8. UTILITY SYSTEM

A. BRAKE SYSTEM

The hydraulic brake system consists of the wheel brake assemblies, two master cylinders for the single brake system, four master cylinders for the dual brake system, and a parking brake assembly. Regular inspections of the brake system should include checking the fluid level in the master cylinder reservoirs, deteriorated hose assemblies, loose or damaged lines or fittings, worn brake linings, and proper parking brake adjustment.

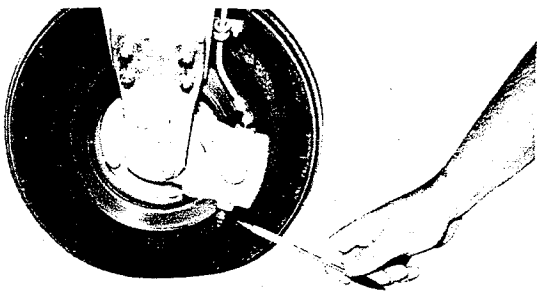


FIGURE 8-1 BRAKE ASSEMBLY BLEEDER VALVE

The optional dual hydraulic brake system used in the Yankee is unique in the fact it requires no additional reservoir. The system is designed for dual operation and incorporates two types of master cylinders. Pressure applied to the left master cylinder (1, Figure 8-4) passes through an intregal piston by-pass port in the right master cylinder (3, Figure 8-4) and on to the left wheel brake assembly. Pressure applied to the right master cylinder (3, Figure 8-4) closes the port and applies the left wheel brake assembly. If pressure is applied to both cylinders simultaneously, the force from the left cylinder is applied to the top of the piston in the right cylinder, nearly doubling the pressure at the wheel brake assembly. Master cylinders 2 and 4 operate in the same manner. When the brake pedals for cylinders 3 and 4 are in neutral position, the ports are open for direct flow to the brake assemblies from cylinders 1 and 2.

The standard single brake system does not use cylinders 3 and 4. However, operation is essentially the same as above, except master cylinders 1 and 2 supply hydraulic pressure directly to the wheel brake assemblies.

The parking brake assembly consists of a cable control attached to locking levers on the master cylinder shafts. These are applied by depressing the top of the pedals and pulling out the parking brake control. Releasing the parking brake is

NOTE: When replacing or adjusting the parking brake cable or chain, be sure chain has adequate free length to prevent the parking brake being engaged when the rudder pedals reach full travel.

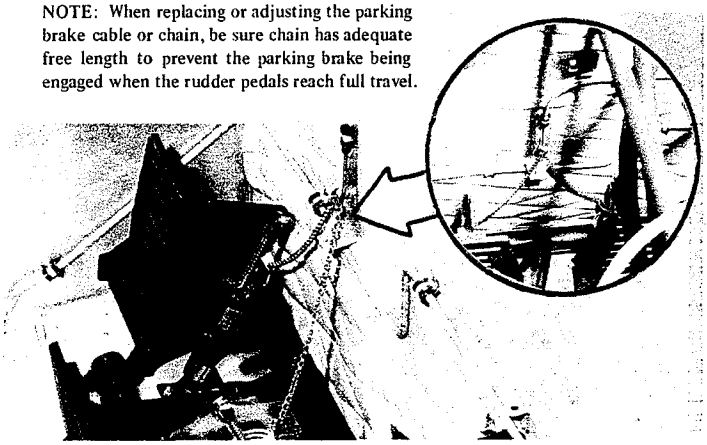
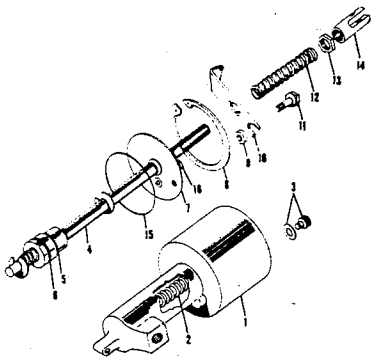
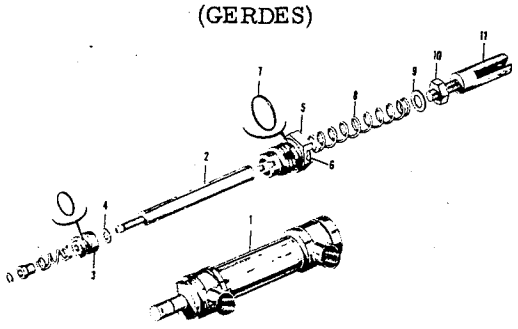


FIGURE 8-2 MASTER CYLINDERS AND PARKING BRAKE ASSEMBLIES



1. Brake housing
2. Spring
3. Screw and washer assembly
4. Shaft assembly
5. "O" ring
6. "O" ring
7. Cover plate assembly
8. Snap ring
9. Spacer
10. Parking brake lever
11. Bolt
12. Spring
13. Lock nut
14. Clevis
15. Square cut rubber seal
16. Filler plug

FIGURE 8-3A MASTER CYLINDER ASSEMBLY (GERDES)



1. Cylinder assembly
2. Piston rod assembly
3. Piston assembly
4. Washer seal
5. Gland packing
6. "O" ring
7. "O" ring
8. Spring
9. Washer
10. Nut, jam
11. Fork end

FIGURE 8-3B MASTER CYLINDER ASSEMBLY (CLEVELAND AIRCRAFT PRODUCTS)

accomplished by depressing the top of the pedals and pushing the control in.

To remove the master cylinder:

1. Actuate the brake pedal corresponding to the master cylinder to be removed.
2. Bleed the fluid from the brake system by removing the bleeder valve in the bottom of the brake assembly (Figure 8-1).
3. Disconnect the flexible hose assembly at the master cylinder connection.
4. Remove the cotter pin and withdraw the clevis pin which connects the clevis on the master cylinder to the rudder pedal.
5. Remove the cotter pin and withdraw the clevis pin which attaches the mounting lug of the master cylinder to the mounting bracket.

Master cylinder repair:

Repair of the master cylinders is limited to replacement of parts, cleaning and adjustment. Figure 8-3A & B may be used as a guide during disassembly and assembly of the brake master cylinders. Use clean hydraulic fluid as a lubricant during assembly of the cylinders.

To install the master cylinder:

Install the master cylinder in reverse of the removal procedure.

NOTE

Do not overtighten the fittings in the master cylinders. Overtightening could crack the casting and cause a leak.

NOTE

Adjustment of the master cylinder for proper fit can be made by loosening the jam nut beneath the clevis and rotating the clevis.

To fill the brake system:

The following procedure applies to both single and duel brake installations.

1. Remove the vent plugs from master cylinders (1 and 2, Figure 8-4) and replace with overflow lines. Immerse the free ends of the overflow lines in a can containing enough hydraulic fluid to cover the ends of the lines.
2. Connect a clean hydraulic pressure source to the brake assembly bleeder valve.
3. Fill the system until the overflow line in the master cylinder being filled shows no more air bubbles. Remove the overflow lines.
4. Remove the source of fluid and pressure and allow the fluid to drain back through the system until the fluid level is approximately 1/4 inch from the top of the reservoir in the master cylinder.
5. Secure the bleeder valve and replace the vent plugs.

NOTE

Do not fill the reservoir higher than 1/4 inch from the top as this will result in spillage. If fluid is accidently spilled on the rug, it can be removed with imperial cleaner.

CAUTION

Whenever the master cylinder is empty of fluid, avoid depressing the brake pedal to its extreme travel. Such action may result in permanent internal damage to the master cylinder.

NOTE

In servicing the hydraulic brake system, always use an approved hydraulic fluid conforming to MIL-H-5606.

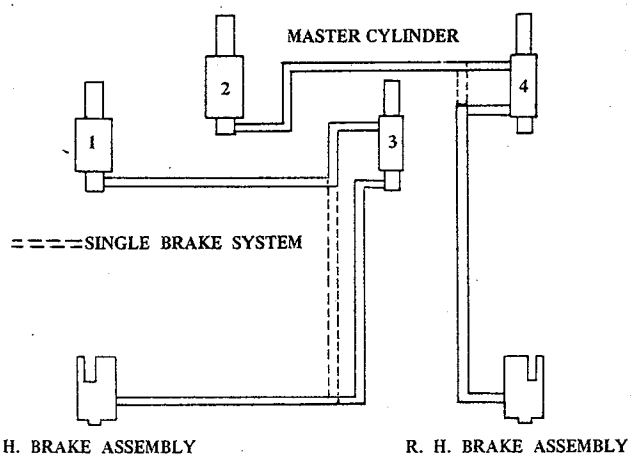


FIGURE 8-4 SCHEMATIC - HYDRAULIC BRAKE SYSTEM - DUAL

BRAKE SYSTEM TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Little or no braking	Low or no fluid	Service with proper grade hydraulic fluid
	Leak in system	Check all lines and connections
	Air in system	Bleed system
	Defective master cylinder	Repair or replace master cylinder
	Worn linings	Replace linings
Dragging Brakes	Warped or scored brake discs	Replace brake discs (check linings)
	Defective master cylinder return spring	Disassemble master cylinder and replace spring. Check spring free length and replace if necessary.
	Bent master cylinder shaft	Disassemble master cylinder and replace shaft
	Wheel cylinder piston sticking	Remove, clean or replace
	Bent line restricting movement of cylinder	Repair or replace line
	Bent or dirty torque plate pins	Clean or replace pins as required.
Floor and master cylinder covered with hydraulic fluid	Master cylinders overfilled	Lower fluid level to 1/4-inch from top of reservoir
	Leaking fittings at master cylinder	Tighten or replace fittings
	Leaking o-rings in master cylinders	Remove, inspect, and replace o-rings
	Cracked master cylinder casting	Replace master cylinder
Parking brake locks one brake only	Control linkage disconnected or connected incorrectly	Connect linkage correctly
Parking brakes will not release	Master cylinder shaft notched	Replace shaft
	Bent parking brake links	Replace links
	Parking brake control rigged too light	Rerig parking brake control

B. CABIN HEATING AND VENTILATING SYSTEM

1. Heating System:

The cabin heating system is basically a controlled air flow in which air, entering the cockpit, passes over the muffler core. The amount of heated air is regulated by a valve mounted through the firewall. Cool air picked up by the nose cowl inlet serves two purposes, that of cooling the muffler, and providing heated air for comfort.

The valve mounted through the firewall is used to regulate the warm air by either ducting it overboard or into the cabin as desired. The amount the push-pull control is moved determines the amount of heat ducted into the cabin.

To provide for windshield defrosting, a flexible duct is connected to the valve and terminated just below the sliding door located on the forward panel deck. Operation of the defroster is accomplished by pulling the push-pull control out and opening the sliding door.

2. Ventilation System:

Cabin ventilation is provided by two ventilators, one in each wing root, and two optional canopy air scoops. The wing root ventilators are controlled by sliding valves and the canopy scoops are controlled by adjustable valves for quantity and direction of air.

3. Troubleshooting

Most of the operational troubles in heating, ventilating and defrosting systems are caused by sticking or binding air valves or damaged air ducting. In most cases air valves can be freed by proper lubrication. Damaged or broken parts should be repaired or replaced. Be sure all valves move freely through the full range of travel and seal properly. Check that all heater and defroster ducting is properly attached. Replace any that are burned, frayed or crushed. If fumes are detected in the cabin, the heater shroud must be removed to allow a very careful inspection of the exhaust muffler and stack. Any holes or cracks may permit exhaust fumes to enter the cabin.

NOTE

Replacement of defective exhaust stacks or mufflers is imperative as exhaust fumes in the cabin constitute an extreme safety hazard.

SECTION IX

INSTRUMENTATION

9. INSTRUMENTATION

For extensive servicing behind the instrument panel, the upper deck and glareshield may be removed for easy access. Individual instruments may be removed for replacement or repair by removing the mounting screws through the face of the panel.

NOTE

Repair of any instrument should be accomplished by an FAA-approved instrument repair station.

A. MAGNETIC COMPASS

The magnetic compass is the liquid-filled, compensating type, incorporating two adjustable magnets. No maintenance is required for the magnetic compass except to occasionally swing it on a compass rose. Adjustments may be made to the instrument by the two screws located on the front face.

NOTE

It was necessary in some aircraft to install a secondary magnet, usually located behind the side panel between the instrument panel and windshield bow, to achieve compass compensation. Since this installation varies with each airplane, no serial numbers can be supplied for those affected.

B. CLUSTER ASSEMBLY

The cluster assembly consists of the fuel and oil pressure gauges, oil-temperature gauge, and ammeter. Defective gauges should be replaced.

C. TURN AND BANK INDICATOR

The turn and bank indicator is an electrically-driven gyro which requires no normal maintenance. Since the turn and bank indicator is electrically-driven, it will only operate when the master switch is in the on position.

D. HOURMETER

The hourmeter is controlled by a pressure-operated switch, installed in the oil pressure gauge circuit. As soon as the engine oil pressure builds up to 15 psi, the switch is activated, completing the electrical circuit through the hourmeter. This reading is indicative of the true engine time.

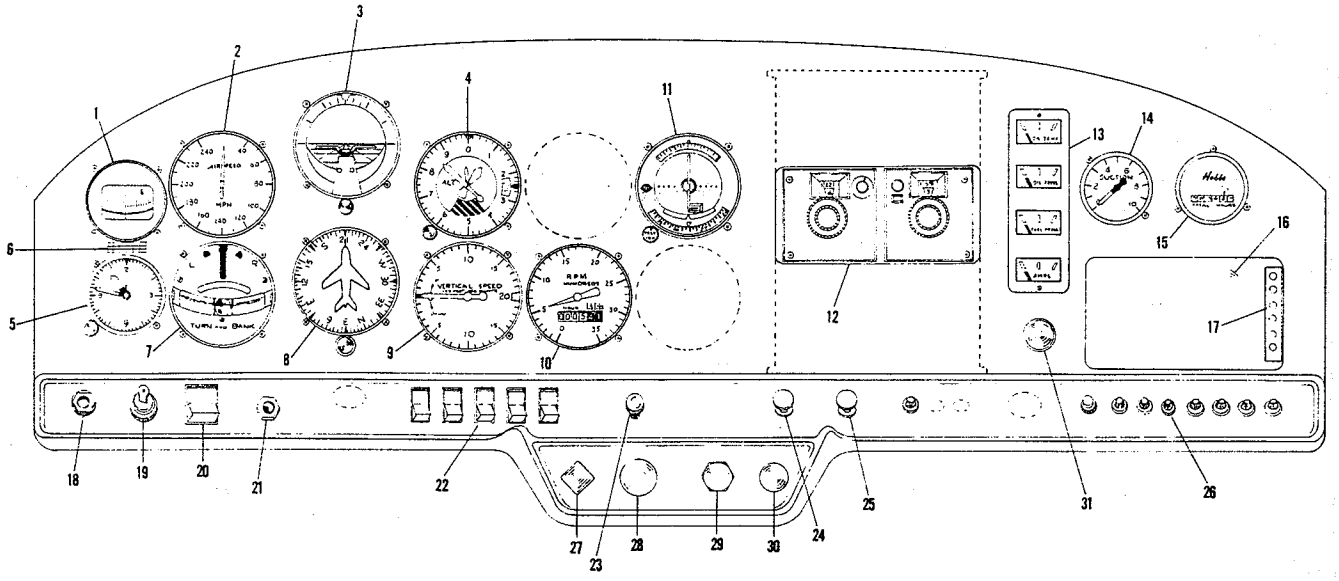
E. TACHOMETER

The tachometer is connected directly to the engine by a flexible shaft. Not only does the tachometer indicate the engine speed, but it includes an odometer for recording the time of engine operation.

TROUBLE	PROBABLE CAUSE	REMEDY
	TURN AND BANK INDICATOR TROUBLE SHOOTING	
Pointer fails to respond or indicate correctly	Blown fuse	Replace with properly rated fuse
	Defective wiring	Isolate with ohmmeter check and repair or replace defective wires.
	Defective mechanism	Replace instrument
	Low voltage	Check for proper voltage and adjust accordingly
	Oil too thick in indicator	Replace instrument
	Excessive friction in gimbal bearings	Replace instrument
Noisy gyro	Voltage too high	Check voltage and adjust accordingly
	Loose or defective rotor bearings	Replace instrument
	HOURMETER TROUBLE SHOOTING	
Not recording	Blown fuse	Replace with properly rated fuse
	Defective wiring	Check with ohmmeter and correct as necessary

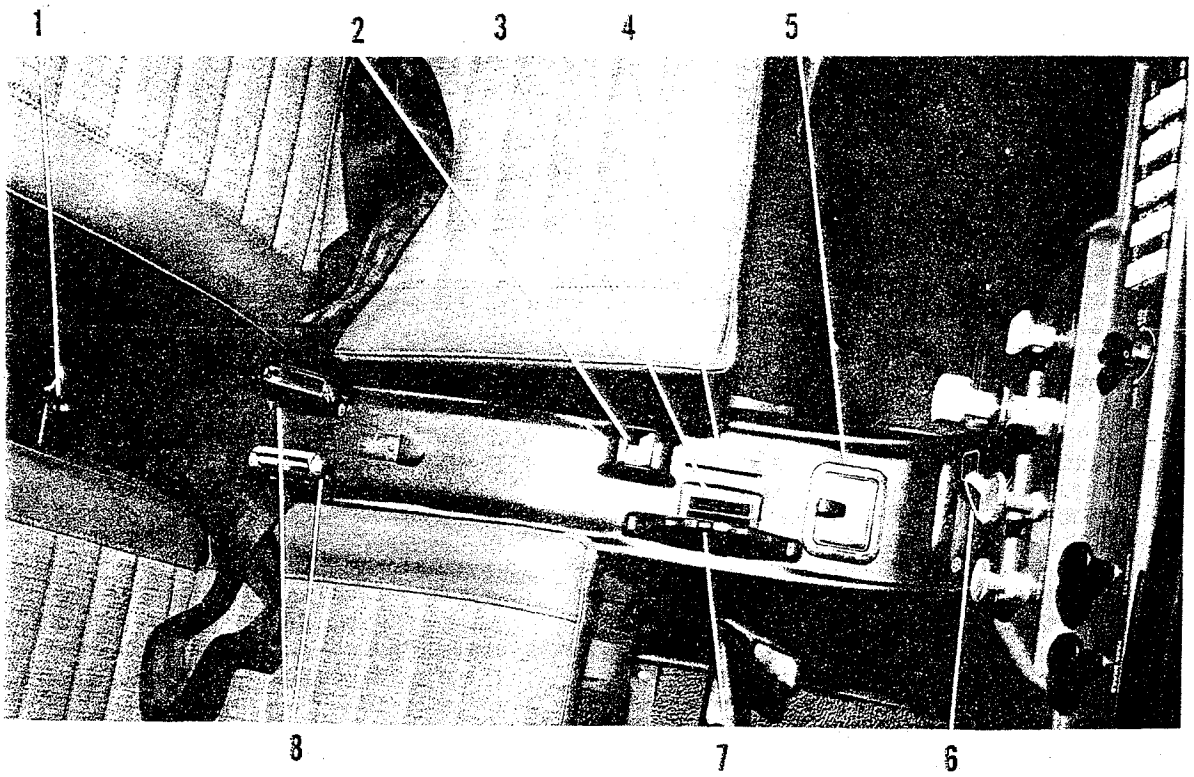
TROUBLE	PROBABLE CAUSE	REMEDY
	HOURMETER TROUBLE SHOOTING (cont)	
Not recording (cont)	Obstruction in line (oil pressure gauge will not be indicating)	Starting with restrictor fitting in engine, remove all fittings and lines and inspect and clean as necessary.
	Defective instrument	Replace instrument
	Defective pressure switch	Replace switch
	MAGNETIC COMPASS TROUBLE SHOOTING	
Excessive error	Compass not compensated	Compensate instrument
	External Interference	Locate interference and eliminate or shield
	TACHOMETER TROUBLE SHOOTING	
Pointer not functioning	Defective instrument	Replace instrument
	Broken drive shaft	Replace flexible drive shaft
Pointer fluctuates excessively	Dirt in instrument	Replace instrument
	Severe bend or broken drive shaft	Replace instrument
	Defective instrument	Replace instrument
Odometer not recording	Defective instrument	Replace instrument
	OIL PRESSURE GAUGE TROUBLE SHOOTING	
No indication	Insufficient oil	Check oil supply and fill as recommended
	Obstruction in pressure line	Remove all fittings and lines, starting at engine, and inspect and clean as required.
	Defective gauge	Replace gauge
High or low indication	Defective gauge	Replace gauge
	Oil pressure relief valve out of adjustment	Check engine pressure with a calibrated gauge and correct pressure setting as required.
	OIL TEMPERATURE GAUGE TROUBLE SHOOTING	
No indication	Blown fuse	Replace with properly rated fuse.
	Gauge not grounded	Check gauge ground connection and perform necessary repairs.
	Defective wiring	Check system with ohmmeter and perform necessary repairs.
	Defective gauge	Replace gauge
	Defective probe	Replace probe

TROUBLE	PROBABLE CAUSE	REMEDY
OIL TEMPERATURE GAUGE TROUBLE SHOOTING (cont)		
High or low indication	Defective gauge	Temporarily substitute a 28.5 ohm resistance for the probe. If gauge does not read 245° F (Red Line), replace gauge.
	Defective probe	Replace probe
	Low voltage	Check voltage and adjust accordingly.



1. COMPASS
2. AIRSPEED INDICATOR
3. HORIZON GYRO
4. ALTIMETER
5. CLOCK
6. COMPASS CARD
7. TURN AND BANK INDICATOR
8. DIRECTIONAL GYRO
9. VERTICAL SPEED INDICATOR
10. TACHOMETER
11. OMNI HEAD
12. RADIO
13. INSTRUMENT CLUSTER
14. SUCTION GAUGE
15. HOURMETER
16. GLOVE COMPARTMENT
17. SPARE FUSES
18. PHONE JACK
19. IGNITION SWITCH
20. MASTER SWITCH
21. STARTER SWITCH
22. INDIVIDUAL CIRCUIT SWITCHES
23. INSTRUMENT LIGHT RHEOSTAT
24. CABIN HEAT CONTROL
25. PARKING BRAKE CONTROL
26. FUSES AND CIRCUIT BREAKERS
27. CARB HEAT CONTROL
28. THROTTLE CONTROL
28. MIXTURE CONTROL
30. ENGINE PRIMER
31. CIGAR LIGHTER

FIGURE 9-1 INSTRUMENT PANEL



1. MICROPHONE JACK
2. FLAP SWITCH
3. ELEVATOR TRIM TAB POSITION INDICATOR
4. FLAP POSITION INDICATOR
5. ASH TRAY
6. FUEL SELECTOR
7. ELEVATOR TRIM WHEEL
8. SEAT BELT HOLDERS

FIGURE 9-2 CONSOLE

F. PITOT AND STATIC SYSTEM

The pitot and static systems consists of metal and plastic tubing which convey ram air pressure and atmospheric pressure to the airspeed indicator, vertical speed indicator and altimeter.

Ram air pressure is picked up by the pitot tube, located under the left wing, approximately three feet from the end. From the pitot tube, a line runs along the leading edge of the wing to the wing root and then to the instruments.

The pitot line should periodically be disconnected inside of the wing root in order to drain any moisture accumulation.

The static system, consisting of a static port on each side of the aft fuselage, conducts atmospheric pressure to the instruments. The line which runs from the ports to the instruments, slopes continuously upward to prevent the possibility of moisture accumulation.

To check the pitot system for leakage:

1. Insert a rubber hose over the pitot tube.
2. Apply pressure by closing the opposite end of the tubing and slowly rolling it up until the airspeed indicator registers between 120-150 mph.
3. Secure the hose.
4. After two to three minutes, recheck the airspeed indicator. Any leakage in the system will result in a lower airspeed indication. If the reading has decreased more than 1 mph per minute, an undesirable leak exists somewhere in the system.
5. If a leak does exist, recheck and retighten all the fittings in the system and apply thread sealant sparingly as required. Take special notice of the pitot line in the wing root and replace the hose if it appears to be deteriorated.
6. Repeat the above test.

CAUTION

Never apply suction to the pitot tube unless the airspeed indicator is disconnected.

To check the static system for leakage:

1. Seal off one static port opening with plastic tape. This must provide an air tight seal.
2. Attach a source of suction to the remaining static port.
3. Slowly apply suction until the altimeter indicates a 12,000-foot increase in altitude.

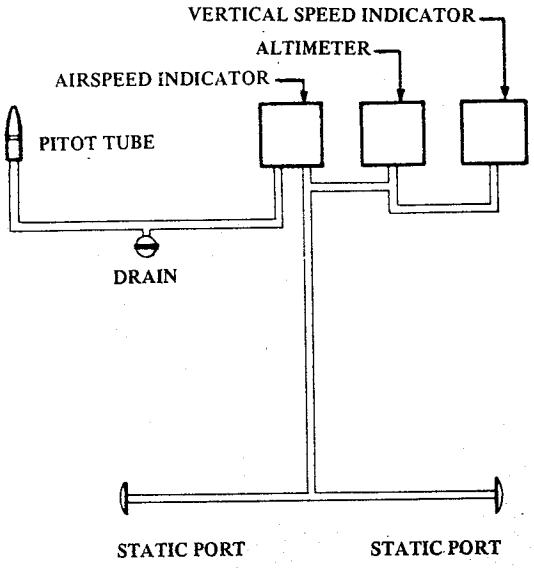


FIGURE 9-3 SCHEMATIC - AIRSPEED SYSTEM

4. Secure the suction source to maintain a closed system. Leakage shall not exceed 100 feet of altitude lost per minute, as indicated on the altimeter.
5. If the leakage rate exceeds 100 feet per minute, tighten all connections and add sealant sparingly to the fittings as required.
6. Repeat the above test.
7. If the leakage rate is still too high, disconnect the static lines from the individual instruments.
8. Proceeding one at a time, and using suitable fittings, connect the lines together so that the altimeter is the only instrument still connected to the static pressure system.
9. Repeat the leakage test to determine whether the static pressure system or the removed instruments are the cause of leakage. If the instruments are at fault, they must be repaired by an "appropriately rated repair station" or replaced. If the static pressure system is at fault, use the above procedure given in 1 through 5.

CAUTION

Never apply positive pressure to the static system unless all instruments are disconnected.

Figure 9-4 shows an outline of the wing contour and a series of parallel lines. To check the proper alignment of the pitot tube, make a template conforming to the lines shown in Figure 9-4. If the pitot tube is properly aligned, it should parallel one of the lines.

TROUBLE	PROBABLE CAUSE	REMEDY
PITOT AND STATIC SYSTEMS TROUBLE SHOOTING		
Airspeed indicator fails to indicate	Obstruction in pitot or static lines	Check all lines and fittings for obstruction and clean as necessary
	Pitot line kinked or disconnected	Check all pitot lines and repair as required
Airspeed indicator fluctuates or indicates incorrectly	Leak in pitot or static systems	Tighten all connections and test system until no leakage is evident
	Defective instrument	Replace instrument
	Instrument leakage	Test instrument individually and replace if necessary
Altimeter fails to operate	Clogged static line	Check all lines and fittings and blow out as required
	Defective instrument	Replace instrument
Altimeter fluctuates	Instrument leakage	Test instrument individually and replace if necessary
	Defective instrument	Replace instrument
	Leak in static system	Tighten all connections and test system until no leakage is evident
Vertical speed indicator fails to operate, fluctuates, or reads incorrectly.	Obstruction in static lines	Remove, inspect, and clean all static lines
	Defective instrument	Replace instrument
	Instrument leakage	Test instrument individually and replace if necessary
HEATED PITOT TROUBLE SHOOTING		
Pitot fails to heat	Blown fuse	Replace with properly rated fuse
	Defective wiring	Check with ohmmeter and repair as necessary
	Heated element burned out	Replace element

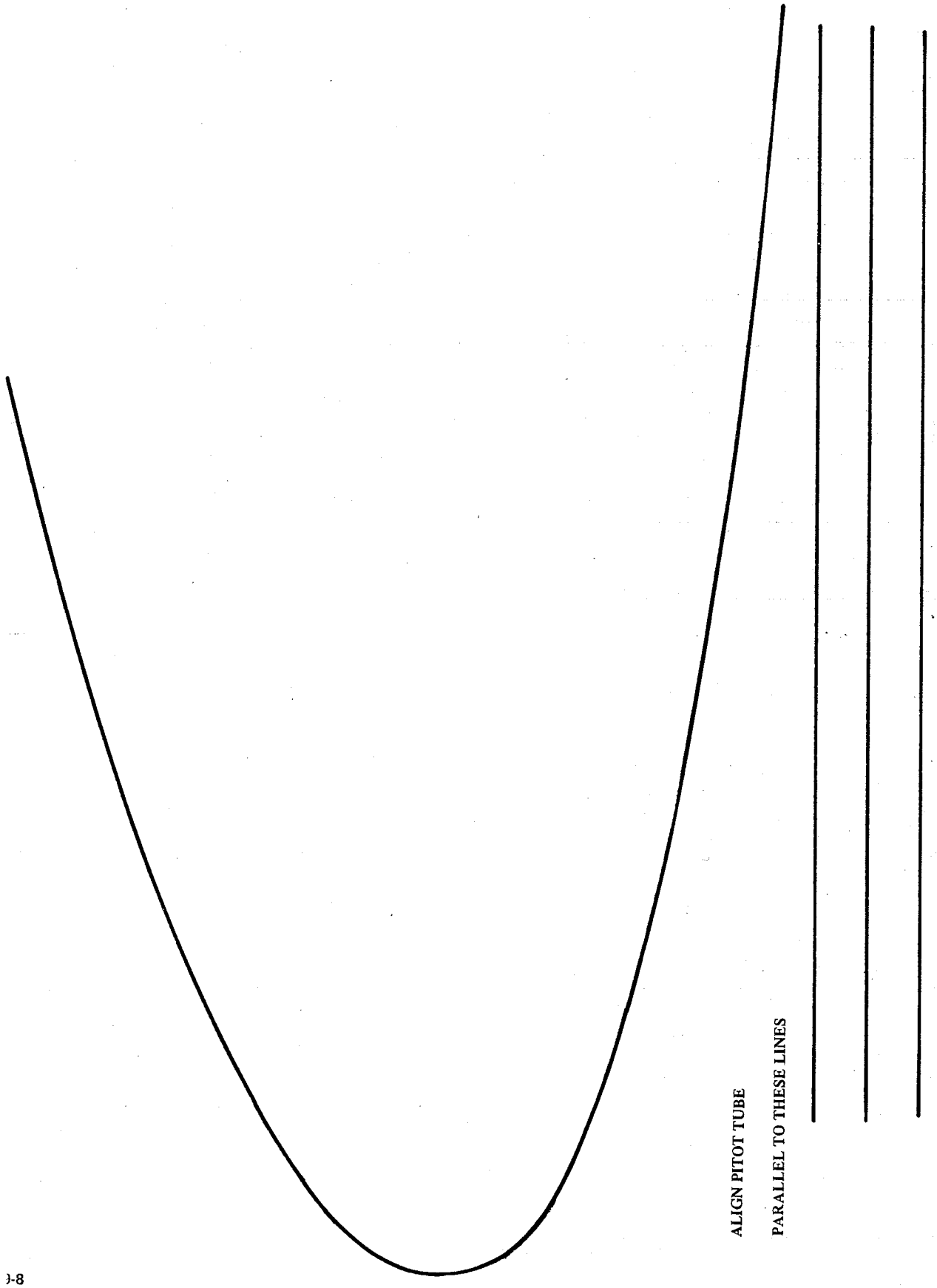


FIGURE 9-4 WING CONTOUR

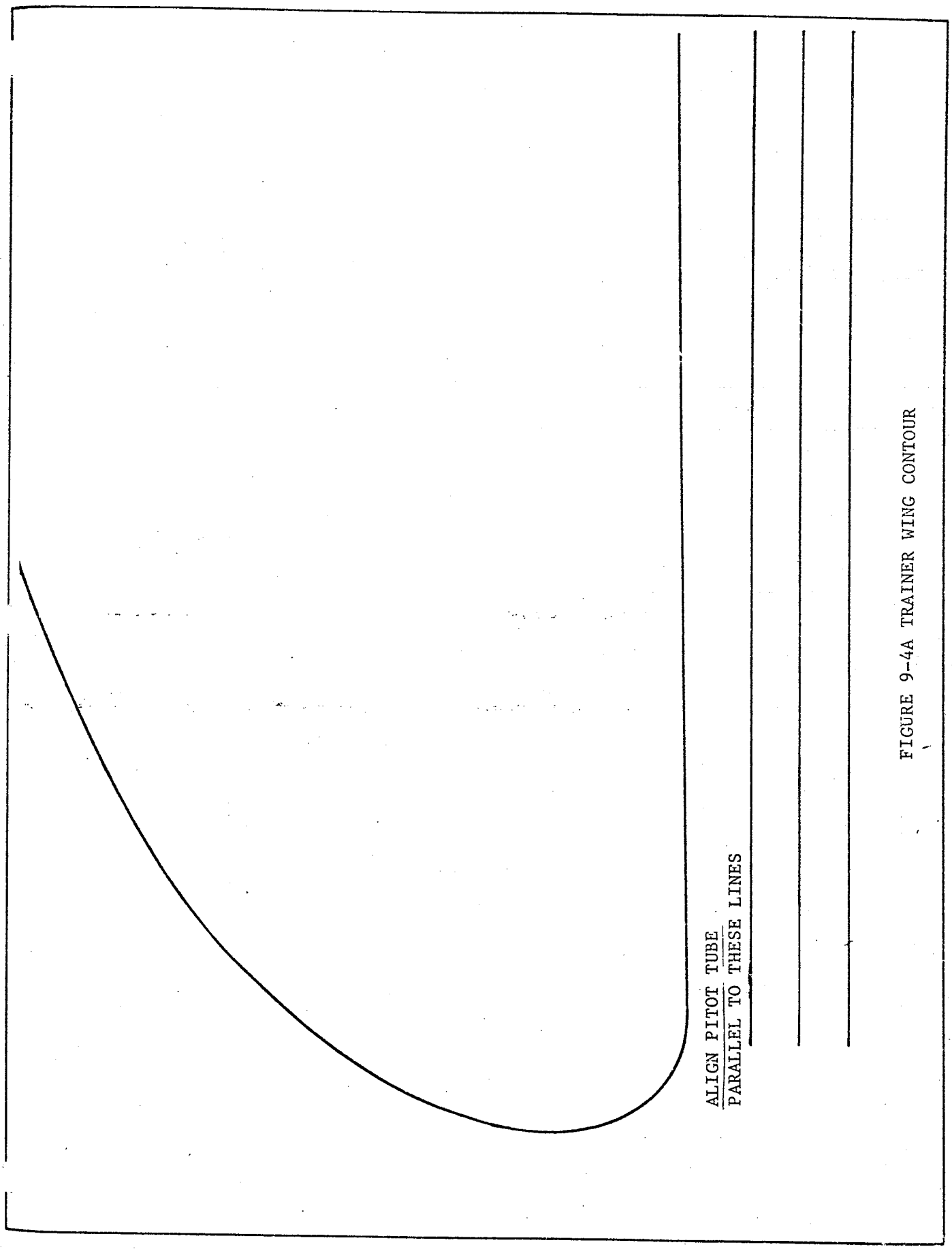


FIGURE 9-4A TRAINER WING CONTOUR

G. VACUUM SYSTEM

The vacuum system consists of an engine driven vacuum pump, vacuum regulator, filter, directional gyro, horizon gyro, and a suction gauge, plus necessary tubing and fittings. Since the vacuum pump is of the dry type, no oil separator is required.

The amount of vacuum being pulled through the instruments is determined by the vacuum regulator. Located behind the instrument panel, the vacuum regulator should be adjusted to indicate 4.6 - 5.4 inches of mercury. This pressure is indicated on the suction gauge which is connected to the horizon gyro.

NOTE

To obtain proper adjustment of the vacuum, adjust with the engine running at 2100 - 2400 rpm.

The vacuum filter is also located behind the instrument panel. It should be checked periodically and the media replaced if necessary. To replace the media, simply remove the filter from the airplane, remove the nut and lock washer, and withdraw the filter element.

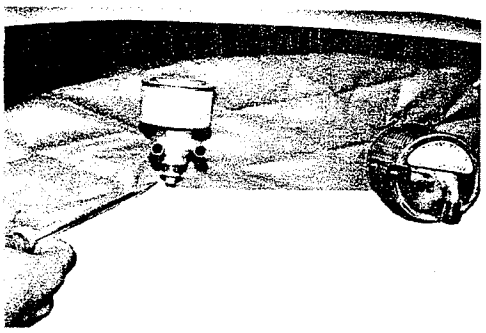


FIGURE 9-5 VACUUM REGULATOR

TROUBLE	PROBABLE CAUSE	REMEDY
VACUUM SYSTEM TROUBLE SHOOTING		
Suction gauge reading excessively high	Regulator not properly adjusted	Adjust vacuum regulator
Suction gauge fails to indicate	Disconnected line somewhere in system	Check all lines for proper and secure connections
	Regulator adjusted to closed position	Adjust vacuum regulator
	Defective gauge	Replace instrument
Gyros sluggish or fail to operate	Disconnected line or leakage somewhere in system	Check all lines for proper and secure connections
Directional gyro processes excessively	Low vacuum	Adjust vacuum regulator
	Dirty filter	Replace filter element
	Defective instrument	Replace instrument
	Defective pump	Replace pump

SECTION X

STRUCTURAL REPAIR

10. STRUCTURAL REPAIR

A. GENERAL

This information should be used in conjunction with the AC 43.13-1. "Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair". Information contained herein is applicable to repair of damage where replacement of the damaged assembly is considered either unnecessary or impractical. If some doubt exists relative to a repair not specifically covered, consult the Customer Service Department.

Field repairs of bonded structures can be made using rivets. Flush, riveted repairs can be made in both sheet metal and honeycomb areas. These repairs are normally covered with an epoxy filler to maintain surface contour and smoothness. Bonded repair shall be performed per approved American Aviation Corporation Specifications.

B. TOOLS, JIGS AND FIXTURES

No special tools are required to maintain and service the Yankee. Standard shop tools (includes a torque wrench and a micrometer) are adequate. Required jigs and fixtures can either be made in the shop or procured through the Customer Service Department.

C. MATERIALS

Structural repairs should be accomplished using identical material to that being repaired (i.e., .032 2024-T3 Clad Aluminum). Figure 10-1 shows the various materials utilized in the Yankee and should be used in determining type of material for all repair work. If material shortages make substitution necessary, 2024-T3 in most cases can be substituted for any other aluminum alloys. However, it is important that the 2024-T3 aluminum contain an aluminum coating (designated as "alclad") for corrosion protection.

D. SERVICE KITS

Available through the Customer Service Department is Service Kit #SK-102, which is a potting kit and includes Epocast 4-K* Resin and Epocast 9421 Hardener plus instructions for proper preparation and application.

E. SHEET METAL REPAIRS - RIVETED

Damage to skin, ribs and frame areas can generally be repaired using normal sheet metal repair techniques. These are covered in AC 43.13-1. Several typical repairs are also shown in Figures 1 and 2.

Local wing skin damage can be satisfactorily repaired using rivets. However, if extensive wing skin damage exists, it is recommended that the complete skin panel be replaced. This operation can be accomplished by the factory. The Customer Service Department should be contacted for additional information.

*Epocast 4-K Resin available through:

Furane Plastics Inc.
4516 Brazil Street
Los Angeles, California

F. HONEYCOMB PANEL REPAIRS - RIVETED

Damage to honeycomb panels can be repaired by removal of the damaged material and splicing in of new repair parts. The splice can be installed with rivets and can be made flush with the external surface if desired. Representative repairs for damaged honeycomb panels are shown in Figures 3 through 10.

Minor damage to one face sheet of a honeycomb panel which is confined to an area of 1.0 inch or less in diameter, and located in a non-critical area, can be repaired by smoothing all sharp edges in the damaged area and filling the area with an epoxy filler.

Minor damage in a critical area which is equal to or less than 1.0 inch in diameter can be repaired by removal of the damaged face sheets, application of resin filler, and installation of a doubler plate. Service Kit #SK-102 includes an acceptable resin filler with resin, hardener, and instructions for preparation and application. It is available through the Customer Service Department. A representative repair is shown in Figure 3.

Damage areas greater than 1.0 inch in diameter or including punctures through both face sheets will require removal of the damaged area and insertion of a honeycomb repair section. Typical repairs are shown in Figures 4, 5, and 6.

Extensive honeycomb panel damage, such as nose gear attachment failure, can be repaired by splicing in new honeycomb repair assemblies supplied by the Customer Service Department. Figures 7 and 10 include an example of such a repair.

When making honeycomb panel repairs which require splicing of the bonding strap angles located at the lower corners of the fuselage, the splice must be so designed to maintain the continuity of the angles from the original panel into the repair panel. This can be achieved with angles riveted over the bonding strap angles across the splice. This is shown in Figure 8. The length of the external splice angle can be increased as required for appearance purposes.

All riveted honeycomb repairs should include some means of sealing the repair joint from external moisture. This protection may be provided by the epoxy filler used to smooth the repair prior to painting or by a suitable faying surface seal prior to final assembly of the joint.

G. REPAIR OF FORMED THERMO-PLASTIC PARTS

Repairs of punctures may be accomplished by cutting out the damaged area, removing the paint and installing an overlapping or flush patch of identical material. A doubler may be added behind the patch if additional strength is required. The bonding agent can be Methyl Ethyl Ketone (MEK) or any commercial solvent. Cracks or voids may be repaired by applying a filler composed of solvent and material shavings. Upon completion of the repair, sand the area smooth and repaint.

Extensively damaged parts should be replaced.

H. ENGINE MOUNT REPAIR

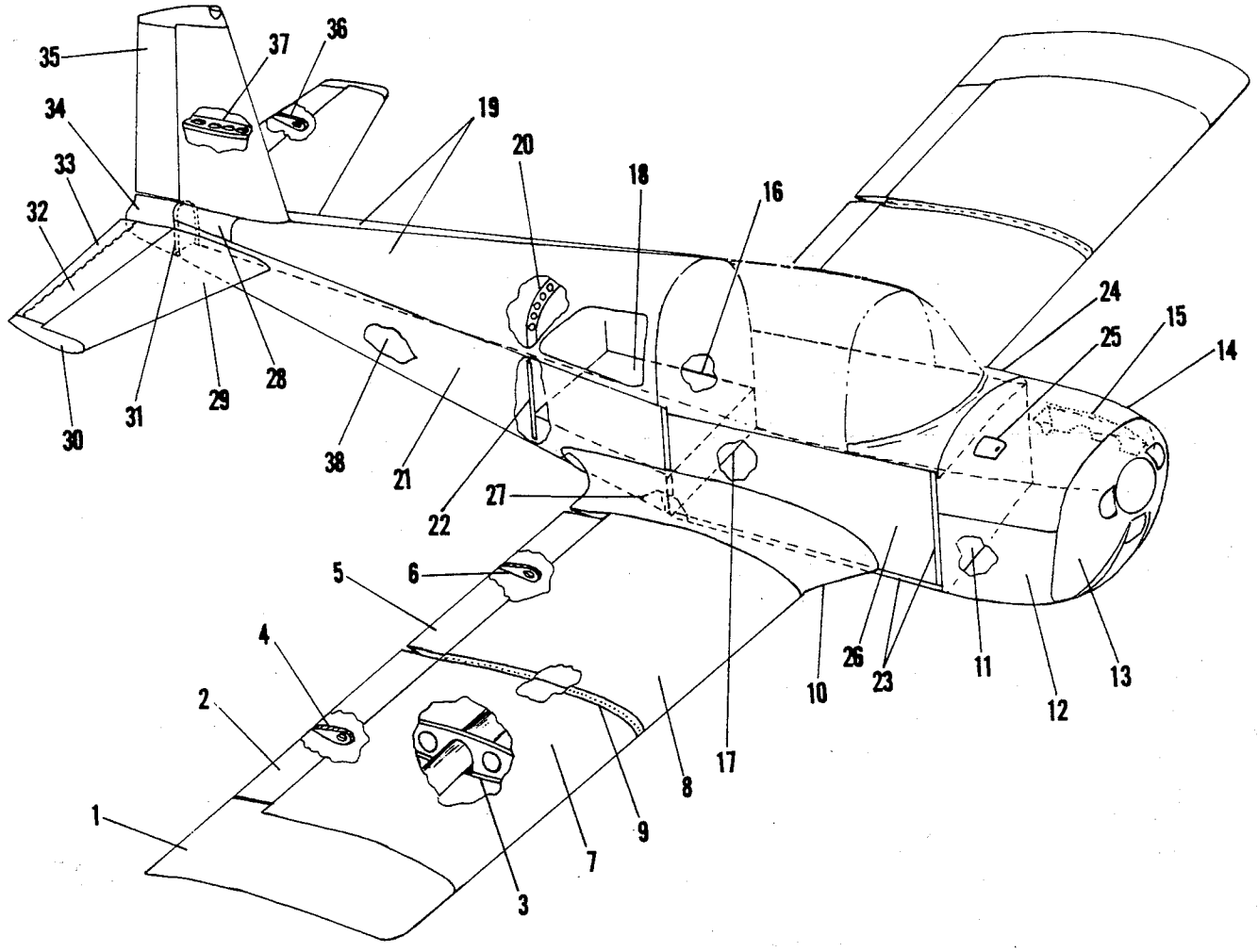
Engine mount repairs should be accomplished in strict accordance with Part 43 of the Federal Aviation Regulations.

I. CONTROL SURFACE REPAIR

After repair and/or repainting of any control surface, it is necessary to check the balance and adjust the mass balance weight as required to bring it within tolerance. These tolerances are as follows:

Elevator and Rudder ..... 0-28 in-oz.
Ailerons ..... -8 to +16 in-oz.

No overbalance (-) allowed on elevators and rudder. A control surface which is leading edge heavy is referred to as "overbalanced" and denoted by (-). Refer to Section V for Control System Rigging.



ITEM NO.	DESCRIPTION	MATERIAL	ITEM NO.	DESCRIPTION	MATERIAL
1	WING TIP	FIBERGLASS	20	BULKHEAD	.025" 2024-T42 ALCLAD
2	AILERON SKIN	.020" 2024-T3 ALCLAD	21	SKIN	.032" 2024-T3 ALCLAD
3	WING RIB	.025" 6061-T6	22	STIFFENER	.032" 2024-T3 ALCLAD
4	AILERON RIB	.50" HONEYCOMB	23	ANGLES	.025" 2024-T3 ALCLAD
5	FLAP SKIN	.020" 2024-T3 ALCLAD	24	SKIN	.025" 6061-T4
6	FLAP RIB	.50" HONEYCOMB	25	ACCESS DOOR	.063" 6061-T4
7	WING SKIN	.020" 2024-T3 ALCLAD	26	FUSELAGE PANELS	.50" HONEYCOMB
8	WING SKIN	.020" 2024-T3 ALCLAD	27	GUSSET	.040" 2024-T42 ALCLAD
9	DOUBLER	.020" 2024-T3 ALCLAD	28	COVER	.020" 2024-T3 ALCLAD
10	WING ROOT FAIRING	FIBERGLASS	29	STABILIZER SKIN	.020" 2024-T3 ALCLAD
11	FIREWALL	.018" ALUMINIZED STEEL	30	STABILIZER TIP	THERMO-PLASTIC
12	LOWER COWL	.040" 6061-T4	31	BULKHEAD	.090" 2024-T42 ALCLAD
13	NOSE COWL	FIBERGLASS	32	SKIN	.016" 2024-T3 ALCLAD
14	UPPER COWL	.032" 6061-T4	33	TRIM TAB SKIN	.016" 2024-T3 ALCLAD
15	BAFFLE	.032" 5052-H32	34	TAILCONE	THERMO-PLASTIC
16	BAGGAGE FLOOR	.032" 2024-T3 ALCLAD	35	SKIN	.016" 2024-T3 ALCLAD
17	BULKHEAD	.50" HONEYCOMB	36	RIB	.50" HONEYCOMB
18	BULKHEAD	.032" 2024-T3 ALCLAD	37	STABILIZER RIB	.025" 2024-T42 ALCLAD
19	SKIN	.020" 2024-T3 ALCLAD	38	BOTTOM SKIN	.025" 2024-T3 ALCLAD

FIGURE 10-1 AIRFRAME MATERIALS CHART

1. Use 1/8" diameter countersunk Cherry rivets (CR162) or equivalant. Use bucked rivets with caution to prevent nearby bond damage.

2. Surface contour must be maintained. Upon completion of the repair, use an epoxy filler as necessary and sand smooth.

3. This repair can be completed in the area of wing ribs by installing the doubler in two pieces, one on each side of the rib flange.

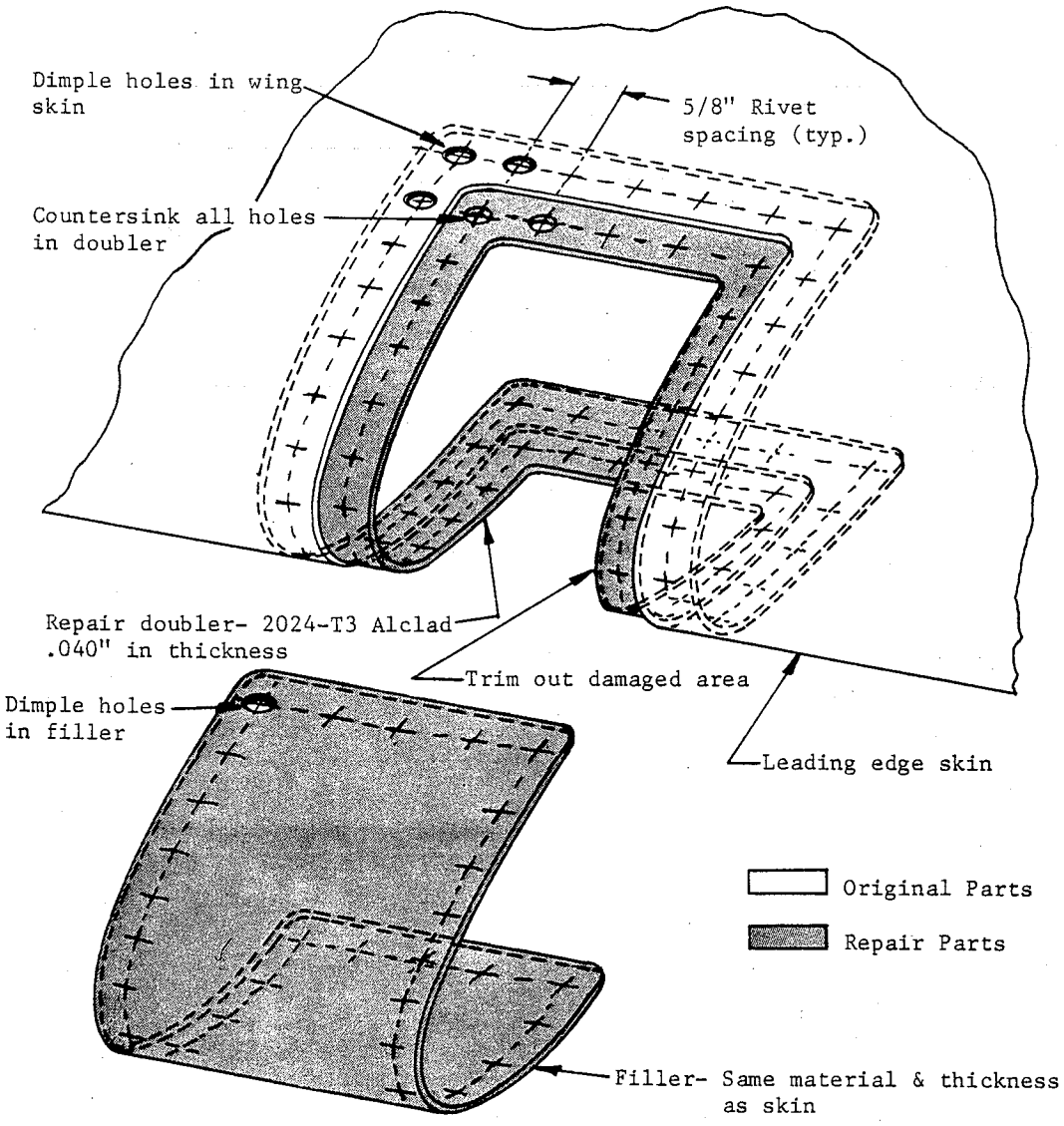


FIGURE 1. LEADING EDGE REPAIR (RIVETED)

1. Use 1/8" diameter Cherry rivets (CR162, CR163) or equivalent. Use bucked rivets with caution to prevent nearby bond damage.

2. Repair parts shall be 6061-T6 or equivalent. Doubler thickness shall be .032" (Spar collar thickness is .040").

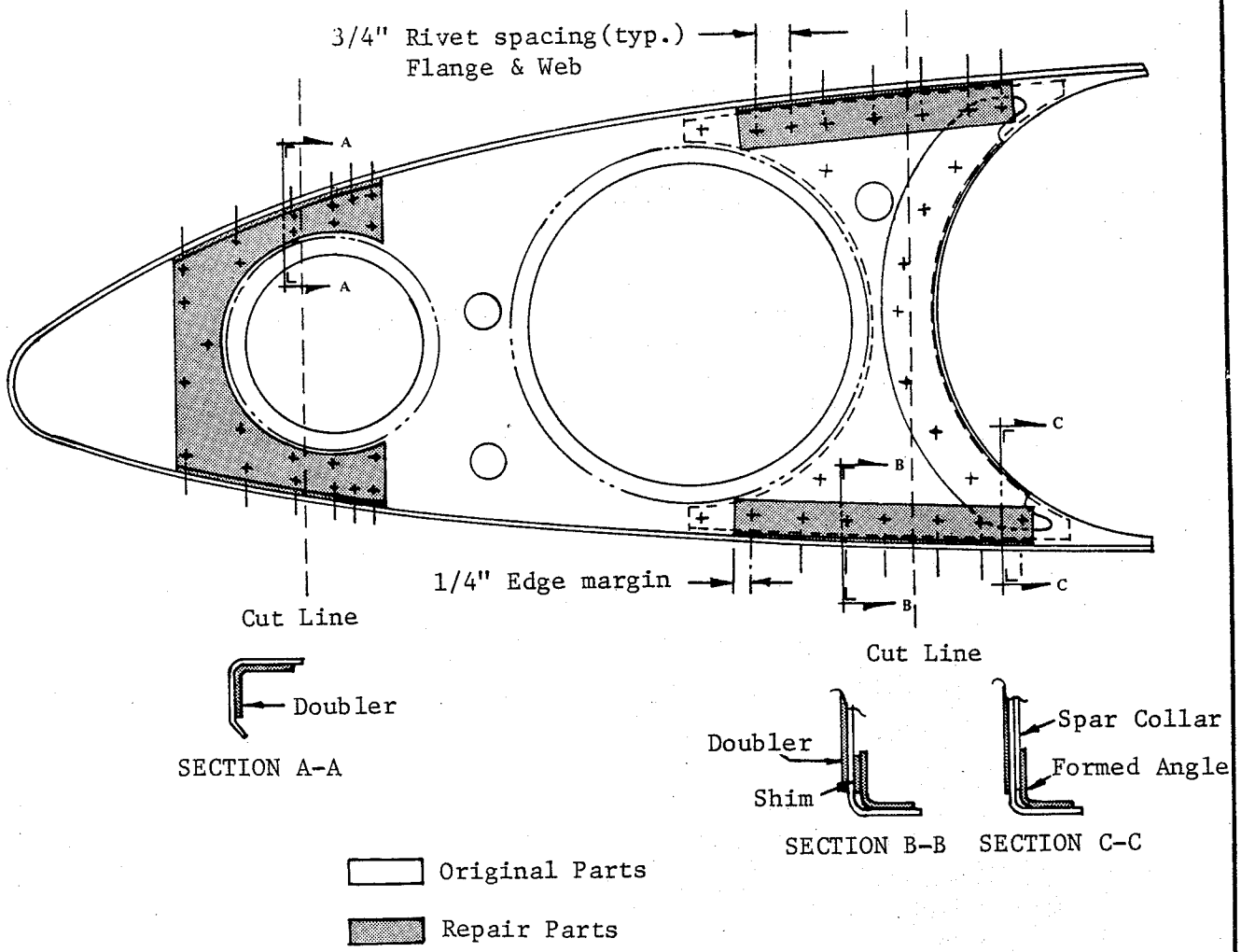
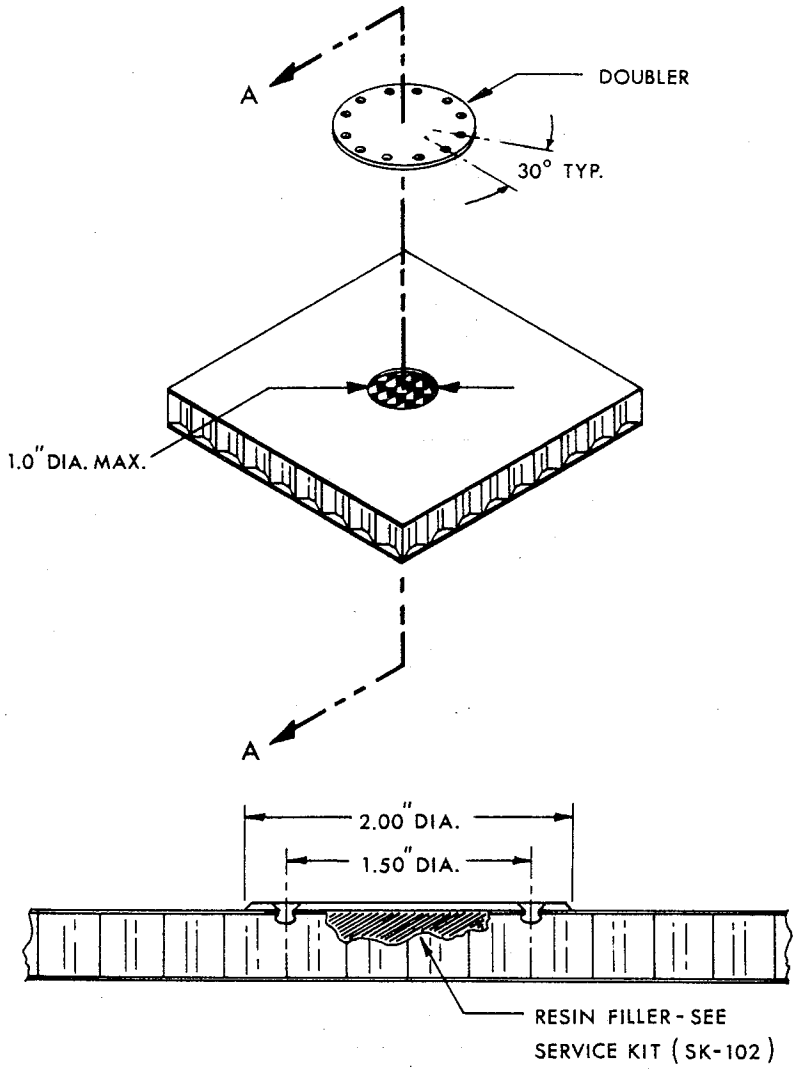


FIGURE 2. WING RIB REPAIR (RIVETED)

NOTES:

1. Use 1/8 inch diameter Cherry rivets (CR162 and CR163) or equivalent.
2. Refer to AC 43.13-1, Figure 2.22 for doubler and rivet pattern dimensions. Doublers for riveted repairs shall be .040 2024-T3 alclad aluminum.
3. Fair external doubler periphery with epoxy filler to maintain a smooth surface.

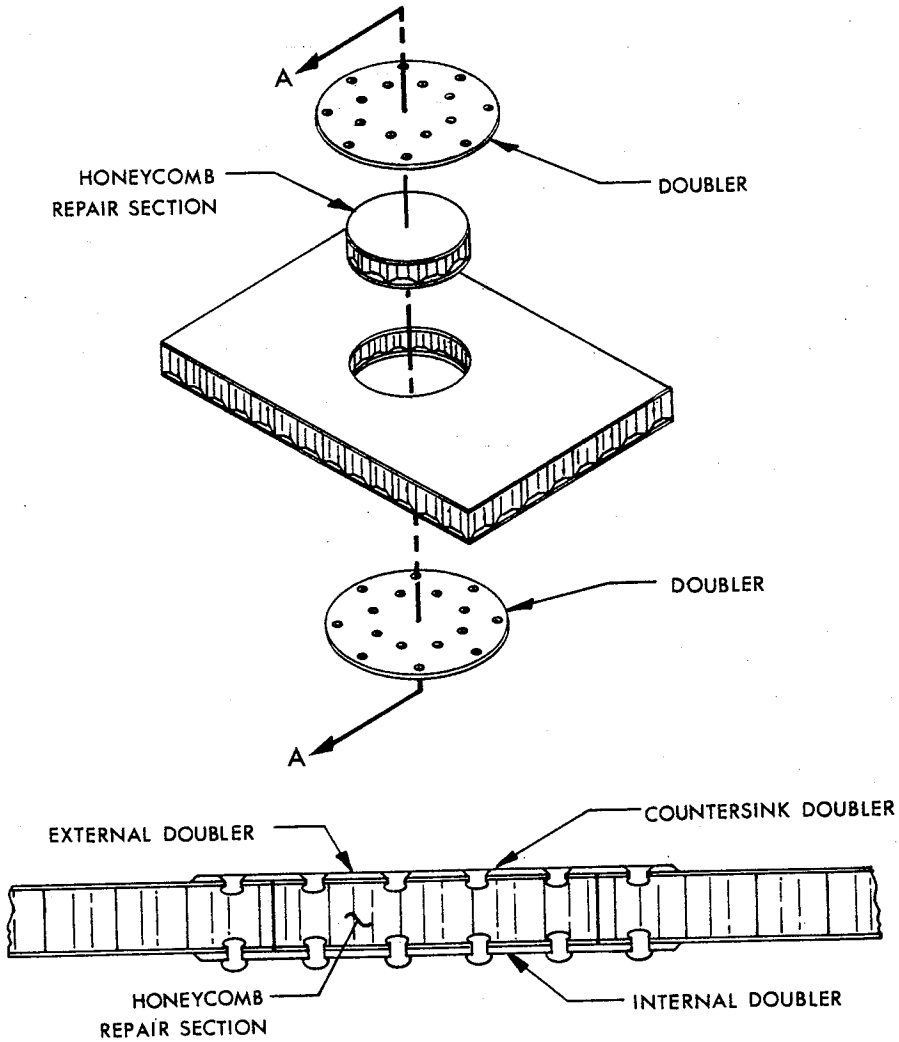


SECTION A-A

FIGURE 3. Honeycomb Repair, External Doubler (Riveted)

NOTES:

1. Use 1/8 inch diameter Cherry rivets (CR162 and CR163) or equivalent.
2. Rivets schould be installed through the doubler and repair section (both sides) such that maximum distance between any two rivets is 1.5 inches.
3. Refer to AC 43.13-1, Figure 2.22 for hole diameter limitations and corresponding rivet patterns. Doublers for riveted repairs shall be .040 2024-T3 alclad aluminum.
4. Fair external doubler periphery with epoxy filler to maintain a smooth surface.



SECTION A-A

FIGURE 4. Honeycomb Repair, External Doubler (Riveted)

NOTES:

1. Use 1/8 inch diameter Cherry rivets (CR162 and CR163) or equivalent.
2. This repair is satisfactory for most honeycomb repairs which require new panel sections to be spliced into existing structure.
3. External doubler shall be .040 2024-T3 alclad aluminum or equivalent and internal doubler shall be .032 2024-T3 alclad aluminum or equivalent.
4. Fair external doubler periphery with epoxy filler to maintain a smooth surface.
5. Dimensions are typical for most honeycomb repairs using external doublers.

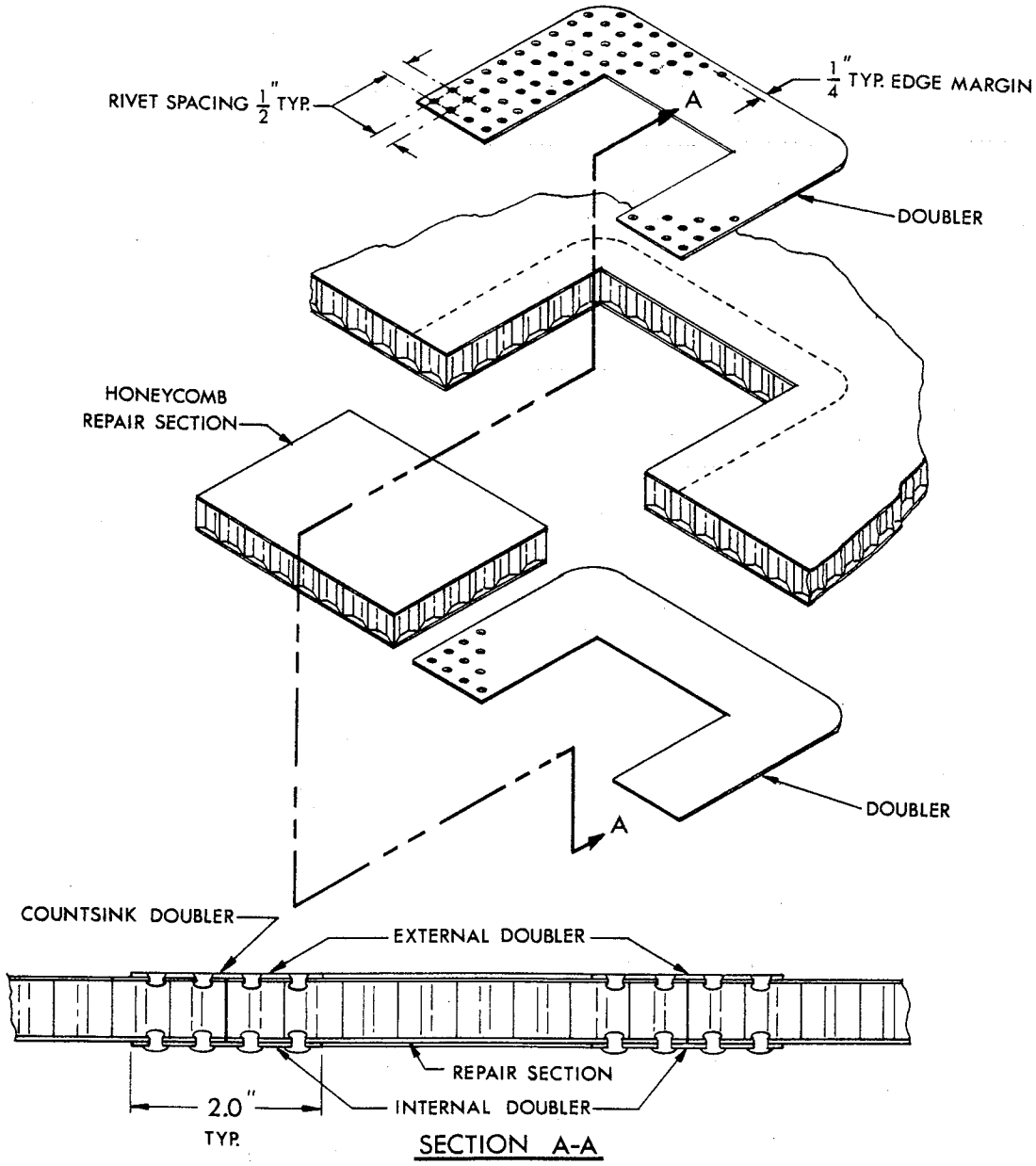


FIGURE 5. Honeycomb Repair, External Doubler (Riveted)

NOTES:

1. Use 1/8 inch diameter Cherry rivets (CR162 and CR163) or equivalent.
2. Remove damaged portion of external face sheet, and 1.0 inch of honeycomb core and internal face sheet around periphery of hole in external face sheet.
3. In general,repairs of this type are not restricted as to size or shape; however, rectangular, circular, or oval shapes with generous corner radii (1/2 inch minimum) are desirable for ease of installation.
4. Obtain repair section material with .040 face sheet through Customer Service Department.
5. Fill external surface with epoxy filler and sand to maintain smooth surface.

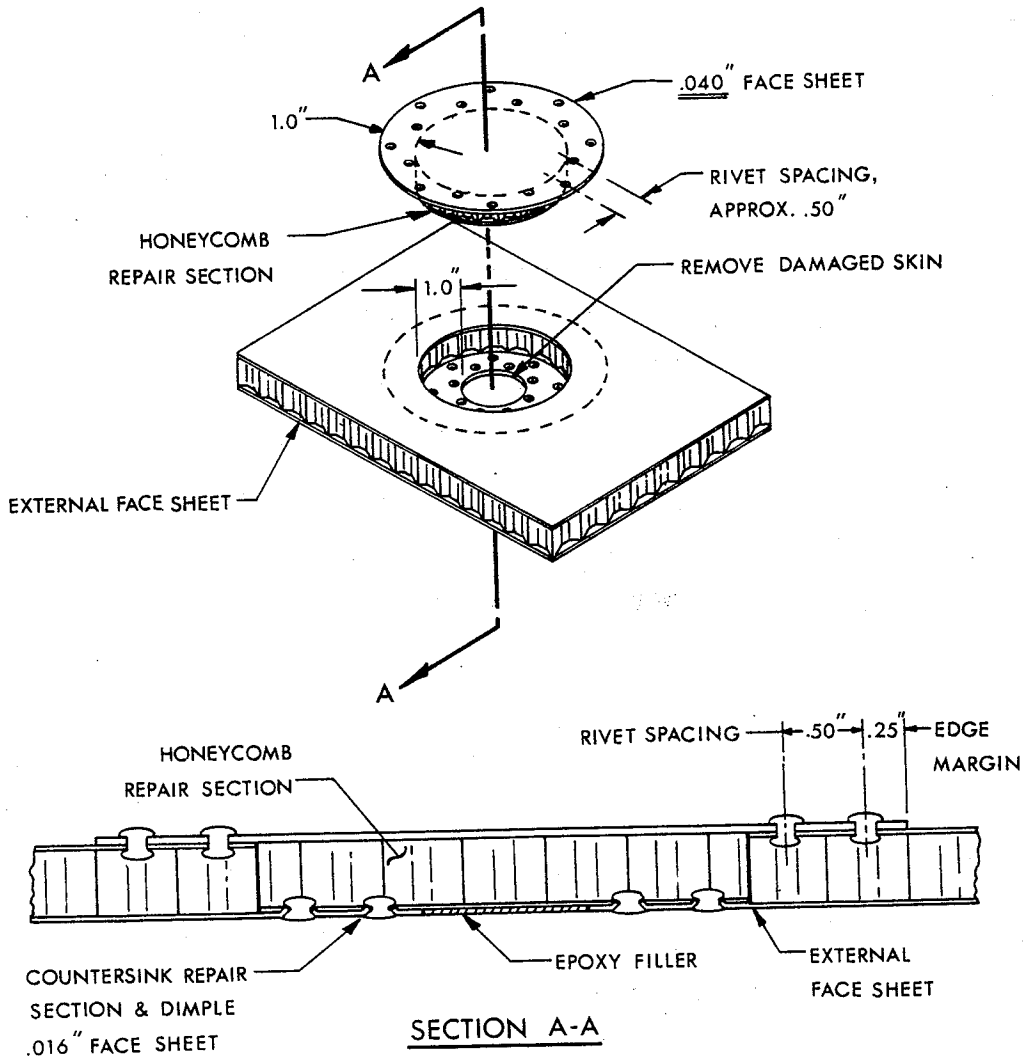


FIGURE 6. Honeycomb Repair, Flush (Riveted)

NOTES:

1. Use 1/8 inch diameter Cherry rivets (CR162 and CR163) or equivalent. Use bucked rivets with caution to prevent adjacent bond damage.

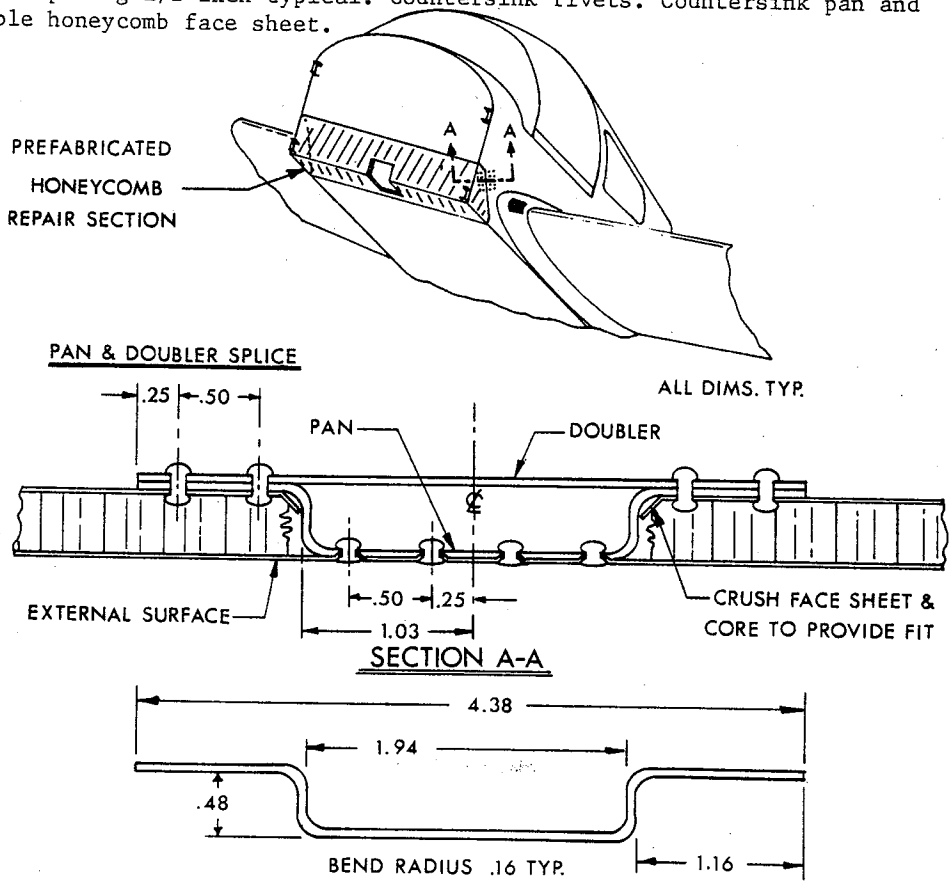
2. This repair can be made using (a) external doublers as shown in Figure 5, (b) rectangular sections of honeycomb the length of the repair splice similar to section A-A of Figure 6, or (c) the sheet metal pan and doubler method as shown below.

3. The external doublers are recommended for repair splices in the firewall and floor honeycomb panels. This allows the honeycomb panels to be butted enhancing ease of repair. The decision on whether to use an external or flush repair on the fuselage side panel depends on individual preference.

4. Pan and doubler material will be .063 2024-T3 alclad aluminum or equivalent. Preformed pan sections can be obtained through the Customer Service Department.

5. To prevent distortion, carefully support outer face sheets of honeycomb panels while removing core material.

6. Rivet spacing 1/2 inch typical. Countersink rivets. Countersink pan and dimple honeycomb face sheet.



PAN (.063 2024-T3 ALCLAD ALUM. SHEET)

FIGURE 7. Honeycomb Repair, Flush (Riveted)

NOTES:

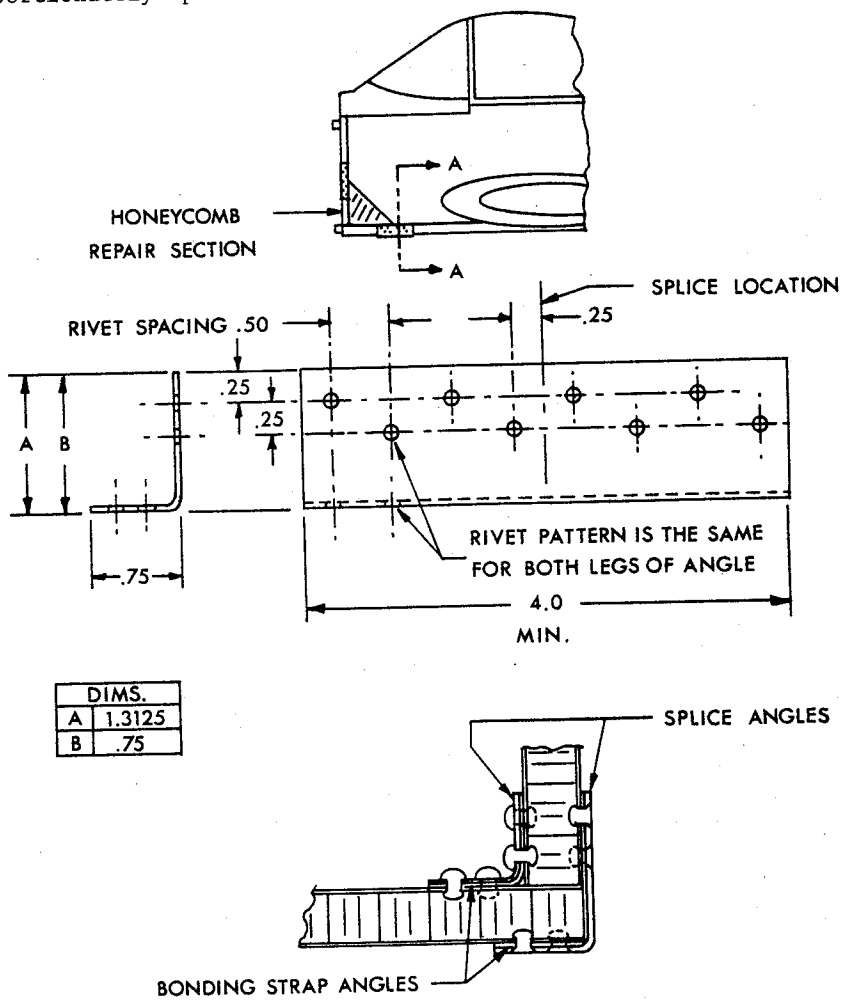
1. Use 1/8 inch diameter Cherry rivets (CR162 and CR163) or equivalent.

2. Splice angle material shall be 2024-T3 alclad aluminum. Where countersunk rivets are to be installed, angle thickness shall be .040 inch. Otherwise, .032 inch thick material is satisfactory.

3. Form splice angles as shown in diagram below.

4. Install a minimum of 8 rivets on each side of splice.

5. If splice angle length is increased, rivet spacing may be increased proportionately up to 1.0 inch maximum.

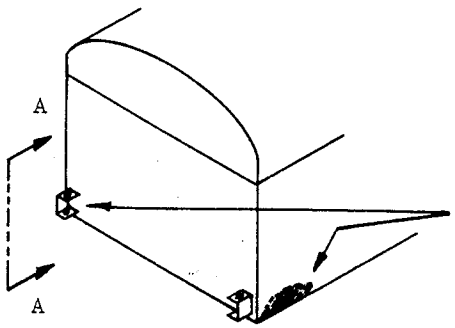


DIMS.	
A	1.3125
B	.75

SECTION A-A

FIGURE 8. Bonding Strap Angle Splice (Riveted)

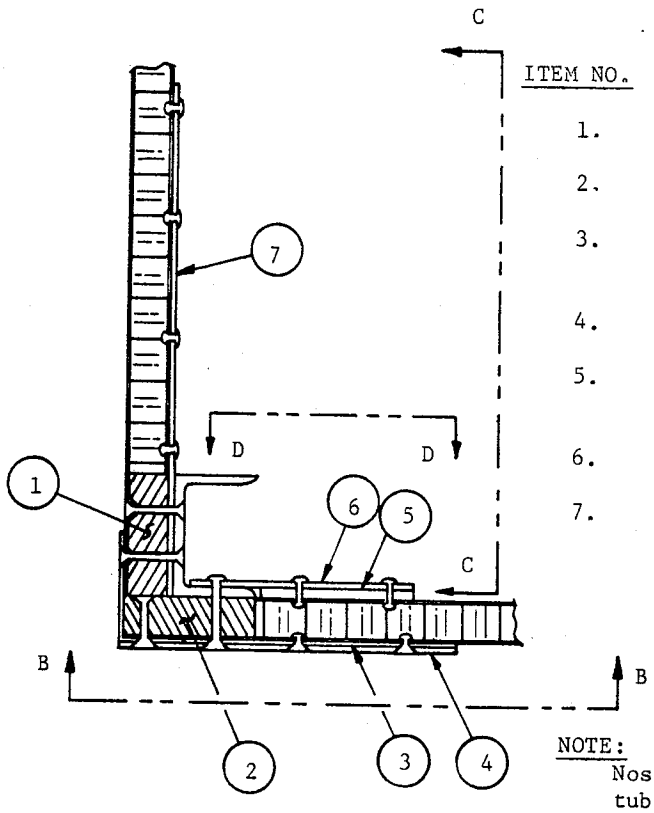
FIELD REPAIR NOTES



Honeycomb crushed & torn in this area.

PURPOSE

This data specifies the repair details for the repair of damaged honeycomb in the area adjacent to the two lower engine mount extrusions.



ITEM NO.	DESCRIPTION	MATERIAL
1.	Block .484 x 1.5 x 9.6	2014-T6 or 2024-T3
2.	Block .484 x 1.7 x 9.6	2014-T6 or 2024-T3
3.	Spacer t = .025, trim to fit under item 4.	2024-T3 Alclad
4.	Splice See Section B-B	2024-T3 Alclad
5.	Spacer t = .090, trim to fit under item 6.	2024-T3 Alclad
6.	Splice See Section D-D	2024-T3 Alclad
7.	Reinforcement t = .080 See Section C-C	2024-T3 Alclad

View B-B, C-C, & D-D on following page.

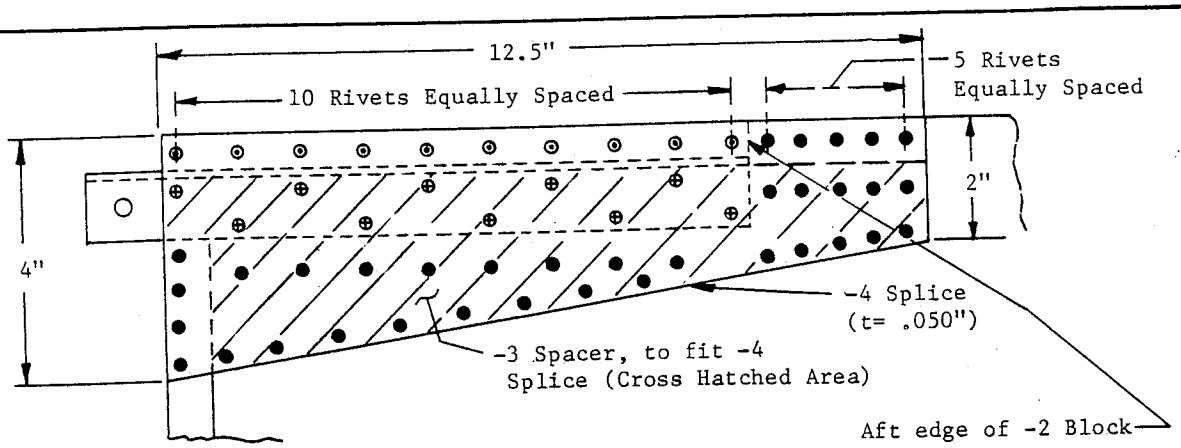
NOTE:
Nose gear torque tube not shown.

SECTION A-A Looking Aft (Firewall Removed)

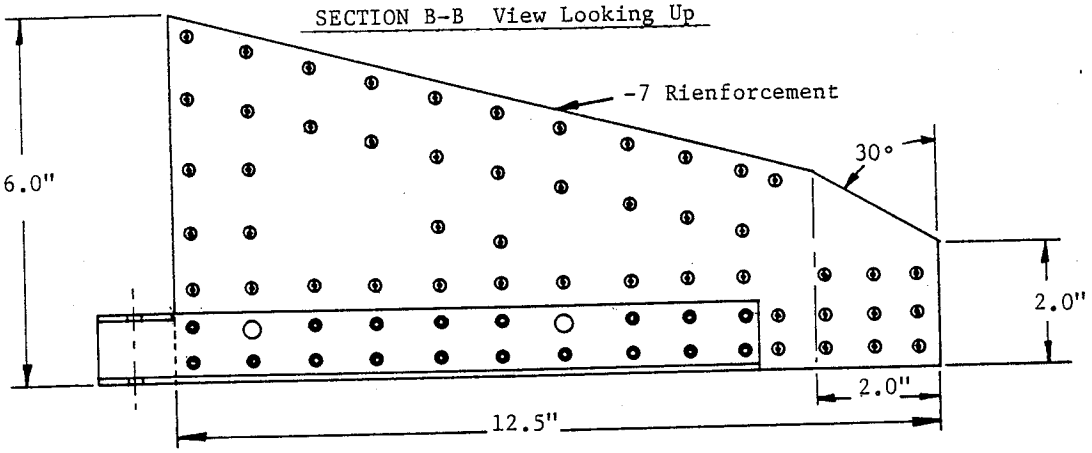
GENERAL NOTES

1. Coat all parts with zinc chromate primer.
2. Install all rivets with wet zinc chromate primer.
3. New engine mount extrusions are required.
4. Fill over rivet heads on exterior areas with filler and smooth before painting.
5. Carefully clean away all remaining adhesive before riveting in repair sections. Use fine grain sand paper.

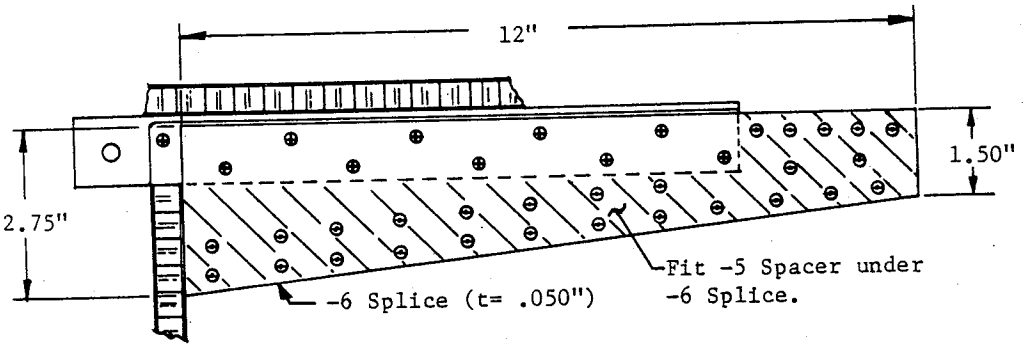
FIGURE 9.



SECTION B-B View Looking Up



SECTION C-C View Looking Outboard



SECTION D-D View Looking Down

⊙ MS426AD4-14 Double Countersunk as shown, page 1.

● CR2248-4-2 Located as shown 34 req'd.

⊕ MS426AD4-16 10 req'd.

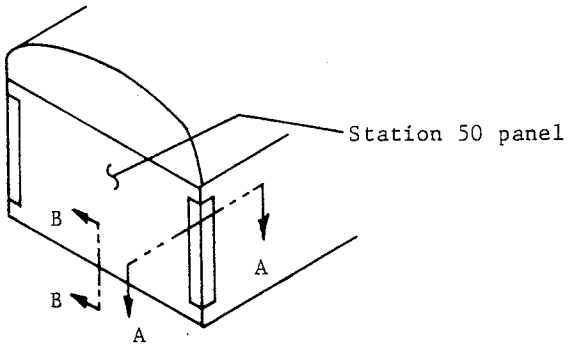
⊖ CR2249-4-3 27 req'd.

● MS426AD4-12 18 req'd.

◉ CR2249-4-2 48 req'd.

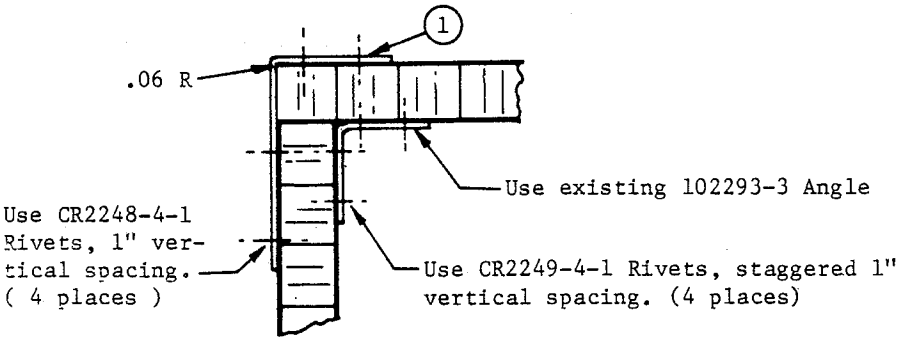
FIGURE 9. (continued)

FIELD REPAIR NOTES



PURPOSE

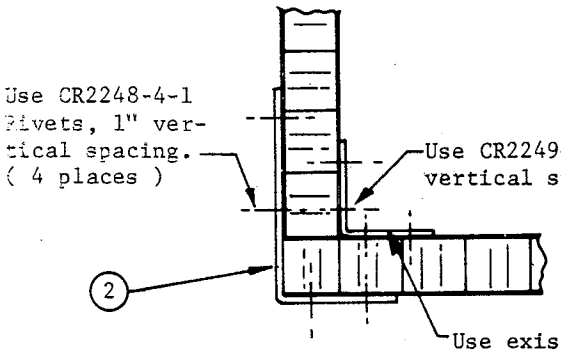
To replace the forward fuselage (Station 50) honeycomb panel.



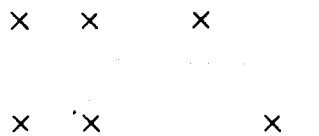
SECTION A-A Top View

-1 ANGLE 1"x 1.5", Make from 2024-T3 Alclad t = .040", L = 21.77"

-2 ANGLE 1"x 1.5", Make from 2024-T3 Alclad t = .040", L = 17.80"



SECTION B-B Side View



GENERAL NOTES

1. Prime all parts.
2. Install all rivets with wet zinc chromate primer.
3. Fill over exterior rivets with filler and smooth before painting.
4. Carefully clean away all remaining adhesive before riveting in repair section. Use fine grain sandpaper.

FIGURE 10.

SECTION XI

ELECTRICAL SYSTEMS

11. ELECTRICAL SYSTEMS

A. GENERAL

Power for the Yankee electrical system is derived from a battery and alternator combination. Power for normal operations is delivered by the alternator, whereas the battery supplies starting power and, in the event of alternator failure, will provide emergency power.

B. BATTERY

The battery is a 12-volt, 25-ampere hour, dry-charge type. Used primarily to provide engine starting power, the battery is also utilized as an emergency supply in the event of alternator failure. The battery requires periodic inspections to determine its condition. Items to check for are: corroded terminals, low water level, plugged vents, and low specific gravity. Corroded terminals should be cleaned using a solution of water and bicarbonate of soda (baking soda) and scrubbing with a stiff brush.

NOTE

It is recommended when replacing terminals, to apply a heavy-body mineral grease or petrolatum to the terminal.

The low water level is caused by decomposition of water from the electrolyte. Distilled or a good grade of drinking water should be added as required. A battery using excessive water is an indication of overcharging and adjustments to the voltage regulator are required.

The specific gravity should be periodically checked with a hydrometer to determine the condition of the battery. A reading of 1.260 indicates a fully charged battery, whereas a reading of 1.225 or below indicates that the battery should be recharged.

CAUTION

Always recharge a battery in an open, well-ventilated area due to explosive gasses being generated during the charging process.

To remove the battery:

1. Cut the safety wire, remove the two wing nuts, and withdraw the battery hold-down bracket.
2. Remove the battery box lid.
3. Disconnect the cables.

NOTE

Remove the ground cable first, and connect it last to prevent accidental short circuiting during installation.

4. Remove the battery heat shield.
5. Remove the battery and battery box by sliding forward.
6. Reassemble in the reverse order.

NOTE

When installing the battery, be sure to check for the correct polarity (negative to ground) to prevent damage to the electrical system, especially to any semi-conductors.

C. ALTERNATOR

The alternator is rated at 40 amps, 12 volts, with a bi-directional rotation. Protection for the alternator is supplied by integral silicone diodes rated at 150 PIV.

NOTE

When connecting a battery into the system, observe proper polarity to prevent damage to the alternator diodes.

To remove the alternator:

1. Cut the safety wire and remove the bolt which attaches the alternator to the adjustment link.
2. Remove the cotter pin and two bolts in the alternator support bracket.
3. Slip the alternator out of its mount, at the same time removing the driving belt.
4. Reassemble in the reverse order.
5. Adjust the belt tension to yield a 3/8 inch deflection at the center of the belt when applying a pressure equivalent to 12 pounds.

NOTE

When a new belt has been installed, the tension should be rechecked within 10 to 20 hours of operation.

NOTE

Service work performed on the alternator should be in accordance with any manuals or bulletins published by the alternator manufacturer.

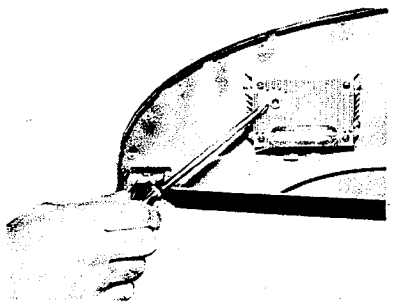


FIGURE 11-1 VOLTAGE REGULATOR

D. VOLTAGE REGULATOR

The voltage regulator is transistorized and temperature compensating for increased charging during cold weather conditions. Adjustments can be made by removing the plastic cap, and with a Phillips screwdriver, turn the screw in a clockwise direction to decrease the voltage. (See Figure 11-1). Voltage setting should yield a nominal 14.0 + .3 -.2 volts.

E. AMMETER

The ammeter is connected in series with the alternator A + lead. It indicates the amount of current required from the alternator, but does not indicate a discharge. With the battery completely charged and all extra electrical equipment turned off, the ammeter will show a minimum rate of charge (near 0 reading).

F. FLAP MOTOR

The flap motor consists of a 12-volt series wound motor turning the worm gear. Its direction of rotation is controlled by a toggle switch which reverses the magnetic field in the motor.

To remove the flap motor:

1. Remove the bolt and nut which connect the actuator to the flap torque tube assembly.
2. Disconnect the four wires.

NOTE

It is recommended that the wires be labeled prior to disconnecting to prevent incorrect installation.

3. Remove the bolt which mounts the flap motor to bracket attached to the carry-through spar.
4. Reassemble in the reverse order and rig in accordance with Section 5D.

G. LANDING LIGHTS

The landing light serves the dual purpose of landing light and taxi light. Adjustment to the landing light can be made by removing the upper cowl and adjusting the mounting screws as required. (See Figure 11-2).

To remove the landing light:

1. Remove the upper cowl as described in Section 3-D.
2. Disconnect the wires at the light terminals.
3. Remove the three mounting screws and withdraw the lamp and rear bracket.
4. Reassemble in the reverse order.

NOTE

Proper adjustment of the light can be determined as shown in Figure 11-2.

H. NAVIGATION LIGHTS

The navigation lights consist of the two wing-tip lights, and the taillight mounted in tailcone.

To remove the wing tip lights:

1. Remove the 8 screws which attach the protective lens to the wing tip.
2. Remove the one screw which holds the lamp shield.
3. Remove the lamp and replace if necessary.

NOTE

To remove the entire lamp housing, it will first be necessary to remove the wing tip and disconnect the wires before proceeding with the following steps.

4. Remove the two screws which attach the lamp housing to the wing tip.
5. Reassemble in the reverse order.

To remove the taillight:

1. Remove the two screws which hold the lamp retainer to the tailcone.
2. Withdraw the retainer and lens.
3. Remove the lamp.

NOTE

If removal of the complete housing is required, it is necessary to remove the tailcone and disconnect the wires.

4. Reassemble in the reverse order.

I. FLASHING BEACON

The flashing beacon consists of the light assembly mounted on top of the vertical fin, and the slave unit (transistorized flasher unit) which is accessible through the tail inspection panel.

To remove the light:

1. Remove the clamp.
2. Withdraw the lens, shield, and lamp.
3. If it is necessary to remove the light socket, removal of the rudder tip is required in order to accomplish the following steps.
4. Disconnect the wires.
5. Remove the two nuts and bolts which attach the socket to the tip.
6. Reassemble in reverse order.

To remove the slave unit:

1. Remove the tail inspection cover.
2. Disconnect the wires.
3. Remove the four screws which attach the

unit beneath the horizontal bulkhead.
4. Reassemble in reverse order.

J. INSTRUMENT LIGHTS

The total instrument lighting system consists of three lights mounted in the glareshield, two fuel gauge lights, and two lights mounted forward of the windshield bow. All seven lights are identical in components.

To remove the glareshield instrument lights:

1. Removal of the screws from the glareshield lower lip will separate the two halves and expose the light assembly.
2. Remove the blub and replace as required.

To remove the fuel measurement gauge light:

1. Remove the thermoplastic fuel measurement gauge cover.
2. Remove the screw which mounts the lamp socket to the fuselage side panel.
3. Remove the bulb and replace as required.

To remove the lights mounted forward of the windshield bow:

1. Remove the thermoplastic fuel measurement gauge cover.
2. The light assembly is attached to the back of this cover. Remove the bulb and replace as required.

K. DOME LIGHT

The dome light and switch are contained in the speaker housing located above and behind the pilot. Electrical power is supplied directly to the switch from the battery in order to make use of the light without first activating the ship's electrical system.

To replace the dome light:

1. Remove the screws which attach the thermoplastic speaker and dome light housing to the forward turtleback bulkhead.
2. Remove the bulb and replace as required.

The dome light is protected by an in-line fuse which is located in the main wire bundle forward of the firewall and near to the battery relay.

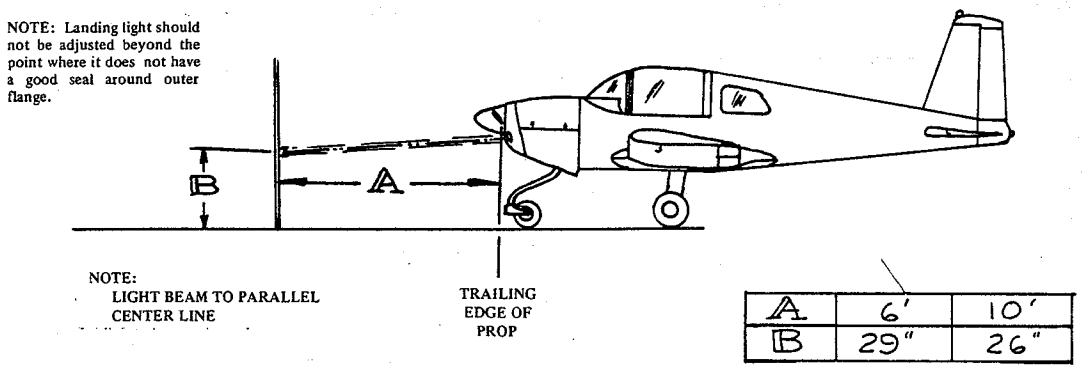


FIGURE 11-2 LANDING LIGHT ADJUSTMENT

TROUBLE	PROBABLE CAUSE	REMEDY
ELECTRICAL SYSTEM TROUBLE SHOOTING		
System not energized when master switch turned on	Dead battery	Recharge or replace
	Defective wiring	With master switch off, check entire D.C. power system for an open circuit with a continuity tester
	Defective battery relay	Connect subsequently a voltmeter from each battery relay terminal voltage with master switch on. If no voltage is indicated from either terminal, replace relay
	Defective master switch	Remove switch from airplane and check with continuity tester. Replace defective switch.