

# SECTION 5 PERFORMANCE

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## 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	2600 Pounds
Usable fuel	44 Gallons

### TAKEOFF CONDITIONS

Field pressure altitude	1500 Feet
Temperature	28°C (16°C above standard)
Wind component along runway	12 Knot Headwind
Field length	3500 Feet

## CRUISE CONDITIONS

Total distance	425 Nautical Miles
Pressure altitude	7500 Feet
Temperature	16°C (16°C above standard)
Expected wind enroute	10 Knot Headwind

## LANDING CONDITIONS

Field pressure altitude	2000 Feet
Temperature	25°C
Field length	3000 Feet

## TAKEOFF

The takeoff distance chart, figure 5-4, should be consulted, keeping in mind that the distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of weight, altitude and temperature. For example, in this particular sample problem, the takeoff distance information presented for a weight of 2650 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1410 Feet
Total distance to clear a 50-foot obstacle	2380 Feet

These distances are well within the available takeoff field length. However, a correction for the effect of wind may be made based on Note 3 of the takeoff chart. The correction for a 12 knot headwind is:

$$\frac{12 \text{ Knots}}{9 \text{ Knots}} \times 10\% = 13\% \text{ Decrease}$$

This results in the following distances, corrected for wind:

Ground roll, zero wind	1410
Decrease in ground roll (1410 feet × 13%)	<u>183</u>
Corrected ground roll	1227 Feet
Total distance to clear a 50-foot obstacle, zero wind	2380
Decrease in total distance (2380 feet × 13%)	<u>309</u>
Corrected total distance to clear 50-foot obstacle	2071 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 5-7, the range profile chart presented in figure 5-8, and the endurance profile chart presented in figure 5-9.

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 65% will be used.

The cruise performance chart for 8000 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 2300 RPM and 22 inches of manifold pressure, which results in the following:

Power	65%
True airspeed	132 Knots
Cruise fuel flow	8.8 GPH

The power computer may be used to determine power and fuel consumption more accurately during the flight.

## FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in figures 5-6 and 5-7. For this sample problem, figure 5-6 shows that a normal climb from 2000 feet to 8000 feet requires 2.4 gallons of fuel. The corresponding distance during the climb is 20 nautical miles. These 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 10°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:

$$\frac{16^{\circ}\text{C}}{10^{\circ}\text{C}} \times 10\% = 16\% \text{ Increase}$$

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CESSNA  
MODEL 172RG

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

Fuel to climb, standard temperature	2.4
Increase due to non-standard temperature (2.4 × 16%)	<u>0.4</u>
Corrected fuel to climb	2.8 Gallons

Using a similar procedure for the distance during climb results in 23 nautical miles.

The resultant cruise distance is:

Total distance	425
Climb distance	<u>-23</u>
Cruise distance	402 Nautical Miles

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

132
<u>-10</u>
122 Knots

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

402 Nautical Miles	= 3.3 Hours
122 Knots	

The fuel required for cruise is:

3.3 hours × 8.8 gallons/hour = 29.0 Gallons

A 45-minute reserve requires:

$\frac{45}{60} \times 8.8$ gallons/hour	= 6.6 Gallons
---	---------------

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.4
Climb	2.8
Cruise	29.0
Reserve	<u>6.6</u>
Total fuel required	39.8 Gallons

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 5-10 presents landing distance information for the short field technique. The distances corresponding to 2000 feet pressure altitude and a temperature of 30°C are as follows:

Ground roll	705 Feet
Total distance to clear a 50-foot obstacle	1465 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:**

Power required for level flight or maximum power during descent.

FLAPS UP												
KIAS	50	60	70	80	90	100	110	120	130	140	150	160
KCAS	55	63	71	80	89	99	108	118	128	138	147	157
FLAPS 10°												
KIAS	40	50	60	70	80	90	100	110	120	130	-----	-----
KCAS	50	54	62	71	81	91	100	110	120	130	-----	-----
FLAPS 30°												
KIAS	40	50	60	70	80	90	100	-----	-----	-----	-----	-----
KCAS	47	54	62	71	81	90	101	-----	-----	-----	-----	-----

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

**AIRSPED CALIBRATION**

**ALTERNATE STATIC SOURCE**

**HEATER AND DEFROSTER FULL ON AND WINDOWS CLOSED**

FLAPS UP										
NORMAL KIAS	50	60	70	80	90	100	110	120	140	160
ALTERNATE KIAS	46	58	69	79	88	98	108	117	136	155
FLAPS 10°										
NORMAL KIAS	50	60	70	80	90	100	110	120	130	---
ALTERNATE KIAS	45	58	69	80	90	100	109	119	128	---
FLAPS 30°										
NORMAL KIAS	50	60	70	80	90	100	---	---	---	---
ALTERNATE KIAS	46	58	68	78	87	96	---	---	---	---

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



### TEMPERATURE CONVERSION CHART

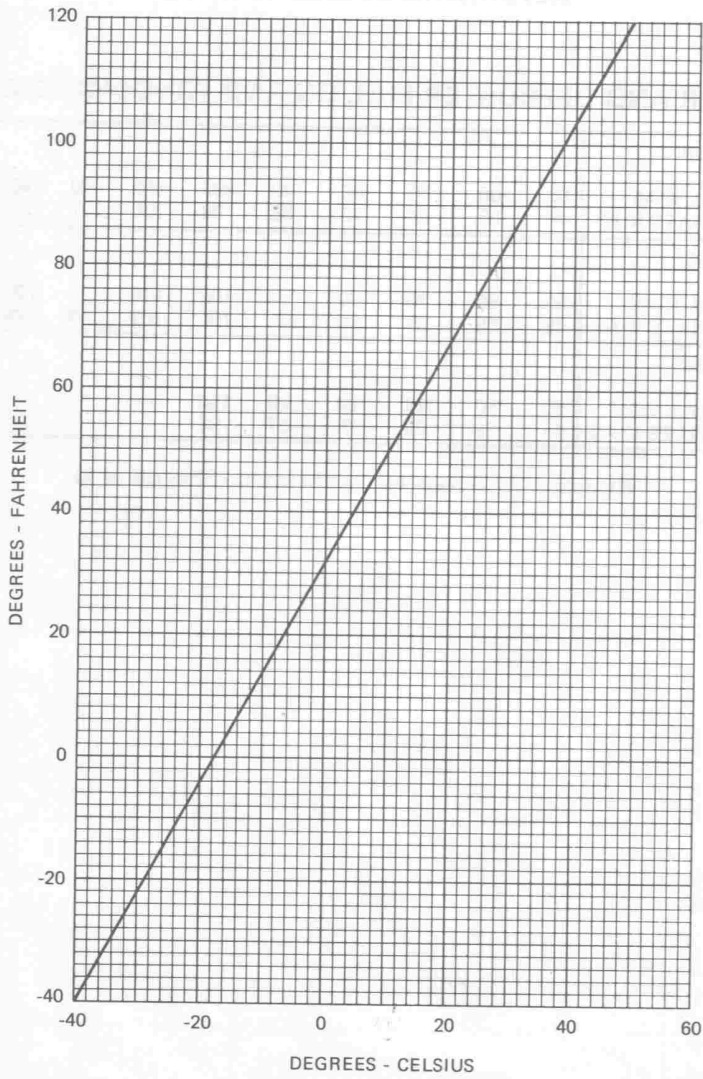


Figure 5-2. Temperature Conversion Chart

### STALL SPEEDS

CONDITIONS:  
Power Off  
Gear Up or Down

NOTES:  
1. Maximum altitude loss during a stall recovery may be as much as 230 feet.  
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
2650	UP	46	54	49	58	55	64	65	76
	10°	42	52	45	56	50	62	59	74
	30°	39	50	42	54	47	59	56	71

#### MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2650	UP	51	57	55	61	61	68	72	81
	10°	46	54	49	58	55	64	65	76
	30°	42	51	45	55	50	61	59	72

Figure 5-3. Stall Speeds

**TAKEOFF DISTANCE**  
**MAXIMUM WEIGHT 2650 LBS**  
**SHORT FIELD**

CONDITIONS:  
Flaps Up  
2700 RPM and Full Throttle Prior to Brake Release  
Cowl Flaps Open  
Paved, Level Dry Runway  
Zero Wind

NOTES:

1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum power in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. 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			10°C			20°C			30°C			40°C				
	LIFT OFF	AT 50 FT		GRND ROLL	TO CLEAR 50 FT OBS	TOTAL	GRND ROLL	TO CLEAR 50 FT OBS	TOTAL	GRND ROLL	TO CLEAR 50 FT OBS	TOTAL	GRND ROLL	TO CLEAR 50 FT OBS	TOTAL	GRND ROLL	TO CLEAR 50 FT OBS	TOTAL		
2650	58	63	S.L.	955	1605	1715	1100	1835	1175	1965	1260	2100	1175	1965	1260	2100	1175	1965	1260	2100
			1000	1040	1880	1200	2015	1285	2310	1285	2155	1375	2310	1285	2155	1375	2310	1285	2155	1375
				1140	1755	2065	1315	2215	1410	2380	1510	2550	1410	2380	1510	2550	1410	2380	1510	2550
				1250	2120	2280	1440	2450	1545	2630	1655	2830	1545	2630	1655	2830	1545	2630	1655	2830
				1370	2345	2525	1585	2715	1700	2930	1820	3160	1700	2930	1820	3160	1700	2930	1820	3160
				1505	2600	2805	1740	3030	1870	3280	2005	3550	1870	3280	2005	3550	1870	3280	2005	3550
				1660	2905	3145	1920	3405	2065	3700	2215	4025	2065	3700	2215	4025	2065	3700	2215	4025
				1830	3265	3545	2120	3865	2280	4220	2450	4630	2280	4220	2450	4630	2280	4220	2450	4630
				2025	3700	4045	2350	4440	2530	4895	2720	5430	2530	4895	2720	5430	2530	4895	2720	5430

Figure 5-4. Takeoff Distance (Sheet 1 of 2)

**TAKEOFF DISTANCE**  
**2500 LBS AND 2300 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
2500	56	61	S.L.	835	1400	895	1495	960	1595	1025	1705	1100	1820
			1000	910	1525	975	1635	1045	1745	1120	1865	1200	1995
			2000	995	1670	1070	1790	1145	1915	1225	2050	1315	2195
			3000	1090	1835	1170	1965	1255	2105	1345	2260	1440	2420
			4000	1195	2015	1280	2165	1375	2325	1475	2500	1580	2685
			5000	1310	2230	1410	2400	1515	2580	1625	2780	1740	2990
			6000	1440	2470	1550	2665	1665	2875	1790	3105	1920	3355
			7000	1585	2760	1710	2980	1840	3230	1975	3500	2120	3800
8000	1755	3095	1890	3360	2035	3655	2185	3980	2350	4350			
2300	54	59	S.L.	690	1160	740	1240	790	1320	845	1405	905	1500
			1000	750	1265	805	1350	860	1440	920	1535	985	1635
			2000	820	1380	880	1475	940	1575	1010	1680	1080	1795
			3000	895	1505	960	1610	1030	1725	1105	1845	1180	1970
			4000	980	1650	1050	1770	1130	1895	1210	2025	1295	2170
			5000	1075	1815	1155	1950	1240	2090	1325	2240	1420	2400
			6000	1180	2005	1265	2150	1360	2310	1460	2485	1565	2670
			7000	1295	2220	1395	2385	1500	2570	1610	2765	1725	2980
8000	1430	2465	1540	2660	1655	2875	1775	3105	1905	3355			

Figure 5-4. Takeoff Distance (Sheet 2 of 2)

## MAXIMUM RATE OF CLIMB

**CONDITIONS:**

Flaps Up  
Gear Up  
2700 RPM  
Full Throttle  
Mixture Leaned above 3000 Feet  
Cowl Flaps Open

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
2650	S.L.	84	925	855	780	710
	2000	83	825	755	685	620
	4000	81	720	655	590	525
	6000	80	620	560	495	435
	8000	78	525	465	405	340
	10,000	77	430	370	310	---
	12,000	75	330	275	220	---

Figure 5-5. Maximum Rate of Climb

**TIME, FUEL, AND DISTANCE TO CLIMB**

**MAXIMUM RATE OF CLIMB**

CONDITIONS:

Flaps Up  
Gear Up  
2700 RPM  
Full Throttle  
Mixture Leaned above 3000 Feet  
Cowl Flaps Open  
Standard Temperature

NOTES:

1. Add 1.4 gallons 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	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
2650	S.L.	15	84	800	0	0.0	0
	1000	13	83	760	1	0.4	2
	2000	11	83	715	3	0.8	4
	3000	9	82	675	4	1.1	6
	4000	7	81	635	6	1.6	8
	5000	5	81	590	7	2.0	10
	6000	3	80	550	9	2.4	13
	7000	1	79	510	11	2.9	16
	8000	-1	78	465	13	3.3	19
	9000	-3	78	425	15	3.8	22
	10,000	-5	77	385	18	4.3	26
	11,000	-7	76	340	21	4.9	30
	12,000	-9	75	300	24	5.5	35

Figure 5-6. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

**TIME, FUEL, AND DISTANCE TO CLIMB**

**NORMAL CLIMB - 90 KIAS**

CONDITIONS:

- Flaps Up
- Gear Up
- 2500 RPM
- 25 Inches Hg or Full Throttle
- Mixture Leaned above 3000 Feet
- Cowl Flaps Open
- Standard Temperature

NOTES:

1. Add 1.4 gallons 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	PRESSURE ALTITUDE FT	TEMP °C	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALLONS	DISTANCE NM
2650	S.L.	15	530	0	0.0	0
	1000	13	530	2	0.4	3
	2000	11	530	4	0.7	6
	3000	9	530	6	1.1	9
	4000	7	530	8	1.4	12
	5000	5	520	9	1.8	15
	6000	3	475	11	2.2	18
	7000	1	430	14	2.6	22
	8000	-1	385	16	3.1	26

Figure 5-6. Time, Fuel, and Distance to Climb (Sheet 2 of 2)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 2000 FEET**

CONDITIONS:  
2650 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE  
For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

RPM	MP	20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	24	77	130	10.3	74	131	9.9	72	132	9.6
	23	72	127	9.7	70	128	9.4	68	128	9.1
	22	68	123	9.1	66	124	8.8	63	124	8.6
	21	63	120	8.6	61	120	8.3	59	120	8.1
2400	25	---	---	---	76	132	10.1	73	133	9.8
	24	74	128	9.9	72	129	9.6	69	130	9.3
	23	70	125	9.3	67	126	9.0	65	126	8.8
	22	65	121	8.8	63	122	8.5	61	122	8.3
2300	25	76	129	10.1	73	130	9.7	71	131	9.4
	24	71	126	9.5	69	127	9.2	67	127	8.9
	23	67	123	9.0	65	123	8.7	63	123	8.5
	22	63	119	8.5	61	119	8.2	59	119	8.0
2200	24	69	124	9.2	66	124	8.9	64	125	8.6
	23	64	121	8.7	62	121	8.4	60	120	8.2
	22	60	117	8.2	58	116	7.9	56	116	7.7
	21	56	112	7.7	54	112	7.5	52	111	7.3
2100	23	62	118	8.3	59	118	8.1	57	118	7.9
	22	57	114	7.9	55	114	7.6	54	113	7.4
	21	53	109	7.4	52	109	7.2	50	108	7.0
	20	49	105	6.9	48	103	6.7	46	101	6.6

Figure 5-7. Cruise Performance (Sheet 1 of 6)



**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 4000 FEET**

CONDITIONS:  
2650 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE

For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

RPM	MP	20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	24	---	---	---	77	135	10.2	74	136	9.9
	23	75	131	10.0	72	132	9.7	70	132	9.4
	22	70	127	9.4	68	128	9.1	66	128	8.8
	21	66	124	8.8	63	124	8.6	61	124	8.3
2400	24	77	132	10.2	74	133	9.9	72	134	9.6
	23	72	129	9.7	70	130	9.3	67	130	9.0
	22	68	126	9.1	65	126	8.8	63	126	8.5
	21	63	122	8.6	61	121	8.3	59	121	8.1
2300	25	---	---	---	76	134	10.1	73	135	9.7
	24	74	130	9.9	71	131	9.5	69	131	9.2
	23	70	127	9.3	67	127	9.0	65	127	8.7
	22	65	123	8.8	63	123	8.5	61	123	8.3
2200	24	71	128	9.5	69	129	9.2	66	129	8.9
	23	67	125	9.0	65	125	8.7	62	125	8.4
	22	63	121	8.5	60	121	8.2	58	120	8.0
	21	58	116	8.0	56	116	7.7	54	115	7.5
2100	23	64	122	8.6	62	122	8.4	60	122	8.1
	22	60	118	8.2	58	118	7.9	56	117	7.7
	21	56	114	7.7	54	113	7.4	52	112	7.2
	20	52	109	7.2	50	108	7.0	48	106	6.8
	19	48	103	6.7	46	101	6.6	44	98	6.4

Figure 5-7. Cruise Performance (Sheet 2 of 6)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 6000 FEET**

CONDITIONS:  
2650 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE  
For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

RPM	MP	20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	23	---	---	---	75	136	10.0	72	136	9.6
	22	73	132	9.7	70	132	9.4	68	132	9.1
	21	68	128	9.1	66	128	8.8	63	128	8.6
	20	63	123	8.6	61	123	8.3	59	123	8.1
2400	24	---	---	---	77	137	10.2	74	138	9.9
	23	75	133	10.0	72	134	9.6	70	134	9.3
	22	70	130	9.4	68	130	9.1	66	130	8.8
	21	66	126	8.8	63	126	8.6	61	125	8.3
2300	24	77	134	10.2	74	135	9.8	71	136	9.5
	23	72	131	9.6	70	132	9.3	67	132	9.0
	22	68	127	9.1	65	128	8.8	63	127	8.5
	21	63	123	8.5	61	123	8.3	59	123	8.0
2200	24	74	132	9.9	71	133	9.5	69	133	9.2
	23	70	129	9.3	67	129	9.0	65	129	8.7
	22	65	125	8.8	63	125	8.5	61	125	8.2
	21	61	121	8.3	59	120	8.0	57	120	7.8
2100	23	67	126	8.9	64	126	8.7	62	126	8.4
	22	62	122	8.5	60	122	8.2	58	122	7.9
	21	58	118	8.0	56	117	7.7	54	117	7.5
	20	54	113	7.5	52	112	7.3	50	110	7.0
	19	50	108	7.0	48	106	6.8	46	103	6.6

Figure 5-7. Cruise Performance (Sheet 3 of 6)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 8000 FEET**

CONDITIONS:  
2650 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE  
For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

RPM	MP	20°C BELOW STANDARD TEMP -21°C			STANDARD TEMPERATURE -1°C			20°C ABOVE STANDARD TEMP 19°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2700	22	---	---	---	77	140	10.3	74	141	9.9
	21	75	135	10.0	72	136	9.6	70	136	9.3
2600	22	---	---	---	75	138	10.0	72	139	9.6
	21	73	134	9.7	70	134	9.4	68	134	9.1
	20	68	129	9.1	65	129	8.8	63	129	8.5
2500	22	75	136	10.0	73	136	9.7	70	137	9.4
	21	71	132	9.4	68	132	9.1	66	132	8.8
	20	66	128	8.8	63	127	8.6	61	127	8.3
	19	61	123	8.3	59	122	8.0	57	121	7.8
2400	22	73	134	9.7	70	134	9.4	68	134	9.1
	21	68	130	9.1	66	130	8.8	63	129	8.6
	20	64	125	8.6	61	125	8.3	59	124	8.1
	19	59	120	8.0	57	120	7.8	55	118	7.6
2300	22	70	132	9.4	68	132	9.1	65	132	8.8
	21	66	128	8.8	63	127	8.5	61	127	8.3
	20	61	123	8.3	59	122	8.0	57	121	7.8
	19	57	118	7.8	55	117	7.5	53	115	7.3
2200	22	68	129	9.1	65	129	8.8	63	129	8.5
	21	63	125	8.5	61	125	8.3	59	124	8.0
	20	59	120	8.0	57	120	7.8	55	118	7.6
	19	54	115	7.5	52	114	7.3	51	112	7.1
2100	22	65	127	8.7	63	127	8.5	60	126	8.2
	21	61	122	8.2	59	122	8.0	57	121	7.7
	20	56	117	7.7	54	116	7.5	53	115	7.3
	19	52	112	7.3	50	110	7.0	49	108	6.8
	18	48	105	6.8	46	102	6.6	45	99	6.4

Figure 5-7. Cruise Performance (Sheet 4 of 6)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 10,000 FEET**

CONDITIONS:  
2650 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE  
For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2700	20	72	136	9.7	70	136	9.3	67	136	9.0
	19	67	131	9.0	65	131	8.7	62	130	8.4
2600	20	70	134	9.4	68	134	9.0	65	133	8.8
	19	65	129	8.8	63	128	8.5	61	128	8.2
	18	60	123	8.2	58	123	7.9	56	121	7.7
2500	20	68	132	9.1	66	132	8.8	63	131	8.5
	19	63	127	8.5	61	126	8.3	59	125	8.0
	18	58	121	8.0	56	120	7.7	54	119	7.5
	17	54	115	7.4	52	113	7.2	50	110	7.0
2400	20	66	130	8.9	63	129	8.6	61	129	8.3
	19	61	124	8.3	59	124	8.0	57	123	7.8
	18	56	119	7.7	54	118	7.5	52	115	7.3
	17	52	112	7.2	50	110	7.0	48	107	6.8
2300	20	64	127	8.6	61	127	8.3	59	126	8.0
	19	59	122	8.0	57	121	7.8	55	119	7.5
	18	54	116	7.5	52	114	7.3	51	112	7.1
	17	50	109	7.0	48	106	6.8	46	103	6.6
2200	20	61	125	8.3	59	124	8.0	57	123	7.8
	19	57	119	7.8	55	118	7.5	53	116	7.3
	18	52	113	7.3	50	111	7.0	49	108	6.9
2100	20	59	122	8.0	57	121	7.8	55	119	7.5
	19	55	116	7.5	52	115	7.3	51	112	7.1
	18	50	110	7.0	48	107	6.8	47	104	6.6

Figure 5-7. Cruise Performance (Sheet 5 of 6)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 12,000 FEET**

CONDITIONS:  
2650 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2700	19	69	135	9.3	67	135	9.0	64	134	8.7
	18	64	130	8.7	62	129	8.4	60	128	8.1
2600	19	67	133	9.0	65	133	8.7	63	132	8.5
	18	62	128	8.4	60	127	8.2	58	125	7.9
	17	57	121	7.8	55	120	7.6	53	117	7.4
2500	19	65	131	8.8	63	131	8.5	61	130	8.3
	18	61	126	8.2	58	125	8.0	56	123	7.7
	17	56	119	7.6	54	117	7.4	52	115	7.2
	16	51	112	7.1	49	108	6.9	47	104	6.7
2400	19	63	129	8.6	61	128	8.3	59	127	8.0
	18	59	123	7.8	56	122	7.7	54	120	7.5
	17	54	117	7.4	52	114	7.2	50	111	7.0
	16	49	108	6.9	47	105	6.7	46	100	6.5
2300	19	61	126	8.3	59	125	8.0	57	124	7.8
	18	57	120	7.8	54	119	7.5	53	116	7.3
	17	52	113	7.2	50	111	7.0	48	107	6.8
2200	19	59	124	8.1	57	123	7.8	55	121	7.6
	18	55	118	7.5	53	115	7.3	51	112	7.1
	17	50	110	7.0	48	107	6.8	46	103	6.6
2100	19	57	121	7.8	55	119	7.5	53	117	7.3
	18	52	114	7.3	50	112	7.1	49	108	6.9
	17	48	106	6.8	46	102	6.6	45	98	6.4

Figure 5-7. Cruise Performance (Sheet 6 of 6)

**RANGE PROFILE**  
**45 MINUTES RESERVE**  
**44 GALLONS USABLE FUEL**

CONDITIONS:  
2650 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 8000 feet and maximum climb above 8000 feet.

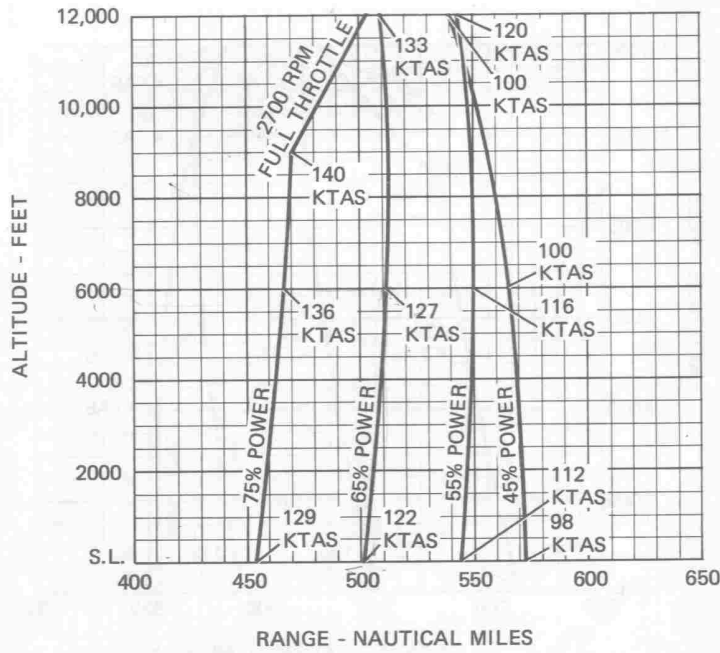


Figure 5-8. Range Profile (Sheet 1 of 2)

### RANGE PROFILE 45 MINUTES RESERVE 62 GALLONS USABLE FUEL

CONDITIONS:  
2650 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 8000 feet and maximum climb above 8000 feet.

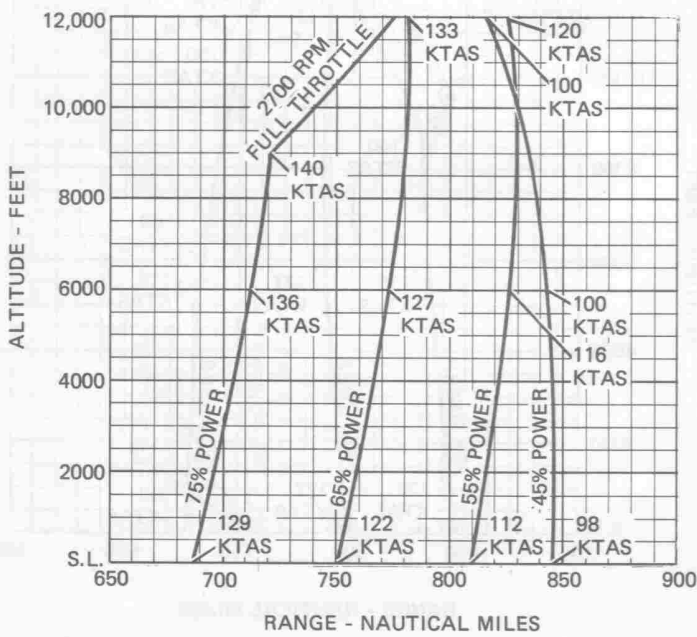


Figure 5-8. Range Profile (Sheet 2 of 2)

# ENDURANCE PROFILE

45 MINUTES RESERVE  
44 GALLONS USABLE FUEL

CONDITIONS:  
2650 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 8000 feet and maximum climb above 8000 feet.

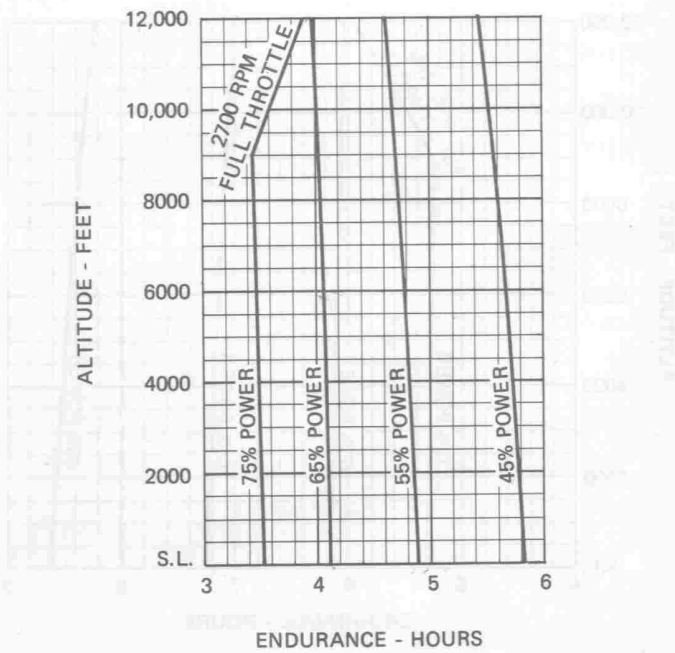


Figure 5-9. Endurance Profile (Sheet 1 of 2)



### ENDURANCE PROFILE 45 MINUTES RESERVE 62 GALLONS USABLE FUEL

CONDITIONS:  
2650 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 8000 feet and maximum climb above 8000 feet.

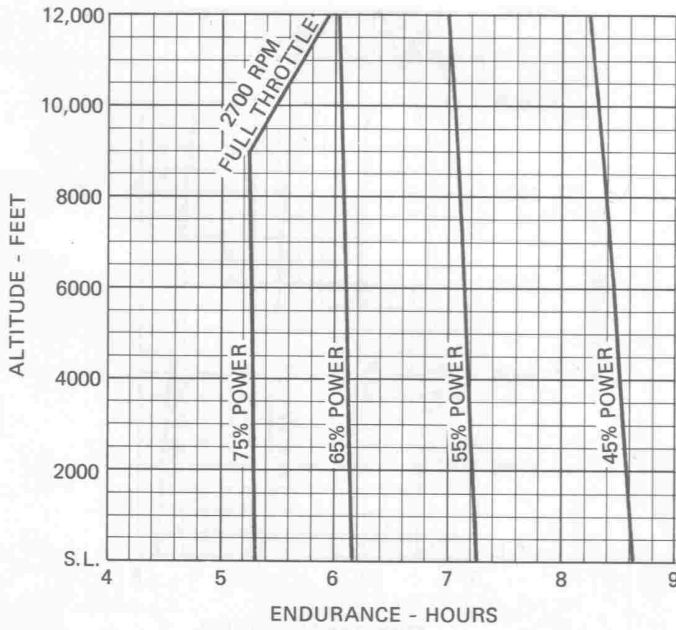


Figure 5-9. Endurance Profile (Sheet 2 of 2)

**LANDING DISTANCE**

**SHORT FIELD**

40  
6.962

**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 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the "ground roll" figure.

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
2650	63	S.L.	590	1290	615	1325	635	1355	660	1390	680	1425
		1000	615	1325	635	1355	660	1395	680	1425	705	1460
		2000	635	1355	660	1395	685	1430	705	1465	730	1500
		3000	660	1395	685	1430	710	1470	735	1505	760	1545
		4000	685	1430	710	1470	735	1510	760	1545	785	1585
		5000	710	1470	740	1515	765	1550	790	1590	815	1630
		6000	740	1515	765	1555	795	1595	820	1635	850	1680
		7000	770	1560	795	1600	825	1645	855	1685	880	1725
8000	800	1605	825	1645	855	1690	885	1735	915	1780		

Figure 5-10. Landing Distance