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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 ARCHER III 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.

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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 6-11) 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, 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) 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 160.2 lbs.)	2239.8 lbs.

The takeoff weight is below the maximum of 2550 lbs. and the weight and balance calculations have determined that the C.G. position is within the approved limits.

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(b) Takeoff and Landing

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

Conditions of 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 5-7 or 5-9) to determine the barrier distance or (Figure 5-11 or 5-13) to determine the length of runway necessary for the takeoff.

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.	2500 ft.
(2) Temperature	23°C	21°C
(3) Wind Component (Headwind)	8 Kt.	5 Kt.
(4) Runway Length Available	7000 ft.	4500 ft.
(5) Runway Required	1073 ft.*	820 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.

*reference Figure 5-11 or 5-13

**reference Figure 5-37

(c) Climb

The next step in the 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 5-17). 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 5-17). 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 the flight planning example.

(1) Cruise Pressure Altitude	6000 ft.
(2) Cruise OAT	15°C
(3) Time to Climb (12 min. minus 3 min.)	9 min.*
(4) Distance to Climb (17 naut. miles minus 5 naut. miles)	12 naut. miles*
(5) Fuel to Climb (4 gal. minus 2 gal.)	2 gal. *

(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, determine the basic time, distance and fuel 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 time, distance and fuel values from

*reference Figure 5-17

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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 time, distance and fuel 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	
(2) Distance to Descend	10 min.*
(3) Fuel to Descend	20 naut. miles*
	(3.2 gal. minus 1.3 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 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 5-20 [a,b] and 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	314 naut. miles
(2) Cruise Distance	
(e)(1) minus (c)(4) minus (d)(2), (314 nm minus 12 nm minus 20 nm)	282 naut. miles

*reference Figure 5-31

(3) Cruise Power	65%
(4) Cruise Speed	117 Kts.*
(5) Cruise Fuel Consumption	9.5 gal./hr.
(6) Cruise Time	
(e)(2) divided by (e)(4),	
(282 nm divided by 117 kts)	2.4 hrs.
(7) Cruise Fuel	
(e)(5) multiplied by (e)(6),	
(9.5 gal./hr multiplied by 2.4 hrs)	22.8 gal..

(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),	
(.15 hr plus .17 hr plus 2.4 hrs)	2.7 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 gal. plus 1.9 gal. plus 22.8 gal.)	26.7 gal.
(26.7 gal. multiplied by 6 lb./gal.)	160.2 lbs

*reference Figure 5-20a

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5.7 PERFORMANCE GRAPHS

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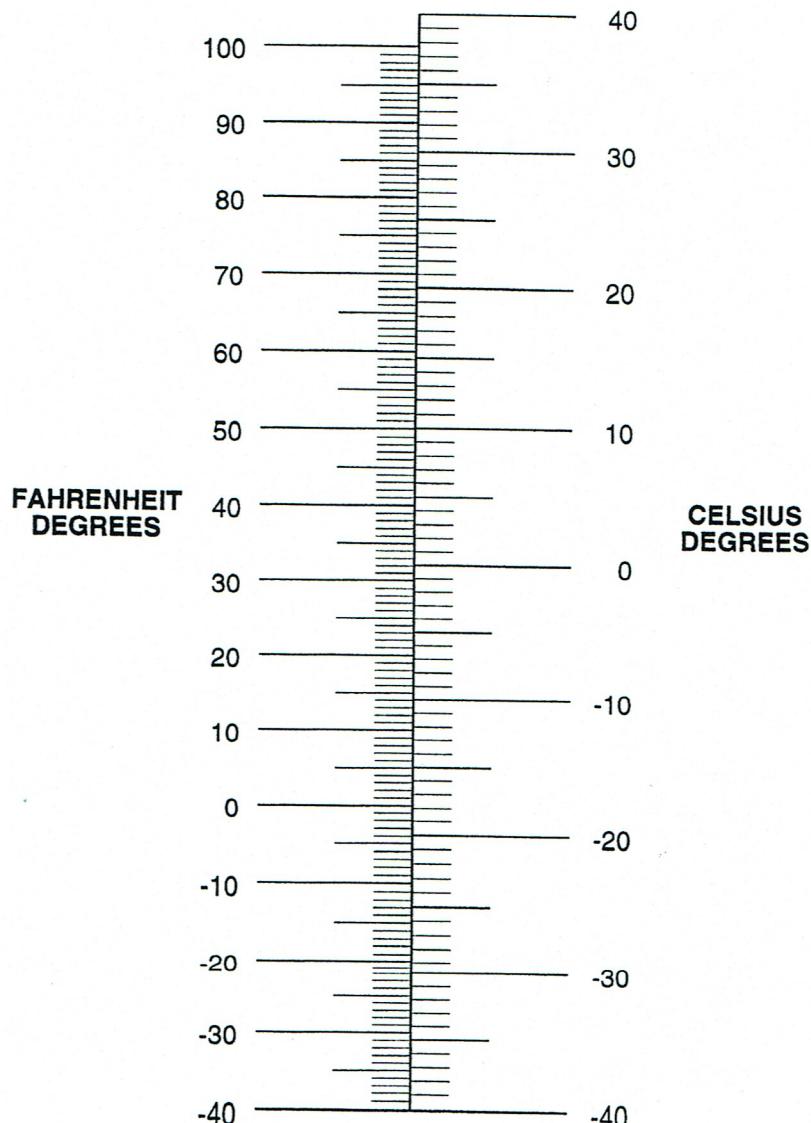
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TEMPERATURE CONVERSION

Figure 5-1

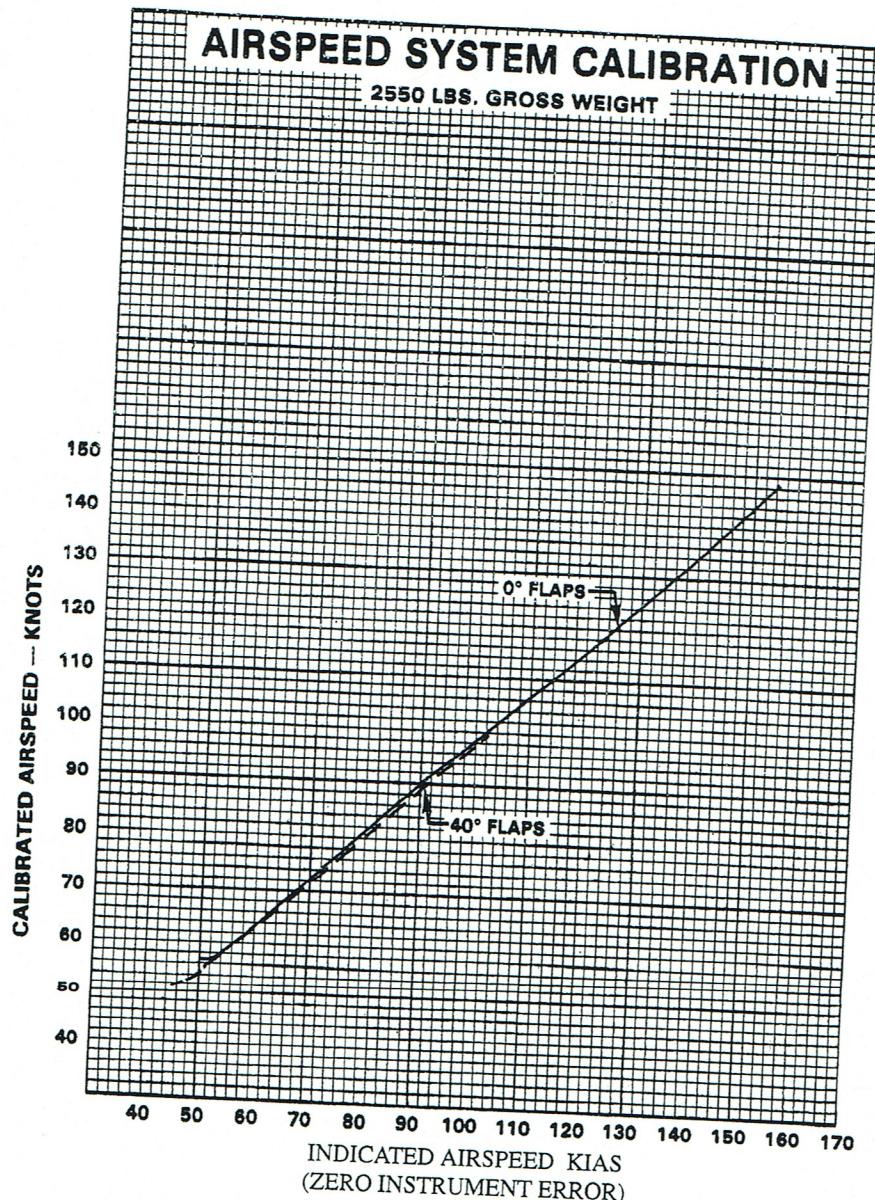
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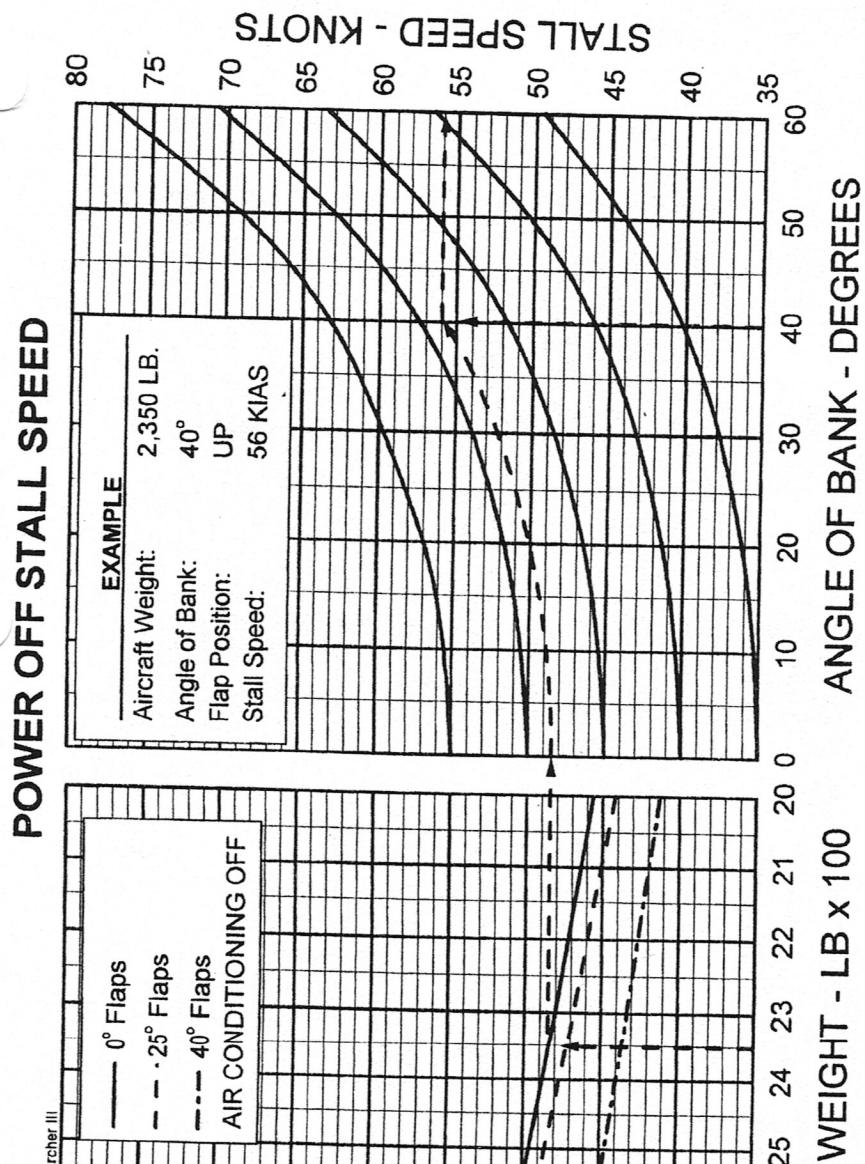


AIRSPEED SYSTEM CALIBRATION

Figure 5-3

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STALL SPEEDS

Figure 5-5

ISSUED: JULY 12, 1995
 REVISED: NOVEMBER 6, 1998

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FLAPS UP TAKEOFF PERFORMANCE

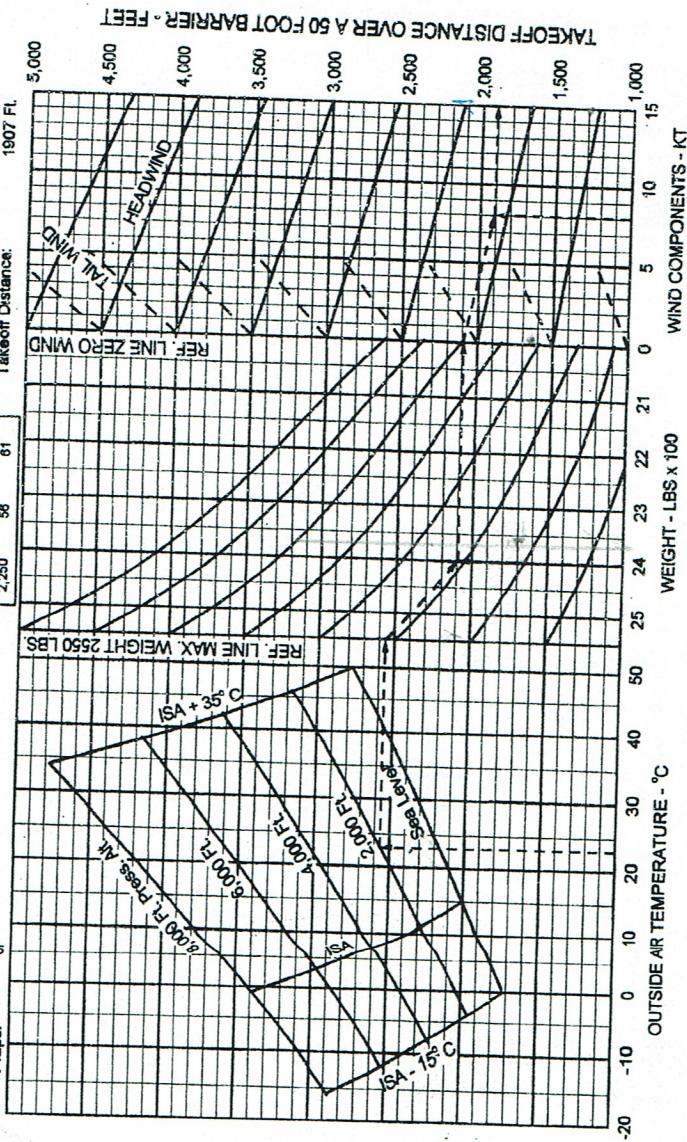
ASSOCIATED CONDITIONS:

Power: FULL THROTTLE BEFORE BRAKE RELEASE
Air Conditioner OFF
Runway: PAVED, LEVEL, & DRY
Airspeed: REFER TO TABLE AT RIGHT
Propeller: SENSENICH 76EM8S14-0-62
Flaps: UP

WT	TAKEOFF SPEEDS KIAS	LIFTOFF 50 FT
2,660	50	65
2,460	58	84
2,350	57	83
2,250	58	61

EXAMPLE:

Depart Airport Pressure Alt: 2,000 Ft
Temperature: 23°C
Gross Weight: 2,400 Lb.
Headwind: 8 Kt.
Takeoff Distance: 1907 Ft.



FLAPS UP TAKEOFF PERFORMANCE

Figure 5-7

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FLAPS 25° TAKE-OFF PERFORMANCE

ASSOCIATED CONDITIONS

Power: FULL THROTTLE BEFORE BRAKE RELEASE
Air Conditioner: OFF
Runway: PAVED, LEVEL, & DRY
Propeller: REFER TO TABLE AT RIGHT
Flaps: SENNICH 75EMBS14-62
25°

TAKEOFF SPEEDS	KIAS	
WT	LIFTOFF	50 FT
2,550	55	60
2,450	55	58
2,350	53	56
2,250	50	54

EXAMPLE

TAKEOFF DISTANCE OVER A 50 FOOT BARRIER - FEET

REF. LINE MAX. WEIGHT 2,550 LBS

OUTSIDE AIR TEMPERATURE - °C	TAKEOFF DISTANCE - FEET
-10	2,000
0	1,800
10	1,600
20	1,400
30	1,200
40	1,000
50	800
60	600
70	400
80	200
90	100
100	50

REF. LINE ZERO WIND

Depart Airport Pressure Alt: 2,000 Ft. Temperature: 23°C
Gross Weight: 2,400 Lb. Headwind: 8 Kt. Takeoff Distance: 1674 Ft.

HEADWIND
TAIL WIND

TAKEOFF SPEEDS KIAS	WT LIFTOFF	WT 50 FT
2,550	55	60
2,450	55	58
2,350	53	56
2,250	50	54

WEIGHT - LBS X 100

OUTSIDE AIR TEMPERATURE - °C

25° FLAPS TAKEOFF PERFORMANCE

Figure 5-9

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FLAPS UP TAKEOFF GROUND ROLL.

ASSOCIATED CONDITIONS:

Power: FULL THROTTLE BEFORE BRAKE RELEASE

Air Conditioner: OFF

Runway: PAVED, LEVEL, & DRY

Refer To Table At Right

Airspeed: SENSENICH 76EM8S14-0-62

Propeller: UP

Flaps: UP

EXAMPLE:

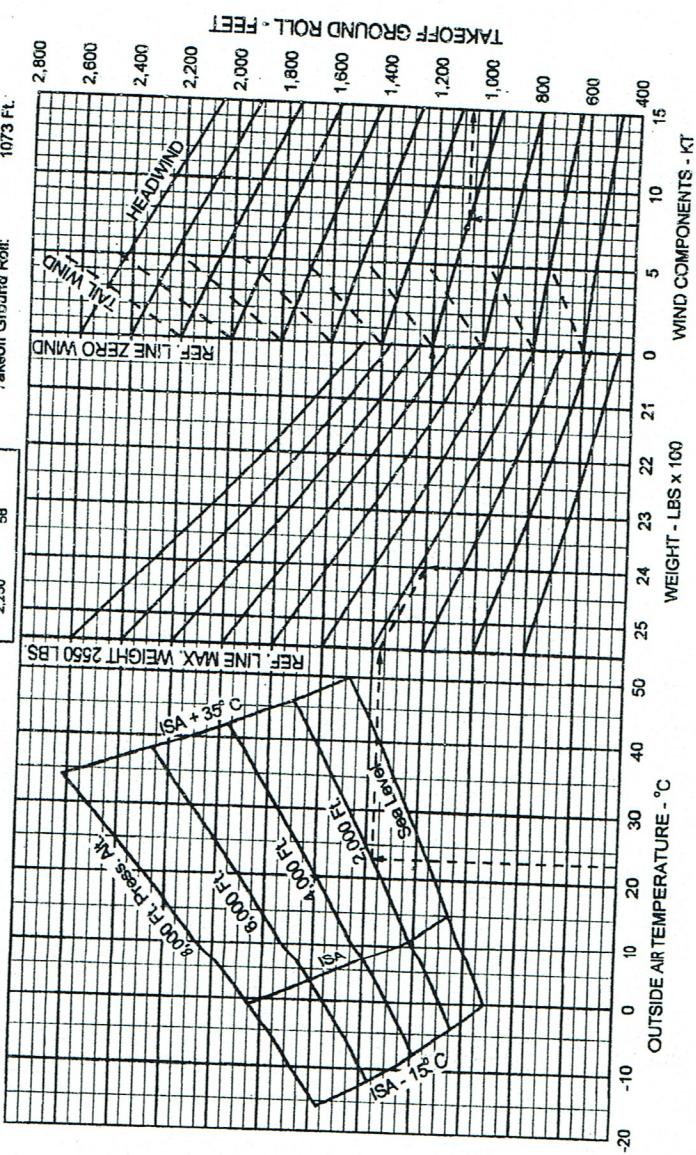
Depart Airport Pressure Alt: 2,000 Ft.

Temperature: 23° C

Gross Weight: 2,400 Lb.

Headwind: 8 Kt.

Takeoff Ground Roll: 1073 Ft.



FLAPS UP TAKEOFF GROUND ROLL

Figure 5-11

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FLAPS 25° TAKEOFF GROUND ROLL**ASSOCIATED CONDITIONS**

Power: FULL THROTTLE BEFORE BRAKE RELEASE
 Air Conditioner: OFF
 Runway: PAVED, LEVEL, & DRY
 Airspeed: REFER TO TABLE AT RIGHT
 Propeller: SENSENICH-176EM/BS14-0-62
 Flaps: 25°

TAKEOFF SPEEDS KIAS	
WT.	LIFTOFF
2,560	65
2,450	55
2,350	53
2,250	50

EXAMPLE
 Depart Airport Pressure Alt: 2,000 Ft.
 Temperature: 23°C
 Gross Weight: 2,400 Lb.
 Headwind: 8 kt.
 Takeoff Ground Roll: 1,071 Ft.

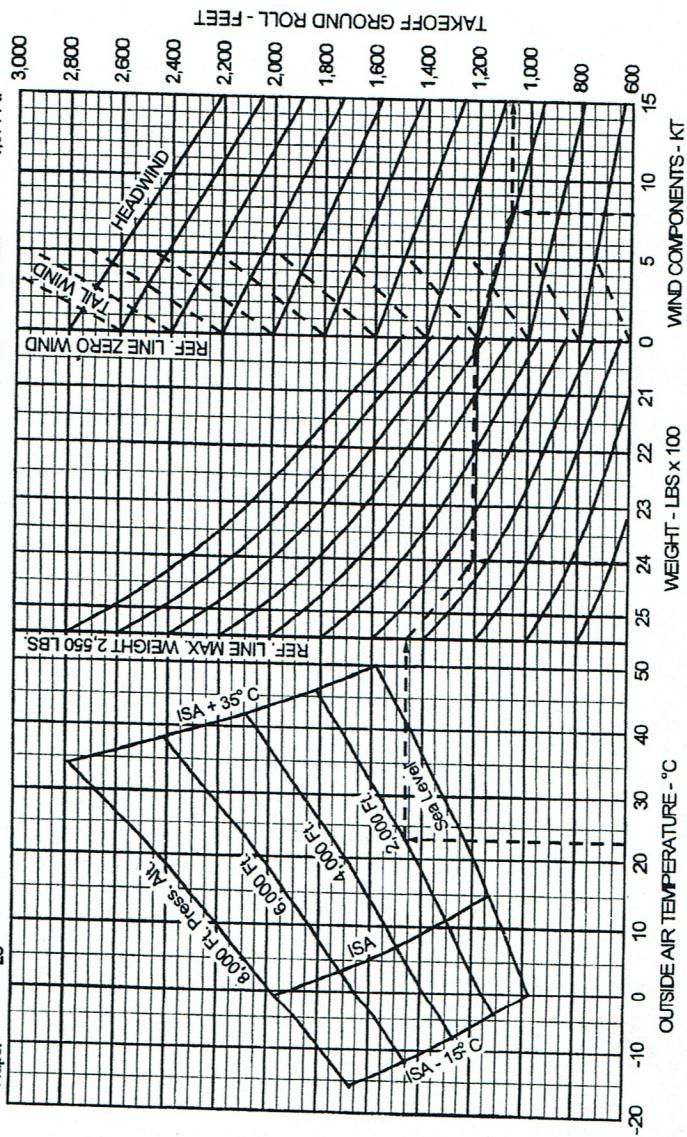
**25° FLAPS TAKEOFF GROUND ROLL**

Figure 5-13

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CLIMB PERFORMANCE

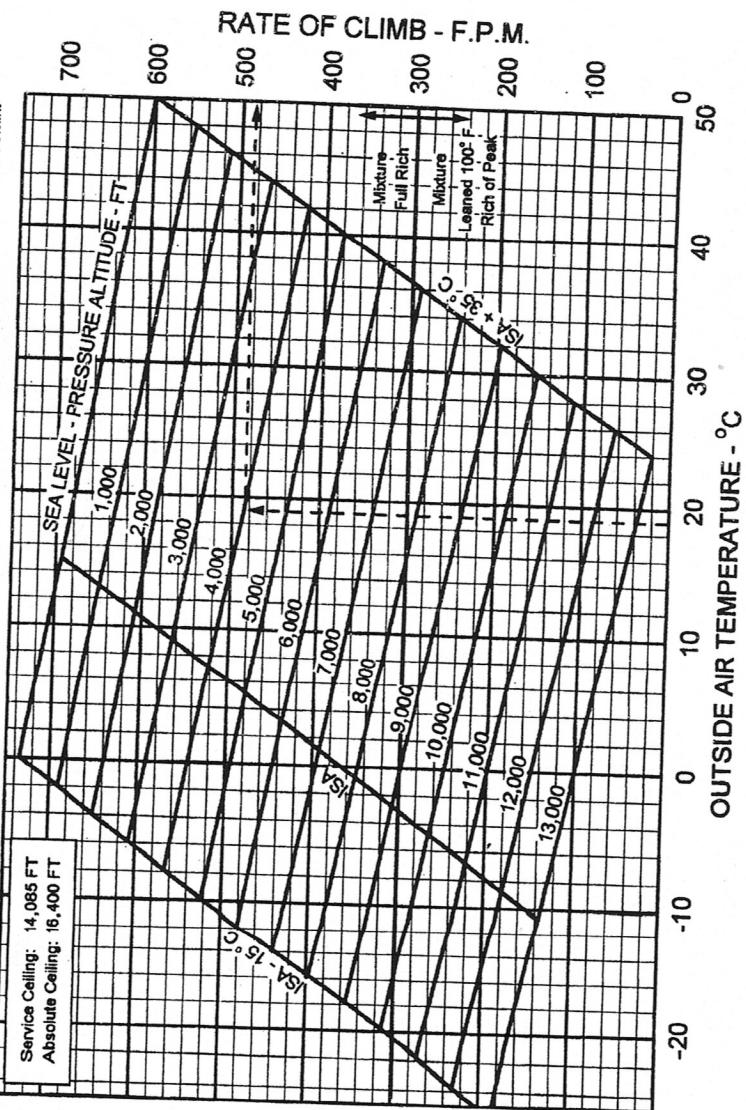
ASSOCIATED CONDITIONS:

Gross Weight: 2550 LBS.
Power: FULL THROTTLE
Airspeed: 78 KIAS
Flaps: UP
Air Conditioner: OFF

Service Ceiling: 14,085 FT
Absolute Ceiling: 16,400 FT

EXAMPLE:

Climb Pressure Alt.: 4000 Ft.
Temperature: 19° C
Rate of Climb: 487 FPM.



CLIMB PERFORMANCE
Figure 5-15

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TIME, FUEL, DISTANCE TO CLIMB**EXAMPLE**

ASSOCIATED CONDITIONS

Gross Weight: 2550 LB Flaps: UP Depart Airport Press Alt.: 2000 FT. Temperature: 23 °C
 Power: FULL THROTTLE Airspeed: 76 KIAS Cruise Press Alt.: 8000 FT. Cruise OAT: 15 °C
 Time to Climb: 12 min. minus 3 min = 9 min
 Fuel to Climb: 4 gal. minus 2 gal = 2 gal
 Distance to Climb: 17 n.m. minus 5 n.m. = 12 n.m.

NOTE: This chart includes fuel allowance for start, taxi, & takeoff.

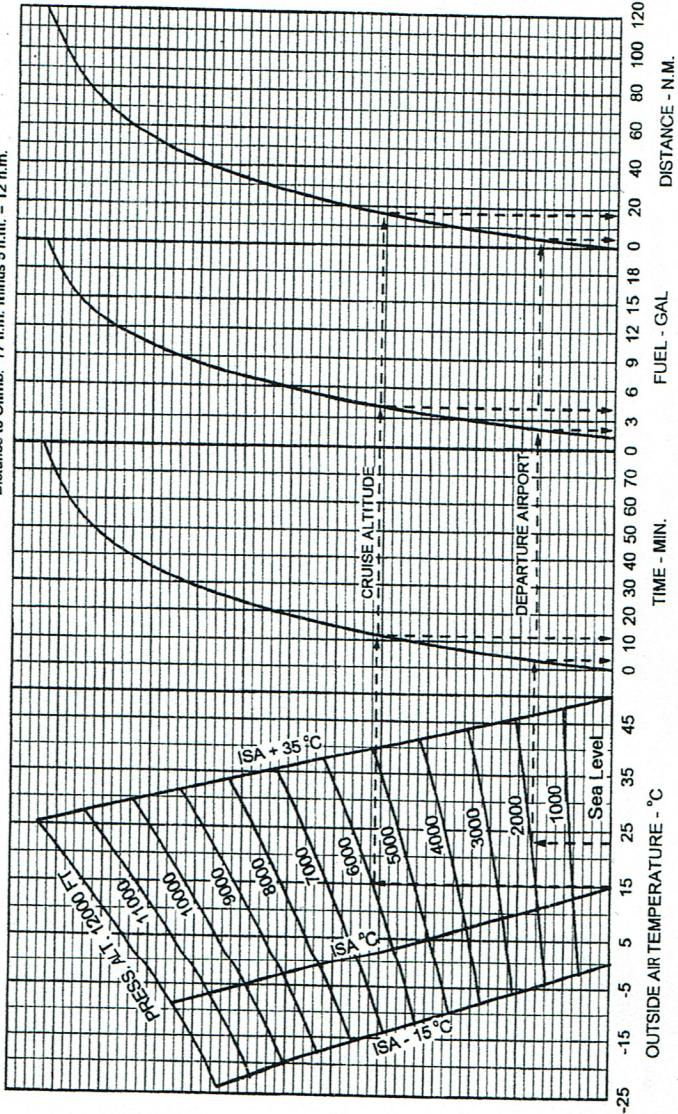
**TIME, DISTANCE AND FUEL TO CLIMB**

Figure 5-17

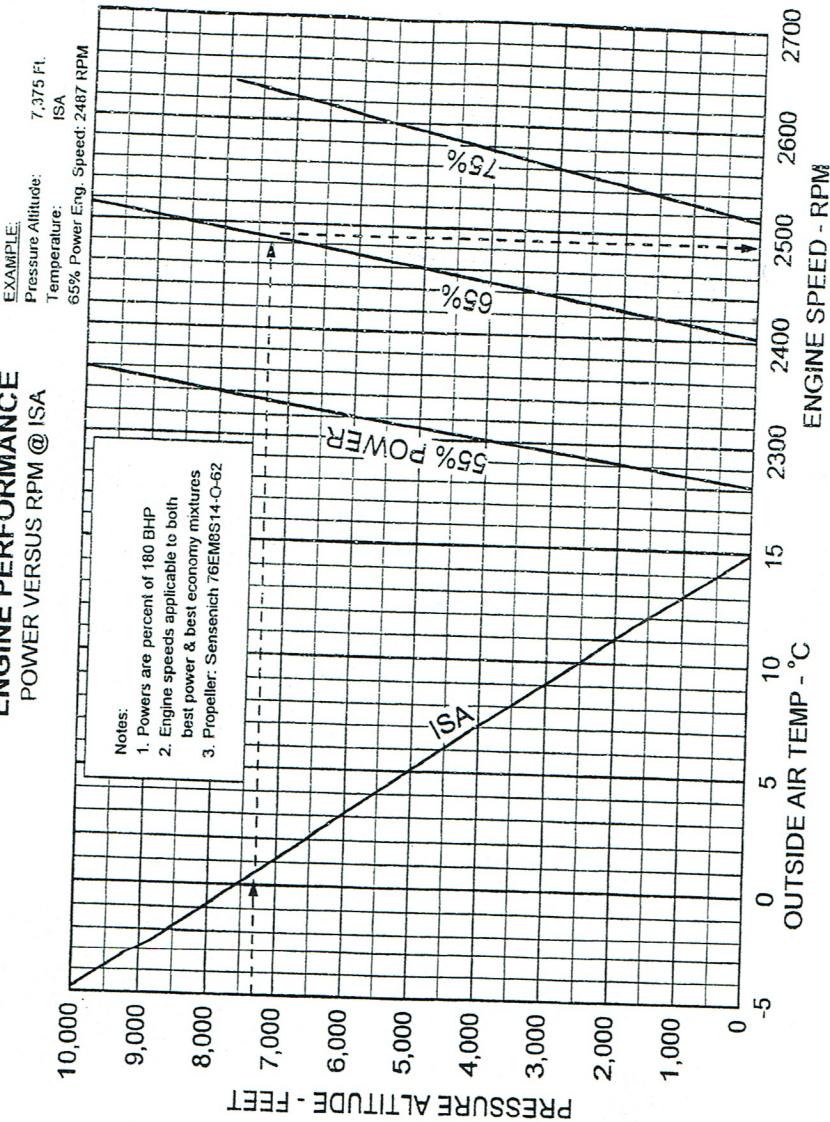
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**ENGINE PERFORMANCE
POWER VERSUS RPM @ ISA**



ENGINE PERFORMANCE
Figure 5-19

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Engine / Cruise Performance for Non-ISA OAT*
RPM for Constant 55% Power
Fuel Flow: Best Economy Mixture, 8.2 GPH

Pressure Altitude Feet	Indicated Outside Air Temperature			Engine Speed RPM	True Air Speed Knots **
	°C	°C	°F		
Sea Level	ISA -15	0	32	2245	105
	ISA	15	59	2265	
	ISA +10	25	77	2275	
	ISA +20	35	95	2285	
	ISA +30	45	113	2295	106
2000	ISA -15	-4	25	2265	106
	ISA	11	52	2280	
	ISA +10	21	70	2295	
	ISA +20	31	88	2305	
	ISA +30	41	106	2315	107
4000	ISA -15	-8	18	2285	106
	ISA	7	45	2300	
	ISA +10	17	63	2315	
	ISA +20	27	81	2325	
	ISA +30	37	99	2335	108
6000	ISA -15	-12	10	2305	107
	ISA	3	37	2320	
	ISA +10	13	55	2330	
	ISA +20	23	73	2345	
	ISA +30	33	91	2355	108
8000	ISA -15	-16	3	2320	107
	ISA	-1	30	2340	
	ISA +10	9	48	2350	
	ISA +17.5	16.5	62	2360	108
9000	ISA -15	-18	0	2330	107
	ISA	-3	27	2350	
	ISA +8.5	5.5	42	2360	108
10000	ISA -15	-20	-4	2340	107
	ISA	-5	23	2360	108
NOTE: * Aircraft weight 2550 Lbs., Wheel pants and strut fairings installed ** Subtract 3 KTAS if wheel pants are removed.					

ENGINE/CRUISE PERFORMANCE (55%)

Figure 5-20

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Engine / Cruise Performance for Non-ISA OAT*
RPM for Constant 65% Power
Fuel Flow: Best Economy Mixture, 9.5 GPH

Pressure Altitude Feet		Indicated Outside Air Temperature			Engine Speed RPM	True Air Speed Knots **
		°C	°C	°F		
Sea Level	ISA -15	0	32	2385	113	
	ISA	15	59	2405		
	ISA +10	25	77	2415		
	ISA +20	35	95	2430		
	ISA +30	45	113	2440		
2000	ISA -15	-4	25	2405	114	
	ISA	11	52	2425		
	ISA +10	21	70	2440		
	ISA +20	31	88	2450		
	ISA +30	41	106	2465		
4000	ISA -15	-8	18	2430	115	
	ISA	7	45	2450		
	ISA +10	17	63	2460		
	ISA +20	27	81	2475		
	ISA +30	37	99	2485		
6000	ISA -15	-12	10	2450	116	
	ISA	3	37	2470		
	ISA +10	13	55	2485		
	ISA +20	23	73	2495		
	ISA +30	33	91	2510		
8000	ISA -15	-16	3	2475	117	
	ISA	-1	30	2495		
	ISA +10	9	48	2505		
	ISA +17.5	16.5	62	2515		
	ISA -15	-18	0	2485		
9000	ISA	-3	27	2505	117	
	ISA +8.5	5.5	42	2515		
10000	ISA -15	-20	-4	2495	118	
	ISA	-5	23	2515		
NOTE: * Aircraft weight 2550 Lbs., Wheel pants and strut fairings installed ** Subtract 3 KTAS if wheel pants are removed.						

ENGINE/CRUISE PERFORMANCE (65%)

Figure 5-20a

Engine / Cruise Performance for Non-ISA OAT*
RPM for Constant 75% Power
Fuel Flow: Best Economy Mixture, 11.0 GPH

Pressure Altitude Feet		Indicated Outside Air Temperature °C	Indicated Outside Air Temperature °F	Engine Speed RPM	True Air Speed Knots **
Sea Level	ISA-15	0	32	2485	119
	ISA	15	59	2515	
	ISA +10	25	77	2535	
	ISA +20	35	95	2550	
	ISA +30	45	113	2565	
2000	ISA -15	-4	25	2520	124
	ISA	11	52	2545	
	ISA +10	21	70	2565	
	ISA +20	31	88	2580	
	ISA +30	41	106	2600	
3000	ISA -15	-6	21	2535	122
	ISA	9	48	2560	
	ISA +10	19	66	2580	
	ISA +20	29	84	2595	
	ISA +30	39	102	2615	
4000	ISA -15	-8	18	2550	123
	ISA	7	45	2575	
	ISA +10	17	63	2595	
	ISA +20	27	81	2610	
	ISA +30	37	99	2630	
5000	ISA -15	-10	14	2565	124
	ISA	5	41	2590	
	ISA +10	15	59	2610	
	ISA +20	25	77	2625	
	ISA +25	30	86	2635	
6000	ISA -15	-12	10	2580	125
	ISA	3	37	2605	
	ISA +10	13	55	2625	
	ISA +15	18	64	2635	
7000	ISA -15	-14	6.8	2595	126
	ISA	1	34	2625	
	ISA +7.5	8.5	47	2635	

NOTE: * Aircraft weight 2550 Lbs., Wheel pants and strut fairings installed

** Subtract 3 KTAS if wheel pants are removed.

ENGINE/CRUISE PERFORMANCE (75%)

Figure 5-20b

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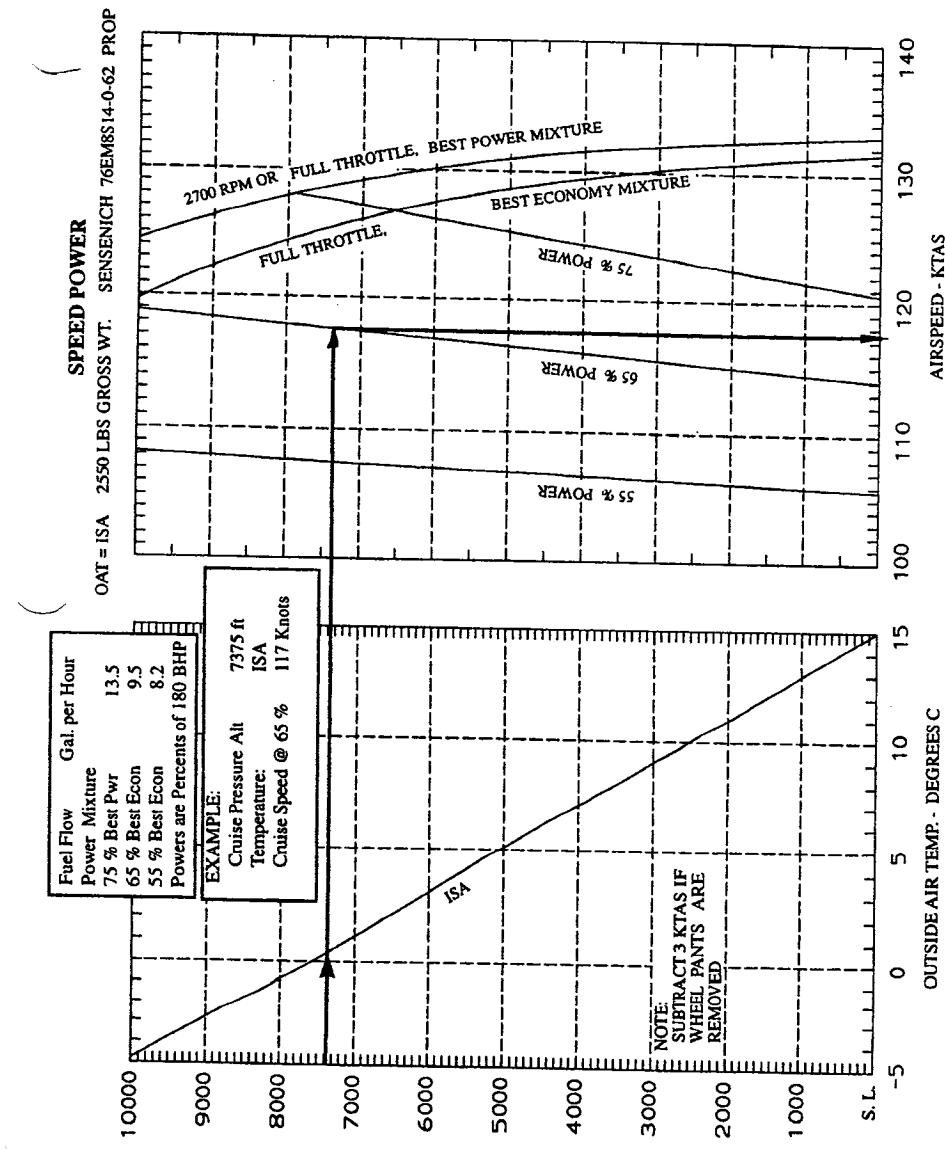
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SPEED POWER

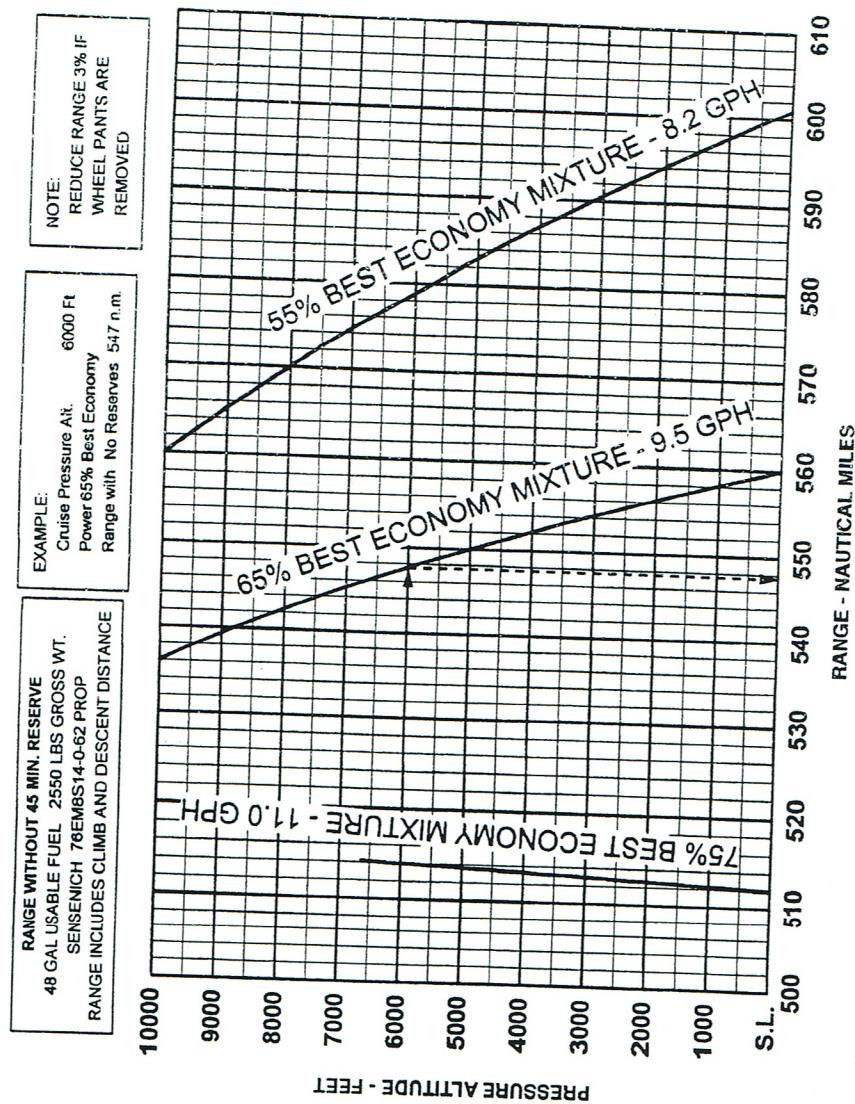
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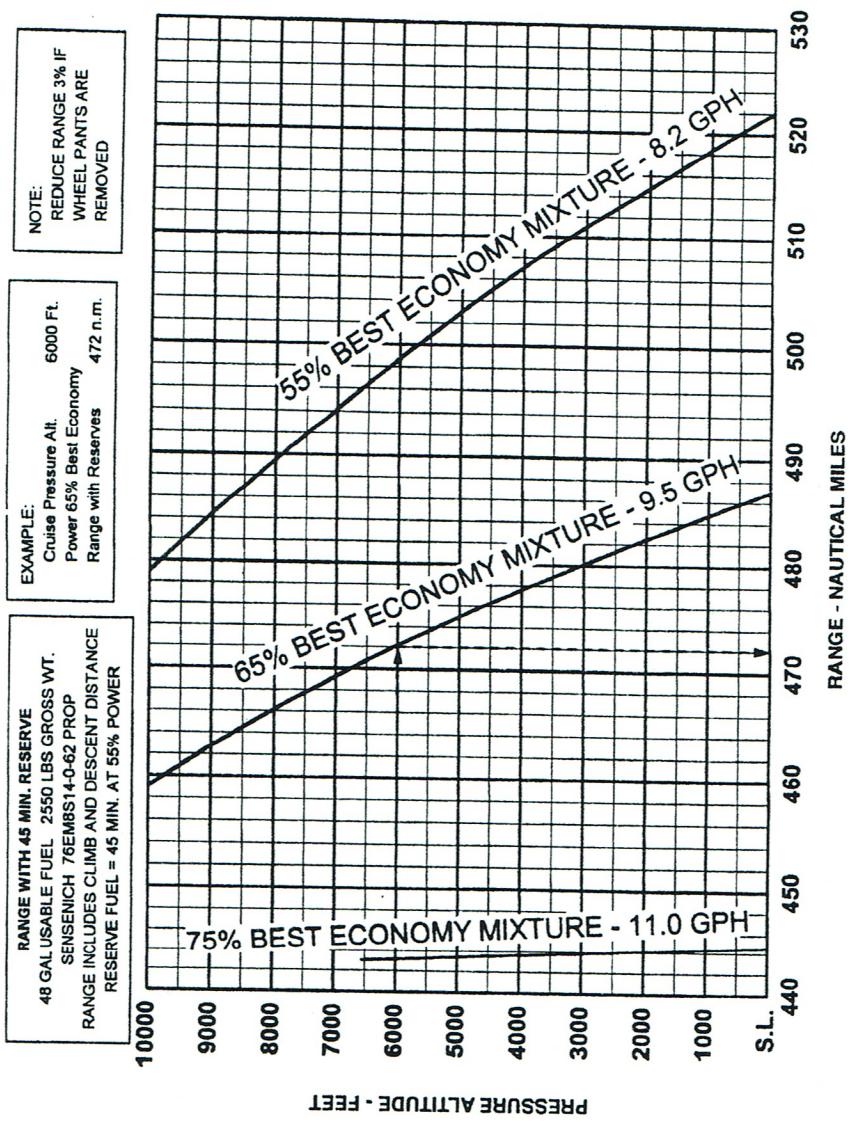


RANGE (NO RESERVE)

Figure 5-27

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RANGE (45 MIN. RESERVE)

Figure 5-27a

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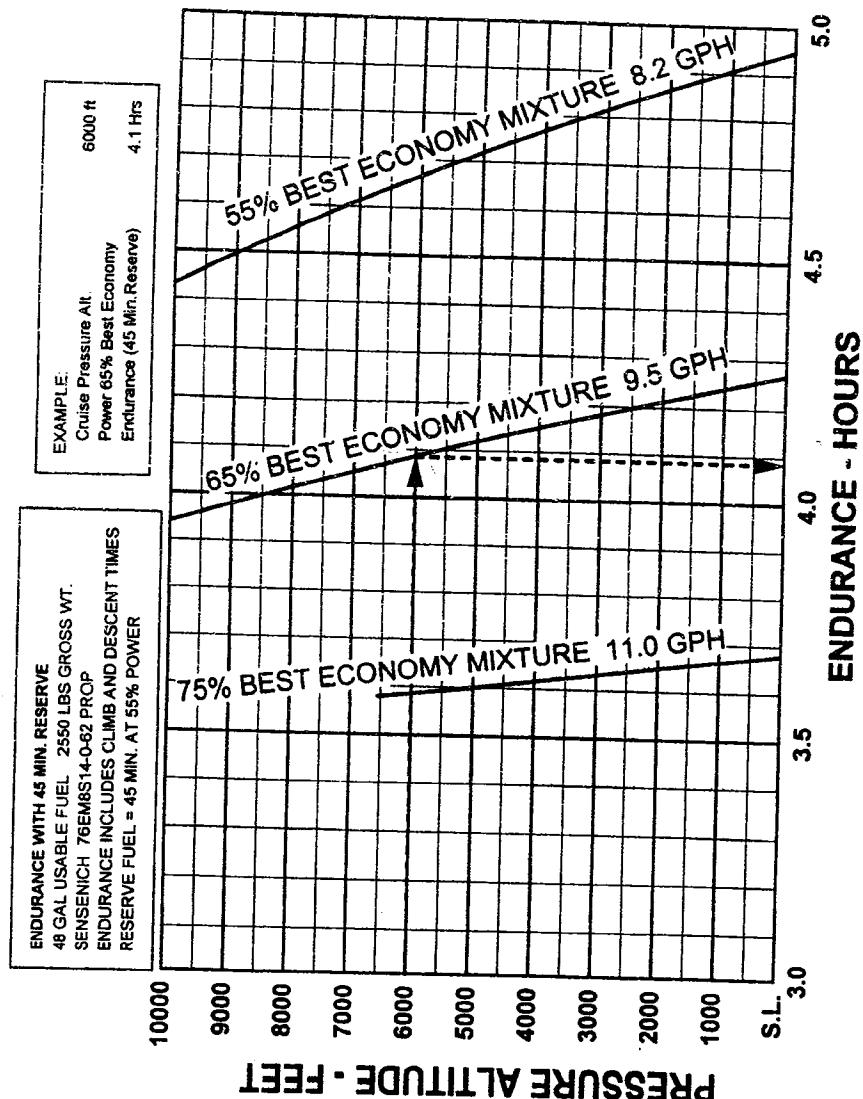
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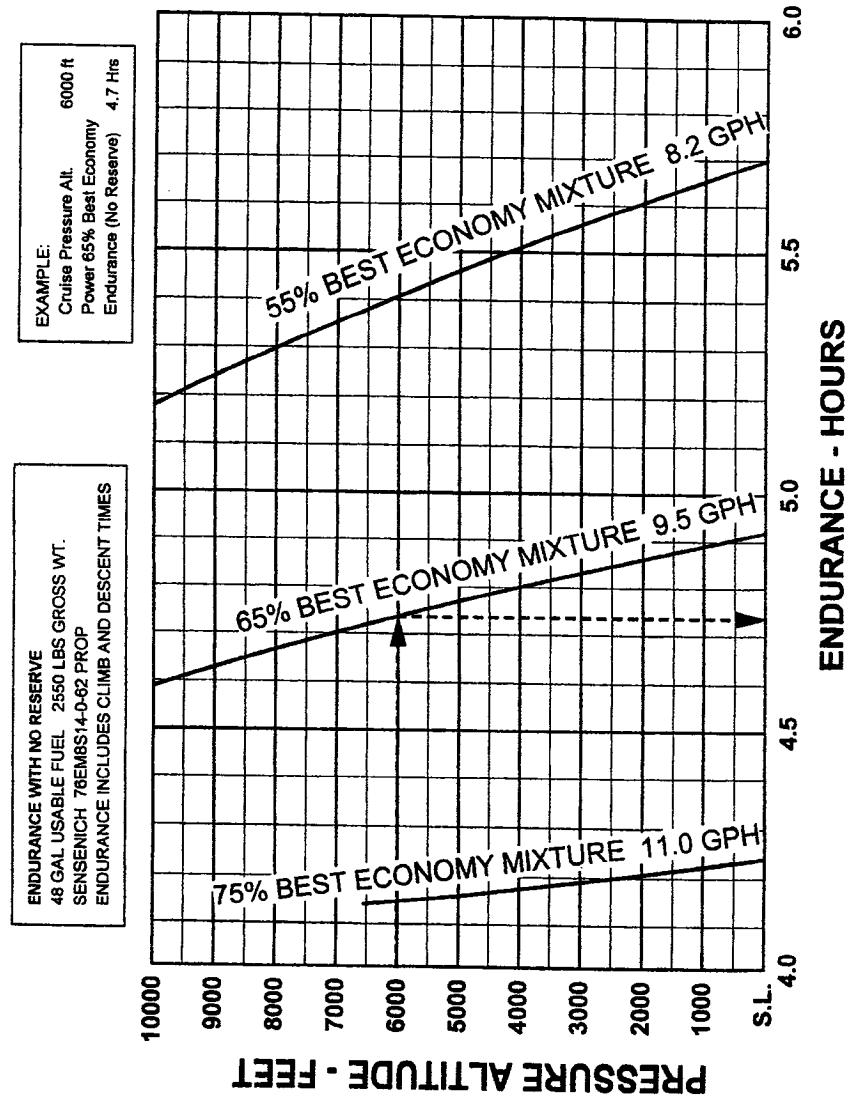


ENDURANCE (45 MIN. RESERVE)

Figure 5-29

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SECTION 5
PERFORMANCE

PA-28-181, ARCHER III

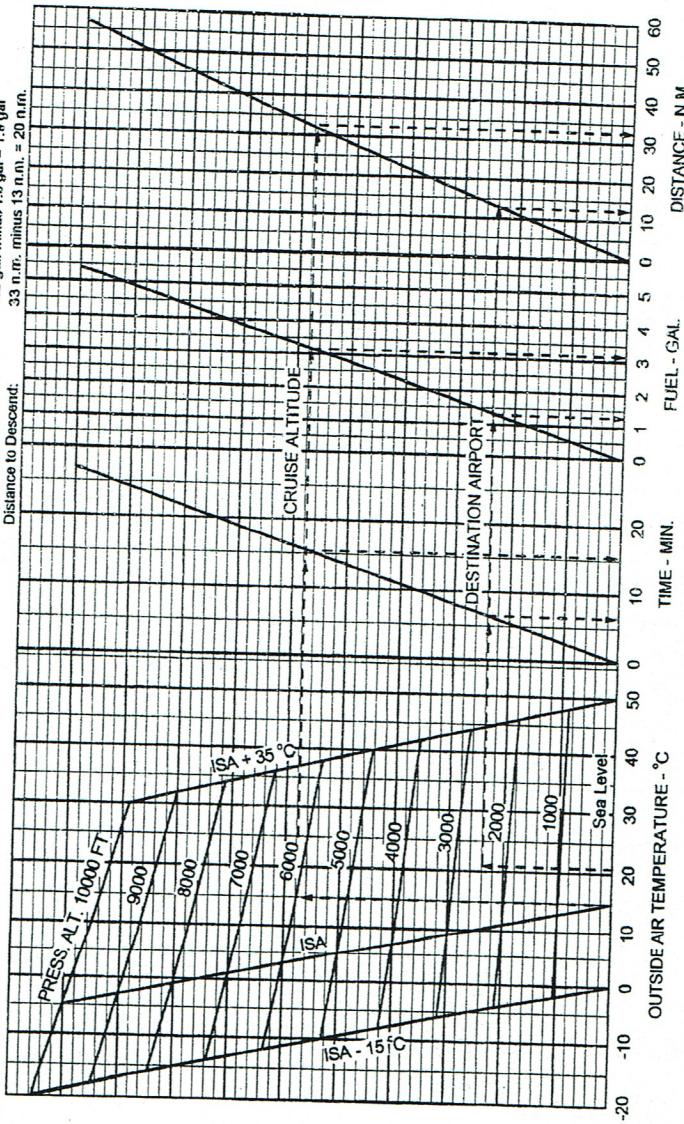
TIME, FUEL, DISTANCE TO DESCEND

EXAMPLE

ASSOCIATED CONDITIONS

Gross Weight: 2550 LB
Engine RPM: 2500
Airspeed: 122 KIAS
Flaps: UP

Depart Airport Press Alt.: 2500 FT. Temperature: 21 °C
Cruise Press Alt.: 6000 FT. Cruise OAT: 15 °C
Time to Descend: 16 min. minus 6 min. = 10 min.
Fuel to Descend: 3.2 gal. minus 1.3 gal = 1.9 gal
Distance to Descend: 33 n.m. minus 13 n.m. = 20 n.m.



TIME, DISTANCE AND FUEL TO DESCEND

Figure 5-31

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ISSUED: JULY 12, 1995
REVISED: MARCH 31, 1998

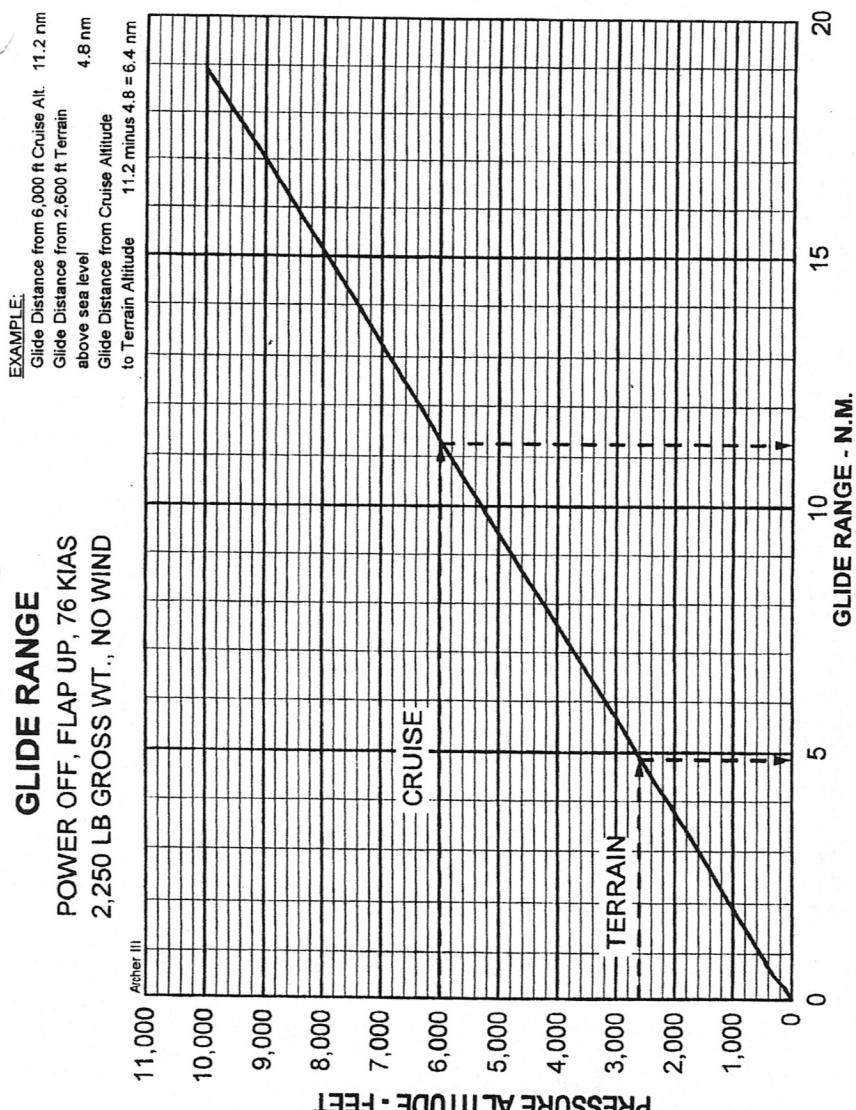
**GLIDE RANGE**

Figure 5-33

ISSUED: JULY 12, 1995
 REVISED: NOVEMBER 6, 1998

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**SECTION 5
PERFORMANCE**

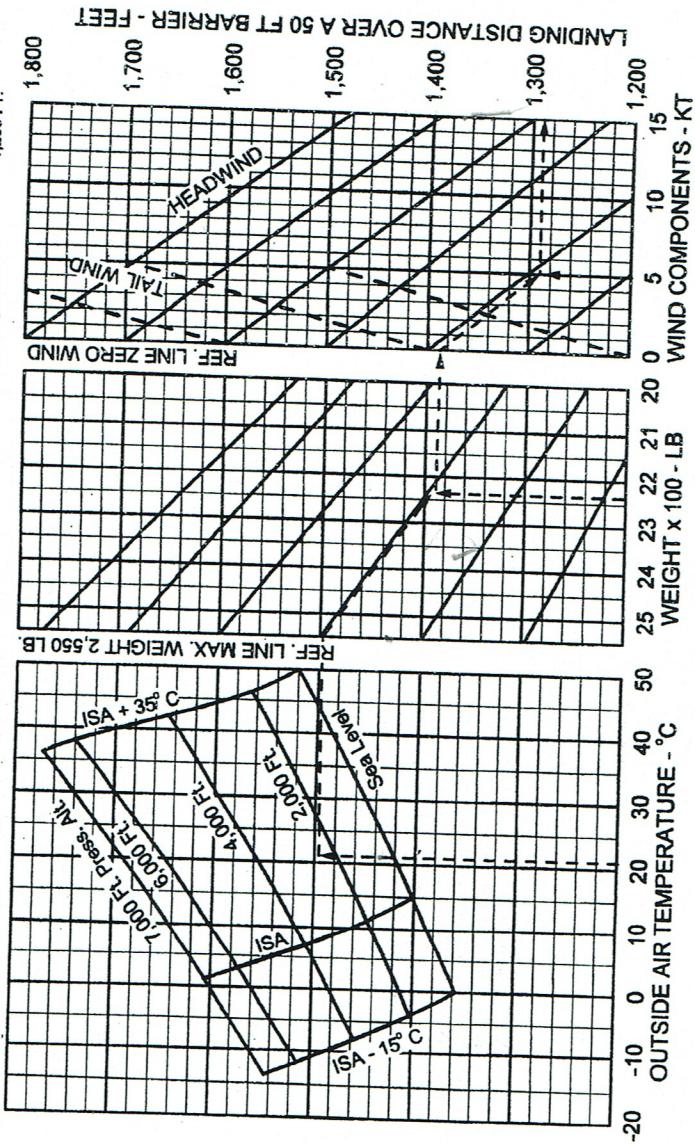
PA-28-181, ARCHER III

**LANDING PERFORMANCE
ASSOCIATED CONDITIONS**

Power Off Approach, 40° Flaps, 66 KIAS, Full Stall
Touchdown, Maximum Braking, Paved, Level, Dry Runway

EXAMPLE:

Airport Pressure Altitude: 2,500 FT.
O.A.T.: 21°C
Gross Weight: 2,240 LB.
Headwind: 5 KT.
Landing Distance: 1,290 FT.



LANDING PERFORMANCE

Figure 5-35

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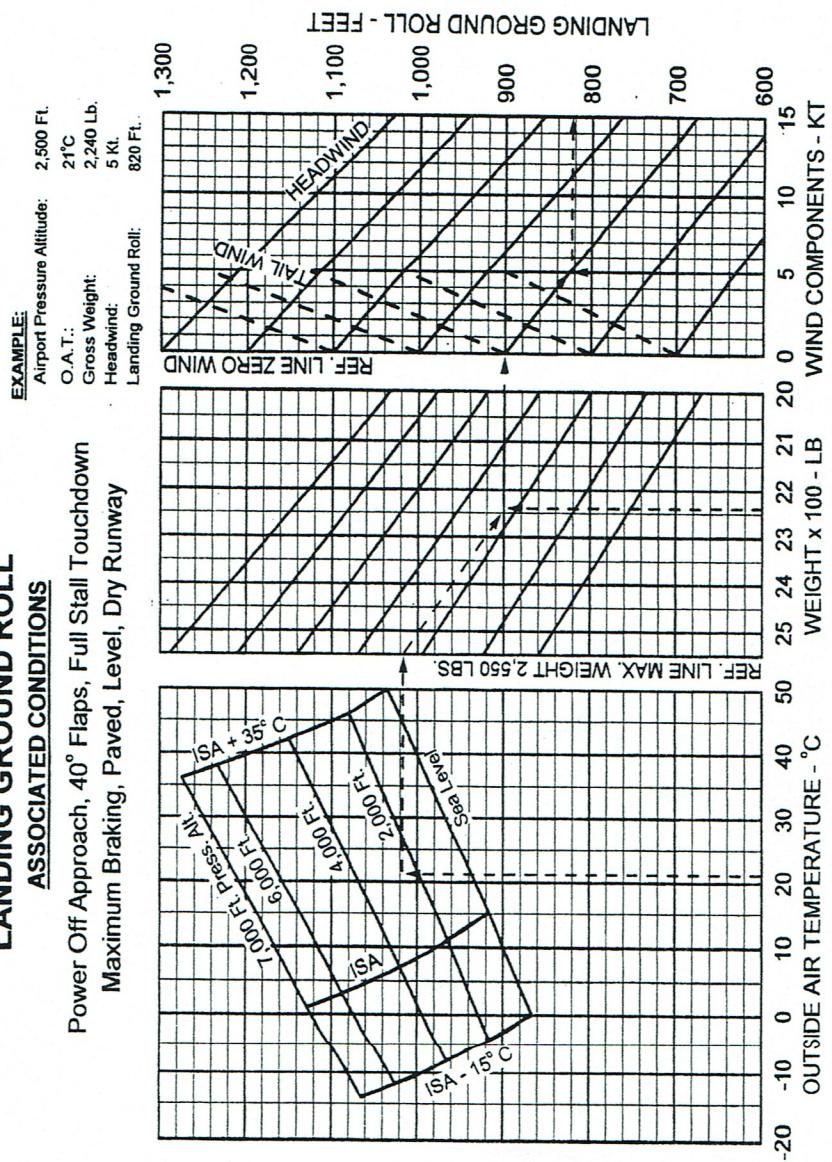
**ISSUED: JULY 12, 1995
REVISED: MARCH 31, 1998**

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PA-28-181, ARCHER III

LANDING GROUND ROLL
ASSOCIATED CONDITIONS

Power Off Approach, 40° Flaps, Full Stall Touchdown
Maximum Braking, Paved, Level, Dry Runway



LANDING GROUND ROLL
Figure 5-37

ISSUED: JULY 12, 1995
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**SECTION 5
PERFORMANCE**

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