



MOONEY 201 HANDLING NOTES

INTRODUCTION

These handling notes have been written to give a basic introduction to the Mooney 201 for members converting on to type, and to act as a revision aid for those members already qualified.

In the event of any conflict with the aircraft Flight Manual, the Flight Manual is the overriding document.

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MOONEY 201 HANDLING NOTES

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1. GENERAL SPECIFICATION

CLASSIFICATION

The Mooney 201 is an all metal, single engine, low wing land plane with retractable undercarriage.

DIMENSIONS

Wing Span	35 ft
Length	24 ft 8 ins
Height	8 ft 4 ins
Propeller Clearance	9.5 ins

UNDERCARRIAGE

Electrically operated retractable tricycle gear with rubber shock discs, steerable nose wheel and hydraulic brakes.

Wheel Base	5 ft 9.5 ins
Wheel Track	9 ft .75 ins
Turning Radius (No brakes)	41 ft
Tyre Pressure: Main	30 psi
Nose	49 psi

ENGINE

Lycoming IO-360 four cylinder, horizontally opposed, air cooled and fuel injected engine, with wet sump lubrication. Producing 200 BHP at 2700 RPM at Sea Level.

PROPELLER

McCaully constant speed, hydraulically controlled propeller with 2 blades 74" in diameter.

FLAPS

Trailing edge Fowler flaps, electrically operated, infinitely variable between 0 and 33. Take Off 15, Landing 33.

MAXIMUM CERTIFICATED WEIGHTS

Max all up weight	2740 lbs
Empty weight (inc oil)	1839 lbs
Useful load	902 lbs
Baggage area 24"x 35"x 35" (H)	120 lbs
Hat rack	10 lbs

FUEL AND OIL

Total fuel capacity	66.5 US Gal	(55.5 Imp Gal)
Total usable fuel	64 US Gal	(53.3 Imp Gal)
Grade	100	LL
Oil quantity	8	US Qts
(6 Qts minimum for flight)		
Grade	Winter	W80
	Summer	W100
	Multi grade	all year

Note: Fuel gauges are in lbs with direct reading gauges in the top surface of the fuel tanks in US Gal. Filler neck indicator = 25 US Gal usable (20.8 imp Gal).

2. PERFORMANCE

Figures are for the aircraft flown at max weight at sea level in still air temp + 10 C.

Take of run 15 Flap short dry grass	1055 ft
Take off distance	1870 ft
Take off run 15 Flap paved dry surface	896 ft
Take off distance	1711 ft
Take off speed 15 Flap	63 Kts
Initial climb speed 15 Flap	71 Kts
Best rate of climb speed 0 Flap S.L.	88 Kts
Best Rate of Climb S.L.	1100 ft/min
Best Angle of Climb speed 15 Flap	66 Kts
Ceiling	20,000 ft
Max speed V.N.E.	198 Kts
Max continuous speed V.N.O.	176 Kts
Max range 75% power at 4,000 ft	831 NM
Max range 55% power at 4,000 ft	1003 NM
Stall speed clean	63 Kts
Stall speed gear down 33 flap	55 Kts
Best Glide speed (2740 lbs)	91 Kts
Landing run 33 flap short dry grass	1311 ft
Landing distance	2408 ft
Landing run 33 flap paved dry surface	865 ft
Landing distance	1962 ft
Landing speed normal 33 flap	71 Kts
Landing speed performance 33 flap	66 Kts
Rough Air Penetration speed	120 Kts

3. LIMITATIONS

FLIGHT LOAD

Flaps up	+ 3.8g	-1.52g
Flaps down	+ 2.0g	-0.0 g

OPERATIONAL LIMITATIONS

Day or night V.F.R. / I.F.R.
Do not operate into known icing conditions

ENGINE LIMITATIONS

Max power	200 BHP
Max RPM	2700
Max cylinder head temperature	475 F (246 C)
Max oil temperature	245 F (118 C)
Oil pressure Max	100 psi
Min	25 psi
Fuel pressure Max	30 psi
Min	14 psi

PROPELLER LIMITATIONS

Avoid continuous operation between 1500 and 1950 RPM with power below 15" HG manifold pressure (yellow arc)

UNDERCARRIAGE

Max speed for retraction	108 Kts
Max speed for extension	133 Kts

FLAPS

Max speed for lowering	115 Kts
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RAM AIR CONTROL

Do not use unless in clear air, i.e. above the haze layer and clear of cloud. Only worth using if above the full throttle height for 75% power.

MIXTURE

Only lean at power settings of 75% or less.

Lean mixture until temperature peaks on E.G.T. gauge.

Then economy cruise: Enrich mixture until E.G.T. drops 25 F or more below peak.

SPINNING

The aircraft is not cleared for spinning.

AUTO PILOT

Must not be engaged below 1,000 ft unless coupled to an I.L.S. G/S with the aircraft in the landing configuration (max 15 flap) and then not below 200 ft A.G.L.

R.Nav coupled approaches are prohibited.
GPS coupled approaches are prohibited.

NAVIGATION

R.Nav approaches are prohibited.
GPS approaches are prohibited.

4. VISUAL AND AUDIBLE WARNINGS

ANNUNCIATOR PANEL WARNING LIGHTS

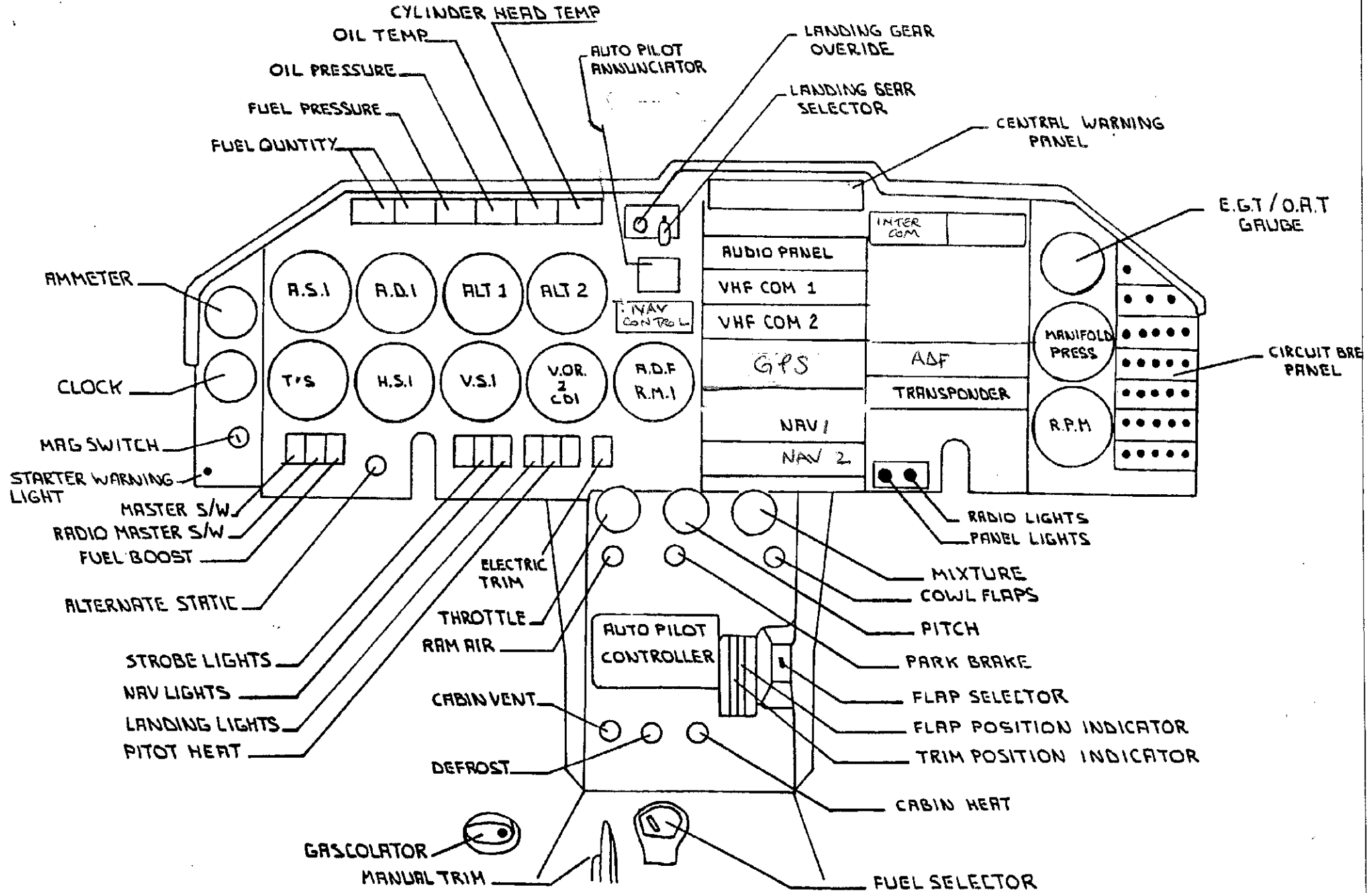
Gear Down	Landing gear is down and locked.
Gear unsafe	Landing gear is not fully extended or fully retracted.
Left or Right low fuel	2.5 to 3 US Gal remaining in respective tank.
VAC (Flashing)	Suction is below 3.5" HG.
VAC (Steady)	Suction is above 5.5" HG.
Volts (Flashing)	Low voltage.
Volts (Steady)	Over voltage or the voltage relay has tripped.
Ram Air	Ram air is open when the landing gear is fully extended.
Area Nav	Inoperative.

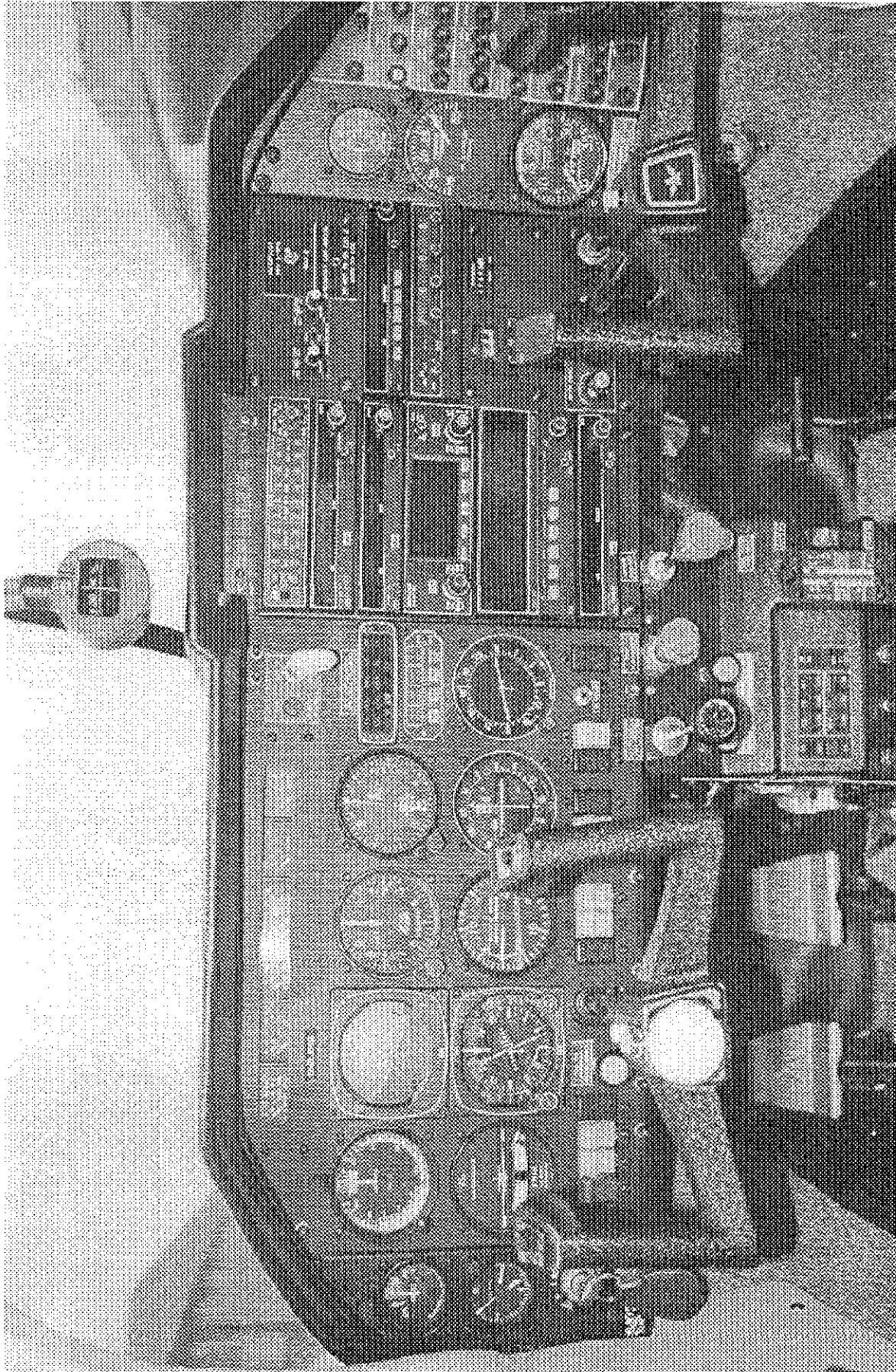
INSTRUMENT PANEL

Trim Warning (on auto pilot annunciator panel)	Illuminates when the electric trim system is not switched on, or failure of the electric trim system.
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AUDIBLE WARNINGS

Continuous Horn	Stall Warning
Intermittent Horn	Gear unsafe with low manifold pressure or airspeed below 57 Kts.
High Pitched Whistle	Electric trim failure.





17th January 2000

05-05-02

6. NORMAL OPERATION

BRAKES

Toe brakes are fitted to the left hand rudder pedals only. They can be used independently for differential braking.

PARKING BRAKE

TO APPLY: Depress toe brakes then pull parking brake knob then release toe brakes. This will lock the applied brake pressure in the system.

TO RELEASE: Push park brake knob in.

WARNING Park brake will not be applied if parking brake knob is pulled without first applying toe brakes.

FLAPS

Electrically operated by a switch on the right hand side of the centre console, next to the flap and trim indicators. The switch has 3 position. Up, centre Off and down. The switch is spring loaded from the down position to off.

TO LOWER FLAPS: Depress switch and hold until flaps reach the required position, then release switch.

TO RAISE FLAPS: Place switch to the up position, the flaps will run fully up. If an intermediate position is required place the switch to the off position when the required setting is reached.

COWL FLAPS

These are used to control the cylinder head temperature by changing the amount of cooling air flowing around the engine. When closed the airflow is reduced. At low speed and high power they should be open to increase cooling flow.

NORMAL OPERATION

They are normally closed during start and warm up, they should be opened fully once the oil temperature is in the green range, prior to take off. They should be left open during low speed climb, once a cruise climb is established they can usually be selected to half open. When established in the cruise they can normally be closed, subject to ambient conditions.

They will then only normally require opening again due to further climb, or after landing.

In the event of a go around they should be opened to at least the half open position.

For circuit work they can normally be left half open without risk of exceeding the cylinder head temperature.

ENGINE CONTROLS

There are three engine controls, throttle, mixture, and propeller. They are of the plunger type.

The mixture and propeller have vernier adjusters, for fine adjustment they can be rotated, clock wise to increase and anti clock wise to decrease. For coarse adjustment a plunger in the end of the knob can be depressed and the control pushed in or pulled out.

PROPELLER

The propeller is variable pitch, controlled by a pitch control in the aircraft.

PITCH CONTROL

FULLY FORWARD The propeller goes to the fully fine position (max r.p.m.)

FULLY AFT The propeller goes to the fully coarse position (min r.p.m.)

The control is infinitely variable between the two positions.

SETTING ENGINE POWER

Because the engine is fitted with a variable pitch prop, the engine power is set by a combination of Manifold Pressure and R.P.M.

The manifold pressure is set by the throttle and the r.p.m. is set by the pitch control.

INCREASING POWER Set r.p.m. first and then set manifold pressure.

DECREASING POWER Set manifold pressure first and then set r.p.m.

A way of remembering this is to remember increasing power REV UP i.e set r.p.m. first. Decreasing power THROTTLE BACK i.e. set manifold pressure first.

It is bad engine management to operate with a manifold setting higher than the r.p.m. setting.

ENGINE STARTING

The engine is fuel injected and therefore requires a different technique for starting.

COLD START Set pitch control fully forward. Set throttle 1/8" open. Mixture fully rich.

Switch fuel pump on and establish fuel pressure for a full 5 seconds, fuel pump should then be switched off and the mixture set to lean. The starter should then be engaged and when the engine starts the mixture should be put to fully rich.

WARM START The engine does not need priming therefore set pitch fully forward, throttle 1/8" open and mixture fully lean. Engage starter, when engine starts push mixture fully forward.

FLOODED ENGINE Set throttle fully open mixture fully lean and pitch fully forward. When engine starts close throttle, and then push mixture fully forward.

POWER CHECKS

The power checks are normal, but with the addition of the function check on the variable pitch propeller. While the engine is running at 2,000 R.P.M. pull the pitch control fully aft and check the R.P.M. decays. As the R.P.M. decays to 1500 R.P.M. push the pitch control fully forward. This should be carried out twice on a cold engine, to ensure warm oil is circulated to the prop, but only once on a warm engine.

Then set the engine to 1500 R.P.M. and again pull the pitch control fully aft as the R.P.M. decays to 1200 push the pitch control fully forward. This needs only be carried out once on a cold engine.

TAKE OFF

Take off technique is normal all engine controls should be fully forward. Rotate the aircraft at 63 Kts and then allow to accelerate to 71 Kts. Once a positive rate of climb has been established, depress toe brakes to stop the wheels spinning and then select the undercarriage up.

CLIMB

Once above 250 ft or any obstacle with the speed accelerating toward 90 Kts, select the flap to 0. Once the flaps have reached 0 climb power can be set 25" HG 2500 R.P.M. (75% power) This is done by slowly pulling the throttle aft, until 25" HG is indicated on the manifold pressure. Then rotate the pitch control anti clockwise until 2500 R.P.M. is indicated.

The engine mixture can then be leaned at 75% power or less.

At high ambient temperatures with max weight 26" HG 2600 R.P.M. can be used for initial climb. But do not lean until power is reduced to 75%.

Re adjust manifold pressure every 1,000 ft in the climb.

CRUISE

Select power for required performance, 75% or less. Check cylinder head temperature and close cowl flaps.

Fine tune mixture for best economy cruise.

DESCENT

R.P.M. can be left in selected cruise position. Retard throttle as required to give desired rate of descent and airspeed. Enrich mixture during the descent

At the end of descent select required power and re lean mixture.

THE CIRCUIT

Power to give a speed compatible with circuit traffic, allow some time for the aircraft to slow down.

DOWN WIND Additional items: Check speed is below 133 Kts and select gear down, check the green light is on. Check RAM AIR closed. Late down wind check speed below 115 Kts and select flap to 15. As you run flap down select nose up trim at the same time, this will keep the aircraft in trim.

BASE LEG Reduce power and then select mixture fully rich and pitch fully fine

FINAL Select full flap, final gear check, aiming for 75 Kts over the threshold.

GO AROUND Full throttle accelerate to 75 Kts, when positive climb is established select gear up. Accelerating to 90 Kts select flaps to 0 and open cowl flaps.

After landing select cowl flaps open.

Shut down checks are normal but the radios should be switched off by using the radio master switch.

POWER SETTINGS

There are many different combinations of manifold pressure and R.P.M. for a particular power setting listed in the flying manual.

Some useful rules of thumb are as follows:

75% power	25" HG 2500 R.P.M. Normal climb and max cruise this will be good up to about 5,500 ft.
65% power	24" HG 2400 R.P.M.
55% power	22" HG 2200 R.P.M. A good initial setting for the circuit at max weight.

7. LOAD AND BALANCE

USEFUL LOAD

The useful load for our Mooney is 894.5 lbs (including 2.5 US Gal unusable fuel). If we fill the fuel tanks they will take 64 US Gal usable (53.3 IMP Gal). On an average day this will weigh 384 lbs, when this is subtracted this from the useful load it will leave 510.5 lbs that can be made up of people and baggage.

As you can see it is very important to keep an eye on the aircraft load.

For this reason it is planned to always leave the aircraft with a part fuel load of 40 US Gal, i.e. 20 US Gal per side. There are fuel gauges in each wing next to the fuel filler port for this purpose.

40 US Gal equals 37.5 US Gal of usable fuel. This will weigh 225 lbs and will leave 669.5 lbs for occupants and baggage. This for example would allow 2 @ 12 st and 2 @ 10 st + 53.5.5 lbs of baggage.

C of G POSITION

To calculate the C of G position it is necessary not only to calculate the all up weight but also the total moment.

To calculate the moments you can either enter the loading computation graph and extract the moment for the particular position and weight.

Or calculate by multiplying a particular weight by the Station Number where it is acting. i.e. basic weight $1845.5 \times \text{STN No } 47.32 = 87.34 \times 10$ to power of 3. This is carried out for each seat, fuel and baggage, the moments are then added together.

You can then enter the graph of aircraft weight verses total moment to check that the C of G falls in the shaded area.

If you wish to calculate the C of G position in inches AFT of the datum you have to divide the total moment by the total weight. You can then check that it is between the forward and aft limits, on the C of G limits envelope.

To make life easy the fuel gauges on the instrument panel are calculated in lbs.

STATION POSITION

Basic weight	47.32"	@ 1845.5 Lbs
Front seats fully forward	32.75"	
Front seats fully aft	39.00"	
Rear seats	70.70"	
Fuel	48.43"	
Baggage area (120 lbs max)	95.50"	
Hat rack (10 lbs max)	119.00"	

Note: The calculations in this section have been based on the following SG.

OIL 7.58 Lbs/US Gal = 1.9 Lbs/US Qt.

FUEL 6 Lbs/US Gal.
7.2 Lbs/IMP Gal.

The Basic Weight of the aircraft assumes the engine sump contains 8 US Qts. It is our policy to operate with a maximum of 7 Qts. due to engine breathing.

This of cause would allow you to increase the useful load by 1.9 Lbs.

Note: The basic weight and moment of the aircraft includes 2.5 US Gal (2.2 Imp Gal) of unusable fuel. Remember to subtract the unusable fuel from your total fuel on board when calculating the weight and index of fuel.

The current basic weight of the aircraft is 1845.5 Lbs.
The current basic moment of the aircraft is 87339.1 Lbs/ins.

PS If you have a moment it is more accurate to calculate it the long way!

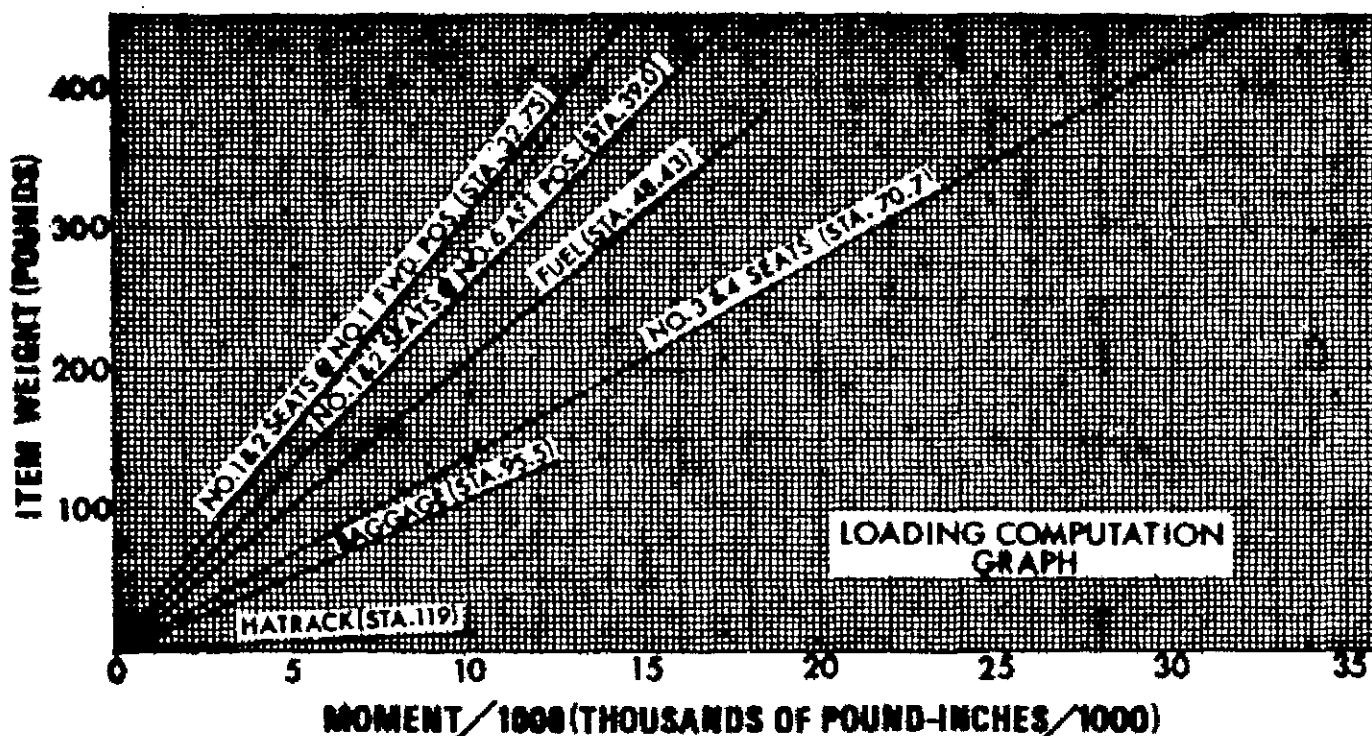
PROBLEM FORM

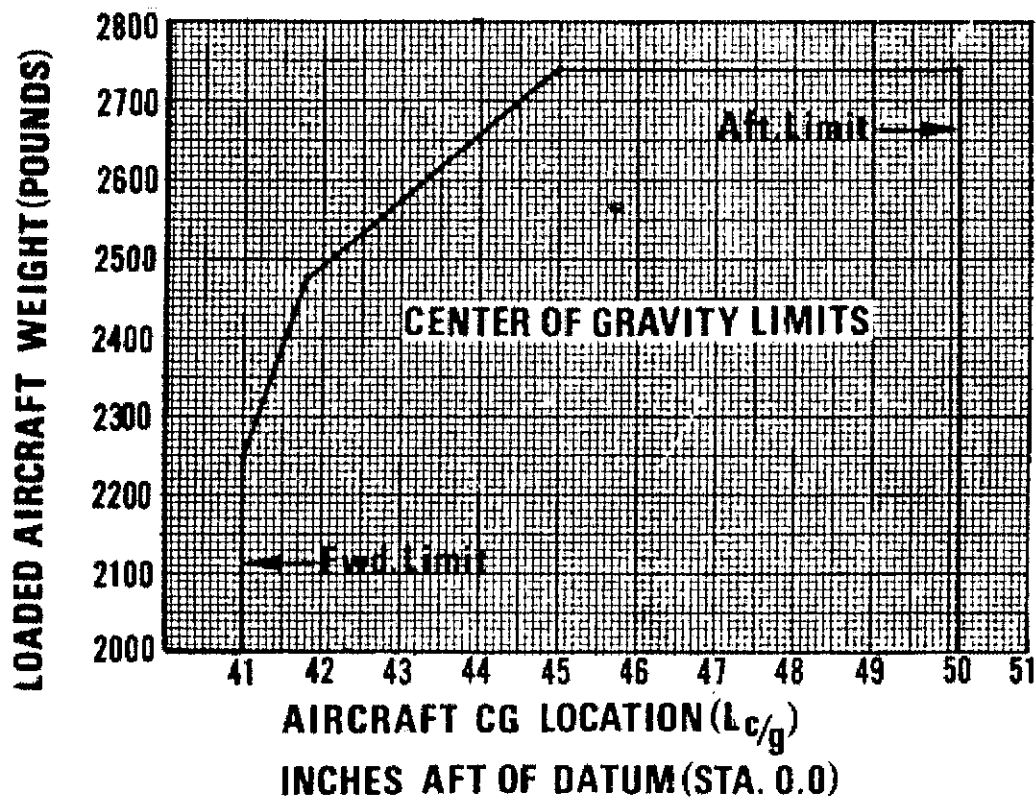
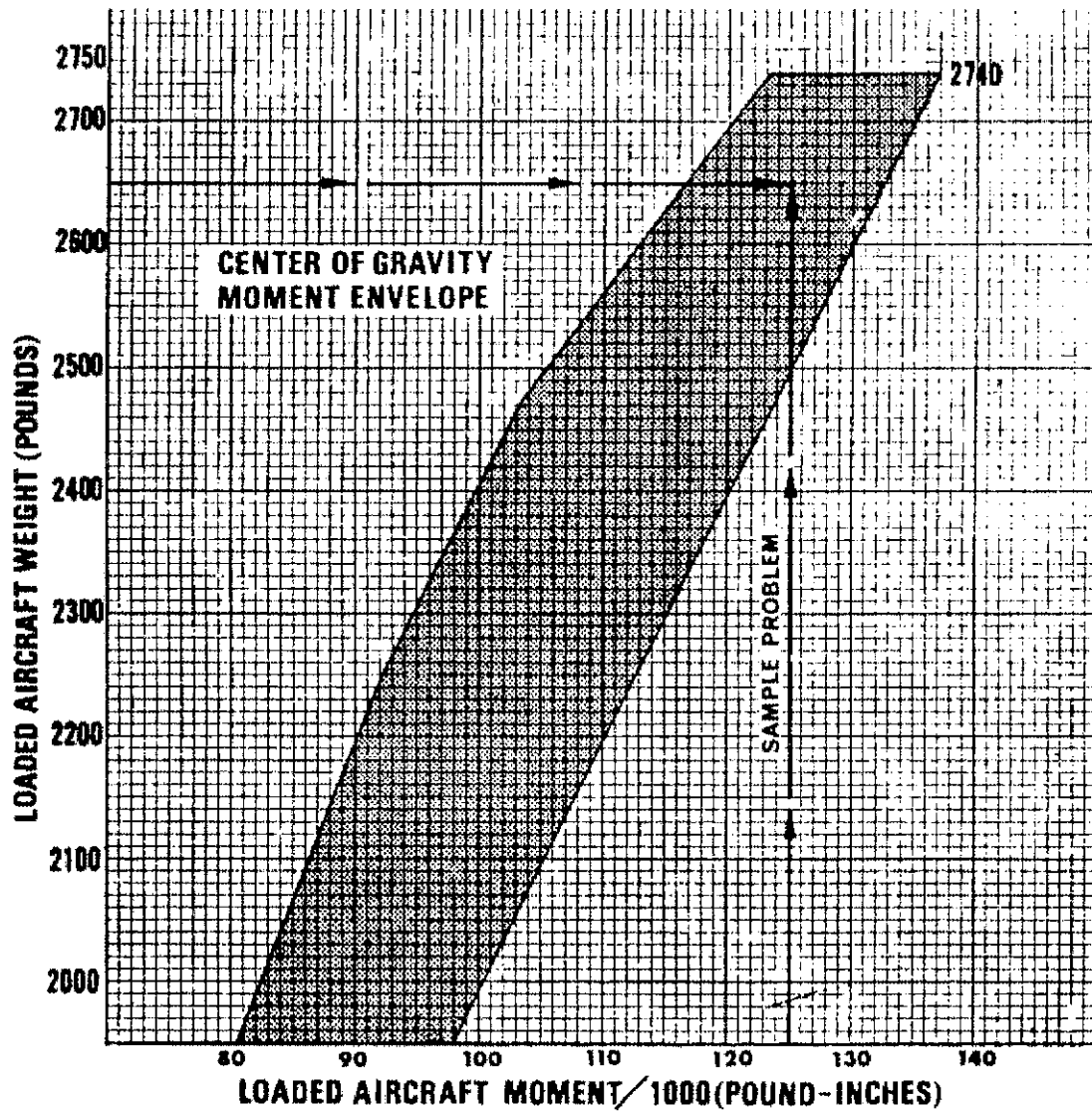
Registration No G-BJHB

M20J Serial No 24-1190

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, Includes Full Oil, and 2.5 US gallons of unusable fuel.	1710.00	75.26		
2	Pilot Seat (#1)*	170.00	6.00		
	Copilot Seat (2#)*	170.00	5.80		
3	Left Rear Seat (#3)	170.00	12.00		
	Right Rear Seat(#4)				
4	Fuel (Max Usable 64 US Gal. 384 Lbs @ Sta 48.43)	312.00	15.11		
5	Baggage (Max 120 Lbs @ Sta 95.5)	110.00	10.23		
	Hat Rack (Max 10 Lbs @ Sta 119.0)	3.00	0.36		
6	Loaded Aircraft Weight	2645.00			
	Total Moment / 1000		124.76		
7	Refer to page 05-07-04, Centre 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.





THE MOONEY CIRCUIT

4.
AT CIRCUIT HEIGHT S&L ATTITUDE,
REDUCE POWER 22" 2,200 RPM,
CHECK CYL HEAD TEMP AND COWL FLAPS.

3.
AIRCRAFT CLEAN

SELECT CLIMB PWR
25" 2,500 RPM,
ACCELERATE TO
85 TO 90 Kts,
*LEAN MIXTURE.

2.
INITIAL CLIMB

75 Kts & SELECT
FLAPS UP.

1.
ROTATE AT 65 Kts

ESTABLISH POSITIVE
CLIMB. TOUCH TOE
BRAKES,
SELECT GEAR UP.

*Re Rudder +
Trim*

5.
AS SPEED REACHES
110 TO 120 Kts REDUCE
POWER TO 17" 2,200 RPM **

NOTES

* Do not try to lean accurately in the circuit, turn Mixture Control 2 to 4 times 725 C approx. Adjust mixture accurately after leaving the circuit.

** Approximate power settings, adjust as required depending on aircraft weight.

COWL FLAPS

It is normally OK to select ½ closed in the circuit. But Cylinder Head Temperature must be monitored.

CAUTION AT WYCOMBE

Do not fly on R/W 17. R/W 35 may be used for departures and arrivals, but must not be used for circuits.

07/25 OK for departures and arrivals, but must not be used for circuits.

6.
DOWN WIND CHECK

BRAKES OFF,
CHECK SPEED,
SELECT GEAR DOWN,
CHECK GREEN LIGHT,
**POWER 19" 2,200 RPM,
FUEL BOOST PUMP ON,
CHECK FUEL TANK
SELECTED.

7.
LATE DOWN WIND

SELECT 15 FLAP,
RUN NOSE UP TRIM AT
THE SAME TIME.

9.
FINAL

SELECT FULL FLAP,
REDUCE SPEED TO
72 Kts BY THRESHOLD,
CHECK GEAR GREEN,
MIXTURE & PITCH,
FULLY FORWARD,
FULL FLAP,
FEET OF THE BRAKES.

8.
BASE LEG

REDUCE POWER TO 14"
SPEED 85 TO 90 Kts,
MIXTURE & PITCH
FULLY FORWARD.