

**Chapter 2
Limitations**

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General

This section presents the operating limitations, instrument markings and placards necessary for the safe operation of the C-172R. Limitations contained in this section of the manual are approved by the Federal Aviation Administration.

CAUTION

Observance of these limitations is mandatory.

Certification Status

The Cessna 172 is certified under CAR 03 and FAR Part 23.

Flight crews shall be able to recall information contained within the **solid-box** outlines from memory during normal operations and be able to apply the information as appropriate the operation being conducted. Rote memorization is not a replacement for a correlative level of knowledge.

NOTE

For aircraft equipped with specific options, refer to Section 9, “Supplements”, of the Pilot’s Information Manual (PIM) and FAA Approved Airplane Flight Manual for amended operating limitations, procedures, performance data and/or other necessary information.

Kinds of Operating Limitations

The airplane is approved for the following operations when equipped in accordance with 14 CFR Part 91 or Part 135.

- ⊕ Day V.F.R.
- ⊕ Night V.F.R.
- ⊖ Day I.F.R.
- ⊖ Night I.F.R.
- ⊕ Non-icing.

Kinds of Operation Minimum Equipment List

The following equipment list is provided by the aircraft manufacturer, Cessna Aircraft Inc., and identifies the systems and equipment upon which type certification for each kind of operation was based.

The equipment listed in the following table must be installed and operable for flight unless:

- A. The airplane is approved to be operated in accordance with a current Master Minimum Equipment List (MMEL) issued by the FAA, or
- B. An alternate procedure is provided in the basic FAA-Approved Airplane Flight Manual for the inoperative state of the listed equipment and the flight crew complies with all limitations.

NOTE

Bridgewater State College does not operate the Cessna 172 with a MMEL. See Chapter 8, “MEL Decision Sequence”, for operating the aircraft with inoperative or uninstalled equipment.

Kinds of Operation Minimum Equipment List

System and/or Component	Kind Of Operation			
	Day VFR	Night VFR	Day IFR	Night IFR
Placards and Markings				
IFR Day and Night Limitations Placard	1	1	1	1
Air Condition				
Cabin Heat System	1	1	1	1
Communications				
Static Discharge Wicks	0	0	10	10
NAV/COM Installation With GS	1	1	1	1
Audio/Intercom/Marker Beacon Installation	1	1	1	1
Basic Avionics (Used with #1 NAV/COM)	1	1	1	1
Electrical Power				
Alternator, 28 Volt 60 Amp	1	1	1	1
Battery, 24 Volt, 12.75 A.H. Manifold Type	1	1	1	1

Kinds of Operation Minimum Equipment List, Continued:

System and/or Component	Kind Of Operation			
	Day VFR	Night VFR	Day IFR	Night IFR
Equipment and Furnishing				
Seat Belt and Shoulder Harness, Inertia Reel, Pilot and Front Passenger	2	2	2	2
Seat Belt and Shoulder Harness, Inertia Reel, Rear Seat	1	1	1	1
Padded Glareshield	1	1	1	1
Baggage Retaining Net	1	1	1	1
Auxiliary Fuel Pump	1	1	1	1
Indicating/Recording System				
Clock/OAT Indicator, Digital	1	1	1	1
Hour Recorder "Hobbs Time"	1	1	1	1
Annunciator	1	1	1	1
Stall Warning Indicator -Pneumatic	1	1	1	1
Landing Gear				
Wheel Brake and Tire (Main)	2	2	2	2
Wheel Brake and Tire (Nose)	1	1	1	1

Kinds of Operation Minimum Equipment List, Continued:

System and/or Component	Kind Of Operation			
	Day VFR	Night VFR	Day IFR	Night IFR
Lights				
Flashing Beacon Light on Vertical Fin Tip	1	1	1	1
Strobe Light Installation on Wing Tips	1	1	1	1
Landing and Taxi Light Installation on Wings	1	1	1	1
Navigation				
Indicator, Airspeed	1	1	1	1
Alternate Static Air Source	1	1	1	1
Altimeter	1	1	1	1
Magnetic Compass	1	1	1	1
Directional Gyro	1	1	1	1
Attitude Indicator	1	1	1	1
Turn Coordinator	1	1	1	1
Vertical Speed Indicator	1	1	1	1
GPS Installation	1	1	1	1
Mode C Transponder	1	1	1	1
Vacuum				
Vacuum System	1	1	1	1
Vacuum Gage/Ammeter	1	1	1	1
Low Vacuum Warning Light	1	1	1	1

Kinds of Operation Minimum Equipment List, Continued:

System and/or Component	Kind Of Operation				Remarks
	Day VFR	Night VFR	Day IFR	Night IFR	
Propeller					
Propeller Assembly, Fixed Pitch	1	1	1	1	
Spinner Installation, Propeller	1	1	1	1	
Filter, Air Intake, Donaldson	1	1	1	1	
Engine, Lycoming IO-360-L2A	1	1	1	1	
Engine Fuel and Control					
EGT/Fuel Flow Indicator	1	1	1	1	
Engine Indicating					
Tachometer	1	1	1	1	

CAUTION

Cleaners containing ammonia are PROHIBITED.

Weight and Center of Gravity Limitations

Structural Weight Limitations

Maximum Ramp Weight (Normal Category)	2,457 lbs
Maximum Takeoff Weight (Normal Category).....	2,450 lbs
Maximum Landing Weight (Normal Category).....	2,450 lbs
Maximum Weight in Baggage Area 1 (Normal Category).....	120 lbs
Maximum Weight in Baggage Area 2 (Normal Category).....	50 lbs
Maximum Weight in Baggage Area 1 & 2 Combined (Normal Category).....	120 lbs
Maximum Ramp Weight (Utility Category).....	2,107 lbs
Maximum Takeoff Weight (Utility Category).....	2,100 lbs
Maximum Landing Weight (Utility Category).....	2,100 lbs
Maximum Weight in Baggage Area (Utility Category).....	NA

Center of Gravity Range and Limitations, Normal Category

Weight	Forward Limit	Aft Limit
1,950 lbs or less	35.0 inches	47.3 inches
2,450 lbs	40.0 inches	47.3 inches

Center of Gravity Range and Limitations, Utility Category

Weight	Forward Limit	Aft Limit
1,950 lbs or less	35.0 inches	40.5 inches
2,100 lbs	36.5 inches	40.5 inches

NOTE

The reference datum for the Cessna 172 is located on the lower portion of the front face of the firewall.

Maneuvering Limitations – Normal Category

The Cessna 172R is rated in both the Normal and Utility category. The only authorized maneuvers in the Cessna 172R are those maneuvers incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles, and steep turns (with not more than 60° of bank). Aerobatic maneuvers, including spins, are not approved.

Maneuvering Limitations – Utility Category

The Cessna 172R is rated in both the Normal and Utility category. The aircraft is not designed for purely aerobatic flight. However, the airplane is approved to conduct all maneuvers required for the FAA Commercial Pilot and Flight Instructor certification, including spins.

Flight Load Factor Limitations

NORMAL Category (Gross Weight, 2,450 lbs)

Configuration	Positive Load Limit	Negative Load Limit
Flaps Up	+3.8 g	-1.52 g
Flaps Down	+3.0 g	0.0 g

UTILITY Category (Gross Weight, 2,100 lbs)

Configuration	Positive Load Limit	Negative Load Limit
Flaps Up	+4.4 g	-1.76 g
Flaps Down	+3.0 g	0.0 g

NOTE

In the utility category, the baggage compartment and rear seat must not be occupied.

WARNING

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

Power Plant Limitations

Manufacturer.....Textron Lycoming
 Model Number.....IO-360-L2A
 Takeoff Power..... 160 hp @ 2400 RPM
 Maximum Continuous Power..... 160 hp @ 2400 RPM
 Fuel Minimum Grade:..... 100/100 LL (Blue)

Engine Operating Limitations for Takeoff and Max Continuous Power

Takeoff Power Maximum RPM.....	2400 RPM
Maximum Continuous Power.....	2400 RPM
Minimum Oil Temperature for Takeoff.....	100°F
Maximum Oil Temperature	245°F
Maximum Oil Pressure.....	115 psi
Minimum Oil Pressure.....	20 psi

Oil Specifications

Average Ambient OAT	MIL-L-6082 or SAE J1966 Straight Mineral Oil SAE Grad	MIL-L-22851 or SAE J1899 Ashless Dispersant SAE Grade
Above 27°C (80°F)	60	60
Above 16°C (60°F)	50	40 or 50
-1°C (30°F) to 32°C (90°F)	40	40
-18°C (0°F) to 21°C (70°F)	30	30, 40 or 20W-40
Below -12° (10°F)	20	30 or 20W-30
-18°C (0°F) to 32°C (90°F)	20W-50	20W-50 or 15W-50
ALL TEMPERATURES	NA	SAE 15W-50 OR 20W-50

Maximum Oil Capacity.....8 qts
 Minimum Oil Quantity..... 6 qts
 Oil Pressure (Normal).....50-90 psi
 Oil Temperature (Normal Cruise)..... 100-245°F

CAUTION

During the first 25 hours of engine operation use straight mineral (non-detergent) oil or corrosion preventive oil that is MIL-C-6529, Type II. Following the initial 25 operational hours, use an ashless dispersant (detergent) oil MHS-24 or MHS-25.

CAUTION

Do not operate the engine with less than six (6) quarts of oil.

Propeller Specifications

Manufacturer.....McCauley/Model 1C235/LFA7570
 Type: Fixed pitch, 2-bladed
 Max. Diameter: 75”
 Min. Diameter: 74”

Power Plant Instrument Markings

INSTRUMENT	Red Line (Min)	Yellow Arc (Lower)	Green Arc Normal	Yellow Arc (Upper)	Red Line (Max)
Tachometer (RPM)	-----	-----	1900-2400 RPM	-----	2400 RPM
Oil Pressure (PSI)	20	-----	50-90	-----	115
Oil Temp. (Degrees F)	-----	-----	100°-245°	-----	245°
Vacuum Pres. (Hg)	-----	-----	4.5”-5.5”	-----	-----

Fuel Limitations

Approved Fuel.....Aviation Grade 100LL (Blue) or 100 (Green)
 Standard Tanks
 Total Capacity.....56 Gallons
 Total Usable Fuel.....53Gallons
 Unusable Fuel.....3 Gallons

To ensure maximum fuel capacity when refueling, place the fuel selector valve in either the LEFT or RIGHT position to prevent cross-feeding.

NOTE

Take off and land with the fuel selector in the BOTH position.

WARNING

The fuel remaining in the tank(s) when the quantity indicator reads zero cannot be safely used in flight.

Electrical System Limitations

Alternator Limitations.....	Maximum 31.5 Volts
Amps Load.....	Maximum 60 Amps

NOTE

Before Night or IFR operations, battery must be charged according to engine run-up procedure.

Airspeed Limitations

Operational speeds shown in the following table apply during Normal Category operations. Airspeed limitations for Utility Category operations are listed in the placard section.

Symbol	Remarks	KCAS	KIAS
Maximum Flap Extend Speed: V_{FE}	Do not exceed this speed with flaps extended.		
10° Flaps		108	110
10° to 30° Flaps		84	85
Maneuvering Speed: V_A	Do not make full or abrupt control movements above this speed.		
2450 lbs		97	99
2000 lbs		91	92
1600 lbs		82	82
Max. Structural Cruising Speed: V_{NO}	Do not exceed this speed in turbulent air	126	129
Never exceed speed: V_{NE}	Maximum speed for all operations.	160	163
Maximum Window Open Speed	Do not exceed this speed with windows open	160	163

CAUTION

Maximum demonstrated crosswind in the Cessna 172R is 15 knots.

Airspeed Indicator Markings

Instrument Marking	Explanation	KIAS
White Arc	Full Flap Operating Range: Lower limit is maximum weight stall speed V_{SO} in the landing configuration. Upper limit is maximum speed permissible with flaps fully extended.	33-85
Green Arc	Normal Operating Range: Lower limit is maximum weight stall speed with flaps retracted. (V_S) The upper limit is V_{NO} .	44-129
Yellow Arc	Caution Range: Flight in this range is limited to smooth air only and then with caution.	129-163
Red Line	Never Exceed Speed: Maximum speed for all operations.	163

System and Equipment Limitations

Maximum Seating.....4

Other Limitations

Maximum Operating Altitude.....13,500 feet

Placards

The following placards are required on the Cessna 172.

NOTE

Flight crews shall check during pre-flight to ensure that these placards are in place and clearly readable.

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
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:

TAKEOFF LANDING	BOTH 53.0 GAL.	ALL FLIGHT ATTITUDES
FUEL SELECTOR		
LEFT 26.5 GAL. LEVEL FLIGHT ONLY		RIGHT 26.5 GAL. LEVEL FLIGHT ONLY

3. Near fuel tank filler cap:

FUEL
100LL/ 100 MIN. GRADE AVIATION GASOLINE
CAP. 26.5 U.S. GAL. USABLE
CAP 17.5 U.S. GAL. USABLE TO BOTTOM
OF FILLER INDICATOR TAB

4. 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°.)

5. In baggage compartment

120 POUNDS MAXIMUM BAGGAGE
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

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

7. On the oil filter cap:

OIL
8 QTS

8. On control lock:

CAUTION!
CONTROL LOCK
REMOVE BEFORE STARTING ENGINE

9. Near airspeed indicator:

MANEUVERING SPEED – 99KIAS

10. On the Upper Right Side of the Aft Cabin Partition:

EMERGENCY LOCATOR TRANSMITTER
INSTALLED AFT OF THIS PARTITION
MUST BE SERVICED IN ACCORDANCE
WITH FAR PART 91.207

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.

12. On the upper right instrument panel:

SMOKING PROHIBITED

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