



THIS BULLETIN DOES NOT CHANGE AIRCRAFT TYPE DESIGN

SUBJECT: This is an informational Service Bulletin to advise all MOONEY owners, The importance to familiarize yourself with the Landing Gear Operation, Warning Systems and Maintenance Checks as specified in the applicable latest FAA approved Mooney Aircraft Flight Manual and Service and Maintenance Manual.

**MODELS/ SN
AFFECTED:** All Mooney M20 Series Aircraft

**TIME OF
COMPLIANCE:** As Required

INTRODUCTION: Mooney International receives FAA reports on all landing gear mishaps, and frequently is called on to evaluate the causes of the incident. It was brought to our attention, that there have been several "incidents" involving Mooney gear-up landings in both manual and electric landing gear aircraft. With the information gathered, we have attached some useful information on how to operate both the manual and electric landing gear and tips on maintenance.

Mooney Engineering released a letter to our Service Center Network, looking for their observations, experience, and recommendations relative to the Johnson Bar system. The feedback we received, was reviewed and most findings were typically the same:

- Nose gear and Main landing gear tensions were not to specifications.
- Failure to lubricate gear retraction components
- Rigging correctly during routine maintenance
- Failure to service springs and linkages after repainting the aircraft.

One of our Service Centers stated; "Through the years, I don't think we have ever seen an accident caused by a properly rigged Mooney landing gear".

OVERVIEW - LANDING GEAR:

- **INCIDENTS**
 - a. Gear Up (Pilot Error)
 - b. Gear Collapse (Maintenance Issue)
 - Improper Rigging
 - Worn or counterfeit (unapproved) parts
 - c. Indication and Warning Failure (Rigging or Electrical Issue)
 - d. Electrical Failure (Use of Emergency Extension)
- **MAINTENANCE - (Refer to applicable latest FAA Approved Service and Maintenance Manual for your model)**
 - a. Rigging of the Landing Gear
 - b. Warning System, illumination and audio - Landing Gear (Rigging)
 - c. Over-steering - Motorized Tugs (requires inspection)
 - d. Hard Landings - (requires inspection)
 - e. Interference - Caused by new interior or foreign object debris
 - f. Log Books (complete records of engine, propeller and airframe entries)



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- **OPERATIONAL - (Response)**
 - a. Familiarization of Landing Gear Operation and it's Warning System (lights and sounds) - Practice
 - b. Know the routine (Up to you to use your training and operation of the aircraft)
 - c. GUMP - Gas control, Undercarriage, Manifold control, Propeller control
 - d. Landing Gear Maintenance Annual/Inspections (gear lubrication, rigging, new hardware, properly shimmed, emergency extension).
 - e. Pay attention, eliminate distractions.
 - e. Practice, Practice, Practice - "It's Not the Design Causing the Problem"

As a vital role in maintaining your aircraft, Mooney also recommends that you have it maintained by an Authorized Mooney Service Center and only use Mooney Factory parts to maintain your aircraft.

NOTE:

For any reason you are having trouble with questionable findings as stated in this Service Instruction, contact Mooney Technical Support at 830-896-6000 or email support@mooney.com.

WARRANTY: N/A

REFERENCE DATA:

1. Mooney Applicable Owners Manual and Aircraft Flight Manual (latest FAA Approved)
2. Mooney Applicable Service and Maintenance Manual (latest FAA Approved)
3. Mooney 100 Hour/Annual Inspection Guide
4. FAA AD research: https://www.faa.gov/regulations_policies/airworthiness_directives
5. Mooney website <https://www.mooney.com/contact-2/> for all Service Bulletins, Service Instructions and Special Letters applicable to your aircraft.

PARTS LIST: N/A



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MANUAL LANDING GEAR SYSTEM

The manual landing gear is operated by the pilot by means of a retraction handle (Johnson-Bar) in the cabin. The system is operated by direct mechanical linkage and is aided by bungee type springs in the fuselage and assist springs in the wing, which balance the weight of the gear. Rubber discs are used for shock absorption in the welded steel tube gear structure. Grease fittings are provided at certain important lubrication points on the landing gear. The manual gear has proven to be one of the most reliable and maintenance-free retraction systems available.

Components of the Manual Gear are:

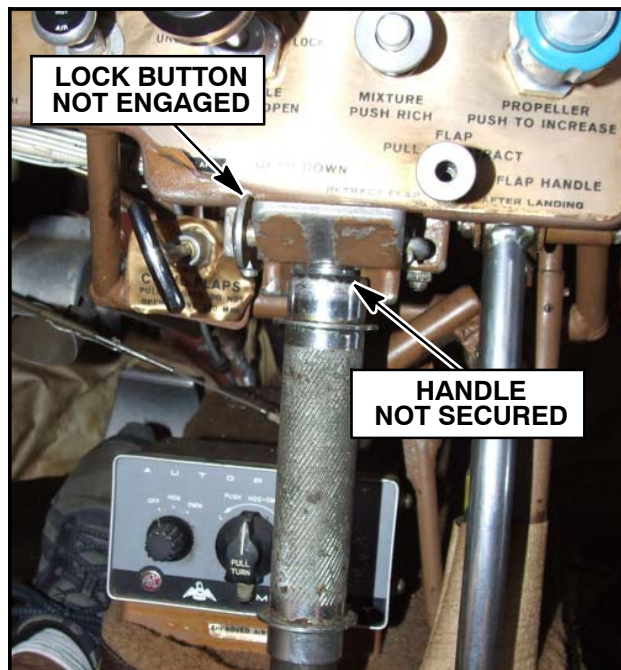
1. Retraction Handle (Johnson Bar)
2. Down- Lock Latch (on instrument panel).
3. Up- Lock Latch (on floor between Pilot/CoPilot)
4. Gear Warning System:
 - Red/Amber Warning Light (unsafe- to- land)
 - Green Warning Light (safe- to- land)
 - Up and Down Limit switches

The gear down- lock is released by depressing the button to the right. Early "B" and "C" model Mooney's did not have this safety lock. Mooney introduced a service bulletin SB M20- 88B, which provided an upgrade to the down- lock assembly. Mooney recommends this to be installed as soon as possible, as well as any other Service Bulletin, Service Instruction and Special letters pertaining to your aircraft.

MANUAL LANDING GEAR WARNING SYSTEM

The position of the gear is indicated by lights (green or red/amber) on the panel which will warn the pilot of an unlocked condition. These lights may be dimmed by rotating the lens housing to prevent glare at night. Press the lens housing in, to test the bulbs.

The red/amber indicator light will come on if the retraction handle is not sufficiently engaged in a "down- lock" position (see Figure 32- 1), thereby indicating an unsafe- to- land condition or when transitioned to the "up- lock" position (see Figure 32- 2). In some cases the down lock assembly can be badly worn causing inadvertent engagement (see Figure 32- 3). When new or freshened interiors are completed, check the proper engagement of the retraction handle and lock assembly are recommended.



RETRACTION HANDLE NOT ENGAGED
FIGURE 32-1



GEAR UP "AMBER/RED LIGHT"
FIGURE 32-2



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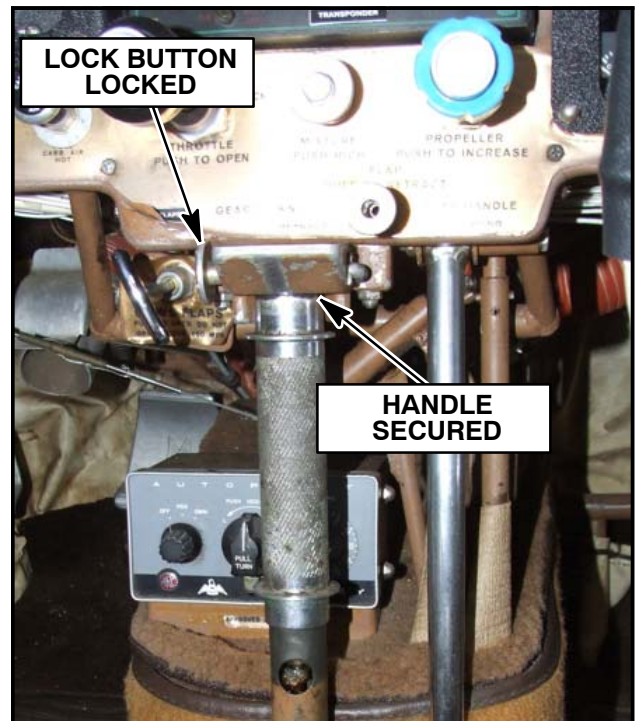


DOWN LOCK ASSEMBLY - WEAR MARKS
FIGURE 32-3

The green light indicates that the handle is properly engaged in the down lock position (see Figure 32- 4), and the gear is in the landing configuration. A thumb operated latch is provided on the down lock socket to prevent unlocking of the gear when it is down unless it is deliberately released (see Figure 32- 5).



GEAR LOCK "GREEN LIGHT"
FIGURE 32-4



GEAR DOWN LOCK - HANDLE SECURED
FIGURE 32-5

-CAUTION-

It is important to to check between the pilot and copilot seats for any items that would interfere with the landing gear retraction or extension movement. If a front passenger is not present, latch the lower seat belt buckle. This prevents the seat belt overlapping the retraction handle.

MANUAL LANDING GEAR OPERATION

To retract (raise) the gear, depress the safety latch button and slide the gear handle from the down lock socket (see Figure 32- 6). With a firm and positive motion, rotate the gear handle rapidly to the floor between the seats without stopping (see Figure 32- 7). At the end of the gear handle travel, slide handle sleeve rearward into the floor Up- Lock latch as shown in Figure 32- 8. The gear retraction is easiest at slower airspeeds.

With the gear retracted, the red unsafe gear light will be visible at all times. This light is operated by a switch located in the socket of the gear down lock.

Gear extended (lowering) the gear, slide the gear handle from the up- lock socket (see Figure 32- 8), and move the handle in a forward motion toward the instru-



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ment panel. Allow the handle to rotate through the palm of your hand as you did while retracting. Engage the gear handle into the down-lock socket and check the gear warning light for a gear-down indication (a Green light). The more rapid the movement of the handle, the easier it is to extend the gear. The gear extension is easiest at higher airspeeds.

-NOTE-

Warning horn will sound if gear is not down and locked, and throttle is retarded. Check for green "Down Lock" light. If green light is not working, it can be unscrewed and replaced in flight with the red "Gear Up" light to verify the locked position.



LANDING GEAR HANDLE
FIGURE 32-7



LANDING GEAR HANDLE UPLOCK
FIGURE 32-8



GEAR UNLOCK - PUSH BUTTON RELEASE
FIGURE 32-6

MANUAL LANDING GEAR SYSTEM - SERVICE AND MAINTENANCE

The landing gear retraction system should be rigged only by a mechanic familiar with the Mooney gear rigging procedures found in the current FAA approved Mooney Service and Maintenance Manual. The landing gear should be kept free of mud or ice to prevent interference when retracted. If you notice an unusual force when operating the manual retraction system, return the lever to the down and locked position and have the gear checked after landing. The gear warning horn may be checked in flight by retarding the throttle with the gear up. The horn should sound at about ten inches Hg manifold pressure.



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**ELECTRIC GEAR SYSTEM - 1975 AND LATER
(NON- GLASS PANEL)**

The electrical landing gear retraction system is operated by the white wheel- shaped switch on the upper portion of the flight panel. To raise the gear, the knob is pulled out and the switch moved up to it's upper detente. An "airspeed switch" is incorporated in the electrical circuit which prevents landing gear retraction until a safe airspeed is attained. The action of the system may be monitored visually by watching the movement of the indicator through the glass in the floorboard, aft of the nose wheel well. A limit switch will stop the gear in its retracted position and the gear switch will require no further attention until landing. To lower the landing gear, the knob is pulled out, moved down, and placed in the lower detente. A limit switch will stop the gear system when the proper locking force has been exerted to hold the gear down. There are three ways to check that the gear is completely down and locked:

1. The green "Safe-to-land" indicator light (on left panel, or annunciator panel) will illuminate.
2. The illuminated indicator marks align, as seen through the visual gear-position indicator in the floorboard.
3. The gear warning horn does not sound at approach power settings (see manifold pressures found in the appropriate aircraft AFM/POH).

When these conditions are full- filled, the aircraft may be landed with no further attention to the landing gear system.

**MANUAL OPERATION - ELECTRICAL LANDING
GEAR SYSTEM**

If the gear does not come down due to electrical malfunction, etc. the system may be operated manually as described below:

1. Pull landing gear circuit breaker OFF.
2. Put gear switch in the gear down position.
3. Push crank engage handle forward.
4. Crank clockwise approximately fifty (5) turns to lower the gear.
5. Gear is down when green gear light is on. If a total electrical malfunction occurs, see gear visual indicator.

-NOTE-

**DO NOT RETRACT GEAR IN FLIGHT WITH
MANUAL HAND CRANK.**

ELECTRIC GEAR SYSTEM - (GARMIN G1000)

The landing gear is operated by an electrical, motor driven, actuator. Travel during the extend and retract cycle is controlled by down and up limit switches located beneath the floorboard under the pilots seat. Power is supplied to actuator through a set of relays actuated by the gear selection switch. The gear selection switch is located on instrument panel in front of the pilot. The actuator worm gear ball nut is connected to retract bellcrank which is connected to push-pull retract tubes and bellcranks throughout entire retraction system.

The gear legs are constructed of welded, chrome- molybdenum, tubular steel, heat treated for greater strength and wear resistance. Main gear attaching points have bushings installed in gear mounting box attached to wing spars. The steerable nose gear mounts to the cabin tubular steel frame.

-NOTE-

Heat treated components should NOT be repaired; replace them.

The main gear wheels have hydraulic disc brakes with a parking brake valve incorporated into system.

Rubber discs in all gear leg assemblies absorb the shock of landing and taxiing.

LANDING GEAR WARNING SYSTEM

The landing gear warning system provides pilot with a gear warning "Voice alert" "Check Gear" that landing gear is not down and locked when throttle is retarded and landing gear is still up.

- 1) landing gear condition lights, GREEN for "GEAR DOWN" and RED for "GEAR UNSAFE", and
- 2) VOICE ALERT, activated when landing gear is not down- and- locked and throttle is approximately 1/4 inch from idle position. The green light shows continuously when landing gear is fully extended. The red light shows when ever landing gear is in transit or not locked down but is OFF when landing gear is fully retracted. A visual gear- position indicator, located on floorboard, aft of the fuel selector, shows that landing gear is down when indicator marks align. The gear down light is dimmed when navigation lights are turned on.

The warning system is activated when throttle is retarded approximately 1/4 inch from idle position. When landing gear is down and locked, the electrical circuit is opened and the alert is stopped. This warning switch is mounted on engine throttle housing and can be adjusted for the proper setting by loosening screw and repositioning.

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sitioning switch (Refer to the Garmin G1000 Cockpit Reference Guide for description).

Keep the gear and exposed gear retraction system components free of mud and ice to prevent retraction interference and binding. It is recommended that retraction/extension cycles (5 minimum) be done any time any tire is replaced to assure that no interference exists during the cycle.

-CAUTION-

After any landing, other than a smooth touchdown and rollout, when aircraft is above 3200 Lbs (1,452 Kg), the aircraft should undergo the Gear System Operational Inspection as outlined in M20V Service and Maintenance Manual, Chapter 32.

The gear warning "Voice Alert" may be checked in flight by retarding throttle with the gear up. The gear warning "Voice Alert" should sound when throttle is positioned 1/4 to 3/8 inch from idle (while gear is up).

MANUAL OPERATION - ELECTRICAL LANDING GEAR SYSTEM

If the gear does not come down due to electrical malfunction, etc. the system may be operated manually as described below:

1. Pull landing gear circuit breaker OFF.
2. Put gear switch in the gear down position.
3. Latch forward/Lever Back to engage manual extension mechanism.
4. Slowly pull "T" handle 1 to 2 inches to rotate clutch mechanism and allow to engage drive shaft.
5. Pull T-handle approximately 12 to 20 times to lower the gear.
6. Gear is down when green gear light is on. If a total electrical malfunction occurs, see gear visual indicator.

-CAUTION-

Continuing to pull on T-Handle, after GEAR DOWN light ILLUMINATES, may bind actuator; electrical retraction MAY NOT be possible until binding is eliminated by ground maintenance. Return lever to normal position and secure with latch. Reset landing gear actuator circuit breaker.

-WARNING-

Do not operate landing gear electrically with manual extension system engaged. Do not fly aircraft until maintenance/inspection is done on landing gear system.