WIPAIRE, INC.

WIPLINE FLOATS • SKIS • MODIFICATIONS • AIRCRAFT SALES
AVIONICS • INTERIOR • MAINTENANCE • PAINT REFINISHING

SERVICE MANUAL
and
INSTRUCTIONS FOR CONTINUED AIRWORTHINESS
for the
WIPLINE MODEL 6000/6100 AMPHIBIOUS AND SEAPLANE FLOATS

Revised: December, 2015

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SECTION PAGE

LOG OF REVISIONS

REV	PAGES	DESCRIPTION	DATE
A		Added an inspection time limit and tolerances for the Nose Block Track wear.	4/18/06
B	1-3, 5,6,10,2 5,27 39	The cover page and footers were revised, additions to maintenance were made on 5, 6, 10. The T-seal upgrade is on page 25. More metal repairs included on 27. Added WT & Bal. Info.	5/1/08
C	5,6,16 27	Added some corrosion & cleaning procedures and warnings. Corrected rudder cable tension.	8/30/08
D	3,5,7 9, 13 14	Added new pages for customers regarding warranty. Updated cleaning & corrosion recommendations.	7/15/09
E	ALL	Reformat of entire document, Add green grease as approved grease	4/16/2013
F	22, 23	Added Shear Torque Chart, PR 1440 C Sealant and Tef-Gel, Removed Warranty Claim Form.	5/26/2015
G	5, 12, 22, 23	Added Dow Corning DC4, Corrosion X, and Mobil Aviation Grease SHC 100 to approved product list. Modified torque limit section	12/4/2015

NEW CUSTOMER INFORMATION

Customer Name	
Billing Address	
Shipping Address	
Phone Number	Fax Number
Purchasing Contact	Phone Number
E-Mail	Fax Number
Accounts Payable Contact	Phone Number
E-Mail	Fax Number
Type(s) of Aircraft Owned or Maintained	
Model(s) of Floats and Skis Owned or Maintained	
FedEx and/or UPS account number (if applicable)	

Please return to Wipaire Customer Service:

Fax 651-306-0666 Phone 651-306-0459 CustomerService@wipaire.com

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INTRODUCTION

This manual describes the general servicing and maintenance for the Model 6000/6100 float, including hull and landing gear. For services and repairs not covered by this manual contact Wipaire Customer Service.

The service products referred to throughout this manual are described by their trade name and may be purchased from Wipaire Customer Service.

To contact Wipaire for technical support or parts sales, call, write or email:

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1.0 GENERAL

The model 6000/6100 seaplane or amphibious float is an all aluminum constructed float with watertight compartments. The actual displacement in fresh water for each float is 5664 pounds buoyancy for the seaplane and 5518 pounds buoyancy for the amphibian. The amphibian float is geometrically the same as the seaplane except for the addition of landing gear and internal structure for the gear.

The water rudder system is cable operated with ball bearing pulleys. Water rudder cables tie into the existing aircraft rudder system.

The main landing gear has dual 600 x 6 6-ply tires and the nose landing gear has one 500 x 5 6-ply tire. The gear system is hydraulically actuated and driven by two hydraulic pumps. Brakes are hydraulic and have a caliper on each main wheel for a total of four brakes.

Steering on land is accomplished by differential braking. The nose wheels are full castering.

Access to the float interior is accomplished by removing covers on the top deck and six covers inside the wheel well. When necessary, water inside the float hulls may be removed through pump out cups located on the outboard edge of each float top skin.

2. 0 FLOAT HULL MAINTENANCE

2.1 GENERAL

The float structure is manufactured entirely of 6061-T6 corrosion resistant aluminum sheet and extrusions. Skins on the inside are primed with a 3M SCOTCHWELD primer after being cleaned and acid-etched. Exterior surfaces are cleaned and alodined. Surfaces are then primed with an epoxy-based primer and finished with enamel color paint.

Hard Landing and Damage Investigation

After a thorough cleaning of the suspected damaged area, all structural parts should be carefully examined to determine the extent of damage. Frequently the force causing the initial damage is transmitted from one member to the next causing strains and distortions. Abnormal stresses incurred by shock or impact forces on a rib, bulkhead or similar structure may be transmitted to the extremity of the structural member, resulting in secondary damage, such as sheared or stretched rivets, elongated bolt holes or canned skins or bulkheads. Points of attachment should be examined carefully for distortion and security of fastenings in the primary and secondary damaged areas at locations beyond the local damage. Inspect aircraft tubes in area of float fitting attach for sign of bending, cracked welds, or any other signs of damage.

Cleaning

The outside of the float should be kept clean by washing with soap and water. Special care should be taken to remove engine exhaust trails, waterline marks, and barnacle deposits. After saltwater operation, washing with fresh water should be done daily with special attention to hard-to-reach places such as: seams, wheel well, etc.

Alternatively, water taxiing in FRESH WATER at step-speed can help to flush the entire system.

OPERATORS IN SALTWATER ARE STRONGLY CAUTIONED – RINSING THE ENTIRE AIRCRAFT & FLOATS WITH FRESH WATER AT THE END OF EACH DAY OR PERIODICALLY IS CRITICAL. FAILING IN THIS CLEANING CAN SEVERLY SHORTEN THE LIFE OF THE FLOATS.

The float interior should be flushed if salt water enters the compartments. If the floats are being stored inside, remove inspection covers so the interior will dry out.

THE ABOVE CLEANING TECHNIQUES ARE VITAL FOR KEEPING CORROSION TO A MINIMUM. SALTWATER OPERATIONS AND ENVIRNMENT ARE STRONGLY LINKED TO CORROSION AND MUST BE ADDRESSED PROACTIVELY.

Corrosion

Corrosion is a reaction that destroys metal by an electrochemical action that converts metal to oxide. Corrosion is accelerated when in contact with dissimilar metals such as aluminum and steel, or any material that absorbs moisture like wood, rubber, or dirt.

After removing the corroded area, restore area to original finish (prime and enamel). BOESHIELD T9, Corrosion X, or ACF-50 may also be applied to stop corrosion. Refer to manufacturer's instructions for application instructions.

Maintaining the float inside and outside finishes by washing after saltwater operations will help protect the float from corrosion. Periodically all hardware should be covered with a waterproof grease or Paralketone. Under saltwater conditions, bolts should be removed at least once a year and grease reapplied to the shafts, heads and nuts.

THE ABOVE CLEANING TECHNIQUES ARE VITAL FOR KEEPING CORROSION TO A MINIMUM. SALTWATER OPERATIONS AND ENVIRONMENT ARE STRONGLY LINKED TO CORROSION AND MUST BE ADDRESSED PROACTIVELY.

3.0 FLOAT HANDLING, JACKING, AND AIRCRAFT TOWING

To jack the floats for servicing tires, brakes, or doing retraction tests, it is recommended that a floor type jack (one ton minimum.) be used. These jacks are commonly used for auto repair. The jack should be positioned on the keel centerline on the first bulkhead forward of the step. Example is shown to the left of this text. The jack should contact the keel squarely and if room permits, slip a board between the jack and keel. Raise the float slowly; making sure the aircraft stays balanced. After raising, block up the keel in several places and lower the jack. Raise only one float at a time with the opposite float landing wheels chocked. Position a sawhorse under main and after body keel to keep aircraft from tipping fore and aft.

For raising the aircraft for float installation and removal, use the lifting rings if provided or lift at front wing attach points. Aircraft may be lifted by spreader bars with a launching dolly. **WITH CAUTION** lift on both spreader bars as close to float hull as possible.

When towing the amphibian aircraft, tow lugs are provided on the lower forward side of the nose spring. A rigid “V” frame can be fabricated to attach to these lugs and aircraft towed with a tractor. Wipaire Parts has this tow bar available.

A lifting apparatus that will pick the aircraft up by the lifting rings at wing attach points from a ceiling hoist, to be fabricated. Contact factory for details if necessary.

4.0 AMPHIBIAN LANDING GEAR SYSTEM OPERATION & MAINTENANCE

The landing gear incorporated within the amphibious floats on this airplane is retractable, quadricycle type with two swiveling nose (or bow) wheels and four (4) (two (2) sets of dual) main wheels. Air-oil shock struts on the two main landing gear assemblies provide shock absorption.

The main landing gear has dual 6:00 x 6 6-ply type III tires and the nose landing gear has one 5:00 x 5 6-ply tire. The gear system is hydraulically actuated and driven by two hydraulic pumps. Brakes are hydraulic and have a caliper on each main wheel.

Steering on land is accomplished by differential braking. The nose wheels are full castering.

Landing gear extension and retraction is accomplished by two (2) electrically-driven hydraulic pumps and four (4) hydraulic actuators (one (1) for each gear). The hydraulic pumps are located in fuselage aft of cockpit and the hydraulic actuators are located adjacent to each gear. Hydraulic system fluid level should be checked periodically by viewing the sight glass for fluid level in the upper one-third of the range. If fluid is low, fill with MIL-H-5606 or equivalent. Filters are installed on pickup tube inside of hydraulic reservoirs. Clean every 100 hours.

Landing gear operation is initiated by movement of the landing gear handle. When the handle is repositioned, hydraulic pressure in the system will drop and pressure switches will automatically turn on the hydraulic pump motors to maintain operating pressure in the system. When the gear cycle is completed, the pump will automatically shut off. If the pressure in the system drops to a preset value, the pressure switches turn the pump motors back on and build up the pressure to the limit again. Eight (8) position-indicator lights four (4) gear UP and four (4) gear DOWN are provided to show landing gear position. Two (2) additional indicator lights show when the landing gear pump motors are operating.

4.1 LANDING GEAR HANDLE

The landing gear handle controls a hydraulic selector valve within the selector head in the instrument panel and has two (2) positions (UP and DOWN LAND) which give a mechanical indication of the gear position selected. From either position, the handle must be pulled out to clear a detent before it can be repositioned.

4.2 INDICATOR LIGHTS

Ten (10) indicator lights are mounted on the landing gear control unit adjacent to the landing gear handle. Four (4) blue indicator lights, labeled NOSE and MAIN (left-hand lights for the left float and right-hand lights for the right float), show by their illumination that the landing gear is up and locked. The four (4) amber indicator lights, labeled NOSE and MAIN (left-hand lights for the let float and right-hand lights for the right float), are illuminated when the landing gear is down and locked. Neither set of lights is illuminated when the landing gear is in transit. Two (2) red indicator lights, labeled PUMP ON 1 and 2 illuminate when current is supplied to the landing gear motors. If the motors continue running during flight or on and off repeatedly, the motors should be shut off by pulling AMPHIBIAN PUMP 1 AND AMPHIBIAN PUMP 2 circuit breakers. Continual running of the motors can result in premature motor failure. Prior to landing, the circuit breakers should be pushed in to reactivate the circuits. Troubleshoot hydraulic problem per section 5.4.

4.3 LANDING GEAR OPERATION

To retract or extend the landing gear, pull out on the landing gear handle and move it to the desired position. When the handle is positioned, pressure on the hydraulic system reduces to where the hydraulic motors automatically turn on. The motors power the hydraulic pumps and actuate the gear actuator for each gear. During operation of the landing gear motors the PUMP ON 1 and 2 indicator lights are illuminated. When the gear cycle is completed, pressure builds up in the hydraulic system and automatically shuts off the hydraulic motors. Each gear operates independently of the other, and therefore, the position lights illuminate at various times.

4.4 EMERGENCY PUMP HANDLE

An emergency hand pump is located on the floor between the front seats in the event the normal hydraulic system fails. This hand pump may be used to retract or extend the land gear. To actuate the hand pump, pull out the handle. Prior to utilizing the emergency hand pump, pull the AMPHIB PUMP 1 and 2 circuit breakers to deactivate the electric hydraulic pumps. Select UP and DOWN using the normal landing gear selector handle. Place the emergency hand pump handle in the pump and pump up and down. When a gear reaches the selected position, its indicator light will illuminate. After all four (4) gears are in the selected position there is a noted increase in resistance of hand pump operation.

5.0 MAIN AND NOSE GEAR OPERATION, REMOVAL AND SERVICE

5.1 DESCRIPTION AND OPERATION

Retraction and extension of the main and nose landing gear is effected by a hydraulic actuation system shown schematically in figure 5.3.

The gear system is hydraulically actuated and driven by two hydraulic pumps located in the aft fuselage.

A pressure of between 500 and 1000 psi is maintained in the supply line. When the pressure falls below 500 psi, the pressure switch activates the pump solenoid, providing power to the pump. When the pressure reaches 1000 psi, the pressure switch deactivates the solenoid and the pump motor stops. Figure 5.2 shows the electrical schematic of the system. A check valve on the output side of the pump retains pressure in the system while the pump is off. The pump has an internal relief valve, which directs oil back to the pump reservoir when the line pressure exceeds 1200 psi. The system also has an internal relief valve to protect against thermal expansion when line pressure exceeds 1900 psi.

A cockpit mounted control valve accomplishes the selection of gear up or gear down. Each float gear has individual indicator lights on the control valve allowing the pilot to confirm that each gear has fully retracted or extended.

An emergency hand pump is provided, in case of total electric pump failure, or loss of fluid. The reservoir has additional hydraulic fluid, available only to the hand pump.

The main gear is mechanically locked in both up and down positions. Locking and unlocking is effected utilizing a small amount of lost motion of the actuator rod. Retraction takes place when pressure is exerted on the actuator piston driving the collar along the slide tube. The lock is tripped when the follower slides up the contoured track in the actuator as shown in figure 5.3. A reverse process affects extension. Gear position light proximity switches are closed when the appropriate hook (containing the magnetic material) nests over the locking bar.

Shock absorption for the main landing gear is provided by a hydraulically dampened air spring. Figure 5.4 shows the main components. The oil and air share a common chamber. When the oleo is collapsed, the oil is forced through the main orifice, compressing the air in the upper cylinder. Extension reverses this process. The extended oleo is initially set at the factory to 140 psi no load. In-field adjustment of air pressure and oil volume is described in this section.

The nose gear has an over-center down lock. Retraction occurs when pressure is applied to the forward face of the actuator piston and the carriage is drawn along the tracks in the nose box as shown in figure 5.6. Gear position light proximity switches are closed when the piston containing the magnetic material has reached either end of its travel.

The nose gear consists of composite fiberglass beams that are attached at the bottom to castering blocks. Inside the block is a castering pin that is set into the machined fork assembly. The castering pin allows the nose wheel to pivot in a complete circle. The geometry is such that no shimmy dampers are necessary.

A spring loaded cam rides in a groove machined in the castering pin. This groove as a flat surface on the back face with the result that the cam provides retention of the pin the block and self-centering of the wheel.

5.1.1 SERVICE – NOSE GEAR

The nose gear pivot assembly should be cleaned every 25 hours or more frequently whenever in water for extended period of time. Nose gear tracks after thorough cleaning can be left clean and dry or wiped with a silicone sprayed cloth on a stick or rod and run along tracks inside of the nose box, both sides.

THE NOSE PIVOT ASSEMBLY AND NOSE BOX TRACKS ARE EXPOSED TO THE ELEMENTS LIKE DIRT AND WATER. CAREFUL AND PROACTIVE CARE IS REQUIRED.

The nose wheels contain grease nipples for the wheel bearings. They should be greased every 25 hours.
Nose tires are standard 5:00 x 5, 6-ply, inflated to 40 +/- 5 psi.

5.1.2 NOSE BOX TRACK WEAR

Due the wear over time the roller/slide block places on the track as the gear are retracted, the block needs to be measured for the amount of wear. The tolerance for wear is .050 inches. If the wear is, or is less than the limit, it can still be used. If the wear in the track is greater than .050 inches, the block must be replaced. This check is to be done every 200 hours and is part of the maintenance checklist.

On the 6000 Series Floats Gear Track P/N 6A07337 (-001 LT -002 RT)

5.1.3 SERVICE – MAIN WHEELS AND BRAKES

Grease nipples are provided on all wheels and bearings and should be greased every 25 hours or after an extended period of time in the water. Water/heat resistant grease is recommended.

The dual piston brakes need no special care other than to maintain the brake disc free of rust, which causes premature brake lining wear. Bleeding is carried out in the usual manner from the bottom up.
Main wheel tires are standard 6:00 x 6, 6-ply type III aircraft tires, inflated to 40 +/- 5 psi. (Refer to figure 5-5)

5.1.4 SERVICE – MAIN GEAR OLEO

Oil Level - The correct level is best set by draining and refilling with the correct quantity of fluid (1050 ml). This should be done with the oleo removed from the float. CAUTION: Release air pressure and remove air valve before attempting to service oleo. After filling, refit valve and cap, then pressurize to 140 psi. (Note: Use only MIL-H-5606 hydraulic fluid.)

Air Pressure – The correct air pressure is 140 psi (+/-10 psi) on a fully extended oleo (no load) or it can be inflated to approximately 5-6 inches on an unloaded aircraft while sitting static on level ground.

Seals – Seals should be replaced whenever the oleo is disassembled or leaking.
CAUTION: Release air pressure and remove air valve before attempting to disassemble oleo.

5.2 ADJUSTMENT/TEST

5.2.1 NOSE GEAR

Adjustment of actuator stroke is provided at the ends of the piston rods.

The length of the nose gear rod is adjusted such that the over-center knuckle (brass) rollers just bottom out on the down side and the piston just bottoms out on the mounting flange.

The up stops nests in the up-stop pin. See figure 5.6 for location and assembly.

Nose gear proximity switches are located on clips that are mounted on the outer cylinder body, one on each end. The most forward switch is for the gear down lights and most aft is for the gear up position lights. Set the proximity switch mounting clip along outer cylinder body to a position such that the light goes out when the over-center track is about ¼ inch from bottomed position while traveling in the up direction. Lights should come on about 1/8 inch from the bottomed position while traveling in the down direction.

The cylinder piston has a magnet that will activate the proximity switches.

5.2.2 MAIN GEAR

The main gear actuator cylinder is not adjustable. These are pre-set at the factory to ensure that the main gear is locked at the end of each stroke and that correct indication is given on the cockpit console. The up and down lock may be adjusted so the lock is fully engaged by adjusting the set screws shown in figure 5.3. Loosen the jamb nut adjust and tighten jamb nut.

The main gear proximity switches are located on each end of the gear stroke. The forward switch is located on the forward side of the gear tunnel. It is accessible through the top deck access cover. The aft proximity switch is located on the float bulkhead just aft of the wheel well, accessible though the float top deck cover.

The main gear proximity switches are adjusted loosening the mounting screws and positioning them as such that the light goes out when the lock hook is raised about 1/8 inch off its nested position and comes on again upon nesting.

5.2.3 BLEEDING HYDRAULIC SYSTEM AFTER SERVICE

The system automatically bleeds, provided sufficient oil is maintained in the reservoir. To check the fluid level, fill the reservoir with hydraulic oil and cycle the gear. The fluid level should be maintained in the upper one third (1/3) of the sight glass. If the reservoir empties (i.e. fluid disappears in sight glass) stop the cycle by pulling the circuit breaker on the control panel. Fill the reservoir again and complete the cycle. Continue this procedure until the fluid level in the reservoir stabilizes (it will vary in level between up and down positions). If the fluid level continues to decline during gear cycles, check for external leaks.

5.3 MAIN AND NOSE GEAR REMOVAL AND DISASSEMBLY

5.3.1 REMOVAL OF MAIN GEAR OLEO

Jack the aircraft by method described in section 3. With main wheels off the ground (both sides), run the gear up so that the main carriage is approximately 2 inches forward of down lock position. This must be accomplished to remove the top oleo bolt. In order to remove the lower bolt, it is necessary to remove the wheel on the head side of the bolt.

5.3.2 REMOVAL OF MAIN GEAR RETRACTION CYLINDER

Relieve pressure in system, place gear selector handle in neutral position (lever between up and down), and remove hydraulic lines. Remove end cap from end of cylinder. Drain fluid. Remove forward end of cylinder from bulkhead flange. Remove cylinder support ring from bulkhead. NOTE: Piston to be in the up position for cylinder removal. Remove cylinder from piston and up through top float inspection cover. To remove piston, remove top inspection cover on top forward end of gear tunnel, accessible from top float inspection cover forward of step. Pull back piston to expose top of carriage in center of access cover. Remove .25 dia. retention bolt. Remove piston by pulling aft. See figure 5.3 for part breakdown.

5.3.3 REMOVAL OF MAIN GEAR DRAG LINK

Remove drag link from trunnions on step bulkhead. Axle is heat shrunk to drag link and is not removable.

5.3.4 REMOVAL OF NOSE GEAR FROM NOSE BOX

Gear must be in down position. Relieve pressure in system, place gear selector handle in neutral position (lever between up and down), and remove rear hydraulic line. Remove (4) bolts on forward end of cylinder. Drain fluid. Pull aft to expose internal piston rod. Loosen jamb nut on forward side of cylinder ram at rod end. Turn piston from aft side of nose box out of rod end. Lift up on gear assembly to unlock. Slide out of nose box. Note: On installation adjust piston so it bottoms out on aft flange when nose gear is in locked position. Also note orientation of trolley blocks. The side with the most edge distance from hole is to go toward each other on inside of trolley. (See figure 5.6 for details).

5.3.5 REMOVAL OF NOSE GEAR BOX

Remove bolts securing forward box from nose bulkhead. Remove bolts securing aft box from bulkhead (2). Slide box out from front of float. Note: Sealant will have to be cut for removal and replaced when installing.

5.3.6 REMOVAL OF LOWER NOSE GEAR FROM PIVOT BLOCK

With weight off of the nose wheel, remove 2 bolts on plate on aft side of pivot block. Remove spring and detent piston. Nose fork assembly will drop down from pivot block.

5.3 SERVICE SCHEDULE

As coded in the Inspection Time Limits chart in this section, there are items to be checked each 25, 50, 100, and 200 hours. Also, there are notes on special items which may require servicing at more frequent intervals.

- When conducting an inspection at 25 hours, all items marked for 25 hours would be accomplished.
- When conducting an inspection at 50 hours, the 25 and 50-hour items would be accomplished.
- When conducting an inspection at 100 hours, the 25, 50, and 100-hour items would be accomplished.
- When conducting an inspection at 200 hours, the 25, 50, 100, and 200-hour items would be accomplished.
- A complete inspection (Annual Inspection) would include all 25, 50, 100, and 200-hour items.

When servicing float hull and amphibian components, below is list of recommended lubricants and “protection” products. This lists products used by Wipaire during assembly of the floats.

There may be equivalent products that are just as satisfactory for protection. It is recommended if trying different products, to inspect them frequently so as to determine their effectiveness.

Protection of nuts, bolts, hydraulic lines or metal surfaces
Zip D-5029NS Corrosion Inhibiting Compound
Zip Chemical Company

CRC – SP400 Soft Seal
CRC Industries

General Lubricants
LPS 1, LPS 2 and LPS 3
LPS Industries

Wheel Bearings
*HCF Grease, P/N 605
HCF Industries

*Aeroshell 22
Shell Global Solutions

*Green Grease, Multi-Purpose
Green Grease Inc.

*Aviation Grease SHC 100
ExxonMobil Aviation Lubricants

Rust Protection
Boeshield T9 Rut Protection
Boeing Company

Corrosion X
Corrosion Technologies Corp.

ACF-50 Rust Protection

Tef-Gel
Ultra Safety Systems, Inc.

Float Sealant
890 B2 or B4
Pro Seal Company

PR 1440 C
PPG Aerospace

1422 B2, B4 or B6
Pro Seal Company

RTV Silicones
General Electric

SIKAFLEX 201 or 252
Sika Manufacturing

Telflon Spray
6P-730A
Comet Industries

Electrical Insulating Compound
Dow Corning 4 (DC4)
Dow Corning Corporation

* If existing grease cannot be identified you must lubri-flush all float grease fittings until visibly exhausting all old grease and new grease is coming out. Additionally if you cannot determine existing grease in wheel bearings, completely clean and repack bearings with new grease.

Hydraulic Fluid
Mil-H-5606

As general inspection guidelines, each of the following areas should be inspected for their own unique attributes:

Movable Parts
For lubrication, servicing, security of attachment, binding, excessive wear, safetying, proper operation, proper adjustment, correct travel, cracked fittings, security of hinges, defective bearings, cleanliness, corrosion, deformation, sealing, and tension.

Fluid Lines and Hoses
For leaks, cracks, dents, kinks, chafing, security, corrosion, and deterioration.

Metal Parts

For security of attachment, cracks, metal distortion, broken welds, corrosion, condition of paint, and any other apparent damage.

Wiring

For security, chafing, burning, defective insulation, loose or broken terminals, corroded terminals.

Bolts in Critical Area

For corrosion, correct torque when installed, or when visual inspection indicates a need for a torque check.

Nut torque should be applied depending on the hardware application, unless the torque is specified for a certain joint in this manual or installation drawings.

****Tension Application**

Nut-Bolt Size	Torque Limits In-lbs	
	Min.	Max.
8-36	12	15
10-32	20	25
1/4-28	50	70
5/16-24	100	140
3/8-24	160	190
7/16-20	450	500
1/2-20	480	690
9/16-18	800	1,000
5/8-18	1,100	1,300
3/4-16	2,300	2,500
7/8-14	2,500	3,000
1-14	3,700	4,500
1 1/8-12	5,000	7,000
1 1/4-12	9,000	11,000

****Shear Application**

Nut-Bolt Size	Torque Limits In-lbs	
	Min.	Max.
8-36	7	9
10-32	12	15
1/4-28	30	40
5/16-24	60	85
3/8-24	95	110
7/16-20	270	300
1/2-20	290	410
9/16-18	480	600
5/8-18	600	780
3/4-16	1,300	1,500
7/8-14	1,500	1,800
1-14	2,200	3,300
1 1/8-12	3,000	4,200
1 1/4-12	5,400	6,600

**A Torque of 80% should be used when Tef-Gel is applied to the bolt.

Some additional general maintenance areas are as follows:

Nose and Main Gear Tracks

Clean and lubricate with a dry teflon coating spray.

Joints

Spray all joints with light penetrating oil such as LPS 3 to ensure lubrication at all times.

Electrical Connections

Apply SP-400 SOFT SEAL or LPS 500 to all electrical connections to prevent corrosion.

Hydraulic Fluid

For use in all hydraulic systems, including brakes: MIL-H-5606.

INSPECTION TIME LIMITS & CHECKLIST

INSTRUCTIONS/PROCEEDURES			HOURLY LIMITS				MECHANIC		INSP.
			25	50	100	200	Right	Left	
General	Wash aircraft and floats with fresh water and inspect surfaces and hardware for signs of corrosion, especially with salt water use.	Refer to Wipaire, Inc. Corrosion Prevention Program Manual for details.	X						
	Check installed placards against the AFM or POH, and installation drawings.				X				
Hulls & Struts	Float Installation	Float exterior - inspect for damage, wrinkled metal, corrosion, paint loss, etc.		X					
	Boarding steps: disassemble as needed and grease the step slide tubes.				X				
	Disassemble and grease the flying wire clevis bolts/pins. Check flying wire tension and alignment.	Spreader Bars: inspect for loose screws and cracks & seal between fairing and side skin. Insp. fairings for cracking and loose screws.			X				
	Float covers: remove all covers and check for metal integrity and hardware security.	Also make sure seals are secure. Look for cracks under nut plates.			X				
	Float interior: Inspect all bulkheads for wrinkled metal, cracked flanges and corrosion.	Pull up baggage floors and inspect bulkheads.				X			
	Check nose box attach hardware and nose bumper.	Inspect hardware for corrosion and security.			X				
	Pumper Tube Installation - inspect for condition, security, routing of hoses.					X			

INSPECTION TIME LIMITS & CHECKLIST

INSTRUCTIONS/PROCEEDURES			HOURLY LIMITS				MECHANIC		INSP.
			25	50	100	200	Right	Left	
Water Rudder System	Water rudder boots - inspect for cuts, tears, and condition		X						
	Water rudder steering and retract systems - inspect the following: cables for broken wire; fittings for cable slippage, cracks and distortion; cable pulleys for freedom of rotation and cable guard pins for presence; rigging & tension at 40 lbs +/- 5 lbs.	Check cable rollers for ease of rotation and lube with LPS 2. Check water rudder steering cable attach bolt for wear and lube with grease.			X				
	Water rudder blades and posts - inspect for damage, security of attachment, corrosion, paint, rigging.	Check post bolts and bushing wear. Lube with LPS 2.			X				
Electrical System	Pump and indicator light wiring - inspect for chafing, broken or loose terminals and general condition.				X				
	Solenoids - inspect wiring, mounting and general condition.				X				
	Pressure Switches - inspect wiring, mounting and general condition.				X				
	Pump Motors - inspect wiring, mounting and general condition.				X				
Landing Gear Systems	Clean & Lubricate nose gear tracks	If the track is gold colored: grease for lubrication. If the track is black: should be clean and dry or clean and wipe with spray silicone on a towel.	X						
	Nose Gear Box/Block Tracks measured at slide route for wear, .050 inches or less wear tolerance.					X			

INSPECTION TIME LIMITS & CHECKLIST

INSTRUCTIONS/PROCEEDURES			HOURLY LIMITS				MECHANIC		INSP.
			25	50	100	200	Right	Left	
	Nose gear pivot blocks and forks - inspect for condition, lubrication, corrosion, paint.	Check side-play; 3/32 – 1/16 tolerance.	X						
	Nose and main wheel bearing - grease Zerk fittings including main gear carriages.		X						
	Hydraulic fluid level: Mil-H-5606			X					
	Wheels and tire - inspect for wear, pressure, condition	Nose inflate to 40 lbs +/- 5 lbs Main inflate to 40 lbs +/- 5 lbs		X					
	Brake assemblies - inspect for wear, corrosion, leakage			X					
	Hydraulic fluid screen - clean and inspect. NOTE: If floats sit for extended periods of time (I.e. If removed during winter months), screen should be cleaned before putting floats back into service. Hydraulic fluid in reservoir should be checked for moisture or other contaminates and changed if necessary.				X				
	Insp. FWD slide tube mounting bolt for corrosion and wear when the gear are out. Clean and lube the slide tube before returning.								
	Main and Nose gear actuator, assemblies - inspect for condition, lubrication, leakage, corrosion, and cleanliness. With gear out: Inspect FWD slide tube mounting bolt for corrosion and wear. Clean & grease FWD slide tube.				X				
	Nose gear springs - scotch ply springs, inspect for cracks, delaminating and paint.				X				
	Main gear drag link garlock bushings - inspect for condition, lubrication, and corrosion.				X				

INSPECTION TIME LIMITS & CHECKLIST

INSTRUCTIONS/PROCEEDURES			HOURLY LIMITS				MECHANIC		INSP.
			25	50	100	200	Right	Left	
	Clean the wheel wells to facilitate general condition inspection.				X				
	Main gear oleos - inspect for evidence of leakage, proper extension, check cylinder for corrosion, pitting, cleanliness and security				X				
	Hydraulic lines and fittings - inspect for leaks, condition and security.	Refer to section 5.2				X			
	Hydraulic Manifolds (if equipped) - inspect for condition, security, and leaks.					X			
	Brake system plumbing - inspect for leaks, condition and security.					X			
	Main gear oleos - service	5606 hydraulic fluid & Nitrogen Refer to section 5.2				X			
	Perform retraction test:	Inspect main gear up and down lock hooks for proper engagement.				X			
	Inspect UP and DOWN switches & lights.	Inspect nose gear trolley for proper travel.				X			
		Inspect nose gear for excessive play in the down position				X			
		Perform emergency gear extension & retraction				X			
	Nose and main wheel bearings - disassemble and inspect	Re-grease bearings with recommended water resistant grease				X			

5.4 HYDRAULIC PUMP SYSTEM, DISASSEMBLY AND SERVICE

The hydraulic pump is factory preset to the following pressures:
Pressures switch operates below 500 psi and shuts off at 1000 psi.
The pump also has an internal relief valve that opens at 1200 psi and a thermal relief valve that opens at 1900 psi. These pressures are set with factory test equipment and are recommended to be sent back for overhaul or repair.

The unit may be disassembled for cleaning.

1. Relieve the pressure in the hydraulic system by placing the gear selector handle in the neutral position.
2. On the forward lower side of the reservoir, remove drain plug to drain most of the hydraulic fluid.
3. Remove the (4) screws on each tank (2) on upper side of the reservoir.
4. Dump out remaining oil, and clean reservoir.
5. Unscrew stand pipe with the filter attached.
6. Clean filter.
7. If filter is removed from stand pipe, a new filter should be used.
8. Reinstall tank and install seals to top of reservoir before installing on pump.
9. Install drain plug and fill with clean MIL-H-5606 hydraulic fluid through the breather pipe.
10. Fluid level should be in the upper 2/3 of the sight gauge

DESCRIPTION AND OPERATION

1. PROBLEM – Power pack does not run after gear selection.

   PROBABLE CAUSE

   a. Circuit breaker has failed
   b. Pressure switch not pulling in at low cut in.
   c. Solenoid switch not pulling in.
   d. Faulty pump motor.
   e. Motor not properly grounded.

   VERIFICATION AND REMEDY

   a. Reset circuit breaker.
   b. Short across pressure switch leads and see if motor runs. If motor operates, replace pressure switch.
   c. Short across solenoid pressure switch leads and see if motor runs. If motor operates, replace solenoid pressure switch.
   d. If c. above does not produce results and it is verified that voltage was actually applied to motor, it can be assumed motor is bad or not properly grounded.
   e. Check motor ground.

2. PROBLEM – Power pack does not shut off after gear reaches position.

   PROBABLE CAUSE

   a. Faulty pressure switch.
   b. Faulty or dirty pressure relief valve allowing insufficient pressure buildup.

REMEDY

a. Replace pressure switch.
b. Clean and check relief valve.

3. PROBLEM – Power pack shuts off before gear reaches position.

PROBABLE CAUSE

a. Binding or jammed gear retractor, which causes pressure to build up (and stay up), and pressure switch shuts off power pack.
b. Faulty or dirty pressure relief valve allowing insufficient pressure buildup.

REMEDY

a. Repair retractor.

4. PROBLEM – Power pack cycles on and off after gear is in position.

PROBABLE CAUSE

a. Internal hydraulic leak.
b. External hydraulic leak.

REMEDY

a. Verify leak is not external by checking fluid level in reservoir and looking at couplings for oil leaks. If no external leaks are found, disconnect and cap off the hydraulic actuators one at a time and find the leaky one by process of elimination. If isolating entire system still indicates internal leak, power pack check valve (located in pressure port of pump) is bad and needs replacement or reseating.
b. Visually inspect lines, cylinders, and hoses and replace as necessary.

5. PROBLEM – Power pack cycles on and off during gear cycle.

PROBABLE CAUSE

a. Binding in retraction unit.
b. Pressure switch cut off limit too low.

REMEDY

a. Investigate for free operation. Check gear that retracts last.
b. Replace pressure switch.

6. PROBLEM – Slow gear operation cycle (considerably longer than 30 seconds.)

PROBABLE CAUSE

a. Plugged oil screen.
b. Poor electrical connection to motor.
c. Poor motor.
d. Worn pump gears.

REMEDY

a. Clean intake screen located inside reservoir tank.

b. Connect motor direct to 24 volt source and note its operation; if good, wire connection is bad; if operation poor, motor needs overhaul.
c. Covered in b. above.
d. Replace pump

7. PROBLEM – Circuit breaker pops during cycle.

PROBABLE CAUSE

a. Wire connections bad or corroded.
b. Bad motor brushes.
c. Bad circuit breaker.

REMEDY

a. Clean and protect terminal with grease.
b. Overhaul motor.
c. Replace circuit breaker

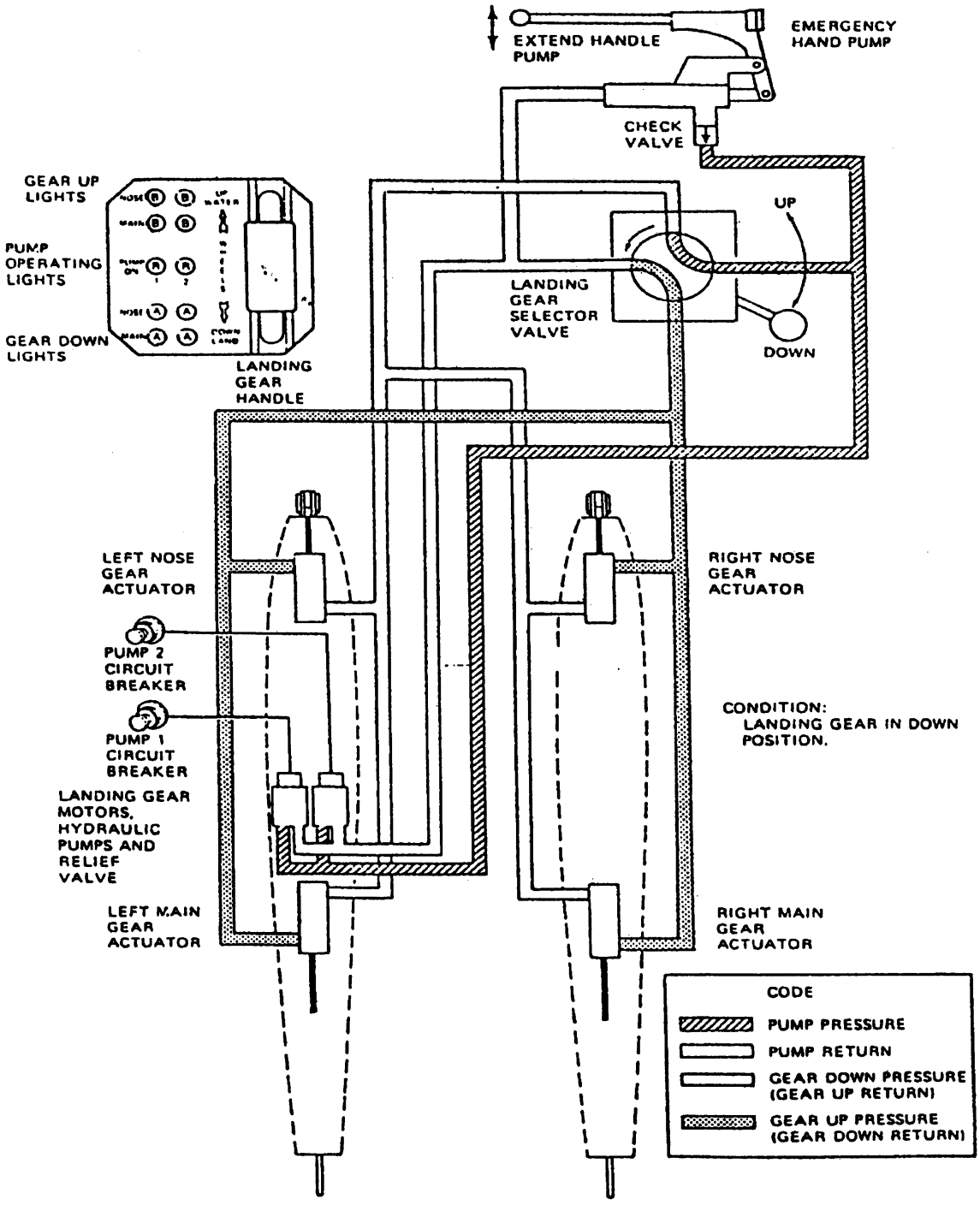


FIGURE 5-1
SCHEMATIC, HYDRAULIC SYSTEM

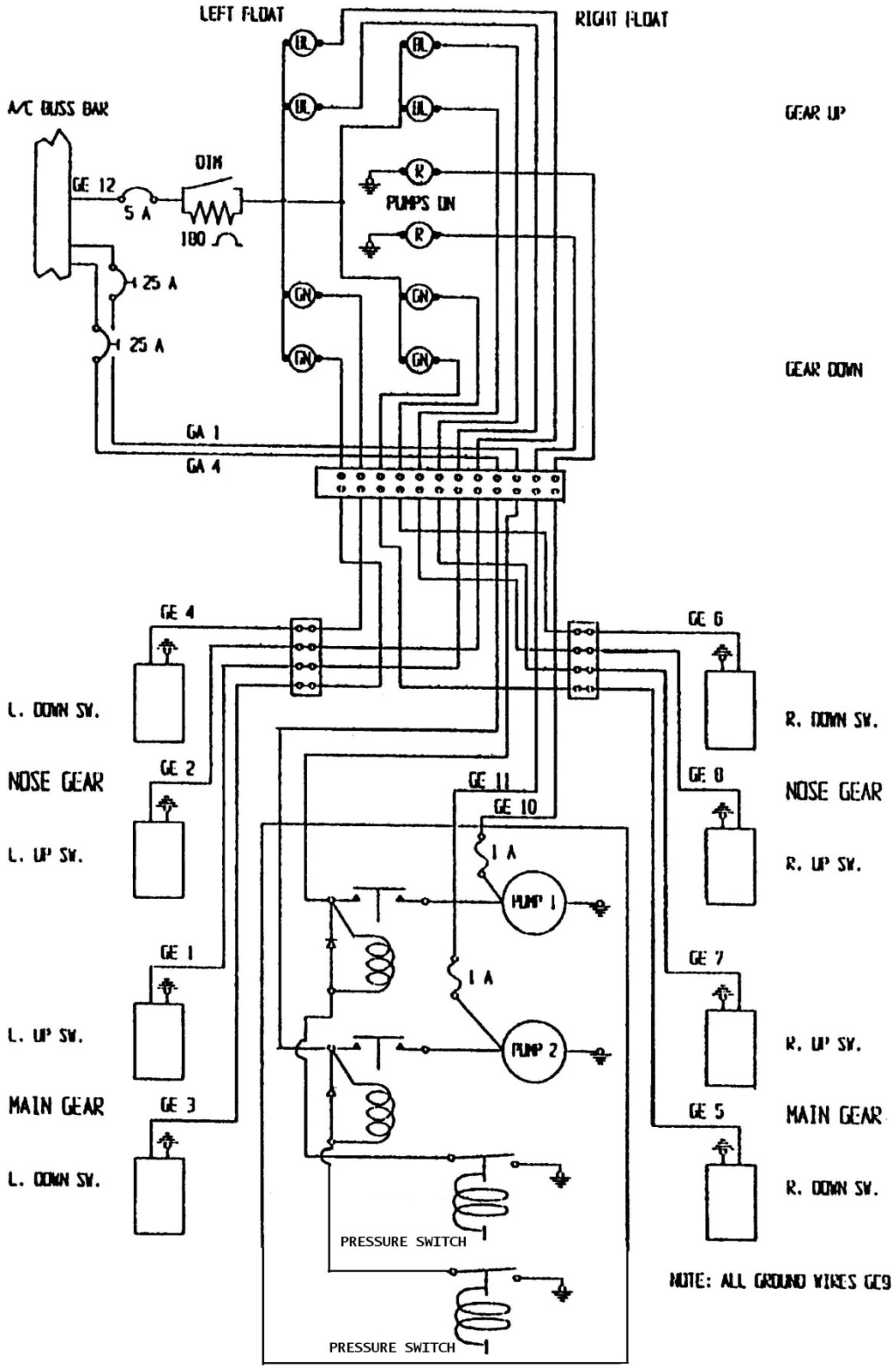


FIGURE 5-2
SCHEMATIC, ELECTRICAL SYSTEM

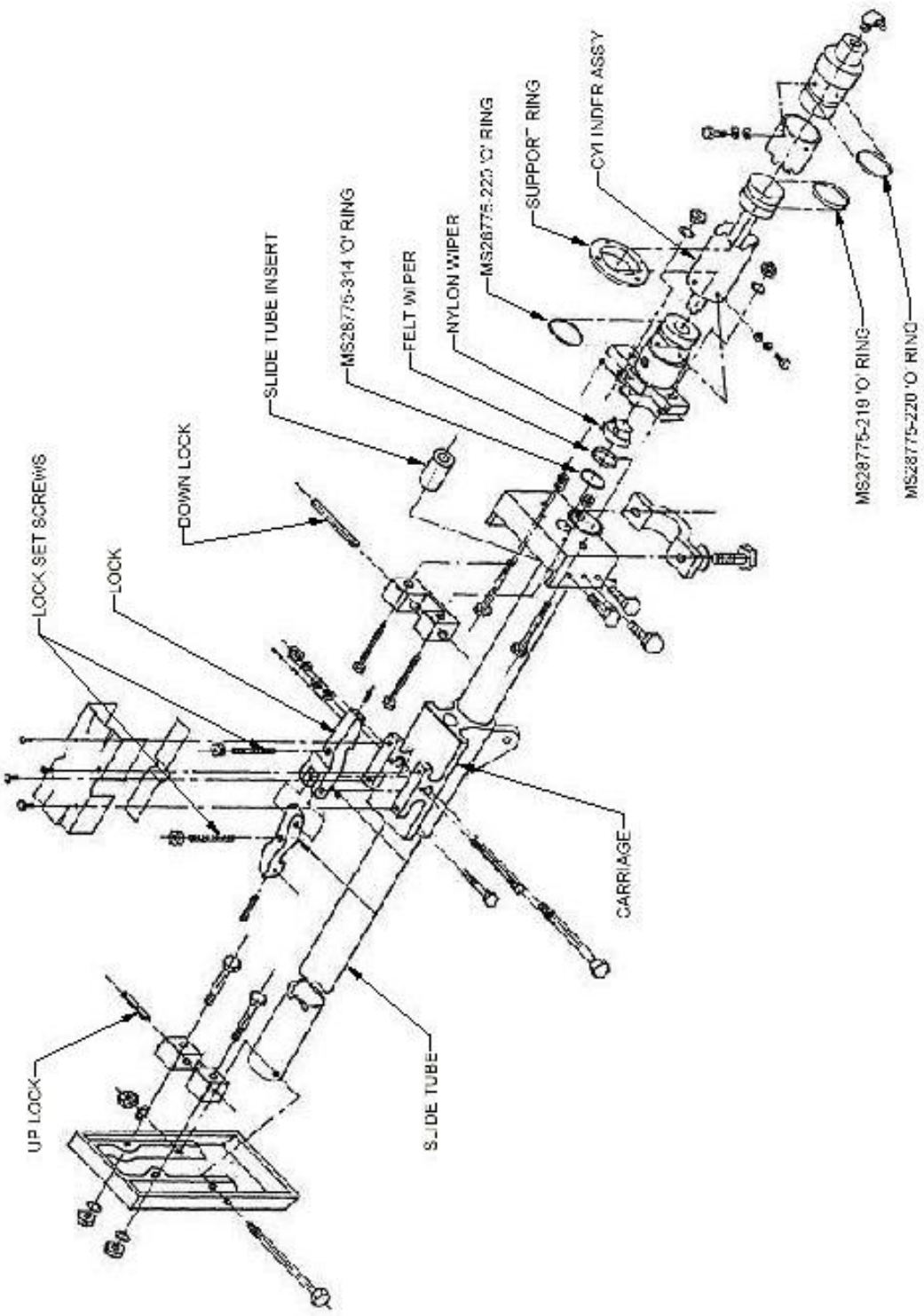


FIGURE 5.3
ASSEMBLY MAIN GEAR RETRACTION SYSTEM

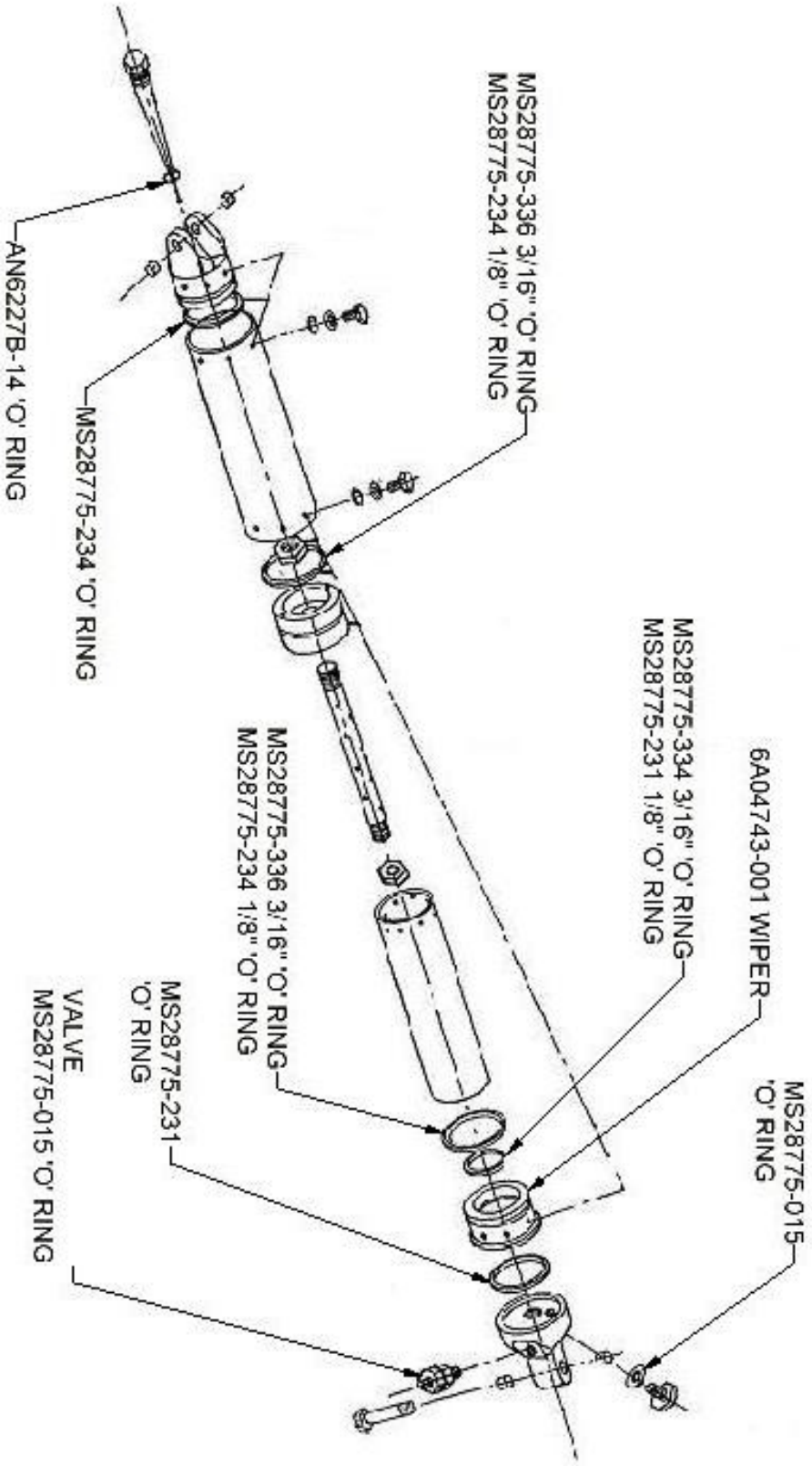


FIGURE 5-4
SECTION MAIN GEAR OLEO

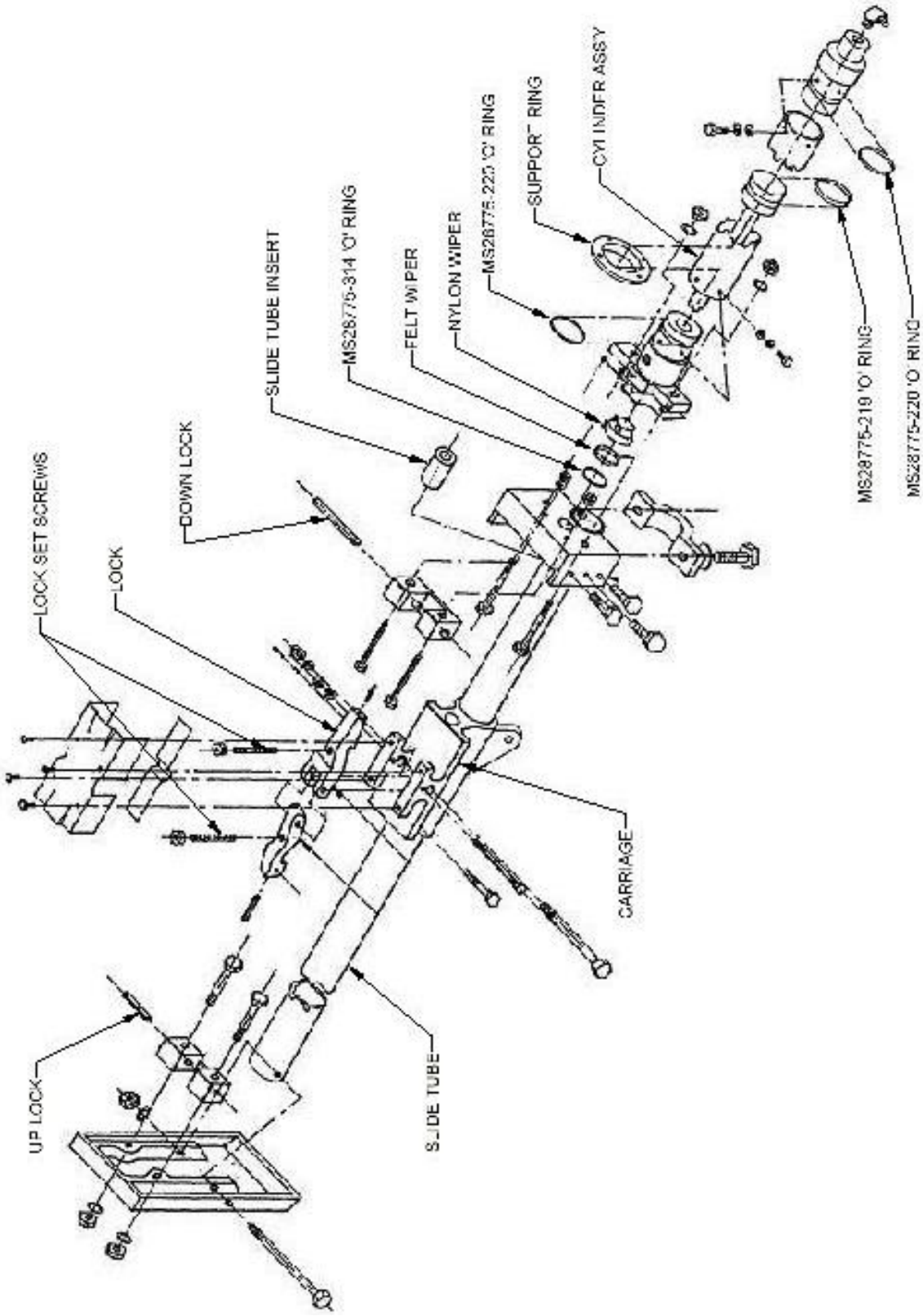


FIGURE 5.3
ASSEMBLY MAIN GEAR RETRACTION SYSTEM

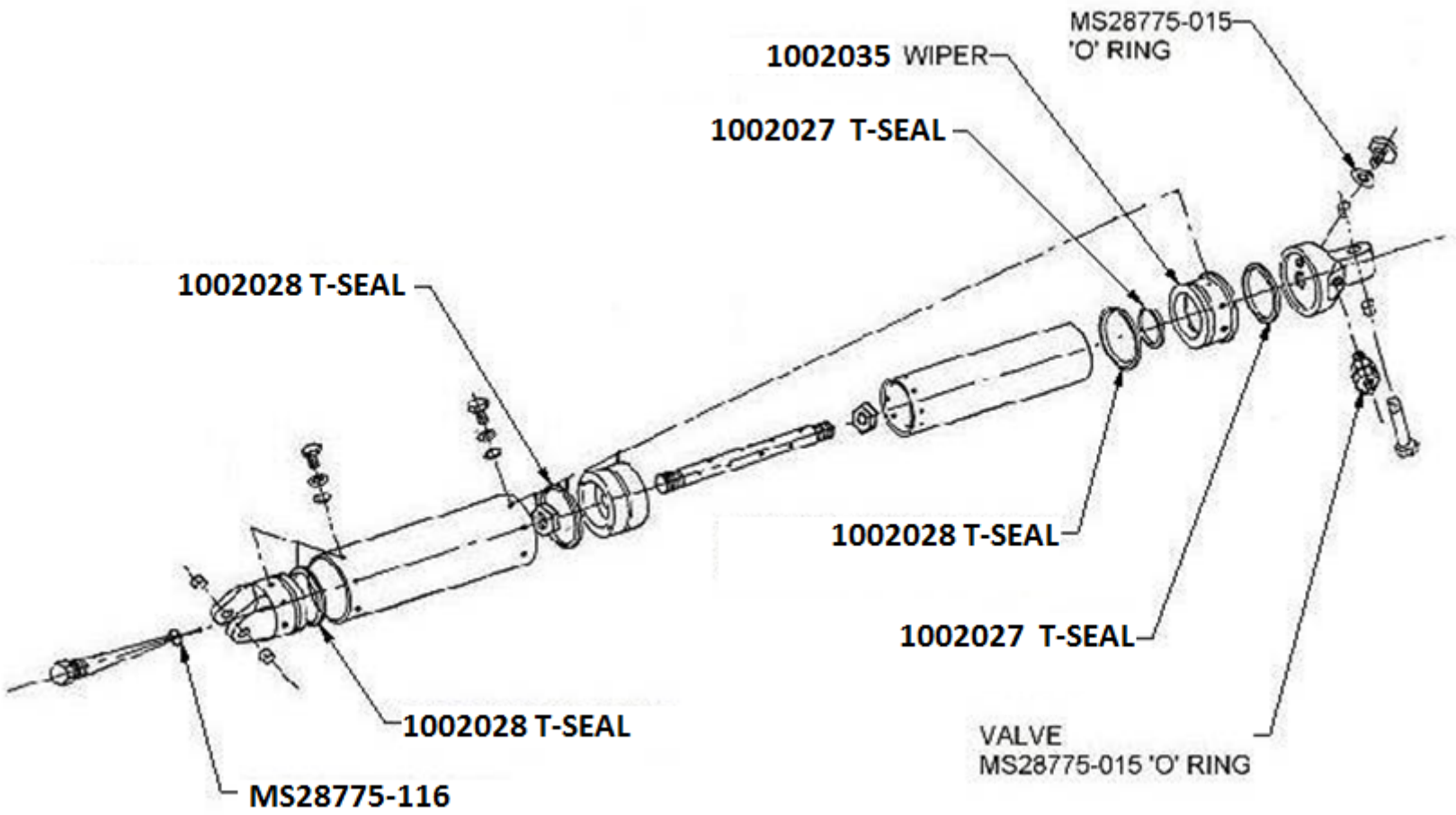


FIGURE 5-4
SECTION MAIN GEAR OLEO (T-SEALS INSTALLED)

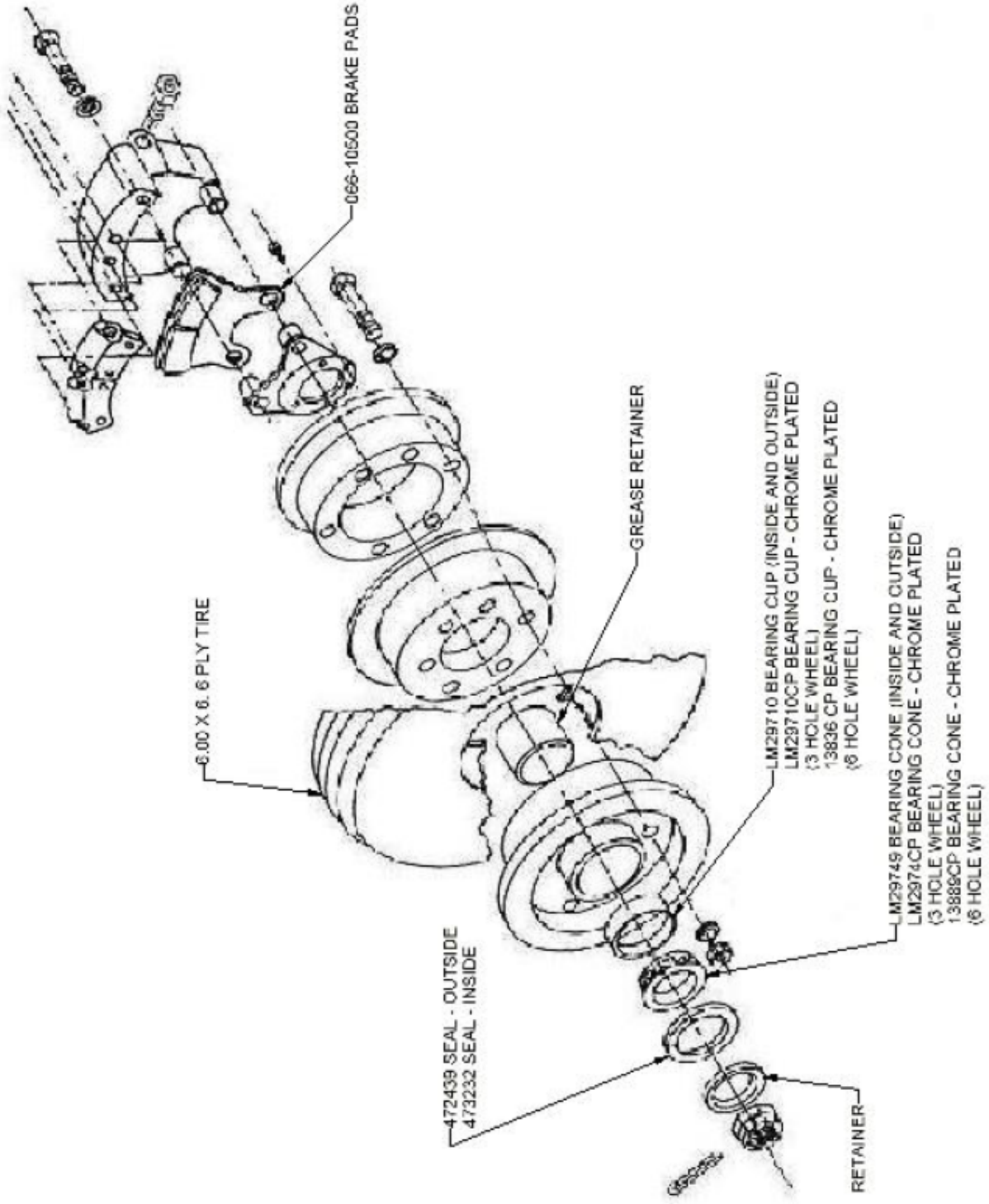


FIGURE 5-5
ASSEMBLY MAIN GEAR AND BRAKE
(Refer to Parts Manual for complete parts list)

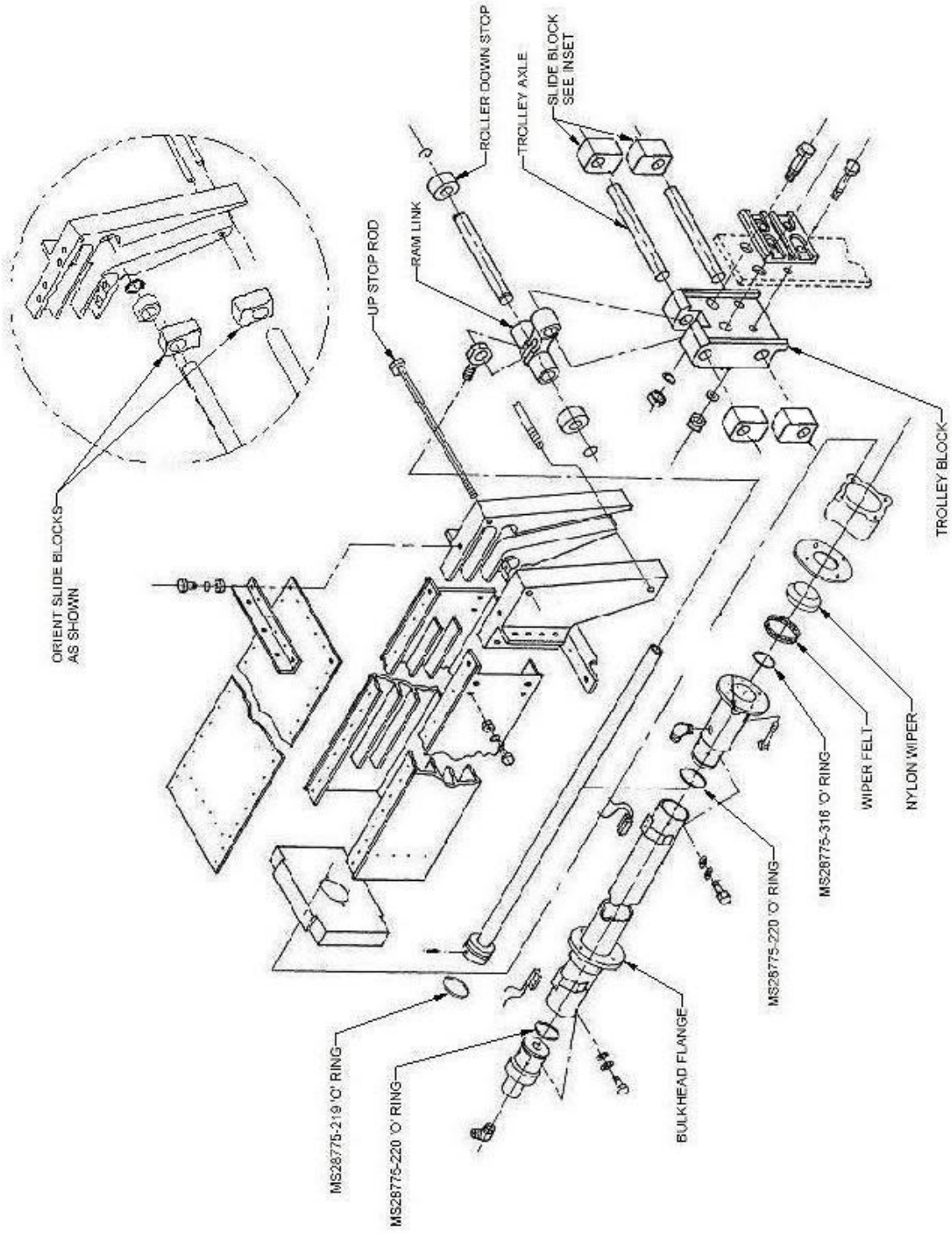


FIGURE 5-6
ASSEMBLY NOSE GEAR SYSTEM

6.0 WATER RUDDER RETRACTION AND STEERING SYSTEM

6.1 DESCRIPTION

The water rudder-retract system is manually operated by a lever through a system of cables and pulleys.

Steering is directed from the aircraft rudder steering system.

6.2 ADJUSTMENT

Rigging of the water rudder steering cables is accomplished by centering the airplane rudder and adjusting the turnbuckles such that both rudders trail with the float center line. Cables should be tensioned to 40 pounds, +/- 5 psi.

Retraction cables should be rigged such that the top of the rudder blade is against the rudder stop on the rudder posts in the up position and that the cables are just slack in the down position.

Service Schedule

Cables - inspect for fraying annually.
Pulleys - inspect and lubricate annually.

7.0 REPAIRING FLOAT HULL SKINS, BLKHDS AND OTHER SHEET METAL REPAIRS

The float hull is manufactured from the following aluminum alloys: Top skins and side skins are .032" thick, 6061-T6, the bottom skin is .040" thick, 6061-T6; the nose bulkhead is .100" thick, 6061-T6; all remaining forward bulkheads are .032" thick, 6061-T6; The aft wheel-well bulkhead is .050" thick, 6061-T6; the after body skin is .032" thick, 6061-T6; all after body bulkheads are .040" thick, 6061-T6.

Damage to the Sheet metal may be repaired per Figures 7-1, 7-2, 7-3, or any acceptable repair method listed in FAA Advisory Circular 43.13.1A.

Any float metal part can be purchased from Wipaire to aid in repair. To simplify repairs, the skins can be ordered precut to shape.

All outside hull skins are bonded to the extrusions with a special heat pressure 3M adhesive. This bond adheres skins to the inside of all extrusions.

Skins may be reattached to extrusions by methods shown in figures in 7-4, 7-5, and 7-6. If the skin bond must be broken from an extrusion for a long distance the caulking material must first be removed from the exterior crack. Then heat the extrusion with a propane torch until the bond starts to loosen. Caution must be taken not to heat and loosen bonds not needing replacement.

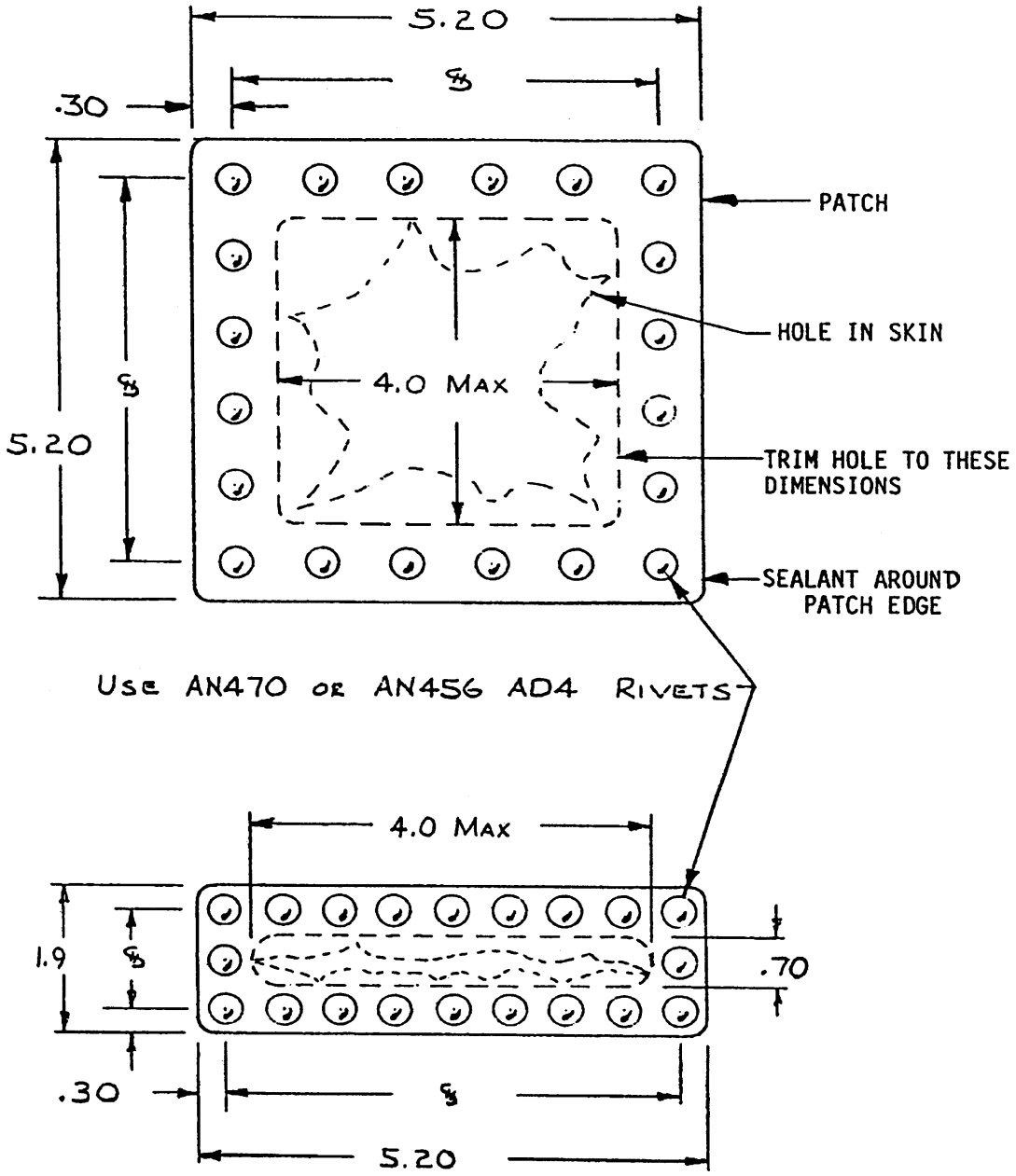


FIGURE 7-1
TYPICAL SKIN REPAIR

1. **TRIM HOLE AS SHOWN BY DOTTED LINE.**
2. **PATCH MATERIAL TO BE AT LEAST SAME THICKNESS AS ORIGINAL SKIN.**
3. **PRIME ALL BARE SURFACES.**
4. **SEAL BETWEEN PATCH AND SKIN.**
5. **RIVET IN PLACE.**

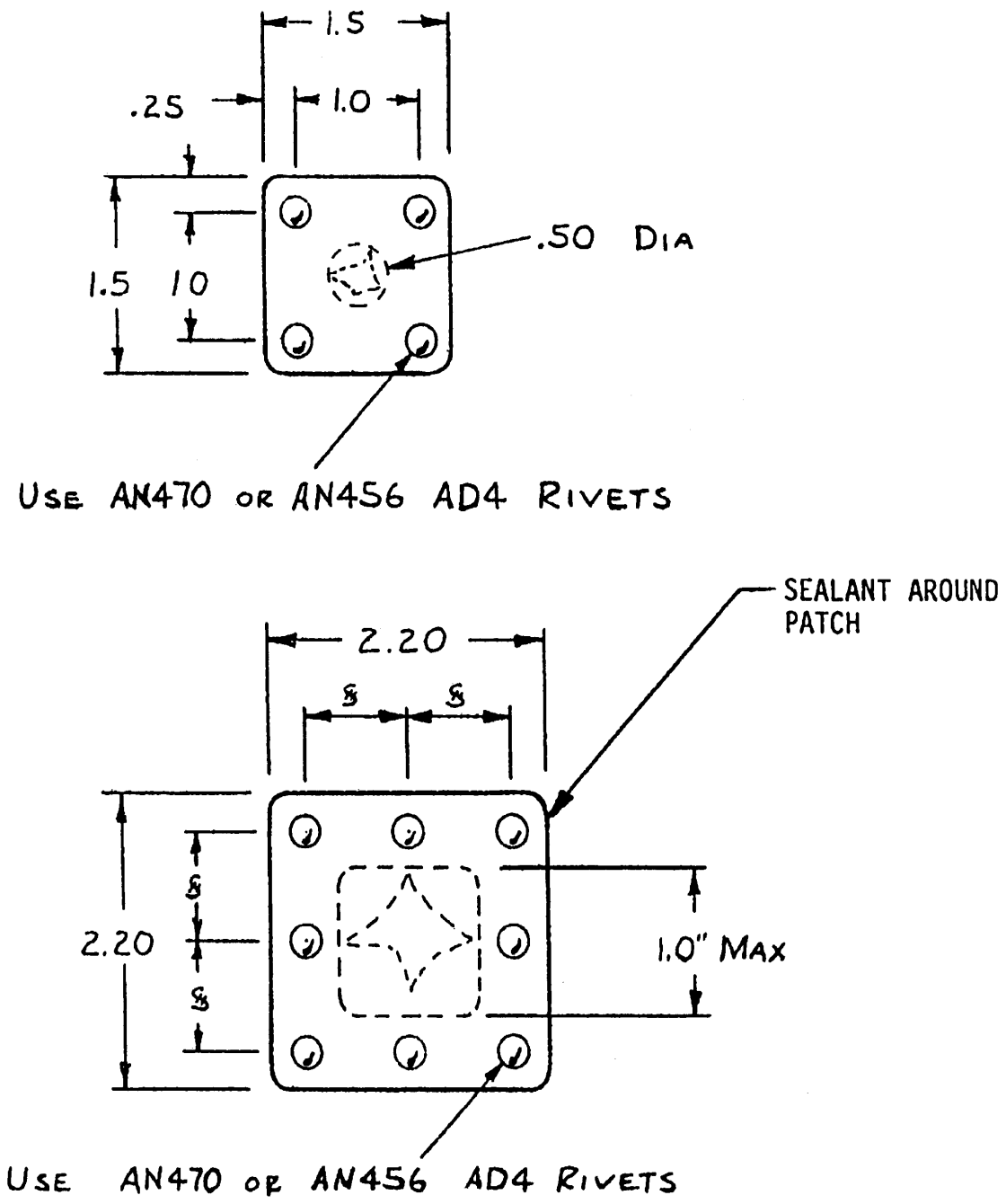


FIGURE 7-2
TYPICAL SKIN REPAIR

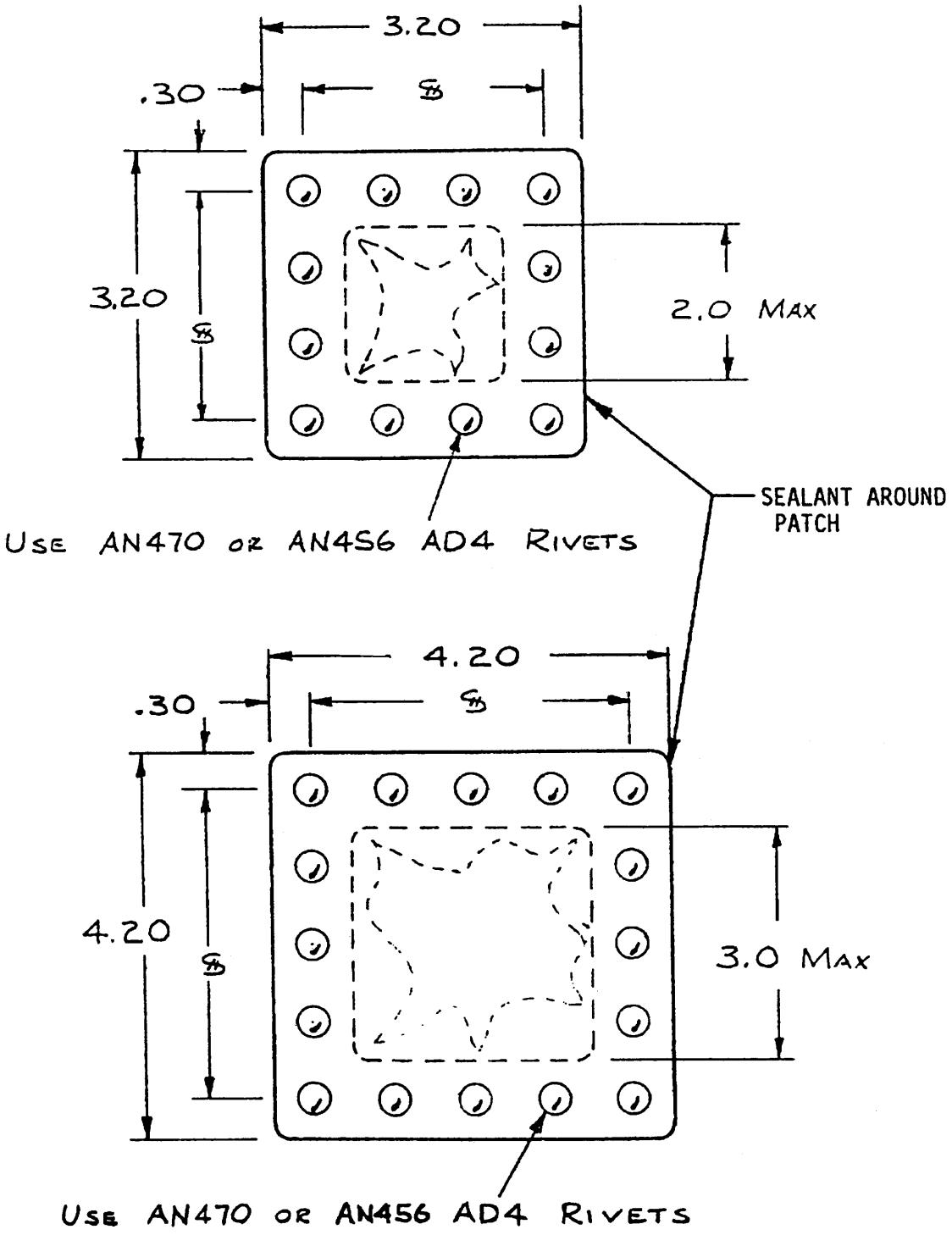


FIGURE 7-3
TYPICAL SKIN REPAIR

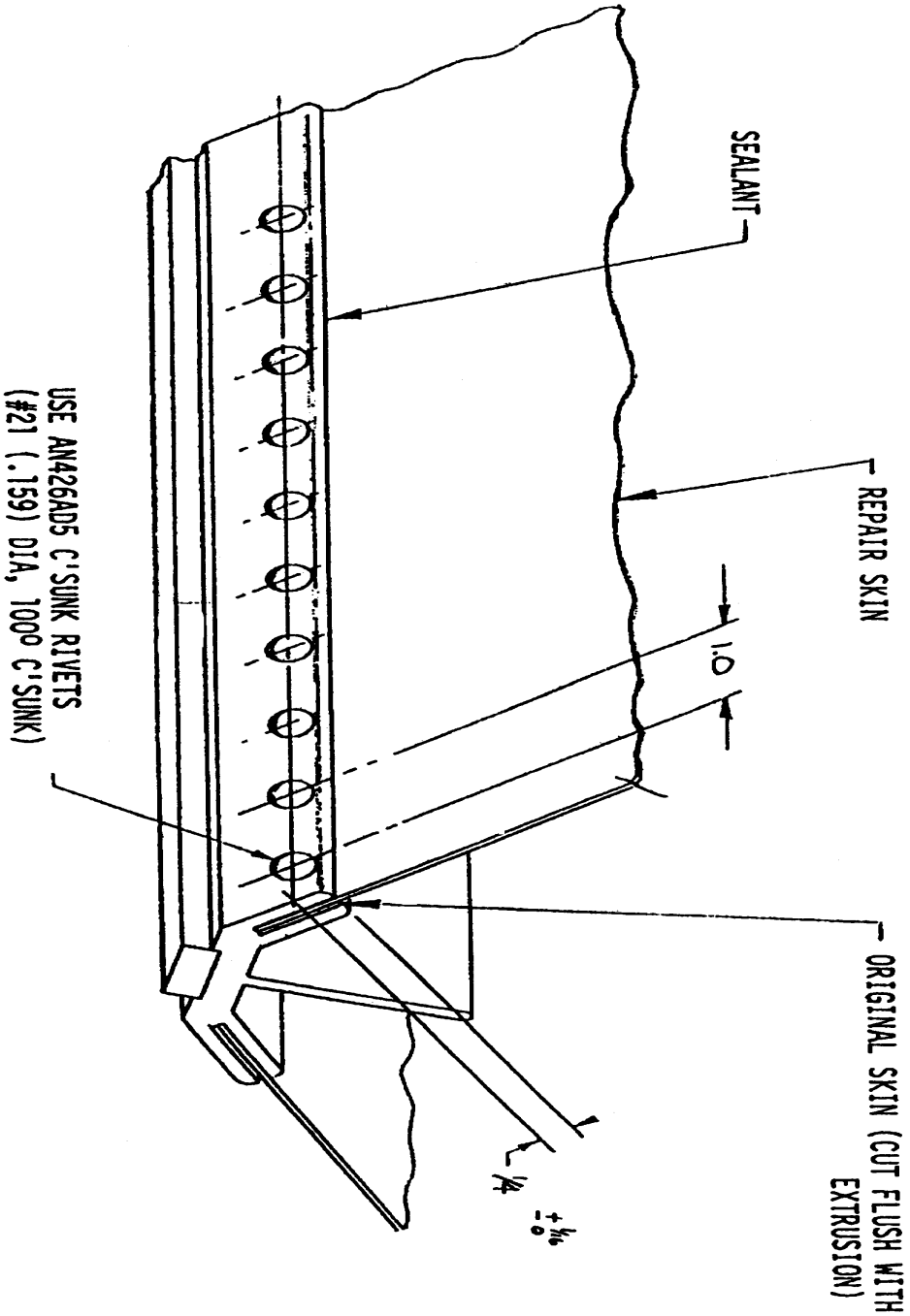


FIGURE 7-4
TYPICAL REPAIR BOTTOM SKIN TO KEEL INSTRUCTIONS
(Preferred method)

1. **REMOVE ORIGINAL DAMAGED SKIN CUT FLUSH WITH EXTRUSION.**
2. **REMOVE CAULKING FROM GROOVE OF EXTRUSION.**
3. **APPLY SEALANT IN GROOVE. (BE SURE TO USE PLENTY OF SEALANT!)**
4. **INSERT REPAIR SKIN INTO EXTRUSION.**
5. **DRILL AND COUNTERSINK HOLES AND RIVET INTO PLACE.**

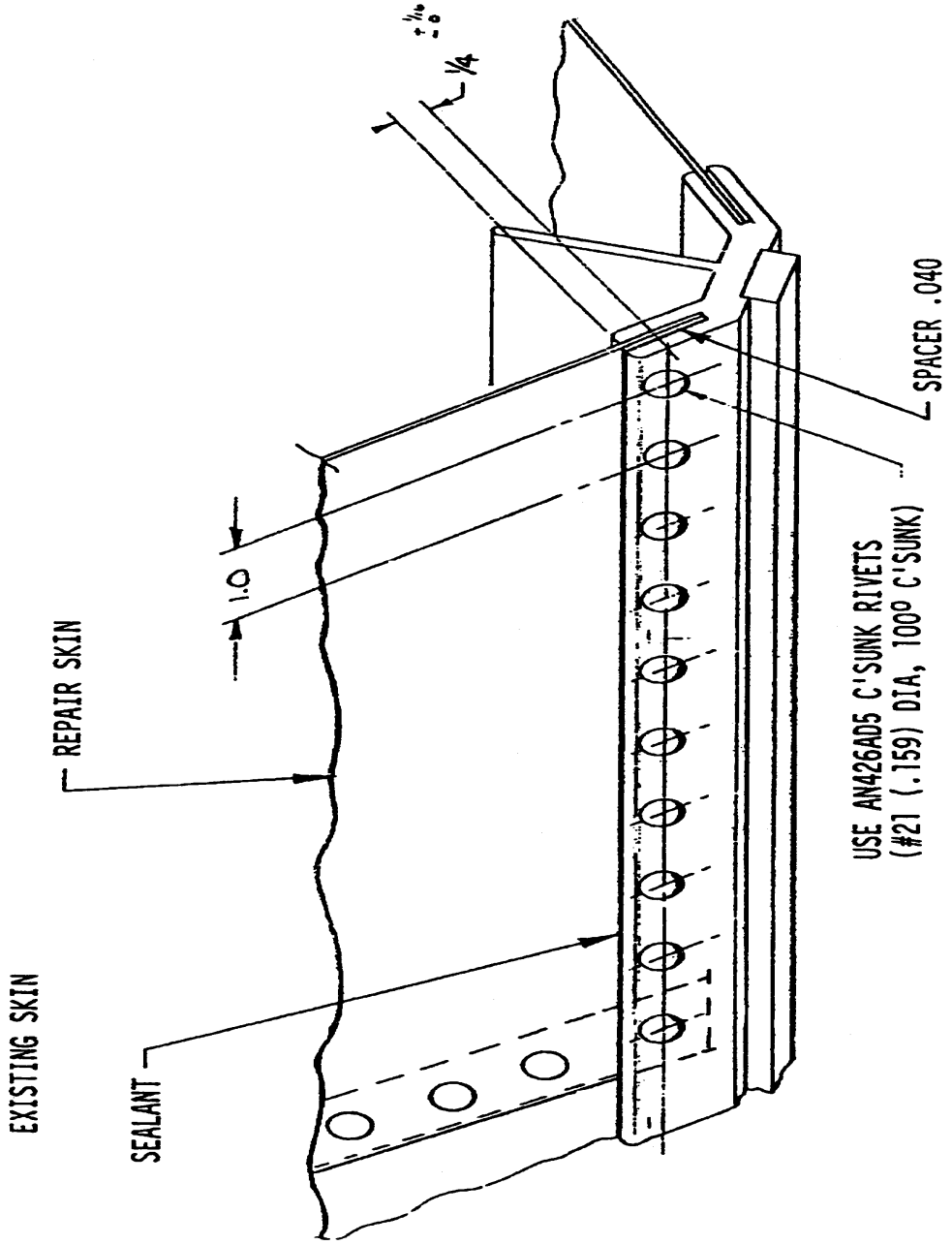


FIGURE 7-5
TYPICAL REPAIR BOTTOM SKIN TO KEEL INSTRUCTIONS.

1. **REMOVE ORIGINAL DAMAGED SKIN FROM EXTRUSION.**
2. **REMOVE CAULKING FROM GROOVE OF EXTRUSION.**
3. **APPLY SEALANT IN GROOVE. (BE SURE TO USE PLENTY OF SEALANT!)**
4. **INSERT REPAIR SKIN INTO EXTRUSION.**
5. **INSTALL SPACER BETWEEN REPAIR SKIN AND EXTRUSION.**
6. **DRILL AND COUNTERSINK HOLES AND RIVET INTO PLACE**.

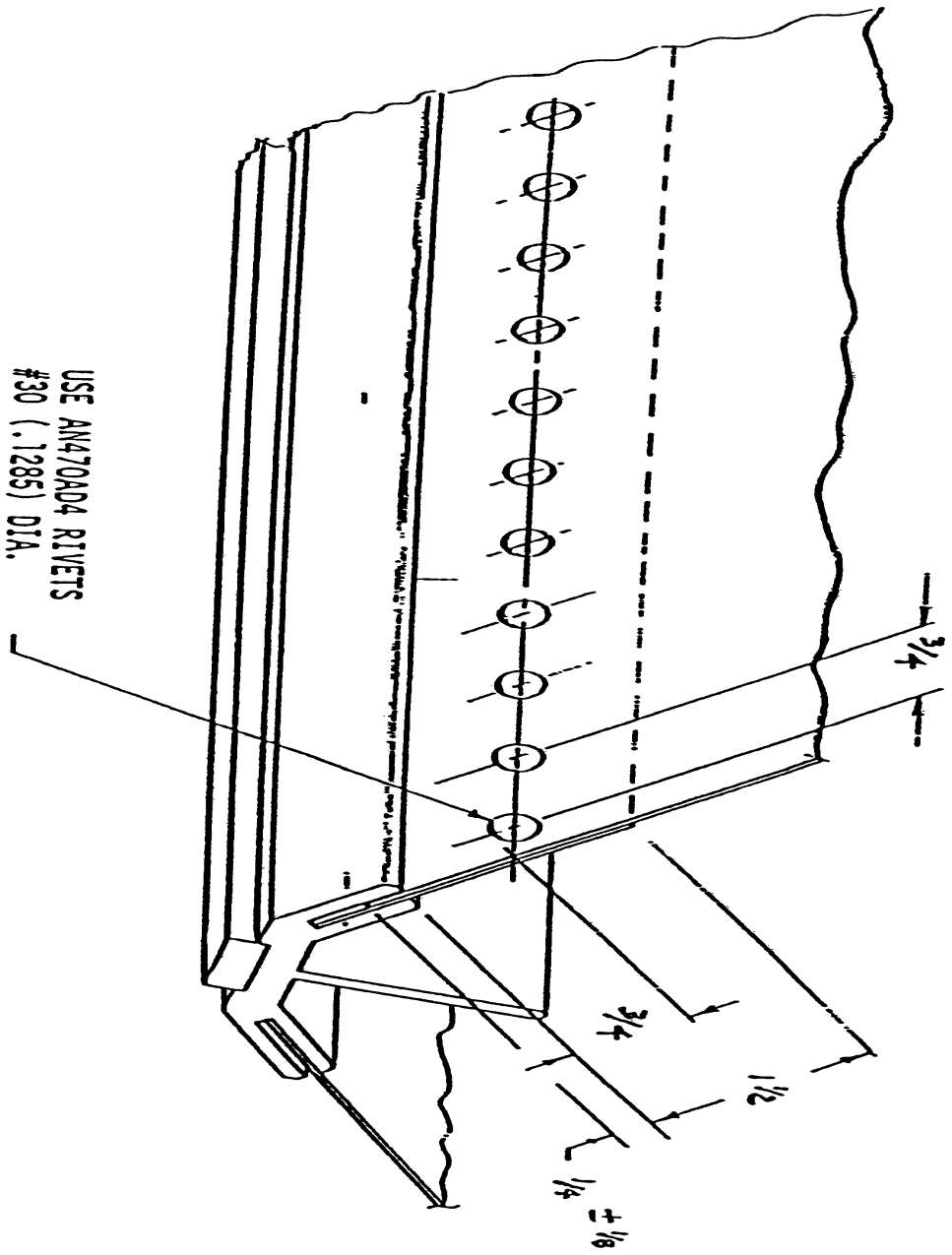


FIGURE 7-6
TYPICAL REPAIR BOTTOM SKIN TO KEEL (ALT) INSTRUCTIONS
(ALTERNATE METHOD)

1. **REMOVE ORIGINAL DAMAGED SKIN LEAVING APPROXIMATELY 1 ½" OF SKIN PROTRUDING FROM EXTRUSION**
2. **REMOVE CAULKING FROM GROOVE IN EXTRUSION.**
3. **INSTALL SEALANT IN GROOVE. (BE SURE TO USE PLENTY OF SEALANT!)**
4. **INSERT REPAIR SKIN IN GROOVE APPROXIMATELY ¼".**
5. **LAYOUT HOLE PATTERN, DRILL, DE-CHIP, SEAL AND RIVET.**

8.0 REPAIRING FLOAT HULL SKINS

All extrusions in the float hull are formed 6061-T6 aluminum alloy. Extrusions have channels on both sides which the hull skins are bonded to.

All extrusions may be repaired by splicing as shown in figure 8-1 and 8-2 or capped as shown in figure 8-3. Splicing normally is done when both sides of an extrusion are damaged. Capping is done when only the outside of an extrusion is damaged, such as the main keel during gear up landings on pavement. Capping also is done when the original skin is still bonded to the inside of the extrusion.

Sections of extrusion for splicing or capping may be purchased from Wipaire in any length needed. Stub skins can also be bonded on extrusion sections if desired, to simplify the repair.

There are many ways to repair Wipline floats and each method depends on the degree and location of the damage. The following figures are examples of some repairs. For additional help contact the Wipaire Customer Service at 651-451-1205.

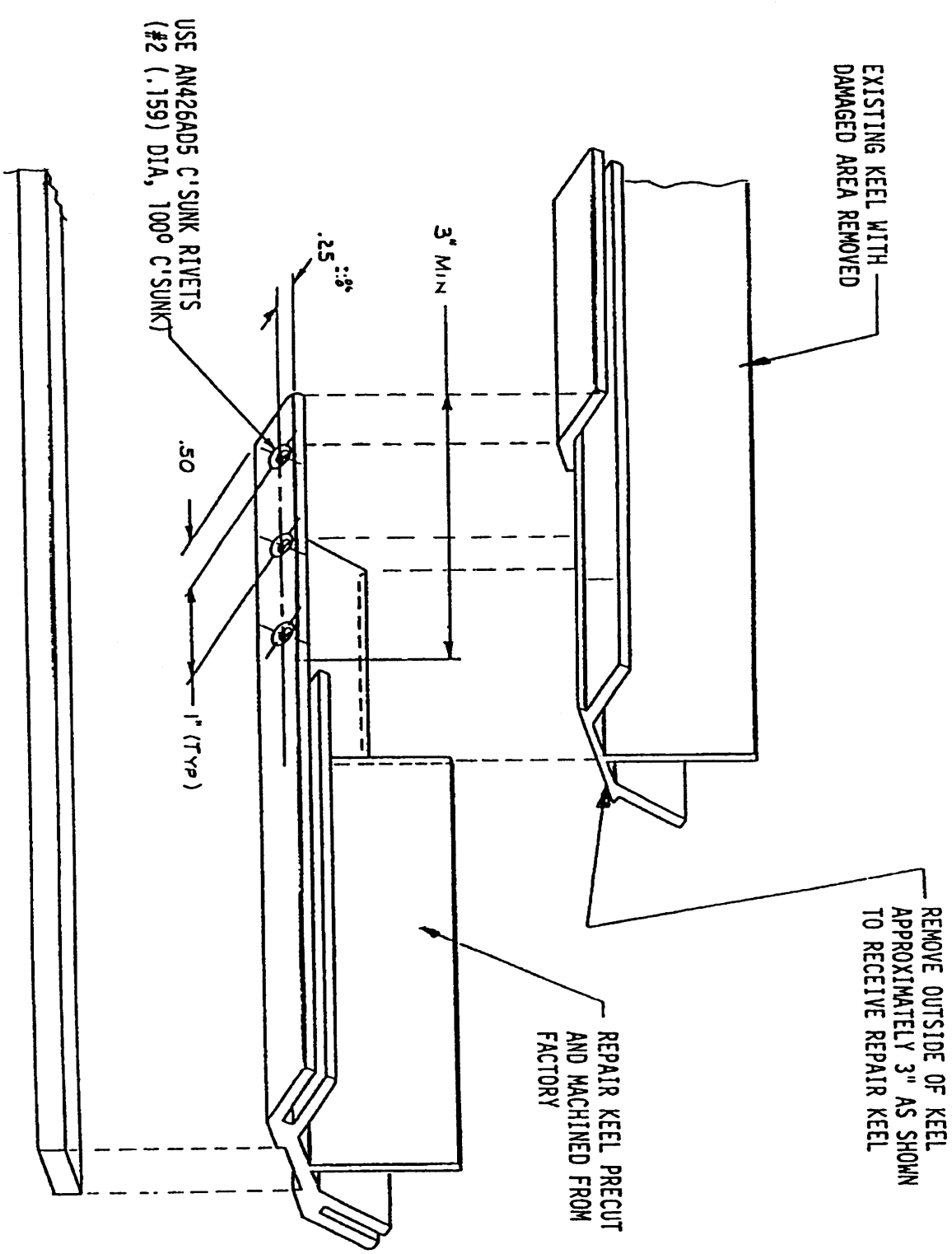


FIG URE 8-1
TYPICAL REPAIR SPLICE OF KEEL

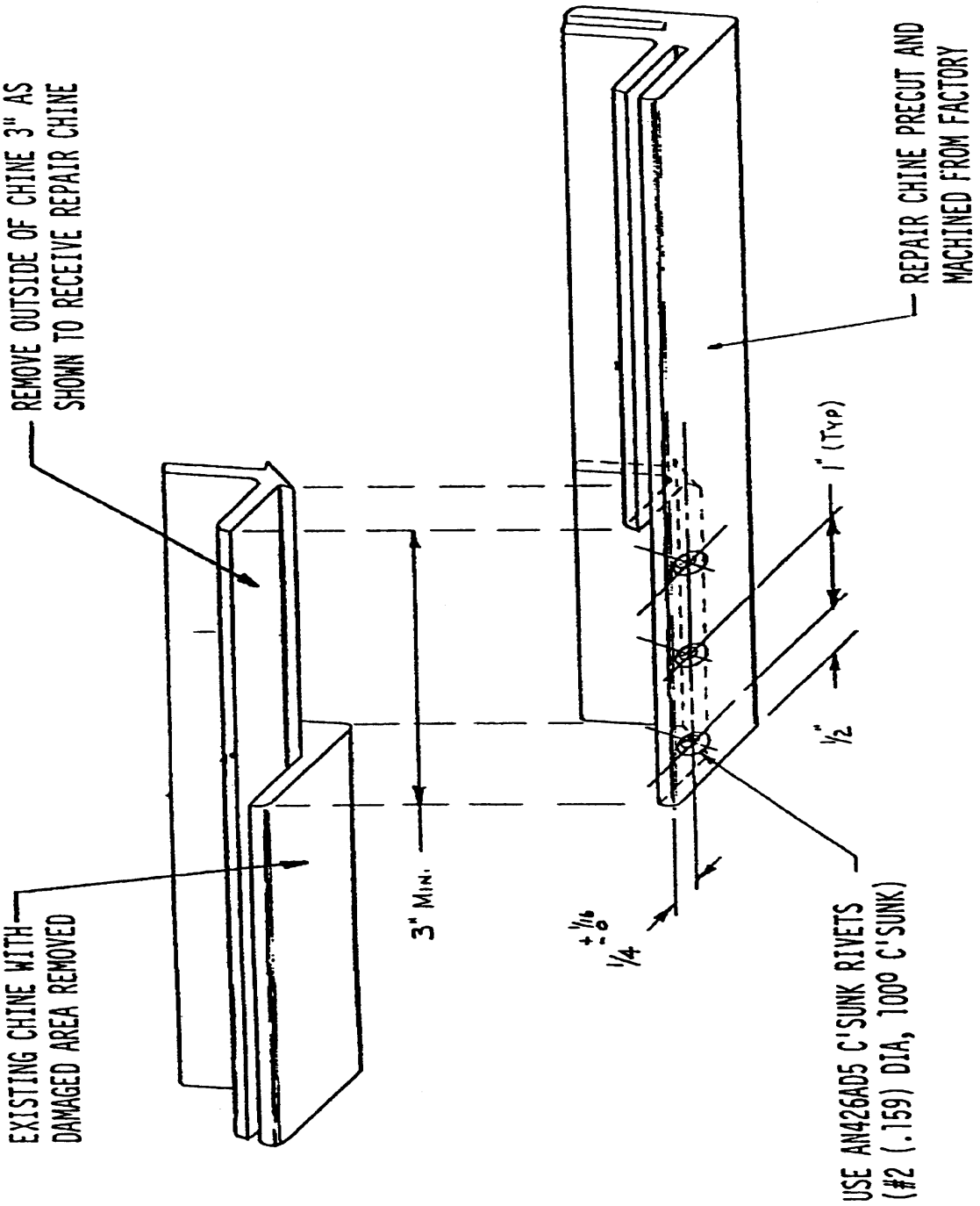
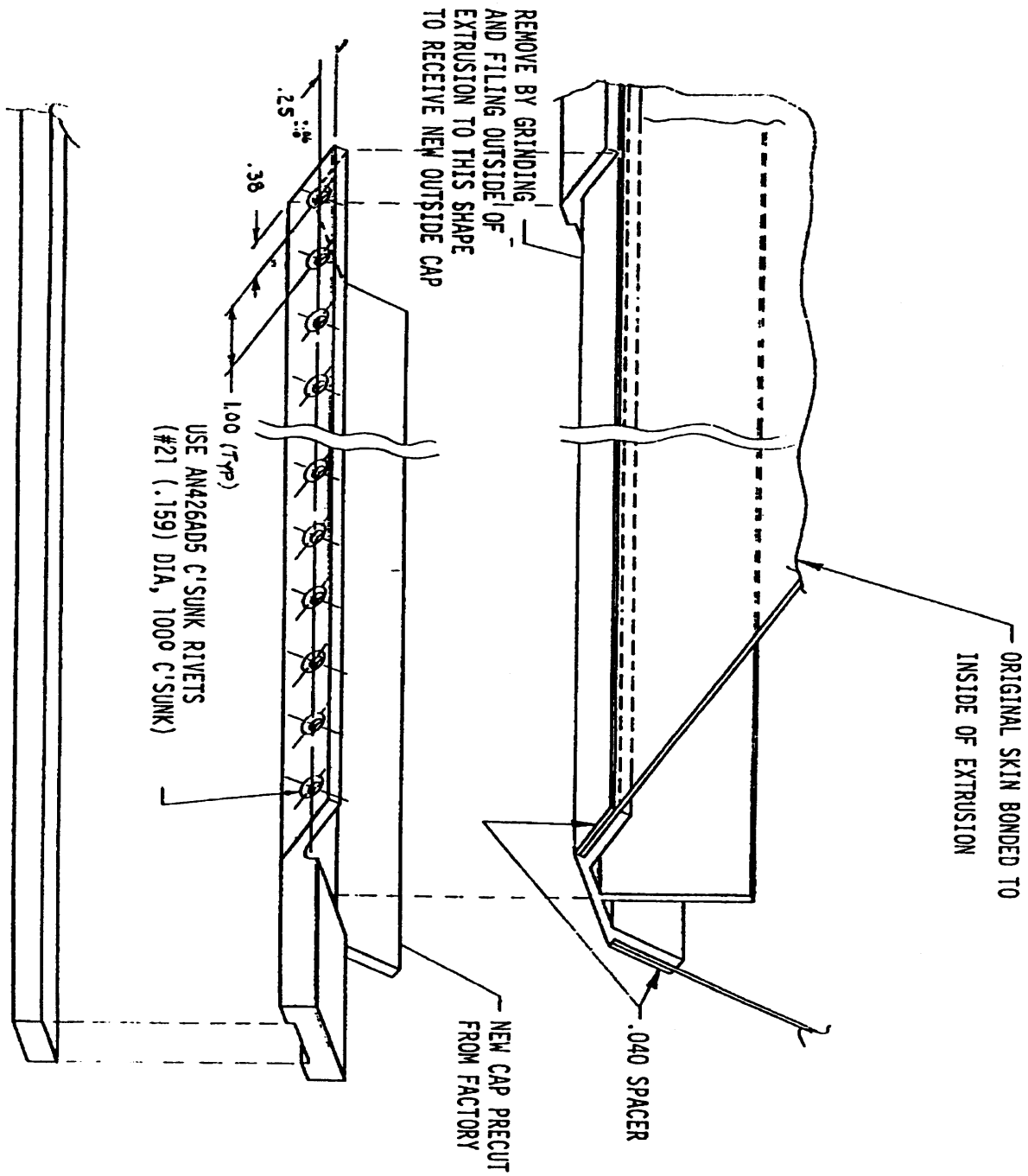


FIGURE 8-2
TYPICAL REPAIR SPLICE OF CHINE



FIGU

RE 8-3
TYPICAL CAP SPLICE TO KEEL

1. **LAYOUT NEW REPAIR CAP ON DAMAGED EXTRUSION.**
2. **REMOVE OUTSIDE OF DAMAGED EXTRUSION BY FILING OR GRINDING TO INSIDE SHAPE OF REPAIR CAP.**
3. **MATCH DRILL OR LAYOUT AND DRILL HOLE PATTERN AS SHOWN.**
4. **RIVET OUTSIDE CAP AND SPACER TO EXISTING INSIDE EXTRUSION.**
5. **APPLY KEEL WEAR STRIP WITH ANY GOOD 2-PART EPOXY.**

9.0 WEIGHT AND BALANCE

WEIGHING PROCEDURES FOR THE BEAVER FLOATPLANE

Level aircraft per manufacturer's instructions. The Type Certificate Data sheet uses the cabin floor.

Place scales under the nose and main gear wheels.
Place blocking under right and left main gear wheels to level aircraft.

Drop plumb bob from wing leading edge on either side of the plane to the floor and mark with a line. This is the datum-line, station 0.0.

Measure the distance from 0.0 to each nose wheel center. This is X_1 and X_2.
Measure the distance from 0.0 to each main wheel center. This is Y_1 and Y_2.

If the floats are seaplane floats, the scales go under the step point in the rear and a point towards the front of the float. These distances are measured and become the same X and Y as for the amphibian.

Use this table for the calculations:

	Scale Reading **Weight**	**x**	Distance from 0.0 **Arm**	**=**	Weight x Arm **Moment**
Left Front X_1	+		- MK I + MK III		-MKI + MK III
Right Front X_2	+		- MK I + MK III		- MK I + MK III
Left Rear Y_1	+		+		+
Right Rear Y_2	+		+		+

Totals:

Notes:

1. Zero out or deduct tare weights at the Y arms.