



**MOONEY AIRPLANE COMPANY, INC.  
LOUIS SCHREINER FIELD KERRVILLE, TEXAS 78028  
FAA APPROVED  
AIRPLANE FLIGHT MANUAL SUPPLEMENT  
FOR  
GARMIN G1000  
INTEGRATED AVIONICS SYSTEM  
INSTALLED IN MOONEY M20M**

REG. NO. \_\_\_\_\_

SERIAL NO. \_\_\_\_\_

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the GARMIN G1000 Integrated Avionics System is installed in accordance with Mooney Drawing Number 950300. The information contained herein supplements and / or replaces the information of the basic Airplane Flight Manual. For Limitations, Procedures and Performance information not contained in this Supplement, consult the basic Airplane Flight Manual.

FAA APPROVED

A handwritten signature in black ink, appearing to read "Michele M. Owsley". The signature is written in a cursive style and is positioned above a horizontal line.

Michele M. Owsley

Manager, Aircraft Certification Office  
FEDERAL AVIATION ADMINISTRATION  
2601 Meacham Boulevard  
Fort Worth, Texas 76137-0150

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### LOG OF REVISIONS

REV. NUMBER	PAGE NUMBER(S)	DESCRIPTION	FAA APPROVED	APR'VD DATE
A	7, 19, 31, 32  16 thru 21  23, 25, 29	<b>Add following components from Garmin G1000 Cockpit Reference Guide:</b> <b>GDL 69A</b> <b>DME</b> <b>ADF</b> <b>Added Modifications Related to Optional A/C</b> <b>Added Plural Reference to Alternator</b>	<i>[Handwritten Signature]</i> <i>[Handwritten Date: 7-10-05]</i>	
B	19, 20, 32	<b>Add SKYWATCH™ Capability</b>	<i>[Handwritten Signature]</i>	<i>[Handwritten Date]</i>

THE REVISED PORTIONS OF AFFECTED PAGES ARE INDICATED BY VERTICAL LINES IN THE MARGIN.



## TABLE OF CONTENTS

SECTION	PAGE
I GENERAL .....	5
II LIMITATIONS .....	7
III EMERGENCY PROCEDURES .....	15
IV NORMAL PROCEDURES .....	23
V PERFORMANCE .....	29
VI WEIGHT AND BALANCE .....	29
VII AIRPLANE AND SYSTEM DESCRIPTIONS .....	29
VIII SERVICING AND HANDLING .....	36
IX SUPPLEMENTAL DATA .....	36
X SAFETY TIPS .....	36



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## SECTION I - GENERAL

1. The GARMIN G1000 Integrated Avionics System is a fully integrated flight, engine, communication, navigation and surveillance instrumentation system. The system consists of a Primary Flight Display (PFD), Multi-Function Display (MFD), audio panel (GMA), Air Data Computer (ADC), Attitude and Heading Reference System (AHRS), engine / airframe processing unit (GEA), and integrated avionics (GIA) containing VHF communications, VHS navigation, and GPS navigation.
2. The primary function of the PFD is to provide attitude, heading, air data, navigation, and alerting information to the pilot. The PFD may also be used for flight planning. The primary function of the MFD is to provide engine information, mapping terrain information and for flight planning. The audio panel is used for selection of radios for transmitting and listening, intercom functions, and marker beacon functions.
3. The primary function of the VHF Communication portion of the G1000 is to enable external radio communication. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS satellites, recover orbital data, make range and Doppler measurements, and process this information in real time to obtain the user's position, velocity, and time.
4. Provided the GARMIN G1000 GPS receivers are receiving adequate and usable GPS and/or VHF navigation signals, it has been demonstrated capable of and meets the accuracy specifications for the following types of flight operations:

VFR/IFR en-route, oceanic, and terminal operations as well as non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System in accordance with AC20-138A.

Navigation in the North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace in accordance with AC91-49 and AC 120-33.

The GARMIN G1000 system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, JAA AMJ 20X2 Leaflet 2 Revision 1, and FAA Order 8110.60 for oceanic and remote



airspace operations, provided it is receiving usable navigation information from the GPS receiver. (A separate software application for prediction of GPS navigation availability may be required for oceanic and remote operations. Refer to appropriate limitations for the airspace you are operating in to determine if this GPS prediction software is required.)

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.



## SECTION II - LIMITATIONS

### GENERAL

#### **G1000 System:**

1. The GARMIN G1000 Cockpit Reference Guide for the M20M Series aircraft, P/N 190-00450-01, Revision A or later approved revision must be immediately available to the flight crew.
2. The GARMIN G1000 must utilize the following or later FAA approved software versions:

<b>SUB-SYSTEM</b>	<b>SOFTWARE VERSION</b>
PFD	4.06
MFD	4.06
GMA	2.08
AHRS	2.03
ADC	2.05
GIA	2.08
GEA	2.04
GPS	3.01

The database version is displayed on the MFD power-up page immediately after system power-up and must be acknowledged. The remaining system software versions can be verified on the AUX group sub-page 5, "AUX – SYSTEM STATUS".

3. IFR enroute, oceanic and terminal navigation predicated upon the G1000 GPS Receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.



4. Instrument approach navigation predicated upon the G1000 GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle.
  - (a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.
  - (b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the G1000 GPS receiver is not authorized.
  - (c) Use of the G1000 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be valid on the PFD display.
  - (d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS navigation, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
  - (e) VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in a normal position to land. VNAV also does not guarantee compliance with intermediate altitude constraints between the top of descent and the waypoint where the VNAV path terminates in terminal or enroute operations.
5. If not previously defined, the following default settings must be made in the "SYSTEM SETUP" menu of the G1000 prior to operation (refer to Pilot's Guide for procedure, if necessary).
  - (a) **DIS, SPD**..... $n_m$   $k_t$  (sets navigation units to "nautical miles" and "knots")
  - (b) **ALT, VS**..... $f_t$  fpm (sets altitude units to "feet" and "feet per minute")





- (c) **MAP DATUM**....WGS 84 (sets map datum to WGS-84, [see note below])
- (d) **POSITION**.....deg-min (sets navigation grid units to decimal minutes)  
example: dd.mm.ss: 45° 30' 30" in decimal minutes are: 45° 30.5'

**NOTE:**

**In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the G1000 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the G1000 prior to its use for navigation.**

- 6. Operation is prohibited north of 70° N and south of 70° S latitudes. In addition, operation is prohibited in the following two regions: 1) north of 65° N between 75° W and 120° W longitude and 2) south of 55° S between 120° E and 165° E longitude.
- 7. **CAUTION:** CDI automatic source switching to the ILS on Nav 1 or 2 must be set to manual for instrument approaches conducted with the autopilot coupled. If the CDI navigation source is changed when autopilot is engaged in GPSS mode, the S-Tec 55x autopilot lateral mode will revert to wings level mode and indicate GPSS FAIL. NAV mode must be manually reselected by the pilot in order to track the ILS or Localizer.
- 8. Display of autopilot operational mode on the PFD is supplemental to the data which is presented on the display of the S-Tec 55X autopilot control unit.

**2.1 AIRSPEED MARKINGS – M20M**

Marking	IAS	Significance
Red band	20 KIAS – 59 KIAS	Low speed awareness - stall is imminent
White band	59 KIAS – 110 KIAS	Operating range with flaps fully extended
Green band	66 KIAS – 174 KIAS	Normal operating range
Yellow band	174 KIAS - 195 KIAS	Caution range - smooth air only
Red band	195 KIAS and greater	Lower limit of 195 KIAS is the maximum speed for all operations

The airspeed indicator is marked in IAS values.



**2.2 POWER PLANT INSTRUMENT MARKINGS**

Power plant instrument markings and their color code significance are shown in the table below.

**NOTE:**

**When an indication lies in the caution range, the legend for that display will change to the color of the caution range. When an indication lies in the upper or lower prohibited range, the legend for that display will change to the color of the prohibited range and will begin flashing as well.**

**MOONEY M20M**

Indication	Red arc / bar = Lower prohibited range	Yellow arc / bar = Caution range	Green arc / bar = Normal operating range	Yellow arc / bar = Caution range	Red arc / bar = Upper prohibited range
Engine RPM	--	--	2200 - 2500	--	2500 - 2650*
Manifold Press. In. Hg	--	--	10 - 38	--	- > 38
Oil Temp °F	--	--	100 - 245	--	>245
Cyl. Head Temp °F	--	--	250 - 500	--	>500
Oil Press PSI	0 - 25	25 - 55	55 - 95	95 - 115	>115
Fuel Press - PSI	0 - 15	15 - 24	25 - 55	--	> 55
Turbine Inlet Temperature	--	--	0 - 1750	--	> 1750

\* To prevent nuisance alerts during normal takeoffs: the “RPM” will not turn red or flash until the RPM exceeds 2640.



**2.3 - TYPES OF OPERATION**

The airplane is approved for the following operations when equipped in accordance with FAR 91 or FAR 135.

- (a) Day V.F.R.
- (b) Night V.F.R.
- (c) Day I.F.R.
- (d) Night I.F.R.
- (e) Non Icing

Minimum Operational Equipment for flight operations listed:

Equipment	Number installed	VFR Day	VFR Night	IFR
Primary Flight Display	1	*	1	1
Multi-Function Display	1	-	1	1
Audio panel	1	-	-	1
Air data computer	1	1	1	1
Attitude and Heading Reference System	1	-	1	1
GPS	2	-	1	2

\* If the PFD is inoperative or removed for service, the MFD may be used as the PFD. The MFD display must be operated in PFD (reversionary) mode by depressing the reversionary button on the Audio Panel. When operating in reversionary mode the system is limited to DAY VFR operations only.

**2.4 - ADVISORY MESSAGES**

The G1000 Cockpit Reference Guide and the G1000 Pilot's Guide contain detailed descriptions of the annunciator system and all advisory messages. These messages appear on the PFD for flight crew awareness.

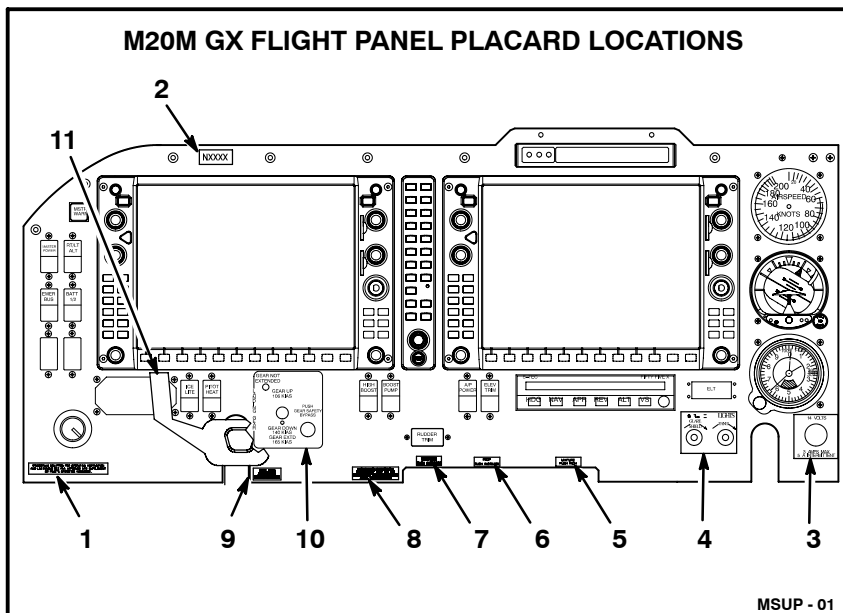
The following warnings and cautions may appear in various locations on the PFD or MFD. Consult the G1000 Cockpit Reference Guide and the G1000 Pilot's Guide for detailed descriptions of each annunciation as necessary.



<b>Annunciation</b>	<b>Cause</b>
AHRS Aligning – Keep Wings Level	Attitude and Heading Reference System is aligning. Keep wings level using standby attitude indicator.
ATTITUDE FAIL	Display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.
AIRSPEED FAIL	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display
ALTITUDE FAIL	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the altimeter display
VERT SPEED FAIL	Display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display
HDG	Display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display
Red X	A red X through any display field, such as com frequencies, nav frequencies, or engine data, indicates that display field is not receiving valid data.



**DECALS AND PLACARDS**



REF LOCATION	PART NUMBER	DECAL/PLACARD NOMENCLATURE
1	150056-1001	SPEEDBRAKE EQUIPPED FOR OPERATING...
2	150056-1004	N NUMBER
3	150056-1012	14V RECEPTACLE
4	800399-007	PANEL LIGHTS/GLARESHIELD
5	150056-1010	MIXTURE PUSH RICH
6	150056-1007	PROP PUSH INCREASE
7	150056-1008	THROTTLE PUSH INCREASE
8	150056-3017	LIGHTING DETECTION EQUIP. OPT...
9	150056-1009	PULL FOR ALTERNATE STATIC SOURCE
10	150056-3038	[STD] GEAR UP/DOWN /BYPASS
10	150085-038	[OPT] GEAR UP/DOWN /BYPASS
11	150056-3039	MIC <CWS A/P DISC TRIM INTR>

**NOTE:**

**150056-1003 Decal is required only when the McCauley 2 Blade Propeller is installed.**



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## SECTION III - EMERGENCY PROCEDURES

### GENERAL

1. These checklists supercede those in the POH as a result of the installation of the G1000 avionics system. All other emergency procedures in the POH remain in effect.
2. These checklists assume that the aircraft is equipped with a standby alternator system installed by Mooney Airplane Company, Inc.
3. If GARMIN G1000 GPS navigation information is not available or invalid, utilize remaining operational navigation equipment as required.
4. If the "POSN ERROR" annunciation is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the G1000 VOR/ILS receivers or an alternate means of navigation other than the G1000 GPS receivers.
5. If the "POSN ERROR" annunciation is displayed in the enroute, oceanic, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the G1000 GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the G1000 VOR/ILS receiver or another IFR-approved primary navigation system.
6. **CAUTION:** If the "POSN ERROR" annunciation is displayed while on the final approach segment (between the Final Approach Fix and the Missed Approach Point), GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity set at 0.3 nautical mile. It is recommended that the pilot initiate the missed approach upon receipt of this message from the G1000. Navigation guidance will continue for 5 minutes allowing the pilot to initiate the missed approach while maintaining course guidance on the final approach course. Then the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach. This is typically caused by the GPS sensor's inability to provide adequate horizontal position accuracy for the final approach segment. It is possible, however unlikely, that the GPS position may degrade to the point where terminal operations cannot be supported for the missed approach segment. Navigate using other primary navigation equipment (VOR receivers, etc) if this occurs.



- 7. In an in-flight emergency, depressing and holding the "Comm" transfer button for 2 seconds will select the emergency frequency of 121.500 MHz, and will show it in the "Active" frequency window.
- 8. The Attitude, Heading and Reference System (AHRS) requires at least one GPS or air data input to function properly. In the unlikely event that both GPS position sources fail, and the air data computer fails, the AHRS will subsequently lose attitude and heading and the pilot will be required to use the standby instrumentation. In this instance, the PFD will not provide altitude, airspeed, attitude, or navigation information

**3.1 - EMERGENCY PROCEDURE CHECKLISTS**

Use the electrical fire checklists found in the M20M POH and appropriate AFM supplements.

**ELECTRICAL FIRE - IN FLIGHT (M20M W/O OPTIONAL AIR CONDITIONING)**

If electrical power is essential for the flight, attempt to isolate the faulty circuit.

- Cabin Ventilation ..... OPEN
- Heating Controls ..... CLOSED
- Circuit Breakers ..... CHECK to identify fault circuit if possible

**Land as soon as practical.**

If smoke in the cockpit continues, press the EMERG BUS switch to shed the non-essential equipment.

**NOTE:**

**If the autopilot is engaged and the EMERG BUS is activated, it will disengage without annunciation.**

If smoke in the cockpit continues, then:

- Left and Right Alternator Switches ..... OFF
- Master Switch ..... OFF

**NOTE:**

**The standby instrumentation will remain powered with the EMER BUS switch ON.**





If power must be re-established to navigation equipment to continue flight: If the faulty component can be determined, pull the associated circuit breaker if not tripped already. Do not close the open breaker to re-establish power to the failed circuit.

If the faulty component cannot be determined, pull all essential circuit breakers, switch the Master switch ON and L & R Alternator switches ON; then close circuit breakers one at a time. Permit a short time to elapse before closing the next circuit breaker.

**ELECTRICAL FIRE - IN FLIGHT (M20M WITH OPTIONAL AIR CONDITIONING)**

If electrical power is essential for the flight, attempt to isolate the faulty circuit.

Cabin Ventilation ..... OPEN

Heating Controls ..... CLOSED

Circuit Breakers ..... CHECK to identify fault circuit if possible

**Land as soon as practical.**

If smoke in the cockpit continues, press the **EMERG BUS** switch and pull the **BATT** circuit breaker to shed the non-essential equipment and energize the Standby 20 amp alternator.

**NOTE:**

**If the autopilot is engaged and the EMERG BUS is activated and the BATT circuit breaker, it will disengage without annunciation.**

If smoke in the cockpit continues, then:

Alternator Switch ..... OFF

Master Switch ..... OFF

**NOTE:**

**The standby instrumentation will remain powered with the EMER BUS switch ON.**

If power must be re-established to the navigation equipment to continue flight: If the faulty component can be determined, pull the associated circuit breaker if not tripped already. Do not close the open breaker to re-establish power to the failed circuit.

If the faulty component cannot be determined, pull all essential circuit breakers, switch the Master switch ON and Alternator switch ON; then close circuit breakers one at a time. Permit a short time to elapse before closing the next circuit breaker.



**ELECTRICAL SYSTEM FAILURES (M20M W/O OPTIONAL AIR CON-  
DITIONING)**

1. All electrical systems will remain powered and functional.
2. Reduce the electrical load if the ammeter indicates a battery discharge.
3. Turn off the affected alternator field switch. Land as soon as practical.

**NOTE:**

**It is permissible to cycle the alternator field switch to attempt to reset the alternator.**

4. If both alternators fail and cannot be restored, then:
5. Reduce the load by pressing the EMER BUS switch. This load sheds the non-essential bus. The following systems remain powered by the essential bus:

**Left / Right Alternator Failure**

- L/R ALT SENSE
- L/R ALT FIELD
- LEFT ALT
- AUX PANEL
- BAT
- AUX OVHD
- RIGHT ALT
- BOOST PUMP
- GLRSHIELD LIGHT
- PFD
- MFD
- AHRS
- ADC
- ENGINE INST
- STBY GYRO
- ICE PROT SYS (if installed)
- COM 1
- NAV 1 / GPS 1
- AUDIO
- XPONDR
- ICE LITE
- PITOT HEAT



The following systems on the non-essential bus will be unpowered:

- TURN COORDINATOR (AUTOPILOT INOP)
- COM 2
- NAV 2 / GPS 2
- WX STORMSCOPE
- DIMMER CONTROL
- ADF/DME/DATA LINK
- TRAFFIC ALERT

### **CAUTION:**

*If the autopilot is engaged, when the EMER BUS switch is activated the autopilot will disconnect without annunciation.*

6. Terminate flight as soon as practicable.
7. If using battery power only and the primary battery has been depleted (minimum of 18 VDC), the pilot may select the alternate battery using the main battery selection switch. There will be no change in available equipment when changing battery sources. All equipment powered previously will remain powered.

### **ELECTRICAL SYSTEM FAILURES (M20M WITH OPTIONAL AIR CONDITIONING)**

If the Main Alternator fails, indicated by the Master Warning “ALT VOLTS” is flashing:

Perform the Standby Alternator Emergency Checklist (repeated below)

8. Push the “Stby Alt/Emergency Bus” switch ON. (This activates the emergency bus circuitry & Standby Alternator system) Verify:
  - A) The AMBER “EMERG BUS” annunciator illuminates, and
  - B) The RED “ALT VOLTS” flashing annunciator extinguishes.

### **NOTE:**

**The most efficient operating RPM is 2575 RPM when operating on the Standby Alternator System.**

9. All electrical systems will remain powered and functional.
10. If the RED “ALT VOLTS” annunciator remains illuminated, then:

### **CAUTION:**

*If the RED “ALT VOLTS” annunciation remains illuminated, then the standby alternator has failed, and only main battery power remains.*

11. Reduce the electrical load by pulling the “BATT” circuit breaker. This load sheds the non-essential bus. The following systems remain powered by the essential bus.



**CAUTION:**

*If the autopilot is engaged, when the BATT circuit breaker is pulled, the autopilot will disconnect without annunciation.*

- ALT SENSE
- EMER ALT BUS
- ALT FIELD
- EMER ALT FIELD
- ALT OUT
- STBY ALT
- BATT
- AUX PANEL
- AUX OVHD
- GLRSHIELD LIGHT
- PFD
- MFD
- AHRS
- ADC
- ENGINE INST
- STBY GYRO
- ICE PROT SYS
- COM 1
- NAV1 / GPS1
- AUDIO
- XPONDR
- STALL WARN
- ICE LITE
- PITOT HEAT

The following systems on the non-essential bus will be unpowered

- COM 2
- NAV2 / GPS2
- ALL LIGHTING ON THE OVERHEAD PANEL
- FUEL PUMPS
- AUTOPILOT
- ELECTRIC TRIM
- LANDING GEAR MOTOR AND INDICATOR
- COWL FLAPS
- DEFROST BLOWER
- WX STORMSCOPE
- SKYWATCH™



12. Terminate flight as soon as practical

13. On approach, the pilot may engage the “BATT” circuit breaker to re-establish power to all systems is necessary.

14. If using battery power only and the primary battery has been depleted (minimum of 18 VDC), the pilot may select the alternate battery using the main battery selection switch. There will be no change in available equipment when changing battery sources. All equipment powered previously will remain powered.

## **AVIONICS EMERGENCIES**

### **a) PFD OR MFD DISPLAY FAILURE**

1. DISPLAY BACKUP button on audio panel ..... PUSH

### **b) AHRS FAILURE**

#### **NOTE:**

failure of the Attitude and Heading Reference System (AHRS) is indicated by a removal of the sky/ground presentation and a red X and a yellow “AHRS FAILURE” shown on the PFD. The digital heading presentation will be replaced with a yellow “HDG” and the compass rose digits will be removed. The course pointer will indicate straight up and course may be set using the digital window.

1. Use Standby Attitude Indicator and Magnetic compass.
2. Course ..... Set using digital window
3. Land as soon as practical.

### **c) AIR DATA COMPUTER (ADC) FAILURE**

#### **NOTE:**

Complete loss of the Air Data Computer is indicated by a red X and yellow text over the airspeed, altimeter, vertical speed, TAS and OAT displays. Some FMS functions, such as true airspeed and wind calculations, will also be lost.

1. Use Standby Airspeed Indicator and Altimeter
2. Land as soon as practical at a suitable airport

### **d) ERRONEOUS OR LOSS OF ENGINE AND FUEL DISPLAYS**



**NOTE:**

**Loss of an engine parameter is indicated by a red X through the data field. Erroneous information may be identified by indications which do not agree with other system information. Erroneous indications may be determined by comparing a display with other displays and other system information.**

1. Set power based on throttle lever position, engine noise and speed.
2. Monitor other indications to determine the health of the engine.
3. Use known power settings in the POH Chapter V for approximate fuel flow values.
4. Use other system information, such as annunciator messages, fuel quantity and flow, to safely complete the flight.

**e) ERRONEOUS OR LOSS OF WARNING/CAUTION  
ANNUNCIATORS**

**NOTE:**

**Loss of an annunciator may be indicated when engine or fuel displays show an abnormal or emergency situation and the annunciator is not present. An erroneous annunciator may be identified when an annunciator appears which does not agree with other displays or system information.**

1. If an annunciator appears, treat it as if the condition exists. Refer to the POH/AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.
2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, fuel quantity and flow, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists. Refer to the POH/AFM Emergency or Abnormal procedures or the procedures contained in this AFM Supplement.



## SECTION IV - NORMAL PROCEDURES

### NOTE:

**View ability of the PFD and MFD displays may be degraded when wearing polarized sunglasses.**

The following normal procedures have been modified as the result of the G1000 installation. Procedures which have not been modified as a result of the G1000 installation should be used as written in the POH/AFM.

### DETAILED OPERATING PROCEDURES

Normal operating procedures for the G1000 are described in the GARMIN G1000 Cockpit Reference Guide and the GARMIN G1000 Pilot's Guide.

### 4.5 - NORMAL PROCEDURES CHECKLISTS

#### BEFORE STARTING ENGINE

Preflight Inspection . . . . . Complete  
Seats, Seatbelt, Shoulder Harness . . . . . Adjust and Secured  
Magneto/Starter Switch . . . . . Off  
Master Switch . . . . . On  
Alternator Field Switch(es) . . . . . Off  
Fuel Boost Pump Switches . . . . . Off  
Circuit Breaker Switches . . . . . Check-All In  
ELT Switch . . . . . Armed  
Rocker Switches . . . . . Off  
Alternate Static Source . . . . . Push Off  
Throttle . . . . . Closed  
Propeller . . . . . Full Forward (High RPM)  
Mixture . . . . . Idle Cut Off  
Cowl Flaps . . . . . Verify Full Open  
Brakes . . . . . Set  
Wing Flap Switch . . . . . Flaps Up



Defrost . . . . . Push Off  
Cabin Heat . . . . . Push Off  
Cabin Vent . . . . . As Desired  
Fuel Selector . . . . . Fullest Tank  
Landing Gear Switch . . . . . Down Position  
Red Emergency Gear Extension Handle . . . . . Down and Latched  
Internal Lights . . . . . Off  
Passenger Briefing . . . . . Completed  
Refer to SECTION IX – Supplemental Data for other Optional Equip-  
ment Procedures and Checks.

**BEFORE TAXI**

Engine Start Checklist . . . . . Completed  
Elevator Trim Switch . . . . . On  
Internal/External Lights . . . . . As Desired  
PFD/MFD . . . . . Check Normal Operation  
Comm/Nav Radios . . . . . Checked and Set  
Altimeter . . . . . Set  
Fuel Selector . . . . . Switch Tanks, verify engine runs on other tank  
Cowl Flaps . . . . . Full Open or As Desired  
Cabin Heat . . . . . As Desired  
Defroster . . . . . As Desired  
Cabin Vent . . . . . As Desired  
Flight Plan . . . . . As Desired  
Optional Equipment Checks . . . . . Reference Section IX

**NOTE:**

**During cold weather, ground operations may be conducted with cowl flaps positioned partially or fully closed to help keep engine temperatures in normal operational ranges prior to takeoff. However, if cowl flaps are fully closed, monitor engine temperatures to avoid exceeding maximum allowable limits.**





**TAXI**

Before Taxi Checklist ..... Completed  
Rudder Trim ..... As Desired

**-CAUTION-**

***With Rudder Trim in the full right position the aircraft will tend to steer to the right during taxi.***

Parking Brake ..... Release  
Brakes ..... Check during taxi  
Heading Indicator ..... Proper Indication During Turns  
PFD/MFD ..... No Flags/Red X's  
Throttle ..... Minimum Power  
Propeller ..... Full Forward (High RPM)

**-CAUTION-**

***To prevent battery depletion in prolonged taxi or holding position before takeoff, increase RPM until the “AMPS” indication on the G1000 indicates a positive number.***

**BEFORE TAKEOFF**

Taxi Checklist ..... Complete  
Parking Brake ..... Set  
Fuel Selector ..... Fullest Tank  
Throttle ..... 1000 RPM  
Cowl Flaps ..... Open or As Desired  
Propeller ..... High RPM  
Mixture ..... Full Forward  
Alternate Air ..... Verify Closed  
Alternator Field Switch(es) ..... Verify ON  
Throttle ..... 2000 RPM  
Parking Brake ..... Set  
Magneto Switch ..... Check – BOTH to L, BOTH to R, BOTH



Verify engine operates smoothly on each magneto separately  
(150 RPM MAX drop on each magneto, 50 RPM MAX difference)

**NOTE:**

**An absence of RPM drop may be an indication of faulty magneto grounding or improper timing. If there is doubt concerning ignition system operation, RPM checks at a leaner mixture setting or higher engine speed will usually confirm whether a deficiency exists.**

Propeller ..... Cycle/Return to High RPM

Ammeter ..... CHECK Positive Charge Indication

Main Battery Voltage ..... Greater than 26.5VDC

Select the other battery using the BAT 1/2 selector

Ammeter ..... CHECK Positive Charge Indication

Main Battery Voltage ..... Greater than 26.5VDC

Select desired Main Battery for use during flight using BAT 1/2 selector

Throttle ..... RETARD to 1000 RPM

Fuel Boost

Pump Switch ..... ON-Verify annunciator light illuminates BLUE

Fuel Boost Pump Switch ..... OFF

Elevator Trim ..... TAKEOFF SETTING

Rudder Trim ..... TAKEOFF SETTING

Wing Flaps ..... CHECK operation

SET AT TAKEOFF POSITION (10 degrees)

Flight Controls ..... CHECK free and correct movement

Cabin Door ..... CHECK SECURED

Seats, Seat Belts and Shoulder Harness ..... SECURED

Avionics and Autopilot ..... CHECK – (Refer to section IX)

Annunciator Lights ..... CHECK

Internal/External Lights ..... AS DESIRED

Strobe Lights/Rotating Beacon ..... ON



Pilots Window . . . . . CLOSED  
Emergency Gear Extension (RED) Handle . . DOWN and LATCHED  
Oil Temperature . . . . . 100°F(38°C) minimum  
CHT . . . . . 250°F(121°C) minimum  
Parking Brake . . . . . RELEASE

**TAKEOFF**

Proper engine operation should be checked early in the takeoff roll. Any significant indication of rough or sluggish engine response is reason to discontinue takeoff. When takeoff must be made over a gravel surface, it is important that the throttle be applied SLOWLY. This will allow the aircraft to start rolling before high RPM is developed, and gravel or loose material will be blown back from the propeller area instead of being pulled into it.

If the turbocharger and its controlling system are properly rigged, manifold pressure will increase to approximately 34 to 38 in. Hg, when the throttle is full open. However, engine operation with oil temperature below 100 F (38 C) will result in an overboost (manifold pressure above 38 in. Hg). If an overboost occurs, retard throttle to lower manifold pressure below 38 in. Hg, and continue flight. As the oil warms above 100 F (38 C) the throttle can be moved to full throttle open and the turbocharger controller will maintain proper manifold pressure for maximum continuous power.

Full throttle operations during hot weather conditions may also result in manifold pressure over 38 in. Hg. If this occurs, retard throttle below 38 in. Hg, and continue flight.

**TAKEOFF (NORMAL)**

Power . . . . . FULL THROTTLE (2575 RPM)  
. . . . . DO NOT EXCEED 38" MAP  
Annunciator . . . . . CHECK  
Blue Boost Pump Light ON  
Engine Instruments . . . . . CHECK for proper indications  
Lift Off/Climb Speed . . As specified in SECTION V (Takeoff Distance)  
Landing Gear . . . . . RETRACT IN CLIMB after clearing obstacles  
Wing Flaps . . . . . UP  
Fuel Pressure . . . . . 24 PSI (minimum)



**NOTE:**

If maximum performance takeoffs are desired obtain full power before brake release. Use lift off and climb speed as specified in Section V.

**CLIMB**

**NOTE:**

If applicable, use noise abatement procedures as required. See Section V, for rate of climb graph.

**CLIMB (CRUISE)**

Power ..... 2400 RPM  
Manifold Pressure ..... 34 Inches  
Mixture ..... RICH  
Cowl Flaps ..... Full Open or As Desired  
Rudder Trim ..... AS DESIRED  
Airspeed ..... 120 KIAS

**CLIMB (BEST RATE)(Vy)**

Power ..... FULL THROTTLE / 2575 RPM  
Do Not Exceed 38" Map  
Mixture ..... RICH  
Cowl Flaps ..... Full Open or As Desired  
Rudder Trim ..... As Desired  
Airspeed ..... 105 KIAS

**CLIMB (BEST ANGLE)(Vx)**

Power ..... FULL THROTTLE / 2500 RPM  
Mixture ..... RICH  
Cowl Flaps ..... Full Open or As Desired  
Rudder Trim ..... As Desired  
Airspeed ..... 85 KIAS

**SHUTDOWN**

**CAUTION**

*Operate the engine at idle (below 1000 RPM) for 5 minutes to allow the turbocharger to cool. Taxi time after landing may be considered as part of the 5 minutes.*



Parking Brake .....	Set
Throttle .....	Idle RPM
Interior/Exterior Lights .....	Off
Pitot Heat .....	Off
Magneto/Starter Switch .....	Grounding Check
Mixture .....	Idle Cut-Off
Alternator Field Switch(es) .....	Off
Master Switch .....	Off
Magneto/Starter Switch .....	Off

**SECURING AIRCRAFT**

Magneto/Starter Switch .....	Verify Off/Key Removed
Master Switch .....	Verify Off
Electrical Switches .....	Verify Off
Interior Light Switches .....	Verify Off
Emergency Bus Switch .....	Verify Off
Parking Brake .....	Release – Install Wheel Chocks
Extended Parking .....	Control Wheel Secured
Cabin Windows and Doors .....	Closed and Locked Tie aircraft down at wing and tail points.

**SECTION V - PERFORMANCE**

No change.

**SECTION VI - WEIGHT AND BALANCE**

See current weight and balance data.

**SECTION VII - SYSTEM DESCRIPTIONS**

The GARMIN G1000 Integrated Avionics System consists of a Primary Flight Display (PFD), a Multi-Function Display (MFD), an Audio Panel, and Attitude and Heading Reference System (AHRS), an Air Data Computer (ADC), and the sensors and computers to process flight and engine information for display to the pilot. The system contains dual GPS receivers, dual VOR/ILS receivers, dual VHF communications transceivers, a transponder, and an integrated annunciation system to alert the pilot of certain abnormal conditions.



The Primary Flight Display (PFD) typically displays airspeed, attitude, altitude, and heading information in a traditional format. Slip information is shown as a trapezoid under the bank pointer. One width of the trapezoid is equal to a one ball width slip. Rate of turn information is shown on the scale above the compass rose; full scale deflection is equal to a standard rate turn. The following controls are available on the PFD (clockwise from top right):

- Communications frequency volume and squelch knob
- Communications frequency set knobs
- Communications frequency transfer button
- Altimeter setting knob (baro/QNH set)
- Course knob
- Map range knob and cursor control
- FMS control buttons and knob
- PFD softkey buttons, including master warning/caution acknowledgement
- Altitude reference set knob
- Heading bug control
- Navigation frequency transfer button
- Navigation frequency set knobs
- Navigation frequency volume and Identifier knob

The PFD displays the crew alerting (annunciator) system. When an alert message is received, an aural tone will be heard. Selecting the Alert button will allow the flight crew to see additional information regarding the alert message.

Trend vectors are shown on the airspeed and altimeter displays as a magenta line predicting 6 seconds at the current rate. The turn rate indicator also functions as a trend indicator on the compass scale.

The PFD can be displayed in a composite format for emergency use by pressing the DISPLAY BACKUP button on the audio panel. In the composite mode, the crew alerting function remains operative, but no map functions are available.

The Multi-Function Display (MFD) typically displays engine data, maps, terrain, traffic and topography displays, and flight planning and progress information. The display unit is identical to the PFD and contains the same controls as previously listed.

The audio panel contains traditional transmitter and receiver selectors, as well as an integral intercom and marker beacon system. The marker



beacon lights appear on the PFD. In addition, a clearance recorder records the last 2 ½ minutes of received audio. Lights above the selections indicate what selections are active. Pressing the red DISPLAY BACKUP button on the audio panel causes both the PFD and MFD to display a composite mode.

The Attitude and Heading Reference System (AHRS) uses GPS, rate sensors, air data, and magnetic variation to determine pitch and roll attitude, sideslip and heading. Operation is possible in a degraded mode if the system loses any of these inputs, but the AHRS must have at least the ADC or GPS input to function. Status messages alert the crew of the loss of any of these inputs. The AHRS will align while the aircraft is in motion, but will align quicker if the wings are kept level during the alignment process.

The Air Data Computer (ADC) provides airspeed, altitude, vertical speed, and air temperature to the display system. In addition to the primary displays, this information is used by the FMS and TIS systems.

Engine instruments are displayed on the MFD. Discrete engine sensor information is processed by the GARMIN Engine Airframe (GEA) subsystem. When an engine sensor indicates a value outside the normal operating range, the legend will turn yellow for caution range, and turn red and flash for warning range.

The G1000 also interfaces to the STEC 55x autopilot and repeats the autopilot mode annunciators on the G1000 PFD. This provides easy viewing of the autopilot operating mode and status, but remains a supplemental display of autopilot operating modes.

The GDL 69A is a remote sensor that receives broadcast weather data from a service of XM Satellite Radio and delivers the data to the G-1000 MFD. Highly reliable, near real-time weather information is transmitted to the aircraft via XM Satellite Radio. XM WX Satellite Weather service operate in the S-band frequency to provide continuous uplink capabilities at any altitude throughout North America. Also available with the GDL-69A is XM's digital audio entertainment, which provides 130-plus channels of music, news, talk, sports and information. For detailed operating instructions, see Garmin G-1000 Cockpit Reference Guide for the Mooney M20M.

The TSO'd KN 63, if installed, is a complete 100 watt, 200-channel remote DME system. Distances up to 389 nm (at line-of-sight altitude), groundspeeds up to 999 knots and time-to-station up to 99 minutes are computed digitally and displayed on the G-1000 PFD and controlled by the G-1000 interface controls. Distance lock-on is virtually instant



neous (usually within one second) with accurate groundspeed and time-to-station readouts following in less than a minute. For detailed operating instructions, see Garmin G-1000 Cockpit Reference Guide for the Mooney M20M.

The TSO'd Becker ADF 3502-(2) Automatic Direction Finder system, if installed, provides accurate bearing-to-station in the 200 kHz to 1799 kHz frequency range, complete with ADF, ANT and BFO tuning modes, plus audio output for station identification and monitoring AM broadcasts. It is displayed on the G-1000 PFD and controlled by the PFD interface controls. For detailed operating instructions, see Garmin

G-1000 Cockpit Reference Guide for the Mooney M20M.

Traffic data detected by the L-3 Communications Goodrich SKYWATCH™ Traffic Advisory System (TAS), if installed, will appear on the MFD and traffic display pages of the G-1000. For detailed operating instructions regarding the interface of the G-1000 with the SKYWATCH™ refer to the Pilot's Guide for the SKYWATCH™ and the Garmin G-1000 Cockpit Reference Guide for the Mooney M20M.

Refer to the GARMIN G1000 Cockpit Reference Guide for the M20R MODEL aircraft, GARMIN P/N 00-00450-01, Rev. A or later FAA approved, for complete descriptions of the G1000 system and operating procedures.

## **7.1 - LANDING GEAR**

Gear down and locked positions are indicated by a single indicator located on the aircraft floor and a red "GEAR WARN" light is located in the system indicator lights, as well as a green "GEAR DWN" indicator. Refer to the aircraft POH/AFM for additional information.

## **7.2 - ELECTRICAL SYSTEM**

The M20M has a 28 Volt DC system, powered by dual 70-amp alternators, which are mounted on the front of the engine. Both are driven by V belts on the starter ring gear and both alternators charge the main batteries. The alternator are the primary source of aircraft power and is connected to the aircraft electrical system at the main bus. In the event of an alternator failure, the remaining alternator has sufficient capability to power all aircraft systems.

Additional battery power is stored in two 11 amp-hour, lead acid batteries, which are mounted in the tailcone of the aircraft, and either battery may feed both the essential and non-essential busses. In the event of both alternators failing, the EMER BUS switch can be activated and the selected main battery will power the following:





- A reduced subset of the G1000 system, which is comprised of the PFD/MFD, AHRS, ADC, Com1, Nav1, GPS1, Transponder, Audio Panel, and Engine Instruments;
- An independent, standby attitude indicator (artificial horizon)
- Lighting for the attitude indicator, altimeter, airspeed indicator, and compass.
- Aux Overhead Equipment, Aux Power Equipment, and Ice Protection System.

When the EMER BUS switch is set to ON, the Emergency Bus annunciator is activated, and non essential equipment is shed from the bus. . A single operating alternator will provide enough current to supply all electrical equipment needed for safe flight, but if both alternators have failed, the battery voltage should be monitored, and additional load shedding may be required Activating the EMER BUS switch bypasses the Master Switch and electrically feeds the standby attitude indicator and all standby lighting using both main batteries.

The circuit breaker panel is located on the right side of the instrument panel. Each breaker is clearly marked to show which circuit it protects. Also, circuit provisions are made to handle the addition of communications and navigation equipment.

Standard electrical accessories include the starter, the electric fuel pump, and the stall warning horn. Electrical accessories include the navigation lights, anti-collision strobe lights, instrument panel lighting, and cabin courtesy lights. Make sure the lighting and Emergency Bus switch are off when leaving the aircraft. Leaving the lights on for an extended period of time could cause depletion of the battery.

Two lights, mounted in the overhead panel, provide instrument and cockpit lighting for night flying, in addition glare shield lighting may be controlled via a dimmer switch on the lower right side of the instrument panel.. Wing tip recognition lights and landing/taxi lights are operated by a rocker type switches mounted in the overhead switch panel. Landing and taxi lights are mounted on the wing leading edges on both wings.

The M20M electrical system is divided into two power buses. A simplified schematic of the electrical system is shown in the diagram, which follows this electrical system description.

## **ESSENTIAL BUS**

The Essential bus is tied directly to the main aircraft battery via the selected battery contactor. When the Master Switch is turned on, power is immediately supplied to the Essential and non-Essential busses. The Essential bus provides power to the G1000 equipment and to the back-



up instruments. When the Emergency Bus switch is activated by the pilot, the non essential bus is shed from the essential bus. The selected main battery (two main batteries are available) remains online.

### **NON - ESSENTIAL BUS**

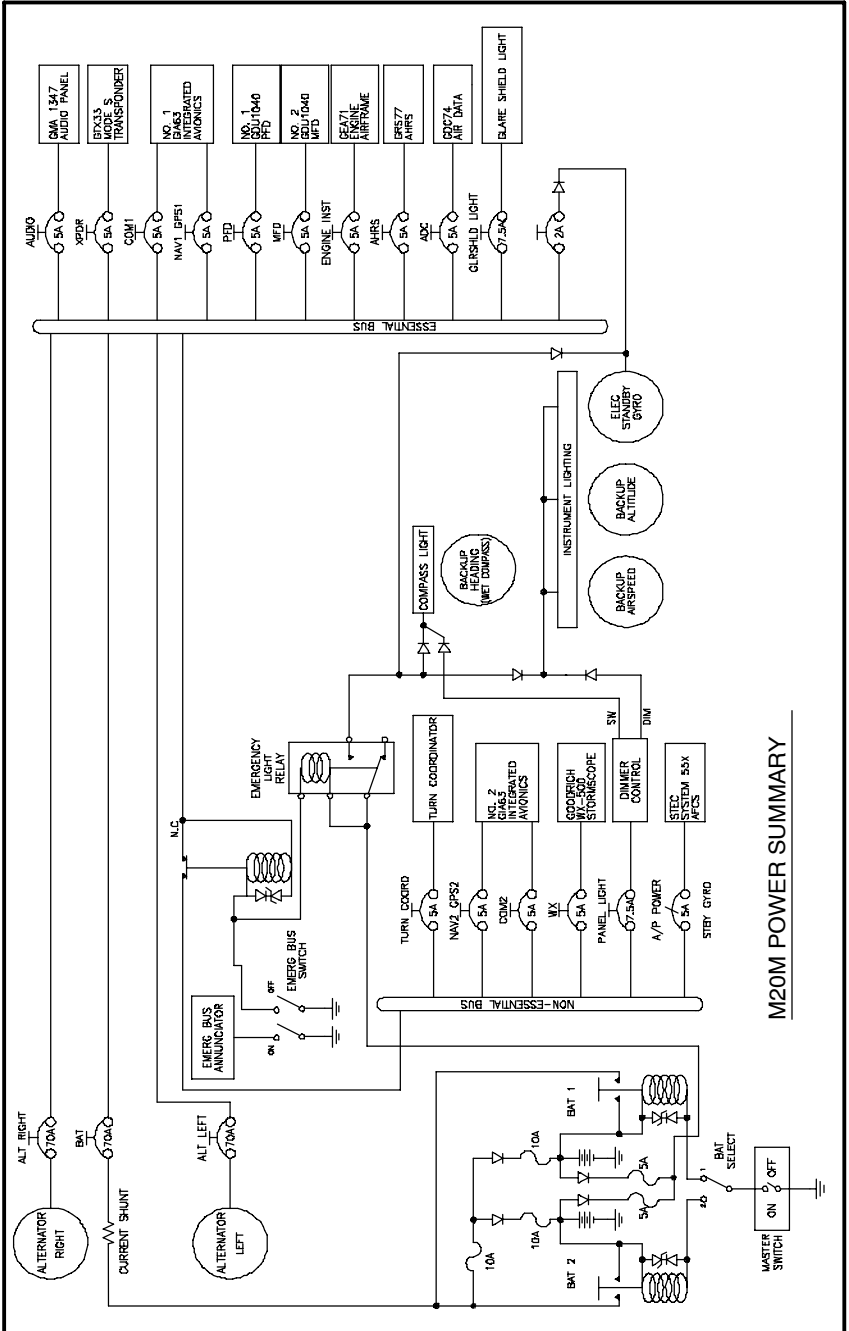
The non-essential bus powers the autopilot, turn coordinator required for the autopilot, the Stormscope, and GIA #2. This bus load is shed when the EMER GUS switch is activated.

### **EQUIPMENT LOCATION**

The G1000 ADC and GEA LRU's are located behind the instrument panel. The PFD, MFD, and Audio Panel are mounted to the panel and may be removed using a hexagonal tool. The magnetometer is located in the right wing outboard of the landing light. The AHRS, and remaining LRU's are located behind the cabin near the main batteries.

Power is stored in two 11 amp-hour lead acid battery which are mounted in the tailcone of the aircraft, and either battery may feed both the essential and non-essential busses. In the event of an alternator failure, the standby alternator and selected main battery will power the following:





M20M POWER SUMMARY

M20M POWER SUMMARY



### **7.3 - VACUUM SYSTEM**

GX aircraft are all electric, there is no Vacuum System in the standard aircraft.

### **7.4 - INSTRUMENT PANEL**

The instrument panel has been designed to incorporate the G1000 Integrated Cockpit. All Communications, Navigation, Engine Instruments, and System annunciations have been integrated into a custom design package specifically for the M20M series aircraft.

Engine and electrical switches are located on the left side of the switch panel. Nav, strobe, recognition / landing and taxi light switches are located on the overhead switch panel.

Instrument panel lighting is provided by post lights, overhead panel lights and the internally lighted G1000 Integrated Cockpit System. Optimum cockpit panel lighting for night flying is achieved by using a combination of panel lights and overhead map lights.

## **SECTION VIII – HANDLING AND SERVICING**

No change.

## **SECTION IX – SUPPLEMENTAL DATA**

Add this supplement to this Section.

## **SECTION X – SAFETY TIPS**

No change.

