

# SECTION II.

## LIMITATIONS

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## INTRODUCTION

Section II 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 have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment such as autopilots are included in Section IX.

### 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 V 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 V.

Your Mooney is certificated under FAA Type Certificate No. 2A3 as Mooney M20J.

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**AIRSPEED LIMITATIONS**

Airspeed limitations and their operational significance are shown in Figure 2-1. This calibration assumes zero instrument error.

| SPEED         |                                     | KCAS  | KIAS                    | REMARKS   |  |
|---------------|-------------------------------------|---|-------------------------|---|--|
| $V_{NE}$      | Never Exceed Speed                  | 195   | 198                     | Do not exceed this speed in any operation.  |  |
| $V_{NO}$      | Maximum Structural Cruising Speed   | 174   | 176                     | Do not exceed this speed except in smooth air, and then only with caution.              |  |
| $V_A$         | Maneuvering Speed                   | LBS/Kg<br>1941/880<br>2250/1021<br>2470/1120<br>2740/1243 | 95<br>103<br>108<br>114 | 97<br>105<br>110<br>116   | Do not make full or abrupt control movements above this speed. |
| $V_{FE}$      | Maximum Flap Extended Speed         | 109   | 115                     | Do not exceed these speeds with the given flap settings.                                |  |
| $V_{LE}$      | Maximum Landing Gear Extended Speed | 130   | 132                     | Maximum speed at which the aircraft can be safely flown with the landing gear extended. |  |
| $V_{LO(EXT)}$ | Maximum Speed for Gear Extension    | 130   | 132                     | Maximum speed at which the landing gear can be safely extended.                         |  |
| $V_{LO(RET)}$ | Maximum Speed for Gear Retraction   | 104   | 107                     | Maximum speed at which the landing gear can be safely retracted.                        |  |
|               | Maximum Pilot Window Open Speed     | 130   | 132                     | Do not exceed this speed with pilot window open   |  |

FIGURE 2-1. AIRSPEED LIMITATIONS

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**AIRSPEED INDICATOR MARKINGS**

Airspeed indicator markings, their color code and operational significance are shown in Figure 2-2.

| MARKING         | IAS VALUE OR RANGE ( KIAS ) | SIGNIFICANCE  |
|-----------------|-----------------------------|---|
| White Arc       | 55 - 115                    | Flap Operating Range. Lower limit is maximum weight $V_{S_0}$ in landing configuration. Upper limit is maximum speed permissible with flaps extended. |
| Green Arc       | 63 - 176                    | Normal Operating Range. Lower limit is maximum weight $V_S$ with flaps retracted. Upper limit is maximum structural cruising speed.                   |
| Yellow Arc      | 176 - 198                   | Operations must be conducted with caution and only in smooth air.   |
| Radial Red Line | 198                         | Maximum speed for all operations.   |

FIGURE 2-2. AIRSPEED INDICATOR MARKINGS

## POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming.  
Engine Model Number: IO-360-A3B6D  
Engine Operating Limits for Takeoff and

Continuous Operations:

Maximum Power: 200 BHP  
Maximum Engine Speed: 2700 RPM.  
Maximum Cylinder Head Temperature: 475°F (246°C)  
Maximum Oil Temperature: 245°F (118°C)

Transient Engine RPM Limit - 2970 RPM for  
3 Seconds or Less

Oil Pressure, Minimum: 25 psi.  
Maximum: 100 psi

Fuel Pressure, Minimum: 14 psi  
Maximum: 30 psi

Propeller Manufacturer: McCauley Accessory Division.\*  
Propeller Model Number: B2D34C214/90DHB-16E\*  
Propeller Diameter, Minimum: 73 In. \*(185.4 cm)  
Maximum: 74 In. \*(187.9 cm)

Propeller Operating Limits: Avoid continuous operation  
between 1500 and 1950 RPM with power settings  
below 15" HG manifold pressure. (McCauley propeller only)

Propeller Blade Angle at 30 Inch Station, Low  $13.9^{\circ} \pm .2^{\circ}$ \*  
High  $33.0^{\circ} \pm .5^{\circ}$ \*

### NOTE

No cutoff allowed on propeller when de-ice  
boots are installed.

\*OPTION: Hartzell HC-C2YK-1BF/F7666A-3Q  
Dia: 73 In. (185.4 cm)  
Blade Angle: Low  $14.1^{\circ} \pm .1$   
High  $29.3^{\circ}$  to  $31.3^{\circ}$

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## POWER PLANT INSTRUMENT MARKINGS

|                                       |                             |
|---------------------------------------|-----------------------------|
| <b>Tachometer</b>                     |                             |
| Radial Red Line (Rated)               | 2700 RPM                    |
| Green Arc-- (Rated operating range)   | 1950-2700 RPM               |
| Yellow Arc (Caution Range)            | 1500-1950 RPM               |
| <b>Cylinder Head Temperature</b>      |                             |
| Radial Red Line (Maximum)             | 475 °F or 246 °C            |
| Green Arc (Operating range)           | 300°-450°F or<br>149°-232°C |
| <b>Oil Pressure</b>                   |                             |
| Radial Red Line (Minimum idling)      | 25 PSI                      |
| Radial Red Line (Maximum)             | 100 PSI                     |
| Green Arc (Operating range)           | 60 to 90 PSI                |
| Yellow Arc (Idling range)             | 25 to 60 PSI                |
| Yellow Arc (Starting & warm-up range) | 90 to 100 PSI               |
| <b>Fuel Pressure</b>                  |                             |
| Radial Red Line (Minimum)             | 14 PSI                      |
| Radial Red Line (Maximum)             | 30 PSI                      |
| Green Arc (Operating range)           | 14 to 30 PSI                |
| <b>Oil Temperature</b>                |                             |
| Radial Red Line (Maximum)             | 245 °F or 118 °C            |
| Green Arc (Operating range)           | 150°-245°F and<br>65°-118°C |

## WEIGHT LIMITS

Maximum Weight (Takeoff & Landing) 2740 LBS (1243 Kg)

Maximum Weight in Baggage

Compartment . . 120 LBS (54.4 Kg) @ Fus. Sta. 95.5

Maximum Weight in Hatrack . . 10 LBS. (4.54 Kg) @ Fus.  
Sta. 119.0

Maximum Weight in Cargo Area

(Rear Seat Folded Down) . . . . . 340 LBS (154.2 Kg)

@ Fus Sta. 70.7

## CENTER OF GRAVITY LIMITS (GEAR DOWN)

|                                |                     |
|--------------------------------|---------------------|
| Most Forward Fus. Sta. in IN.  | (41.0 IN.)          |
| 13.4% MAC . . . . .            | 2250 LBS. (1021 Kg) |
| Intermediate Forward Fus. Sta. | (41.8 IN.)          |
| 14.7% MAC . . . . .            | 2470 LBS. (1120 Kg) |
| Forward Gross Fus. Sta. in IN. | (45.0 IN.)          |
| 20.1% MAC . . . . .            | 2740 LBS. (1243 Kg) |
| Rear Gross Fus. Sta. in IN.    | (50.1 IN.)          |
| 28.7% MAC . . . . .            | 2740 LBS. (1243 Kg) |
| MAC (At Wing Sta. 93.83)       | 59.18 IN.           |

Datum (Fuselage Station Zero) is 5 inches aft of the center line of the nose gear attaching bolts, and 33 inches forward of the wing leading edge at wing station 59.25.

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## MANEUVER LIMITS

This airplane must be operated as a Normal Category airplane. Aerobatic maneuvers, including spins, are not approved.

Extreme sustained sideslips may result in fuel venting thereby causing fuel fumes in the cabin.



Prolonged sideslips, steep descents, or takeoff maneuvers may cause loss of power if the selected fuel tank contains less than 48 lbs. (21.7 Kg) (8 gallons - 30.3 liters - 6.6 IMP. GAL.) of fuel.

### NOTE

Up to 290-foot altitude loss may occur during stalls at maximum weight.

### NOTE

Slow throttle movement required at airspeeds above 165 KIAS. Above 165 KIAS, rapid throttle reduction may result in momentary propeller RPM overspeed.

## FLIGHT LOAD FACTOR LIMITS

Maximum Positive Load Factor,  
Flaps Up . . . . . +3.8g  
Maximum Positive Load Factor,  
Flaps Down (33°). . . . . +2.0g  
Maximum Negative Load Factor,  
Flaps Up . . . . . -1.52g

## KINDS OF OPERATION LIMITS

Do not operate in known icing conditions.

This is a Normal Category aircraft approved for VFR/IFR day or night operations, when equipped in accordance with FAR 91.

## FUEL LIMITATIONS

2 Standard Tanks: 33.25 U.S. Gallons Each  
(125.9 liters)(27.7 IMP. GAL.)  
Total Fuel: 66.5 U.S. Gallons  
(251.8 liters)(55.4 IMP. GAL.)  
Usable Fuel: 64 U.S. Gallons  
(242.4 liters)(53.3 IMP. GAL.)  
Unusable Fuel: 2.5 U.S. Gallons  
(9.5 liters)(2.1 IMP. GAL.)

### NOTE

A reduced fuel quantity indicator is installed in each tank. These indicators show the 25 U.S. gallon (94.7 liters)(20.8 IMP. GAL.) usable fuel level in each tank. A visual fuel quantity gauge is also installed on top of each tank and is to be used as a reference for filling the tanks only.

Fuel Grade (and Color): 100 minimum grade aviation fuel (green). 100LL (low lead) aviation fuel (blue) with a lead content limited to 2 cc per gallon is also approved.

## OTHER INSTRUMENTS AND MARKINGS

The following standard equipment is vacuum operated:

1. Artificial horizon
2. Directional gyro

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## DECALS & PLACARDS

### CABIN INTERIOR

The following placards must be installed inside the cabin at the locations specified.

| OPERATIONAL LIMITATIONS  |  |
|--|--|
| THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS. NO AEROBATIC MANEUVERS, INCLUDING SPINS, ARE APPROVED. MAXIMUM SPEED WITH LANDING GEAR EXTENDED, 132 KIAS. MAXIMUM SPEED TO RETRACT GEAR, 107 KIAS. MAXIMUM SPEED TO EXTEND GEAR, 132 KIAS. MAXIMUM MANEUVERING FLIGHT LOAD FACTOR - FLAPS UP +3.8, -1.5; DN +2.0, -0. |  |
| EMERGENCY MANUAL GEAR EXTENSION  |  |
| 1. PULL LANDING GEAR CIRCUIT BREAKER.  |  |
| 2. PUT GEAR SWITCH IN GEAR DOWN POSITION.  |  |
| 3. PUSH RELEASE TAB FORWARD AND LIFT UP RED HANDLE.  |  |
| 4. PULL T-HANDLE STRAIGHT UP (12 TO 20 INCHES).  |  |
| 5. ALLOW T-HANDLE TO RETURN TO ORIGINAL POSITION.  |  |
| 6. REPEAT UNTIL GEAR DOWN LIGHT COMES ON (12 TO 20 PULLS). IF TOTAL ELECTRICAL FAILURE - SEE MECHANICAL INDICATOR.   |  |
| CAUTION  |  |
| 1. TURN OFF STROBE LITES WHEN TAXIING NEAR OTHER ACFT OR WHEN FLYING IN FOG OR IN CLOUDS. STD POSITION LITES MUST BE USED FOR ALL NIGHT OPERATIONS.  |  |
| 2. IN CASE OF FIRE TURN OFF CABIN HEAT.  |  |
| 3. DO NOT SCREW VERNIER CONTROLS CLOSER THAN 1/8" FROM NUT FACE.   |  |

### On Left Side Panel

|                       |                      |                       |
|-----------------------|----------------------|-----------------------|
| CABIN VENT<br>PULL ON | DEFROSTER<br>PULL ON | CABIN HEAT<br>PULL ON |
|-----------------------|----------------------|-----------------------|

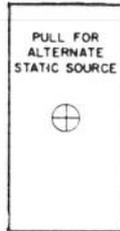
| CHECK LIST |                                     |                         |
|------------|-------------------------------------|-------------------------|
| T          | CONTROLS                            | RUN-UP DOOR             |
| A          | FUEL                                | PROP WINDOW             |
| K          | INSTRUMENTS                         | WING FLAPS RAM AIR      |
| E          | TRIM                                | SEAT LATCH MIXTURE      |
|            | COWL FLAPS                          | BELT/HARNESS BOOST PUMP |
| O          | CONDUCT TRIM CHECK PRIOR TO FLIGHT, |                         |
| F          | SEE PILOT'S OPERATING HANDBOOK.     |                         |
| L          | BELT/HARNESS                        | MIXTURE GEAR            |
| D          | FUEL                                | WING FLAPS PROP         |
| G          | BOOST PUMP                          | RAM AIR                 |

### Console Below Controls

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On Lower Left  
Instrument  
Panel



On Pilots Window

DO NOT OPEN  
ABOVE 132 KIAS

On Right Instrument Panel Below  
Manifold Pressure Gage (McCauley propeller only)

AVOID CONT. OPERATION BETWEEN  
1500 & 1950 RPM W/POWER SETTINGS  
BELOW 15" HG. MANIFOLD PRESSURE.

On Lower Console Below Controls

RAM AIR  
PULL ON

PARK BRAKE  
PULL ON

COWL FLAPS  
PULL OPEN

← PUSH TO RELEASE

Between Seats on  
Emergency Gear  
Extension Release



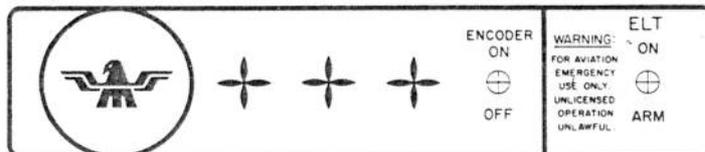
MIKE



PHONE

Lower Left  
Instrument Panel

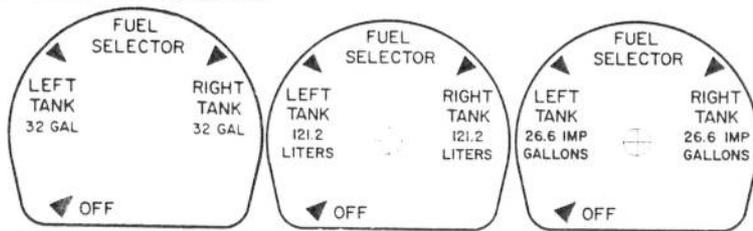
ELT Placard - Top Right Instrument Panel  
(Legend Varies With Equipment Installed)



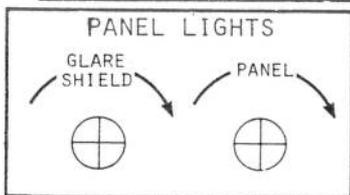
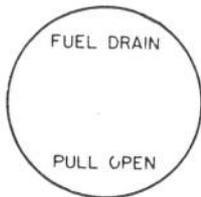
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Floor Board Aft  
Of Console



Floor Board Fwd Of  
Pilot Seat

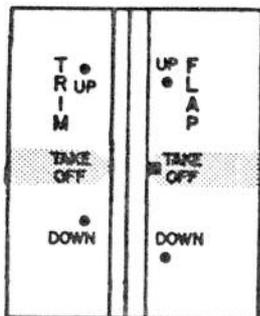


On Windshield  
Center Post

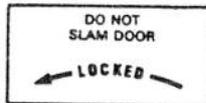
| DATE | FOR | STR |
|------|-----|-----|
|      | 30  |     |
|      | 30  |     |
|      | 60  |     |
|      | 120 |     |
|      | 150 |     |
|      | 210 |     |
|      | 240 |     |
|      | 300 |     |
|      | 330 |     |

Right Lower  
Radio Panel

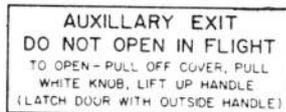
On Lower Engine  
Control Console



Above Inside  
Door Handle



Above Inside  
Baggage Door Handle



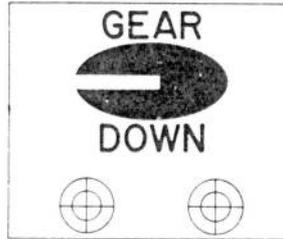
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FLAPS UP

Floorboard Aft  
Of Console

Right Console  
Above and Below  
Flap Switch

FLAPS DN



THROTTLE  
PUSH INCREASE

PROP  
PUSH INCREASE

MIXTURE  
PUSH RICH

Above Each Control on Lower Instrument Panel

Above Baggage Compartment On Hatrack Shelf.

WARNING:

DO NOT EXCEED 10 LBS (4.5 Kg) IN THIS COMPARTMENT  
USE FOR STOWAGE OF LIGHT SOFT ARTICLES ONLY  
SEE AIRCRAFT LOADING SCHEDULE DATA  
FOR BAGGAGE COMPARTMENT ALLOWABLE



On Top Baggage Door Jamb.

WARNING:

DO NOT EXCEED 120 LBS  
(54.4 Kg) IN THIS COMPARTMENT  
SEE AIRCRAFT LOADING SCHEDULE DATA  
FOR BAGGAGE COMPARTMENT ALLOWABLE

On Fwd. End Of Rear Seat Bottom Structure.

**WARNING:**

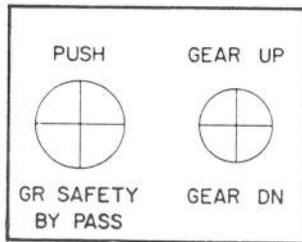
DO NOT EXCEED 170 LBS  
(77.1 Kg) ON THIS SEAT BACK.  
SEE AIRCRAFT LOADING SCHEDULE DATA  
FOR BAGGAGE COMPARTMENT ALLOWABLE

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Upper Center  
Instrument Panel

Under Right Radio  
Panel (Fuses)



GLARE  
SHIELD

PANEL

### FUSELAGE INTERIOR

The following placards must be installed inside the fuselage at the locations specified.

**MAINTAIN** ↓  
—————  
**LEVEL HERE**

On Hydraulic  
Brake Reservoir  
—————

### EXTERIOR:

The following placards must be installed on the exterior of the aircraft at the locations specified.

On Main Gear Doors

**TIRE PRESSURE 30 LBS.**  
—————

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On Nose Gear Door

## TIRE PRESSURE 49 LBS

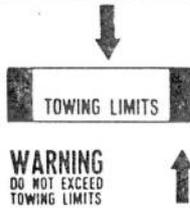
On Fuel Tank Caps

FUEL-100 (GREEN) OR  
100 LL (BLUE) MIN. OCT.  
32 U.S. GAL

FUEL-100 (GREEN) OR  
100 LL (BLUE) MIN OCT  
121.2 LITERS USEABLE

FUEL-100 (GREEN) OR  
100 LL (BLUE) MIN OCT  
26.6 IMP GAL USEABLE

On Nose Gear Leg



On Leading Edge of  
Horizontal Stabilizer  
and Trailing Edge of  
Both Sides of Rudder

**DO NOT PUSH**

On Inboard End Of Flaps, Wing Leading  
Edges and Wing Ahead Of Flaps

**NO STEP**

On Underside of Wings (2 plcs)

**HOIST POINT**

### OPTIONAL:

See Section IX Supplements for optional placards  
required.

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INFORMATIONAL:

The following placards are not required for airworthiness but are provided for informational purposes or aesthetics.

CARE SHOULD BE TAKEN NOT TO SPILL  
BATTERY ACID WHEN SERVICING  
OR REMOVING BATTERY

**IMPORTANT INSTRUCTIONS**  
ALWAYS ADD WATER - NEVER ADD ACID.  
NEVER FILL OVER BAFFLE NOR MORE THAN  
1/4" OVER THE TOPS OF SEPARATORS.  
FULLY CHARGED SPECIFIC GRAVITY - 1.275  
RECHARGE REQUIRED WHEN SP. GR. REACHES 1.225  
CHARGING RATES:  
START - 4 AMPERES    FINISH - 2 AMPERES  
MAXIMUM TEMPERATURE ON CHARGE - 120° F (49° C)

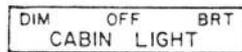
**KEEP CHARGED — PREVENT FREEZING**

CARE SHOULD BE TAKEN NOT TO SPILL BATTERY  
ACID WHEN SERVICING OR REMOVING BATTERY

Above Battery On Aft Side  
Baggage Compartment  
Bulkhead



Front Center of  
Control Wheels



On Headliner By  
Interior Light Switches



On Headliner Near  
overhead shutoff valve.