SECTION 5
PERFORMANCE

TABLE OF CONTENTS

	Page
Introduction	5-3
Use Of Performance Charts	5-3
Sample Problem	5-3
Takeoff	5-4
Cruise	5-5
Fuel Required	5-5
Landing	5-7
Demonstrated Operating Temperature	5-8
Figure 5-1, Airspeed Calibration - Normal Static Source	5-9
Airspeed Calibration - Alternate Static Source	5-10
Figure 5-2, Temperature Conversion Chart	5-12
Figure 5-3, Stall Speeds	5-13
Figure 5-4, Wind Components	5-15
Figure 5-5, Takeoff Distance - 4000 Lbs	5-16
Takeoff Distance - 3700 Lbs And 3400 Lbs	5-17
Figure 5-6, Maximum Rate Of Climb	5-18
Figure 5-7, Time, Fuel, And Distance To Climb - Maximum Rate Of Climb	5-19
Time, Fuel, And Distance To Climb - Normal Climb	5-20
Figure 5-8, Cruise Performance - 2000 Feet	5-21
Cruise Performance - 4000 Feet	5-22
Cruise Performance - 6000 Feet	5-23
Cruise Performance - 8000 Feet	5-24
Cruise Performance - 10,000 Feet	5-25
Cruise Performance - 12,000 Feet	5-26
Cruise Performance - 14,000 Feet	5-27
Cruise Performance - 16,000 Feet	5-28
Cruise Performance - 18,000 Feet	5-29
Cruise Performance - 20,000 Feet	5-30
Cruise Performance - 22,000 Feet	5-31
Cruise Performance - 23,000 Feet	5-32
Figure 5-9, Range Profile - 384 Pounds Fuel	5-33
Range Profile - 522 Pounds Fuel	5-34
Figure 5-10, Endurance Profile - 384 Pounds Fuel	5-35
Endurance Profile - 522 Pounds Fuel	5-36
Figure 5-11, Landing Distance	5-37

INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also, to facilitate the planning of flights in detail and with reasonable accuracy. The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting techniques.

It should be noted that the performance information presented in the range and endurance profile charts allows for 45 minutes reserve fuel at the specified cruise power. Fuel flow data for cruise is based on the recommended lean mixture setting. Some indeterminate variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

SAMPLE PROBLEM

The following sample flight problem utilizes information from the various charts to determine the predicted performance data for a typical flight. The following information is known:

AIRPLANE CONFIGURATION	
Takeoff weight	3950 Pounds
Usable fuel	522 Pounds
TAKEOFF CONDITIONS	
Field pressure altitude	3500 Feet
Temperature	24°C (16°C above standard)
Wind component along runway	12 Knot Headwind
Field length	4000 Feet

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Wind component along runway	12 Knot Headwind
Field length	4000 Feet

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A cruising altitude and the expected wind enroute have been given for this sample problem. However, the power setting selection for cruise must be determined based on several considerations. These include the cruise performance characteristics presented in figure 5-8, the range profile chart presented in figure 5-9, and the endurance profile chart presented in figure 5-10.

The relationship between power and range is illustrated by the range profile chart. Considerable fuel savings and longer range result when lower power settings are used. For this sample problem, a cruise power of approximately 70% will be used.

The cruise performance chart for 16,000 feet pressure altitude is entered using 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions. The power setting chosen is 2400 RPM and 28 inches of manifold pressure which results in the following:

Power	69%
True airspeed	172 Knots
Cruise fuel flow	94 PPH

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in figures 5-7 and 5-8. For this sample problem, the time, fuel, and distance to climb may be determined from figure 5-7 for a normal climb using the data for 4000 pounds. The difference between the values shown in the table for 4000 feet and 16,000 feet results in the following:

Time	23 Minutes
Fuel	47 Pounds
Distance	48 Nautical Miles

The above values are for a standard temperature and are sufficiently accurate for most flight planning purposes. However, a further correction for the effect of temperature may be made as noted on the climb chart. The approximate effect of a non-standard temperature is to increase the time,

fuel, and distance by 10% for each 7°C above standard temperature, due to the lower rate of climb. In this case, assuming a temperature 16°C above standard, the correction would be:

$$\frac{16°C}{7°C} \times 10\% = 23\% \text{ Increase}$$

With this factor included, the fuel estimate would be calculated as follows:

Fuel to climb, standard temperature	47
Increase due to non-standard temperature (47 × 23%)	11
Corrected fuel to climb	58 Pounds

Using a similar procedure for time and distance during a climb, the following results are obtained:

Time to climb	28 Minutes
Distance to climb	59 Nautical Miles

The distances shown on the climb chart are for zero wind. A correction for the effect of wind may be made as follows:

Distance with no wind	59
Decrease in distance due to wind (28/60 ×10 knot headwind)	5
Corrected Distance to Climb	54 Nautical Miles

The resultant cruise distance is:

Total distance	650
Climb distance	-54
Cruise distance	596 Nautical Miles

With an expected 10 knot headwind, the ground speed for cruise is predicted to be:

172
-10
162 Knots

Therefore, the time required for the cruise portion of the trip is:

$$\frac{596 \text{ Nautical Miles}}{162 \text{ Knots}} = 3.7 \text{ Hours}$$

The fuel required for cruise is:

$$3.7 \text{ hours} \times 94 \text{ pounds/hour} = 348 \text{ Pounds}$$

A 45-minute reserve requires:

$$\frac{45}{60} \times 94 \text{ pounds/hour} = 71 \text{ Pounds}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	16
Climb	58
Cruise	348
Reserve	71
Total fuel required	493 Pounds

Once the flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel required to complete the trip with ample reserve.

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-11 presents landing distance information for the short field technique. The distances corresponding to 3000 feet pressure altitude and a temperature of 30°C are as follows:

Ground roll	900 Feet
Total distance to clear a 50-foot obstacle	1705 Feet

A correction for the effect of wind may be made based on Note 2 of the landing chart using the same procedure as outlined for takeoff.

DEMONSTRATED OPERATING TEMPERATURE

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

AIRSPEED CALIBRATION
NORMAL STATIC SOURCE

CONDITIONS:
4000 Pounds.
Power required for level flight or maximum power during descent.
Pressurized or unpressurized (openable window open or closed).

FLAPS UP								
KIAS	60	80	100	120	140	160	180	200
KCAS	59	79	99	119	139	158	177	195
FLAPS 10°								
KIAS	60	70	80	90	100	120	140	160
KCAS	63	71	80	90	100	120	140	159
FLAPS 20°								
KIAS	60	70	80	90	100	110	120	130
KCAS	64	73	82	92	101	111	121	131
FLAPS 30°								
KIAS	50	60	70	80	90	100	110	115
KCAS	57	65	74	83	92	102	111	116

Figure 5-1. Airspeed Calibration (Sheet 1 of 3)

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

NOTE:
With a Cessna air conditioning system installed, the alternate KIAS will be approximately 3 knots less than shown in these tables.

PRESSURIZED

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	63	82	102	122	142	163	184

UNPRESSURIZED WITH WINDOW CLOSED
(Dump Valve Open (Pulled Out) and Vents Closed)

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	63	83	103	124	145	165	186
FLAPS 10°							
NORMAL KIAS	60	80	100	120	140	150	- - -
ALTERNATE KIAS	65	83	104	125	145	156	- - -
FLAPS 30°							
NORMAL KIAS	50	60	70	80	90	100	110
ALTERNATE KIAS	61	70	79	90	100	110	120

Figure 5-1. Airspeed Calibration (Sheet 2 of 3)

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

UNPRESSURIZED WITH WINDOW CLOSED
(Dump Valve Closed (Pushed In) and Vents Open)

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	58	77	98	119	140	162	183
FLAPS 10°							
NORMAL KIAS	60	80	100	120	140	150	- - -
ALTERNATE KIAS	60	78	100	121	141	151	- - -
FLAPS 30°							
NORMAL KIAS	50	60	70	80	90	100	110
ALTERNATE KIAS	56	64	74	84	94	105	115

UNPRESSURIZED WITH WINDOW OPEN
(Dump Valve/Vents Open Or Closed)

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	59	80	101	123	145	166	190
FLAPS 10°							
NORMAL KIAS	60	80	100	120	140	150	- - -
ALTERNATE KIAS	62	81	103	123	144	154	- - -
FLAPS 30°							
NORMAL KIAS	50	60	70	80	90	100	110
ALTERNATE KIAS	58	67	77	86	97	107	118

Figure 5-1. Airspeed Calibration (Sheet 3 of 3)

TEMPERATURE CONVERSION CHART

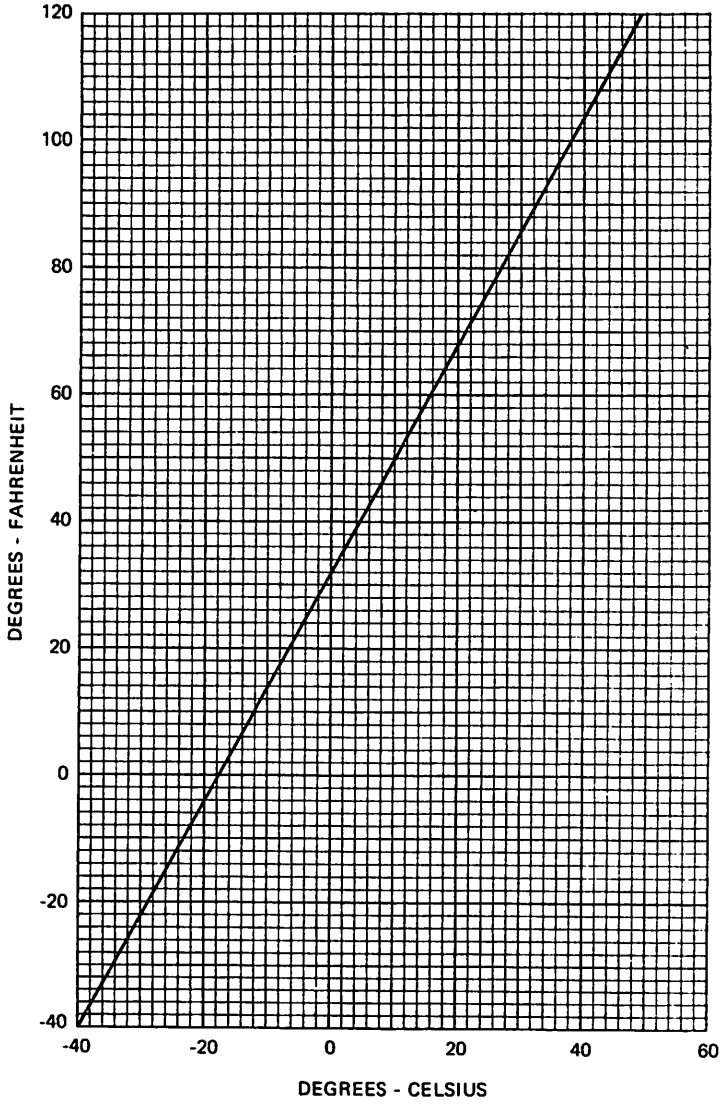

Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off
Gear Up or Down

NOTES:
1. Altitude loss during a stall recovery may be as much as 300 feet from a wings level stall and even greater from a turning stall.
2. KIAS values are approximate.

MOST REARWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
4000	UP	67	67	72	72	80	80	95	95
	10°	63	63	68	68	75	75	89	89
	20°	59	60	63	64	70	71	83	85
	30°	54	58	58	62	64	69	76	82

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
4000	UP	73	73	78	78	87	87	103	103
	10°	68	68	73	73	81	81	96	96
	20°	63	64	68	69	75	76	89	91
	30°	58	61	62	66	69	73	82	86

Figure 5-3. Stall Speeds

WIND COMPONENTS

NOTE:
Maximum demonstrated crosswind velocity is 21 knots (not a limitation).

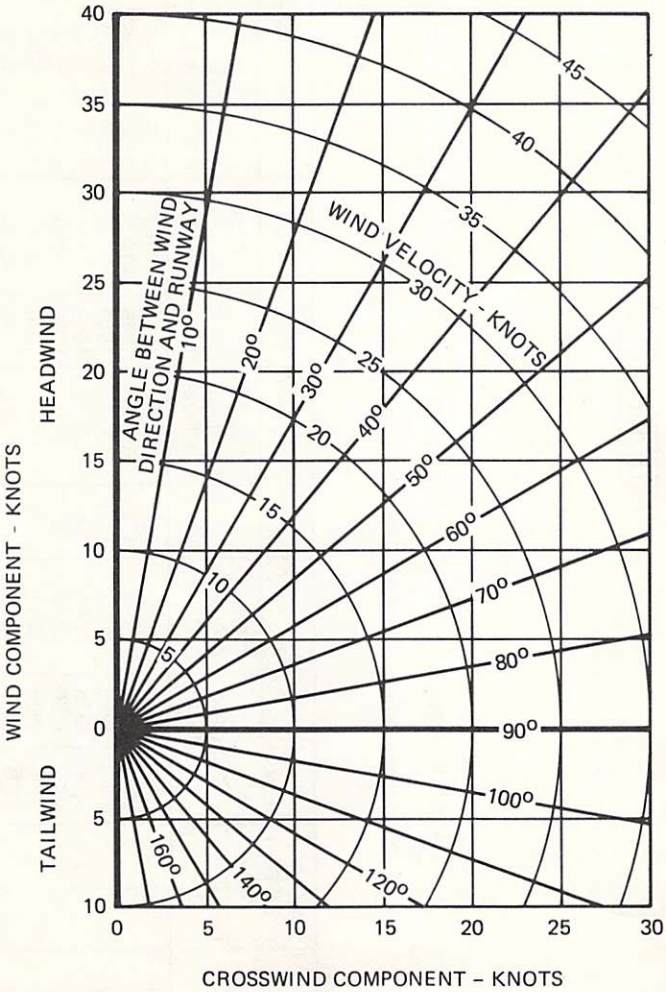

Figure 5-4. Wind Components

TAKEOFF DISTANCE

MAXIMUM WEIGHT 4000 LBS

SHORT FIELD

CONDITIONS:
Flaps 10°
2700 RPM, 35.5 Inches Hg, and
Mixture Set at 180 PPH Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
3. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C 32°F		10°C 50°F		20°C 68°F		30°C 86°F		40°C 100°F	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
4000	72	78	S.L.	1140	1885	1245	2065	1360	2265	1485	2490	1620	2755
			1000	1215	1995	1325	2185	1445	2400	1580	2650	1730	2930
			2000	1290	2115	1410	2320	1540	2555	1685	2820	1845	3125
			3000	1375	2245	1505	2465	1645	2715	1795	3000	1970	3340
			4000	1465	2380	1605	2620	1755	2890	1920	3200	2100	3570
			5000	1565	2530	1710	2790	1870	3080	2050	3420	2245	3820
			6000	1670	2695	1825	2970	2000	3285	2190	3655	2405	4095
			7000	1785	2865	1950	3165	2140	3510	2345	3915	2575	4400
			8000	1905	3055	2085	3380	2290	3755	2510	4195	2760	4735

Figure 5-5. Takeoff Distance (Sheet 1 of 2)

TAKEOFF DISTANCE

3700 LBS AND 3400 LBS

SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
3700	69	75	S.L.	950	1565	1035	1705	1125	1865	1230	2045	1340	2245
			1000	1010	1655	1100	1805	1200	1975	1310	2170	1430	2385
			2000	1075	1750	1170	1915	1275	2095	1395	2300	1525	2535
			3000	1145	1855	1245	2030	1360	2225	1485	2445	1625	2700
			4000	1215	1965	1330	2155	1450	2365	1585	2605	1735	2880
			5000	1300	2085	1420	2290	1550	2515	1695	2775	1855	3070
			6000	1385	2215	1515	2435	1655	2675	1810	2955	1980	3280
			7000	1480	2355	1615	2590	1770	2855	1935	3155	2120	3510
			8000	1580	2505	1725	2760	1890	3045	2070	3370	2270	3755
3400	66	72	S.L.	780	1290	850	1405	925	1530	1010	1670	1100	1830
			1000	830	1365	905	1485	985	1620	1075	1770	1170	1940
			2000	885	1440	965	1570	1050	1715	1145	1875	1250	2060
			3000	940	1525	1025	1665	1120	1820	1220	1990	1330	2185
			4000	1000	1615	1095	1765	1190	1930	1300	2115	1420	2325
			5000	1070	1715	1165	1870	1270	2050	1390	2250	1515	2475
			6000	1140	1815	1245	1985	1355	2180	1480	2390	1620	2635
			7000	1215	1930	1325	2110	1450	2315	1585	2550	1730	2815
			8000	1300	2050	1415	2245	1550	2465	1695	2715	1855	3005

Figure 5-5. Takeoff Distance (Sheet 2 of 2)

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Gear Up
2600 RPM
Cowl Flaps Open

PRESS ALT	MP	PPH
S.L. to 18,000	34.5	168
20,000	32.5	156
22,000	30.5	144
23,000	29.5	138

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-18°F	32°F	68°F	100°F
			-20°C	0°C	20°C	40°C
4000	S.L.	100	1185	1050	910	775
	4000	100	1090	955	815	675
	8000	100	990	855	715	575
	12,000	100	885	750	615	- - -
	16,000	100	760	635	500	- - -
	20,000	98	550	425	- - -	- - -
	23,000	97	335	210	- - -	- - -
3700	S.L.	98	1325	1180	1040	895
	4000	98	1230	1085	940	795
	8000	98	1125	985	840	695
	12,000	98	1020	880	740	- - -
	16,000	98	890	760	620	- - -
	20,000	97	670	540	- - -	- - -
	23,000	95	445	320	- - -	- - -
3400	S.L.	97	1485	1335	1185	1030
	4000	97	1385	1235	1085	930
	8000	97	1280	1130	980	825
	12,000	97	1170	1020	875	- - -
	16,000	97	1035	900	760	- - -
	20,000	95	805	675	- - -	- - -
	23,000	94	570	440	- - -	- - -

Figure 5-6. Maximum Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Gear Up
2600 RPM
Cowl Flaps Open
Standard Temperature

PRESS ALT	MP	PPH
S.L. to 18,000	34.5	168
20,000	32.5	156
22,000	30.5	144
23,000	29.5	138

NOTES:
1. Add 16 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED POUNDS	DISTANCE NM
4000	S.L.	100	945	0	0	0
	4000	100	905	4	12	7
	8000	100	860	9	25	15
	12,000	100	810	14	38	25
	16,000	100	740	19	53	35
	20,000	98	580	25	69	48
	23,000	97	400	31	84	62
3700	S.L.	98	1075	0	0	0
	4000	98	1035	4	11	6
	8000	98	990	8	22	13
	12,000	98	940	12	33	21
	16,000	98	870	16	46	30
	20,000	97	700	21	60	41
	23,000	95	510	26	72	52
3400	S.L.	97	1220	0	0	0
	4000	97	1180	3	9	5
	8000	97	1135	7	19	11
	12,000	97	1085	10	29	18
	16,000	97	1010	14	40	26
	20,000	95	835	18	52	35
	23,000	94	635	23	62	44

Figure 5-7. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 110 KIAS

CONDITIONS:
Flaps Up
Gear Up
2500 RPM
30 Inches Hg.
125 PPH Fuel Flow
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 16 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 7°C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	RATE OF CLIMB FPM	FROM SEA LEVEL		
			TIME MIN	FUEL USED POUNDS	DISTANCE NM
4000	S.L.	635	0	0	0
	4000	600	6	14	12
	8000	560	13	28	26
	12,000	515	21	44	42
	16,000	455	29	61	60
	20,000	380	39	81	84
3700	S.L.	735	0	0	0
	4000	700	6	12	10
	8000	660	11	24	22
	12,000	615	18	37	35
	16,000	555	25	51	51
	20,000	475	33	68	70
3400	S.L.	845	0	0	0
	4000	810	5	10	9
	8000	770	10	21	19
	12,000	725	15	32	30
	16,000	665	21	44	43
	20,000	585	27	57	59

Figure 5-7. Time, Fuel, and Distance to Climb (Sheet 2 of 2)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	---	---	---	80	164	112
	28	84	160	117	80	160	110	75	159	104
	26	77	154	107	73	154	101	68	153	95
	24	70	148	97	66	147	91	62	146	86
	22	62	141	86	59	140	81	55	137	76
2400	30	---	---	---	81	161	111	76	160	104
	28	80	156	109	75	156	103	70	155	96
	26	73	151	99	69	150	94	64	149	88
	24	66	144	90	62	143	85	58	141	79
	22	58	136	79	55	135	75	51	132	71
2300	30	81	157	108	76	157	102	72	156	96
	28	75	152	100	71	152	94	66	150	88
	26	68	146	91	64	146	86	60	144	81
	24	61	140	82	58	139	77	54	136	72
	22	54	132	72	51	130	69	48	127	65
2200	30	76	153	98	72	153	92	67	152	86
	28	70	148	90	66	147	85	62	146	80
	26	64	142	82	60	141	77	56	139	72
	24	57	135	73	54	133	69	50	131	66
	22	50	126	65	47	124	63	44	121	60

Figure 5-8. Cruise Performance (Sheet 1 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	---	---	---	80	166	112
	28	84	163	117	80	162	110	75	161	104
	26	77	157	108	73	157	101	69	155	95
	24	70	151	97	66	150	92	62	149	86
	22	63	143	87	59	142	82	55	140	77
2400	30	---	---	---	81	164	111	76	163	104
	28	80	159	109	75	159	103	71	157	97
	26	73	153	100	69	153	94	65	151	88
	24	66	147	90	62	146	85	58	144	80
	22	59	139	80	55	137	76	52	135	71
2300	30	81	160	108	76	160	102	72	159	96
	28	75	155	100	71	154	94	66	153	89
	26	68	149	91	65	148	86	61	147	81
	24	62	142	82	58	141	77	55	139	73
	22	55	134	73	51	132	69	48	129	66
2200	30	76	156	98	72	155	92	67	154	87
	28	70	151	90	66	150	85	62	149	80
	26	64	145	82	60	144	77	57	141	73
	24	57	138	74	54	136	70	51	133	66
	22	50	129	66	48	126	63	45	123	60

Figure 5-8. Cruise Performance (Sheet 2 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	---	---	---	80	169	111
	28	84	165	117	79	165	110	75	164	104
	26	78	160	108	73	159	101	69	158	95
	24	70	154	98	66	153	92	62	151	87
	22	63	146	87	59	145	82	56	142	77
2400	30	---	---	---	81	166	110	76	165	104
	28	80	162	109	75	161	103	70	160	96
	26	73	156	100	69	155	94	65	154	88
	24	66	149	90	62	148	85	59	146	80
	22	59	142	81	56	140	76	52	137	72
2300	30	81	163	108	76	162	102	72	161	95
	28	75	158	100	71	157	94	66	156	88
	26	68	152	91	65	151	86	61	149	81
	24	62	145	82	58	143	78	55	141	73
	22	55	136	73	52	134	70	49	131	66
2200	30	76	159	97	72	158	92	67	157	86
	28	70	153	90	66	153	85	62	151	80
	26	64	147	82	60	146	77	57	144	73
	24	57	140	74	54	138	70	51	135	66
	22	51	131	66	48	128	63	45	124	61

Figure 5-8. Cruise Performance (Sheet 3 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -21°C			STANDARD TEMPERATURE -1°C			20°C ABOVE STANDARD TEMP 19°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	---	---	---	80	172	111
	28	84	168	117	79	168	110	75	167	103
	26	78	163	108	73	162	101	69	161	95
	24	71	156	98	66	155	92	62	153	87
	22	63	149	88	60	147	83	56	145	78
2400	30	---	---	---	80	169	110	76	168	103
	28	79	165	109	75	164	102	70	163	96
	26	73	159	100	69	158	94	65	156	89
	24	66	152	91	62	151	85	59	148	80
	22	59	144	81	56	142	76	52	139	72
2300	30	81	166	107	76	165	101	71	164	95
	28	75	160	100	71	160	94	66	158	88
	26	69	154	91	65	153	86	61	151	81
	24	62	147	83	58	146	78	55	143	73
	22	55	139	74	52	137	70	49	133	66
2200	30	76	161	97	72	161	92	67	159	86
	28	70	156	90	66	155	85	62	153	80
	26	64	150	82	60	148	77	57	146	73
	24	58	142	74	54	140	70	51	137	67
	22	51	133	67	48	130	64	45	126	61

Figure 5-8. Cruise Performance (Sheet 4 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	---	---	---	79	175	110
	28	84	171	116	79	171	110	74	169	103
	26	77	166	107	73	165	101	68	163	95
	24	70	159	98	66	158	92	62	156	87
	22	63	151	88	60	150	83	56	147	78
2400	30	---	---	---	80	172	109	75	171	103
	28	79	167	108	75	167	102	70	165	96
	26	73	161	100	69	160	94	65	158	88
	24	66	155	91	62	153	85	59	151	80
	22	59	146	81	56	144	77	53	141	72
2300	30	80	168	107	76	167	101	71	166	95
	28	75	163	99	70	162	94	66	160	88
	26	68	157	91	65	156	86	61	153	81
	24	62	150	83	58	148	78	55	145	73
	22	55	141	74	52	138	70	49	134	66
2200	30	75	164	97	71	163	91	67	161	86
	28	70	158	90	66	157	85	62	155	79
	26	64	152	82	60	150	77	57	147	73
	24	58	144	74	54	142	70	51	138	67
	22	51	135	67	48	132	64	46	127	61

Figure 5-8. Cruise Performance (Sheet 5 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	- - -	- - -	- - -	- - -	- - -	- - -	79	177	109
	28	83	174	116	79	173	109	74	172	102
	26	77	168	107	73	168	101	68	166	95
	24	70	162	98	66	160	92	62	158	87
	22	63	154	88	60	152	83	56	149	78
2400	30	- - -	- - -	- - -	80	174	109	75	173	102
	28	79	170	108	74	169	102	70	168	95
	26	73	164	99	69	163	94	64	161	88
	24	66	157	91	62	155	85	59	152	80
	22	60	149	81	56	146	77	53	143	72
2300	30	80	171	106	75	170	100	71	169	94
	28	74	165	99	70	165	93	66	163	88
	26	68	159	91	64	158	86	60	155	81
	24	62	152	83	58	150	78	55	146	73
	22	56	143	74	52	140	70	49	136	67
2200	30	75	166	96	71	166	91	67	164	85
	28	70	161	89	66	160	84	62	157	79
	26	64	154	82	60	152	77	57	149	73
	24	58	146	74	55	144	70	51	140	67
	22	52	137	67	49	133	64	46	129	61

Figure 5-8. Cruise Performance (Sheet 6 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 14,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTES

1. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.
2. Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -33°C			STANDARD TEMPERATURE -13°C			20°C ABOVE STANDARD TEMP 7°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	83	181	115	78	180	108
	28	83	177	115	78	176	108	73	174	102
	26	77	171	106	72	170	100	68	168	94
	24	70	164	97	66	163	92	62	160	86
	22	63	156	88	60	154	83	56	150	78
2400	30	84	177	114	79	177	108	74	175	101
	28	78	172	107	74	172	101	69	170	95
	26	72	166	99	68	165	93	64	163	88
	24	66	159	90	62	157	85	58	154	80
	22	59	151	81	56	148	77	53	144	72
2300	30	79	173	105	75	172	99	70	171	93
	28	74	168	98	70	167	93	65	164	87
	26	68	162	91	64	160	85	60	157	80
	24	62	154	82	58	152	78	55	148	73
	22	56	145	74	52	142	70	49	137	67
2200	30	75	169	96	70	168	90	---	---	---
	28	69	163	89	65	162	84	61	159	79
	26	64	156	82	60	154	77	56	151	72
	24	58	148	74	54	145	70	51	141	66
	22	52	138	67	49	135	64	46	129	61

Figure 5-8. Cruise Performance (Sheet 7 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 16,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTES

1. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.
2. Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -37°C			STANDARD TEMPERATURE -17°C			20°C ABOVE STANDARD TEMP 3°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	82	184	114	77	182	107
	28	82	179	114	77	179	107	73	177	101
	26	76	173	106	72	172	100	67	170	94
	24	70	167	97	66	165	92	62	162	86
	22	63	158	88	60	156	83	56	152	78
2400	30	83	180	113	78	179	107	73	178	100
	28	78	175	106	73	174	100	69	172	94
	26	72	169	98	68	167	93	64	164	87
	24	66	162	90	62	159	85	58	156	80
	22	59	153	81	56	150	77	53	146	72
2300	30	78	176	105	74	175	99	69	173	93
	28	73	170	98	69	169	92	65	166	86
	26	68	164	90	64	162	85	60	158	80
	24	62	156	82	58	153	78	55	149	73
	22	56	147	74	52	143	70	49	138	67
2200	30	74	171	95	70	170	89	---	---	---
	28	69	165	88	65	163	83	61	160	78
	26	63	158	81	60	156	76	56	152	72
	24	58	150	74	54	147	70	51	142	66
	22	52	140	67	49	136	64	46	130	61

Figure 5-8. Cruise Performance (Sheet 8 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 18,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTES

1. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.
2. Maximum allowable cruise power is 80%,

		20°C BELOW STANDARD TEMP -41°C			STANDARD TEMPERATURE -21°C			20°C ABOVE STANDARD TEMP -1°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	81	186	113	76	184	106
	28	81	182	113	77	181	106	72	179	100
	26	76	176	105	71	174	99	67	172	93
	24	69	169	96	65	167	91	62	163	85
	22	63	160	88	60	158	83	56	153	78
2400	30	82	182	112	77	182	106	73	179	99
	28	77	177	105	72	176	99	68	173	93
	26	71	171	98	67	169	92	63	166	86
	24	65	164	89	62	161	84	58	157	79
	22	59	155	81	56	151	76	52	146	72
2300	30	77	178	103	73	177	97	---	---	---
	28	72	172	97	68	171	91	64	168	86
	26	67	166	89	63	163	84	59	160	79
	24	61	158	82	58	155	77	54	150	73
	22	55	148	74	52	144	70	49	139	66
2200	30	73	173	94	69	171	88	---	---	---
	28	68	167	87	64	165	82	---	---	---
	26	63	160	80	59	157	76	56	153	72
	24	57	151	73	54	148	70	51	142	66
	22	51	141	67	48	136	64	46	130	61

Figure 5-8. Cruise Performance (Sheet 9 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 20,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTES

1. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.
2. Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -45°C			STANDARD TEMPERATURE -25°C			20°C ABOVE STANDARD TEMP -5°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	80	188	112	75	186	105
	28	80	184	111	76	183	105	71	180	99
	26	75	178	104	71	176	98	66	173	92
	24	69	171	96	65	169	90	61	165	85
	22	63	162	87	59	159	82	56	154	77
2400	30	81	185	111	76	184	104	72	181	98
	28	76	179	104	72	178	98	67	175	92
	26	71	173	97	67	171	91	63	167	86
	24	65	165	89	61	163	84	58	158	79
	22	59	156	81	56	153	76	52	147	72
2300	30	77	180	102	72	179	96	---	---	---
	28	72	174	96	68	172	90	64	169	85
	26	66	168	89	63	165	84	59	161	79
	24	61	159	81	57	156	77	54	151	72
	22	55	150	74	52	145	70	49	139	66
2200	30	72	175	93	---	---	---	---	---	---
	28	67	169	86	64	166	82	---	---	---
	26	62	161	80	59	158	75	55	153	71
	24	57	153	73	54	149	69	50	143	66
	22	51	142	67	48	137	64	45	130	61

Figure 5-8. Cruise Performance (Sheet 10 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 22,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTES

1. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.
2. Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -49°C			STANDARD TEMPERATURE -29°C			20°C ABOVE STANDARD TEMP -9°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	30	---	---	---	79	190	110	74	188	103
	28	79	186	110	75	185	104	70	182	97
	26	74	180	103	70	178	97	66	174	91
	24	68	173	95	64	170	89	61	165	84
	22	62	164	87	59	160	82	55	155	77
2400	30	80	187	109	75	185	103	71	182	97
	28	75	181	103	71	179	97	66	176	91
	26	70	175	96	66	172	90	62	168	85
	24	64	167	88	61	164	83	57	159	78
	22	59	158	80	55	153	76	52	147	71
2300	30	75	182	101	71	180	95	---	---	---
	28	71	176	94	67	174	89	---	---	---
	26	66	169	88	62	166	83	58	161	78
	24	60	160	80	57	157	76	53	151	72
	22	55	150	73	52	145	69	48	139	66
2200	30	71	177	91	---	---	---	---	---	---
	28	67	170	85	63	167	81	---	---	---
	26	62	163	79	58	159	75	---	---	---
	24	56	153	72	53	149	69	50	142	65
	22	51	143	66	48	137	63	45	129	61

Figure 5-8. Cruise Performance (Sheet 11 of 12)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 23,000 FEET

CONDITIONS:
4000 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTES

1. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.
2. Maximum allowable cruise power is 80%.

		20°C BELOW STANDARD TEMP -51°C			STANDARD TEMPERATURE -31°C			20°C ABOVE STANDARD TEMP -11°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	29.5	82	191	114	77	190	107	73	187	101
	28	79	187	109	74	186	103	70	182	97
	26	74	181	102	69	179	96	65	175	90
	24	68	174	94	64	171	89	60	166	84
	22	62	165	86	59	161	81	55	155	77
2400	29.5	78	187	107	73	185	101	69	181	94
	28	74	182	102	70	180	96	66	176	90
	26	69	176	95	65	173	90	62	168	84
	24	64	168	88	60	164	83	57	159	78
	22	58	158	80	55	154	75	52	147	71
2300	29.5	74	181	98	70	179	93	- - -	- - -	- - -
	28	70	177	94	66	174	88	- - -	- - -	- - -
	26	65	170	87	62	166	82	58	161	77
	24	60	161	80	57	157	76	53	151	71
	22	55	151	73	51	146	69	48	138	66
2200	29.5	70	176	89	- - -	- - -	- - -	- - -	- - -	- - -
	28	66	171	85	62	168	80	- - -	- - -	- - -
	26	61	163	79	58	159	74	- - -	- - -	- - -
	24	56	154	72	53	149	68	50	142	65
	22	51	143	66	48	136	63	45	128	61

Figure 5-8. Cruise Performance (Sheet 12 of 12)

RANGE PROFILE
45 MINUTES RESERVE
384 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the distance during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

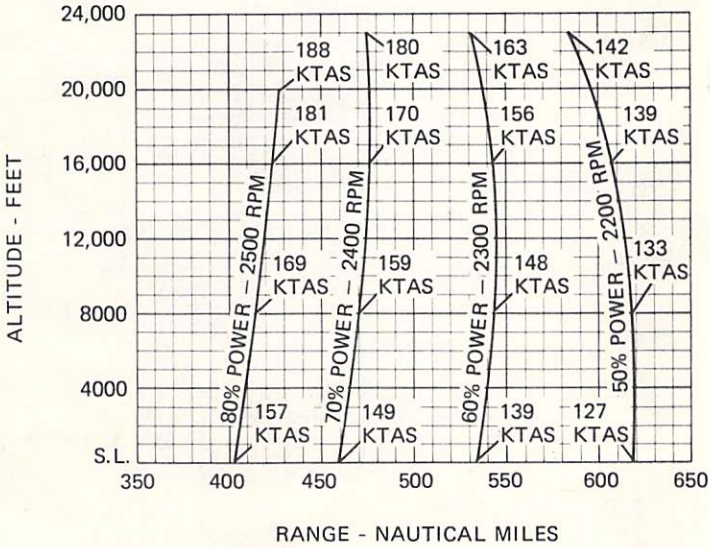

Figure 5-9. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
522 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the distance during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

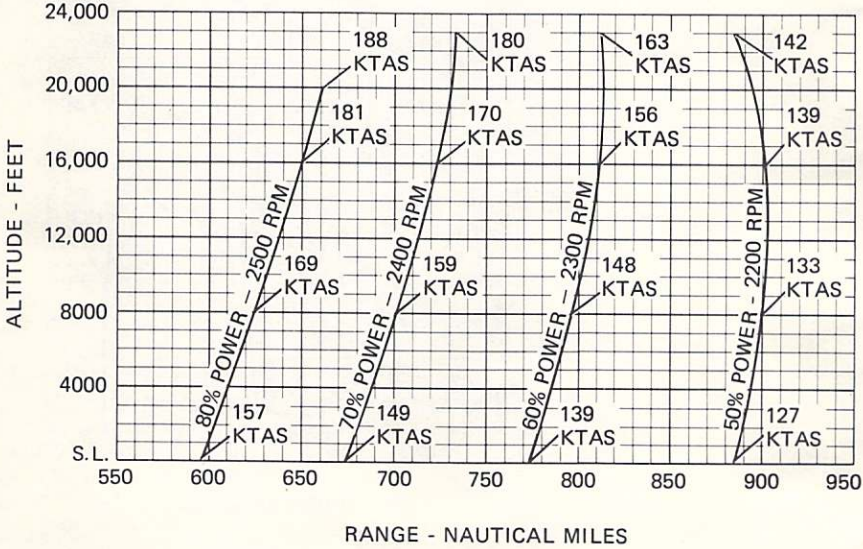

Figure 5-9. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE

45 MINUTES RESERVE
384 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the time during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

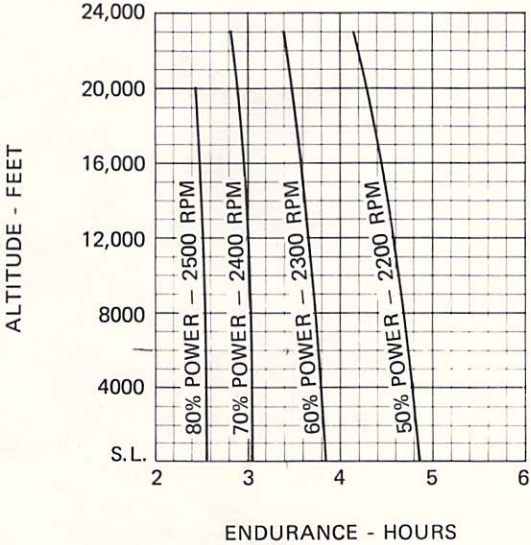

Figure 5-10. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE

45 MINUTES RESERVE
522 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the time during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

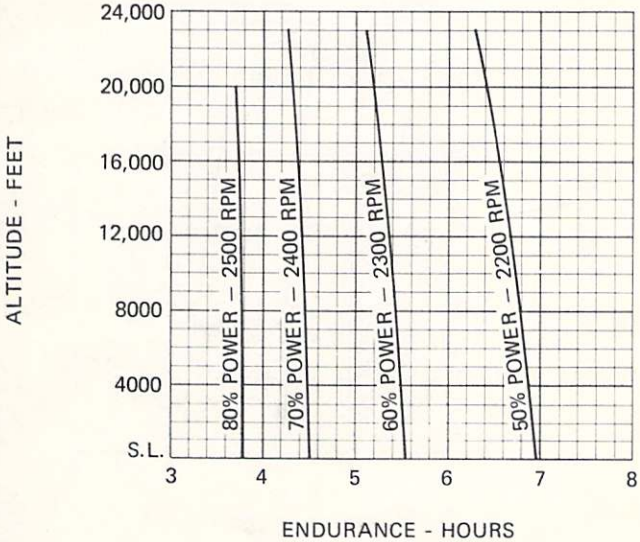

Figure 5-10. Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 30°
Power Off
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the "ground roll" figure.
4. If a landing with flaps up is necessary, increase the approach speed by 14 KIAS and allow for 35% longer distances.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
3800	72	S.L.	725	1440	750	1480	780	1520	805	1560	830	1600
		1000	750	1480	780	1520	805	1560	835	1605	860	1645
		2000	780	1525	810	1565	835	1605	865	1650	895	1695
		3000	810	1565	840	1610	870	1660	900	1705	930	1750
		4000	840	1615	870	1660	900	1705	930	1750	965	1800
		5000	870	1660	905	1710	935	1755	965	1805	1000	1855
		6000	905	1710	940	1765	970	1810	1005	1860	1035	1910
		7000	940	1765	975	1815	1010	1870	1045	1920	1075	1970
		8000	975	1815	1010	1870	1050	1930	1085	1980	1120	2035

Figure 5-11. Landing Distance