

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 based on 45% 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 2250 Pounds
Usable fuel 40 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	460 Nautical Miles
Pressure altitude	5500 Feet
Temperature	20°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 2300 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1075 Feet
Total distance to clear a 50-foot obstacle	1915 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	1075
Decrease in ground roll (1075 feet \times 13%)	140
Corrected ground roll	<u>935</u> Feet

Total distance to clear a 50-foot obstacle, zero wind	1915
Decrease in total distance (1915 feet \times 13%)	<u>249</u>
Corrected total distance to clear 50-foot obstacle	1666 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 5-7, 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.

The range profile chart indicates that use of 65% power at 5500 feet yields a predicted range of 523 nautical miles with no wind. The endurance profile chart, figure 5-9, shows a corresponding 4.7 hours.

The range figure of 523 nautical miles is corrected to account for the expected 10 knot headwind at 5500 feet.

Range, zero wind	523
Decrease in range due to wind (4.7 hours \times 10 knot headwind)	<u>47</u>
Corrected range	476 Nautical Miles

This indicates that the trip can be made without a fuel stop using approximately 65% power.

The cruise performance chart, figure 5-7, is entered at 6000 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 2500 RPM, which results in the following:

Power	64%
True airspeed	114 Knots
Cruise fuel flow	7.1 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 climb from 2000 feet to 6000 feet requires 1.3 gallons

of fuel. The corresponding distance during the climb is 9 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:

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

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

Fuel to climb, standard temperature	1.3
Increase due to non-standard temperature (1.3 × 16%)	0.2
Corrected fuel to climb	1.5 Gallons

Using a similar procedure for the distance to climb results in 10 nautical miles.

The resultant cruise distance is:

Total distance	460
Climb distance	-10
Cruise distance	450 Nautical Miles

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

114
-10
104 Knots

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

$$\frac{450 \text{ Nautical Miles}}{104 \text{ Knots}} = 4.3 \text{ Hours}$$

The fuel required for cruise is:

$$4.3 \text{ hours} \times 7.1 \text{ gallons/hour} = 30.5 \text{ Gallons}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.1
Climb	1.5
Cruise	30.5
Total fuel required	33.1 Gallons

This will leave a fuel reserve of:

40.0
-33.1
6.9 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 and 30°C are as follows:

Ground roll	590 Feet
Total distance to clear a 50-foot obstacle	1370 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.

AIRSPEED CALIBRATION NORMAL STATIC SOURCE

FLAPS UP	40	50	60	70	80	90	100	110	120	130	140
KIAS	49	55	62	70	80	89	99	108	118	128	138
KCAS											
FLAPS 10°	40	50	60	70	80	85	---	---	---	---	---
KIAS	49	55	62	71	80	85	---	---	---	---	---
KCAS											
FLAPS 40°	40	50	60	70	80	85	---	---	---	---	---
KIAS	47	54	62	71	81	86	---	---	---	---	---
KCAS											

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

AIRSPEED CALIBRATION ALTERNATE STATIC SOURCE

HEATER/VENTS AND WINDOWS CLOSED

FLAPS UP	40	50	60	70	80	90	100	110	120	130	140
NORMAL KIAS	39	51	61	71	82	91	101	111	121	131	141
ALTERNATE KIAS											
FLAPS 10°	40	50	60	70	80	85	---	---	---	---	---
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	40	51	61	71	81	85	---	---	---	---	---
FLAPS 40°	40	50	60	70	80	85	---	---	---	---	---
NORMAL KIAS	38	50	60	70	79	83	---	---	---	---	---
ALTERNATE KIAS											

HEATER/VENTS OPEN AND WINDOWS CLOSED

FLAPS UP	40	50	60	70	80	90	100	110	120	130	140
NORMAL KIAS	36	48	59	70	80	89	99	108	118	128	139
ALTERNATE KIAS											
FLAPS 10°	40	50	60	70	80	85	---	---	---	---	---
NORMAL KIAS	38	49	59	69	79	84	---	---	---	---	---
ALTERNATE KIAS											
FLAPS 40°	40	50	60	70	80	85	---	---	---	---	---
NORMAL KIAS	34	47	57	67	77	81	---	---	---	---	---
ALTERNATE KIAS											

WINDOWS OPEN

FLAPS UP	40	50	60	70	80	90	100	110	120	130	140
NORMAL KIAS	26	43	57	70	82	93	103	113	123	133	143
ALTERNATE KIAS											
FLAPS 10°	40	50	60	70	80	85	---	---	---	---	---
NORMAL KIAS	25	43	57	69	80	85	---	---	---	---	---
ALTERNATE KIAS											
FLAPS 40°	40	50	60	70	80	85	---	---	---	---	---
NORMAL KIAS	25	41	54	67	78	84	---	---	---	---	---
ALTERNATE KIAS											

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

TEMPERATURE CONVERSION CHART

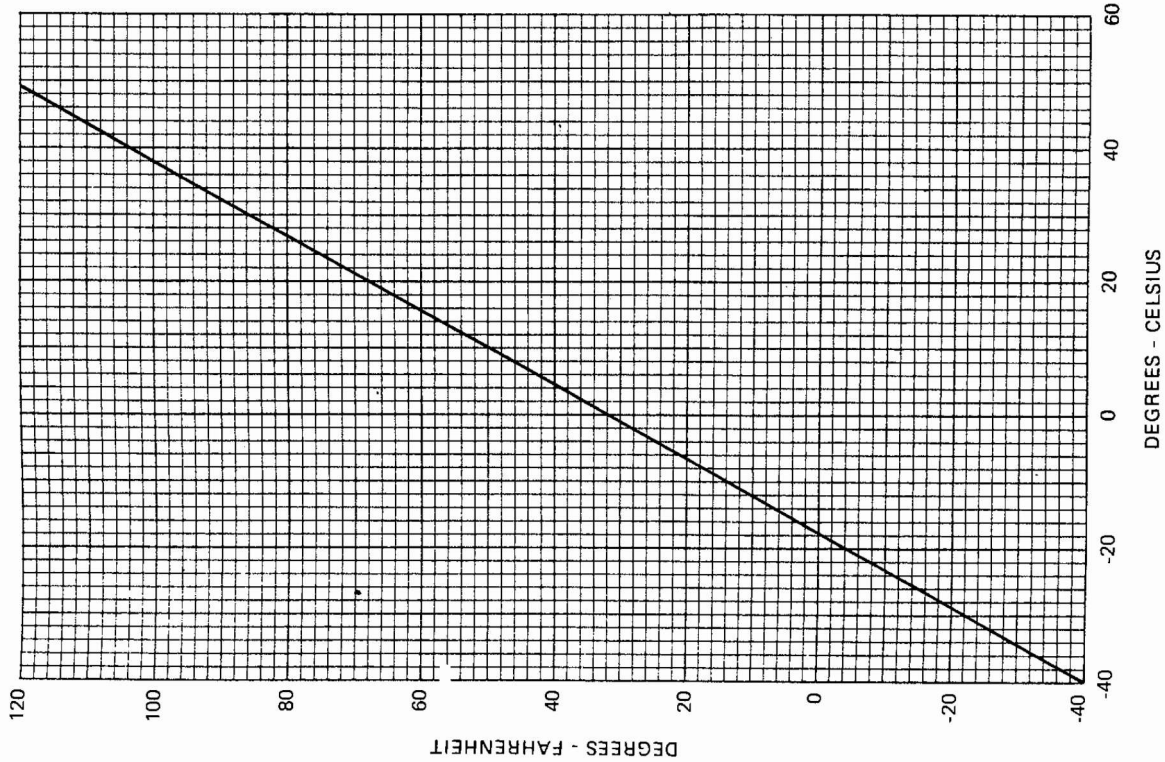


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off

NOTES:

1. Maximum altitude loss during a stall recovery may be as much as 180 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	KIAS	KCAS		
2300	UP	42	50	45	54	50	59	59	59	59	71		
	10°	38	47	40	51	45	56	54	54	66			
	40°	36	44	38	47	43	52	51	51	62			

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK											
		0°			30°			45°			60°		
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS		
2300	UP	47	53	51	57	56	63	66	66	75			
	10°	44	51	47	55	52	61	62	62	72			
	40°	41	47	44	51	49	56	58	58	66			

Figure 5-3. Stall Speeds

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

WEIGHT LBS	TAKEOFF SPEED KIAS	LIFT AT 50 FT	OFF 50 FT	TAKEOFF S.L.	0°C		10°C		20°C		30°C		40°C	
					TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS
1900	47	54			865	920	540	920	585	580	1045	620	1115	1115
2100	50	56			585	630	680	1140	680	725	1300	780	1390	1390
8000	7000	6000	5000	4000	3000	2000	1000	640	585	540	470	400	3000	2000
6000	5000	4000	3000	2000	1000	640	585	540	585	540	470	400	3000	2000
4000	3000	2000	1000	640	585	540	585	540	585	540	470	400	3000	2000
3000	2000	1000	640	585	540	585	540	585	540	585	470	400	3000	2000
2000	1000	640	585	540	585	540	585	540	585	540	470	400	3000	2000
1000	640	585	540	585	540	585	540	585	540	585	470	400	3000	2000
810	740	810	740	810	740	810	740	810	740	810	740	810	740	810
895	810	895	810	895	810	895	810	895	810	895	810	895	810	895
1620	1470	1620	1470	1620	1470	1620	1470	1620	1470	1620	1470	1620	1470	1620
1790	1340	1790	1340	1790	1340	1790	1340	1790	1340	1790	1340	1790	1340	1790
1065	795	1065	795	1065	795	1065	795	1065	795	1065	795	1065	795	1065
965	875	965	875	965	875	965	875	965	875	965	875	965	875	965
1925	1435	1925	1435	1925	1435	1925	1435	1925	1435	1925	1435	1925	1435	1925
1740	1575	1740	1575	1740	1575	1740	1575	1740	1575	1740	1575	1740	1575	1740
1145	710	1145	710	1145	710	1145	710	1145	710	1145	710	1145	710	1145
1035	940	1035	940	1035	940	1035	940	1035	940	1035	940	1035	940	1035
2065	1535	2065	1535	2065	1535	2065	1535	2065	1535	2065	1535	2065	1535	2065
1865	1690	1865	1690	1865	1690	1865	1690	1865	1690	1865	1690	1865	1690	1865
1230	1010	1230	1010	1230	1010	1230	1010	1230	1010	1230	1010	1230	1010	1230
2220	1640	2220	1640	2220	1640	2220	1640	2220	1640	2220	1640	2220	1640	2220
2000	1810	2000	1810	2000	1810	2000	1810	2000	1810	2000	1810	2000	1810	2000
1320	1085	1320	1085	1320	1085	1320	1085	1320	1085	1320	1085	1320	1085	1320
1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195
2385	1755	2385	1755	2385	1755	2385	1755	2385	1755	2385	1755	2385	1755	2385
2145	1595	2145	1595	2145	1595	2145	1595	2145	1595	2145	1595	2145	1595	2145
1940	1455	1940	1455	1940	1455	1940	1455	1940	1455	1940	1455	1940	1455	1940
1755	1330	1755	1330	1755	1330	1755	1330	1755	1330	1755	1330	1755	1330	1755
1595	1215	1595	1215	1595	1215	1595	1215	1595	1215	1595	1215	1595	1215	1595
1455	1115	1455	1115	1455	1115	1455	1115	1455	1115	1455	1115	1455	1115	1455
1330	1025	1330	1025	1330	1025	1330	1025	1330	1025	1330	1025	1330	1025	1330
1215	940	1215	940	1215	940	1215	940	1215	940	1215	940	1215	940	1215
1115	865	1115	865	1115	865	1115	865	1115	865	1115	865	1115	865	1115
3090	1245	3090	1245	3090	1245	3090	1245	3090	1245	3090	1245	3090	1245	3090
2755	1130	2755	1130	2755	1130	2755	1130	2755	1130	2755	1130	2755	1130	2755
2475	1025	2475	1025	2475	1025	2475	1025	2475	1025	2475	1025	2475	1025	2475
2230	930	2230	930	2230	930	2230	930	2230	930	2230	930	2230	930	2230
2015	845	2015	845	2015	845	2015	845	2015	845	2015	845	2015	845	2015
1830	770	1830	770	1830	770	1830	770	1830	770	1830	770	1830	770	1830
1665	700	1665	700	1665	700	1665	700	1665	700	1665	700	1665	700	1665
1520	640	1520	640	1520	640	1520	640	1520	640	1520	640	1520	640	1520
1390	585	1390	585	1390	585	1390	585	1390	585	1390	585	1390	585	1390

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

SHORT FIELD
TAKEOFF DISTANCE
2100 LBS AND 1900 LBS

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

WEIGHT LBS	TAKEOFF SPEED KIAS	LIFT AT 50 FT	OFF 50 FT	TAKEOFF S.L.	0°C		10°C		20°C		30°C		40°C	
					TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS	TOTAL TO CLEAR 50 FT OBS	GRND TO CLEAR 50 FT OBS
2300	52	59			720	1300	775	1390	835	1490	895	1590	960	1700
8000	7000	6000	5000	4000	3000	2000	1000	640	585	540	470	400	3000	2000
6000	5000	4000	3000	2000	1000	640	585	540	585	540	470	400	3000	2000
4000	3000	2000	1000	640	585	540	585	540	585	540	470	400	3000	2000
3000	2000	1000	640	585	540	585	540	585	540	585	470	400	3000	2000
2000	1000	640	585	540	585	540	585	540	585	540	470	400	3000	2000
1000	640	585	540	585	540	585	540	585	540	585	470	400	3000	2000
810	740	810	740	810	740	810	740	810	740	810	740	810	740	810
895	810	895	810	895	810	895	810	895	810	895	810	895	810	895
1620	1470	1620	1470	1620	1470	1620	1470	1620	1470	1620	1470	1620	1470	1620
1790	1340	1790	1340	1790	1340	1790	1340	1790	1340	1790	1340	1790	1340	1790
1065	795	1065	795	1065	795	1065	795	1065	795	1065	795	1065	795	1065
965	875	965	875	965	875	965	875	965	875	965	875	965	875	965
1925	1435	1925	1435	1925	1435	1925	1435	1925	1435	1925	1435	1925	1435	1925
1740	1575	1740	1575	1740	1575	1740	1575	1740	1575	1740	1575	1740	1575	1740
1145	710	1145	710	1145	710	1145	710	1145	710	1145	710	1145	710	1145
1035	940	1035	940	1035	940	1035	940	1035	940	1035	940	1035	940	1035
2065	1535	2065	1535	2065	1535	2065	1535	2065	1535	2065	1535	2065	1535	2065
1865	1690	1865	1690	1865	1690	1865	1690	1865	1690	1865	1690	1865	1690	1865
1230	1010	1230	1010	1230	1010	1230	1010	1230	1010	1230	1010	1230	1010	1230
2220	1640	2220	1640	2220	1640	2220	1640	2220	1640	2220	1640	2220	1640	2220
2000	1810	2000	1810	2000	1810	2000	1810	2000	1810	2000	1810	2000	1810	2000
1320	1085	1320	1085	1320	1085	1320	1085	1320	1085	1320	1085	1320	1085	1320
1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195	1195
2385	1755	2385	1755	2385	1755	2385	1755	2385	1755	2385	1755	2385	1755	2385
2145	1595	2145	1595	2145	1595	2145	1595	2145	1595	2145	1595	2145	1595	2145
1940	1455	1940	1455	1940	1455	1940	1455	1940	1455	1940	1455	1940	1455	1940
1755	1330	1755	1330	1755	1330	1755	1330	1755	1330	1755	1330	1755	1330	1755
1595	1215	1595	1215	1595	1215	1595	1215	1595	1215	1595	1215	1595	1215	1595
1455	1115	1455	1115	1455	1115	1455	1115	1455	1115	1455	1115	1455	1115	1455
1330	1025	1330	1025	1330	1025	1330	1025	1330	1025</					

RATE OF CLIMB

MAXIMUM

CONDITIONS:
Flaps Up
Full Throttle
Standard Temperature

NOTE:
Mixture leaned above 3000 feet for maximum RPM.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
2300	S.L.	73	875	815	755	695
	2000	72	765	705	650	590
	4000	71	655	600	545	485
	6000	70	545	495	440	385
	8000	69	440	390	335	280
	10,000	68	335	285	230	---
12,000	67	230	180	---	---	

Figure 5-5. Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Full Throttle
Standard Temperature

- NOTES:
1. Add 1.1 gallons of fuel for engine start, taxi and takeoff allowance.
 2. Mixture leaned above 3000 feet for maximum RPM.
 3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
 4. 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
2300	S.L.	15	73	770	0	0.0	0
	1000	13	73	725	1	0.3	2
	2000	11	72	675	3	0.6	3
	3000	9	72	630	4	0.9	5
	4000	7	71	580	6	1.2	8
	5000	5	71	535	8	1.6	10
	6000	3	70	485	10	1.9	12
	7000	1	69	440	12	2.3	15
	8000	-1	69	390	15	2.7	19
	9000	-3	68	345	17	3.2	22
	10,000	-5	68	295	21	3.7	27
	11,000	-7	67	250	24	4.2	32
12,000	-9	67	200	29	4.9	38	

Figure 5-6. Time, Fuel, and Distance to Climb

CRUISE PERFORMANCE

CONDITIONS:
2300 Pounds
Recommended Lean Mixture

PRESSURE ALTITUDE FT	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2000	2500	---	---	---	75	116	8.4	71	115	7.9
	2400	72	111	8.0	67	111	7.5	63	110	7.1
	2300	64	106	7.1	60	105	6.7	56	105	6.3
	2200	56	101	6.3	53	100	6.1	50	99	5.8
	2100	50	95	5.8	47	94	5.6	45	93	5.4
4000	2550	---	---	---	75	118	8.4	71	118	7.9
	2500	76	116	8.5	71	115	8.0	67	115	7.5
	2400	68	111	7.6	64	110	7.1	60	109	6.7
	2300	60	105	6.8	57	104	6.4	54	104	6.1
	2200	54	100	6.1	51	99	5.9	48	98	5.7
6000	2100	48	94	5.6	46	93	5.5	44	92	5.3
	2600	---	---	---	75	120	8.4	71	120	7.9
	2500	72	116	8.1	67	115	7.6	64	114	7.1
	2400	64	110	7.2	60	109	6.8	57	109	6.4
	2300	57	105	6.5	54	104	6.2	52	103	5.9
8000	2200	51	99	5.9	49	98	5.7	47	97	5.5
	2100	46	93	5.5	44	92	5.4	42	91	5.2
	2650	---	---	---	75	122	8.4	71	122	7.9
	2600	76	120	8.6	71	120	8.0	67	119	7.5
	2500	68	115	7.7	64	114	7.2	60	113	6.8
10,000	2400	61	110	6.9	58	109	6.5	55	108	6.2
	2300	55	104	6.2	52	103	6.0	50	102	5.8
	2200	49	98	5.7	47	97	5.5	45	96	5.4
	2650	72	122	8.5	71	122	8.0	67	121	7.5
	2600	76	120	8.1	68	119	7.6	64	118	7.1
12,000	2500	65	114	7.3	61	114	6.8	58	112	6.5
	2400	58	109	6.5	55	108	6.2	52	107	6.0
	2300	52	103	6.0	50	102	5.8	48	101	5.6
	2200	47	97	5.6	45	96	5.4	44	95	5.3
	2600	68	119	7.7	64	118	7.2	61	117	6.8
2500	62	114	6.9	58	113	6.5	55	111	6.2	
2400	56	108	6.3	53	107	6.0	51	106	5.8	
2300	50	102	5.8	48	101	5.6	46	100	5.5	
2200	46	96	5.5	44	95	5.4	43	94	5.3	

Figure 5-7. Cruise Performance

RANGE PROFILE 45 MINUTES RESERVE 40 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

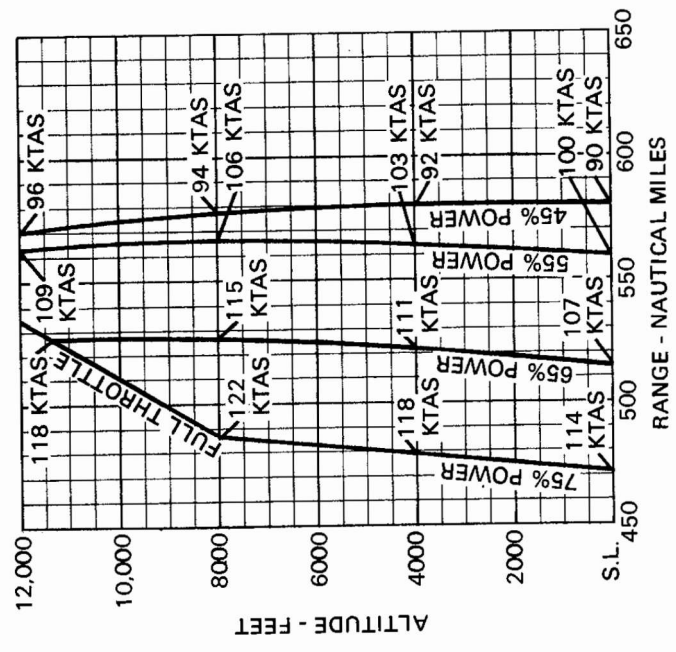


Figure 5-8. Range Profile (Sheet 1 of 2)

RANGE PROFILE

45 MINUTES RESERVE
50 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

- NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb as shown in figure 5-6.
 2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

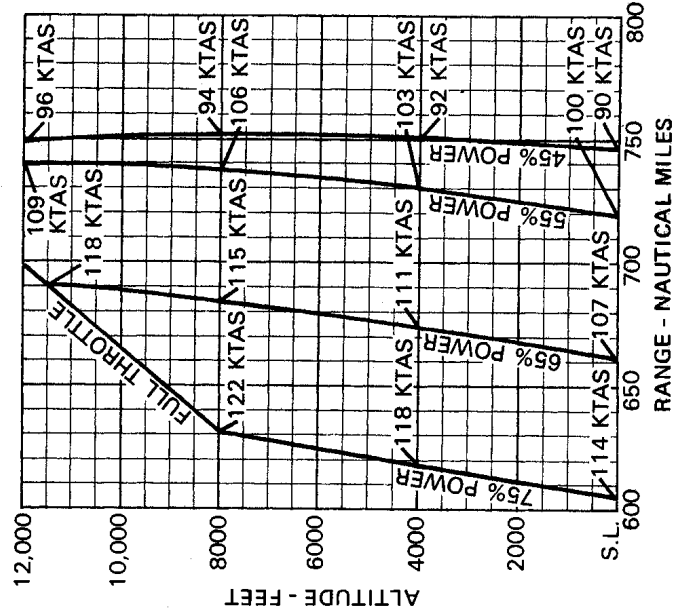


Figure 5-8. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE

45 MINUTES RESERVE
40 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

- NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb as shown in figure 5-6.
 2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

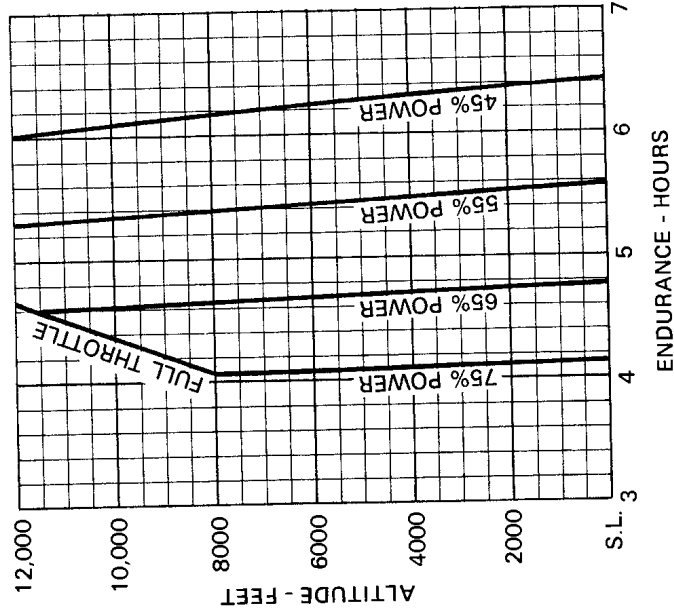


Figure 5-9. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE 45 MINUTES RESERVE 50 GALLONS USABLE FUEL

CONDITIONS:

2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTES:

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

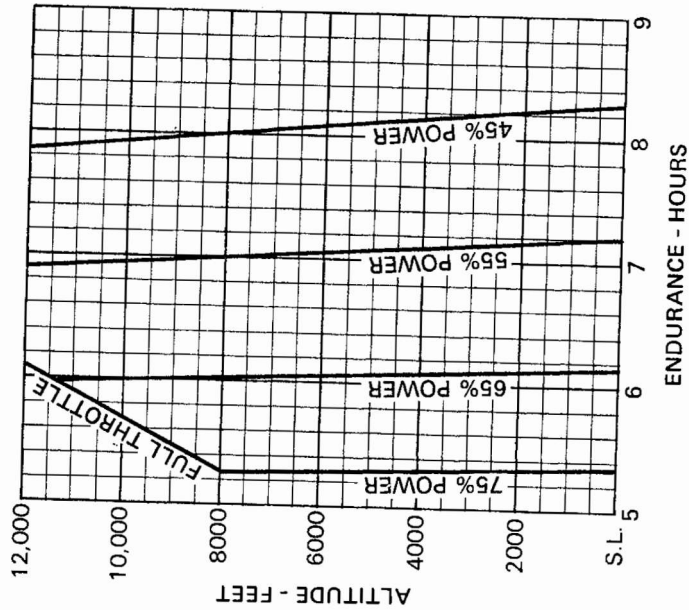


Figure 5-9. Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 40°
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 45% 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	
			TOTAL GRND TO CLEAR ROLL 50 FT OBS	TOTAL GRND TO CLEAR ROLL 50 FT OBS	TOTAL GRND TO CLEAR ROLL 50 FT OBS	TOTAL GRND TO CLEAR ROLL 50 FT OBS	TOTAL GRND TO CLEAR ROLL 50 FT OBS	TOTAL GRND TO CLEAR ROLL 50 FT OBS				
2300	60	S.L.	1205	510	1235	530	1265	545	1295	555	1330	565
2000	1000	1000	1265	550	1285	570	1305	585	1320	610	1365	630
1700	1500	1500	1335	590	1355	610	1375	625	1390	635	1440	655
1400	2000	2000	1415	635	1435	650	1450	665	1465	680	1525	705
1100	2500	2500	1495	685	1515	700	1530	715	1545	730	1615	760
800	3000	3000	1580	735	1600	750	1615	765	1630	780	1715	810

Figure 5-10. Landing Distance

SECTION 6 WEIGHT & BALANCE/ EQUIPMENT LIST

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INTRODUCTION

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this airplane is included at the back of this section.

It should be noted that specific information regarding the weight, arm, moment and installed equipment list for this airplane can only be found in the appropriate weight and balance records carried in the airplane.

AIRPLANE WEIGHING PROCEDURES

1. Preparation:
 - a. Inflate tires to recommended operating pressures.
 - b. Remove the fuel tank sump quick-drain fittings and fuel selector valve drain plug to drain all fuel.
 - c. Remove oil sump drain plug to drain all oil.
 - d. Move sliding seats to the most forward position.
 - e. Raise flaps to the fully retracted position.
 - f. Place all control surfaces in neutral position.
2. Leveling:
 - a. Place scales under each wheel (minimum scale capacity, 500 pounds nose, 1000 pounds each main).
 - b. Deflate the nose tire and/or lower or raise the nose strut to properly center the bubble in the level (see figure 6-1).
3. Weighing:
 - a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.
4. Measuring:
 - a. Obtain measurement A by measuring horizontally (along the airplane center line) from a line stretched between the main wheel centers to a plumb bob dropped from the firewall.
 - b. Obtain measurement B by measuring horizontally and parallel to the airplane center line, from center of nose wheel axle, left side, to a plumb bob dropped from the line between the main wheel centers. Repeat on right side and average the measurements.
5. Using weights from item 3 and measurements from item 4, the

airplane weight and C.G. can be determined.

- Basic Empty Weight may be determined by completing figure 6-1.

WEIGHT AND BALANCE

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure weight and balance, use the Sample Problem, Loading Graph, and Center of Gravity Moment Envelope as follows:

Take the basic empty weight and moment from appropriate weight and balance records carried in your airplane, and enter them in the column titled YOUR AIRPLANE on the Sample Loading Problem.

NOTE

In addition to the basic empty weight and moment noted on these records, the C.G. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment/1000 on the loading problem.

Use the Loading Graph to determine the moment/1000 for each additional item to be carried; then list these on the loading problem.

NOTE

Loading Graph information for the pilot, passengers and baggage is based on seats positioned for average occupants and baggage loaded in the center of the baggage areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitations (seat travel and baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.

Total the weights and moments/1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

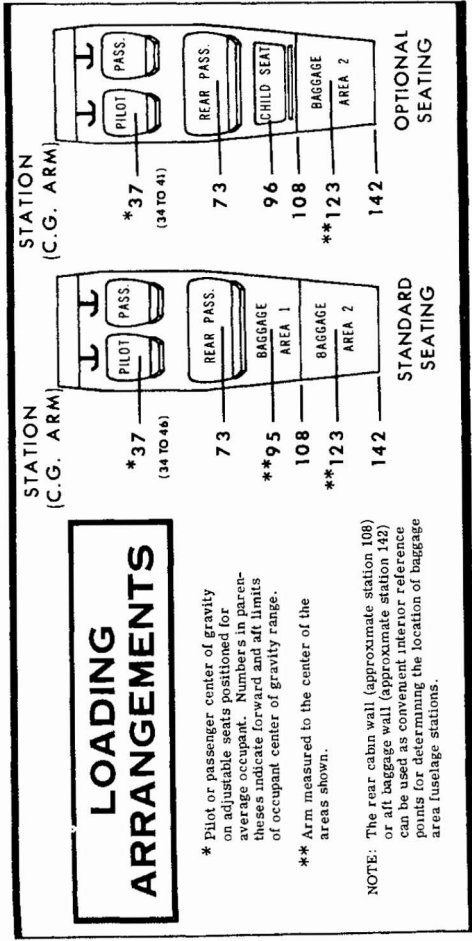


Figure 6-3. Loading Arrangements

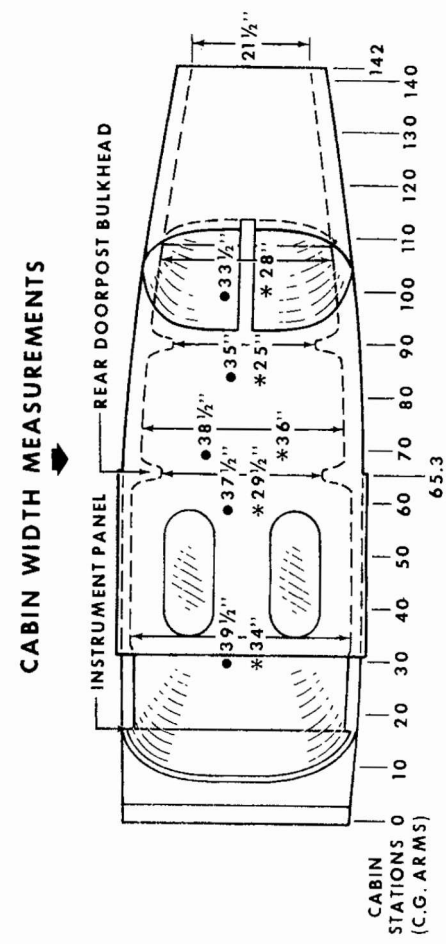
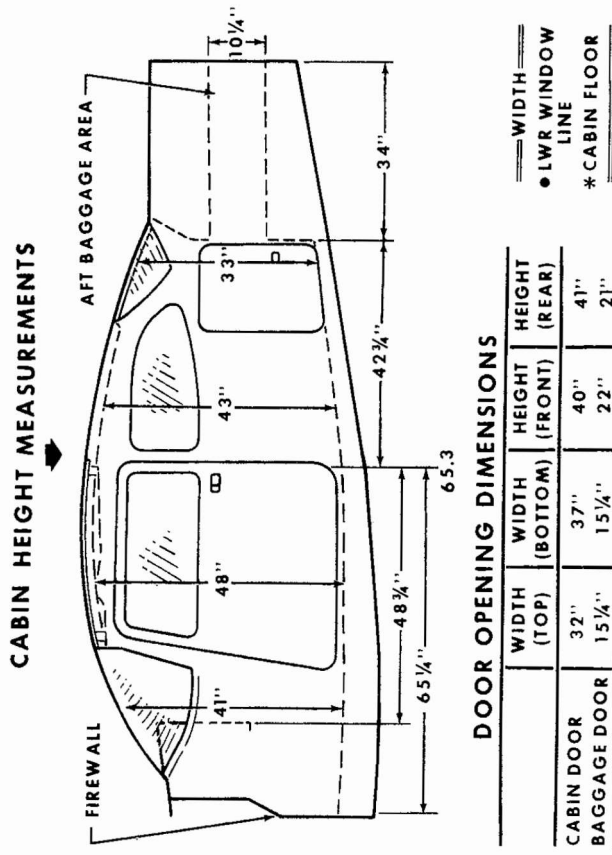


Figure 6-4. Internal Cabin Dimensions

SAMPLE AIRPLANE		LOADING PROBLEM	
YOUR AIRPLANE	Moment (lb. - ins. /1000)	Weight (lbs.)	1454
	Weight (lbs.)	240	11.5
	Moment (lb. - ins. /1000)	170	12.4
	Weight (lbs.)	96	9.1
	Moment (lb. - ins. /1000)	2300	103.2

7. TOTAL WEIGHT AND MOMENT	2300	103.2
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	1454	57.6
2. Usable Fuel (At 6 Lbs./Gal.)	240	11.5
Standard Tanks (40 Gal. Maximum)		
Long Range Tanks (50 Gal. Maximum)		
3. Pilot and Front Passenger (Station 34 to 46)	340	12.6
4. Rear Passengers	170	12.4
5. * Baggage Area 1 or Passenger on Child's Seat (Station 82 to 108) 120 Lbs. Max.	96	9.1
6. * Baggage Area 2 (Station 108 to 142) 50 Lbs. Max.		

NOTE

8. Locate this point (2300 at 103.2) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.

* The maximum allowable combined weight capacity for baggage areas 1 and 2 is 120 lbs.

Figure 6-5. Sample Loading Problem

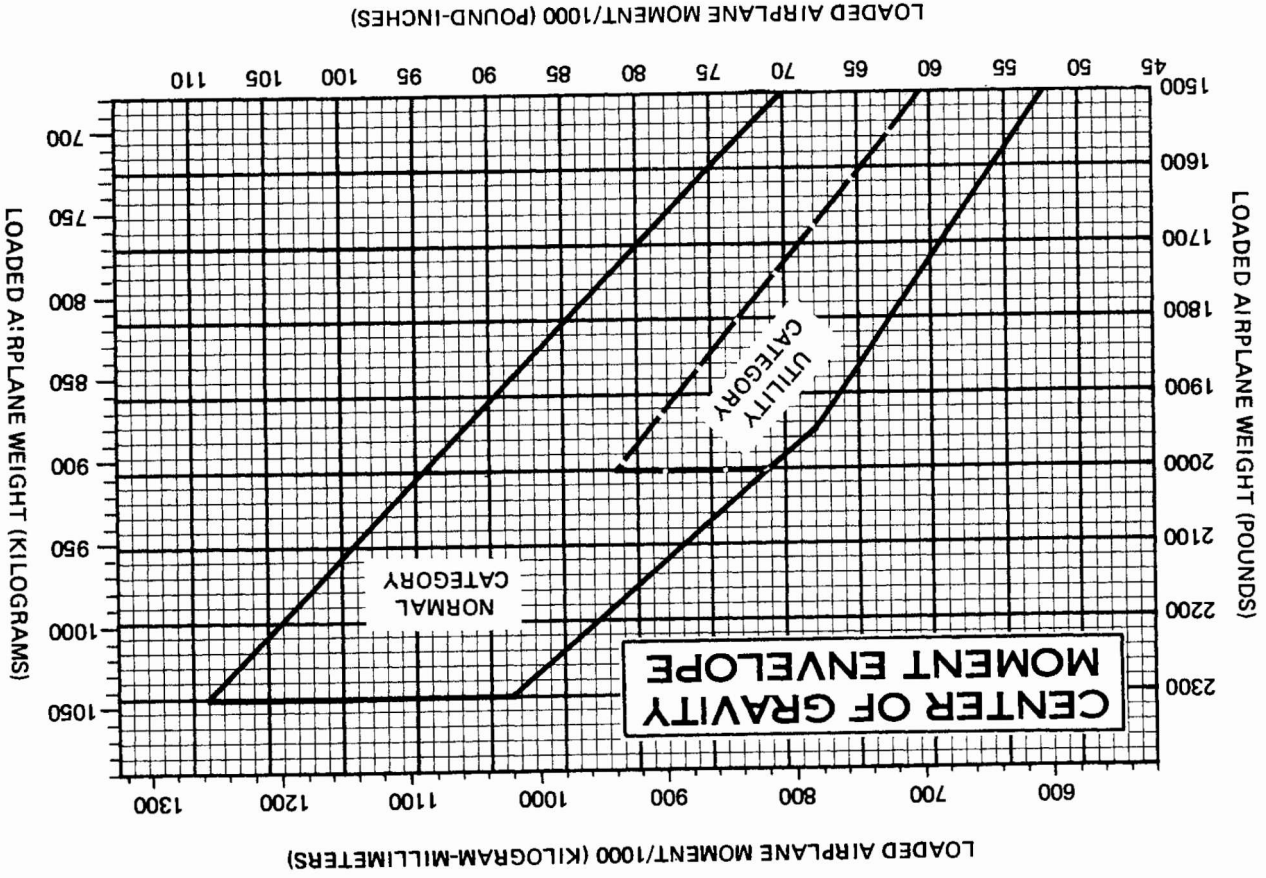
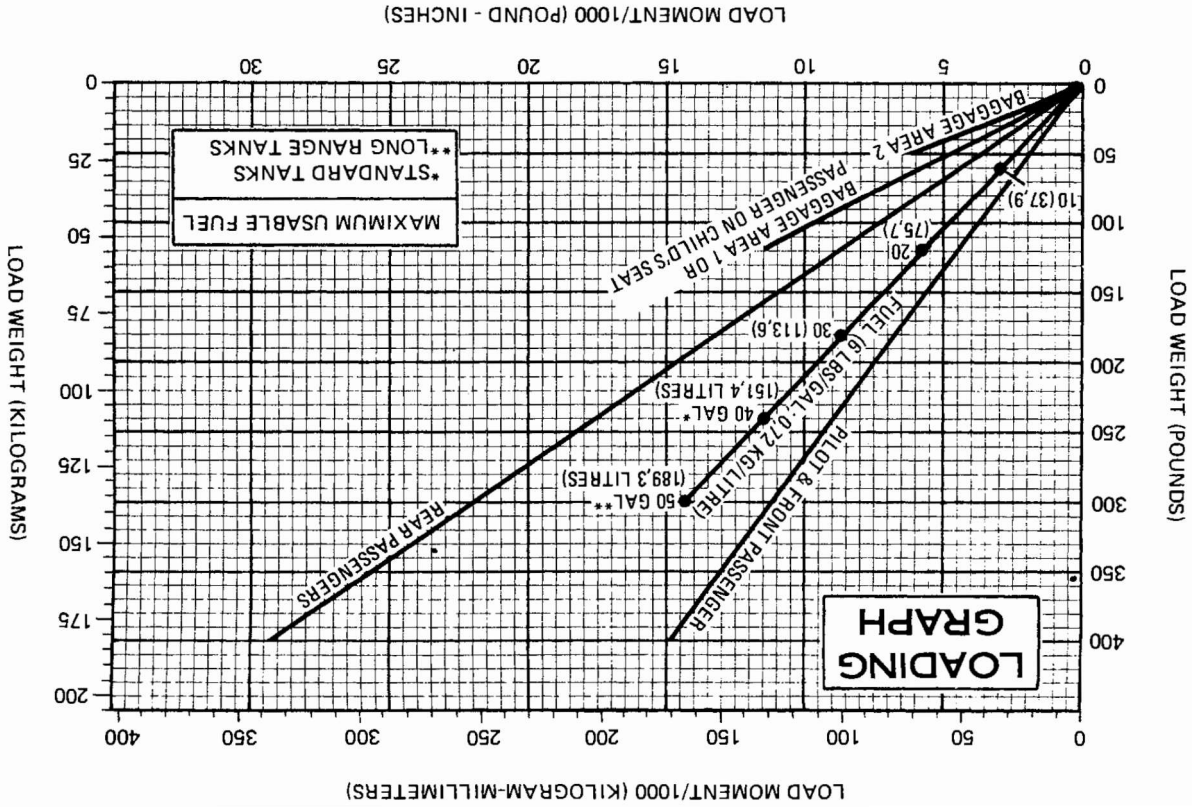


Figure 6-7. Center of Gravity Moment Envelope

NOTE: Line representing adjustable seats shows the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements diagram for forward and aft limits of occupant C.G. range.

Figure 6-6. Loading Graph



EQUIPMENT LIST

The following equipment list is a comprehensive list of all Cessna equipment available for this airplane. A separate equipment list of items installed in your specific airplane is provided in your aircraft file. The following list and the specific list for your airplane have a similar order of listing.

This equipment list provides the following information:

An **item number** gives the identification number for the item. Each number is prefixed with a letter which identifies the **descriptive** grouping (example: A. Powerplant & Accessories) under which it is listed. Suffix letters identify the equipment as a required item, a standard item or an optional item. Suffix letters are as follows:

- R = required items of equipment for FAA certification
- S = standard equipment items
- O = optional equipment items replacing required or standard items
- A = optional equipment items which are in addition to required or standard items

A **reference drawing** column provides the drawing number for the item.

NOTE

If additional equipment is to be installed, it must be done in accordance with the reference drawing, accessory kit instructions, or a separate FAA approval.

Columns showing **weight (in pounds)** and **arm (in inches)** provide the weight and center of gravity location for the equipment.

NOTE

Unless otherwise indicated, true values (not net change values) for the weight and arm are shown. Positive arms are distances aft of the airplane datum; negative arms are distances forward of the datum.

NOTE

Asterisks (*) after the item weight and arm indicate complete assembly installations. Some major components of the assembly are listed on the lines immediately following. The summation of these major components does not necessarily equal the complete assembly installation.

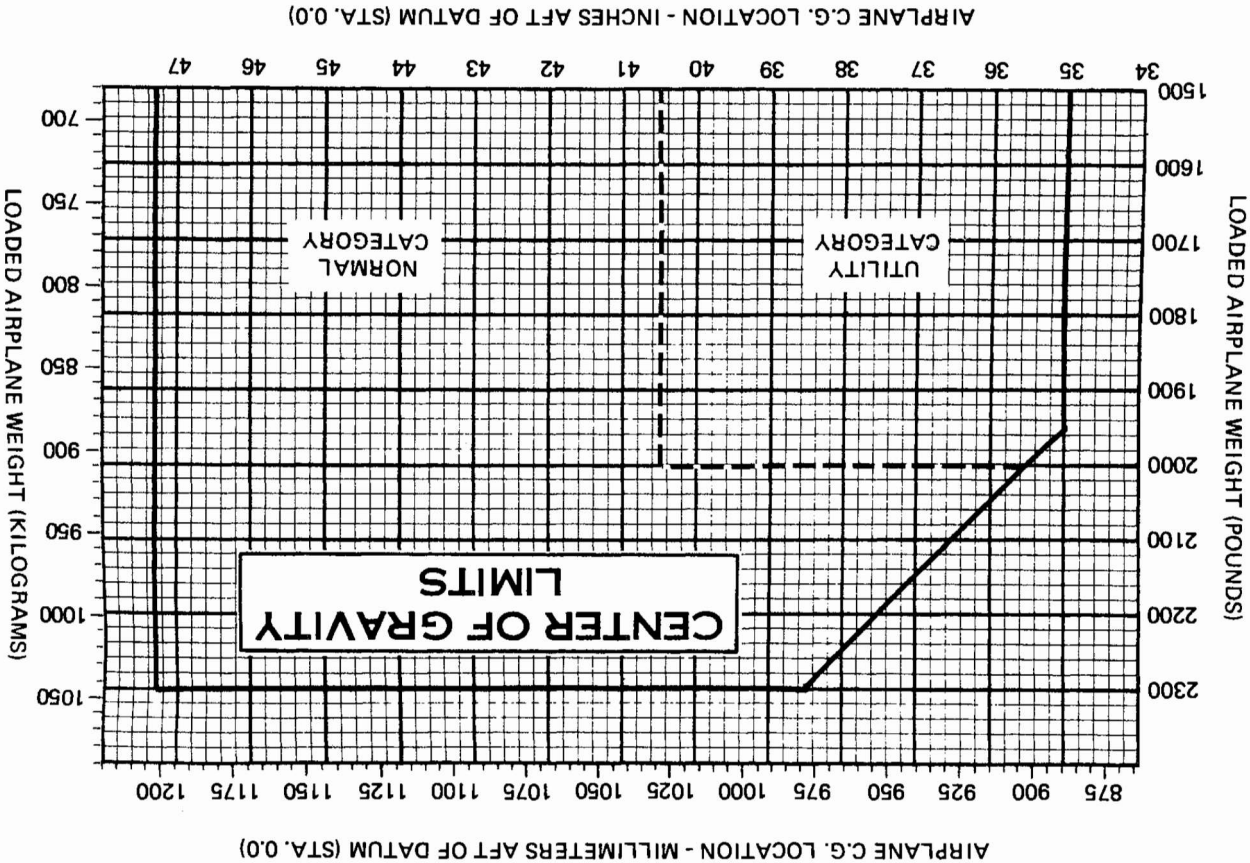


Figure 6-8. Center of Gravity Limits

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	J15-A INTERCONNECT SYSTEM (STOWED) COWL ASSY, FLDATPLANE (NET CHG)	0560012 0552162	0 4 NEGL	95 0 1

SECTION 7 AIRPLANE & SYSTEMS DESCRIPTIONS

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