
THERE ARE MORE CESSNAS FLYING THAN ANY OTHER MAKE



MODEL
177
AND
CARDINAL

1968

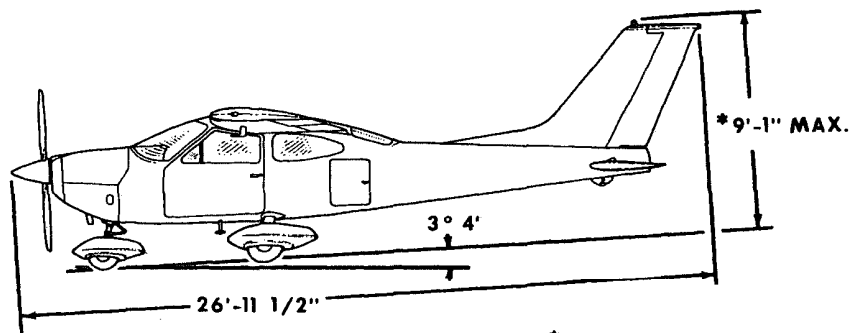
OWNER'S MANUAL

WORLD'S LARGEST PRODUCER OF GENERAL AVIATION AIRCRAFT SINCE 1956

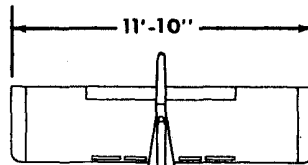
PERFORMANCE - SPECIFICATIONS

	* Model 177	* Cardinal
GROSS WEIGHT	2350 lbs	2350 lbs
SPEED:		
Top Speed at Sea Level	141 mph	144 mph
Cruise, 75% Power at 9000 ft	130 mph	134 mph
RANGE:		
Cruise, 75% Power at 9000 ft	755 miles	780 miles
48 Gal. No Reserve	5.8 hours	5.8 hours
Optimum Range at 10,000 ft	130 mph	134 mph
48 Gal. No Reserve	825 miles	855 miles
Optimum Range at 10,000 ft	7.6 hours	7.7 hours
Rate of Climb at Sea Level	108 mph	110 mph
RATE OF CLIMB AT SEA LEVEL	670 fpm	670 fpm
SERVICE CEILING	12,700 ft	12,700 ft
TAKE-OFF:		
Ground Run	845 ft	845 ft
Total Distance Over 50-Foot Obstacle.	1575 ft	1575 ft
LANDING:		
Landing Roll	400 ft	400 ft
Total Distance Over 50-Foot Obstacle.	1135 ft	1135 ft
EMPTY WEIGHT (Approximate)	1340 lbs	1415 lbs
BAGGAGE	120 lbs	120 lbs
WING LOADING: Pounds/Sq Foot	13.6	13.6
POWER LOADING: Pounds/HP	15.7	15.7
FUEL CAPACITY: Total	49 gal.	49 gal.
OIL CAPACITY	8 qts	8 qts
(One additional quart is required when optional oil filter is installed).		
PROPELLER: Fixed Pitch (Diameter)	76 inches	76 inches
ENGINE:		
Lycoming Engine	O-320-E2D	O-320-E2D
150 rated HP at 2700 RPM		

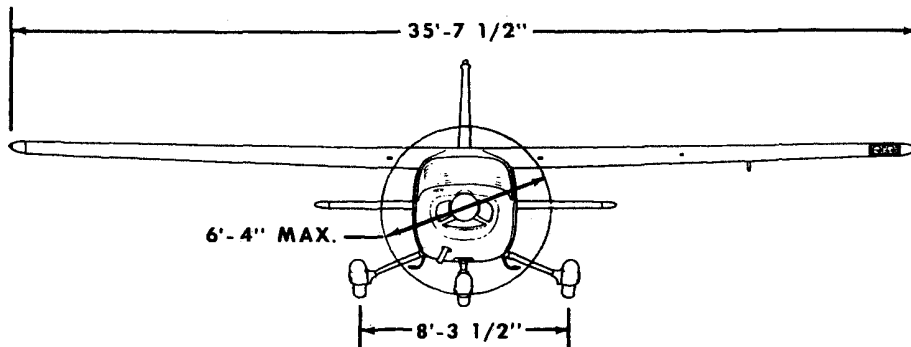
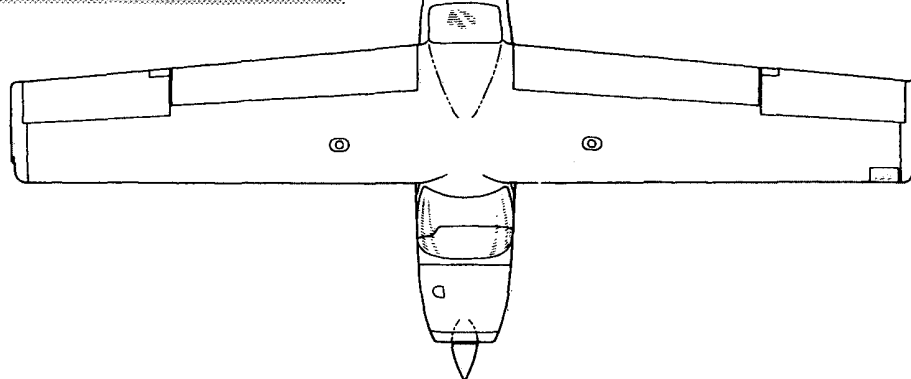
* This manual covers operation of the Model 177/Cardinal which is certificated as Model 177 under FAA Type Certificate No. A13CE



* Maximum height of airplane with nose gear depressed.



PRINCIPAL DIMENSIONS



Section II

DESCRIPTION AND OPERATING DETAILS

The following paragraphs describe the systems and equipment whose function and operation is not obvious when sitting in the airplane. This section also covers in somewhat greater detail some of the items listed in Check List form in Section I that require further explanation.

FUEL SYSTEM.

Fuel is supplied to the engine from two integral fuel bays, one in each wing. Usable fuel in each bay, for all flight conditions, is 24 gallons when completely filled.

The fuel capacity of this aircraft has been designed to provide the owner with a choice of long range capability with partial cabin loading or reduced range with full cabin loading. For example, with full cabin loading, it normally will be necessary to reduce the fuel load to keep the aircraft within approved weight and balance limits. (Refer to Section III for weight and balance control procedures.) A 21 gallon marker, in the form of a series of small holes just inside the filler neck, is provided to facilitate fueling to reduced fuel loads.

Fuel from each wing fuel bay flows through a selector valve, small reservoir, and fuel shut-off valve to the fuel strainer. From here, it is routed to an engine-driven pump which delivers the fuel under pressure to the carburetor. An electric auxiliary fuel pump parallels the engine-driven pump and is used when fuel pressure drops below 2 psi. It is not necessary to have the auxiliary pump operating during normal take-off and landing, since gravity feed will supply adequate fuel flow to the carburetor with the engine-driven pump inoperative. However, gravity flow is considerably reduced at maximum performance take-off and climb attitudes, and the auxiliary fuel pump would be required if the engine-driven pump should fail during these maneuvers.

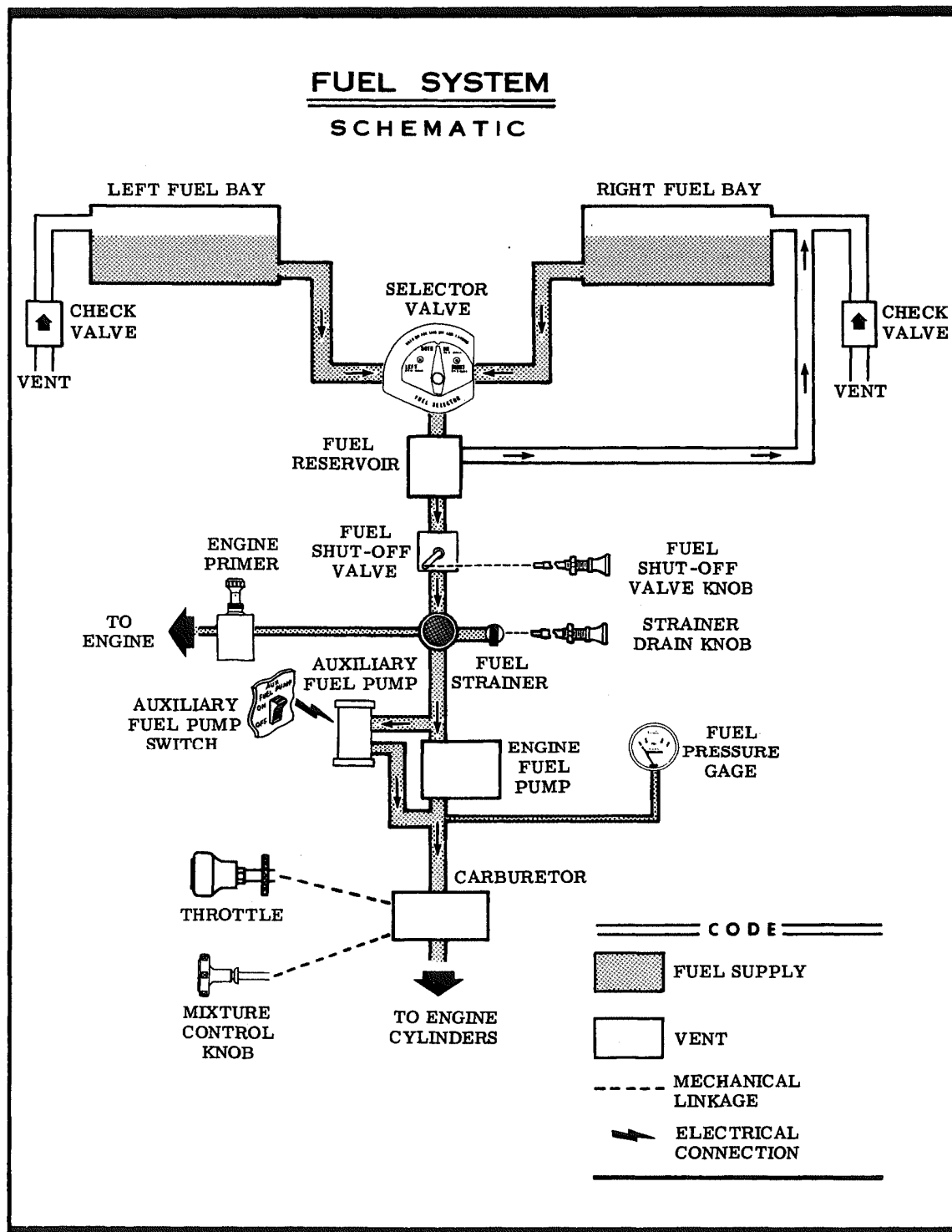


Figure 2-2.

NOTE

Take off with the fuel selector valve handle in the "BOTH ON" position to prevent inadvertent take-off on an empty bay. However, during long range flight with the selector valve handle in the "BOTH ON" position, unequal fuel flow from each bay may occur if the wings are not maintained exactly level. Resulting wing heaviness can be alleviated gradually by turning the selector valve handle to the fuel bay in the "heavy wing." The recommended cruise fuel management procedure for extended flight is to use the left and right bay alternately.

For fuel system servicing information, refer to Lubrication and Servicing Procedures in Section IV.

ELECTRICAL SYSTEM.

Electrical energy is supplied by a 14-volt, direct-current system powered by an engine-driven alternator (see figure 2-3). The 12-volt battery is located aft of the rear cabin wall. Power is supplied to all electrical circuits through a split bus bar, one side containing electronic system circuits and the other side having general electrical system circuits. Both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the semi-conductors in the electronic equipment.

AMMETER.

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the aircraft electrical system. When the engine is operating and the master switch is "ON," the ammeter indicates the charging rate applied to the battery. In the event the alternator is not functioning or the electrical load exceeds the output of the alternator, the ammeter indicates the discharge rate of the battery.

CIRCUIT BREAKERS AND FUSES.

Most of the electrical circuits in the airplane are protected by

GO-AROUND CLIMB.

In a balked landing (go-around) climb, apply full throttle smoothly, remove carburetor heat, and reduce wing flaps promptly to the "1/2" position.

Upon reaching an airspeed of approximately 75 MPH, flaps should be slowly retracted to the full up position. If obstacles are immediately ahead during the go-around, the wing flaps should be left in the "1/2" position until obstacles are cleared.

CRUISE.

Normal cruising is done between 65% and 75% power. The power settings required to obtain these powers at various altitudes and outside air temperatures can be determined by using your Cessna Power Computer or the OPERATIONAL DATA, Section V.

Cruising can be done most efficiently at high altitudes because of lower air density and, therefore, higher true airspeeds for the same power. This is illustrated in figure 2-5, which shows performance at 75% power at various altitudes.

All figures are based on lean mixture, 48 gallons of fuel (no reserve), zero wind, standard atmospheric conditions, and 2350 pounds gross weight.

OPTIMUM CRUISE PERFORMANCE			
ALTITUDE	RPM	TRUE AIRSPEED	RANGE
Sea Level	2470	125	720
5000 ft.	2580	130	750
9000 ft.	Full Throttle	134	780

Figure 2-5.

To achieve the lean mixture fuel consumption figures shown in Section V, the mixture should be leaned as follows: pull mixture control out until engine speed peaks and begins to fall off, then enrichen slightly back to peak RPM.

Carburetor ice, as evidenced by an unexplained drop in RPM, can be removed by application of full carburetor heat. Upon regaining the original RPM (with heat off), use the minimum amount of heat (by trial and error) to prevent ice from forming. Since heated air causes a richer mixture, readjust the mixture setting when carburetor heat is used continuously in cruising flight.

STALLS.

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 10 MPH above the stall in all configurations.

Power-off stall speeds at maximum gross weight and aft c.g. position are presented on page 5-2 as calibrated airspeeds since indicated airspeeds are unreliable near the stall.

LANDING.

Normal landings are made power-off with any flap setting. Slips are prohibited in full flap approaches because of a downward pitch encountered under certain combinations of airspeed, sideslip angle and center of gravity loadings.

Landings should be made on the main wheels first to reduce the landing speed and subsequent need for braking in the landing roll. The nose wheel is lowered to the runway gently after the speed has diminished to avoid unnecessary nose gear loads. This procedure is especially important in rough or soft field landings.

Full down stabilator (control wheel positioned full forward) should not be used during the ground roll. This reduces the weight on the main wheels which causes poor braking and increases the possibility of sliding the tires.

Section V

OPERATIONAL DATA

The operational data shown on the following pages are compiled from actual tests with the airplane and engine in good condition and using average piloting technique. You will find this data a valuable aid when planning your flights.

A power setting selected from the range chart usually will be more efficient than a random setting, since it will permit you to estimate your fuel consumption more accurately. You will find that using the chart and your Power Computer will pay dividends in overall efficiency.

Cruise and range performance shown in the chart on page 5-4 are based on flight test using a McCauley 1C172/TM7653 propeller. Other conditions of the tests are shown in the chart headings. Allowances for fuel reserve, headwinds, take-offs, and climb, and variations in mixture leaning technique should be made and are in addition to those shown on the chart. Other indeterminate variables such as carburetor metering-characteristics, engine and propeller conditions, and turbulence of the atmosphere may account for variations of 10% or more in maximum range.

Remember that the charts contained herein are based on standard day conditions. For more precise power, fuel consumption, and endurance information, consult the Cessna Flight Guide (Power Computer) supplied with your aircraft. With the Flight Guide, you can easily take into account temperature variations from standard at any flight altitude.

AIRSPEED CORRECTION TABLE										
FLAPS UP										
IAS-MPH	60	70	80	90	100	110	120	130	140	145
CAS-MPH	61	71	81	90	100	110	119	129	138	143
FLAPS 1/4										
IAS-MPH	60	70	80	90	100	110	120	130	—	—
CAS-MPH	63	72	82	91	101	110	120	129	—	—
FULL FLAPS										
IAS-MPH	50	60	70	80	90	100	105	—	—	—
CAS-MPH	54	63	73	82	91	101	105	—	—	—

Figure 5-1.

POWER OFF	STALLING SPEEDS				MPH - CAS
GROSS WEIGHT 2350 LBS	ANGLE OF BANK				
CONDITION	 0°	 20°	 40°	 60°	
FLAPS UP	64	66	73	91	
FLAPS 1/4	60	62	69	85	
FULL FLAPS	53	55	61	75	

Figure 5-2.

TAKE-OFF DATA										
TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY WITH FLAPS 1/4										
GROSS WEIGHT POUNDS	IAS AT 50' MPH	HEAD WIND KNOTS	AT SEA LEVEL & 59°F		AT 2500 FT. & 50°F		AT 5000 FT. & 41°F		AT 7500 FT. & 32°F	
			GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS
2350	67	0 10 20	845 585 370	1575 1190 850	1025 720 465	2000 1530 1115	1260 900 595	2740 2145 1600	1575 1140 770	4680 3765 2915
2000	62	0 10 20	580 385 230	1060 775 530	695 475 290	1280 955 665	850 585 370	1610 1215 865	1050 740 475	2150 1650 1205
1700	57	0 10 20	400 255 145	745 535 350	475 315 180	885 640 430	580 385 230	1070 785 535	710 485 295	1340 1000 695

NOTES: 1. Increase distance 10% for each 20°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 7% of the "total to clear 50 ft. obstacle" figure.

MAXIMUM RATE-OF-CLIMB DATA											
GROSS WEIGHT POUNDS	AT SEA LEVEL & 59°F			AT 5000 FT & 41°F			AT 10,000 FT & 23°F			AT 15,000 FT & 5°F	
	IAS MPH	RATE OF CLIMB FT/MIN	GAL. OF FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN
2350	88	670	1.0	87	445	2.9	85	225	5.3	84	0
2000	86	825	1.0	85	585	2.5	83	350	4.1	82	110
1700	84	960	1.0	83	710	2.2	81	460	3.5	80	210

NOTES:

1. Flaps up, full throttle and mixture leaned for smooth operation above 5000 ft.
2. Fuel used includes warm up and take-off allowance.
3. For hot weather, decrease rate of climb 20 ft./min. for each 10°F above standard day temperature for particular altitude.

NOTES: 1. Flaps up, full throttle and mixture leaned for smooth operation above 5000 ft.
2. Fuel used includes warm up and take-off allowance.
3. For hot weather, decrease rate of climb 20 ft./min. for each 10°F above standard day temperature for particular altitude.

Figure 5-3.

CRUISE & RANGE PERFORMANCE

CARDINAL

Gross Weight- 2350 Lbs.
Standard Conditions
Zero Wind Lean Mixture
48 Gal. of Fuel (No Reserve)

NOTE: Maximum cruise is normally limited to 75% power. Cruise speeds for the standard Model 177 are 3 to 4 MPH less than shown below for the Cardinal configuration.

ALT.	RPM	% BHP	TAS MPH	GAL / HOUR	ENDR. HOURS	RANGE MILES
2500	2700	89	138	9.9	4.8	670
	2600	81	132	8.9	5.4	710
	2500	73	126	8.1	5.9	750
	2400	65	119	7.3	6.6	785
	2300	58	112	6.6	7.3	815
	2200	52	104	6.0	7.9	825
	2100	46	94	5.7	8.5	795
5000	2700	84	137	9.3	5.2	710
	2600	76	131	8.4	5.7	745
	2500	69	125	7.6	6.3	785
	2400	61	118	6.9	7.0	820
	2300	55	110	6.3	7.6	840
	2200	48	100	5.8	8.2	820
7500	2700	79	136	8.7	5.5	745
	2600	71	130	7.9	6.1	785
	2500	64	123	7.2	6.7	820
	2400	57	115	6.5	7.4	845
	2300	51	105	6.0	8.0	840
10000	2650	70	131	7.8	6.2	805
	2600	67	127	7.4	6.5	825
	2500	60	120	6.8	7.1	850
	2400	54	110	6.2	7.7	855
	2300	48	98	5.8	8.3	810
12500	2600	62	124	7.0	6.9	855
	2500	56	115	6.4	7.5	865
	2400	50	103	5.9	8.1	830

Figure 5-4.

LANDING DISTANCE TABLE

LANDING DISTANCE WITH FULL FLAPS, POWER OFF,
AND NO WIND ON HARD SURFACE RUNWAY

GROSS WEIGHT POUNDS	IAS AT 50' MPH	AT SEA LEVEL & 59° F		AT 2500 FT. & 50° F		AT 5000 FT. & 41° F		AT 7500 FT. & 32° F	
		GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.
2350	66	400	1135	420	1195	445	1265	470	1335

- NOTES:
1. Reduce landing distance 10% for each 4 knots of headwind.
 2. For operation on a dry, grass runway, increase distances (both "ground roll" and "total to clear 50 ft. obstacle") by 20% of the "total to clear 50 ft. obstacle" figure.

Figure 5-5.

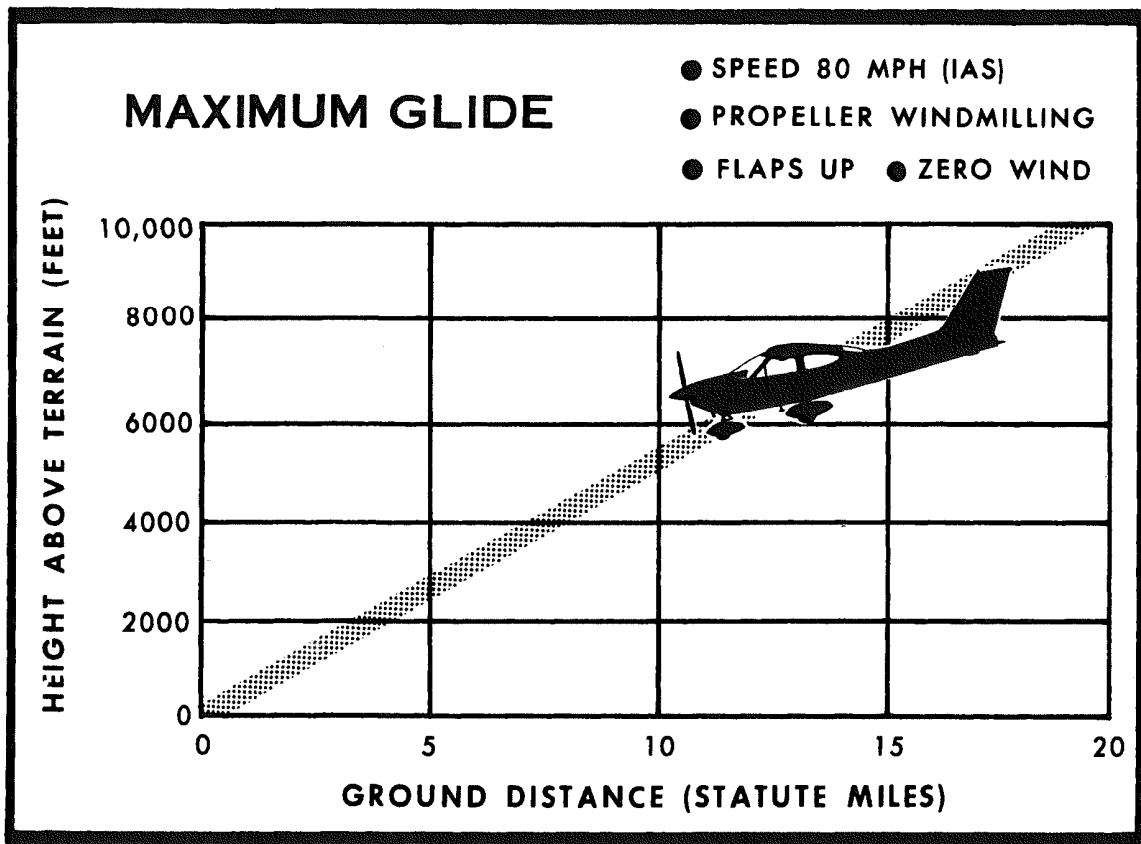


Figure 5-6.