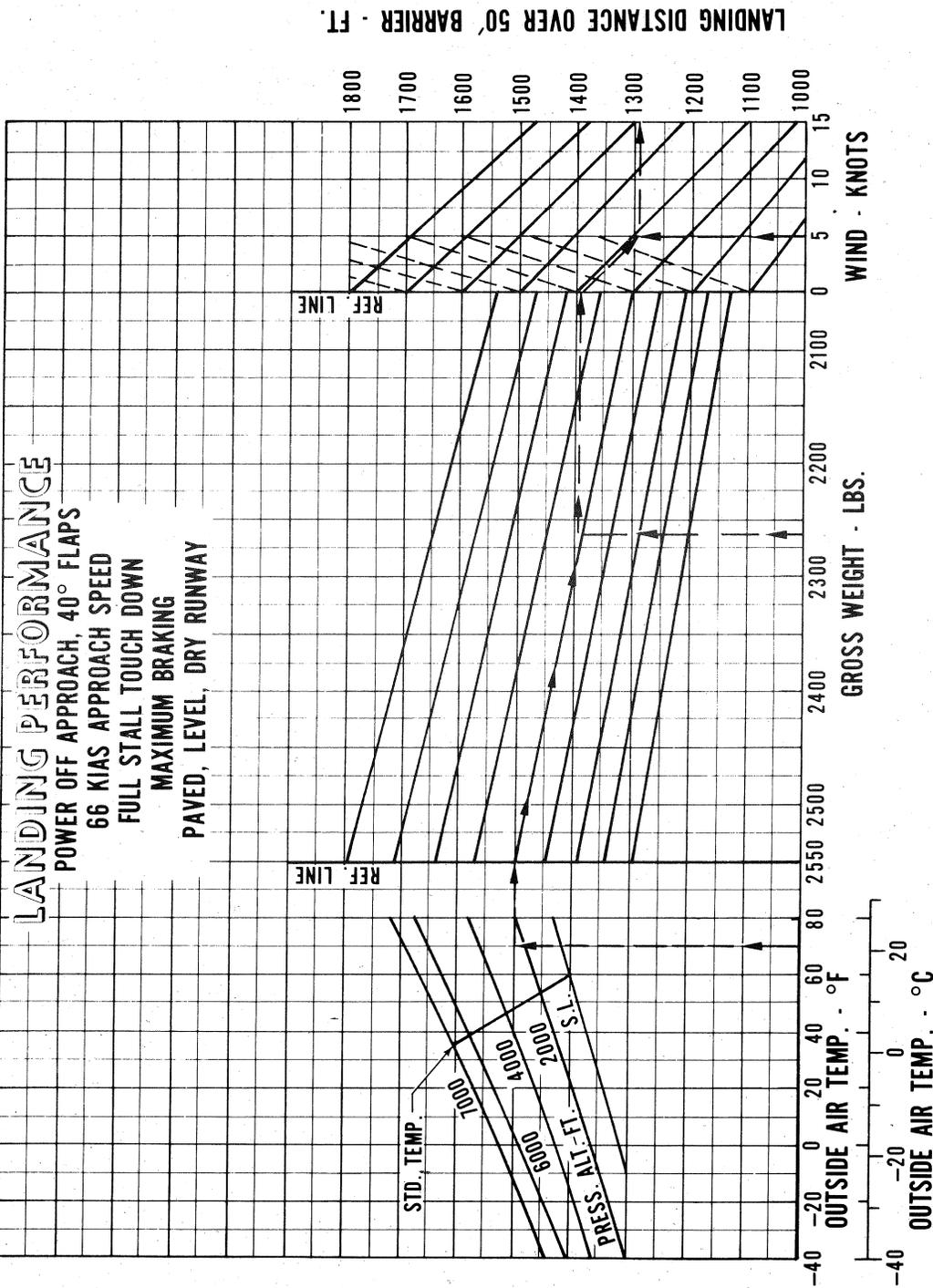
Terrain temperature: 70°F

Glide Range: 14.5 miles minus 3.5 miles = 11 nautical miles

GLIDE RANGE

Figure 5-31

PA-28-181

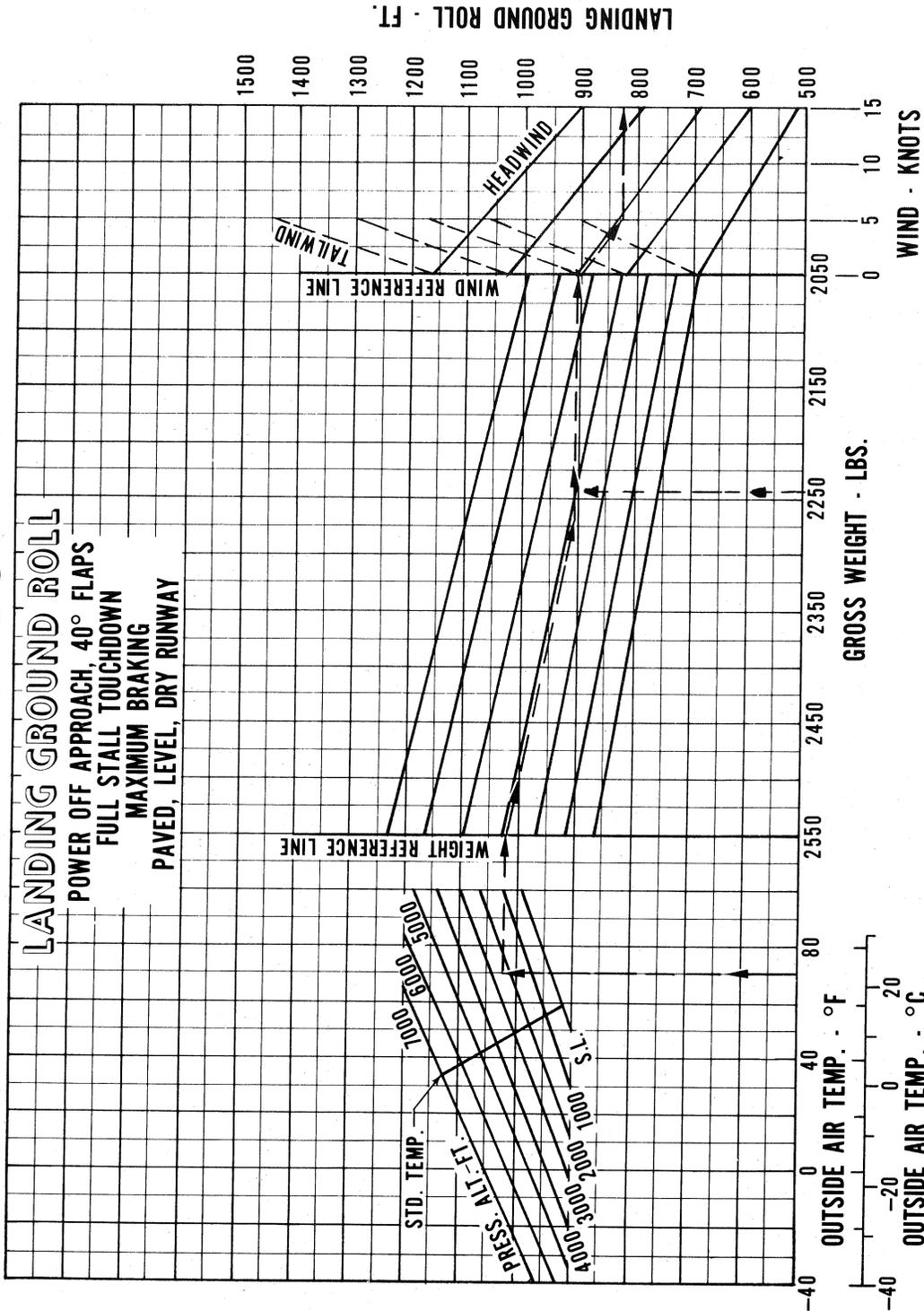


Example:
 Airport pressure altitude: 2300 ft.
 Gross weight: 2264
 Temperature: 70°F
 Wind: 5 knots (headwind)
 Landing distance: 1290 ft.

LANDING PERFORMANCE

Figure 5-33

PA-28-181



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

LANDING GROUND ROLL

Figure 5-35

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