

SECTION VI. WEIGHT & BALANCE

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NOTE:

The empty weight, center of gravity, and equipment list for the airplane as delivered from Mooney Aircraft Corporation is contained in this section. The use of this section is valid for use with the airplane identified below when approved by Mooney Aircraft Corporation.

Model - M20J

Aircraft Serial No. 24-1316

Aircraft Registration No. N1170N

T. Wash 7/26/82
Mooney Aircraft Corp. Approval Signature & Date

INTRODUCTION

This section describes the procedure for calculating loaded aircraft weight and moment for various flight operations. In addition, procedures are provided for calculating the empty weight and moment of the aircraft when the removal or addition of equipment results in changes to the empty weight and center of gravity. A comprehensive list of all Mooney equipment available for this airplane is included in this section. Only those items checked (X) were installed at Mooney and are included in the empty weight-and-balance data.

The FAA charges you, the aircraft owner and pilot, with the responsibility of properly loading your aircraft for safe flight. Data presented in this section will enable you to carry out this responsibility and insure that your airplane is loaded to operate within the prescribed weight and center-of-gravity limitations.

At the time of delivery, Mooney Aircraft Corporation provides the empty weight and center of gravity data for the computation of individual loadings. (The empty weight and C.G. (gear extended) as delivered from the factory is tabulated on page 6-5 when this manual is supplied with the aircraft from the factory.)

FAA regulations also require that any change in the original equipment affecting the empty weight and center of gravity be recorded in the Aircraft Log Book. A convenient form for maintaining a permanent record of all such changes is provided on page 6-5. This form, if properly maintained, will enable you to determine the current weight-and-balance status of the airplane for load scheduling. The weight-and-balance data entered as your aircraft left the factory, plus the record you maintain on page 6-5, is all of the data needed to compute loading schedules.

The maximum certificated gross weight for the Model M20J under all operating conditions is 2740 pounds (1243 Kg.). Maximum useful load is determined by subtracting the corrected aircraft empty weight from its maximum gross weight. The air-

craft must be operated strictly within the limits of the Center-of-Gravity Moment Envelope shown on page 6-8.

AIRPLANE WEIGHING PROCEDURE

(A) LEVELING: Place a spirit level on the leveling screws above the tailcone access door when leveling the aircraft longitudinally. Level the aircraft by increasing or decreasing air pressure in the nose wheel tire.

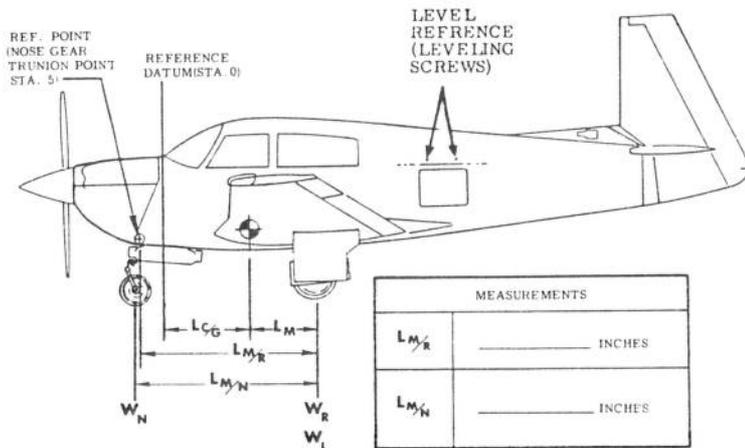
(B) WEIGHING: To weigh the aircraft, select a level work area and:

1. Check for installation of all equipment as listed in the Weight & Balance Record Equipment List.
2. Top off both tanks with full fuel. Subtract usable fuel, 64.0 gal. (242.4 liters, 53.3 Imp. Gal.) @ 6 lb/gal = 384 lbs. (174.2 Kg.) from total weight as weighed.

OPTIONAL METHOD Ground aircraft and defuel tanks as follows:

- a. Disconnect fuel line at electric boost pump outlet fitting.
- b. Connect to output fitting a flexible line that will reach fuel receptacle.
- c. Turn fuel selector valve to the tank to be drained, and remove filler cap from fuel filler port.
- d. Turn on boost pump until tank is empty. Repeat steps c. and d. to drain the other tank.
- e. Replace 1.25 gal. (4.7 liters, 1.0 Imp. Gal) fuel @ 6.0 lb/gal. into each tank (unusable fuel).
- f. Replace filler caps.
3. Fill oil to capacity - 8 qts. (7.6 liters)
4. Position front seats in full forward position.
5. Position flaps in full up position.
6. Position a 2000-pound (907.2 Kg.) capacity scale under each of the three wheels.
7. Level aircraft as previously described making certain nose wheel is centered.
8. Weigh the aircraft and deduct any tare from each reading.
9. Find reference point by dropping a plumb bob from center of nose gear trunnion (retracting pivot axis) to the floor. Mark the point of intersection.
10. Locate center line of nose wheel axle and main wheel axles in the same manner.

11. Measure the horizontal distance from the reference point to main wheel axle center line. Measure horizontal distance from center line of nose wheel axle to center line of main wheel axles.
12. Record weights and measurements, and compute basic weight and CG as follows:



SCALE POSITION AND SYMBOL	SCALE READING	TARE	NET WEIGHT
Nose Wheel (W_N)			
Right Main Wheel (W_R)			
Left Main Wheel (W_L)			
Basic Empty Weight, as Weighed (W_T)			

a. CG Forward of Main Wheels:

$$\frac{\text{LBS./KG.} \times \text{IN./CM.}}{\text{Weight of Nose}} = \frac{\text{IN./CM.}}{\text{Distance Between Main and Nose Wheel Axle Centers}} + \frac{\text{LBS./KG.}}{\text{Total Weight of Aircraft}} = \frac{\text{IN./CM.}}{\text{CG Forward of Main Wheels}}$$

$$\frac{(W_N)}{(L_{M_N})} = \frac{(W_T)}{(L_M)}$$

b. CG Aft of Datum (Station 0):

$$\frac{\text{IN./CM.}}{\text{Distance from Center Nose Gear Trunion to Center of Main Wheel Axles (Horizontal)}} = \frac{\text{IN./CM.} - 5 \text{ IN. (12.7 CM.)}}{\text{Distance from Nose Gear Trunion to Datum}} = \frac{\text{IN./CM.}}{\text{Result of Computation Above}} = \frac{\text{IN./CM.}}{\text{CG (FUS. STA.) Distance Aft of Datum. (Empty Weight CG)}}$$

$$\frac{(L_{M_R})}{\text{Constant}} = \frac{(L_M)}{(L_{CG})}$$

PILOT'S LOADING GUIDE

LOADING CALCULATION PROCEDURE

Proper loading of the aircraft is essential for maximum flight performance and safety. This section will assist you in determining whether the aircraft loading schedule is within the approved weight and center-of-gravity limits.

To figure an actual loading problem for your aircraft, proceed as follows:

- Step 1. Refer to the latest entry on page 6-5 for the current empty weight and moment.
NOTE: Since the engine oil is normally kept at the full level, the oil weight and moment is included in basic empty weight and is constant in calculating all loading problems.
- Step 2. Note the pilot's weight and the position his seat will occupy in flight. Find this weight on the left scale of the Loading Computation Graph (page 6-7) and cross the graph horizontally to the point representing the pilot's seat position between the FWD and AFT position lines on the graph for #1 and #2 seats. When this point is located, drop down to the bottom scale to find the value of the moment/1000 due to the pilot's weight and seat position.

Repeat the procedure for the copilot and enter these weights and moment/1000 values in the proper subcolumns in the Problem Form on page 6-7.
- Step 3. Proceed as in Step 2 to account for the passengers in seats 3 and 4. Enter the weight and value of moment/1000 in the proper columns.
- Step 4. Again proceed as in Step 2 to account for the amount of fuel carried, and enter the weight and moment/1000 values in the proper columns.

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PROBLEM FORM

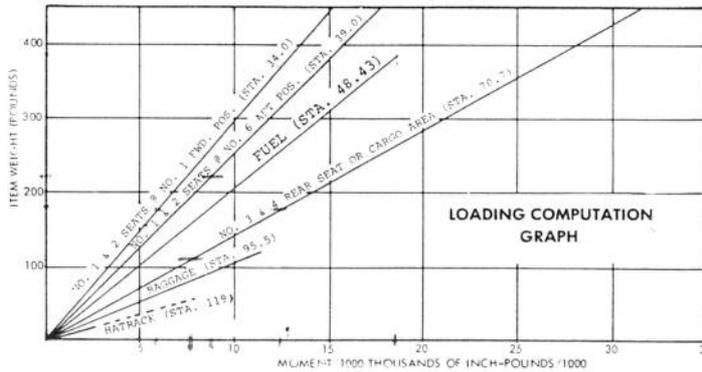
FAA REGISTRATION NO. _____ M20J SERIAL NO. _____

Step	ITEM	Sample Problem Pilot & Two Pass.		Your Problem	
		Weight (LBS)	Moment (LB-INS. 1000)	Weight (LBS)	Moment (LB-INS. 1000)
1	Aircraft Basic Empty Weight, W_T (From Page 6-5) Includes Full Oil -- 8 QT. @ 1.875 LBS/QT (Sta - 11.5) (Sump assumed full for all flights)	1710.0	75.26		
2	Pilot Seat (*1)*	170.0	6.0 (2nd Pos.)		
	Copilot Seat (*2)*	170.0	5.8 (Fwd. Pos.)		
3	Left-Rear Seat (*3) or Cargo Area	170.0	12.00		
	Right-Rear Seat (*4) or Cargo Area				
4	Fuel (Max. Usable 64 Gal., 384 LBS.) (Sta. 48.43) (242.4 liter, 174.2 Kg)	312.0	15.11		
5	Baggage (Max. 120 LBS @ Sta 95.5)	110.0	10.23		
	Hat Rack (Max. 10 LBS @ Sta 119.0)	3.0	.36		
6	Loaded Aircraft Weight	2645.0	 	 	
	Total Moment/1000	 	124.76	 	
7	Refer to Page 6-8, Center-of-Gravity Moment Envelope, to determine whether your aircraft loading is acceptable.				

*Obtain the moment/1000 value for each seat position (FWD, MID, or AFT.) from loading computation graph below.

CAUTION

Cargo loaded in rear seat area, with seat backs folded down, should have center of gravity over fuselage station 70.7.

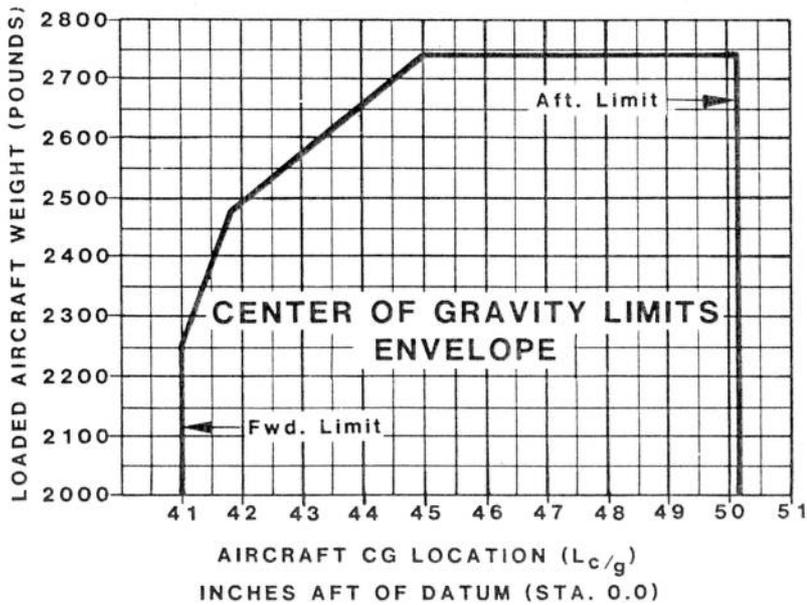
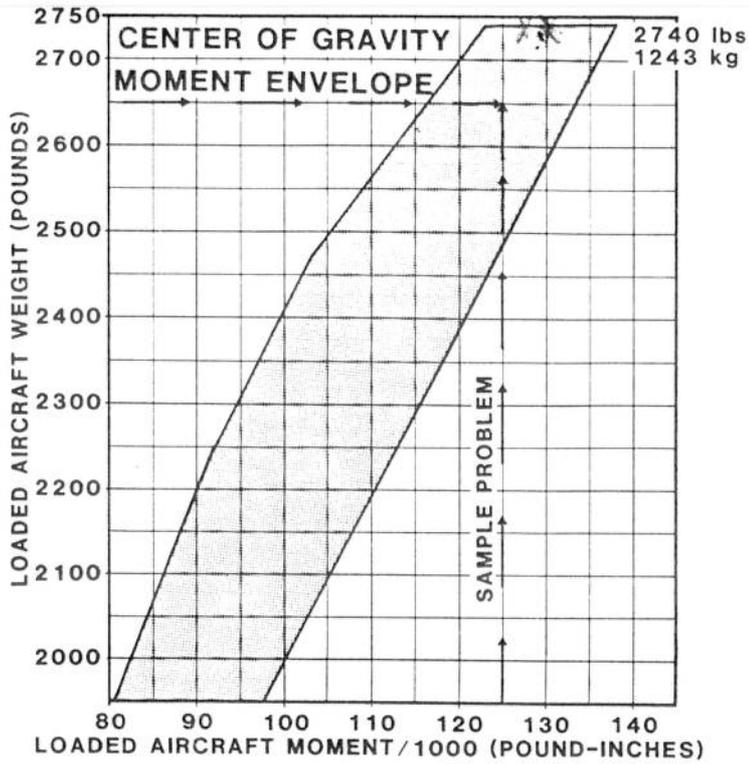


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Mooney M20J

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- Step 5. Once more proceed as in Step 2 to account for the baggage to be carried and enter the figures in the proper columns.
- Step 6. Total the weight columns. This total must be 2740 pounds or less. Total the Moment/1000 column. Do not forget to subtract negative numbers.
- Step 7. Refer to the Center-of-Gravity Moment Envelope (page 6-8). Locate the loaded weight of your airplane on the left scale of the graph and trace a line horizontally to the right. Locate the total moment/1000 value for your airplane on the bottom scale of the graph and trace a line vertically above this point until the horizontal line for weight is intersected. If the point of intersection is within the shaded area, your aircraft loading is acceptable. If the point of intersection falls outside the shaded area, you must rearrange the load before takeoff.

EQUIPMENT LIST

The following Equipment List is a listing of all items approved at the time of publication for the Mooney M20J.

Only those items having an X in the "Mark If Installed" column and dated were installed at Mooney.

If additional equipment is to be installed it must be done in accordance with the reference drawing or a separate FAA approval.

NOTE

Positive arms are distances aft of the airplane datum. Negative arms are distances forward of the airplane datum.

Asterisks (*) after the item weight and arm indicate complete assembly installations. Some major components of the assembly are listed and indented on the lines following. The summation of the major components will not necessarily equal the complete assembly installation.

EQUIPMENT LIST

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MO			
					DAY	YEAR	MARK IF INSTALLED	
	Powerplant and Accessories							
1A	Engine, Lycoming IO360-A3B6D (Includes Starter, Prestolite 60 Amp Alternator, and Oil Filter)	600363	330.00*	-15.76*			7	X
2A	Oil Radiator (Stewart Warner)	620052	2.4	-3.8				X
3A	Valve, Oil Quick Drain (Net Change)	600363	0.00	-14.00				X
4A-1	Propeller - Constant Speed (McCauley - B2D34C214/90DHB-16E)	680031	49.50	-35.50				X
5A	Governor, Propeller (McCauley C290D5/T17)	660115	2.75	-1.40				X