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SECTION 5

PERFORMANCE

SECTION 5

PERFORMANCE

5.1 GENERAL

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

Performance information associated with those optional systems and equipment which require handbook supplements is provided in 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.

WARNING

Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.

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 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 6-13) 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 the following weights have been determined 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	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 89 lbs.)	3391 lbs.

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

(b) Takeoff and Landing

After determining the aircraft loading, all aspects of takeoff and landing must be considered.

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, 5-8, 5-9 and 5-10) 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) Elevation	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 the flight plan example 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 Fuel, Distance, and Time to Climb graph (Figure 5-15). After the fuel, distance and time for the cruise altitude and temperature values have been established, apply the existing conditions at the departure field to graph (Figure 5-15). 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	42°F
(3) Time to Climb (8 min. minus 1 min.)	7 min.***
(4) Distance to Climb (16 miles minus 3 miles)	13 miles***
(5) Fuel to Climb (3.2 gal. minus 0.4 gal.)	2.8 gal.***

*reference Figure 5-9
**reference Figure 5-31
***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 altitude and temperature, determine the basic fuel, distance and time for descent (Figure 5-27). 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 fuel, distance and time values from the graph (Figure 5-27). 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 the example are shown below:

(1)	Time to Descend (12.5 min. minus 2.5 min.)	10 min.*
(2)	Distance to Descend (38 miles minus 8 miles)	30 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 5-17) 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 5-19 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 the flight planning example are as follows:

(1)	Total Distance	150 miles
(2)	Cruise Distance (e)(1) minus (c)(4) minus (d)(2), (150 miles minus 13 miles minus 30 miles)	107 miles
(3)	Cruise Power	65% rated power
(4)	Cruise Speed	163 MPH TAS**
(5)	Cruise Fuel Consumption	13.8 GPH
(6)	Cruise Time (e)(2) divided by (e)(4), (107 miles divided by 163 MPH)	.656 hrs.
(7)	Cruise Fuel (e)(5) multiplied by (c)(6), (13.8 GPH multiplied by .656 hrs.)	9.1 gal.

*reference Figure 5-27
**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 the flight planning example.

(1) Total Flight Time
(c)(3) plus (d)(1) plus (e)(6), (.12 hrs. plus .17 hrs. plus .656 hrs.) .946 hrs.

(g) Total Fuel Required

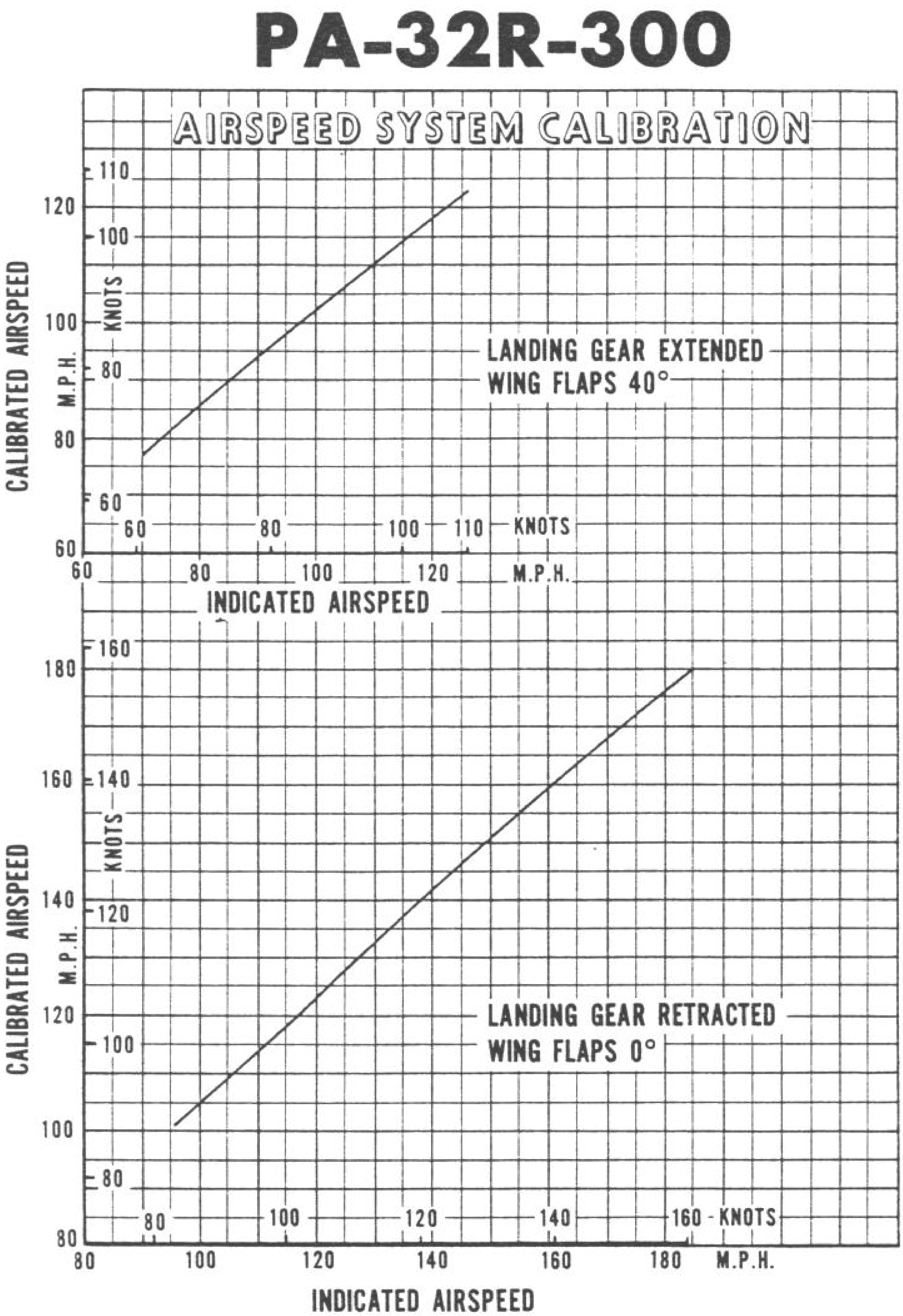
Determine the total fuel required by adding the fuel to climb, the fuel to descend and the cruise fuel. When the total fuel (in gallons) is determined, multiply this value by 6 lb/gal to determine the total fuel weight used for the flight.

The total fuel calculations for the 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 9.1 gal.) 14.9 gal.
(14.9 gal. multiplied by 6 lb/gal.) 89 lbs.

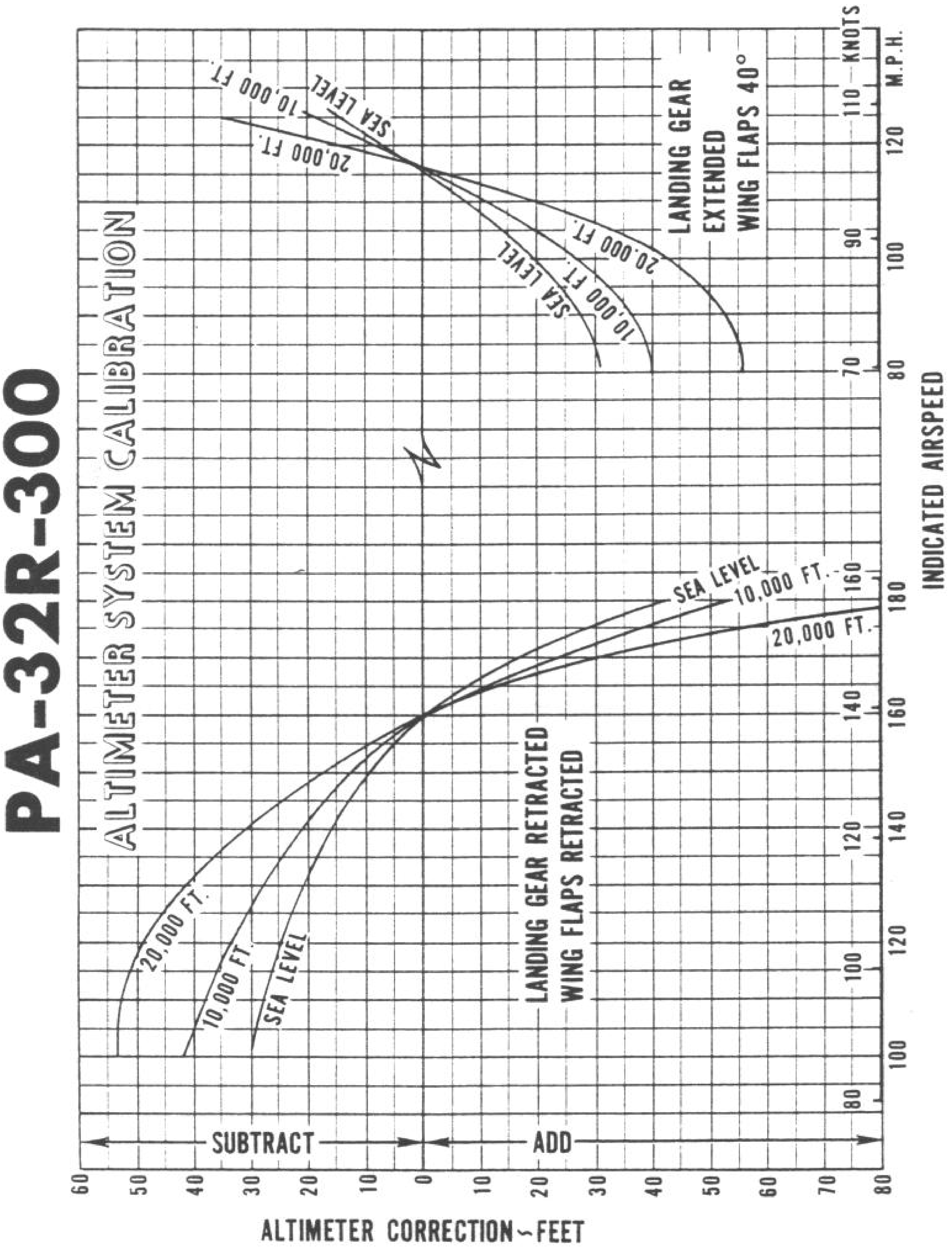
5.7 PERFORMANCE GRAPHS

LIST OF FIGURES



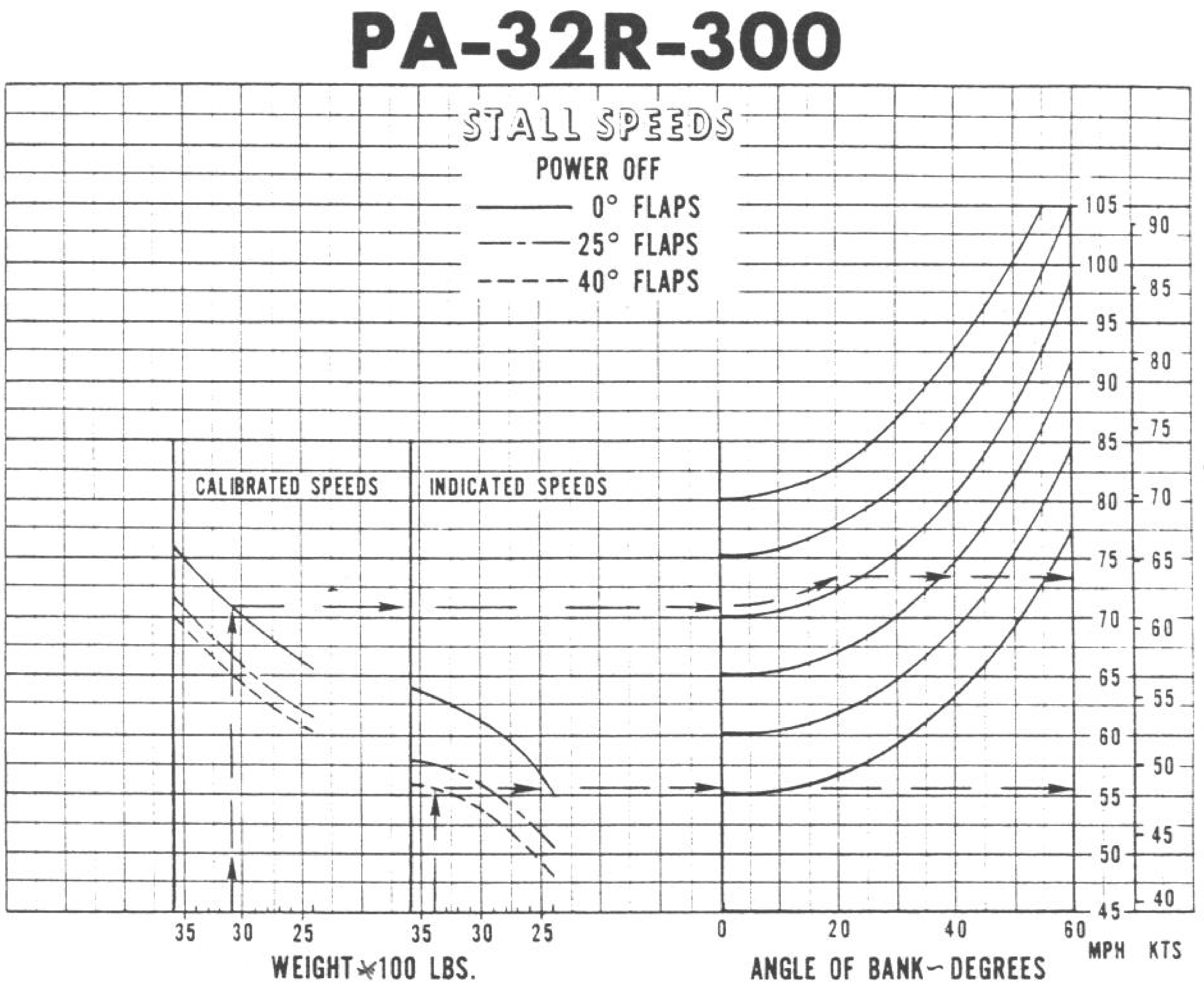
AIRSPEED SYSTEM CALIBRATION

Figure 5-1



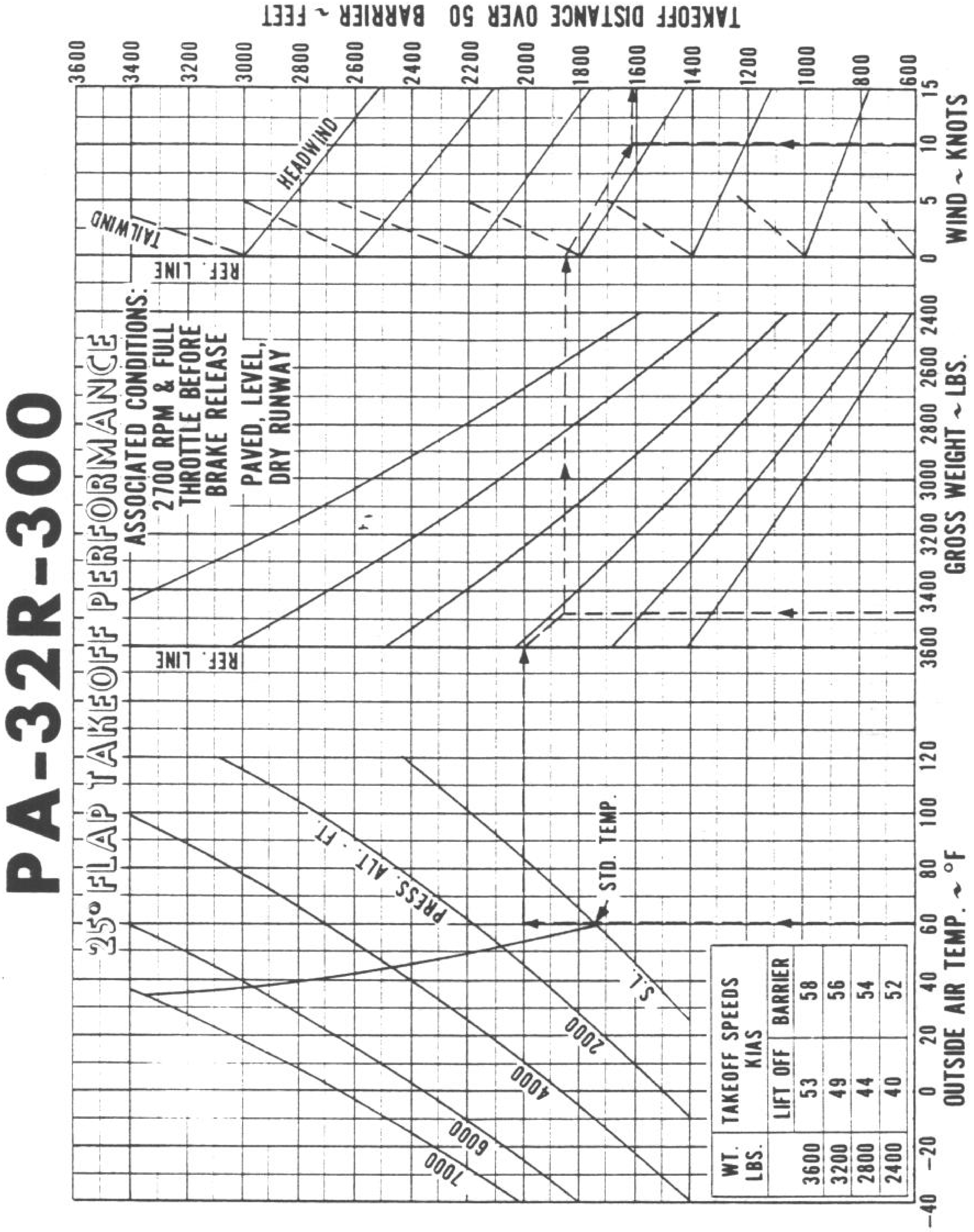
ALTIMETER CALIBRATION

Figure 5-3



STALL SPEEDS

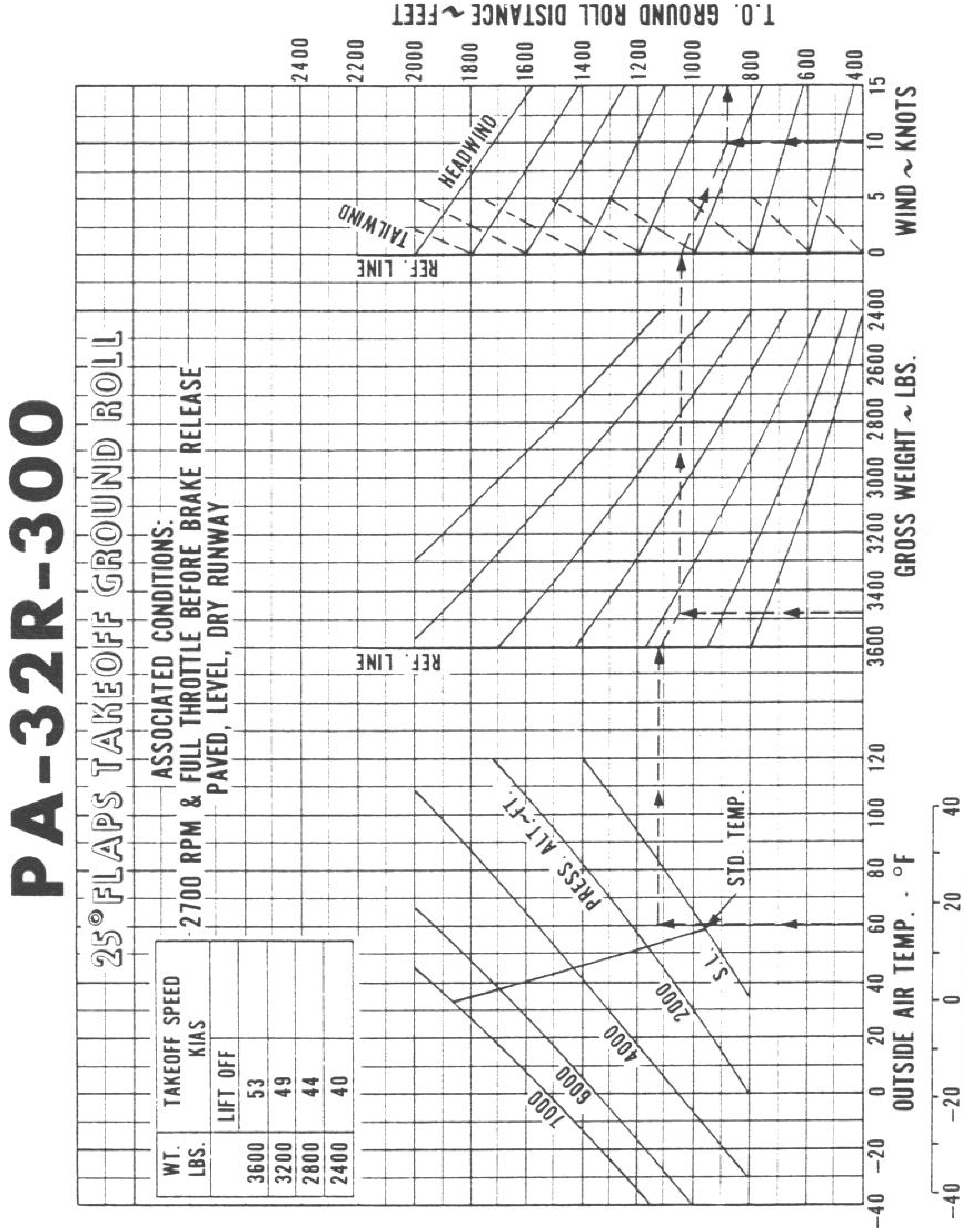
Figure 5-5



WT. LBS.	TAKEOFF SPEEDS KIAS LIFT OFF	BARRIER
3600	53	58
3200	49	56
2800	44	54
2400	40	52

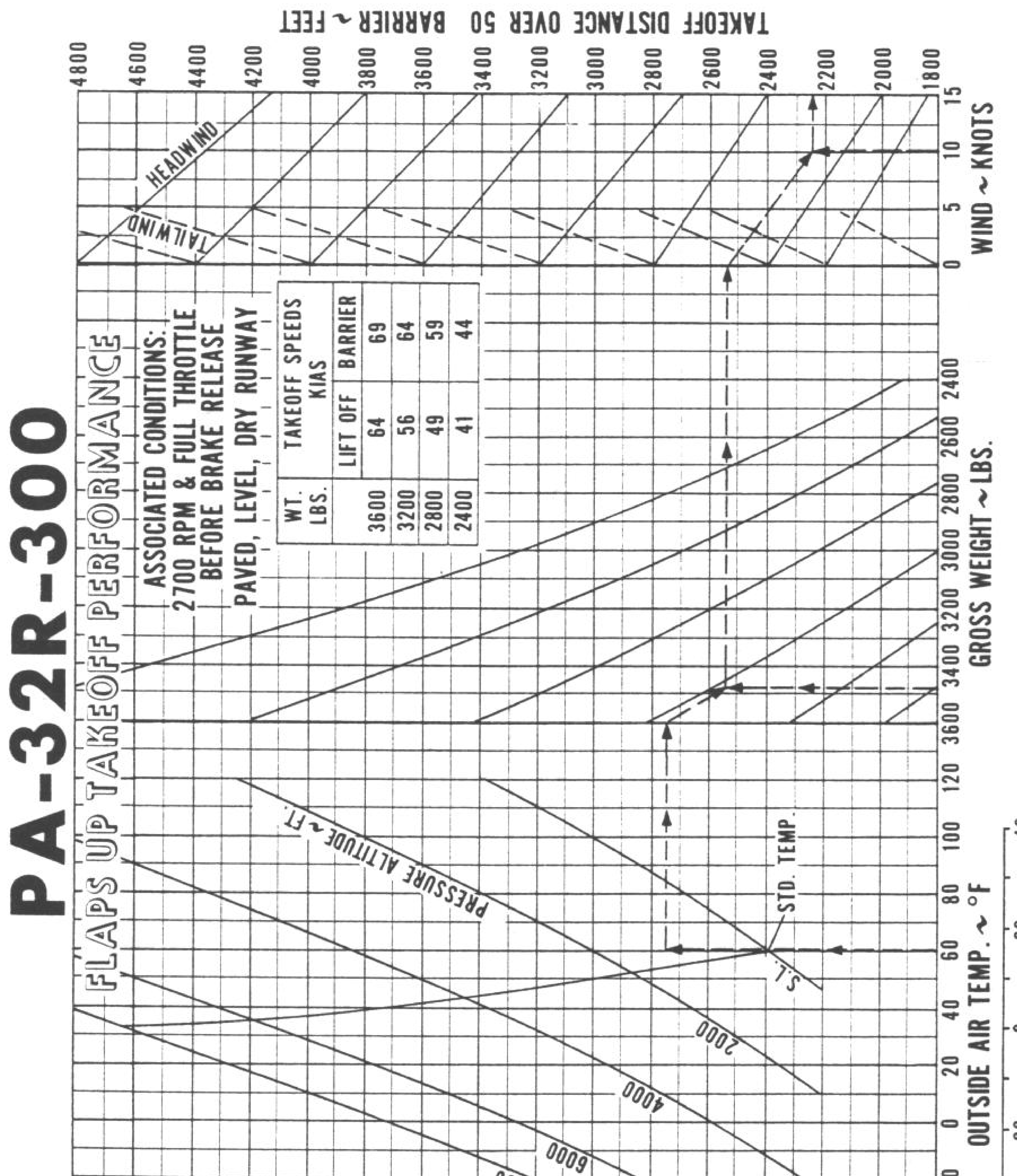
25° FLAPS TAKEOFF PERFORMANCE

Figure 5-7



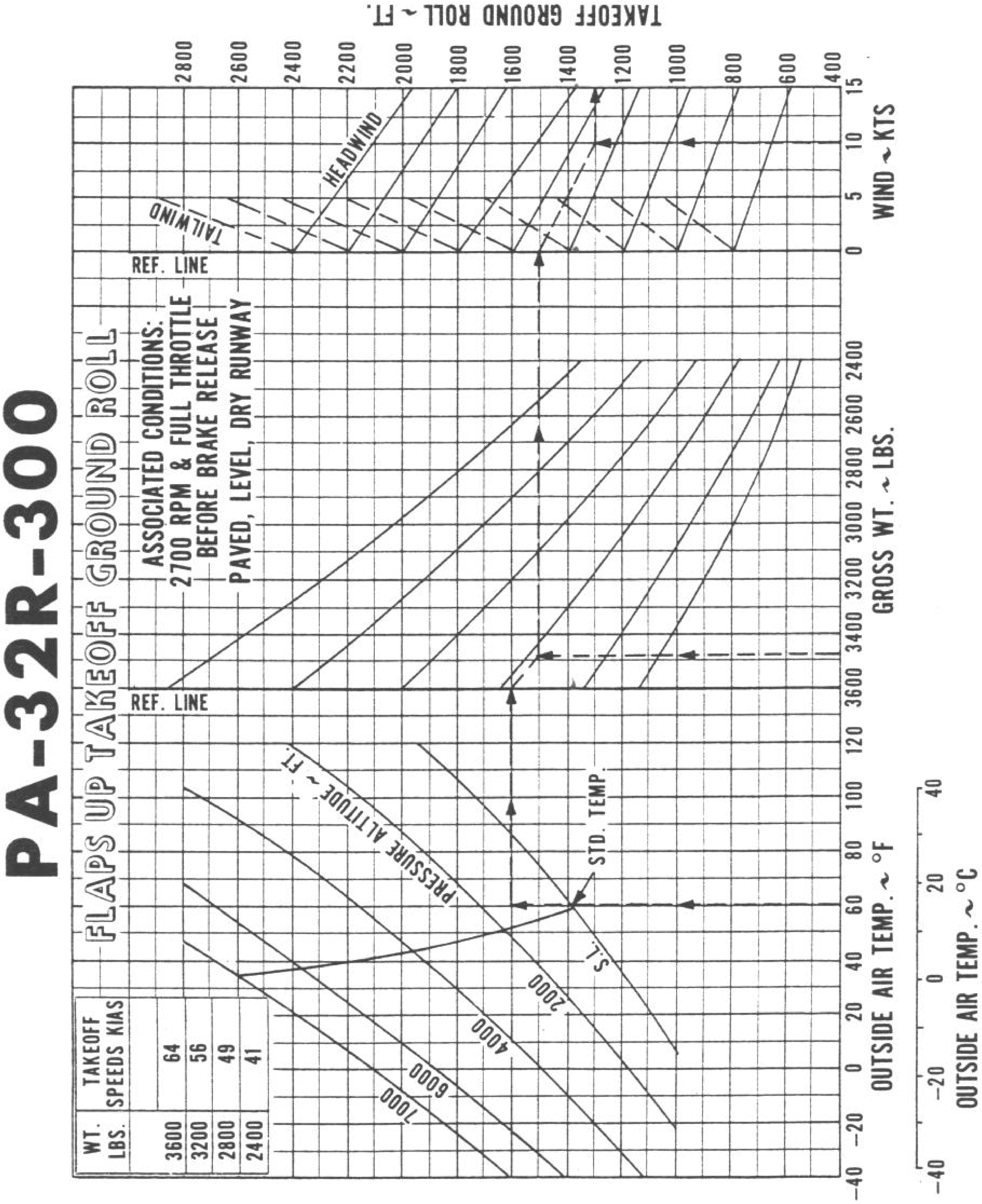
25° FLAPS TAKEOFF GROUND ROLL

Figure 5-8



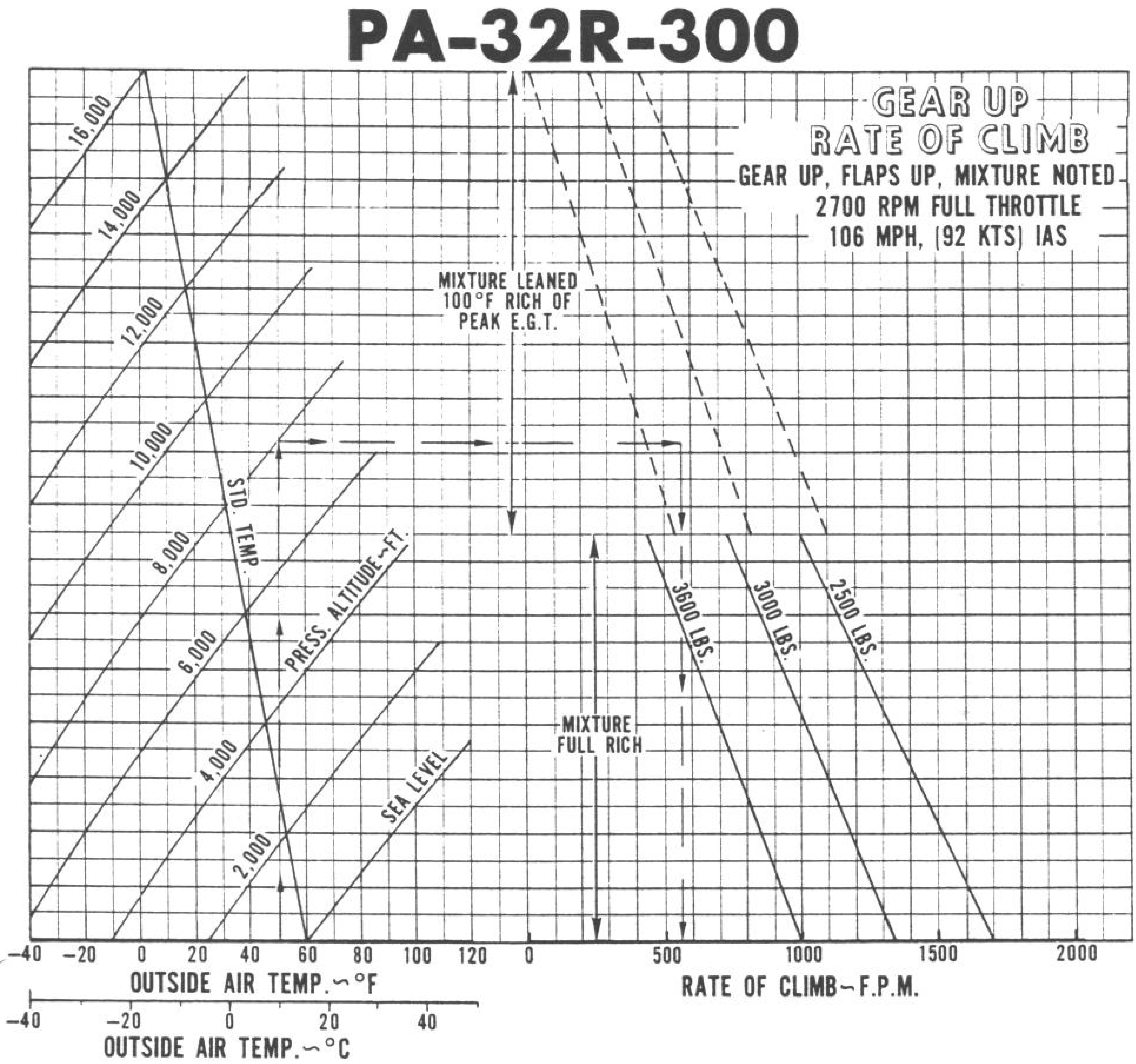
FLAPS UP TAKEOFF PERFORMANCE

Figure 5-9



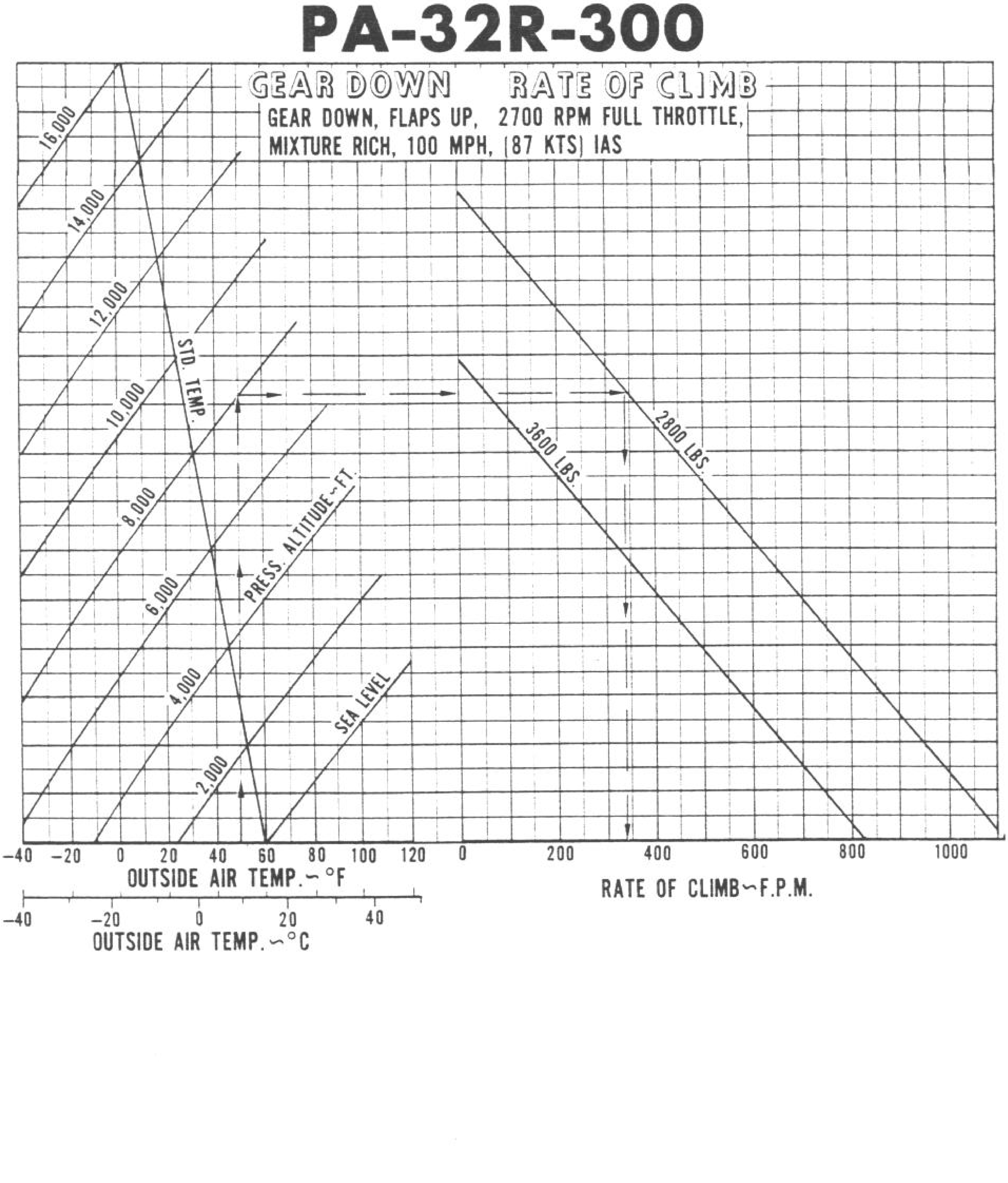
FLAPS UP TAKEOFF GROUND ROLL

Figure 5-10



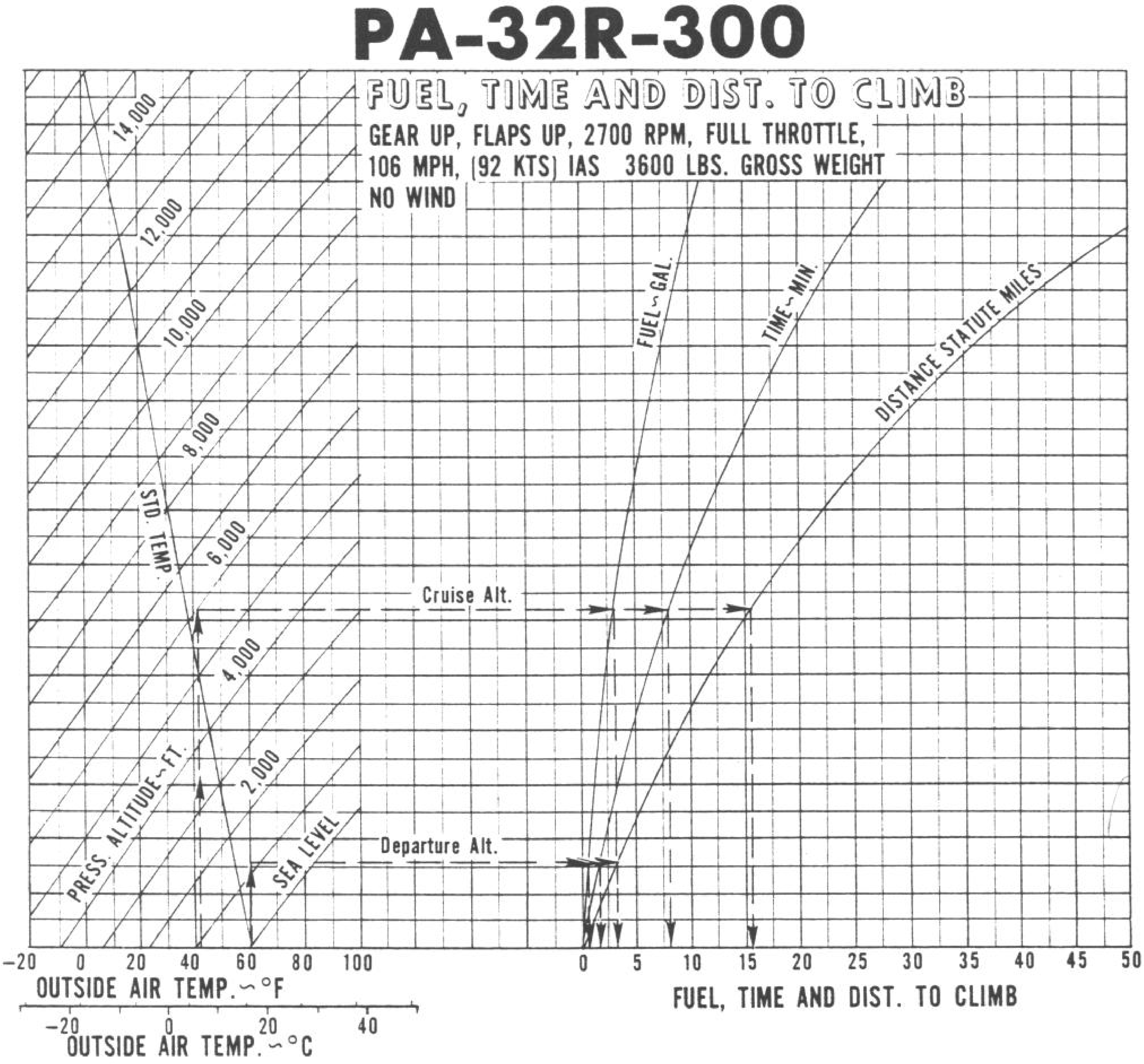
GEAR UP RATE OF CLIMB

Figure 5-11



GEAR DOWN RATE OF CLIMB

Figure 5-13



FUEL, TIME AND DISTANCE TO CLIMB

Figure 5-15

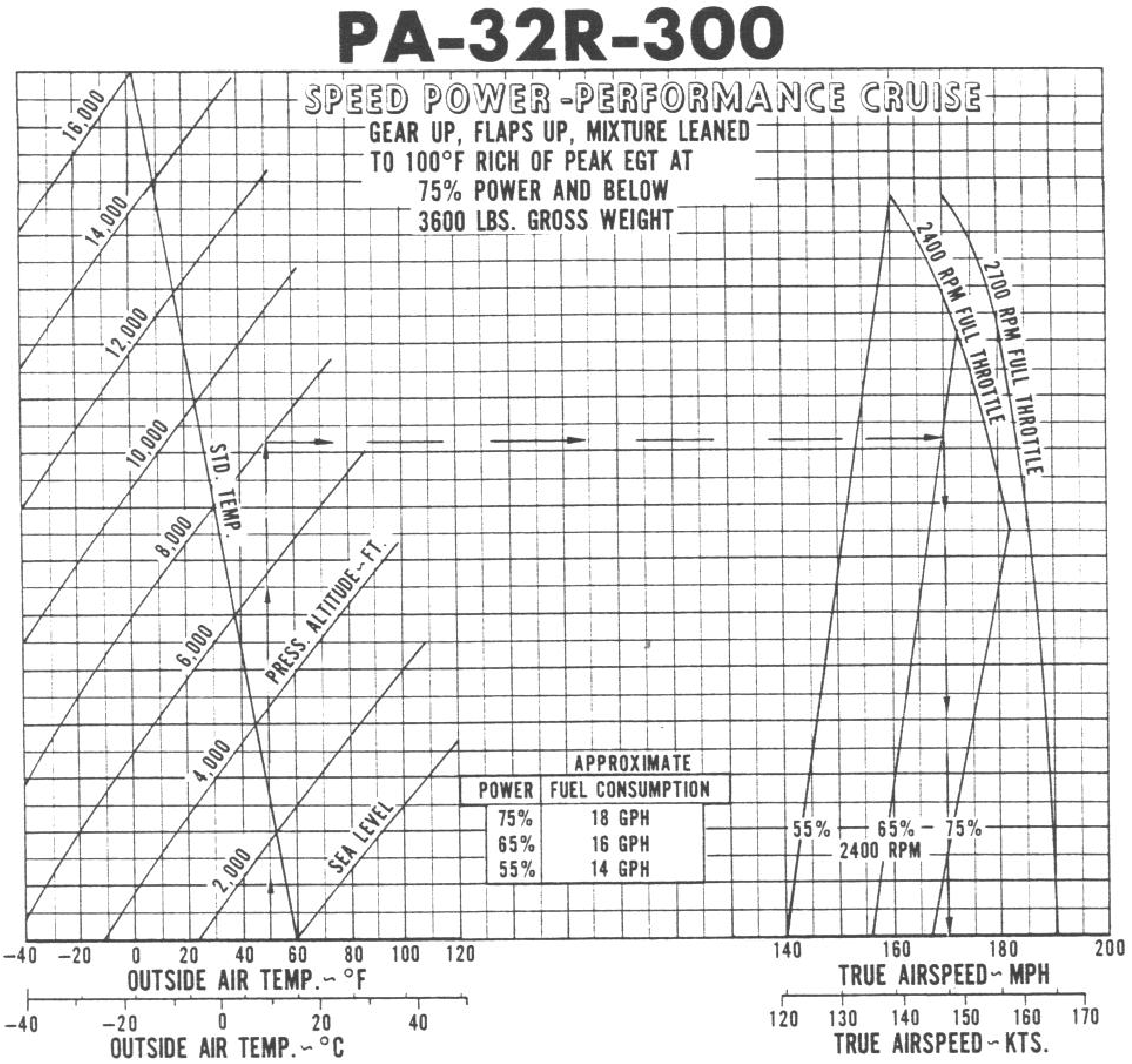
POWER SETTING TABLE – LYCOMING MODEL IO-540-K, -L, -M SERIES, 300 HP ENGINE

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	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	27.6	26.6	25.8
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	27.3	26.3	25.5
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	27.1	26.1	25.2
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	26.8	25.8	24.9
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	26.5	25.6	24.6
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	–	25.3	24.4
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	–	25.0	24.1
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	–	–	23.8
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							

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.

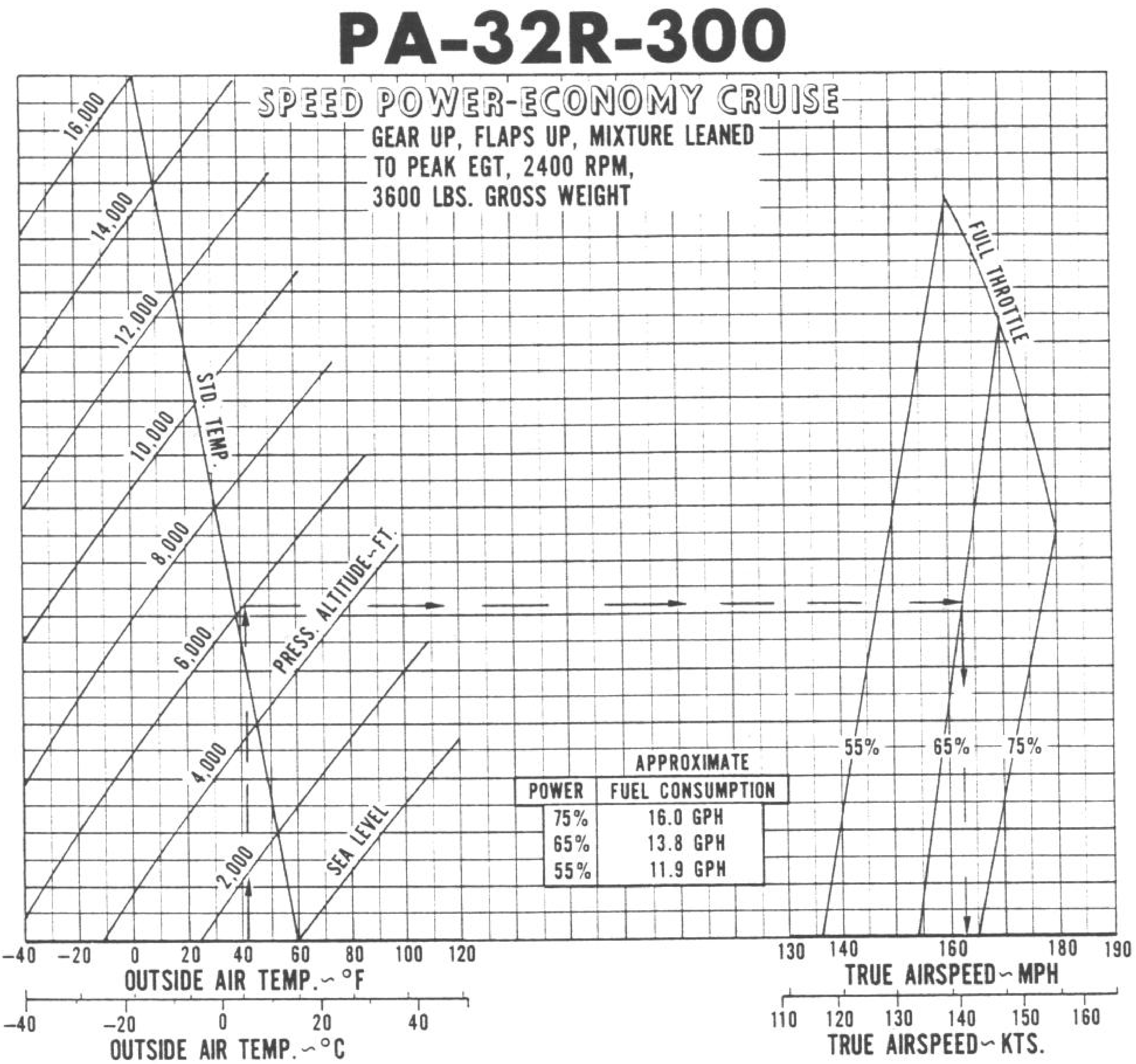
POWER SETTING TABLE

Figure 5-17



SPEED POWER - PERFORMANCE CRUISE

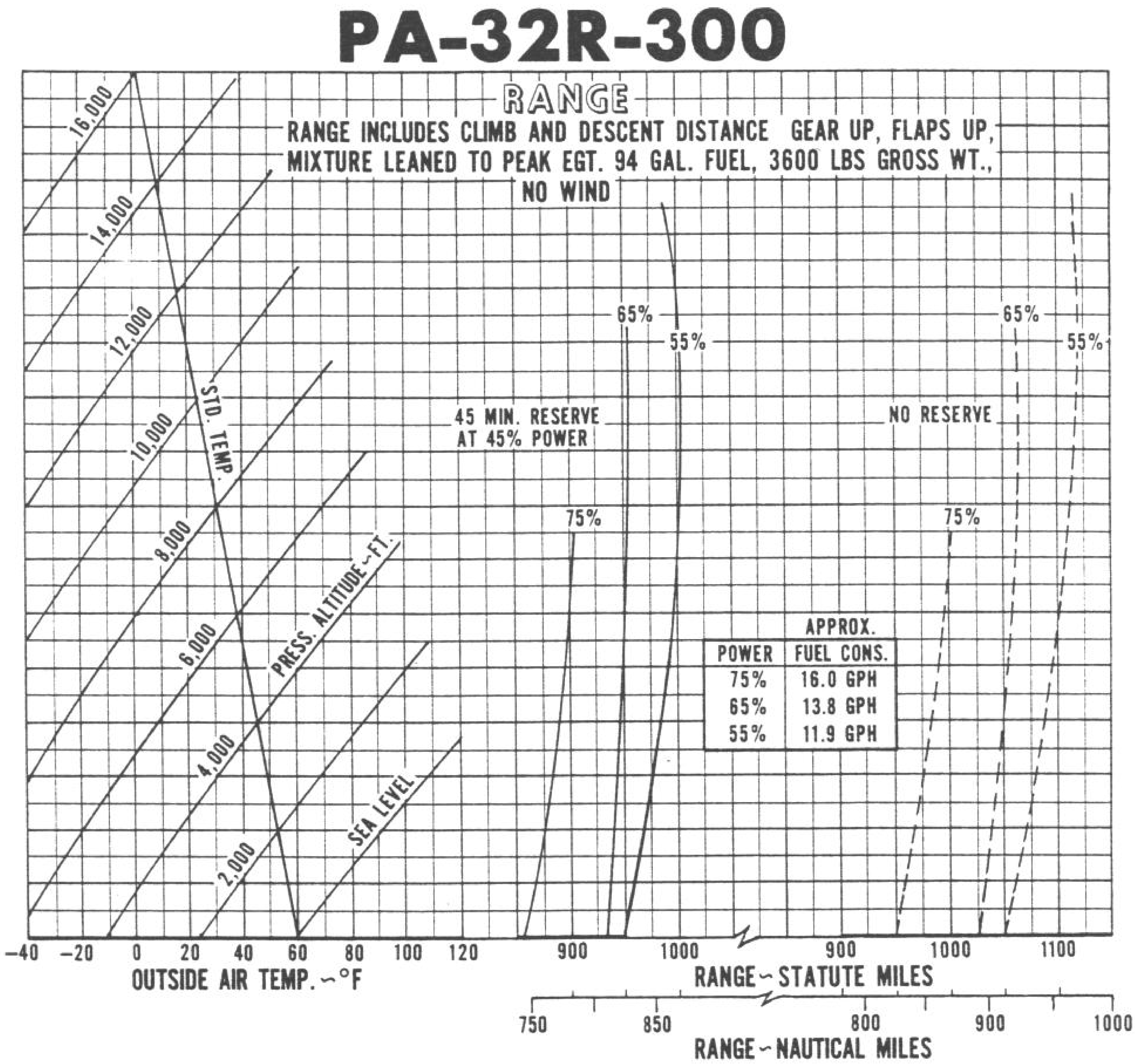
Figure 5-19



POWER	APPROXIMATE FUEL CONSUMPTION
75%	16.0 GPH
65%	13.8 GPH
55%	11.9 GPH

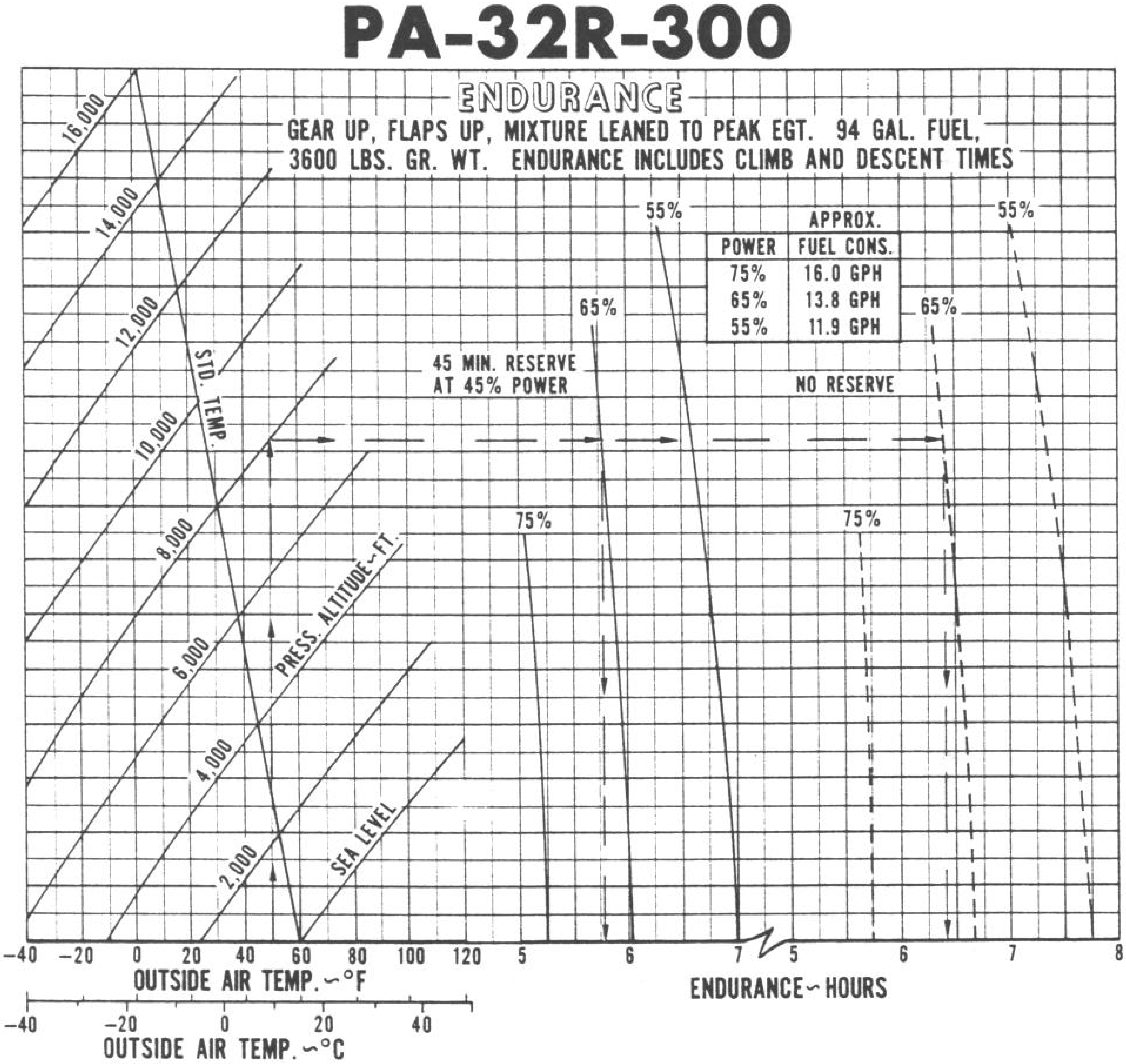
SPEED POWER - ECONOMY CRUISE

Figure 5-21



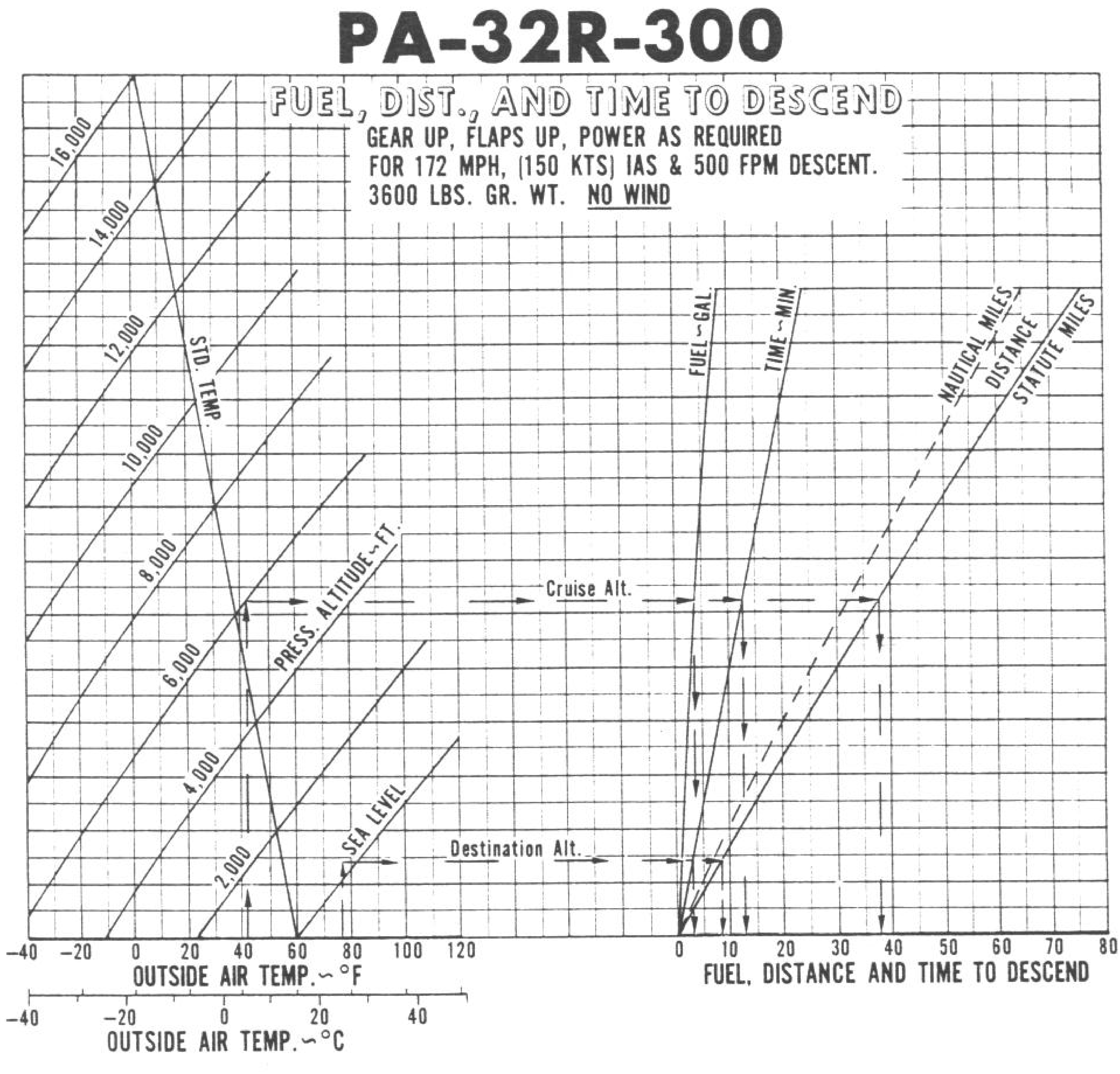
RANGE

Figure 5-23



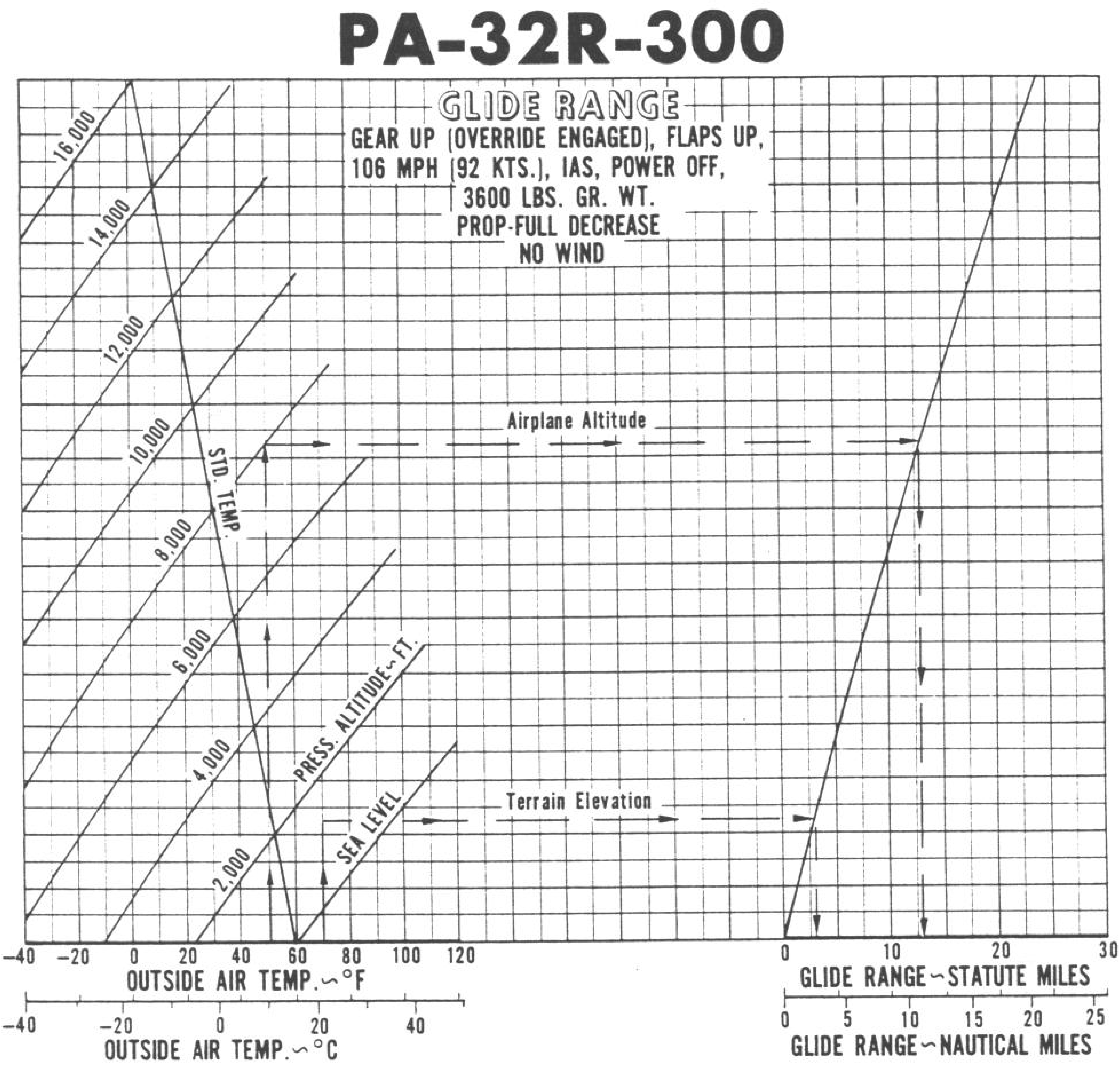
ENDURANCE

Figure 5-25



FUEL, DISTANCE AND TIME TO DESCEND

Figure 5-27

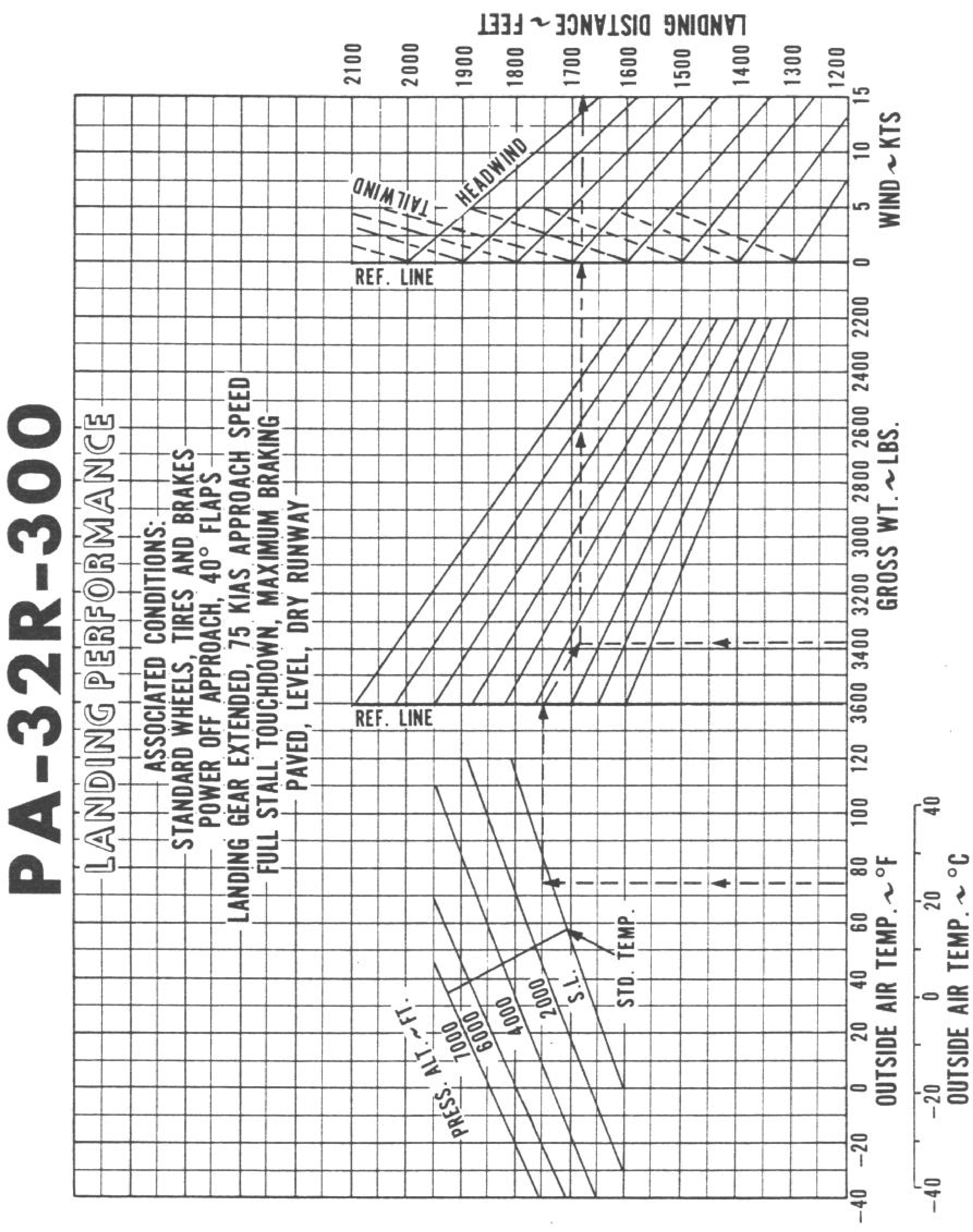


Example:

Cruise altitude = 8000 ft.
Terrain elevation = 1300 ft.
Glide distance = 13 miles minus 3 miles equals 10 miles

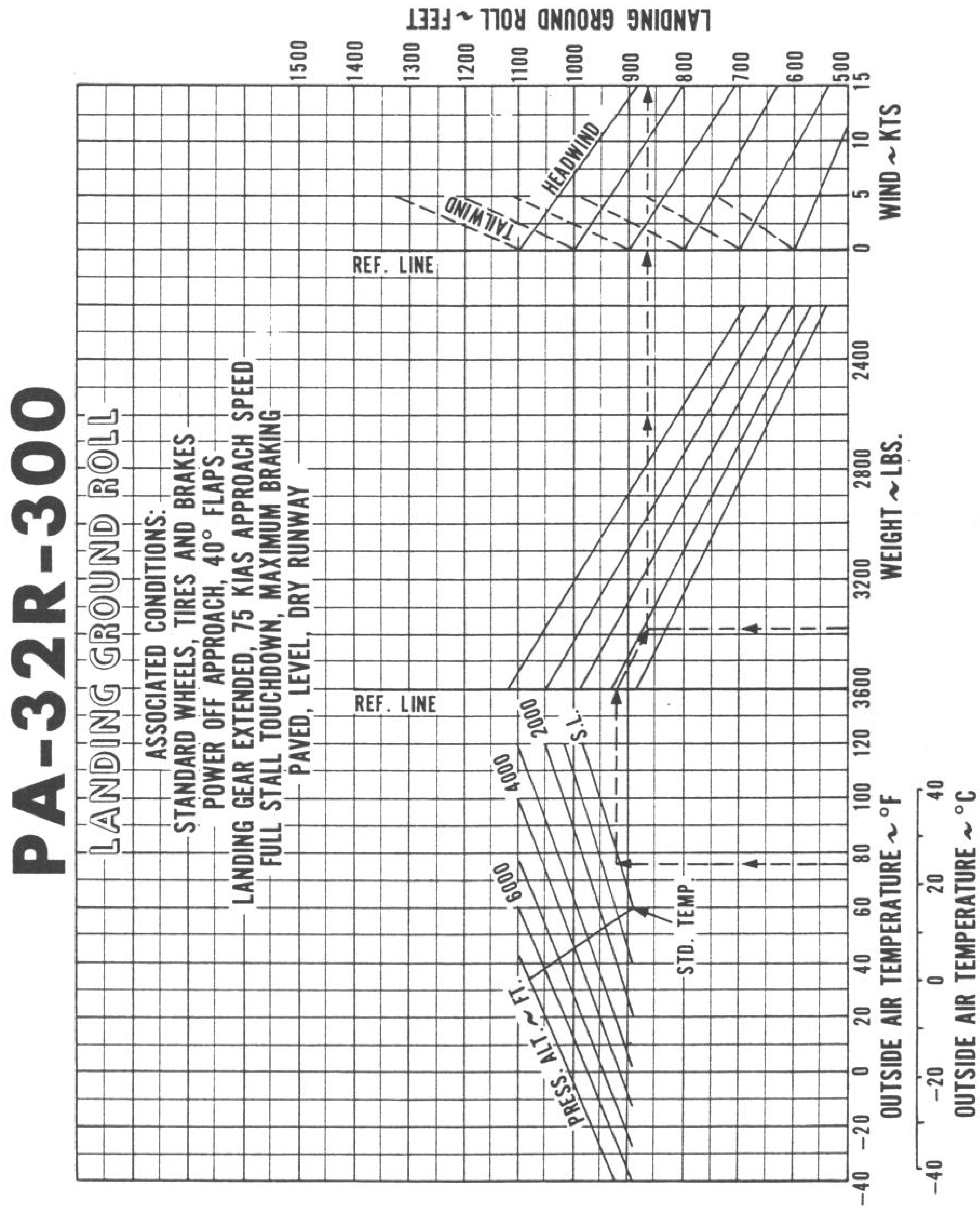
GLIDE RANGE

Figure 5-29



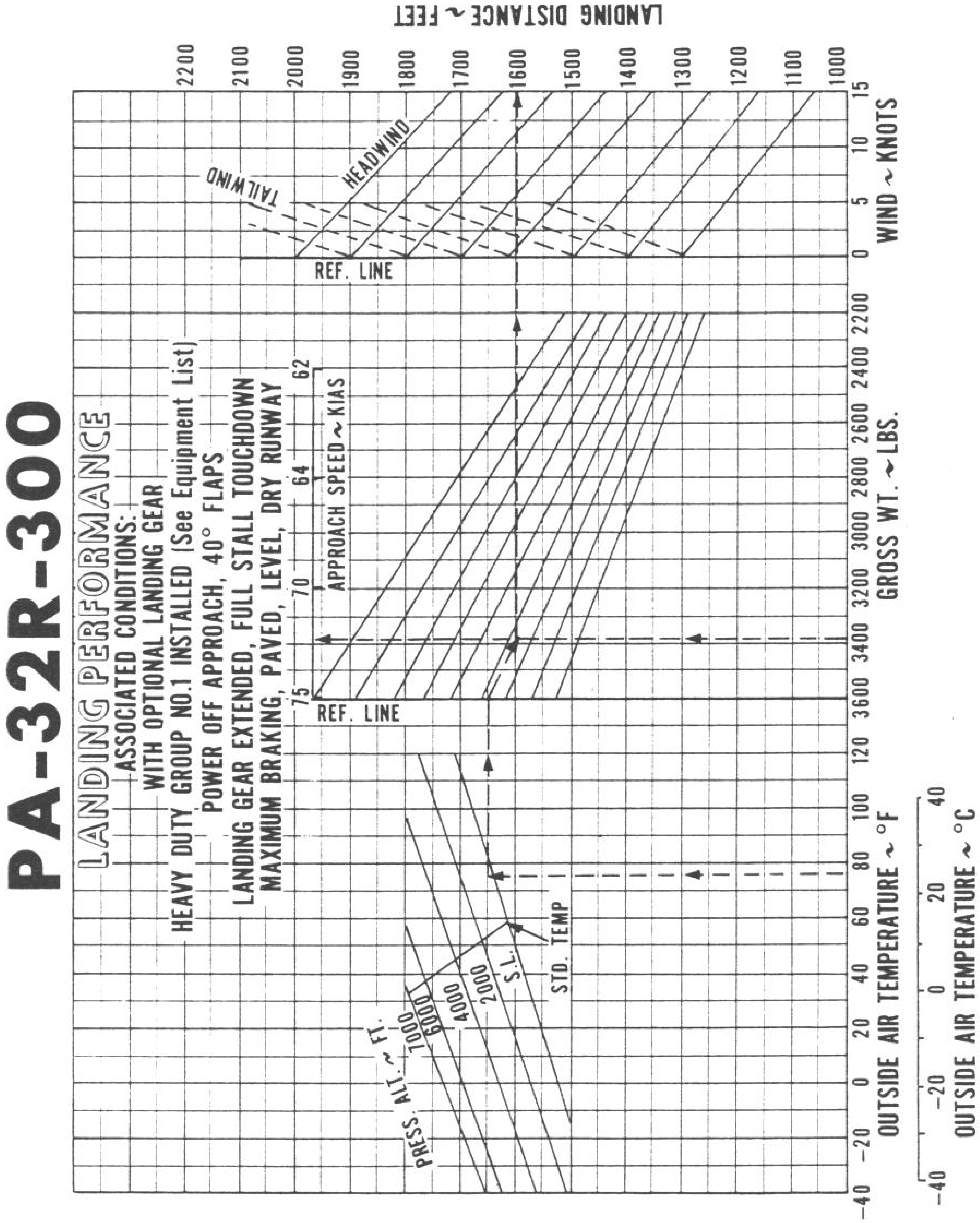
LANDING PERFORMANCE

Figure 5-31



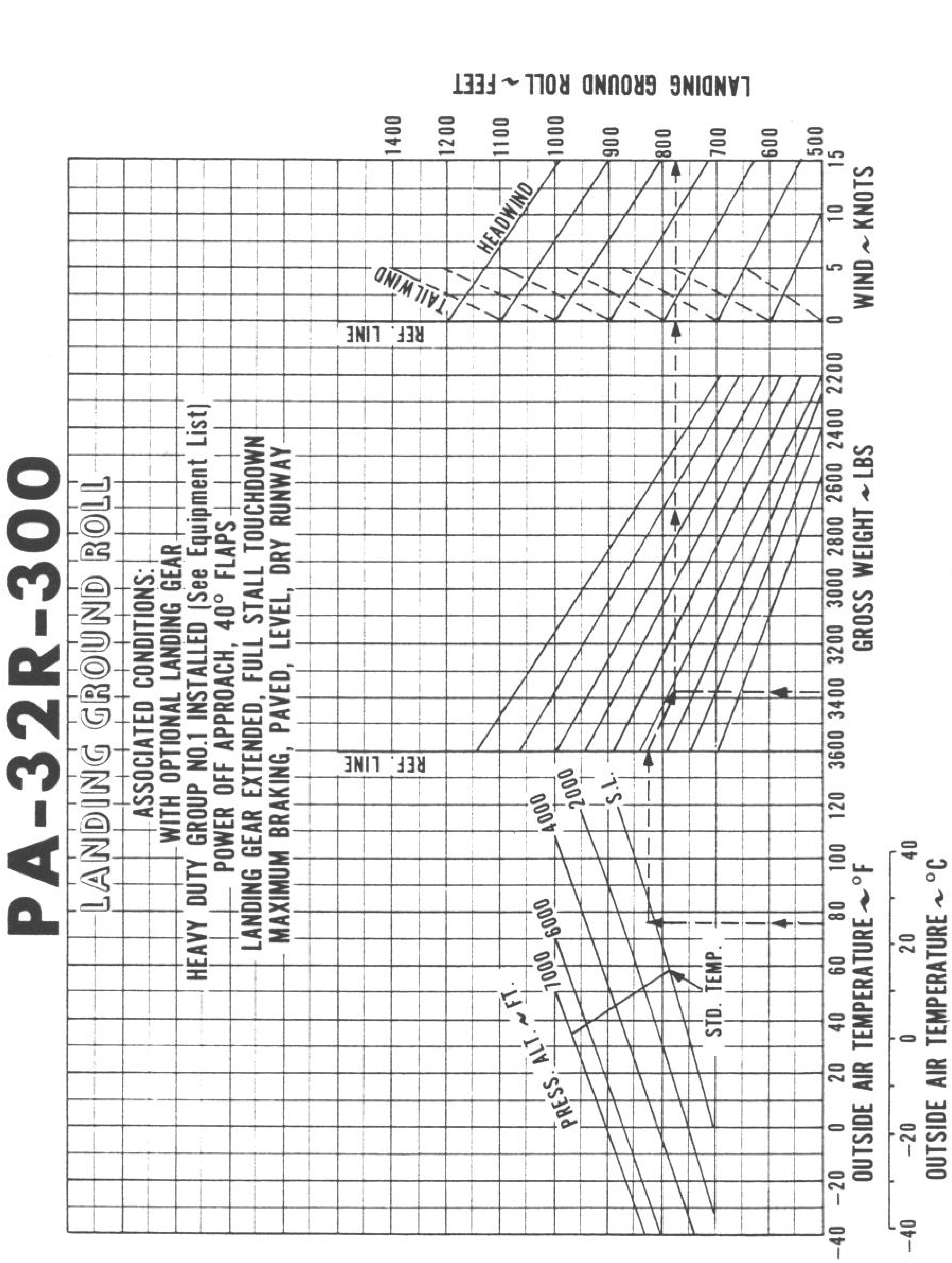
LANDING GROUND ROLL

Figure 5-33



LANDING PERFORMANCE (HEAVY DUTY GROUP)

Figure 5-35



LANDING GROUND ROLL (HEAVY DUTY GROUP)

Figure 5-37