MAULE AEROSPACE TECHNOLOGY, INC.

Maintenance Manual

FOR

MAULE M-4-180V

Vintage Rocket

P/N: ***TLC-M-4-180V***
Rev A: 04/13/16
PC: SMM

PERFORMANCE THAT COUNTS!
2099 Georgia Hwy 133 South ~ Moultrie, GA 31788
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FORWARD

Ahead of you are many hours of flying pleasure. The more you fly your Vintage M-4-180V the more you will realize that flying this aircraft is a stimulating new sensation that will never grow old.

The Maule M-4 was designed and built to give you the airplane you have always wanted. It is fast, comfortable, and easy to fly, yet no light airplane is safer than the Maule M-4. Its sturdy construction means you will not have to pamper it to enjoy long years of trouble-free service.

Our dealers and distributors are anxious to serve you and will gladly furnish advice as to proper servicing methods. You may also address requests for information on any items not covered in this manual to the Service Department of Maule Air. In correspondence, please be certain to give complete information on serial number, engine make and model, etc.

WARRANTY

Maule Air, Inc. warrants each new airplane manufactured by it to be free from defects in material and workmanship under normal use and service, provided, however, that this warranty is limited to making good at the Maule factory any part or parts thereof which shall, within one (1) year after delivery of such airplane to the original purchaser, be returned to Maule with transportation charges prepaid, and which upon Maule's examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on the part of Maule, and Maule neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of its airplane.

This warranty shall not apply to any airplane which shall have been repaired or altered outside Maule's factory in any way so as, in Maule's judgment, to affect the airplane's stability or reliability, or which airplane has been subject to misuse, negligence or accident.

Certain items of equipment are warranted separately by their manufacturer. The engine and accessories are warranted by Textron Lycoming, Williamsport, PA. The Hartzell Propeller is warranted by Hartzell Propeller, Inc., Piqua, OH. Sensenich Propeller is warranted by Sensenich Propeller Manufacturing Company, Inc., Lititz, PA 17543. Avionics items are warranted by their manufacturers. Manufacturers of separately warranted item of equipment request that warranty claims be made through your nearest authorized Distributor or authorized Service Center. Maule Air will be glad to help you find that facility nearest to you.

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LOG OF REVISIONS

REV.	TO PAGES	DESCRIPTION	DATE
A	6, 17, 21, 22	Changed oleo strut oil to API GL-4 or GL-5 gear oil.	04/13/16

SECTION I

GENERAL DATA

GENERAL DESCRIPTION:

Type:
Two place high wing cabin monoplane.

Engine Installation:
Single tractor Lycoming O-360-C1F or O-360-C4F engine in nose of fuselage. Propeller for O-360-C1F: Hartzell Constant Speed HC-C2YR-1BF/F7666A (76") and for O-360-C4F (or O-360-C1F modified for fixed pitch): Sensenich Fixed Pitch 76EM8S5-0-56 (76") or 76EM8S8-0-56 (76")

Wing:
Strut braced, two spar, metal covered, modified USA 35-B airfoil.

Fuselage:
Welded Steel Tubing.
Frame covered with Ceconite synthetic fabric. Front doors on right and left sides.

Landing Gear:
Main gear split axle type, spring-oil oleo shock absorber. Hydraulic Brakes. Steerable tailwheel.

Control Systems:
Dual controls wheels and rudder pedals. All controls directly cable driven. Fuel control/shut off valve is at the left lower side panel. Mechanical flap and trim controls are at the center on the floor. All other controls, switches, etc., are instrument panel mounted.

DESIGN SPECIFICATIONS:

Wing Span	30 feet 10 inches
Length	23 feet
Height	6 feet 2 ½ inches
Gross Weight	2300 lbs.
Empty Weight	Approx. 1320 lbs.
Wing Loading	14.6 lbs./sq.ft.
Power Loading	12.8 lbs./BHP
Useful Load	Approx. 980 lbs.
Seats	Two
Flaps	0°, 20°, 35°
Baggage Allowance	200 lb. Structural Limit
Baggage Compartment Dimensions	39H x 38W x 26L (Approx.)

DESIGN SPECIFICATIONS**:** (Cont'd)

Wings:

a.	Airfoil	Modified USA 35-B
b.	Chord	63 inches
c.	Incidence	+30 minutes
d.	Dihedral	3 inches
e.	Sweepback	None

Areas:

a.	Wing, Aileron and Flaps	157.9 sq.ft.
b.	Ailerons (total)	12.6 sq.ft.
c.	Flaps (total)	22.8 sq. ft.
d.	Horizontal Stabilizer	12.6 sq. ft.
e.	Elevators (including tab)	14.1 sq. ft.
f.	Vertical Stabilizer	14.0 sq. ft.
g.	Rudder	7.0 sq. ft.
h.	Elevator Trim tab	1.1 sq. ft.
i.	Rudder Tab	.38 sq. ft.

FLUID CAPACITIES AND SPECIFICATIONS:

a. Main Fuel Tanks - Inboard - 100 Octane

Right Main Tank	21.5 gallons
Left Main Tank	21.5 gallons

Note: 2.3 gallons unusable fuel per 21.5 gallon main tank

b. Auxiliary Fuel Tanks - Outboard - 100 Octane

Right Auxiliary Tank	11.5 gallons
Left Auxiliary Tank	11.5 gallons

c. Engine Oil (SAE 50 above 60°F, SAE 40 at 30° to 90°F, SAE 20 below 10°F ambient air temp, at sea level. Refer to Engine Manual for AD Oil grades.)

8.0 qt. Maximum
5.0 qt. Minimum

d. Brakes (Texaco Aircraft Hydraulic Oil 15, MIL-H-5606E or equiv.)

1 pint

e. Landing Gear (APR GL-4 or GL-5 85@-140 gear oil.)

2 pint

SECTION II

GENERAL MAINTENANCE

CLEANING AND CARE OF AIRCRAFT

Keeping the performance, speed and durability that was built into your aircraft at the factory requires more than casual attention. The accumulation of dirt and oil on the outside and debris inside does affect these factors and can be a fire hazard as well. The first step to proper maintenance is a clean aircraft.

EXTERIOR

Frequent washing is good for your aircraft finish, especially during the first few months. Use any car soap or detergent with a soft cloth or sponge and plenty of clean water. Drying should be done with a chamois. Accumulation of oil, grease and exhaust carbon deposits should be removed frequently by using a soft cloth soaked in mineral spirits or other neutral cleaner.

For general polishing, apply a good quality car polish or wax according to instructions. Clean Plexiglas with plenty of soap and water using grit free soft cloth, chamois or sponge. Use of a dry cloth on Plexiglas will not only cause scratches but will also build up an electrostatic field which will attract dust to the surface. Blotting with a clean damp chamois will remove the charge and the dust. After cleaning, polishing with a good Plexiglas cleaning product such as "Mirror Glaz" will keep the glass clean and help polish out minor scratches.

INTERIOR

Floorboards should be vacuumed frequently and can be cleaned with any good rug cleaner.

Care should be taken in the disposal of candy wrappers, paper scraps, cigarette butts, etc. These can work their way under the floorboards and become a fire hazard and moisture trap.

NOTE: While washing the aircraft, ascertain that all drain holes are open. Clean out any debris blocking them. Accumulated water can be dangerous, so check behind the baggage compartment frequently.

Textile upholstery may be cleaned using a vacuum cleaner. Grease and oil spots on the upholstery should be treated with a spot remover or dry cleaning fluid. Do not use soap and water on textile materials.

Vinyl upholstery may be cleaned using soft whisk broom or suds of any mild soap (castile or olive oil base) in lukewarm water. Use water sparingly as the upholstery otherwise requires a long time to dry if water trickles through the seam stitches.

INTERIOR CLEANING (Cont'd)

For best results, stains, especially those caused by grease or paint, should be removed from upholstery as soon as possible or they may become "set"" and hard or impossible to remove. "Set" stains should be removed carefully with a clean cloth dampened in denatured alcohol. Stains caused by shoe polish can best be removed with turpentine. However, such cleaning agents are liable to affect the dust-repellent finish of the vinyl if used in excess of the actual requirements. Never use volatile solvents such as lacquer thinner, acetone, etc. on upholstery.

The cleaning should be completed by wiping the surface of the vinyl dry with a clean cloth, particularly in the seam. No attempt should be made to apply preservatives such as wax, polish, or varnishes, as these will not be absorbed by vinyl, but will merely collect dust. There are protective treatments made especially for vinyl which are commercially available and quite satisfactory.

INSPECTION GUIDES

At ***25 Hour Total Time:***

Perform ***50 Hour*** Inspection as described below:

At ***50 Hour Total Time*** and every ***50 hours*** thereafter:

A. POWER PLANT

	MECH	INSP
1. Perform appropriate inspection as called for in the Textron Lycoming Operator's Manual, p/n 60297-12, Revision No. 60297-12-6 or later.		
2. Perform appropriate inspection as called for in the Hartzell Owner's Manual and Logbook, p/n 115N, Revision 10 or later for the constant speed prop or the Sensenich Fixed-Pitch Metal Propellers Instructions For Use and Care dated 9/4/97 or later for the fixed pitch prop.		
3. Remove the outer muffs from the mufflers and inspect the mufflers and tubes for cracks. Inspect muffs for cracks before reinstalling.		
4. Inspect gascolator, clean if necessary.		
5. Inspect engine controls for security and proper operation.		
6. Clean or replace air filter. (See page 29 for Brackett air filter.)		
7. Inspect all engine and engine mount attach bolts.		

8. Inspect all engine fuel and oil lines for general condition and security.		
9. Check all engine compartment electrical connections and wires for security and chafing.		
B. AIRCRAFT		
1. Check battery for general condition and electrolyte level.		
2. Check all main electrical connections.		
3. Check fluid level in brake reservoirs.		
4. Check the entire fuselage, tail surfaces and wings for cracks, security of fairings and general condition.		
5. Check the security, operation and general condition of all control surfaces.		
6. Check general condition of tailwheel and spring attachment.		
7. Check main landing gear oleo struts and brakes for leakage, wear and condition.		
8. Drain sumps of fuel tanks.		
9. Check tires for inflation and cuts.		

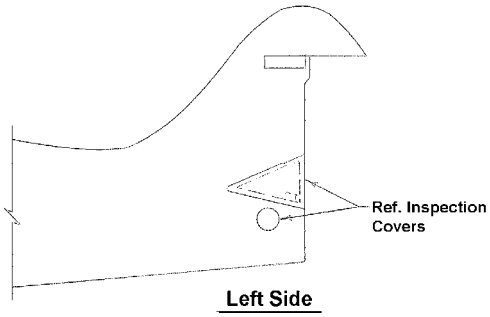
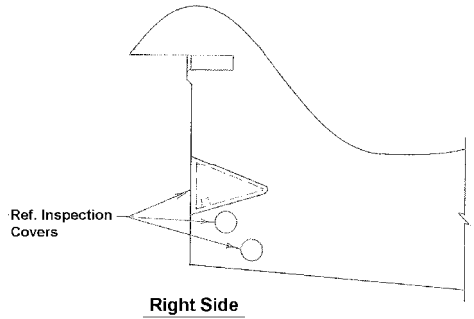
At ***100 Hours Total Time*** and ***every 100 Hours*** thereafter, perform the **50 hour** inspection plus the following:

A. POWER PLANT		
	MECH	INSP
1. Perform appropriate inspection as called for in the Textron Lycoming Operator's Manual, p/n 60297-12, Revision No. 60297-12-6 or later.		
2. Perform appropriate inspection as called for in the Hartzell Owner's Manual and Logbook, p/n 115N, Revision 10 or later for the constant speed prop or the Sensenich Fixed-Pitch Metal Propellers Instructions For Use and Care dated 9/4/97 or later for the fixed pitch prop.		
3. Clean the engine with any good engine cleaner (Gunk, etc.) Be sure to protect magneto from getting wet.		
4. Examine baffles and baffle extensions for security and cracking.		
5. Clean gascolator screen.		
6. Retorque bolts attaching engine mount to fuselage, engine to engine mount. Visually inspect mount structure for condition. See "Engine Mount" under "Power Plant System".		

7. Inspect induction system and air box for cracks and security. Check rubber seal on air valve for condition. CAUTION: Use rubber seal with cotton insert only when replacing seal.		
B. AIRCRAFT		
1. Remove right and left kick panels in cockpit, windshield side post covers, front seats, all floorboards and panel behind baggage compartment. Examine rudder cables (located behind kick panels) and attaching clamps, bolts and nuts for security and general condition.		
2. Examine all front cockpit electrical connections and wires, fuel lines and fittings, control cables attachments and pulleys for security, leaks, chafing, etc.		
3. Examine all tubing and tubing clusters for corrosion and general condition.		
4. Inspect all control cables, pulleys, fairings and electrical connections and wires under floorboards and in tail cone for security and chafing.		
5. Open zippers in headliner and inspect all control cables, pulleys, fairleads and electrical connections and wires for security and chafing.		
6. Remove wing root fairings and inspect control cables, fairleads, fuel lines and connections, and electrical wires and connections for security, chafing and leaks.		
7. Remove wing strut fairings, top and bottom, and inspect attaching fittings and bolts for security, corrosion and cracks. Carefully inspect both sides of lift struts for abrasion, corrosion, pin holes and punctures. Any paint loss or minor corrosion should be sanded down to bare metal with fine sandpaper and metal primer should be applied. After the primer is dried, a finish coat of the desired color may be added. Powder coating is recommended if complete strut is being refinished. NOTE: Sealed lift strut were installed on this aircraft during manufacturing and are identified by two weld spots located at upper end. WARNING: Any unrepairable dents or punctures in strut are cause for replacement of the strut.		
8. Remove wheels and inspect wheels, tires, brake disc, bearings, brake lines and brake pad for wear, cuts, chafing, leaks and general condition. Repack wheel bearings. (See page 12 for jacking information)		

9. Remove landing gear top fairings and inspect attaching fittings and bolts for security, corrosion and cracks and inspect brake hose for security, chafing and leaks.		
10. Check resilience of oleo springs. A lax spring is indicated by a low wing condition when the airplane is on the ground, or the measurement between the inside faces of the brake caliper mount rings exceeds 67 inches for an empty airplane, or 68 inches for one with full fuel. CAUTION: Use Steps 9 and 10, above as a guide for inspection after an unusually hard landing or any time there is concern about the condition of the main landing gears or their attachments.		
11. If a lax oleo spring is suspected, disassemble subject oleo strut and measure the free height of the spring. Less than 6 1/4 inch is unacceptable.		
12. Check fluid level in landing gear oleo struts. Fill to overflowing (no air).		
13. Remove all inspection covers (includes 9 each inspection covers in bottom side of left wing, 8 each inspection covers in bottom side of right wing and 1 each in top side of each wing) and inspect all visible control cables, pulleys, bellcranks, electrical wires and connections, fuel lines and fittings, nuts, bolts, etc. for security, chafing, leaks, etc. (See inspection cover locations in tail on page 13)		

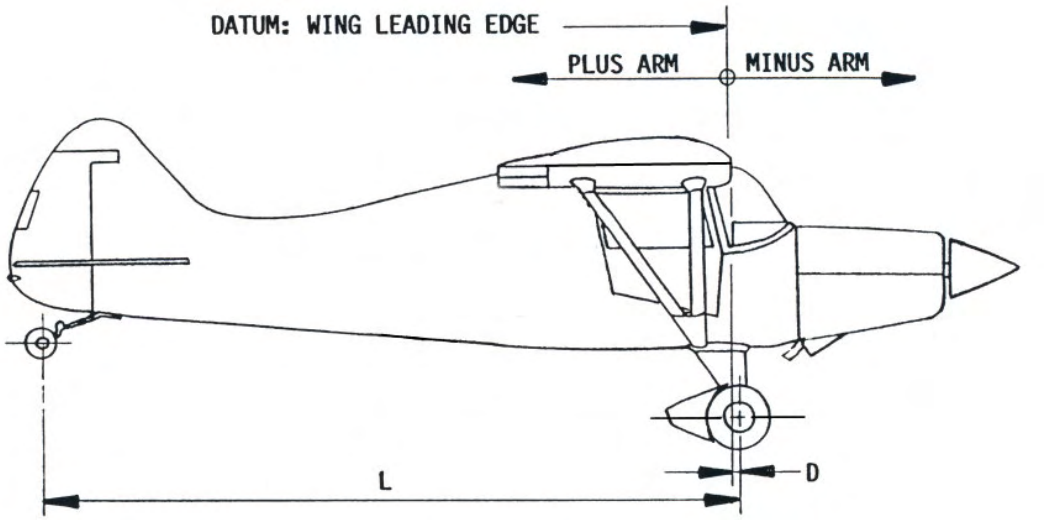

Wrap hoist
cable around
Fairing attach
tube to lift

14. CAUTION: At inspection hole in tail, visually check the pivoting action at the control cable attachment points over the full range of rudder and elevator travel. This action should be such that there are no bending loads imparted to the turnbuckles (which are designed for straight tension load only). Any binding which causes bending of the turnbuckles should be removed. Any cable attachment parts which display appreciable corrosion must be replaced before further flight. NOTE: Pivot points must be cleaned and lubricated with any lightweight lubricating oil. Following lubrication, the cable attachments, including the turnbuckles, must be heavily coated with a good preservative such as: Black Bear Paralketone Preventative/Black Bear Co./Long Island City, NY. (Preferred) LPS 3, Heavy Duty Rust Inhibitor/LPS Laboratories, Inc./Tucker, GA NOTE: Larger stainless steel turnbuckles and corrosion resistant steel fasteners for the elevator cables are approved and recommended for airplanes operating in a potentially corrosive environment.		
 Left Side	 Right Side	
15. Lubricate all chains and points of rotation on sprockets, pulleys and bellcranks,		
16. Inspect and lubricate all control surface hinges and control horn connections.		
17. Lubricate door hinges and latches and seat tracks.		
18. Lubricate rudder pedals and rudder bar points of rotation.		
19. Check control rigging and cable tensions.		
20. Check and clean vacuum system regulator valve filter and intake filter.		
21. Check the pitot static system for leaks.		

22. Ensure that all applicable Airworthiness Directives and Maule Service Letters and Bulletins that are mandatory have been complied with.		

WEIGHING PROCEDURE

DETAILED CALCULATIONS OF EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY:



PROCEDURE:

1. Place each of the wheels on a scale with the tailwheel elevated to place the airplane in approximately the flight attitude.

2. Place a level on the leveling mark and leveling lug on the bottom of the right wing near the root. Adjust the height of the tailwheel until the aircraft is level.

3. Measure the following distances:

   a. Wheel base (**L**) - the horizontal distance from the tailwheel weight point (center of axle) to the main wheel weight point (center of axle).
   L = _____ Inches

   b. Main Wheel Station (**D**) - the horizontal distance from the main wheel weight point (center of axle) to the datum line.
   D = _____ Inches

4. Measure the weights at the following points:

   a. **Right** Main Wheel.....= _____ Lbs.

   b. **Left** Main Wheel.....= _____ Lbs.

   c. **Tailwheel,** with tare =_____Lbs., minus tare of _____ Lbs.

= net Tailwheel wt. **(T)** of _____ Lbs.

Total Weight as Weighted **(W) =** _____ Lbs.

WEIGHTING PROCEDURES: (Cont'd)

The above empty weight includes unusable fuel of 27.6 lbs. at 24 inches and 8 quarts of oil at minus 36.5 inches, plus all items of equipment as marked on the accompanying Equipment Lists. The Certificated empty weight is the above weight less 16 lbs.

drainable oil at a minus arm of 36.5 inches and for this airplane is _____lbs.

The corresponding empty weight center of gravity is _____inches.

5. Calculations for determining weight, C.G. and moment:

a. Center of Gravity (inches) = $\frac{\mathbf{L \times T}}{\mathbf{W}}$ **- D**

i.e., C.G. = _____ - _____ = _____inches.

b. Moment (inch pounds) = **W** x C.G.

i.e., Moment = _____ x _____ = _____inch lbs.

CENTER OF GRAVITY LIMITS: +15.6 to +19.0 @ 2300 lbs.
+11.0 to +19.0 @ 1500 lbs. or less

RIGGING PROCEDURES

1. LEVELING:

Laterally: Using a level twenty four (24) inches long, place across the front spar carry-through tube at the windshield. Add blocks under the landing gear to bring bubble to the center.

Longitudinally: Using a level thirty six (36) inches long or longer, place it on the leveling lug and leveling mark thirty one (31) inches to the rear of the leveling lug on the bottom of the right wing root. Raise the tail to bring bubble to center.

2. DIHEDRAL ANGLE:

To check the dihedral angle at the front spar, proceed as follows:

Stretch a string along the top of the wing above the front spar, from wing tip to wing tip, and draw it tight. Check the dimension vertically from the top of the spar at root end fitting. The correct dihedral dimension should be three (3) inches ±1/8.

Using a level (without any spacer blocks) hold it spanwise against the bottom of the wing under the front spar just outboard of the fuselage.

Note the position of the bubble and do the same on the other wing. Readjust the front struts until both wings show the same amount deviation from level being careful with each adjustment to set the left strut out the same number of turns as the right one is set in, or vice-versa.

3. WASH OUT:

To adjust the wash-out in the wings, proceed as follows:

Put a leveling protractor chordwise on the underside of the wing root and adjust it to a zero degree reading. Now put the protractor chordwise just inboard of the wing tip and adjust the rear strut to give ½° trailing edge up, difference from the wing root angle.

4. TAIL ASSEMBLY:

With the airplane in level position, the stabilizers should be leveled at their rear spars. The hinge line should be straight from tip to tip. The vertical stabilizer should be plumb at the hinge.

5. AILERONS:

Adjust the ailerons to streamline position by placing a straight edge on the bottom of the wing chordwise at the inboard end of the aileron. Then adjust the turnbuckles in the aileron system so the control wheels are centered and there is a gap of zero to ¼ inch between the straight edge and the trailing edge of the aileron.

Check the aileron travel for 20° ±1° up and 20° ±1° down. Adjust turnbuckles to stay within these limits. Proper cable tension is 15 to 25 lbs.

6. FLAPS:

Adjust the first notch flap position to be aligned with the aileron trailing edge with the ailerons centered. Check the flap travel with flap handle at fully retracted (handle down) position for negative 7°± 1°up, 0°± 1°for firs t notch, 20°± 3°down for the second notch, 35°± 3°down for the third notch and maximum trave l of 38°. Adjustment, if needed, may be accomplished by adjusting turnbuckle at end of drive chain located above headliner in line with the trailing edge of wing. Adjust to 60lbs. ± 10lbs cable tension

7. RUDDER:

Check the rudder travel for 21° ±1° right and left. Adjustment, if needed, may be accomplished by backing on the locknuts on the rudder stops located on fuselage frame and screwing stop screw in or out, whichever is required.

8. ELEVATORS:

Elevator control movements are up 25° ±2°, down 21° ±1°. Stops are located on the vertical tail rear spar just inside the inspection plate. Proper cable tension is 25 to 45 lbs.

9. ELEVATOR TRIM:

Elevator trim tab movement is 11° ± 3° up, 25° ± 1° down. If adjustment is needed, it may be done at the turnbuckles located just aft of the trim control. Proper cable tension is 15 to 25 lbs.

10. RUDDER TAB:

This tab is interconnected with the aileron system to automatically coordinate rudder with aileron to reduce adverse yaw. The tab should normally be streamlined with the rudder when the aileron and rudder controls are centered.

The tab may be used to adjust rudder trim. In normal cruise, it is desirable to have the ball centered with the “Rudder Trim” control out to first line. This allows for inflight adjustment of rudder trim in cruise.

Rudder trim may be adjusted by changing the position of the tab cables located just over the front doors on the inside of the airplane.

The tab travel is 48° ±4° right or left. Proper cable tension is 5 to 10 lbs.

CAUTION: Make sure tab is free at extreme aileron travel.

NOTE: The “Rudder Trim Control” on the instrument panel pulls on a spring attached to the right rudder pedal. It is not connected to the tab on the rudder.

LUBRICATION

1. Main wheel and tailwheel bearings - Use aircraft quality bearing grease.

2. Oleo shock struts - Use API GL-4 or GL-5 85W-140 gear oil.

3. Landing gear hinges - Use motor oil.

4. Hydraulic brake reservoirs - Use Texaco Aircraft Hydraulic Oil 15 conforming to MIL-H-5606E, or equivalent.

5. Control Column - Apply light coat of graphite base lubricant to aileron balance chain, torque tube and control guide. Use lightweight motor oil or LPS 2 (LPS 3 recommended for airplanes operating in a potentially corrosive environment.) on all other bearings.

6. Use lightweight motor oil or LPS 2 (LPS 3 recommended for airplanes operating in a potentially corrosive environment.) for:
    - Flap bellcrank and mechanism
    - Aileron and flap hinge
    - Elevator and trim tab
    - Tailwheel fork
    - Control pulley bearings and control surface hinges

TOWING

Aircraft can be towed using a Maule tow bar p/n TB101 or equivalent as shown below.

FABRIC REPAIRS:

(Applicable to Polyurethane paint on Ceconite fabric only)

REPAIRS:

1. Small holes and damaged areas can easily be repaired without removing the existing paint topcoat.

2. Trim the damaged area to a rectangular or circular shape.

3. Lightly scuff sand with #320 or #400 wet/dry sandpaper approximately 2 inches around the repair area.

4. Mix one part gray urethane primer (catalyst) with two (2) parts gray urethane primer (2:1 ratio - 2 parts paint/1 part catalyst), mixing a very small amount only for coating the sanded area around the repair.

5. Apply one coat (this may be brushed) to the sanded area slightly larger than the size of the patch to be applied. This application aids in total adhesion to the topcoat and offers a fresh chemical adhesion base for the repair patch.

6. Allow prime to dry for 4 hours.

7. Apply a coat of urethane adhesive (thinned one to one (1:1) with urethane adhesive thinner by volume) to the primed area slightly larger than the repair patch size. Allow this to dry for approximately 15 minutes.

8. Apply a second coat of the thinned urethane adhesive and lay the patch in the wet bed of adhesive, smoothing the edges while applying a topcoat of the thinned urethane adhesive, working he edges down. Allow to dry at least 8 hours prior to any shrinkage.

SHRINKING THE REPAIR AREA:

When using an iron to shrink the patch, always use a piece of aluminum foil over the area to be tautened and the surrounding undamaged topcoat. This is to prevent any scorching of the topcoat. Follow the procedure previously mentioned (primer and finish coat application). Take care to feather sand as required during primer procedure to feather the repair patch and blend in prior to topcoat spraying.

SPECIAL PRECAUTIONS:

For any repair or damaged area, refer to FAA AC 43.13 1B. Only use equal or next heavier weight fabric for repair patch. Do not substitute any other products or brands in this procedure

SECTION III

MAJOR COMPONENT PARTS

WINGS:

The complete wing is of metal construction (2024-T3 aluminum) with a fiberglass wing tip.

Spar root end strut fittings are made of 2024-T4 aluminum.

LIFT STRUTS:

The lift struts are streamlined tubes attached to the wing and fuselage by means of AN standard steel bolts. When inspecting the struts, check for nicks and dents and see that all bolts are snug (not tight).

In handling the airplane on the ground, care should be taken to prevent damage to the lift struts by pushing or lifting in the middle of the strut. Frequent inspection of the struts should be made and any paint loss or minor corrosion should be sanded down to bare metal with fine sandpaper and metal primer should be applied. After the primer is dried, a finish coat of the desired color may be added.

WARNING: Any unrepairable dents or punctures are cause for replacement of the strut.

FUSELAGE:

The fuselage is a welded truss type structure having an integral vertical tail fin. Chrome molybdenum steel (4130) is used for all tube members, control fittings, floor supports and seat members. Doorframes and other nonstructural parts are made of cold rolled steel (1008 to 1015).

If it becomes necessary to replace any fuselage members, sleeve type splices should be made in accordance with practices outlined in FAA AC 43.13-1, Aircraft Inspection and Repair.

The forward fuselage section is aluminum covered (5052-H34 or 2024-T3). The firewall and bottom fuselage just aft of the cooling air egress are made of .018 galvanized sheet steel.

The aft fuselage section is covered with Ceconite fabric and standard dope and paint finish. This fabric need not be pulled or punch tested.

MOVABLE SURFACES AND CONTROL

AILERONS AND FLAPS:

The ailerons and flaps are aluminum alloy structures covered with 2024-T3.

The aileron control system consists of a chain drive connecting the two control wheels and is attached to the necessary cables which are routed over pulleys through the fuselage and into the wing section to the aileron horns.

The flap control system consists of a control lever which has two active positions (20° and 35°). This is connected to the control cables which are routed to the flap through the fuselage and wing to the flap bellcrank which operates the flap by means of a push-pull rod attached to the inboard hinge fitting.

ELEVATORS:

The elevator has a chrome molybdenum (4130) internal structure covered with Ceconite fabric. Inspect for corrosion. Drain grommets should be kept open. The hinge attachments should be lubricated with light engine oil. Accumulations of dust and dirt on hinges should be removed.

STABILIZERS:

The stabilizers have chrome molybdenum steel (4130) internal structures covered with Ceconite fabric. Steel tie rods brace the stabilizers to the fin and fuselage. These tie rods should not be rigged tighter than necessary as high loads may be imposed on other parts of the tail surfaces or fuselage. In adjusting the tension of the tie rods, care should be taken so that marring the rods will not result. The threads at each end of the tie rods must close the inspection holes in the end fittings. A line inspection of the tie rods and fittings should be made to check cotter pins, lock nuts, and to see if they have been damaged in any way.

RUDDER:

The rudder structure is very similar to the elevators. No maintenance other than inspection for corrosion is needed. The hinges should be cleaned and lubricated with light engine oil at frequent intervals. The cable attachment points should be checked for wear and corrosion.

TRIM AND RUDDER TABS:

These surfaces have low carbon steel frames with aluminum alloy skin (2024-T3).

These surfaces need no maintenance other than inspection for corrosion. The hinges should be lubricated at frequent intervals using light engine oil.

LANDING GEAR, WHEELS AND BRAKES

MAIN LANDING GEAR:

This gear is supported by two spring oil type oleo struts which must be full of oil at all times. The oil may be checked by removing a 1/8" pipe plug at the top end of the strut. If oil is needed, use API GL-4 or GL-5 85W gear oil.

A. Disassembly of Oleo Strut:

1. To remove the strut, the weight must be taken off of the gear. The bolt at the top and bottom can then be removed, freeing the strut.
2. Remove four (4) bolts at top of strut.
3. Remove oil filler plug.
4. Pull out cylinder head and spring assembly.
5. To remove spring take all nuts off of strut shaft and press piston upward to free bolts for removal. Remove bolts, and piston will come out of end of shaft.
6. Replace worn parts, weak spring, etc. The "O" ring on the strut shaft and on the cylinder head should be replaced at this time also.

B. Assembly of Oleo Strut:

1. Reassembly is the reverse of steps 5 and 6.
2. Fill cylinder 3/4 full of API GL-4 or GL-5 85W-140 gear oil. Fill strut shaft full of same gear oil as cylinder.
3. Quickly align cylinder head bolt holes with cylinder bolt holes and insert spring assembly allowing excess oil to escape.
4. Install cylinder head bolts, filler plug and safety. Torque bolts to 100-140 in.-lb.
5. Reinstall strut on airplane being careful to get the spacers in at the top attaching bolt.
6. Work airplane up and down on strut and check for oil leaks.

LANDING GEAR LEGS AND AXLE:

The landing gear is made of chrome molybdenum steel (4130) and has an aluminum skin (2024-T3).

These need no maintenance other than inspection for corrosion. Their hinges should be lubricated at frequent intervals using a light engine oil.

MAIN WHEELS AND BRAKES:

See Equipment Lists for items installed and options.

To change a tire, follow these steps:

1. Chock opposite main wheel and tailwheel.

2. Raise wheel with a light scissors jack placed about 2" inboard of brake mount plate. (See page 12 for reference)

3. Remove brake calipers by removing two (2) brake bolts.

4. Remove hub cap, cotter pin and retainer nut.

5. Deflate tire by removing valve core.

6. Remove wheel.

7. Break tire bead on both rim halves.

8. Remove wheel rim through-bolts.

9. Clean rims thoroughly.

10. Remove bearings and check for scoring, galling and corrosion. Replace as required.

11. Regrease and assemble. (Tire and wheel rims are prebalanced. Balance points are usually marked by a colored dot.)

12. Lightly inflate to prevent pinching of tube when tightening through-bolts. Torque to 150 ±10 in.-lb.

13. Reinstall wheel. Install axle nut and torque as follows: Rotate wheel-tire while tightening axle nut to 150-200 in.-lb. to seat the bearing. Back off axle nut to zero torque. Tighten axle nut to 30-40 in.-lb. while rotating wheel-tire. Rotate axle nut (CW or CCW) to align nearest axle nut hole with axle slot. Insert axle nut retainer spring fully into axle slot and ensure engagement with holes in axle nut.

14. Inflate tire to 35 psi to seat tire on rims and back off to 27-34 psi normal pressure. (16-18 psi for oversize tires.)

15. Thoroughly inspect landing gear and axle; check that axle attach bolts are torqued to 90 in.-lb. (dry).

16. Inspect brake pads. Replace if necessary.

17. Replace brake calipers and hubcap.

BRAKE CYLINDERS:

The hydraulic brakes are actuated by two (2) master cylinders, Maule P/N 4046B, on the left side, and two (2) slave cylinders on the right side.

Check hydraulic oil level in master brake cylinders, proper level is no closer than ¼ inch to top of cylinder. Add oil, if needed.

Bleeding brake system may be done as follows:

1. Fill reservoir if necessary.

2. Replace plug in reservoir.

3. Connect a clear plastic tube to the bleeder valve with the free end of the tube in a container of hydraulic brake fluid.

4. Actuate brake pedal full stroke with the bleeder valve open which will force fluid into the receptacle where a check can be made for escaping air bubbles. Continue to actuate pedal until no more air bubbles are observed.

5. When no bubbles are observed, close the bleeder valve after pedal has returned to "off" position. Remove the plastic tube.

6. Recheck reservoir level and fill as necessary.

MAINTENANCE HINTS ON HYDRAULIC BRAKES:

Excessive pedal travel:

Probable cause	Corrective Action
1. Normal wear of brake pad at wheel	1. If pad is worn thin, replace with new pad.
2. Leak in system	2. Inspect all attachments and fittings in brake system.
3. Air in system	3. A springy, rubber action of the pedal indicates air in the system. An excessive amount of air in system will allow the pedal to continue traveling under normal pressure. In either case, the system should be filled and bled.
4. Lack of fluid in reservoir	4. Air will enter system if the reservoir runs dry.

		Inspect at regular intervals and keep reservoir full at all times.
5.	Vent plug stopped up	5. If vent hole in reservoir plug becomes stopped, there is a possibility that a partial vacuum will be created in the system which will interrupt the fluid flow in the system. Clear vent hole.
6.	Improper bleeding - air mixed with fluid	6. Bleed brakes.
7.	Master cylinder cup or "O" ring wear	7. Replace brake cylinder cups and "O" rings.

DRAGGING BRAKES:

NOTE: These disc brakes have no spring return of the pads and thus will always drag slightly. Do not be concerned unless this drag is noticeable while taxiing.

6.	Improper bleeding - air mixed with fluid	6. Bleed brakes.

Probable Cause		Corrective Action
1.	Foreign matter in system	1. If dirt is found in the system, the master cylinder and brake assemblies must be dismantled and parts cleaned with alcohol and reinstalled. Flush system and install new brake fluid.
2.	Binding of brake piston	2. Dust or dirt mixing with brake fluid at the brake may
3.	Use of improper fluid	3. Improper fluid may destroy the seal and packings. Use only the recommended hydraulic fluid.

SFS-P8B TAILWHEEL

A later Maule SFS-P8B Full Swivel Steerable Tailwheel may be installed on aircraft. See Fig. 1 for detailed breakdown. If shimmy of the tailwheel becomes a problem, it should be lubricated and adjusted as follows:

A. DISASSEMBLY

1. Remove cap (74B) - may be pried off with flat side of a screwdriver.

2. Hold the fork (69B) and loosen the nut (A1).

3. With the nut removed, carefully remove the fork spindle from the rest of the assembly. Slowly rotate the fork back and forth while withdrawing it and collect the loose parts.

4. Clean all of the metal parts in solvent. Inspect all parts and replace any parts that exhibit excessive wear.

B. SHIM SELECTION

1. Position the bearings (A5) in bracket (71B) and slide the fork (69B) through the bearings. Do not install any of the other parts at this time.

2. Slide lock ring (73B) over the threaded end of the fork spindle and run nut (A1) down until it bottoms on the lock ring.

3. Tighten the nut moderately and note whether or not there is any end play in the bearings. If there is no endplay and no excessive rotational drag, shimming will not be required. If there is any bearing endplay, remove the nut and spindle and install one (1) shim (83B) on the spindle and repeat the check. Normally only one (1) or two (2) shims will be required to remove any bearing clearance. Too many shims will cause the bearings to drag when the nut is tightened.

C. ASSEMBLY

1. Grease pack roller bearings (A5) and lock pin (13AB) with wheel bearing grease. Grease the parts adjacent to lock pin. Do Not grease friction washer (72B-4) or the parts adjacent to it.

2. Place the roller bearings (A5) in their races, the felt seals (78B-2) on the bearings, and the three (3) springs (76B) in the three deeper holes in bracket (71B). Place friction ring assembly (72B-3) over the springs with the pin in the shallow hole in bracket (71B). Grease may be used to hold the foregoing parts in place. Do Not allow any grease on the friction washer surface of the friction ring assembly (72B-3).

3. Place shim(s) (83B) on lower shoulder of the spindle on fork (69B). Place the friction washer (72B-4) on the large diameter friction surface of the fork.

4. Carefully slide the fork spindle through the friction ring and bearings until the friction washer is bottomed against the springs. Make sure that all parts stay in place.

5. Assemble lock ring (73B), arm (6) (with lock pin (13AB) and spring (14) installed), shield (36), and pins (60AB) together as a unit. Make sure that the key end of lock pin 13AB) is properly aligned with the slot in lock ring (73B).

6. Slide the lock pin subassembly over the threaded end of the fork spindle being careful to keep the parts together. It will be necessary to retract lock pin (13AB) slightly to clear wear plate (75B) as the assemblies are brought together.

7. Thread on nut (A1) and torque to 15-20 foot pounds. Fork should rotate by hand, but with some drag, which is normal and caused by the friction washer.

8. Install cap (74B) with soft mallet. Check wheel rotation. There must be no play in the bearings. Wheel should rotate with a slight drag.

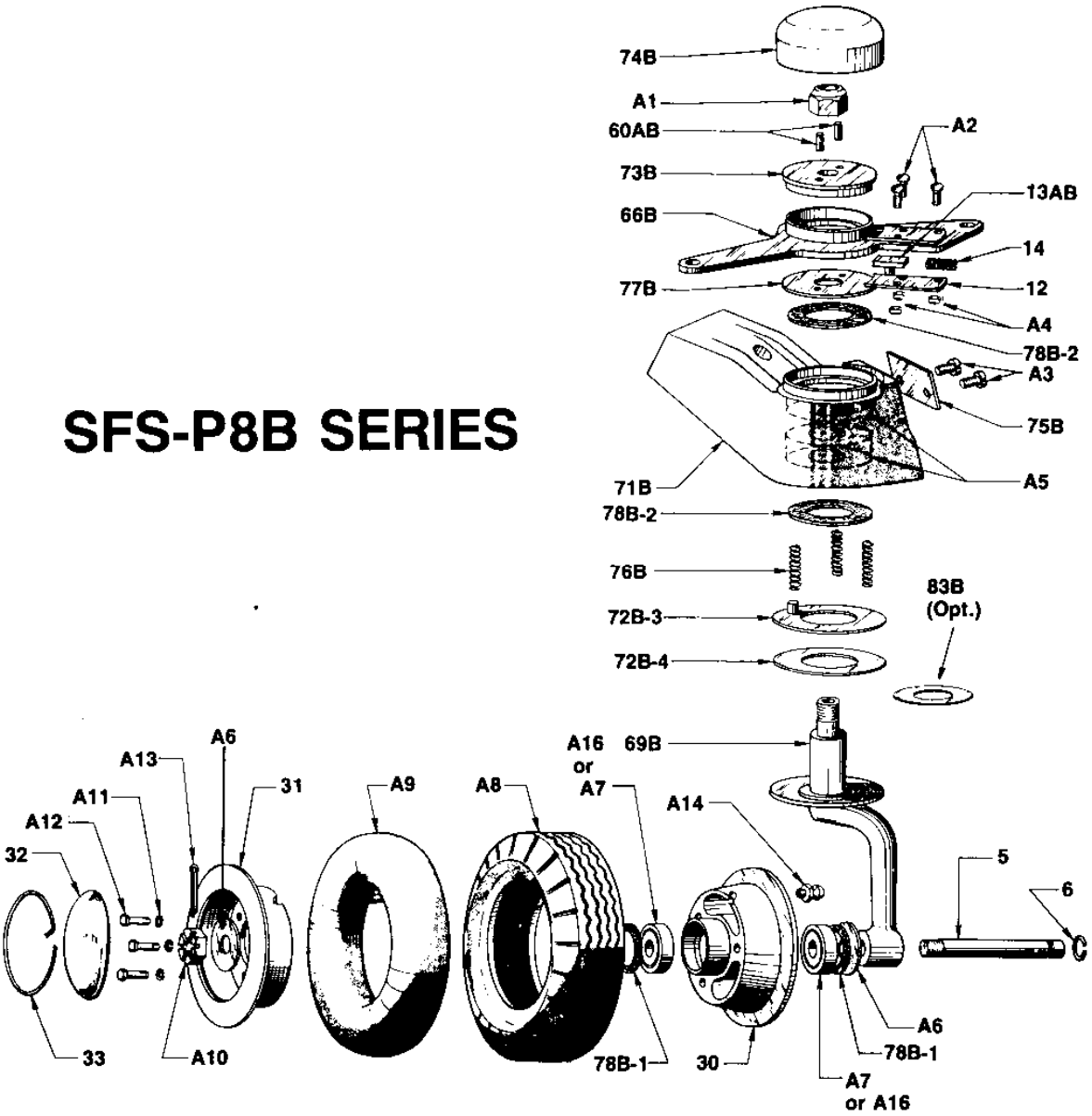


FIGURE 1

D. TAILWHEEL INSTALLATION

1. Check all bolts and nuts holding the tail springs to the fuselage. They must be tight so that there is no play or side movement in the springs or their attachment.

2. Tighten the bracket bolt and back off enough to install the cotter pin. There must be no looseness or play between the bracket (71B) and the spring.

3. Install the connector springs, using the **heavier spring on the right side.** Install the springs so that the light spring is compressed approximately 112 to 3/4 inch.

4. Inflate the tire to approximately 20 psi Higher pressure may be used if the wheel has no tendency to shimmy.

POWER PLANT SYSTEM

The power plant system consists of the engine, engine mount, propeller, cowl, engine controls, exhaust, air intake system and fuel system.

ENGINE:

Engine instructions covering the care and operation are covered in the engine manufacturer's Operator's Manual.

ENGINE MOUNT:

The engine mount is a welded structure of chrome molybdenum steel (4130) tubing. The engine is attached to the mount by means of four point suspension to four (4) mounting pads on the engine case. Each leg attachment incorporates a shock mount designed to absorb torsional fluctuation and vibrations of the engine. The engine mount assembly is bolted at the firewall to the fuselage structure by means of four (4) 3/8" attaching bolts, (requiring a torque of 13.3-15.8 ft. lb.) which should be checked for tightness periodically.

An extremely close visual inspection of the engine mount should be made to periodically check for cracks, dents, weld failures, etc., of the mount tubular members as well as the general condition of the mount. At regular intervals, the attaching bolts at the engine should be checked for tightness (required torque value of 40.0-57.5 ft. lb.) The rubber engine mounts should be carefully inspected and replaced if necessary at each 100-hour inspection. Excessive engine vibration at various RPM ranges should also prompt their inspection. Care should be exercised to prevent the rubber mount's contact with oil as this may result in their premature deterioration. When torquing any engine or mount bolts, precaution should be taken against any over-tightening, as this also may cause early failure.

PROPELLER:

The propeller manufacturer's Installation, Operation and Service manual contains information on the proper use and care of the propeller.

COWLING AND BAFFLING:

The cowling consists of an upper and lower section. Removal is accomplished by unlocking the dzus fasteners and removing the AN526 screws.

A periodic inspection of the cowling should be made checking for cracks, chafing, security of attachment, etc.

Baffling should be checked for security and the rubber sealing extensions should be checked for wear and security. When the cowl is installed, these sealing extensions should lay up, forward or inboard, and provide a good seal against the cowl.

BRACKETT AIR FILTER:

Service by: 1. Replacement of element when:
a) Every 12 months regardless of hours used,
b) or, every 100 hours use,
c) or, when operating in extremely dusty conditions, change frequently; use your good judgment.

Special instructions for new element: Squeeze out all excess wettant in element prior to installation. And DO NOT WASH OUT wettant as this will destroy some of the filter's efficiency. Be sure safety pin is in place after installing.

AIR FILTER:

Visually inspect at each periodic maintenance. Follow cleaning instructions as printed on air filter. Clean periodically as determined by environmental conditions encountered. Replace when cleaning no longer services unit.

EXHAUST SYSTEM:

Remove Heater Shells, check mufflers and tailpipes for cracks. Check attachments for security. Note that the tailpipe clamps and the muffler-to header attachments should not be tightened to the point of rigidity, but should be loose enough to be moved easily by hand.

Check the heater shell retaining screws for security and ensure that hot air hoses are clamped tightly and are not worn or chafed.

FUEL SYSTEM:

Two (2), 21.5 gallon main fuel tanks, mounted in the inboard end of the wings, have front and rear outlets. The fuel lines running from these tanks terminate at the fuel selector valve on the left side kick panel. The fuel selector valve has four positions: LEFT, RIGHT, BOTH and OFF. The fuel then runs through the firewall to the fuel gascolator. Fuel runs from the gascolator to the electric fuel boost pump, to the engine driven fuel pump, and then to the carburetor.

If installed, two (2) auxiliary wing tip fuel tanks, eleven and one-half (11.5) gallon capacity, are mounted in the second from the outboard wing bay. They are fuel transfer tanks and simply supply fuel to the main tank through a small vibrator pump.

The fuel line should be checked for cracks and chafing every 100 hours or annually and the gascolator should be cleaned at the same time. The auxiliary tank transfer pump strainers should be cleaned at the same interval. This is done by removing the pump bottom with a 5/8" wrench. The pump is on the rear spar, inboard of the auxiliary tank, and the bottom is exposed.

ELECTRICAL SYSTEM

The electrical system is a 14 or 28 volt, 50 amp, direct current, single wire circuit using the airplane structure as a ground return to the battery. All wiring in the airplane is fabricated into harnesses which are groups of related wires tied together. Most of the harnesses originate at circuit breakers on the main bus (center of instrument panel) and terminate at the load (light, pump motor, etc.) A wiring diagram is shown at the end of this manual.

CAUTION: Addition(s) of electrical equipment must not cause the total load to exceed 50 amperes. The total rated alternator capacity is a nominal 63 amperes at cruise rpm. Paragraph 4-26(d) of FAA AC 43.13-1A limits the total continuous load to 80% of the total rated capacity, or 50 amperes. A 50 amp circuit breaker is installed in aircraft.

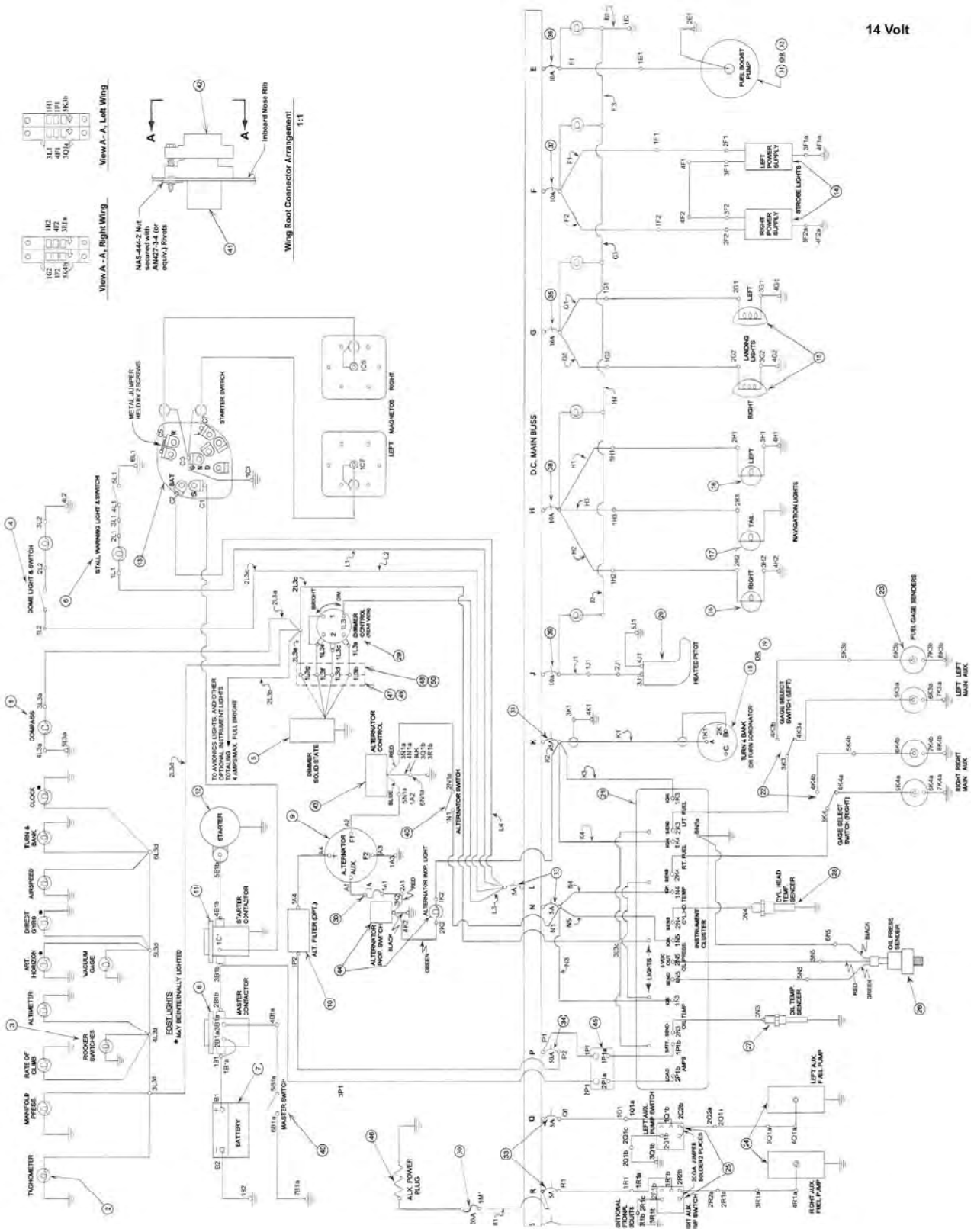
BATTERY:

A lead plate type storage battery rated at 12 or 24 volts is installed in the battery frame assembly under the copilot's seat (or on firewall). The battery supplies current for the airplane electrical system when the master switch is in the "ON" position only. A heavy-duty battery solenoid switch is installed next to the battery and is controlled from the Instrument panel by the battery switch.

The battery is the sealed type, with the base being integrally vented. Tubes attached to the case vent the battery to the fuselage bottom. Battery caps should be kept tight to prevent electrolyte spillage. If spillage does occur, the affected area should be cleaned with a liberal application of an acid neutralizing solution such as baking soda and water.

This battery is considered fully charged at a hydrometer specific gravity reading of 1.265. A low charge would be 1.225 or lower. Operating with a low charge will shorten the life of the battery and can be prevented by recharging or operating with the electrical equipment turned off until the battery has been sufficiently recharged.

Electrical Schematic The wire numbering system has been designed to ease tracing a faulty wire. The circuit tracing code is as shown below in the
s



chematic. Wires are plainly labeled near each end.

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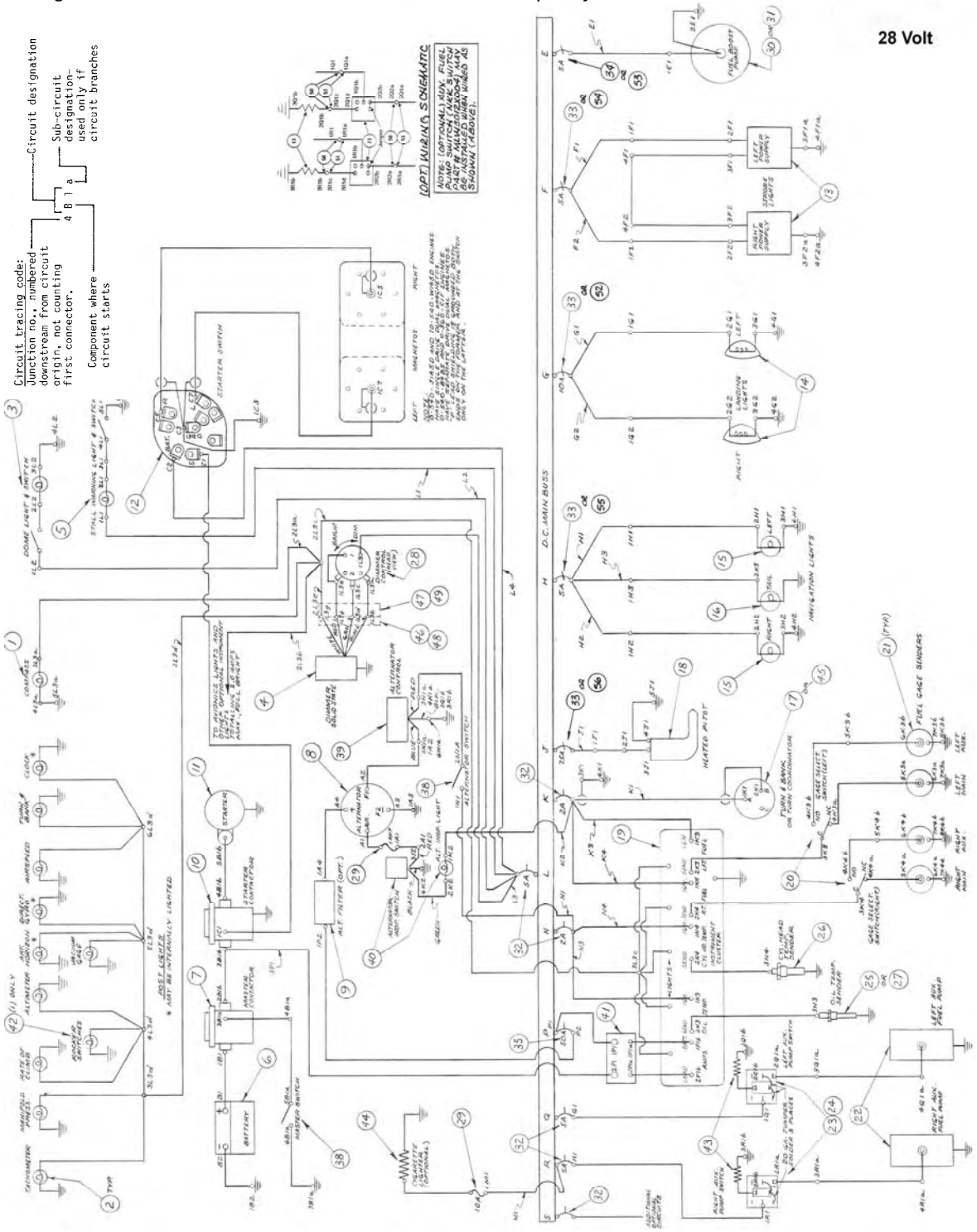
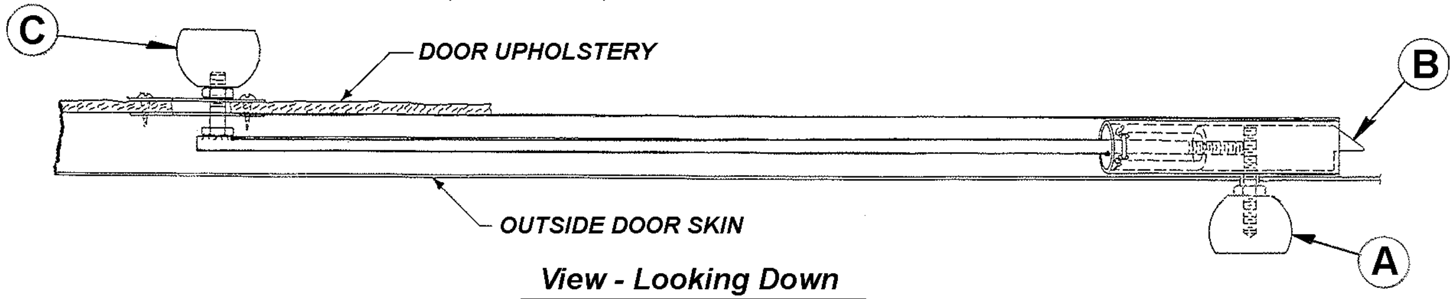
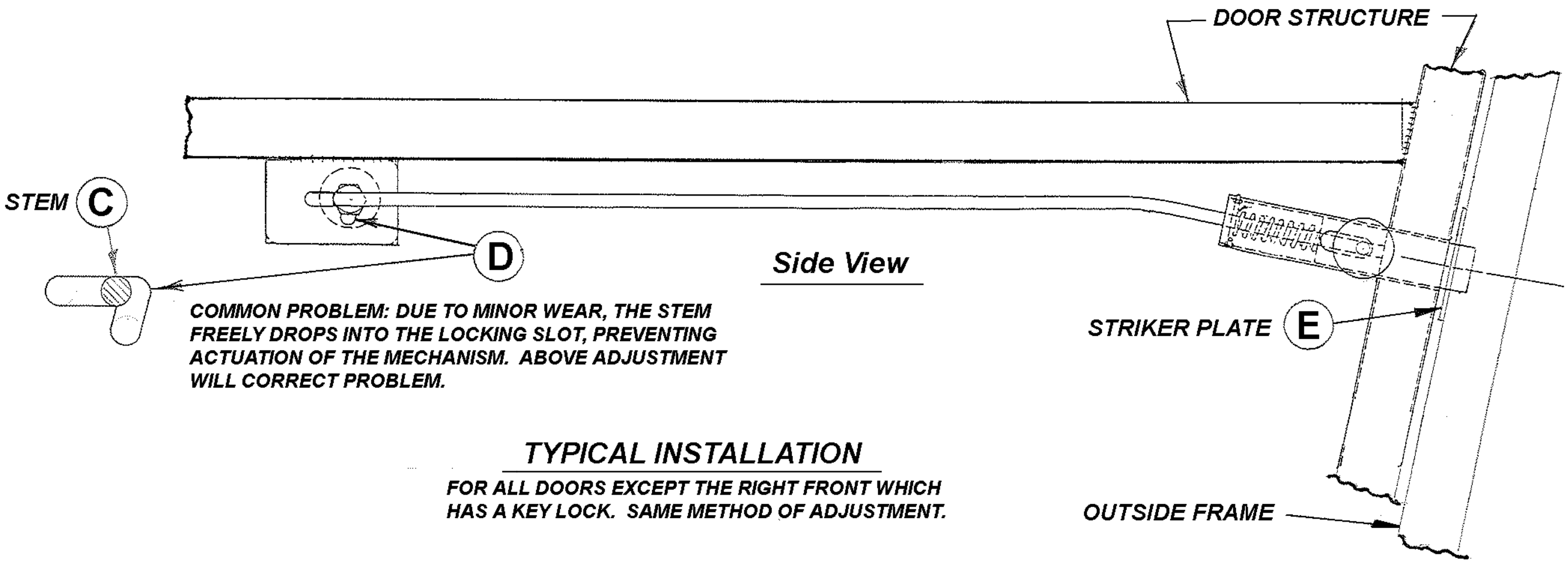


DOOR LATCH ADJUSTMENT PROCEDURE

1) ***WITH DOOR OPEN, REMOVE(UNSCREW) OUTSIDE KNOB (A) AND THREADED STEM.***
2) ***ROTATE BOLT (B) WHICH WILL CAUSE INSIDE KNOB (C) TO TRAVEL IN ITS SLOT. ADJUST THE POSITION OF THE INSIDE KNOB STEM SO THAT IT IS ALMOST READY TO DROP INTO ANGLED LOCK SLOT (D). BOLT (B) SHOULD BE IN PROPER ROTATIONAL POSITION TO ENTER STRIKER PLATE (E). MODERATE FORCE SHOULD BE REQUIRED TO CAUSE KNOB (C) TO DROP INTO LOCK SLOT (D).***
3) ***REINSTALL OUTSIDE KNOB (A).***
4) ***CHECK OPERATION: IT SHOULD BE EASY TO MOVE INSIDE KNOB (C) IN AND OUT OF LOCK SLOT (D) WITH NO TENDENCY FOR THE KNOB TO DROP INTO THE SLOT BY ITSELF. WHEN DOOR IS CLOSED, BOLT (B) SHOULD READILY ENTER STRIKER PLATE SLOT (E) AND FIRMLY LATCH DOOR. FILE SLOT, IF NECESSARY, FOR CLEARANCE.***



View - Looking Down



Side View

COMMON PROBLEM: DUE TO MINOR WEAR, THE STEM FREELY DROPS INTO THE LOCKING SLOT, PREVENTING ACTUATION OF THE MECHANISM. ABOVE ADJUSTMENT WILL CORRECT PROBLEM.

TYPICAL INSTALLATION

FOR ALL DOORS EXCEPT THE RIGHT FRONT WHICH HAS A KEY LOCK. SAME METHOD OF ADJUSTMENT.

SECTION VI

Airworthiness Limitations

The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§43.16 and 91.403 of the Federation Aviation Regulations unless an alternate program has been FAA approved.

The airframe does not have mandatory life limits or overhaul requirements. See Textron Lycoming Operator's Manual, p/n 60297-12, Revision No. 60297-12-6 or later and the Hartzell Owner's Manual and Logbook, p/n 115N, Revision 10 or later for the constant speed prop or the Sensenich Fixed-Pitch Metal Propellers Instructions For Use and Care dated 9/4/97 or later for their airworthiness limitations.