

SECTION 2 LIMITATIONS

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INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section and in Section 9 have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

NOTE

Refer to Section 9 of this Pilot's Operating Handbook for amended operating limitations, operating procedures, performance data and other necessary information for airplanes equipped with specific options.

NOTE

The airspeeds listed in the Airspeed Limitations chart (figure 2-1) and the Airspeed Indicator Markings chart (figure 2-2) are based on Airspeed Calibration data shown in Section 5 with the normal static source. If the alternate static source is being used, ample margins should be observed to allow for the airspeed calibration variations between the normal and alternate static sources as shown in Section 5.

Your Cessna is certificated under FAA Type Certificate No. 3A12 as Cessna Model No. 172P.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1. Maneuvering speeds shown apply to normal category operations. The utility category maneuvering speed is 102 KIAS at 2100 pounds.

	SPEED	KCAS	KIAS	REMARKS
V _{NE}	Never Exceed Speed	152	158	Do not exceed this speed in any operation.
V _{NO}	Maximum Structural Cruising Speed	123	127	Do not exceed this speed except in smooth air, and then only with caution.
V _A	Maneuvering Speed: 2400 Pounds 2000 Pounds 1600 Pounds	97 91 81	99 92 82	Do not make full or abrupt control movements above this speed.
V _{FE}	Maximum Flap Extended Speed: 10° Flaps 10° - 30° Flaps	108 84	110 85	Do not exceed this speed with flaps down.
	Maximum Window Open Speed	152	158	Do not exceed this speed with windows open.

Figure 2-1. Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	33 - 85	Full Flap Operating Range. Lower limit is maximum weight V_{SO} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	44 - 127	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	127 - 158	Operations must be conducted with caution and only in smooth air.
Red Line	158	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming.

Engine Model Number: O-320-D2J.

Maximum Power: 160 BHP rating.

Engine Operating Limits for Takeoff and Continuous Operations:

Maximum Engine Speed: 2700 RPM.

NOTE

The static RPM range at full throttle (carburetor heat off and mixture leaned to maximum RPM) is 2300 to 2420 RPM.

Maximum Oil Temperature: 245°F (118°C).

Oil Pressure, Minimum: 20 psi.

Maximum: 115 psi.

Fuel Grade: See Fuel Limitations.

Oil Grade (Specification):

MIL-L-6082 Aviation Grade Straight Mineral Oil or MIL-L-22851 Ash-less Dispersant Oil.

Propeller Manufacturer: McCauley Accessory Division.

Propeller Model Number: 1C160/DTM7557.

Propeller Diameter, Maximum: 75 inches.

Minimum: 74 inches.

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POWER PLANT INSTRUMENT MARKINGS

Power plant instrument markings and their color code significance are shown in figure 2-3.

INSTRUMENT	RED LINE	GREEN ARC	RED LINE
	MINIMUM LIMIT	NORMAL OPERATING	MAXIMUM LIMIT
Tachometer: Sea Level 5000 Feet 10000 Feet	---	2100-2450 RPM 2100-2575 RPM 2100-2700 RPM	2700 RPM
Oil Temperature	---	100°-245°F	245°F
Oil Pressure	20 psi	50-90 psi	115 psi
Fuel Quantity (Standard Tanks)	E (1.5 Gal. Unusable Each Tank)	---	---
Fuel Quantity (Long Range Tanks)	E (2.0 Gal. Unusable Each Tank)	---	---
Fuel Quantity (Integral Tanks)	E (3.0 Gal. Unusable Each Tank)	---	---
Suction	---	4.5-5.4 in.Hg	---

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

NORMAL CATEGORY

Maximum Ramp Weight: 2407 lbs.

Maximum Takeoff Weight: 2400 lbs.

Maximum Landing Weight: 2400 lbs.

Maximum Weight in Baggage Compartment:

Baggage Area 1 (or passenger on child's seat) - Station 82 to 108: 120 lbs. See following note.

Baggage Area 2 - Station 108 to 142: 50 lbs. See following note.

NOTE

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

UTILITY CATEGORY

Maximum Ramp Weight: 2107 lbs.

Maximum Takeoff Weight: 2100 lbs.

Maximum Landing Weight: 2100 lbs.

Maximum Weight in Baggage Compartment: In the utility category, the baggage compartment and rear seat must not be occupied.

CENTER OF GRAVITY LIMITS

NORMAL CATEGORY

Center of Gravity Range:

Forward: 35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 39.5 inches aft of datum at 2400 lbs.

Aft: 47.3 inches aft of datum at all weights.

Reference Datum: Lower portion of front face of firewall.

UTILITY CATEGORY

Center of Gravity Range:

Forward: 35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 36.5 inches aft of datum at 2100 lbs.

Aft: 40.5 inches aft of datum at all weights.

Reference Datum: Lower portion of front face of firewall.

MANEUVER LIMITS

NORMAL CATEGORY

This airplane is certificated in both the normal and utility category. The normal category is applicable to aircraft intended for non-aerobatic operations. These include any maneuvers incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles, and turns in which the angle of bank is not more than 60°. Aerobatic maneuvers, including spins, are not approved.

UTILITY CATEGORY

This airplane is not designed for purely aerobatic flight. However, in the acquisition of various certificates such as commercial pilot and flight

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instructor, certain maneuvers are required by the FAA. All of these maneuvers are permitted in this airplane when operated in the utility category.

In the utility category, the baggage compartment and rear seat must not be occupied. No aerobatic maneuvers are approved except those listed below:

MANEUVER	RECOMMENDED ENTRY SPEED*
Chandelles	105 knots
Lazy Eights	105 knots
Steep Turns	95 knots
Spins	Slow Deceleration
Stalls (Except Whip Stalls)	Slow Deceleration

*Abrupt use of the controls is prohibited above 99 knots.

Aerobatics that may impose high loads should not be attempted. The important thing to bear in mind in flight maneuvers is that the airplane is clean in aerodynamic design and will build up speed quickly with the nose down. Proper speed control is an essential requirement for execution of any maneuver, and care should always be exercised to avoid excessive speed which in turn can impose excessive loads. In the execution of all maneuvers, avoid abrupt use of controls. Intentional spins with flaps extended are prohibited.

FLIGHT LOAD FACTOR LIMITS

NORMAL CATEGORY

Flight Load Factors (Maximum Takeoff Weight - 2400 lbs.):

- *Flaps Up +3.8g, -1.52g
- *Flaps Down +3.0g

*The design load factors are 150% of the above, and in all cases, the structure meets or exceeds design loads.

UTILITY CATEGORY

Flight Load Factors (Maximum Takeoff Weight - 2100 lbs.):

- *Flaps Up +4.4g, -1.76g
- *Flaps Down +3.0g

*The design load factors are 150% of the above, and in all cases, the structure meets or exceeds design loads.

KINDS OF OPERATION LIMITS

The airplane is equipped for day VFR and may be equipped for night VFR and/or IFR operations. FAR Part 91 establishes the minimum required instrumentation and equipment for these operations. The reference to types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.

Flight into known icing conditions is prohibited.

FUEL LIMITATIONS

2 Standard Tanks: 21.5 U.S. gallons each.

Total Fuel: 43 U.S. gallons.

Usable Fuel (all flight conditions): 40 U.S. gallons.

Unusable Fuel: 3 U.S. gallons.

2 Long Range Tanks: 27 U.S. gallons each.

Total Fuel: 54 U.S. gallons.

Usable Fuel (all flight conditions): 50 U.S. gallons.

Unusable Fuel: 4 U.S. gallons.

2 Integral Tanks: 34 U.S. gallons each.

Total Fuel: 68 U.S. gallons.

Usable Fuel (all flight conditions): 62 U.S. gallons.

Unusable Fuel: 6 U.S. gallons.

NOTE

To ensure maximum fuel capacity when refueling and minimize cross-feeding when parked on a sloping surface, place the fuel selector valve in either LEFT or RIGHT position.

Takeoff and land with the fuel selector valve handle in the BOTH position.

Maximum slip or skid duration with one tank dry: 30 seconds.

With 1/4 tank or less, prolonged uncoordinated flight is prohibited when operating on either left or right tank.

Fuel remaining in the tank after the fuel quantity indicator reads empty (red line) cannot be safely used in flight.

Approved Fuel Grades (and Colors):

100LL Grade Aviation Fuel (Blue).

100 (Formerly 100/130) Grade Aviation Fuel (Green).

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 10°.
Approved Landing Range: 0° to 30°.

PLACARDS

The following information must be displayed in the form of composite or individual placards.

1. In full view of the pilot: (The "DAY-NIGHT-VFR-IFR" entry, shown on the example below, will vary as the airplane is equipped.)

The markings and placards installed in this airplane contain operating limitations which must be complied with when operating this airplane in the Normal Category. Other operating limitations which must be complied with when operating this airplane in this category or in the Utility Category are contained in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

Normal Category - No acrobatic maneuvers, including spins, approved.

Utility Category - No acrobatic maneuvers approved, except those listed in the Pilot's Operating Handbook.

Baggage compartment and rear seat must not be occupied.

Spin Recovery - Opposite rudder - forward elevator - neutralize controls.

Flight into known icing conditions prohibited.

This airplane is certified for the following flight operations as of date of original airworthiness certificate:

DAY-NIGHT-VFR-IFR

2. On the fuel selector valve (standard tanks):

TAKEOFF LANDING		BOTH 40.0 GAL.	ALL FLIGHT ATTITUDES	FUEL SELECTOR
LEFT 20.0 GAL. LEVEL FLIGHT ONLY	OFF	PUSH DOWN ROTATE		RIGHT 20.0 GAL. LEVEL FLIGHT ONLY

On the fuel selector valve (long range tanks):

TAKEOFF LANDING		BOTH 50.0 GAL.	ALL FLIGHT ATTITUDES	FUEL SELECTOR
LEFT 25.0 GAL. LEVEL FLIGHT ONLY	OFF	PUSH DOWN ROTATE		RIGHT 25.0 GAL. LEVEL FLIGHT ONLY

On the fuel selector valve (integral tanks):

TAKEOFF LANDING		BOTH 62.0 GAL.	ALL FLIGHT ATTITUDES	FUEL SELECTOR
LEFT 31.0 GAL. LEVEL FLIGHT ONLY	OFF	PUSH DOWN ROTATE		RIGHT 31.0 GAL. LEVEL FLIGHT ONLY

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- ✓ 3. Near fuel tank filler cap (standard tanks):

FUEL
100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 21.5 U.S. GAL.

Near fuel tank filler cap (long range tanks):

FUEL
100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 27 U.S. GAL.

Near fuel tank filler cap (integral tanks):

FUEL
100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 34 U.S. GAL.
CAP. 24.0 U.S. GAL. TO BOTTOM OF FILLER COLLAR

- ✓ 4. Near wing flap switch:

AVOID SLIPS WITH FLAPS EXTENDED

- ✓ 5. On flap control indicator:

0° to 10°	110 KIAS	(Partial flap range with blue color code; also, mechanical detent at 10°.)
10° to 30°	85 KIAS	(White color code; also, mechanical detent at 20°.)

- #
✓ 6. In baggage compartment:

120 POUNDS MAXIMUM
BAGGAGE AND/OR AUXILIARY PASSENGER
FORWARD OF BAGGAGE DOOR LATCH

50 POUNDS MAXIMUM
BAGGAGE AFT OF BAGGAGE DOOR LATCH

MAXIMUM 120 POUNDS COMBINED

FOR ADDITIONAL LOADING INSTRUCTIONS
SEE WEIGHT AND BALANCE DATA

7. A calibration card must be provided to indicate the accuracy of the magnetic compass in 30° increments.

- ✓ 8. On oil filler cap:

OIL
7 QTS

- ✓ 9. On control lock:

CAUTION!
CONTROL LOCK
REMOVE BEFORE STARTING ENGINE

- ✓ 10. Near airspeed indicator:

MANEUVER SPEED - 99 KIAS

- ✓ 11. On forward face of firewall adjacent to the battery:

CAUTION 24 VOLTS D.C.
This aircraft is equipped with alternator
and a negative ground system.
OBSERVE PROPER POLARITY
Reverse polarity will damage electrical components.