

# DELTAHAWK

FAA APPROVED  
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL  
FOR CESSNA MODELS 172N,  
SERIAL NUMBERS 17267585 THROUGH 17271034  
FOR STC SA-1356GL  
&  
INSTALLATION INSTRUCTIONS OF  
O-320-D2J, D2G, OR D1A 160 HP ENGINE  
IN 1977 THROUGH 1978 CESSNA 172N

*The Power of Experience*



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Supplemental Airplane Flight Manual  
for

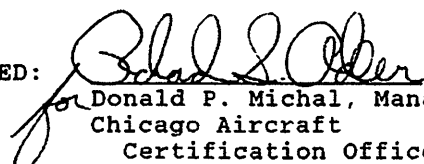
CESSNA MODELS 172N, S/N 17267585 THRU 17271034

REGISTRATION NO. N739UE

SERIAL NO. 17270810

This supplement must be carried in the aircraft when it is modified by the installation of the O-320-D series engines and gross weight is increased to 2400 lbs in accordance with STC # SA1356GL . The information contained herein supplements or supercedes the basic placards and instrument markings only in those areas listed.

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for Donald P. Michal, Manager  
Chicago Aircraft  
Certification Office  
FAA Central Region

DATE: MAR 01 1989

Page 1 of 11

Penn Yan Aero Service, Inc.  
2499 Bath Road, Airport  
Penn Yan, NY 14527-9599

POH and AFM Supplement  
for Cessna 172N

SECTION I - General

DESCRIPTIVE DATA

A. Engine

Number of engines: 1  
Engine Manufacturer: Textron Lycoming  
Engine Model: O-320-D2J, -D2G, -D1A  
Horsepower Rating and Speed: 160 rated BHP at 2700 RPM

SECTION II - Limitations

- A. The following placard must be displayed adjacent to the flap position selector switch:

MAXIMUM FLAP TRAVEL IS 30°

B. C.G. Range

Landplane:

Normal category (+39.5) to (+47.3) at 2400 lb.  
(+35.0) to (+47.3) at 1950 lb. or less  
Utility category (+36.5) to (+40.5) at 2100 lb.  
(+35.0) to (+40.5) at 1950 lb. or less

Floatplane: (Edo 89-2000 or 89A2000 floats)

Normal category (+39.8) to (+45.5) at 2220 lb.  
(+36.4) to (+45.5) at 1825 lb. or less

Straight line variation between points given.

SECTION III - Emergency Procedures - No Change.

SECTION IV - Normal Procedures - No Change.

SECTION V - Performance - See Pages 3 thru 10.

SECTION VI - Weight and Balance - See Page 11.

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MAR 0 1 1989

CESSNA Aircraft Modified SECTION 5  
 MODEL 172N Per Penn Yan STC PERFORMANCE  
 2400 lb. gross wt.

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 610 Feet  
 Total distance to clear a 50-foot obstacle 1390 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 rated RPM dive.

<b>FLAPS UP</b>												
KIAS	50	60	70	80	90	100	110	120	130	140	150	160
KCAS	56	62	70	79	89	98	107	117	126	135	145	154
<b>FLAPS 10°</b>												
KIAS	40	50	60	70	80	90	100	110	---	---	---	---
KCAS	49	55	62	70	79	89	98	108	---	---	---	---
<b>FLAPS 30°</b>												
KIAS	40	50	60	70	80	85	---	---	---	---	---	---
KCAS	47	53	61	70	80	84	---	---	---	---	---	---

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

SECTION 5 Aircraft Modified CESSNA  
 PERFORMANCE Per Penn Yan STC MODEL 172N  
 2400 lb. gross wt.

**AIRSPEED CALIBRATION  
 ALTERNATE STATIC SOURCE**

**HEATER/VENTS AND WINDOWS CLOSED**

<b>FLAPS UP</b>												
NORMAL KIAS	50	60	70	80	90	100	110	120	130	140	---	---
ALTERNATE KIAS	51	61	71	82	91	101	111	121	131	141	---	---
<b>FLAPS 10°</b>												
NORMAL KIAS	40	50	60	70	80	90	100	110	---	---	---	---
ALTERNATE KIAS	40	51	61	71	81	90	99	108	---	---	---	---
<b>FLAPS 30°</b>												
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---	---
ALTERNATE KIAS	38	50	60	70	79	83	---	---	---	---	---	---

**HEATER/VENTS OPEN AND WINDOWS CLOSED**

<b>FLAPS UP</b>												
NORMAL KIAS	40	50	60	70	80	90	100	110	120	130	140	---
ALTERNATE KIAS	36	48	59	70	80	89	99	108	118	128	139	---
<b>FLAPS 10°</b>												
NORMAL KIAS	40	50	60	70	80	90	100	110	---	---	---	---
ALTERNATE KIAS	38	49	59	69	79	88	97	106	---	---	---	---
<b>FLAPS 30°</b>												
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---	---
ALTERNATE KIAS	34	47	57	67	77	81	---	---	---	---	---	---

**WINDOWS OPEN**

<b>FLAPS UP</b>												
NORMAL KIAS	40	50	60	70	80	90	100	110	120	130	140	---
ALTERNATE KIAS	26	43	57	70	82	93	103	113	123	133	143	---
<b>FLAPS 10°</b>												
NORMAL KIAS	40	50	60	70	80	90	100	110	---	---	---	---
ALTERNATE KIAS	25	43	57	69	80	91	101	111	---	---	---	---
<b>FLAPS 30°</b>												
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---	---
ALTERNATE KIAS	25	41	54	67	78	84	---	---	---	---	---	---

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

CESSNA  
MODEL 172N

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

SECTION 5  
PERFORMANCE

SECTION 5  
PERFORMANCE

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

CESSNA  
MODEL 172N

MAR 01 1989

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 5-8, the range profile charts presented in figure 5-9, and the endurance profile charts presented in figure 5-10.

The relationship between power and range is illustrated by the range profile charts. 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, figure 5-8, 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	66%
True airspeed	112 Knots
Cruise fuel flow	7.4 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 5-7 and 5-8. For this sample problem, figure 5-7 shows that a climb from 2000 feet to 6000 feet requires 1.6 gallons of fuel. The corresponding distance during the climb is 10 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	1.6
Increase due to non-standard temperature (1.6 × 16%)	0.3
Corrected fuel to climb	1.9 Gallons

Using a similar procedure for the distance to climb results in 12 nautical miles.

The resultant cruise distance is:

Total distance	320
Climb distance	-12
Cruise distance	308 Nautical Miles

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

112
-10
102 Knots

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

308 Nautical Miles	= 3.0 Hours
102 Knots	

The fuel required for cruise is:

$$3.0 \text{ hours} \times 7.4 \text{ gallons/hour} = 22.2 \text{ Gallons}$$

A 45-minute reserve requires:

$$\frac{45}{60} \times 7.4 \text{ gallons/hour} = 5.6 \text{ Gallons}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.1
Climb	1.9
Cruise	22.2
Reserve	5.6
Total fuel required	30.8 Gallons

Once the flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel

CESSNA  
MODEL 172N

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

SECTION 5  
PERFORMANCE

SECTION 5  
PERFORMANCE

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

CESSNA  
MODEL 172N

MAXIMUM RATE OF CLIMB

CONDITIONS:  
Flaps Up  
Full Throttle

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
2400	S.L.	76	805	745	685	625
	2000	75	695	640	580	525
	4000	74	590	535	480	420
	6000	73	485	430	375	320
	8000	72	380	330	275	220
	10,000	71	275	225	175	...
	12,000	70	175	125	...	...

Figure 5-6. Maximum Rate of Climb

TAKEOFF DISTANCE  
2200 LBS AND 2000 LBS  
SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

WEIGHT LBS	TAKEOFF SPEED KIAS	LIFT OFF 50 FT	AT 50 FT	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
					GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
2200	49	54	51	S.L.	650	1185	700	1280	750	1375	805	1470	865	1575
				1000	710	1310	785	1405	825	1510	885	1615	960	1735
				2000	780	1440	840	1545	905	1660	975	1785	1045	1915
				3000	855	1585	925	1705	995	1835	1070	1975	1150	2130
				4000	945	1750	1020	1890	1100	2040	1180	2200	1270	2375
				5000	1040	1945	1125	2105	1210	2275	1305	2485	1465	2685
				6000	1150	2170	1240	2355	1340	2555	1445	2775	1585	3020
7000	1270	2440	1375	2655	1485	2890	1605	3155	1730	3450				
8000	1410	2760	1525	3015	1650	3305	1785	3630	1925	4005				
2000	46	51	S.L.	525	970	565	1035	605	1110	660	1185	695	1285	
			1000	570	1060	615	1135	665	1215	710	1285	765	1385	
			2000	625	1160	675	1240	725	1330	780	1425	840	1525	
			3000	690	1270	740	1365	800	1485	860	1570	920	1685	
			4000	755	1400	815	1500	880	1615	945	1735	1015	1865	
			5000	830	1545	890	1660	970	1790	1040	1925	1120	2070	
			6000	920	1710	985	1845	1070	1990	1150	2145	1235	2315	
7000	1015	1890	1095	2055	1180	2225	1275	2405	1370	2605				
8000	1125	2125	1215	2315	1310	2500	1410	2715	1520	2950				

MAR 0 1 1989

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

Page 5 of 11

SECTION 5  
 PERFORMANCE  
 Aircraft Modified  
 Per Penn Yan STC  
 2400 lb. gross wt.  
 CESSNA  
 MODEL 172N

**STALL SPEEDS**

CONDITIONS:  
 Power Off

- NOTES:  
 1. 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
2400	UP	44	51	47	55	52	61	62	72
	10°	35	48	38	52	42	57	49	68
	30°	33	46	35	49	39	55	47	65

**MOST FORWARD CENTER OF GRAVITY**

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2400	UP	44	52	47	56	52	62	62	74
	10°	37	49	40	53	44	58	52	69
	30°	33	46	35	49	39	55	47	65

**TAKEOFF DISTANCE  
 MAXIMUM WEIGHT 2400 LBS**

**SHORT FIELD**

CONDITIONS:  
 Flaps 10°  
 Full Throttle Prior to Brake Release  
 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 RPM 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 FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
				2400	51	58	S.L.	795	1460	860	1570	925	1685
1000	875	1605	840				1725	1015	1860	1080	2000	1170	2155
2000	960	1770	1035				1910	1115	2060	1200	2220	1290	2395
3000	1055	1960	1140				2120	1230	2295	1325	2480	1425	2685
4000	1165	2185	1260				2365	1355	2570	1465	2790	1575	3030
5000	1285	2445	1390				2660	1500	2895	1620	3160	1745	3455
6000	1425	2755	1540				3015	1665	3300	1800	3620	1940	3990
7000	1580	3140	1710				3450	1850	3805	2000	4220	2150	4650
8000	1755	3615	1905	4015	2060	4480	2250	5000	2380	5350			

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

SECTION 5  
 PERFORMANCE  
 Aircraft Modified  
 Per Penn Yan STC  
 2400 lb. gross wt.  
 CESSNA  
 MODEL 172N



MAR 0 1 1989

CESSNA  
MODEL 172N

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

SECTION 5  
PERFORMANCE

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
2400	S.L.	15	76	700	0	0.0	0
	1000	13	76	655	1	0.3	2
	2000	11	75	610	3	0.6	4
	3000	9	75	560	5	1.0	6
	4000	7	74	515	7	1.4	9
	5000	5	74	470	9	1.7	11
	6000	3	73	425	11	2.2	14
	7000	1	72	375	14	2.6	18
	8000	-1	72	330	17	3.1	22
	9000	-3	71	285	20	3.6	26
	10,000	-5	71	240	24	4.2	32
	11,000	-7	70	190	29	4.9	38
12,000	-9	70	145	35	5.8	47	

Figure 5-7. Time, Fuel, and Distance to Climb

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Page 7 of 11

CESSNA  
MODEL 172N

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

SECTION 5  
PERFORMANCE

RANGE PROFILE  
45 MINUTES RESERVE  
40 GALLONS USABLE FUEL

CONDITIONS:  
2400 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 climb.

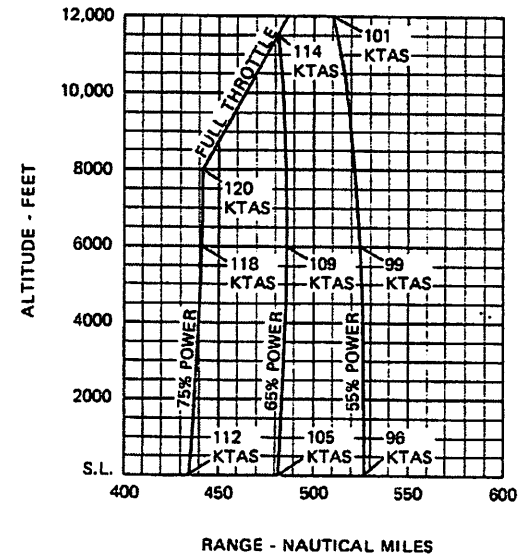


Figure 5-9. Range Profile (Sheet 1 of 3)

**SECTION 5**  
**PERFORMANCE**  
**CRUISE PERFORMANCE**

Aircraft Modified  
 Per Penn Yan STC  
 2400 lb. gross wt.

CESSNA  
 MODEL 172N

**CONDITIONS:**  
 2400 Pounds  
 Recommended Lean Mixture (See Section 4, Cruise)

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	72	110	8.1	114	8.5	72	114	8.1	
	2400	65	104	7.3	109	7.7	65	108	7.3	
	2300	58	99	6.6	103	6.9	59	102	6.6	
	2200	52	92	6.0	97	6.3	53	96	6.1	
	2100	52	82	6.0	91	5.8	48	89	5.7	
4000	2550	77	115	8.6	117	8.5	72	116	8.1	
	2500	77	109	7.8	114	8.1	69	113	7.7	
	2400	69	104	7.0	108	7.3	62	107	7.0	
	2300	62	98	6.3	102	6.6	57	101	6.4	
	2200	56	92	5.8	96	6.1	51	94	5.9	
6000	2100	51	91	5.8	88	5.7	47	88	5.5	
	2600	73	114	8.2	119	8.6	72	118	8.1	
	2400	66	108	7.4	113	7.8	66	112	7.4	
	2300	60	103	6.7	107	7.0	60	106	6.7	
	2200	54	96	6.1	101	6.4	55	101	6.2	
8000	2100	49	90	5.7	88	5.5	46	86	5.5	
	2650	77	119	8.7	121	8.6	73	120	8.1	
	2600	77	113	7.8	118	8.2	69	117	7.8	
	2500	70	108	7.1	112	7.4	63	111	7.1	
	2400	63	103	6.4	106	6.7	58	104	6.5	
10,000	2300	57	101	6.4	100	6.2	53	97	6.0	
	2200	52	95	6.0	93	5.8	49	91	5.7	
	2600	74	118	8.3	117	7.8	66	115	7.4	
	2500	67	112	7.5	111	7.1	61	109	6.8	
	2400	61	106	6.8	105	6.5	56	102	6.3	
12,000	2300	55	100	6.3	98	6.0	51	96	5.9	
	2200	50	93	5.8	91	5.7	47	89	5.6	
	2550	67	114	7.5	112	7.1	61	111	6.9	
	2500	64	111	7.2	109	6.8	59	107	6.6	
	2400	59	105	6.9	103	6.3	54	100	6.1	

Figure 5-8. Cruise Performance

**SECTION 5**  
**PERFORMANCE**  
**RANGE PROFILE**

Aircraft Modified  
 Per Penn Yan STC  
 2400 lb. gross wt.

CESSNA  
 MODEL 172N

45 MINUTES RESERVE  
 50 GALLONS USABLE FUEL

**CONDITIONS:**  
 2400 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 climb.

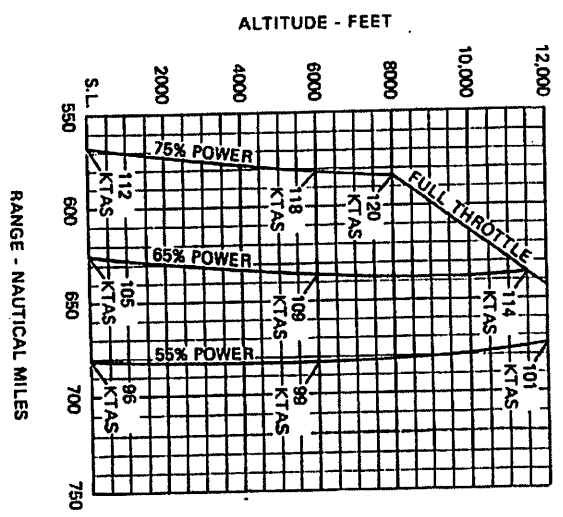


Figure 5-8. Range Profile (Sheet 2 of 3)

SECTION 5  
PERFORMANCE

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

CESSNA  
MODEL 172N

**ENDURANCE PROFILE**  
45 MINUTES RESERVE  
40 GALLONS USABLE FUEL

MAR 0 1 1989

CONDITIONS:  
2400 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 climb.

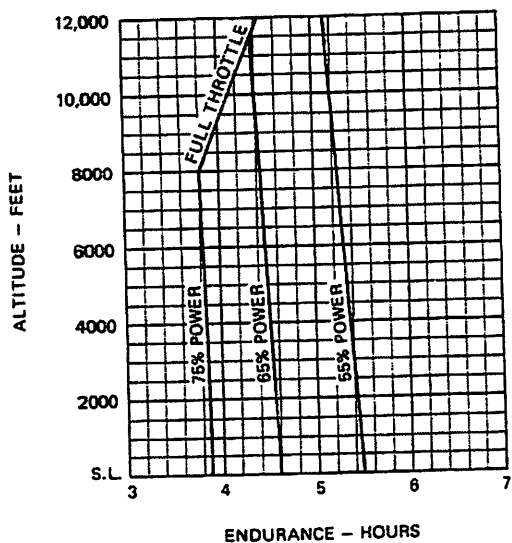


Figure 5-10. Endurance Profile (Sheet 1 of 3)

CESSNA  
MODEL 172N

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.

SECTION 5  
PERFORMANCE

**ENDURANCE PROFILE**  
45 MINUTES RESERVE  
50 GALLONS USABLE FUEL

CONDITIONS:  
2400 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 climb.

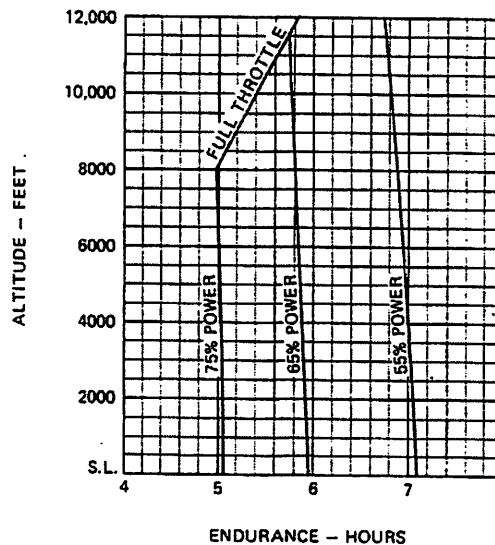


Figure 5-10. Endurance Profile (Sheet 2 of 3)

SECTION 5  
PERFORMANCE

Aircraft Modified  
Per Penn Yan STC  
2400 lb. gross wt.  
  
CESSNA  
MODEL 172N

LANDING DISTANCE

SHORT FIELD

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

- NOTES:
1. Short field technique as specified in Section 4.
  2. Decrease distances 10% for each 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.
  4. If a landing with flaps up is necessary, increase the approach speed by 7 KIAS and allow for 35% longer distances.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
2400	61	S.L.	510	1235	530	1265	550	1295	570	1325	585	1350
		1000	530	1265	550	1295	570	1325	585	1350	610	1390
		2000	550	1295	570	1330	590	1360	610	1390	630	1425
		3000	570	1330	590	1360	615	1395	635	1430	655	1460
		4000	595	1365	615	1400	635	1430	660	1470	680	1500
		5000	615	1400	640	1435	660	1470	685	1510	705	1540
		6000	640	1435	660	1470	685	1510	710	1550	730	1580
		7000	665	1475	680	1515	710	1550	735	1590	760	1630
8000	690	1515	715	1555	740	1595	765	1635	790	1675		

Figure 5-11. Landing Distance

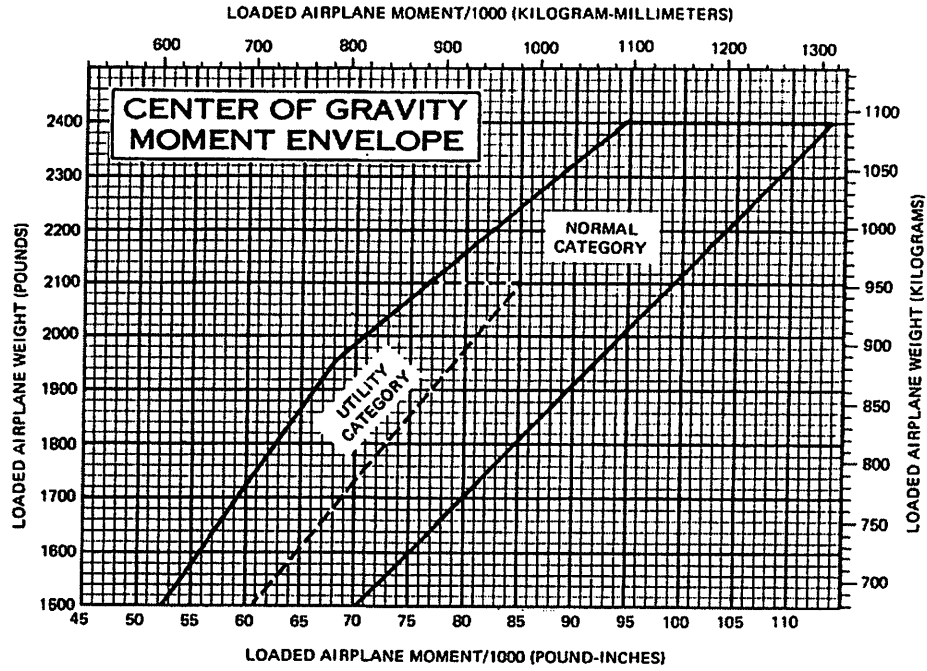


Figure 6-7. Center of Gravity Moment Envelope

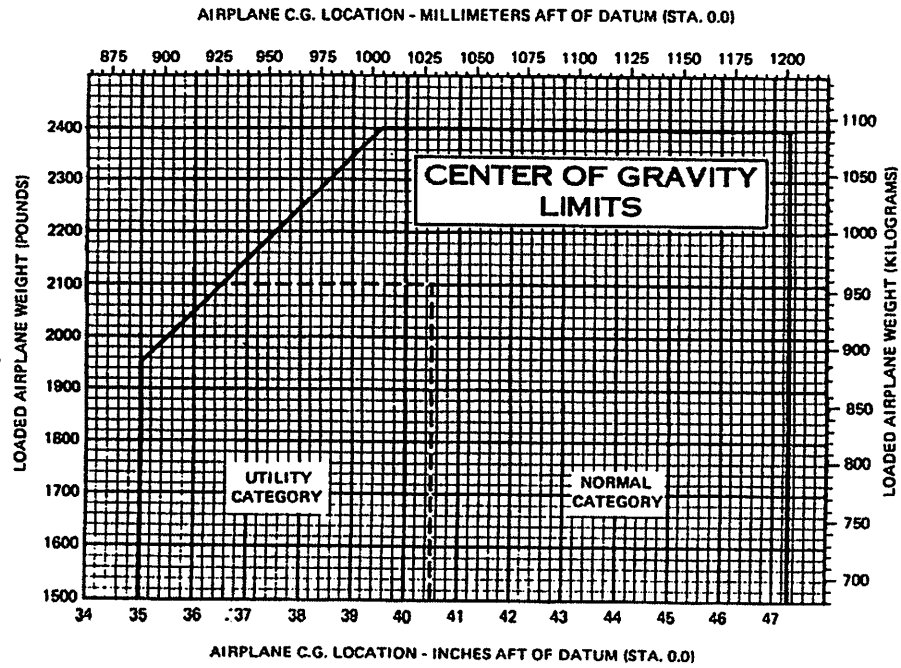


Figure 6-8. Center of Gravity Limits

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Page 11