



**SUBJECT:** Landing Gear Rigging Instructions

**MODELS AFFECTED:** M20 & M20A. All Serial Numbers

**TIME OF COMPLIANCE:** The pre-load in the landing gear system should be checked at the following times: (1) After the first 50 hours (on a new gear system) and at subsequent 100 hour intervals and (2) More often if determined necessary for aircraft operated on rough field or subject to rough landings.

## I. INTRODUCTION:

Gear failures on M-20 and M-20A aircraft have occurred due to improper gear rigging. This service letter is issued with the suggestion that all aircraft owners and those responsible for the maintenance of these aircraft acquaint themselves with the proper rigging of the landing gear retraction system.

The retraction handle and connecting rods are not designed to carry ground loads imposed on the landing gear but are designed to hold the overcenter locking mechanism in its overcenter position.

The following example (using the maingear as shown in Figure 1) will explain the operation of the retraction system. With the proper preloads in P/N 5087 Points 1, 2 and 3 (on P/N 5031 and P/N 5026) will form a triangle with Point 3 below Point 1 and 2. A side load inward on the gear will be reacted at Point 1 along line 1-2 and will tend to force Point 3 further down. A side load outward on the gear will tend to force Points 1, 2 and 3 into a straight line, and will be reacted along this line at Point 1. Upon removal of this outward load the preload in P/N 5087 will again force Point 3 downward. It is emphasized that if Point 3 moves upward past line 1-2 due to improper preload in P/N 5087, this rod and the retraction handle will not carry the imposed load.

The retraction system functions in a similar manner with regard to fore and aft loads at the nose gear.

As shown by tests the gear system will not fail under design loads if it is properly rigged. In order to facilitate a more exact gear rigging procedure a set of tools has been designed for use in checking the pre-load on the system. It is recommended that the tools be purchased from the Spare Parts Department, Mooney Aircraft, Inc., P. O. Box 72, Kerrville, Texas. Order P/N 8442 Rigging tool (Nose Gear), and P/N 8444 Rigging tool (Main Gear).

## II. RIGGING INSTRUCTIONS (See Figure 2)

1. Hoist Airplane and remove access panels shown in Figure 2.
2. Remove P/N 5059 retraction handle from gear down lock. Tie handle loosely to prevent bungee from forcing it down. In order to prevent damage to retraction tubes do not move gear legs from outside until step 3 has been accomplished.
3. Disconnect P/N 5085 (2) and P/N 5086 (2) at Point B. Loosen check nuts on heims on P/N 5035 (2) at Point A and on P/N 5086 (2) at Point E.
4. Check nose gear and main gear (2) for any bind at hinge points designated by a star in Figure 2 by moving gear legs back and forth by hand. P/N 5087 (2) may be disconnected at Point C during check of main gear if desired. For easy gear retraction the points indicated should be lubricated with a light weight oil impregnated with graphite. (See Service Letter 20-12)
5. Place P/N 5059 in gear-down lock. Check for and remove any foreign matter between retraction trusses and links at Point R (Fig. 3) and Point X (Fig. 4) and place all gears in the down and lock position. It is recommended that a C-clamp be used at Point R (Fig. 3) and Point X (Fig. 4) clamping retraction trusses solidly to retraction links in the full overcenter position.
6. By turning tubes adjust P/N 5085 (2) and P/N 5086 (2) so that a 3/16 D bolt can be inserted thru P/N 5059 and Heim bearings at Point B. This will give a zero pre-load in system with the handle in the gear down lock.
7. By turning tubes shorten P/N 5085 (2) two turns and lengthen P/N 5086 (2) two to two and one-half turns. Tighten check nuts (4) at Points A and E.
8. Remove P/N 5059 from gear down lock and connect P/N 5085 (2) and P/N 5086 (2). Place P/N 5059 in gear down lock.



### III. INSPECTION OF SYSTEM PRELOAD

Inspect preload using rigging tools and torque wrench as follows:

#### 1. Nose Gear (See Figure 3)

- A. Place P/N 8442 tool on P/N 5032 with sloped edge aft. Hold tool in place against P/N 5032.
- B. Place finger at Point (R).
- C. Apply force on torque wrench and read torque at instant that Point (R) first begins to move. Movement of P/N 5062 may be felt at Point (R) and may be seen in area of Joint (S). Practice this several times before recording torque. Torque should be between 150 and 200 inch pounds.
- D. After release of force P/N 5062 should snap back to full overcenter and should bear tightly against P/N 5032 at Point (R). This should be carefully checked by pulling down on P/N 5062. If P/N 5062 moves down then the preload in P/N 5085 (2) is not sufficient.

#### 2. Main Gear (See Fig. 4)

- A. Place P/N 8444 tool as shown. Hold in place with thumb at Point (Y) pressing forward.
- B. Place finger at Point (X).
- C. Apply force to torque wrench and read torque at instant that Point (X) first begins to move. Movement of P/N 5031 may be felt at Point (X) and may be seen in the area of Joint (Z). Practice this several times before recording torque. Torque should be between 275 and 375 inch-pounds. The torque should register approximately the same at both main gears.
- D. After release of force P/N 5031 should snap back to full overcenter and should bear tightly against P/N 5026 at Point (X). This should be carefully checked by pulling down on P/N 5031. If P/N 5031 moves down, then the preload in P/N 5086 (2) is not sufficient.

### IV. ADJUSTMENT OF PRELOAD

If the torque values do not fall within the limits specified, then the system preload should be changed by changing the lengths of P/N 5085 and 5086 tubes. This is done by taking a turn on the Heim bearings in the proper direction. One half turn is usually sufficient. Any adjustment made to the nose gear should be made identically to both P/N 5085 tubes since they should carry the same preload.

Since the retraction tubes from all gears are attached to the gear retraction handle, a change in preload in the retraction tube at one gear can affect the preload in the retraction tubes at the remaining gears. Therefore after an adjustment is made at one gear, the other gears must be rechecked. This process must continue until the proper preloads are obtained in the retraction tubes at all gears.

The amount of freedom of the gears as determined from the check made under Paragraph II, 4, will affect the torque readings. Gear systems with free joints will be adequately rigged when the torque is on the low end of the range while gears that are stiffer may require torque values on the high end of the range for adequate preload.

A final check should be made of the force required to place the gear handle P/N 5059 in the gear down lock (gear extended position). If the force required to move the gear handle forward the last 1 to 2 inches is excessive, then the system preload may be reduced slightly within the prescribed torque limits. Check for and relieve any bind in the sliding hand grip at the top of the gear handle since a bind at this point may make it difficult to lock the gear handle in place.

NOTE: No attempt should be made to rig this gear mechanism without the proper tools.



