SECTION 5
PERFORMANCE

TABLE OF CONTENTS **Page**

INTENTIONALLY LEFT BLANK

INTRODUCTION

Section 5 presents performance data charts to indicate the expected airplane performance under various ambient and field conditions. It also provides general guidelines for flight planning with reasonable accuracy. Performance data is presented for takeoff, climb, cruise and landing. The data in the charts has been prepared and derived from actual flight test with an airplane in good condition and using average piloting techniques.

The charts in this section provide data for ambient temperatures from -20°C (-4°F) to 40°C (104°F) unless specified otherwise. If the ambient temperature is below the chart value, use the lowest temperature on chart to compute performance. This will result in more conservative performance calculations. **If the ambient temperature is above the highest number on chart, use extreme caution as performance degrades rapidly at higher temperatures.**

FLIGHT PLANNING

The performance tables in this section provide sufficient information to predict airplane performance with reasonable accuracy. However, variables in fuel metering characteristic, engine and propeller condition, mixture leaning technique, air turbulence and other variables may account for variations of 10% or more. Therefore, selecting the most conservative values from the following charts provides an extra margin of safety and accounts for events that could occur during a flight.

INTENTIONALLY LEFT BLANK

HEIGHT LOSS IN STALLS

The height loss in a stall may be as much as 250 ft.

CONDITIONS FOR FULL USABLE FUEL

The full amount of usable fuel in each tank is available in normal level flight conditions.

INTENTIONALLY LEFT BLANK

USE OF PERFORMANCE CHARTS

The data contained in this section has been compiled from actual flight test evaluations of the airplane and powerplant while in good operating condition. All performance figures are based on average piloting techniques.

Fuel flow data for cruise assumes that the engine has been leaned to the *Recommended Lean Mixture Setting* at all altitudes. However, range and endurance may vary by as much as 10% because of variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and atmospheric turbulence. It is therefore important to use all available information to plan a particular flight, and to conservatively estimate the fuel required.

Performance data is presented in tabular 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 uses information from the various airplane performance charts and tables to determine the expected airplane performance for a typical flight.

The flight planning requires aircraft weight, centre of gravity, fuel information as well as information about the flight. For this following sample calculation, assume the information below has already been determined.

NOTE

The data in this section utilizes US gallons for fuel quantity.

Airplane Configurations

Takeoff Weight ..... 3800 pounds
Usable Fuel ..... 98.0 Gallons

Takeoff Conditions

Field Pressure Altitude ..... 1500 Feet
Temperature ..... 20°C (ISA + 8°C)
Wind Component along Runway ..... 10 Knots Headwind
Field Length ..... 4000 Feet

Cruise Conditions

Total Distance ..... 400 Nautical Miles
Pressure Altitude 8000ft
Temperature ..... 10°C (ISA + 11°C)
Expected Wind Enroute ..... 10 Knots Headwind

Landing Conditions

Field Pressure Altitude ..... 2000 Feet
Temperature ..... 20°C (ISA + 9°C)
Wind Component along Runway ..... 5 Knots Headwind
Field Length ..... 3500 Feet

TAKEOFF

The chart gives the Ground Roll = 935 feet for zero wind.
(Used interpolation between 1000ft and 2000ft takeoff distance data for 20°C. From Figure 5-7, 882 + (978 – 882) x 0.5 = 930 feet)
This is corrected for the headwind using 10% decrease per 9 knot headwind

% Decrease	= (10 / 9) x 10 = 11, giving
Distance correction	= - (11/100) x 930 = -102 feet
Giving:	
Corrected Ground Roll	= 930 - 102 = 828 feet

Similarly, the chart gives Total Distance to clear 50ft
= 1558 feet for zero wind
(From Figure 5-7, 1477 + (1638 – 1477) x 0.5 = 1558 feet)
This is corrected for the headwind by

% Decrease	= (10 / 9) x 10 = 11, giving
Correction	= - (11/100) x 1558 = - 171 feet
Giving:	
Corrected Total Distance	= 1558 - 171 = 1386 feet

The available field length is 4000 feet so ample distance is available for the takeoff.

CRUISE

The selection of cruise speed and altitude is done considering the available fuel, the distance to be covered and the time available. The selected cruise power setting will not usually exceed 75% if the engine is to be run at the recommended maximum lean conditions.

For the mission considered, the cruise performance chart, Figure 5-13, is entered at 8000 feet and 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions while they are still conservative since the actual cruise condition is ISA + 11°C. The engine power selected is a manifold pressure of 21 inches at 2400 rpm gives 63% power.

Cruise Speed	= 146 knots TAS and
Fuel Flow	= 16.8 gallons per hour.

FUEL REQUIRED

The total fuel required can be estimated using the climb information in Figure 5-12 combined with the cruise performance in Figure 5-13. For the example considered:

Allowances for start, taxi and takeoff
Fuel = 2.0 gallons

From Figure 5-12, the climb time, fuel and distance were estimated between 1000ft and 8000ft. These values most nearly correspond to the flight plan and are conservative.

Climb distance = 15 – 1 = 14 nautical miles
Climb fuel = 3.6 – 0.4 = 3.2 gallons
Climb time = 10 – 1 = 9 minutes

The effect of a higher temperature on climb performance is to increase the time, fuel and distance to climb. If climb conditions are non-standard day then the prescribed corrections of 10% penalty per 10°C increase are to be applied. For example, 20°C at 1500 feet in the takeoff condition is ISA + 8°C and would require 8% penalty.

Climb distance = 14 x 1.08 = 15.1 nautical miles
Climb fuel = 3.2 x 1.08 = 3.5 gallons
Climb time = 9 x 1.08 = 9.7 minutes

Cruise distance = 400 – 15.1 = 385 nautical miles
Ground speed = 146 – 10 = 136 knots
Cruise time = 385 / 136 = 2.8 hours
Cruise fuel = 2.8 x 16.8 = 47.6 gallons

Reserve fuel = 45 minutes continued cruise
= 0.75 x 16.8 = 12.6 gallons

Total fuel = 2.0 + 3.5 + 47.6 + 12.6
= 65.7 gallons

The usable fuel available is 98 gallons so the prescribed mission profile can be planned for the airplane. During the flight the ground speed and engine fuel flows should be checked and adjustments made to meet the mission with ample reserves.

LANDING

A similar procedure to the takeoff is taken for conservatively estimating landing performance at the destination. The landing performance information is presented in Figure 5-16.

The distances corresponding to conditions of 2000 feet altitude and 20°C are :

Ground Roll	= 655 feet, in zero wind.
Head Wind correction 10% reduction for 9 knots	
5 knots wind	= 5.6% reduction
	= - 655 x 5.6/100 = - 37 feet
Corrected Ground Roll	= 655 -37 = 618 feet

Total Distance to clear 50 feet	= 1591 feet in zero wind
Head Wind correction 10% reduction for 9 knots	
5 knots wind	= 5.6% reduction
	= -1591 x 5.6/100 = -89 feet
Corrected Total Distance	= 1591
	-89
	= 1502 feet

Given the available field length of 3500 feet there is ample margin available for landing the airplane at the destination.

AIRSPEED CALIBRATION

Normal Static Source

Conditions:

Power for level flight or maximum continuous, whichever is less

Example:

Conditions

Flaps	0 degree
Indicated Airspeed	120 KIAS
Calibrated Airspeed	119 KCAS

KIAS	KCAS		
	FLAPS	FLAPS	FLAPS
	0^o	20^o	30^o
60	-	59	59
70	70	69	69
80	80	78	78
90	89	88	88
100	99	98	98
110	109	107	107
120	119	117	117
130	128	-	-
140	138	-	-
150	148	-	-
160	158	-	-
170	167	-	-
180	177	-	-
190	187	-	-

* KCAS = Calibrated Airspeed in knots
* KIAS = Indicated Airspeed in knots with "zero" instrument error

Figure 5-1 Airspeed Calibration – Normal Static Source

AIRSPEED CALIBRATION

Alternate Static Source

Conditions:

Power for level flight or maximum continuous, whichever is less
Cabin Heater, Air & Defrost on maximum

Example:

Conditions

Flaps	0 degree
Indicated Airspeed	120 KIAS
Calibrated Airspeed	116 KCAS

KIAS	KCAS		
	FLAPS 0^o	FLAPS 20^o	FLAPS 30^o
60	-	61	61
70	69	70	70
80	78	79	79
90	87	88	88
100	96	97	97
110	105	107	107
120	115	116	116
130	124	-	-
140	133	-	-
150	142	-	-
160	151	-	-
170	160	-	-
180	169	-	-
190	179	-	-

* KCAS = Calibrated Airspeed in knots
* KIAS = Indicated Airspeed in knots with "zero" instrument error

Figure 5-2 Airspeed Calibration – Alternate Static Source

ALTITUDE CORRECTION

Conditions:

Power for level flight or maximum continuous, whichever is less

Example:

Flight Condition - Flap 0° & 120 KIAS
Desired Altitude = 6000 FT
Altitude correction = -16 FT
Altitude to fly = 5984 FT

KIAS	CORRECTION TO BE ADDED (ft)		
	FLAPS 0°	FLAPS 20°	FLAPS 30°
60	-	1	1
70	-2	-5	-5
80	-4	-11	-11
90	-7	-17	-17
100	-10	-23	-23
110	-13	-29	-29
120	-16	-35	-35
130	-18	-	-
140	-21	-	-
150	-24	-	-
160	-27	-	-
170	-30	-	-
180	-32	-	-
190	-35	-	-

* KIAS = Indicated Airspeed in knots with "zero" instrument error

Figure 5-3 Altitude Correction – Normal Static Source

ALTITUDE CORRECTION

Alternate Static Source

Conditions:

Power for level flight or maximum continuous, whichever is less

Example:

Condition

Flight Condition - Flap 0^o & 120 KIAS

Desired Altitude 6000 feet

Altitude Correction -12 feet

Altitude to fly 5988 feet

KIAS	CORRECTION TO BE ADDED (ft)		
	FLAPS 0^o	FLAPS 20^o	FLAPS 30^o
60	-	-23	-23
70	22	-19	-19
80	30	-15	-15
90	38	-10	-10
100	46	-6	-6
110	54	-2	-2
120	62	2	2
130	70	-	-
140	78	-	-
150	86	-	-
160	93	-	-
170	101	-	-
180	109	-	-
190	117	-	-

* KIAS = Indicated Airspeed in knots with "zero" instrument error

Figure 5-4 Altitude Correction – Alternate Static Source

TEMPERATURE CONVERSION

- To convert from Celsius(°C) to Fahrenheit(°F), the temperature in the shaded area represents in Celsius. The equivalent temperature in Fahrenheit is read to the right.

  Example: 20°C = 68°F

- To convert from Fahrenheit(°F) to Celsius(°C), the temperature in the shaded area represents in Fahrenheit. The equivalent temperature in Celsius is read to the right.

  Example: 50°F = 10°C

Temp. to Convert °C or °F			Temp. to Convert °C or °F			Temp. to Convert °C or °F		
°C	↔	°F	°C	↔	°F	°C	↔	°F
-46	-50	-58	-13	8	46	19	66	151
-44	-48	-54	-12	10	50	20	68	154
-43	-46	-51	-11	12	54	21	70	158
-42	-44	-47	-10	14	57	22	72	162
-41	-42	-44	-9	16	61	23	74	165
-40	-40	-40	-8	18	64	24	76	169
-39	-38	-36	-7	20	68	26	78	172
-38	-36	-33	-6	22	72	27	80	176
-37	-34	-29	-4	24	75	28	82	180
-36	-32	-26	-3	26	79	29	84	183
-34	-30	-22	-2	28	82	30	86	187
-33	-28	-18	-1	30	86	31	88	190
-32	-26	-15	0	32	90	32	90	194
-31	-24	-11	1	34	93	33	92	198
-30	-22	-8	2	36	97	34	94	201
-29	-20	-4	3	38	100	36	96	205
-28	-18	0	4	40	104	37	98	208
-27	-16	3	6	42	108	38	100	212
-26	-14	7	7	44	111	39	102	216
-24	-12	10	8	46	115	40	104	219
-23	-10	14	9	48	118	41	106	223
-22	-8	18	10	50	122	42	108	226
-21	-6	21	11	52	126	43	110	230
-20	-4	25	12	54	129	44	112	234
-19	-2	28	13	56	133	46	114	237
-18	0	32	14	58	136	47	116	241
-17	2	36	16	60	140	48	118	244
-16	4	39	17	62	144	49	120	248
-14	6	43	18	64	147	50	122	252

Figure 5-5 Temperature Conversion

STALL SPEED

Conditions:

Weight	3800 lb
C.G.	Most Fwd. CG
Power	Idle
Bank Angle	Noted

Example:

Flaps	Up
Bank Angle	30°
Stall Speed	60 KIAS
	64 KCAS

Flap Setting	0°		30°		45°		60°	
(deg)	(KIAS)	(KCAS)	(KIAS)	(KCAS)	(KIAS)	(KCAS)	(KIAS)	(KCAS)
0	56	60	60	64	67	71	81	85
20	51	55	55	59	61	65	74	78
30	50	54	54	58	60	64	72	76

Notes:

1. Altitude loss in the stall may be as much as 250ft.
2. KIAS values are approximate.

Figure 5-6 Stall Speeds

TAKEOFF DISTANCE

Conditions:

Weight	3800 lb
Flaps	20 degrees
Power	Full Throttle Prior to Brake Release, 2700RPM
Wind	0 knots
Liftoff Speed	63 kias
50ft Speed	67 kias
Runway	Paved, Level, Dry Runway

	0°C		10°C		20°C		30°C		40°C	
Pressure Altitude	GND. DIST.	TOTAL DIST.	GND. DIST.	TOTAL DIST.	GND. DIST.	TOTAL DIST.	GND. DIST.	TOTAL DIST.	GND. DIST.	TOTAL DIST.
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
0	706	1183	753	1260	799	1338	853	1429	907	1519
1000	776	1300	829	1388	882	1477	944	1581	1006	1685
2000	856	1434	917	1536	978	1638	1050	1758	1122	1878
3000	955	1599	1026	1719	1098	1838	1181	1978	1264	2118
4000	1071	1794	1156	1936	1241	2078	1339	2242	1437	2406
5000	1219	2041	1319	2210	1420	2378	1538	2575	1655	2772
6000	1400	2345	1521	2548	1643	2751	1787	2993	1931	3235
7000	1635	2738	1786	2991	1937	3243	2125	3559	2314	3875
8000	1940	3248	2133	3572	2326	3896	2583	4326	2840	4756
9000	2365	3960	2634	4412	2904	4863	3283	5499	3663	6134
10000	2973	4979	3376	5653	3778	6328	4398	7365	5017	8402

1. Head Wind - Decrease 10% from the table distances for each 9 knots headwind.
2. Tail Wind - Add 10% to the table distances for each 2 knots tailwind up to 10 knots
3. Grass Runway - For operation on dry grass runway, increase the ground distances from the table by 15%.
4. Sloped Runway - For operation on sloped runway, increase the total takeoff distance by 10% for each 2% of upslope (ex 2ft per 100ft). The effect on the ground distance can be greater. Use the table distance for downsloped runway. The correction should be used with caution since the published runway slope data is usually the net slope from one end to the other end.
5. The following distances can be used in extremely hot conditions of 45°C.
   At Sea Level: Ground Distance = 938 ft, Total Distance = 1570 ft
   At 2000ft : Ground Distance = 1187 ft, Total Distance = 1987 ft
6. For operation in outside air temperatures colder than this table provides, use coldest data shown.

Figure 5-7 Takeoff Distance

TAKEOFF CLIMB GRADIENT

Conditions:

Flaps	20 degrees
Power	Full Throttle
Mixture	Best Power Schedule
RPM	2700
Airspeed	Best Angle of Climb

Weight (lb)	Pressure Altitude (ft)	Climb Speed (kias)	Climb Gradient (Feet per Nautical Mile)			
			-20°C	0°C	20°C	40°C
3800	S.L	67	942	860	786	714
	2,000	67	810	734	664	598
	4,000	67	677	607	542	484
	6,000	67	546	481	425	373
	8,000	68	417	361	311	263
	10,000	68	293	245	199	156
3200	S.L	67	1307	1208	1118	1032
	2000	67	1147	1055	972	892
	4000	67	987	902	825	755
	6000	67	830	751	684	622
	8000	67	675	607	548	491
	10,000	67	526	468	414	362

1. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
2. For operation at 45°C, the following climb performance can be used.
3800 lb - At Sea Level ROC = 697 ft/NM At 2000 ft = 582 ft/NM
3200 lb - At Sea Level ROC = 1011 ft/NM At 2000 ft = 873 ft/NM

Figure 5-8 Takeoff Climb Gradient

TAKEOFF RATE OF CLIMB

Conditions:

Flaps	20 degrees
Power	Full Throttle
Mixture	Best Power Schedule
RPM	2700
Airspeed	Best Rate of Climb

Weight (lb)	Pressure Altitude (ft)	Climb Speed (kias)	Rate of Climb (Feet per Minute)			
			-20°C	0°C	20°C	40°C
3800	S.L	82	1039	987	933	876
	2000	80	923	871	817	761
	4000	78	797	746	692	636
	6000	76	666	615	561	505
	8000	75	528	478	424	368
	10,000	72	383	335	280	225
3200	S.L	80	1380	1325	1270	1211
	2000	78	1252	1198	1143	1086
	4000	76	1114	1061	1006	949
	6000	73	969	917	863	807
	8000	72	818	767	713	657
	10,000	70	659	611	557	501

1. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
2. For operation at 45°C, the following climb performance can be used.
3800 lb - At Sea Level ROC = 862 ft/min At 2000 ft = 747 ft/min
3200 lb - At Sea Level ROC = 1197 ft/min At 2000 ft = 1071 ft/min

Figure 5-9 Takeoff Rate-of-Climb

ENROUTE CLIMB GRADIENT

Conditions:

Flaps	0 degree
Power	Full Throttle
Mixture	Best Power Schedule
RPM	2700
Airspeed	Best Rate of Climb

Weight (lb)	Pressure Altitude (ft)	Climb Speed (kias)	Climb Gradient (Feet per Nautical Mile)			
			-20°C	0°C	20°C	40°C
3800	S.L	91	840	776	724	660
	2,000	88	749	688	624	572
	4,000	86	644	588	529	481
	6,000	84	538	481	434	388
	8,000	82	431	386	337	294
	10,000	80	315	287	239	199
3200	S.L	88	1133	1054	996	941
	2000	85	1028	953	898	835
	4000	84	905	836	784	709
	6000	82	781	719	654	610
	8000	80	657	601	549	500
	10,000	77	539	483	435	390

1. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
2. For operation at 45°C, the following climb performance can be used.
3800 lb - At Sea Level ROC = 646 ft/NM At 2000 ft = 558 ft/NM
3200 lb - At Sea Level ROC = 922 ft/NM At 2000 ft = 818 ft/NM

Figure 5-10 Enroute Climb Gradient

ENROUTE RATE OF CLIMB

Conditions:

Flaps	0 degree
Power	Full Throttle
Mixture	Best Power Schedule
RPM	2700
Airspeed	Best Rate of Climb

Weight (lb)	Pressure Altitude (ft)	Climb Speed (kias)	Rate of Climb (Feet per Minute)			
			-20°C	0°C	20°C	40°C
3800	S.L	91	1183	1136	1076	1015
	2000	88	1059	1012	952	893
	4000	86	925	878	820	762
	6000	84	785	739	682	624
	8000	82	638	594	538	480
	10,000	80	486	443	387	330
3200	S.L	88	1549	1500	1437	1373
	2000	85	1412	1362	1300	1238
	4000	84	1264	1215	1154	1093
	6000	82	1109	1061	1001	942
	8000	80	947	901	842	784
	10,000	77	778	735	677	619

1. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
2. For operation at 45°C, the following climb performances can be used.
3800 lb - At Sea Level ROC = 1000 ft/min At 2000 ft = 879 ft/min
3200 lb - At Sea Level ROC = 1357 ft/min At 2000 ft = 1222 ft/min

Figure 5-11 Enroute Rate-of-Climb

TIME, FUEL AND DISTANCE TO CLIMB

Conditions:

Power	Full Throttle
Mixture	Best Power
Wind	0 knot
Airspeed	Noted
Weight	3800 lb
Flaps	0 degree
Temperature	ISA

Pressure Altitude (ft)	TEMP (^{o}C)	Climb Speed (kias)	Rate of Climb (fpm)	From Sea Level		
				Time (minute)	Fuel (gallons)	Distance (NM)
0	15	91	1091	0	0.0	
1000	13	90	1037	1	0.4	1
2000	11	88	979	2	0.8	3
3000	9	87	919	3	1.2	4
4000	7	86	858	4	1.6	6
5000	5	86	795	5	2.1	8
6000	3	85	731	7	2.6	10
7000	1	84	665	8	3.1	12
8000	-1	82	585	10	3.6	15
9000	-3	82	496	12	4.2	17
10000	-5	80	428	14	4.9	21
11000	-7	80	357	16	5.7	25
12000	-9	79	285	19	6.6	30
13000	-11	79	212	23	7.8	36
14000	-13	77	136	29	9.4	45

1. Add 2 gallons for start, taxi and takeoff
2. Add 10% for each 10^{o}C above standard temperature.

Figure 5-12 Time, Fuel and Distance to Climb

CRUISE PERFORMANCE

Conditions:

Mixture	Best Power
Cruise Weight	3800 lb
Winds	Zero
Cowl Flaps	Closed

2000ft Pressure Altitude

		ISA -20°C (-9°C)			ISA (11°C)			ISA +20°C (31°C)		
RPM	MAP	% PWR	KTAS	GPH	% PWR	KTAS	GPH	% PWR	KTAS	GPH
2600	27	94	158	24.1	90	162	23.3	87	163	22.6
2600	26	89	154	23.0	86	159	22.3	83	159	21.6
2600	25	84	151	21.9	81	154	21.3	79	156	20.7
2600	24	80	147	20.9	77	150	20.3	74	151	19.7
2600	23	75	146	19.9	72	146	19.3	70	147	18.8
2400	27	87	157	22.1	84	158	21.3	82	159	20.7
2400	26	83	153	21.1	80	154	20.4	77	156	19.8
2400	25	79	150	20.1	76	150	19.4	73	151	18.9
2400	24	74	146	19.1	71	146	18.5	69	147	18.0
2400	23	70	142	18.1	67	142	17.6	65	143	17.2
2200	27	78	150	19.7	76	150	19.0	73	151	18.4
2200	26	75	147	18.8	72	147	18.2	70	147	17.6
2200	25	71	143	17.9	68	143	17.3	66	144	16.8
2200	24	67	140	17.1	65	140	16.6	62	140	16.1
2200	23	63	136	16.3	61	136	15.8	59	135	15.4

Figure 5-13 Cruise Performance (1 of 6)

CRUISE PERFORMANCE

Conditions:

Mixture	Best Power
Cruise Weight	3800 lb
Winds	Zero
Cowl Flaps	Closed

4000ft Pressure Altitude

		ISA -20°C (-13°C)			ISA (7°C)			ISA +20°C (27°C)		
RPM	MAP	% PWR	KTAS	GPH	% PWR	KTAS	GPH	% PWR	KTAS	GPH
2600	25	87	155	22.5	84	159	21.8	81	160	21.2
2600	24	82	151	21.5	79	155	20.8	77	156	20.2
2600	23	78	147	20.4	75	151	19.8	72	152	19.3
2600	22	73	143	19.4	70	146	18.9	68	147	18.4
2600	21	68	138	18.5	66	141	18.0	63	142	17.5
2400	25	81	154	20.7	78	155	20.0	76	156	19.4
2400	24	77	150	19.7	74	152	19.1	72	152	18.5
2400	23	72	146	18.7	70	146	18.1	67	147	17.7
2400	22	68	142	17.7	65	142	17.2	63	142	16.8
2400	21	63	137	16.8	61	137	16.4	59	136	16.0
2200	25	73	147	18.4	70	147	17.8	68	147	17.3
2200	24	69	144	17.5	67	144	17.0	64	144	16.5
2200	23	65	140	16.7	63	140	16.2	61	139	15.7
2200	22	61	136	15.9	59	136	15.4	57	134	15.0
2200	21	58	131	15.1	56	131	14.7	54	130	14.3

Figure 5-13 Cruise Performance (2 of 6)

CRUISE PERFORMANCE

Conditions:

Mixture	Best Power
Cruise Weight	3800 lb
Winds	Zero
Cowl Flaps	Closed

6000ft Pressure Altitude

		ISA -20°C (-17°C)			ISA (3°C)			ISA +20°C (23°C)		
RPM	MAP	% PWR	KTAS	GPH	% PWR	KTAS	GPH	% PWR	KTAS	GPH
2600	24	85	156	22.1	82	160	21.3	79	161	20.7
2600	23	80	153	21.0	77	155	20.3	74	156	19.8
2600	22	75	147	19.9	73	151	19.3	70	152	18.8
2600	21	71	142	18.9	68	147	18.4	66	146	17.9
2600	20	66	138	18.0	63	141	17.5	61	140	17.1
2400	24	80	155	20.3	77	156	19.6	74	156	19.1
2400	23	75	151	19.3	72	152	18.7	70	152	18.1
2400	22	70	146	18.3	68	147	17.7	65	147	17.3
2400	21	66	141	17.3	63	141	16.8	61	142	16.4
2400	20	61	136	16.4	59	136	15.9	57	135	15.6
2200	24	71	149	18.0	69	148	17.4	66	148	16.9
2200	23	67	144	17.1	65	144	16.6	63	143	16.1
2200	22	63	140	16.3	61	139	15.8	59	138	15.4
2200	21	59	135	15.5	57	135	15.0	55	133	14.6
2200	20	56	130	14.7	54	129	14.3	52	127	14.0

Figure 5-13 Cruise Performance (3 of 6)

CRUISE PERFORMANCE

Conditions:

Mixture	Best Power
Cruise Weight	3800 lb
Winds	Zero
Cowl Flaps	Closed

8000ft Pressure Altitude

		ISA -20°C (-21°C)			ISA (-1°C)			ISA +20°C (19°C)		
RPM	MAP	% PWR	KTAS	GPH	% PWR	KTAS	GPH	% PWR	KTAS	GPH
2600	22	78	153	20.5	75	156	19.8	72	155	19.3
2600	21	73	148	19.4	70	151	18.9	68	151	18.4
2600	20	68	142	18.4	65	146	17.9	63	145	17.5
2600	19	63	137	17.5	61	139	17.0	59	138	16.6
2600	18	58	130	16.6	56	133	16.1	54	131	15.8
2400	22	73	151	18.8	70	151	18.2	68	152	17.7
2400	21	68	145	17.8	65	147	17.3	63	146	16.8
2400	20	63	141	16.9	61	140	16.4	59	139	16.0
2400	19	59	135	15.9	56	134	15.5	54	132	15.1
2400	18	54	127	15.0	52	125	14.7	50	123	14.3
2200	22	65	144	16.7	63	143	16.2	61	143	15.7
2200	21	61	139	15.9	59	139	15.4	57	137	15.0
2200	20	57	134	15.1	55	133	14.6	53	130	14.3
2200	19	53	128	14.3	51	125	13.9	50	122	13.6
2200	18	49	121	13.5	48	117	13.2	46	110	12.9

Figure 5-13 Cruise Performance (4 of 6)

CRUISE PERFORMANCE

Conditions:

Mixture	Best Power
Cruise Weight	3800 lb
Winds	Zero
Cowl Flaps	Closed

10000ft Pressure Altitude										
		ISA -20°C (-25°C)			ISA (-5°C)			ISA +20°C (15°C)		
RPM	MAP	% PWR	KTAS	GPH	% PWR	KTAS	GPH	% PWR	KTAS	GPH
2600	20	70	148	18.9	68	150	18.3	65	150	17.9
2600	19	65	141	17.9	63	143	17.4	61	142	17.0
2600	18	61	134	17.0	58	136	16.5	56	135	16.1
2600	17	56	128	16.0	54	129	15.7	52	125	15.3
2600	16	51	116	15.2	49	119	14.8	---	---	---
2400	20	66	146	17.3	63	145	16.8	61	145	16.4
2400	19	61	139	16.4	59	138	15.9	57	138	15.5
2400	18	56	132	15.5	54	130	15.1	52	128	14.7
2400	17	51	124	14.6	49	121	14.2	48	113	13.9
2400	16	47	113	13.7	---	---	---	---	---	---
2200	20	59	138	15.4	57	136	15.0	55	134	14.6
2200	19	55	132	14.6	53	129	14.2	51	125	13.8
2200	18	51	124	13.8	49	121	13.5	47	112	13.2
2200	17	47	115	13.1	45	107	12.8	---	---	---
2200	16	---	---	---	---	---	---	---	---	---

Figure 5-13 Cruise Performance (5 of 6)

CRUISE PERFORMANCE

Conditions:

Mixture	Best Power
Cruise Weight	3800 lb
Winds	Zero
Cowl Flaps	Closed

12000ft Pressure Altitude

		ISA -20°C (-29°C)			ISA (-9°C)			ISA +20°C (11°C)		
RPM	MAP	% PWR	KTAS	GPH	% PWR	KTAS	GPH	% PWR	KTAS	GPH
2600	18	63	139	17.4	60	141	16.9	58	140	16.5
2600	17	58	132	16.4	56	133	16.0	54	130	15.7
2600	16	53	122	15.5	51	123	15.2	49	113	14.9
2400	18	58	137	15.9	56	136	15.5	54	133	15.1
2400	17	53	128	15.0	51	125	14.6	50	120	14.3
2400	16	49	118	14.1	---	---	---	---	---	---
2200	18	53	129	14.1	51	125	13.8	49	115	13.4
2200	17	49	119	13.4	47	109	13.0	---	---	---
2200	16	---	---	---	---	---	---	---	---	---

Figure 5-13 Cruise Performance (6 of 6)

BALKED LANDING CLIMB GRADIENT

Conditions:

Flaps	30 degrees
Power	Full Throttle
Mixture	Best Power Schedule
RPM	2700
Airspeed	Best Angle of Climb

Weight (lb)	Pressure Altitude (ft)	Climb Speed (kias)	Climb Gradient (Feet per Nautical Mile)			
			-20°C	0°C	20°C	40°C
3800	S.L	71	740	659	585	515
	2,000	71	610	535	467	407
	4,000	71	480	411	353	296
	6,000	71	352	293	239	187
	8,000	71	229	177	127	79
	10,000	71	108	62	- - -	- - -
3200	S.L	66	1126	1028	939	853
	2000	66	968	877	794	715
	4000	66	808	724	648	575
	6000	66	652	574	505	443
	8000	66	498	428	369	312
	10,000	66	347	289	235	183

1. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
2. For operation at 45°C, the following climb performance can be used.
3800 lb - At Sea Level ROC = 500 ft/NM At 2000 ft = 392 ft/NM
3200 lb - At Sea Level ROC = 833 ft/NM At 2000 ft = 696 ft/NM

Figure 5-14 Balked Landing Climb Gradient

BALKED LANDING RATE OF CLIMB

Conditions:

Flaps	30 degrees
Power	Full Throttle
Mixture	Best Power Schedule
RPM	2700
Airspeed	Best Rate of Climb

Weight (lb)	Pressure Altitude (ft)	Climb Speed (kias)	Rate of Climb (Feet per Minute)			
			-20°C	0°C	20°C	40°C
3800	S.L	73	807	745	685	627
	2000	72	689	627	570	512
	4000	71	563	502	446	387
	6000	71	429	371	314	254
	8000	71	291	233	173	111
	10,000	71	142	- - -	- - -	- - -
3200	S.L	70	1144	1082	1022	959
	2000	69	1017	955	895	832
	4000	68	880	818	757	698
	6000	66	736	674	615	557
	8000	66	585	523	467	408
	10,000	66	425	367	310	249

1. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
2. For operation at 45°C, the following climb performance can be used.
3800 lb - At Sea Level ROC = 612 ft/min At 2000 ft = 497 ft/min
3200 lb - At Sea Level ROC = 942 ft/min At 2000 ft = 815 ft/min

Figure 5-15 Balked Landing Rate-of-Climb

LANDING DISTANCE

Conditions:

Weight	3800 lb
Flaps	30 degrees
Power	Off
Wind	0 knot
Brake	Maximum
Runway	Paved, level, dry runway
50ft Speed	71 kias

PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	GND ROLL (ft)	50ft Clear Dist. (ft)	GND ROLL (ft)	50ft Clear Dist. (ft)	GND ROLL (ft)	50ft Clear Dist. (ft)	GND ROLL (ft)	50ft Clear Dist. (ft)	GND ROLL (ft)	50ft Clear Dist. (ft)
0	582	1415	599	1457	617	1499	634	1541	651	1582
1000	600	1457	617	1501	635	1544	653	1587	671	1631
2000	618	1501	636	1546	655	1591	673	1636	692	1681
3000	637	1547	656	1594	675	1640	694	1687	713	1734
4000	656	1595	676	1644	696	1692	716	1740	736	1789
5000	677	1645	698	1696	718	1746	739	1796	760	1846
6000	699	1698	720	1750	741	1802	763	1854	784	1906
7000	721	1753	743	1807	766	1861	788	1915	810	1969
8000	745	1810	768	1866	791	1922	814	1979	837	2035
9000	769	1870	793	1929	817	1987	841	2045	866	2104
10000	795	1933	820	1994	845	2054	870	2115	895	2176

NOTES:

1. Head Wind - Decrease total distances 10% from the table distances for each 9 knot headwind. Tail Wind - Add 10% to the table distances for each 2 knots tail wind up to 10 knots.
2. Grass Runway - For operation on dry grass runway, increase landing ground roll distances by 50%.
3. For operation in cooler than the lowest temperature shown, use data in coldest temperature.
4. For operation in hotter than the highest temperature shown, use extreme caution.
5. Sloped Runway - For operation on sloped runway, increase the ground roll distance by 20% for each 1% of downslope (ex 1ft per 100ft). Use the table distances for operation on upsloped runway. The correction should be used with caution since the published runway slope data is usually the net slope from one end to the other end.

Figure 5-16 Landing Distance