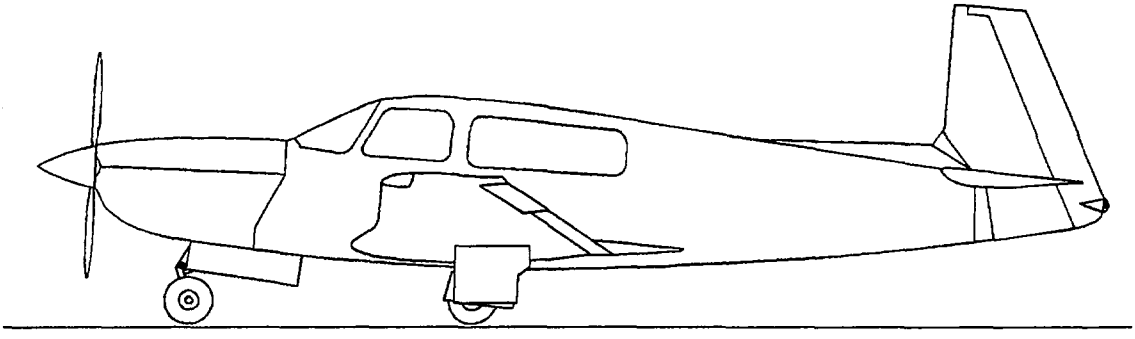
Mooney M20M

SERVICE AND MAINTENANCE MANUAL



MOONEY AIRCRAFT CORPORATION
LOUIS SCHREINER FIELD, KERRVILLE, TX 78028

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CHAPTER 5

TIME LIMITS/MAINTENANCE CHECKS

TABLE OF CONTENTS

R. Inspect exhaust system for cracks, looseness and for evidence of leakage. Replace or repair damaged components. Reference (G) 50 hour inspection.

S. Inspect exhaust stacks for burned areas, cracks, distortion and looseness.

T. Inspect exhaust couplings, seals, clamps and slip-joints for cracks, deformation, leaks and security.

U. Inspect studs, nuts, bolts, etc. for damage and proper torque.

V. Inspect & re-install cowling. Check cowl flaps for proper operation, condition and proper position indication.

2. **PROPELLER INSPECTION.**

A. Remove spinner (if not already removed).

B. Inspect security of propeller installation.

C. Inspect hub bolts for proper torque (61-00-20) security and damage.

D. Inspect hub components for damage or leaks and blades for cracks and nicks. Repair prior to next flight.

E. Inspect Anti-ice boots for security and operation.

F. Inspect spinner and bulkhead for cracks and condition.

G. Inspect spinner & bulkhead for snug fit between propeller cylinder & spinner support. Use shims as necessary to obtain correct snug fit.

3. **LANDING GEAR and RETRACTION SYSTEM INSPECTION.**

A. Inspect tires for proper inflation, cuts, blisters, slippage, and excessive wear. Replace with new, approved, tire if necessary.

CAUTION

Always run at least 5 Landing Gear Retraction Cycle checks after any tire has been removed and/or replaced before flying the aircraft.

B. Inspect wheels for cracks, distortion, misalignment, corrosion or bolt failure. Inspect condition of felt seals and bearings; repack bearings at 250 hour intervals.

C. Inspect brake pads & discs for warpage or wear (Ref. Section 32-40-04).

D. Inspect hydraulic reservoir for proper fluid level.

E. Inspect hydraulic brake lines and hoses for leakage, dents, cracks chafing, kinks, and security.

F. Inspect parking brake system for proper engagement and release.

G. Check shock disc gap on main & nose landing gear. (See 32-81-00)

H. Conduct Hard/Overweight Landing Inspection per SECTION 32-82-00.

Jack aircraft as recommended in paragraph 7-10-00 for the following inspections:.

I. Inspect nose gear for cleanliness and damage. Check nose gear retraction tube bungees for sheared or broken roll pins.

NOTE

Maximum allowable towing damage on leg assembly is 1/32 inch dent. No repair allowed on heat treated landing gear components

J. Inspect nose wheel steering mechanism for adjustment, alignment, corrosion, and lubrication.

K. Inspect main gear for cleanliness and damage.

L. Inspect landing gear retraction linkage, bellcranks, pivots, and bearings for wear, damage, distortion, misalignment, corrosion, cleanliness, and lubrication.

M. Inspect landing gear actuator for security of mounting, cleanliness, and indication of overheating, damage, and operation. Inspect motor brushes for wear.

N. Perform landing gear operational Inspection per Section 32-30-01.

4. **FUEL SYSTEM INSPECTION.**

A. Inspect fuel tank exterior for evidence of fuel seepage or stain.

B. Drain tank and inspect tank interior when seepage is evident.

C. Inspect fuel tank drains for leakage, sediment, or water contamination.

D. Inspect fuel-tank vents for obstruction.

E. Inspect fuel selector valve for proper tank selection, smooth operation, or any leakage when in OFF position.

F. Inspect gascolator for leakage; check sump for sediment, water or other contamination.

G. Inspect electric boost pump for leaks, security of mounting, adequate fuel pressure, switch operation, and condition of wiring and electrical connections.

(1) Inspect electric boost pump for proper operation by "T ing" into the line with a calibrated fuel pressure gauge. Boost operation should result in a 45-55 P.S.I. reading (mixture full RICH, throttle-IDLE).

(2) Adjust relief setting on pump if needed.

H. Inspect fuel quantity gauges and transmitters for security of mounting and condition of wiring and electrical connections.

I. Inspect fuel tank filler port for cleanliness, cap security, and condition of servicing placards. Inspect fuel filler cap O'rings for condition and replace if needed (Reference SECTION 28-00-01).

5. **EXTERIOR INSPECTION.**

A. Inspect fuselage exterior surfaces for corrosion, damage, loose or popped rivets, dents, oilcans(stretched skins), scratches, cracks, or deteriorated paint.

B. Inspect windshields and windows for cracks, crazing, scratches, condition of sealant, and security of installation.

C. Inspect wings, flaps, and ailerons for corrosion, damage, loose or popped rivets, dents, scratches, cracks, condition of attaching points, lubrication, freedom of operation, free-play, travel, and balance weight attachment. Inspect speedbrake cartridges for damage or wear. Check for proper operation. Every 200 hours remove speedbrake cartridges per 27-96-01.

D. Inspect empennage for corrosion, damage, loose or popped rivets, free-play, dents, scratches, cracks, condition and lubrication of hinge points, attachment of balance weights, and freedom of operation, manually and electrically.

6-00-00 - DIMENSIONS AND AREAS

6-00-01 - AIRCRAFT SPECIFICATIONS

ENGINE	STANDARD	METRIC/OPT/MISC.
Engine Manufacturer	TEXTRON-Lycoming	
Engine Model	TIO-540-AF1A or -AF1B *	
No. Cylinders	6	
Rated Horsepower	270 HP	
RPM	2575	
Min. Fuel Octane	100 or 100 LL.	
Fuel Capacity		
Total	95 U.S. Gal.	359.6 Liters
Useable	89 U.S. Gal.	336.9 Liters

* Refer to TCDS for engine configuration

** Oil Specification	MIL-L-22851	
Oil Grade-Above 30° F(-1° C)Ambient air @ SL	SAE 40 or 15W-50	
Below 30° F(-1° C)Ambient air @ SL	SAE 30 or 20W-30	
Oil Capacity	10 qts.	9.5 Liters
Minimum for Flight Oil Level	6 qts.	5.7 Liters

** Break in oil for Lycoming turbocharged engines is required to be ashless dispersant oil per Lycoming SI # 1014(M) (or current revision) corresponding to MIL-L-22851 or SAE J1899.

Max Operational Induction Air Temperature	280° F	138° C.
Max Continous Operation TIT	1750° F	
Normal Operating TIT	1300 - 1750° F	
Oil Pressure		
Idle, Minimum-	25 PSI	
Normal Operation	55-95 PSI	
Max. Allowable (cold oil)	115 PSI	
Oil Temperature Max. Allowable	118° C	244° F
Recommended Takeoff-Min	100° F	38° C
Recommended Flight Operation (Cruise)	38 - 118° C	100 - 244° F
Cylinder Head Temperature (CHT)		
Max. Allowable	500° F	260° C
Recommended Cruise	250 to 500° F.	121 to 260° C
Turbocharger		
Turbocharger Mfg.	Airesearch	
Type	Exhaust Driven	
Turbocharger Model	TA0413	

PROPELLER

Propeller Mfg.	McCauley	
Type	Constant Speed	
Model	B3D32C417/G82NRD-7	
Pitch Angle @ 30 in. Sta.		
LOW	15.1 DEG (+/-)0.2 DEG.	
HIGH	43 DEG (+/-)0.5 DEG.	
Diameter	75.0 Inches.	190.5 cm
Governor	McCauley	

CHAPTER

08

LEVELING AND WEIGHING

10-00-00 - GENERAL

The parking brakes are set by applying the brakes and pulling out on the parking brake knob. Release the brakes by pushing in on the parking brake control knob.

NOTE
There is no need to depress the brake pedals to relieve the pressure in the lines during release of parking brake control.

There are three tiedown points on the aircraft, one on each wing outboard of main gear (tiedown rings are to be threaded into built in receptacles) and the tail skid/tiedown fitting on the aft end of the tailcone.

10-10-00 - PARKING

When parking the aircraft, place wheel chocks fore and aft of the main wheels. The parking brakes may be used for short-duration parking.

CAUTION
Do not set parking brakes when they are overheated or when cold weather could freeze moisture and slush accumulation in the brake mechanism. Do not set parking brakes when aircraft is tied down. For maximum protection, hangar the aircraft during severe weather and high winds.

10-10-01 - STORAGE (FLYABLE)

Outdoor storage requires adequate mooring and tiedown facilities. The following precautionary measures are recommended for keeping the aircraft serviceable and ready-to-fly.

1. Refer to paragraph 10-20-00 for mooring instructions.
2. Magneto switches.....OFF
3. Throttle.....CLOSED
4. Mixture.....IDLE CUTOFF
5. Rotate propeller 6 revolutions every seven days; STOP propeller 45 to 90 degrees from original position.
6. Keep fuel tanks filled at least one-half full to minimize moisture condensation. Keep batteries fully charged.
7. Install protective covers over pitot head, engine cowl openings, static ports, etc.
8. Maintain a good wax finish on all exterior surfaces after 90 days.

10-10-02 - STORAGE (PROLONGED)

If the aircraft is to be stored for an extended period of time, the following steps are recommended for protection:

1. Refer to paragraph 10-20-00 for mooring instructions.
2. Tape or cover all openings.
3. Remove battery, charge fully, and store in a cool place.
4. Raise aircraft to remove weight from the tires, and block up the wheels.

CAUTION
If weight is not removed from tires, rotate wheels to a new position at least once each 30 days to prevent flat-spotting the tires.

5. See appropriate Lycoming Service Bulletin/Information for engine preservation. Attach warning placards if preservation procedures make engine inoperable.

10-10-03 - RETURNING TO SERVICE

If the aircraft has been stored for an extended period of time, it is advisable to perform a 50-hour periodic inspection after completion of the following preliminary steps:

1. Remove blocks from wheels. Check tire inflation.
2. Check and install battery.
3. Remove tape and covers from openings.
4. Remove warning placards (if any).
5. Replace engine oil filter.
6. Clean engine oil suction and pressure screens.
7. Clean and check oil pressure relief valve.
8. Clean and check oil temperature bypass valve.
9. Fill engine sump with proper grade of lubricating oil.
10. Clean and reinstall engine air-inlet filter.
11. Check ignition harness.
12. Clean and regap spark plugs.
13. Check and clean fuel injector nozzles and screens. Drain oil from fuel injector.
14. Check fuel tank vents for obstruction, and drain sumps to remove moisture and sediment.
15. Complete 50-hour and preflight inspections.
16. See appropriate Lycomong Service Bulletins/Information for servicing of the engine.

10-20-00 - MOORING

When mooring the aircraft out of doors:

1. Head aircraft into the wind.
2. Place chocks fore and aft of each main wheel.
3. Drive stakes in ground approximately three feet outboard of each main gear and to either side of tailskid.
4. Install tiedown rings in wing receptacles outboard of each main gear. Tie a 600-pound tensile strength rope to each wing tiedown ring and anchor to ground stake. Allow a little slack in each tiedown rope.
5. Tie the center of a rope to tail skid tiedown ring and anchor rope ends to ground stakes at either side of tail.
6. For additional security, attach a rope to the nose gear and anchor to a ground stake.
7. Lock controls by looping right front seat safety belt through the control wheel and drawing belt snug.

NOTE
If filter shows an accumulation of carbon, soot, or oil, continue with cleaning steps 3 through 5.

3. Soak filter in nonsudsing detergent for 15 minutes; then agitate filter back and forth for two to five minutes to free filter element of deposits.

4. Rinse filter element with a stream of clean water until rinse water is clean.

5. Dry filter thoroughly. Do not use light or air above 180 deg. F. for filter drying.

6. Check alternate air door for proper operation and sealing.

7. Reinstall filter in aircraft making sure of proper sealing and security.

12-20-02 - BATTERIES

Service batteries with distilled water to maintain electrolyte above plates. After adding water in freezing weather, charge battery long enough to mix electrolyte and water. Keep battery electrolyte above a specific gravity of 1.225 to avoid freezing.
To service the battery(ies):

1. Remove battery caps. Check electrolyte and service battery as required.

CAUTION
Battery gases may be explosive.

2. Inspect battery mounting area for corrosion and spilled electrolyte. To clean cables, terminals, mounting area and battery case, use a solution of bicarbonate of soda and clean water to neutralize corrosion and spilled electrolyte.

CAUTION
When cleaning, do not allow bicarbonate of soda to enter battery cells - permanent damage will result if soda mixes with electrolyte.

3. Rinse battery with clean water, and wipe clean with a dry cloth.

4. To retard corrosion, coat terminals with petroleum jelly after cleaning and tightening them.

5. Inspect battery vent lines for obstruction, line kinks, etc.

12-20-03 - TIRES AND WHEELS

Keep the tires at recommended air pressure. (Refer to CHAPTER 6-00-01.

1. Inspect tires for wear, cuts, and bruises.

2. Inspect valve stems for evidence of tire slippage or pulling.

3. Inspect wheels for damage.

4. Inspect wheel bearings for condition and lubrication.

12-20-04 - BRAKE RESERVOIR

Frequently inspect brake reservoir for proper fluid level. See CHAPTER 12-20-05 for location. See CHAPTER 5-20-07 for proper fluid.

CAUTION
Do not fill reservoir while parking brake is set.

Use only hydraulic fluid (red), per specification MIL-H-5606. Do not fill reservoir above two inches below filler port.

12-20-05 - HYDRAULIC BRAKES (Bleeding)

CAUTION
Fluid in the wheel cylinders may be under high pressure due to expansion. Therefore, be sure parking brakes are released prior to beginning hydraulic system servicing.

For best results, use a diaphram type hydraulic pressure service unit (pressure pot) to back bleed the system through the wheel cylinder bleeder valves.

- SINGLE BRAKE SYSTEM (PILOTS SIDE ONLY) -

1. Remove hydraulic fluid reservoir filler plug, and install a suitable fitting for attaching a flexible drain line.

2. Immerse open end of drain line into a hydraulic fluid container or catch container.

3. Attach pressurized hydraulic fluid service unit to wheel cylinder bleeder valve and open valve. Hydraulic service unit should be free of air prior to servicing aircraft system.

4. Feed fluid from service unit into brake system. Check for air bubbles at end of drain line immersed in fluid.

5. When fluid is flowing, slowly depress pilot's brake pedal by hand and slowly release. Repeat three (3) to four (4) times.

6. Allow fluid to flow until clear of air bubbles.

- If shuttle valve is installed in single brake system -

7. Loosen plug/cap on shuttle valve (port is plugged if no co-pilot's brake system is installed). Allow air bubbles to purge from back side of shuttle valve; indicated by clear fluid flowing from shuttle valve into catch container.

8. Close wheel cylinder bleeder valve and remove service line.

NOTE
Brake pedal may need to be pulled back in order for fluid to bleed back into reservoir.

9. To bleed opposite brake, (single brake system only) repeat steps 3 through 8.

- IF DUAL BRAKES AND SHUTTLE VALVE ARE INSTALLED -(See steps 1 & 2, Single Brake System)

1. While pressurized hydraulic fluid service unit is still attached to either wheel cylinder bleeder valve.

2. Loosen co-pilot's brake line at shuttle valve. Provide another catch container.

3. Restrict outflow from reservoir drain tube to catch container.

4. Allow fitting to remain loose until fluid is clear of air bubbles as it drains from shuttle valve fitting into catch container.

5. When clear, tighten co-pilot line fitting and remove restriction from reservoir out flow tube.

6. Stroke co-pilot's brake pedal several times and allow any purged air to exit through reservoir.

CHAPTER

21

AIR CONDITIONING

24-34-00 - POWER PLANT CIRCUITS

1. Starter-Ignition Circuit. The starter-ignition switch has five positions: OFF, R (right), L (left), BOTH, and START. In the OFF position both magnetos are grounded. At the R position the left magneto grounds. At the L position the right magneto grounds. At the BOTH position both magnetos are HOT and the ignition system is on. Turning the ignition switch to start and pushing in, closes the starter solenoid, engages the starter and allows the impulse coupling to automatically retard the magneto until the engine is also at its retard firing position. The spring action of the impulse coupling is then released to spin the rotating magnet and produce the spark to fire the engine. After the engine starts, the impulse coupling flyweights do not engage due to centrifugal action. The coupling then acts as a straight drive and the magneto fires at the normal firing position of the engine. The starter-ignition switch is spring loaded to return from START to the BOTH position when released.

CAUTION
Do not operate the starter in excess of 15 seconds or re-engage the starter without allowing it time to cool.

WARNING
Do not turn the propeller when the magnetos are not grounded. Ground the magneto points before removing switch wires or electrical connectors. All spark plug leads can be removed as an alternate safety measure.

A. **LOW BATTERY STARTING PROCEDURE.** A battery that has been discharged to the point where it will not turn the engine over but has sufficient power remaining for other equipment; should NOT have the engine jump started with another power source for two major reasons:

(1) The discharged aircraft battery is not airworthy because it will not have the necessary reserve capacity required to operate the aircraft electrical system and avionics in the event of the failure of the generating system during flight.

(2) Active material on the positive plate expands when the battery is discharged and the fast recharge from the higher potential source, battery, alternator, rectifier, etc., will severely damage the battery. A slow charge is recommended prior to flight.

The M20M has a second battery that may be selected as the primary battery for a particular flight. The battery not being utilized will be recharged by a trickle charge from the aircraft alternator's charging system. Therefore if only one battery is discharged to the point that it will not start the engine the other battery may be selected and the flight continued.

2. Oil and Cylinder Head Temperature Gauge Circuits. Both the oil and cylinder head temperature indicators operate electrically. The oil temperature gauge circuit has a resistance bulb in the filter adapter adjacent to vern-a-therm valve.. Changes in resistance caused by changes in oil temperature alter current flow rate, thereby varying the magnetic field in the indicator coils. The cylinder head temperature indicator connects to a tip sensitive resistance bulb in a cylinder head, normally No. 5 cylinder. Increase or decrease in temperature causes an increase or decrease in bulb resistance, varying the magnetic field in the indicator coils.

3. The oil pressure instrument circuit contains an electrical instrument and a transducer which varies resistance with pressure.

4. Fuel Flow read on the indicator uses an electrical instrument which counts electrical pulses produced by a turbine flow transducer.

24-35-00 - LIGHTING CIRCUITS

1. Navigation Lights. A circuit breaker switch on the upper left flight panel controls the navigation lights.

2. Landing/Taxi Lights. A pair of circuit breaker split switches on the upper left flight panel controls the landing and taxi lights located in the left and right wings.

3. Cabin Lights. A three-position (Bright, Off, Dim) rocker switch overhead, between the pilot and co-pilot in the overhead panel controls the cabin lights.

Aircraft S/N 27-0053 thru 27-0107 may have a door switch and timer mechanism that illuminate forward set of interior lights while cabin door is open. After door is closed, if rocker switch is left ON, forward interior lights will remain ON for approximately 2 minutes.
The rocker switch is connected through the MASTER switch on these aircraft and forward interior lights will go OFF when MASTER switch is turned OFF **if door is closed.**

4. Strobe Lights. A circuit breaker switch on upper left flight panel controls the white anti-collision strobe lights.

5. Instrument and Radio Lights. Switches are located on the lower co-pilot's control panel for the glareshield, and radio lights. The glareshield rheostat also controls the compass light. Lighting is controlled by manually pushing top of switch to intensify or bottom to dim either light system (S/N 27-0001 thru 27-0107) S/N 27-0108 & ON have a rotary type rheostat to dim these lights.

6. Baggage Compartment Lights. A three-position (Bright, Off, Dim) rocker switch in overhead panel controls this light.

Aircraft S/N 27-0053 thru 27-0107 may have a door switch and timer mechanism that illuminate aft set of interior lights while baggage door is open. After door is closed, if rocker switch is left ON, aft interior lights will remain ON for approximately 2 minutes.
The rocker switch is connected through the MASTER switch on these aircraft and aft interior lights will go OFF when MASTER switch is turned OFF **if door is closed.**

CAUTION
On S/N 27-0001 thru 27-0052 the cabin and baggage interior lights are not connected to the master switch circuitry and can be operated with master switch in the Off position. Care must be exercised to prevent leaving switch ON and discharging one of the batteries.

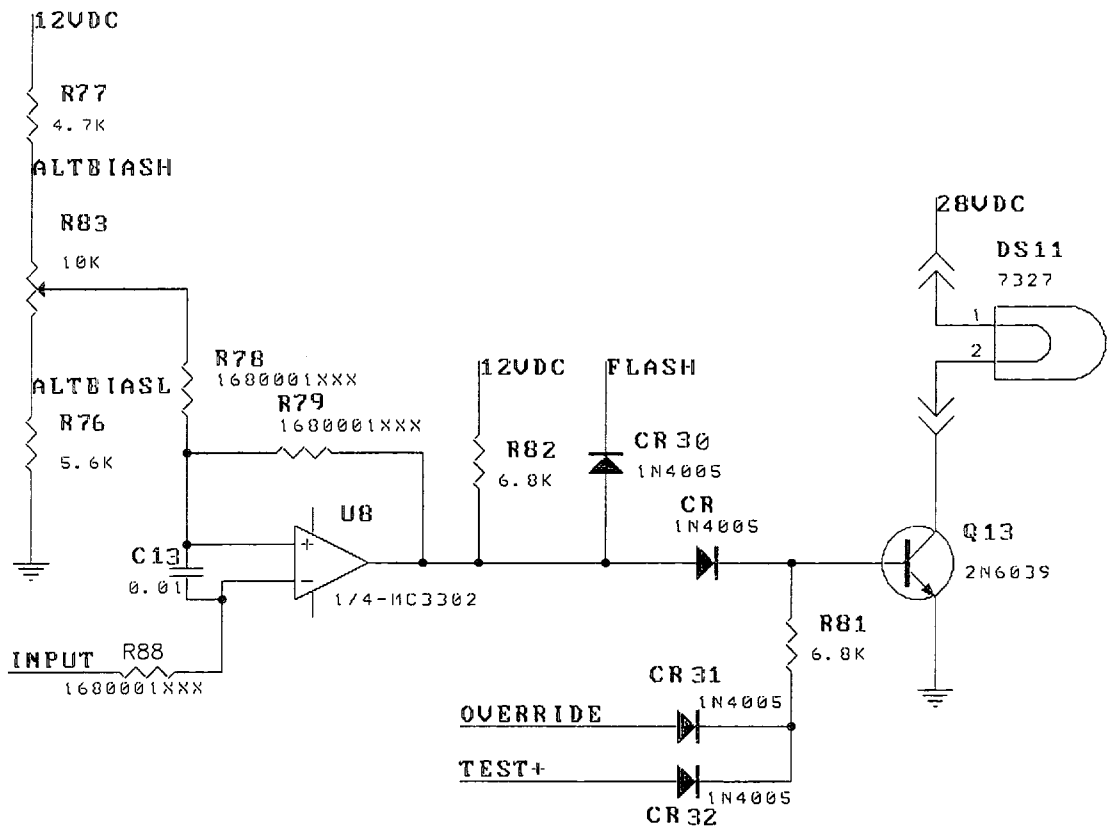


FIGURE 7 - RIGHT ALTERNATOR/OVER VOLT

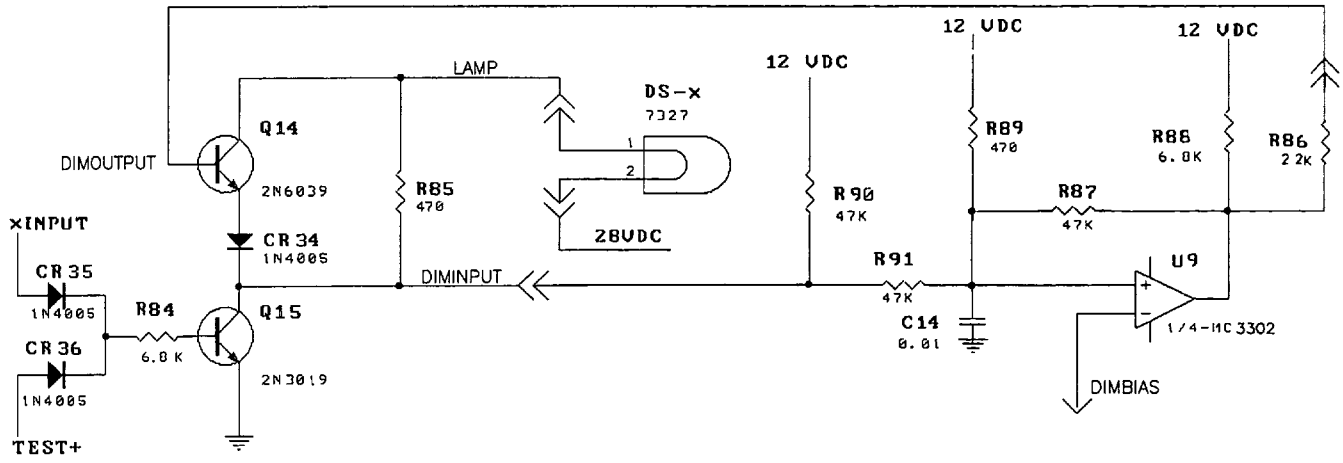


FIGURE 8 - TYPICAL POSITIVE APPLY W/DIM

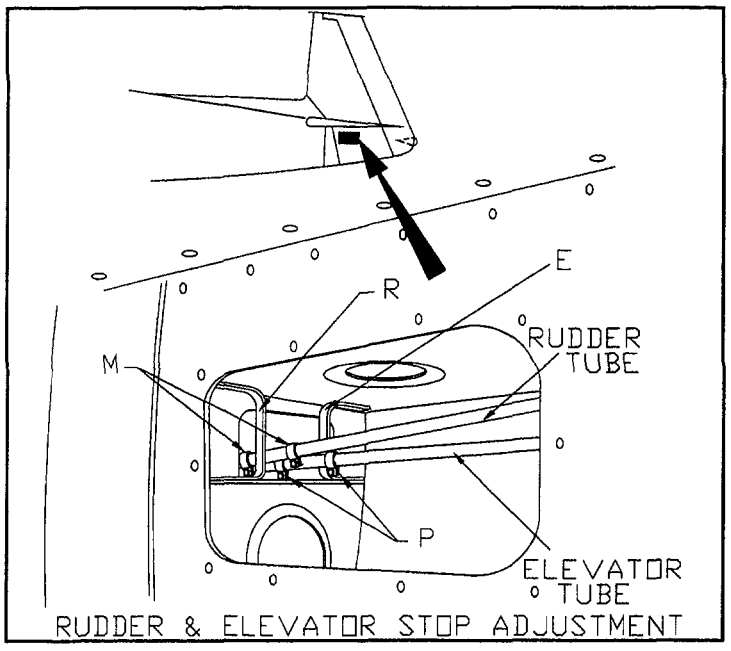


FIGURE 27-9

D. Install elevators in reverse sequence of removal. Recheck attaching bolts for security and safety. Set elevators, RH/LH, to be even with horizontal stabilizer. Adjust rod end bearings (9), **Fig. 27-8**, at elevator horn.

2. **Elevator Rigging and Adjustment**

A. Adjust rod end bearing (3), (**Figure 27-1**), at control yoke (G) for control shaft (H) clearance from firewall and control yoke and bob weight (P) clearance from fuselage structure.

B. Level aircraft and set control column in neutral with stabilizer parallel to center line of aircraft.

NOTE

Measure elevator travel from 0 degrees stabilizer thrust line with travel board positioned at stabilizer station 16.00 as indicated on travel board, P/N GSE 030004-503 and with stabilizer at 0 degrees. (See Figure 27-12 and Figure 27-4 for travel board placement.

NOTE

Elevator bellcrank, aft tailcone, should be modified per SI-M20-44.

C. Adjust rod end bearings of control tube (L), (**Figure 27-6**), at rear tailcone bulkhead,

D. Adjust elevator horn rod end (9) LH & RH, (**Fig. 27-8**) OUT 7 or 8 turns as a starting point.

E. Main spar adjustable rod end bearing is turned OUT approximatley 6 turns as a starting point; to obtain additional elevator travel adjust as required.

F. Set stops (P), (Figure 27-9), in empennage stinger for elevator uptravel of 22°(+0/-2) and down travel of 22°(+0/-2).

G. After stops (P & M) are set, rotate elevators thru full range of travel to assure solid contact with stops and that nuts and bolt heads clear stop limiter. Elevator Stop limiter (E) may be bent to obtain clearances and positive contact with (P), (**Figure 27-9**).

H. Rotate trim full down to check clearance of bellcrank at wing rear spar. Adjust rod end bearing at rear tailcone bulkhead if needed for clearance. Recheck elevator up and down travel.

I. Rotate trim full up to check that up stop makes solid contact on stop limiter.

J. Re-tighten all jam nuts, attach bolts and secure as necessary; recheck all control tube clearances and travel limits.

27-30-01 -EMPENNAGE FREE PLAY LIMITS

Allowable free-play movement of the empennage assembly on the tail cone of the aircraft, with the tailcone fixed at the tail skid.

Horizontal stabilizer @ Tip:

0.12 inch max. - Fore & Aft

0.10 inch max. - Up & Down

Rudder @ Lower trailing edge:

0.08 inch max. - Up & Down.

(1) If excessive free-play exists check the following areas for wear:

(a) Trim screw jackshaft.

(b) Trim link connecting empennage to trimscrew.

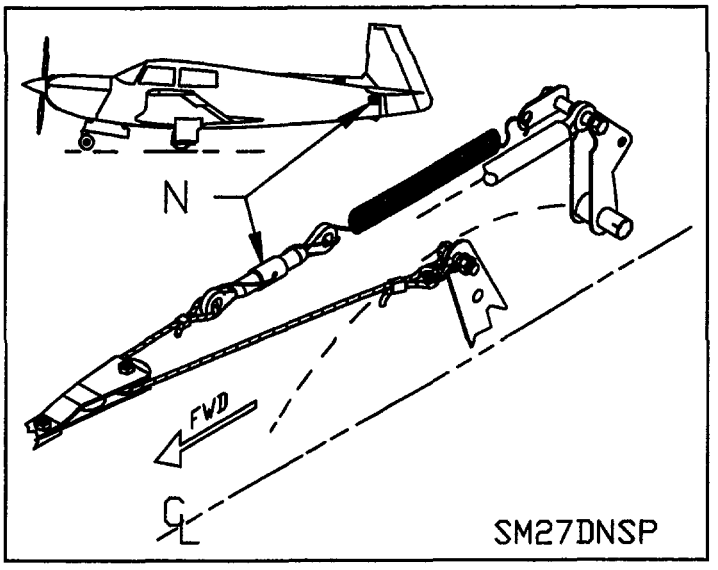
(c) Bolts and brackets attaching empennage to tailcone.

27-31-00 - VARIABLE DOWNSPRING SYSTEM

A spring hooked into the elevator control system in the tailcone refines the feel of the elevator in flight. A bellcrank and cable tailors the spring tension appropriate to the trimmed position of the stabilizer.

NOTE

Negative stabilizer (- degrees) settings mean that stabilizer leading edge is moved down relative to the thrust line.



VARIABLE DOWNSPRING - FIGURE 27-10

BLANK

28-23-00 - FUEL INJECTION SYSTEM

28-24-00 - ENGINE PRIMING

There is no independent priming system on the M20M *aircraft. Operating the boost pump switch in the* cockpit turns on the auxiliary fuel pump. The time for running the pump for starting purposes is dependent upon the outside ambient temperature (See POH/AFM SECTION IV for chart).

28-25-00 - FUEL SELECTOR VALVE REMOVAL & INSTALLATION

The fuel selector valve is located below the floor board just aft of the console.

1. Drain both fuel tanks.
2. Disconnect inlet lines at valve body.
3. Disconnect outlet line at valve body.
4. Remove handle above floorboard in fuel selector pan.
5. Remove screws that mount valve to the tubular structure.
6. Remove valve.
7. Reverse the removal procedure to install valve.
8. *Leak check fuel system.*

28-30-00 - DUMP

The fuel tanks can be emptied for maintenance purposes by (1) removing the sump drains in the lower panel of each fuel tank and allowing fuel to drain into suitable container or (2) disconnect the fuel line at outlet of the fuel pump and use boost pump to transfer fuel from both tanks into a suitable storage container.

28-31-00 - FUEL SYSTEM DRAINS

Fuel drains are installed in the inboard corners of the wing tanks and at the gascolator, the lowest point in the fuel system. The engine manifold and engine-driven fuel pump drains join at a juncture on the right side of the engine. A single drain line dumps fuel overboard below the cowling at the left cowl flap opening. Tank drains are recessed and spring loaded. An O-ring at the lower flange seals the valve seat.

28-32-00 - FUEL VENTS

The fuel tanks are vented from the outboard upper edge. This vent is routed outboard thru the wing structure and vented overboard through a NACA vent on lower wing surface. Expansion of fuel takes place inside the tank.

NOTE
It is important that the fuel tank vent tube protrude only enough to be flush with lower wing skins.

28-40-00 - INDICATING

28-41-00 - FUEL QUANTITY INDICATING TRANSMITTERS

The fuel quantity indicating system has two fuel quantity transmitters in each wing tank, one on I/B wing tank rib and one on O/B wing tank rib. The transmitters are electrically connected to the fuel gauges in the cluster gauge and work in series with each other.

1. Fuel Quantity Transmitter Removal.

Drain fuel from tank. Reference 28-30-00.

A. I/B Transmitter removal

(1) Remove Pilot or Co-Pilot seat as needed.

(2) Remove interior panel, LH or RH as needed.

(3) Locate & remove transmitter wires.

(4) Remove six screws attaching transmitter to rib doubler.

(5) Remove transmitter from rib.

B. O/B Transmitter removal

(1) Gain access through lower access cover outside of tank area.

(2) Locate & remove transmitter wires.

(3) Remove six screws attaching transmitter to rib doubler.

(4) Remove transmitter from rib.

2. For reinstallation, reverse the fuel quantity transmitter removal procedure.

A. A calibrated, certified torque application devise must be used to install the fuel quantity transmitters.

B. Snug each screw, then **TORQUE each screw to 20-25 INCH LBS. in a cross flange-random order.**

C. The torque and screw clamp load will naturally relax as the gasket flows to a normal condition. NEVER RE-TORQUE JUST TO RESTORE THE 20-25 INCH LBS.

"DO NOT OVER TORQUE"
--- DO NOT RE-TORQUE UNLESS LEAKING ---

D. Excessive torque or re-torqueing may warp or distort the transmitter mounting flange and cause a malfunction.

E. Make certain wire from outboard transmitter goes under head of insulating sleeve against the inboard transmitter flange and not under the mounting screw head.

F. System voltage should NOT BE APPLIED to the transmitter terminal. The exicitation from the fuel quantity indicator must be current and voltage limited and incapable of causing ignition of fuel vapor if transmitter wire is inadvertently shorted to ground.

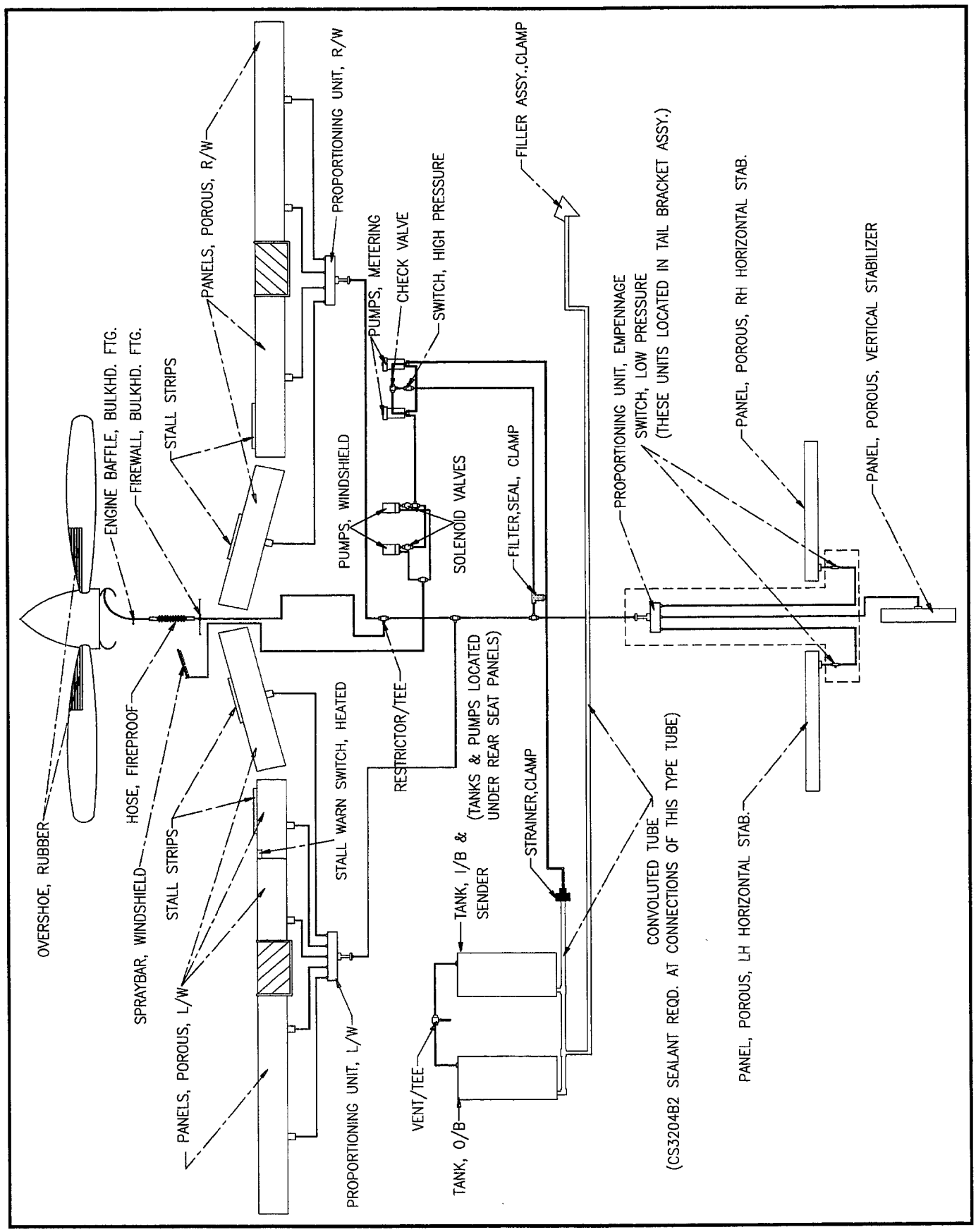
G. Care must be taken to insure that the bottom nut on the terminal stud is not disturbed when the electrical connection is made. This bottom terminal stud nut torque is factory set to provide the correct terminal stud seal preload.

H. Other nuts on the electrical terminals should be tightened as follows:

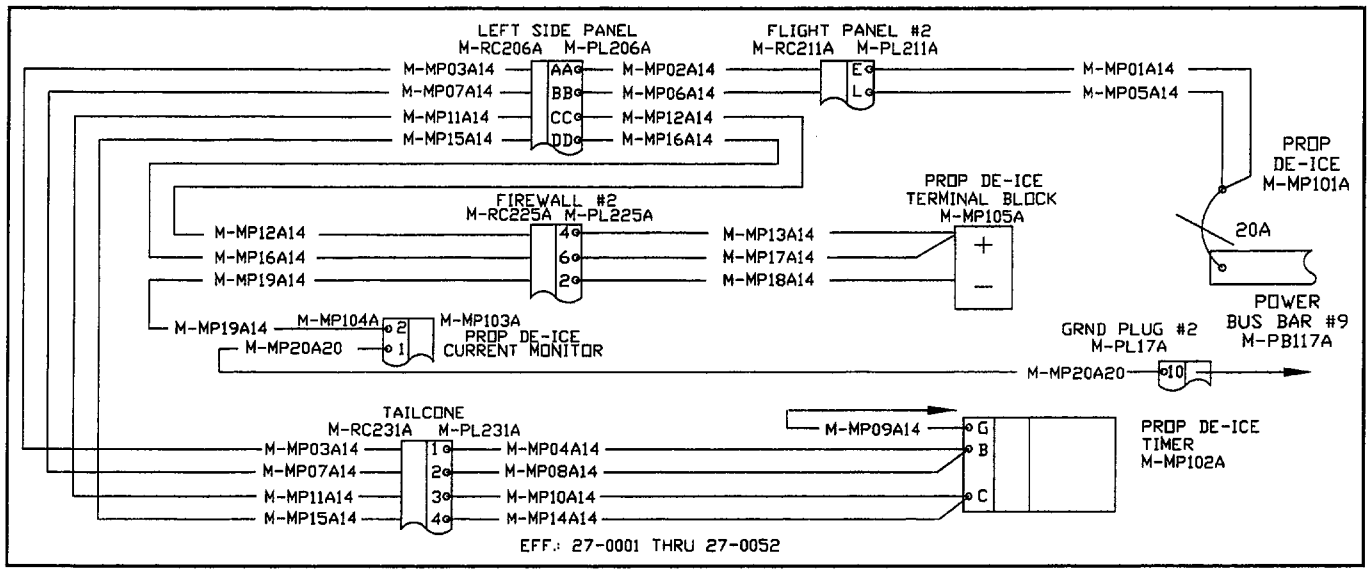
#6 - 6 in. lbs./ #8 - 12 in. Lbs./ #10 - 14 in. lbs.

28-42-00 - FUEL QUANTITY INDICATOR

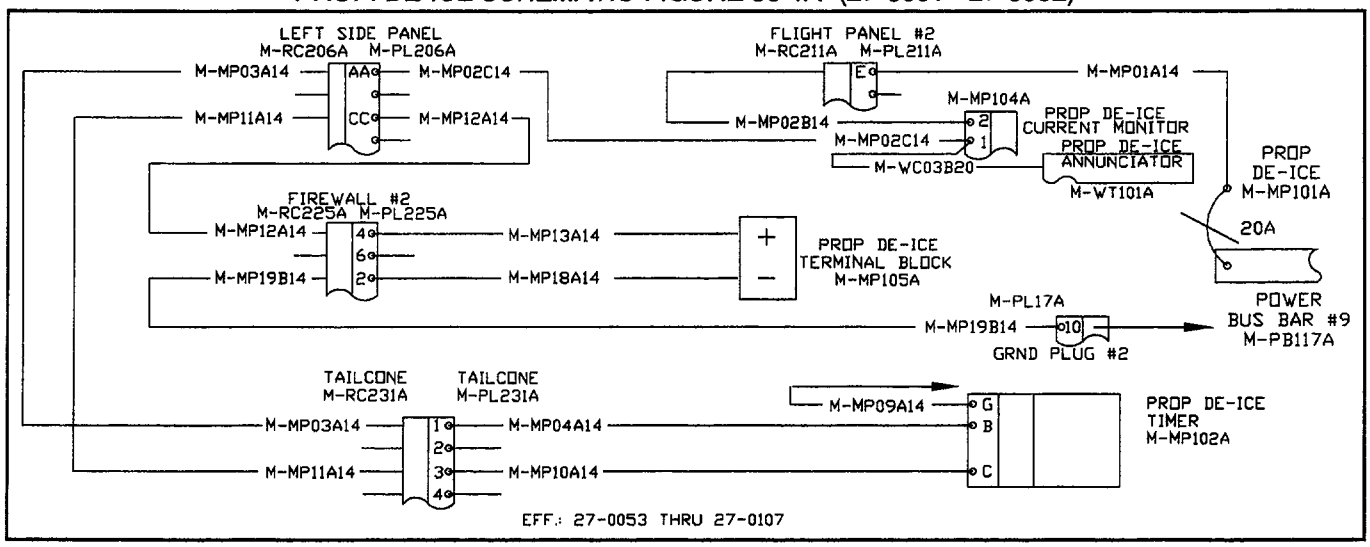
Two fuel quantity gauges are in the instrument cluster gauge. These gauges indicate percentage of fuel remaining. Each gauge operates by the change in resistance of two transmitters located in the fuel tanks.



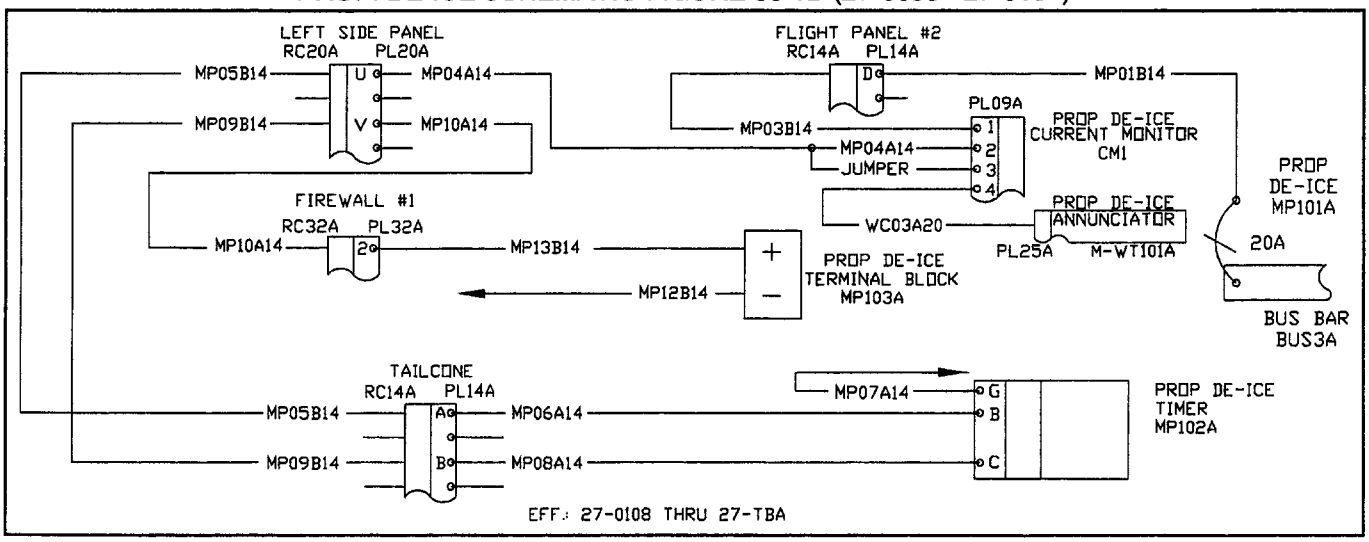
AIRFOIL ICE PROTECTION FLUID SCHEMATIC - FIGURE 30-1



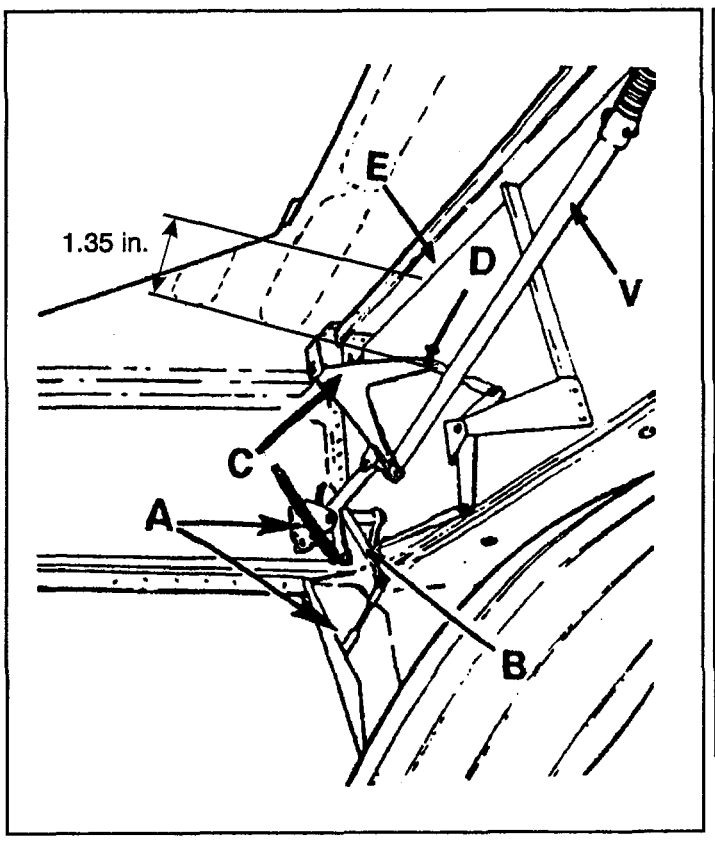
PROP. DE-ICE SCHEMATIC-FIGURE 30-1A (27-0001 - 27-0052)



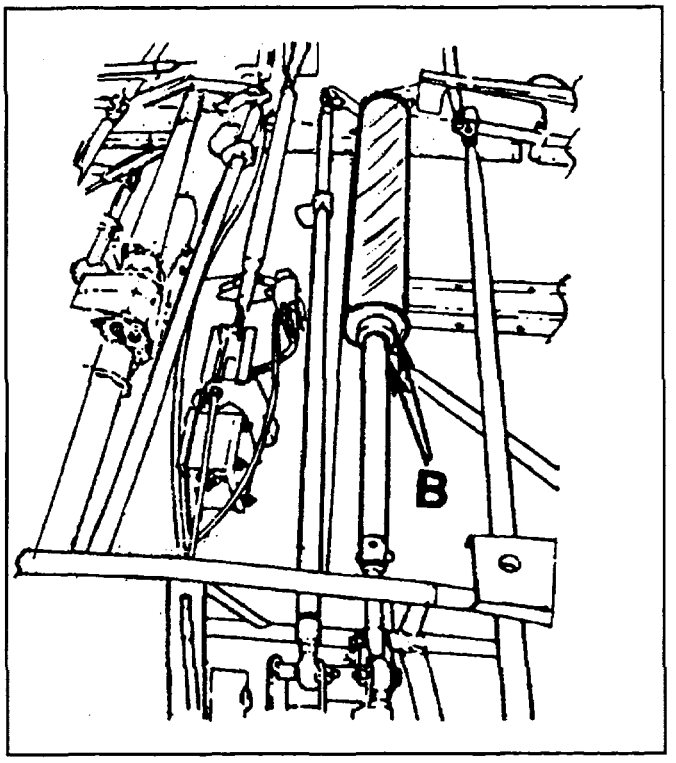
PROP. DE-ICE SCHEMATIC-FIGURE 30-1B (27-0053 - 27-0107)



PROP. DE-ICE SCHEMATIC-FIGURE 30-1C (27-0108 & ON)



MAIN INBOARD GEAR DOOR RIGGING - FIGURE 32-3



ASSIST BUNGEE - FIGURE 32-4

5. Remove aircraft from jacks.

6. Return aircraft to service.

NOTE
To remove INBOARD GEAR DOORS use a sharpened punch less than .093 dia. or a short piece of hinge pin to open the crimped hinge assembly pin hole.

32-10-06 INSTALLING ASSIST BUNGEE (560213-501)

1. Retract gear.

2. Pull gear down with emergency extension until main retract bellcrank and rod end bungee line up. Install proper length AN3 bolt through rod end bearing and proper length AN4 bolt through block. Torque nuts and safety.

CAUTION
Bump gear up, CAREFULLY, just to take load off the 3/16 in. installation pin at (B). Remove pin from (B) (Fig. 32-4).

3. With bungee installed re-check preload per steps 30 thru 34 of SECTION 32-30-02.

32-20-00 - NOSE GEAR AND DOORS

32-20-01 - NOSE GEAR REMOVAL.

1. Raise aircraft on jacks per SECTION 7-10-00.

2. Partially retract gear as described by SECTION 32-60-01.

3. Disconnect link (A) on nose gear truss assembly (Figure 32-5).

CAUTION
Eccentric bushings at (J) (Fig. 32-6) may have a flush head screw installed on either side. This flushhead screw and counter sunk eccentric MUST BE re-installed at same locations.

4. Disconnect nose gear steering horn link (B) (Figure 32-5).

5. Remove left and right gear mounting bolts (D) and (E) (Figure 32-5) from tubular structure and nose gear truss assembly.

6. Carefully remove nose gear assembly.

7. DO NOT attempt to repair heat treated components of nose landing gear assembly.

32-20-02 - NOSE GEAR INSTALLATION

1. Lubricate wheel bearings, retraction linkage and left and right mount bearings.

2. Install gear in reverse order of removal procedure.

32-20-03 - NOSE GEAR DOOR RIGGING

1. Raise aircraft on jacks. (Refer to SECTION 7-10-00.)

NOTE
Gear system must be properly rigged prior to gear door rigging, see SECTION 32-30-01.

2. Adjust gear door link rods (H and J Figure 32-5) to obtain proper door fit when closed.

TROUBLE	PROBABLE CAUSE	REMEDY
Gear will not retract and gear actuator C/B trips.	Manual engage handle in engaged position.	Disengage manual system.
Aircraft does not track or steer properly.	Nose wheel location improper.	See SECTION 32-50-02.
Gear will extend; green indicator-light will not illuminate.	Lamp burned out in annunciator -green -light circuit.	Push press-to-test on annunciator and replace burned out lamp if needed.
	Down-limit switch inoperative.	Check circuit and/or down-limit switch.
Actuating motor extends gear to an intermediate position.	Same causes as listed with "Incomplete Retraction".	Same remedies as listed with "Incomplete Retraction" above.
Gear will extend manually, but green indicator light will not illuminate.	Gear switch is not in DOWN position.	Place gear switch in DOWN position.
	Lamp burned out in green indicator light.	Replace burned out lamp.
Manual system will not lower gear.	Actuator internal clutch spring broken (Avionics Products/Eaton Actuator only).	Replace spring.
	Manual engage arm improperly rigged.	Rig manual engage arm.
	Sheared female spline in drive connector.	Replace drive connector if female spline is stripped.
	Drive connector is out of rig.	Adjust control cable tension of drive connector.
Landing Gear Actuator will not retract nor extend gear.	Any of the above or motor brushes worn.	Applicable remedy listed above or replace motor or brushes.

32-40-00 - WHEELS AND BRAKES

32-40-01 - MAIN WHEELS

The main wheels have standard brand, 6:00 x 6, Type III, six-ply rated tires with standard tubes.

To remove main wheel/tire assemblies:

1. Remove MID gear door. (Ref. Figure 32-15)

2. Detach dust shield. Remove three screws and washers.

3. Remove 2 bolts from single puck brake caliper; (4 bolts on dual puck caliper).

4. Remove wheel by removing cotter key, nut and spacer from axle. (See Figure 32-15.)

5. Slide wheel off axle.

32-40-02 - MAIN WHEEL DISASSEMBLY/ ASSEMBLY

1. Remove snap ring, (10) grease seal rings, (8) and felt seals (9) (See Figure 32-16).

2. Remove bearings (7).

3. Completely deflate tire.

WARNING

Do not loosen wheel half retaining nuts before tire is completely deflated. Failure to observe this warning may result in bodily injury.

4. Remove nuts, washers, and wheel half retaining bolts, (5); remove brake disc (2), separate halves, (3 & 4) and remove tire and tube.

NOTE

Bearing cups are shrink fitted; do not remove them unless necessary for replacement.

5. Clean all wheel parts thoroughly in cleaning fluid (Federal Specification PS-661). Exercise special care in cleaning bearing cones and felt rings to insure thorough cleaning.

6. Inspect all parts for cracks, corrosion, or evidence of wear.

7. Inspect bearing cups and replace if cups are damaged or worn. If necessary to remove bearing cups, heat wheel in boiling water for at least 30 minutes. Then remove cup by tapping evenly.
To install cup, heat wheel half again as above; cool cup with dry ice. Position cup and tap lightly to insure proper seating.

8. Polish small burrs or nicks out of wheel halves with No. 400 grit sandpaper, clean thoroughly, and refinish protective coating as required.

9. Replace bearing cones that show signs of wear or bearing fretting.

10. Repack wheel bearings and lubricate seals with grease. Install bearings, grease seal rings, and felt seals in wheel halves. Secure with snap rings.

11. Position tire & tube on wheel half with valve stem hole; then position other wheel half in tire to match mounting holes.

CAUTION

Use correct axle spacer to position brake disc .12 inches from MLG assy.

CHAPTER 33

LIGHTS

BLANK

CHAPTER 35

OXYGEN

Seals in front frame of housing behind coupling are designed to keep out foreign material such as dirt, dust and light fluid. However, fluid under high pressure can be forced past seals and enter pump.

2. Dry air pump fittings. Before washing engine off, check pump fittings for looseness of threaded fittings. Fluid can seep through loose threads and enter pump.

3. Dry air pump discharge hose (vacuum instrument system). Plug end of hose or fitting and flag it with a RED "Remove Before Running Engine" tag, then clean engine.

CAUTION
Remove plug prior to running engine.

37-11-02 - SERVICING

The dry air pump requires no servicing. The internal parts are self-lubricating and require NO ADDITIONAL lubricating.

37-11-03 - REMOVAL

1. Disconnect hoses from dry air pump.

2. Remove main air pump from engine and discard old mounting gasket and locking hardware.

3. Remove fittings from pump. Retain fittings if they are serviceable; clean thoroughly before reusing. Discard twisted fittings and any nuts with rounded corners.

4. Pad inspection. Check condition of the AND 20000 pad seal. If seal shows any signs of oil leakage, replace seal. Replace seal if there is any doubt as to its serviceability.

37-11-04 - INSTALLATION OF NEW PUMP (Main or Stand-by)

CAUTION
Never install a pump that has been dropped.

1. Consult airframe manufacturer's current Parts Catalog, Airborne's Application List, or the PMA label on pump box to verify that pump is correct model for the engine and/or system application.

2. Place pump mounting flange in a jaw-protected vise, with the drive coupling downward. Protect pump mounting flange with soft metal or wood.

CAUTION
Pump housing should never be placed directly in a vise, since clamping across the center housing will cause an internal failure of the carbon rotor.

3. Spray fitting thread with silicone and LET IT DRY. DO NOT use teflon tape, pipe dope or thread lube.

4. Install fittings in the pump. Hand tighten initially.

5. Use only a box wrench to tighten fittings to desired position. DO NOT make more than one and one half (1 1/2) turns beyond hand-tight position.

6. Install new pump mounting gasket (supplied with new pump). (NOTE: No gasket is required between stand-by pump/clutch assembly and its adapter plate mounting pad.)

7. Always replace ALL locking washers when installing a new pump. Tighten all four (4) mounting nuts : - 90 to 110 in. lbs.

8. Prior to reconnecting hoses, inspect inside of hose carefully to make sure it is clean and free of all debris, oils or solvents. Use vacuum or air pressure to clean all lines. Remove hoses from aircraft if necessary to clean.

When hose clearance is tight, making it difficult to reinstall onto pump fitting, spray fitting at hose end with silicone. LET IT DRY, then install hose by pushing it straight onto fitting.

CAUTION
Do not wiggle hose from side to side during placement. Wiggling could cause particles to be cut from hose ID. These particles would damage the pump.

CAUTION
Change all filters in the system. This must be done or pump warranty MAY BE VOIDED.

37-12-00 - VACUUM REGULATOR

The vacuum regulator (2) (Figure 37-1) is a spring-controlled diaphragm valve for regulating vacuum for the aircraft pneumatic instrument system. The vacuum regulator is located on left-hand side of firewall, inside cabin, just under glareshield. Adjust vacuum regulator valve according to Section 37-12-05.

37-12-01 - MAINTENANCE PRACTICES

Check general condition of regulator to insure it is secure and in airworthy condition.

37-12-02 - SERVICING

No servicing is required on regulator other than filter replacement. See Section 37-13-00 for details.

37-12-03 - REMOVAL

1. Underneath the instrument panel, remove both instrument lines from vacuum regulator; cap off to prevent foreign objects from entering them.

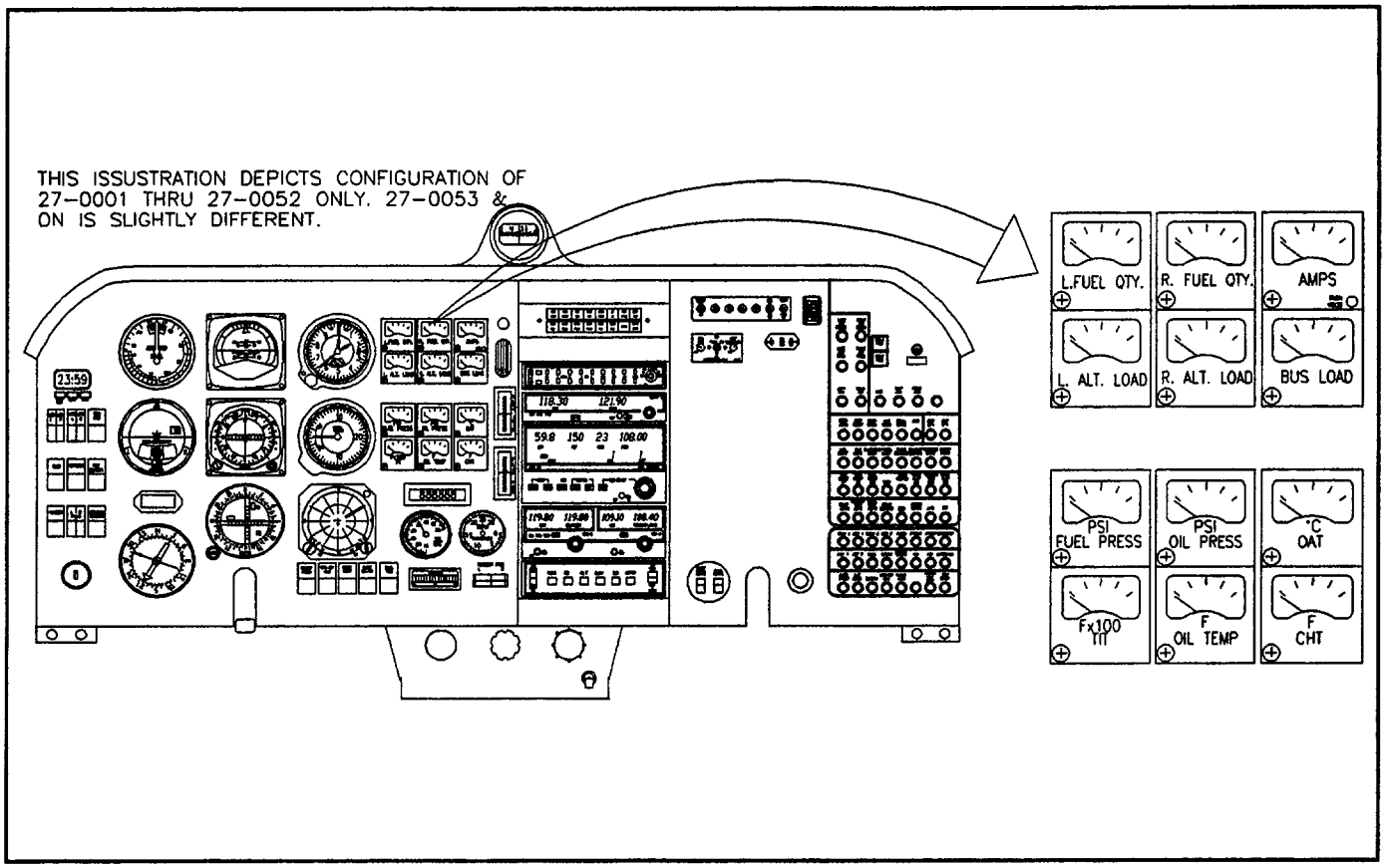
2. Engine compartment - remove hoses from vacuum regulator; cap off to prevent foreign objects from entering.

3. Loosen and remove large nuts at firewall on vacuum regulator.

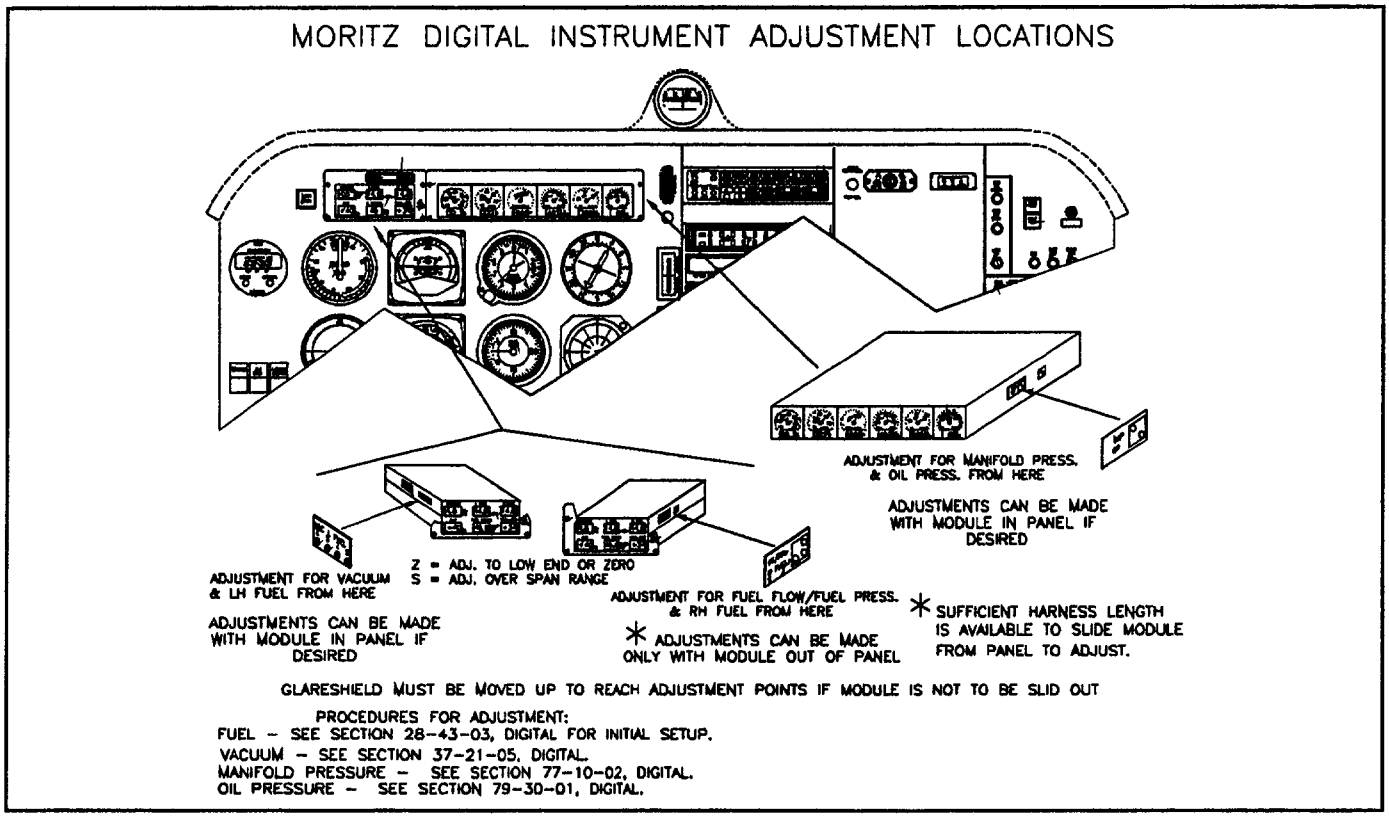
4. Pull regulator aft to remove from aircraft.

37-12-04 - REINSTALL

1. Inside aircraft - insert vacuum regulator thru mounting hole in firewall.



CLUSTER GAUGE - FIGURE 39-4A



MORITZ CLUSTER GAUGE ADJUSTMENT LOCATIONS - FIGURE 39-4B

size to match the oversize dimple and install the next standard size larger diameter rivet of the same type and material as the original rivet. Dimples in 75S-T6 must be hot formed when reworked.

(3) Combined Countersink and Dimpled Joint. If the edge distance is a minimum of two times the diameter of the next standard size larger diameter rivet, it will be permissible to rework the smaller countersink or dimple to a size to match the oversize dimple or countersink and install the next standard size larger rivet according to paragraph 2, A (4). Dimples in 75S-T6 must be hot formed when reworked.

C. RIVET HEAD TOLERANCE.

(1) A rivet head will be considered open if .001 feeler gauge can be inserted between the head of the flush or protruding head rivet and the top skin. The top of a flush head rivet must not be below the skin in which it is installed by a dimension of more than .004.

D. RIVET HOLE TOLERANCE.

(1) An enlarged hole is defined as having an internal diametric dimension in any direction which exceeds the sum of the drill diameter normally used plus ten percent of the diameter of the rivet shank.

(2) The following table specifies the maximum acceptable diametric dimensions for the various rivet sizes that occur in multiple layer assemblies which are "drilled on assembly".

NOMINAL RIVET SIZE	MAX. ACCEPTABLE DRILL SIZE	DIAMETRIC DIMENSION
AN470AD3 or AN426AD3	#40 (.098 dia.)	.108 in.
AN470AD4 or AN426AD4	#30 (.1285 dia.)	.141 in.

(3) When a hole becomes enlarged beyond the acceptble diametric limit and the prescribed rivet cannot be used, the next larger diameter rivet may be used if (a) four-diameter (4D) rivet spacing is maintained and if (b) two-diameter (2D) edge distance is maintained.

3. BLIND RIVET INSTALLATION. Ordinarily, where rivet bucking is impossible, CherryLock (CR-2248 and CR-2249) rivets may be substituted for AD rivets to repair skins and structural members. However, consult the MAC Customer Support Department or a representative of the Federal Aviation Administration before using blind-type or hollow rivets in primary structure.

CAUTION

The use of blind rivets normally require more frequent inspection of the area where used. Inspect for evidence of loosening of the rivet(s) or crack development that may cause deterioriation of structural integrity. Solid rivet replacement of blind rivets is recommended at earliest possible maintenance.

Check existing rivet hole size before installing blind rivets. When hole is marginal, use the next larger size rivet to assure firm attachment.

4. "AN"- BOLT, NUT AND WASHER INSTALLATION. To compensate for material thickness tolerances, the length of AN bolts may be increased or decreased by one dash number from prescribed length. AN960 regular washers and AN960L thin washers may be used interchangeably for proper bolt and nut installation.

One regular washer or one thin washer may be added to any bolt installation. Washers may be used under the bolthead and/or under the nut. AN365 and AN363 nuts may be used interchangeably. The AN363 nut is acceptable for higher operating temperature installations.

5. HI-SHEAR RIVET INSTALLATION. When a hi-shear rivet pin of the prescribed length is not available, the next longer length pin may be used with cadmium-plated steel washers to adjust the pin grip length. The combined washer thickness shall not exceed .096 inch.

6. SPOT WELD REPAIR

MS20470-AD4 or MS20426-AD4 rivets may replace spotwelds, (1) per spotweld, head side & double flush requirements determined by form, fit & function of assembly. Contact Mooney engineering department prior to beginning repair.

51-11-00 - RESERVED

51-12-00 - FUSELAGE REPAIR

51-12-01 - TUBULAR STRUCTURE REPAIR

Check tubular structure annually for corrosion and damage. Interior panels may require removal to gain access to areas which are difficult to inspect.

Refer to AC 43.13-1( ) for tubular frame repair procedures. Warped or bent tube members can often be straightened; however, all surrounding welds should be dye checked for cracks after tube straightening.

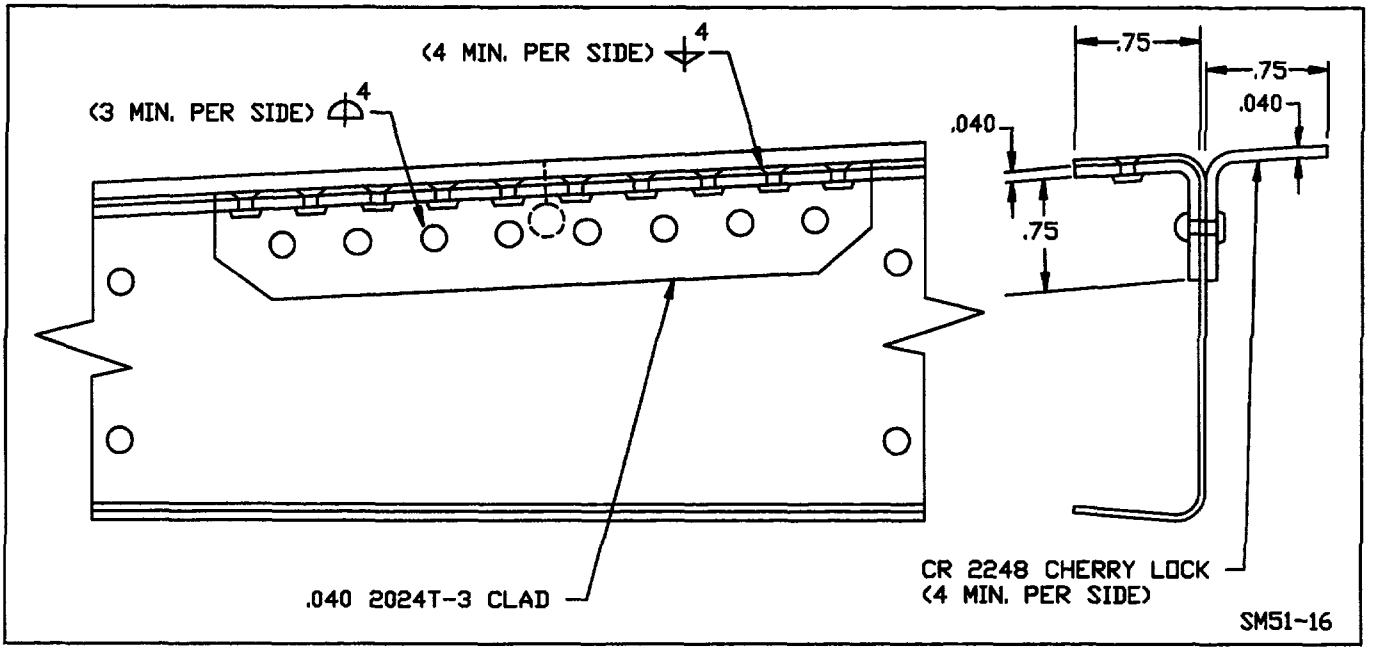
Use proper material when making weld repairs. Welding rod, meeting the requirement of specification MIL-R-5632, class 2, is recommended for oxyacetylene welding. Electrodes meeting the requirement of specification MIL-R-5632-A, class 2, MIL-E-23765/1C (Type MIL-70S-2) or AWS A5.18-69, class E70S-2 (IE. Linde 65, Linde 32 or Page AS-35) are recommended for non-heat treated parts, inert-gas shielded-arc welding (Heliarc). Use AISI 4130 condition N steel for replacement and repair of tubes, and for making repair sleeves. Replacing a member or subassembly is often advantageous and more feasible than repair. All detail tubes or assemblies needed for replacement can be purchased from SERVICE PARTS DEPARTMENT, Mooney Aircraft Corporation, Louis Schreiner Field, Kerrville, Texas 78028.

1. WELDED PATCH REPAIR OF LOCAL DAMAGE. Use a welded patch to repair dents, small holes, and cracks no longer than the outside diameter of the tube and covering a maximum of 1/4 of the tube circumference.

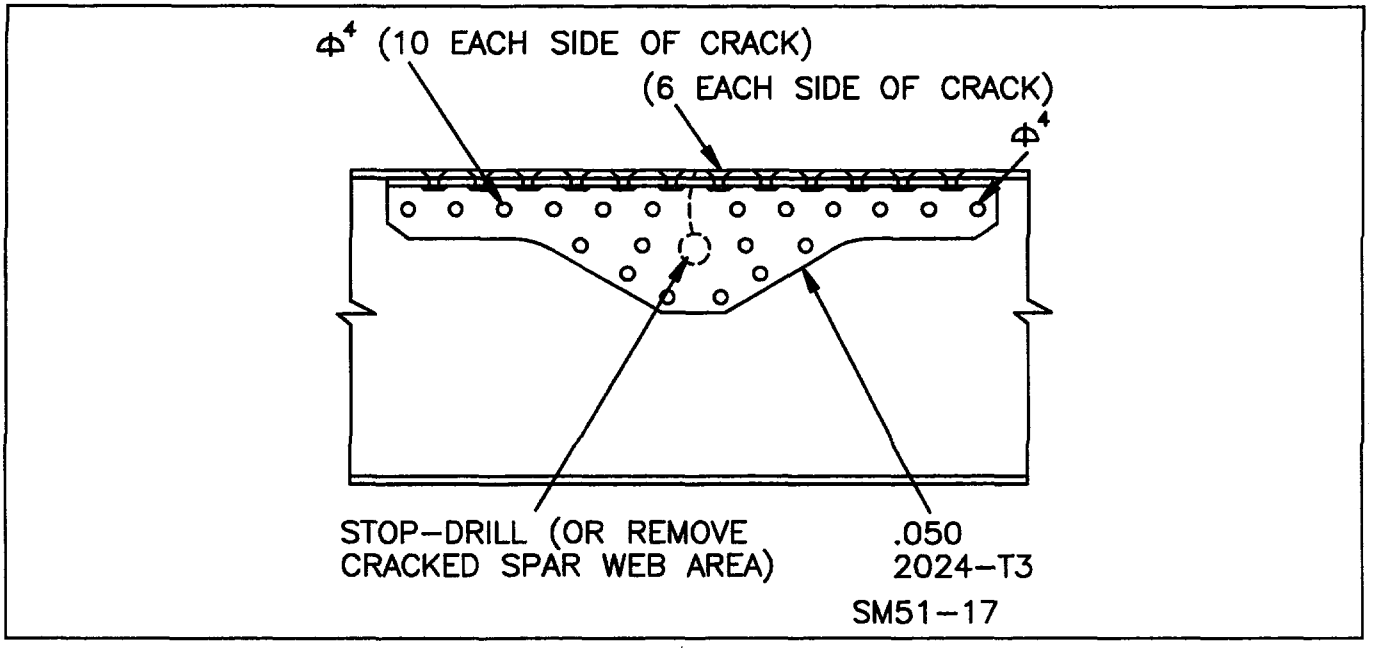
Pick up three existing holes and drill three new holes between existing holes on each side of damaged area. (See **Figure 51-16**).

4. Repair main spar web damage outboard of STA 34.0, top flange, and STA 48.5, lower flange by forming a splice angle from .050 2024-T3 aluminum. The splice angle web flange should be cut to allow sufficient coverage of the damaged area of existing web and long enough to install 6 AD4 rivets on the flange on each side of the damaged area. *Pick up 3 existing rivet* holes on flange of spar and drill 3 new rivet holes between existing holes. Drill 10 rivet holes through splice angle and web on each side of the damaged web area. The damaged web should be stop drilled or cracked area removed prior to splice angle installation. Prime splice angle and deburr spar web and flange before installing splice (see **Figure 51-17**).

5. Spar webs outboard of STA 48.5 cracked more than 50% of the web height may be repaired (see **Figure 51-18**). Form a splice plate from .050 2024-T3 aluminum to fit the inside dimensions of the web and *flange at the damaged area. Pick up 3 existing rivet* holes on top and bottom flange on each side of damaged area and drill 2 new AD4 rivet holes between



SPAR REPAIR (STA. 48.5 APPROX.) - FIGURE 51-16



SPAR REPAIR (OUTBD. of STA. 34.0) - FIGURE 51-17

A. Latching pin must contact striker plate on door frame the full circumference of pin when mechanism is in full latched position.

B. Latching pin must clear striker plate when opening or closing the door with latching mechanism in full open position.

C. As the lower link (1) and bellcrank arm (2), (Fig. 52-1) travel over center, the spring (3), is to be compressed to 1.000 +/-.030.

NOTE
Washers may be added between spring and link or 310294-501 housing assembly (4) to comply with items B and C, (Figure 52-1).

D. The lower link (1) and bellcrank arm (2), in full locked position, should be overcenter a minimum of .3 inches, (Figure 52-1).

NOTE
It is not necessary that the lower link (1) contact the upper link (5), (Figure 52-1).

E. The outside handle is to be flush with outside skin when mechanism is in full latched position.

F. In full latched position, the upper latch jaws (6) must be closed and the latch slide cam (7) at the end of its full travel. See adjustment points (8) and (9), (**Figure 52-1**).

G. In full open position the upper latch jaws must be open and slide cam at the end of its full travel.

NOTE
Slide cam (7) moves 1.13 in. from the full latched to full open position.

52-12-00 - CABIN DOOR SEAL

The cabin door seal is an extruded rubber seal filled with a soft foam. Unless deformed or torn, the seal will provide adequate sealing around the periphery of the door during flight conditions.

1. Cabin door seal replacement.

A. The seal is held to inner door frame with adhesive.

B. Remove the door inner trim panel to gain access to the door seal.

C. Pull the seal from the door frame.

D. Clean the area with lacquer thinner to help soften the remaining adhesive. Remove excess adhesive.

CAUTION
Care should be exercised to keep the lacquer thinner from dripping on the wing or any other portion of the airplane.

E. Coat cleaned door frame with adhesive (St. Clair #4587).

F. Coat bond area of new seal with adhesive (St. Clair #4587).

G. Let both applications dry until tacky.

H. Carefully place end of seal into position at bottom of door and continue around the door until the seal is firmly attached. Do not pull tight around corners. Cut off any excess seal.

I. When seal is properly attached the door should close with little effort.

NOTE
Door contour can be altered slightly to conform with cabin contour, if needed, for proper fit and sealing.

52-30-00 - BAGGAGE COMPARTMENT DOOR - MAINTENANCE PRACTICES

1. Removal. The baggage compartment door may be removed to replace or repair the door or to replace a damaged hinge.

A. Remove the coat hanger and headliner panel located inside and directly under the baggage door hinge area.

B. Pull insulation back to clear rivet shanks.

C. Center punch rivet heads holding the hinge half to the fuselage.

D. Carefully drill rivet heads and punch rivets from holes.

E. Work a putty knife or thin piece of aluminum between outer skin and hinge and inner skin frame and hinge to break sealant bond.

F. Remove hinge and baggage door assembly carefully.

G. Clean hinge and hinge mounting area thoroughly of all sealant or foreign material.

2. Repair. The baggage door may be repaired per standard repair procedures in accordance with AC 43.13-1( ). Repairs may be made to the baggage door on the airplane if feasible.

NOTE
If repairs are to be made the interior trim panel may require removal.

3. Installation.

OLD HINGE

A. Place repaired baggage door with old hinge into position and cleco securely to assure fit of door; check latching operations.

B. Remove door-assure attachment area is clean of old sealant.

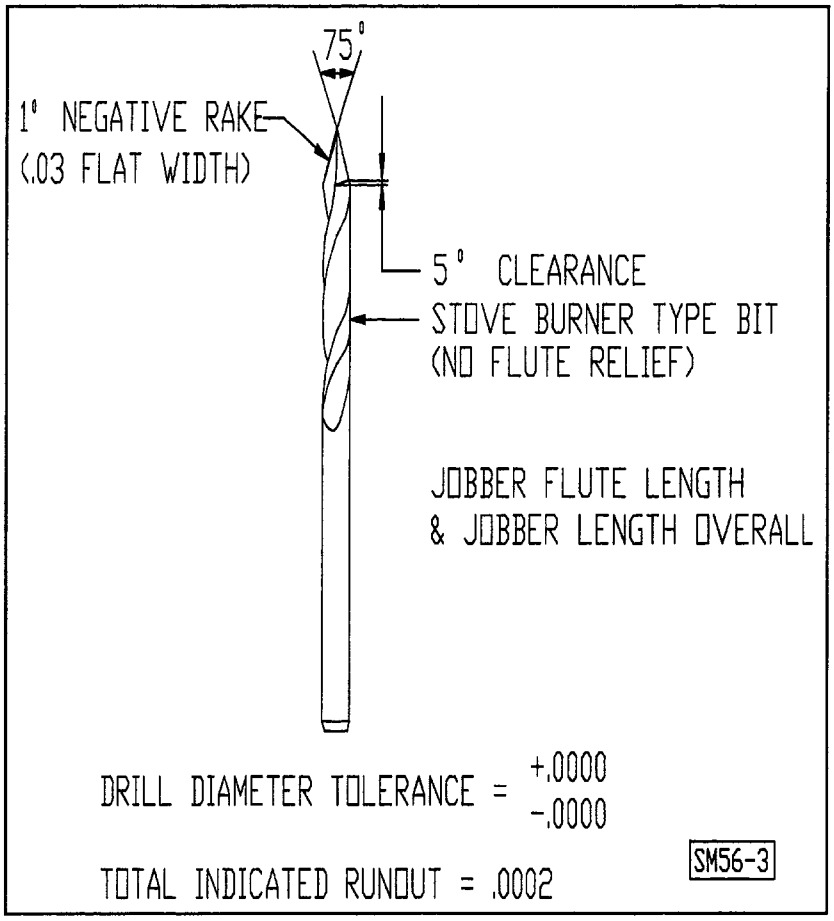
C. Apply sealant, PR1403-G-B2, PR1428 or equivalent, to hinge attachment area between outer skin and inner frame.

D. Reinstall door assembly with old hinge and cleco hinge for proper placement.

E. Install rivets (AD4 standard, AD5 oversize) in all holes.

CHAPTER 55

STABILIZERS



ACRYLIC DRILL BIT - FIGURE 56-3

for sealing purposes when closed, (reference **Figure 56-2).**

56-50-00 - ACRYLIC DRILLING

Drill bits for acrylic should be ground per (Figure 56-3). A slow turning drill bit with light pressures is desirable.

CHAPTER

60

STANDARD PRACTICES (PROP/ROTOR)

61-40-00 - PROPELLER BALANCING

The propeller/spinner combination assembly is dynamically balanced during the manufacturing process by Mooney Aircraft Corporation. Any maintenance action to be accomplished on any component of these two assemblies should take this in to consideration.

There are many different models of Dynamic Propeller Balancing Equipment, therefore details of proper operation and procedures should be taken from manuals of the specific Manufacturer for the equipment being used.

2. Reconnect mixture control.

A. Reverse disconnect procedure to reconnect mixture control.

3. Adjustment of mixture control arm.

A. Loosen locknut on control rod end and adjust control arm rod as required.

B. Check for full travel.

C. Check for proper thread grip.

D. Secure locknut.

71-00-90 - STARTER TROUBLE SHOOTING

See SECTION 24-39-04 for procedure. TEXTRON-Lycoming's MAINTENANCE AND OPERATORS MANUAL should be consulted.

71-10-00 - COWLING REMOVAL

71-10-01 - TOP COWLING

1. Remove two (2) screws from top cowling on each inboard side of engine cooling air intakes.

2. Remove (1) screw from each side of top cowling, forward and outboard. Then unlatch seven cam locks along each side.

3. Unlatch seven cam locks on the aft edge of the top cowling just ahead of windshield.

4. Carefully lift top cowling off.

71-10-02 - BOTTOM COWLING

1. Unlatch seven cam locks located on bottom of cowling, forward and between the cowl flaps.

2. Unlatch twelve cam locks around NACA duct on lower, right, forward end of lower cowl.

3. Unlatch eight cam locks around induction air inlet duct at forward center of lower cowl.

4. Unlatch six cam locks on aft sides of bottom cowling while supporting the cowl.

5. Carefully lower cowling clear of spinner and remove from aircraft.

71-11-00 - COWLING INSTALLATION

NOTE
Check condition of tape on firewall flange where cowling will rest. A polyethylene tape, P/N 5421(UHMW) (3M) 1 in. wide is recommended. This will decrease streaking during wet weather operations.

71-11-01 - BOTTOM COWLING

1. The bottom cowling is installed "first" in reverse sequence of removal.

71-11-02 - TOP COWLING

1. The top cowling is installed in reverse sequence of removal.

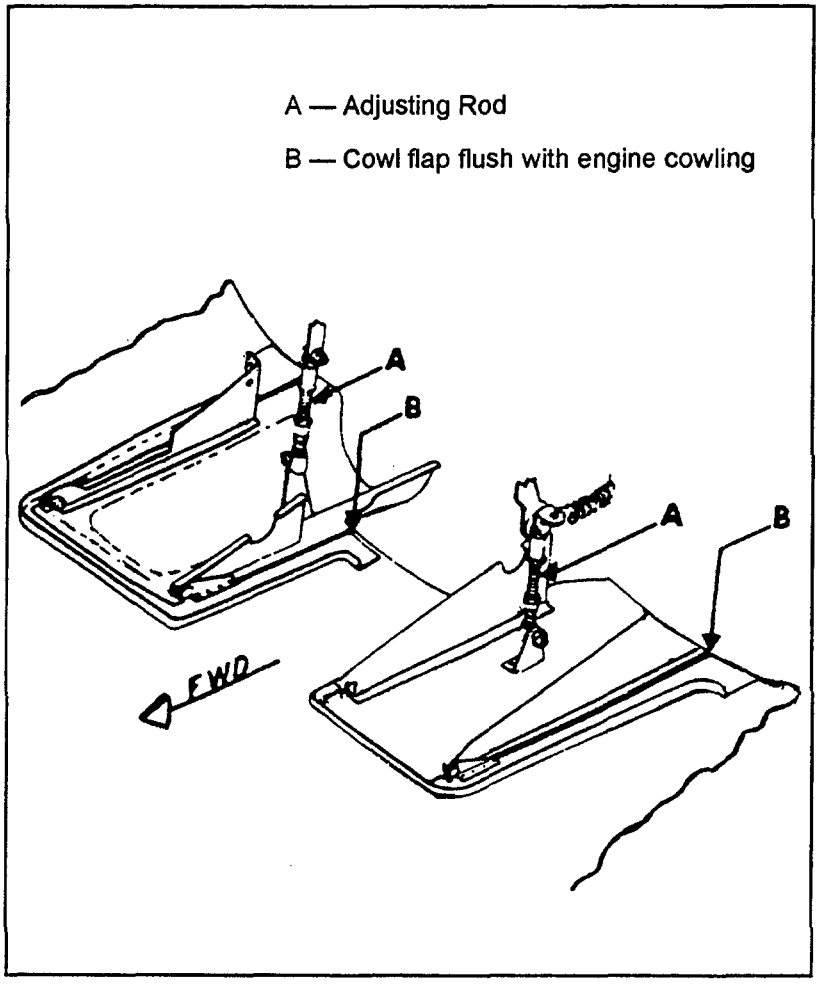
71-12-00 - ENGINE COWL FLAPS

The cowl flaps are activated OPEN and CLOSED by an idler arm which is connected by a push-pull rod to the actuator arm on the geared motor. A cowl flap switch, located on the cockpit console directly under the mixture control, activates the geared motor. The switch has three positions: a center (OFF), an up (CLOSED) and a down (OPEN) position. The cowl flaps may be positioned at any angle by selecting the switch either up or down until the desired position, as shown on the position indicator, has been reached. Then return the switch to the center (OFF) position. Limit switches, which are not adjustable, prevent the cowl flap from exceeding the full open or full closed position.

A cowl flap position indicator is located on the lower console adjacent to the cowl flap switch. This indicator is operated electrically thru a potentiometer which is connected to cowl flap actuator shaft. See SECTION 71-13-01 for Cowl Flap Indicator rigging procedures.

71-13-00 - COWL FLAP RIGGING

The cowl flaps are rigged for a flush contour between the cowl flap's trailing edges and lower cowl and fuselage when in the closed position (See **Figure 71-4**).



COWL FLAP RIGGING - FIGURE 71-4

FT-101 SWITCH ARRANGEMENT (con't.)

FUNCTION	SWITCH ARRANGEMENT				
SWITCH #	S3	S4	S5	S6	S7
GALLONS	ON	OFF	OFF	NA	NA
POUNDS	OFF	ON	OFF	NA	NA
LITERS	OFF	OFF	ON	NA	NA

FT-101 TRUTH TABLE
FIGURE 73-1

FT-101 A (HOSKINS) SYSTEM

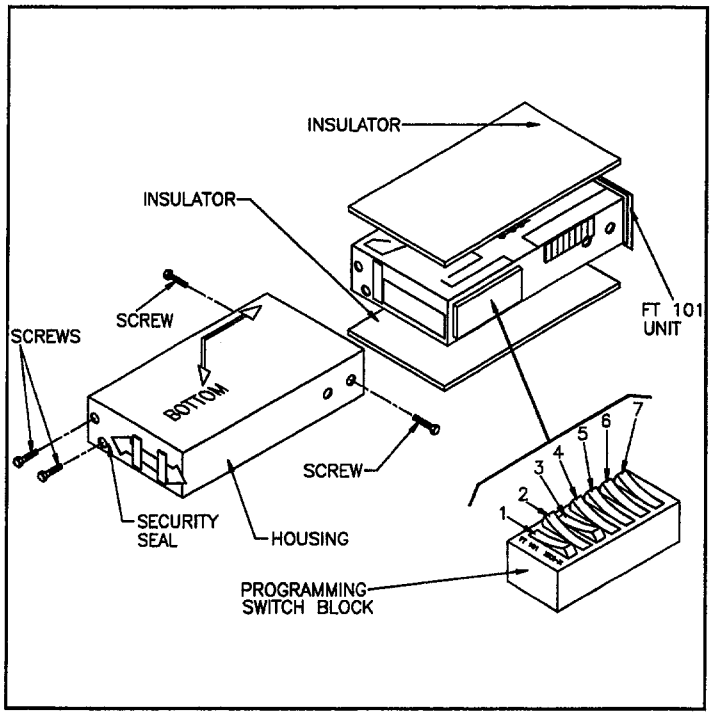
1. Basically same as Ft-101.
2. Refer to Hoskins Operators or Maintenance Manual for specific data.
3. See **Figure 73-1A** for FT-101A Switch arrangement.

K-FACTOR ADJUSTMENT - FT 101A

SWITCH NUMBERS	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**
(1111) LOW LOW LOW		CLOSED	OPEN	OPEN	X	X	N X
(2222) LOW LOW	OPEN	CLOSED	OPEN	X	X	O	X
(3333) LOW		CLOSED	CLOSED	OPEN	X	X	T X
(4444) MEDIUM	OPEN	OPEN	CLOSED	X	X	U	X
(5555) HIGH		CLOSED	OPEN	CLOSED	X	X	S X
(6666) HIGH HIGH	OPEN	CLOSED	CLOSED	X	X	E	X
(7777) HIGH HIGH HIGH		CLOSED	CLOSED	CLOSED	X	X	D X
FUNCTIONS							
GALLONS	X	X	X	OPEN	OPEN		CLOSED
LITERS	X	X	X	CLOSED	OPEN		OPEN
POUNDS	X	X	X	OPEN	CLOSED		OPEN

FT-101A SWITCH ARRANGEMENT --- FIGURE 73-1A

SHADIN SYSTEM



FT-101 SWITCH ARRANGEMENT - FIGURE 73-2

The -L option is a fuel management system designed to provide information relative to actual flight conditions without any manual data entry, except for initial fuel on board. It is connected to engine fuel flow transducer for fuel flow data and the Loran-C (or GPS) receiver for navigation data. The system provides:

Specific Range: NM/gal. or NM/10 lb. of fuel burned. Optimum cruise speed can be obtained by selecting power setting which yields highest NM/gal.

Fuel to Destination: System calculates fuel necessary to reach destination as selected on Loran-C (GPS) receiver by multiplying Fuel Flow by ETE to destination.

Fuel Reserve: System calculates amount of fuel which will be available onboard when aircraft reaches destination, as indicated on Loran-C (GPS) receiver waypoint. This feature provides pilot with necessary data to evaluate reserve fuel situation based on accurate data early enough to take necessary action.

Endurance: System calculates time left to fly in hours and minutes based on fuel on board and fuel consumption.

74-00-00 - GENERAL

The TIO 540-AF1A/-AF1B series engines are equipped with Slick 6200 Series, magnetos. The left magneto incorporate an impulse coupling that retards the spark 35 degrees for starting. When the engine starts, counter weights hold the latch pawls away from stop pins. The magneto then will fire at its advanced firing position.

The magneto/starter switch combines both ignition and starting functions. Turn the key clockwise through R, L and BOTH to START position; push forward on key while in START and the starter relay is energized. Release of the key, after engine starts, will return the switch to the BOTH position where both magnetos are operative.

In the OFF position both magnetos are grounded. At the R position the left magneto is grounded and at the L position the right magneto is grounded.

74-10-00 - ELECTRICAL POWER

74-10-01 - IGNITION SYSTEM TROUBLE SHOOTING

1. Hard starting.

A. Assure that the impulse coupling is operating properly.

B. Check magneto timing to engine.

2. Engine roughness.

A. Install new spark plugs.

B. Check plug leads for deterioration.

C. Check magneto points for wear or improper setting.

3. Magneto drop out of limits.

A. Check magneto-to-engine timing.

B. Inspect and service magnetos per TEXTRON-Lycoming maintenance information.

C. Check spark plugs and leads.

4. Check magneto pressurization hoses and connections.

NOTE

Aircraft which are flown at higher altitudes during normal flight operations require more frequent maintenance on ignition components than aircraft flown at lower altitudes.

74-20-00 - ENGINE FIRING ORDER

Engine firing order is 1-4-5-2-3-6 (**Figure 74-1**). Observe position of the No. 1 cable terminal in the magneto outlet plate in relation to the magneto case. As viewed from the distributor end, magneto rotor turns counterclockwise, passing in succession the terminals of spark plug cables in engine firing order. Cables are connected to the magnetos so that the right magneto fires the upper plugs on the right side and lower plugs on the left. The left magneto fires the upper plugs on the left and the lower plugs on the right. The magneto cases, spark plugs, cables and connections are shielded to prevent radio interference.

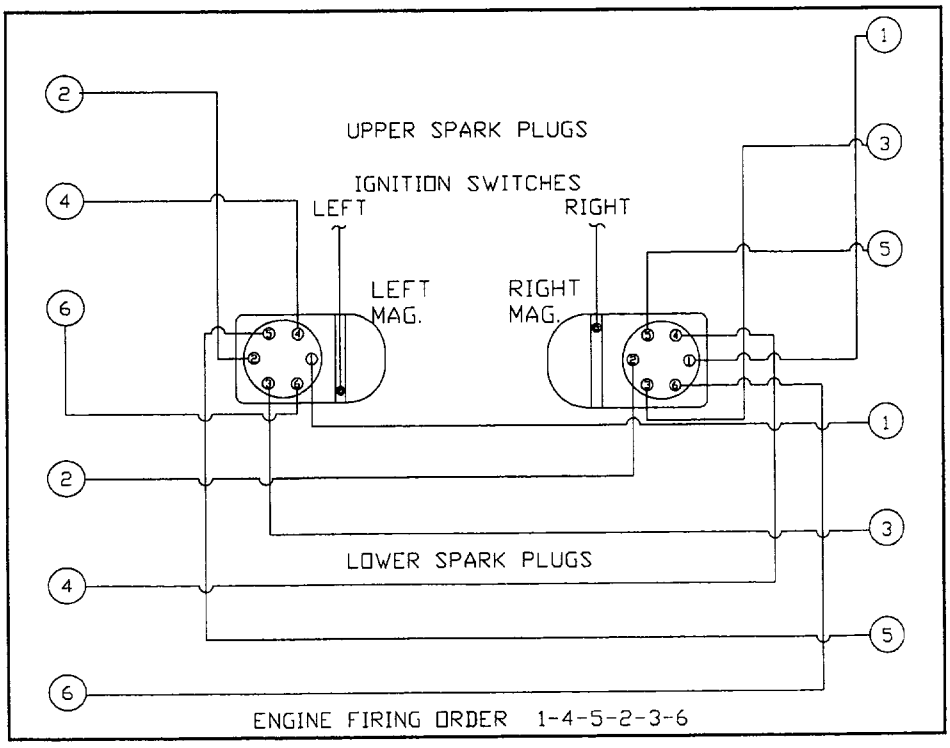
NOTE

It is recommended that all spark plugs be removed, inspected, cleaned, reagapped and reinstalled in the same cylinder but in a different spark plug hole every 100 hrs. Replace spark plugs after 400 Hrs. of operation.

74-30-00 - SWITCHING

The Magneto/Starter switch is connected to the magneto grounding wires ("P" leads) of both magnetos. Turning this switch from "BOTH" to "OFF" or from "R" to "L" to "OFF" will ground out both or either magneto. (See Section 74-00-00 for grounding sequence.)

RELIABLIITY: With proper installation and compliance with prescribed maintenance procedures Slick Magnetos should last the life of the engine before overhaul or replacement is required.



IGNITION WIRING DIAGRAM - FIGURE 74-1

CHAPTER 78

EXHAUST

79-30-00 - INDICATING

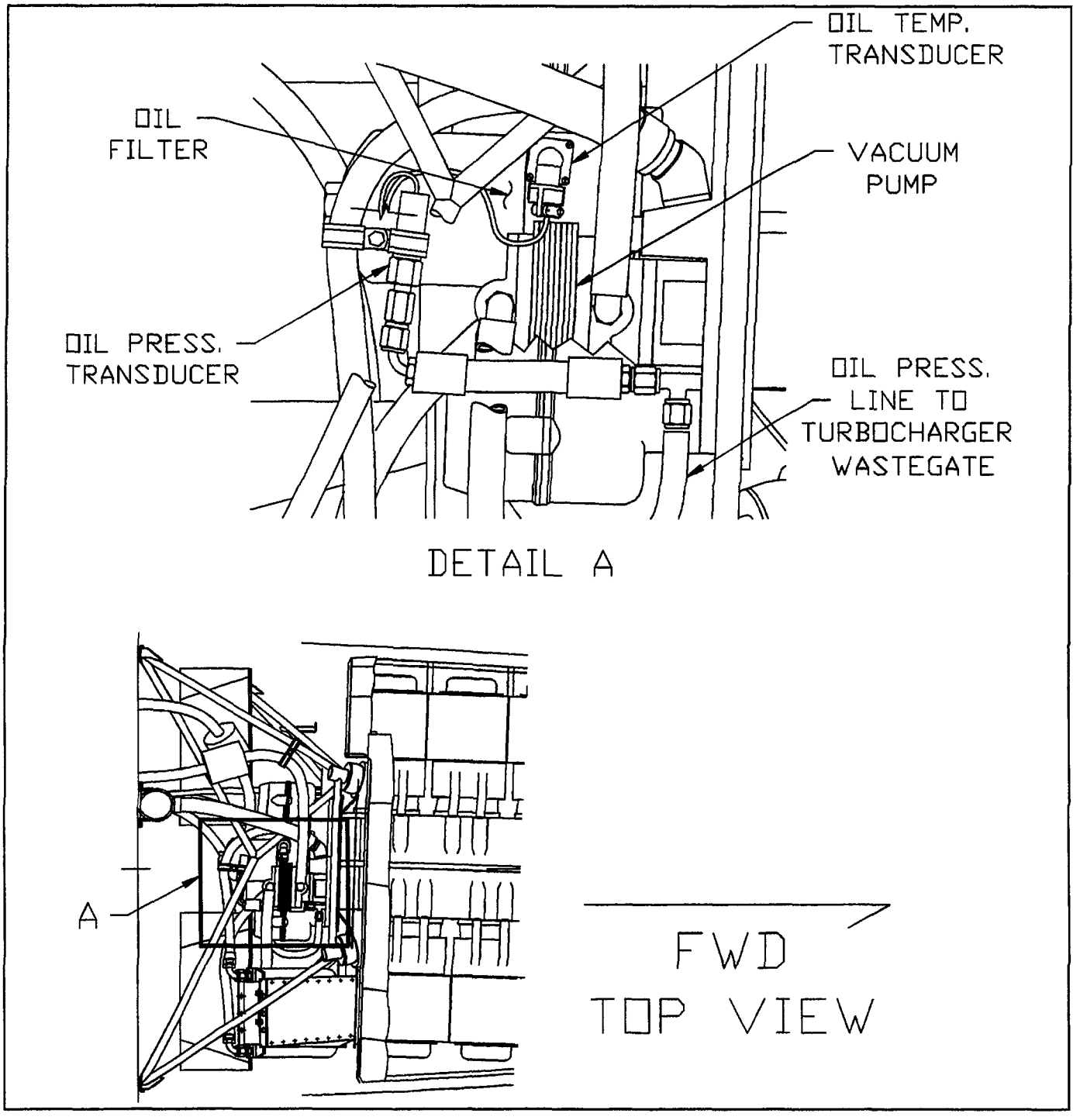
79-30-01 - OIL PRESSURE

Oil pressure indicating is provided through a pressure transducer plumbed into the engine oil system, see (**Figure 79-1**). Pressure variations change the resistance within the transducer and this signal drives the oil pressure gauge located within the cluster gauge.

DIGITAL GAUGES (27-0258 THRU 27-TBA)

Ref. Figure 39-4B for OP adjustment location.

1. Tee in calibrated OP gauge upstream of transducer.
2. Adjust Z (zero) and S (span) of Moritz gauge face to concure with value on calibrated gauge.
3. Disconnect CalibratedOP gauge. and check for leaks.



OIL PRESSURE TRANSDUCER - FIGURE 79-4

81-10-02 - ALTERNATE AIR SYSTEM - TURBOCHARGER OPERATION

The turbocharger system will continue to operate when the primary air source is obstructed. An engine automatic alternate air system is provided to allow air from inside the cowling to pass through the compressor and into the engine. This air is warmer than primary air so less power will be available at normal throttle settings.

NOTE

Inspection of the induction system and turbocharger assembly should be conducted after any obstruction of the primary air source prior to the next engine operation.

81-20-00 - TURBOCHARGER TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive noise or vibration.	Improper bearing lubrication.	Supply required oil pressure. Clean or replace oil line. If trouble continues, remove turbocharger and return to approved overhaul station for overhaul or repair.
	Leak in engine intake or exhaust manifold.	Tighten loose connections, or replace manifold gaskets as necessary.
Engine will not deliver rated power.	Clogged manifold system.	Clean all ducting.
	Foreign material lodged in compressor impeller or turbine.	Remove turbocharger and return to approved overhaul station for overhaul or repair.
	Excessive dirt buildup in compressor.	Service engine induction air filter and check for leakage. Remove turbocharger and return to approved overhaul station for overhaul or repair.
	Leak in engine intake of exhaust manifold.	Tighten loose connections, or replace manifold gaskets as necessary.
	Rotating assembly bearing seizure.	Remove turbocharger and return to approved overhaul station for overhaul or repair.
	Compressor blades chipped, bent or missing.	Remove turbocharger and return to approved overhaul station for overhaul or repair.
	Impeller binding or frozen.	Remove turbocharger and return to approved overhaul station for overhaul or repair.
	Induction or exhaust system leaks.	Perform leak checks.
	Compressor blades chipped, bent or missing.	Remove turbocharger and return to approved overhaul station for overhaul or repair.
Engine surges or smokes.	Oil leaking into turbine wheel chamber.	Remove turbocharger and return to approved overhaul station for overhaul or repair.
	Clogged breather.	Check breather for restriction to air flow.

BLANK

ELECTRICAL EQUIPMENT CHART

CODE NOTES	DESCRIPTION	VENDOR	PART NO.
M-MB101A	C/B SWITCH, AVIONICS MASTER	MOONEY	930023-213
M-MB102A			
M-MB103A			
M-MB104A	DIODE		1N2483
M-MB105A	RELAY, AVIONICS MASTER	KISSLING	26.64.01
M-MB106A			
M-MB107A			
M-MB108A	AVIONICS BUS BAR #1	MOONEY	913127-67
M-MB109A	AVIONICS BUS BAR #2	MOONEY	913127-67
M-MB110A	AVIONICS BUS BAR #3	MOONEY	913127-67
M-MB111A	AVIONICS BUS BAR #4	MOONEY	913127-67
M-MB112A	AVIONICS BUS BAR #5	MOONEY	913127-67
M-MB113A	AVIONICS BUS BAR #6	MOONEY	913127-67
M-MB114A	AVIONICS BUS BAR #7	MOONEY	913127-67
M-MB115A	C/B, COM 1	KLIXON	7277-2-10***
M-MB116A	CIRCUIT BREAKER, NAV 1	KLIXON	7277-2-7.5***
M-MB117A	C/B, AUDIO	KLIXON	7277-2-7.5***
M-MB118A	C/B, COM 2	KLIXON	7277-2-10***
M-MB119A	C/B, NAV 2	KLIXON	7277-2-7.5***
M-MB120A	C/B, PHONE	KLIXON	7277-2-7.5***
M-MB121A	C/B, TRANSPONDER.	KLIXON	7277-2-7.5***
M-MB122A	C/B, ENCODER	KLIXON	7277-2-7.5***
M-MB123A	C/B, RAD BLOWER	KLIXON	7277-2-7.5***
M-MB124A	C/B, ADF	KLIXON	7277-2-7.5***
M-MB125A	C/B, DME	KLIXON	7277-2-7.5***
M-MB126A	C/B, R/NAV	KLIXON	7277-2-7.5***
M-MB127A	C/B, STORMSCOPE	KLIXON	7277-2-7.5***
M-MB127B	C/B, RMI	KLIXON	7277-2-7.5***
M-MB129A	C/B, LORAN	KLIXON	7277-2-7.5***
M-MB130A	C/B, STEREO	KLIXON	7277-2-7.5***
M-MB131A	C/B, TELEPHONE	KLIXON	7277-2-7.5***
M-MB132A	C/B, VME	KLIXON	7277-2-7.5***
M-MB133A	C/B, AUTOPILOT/TRIM	KLIXON	7277-2-10***
M-MB134A	C/B, YAW DAMP	KLIXON	7277-2-7.5***
M-MB135A	C/B, INVERTER	KLIXON	7277-2-7.5***
M-MB136A	C/B, HSI	KLIXON	7277-2-2***
M-MB137A	C/B, ART HORIZON	KLIXON	7277-2-2***
M-MB138A	C/B, A/P ALERT	KLIXON	7277-2-7.5***
	***MAXIMUM CIRCUIT BREAKER RATING IS SHOWN. AMPERAGE OF INSTALLED CIRCUIT BREAKER IS DETERMINED BY PARTICULAR UNIT INSTALLED.		
M-MC101A	CIRCUIT BREAKER	KLIXON.	7277-2-10
M-MC102A	CIGAR LIGHTER	MOONEY.	800336-503
—	/ALTERNATE	CASCO	208292
M-ME101A	CLOCK	PORSCHE	944.641.213.00
M-ME101B	CLOCK (ALT)	MID-CONT	MD-89
M-ME102A	R1 150 OHM 3 WATT	CLAROSTAT	VC3D
—	R1 150 OHM 3 WATT (ALT)	OHMITE	23J
M-ME103A	R2 3.9K OHM 1/2 WATT		
M-ME104A	R3 3.0K OHM 1/2 WATT		
M-ME105A	CONN, 4 PIN	PORSCHE	944.612.217.00
—	/PIN	PORSCHE	999.652.351.12
M-ME105B	CONN, 4 PIN (ALT)	MID-CONT	6016177
—	/PIN	MID-CONT	6016125
MMIC101A	MICROPHONE JACK.	SWITCHCRAFT	C-12B
—	/WASHERS	SWITCHCRAFT	S-1028, S-1029
MMIC102A	SWITCH,MIKE KEY, PILOT	ALCO	MPE-106F-C-22-9
—	(ALT)	CUTLER-HAMMER	SAIRV20
MMIC103A	SWITCH,MIKE,KEY,CO-PILOT	ALCO	MPE-106F-C-22-9
—	(ALT)	CUTLER-HAMMER	SAIRV20

ELECTRICAL EQUIPMENT CHART

CODE NOTES	DESCRIPTION	VENDOR	PART NO.
BS1	RELAY, BASE	MAGNACRAFT	70-303
BUS2A	BUSS BAR (2 PLC)	MOONEY	913127-033
BUS2B	BUSS BAR (2 PLC)	MOONEY	913127-097
BUS2C	BUSS BAR ( )	MOONEY	913127-099
BUS3A	BUSS BAR (3 PLC)	MOONEY	913127-087
BUS3B	BUSS BAR (3 PLC)	MOONEY	913127-059
BUS3C	BUSS BAR (3 PLC)	MOONEY	913127-073
BUS4A	BUSS BAR (4 PLC)	MOONEY	913127-069
BUS4B	BUSS BAR (4 PLC)	MOONEY	913127-089
BUS4C	BUSS BAR (4 PLC)	MOONEY	913127-005
BUS5A	BUSS BAR (5 PLC)	MOONEY	913127-093
BUS5B	BUSS BAR (5 PLC)	MOONEY	913127-077
BUS5C	BUSS BAR (5 PLC)	MOONEY	913127-085
BUS5D	BUSS BAR (5 PLC)	MOONEY	913127-019
BUS6A	BUSS BAR (6 PLC)	MOONEY	913127-035
BUS6B	BUSS BAR (6 PLC)	MOONEY	913127-079
BUS7A	BUSS BAR (7 PLC)	MOONEY	913127-081
BUS8A	BUSS BAR (8 PLC)	MOONEY	913127-095
BUS8B	BUSS BAR (8 PLC)	MOONEY	913127-083
C1	CAPACITOR	MALLORY	CGS302V-050R2C
CAP1	CAP, WHITE	MICRO SW	15PA90-8W
CAP2	CAP, BLACK	ALCO SW	C-22
CAP3	CAP, DUST	MATRIX SCIENCE	M83723/60-122RC
CB101A	BLOWER, DEFROST	MOONEY	640317-503
CC101A	MOTOR, COWL FLAP	MOONEY	880050-505
CC102A	INDICATOR, COWL FLAP	MOONEY	880242-505
CC103A	SWITCH, COWL FLAP	MOONEY	880052-517
CC103B	SWITCH, COWL FLAP (M20J)	MICRO-SWITCH	12TW1-10
CC103C	SWITCH, COWL FLAP	MOONEY	880052-117
CF101A	ACTUATOR, FLAP	MOONEY	750105-501
CF102A	INDICATOR, TRIM/FLAP	MOONEY	800242-501
CF103A	INDICATOR, FLAP	MOONEY	800242-505
CF108A	SWITCH, FLAP	C-H	8906K3149
CL03A	CLAMP, 3/14/16/28 PIN	AMP	206070-1
CL03B	CLAMP, 3 PIN	AMP	M85049-41-4A
CL03C	CLAMP, 3 PIN		MS3057-4A
	(ALT)		MS3057-4B
CL04A	CLAMP, 4/8 PIN	AMP	206062-1
CL05A	CLAMP, 5 PIN		MS3057-6A/B
CL06A	CLAMP, 6 PIN		MS3057-16A/B
CL09A	CLAMP, 9 PIN, LT. CONTROL BOX	AMP	206966-1
CL09B	CLAMP, 9 PIN	AMP	P/O 126-222
CL09C	CLAMP, 9 PIN		DE-24657
—	/LOCK RETAINER		DE-51224-1
—	/LOCK RETAINER (ALT)		D110278
CL09D	CLAMP, 9 PIN		DE-19977-5
—	/LOCK, RETAINER		DE-51224-1

ELECTRICAL EQUIPMENT CHART

CODE NOTES	DESCRIPTION	VENDOR	PART NO.
SW13	SWITCH (ALT)	MICRO	12TW1-10
—	/CAP, WHITE	MICRO	15PA90-8W
—	(ALT)		MS27753-38
SW14	SWITCH, F/F MEM.	C & K	7101K
SW15	SWITCH, LDG, OVERRIDE	NKK	DLB241-W01-L3C/ AT506M/AT503MB
—	/BUTTON/LOCK RING/LOCK WASHER/HEX NUT (2 EA) (NKK)		
—	/SWITCH (ALT)	C-H	SB1DDX492-2
—	/LOCK RING	C-H	29-761
—	/LOCK WASHER	C-H	16-886
—	/HEX NUT (2 EA)	C-H	15-966-6
SW16	SWITCH, VAC. HI/LO	MOONEY	880012-501
SW17	SWITCH	CARLING	TILC64-1S-WHFN
	SW (ALT)	TSCHUDIN	504202
	LENS	TSCHUDIN	464415
	BULB	TSCHUDIN	590002
SW18	SWITCH	MOONEY	880062-501
SW19	SWITCH	CARLING	TIGM64-1S-WHFN
SW20	SWITCH		MS35058-22
SW21	SWITCH, MIKE KEY	CROUZET	83-450-001
SW22	SWITCH, SPDBRK	CROUZET	83-452-504
SW23	SWITCH	ALCO	MPE106F
SW25	SWITCH	NKK	MB2085SB1W01-EA
SW35	SWITCH	NKK	MB2085SB1W01-EA
VR1	VARISTOR	GE	V47ZA05
WM101A	MASTER WARNING	MICRO SWITCH	DSK-104-GYR
WM102A	MASTER WARNING	MICRO SWITCH	DSB-11-RRRR-LR2
WS101A	ALERT, STALL WARN/GEAR WARN	IAI	950D0309-000
WS103A	SWITCH, STALL WARNING	MOONEY	800364-507
WT101A	ANNUNCIATOR	MOONEY	880048-501
WT102A	ANNUNCIATOR	MOONEY	880048-503
WT103A	ANNUNCIATOR	MOONEY	880048-507
WT104A	ANNUNCIATOR	MOONEY	880048-509

NOTES:

1. SHADIN MODEL NO. INTERFACE WITH II MORROW APOLLO, ARNAV AND NORTHSTAR LORAN SYSTEMS.
2. SHADIN MODEL NO. INTERFACE WITH BENDIX/KING KLN-88 OR KLN90 SERIES.
3. B & D TACH SENSOR'S P/N 0406-004 IS 9/16 " DIAMETER FOR BENDIX MAGNETOS. 0406-003 IS 11/16 " DIAMETER FOR SLICK MAGNETOS