

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

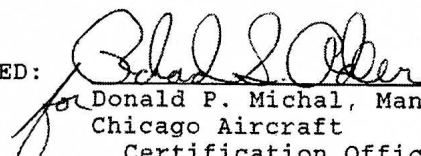
CESSNA MODELS 172N, S/N 17267585 THRU 17271034

REGISTRATION NO. N733KC

SERIAL NO. 17268344

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.

FAA APPROVED:


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

DATE: MAR 01 1989

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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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CESSNA
MODEL 172N

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

SECTION 5
PERFORMANCE

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.

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

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

SECTION 5
PERFORMANCE

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

CESSNA
MODEL 172N

AIRSPEED CALIBRATION ALTERNATE STATIC SOURCE

HEATER/VENTS AND WINDOWS CLOSED

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

HEATER/VENTS OPEN AND WINDOWS CLOSED

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

WINDOWS OPEN

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

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

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

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 1.5 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:

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

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

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

Fuel to climb, standard temperature	1.5
Increase due to non-standard temperature ($1.6 \times 16\%$)	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

SECTION 5
PERFORMANCE

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

CESSNA
MODEL 172N

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

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	125
	12,000	70	175	125	75	25

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		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
2200	49	54	S.L.	650	1195	700	1280	750	1375	805	1470	865	1575
			1000	710	1310	765	1405	825	1510	885	1615	950	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	2465	1405	2665
			6000	1150	2170	1240	2355	1340	2555	1445	2775	1555	3020
			7000	1270	2440	1375	2655	1485	2890	1605	3155	1730	3450
2000	46	51	8000	1410	2760	1525	3015	1650	3305	1785	3630	1925	4005
			S.L.	525	970	565	1035	605	1110	650	1185	695	1265
			1000	570	1060	615	1135	665	1215	710	1295	765	1385
			2000	625	1180	675	1240	725	1330	780	1425	840	1525
			3000	690	1270	740	1365	800	1465	860	1570	920	1685
			4000	755	1400	815	1500	880	1615	945	1735	1015	1865
			5000	830	1545	900	1660	970	1790	1040	1925	1120	2070
			6000	920	1710	990	1845	1070	1990	1150	2145	1235	2315
			7000	1015	1900	1095	2055	1180	2225	1275	2405	1370	2605
			8000	1125	2125	1215	2305	1310	2500	1410	2715	1520	2950

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

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SECTION 5 PERFORMANCE

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

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MODEL 172N

STALL SPEEDS

SECTION 5 PERFORMANCE

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

CONDITIONS:

Power Off

NOTES:

- 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

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE
MAXIMUM WEIGHT 2400 LBS

SHORT FIELD

CONDITIONS:

- 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 8 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	40°C		30°C		20°C		10°C		0°C	
			TOTAL FT TO CLEAR	50 FT OBS	TOTAL FT TO CLEAR	50 FT OBS	TOTAL FT TO CLEAR	50 FT OBS	TOTAL FT TO CLEAR	50 FT OBS	TOTAL FT TO CLEAR	50 FT OBS
2400	51	56	S.L.	795	1810	995	1685	925	1570	1725	1605	1460
			1000	875	2000	1090	1860	1015	940	1770	1605	1460
8000	50 FT	FT	7000	1580	3620	1800	3805	1850	3450	1710	1540	3140
			6000	1425	3160	1620	2895	1500	2660	1380	2445	1260
5000	4000	3000	4000	1165	2790	1455	2570	1355	2120	1910	1770	1605
			3000	1055	2480	1325	2295	1230	1140	1980	1770	1605
1755	1580	1425	1285	2445	2220	2000	1860	1725	1570	1425	1285	1165
			1165	2185	1980	1810	1685	1570	1460	1380	1260	1140
1905	1710	1540	1380	2445	2220	2000	1860	1725	1570	1425	1285	1165
			1260	2185	1980	1810	1685	1570	1460	1380	1260	1140
4015	3450	3015	2660	1380	2295	1230	1140	1980	1770	1605	1460	1380
			2365	1260	2120	1910	1725	1570	1425	1285	1165	1035
2060	1850	1665	1500	2660	2220	2000	1860	1725	1570	1425	1285	1165
			1355	2365	2120	1910	1725	1570	1425	1285	1165	1035
4480	3805	3300	2895	1620	2790	1455	2570	1355	2120	1910	1770	1605
			2570	1455	2220	2000	1860	1725	1570	1425	1285	1165
3990	3455	3030	2685	1425	2220	2000	1860	1725	1570	1425	1285	1165
			2395	1290	2000	1810	1685	1570	1460	1380	1260	1140

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

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

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MODEL 172N 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

CONDITIONS:
2400 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

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

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

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.

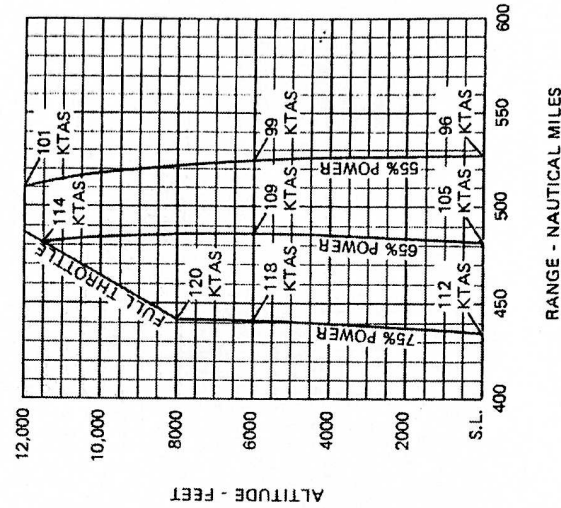


Figure 5-9. Range Profile (Sheet 1 of 3)

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

CRUISE PERFORMANCE

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

PRESSURE ALTITUDE FT	RPM	20°C BELOW			STANDARD TEMPERATURE			20°C ABOVE		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2000	2500	---	---	---	76	114	8.5	72	114	8.1
	2400	72	110	8.1	69	109	7.7	65	108	7.3
	2300	65	104	7.3	62	103	6.9	59	102	6.6
	2200	58	98	6.6	55	97	6.3	53	96	6.1
	2100	52	92	6.0	50	91	5.8	48	89	5.7
4000	2550	---	---	---	76	117	8.5	72	116	8.1
	2500	77	115	8.6	73	114	8.1	69	113	7.7
	2400	69	109	7.8	65	108	7.3	62	107	7.0
	2300	62	104	7.0	59	102	6.6	57	101	6.4
	2200	56	98	6.3	54	96	6.1	51	94	5.9
6000	2100	51	91	5.8	48	89	5.7	47	88	5.5
	2600	---	---	---	77	119	8.6	72	118	8.1
	2500	73	114	8.2	69	113	7.8	66	112	7.4
	2400	66	108	7.4	63	107	7.0	60	106	6.7
	2300	60	103	6.7	57	101	6.4	55	99	6.2
8000	2200	54	96	6.1	52	95	5.9	50	92	5.8
	2100	49	90	5.7	47	88	5.5	46	86	5.5
	2650	---	---	---	77	121	8.6	73	120	8.1
	2600	77	119	8.7	73	118	8.2	69	117	7.8
	2500	70	113	7.8	66	112	7.4	63	111	7.1
10,000	2400	63	108	7.1	60	106	6.7	58	104	6.5
	2300	57	101	6.4	55	100	6.2	53	97	6.0
	2200	52	95	6.0	50	93	5.8	49	91	5.7
	2600	74	118	8.3	70	117	7.8	66	115	7.4
	2500	67	112	7.5	64	111	7.1	61	109	6.8
12,000	2400	61	106	6.8	58	105	6.5	56	102	6.3
	2300	55	100	6.3	53	98	6.0	51	96	5.9
	2200	50	93	5.8	49	91	5.7	47	89	5.6
	2550	67	114	7.5	64	112	7.1	61	111	6.9
	2500	64	111	7.2	61	109	6.8	59	107	6.6
2300	2400	59	105	6.6	56	103	6.3	54	100	6.1
	2300	53	98	6.1	51	96	5.9	50	94	5.8

Figure 5-8. Cruise Performance

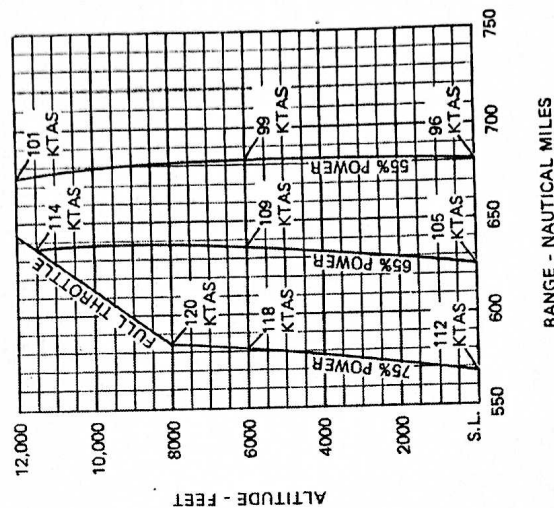
SECTION 5
PERFORMANCEAircraft Modified
Per Penn Yan STC
2400 lb. gross wt.CESSNA
MODEL 172NRANGE PROFILE
45 MINUTES RESERVE
50 GALLONS USABLE FUELCONDITIONS:
2400 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero WindNOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb.

Figure 5-9. Range Profile (Sheet 2 of 3)

SECTION 5
PERFORMANCE

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

CESSNA
MODEL 172N

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.

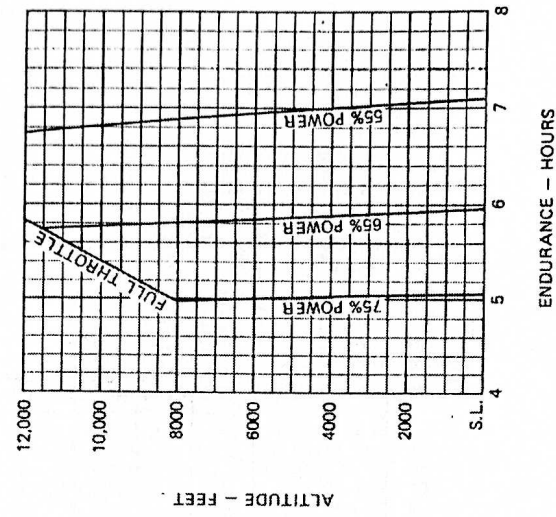


Figure 5-10. Endurance Profile (Sheet 2 of 3)

CESSNA
MODEL 172N

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

ENDURANCE PROFILE
45 MINUTES RESERVE
40 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.

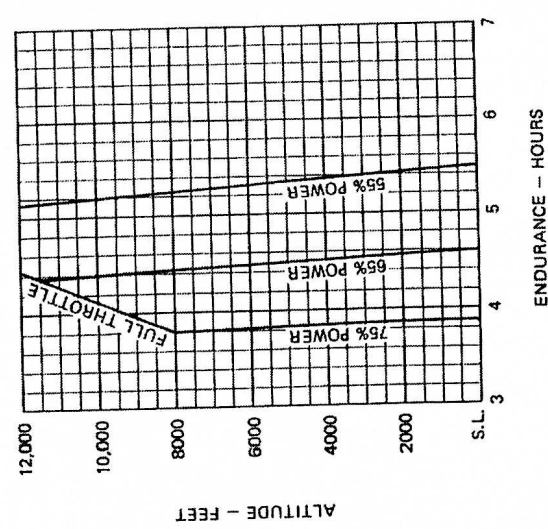


Figure 5-10. Endurance Profile (Sheet 1 of 3)

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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	590	1360	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	690	1515	710	1550	735	1590	760	1630
		8000	690	1515	715	1555	740	1595	765	1635	790	1675

Figure 5-11. Landing Distance

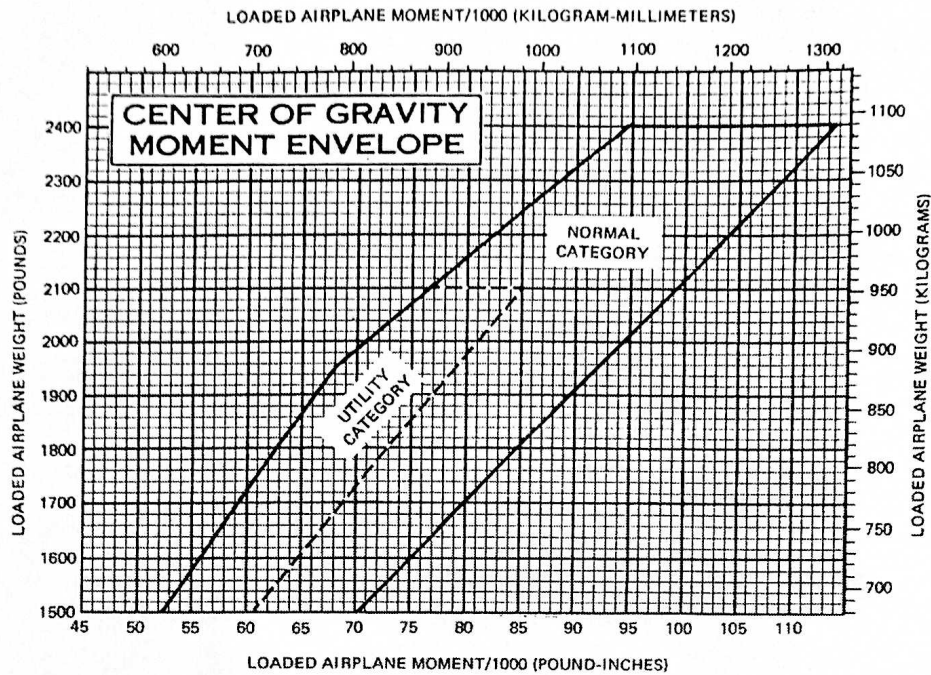


Figure 6-7. Center of Gravity Moment Envelope

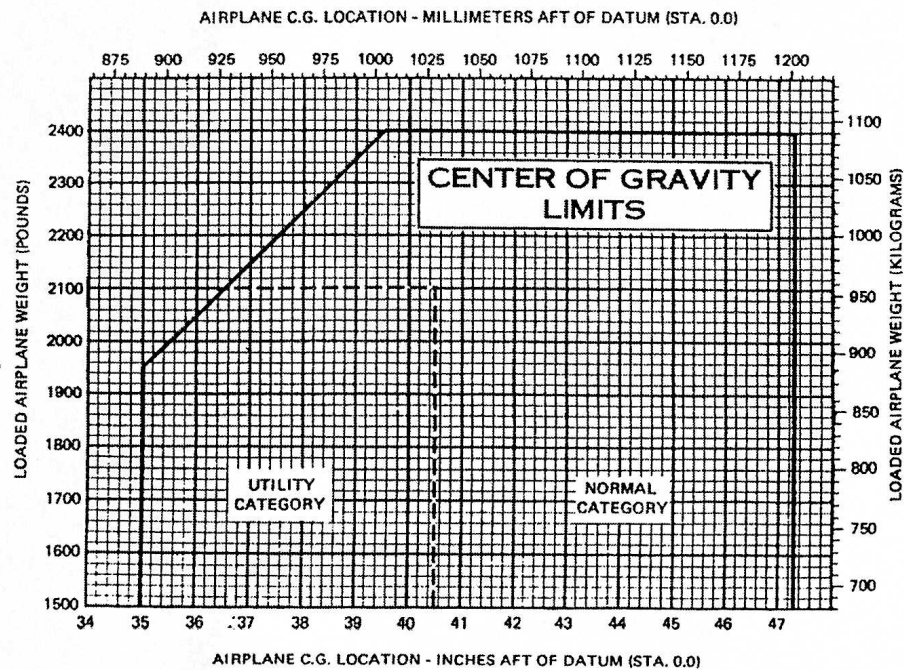


Figure 6-8. Center of Gravity Limits

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