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 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 at all altitudes. 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 and to flight plan in a conservative manner.

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. Assume the following information has already been determined:

AIRPLANE CONFIGURATION:	
Takeoff weight	3100 Pounds
Usable fuel	88.0 Gallons
TAKEOFF CONDITIONS	
Field pressure altitude	1500 Feet
Temperature	28°C
Wind component along runway	12 Knot Headwind
Field length	3500 Feet

CRUISE CONDITIONS:

Total distance	450 Nautical Miles
Pressure altitude	7500 Feet
Temperature	16°
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 5-5, should be consulted, keeping in mind that 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 3100 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1055 Feet
Total distance to clear a 50-foot obstacle	2035 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	1055
Decrease in ground roll (1055 feet X 13%)	-137
Corrected ground roll	918 Feet

Total distance to clear a 50-foot obstacle, zero wind	2035
Decrease in total distance (2035 feet X 13%)	-265
Corrected total distance to clear 50-foot obstacle	1770 Feet

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A typical 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 5-9, the range profile chart presented in Figure 5-10, and the endurance profile chart presented in Figure 5-11.

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 60% will be used.

The cruise performance chart, Figure 5-9, is entered at 8000 feet altitude and 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions. The engine speed chosen is 2400 RPM and 21 inches of manifold pressure, which results in the following:

Power	60%
True airspeed	127 Knots
Cruise fuel flow	10.4 GPH

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in Figure 5-8 and Figure 5-9. For this sample problem, Figure 5-8 shows that a normal climb from 2000 feet to 8000 feet requires 2.7 gallons of fuel. The corresponding distance during the climb is 18 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:

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

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

Fuel to climb, standard temperature	2.7
Increase due to non-standard temperature (2.7 X 16%)	0.4
Corrected fuel to climb	3.1 Gallons

Using a similar procedure for the distance to climb results in 21 nautical miles.

The resultant cruise distance is:

Total distance	450
Climb distance	-21
Cruise distance	429
	Nautical Miles

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

$$\begin{array}{r} 127 \\ -10 \\ \hline 117 \text{ Knots} \end{array}$$

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

$$\frac{429 \text{ Nautical Miles}}{117 \text{ Knots}} = 3.7 \text{ Hours}$$

The fuel required for cruise is:

$$3.7 \text{ hours} \times 10.4 \text{ gallons/hour} = 38.5 \text{ Gallons}$$

A 45-minute reserve requires:

$$\frac{45}{60} \times 10.4 \text{ gallons / hour} = 7.8 \text{ Gallons}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.7
Climb	3.1
Cruise	38.5
Reserve	7.5
Total fuel required	50.8 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 5-11 presents landing distance information for the short field technique. The distances corresponding to 2000 feet and 30°C are as follows:

Ground roll	540 Feet
Total distance to clear a 50-foot obstacle	1280 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

CONDITION:

Power required for level flight or maximum power descent.

FLAPS UP												
KIAS	55	60	70	80	90	100	110	120	130	140	150	160
KCAS	62	65	73	82	90	100	109	118	127	137	146	156
FLAPS 20°												
KIAS	40	50	60	70	80	90	100	110	120	- - -	- - -	- - -
KCAS	53	58	64	72	81	91	100	110	119	- - -	- - -	- - -
FLAPS FULL												
KIAS	40	50	60	70	80	90	95	- - -	- - -	- - -	- - -	- - -
KCAS	51	56	64	72	81	91	95	- - -	- - -	- - -	- - -	- - -

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

AIRSPEED CALIBRATION

ALTERNATE STATIC SOURCE

NOTE:

Windows closed, ventilators closed, cabin heater, cabin air, and defroster on maximum.

CONDITION:

Power required for level flight or maximum power descent.

FLAPS UP											
KIAS	60	70	80	90	100	110	120	130	140	150	160
ALT KIAS	62	72	82	92	103	114	124	133	143	153	164
FLAPS 20°											
KIAS	50	60	70	80	90	100	110	120	---	---	---
ALT KIAS	50	60	70	81	92	102	112	121	---	---	---
FLAPS FULL											
KIAS	50	60	70	80	90	95	---	---	---	---	---
ALT KIAS	43	57	68	79	89	93	---	---	---	---	---

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

ALTIMETER CORRECTION

ALTERNATE STATIC SOURCE

NOTE:

Add correction to desired altitude to obtain indicated altitude to fly.
Windows closed, ventilators closed, cabin heater, cabin air, and defroster on maximum.

CONDITIONS:

Power required for level flight or maximum power descent cruise configuration. Altimeter corrections for the takeoff and landing configuration are less than 50 feet.

CONDITION FLAPS UP	CORRECTION TO BE ADDED-FEET KIAS - alternate static source **ON**					
	60	80	100	120	140	160
S.L.	20	-10	-30	-60	-90	-120
2000 ft.	20	-10	-30	-60	-90	-130
4000 ft.	20	-10	-30	-70	-100	-140
6000 ft.	30	-10	-40	-70	-110	-140
8000 ft.	30	-10	-40	-80	-110	-150
10,000 ft.	30	-10	-40	-80	-120	-160
12,000 ft.	30	-10	-40	-80	-120	-170
14,000 ft.	30	-10	-50	-90	-120	-180

Figure 5-2. Altimeter Correction

TEMPERATURE CONVERSION CHART

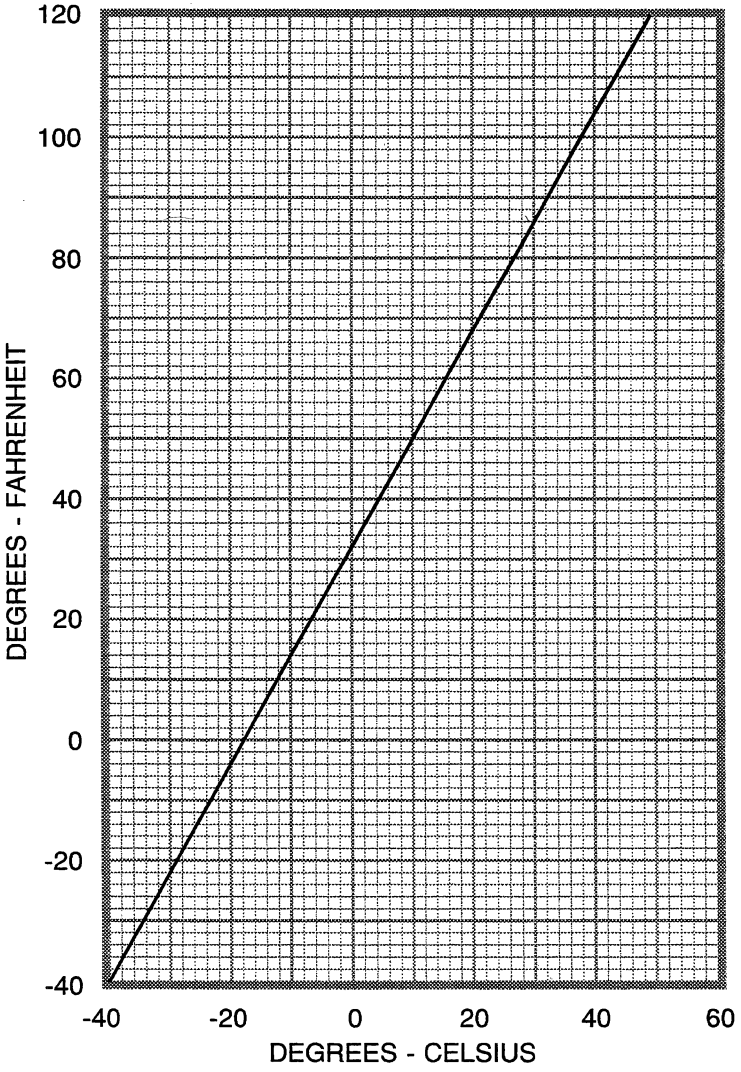

Figure 5-3. Temperature Conversion Chart

STALL SPEEDS AT 3100 POUNDS

Conditions:
Power Off

MOST REARWARD CENTER OF GRAVITY

FLAP SETTING	ANGLE OF BANK							
	0°		30°		45°		60°	
	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	40	54	43	58	48	64	57	76
20°	29	50	31	54	34	59	41	71
FULL	35	49	38	53	42	58	49	69

MOST FORWARD CENTER OF GRAVITY

FLAP SETTING	ANGLE OF BANK							
	0°		30°		45°		60°	
	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
UP	43	56	46	60	51	67	61	79
20°	35	52	38	56	42	62	49	74
FULL	36	50	39	54	43	59	51	71

NOTES:

1. Altitude loss during a stall recovery may be as much as 250 feet.
2. KIAS values are approximate.

Figure 5-4. Stall Speeds

WIND COMPONENTS

NOTE:
Maximum demonstrated crosswind velocity is 15 knots (not a limitation).

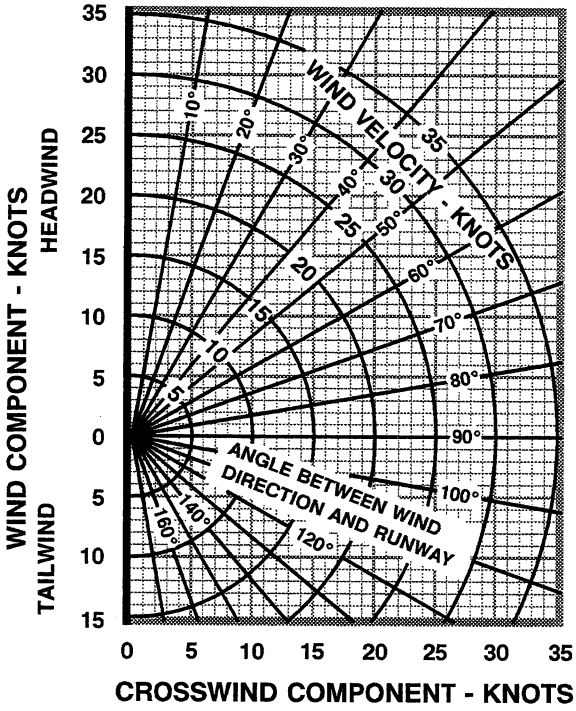

Figure 5-5. Crosswind Components

SHORT FIELD TAKEOFF DISTANCE AT 3100 POUNDS

CONDITIONS:

Flaps 20°
2400 RPM, Full Throttle and Mixture Set Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind
Lift Off: 49 KIAS
Speed at 50 Ft: 58 KIAS

Press Alt In Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S. L.	715	1365	765	1460	825	1570	885	1680	945	1800
1000	775	1490	835	1600	900	1720	965	1845	1030	1980
2000	850	1635	915	1760	980	1890	1055	2035	1130	2190
3000	925	1800	995	1940	1070	2090	1150	2255	1235	2435
4000	1015	1990	1090	2150	1175	2325	1260	2515	1355	2720
5000	1110	2210	1195	2395	1290	2595	1385	2820	1485	3070
6000	1220	2470	1315	2690	1415	2930	1520	3200	1635	3510
7000	1340	2785	1445	3045	1560	3345	1675	3685	---	---
8000	1480	3175	1595	3500	1720	3880	---	---	---	---

NOTES:

1. Short field technique as specified in Section 4.
2. Prior to takeoff, the mixture should be leaned to the climb schedule in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
5. Where distance value has been deleted, climb performance is minimal.

Figure 5-6. Short Field Takeoff Distance (Sheet 1 of 3)

SHORT FIELD TAKEOFF DISTANCE AT 2700 POUNDS

CONDITIONS:

Flaps 20°
2400 RPM, Full Throttle and Mixture Set Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind
Lift Off: 45 KIAS
Speed at 50 Ft: 54 KIAS

Press Alt In Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S. L.	520	995	560	1065	600	1135	645	1215	690	1295
1000	565	1080	610	1155	655	1235	700	1320	750	1410
2000	615	1180	665	1260	710	1350	765	1445	820	1545
3000	675	1285	725	1380	775	1480	835	1585	895	1695
4000	735	1410	790	1510	850	1625	910	1740	975	1870
5000	805	1550	865	1665	930	1790	1000	1920	1070	2065
6000	880	1705	950	1840	1020	1980	1095	2135	1175	2300
7000	965	1890	1040	2040	1120	2205	1200	2380	1290	2575
8000	1060	2100	1145	2275	1230	2465	1320	2675	1420	2910

NOTES:

1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 5000 feet elevation, the mixture should be leaned to the climb schedule in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.

Figure 5-6. Short Field Takeoff Distance (Sheet 2 of 3)

SHORT FIELD TAKEOFF DISTANCE AT 2300 POUNDS

CONDITIONS:

Flaps 20°
2400 RPM, Full Throttle and Mixture Set Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind
Lift Off: 42 KIAS
Speed at 50 Ft: 50 KIAS

Press Alt In Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S. L.	365	705	390	750	420	800	450	850	480	905
1000	395	765	425	815	455	870	490	925	520	985
2000	430	830	460	885	495	940	530	1005	565	1070
3000	470	900	505	960	540	1025	580	1090	620	1165
4000	510	980	550	1045	590	1115	630	1190	675	1270
5000	555	1065	600	1140	640	1220	690	1305	735	1390
6000	610	1165	655	1250	700	1335	755	1430	805	1530
7000	665	1275	715	1370	770	1470	825	1570	885	1685
8000	730	1405	785	1510	845	1620	905	1735	970	1865

NOTES:

1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 5000 feet elevation, the mixture should be leaned to the climb schedule in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.

Figure 5-6. Short Field Takeoff Distance (Sheet 3 of 3)

MAXIMUM RATE-OF-CLIMB AT 3100 POUNDS

CONDITIONS:

Flaps Up
2400 RPM, Full Throttle, Mixture Set to Climb Schedule
Cowl Flaps Open

PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
		-20°C	0°C	20°C	40°C
S.L.	80	1055	980	905	835
2000	79	945	875	805	735
4000	78	840	770	705	635
6000	77	735	670	605	535
8000	75	625	560	495	430
10,000	74	520	455	390	330
12,000	73	410	350	285	225
14,000	72	310	250	190	130

Figure 5-7. Maximum Rate of Climb

TIME, FUEL AND DISTANCE TO CLIMB AT 3100 POUNDS

MAXIMUM RATE OF CLIMB

CONDITIONS:

Flaps Up
2400 RPM, Full Throttle, Mixture Set to Climb Schedule
Cowl Flaps Open
Standard Temperature

PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
			TIME IN MIN	FUEL USED GAL	DIST NM
S.L.	80	925	0	0.0	0
2000	79	835	2	0.8	3
4000	78	750	5	1.5	7
6000	77	660	8	2.3	11
8000	75	565	11	3.2	16
10,000	74	470	15	4.2	21
12,000	73	375	20	5.2	29
14,000	72	285	26	6.5	38

NOTES:

1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned to climb schedule for smooth engine operation and increased power.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

Figure 5-8. Time, Fuel and Distance to Climb (Sheet 1 of 2)

TIME, FUEL AND DISTANCE TO CLIMB AT 3100 POUNDS

NORMAL CLIMB - 90 KIAS

CONDITIONS:

Flaps Up
2400 RPM, 23 in. Hg. or Full Throttle (whichever is less), Mixture 15 GPH or Full Rich (whichever is less)
Cowl Flaps As Required.
Standard Temperature

PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
			TIME IN MIN	FUEL USED GAL	DIST NM
S.L.	90	665	0	0.0	0
2000	90	625	3	0.8	5
4000	90	580	6	1.6	10
6000	90	540	10	2.5	16
8000	90	455	14	3.5	23
10,000	90	370	19	4.6	31

NOTES:

1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned to climb schedule for smooth engine operation and increased power.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

Figure 5-8. Time, Fuel and Distance to Climb (Sheet 2 of 2)

CRUISE PERFORMANCE
PRESSURE ALTITUDE SEA LEVEL

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE: Maximum cruise power is 80% MCP. Those powers above that value in the table are for interpolation purposes only.

RPM	MP	20°C BELOW STANDARD TEMP -5°C			STANDARD TEMPERATURE 15°C			20°C ABOVE STANDARD TEMP 35°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	27	---	---	---	82	133	13.7	76	132	12.7
	26	---	---	---	78	131	13.0	72	129	12.1
	25	80	129	13.3	73	128	12.3	68	126	11.5
	24	75	126	12.6	69	125	11.7	64	123	10.9
	23	70	123	11.9	65	122	11.0	60	119	10.3
	22	66	120	11.2	61	117	10.4	56	116	9.8
	21	61	116	10.5	57	114	9.9	52	112	9.3
	20	57	112	9.9	53	110	9.3	49	107	8.7
2300	27	---	---	---	79	132	13.2	73	130	12.2
	26	81	130	13.6	75	129	12.5	69	127	11.6
	25	77	127	12.8	71	126	11.9	65	124	11.1
	24	72	124	12.2	67	123	11.3	62	120	10.6
	23	68	121	11.5	63	119	10.7	58	117	10.0
	22	64	118	10.9	59	116	10.2	54	114	9.5
	21	59	114	10.2	55	112	9.6	51	110	9.0
	20	55	110	9.6	51	108	9.0	47	105	8.5
2200	27	82	131	13.7	76	129	12.7	70	128	11.8
	26	78	128	13.0	72	127	12.1	66	125	11.2
	25	74	125	12.4	68	124	11.5	63	121	10.7
	24	70	122	11.7	64	121	10.9	59	119	10.2
	23	66	119	11.1	60	117	10.4	56	115	9.7
	22	61	116	10.5	57	114	9.9	52	112	9.3
	21	57	112	10.0	53	110	9.3	49	108	8.8
	20	53	109	9.4	49	106	8.8	45	103	8.3

Figure 5-9. Cruise Performance (Sheet 1 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE SEA LEVEL

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE: Maximum cruise power is 80% MCP. Those powers above that value in the table are for interpolation purposes only.

RPM	MP	20°C BELOW STANDARD TEMP -5°C			STANDARD TEMPERATURE 15°C			20°C ABOVE STANDARD TEMP 35°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2100	27	78	128	13.0	72	127	12.1	66	125	11.3
	26	74	126	12.4	68	124	11.5	63	122	10.8
	25	70	123	11.8	65	121	11.0	60	119	10.3
	24	66	120	11.2	61	118	10.5	56	116	9.8
	23	62	117	10.7	58	115	10.0	53	112	9.4
	22	58	113	10.1	54	111	9.5	50	109	8.9
	21	55	110	9.6	50	108	9.0	47	105	8.4
2000	27	74	126	12.4	68	124	11.5	63	122	10.8
	26	70	123	11.8	65	122	11.0	60	119	10.3
	25	67	120	11.3	61	118	10.5	57	116	9.9
	24	63	118	10.7	58	115	10.0	54	113	9.4
	23	59	114	10.2	55	112	9.6	50	110	9.0
	22	56	111	9.7	51	109	9.1	47	106	8.5
	21	52	107	9.2	48	105	8.6	44	101	8.1

Figure 5-9. Cruise Performance (Sheet 2 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 2000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE: Maximum cruise power is 80% MCP. Those powers above that value in the table are for interpolation purposes only.

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
2400	26	---	---	---	80	135	13.4	74	133	12.4
	25	82	133	13.8	76	132	12.7	70	130	11.8
	24	78	130	13.0	71	129	12.0	66	126	11.2
	23	73	127	12.3	67	126	11.4	62	123	10.6
	22	68	124	11.6	63	121	10.8	58	119	10.1
	21	64	120	10.9	59	118	10.2	54	115	9.5
	20	59	116	10.2	55	114	9.6	50	111	9.0
2300	26	---	---	---	77	132	12.9	71	131	12.0
	25	79	131	13.2	73	130	12.2	67	128	11.4
	24	75	128	12.5	69	127	11.6	64	124	10.8
	23	70	125	11.8	65	123	11.0	60	121	10.3
	22	66	122	11.2	61	119	10.4	56	117	9.8
	21	62	118	10.6	57	116	9.9	52	113	9.3
	20	57	114	9.9	53	112	9.3	49	109	8.7
2200	26	80	132	13.4	74	130	12.4	68	129	11.5
	25	76	129	12.7	70	128	11.8	65	125	11.0
	24	72	126	12.1	66	125	11.2	61	122	10.5
	23	68	123	11.4	62	121	10.7	58	119	10.0
	22	64	120	10.8	59	118	10.1	54	115	9.5
	21	59	116	10.2	55	114	9.6	51	111	9.0
	20	55	112	9.7	51	110	9.0	47	106	8.5

Figure 5-9. Cruise Performance (Sheet 3 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 2000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE: Maximum cruise power is 80% MCP. Those powers above that value in the table are for interpolation purposes only.

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
2100	26	76	129	12.8	70	128	11.8	65	125	11.0
	25	72	126	12.1	67	125	11.3	62	123	10.5
	24	68	124	11.5	63	121	10.8	58	119	10.1
	23	64	121	11.0	59	118	10.2	55	116	9.6
	22	60	117	10.4	56	115	9.7	51	112	9.1
	21	56	114	9.8	52	111	9.2	48	108	8.7
	20	53	110	9.3	48	107	8.7	45	103	8.2
2000	26	72	126	12.2	67	125	11.3	62	123	10.6
	25	69	124	11.6	63	122	10.8	58	120	10.1
	24	65	121	11.0	60	119	10.3	55	116	9.7
	23	61	117	10.5	56	115	9.8	52	113	9.2
	22	57	114	10.0	53	112	9.3	49	109	8.8
	21	54	111	9.4	49	108	8.8	46	104	8.3

Figure 5-9. Cruise Performance (Sheet 4 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 4000 FEET

CONDITIONS:

•3100 Pounds •Recommended Lean Mixture •Cowl Flaps Closed

NOTE: Maximum cruise power is 80% MCP. Those powers above that value in the table are for interpolation purposes only.

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
2400	25	---	---	---	78	136	13.1	72	134	12.1
	24	80	134	13.4	74	133	12.4	68	130	11.5
	23	75	131	12.7	69	130	11.7	64	127	10.9
	22	71	128	11.9	65	125	11.1	60	123	10.4
	21	66	124	11.2	61	122	10.5	56	119	9.8
	20	61	120	10.5	57	118	9.9	52	115	9.2
2300	25	81	135	13.6	75	133	12.6	69	132	11.7
	24	77	132	12.9	71	131	12.0	66	128	11.1
	23	73	129	12.2	67	127	11.3	62	125	10.6
	22	68	126	11.5	63	123	10.7	58	121	10.1
	21	64	122	10.9	59	120	10.2	54	117	9.5
	20	59	118	10.2	55	115	9.6	50	113	9.0
2200	25	78	133	13.1	72	131	12.1	67	129	11.3
	24	74	130	12.4	68	128	11.5	63	126	10.8
	23	70	127	11.8	64	124	10.9	59	122	10.2
	22	66	124	11.1	60	121	10.4	56	119	9.7
	21	61	119	10.5	57	117	9.8	52	115	9.2
	20	57	116	9.9	53	113	9.3	49	110	8.7
2100	25	74	130	12.5	68	129	11.6	63	126	10.8
	24	70	127	11.9	65	125	11.0	60	123	10.3
	23	66	124	11.2	61	122	10.5	56	119	9.8
	22	62	120	10.7	57	118	10.0	53	116	9.4
	21	58	117	10.1	54	115	9.5	50	111	8.9
	20	54	113	9.5	50	111	8.9	46	106	8.4
2000	25	71	127	11.9	65	125	11.0	60	123	10.3
	24	67	125	11.3	61	122	10.5	57	120	9.9
	23	63	121	10.8	58	119	10.1	54	116	9.4
	22	59	118	10.2	55	115	9.6	50	112	9.0
	21	55	114	9.7	51	112	9.1	47	108	8.5

Figure 5-9. Cruise Performance (Sheet 5 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 6000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

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
2400	23	78	135	13.0	72	134	12.1	66	131	11.2
	22	73	132	12.3	67	129	11.4	62	127	10.6
	21	68	128	11.6	63	126	10.8	58	123	10.1
	20	64	123	10.9	59	121	10.1	54	119	9.5
	19	59	120	10.2	54	117	9.5	50	113	8.9
2300	23	75	133	12.6	69	131	11.6	64	129	10.9
	22	70	130	11.9	65	127	11.0	60	125	10.3
	21	66	126	11.2	61	124	10.4	56	121	9.8
	20	61	122	10.5	57	119	9.8	52	116	9.2
	19	57	117	9.9	52	115	9.3	48	111	8.7
2200	23	72	131	12.1	66	128	11.2	61	126	10.5
	22	68	127	11.4	62	125	10.7	58	122	10.0
	21	63	123	10.8	58	121	10.1	54	119	9.5
	20	59	120	10.2	54	117	9.5	50	114	9.0
	19	55	115	9.6	51	112	9.0	47	108	8.4
2100	23	68	128	11.6	63	126	10.8	58	123	10.1
	22	64	124	10.9	59	122	10.2	55	119	9.6
	21	60	121	10.4	56	118	9.7	51	115	9.1
	20	56	117	9.8	52	114	9.2	48	110	8.6
	19	52	112	9.2	48	109	8.6	44	104	8.1
2000	23	65	125	11.0	60	123	10.3	55	120	9.6
	22	61	121	10.5	56	119	9.8	52	116	9.2
	21	57	118	9.9	53	115	9.3	49	111	8.7
	20	53	114	9.4	49	110	8.8	45	106	8.3
	19	50	109	8.9	46	105	8.3	42	99	7.8

Figure 5-9. Cruise Performance (Sheet 6 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 8000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

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
2400	21	71	132	11.9	65	130	11.1	60	127	10.4
	20	66	127	11.2	61	125	10.4	56	123	9.8
	19	61	124	10.5	56	121	9.8	52	117	9.2
	18	56	119	9.8	52	116	9.2	48	111	8.6
2300	21	68	130	11.5	63	127	10.7	58	125	10.0
	20	64	126	10.8	58	123	10.1	54	120	9.5
	19	59	121	10.2	54	119	9.5	50	115	8.9
	18	54	117	9.5	50	113	8.9	46	108	8.4
2200	21	65	127	11.1	60	125	10.4	56	122	9.7
	20	61	123	10.5	56	121	9.8	52	117	9.2
	19	57	119	9.9	52	116	9.2	48	111	8.7
	18	52	114	9.3	48	110	8.7	45	104	8.1
2100	21	62	124	10.6	57	122	9.9	53	118	9.3
	20	58	120	10.1	53	118	9.4	49	113	8.8
	19	54	116	9.5	50	113	8.9	46	108	8.3
	18	50	111	8.9	46	107	8.3	42	99	7.8
2000	21	59	121	10.2	54	119	9.5	50	115	8.9
	20	55	117	9.6	51	114	9.0	47	109	8.5
	19	51	113	9.1	47	109	8.5	43	102	8.0

Figure 5-9. Cruise Performance (Sheet 7 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

RPM	MP	20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	20	68	132	11.5	63	130	10.7	58	127	10.0
	19	63	128	10.8	58	125	10.1	54	121	9.5
	18	59	123	10.1	54	120	9.5	50	115	8.9
2300	20	66	130	11.1	60	127	10.4	56	124	9.7
	19	61	125	10.5	56	123	9.8	52	118	9.2
	18	56	120	9.8	52	117	9.2	48	112	8.6
2200	20	63	127	10.8	58	125	10.0	53	121	9.4
	19	59	123	10.1	54	120	9.5	50	115	8.9
	18	54	118	9.5	50	114	8.9	46	108	8.4
2100	20	60	124	10.3	55	121	9.6	51	117	9.0
	19	56	120	9.7	51	116	9.1	47	111	8.5
	18	52	115	9.1	47	110	8.6	44	102	8.0
2000	20	57	121	9.9	52	117	9.2	48	113	8.7
	19	53	117	9.3	49	112	8.7	45	105	8.2
	18	49	111	8.8	45	106	8.2	42	97	7.7

Figure 5-9. Cruise Performance (Sheet 8 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

RPM	MP	20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	18	61	127	10.4	56	124	9.7	51	119	9.1
	17	56	122	9.7	51	117	9.1	47	111	8.5
	16	51	115	9.0	47	110	8.5	43	101	7.9
2300	18	58	124	10.1	54	121	9.4	49	116	8.8
	17	54	119	9.4	49	114	8.8	45	106	8.3
	16	49	112	8.8	45	105	8.2	41	99	7.7
2200	18	56	122	9.8	52	118	9.1	48	111	8.6
	17	52	116	9.1	47	111	8.6	44	102	8.0
2100	18	53	119	9.4	49	114	8.8	45	106	8.2
	17	49	112	8.8	45	106	8.2	42	99	7.7
2000	18	51	115	9.0	46	109	8.4	43	100	7.9

Figure 5-9. Cruise Performance (Sheet 9 of 10)

CRUISE PERFORMANCE
PRESSURE ALTITUDE 14,000 FEET

CONDITIONS:

3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

RPM	MP	20°C BELOW STANDARD TEMP -33°C			STANDARD TEMPERATURE -13°C			20°C ABOVE STANDARD TEMP 7°C		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	16	53	119	9.3	48	114	8.7	45	104	8.2
	15	48	111	8.6	44	102	8.0	40	99	7.5
2300	16	51	116	9.0	47	109	8.5	43	102	7.9
2200	16	49	113	8.8	45	105	8.2	41	100	7.7
2100	16	46	109	8.4	43	100	7.9	39	98	7.4

Figure 5-9. Cruise Performance (Sheet 10 of 10)

RANGE PROFILE
45 MINUTES RESERVE
65 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Maximum Performance Climb with Placard Mixture
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, cruise at the designated power, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

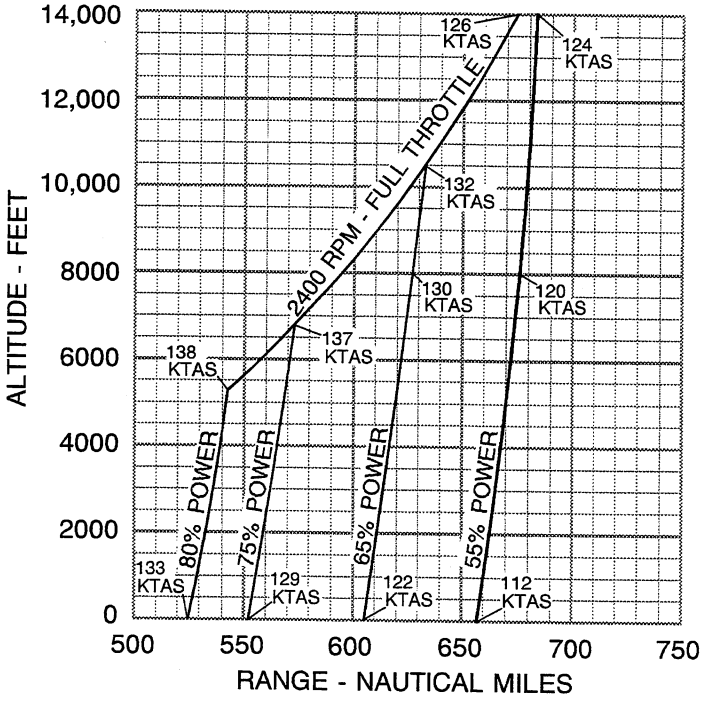

Figure 5-10. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
88 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Maximum Performance Climb with Placard Mixture
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, cruise at the designated power, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

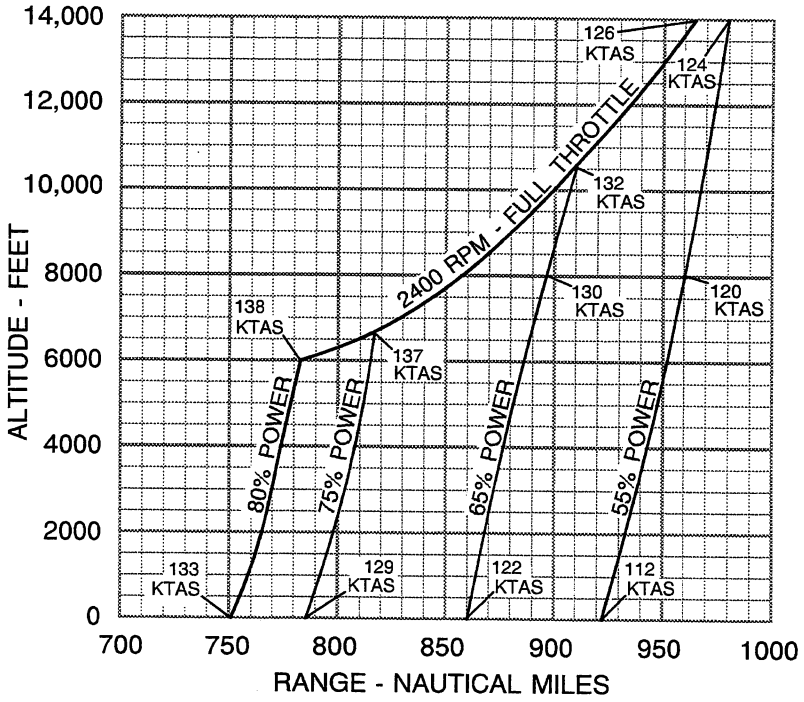

Figure 5-10. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
65 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Maximum Performance Climb with Placard Mixture
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, cruise at the designated power, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

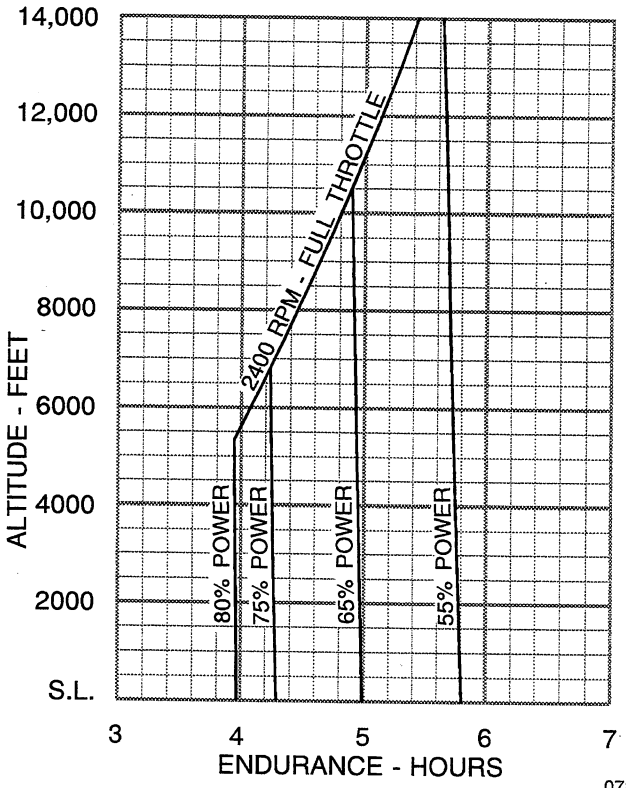

Figure 5-11. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
88 GALLONS USABLE FUEL

CONDITIONS:
3100 Pounds
Maximum Performance Climb with Placard Mixture
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, cruise at the designated power, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

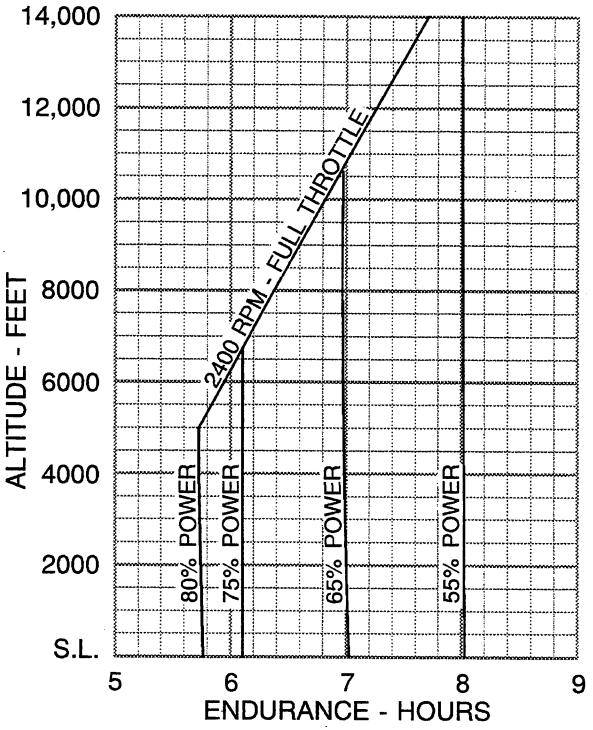

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Figure 5-11. Endurance Profile (Sheet 2 of 2)

SHORT FIELD LANDING DISTANCE AT 2950 POUNDS

CONDITIONS:

Flaps FULL
Power Off
Maximum Braking
Paved, level, dry runway
Zero Wind
Speed at 50 Ft: 60 KIAS

Press Alt In Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S. L.	560	1300	580	1335	600	1365	620	1400	640	1435
1000	580	1265	600	1365	620	1400	645	1440	665	1475
2000	600	1370	625	1405	645	1440	670	1480	690	1515
3000	625	1410	645	1445	670	1485	695	1525	715	1560
4000	650	1450	670	1485	695	1525	720	1565	740	1600
5000	670	1485	695	1525	720	1565	745	1610	770	1650
6000	700	1530	725	1575	750	1615	775	1660	800	1700
7000	725	1575	750	1615	780	1665	805	1710	830	1750
8000	755	1625	780	1655	810	1715	835	1760	865	1805

NOTES:

1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on dry, grass runway, increase distances by 45% of the "ground roll" figure.
4. If a landing with flaps up is necessary, increase the approach speed by 10 KIAS and allow for 40% longer distances.

Figure 5-12. Short Field Landing Distance