N2702L

1981 Cessna 414A Ram IV

Performance Data

Aircraft S/N: 414A-0608

Prepared by the worldwide aviation specialists at RidgeAire, Inc.

SECTION 5
PERFORMANCE

TABLE OF CONTENTS

INTRODUCTION

Section 5 of this handbook contains all the performance information required to operate the airplane safely and to help you plan your flights in detail with reasonable accuracy. Safe and precise operation of the airplane requires the pilot to be thoroughly familiar with and understand the data and calculations of this section.

The data on these graphical and tabular charts have been compiled from actual flight tests, with the airplane and engines in good condition, using average pilot techniques. Note that the cruise performance data makes no allowance for wind and/or navigational errors. Allowances for start, taxi, takeoff, climb, descent and 45 minutes reserve fuel at the particular cruise power are provided in the range profile chart.

To determine pressure altitude at origin and destination airports, add 100 feet to field elevation for each .1 inch Hg. below 29.92 or subtract 100 feet from field elevation for each .1 inch Hg. above 29.92.

DEMONSTRATED OPERATING TEMPERATURE

Satisfactory engine cooling has been demonstrated for this airplane with an outside air temperature 23°C (41°F) above standard. This is not to be considered as an operating limitation. Reference should be made to Section 2 for engine operating limitations.

INTRODUCTION TO TABULATED PERFORMANCE

The performance tables are presented in increments of temperature, altitude and any other variables involved. Performance for a given set of conditions can be approximated as follows:

(1) Takeoff, Accelerate Stop, Accelerate Go, Landing - Enter tables at the next higher increment of weight, altitude and temperature.
(2) Cruise - Enter tables at next lower increment of temperature and altitude.

To obtain exact performance values from the tables, it is necessary to interpolate between the increment values. The following is an example of approximation and interpolation, using an excerpt from the Normal Takeoff Distance Chart.

EXAMPLE

Given:		Find:	
Weight	6500 Pounds	Takeoff Speed	____ KIAS
Temperature	(16°C) 61°F	Ground Roll	____ Feet
Pressure Altitude	2400 Feet	Total Distance to Clear 50-Foot Obstacle	____ Feet
Headwind	19 Knots		

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6750	98	2000	2350	2770	2570	3030
		3000	2500	2930	2730	3210
6200	94	2000	1880	2220	2100	2480
		3000	2040	2400	2230	2620

Approximation Method

Extract from the chart the next increment of weight, altitude and temperature which is more conservative than the actual conditions [i.e.: 6750 pounds, 3000 feet and 20°C (68°F)].

Takeoff and Climb Speed	98 KIAS
Ground Roll	2730 Feet
Total Distance to Clear 50-Foot Obstacle	3210 Feet

Interpolation Method

If the approximation method yields a value larger than can be tolerated, a more exact value should be determined using the interpolation method.

The example weight (6500 pounds) is 6200 pounds plus 300/550 or .55 times the difference between 6200 pounds and 6750 pounds [i.e.: 6200-pound value +.55 (6750-pound value - 6200-pound value)]

The example pressure altitude (2400 feet) is 2000 feet plus 400/1000 or .4 times the difference between 2000 feet and 3000 feet [i.e.: 2000-foot value + .4 (3000-foot value - 2000-foot value)].

The example temperature of 16°C (61°F) is 10°C plus 6/10 or .6 times the difference between 10°C and 20°C [i.e.: 10°C value + .6 (20°C value - 10°C value)].

Interpolating Values for Normal Takeoff Distance:

Ground Roll (7 interpolations required)

Altitude interpolation at 10°C (50°F) and 6750 pounds

= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]

= 2350 feet + [.4 (2500 feet - 2350 feet)]

= 2350 feet + [60 feet]

= 2410 feet

Altitude interpolation at 20°C (68°F) and 6750 pounds

= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]

= 2570 feet + [.4 (2730 feet - 2570 feet)]

= 2570 feet + [64 feet]

= 2634 feet

Altitude interpolation at 10°C (50°F) and 6200 pounds

= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]

= 1880 feet + [.4 (2040 feet - 1880 feet)]

= 1880 feet + [64 feet]

= 1944 feet

Altitude interpolation at 20°C (68°F) and 6200 pounds

= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]

= 2100 feet + [.4 (2230 feet - 2100 feet)]

= 2100 feet + [52 feet]

= 2152 feet

The Normal Takeoff Distance chart, with altitude interpolation, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6750	98	2400	2410	----	2634	----
6200	94	2400	1944	----	2152	----

Weight interpolation at 10°C (50°F) and 2400 feet

= 6200-pound value + [.55 (6750-pound value - 6200-pound value)]

= 1944 feet + [.55 (2410 feet - 1944 feet)]

= 1944 feet + [256 feet]

= 2200 feet

Weight interpolation at 20°C (68°F) and 2400 feet

= 6200-pound value + [.55 (6750-pound value - 6200-pound value)]

= 2152 feet + [.55 (2634 feet - 2152 feet)]

= 2152 feet + [265 feet]

= 2417 feet

Takeoff and Climb Speed

= 6200-pound value + [.55 (6750-pound value - 6200-pound value)]

= 94 KIAS + [.55 (98 KIAS - 94 KIAS)]

= 94 KIAS + [2.2 KIAS]

= 96 KIAS

The Normal Takeoff Distance chart, with altitude and weight interpolation, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6500	96	2400	2200	----	2417	----

Temperature interpolation at 2400 feet and 6500 pounds

= 10°C (50°F) value + [.6 (20°C (68°F) value - 10°C (50°F) value)]

= 2200 feet + [.6 (2417 feet - 2200 feet)]

= 2200 feet + [130 feet]

= 2330 feet

The Normal Takeoff Distance chart, with altitude, weight and temperature, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	16°C (61°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6500	96	2400	2330	----

Ground Roll with 19-knot headwind

$$= 2330 \text{ feet} - \left[2330 \text{ feet} \left(\frac{19 \text{ knots headwind}}{10 \text{ knots headwind}} \right) (7\%)\right]$$

= 2330 feet - 310 feet

= 2020 feet

Total Distance to Clear 50-Foot Obstacle (7 interpolations required)

The interpolations required are identical to the ground roll interpolations, except "total distance to clear 50-foot obstacle" values are substituted for the "ground roll" values.

The interpolated value for the total distance to clear 50-foot obstacle is 2744 feet (no wind) and 2379 feet (19-knot headwind).

SAMPLE FLIGHT

The following is an example of a typical flight using the performance data contained in Figures 5-9 through 5-25. The approximation method is used in tabular performance except where noted.

AIRPLANE CONFIGURATION

Airplane Weight	6500 Pounds
Usable Fuel Load	978 Pounds

TAKEOFF AIRPORT CONDITIONS

Field Length	5000 Feet (Runway 23)
Temperature	16°C (61°F)
Field Pressure Altitude	2400 Feet
Wind	270° at 25 Knots
Obstacles	None

CRUISE CONDITIONS

Distance	600 Nautical Miles
Cruise Altitude	17,500 Feet
Temperature	-10°C (14°F)
Wind	15-Knot Tailwind
Power	Maximum Recommended Cruise Power at Recommended Lean Mixture

LANDING AIRPORT CONDITIONS

Field Length	3500 Feet (Runway 19)
Temperature	7°C (45°F)
Field Pressure Altitude	1700 Feet
Wind	210° at 17 Knots
Landing Weight	To be Calculated
Obstacles	50-Foot Trees

SAMPLE CALCULATIONS

Wind Component Chart (Figure 5-9)

(1) The angle between the runway and the prevailing wind is 40°.
(2) Enter Figure 5-9 on the 40° wind line and proceed out to the intersection with the 25-knot arc.
(3) Read horizontally left from this intersection; the headwind component is 19 knots.

Normal Takeoff Distance (Figure 5-10)

(1) Enter Figure 5-10 at 6750 pounds weight; the takeoff and climb speed is 98 KIAS.
(2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The takeoff ground run is 2730 feet and the total distance required to clear a 50-foot obstacle is 3210 feet without wind correction. With a 19-knot headwind component, the corrected takeoff ground run is 2367 feet and the corrected total distance required is 2783 feet.

$$\frac{\text{19 Knots Headwind}}{\text{10 Knots Headwind}} \quad (7\%) = 13.3\%$$

Corrected Takeoff Ground Run
= 2730 feet - [13.3% (2730 feet)]
= 2730 feet - [363 feet]
= 2367 feet

Corrected Total Distance Required
= 3210 feet - [13.3% (3210 feet)]
= 3210 feet - [427 feet]
= 2783 feet

Accelerate Stop Distance (Figure 5-11)

(1) Enter Figure 5-11 at 6750 pounds weight; engine failure speed is 98 KIAS.

(2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The distance required to accelerate to 98 KIAS and stop is 5070 feet without wind correction. With a 19-knot headwind component, the accelerate stop distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{4 \text{ Knots Headwind}} \quad (3\%) = 14.25\%$$

Corrected Accelerate Stop Distance = 5070 feet - [14.25% (5070 feet)]

= 5070 feet - [722 feet]

= 4348 feet

Accelerate Go Distance (Figure 5-12)

(1) Enter Figure 5-12 at 6750 pounds weight; engine failure speed is 98 KIAS.
(2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The distance required to clear a 50-foot obstacle, after losing an engine at 98 KIAS, is 5090 feet without wind correction. With a 19-knot headwind component, the distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} \quad (6\%) = 11.4\%$$

Corrected Accelerate Go Distance = 5090 feet - [11.4% (5090 feet)]

= 5090 feet - [580 feet]

= 4510 feet

NOTE

- **The distance required to accelerate go using the approximation method is often so great that a more exact value should be obtained using the interpolation method.**
- **The interpolation method gives an accelerate go distance of 4111 feet without wind or 3642 feet with 19 knots of headwind.**

Rate-Of-Climb — Maximum Climb (Figure 5-13)

(1) Enter Figure 5-13 at 16°C (61°F).
(2) Proceed vertically up to the 2400-foot pressure altitude line.
(3) Proceed horizontally right to the reference line. Follow the slope of the adjacent rate-of-climb lines until intersecting the vertical 6500-pound line.
(4) Proceed horizontally right to obtain rate-of-climb. (1500 Feet per minute)
(5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (108 KIAS)

Rate-Of-Climb — Cruise Climb (Figure 5-14)

(1) Enter Figure 5-14 at 16°C (61°F).
(2) Proceed vertically up to the 2400-foot pressure altitude line.
(3) Proceed horizontally right to the reference line. Follow the slope of the adjacent rate-of-climb lines until intersecting the vertical 6500-pound line.
(4) Proceed horizontally right to obtain rate-of-climb. (1055 Feet per minute)
(5) Climb speed is 120 KIAS for all conditions.

Rate-Of-Climb — Single Engine (Figure 5-15)

(1) Enter Figure 5-15 at 16°C (61°F).
(2) Proceed vertically up to the 2400-foot pressure altitude line.
(3) Proceed horizontally right to the reference line. Follow the slope of the adjacent rate-of-climb lines until intersecting the vertical 6500-pound line.
(4) Proceed horizontally right to obtain rate-of-climb. (280 Feet per minute)
(5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (108 KIAS)

Time, Fuel And Distance To Climb — Cruise Climb (Figure 5-19)

Time, fuel and distance to climb are determined by finding the difference between the airport and the cruise conditions; thus, two calculations are required, one for the airport condition and the second for the cruise condition.

Airport Condition:
(1) Enter Figure 5-19 at 16°C (61°F).
(2) Proceed vertically up to 2400-foot pressure altitude line.
(3) Proceed horizontally right to the 6500-pound line.
(4) Proceed vertically down to obtain time to climb (2.3 minutes), fuel to climb (9.5 pounds) and distance to climb (5 nautical miles).

Cruise Condition:
(5) Enter Figure 5-19 at -10°C (14°F).
(6) Proceed vertically up to 17,500-foot pressure altitude line.
(7) Proceed horizontally right to the 6500-pound line.
(8) Proceed vertically down to obtain time to climb (22.0 minutes), fuel to climb (88 pounds) and distance to climb (52 nautical miles).

Final Calculations:

Time to Climb = Cruise time to climb - Airport time to climb

= 22 minutes - 2.3 minutes

= 20 minutes

Fuel to Climb = Cruise fuel to climb - Airport fuel to climb

= 88 pounds - 9.5 Pounds

= 78.5 pounds (add 32 pounds for start, taxi and runup) (110.5 pounds total)

Distance to Climb = Cruise distance to climb - Airport distance to climb

= 52 nautical miles - 5 nautical miles

= 47 nautical miles

Adjusted for wind (use 60% of the wind at altitude for climb wind),

= 47 ± wind contribution

$= 47 + [\frac{20 \text{ minutes}}{60 \text{ minutes}} (.6 \times 15 \text{ knots})]$

= 47 nautical miles + 3 nautical miles

= 50 nautical miles

Time, Fuel And Distance To Descend (Figure 5-24)

Time, fuel and distance to descend are determined by finding the difference between the cruise and the landing airport conditions; thus two calculations are required, one for the cruise condition and the second for the landing airport condition.

Cruise Condition:
(1) Enter Figure 5-24 at the cruise altitude of 17,500 feet.
(2) Proceed horizontally right to the guideline.
(3) Proceed vertically down to obtain time to descend (14.4 minutes), fuel to descend (34 pounds) and distance to descend (48 nautical miles).

Landing Airport Condition:
(4) Enter Figure 5-24 at the airport altitude of 1700 feet.
(5) Proceed horizontally right to the guideline.
(6) Proceed vertically down to obtain time to descend (2.0 minutes), fuel to descend (5 pounds) and distance to descend (6.5 nautical miles).

Final Calculations:
Time to Descend = Cruise time to descend - Airport time to descend

= 14.4 minutes - 2.0 minutes

= 12.4 minutes

Fuel to Descend = Cruise fuel to descend - Airport fuel to descend

= 34 pounds - 5 pounds

= 29 pounds

Distance to Descend = Cruise distance to descend - Airport distance to descend.

= 48 nautical miles - 6.5 nautical miles

= 41.5 nautical miles

Adjusted for wind (use 40% of the wind at altitude for descent wind),

= 41.5 ± wind contribution

$$= 41.5 + \left[\frac{12.4 \text{ minutes}}{60 \text{ minutes}} (.4 \times 15 \text{ knots}) \right]$$

= 41.5 nautical miles + 1.2 nautical miles

= 42.7 nautical miles

Cruise Performance With Recommended Lean Mixture (Figure 5-20)

Maximum recommended cruise can be obtained with either 2450 RPM and 31.5 Inches Hg. manifold pressure or 2300 RPM and 34 Inches Hg. manifold pressure.

The approximation method for extracting data from the cruise tables is to select the next lower temperature and altitude values, which are generally conservative with respect to fuel economy.

(1) Enter the 15,000-foot data at 2450 RPM and 31.5 Inches Hg. manifold pressure.
(2) Use -15°C (5°F) data for a power of 74.8%, airspeed of 199 KTAS and a total fuel flow of 204 pounds per hour.
(3) Correcting for a weight of 6500 pounds, the airspeed increases to:

$$199 \text{ KTAS} + \frac{(6750 \text{ pounds} - 6500 \text{ pounds})}{1000 \text{ pounds}} (6 \text{ KTAS}) =$$

199 KTAS + 1.5 KTAS = 200 KTAS

Using the interpolation method, interpolating altitude, temperature and weight, the actual performance is 72.5% power, 204 KTAS and total fuel flow of 198 pounds per hour.

In the above calculations, for convenience, the weight was assumed to be equal to the takeoff weight of 6500 pounds. More realistic data can be determined if the average cruise weight is used. This average cruise weight is determined as follows:

$$\text{Cruise Fuel} = \frac{\text{Total distance} - \text{climb distance} - \text{descent distance}}{\text{True airspeed} + \text{wind correction}} \times [\text{Total fuel flow per hour}]$$

$$= \frac{600 \text{ Nautical Miles} - 50 \text{ Nautical Miles} - 42.7 \text{ Nautical Miles}}{204 \text{ KTAS} + 15 \text{ Knot Tailwind}} \times [198 \text{ pounds per hour}]$$

$$= \frac{507.3 \text{ Nautical miles}}{219} \times 198 \text{ pounds per hour}$$

$$= 2.32 \text{ hours} \times 198 \text{ pounds per hour}$$

$$= \underline{458 \text{ pounds}}$$

$$\text{Average Cruise Weight} = \text{Takeoff weight} - \text{start, taxi and climb fuel} - \frac{\text{Cruise fuel}}{2}$$

$$= 6500 \text{ pounds} - 110.5 \text{ pounds} - \frac{458 \text{ pounds}}{2}$$

$$= \underline{6161 \text{ pounds}}$$

$$\text{Average Cruise Speed} = \text{True airspeed from Figure 5-20} + \text{weight correction}$$

$$= 204 \text{ KTAS} + 6 \left(\frac{340}{1000} \right)$$

$$= \underline{206 \text{ KTAS}}$$

$$\text{Average Ground Speed} = 206 \text{ KTAS} + \text{tailwind}$$

$$= 206 \text{ KTAS} + 15 \text{ knots}$$

$$= \underline{221 \text{ knots}}$$

$$\text{Distance During Cruise} = \text{Total distance} - \text{Climb distance} - \text{Descent distance}$$

$$= 600 - 50 - 42.7$$

$$= \underline{507.3 \text{ Nautical Miles}}$$

$$\text{Time During Cruise} = \frac{\text{Cruise distance}}{\text{ground speed}}$$

$$= \frac{507.3}{221}$$

$$= \underline{2.30 \text{ hours}}$$

Normal Landing Distance (Figure 5-25)

Landing Weight = Takeoff weight - climb fuel - cruise fuel - descent fuel

= 6500 pounds - 110.5 pounds - 458 pounds - 29 pounds

= <u>5903 pounds</u>

Wind = 210° at 17 knots. Determine headwind component from Figure 5-9. (16 knots headwind)

Enter Figure 5-25 at 6200 pounds; the approach speed is 91 KIAS. Proceed horizontally right from 2000-foot pressure altitude to the vertical column for 10°C (50°F). The landing distance ground roll is 890 feet and the total distance required to clear a 50-foot obstacle is 2270 feet without wind correction. With a 16-knot headwind component, the corrected ground roll distance is 783 feet and the corrected total distance required is 1998 feet.

$$\frac{\text{16 Knots Headwind}}{\text{4 Knots Headwind}} \quad (3\%) = 12\%$$

Corrected Landing Ground Roll
= 890 feet - [12% (890)]
= 890 feet - 107 feet
= 783 feet

Corrected Total Distance Required
= 2270 - [12% (2270)]
= 2270 feet - 272 feet
= 1998 feet

Rate-Of-Climb — Balked Landing Climb (Figure 5-16)

(1) Enter Figure 5-16 at 7°C (45°F).
(2) Proceed vertically up to the 1700-foot pressure altitude line.
(3) Proceed horizontally right to the weight reference line. Follow the guidelines up and to the right until intersecting the vertical 5903-pound weight line.
(4) Proceed horizontally right to determine the rate-of-climb. (1035 Feet per minute)

Total Fuel Required
= Start, taxi and climb fuel + cruise fuel + descent fuel
= 111 pounds + 458 pounds + 29 pounds = 598 pounds (Without Holding Fuel)
or 598 pounds + 97 pounds = 695 pounds (With 45 Minutes Holding Fuel)

Holding Time (Figure 5-23)

To determine holding time, the fuel available for holding must be determined.

Fuel Available for Holding
= Initial fuel - [start, taxi and climb fuel + cruise fuel + descent fuel]
= 978 pounds - [111 pounds + 458 pounds + 29 pounds]
= 380 pounds

(1) Enter Figure 5-23 at 380 pounds of fuel available.
(2) Proceed vertically up to the intersection with the guideline.
(3) Proceed horizontally left to obtain holding time available. (2.9 hours)

AIRSPEED CALIBRATION
NORMAL STATIC SOURCE

NOTE:

1. Indicated airspeed assumes zero instrument error.

2. The following calibrations are not valid in the prestall buffet.

3. The following calibrations are valid for the pilot's and copilot's airspeed indicators when the standard or optional dual static system is installed.

Gear Up Flaps 0°		Gear Down Flaps 15°		Gear Down Flaps 45°	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
70	70	70	71	70	71
80	80	80	81	80	80
90	90	90	91	90	90
--	--	--	--	94 *	93 *
100	100	100	100	100	99
110	110	110	109	110	109
120	119	120	119	120	117
140	139	130	128	130	127
160	158	140	138	140	136
180	178	150	147	145	140
200	197	160	157	---	---
220	216	170	166	---	---
230	226	179	175	---	---
237	232	---	---	---	---

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

Figure 5-1

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

NOTE:

1. Indicated airspeed assumes zero instrument error.
2. The following calibrations are not valid in the prestall buffet.
3. The following calibrations are valid for pilot's and copilot's airspeed indicators when the standard static system is installed.
4. An alternate static source is not available for copilot's instruments when optional dual static system is installed.

Gear Up Flaps 0°		Gear Down Flaps 15°		Gear Down Flaps 45°	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
---	---	---	---	70	75
80	89	80	85	80	83
90	98	90	94	90	92
---	---	---	---	92 *	93 *
100	108	100	102	100	100
110	117	110	111	110	109
120	126	120	119	120	117
140	144	130	128	130	126
160	163	140	136	140	134
180	181	150	145	150	143
200	199	160	153	---	---
220	218	180	170	---	---
240	236	---	---	---	---

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

Figure 5-2

ALTIMETER CORRECTION
NORMAL STATIC SOURCE

NOTE:

1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for the pilot's and copilot's altimeters when the standard or optional dual static system is installed.

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	45°	0°	15°	45°	0°	15°	45°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
70	+3	+8	+5	+3	+10	+6	+5	+14	+9
80	+1	+6	0	+1	+7	0	+2	+11	0
90	0	+4	-5	0	+5	-6	0	+7	-9
94*	----	----	-8	----	----	-9	----	----	-14
100	-1	0	-10	-2	0	-12	-3	0	-17
110	-2	-5	-19	-2	-6	-22	-3	-9	-33
120	-2	-8	-25	-3	-9	-29	-4	-14	-43
140	-13	-21	-50	-15	-24	-63	-22	-37	-90
160	-21	-39	----	-24	-49	----	-36	-68	----
180	-31	-58	----	-39	-78	----	-55	-110	----
200	-55	----	----	-69	----	----	-100	----	----
220	-73	----	----	-90	----	----	-130	----	----
230	-87	----	----	-111	----	----	-157	----	----
237	-100	----	----	-132	----	----	-183	----	----

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

ALTITUDE CORRECTION PROCEDURE

[INDICATED ALTITUDE TO FLY] = [DESIRED ALTITUDE (MSL)] - [ALTIMETER CORRECTION]

Figure 5-3

ALTIMETER CORRECTION
ALTERNATE STATIC SOURCE

NOTE:

1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for pilot's and copilot's altimeters when the standard static system is installed.
3. An alternate static source is not available for copilot's instruments when the optional dual static system is installed.

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	45°	0°	15°	45°	0°	15°	45°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
80	64	36	24	87	48	32	120	67	44
90	68	28	16	91	38	22	127	53	30
92 *	68	26	14	91	36	19	127	49	26
100	68	18	5	92	24	6	128	34	8
120	63	-11	-30	85	-15	-41	122	-20	-57
140	51	-48	-76	69	-65	-103	95	-90	-143
160	36	-102	----	49	-138	----	68	-191	----
180	12	-174	----	16	-235	----	22	-326	----
200	-13	----	----	-18	----	----	-24	----	----
220	-51	----	----	-70	----	----	-96	----	----
240	-90	----	----	-123	----	----	-170	----	----

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps

ALTITUDE CORRECTION PROCEDURE

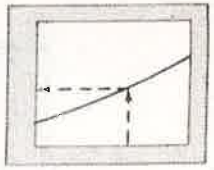
[INDICATED ALTITUDE TO FLY] = [DESIRED ALTITUDE (MSL)] - [ALTIMETER CORRECTION]

Figure 5-4

TEMPERATURE RISE DUE TO RAM RECOVERY

RECOVERY FACTOR (K) = .90

NOTE:
1. Subtract temperature rise from indicated outside air temperature to obtain true outside air temperature



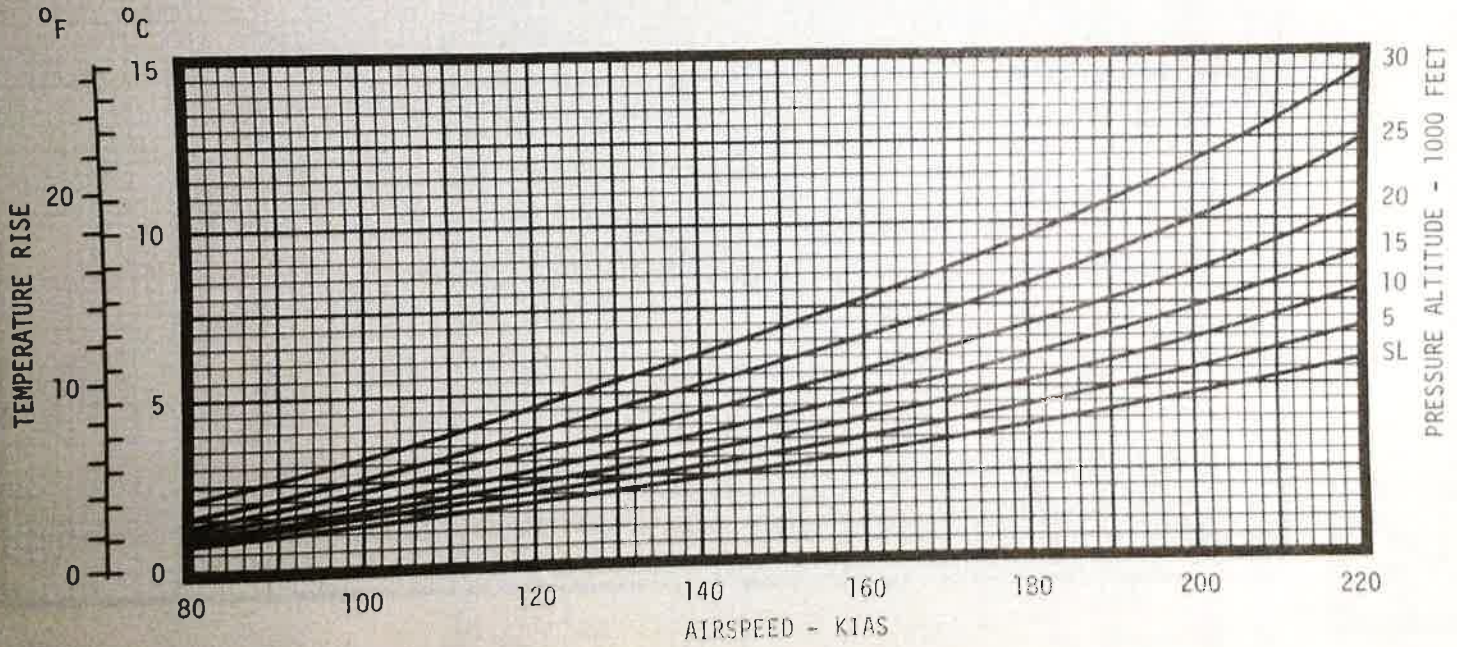
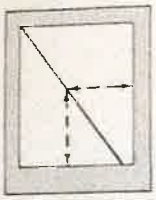


Figure 5-5



TEMPERATURE CONVERSION FROM FAHRENHEIT TO CELSIUS

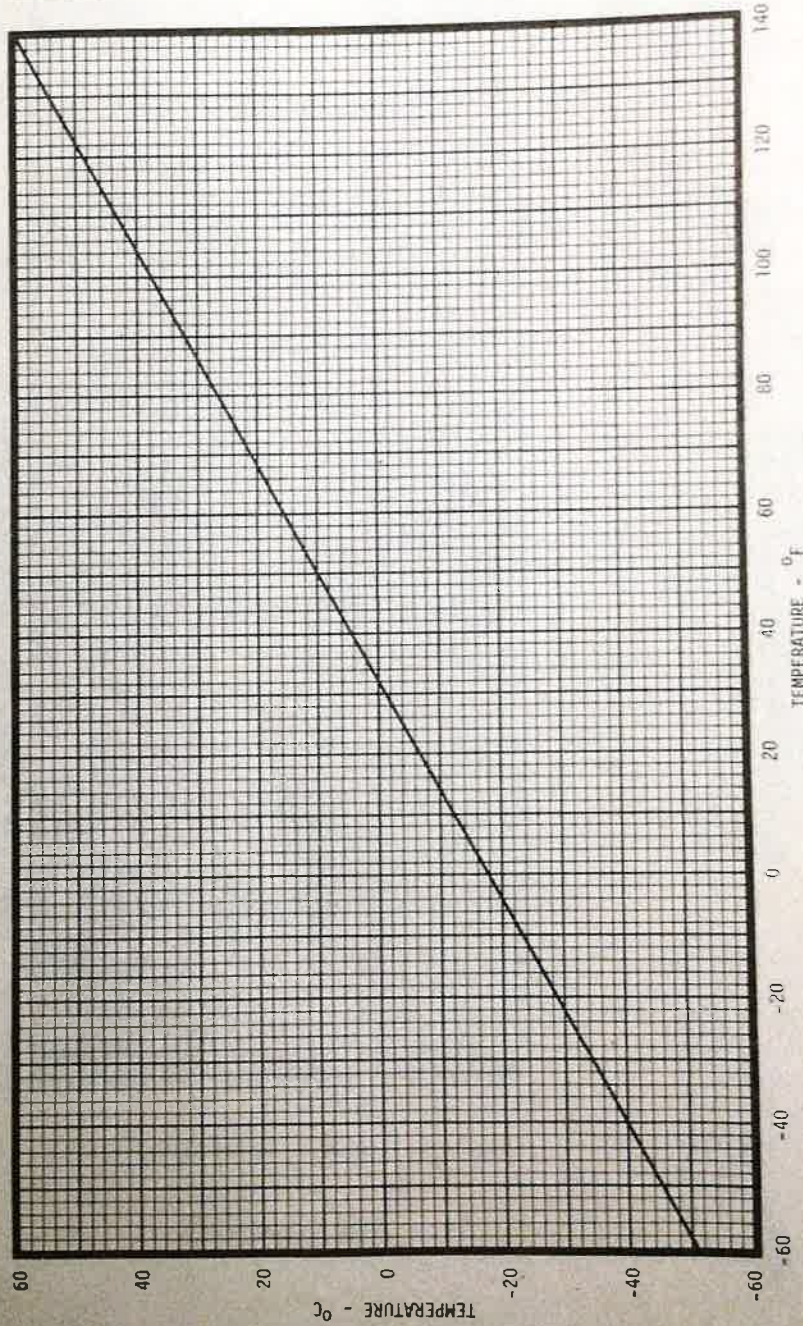


Figure 5-6

Serial N
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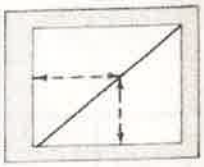
PRESSURE CONVERSION
INCHES OF MERCURY TO MILLIBARS



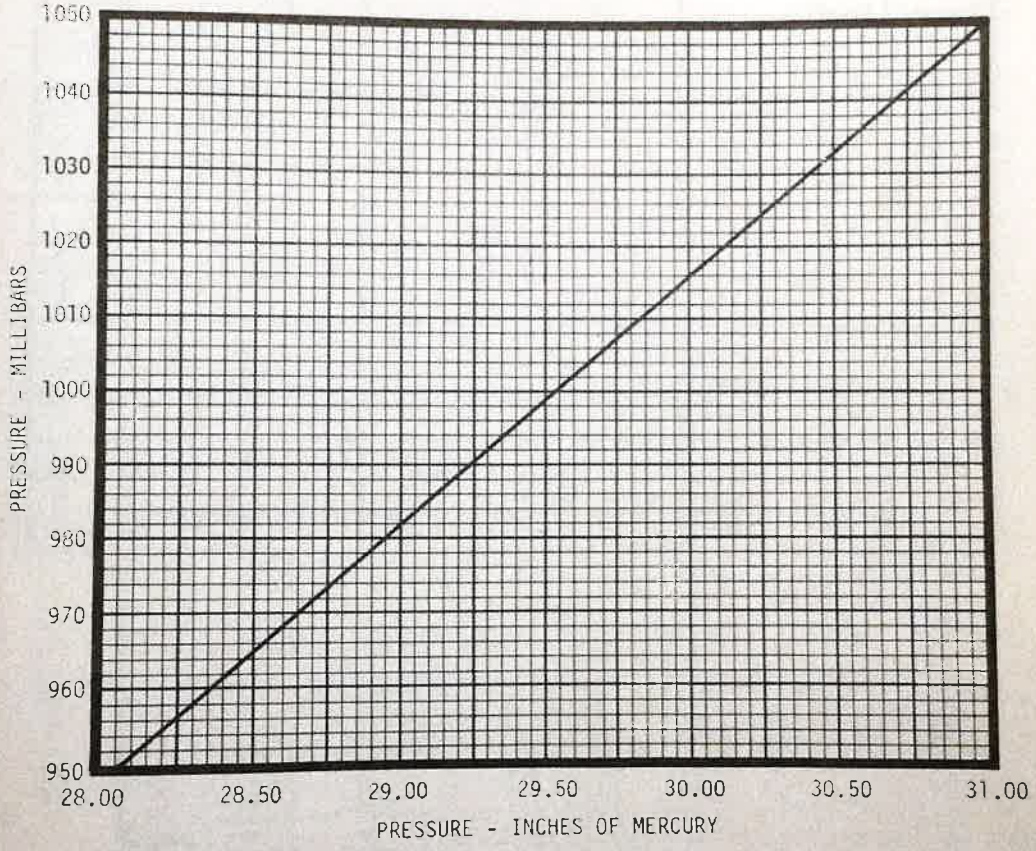


Figure 5-7

Figure 5-6

TEMPERATURE - °F

STALL SPEEDS

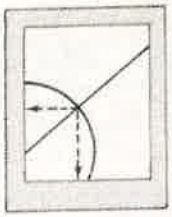
CONDITIONS:
Throttles - IDLE

NOTE:
Maximum altitude lost during a stall is 300 feet.

WEIGHT Pounds	Configuration		ANGLE OF BANK							
			0°		20°		40°		60°	
	Flaps	Gear	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
6750	0°	Up	82	82	85	85	94	94	116	116
	15°	Down	76	77	79	80	87	88	111	110
	45°	Down	71	72	73	74	82	82	103	102
6200	0°	Up	79	79	81	81	90	90	111	111
	15°	Down	73	74	76	77	84	85	105	105
	45°	Down	67	69	70	71	79	79	98	97
5700	0°	Up	75	75	78	78	86	86	107	107
	15°	Down	70	71	72	73	80	81	101	101
	45°	Down	65	66	67	68	74	75	94	93
5200	0°	Up	72	72	74	74	82	82	102	102
	15°	Down	67	68	69	70	77	78	96	96
	45°	Down	61	63	63	65	71	72	90	89

Figure 5-8

WIND COMPONENT



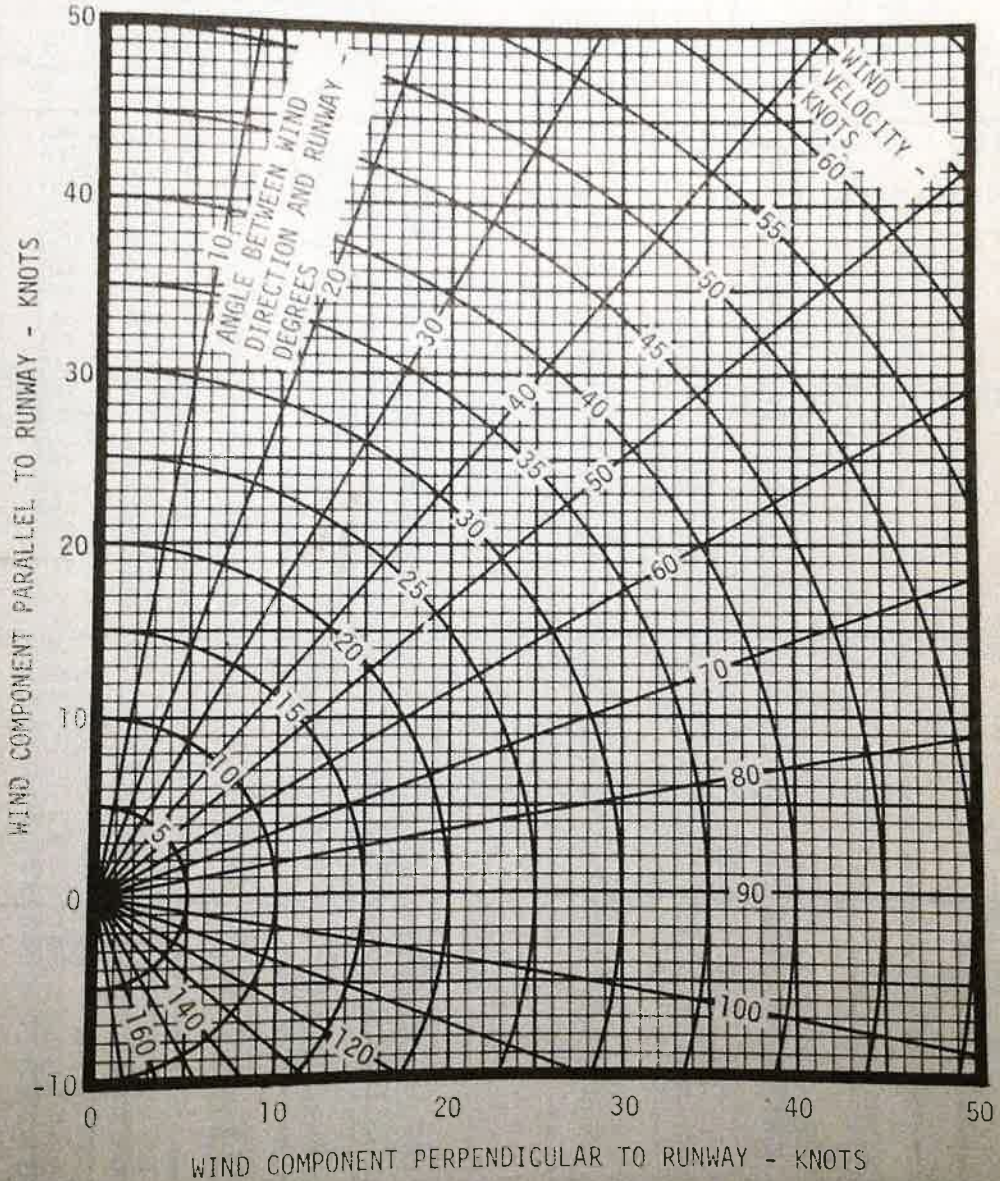


Figure 5-9

NORMAL TAKEOFF DISTANCE

CONDITIONS:
1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.

NOTE:
1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 7% for each 10 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT-POUNDS	TAKEOFF TO 50-FOOT OBSTACLE SPEED-KIAS	PRESSURE ALTITUDE-FEET	-20°C (-4°F)		-10°C (14°F)		0°C (32°F)		10°C (50°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET
6750	98	Sea Level	1560	1870	1710	2040	1870	2230	2040	2430
		1000	1660	1970	1810	2150	1980	2350	2220	2620
		2000	1760	2080	1920	2270	2150	2530	2350	2770
		3000	1860	2200	2090	2450	2280	2680	2500	2930
		4000	2020	2370	2210	2590	2420	2830	2650	3100
		5000	2150	2500	2350	2740	2570	2990	2820	3280
		6000	2280	2650	2500	2900	2730	3170	3000	3480
		7000	2420	2800	2650	3070	2910	3360	3190	3690
		8000	2580	2970	2830	3250	3100	3570	3400	3920
		9000	2740	3150	3010	3450	3310	3790	3630	4170
		10,000	2930	3350	3210	3670	3530	4030	3880	4440
6200	94	Sea Level	1280	1540	1400	1680	1530	1830	1670	1990
		1000	1360	1630	1480	1770	1620	1930	1770	2100
		2000	1440	1720	1570	1870	1720	2040	1880	2220
		3000	1530	1810	1670	1980	1820	2150	2040	2400
		4000	1620	1910	1770	2090	1980	2320	2160	2530
		5000	1720	2030	1920	2250	2100	2450	2300	2680
		6000	1870	2180	2040	2380	2230	2590	2440	2840
		7000	1980	2300	2170	2520	2370	2750	2600	3010
		8000	2110	2440	2310	2670	2530	2920	2770	3190
		9000	2250	2590	2460	2830	2690	3100	2950	3390
		10,000	2390	2740	2620	3000	2870	3290	3150	3610
5700	90	Sea Level	1050	1280	1150	1390	1250	1510	1360	1640
		1000	1120	1350	1220	1460	1330	1590	1450	1730
		2000	1180	1420	1290	1540	1410	1680	1530	1830
		3000	1260	1500	1370	1630	1490	1770	1630	1930
		4000	1330	1580	1460	1720	1590	1880	1730	2040
		5000	1420	1670	1550	1820	1690	1990	1880	2200
		6000	1510	1770	1650	1930	1830	2140	2000	2330
		7000	1600	1880	1780	2070	1950	2260	2130	2470
		8000	1730	2010	1890	2200	2070	2400	2260	2620
		9000	1840	2130	2020	2330	2200	2540	2410	2780
		10,000	1960	2260	2150	2470	2350	2700	2570	2950
5200	86	Sea Level	850	1040	930	1130	1010	1230	1100	1330
		1000	900	1100	980	1190	1070	1290	1160	1400
		2000	960	1160	1040	1260	1130	1370	1240	1480
		3000	1010	1220	1110	1330	1200	1440	1310	1570
		4000	1080	1290	1170	1400	1280	1520	1390	1660
		5000	1140	1360	1250	1480	1360	1610	1480	1750
		6000	1220	1440	1330	1570	1450	1710	1580	1860
		7000	1300	1530	1410	1660	1540	1810	1680	1970
		8000	1380	1620	1510	1760	1640	1920	1820	2110
		9000	1470	1720	1630	1890	1770	2060	1940	2240
		10,000	1580	1840	1730	2000	1890	2180	2060	2380

Figure 5-10 (Sheet 1 of 2)

NORMAL TAKEOFF DISTANCE

CONDITIONS:
1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.

NOTE:
1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 7% for each 10 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT-POUNDS	TAKEOFF TO 50-FOOT OBSTACLE SPEED-KIAS	PRESSURE ALTITUDE-FEET	20°C (68°F)		30°C (86°F)		40°C (104°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET
6750	98	Sea Level	2290	2720	2510	2980	2750	3270
		1000	2430	2870	2660	3150	2920	3460
		2000	2570	3030	2820	3330	3100	3660
		3000	2730	3210	3000	3520	3290	3880
		4000	2900	3400	3190	3730	3500	4120
		5000	3090	3600	3390	3960	3730	4370
		6000	3290	3820	3610	4210	3980	4650
		7000	3500	4060	3850	4470	4250	4950
		8000	3740	4310	4110	4760	4540	5270
		9000	3990	4590	4400	5070	4850	5630
		10,000	4270	4890	4700	5410	5200	6010
6200	94	Sea Level	1820	2170	1990	2370	2230	2660
		1000	1930	2300	2160	2560	2370	2810
		2000	2100	2480	2290	2710	2510	2970
		3000	2230	2620	2440	2860	2670	3140
		4000	2360	2770	2590	3030	2840	3330
		5000	2510	2930	2750	3210	3020	3530
		6000	2670	3110	2930	3410	3220	3750
		7000	2850	3300	3120	3620	3430	3990
		8000	3040	3500	3330	3850	3660	4240
		9000	3240	3720	3560	4090	3920	4520
		10,000	3460	3960	3800	4360	4190	4820
5700	90	Sea Level	1490	1790	1620	1950	1770	2120
		1000	1580	1890	1720	2060	1880	2240
		2000	1670	1990	1830	2170	2050	2430
		3000	1780	2110	1990	2340	2170	2560
		4000	1930	2270	2110	2480	2310	2710
		5000	2050	2400	2240	2620	2460	2880
		6000	2180	2540	2390	2780	2620	3050
		7000	2320	2700	2540	2960	2790	3240
		8000	2480	2860	2710	3130	2970	3440
		9000	2640	3040	2890	3330	3170	3660
		10,000	2820	3230	3090	3550	3390	3900
5200	86	Sea Level	1190	1450	1300	1570	1420	1710
		1000	1270	1530	1380	1660	1500	1810
		2000	1350	1610	1470	1750	1600	1910
		3000	1430	1700	1560	1850	1700	2020
		4000	1520	1800	1660	1960	1810	2140
		5000	1620	1910	1760	2080	1960	2310
		6000	1720	2020	1910	2240	2090	2440
		7000	1860	2170	2040	2370	2230	2590
		8000	1980	2300	2170	2520	2370	2750
		9000	2110	2440	2310	2670	2530	2920
		10,000	2260	2600	2470	2840	2700	3110

Figure 5-10 (Sheet 2 of 2)

ACCELERATE STOP DISTANCE

CONDITIONS:
1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.
6. Engine Failure at Engine Failure Speed.
7. Idle Power and Maximum Effective Braking After Engine Failure.

NOTE:
1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 3% for each 4 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	PRESSURE ALTITUDE - FEET	TOTAL DISTANCE - FEET						
			-20°C -4°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F
6750	98	Sea Level	3370	3590	3820	4120	4390	4670	4980
		1000	3530	3760	4060	4320	4600	4900	5240
		2000	3700	3990	4250	4530	4830	5150	5500
		3000	3880	4180	4460	4750	5070	5410	5790
		4000	4120	4390	4680	4990	5330	5690	6090
		5000	4320	4610	4920	5250	5610	5990	6420
		6000	4540	4840	5170	5520	5900	6320	6770
		7000	4770	5090	5440	5810	6220	6660	7140
		8000	5010	5360	5730	6130	6560	7030	7550
		9000	5280	5640	6040	6460	6920	7420	7980
		10,000	5560	5950	6370	6820	7310	7850	8450
6200	94	Sea Level	2780	2960	3150	3340	3560	3780	4090
		1000	2910	3100	3300	3510	3730	4030	4290
		2000	3050	3250	3460	3680	3970	4230	4510
		3000	3200	3410	3630	3910	4170	4440	4740
		4000	3360	3580	3850	4110	4380	4670	4990
		5000	3530	3800	4050	4310	4600	4910	5250
		6000	3740	3990	4250	4540	4840	5170	5530
		7000	3930	4190	4470	4770	5100	5450	5840
		8000	4130	4410	4710	5030	5370	5750	6160
		9000	4350	4640	4960	5300	5670	6070	6510
		10,000	4580	4890	5230	5590	5990	6410	6880
5700	90	Sea Level	2300	2450	2600	2760	2930	3120	3310
		1000	2410	2560	2720	2890	3080	3270	3480
		2000	2530	2690	2860	3040	3230	3430	3710
		3000	2650	2820	3000	3190	3390	3650	3890
		4000	2780	2960	3150	3350	3610	3840	4100
		5000	2920	3110	3310	3560	3790	4040	4310
		6000	3060	3260	3510	3740	3980	4250	4540
		7000	3220	3460	3690	3930	4190	4480	4780
		8000	3410	3640	3880	4140	4420	4720	5050
		9000	3590	3830	4090	4360	4660	4980	5330
		10,000	3780	4030	4310	4600	4920	5260	5630
5200	86	Sea Level	1870	1990	2110	2240	2380	2520	2680
		1000	1960	2080	2210	2350	2490	2650	2810
		2000	2050	2180	2320	2460	2610	2780	2950
		3000	2150	2290	2430	2580	2750	2920	3110
		4000	2260	2400	2550	2710	2890	3070	3270
		5000	2370	2520	2680	2850	3030	3230	3480
		6000	2490	2650	2820	3000	3190	3430	3660
		7000	2620	2790	2970	3190	3390	3620	3860
		8000	2750	2930	3150	3350	3570	3810	4070
		9000	2900	3110	3310	3530	3760	4020	4290
		10,000	3070	3270	3490	3720	3970	4240	4530

Figure 5-11

ACCELERATE GO DISTANCE

CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In The White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level Hard Surface Dry Runway.
6. Engine Failure At Engine Failure Speed.
7. Landing Gear Up On In Transit And Propeller Feathered During Climb.
8. Maintain Engine Failure Speed Until Clear of Obstacle.

NOTE:

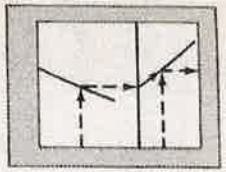
1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 6% for each 10 knots headwind.
3. Increase distance 2% for each knot of tailwind.
4. Distance in boxes represent rates of climb less than 50 ft/min.

WEIGHT - POUNDS	ENGINE FAILURE - SPEED - KIAS	PRESSURE ALTITUDE - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET						
			-20°C -4°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F
6750	98	Sea Level	2590	2870	3200	3600	4160	4830	5800
		1000	2730	3030	3390	3880	4430	5190	6330
		2000	2880	3210	3640	4120	4740	5610	6970
		3000	3050	3440	3860	4390	5090	6090	7770
		4000	3270	3650	4110	4690	5480	6660	8780
		5000	3460	3870	4380	5030	5930	7340	10,160
		6000	3660	4110	4670	5410	6450	8190	12,170
		7000	3890	4380	5000	5840	7070	9280	15,500
		8000	4140	4680	5380	6330	7820	10,770	------
		9000	4410	5010	5800	6910	8750	12,990	------
		10,000	4710	5380	6280	7600	9970	16,780	------
6200	94	Sea Level	2070	2270	2500	2770	3080	3470	4010
		1000	2180	2390	2640	2930	3270	3740	4280
		2000	2290	2520	2790	3090	3510	3970	4570
		3000	2420	2660	2940	3320	3730	4240	4910
		4000	2550	2810	3160	3520	3960	4520	5290
		5000	2690	3010	3340	3740	4220	4850	5720
		6000	2880	3190	3540	3970	4510	5210	6220
		7000	3040	3370	3760	4230	4830	5260	6810
		8000	3220	3580	4000	4520	5180	6100	7520
		9000	3420	3810	4270	4840	5590	6650	8410
		10,000	3630	4060	4560	5200	6050	7300	9560
5700	90	Sea Level	1690	1840	2010	2200	2430	2690	2990
		1000	1770	1930	2110	2320	2560	2840	3170
		2000	1860	2030	2230	2450	2700	3000	3420
		3000	1960	2140	2350	2580	2860	3230	3630
		4000	2060	2260	2480	2730	3070	3420	3860
		5000	2170	2380	2620	2930	3250	3630	4110
		6000	2290	2510	2800	3100	3440	3870	4400
		7000	2420	2690	2960	3280	3660	4120	4710
		8000	2580	2840	3140	3480	3900	4400	5060
		9000	2730	3010	3330	3710	4160	4720	5460
		10,000	2900	3200	3540	3950	4440	5070	5910
5200	86	Sea Level	1360	1480	1610	1750	1910	2100	2310
		1000	1430	1550	1690	1840	2010	2210	2440
		2000	1500	1630	1770	1940	2120	2330	2570
		3000	1570	1710	1870	2040	2240	2460	2720
		4000	1650	1800	1970	2150	2360	2600	2880
		5000	1740	1900	2070	2270	2490	2750	3100
		6000	1830	2000	2190	2400	2640	2950	3290
		7000	1940	2110	2310	2540	2830	3130	3490
		8000	2040	2240	2450	2720	3000	3320	3720
		9000	2160	2380	2620	2880	3180	3540	3970
		10,000	2300	2520	2770	3050	3380	3700	4240

Figure 5-12

RATE-OF-CLIMB - MAXIMUM CLIMB

ALTITUDE - FEET	CLIMB SPEED - KIAS
SL	108
20,000	107
30,000	104



CONDITIONS:
1. 2600 RPM and 38.0 Inches Hg.*
2. Mixture - Fuel Flow White Triangle.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Cowl Flaps - OPEN.

*Above 20,000 Feet, Use Placarded Manifold Pressure

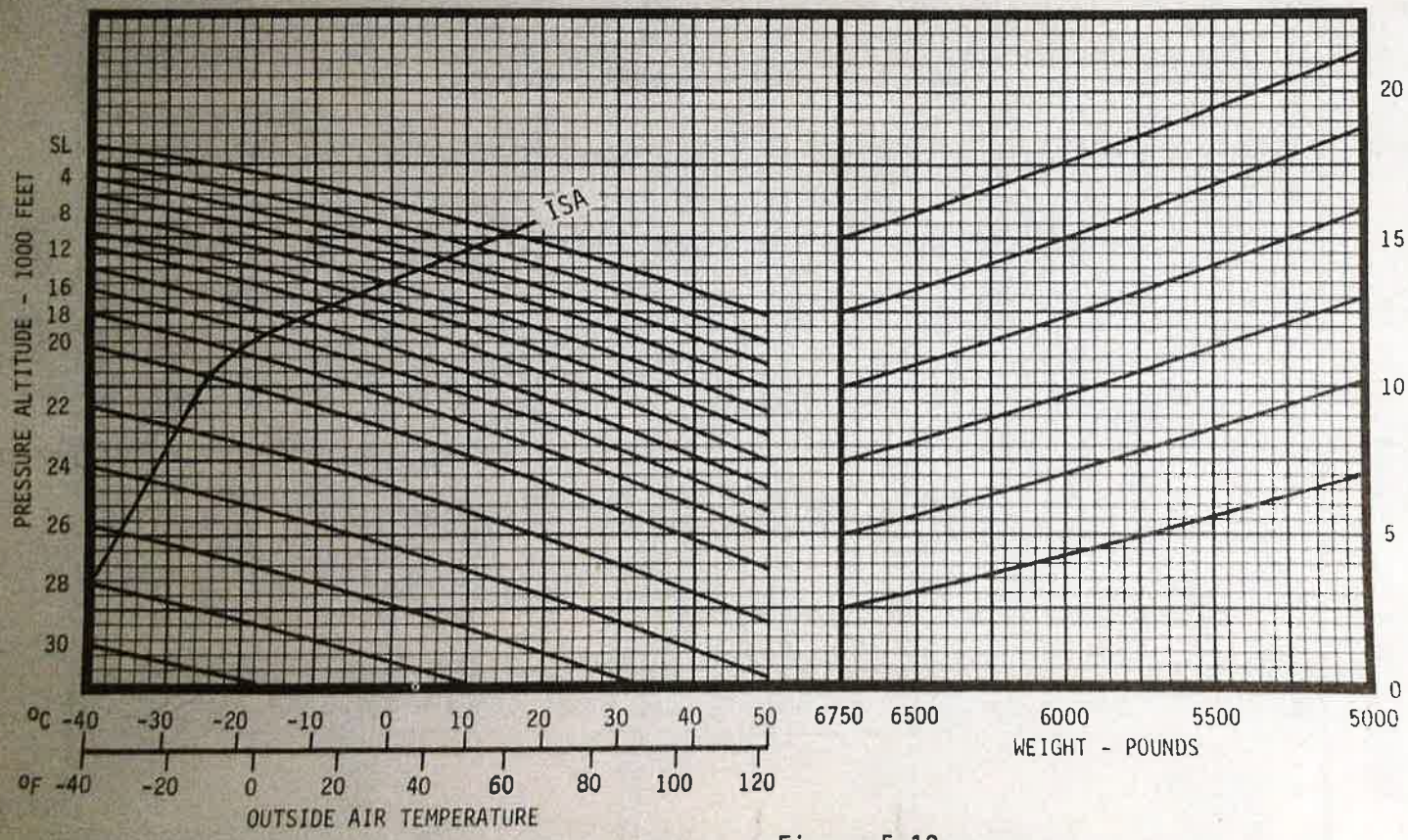
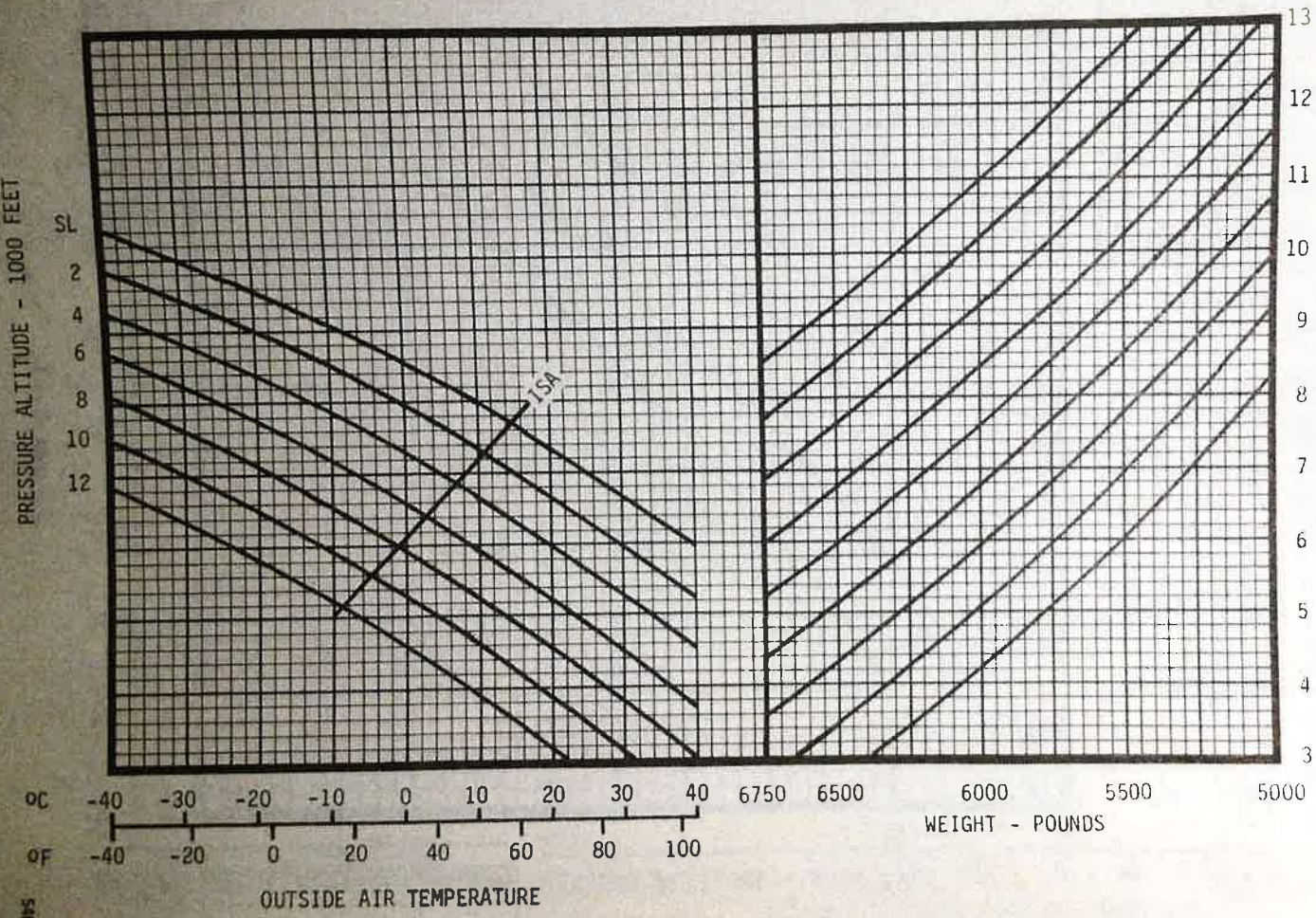
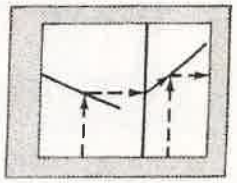


Figure 5-13

RATE-OF-CLIMB - BALKED LANDING CLIMB





CONDITIONS:

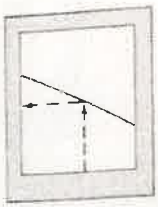
1. 2700 RPM and 38.0 Inches Hg.
2. Mixtures - Check Fuel Flows In White Arc.
3. Landing Gear - DOWN.
4. Wing Flaps - 45°.
5. Cowl Flaps - OPEN.
6. Climb Speed - 82 KIAS.

Figure 5-16

ENGINE INOPERATIVE SERVICE CEILING

CONDITIONS:
1. One Engine Inoperative Climb Configuration.

NOTE:
1. Engine inoperative service ceiling is the maximum altitude where the airplane has the capability of climbing 50 feet per minute with one engine inoperative and feathered.
2. Increase indicated service ceiling 100 feet for each 0.10 inch Hg. altimeter setting greater than 29.92.
3. Decrease indicated service ceiling 100 feet for each 0.10 inch Hg. altimeter setting less than 29.92.
4. This chart provides performance information to aid in route selection when operating under FAR 135.181 and 91.119 requirements.



WEIGHT POUNDS	CLIMB SPEED - KIAS		
	SL	10,000	20,000
6750	108	105	103
6200	105	103	101
5700	102	101	100
5200	99	98	97

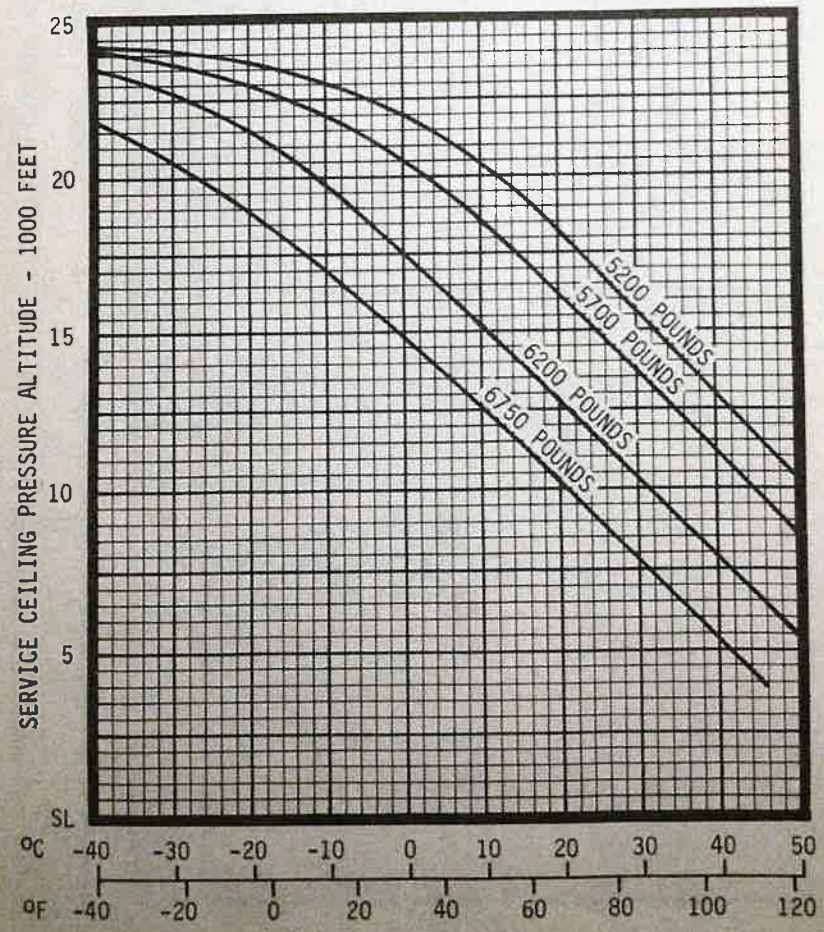
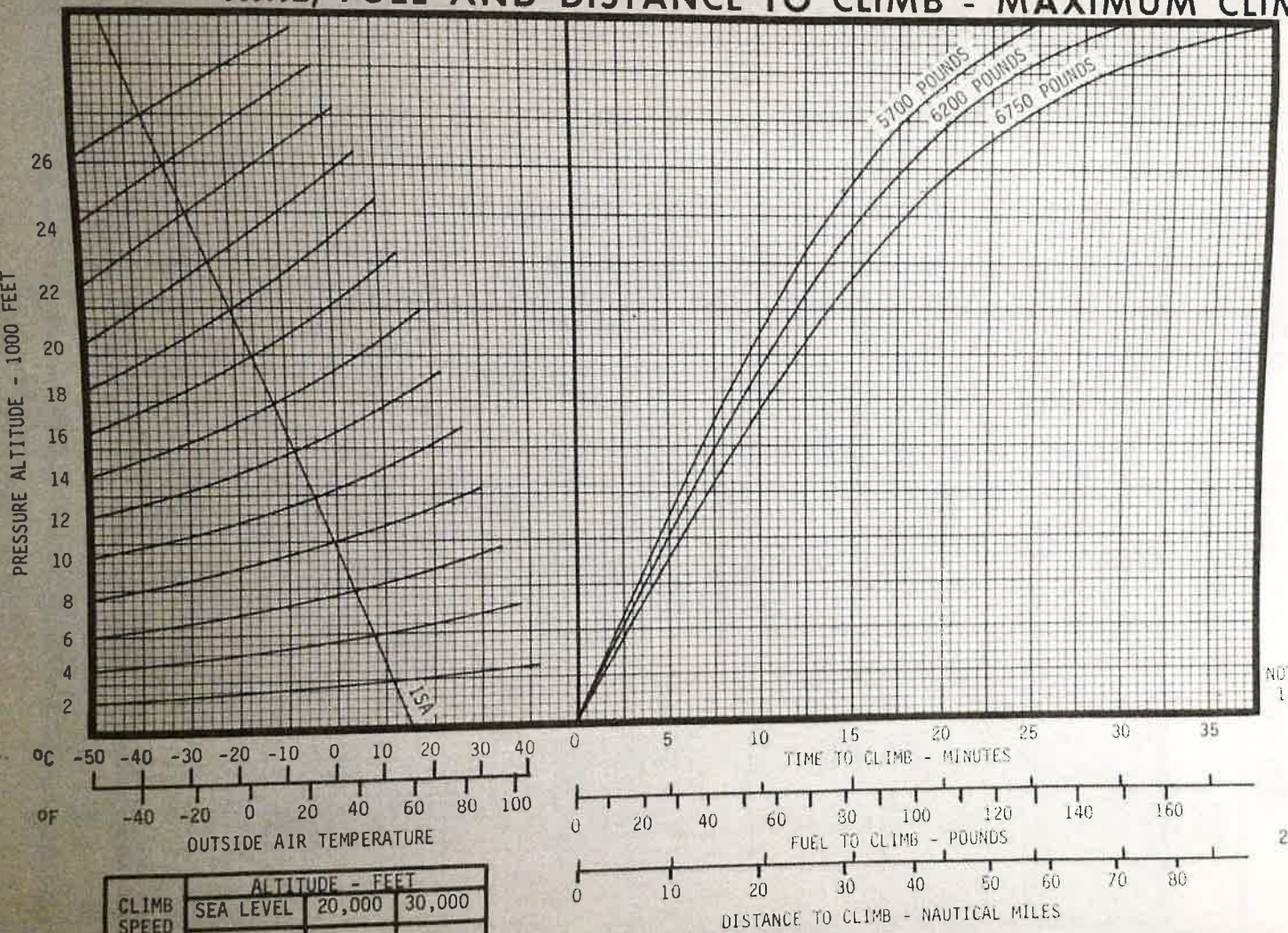
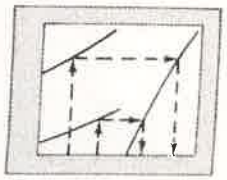


Figure 5-17

TIME, FUEL AND DISTANCE TO CLIMB - MAXIMUM CLIMB



CLIMB SPEED	ALTITUDE - FEET		
	SEA LEVEL	20,000	30,000
	108	107	104



CONDITIONS:
1. 2600 RPM and 38.0 Inches Hg.*
2. Mixture - Check Fuel Flow in White Triangle.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Cowl Flaps - OPEN.

*Above 20,000 Feet, Use Placarded Manifold Pressure

NOTE:
1. Time, Fuel and Distance for the Climb are Determined by Taking the Difference Between the Airport Altitude and Initial Cruise.
2. For Total Fuel Used, Add 32 Pounds for Start, Taxi and Takeoff.

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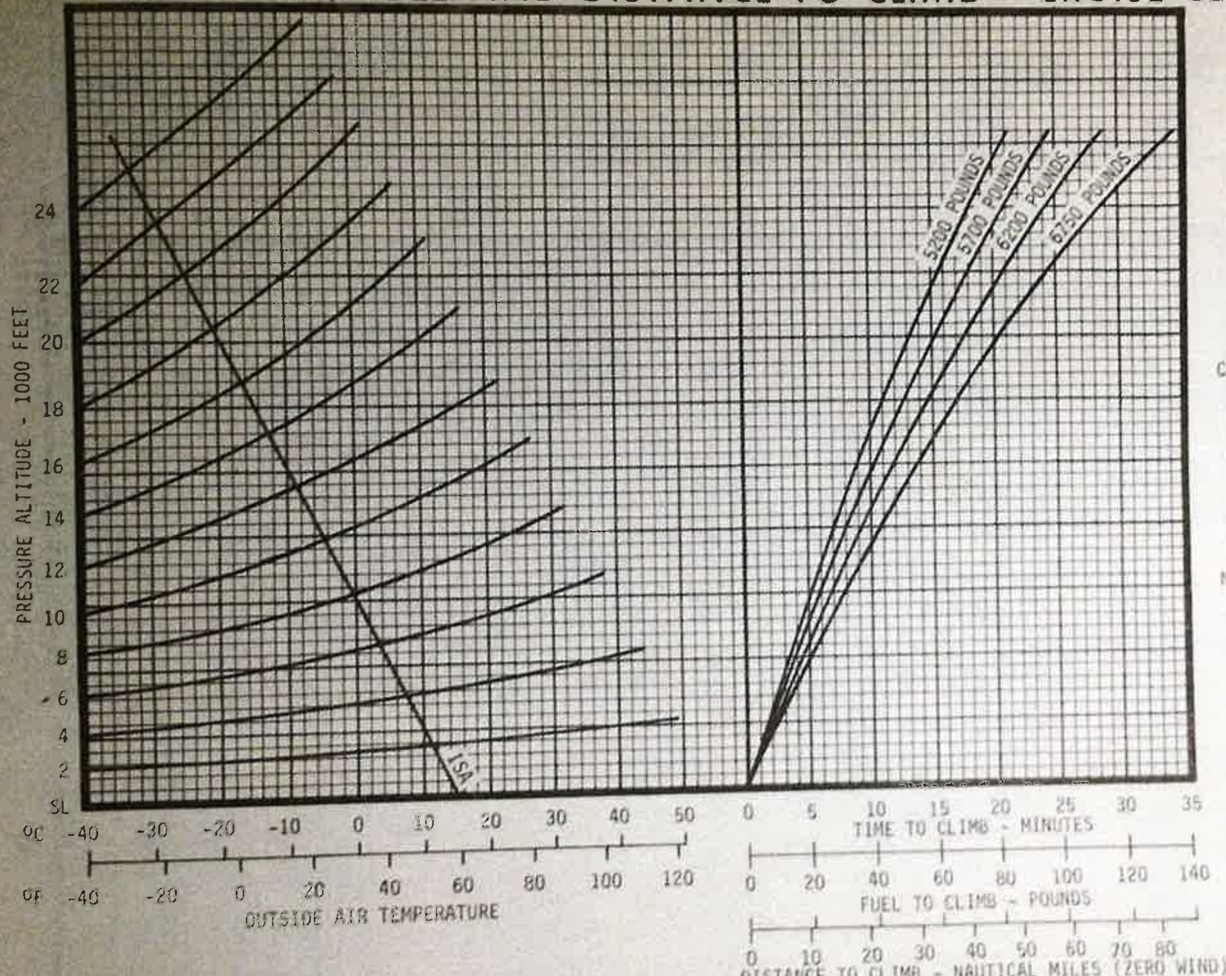
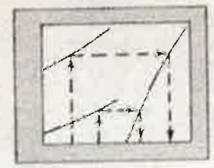
Figure 5-18

TIME, FUEL AND DISTANCE TO CLIMB - CRUISE CLIMB





CONDITIONS:
1. 2450 RPM And 31.5 Inches Hg.
2. Landing Gear - UP.
3. Wing Flaps - UP
4. Cowl Flaps - AS REQUIRED.
5. Airspeed - 120 KIAS.
6. Mixtures - 120 Pounds/Hour Fuel Flow (Blue Triangle).

NOTE:
1. Time, fuel and distance for the climb are determined by taking the difference between the airport altitude and initial cruise altitude conditions.
2. For total fuel used, add 32 pounds for start, taxi and takeoff.

Figure 5-19

CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE

NOTE:

1. At Sea Level, increase speed by 4 KTAS for each 1000 pounds below 6750 pounds.
2. At 5000 feet, increase speed by 5 KTAS for each 1000 pounds below 6750 pounds.
3. Operations at peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-5°C (23°F) PERCENT BHP	KTAS	TOTAL LB/HR	15°C (STD TEMP) (59°F) PERCENT BHP	KTAS	TOTAL LB/HR	35°C (95°F) PERCENT BHP	KTAS	TOTAL LB/HR
SEA LEVEL	2450	31.5	79.5	174	215	74.8	174	204	70.2	173	192
	2450	29.0	73.5	169	200	69.2	169	189	64.9	167	178
	2450	27.0	67.9	164	186	63.9	163	175	60.0	162	166
	2450	25.5	62.9	159	173	59.2	158	164	55.6	156	155
	2300	34.0	79.5	174	215	74.8	174	204	70.2	173	192
	2300	32.5	76.8	172	208	72.3	172	197	67.9	171	185
	2300	30.5	72.2	168	197	68.0	167	186	63.8	166	175
	2300	29.0	67.6	163	185	63.6	163	175	59.7	162	165
	2300	27.0	62.3	158	171	58.6	157	163	55.0	155	154
	2300	25.0	57.3	153	160	53.9	151	151	50.6	149	143
	2200	34.0	74.5	170	203	70.2	169	191	65.8	168	180
	2200	33.0	72.2	168	197	68.0	167	186	63.8	166	175
	2200	31.0	67.9	164	186	63.9	163	175	60.0	162	166
	2200	29.0	63.3	159	174	59.6	158	165	55.9	156	156
	2200	27.0	58.3	154	162	54.9	152	154	51.5	150	146
	2200	25.0	53.7	148	151	50.5	146	143	47.4	144	135
	2100	31.5	64.6	160	177	60.8	160	168	57.0	158	159
	2100	29.0	59.3	155	164	55.8	154	156	52.4	152	148
	2100	27.5	55.0	150	154	51.8	148	146	48.6	146	138
	2100	25.5	50.3	144	143	47.4	142	135	44.5	139	128
			-15°C (5°F)			5°C (STD TEMP) (41°F)			25°C (77°F)		
5000 FEET	2450	31.5	79.5	182	215	74.8	182	204	70.2	181	192
	2450	29.5	73.5	177	200	69.2	176	189	64.9	175	178
	2450	27.5	68.1	171	186	64.1	170	176	60.1	169	166
	2450	25.5	63.3	166	174	59.6	165	165	55.9	163	156
	2300	34.0	79.5	182	215	74.8	182	204	70.2	181	192
	2300	33.0	76.8	180	208	72.3	179	197	67.9	178	185
	2300	31.0	72.4	175	197	68.1	175	186	63.9	174	175
	2300	29.0	68.1	171	186	64.1	170	176	60.1	169	166
	2300	27.0	62.6	165	172	58.9	164	163	55.3	162	155
	2300	25.5	57.6	159	160	54.3	158	152	50.9	155	144
	2200	34.0	74.7	178	203	70.3	177	192	66.0	176	180
	2200	33.0	72.4	175	197	68.1	175	186	63.9	174	175
	2200	31.0	68.2	171	186	64.2	171	176	60.2	169	167
	2200	29.0	63.6	166	175	59.9	165	166	56.2	163	157
	2200	27.0	58.6	160	163	55.2	159	154	51.8	156	146
	2200	25.5	54.3	155	152	51.1	153	145	48.0	150	137
	2100	32.0	65.2	168	179	61.4	167	169	57.6	165	160
	2100	29.5	59.6	162	165	56.1	160	157	52.6	158	148
	2100	27.5	55.6	156	156	52.4	155	148	49.1	152	140
	2100	26.0	51.3	150	145	48.3	148	138	45.3	145	130

Figure 5-20 (Sheet 1 of 3)

DISTANCE TO CLIMB - NAUTICAL MILES (ZERO WIND)
Figure 5-19

CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE

NOTE:
1. At 10,000 Feet, increase speed by 5 KTAS for each 1000 pounds below 6750 pounds.
2. At 15,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
3. Operations at Peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-25°C (-13°F) PERCENT BHP	KTAS	TOTAL LB/HR	-5°C (STD TEMP) (23°F) PERCENT BHP	KTAS	TOTAL LB/HR	15°C (59°F) PERCENT BHP	KTAS	TOTAL LB/HR
10,000 FEET	2450	31.5	79.5	191	215	74.8	190	204	70.2	189	192
	2450	29.5	73.5	185	200	69.2	184	189	64.9	182	178
	2450	27.5	68.2	179	186	64.2	178	176	60.2	176	167
	2450	26.0	63.6	174	175	59.9	172	166	56.2	169	157
	2300	34.0	79.5	191	215	74.8	190	204	70.2	189	192
	2300	33.0	76.8	188	208	72.3	188	197	67.9	186	185
	2300	31.0	72.5	184	198	68.3	183	187	64.1	181	176
	2300	29.0	68.2	179	186	64.2	178	176	60.2	176	167
	2300	27.0	62.9	173	173	59.2	171	164	55.6	168	155
	2300	25.5	58.0	166	161	54.6	164	153	51.2	161	145
	2200	34.0	74.8	186	204	70.5	185	192	66.1	184	181
	2200	33.0	72.5	184	198	68.3	183	187	64.1	181	176
	2200	31.0	68.6	179	187	64.5	178	177	60.5	176	167
	2200	29.0	63.9	174	175	60.2	173	166	56.4	170	157
	2200	27.5	59.3	168	164	55.8	166	156	52.4	163	148
	2200	25.5	55.0	162	154	51.8	159	146	48.6	155	138
	2100	32.0	65.9	176	180	62.1	175	171	58.2	172	162
	2100	30.0	60.3	169	167	56.8	167	158	53.2	164	150
	2100	28.0	56.3	164	157	53.0	161	149	49.7	158	141
	2100	26.0	52.3	157	148	49.3	155	140	46.2	150	132
			-35°C (-30°F)			-15°C (STD TEMP) (6°F)			5°C (42°F)		
15,000 FEET	2450	31.5	79.5	200	215	74.8	199	204	70.2	197	192
	2450	29.5	73.5	193	200	69.2	192	189	64.9	190	178
	2450	27.5	68.4	187	187	64.4	186	177	60.4	183	167
	2450	26.0	63.9	181	175	60.2	179	166	56.4	176	157
	2300	34.0	79.5	200	215	74.8	199	204	70.2	197	192
	2300	33.0	76.8	197	208	72.3	196	197	67.9	194	185
	2300	31.0	72.7	192	198	68.4	191	187	64.2	189	176
	2300	29.0	68.4	187	187	64.4	186	177	60.4	183	167
	2300	27.0	63.3	180	174	59.6	178	165	55.9	175	156
	2300	25.5	58.3	173	162	54.9	171	154	51.5	166	146
	2200	34.0	75.0	195	204	70.6	194	193	66.2	192	181
	2200	33.0	72.7	192	198	68.4	191	187	64.2	189	176
	2200	31.5	68.9	188	188	64.9	186	178	60.8	183	168
	2200	29.5	64.2	182	176	60.5	180	167	56.7	177	158
	2200	27.5	59.9	175	166	56.4	173	157	52.9	169	149
	2200	26.0	55.6	169	156	52.4	166	148	49.1	160	140
	2100	32.5	66.6	185	182	62.7	183	172	58.8	180	163
	2100	30.5	60.9	177	168	57.4	175	160	53.8	171	151
	2100	28.0	57.0	171	159	53.6	168	151	50.3	163	143
	2100	26.5	53.3	165	150	50.2	161	142	47.1	152	134

Figure 5-20 (Sheet 2 of 3)

CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE

NOTE:
1. At 20,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
2. At 23,500 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
3. At 25,000 Feet, increase speed by 7 KTAS for each 1000 pounds below 6750 pounds.
4. Operations at peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-45°C (-48°F) PERCENT BHP	KTAS	TOTAL LB/HR	-25°C (STD TEMP) (-12°F) PERCENT BHP	KTAS	TOTAL LB/HR	-5°C (24°F) PERCENT BHP	KTAS	TOTAL LB/HR
20,000 FEET	2450	31.5	79.5	209	215	74.8	208	204	70.2	206	192
	2450	29.5	73.5	202	200	69.2	201	189	64.9	198	178
	2450	27.5	68.6	196	187	64.5	193	177	60.5	190	167
	2450	26.0	64.1	189	176	60.3	187	167	56.6	182	158
	2300	34.0	79.5	209	215	74.8	208	204	70.2	206	192
	2300	33.0	76.8	206	208	72.3	205	197	67.9	202	185
	2300	31.0	72.9	201	198	68.6	200	187	64.3	197	176
	2300	29.0	68.6	196	187	64.5	193	177	60.5	190	167
	2300	27.0	63.6	188	175	59.9	186	166	56.2	181	157
	2300	25.5	58.6	180	163	55.2	176	154	51.8	168	146
	2200	34.0	75.2	204	204	70.8	203	193	66.4	200	182
	2200	33.0	72.9	201	198	68.6	200	187	64.3	197	176
	2200	31.5	69.2	196	189	65.2	194	178	61.1	191	169
	2200	29.5	64.6	190	177	60.8	187	168	57.0	183	159
	2200	28.0	60.3	183	167	56.8	180	158	53.2	173	150
	2200	26.0	56.3	176	157	53.0	171	149	49.7	158	141
	2100	32.5	66.9	193	183	63.0	191	173	59.1	187	164
	2100	30.5	61.6	185	170	58.0	182	161	54.4	176	153
	2100	28.5	57.6	178	160	54.3	174	152	50.9	164	144
	2100	27.0	54.3	172	152	51.1	166	145	----	---	---
			-52°C (-61°F)			-32°C (STD TEMP) (-25°F)			-12°C (11°F)		
23,500 FEET	2450	31.0	77.0	213	209	72.5	212	198	68.0	208	186
	2450	29.5	73.5	209	200	69.2	206	189	64.9	203	178
	2450	27.5	68.8	202	188	64.8	199	178	60.8	194	168
	2450	26.0	64.2	194	176	60.4	191	167	56.7	184	158
	2300	29.5	68.7	202	188	64.7	199	177	60.7	194	168
	2300	27.5	63.8	194	175	60.0	190	166	56.3	183	157
	2300	26.0	59.0	185	163	55.5	180	155	52.1	161	147
	2200	30.0	64.9	196	178	61.1	193	169	57.3	186	160
	2200	28.0	60.6	188	167	57.1	184	159	53.5	172	150
	2200	26.0	57.0	181	159	53.6	174	151	----	---	---
			-54°C (-66°F)			-34°C (STD TEMP) (-30°F)			-14°C (6°F)		
25,000 FEET	2450	31.0	77.0	216	209	72.5	214	198	68.0	211	186
	2450	29.5	73.5	211	200	69.2	209	189	64.9	205	178
	2450	27.5	68.9	204	188	64.9	202	178	60.8	196	168
	2450	26.0	64.2	197	176	60.5	193	167	56.7	184	158
	2300	29.0	68.9	204	188	64.9	202	178	60.8	196	168
	2300	27.0	63.9	196	175	60.2	192	166	56.4	183	157
	2300	26.0	59.3	188	164	55.8	182	156	----	---	---
	2200	30.0	65.2	199	179	61.4	195	169	57.6	187	160
	2200	28.0	60.9	191	168	57.4	186	160	53.8	170	151
	2200	27.0	57.6	184	160	54.3	176	152	----	---	---

Figure 5-20 (Sheet 3 of 3)

RANGE PROFILE

CONDITIONS:

1. Takeoff Weight - 6750 Pounds.
2. Cruise Climb to Desired Altitude.
3. Recommended Lean Fuel Flow.
4. Zero Wind
5. Standard Day.

NOTE:

1. Range computations include fuel required for start, taxi, takeoff, cruise climb to altitude, cruise, descent and 45 minutes reserve fuel at the particular cruise power.
2. The distances shown are the sum of the distances to climb, cruise and descend.

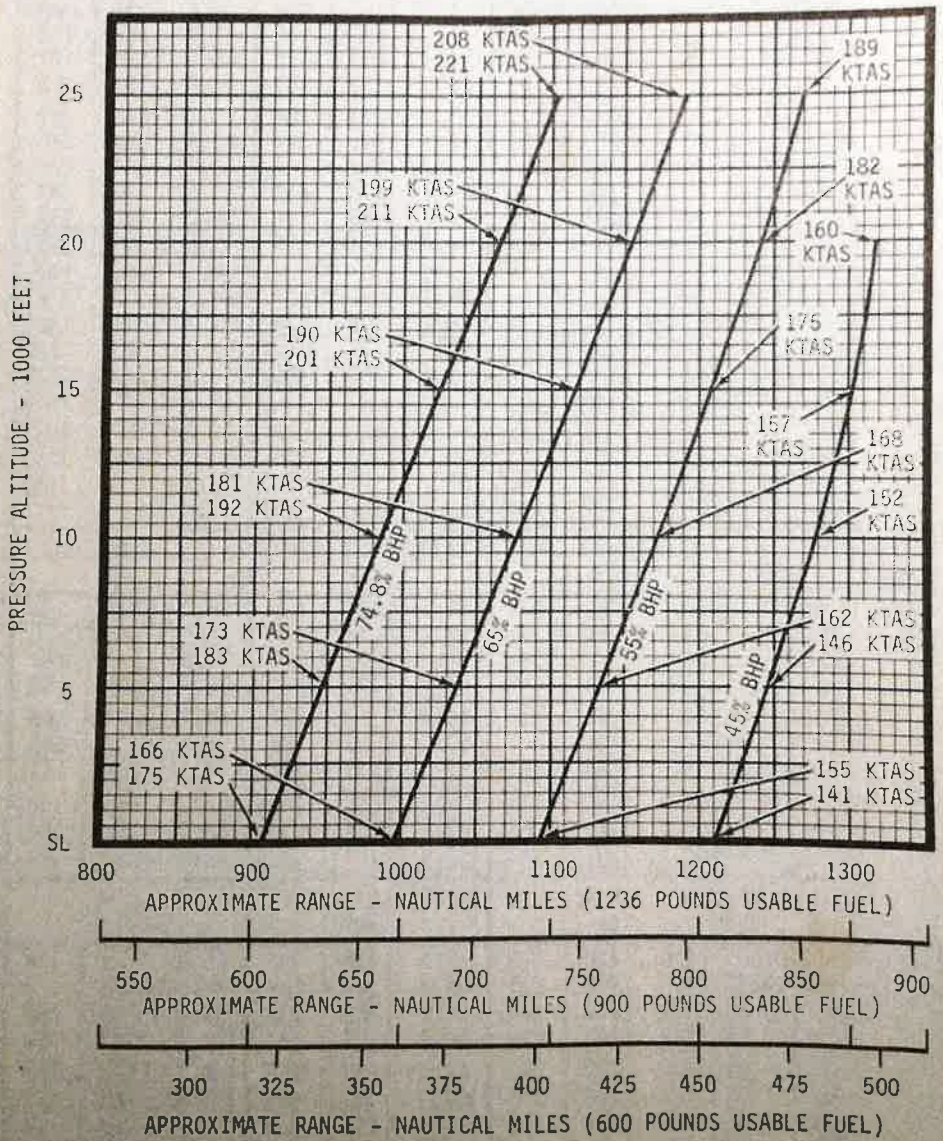


Figure 5-21

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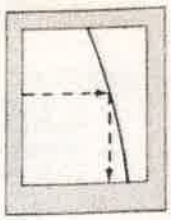
ENDURANCE PROFILE



CONDITIONS:

1. Takeoff Weight - 6750 Pounds.
2. Cruise Climb to Desired Altitude.
3. Recommended Lean Fuel Flow.
4. Standard Day.

NOTE:

1. Endurance computations include fuel required for start, taxi, takeoff, cruise climb to altitude, cruise, descent and 45 minutes reserve fuel at the particular cruise power.
2. The endurance shown is the sum of the times to climb, cruise and descend.

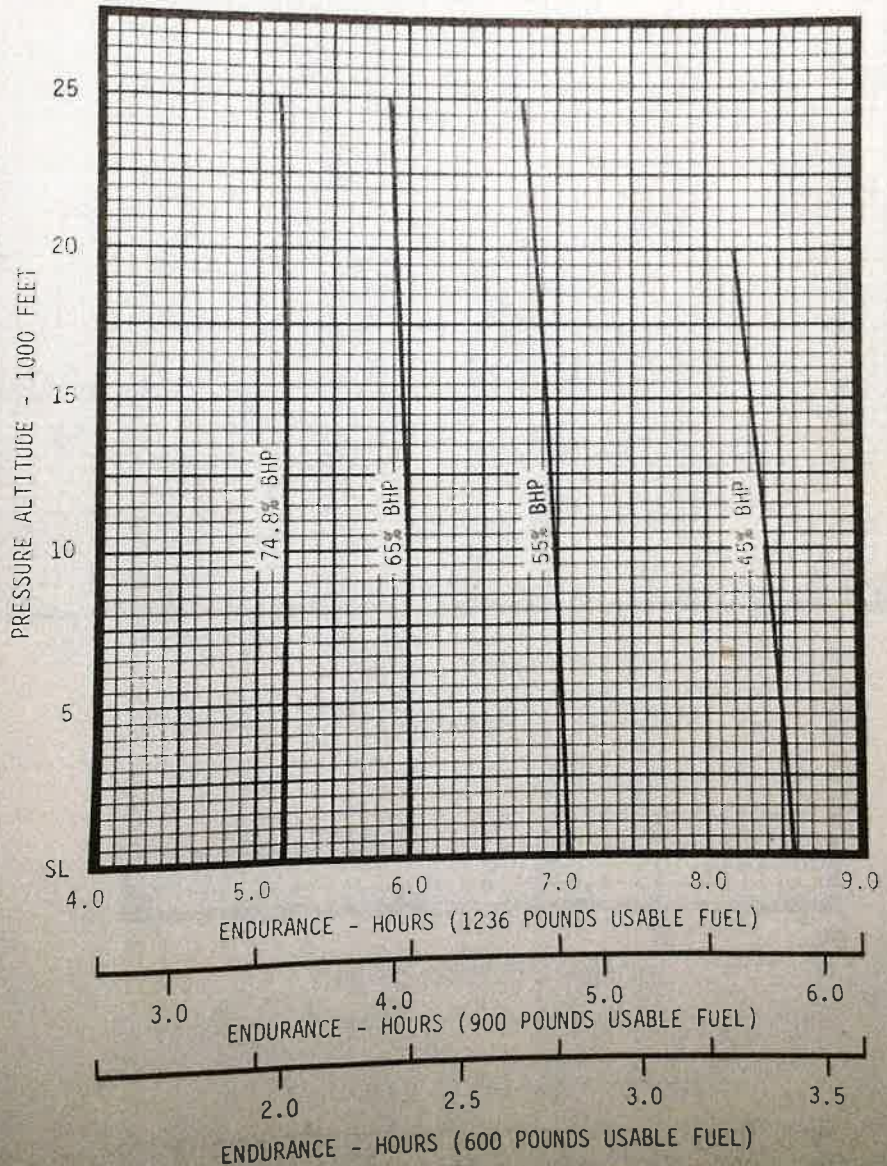


Figure 5-22

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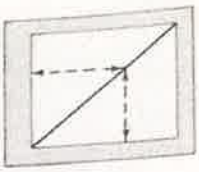
HOLDING TIME

CONDITIONS:
1. 2100 RPM and 24 Inches Hg. Manifold Pressure (45% Power).
2. Recommended Lean Fuel Flow (129 Pounds Per Hour Total).



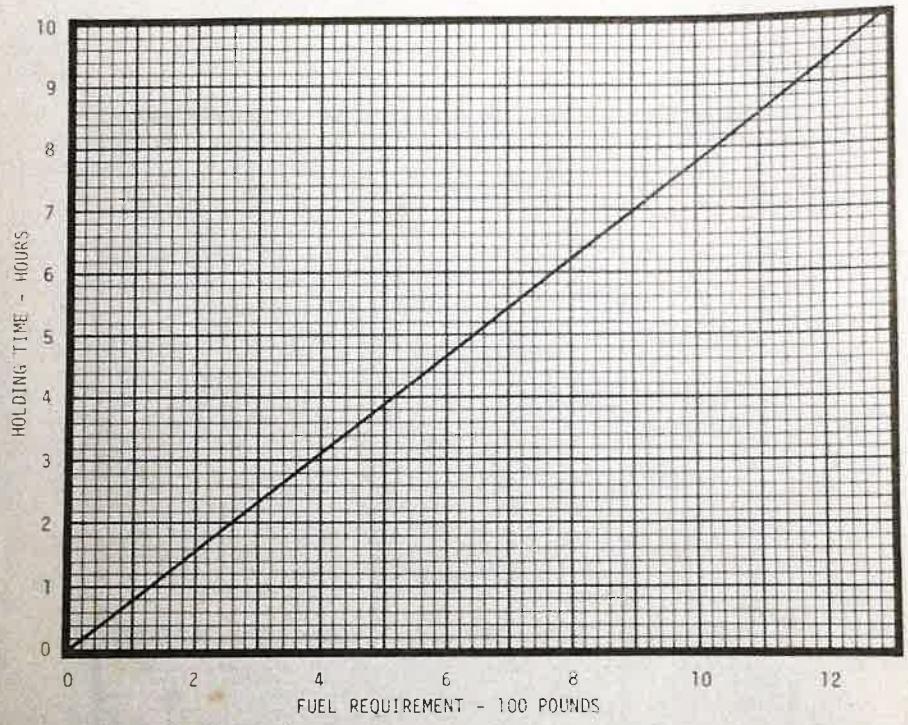
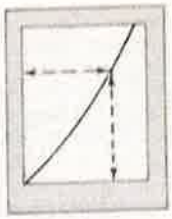


Figure 5-23

TIME, FUEL AND DISTANCE TO DESCEND

CONDITIONS:

1. Power - 2200 RPM and 24.5 Inches Hg. Manifold Pressure.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Airspeed - 180 KIAS
5. Cowl Flaps - CLOSED.



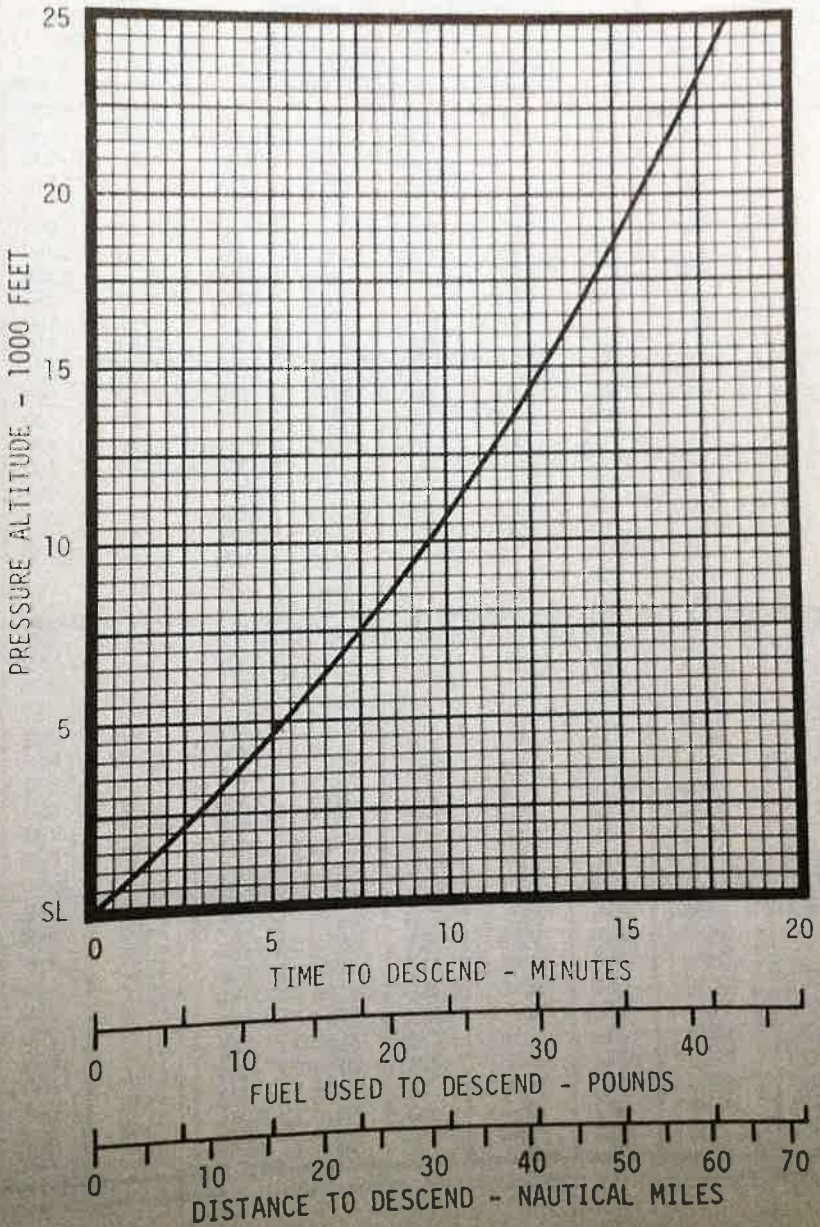


Figure 5-24

NORMAL LANDING DISTANCE

CONDITIONS:
1. Throttles - IDLE.
2. Landing Gear - DOWN.
3. Wing Flaps - 45°.
4. Cowl Flaps - CLOSE.
5. Level, Hard Surface Runway.
6. Maximum Effective Braking.

NOTE:
1. If necessary to land with wing flaps UP, the approach speed should be increased above the normal approach speed by 13 knots. Expect total landing distance to increase by 35%.
2. Decrease total distances by 3% for each 4 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 8% for each 3 knots wind.

WEIGHT-POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C (-4°F)		-10°C (14°F)		0°C (32°F)		10°C (50°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
6750	94	Sea Level	890	2270	930	2310	970	2350	1000	2380
		1000	930	2310	960	2340	1000	2380	1040	2420
		2000	960	2340	1000	2380	1040	2420	1080	2460
		3000	1000	2380	1040	2420	1080	2460	1120	2500
		4000	1040	2420	1080	2460	1120	2500	1160	2540
		5000	1070	2450	1120	2500	1160	2540	1200	2580
		6000	1120	2500	1160	2540	1200	2580	1250	2630
		7000	1160	2540	1200	2580	1250	2630	1300	2680
		8000	1200	2580	1250	2630	1300	2680	1350	2730
		9000	1250	2630	1300	2680	1350	2730	1400	2780
		10,000	1300	2680	1350	2730	1400	2780	1450	2830
6200	91	Sea Level	740	2120	770	2150	800	2180	830	2210
		1000	770	2150	800	2180	830	2210	860	2240
		2000	800	2180	830	2210	860	2240	890	2270
		3000	830	2210	860	2240	890	2270	930	2310
		4000	860	2240	890	2270	930	2310	960	2340
		5000	890	2270	930	2310	960	2340	1000	2380
		6000	930	2310	960	2340	1000	2380	1040	2420
		7000	960	2340	1000	2380	1040	2420	1080	2460
		8000	1000	2380	1040	2420	1080	2460	1120	2500
		9000	1040	2420	1080	2460	1120	2500	1160	2540
		10,000	1080	2460	1120	2500	1160	2540	1210	2590
5700	86	Sea Level	620	2000	640	2020	670	2050	690	2070
		1000	640	2020	670	2050	690	2070	720	2100
		2000	660	2040	690	2070	720	2100	740	2120
		3000	690	2070	720	2100	740	2120	770	2150
		4000	720	2100	740	2120	770	2150	800	2180
		5000	740	2120	770	2150	800	2180	830	2210
		6000	770	2150	800	2180	830	2210	860	2240
		7000	800	2180	830	2210	860	2240	890	2270
		8000	830	2210	860	2240	900	2280	930	2310
		9000	860	2240	900	2280	930	2310	970	2350
		10,000	900	2280	930	2310	970	2350	1000	2380
5200	84	Sea Level	570	1950	590	1970	620	2000	640	2020
		1000	590	1970	620	2000	640	2020	660	2040
		2000	610	1990	640	2020	660	2040	690	2070
		3000	640	2020	660	2040	690	2070	710	2090
		4000	660	2040	690	2070	710	2090	740	2120
		5000	690	2070	710	2090	740	2120	770	2150
		6000	710	2090	740	2120	770	2150	800	2180
		7000	740	2120	770	2150	800	2180	830	2210
		8000	770	2150	800	2180	830	2210	860	2240
		9000	800	2180	830	2210	860	2240	890	2270
		10,000	830	2210	860	2240	890	2270	930	2310

Figure 5-25 (Sheet 1 of 2)

NORMAL LANDING DISTANCE

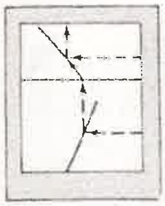
CONDITIONS:
1. Throttles - IDLE.
2. Landing Gear - DOWN
3. Wing Flaps - 45°.
4. Cowl Flaps - CLOSE.
5. Level, Hard Surface Runway.
6. Maximum Effective Braking.

NOTE:
1. If necessary to land with wing flaps UP, the approach speed should be increased above the normal approach speed by 13 knots. Expect total landing distance to increase by 35%.
2. Decrease total distances by 3% for each 4 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 8% for each 3 knots wind.

WEIGHT-POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	20°C (68°F)		30°C (86°F)		40°C (104°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
6750	94	Sea Level	1040	2420	1070	2450	1110	2490
		1000	1070	2450	1110	2490	1150	2530
		2000	1110	2490	1150	2530	1190	2570
		3000	1150	2530	1190	2570	1230	2610
		4000	1200	2580	1240	2620	1280	2660
		5000	1240	2620	1290	2670	1330	2710
		6000	1290	2670	1330	2710	1380	2760
		7000	1340	2720	1390	2770	1430	2810
		8000	1390	2770	1440	2820	1490	2870
		9000	1450	2830	1500	2880	1550	2930
		10,000	1500	2880	1550	2930	1610	2990
6200	91	Sea Level	860	2240	890	2270	920	2300
		1000	890	2270	920	2300	950	2330
		2000	920	2300	960	2340	990	2370
		3000	960	2340	990	2370	1020	2400
		4000	990	2370	1030	2410	1060	2440
		5000	1030	2410	1070	2450	1100	2480
		6000	1070	2450	1110	2490	1140	2520
		7000	1110	2490	1150	2530	1190	2570
		8000	1160	2540	1200	2580	1230	2610
		9000	1200	2580	1240	2620	1280	2660
		10,000	1250	2630	1290	2670	1330	2710
5700	86	Sea Level	720	2100	740	2120	760	2140
		1000	740	2120	770	2150	790	2170
		2000	770	2150	800	2180	820	2200
		3000	800	2180	820	2200	850	2230
		4000	830	2210	860	2240	880	2260
		5000	860	2240	890	2270	920	2300
		6000	890	2270	920	2300	950	2330
		7000	930	2310	960	2340	990	2370
		8000	960	2340	990	2370	1030	2410
		9000	1000	2380	1030	2410	1070	2450
		10,000	1040	2420	1070	2450	1110	2490
5200	84	Sea Level	660	2040	680	2060	710	2090
		1000	690	2070	710	2090	730	2110
		2000	710	2090	740	2120	760	2140
		3000	740	2120	760	2140	790	2170
		4000	770	2150	790	2170	820	2200
		5000	790	2170	820	2200	850	2230
		6000	820	2200	850	2230	880	2260
		7000	860	2240	890	2270	910	2290
		8000	890	2270	920	2300	950	2330
		9000	920	2300	960	2340	990	2370
		10,000	960	2340	990	2370	1030	2410

Figure 5-25 (Sheet 2 of 2)

RATE-OF-CLIMB - CRUISE CLIMB



CONDITIONS:
1. 2450 RPM and 31.5 Inches Hg.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Cowl Flaps - AS REQUIRED.
5. Airspeed - 120 KIAS.
6. Mixtures - 120 Lbs/Hr Fuel Flow (Blue Triangle).

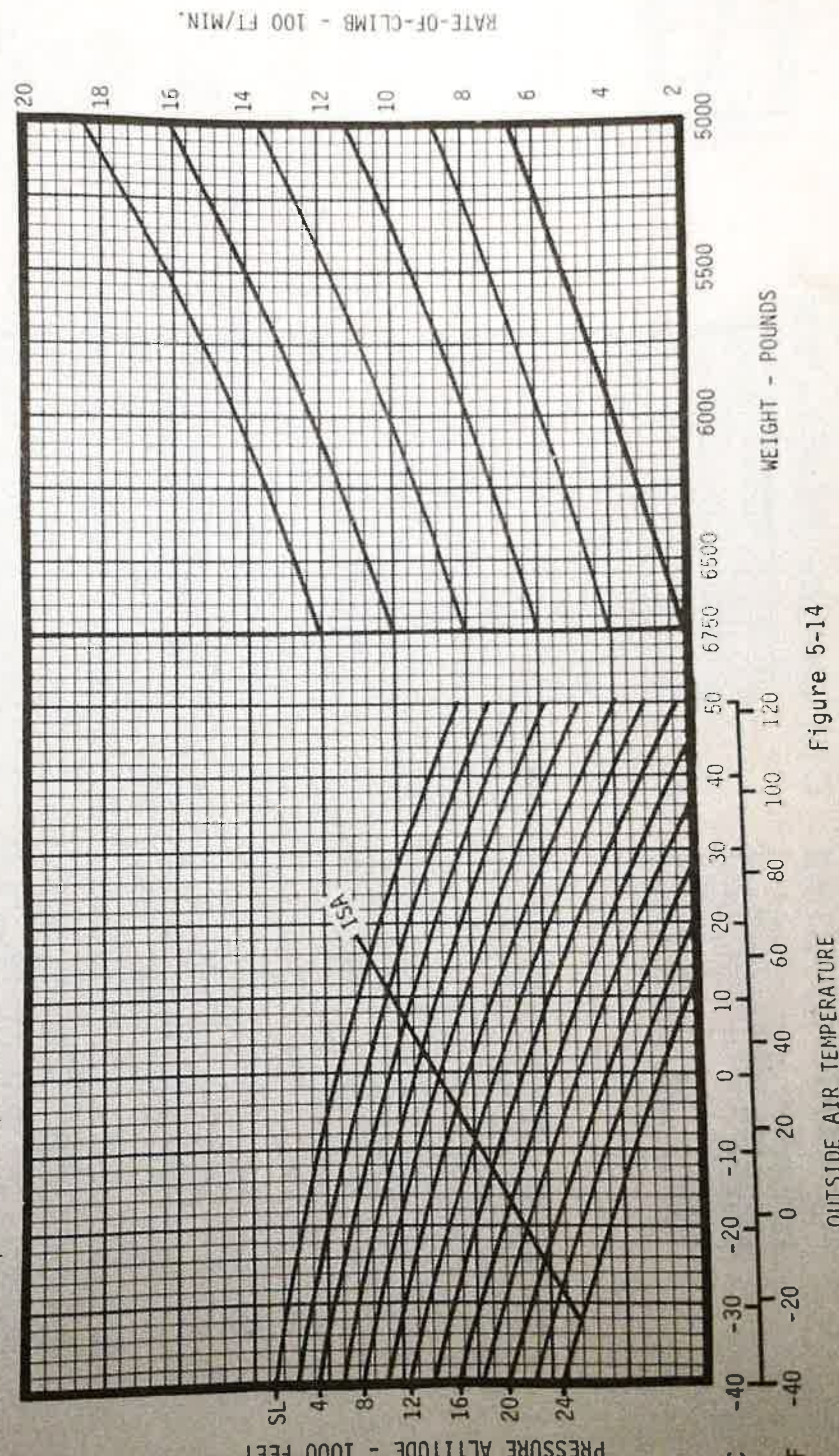


Figure 5-14

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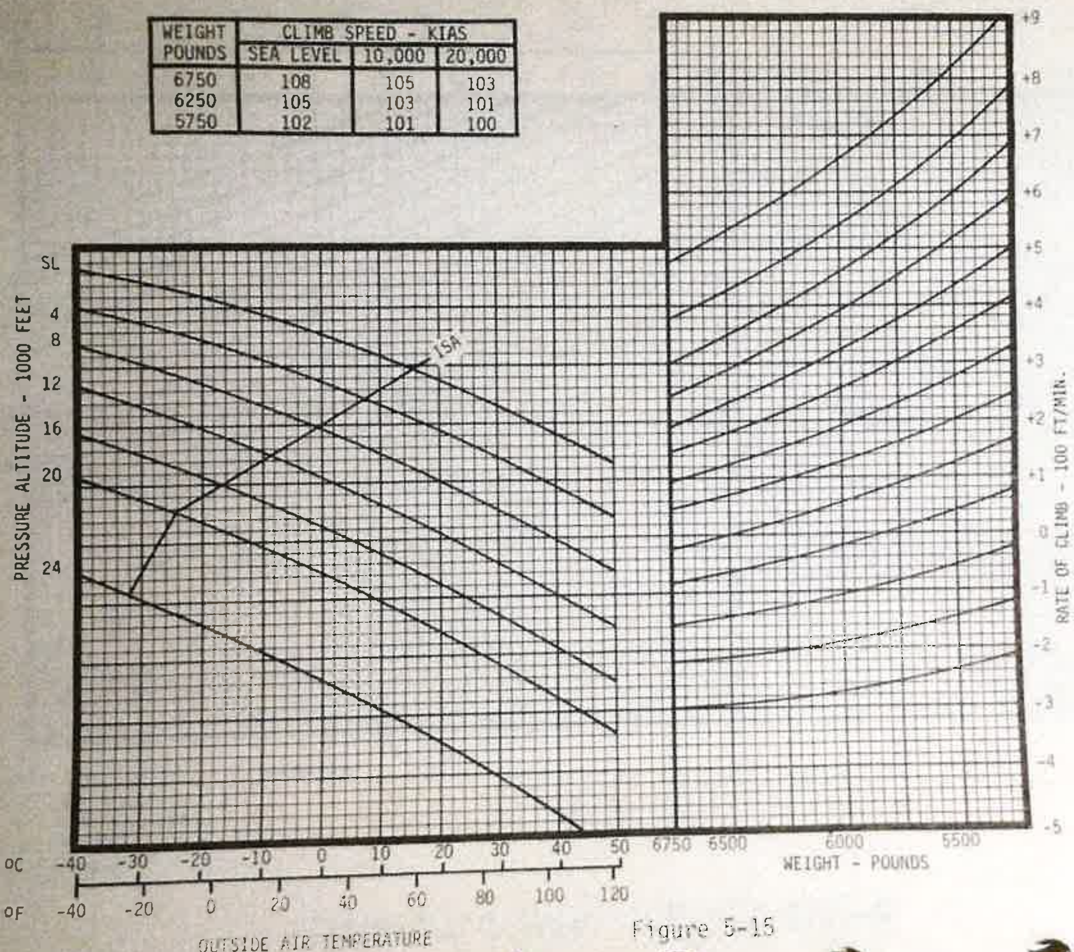
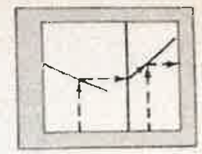
RATE-OF-CLIMB - ONE ENGINE INOPERATIVE

WEIGHT POUNDS	CLIMB SPEED - KIAS		
	SEA LEVEL	10,000	20,000
6750	108	105	103
6250	105	103	101
5750	102	101	100





CONDITIONS:
1. 2700 RPM and 38.0 Inches Hg.*
2. Mixture - Check Fuel Flow in White Arc.*
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Inoperative Propeller - FEATHERED.
6. Wings Banked 5° Toward Operative Engine with Approximately 1/2 Ball Slip Indicated on the Turn and Bank Indicator.
7. Cowl Flaps - Closed on Inoperative Engine.

*Above 20,000 Feet, Use Placarded Manifold Pressure and Climb Fuel Flow.

NOTE: Approximate Effect of Configuration on Single-Engine Rate-of-Climb.

Subtract values listed below from value obtained in the graph. Effects for a combination of gear, flap or windmilling propeller may be obtained by adding the effects for each.

Inoperative Engine Windmilling	400 Ft/Min
Gear Down	350 Ft/Min
Flaps Down 15°	200 Ft/Min
Flaps Down 45°	800 Ft/Min

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Figure 5-15