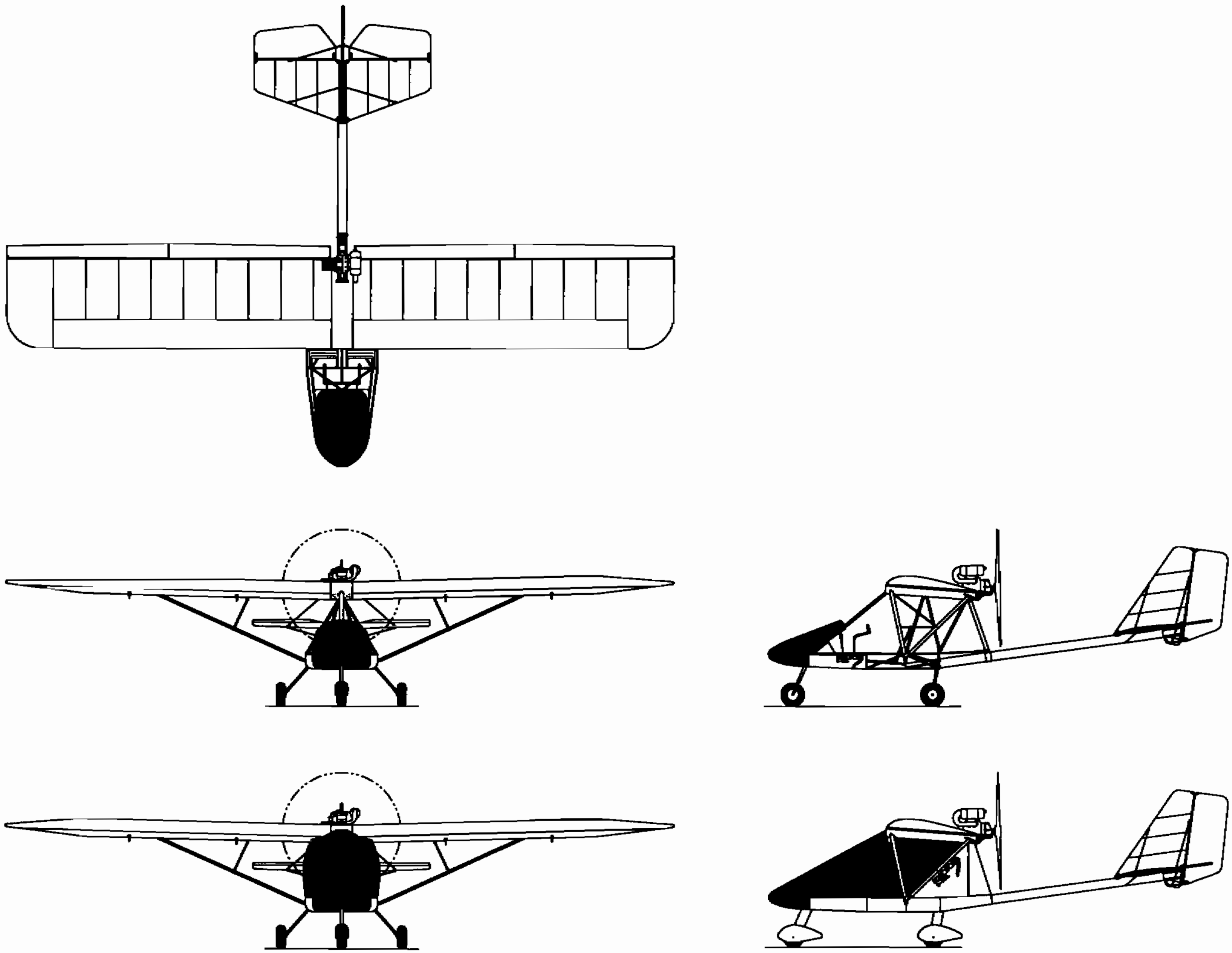
RANS S-12XL AIRAILE



RANS
4600 Highway 183 Alternate
Hays, KS 67601
(785) 625-6346

DESIGNED BY:
RANDY SCHLITTER

RANS, INC S-12XL AIRAILE

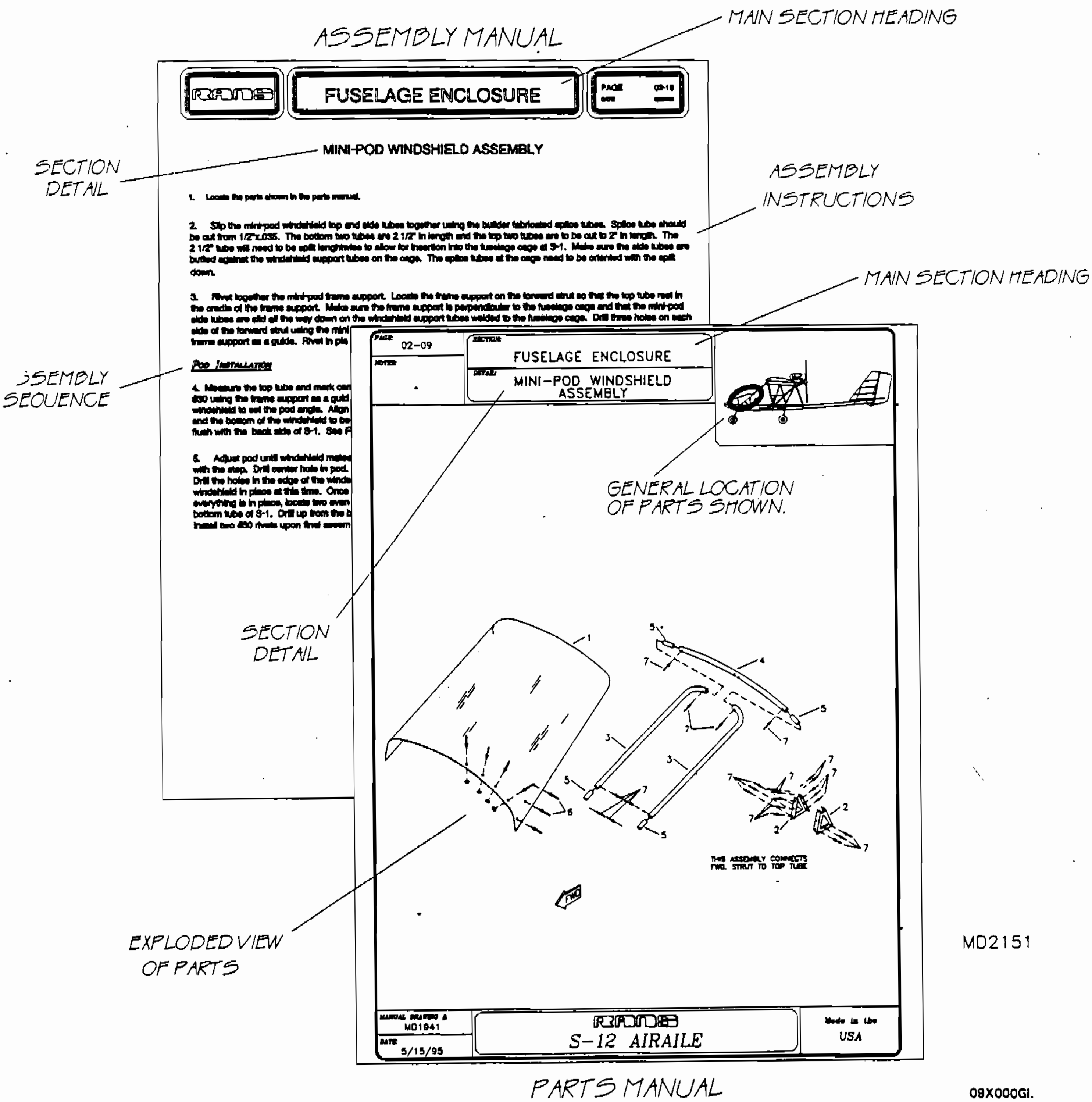
About Your New Manuals

Your new manuals are designed to cover every possible option on the S-12. You will only need to use the sections that pertain to your particular purchase. As you read through the manuals realize that some sections seem very similar, but they are different. The wheel/tire assembly sections are very similar, but are designed to meet your exact building situation. For example: You purchased hydraulic brakes at an extra cost, but did not decide to buy wheel pants. You would need to turn to the *"Wheel and Hydraulic Brake Assembly without Wheel Pants"* section of both the assembly and parts manual. All other sections related to wheel and brake possibilities will not pertain to your aircraft. Many sections will only contain one possibility, such as aileron assembly. There is only one type of aileron; therefore, only one section explaining aileron assembly.

The Table of Contents in the parts manual lists all of the possible scenarios. Notice that the items which will come with the plane (Base Pack List) no matter what "options" you purchase, are pre-marked on the parts manual Table of Contents. It is recommended to mark the other items which will be a part of your building process using the copy of your order form included in this package. With this information in place you are now ready to begin.

GENERAL INFORMATION

As you read through the Assembly Manual, follow along in the Parts Manual. Study each and every parts drawing. The Assembly and Parts manuals will parallel each other; however, at times the assembly manual will use parts from two or more pages of the Parts manual. As you can see below, the Assembly and Parts manual are formatted in a similar manner.



RANS, Inc.
4600 Highway 183 Alternate
Hays, KS 67601

Technical Support
(785) 625-0069

Parts Department
(785) 625-6346

When calling Technical Support or the Parts Department please have the following ready:

- Aircraft Model
- Serial Number
- Engine Model
- Part Numbers Needed (Parts Department Only)
- Your Aircraft Assembly Manual

Note: Please make your questions precise and to the point so that we may assist as many customers as possible.

RANS, INC.

AIRCRAFT TOOL LIST

The following is a list of tools that will be helpful when assembling your RANS aircraft.

HAND TOOLS

Pliers
Needle Nose Pliers
Side Cutters
Aviation Snips
Hammer
Rubber Mallet*
Center Punch
Drift Pin & Punch Set
Several Small Clamps (Stanley quick clamps work well)
Wrench Set SAE & Metric
Ruler & Tape Measure
Adjustable Fly Cutter*
Set of Drill Bits (sizes listed below)
Hack Saw

Safety Wire Pliers
Linesman Pliers
Electrical Wire Stripers
Pop Rivet Tool
Click Punch
Ball Peen Hammer
Scratch Awl
Screwdriver Set
Safety Glasses
Socket Set SAE & Metric
2 or 4 ft. Level
Utility Knife
Hole Saw*
Files

POWER TOOLS

Electric Hand Drill
Dremel*
Soldering Gun/Hot Knife
CD Player*

Small Electric Grinder
Bench Disk Sander*
Heat Gun*

LUBRICANTS & ADHESIVES

Small Can Lithium Grease
Contact Cement
Super Glue

Clear Silicone
WD40
Lubricating oil

DRILL BIT SIZES

A full set of fractional drill bits ranging from 3/32" to 5/8" is strongly recommended. In addition to these the following number and letter bits will be required to assemble your S-7 Courier.

NUMBERED BITS	LETTERED BITS	FRACTIONAL BITS
#40	"D"	1/4"
#30		5/16"
#11		3/8"
#28		½"
		7/8"

*Not a necessary tool but helpful

RANS S-12XL
ASSEMBLY SEQUENCE

Fuselage

Assemble Superstructure

Floorboard Pre-fit

Rudder Pedal Pre-fit

Radiator Scoop Assembly & Pre-fit

Install Control Stick Torque Tube

Install Enclosure (Sheet Metal)

SPEEDY ASSEMBLY

A quick study of this assembly sequence reveals a primary time saver. The Aircraft is already covered and clear coated prior to final assembly.

Tail Group

Vertical & Horizontal Stabilizer Assembly

Elevator Assembly

Rudder Assembly

Wings

Wing Assembly

Flap & Aileron Assembly

Covering

Clear Coat

Final Assembly & Installation of all Parts & Components

MD3630

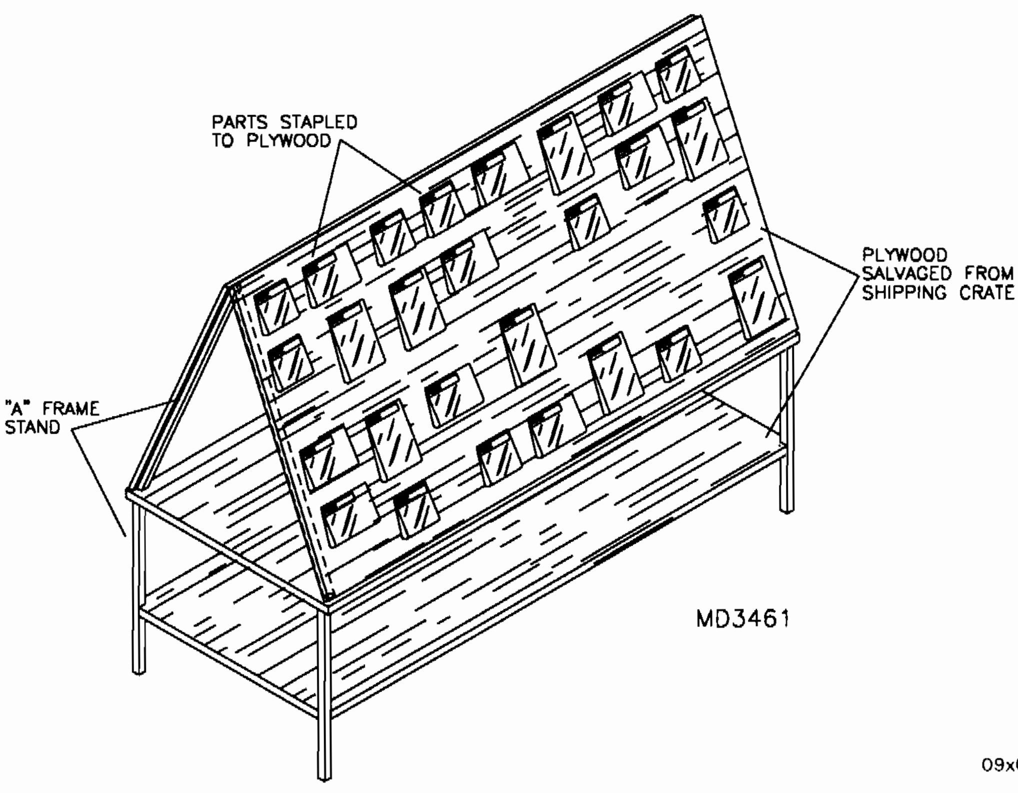
S-12 AIRAILE INTRODUCTION

As the builder of the S-12 AIRAILE kit you are considered the manufacturer by law. The rules state that you must build 51% of the total. In essence we are your parts supplier. You have the final say in regard to every single item that goes into your project. The responsibility of making a safe aircraft is on your shoulders. It is by your hand this box of parts becomes an aircraft. Set up your quality assurance and construction activity according to the level of risk you are willing to take. The manual provided is to be thought of as a suggested guide book. Use the book, but learn to think things through. This will minimize errors and reduce build time.

As you read through the Assembly Manual, follow along in the Parts Manual. Study each and every parts drawing. The Assembly and Parts manuals will parallel each other; however, at times the assembly manual will use parts from two or more pages of the Parts manual. As you can see below, the Assembly and Parts manual are formatted in a similar manner.

NOTES AND HINTS ON BUILDING THE S-12 AIRAILE

TAKE INVENTORY*:* You must complete an inventory within 60 days of receiving your kit. We check and re-check and are 99.9% certain that if we say we shipped it, we did. The first task in building your kit is to inventory the parts using the packing list provided. It's your job to keep all parts organized and accounted for. We can not provide missing parts cost free after 60 days. Use the supplied pack list to verify that everything that we packed is in the box. The fast way to inventory, is to use the Priority Number that appears on the Part Number labels, these will match the pack list in numeric order. Go through the list item by item. If anything is not there that should be, please contact our parts department immediately. ***HINT:*** *Use sections of plywood from the packing crate to fabricate a part inventory board. As each part is inventoried and checked off on the pack list, staple the bag to the board. This allows for quick identification and part selection during assembly. We fabricate "A" Frame stands to support the plywood. Refer to the figure below. Plywood can also be attached to shop wall.*



GET ORGANIZED! Prepare your workshop and be sure that what goes in the shop door will be able to come out!!!

KEEP IT CLEAN: Wash your hands, tools, and work tables. You will notice many of the parts are marked with part numbers. These numbers wipe off with a cloth dampened with acetone or lacquer thinner. **CAUTION**: Do no allow acetone, lacquer thinner or Loctite to come in contact with the lexan glazing. These and some other solvents will destroy the lexan.

DENTS, SCRATCHES, AND NICKS: Aluminum is sensitive to such abuse. Avoid doing anything nasty to any of your kits aluminum parts. Be careful when laying sheet metal on benches; watch out for debris underneath that may scratch. After drilling holes they will need to be deburred. This is an IMPORTANT step and must be performed. Assembly of parts with burrs can cause stress risers and eventually part failure. Various tools can be used. An official deburring tool is nice but a ½" drill bit can do a good job on most holes. Radius and smooth sharp corners with files or fine grit sanders and grinders. Edges of certain parts also need deburring...a good file works here.

MARKERS: Throughout the manual you are instructed to mark various parts. Use flairs or any type of felt tip marker. Avoid using pencils. The graphite in the lead will cause the aluminum to corrode.

SPECIAL TOOLS: A few special tools will be needed: A power drill, wrenches, and a pop riveter. "Clecos" make trial fitting and assembly go smooth on assemblies such as windows, cowling and firewall.

SIZE DRILL: This term is used throughout the assembly manual. When size drilling is instructed, drill the pilot hole to the appropriate bolt or rivet size shown in the parts manual.

=Denotes the centerline. This will be seen on many drawings.

STRUCTURAL STATIONS: In the manual references will be made to the structural stations. Observe the planview diagram on the following page for station locations.

ROD ENDS: When installing rod ends and similar hardware, be certain at least ten threads are engaged, unless directed otherwise within the text.

CLECOS: Included in your kit is a supply of clecos. These are temporary fasteners that will be used to hold things together while fitting and drilling. A pair of pliers is also included to install and remove the clecos. The cleco's are color coded as to hole size.

(6) Silver	#40
(12) Copper	#30
(6) Gold	#11

To use, simply set cleco in the special pliers, squeeze closed, insert into the hole and release. (Reverse for removal). You'll find the clecos to be extremely useful throughout assembly

RIVETS: Your kit is supplied with various sizes of aluminum and stainless steel pop rivets. Even though we are careful, there is always the chance of the packages being mis-labeled. So before riveting, be sure to double check that you have the correct aluminum or stainless steel pop rivet for the particular section you are working on.

LOC-TITE: Use Loc-tite on all fasteners that are not retained by loc nuts, washers, cotter pins or safety wire. Example: Loc-tite wire nuts used to secure throttle and choke cables.

PLACARDS AND MARKINGS

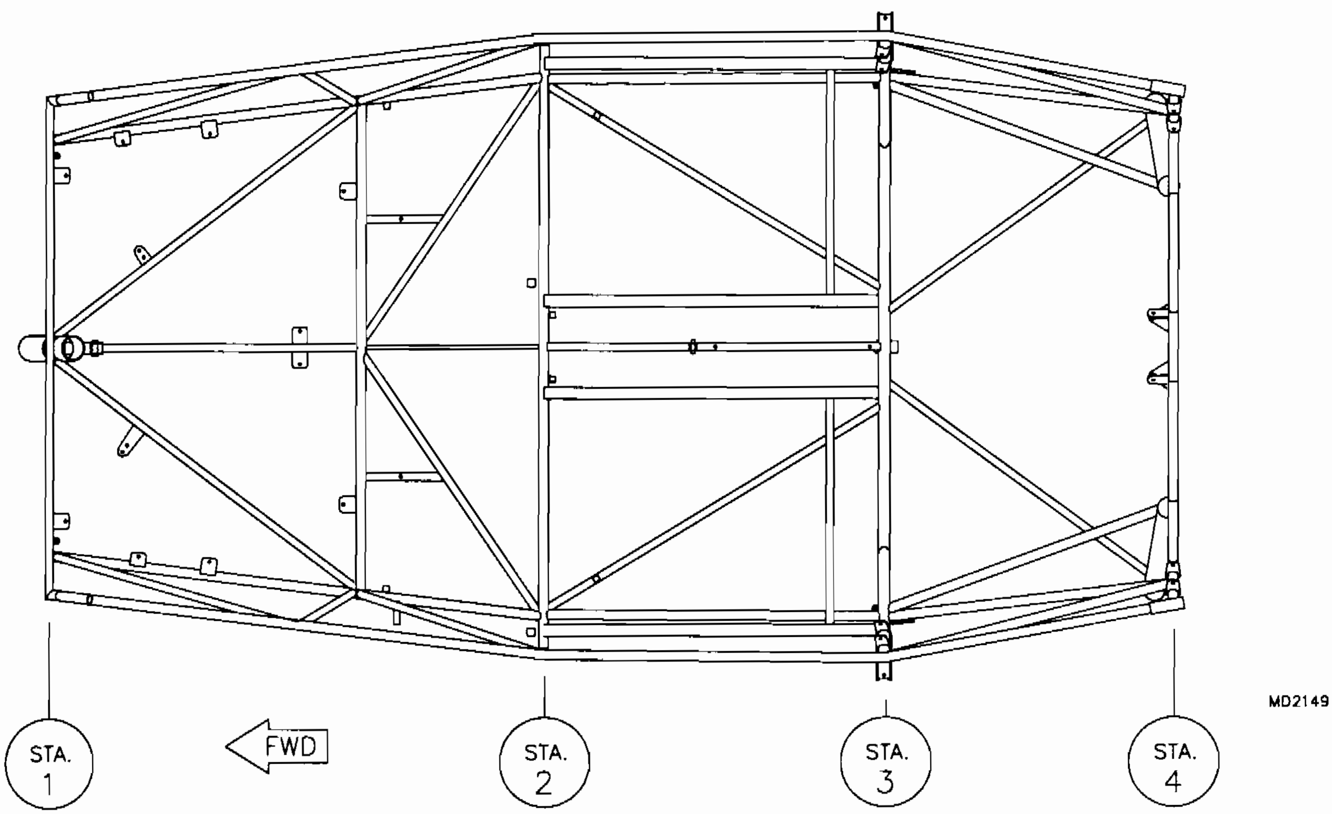
Included in your S-12 Airaile kit is a decal sheet and gauge marking decal. These should provide you with just about every label/placard the FAA requires. Apply the decals as per FAA recommendations. Affix the passenger warning decal to the instrument panel. Not included in your kit is the data plate and aircraft identifier plate. The data plate can be purchased from one of the aircraft supply houses such as Spruce & Speciality. The identifier plate (which is a fairly new requirement) can be made from a small 1" X 1 ½" piece of aluminum. Hand stamp or engrave the make, model, and serial number and then rivet this to the very AFT end of the tail boom.

The Experimental decal is best applied along both sides of the forward strut. Screw the metal identifier plate to the floorboard just forward of the seat truss, out of the way of pilot or passengers feet.

For the "N" number, use at least 3" vinyl letters. We have a local decal shop make ours. These just stick on to the tail boom, about midway. Make sure the surface is clean before applying.

STRUCTURAL STATIONS

- Shown below are the structural station locations referred to in the manual. Become familiar with these general areas of the Airaile.



FAA PROCEDURES

--Obtaining an "N" Number

--Registration

--Obtaining An Airworthiness Certificate

OBTAINING AN "N" NUMBER

In order to register your plane, it will be necessary to obtain an identification number for the plane. This is referred to as an "N" number.

If any number is acceptable to you, write to the FAA Aircraft Registry, Dept. of Transportation, P.O. Box 25504, Oklahoma City, OK 73125 and ask them to assign you a free U.S identification number of their choice.

If you prefer a number of your own choosing or a smaller number, you may be able to obtain the exact number you want by asking the FAA registry to assign you a specific number of your choice.

NOTE: U.S. identification numbers do not exceed 5 symbols in addition to the prefix "N". These symbols may be all numbers (N55555), one to four numbers and a suffix letter (N5555A or N5A), or one to three numbers and two suffix letters (N555AB).

If you request a special "N" number it would be best to list at least five choices in case your first choice is not available. A special number of your own choosing will cost $10.00 and you should enclose that fee with your letter.

When To Obtain Your "N" Number

If you plan to complete your kit within a very short time, it is recommended that you obtain your "N" number right away. If your project will be fairly lengthy, you will not need to obtain your number until the last several months of construction. Keep in mind that if you request a special "N" number it can be reserved for no longer than one year. If this number has not been affixed to the fuselage within this time and the registration completed, it will be necessary to pay an additional $10.00 to reserve that number for another year.

AFFIDAVIT OF OWNERSHIP FORM

Enclosed you will find an Affidavit of Ownership Form. This form should accompany your letter requesting the assignment of an "N" number.

This form must be notarized as it establishes your ownership to the airplane even though you know you did build it. It will be used by the FAA to create a file on your aircraft and will serve as a legal document and a **substitute for the Bill of Sale** (AC Form 8050-2) that a buyer gets when he buys any existing airplane.

REGISTERING YOUR AIRCRAFT

After you have written the Aircraft Registry requesting an "N" number, you will receive a form letter giving your number assignment. You will also receive a blank Aircraft Registration Form. (Sample Enclosed.) Complete the Application for Aircraft Registration (Form 8050-1) and return it to the Aircraft Registry along with the $5.00 registration fee.

Retain the **PINK** copy of the Registration and mail both the **WHITE** original and the **GREEN** copy. Your **PINK** copy is your authority to operate the aircraft, **when carried in the aircraft with an appropriate and current airworthiness certificate**.

RECEIVING AUTHORITY TO FLY YOUR AIRCRAFT

Registration alone does not authorize you to fly your aircraft. The aircraft must, after it has been properly registered, also obtain an Airworthiness Inspection by an inspector of the FAA, at which time the necessary Airworthiness Certificate may be issued. Then, and only then, is your aircraft ready for flight.

WHAT IS THE PROCEDURE FOR OBTAINING AN AIRWORTHINESS CERTIFICATE

Since the final step in obtaining an Airworthiness Certificate is to obtain an inspection of your airplane by an official of the FAA, it is a good idea to make an early contact with the FAA inspector's office nearest your home. Members of the local EAA chapter or a local flying service may be able to help direct you to this office. The purpose of such an early contact would be to discuss with the FAA representative, your proposed home built project and to generally familiarize yourself with the procedures established by the FAA for home built projects. At this time you can establish a tentative plan for inspection of the aircraft upon completion. The typical FAA inspector is interested in your project and wants to help you do a good job.

The FAA requires that everyone building an airplane must maintain a construction log of the work he does on his airplane. You can use a notebook of conventional size and keep a daily diary of the work done on your aircraft. Since all our planes come with assembly manuals, it is a good idea to also make notes in the manual as well as listing dates when certain procedures were done. It is a very good idea to take photographs of work on your plane in various stages. This helps to document that you, the builder, actually completed 51% of this kit. (Advisory Circular 20-27C available from the FAA or EAA describes the procedure used so that your logbook will be a verification of having complete at least 51% of the aircraft yourself.)

WHAT ARE THE SPECIAL REQUIREMENTS FOR ATTACHING NUMBERS AND PLACARDS TO A HOME BUILT AIRCRAFT?

10-1 DISPLAY OF MARKS (Reference is FAR Part 45.23)

After you obtain the registration for your aircraft, the Registration numbers or marks must be affixed to the aircraft in some permanent fashion. The marks must be legible and have ornamentation. They must contrast in color with the background.

The marks displayed on the aircraft shall include the letter "N" signifying U.S. Registry, followed by the registration number issued for the aircraft.

In addition, amateur-built (Experimental) aircraft must have displayed on that aircraft near each entrance to the cabin or cockpit, in letters not less than 2" nor more than 6" in height, the word, "EXPERIMENTAL"

10-2 LOCATION OF MARKS ON FIXED WING AIRCRAFT (Reference is FAR Part 45.25)

(b)(1) If displayed on the vertical tail surfaces, horizontally on both surfaces, horizontally on both surfaces of a single vertical tail or on the outer surfaces of a multi vertical tail. However, an aircraft on which marks at least 3" high may be displayed and in accordance with 45.29(b)(1), the marks may be displayed vertically on the vertical tail surfaces.

(2) If displayed on the fuselage surfaces, horizontally on both sides of the fuselage between the trailing edge of the wing and the leading edge of the horizontal stabilizer. However, if engine pods or other appurtenances are located in this area and are an integral part of the fuselage side surfaces, the operator may place the marks on those pods or appurtenances.

10-3 SIZE OF MARKS

FAR 45.29(b)(1)(iii) states "Marks at least 3" high may be displayed on an aircraft for which an experimental certificate has been issued under 21.191(d) or 21.191(g) for operating as an exhibition aircraft or as an amateur-built aircraft when the maximum cruising speed of the aircraft does not exceed 180 knots Calibrated Air Speed (CAS).

And (c) characters must be two-thirds as wide as they are high except "1" which must be one-sixth as wide as it is high and the letters "M" and "W" which may be as wide as they are high.

(d) Characters must be formed by solid lines one-sixth as thick as the character is high.

(e) Spacing. The space between each character may not be less than one-fourth of the character width.

10-5 IDENTIFICATION PLATE (Reference is FAR Part 45.11)

In addition to affixing the aircraft's registration number to the sides of the fuselage, the builder must also identify his aircraft by attaching an identification plate to the aircraft's structure.

This identification data required to be inscribed on the plate for amateur-built aircraft shall include the following information:

a. Builder's name and address
b. Model designation
c. Builder's serial number
d. Date of manufacture

The identification plate containing these essential elements must be of fireproof material and must be secured in such a manner that it will not likely be defaced or removed during normal service, or lost or destroyed in an accident. It must be secured to the aircraft at an accessible location near an entrance, except that if it is legible to a person on the ground it may be located externally on the fuselage near the tail surface.

The identification plate information must be marked thereon by etching, stamping, engraving, or other acceptable fireproof marking.

Metal plates which comply with these requirements may be purchased from the Experimental Aircraft Association for the very nominal fee of $5.00 per each set.

AIRCRAFT INSTRUMENT MARKINGS & COCKPIT PLACARDS

Your reference is FAR Part 91.31 Civil Aircraft Operating Limitations and Marking Requirements.

8-1 GENERAL

To insure that each person operating an aircraft does so within the operating limitations prescribed for it, the FAA requires that there is available in it a current Flight Manual, appropriate instrument marking and placards, **or any combination there of.**

The purpose of the flight manual, markings and placards is to detail for the operator of the aircraft, the operational limitations prescribed for the aircraft.

In lieu of a flight manual most amateur builders prefer to mark their instruments and to affix the necessary placards to the instrument panel as the primary means for complying with these requirements.

8-2 MARKINGS AND PLACARDS

The markings and placards necessary for the safe operation and handling of the aircraft should be displayed in a conspicuous place and may not be easily erased, disfigured or obscured. Such placards and markings should include but not necessarily be limited to the following criteria: special emphasis on fuel system markings are very important; such as fuel valves-on-off fuel octane quantity, unusable fuel, minimum fuel for take-off, minimum fuel for inverted flight, etc.

8-3 POWERPLANT INSTRUMENT MARKINGS

Each required powerplant instrument should be marked to indicate the maximum and, if applicable, minimum safe operating limit with a red radial line.

Each normal operating range is to be marked with a green arc not extending beyond the maximum and minimum continuous safe operating limits.

Each engine speed range that is restricted because of excessive vibration should be marked with a red arc.

8-4 AIRSPEED INSTRUMENT MARKINGS

The airspeed indicator should be marked with a **radial red line** to establish the never-exceed speed (Vne).

The takeoff and any precautionary range should be marked with a **yellow arc**. The normal range is marked with a **green arc**. The flap actuation range is marked with a **white arc**.

8-5 AIRSPEED PLACARDS

There should be an airspeed placard in clear view of the pilot and as close as practicable to the airspeed indicator listing:

The design maneuvering speed.
The maximum landing gear operating speed (if applicable).
The maximum flap extension operating speed (if applicable).

8-6 LANDING GEARS

If a retractable landing gear is used, an indicator should be marked so that the pilot can, at any time, ascertain that the wheels are secured in their extreme positions.

Each emergency control should be **red** and must be marked as to method of operation and identity.

8-7 CONTROL MARKINGS

Each fuel tank selector should be marked to indicate the position corresponding to each tank and to existing cross feed position.

If safe operation requires the use of any tanks in a specific sequence, that sequence must be identified.

8-8 POWERPLANT FUEL CONTROLS

Each fuel tank selector should be marked to indicate the position corresponding to each tank and to existing cross feed position.

If safe operation requires the use of any tanks in a specific sequence, that sequence must be identified.

8-9 FLIGHT MANEUVER PLACARD

For non-acrobatic category airplanes, there should be a placard in front of and in clear view of the pilot stating: "No acrobatic maneuvers, including spins, approved."

For acrobatic category airplanes, there should be a placard in clear view of the pilot listing the approved acrobatic maneuvers and the recommended entry airspeed for each. If inverted flight maneuvers are not approved, the placard must have a notation to this effect.

8-10 BAGGAGE PLACARD

The maximum baggage load permitted should be displayed in a conspicuous place adjacent to the baggage area.

8-11 PASSENGER WARNING PLACARD

A placard must be affixed to the aircraft so that it is readily seen in the cockpit. It will state: "Passenger Warning-This aircraft is amateur built and does not comply with the Federal Safety Regulations for "Standard Aircraft". This placard is part of a set available from EAA. See Section 10-5.

MY AIRCRAFT IS COMPLETED, ALL MARKING AND PLACARDS ARE IN PLACE. WHAT ELSE MUST I DO TO MY AIRCRAFT BEFORE I AM READY FOR MY PRE-CERTIFICATION INSPECTION?

Included in your manual is a weight and balance sheet. This will need to be completed before the inspection.

You will need to purchase a logbook for the aircraft, engine and propeller. These can be separate books or just one.

Have handy a copy of your Sales Invoice from us.

I FEEL I AM READY FOR INSPECTION BY THE FAA INSPECTOR, WHAT DO I DO?

If you have had prior contact with your FAA inspector, you will probably be familiar with the procedures used by that office. Different offices have slightly different procedures. Some inspectors will help you fill out the paperwork at the time of inspection. Others require that you submit the paperwork prior to inspection. If you are not sure and there are no other builders in your area to ask, you could call and ask the local office. Or you can submit the following to the Inspector's Office.

1. A letter requesting a final inspection.
2. Form 8130-12 Eligibility Statement (sample follows).
3. Form 8130-6 Application for Airworthiness Certificate (sample follows).
4. A 3-view drawing of the aircraft or photos of topside and front view. Include with this the following:

   Horsepower rating of engine and type of prop.
   Empty weight and maximum weight at which the aircraft will be operated.
   Number of seats and their arrangement (tandem, side by side).
   Whether single or dual controlled.
   Fuel capacity.
   Maximum speed at which you expect to operate the aircraft.

5. Estimated time or number of flights required. (Usually 25 hours for aircraft equipped with certified aircraft engine and prop combinations and 40 hours for those with non-aircraft engine propeller combinations.)

6. The area over which you will be testing. (Request an area encompassing a 25 mile radius for day VFR operations. Exclude congested areas and airways, but try to include nearby airports even if a few miles beyond the 25 mile radius.

Upon satisfactory completion of the necessary final FAA inspection of the aircraft and whatever ground tests may be required, the FAA Inspector will issue your amateur-built "Experimental" Airworthiness Certificate. Along with the certificate you will be given certain "**OPERATING LIMITATIONS**" under which you must operate the aircraft.

OPERATING LIMITATIONS

13-1 MANDATORY TEST FLIGHT PROVING PHASE

All amateur-built sport aircraft as well as standard aircraft have federally imposed operating limitations.

Upon satisfactory completion of the necessary final FAA Inspection of the aircraft and whatever ground tests may be required, the FAA Inspector will issue your amateur-built "Experimental" Airworthiness Certificate.

He will also issue a form letter establishing the operating limitations applicable to your aircraft during its mandatory flight proving period. These Special Airworthiness Experimental Operating Limitations must be displayed in the aircraft at all times. (See sample Operating Limitations, Figure 13-1).

The operating limitations imposed on the aircraft during its flight proving period will be more stringent than those issued later after the mandatory flight testing phase has been completed.

This phase may begin with the issuance of the aircraft's initial airworthiness certificate and the original operating limitations. At this time the FAA Inspector will acquaint you with the requirement for a mandatory flight test and proving period. This flying will be confined to an assigned flight area approved by the FAA Inspector.

The presence of the FAA Inspector is not required, by regulation, at the initial flight of the experimental amateur-built aircraft. If time permits, however, it is not unusual for him to attend.

If he deems necessary, the inspector could issue a permit for a single flight within the boundaries of the airport and, upon witnessing the safe completion of the test, issue a further permit for more extended flights within the permissible area.

A tremendous responsibility for the safe operation of the experimental aircraft rests on the FAA Inspector. If the plane has any new and unusual features he will naturally tend to treat its first flights with care. Also pilot qualification and skill is a consideration.

13-2 PURPOSE OF THE FLIGHT TEST PERIOD

A flight test period is necessary to show to the FAA that the aircraft is controllable throughout its normal range of speeds and throughout all the maneuvers to be executed. It will also serve to prove that the aircraft has no hazardous operating characteristics or design features.

13-3 DURATION OF MANDATORY FLIGHT TEST PERIOD

For standard aircraft type engines: When an FAA approved aircraft engine/propeller combination is installed the flight test period is usually limited to 25 hours of flight time.

For non-aircraft type or automotive engines: An aircraft equipped with such an engine is required to be flown for a longer test period, usually at least 40 hours, to prove its reliability.

NOTE: It should be understood that the local FAA Inspector has the prime responsibility in determining the extent of the flight test period to be required for your aircraft. He is permitted to exercise considerable discretion in extending or in reducing the number of hours required to be flown during this period.

13-4 FLIGHT TEST AREA

The FAA Inspector will authorize the flight tests to be carried out in a designated and limited test area, usually, within a 25 mile radius of the aircraft's base of operations.

He will insure that the area selected is not over densely populated areas or in a congested airway.

In assigning the flight test area the FAA Inspector may modify the size and shape of the area to suit the best purposes of the flight test program. In some locations, particularly around bigger cities where air traffic is heavy, a flight test area may not be practical. The builder must be prepared to except that an approved flight test area may not be the one chosen to him as the most convenient.

13-5 OTHER LIMITATIONS DURING THE FLIGHT TEST PERIOD

As a rule, the carrying of passengers or other crew members will not be permitted unless necessary to the safe operation of that aircraft.

13-6 AIRCRAFT FLIGHT LOG

During the flight test period, the pilot should record the aircraft flight history in an appropriate log book. This should be in addition to any engine tachourmeter or engine hour meter that may be installed in the aircraft.

Specifically, the duration of each individual flight should be recorded including the number of landings made.

A full description of any mishaps, however minor, or any experiences not entirely normal that occur during the flight experience period should also be duly recorded.

Although not required, it is strongly recommended that all operating data be recorded flight by flight. Such information as airspeeds, cylinder head temperatures, etc., will be very valuable and may be used to determine or establish the various performance figures and operating characteristics of the aircraft.

Although the FAA Inspector is required by law to apply certain basic restrictions permanently to the amateur-built aircraft he is certificating, he can apply whatever other limitations he deems necessary at his own discretion. Unfortunately, nothing in the regulations states that the initial restrictings are required to be removed after successful completion of the test period...they only may be modified.

After the mandatory flight test period...then what?

REPAIRMAN'S CERTIFICATION

The Repairman's Certificate is applied for using the application from 8610-2, available from the local FAA offices. You should ask for this when you apply for your final inspection on your aircraft. You should also be familiar with the Appendix D of FAR part 43. (Items included in the Annual Condition Inspection.)

The Repairman's Certificate is only available to those who have built 51% or more of the specific aircraft they are having inspected.

Every twelve calendar months a condition inspection is performed in accordance with Appendix D of FAR part 43. The repairman has to include the aircraft total time in service, the name, the signature and the certificate type number of the repairman or A & P, who does the examination.

A & P mechanics must do the Annual Condition Inspection for those who are non-builders who own an amateur-built aircraft. On those aircraft where the builder has a Repairman's Certificate, it is recommended that from time to time the Annual Condition Inspection of those aircraft be done by an A & P simply as a check on the builder/repairman's work. One legal representative recommends that every other Annual Condition Inspection for a builder holding a repairman's certificate be done by an A & P mechanic.

AFFIDAVIT OF OWNERSHIP FOR AMATEUR-BUILT AIRCRAFT

U.S. Identification Number: ____________________

Builder's Name: ____________________

Model: ____________________ Serial Number: ____________________

Class (airplane, rotorcraft, glider, etc.): ____________________

Type of Engines Installed (reciprocating, turbopropeller, etc.):

____

Number of Engines Installed: ____________________

Manufacturer, Model, and Serial Number of each Engine Installed: ____________________

____

Built for Land or Water Operation: ____________________

Number of Seats: ____________________

The above-described aircraft was built from parts by the undersigned and I am the owner.

____
(Signature of Owner-Builder)

State Of: ____________

County Of: ____________

Subscribed and sworn to before me this ______day of ____________, 19______

My commission expires ____________________

____
(Signature of Notary Public)

AC Form 8050-88 (9-75) (0052-00-559-0002) Supersedes previous edition

Warranty Information

KODIAK RESEARCH, INC.
1575 W. COMMERCIAL BLVD. #33B
FT. LAUDERDALE, FL 33309

PH: (305) 776-9904
FAX: (305) 776-9908

Attn: O.E.M.'s

Date: October 31,1991

Subject: Warranty Extension Requests

Dear Customer (RANS, Inc.),

1) In order for your customers (the builder) to receive their six month full warranty from time of first use, you must submit for extension on the enclosed form (please add your letterhead to this form). If no request is received warranty will begin from the date invoice was sent to your customer (the builder).

2) Extension will be required, for any warranty outside the original six month period. This must be submitted prior to any claim or failure and cannot be applied retro-actively.

3) Supply a copy of original customer request and reason for same as per guideline, submit with your verification on request form.

4) All request must be submitted by manufacturer only. Any request for extensions from retail customers direct will be forwarded to the O.E.M. to process in the above format.

If you have any problem understanding this policy please call for clarification.

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CALCULATING WARRANTY

"When does the warranty start?"

1. The final owner should have a six (6) month period of operation to find any proven defective part in his engine or Rotax assembly.

2. There is, however, a one (1) year limit which starts on our invoice date to you. If we sold you an engine today, unless we hear from you, the warranty will end one year from today's date regardless of whether the engine was delivered to a customer of yours or not.

EXAMPLE A: We invoice an engine to you today and two (2) weeks later the engine is sold to your customer and put into service. Six (6) months from date of sale to customer the warranty period is finished. (The customer has owned the engine for six (6) months.)

EXAMPLE B: Engine is invoiced to you today but not put into service (not sold by you) for 3, 4, 5, or up to 6 months later. Your customer still has 6 months warranty as it still falls in the one period to you.

EXAMPLE C: Engine is invoiced to you today, but for some legitimate reason, either at your end or at your customer's end, the engine cannot be put into service until 7 months or up to a maximum of the 12 months after the invoice date to you. Then, before the 12 months from invoice date to you are up, you advise us that the engine still has not been used and ask us for a one time, 6 month extension together with a valid reason. We ask permission from Rotax for a 6 month extension of that particular engine. To this date, we have not been refused a **legitimate** request for extension. In this case, warranty period will elapse 18 months from our invoice date to you.

3. As you can see, it is important to properly rotate your engine stock. Never send out a newly arrived engine if you still have older engines in house.

AN3 - AN8 AIRFRAME BOLTS

AN3-AN8 CADMIUM-PLATED STEEL BOLTS (DRILLED AND UNDRILLED)

A non-corrosion-resistant steel machine bolt which conforms to Specification MIL-B-6812. Cadmium-plated to Specification QQ-P-416.

Available with or without single hole through shank and/or single hole through head. Examples of part members for a cadmium plated steel bolt having a diameter of 1/4" and nominal length of 1".

AN4-6	For drilled shank
AN4-6A	Designates undrilled shank
AN4H-6	Drilled head, drilled shank
AN4H-6A	Drilled head, undrilled shank

NUT AND COTTER PIN SIZES

AN NUMBER	DIAMETER	PLAIN NUT AN NUMBER	CASTLE NUT AN NUMBER	COTTER PIN MS NUMBER
AN3	3/16	AN315-3R	AN310-3	MS24665-132
AN4	1/4	AN315-4R	AN310-4	MS24665-132
AN5	5/16	AN315-5R	AN310-5	MS24665-132
AN6	3/8	AN315-6R	AN310-6	MS24665-283
AN7	7/16	AN315-7R	AN310-7	MS24665-283
AN8	1/2	AN315-8R	AN310-8	MS24665-283

HOW TO DETERMINE GRIP For Steel and Aluminum Aircraft Bolts
(Subtract Fractions Shown Below From Length of Bolt)

AN 3 to AN 8	AN NUMBER, Diameter, and Threads per Inch	AN3 10 -32	AN4 1/4 -28	AN5 5/16 -24	AN6 3/8 -24	AN7 7/16 -20	AN8 ½ -20
	Grip = Length Less	13/32	15/32*	17/32	41/64	21/32	25/32

*Formula does not apply for AN4-3. Grip for AN4-3 is 1/16.

DASH NUMBER -- NOMINAL LENGTH

-3 . . . 3/8 -4 . . . ½ -5 . . . 5/8	-6 . . . 3/4 -7 . . . 7/8 -10 . . . 1	-11 . . . 1 ⅛ -12 . . . 1 1/4 -13 . . . 1 3/8	-14 . . . 1 ½ -15 . . . 1 5/8 -16 . . . 1 3/4	-17 . . . 1 7/8 -20 . . . 2 -21 . . . 2 1/8	-22 . . . 2 1/4 -23 . . . 2 3/8 -24 . . . 2 ½	-25 . . . 2 5/8 -26 . . . 2 3/4 -27 . . . 2 7/8 -30 . . . 3

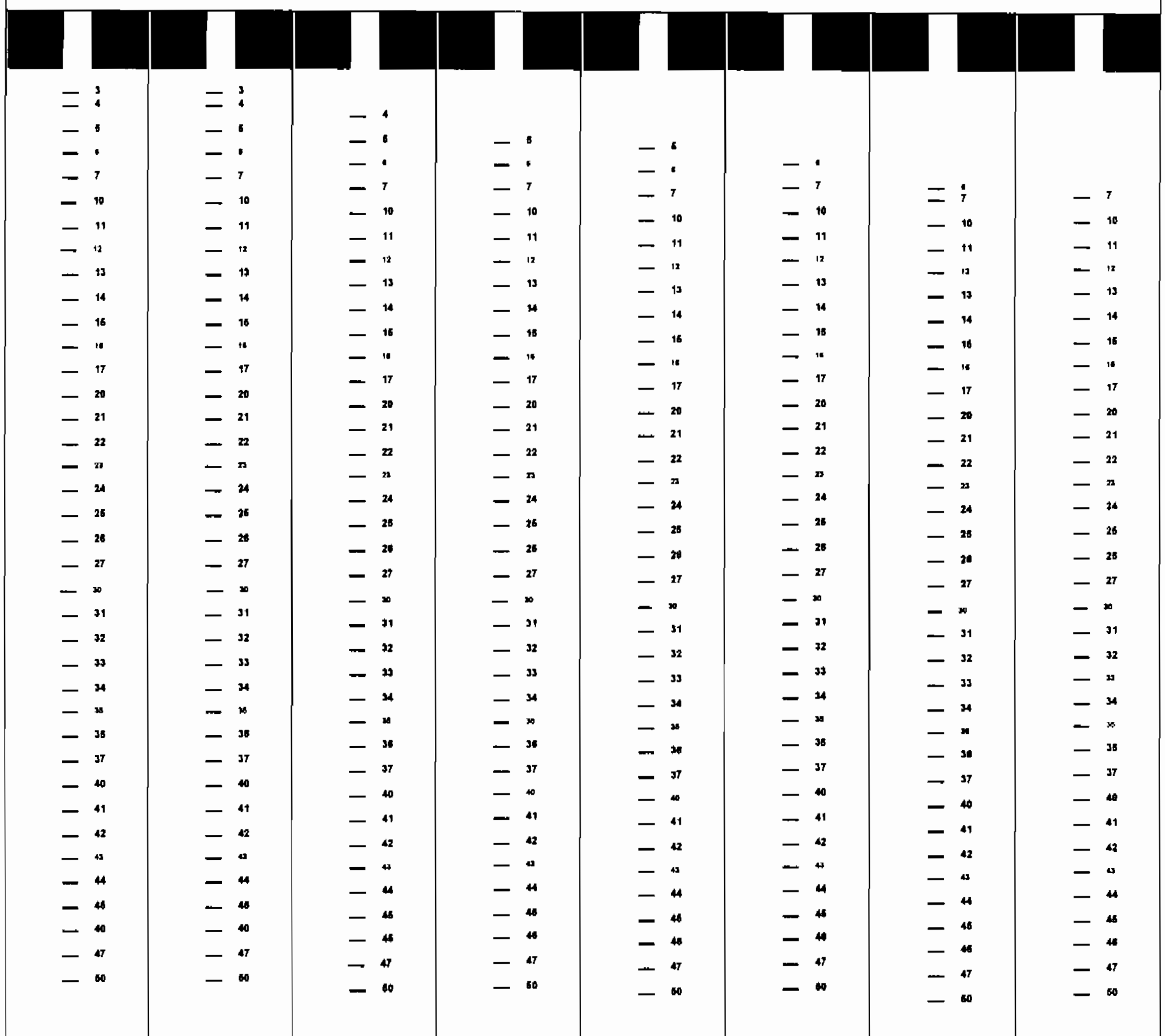
PART IDENTIFICATION

Use the above chart to determine lengths of bolts. Diameters are as follows:

AN3 = 3/16"   AN4 = 1/4"   AN5 = 5/16"   AN6 = 3/8"

Use the parts manual for other part identification. The drawings depict a fairly accurate likeness of the real thing. Other parts are labeled by part number. Again, reference the parts manual to confirm part identity.

AN Bolt Gauge



AN3	AN4	AN5	AN6	AN7	AN8	AN9	AN10
3/16	¼	5/16	⅜	7/16	½	9/16	⅝

RIVETS CROSS REFERENCE LIST

DIA.	RANS	POP RIVET				CHERRY Q			
	NO.	NO.	SHER.	TNSL.	GRIP	NO.	SHER.	TNSL.	GRIP
3/32 (#41)	40APR1/8	AD32ABS	85	135	.031-.125	--	--	--	--
3/32 (#41)	40APR1/4	AD34ABS	85	135	.126-.250	--	--	--	--
3/32 (#41)	40APR3/8	AD36ABS	85	135	.251-.375	--	--	--	--
1/8 (#30)	30APR1/16	--	--	--	--	AAPQ-41	225	250	.0-.062
1/8 (#30)	30APR1/8	AD42ABS	155	235	.063-.125	AAPQ-42	225	250	.063-.125
1/8 (#30)	30APR1/4	AD44ABS	155	235	.188-.250	AAPQ-44	225	250	.126-.250
1/8 (#30)	30APR3/8	AD46ABS	155	235	.313-.375	AAPQ-46	225	250	.251-.375
1/8 (#30)	30SSPR1/16	--	--	--	--	CCPQ-41	700	600	0-.062
1/8 (#30)	30SSPR1/8	SSD42SSBS	550	700	.031-.125	CCPQ-42	700	600	.063-.125
1/8 (#30)	30SSPR1/4	SSD44SSBS	550	700	.188-.250	CCPQ-45	700	600	.188-.312
1/8 (#30)	30SSPR3/8	SSD46SSBS	550	700	.251-.375	CCPQ-46	700	600	.251-.375
3/16 (#11)	12APR1/8	AD62ABS	315	500	.063-.125	AAPQ-62	500	450	.062-.125
3/16 (#11)	12APR1/4	AD64ABS	315	500	.126-.250	AAPQ-64	500	450	.126-.250
3/16 (#11)	12APR3/8	--	--	--	--	AAPQ-66	500	450	.251-.375
3/16 (#11)	12APR1/2	AD68ABS	315	500	.375-.500	AAPQ-68	500	450	.376-.500
3/16 (#11)	12SSPR1/8	--	--	--	--	CCPQ-62	1650	1300	.062-.125
3/16 (#11)	12SSPR1/4	SSD64SSBS	1000	1375	.126-.250	CCPQ-64	1650	1300	.126-.250
3/16 (#11)	12SSPR3/8	SSD66SSBS	1000	1375	.251-.375	CCPQ-66	1650	1300	.251-.375
3/16 (#11)	--	--	--	--	--	SSPQ-68	1050	825	.376-.50
3/16 (#11)	--	--	--	--	--	SSPQ-610	1050	825	.501-.625
1/8"	--	--	--	--	--	CCPQ-44	700	600	.126-.250
						AVEX RIVET			
1/8 (#30)	--	--	--	--	--	1691-0410	165	230	.031-.187

COCKPIT CAGE

The S-12 Airaile cockpit cage comes powder coated and ready to inspect. Conduct an inspection of the cage prior to assembly to be sure shipment has not inflicted damage. Follow the inspection guide below.

1. View the cage from the front for any twist. All the crossing members in the cage such as the seat and gear truss should be in parallel. Very minor misalignment is possible due to the heat from the welding process; however, it is unlikely. The super structure is designed to compensate for this small amount of twist, if any exists. If the frame has been damaged in shipment there may be obvious signs such as cracks in the paint or ruptured tubes.

2. Inspect the frame for bent tabs. If bent tabs are present, correct by gently pulling back into original alignment.

3. The serial number plate is located on the right-hand gusset at S-2. Note the location of the serial number. It will be used in filing of FAA Forms.

4. Inspect the frame for general condition. If your cockpit cage has come through inspection with flying colors you are ready to begin assembly.

GEAR LEG ASSEMBLY

- **The use of a "D" size drill bit should be followed as described in gear leg assembly. Due to the nature of the heat treated gear legs it will be necessary to drill the gear legs to 1/4", while only drilling the sockets to "D". This will ensure the most accurate installation possible.**

1. Locate the parts shown in the parts manual

2. Slip the gear leg socket onto the lower end of the gear leg. Line up the hole in the socket with the hole in the gear leg and drill using a letter "D" drill bit. Remove the socket, and drill the hole in the **gear leg** out to 1/4". Install gear leg socket using the hardware shown.

3. Turn the fuselage cage over and place on a set of saw horses. Make sure that the gear leg sockets welded in the fuselage cage are free of powder coating and any weld slag. Mark a line around the gear leg 8 1/8" from the top. Slip the gear leg inside the landing gear socket. It may be necessary to remove the powder coating from the top of the gear leg; however, the gear leg should remain tight in the bushing. <u>**HINT**</u>: Sand paper or a steel brush attachment for an electric grinder works well for removing powder coat. Be sure not to remove more powder coat than the depth of the socket. Make sure that the gear leg is completely inserted into the socket. Use the line marked on the gear leg as a reference. Temporarily insert the axles into the gear leg sockets with the excess axle to the inside of the socket. Clamp a straight edge between the axles (use a straight board or aluminum angle). This will align the wheels at 0° toe out. Use the reference dimensions shown in **Figure 01-03** to ensure gear legs are properly installed. These are **reference** dimensions only; the importance of these dimensions is that they be equal. If dimensions are not equal trim the top of the long gear leg as required.

NOTE: Due to an internal doubler at the top of the gear leg socket, improper insertion of the gear leg may result. It is recommended to bevel the top edge of the gear leg to help guide it past the upper doubler. Failure to insert the gear leg to the full depth will exert excessive loads on the gear leg and socket and may result in failure of the gear leg or socket. Verify the depth of the gear leg by placing a piece of masking tape on the gear leg at the gear leg socket opening. Remove the gear leg and measure the insertion depth. This depth must match the depth of the socket. See **FIGURE 01-03A.**

<u>**FIGURE 01-03**</u>

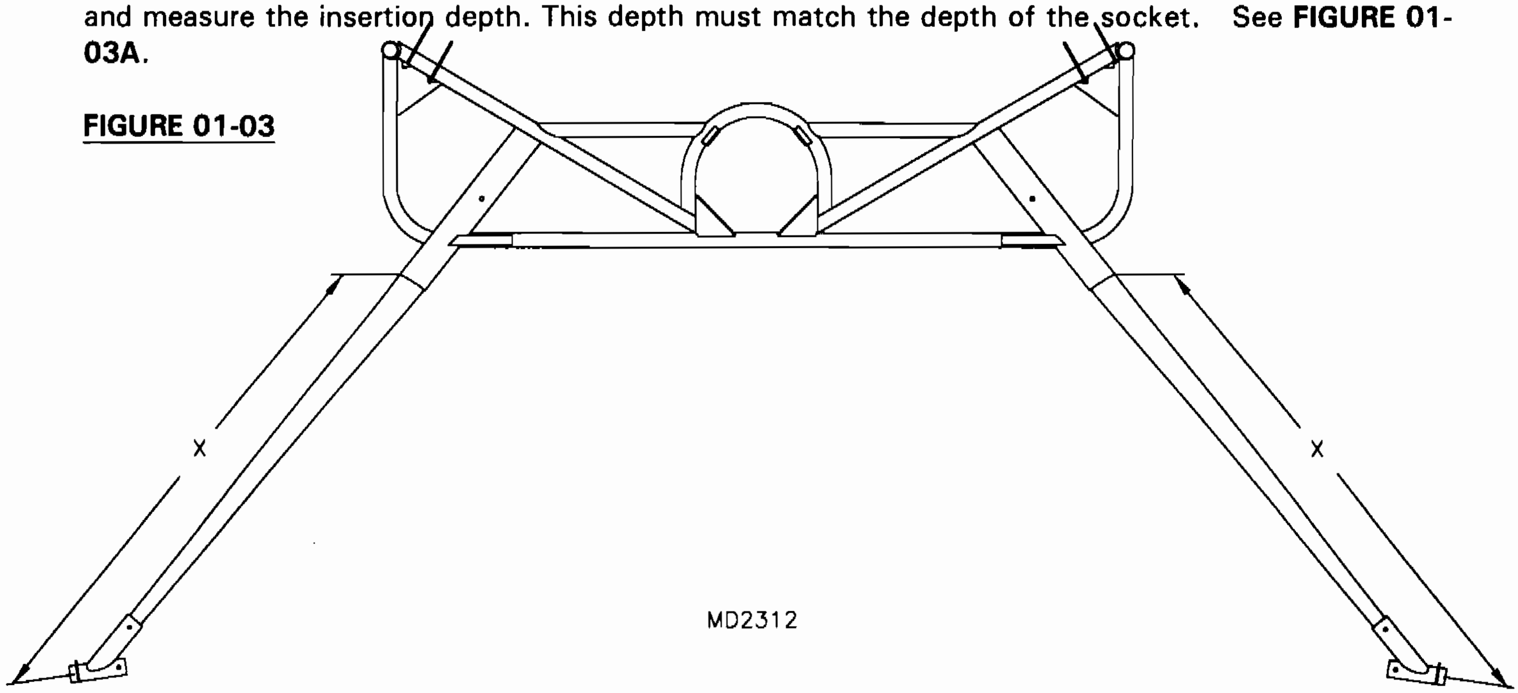
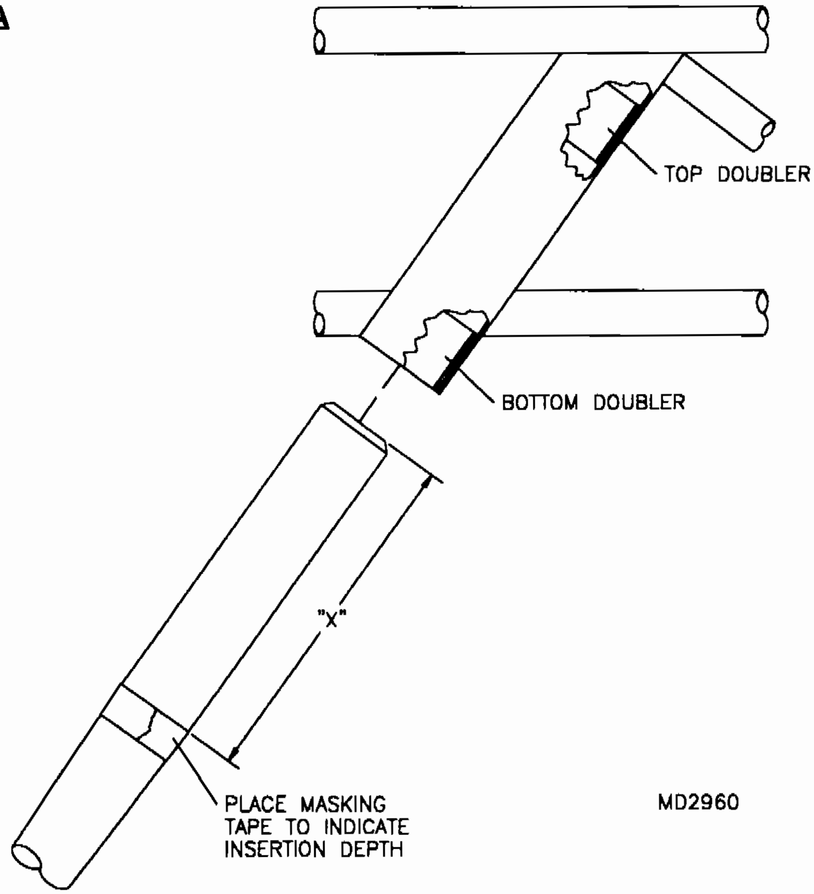


FIGURE 01-03A



4. After the gear legs are completely inserted into the fuselage and aligned, drill a #11 hole in the gear leg using the hole in the socket as a guide. Drill from each side to properly locate holes. Remove the gear leg and drill the sockets in the fuselage to a letter "D". Drill the top hole in the **gear leg** to 1/4". Install the gear leg using the hardware shown in the parts manual.

5. Axle installation will be covered in wheel assembly.

MAIN GEAR LEG ASSEMBLY

1. Locate the parts shown in the parts manual

   The use of a “D” size drill bit should be followed as described in gear leg assembly. Due to the nature of the heat-treated gear legs it will be necessary to drill the gear legs to 1/4", while only drilling the sockets to “D”. This will ensure the most accurate installation possible. Always drill the gear leg with a drill press and cutting fluid.

2. Slip the gear axle socket onto the lower end of the gear leg. Line up the hole in the socket with the hole in the gear leg and drill using a letter “D” drill bit. Remove the socket, and drill the hole in the **gear leg** out to 1/4". Install gear leg socket using the hardware shown.

3. Place the fuselage on a set of sawhorses, or other suitable work surface. Measure the depth of each gear leg socket in the fuselage. Transfer this measurement to the top of each gear leg and mark with a piece of masking tape. Install the gear legs with the fuselage in its upright position. Slide each gear leg into the sockets on the fuselage until the tape on the gear leg is flush with the socket. **IMPORTANT:** *The gear legs must be completely bottomed in their socket.* It may be necessary to slightly ream the inside of the socket to allow the gear leg to fully insert. It’s also acceptable to lightly sand the upper portion of the gear leg (spinning the end of the gear leg over a disk sander works well). Both gear legs should measure equal length from a common point on the fuselage. See **FIGURE 01A-03**. If adjustments need to be made to gear leg length, remove material from the top of the longer gear leg. **NOTE:** Due to an internal doubler at the top of the gear leg socket, improper insertion of the gear leg may result. It is recommended to bevel the top edge of the gear leg to help guide it past the upper doubler. Failure to insert the gear leg to the full depth will exert excessive loads on the gear leg and socket and may result in failure of the gear leg or socket. See **FIGURE 01A-03A**.

<u>FIGURE 01A-03</u>

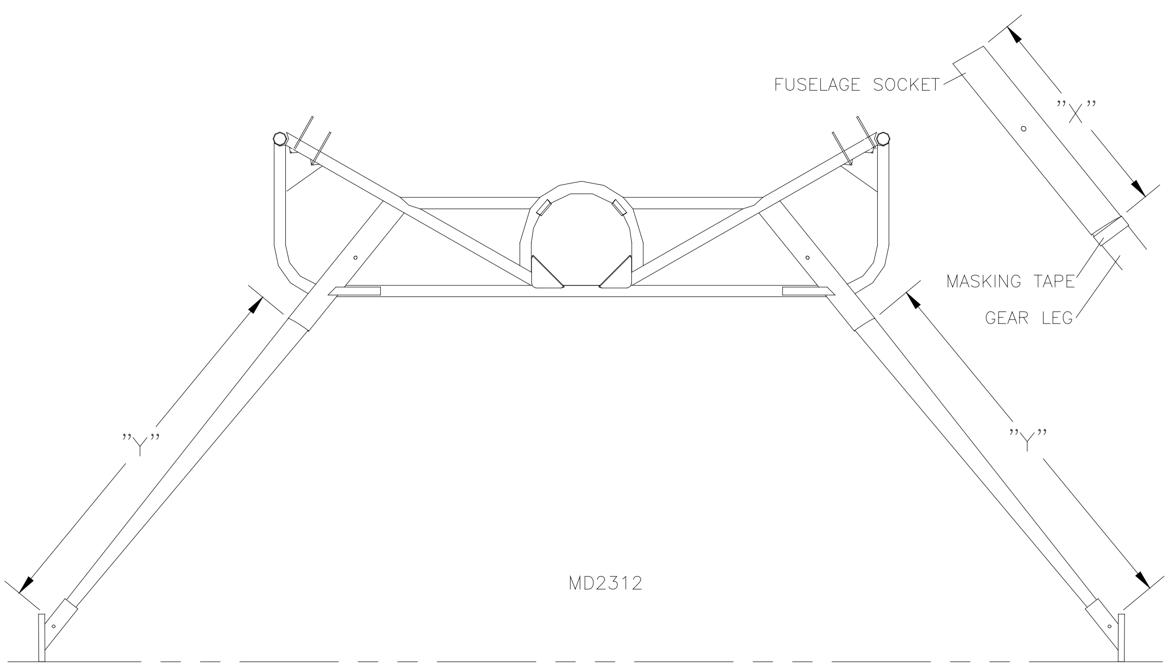
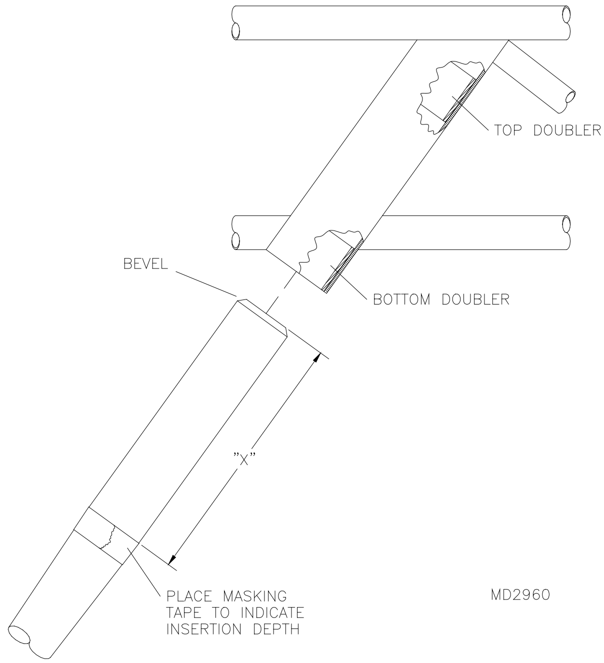


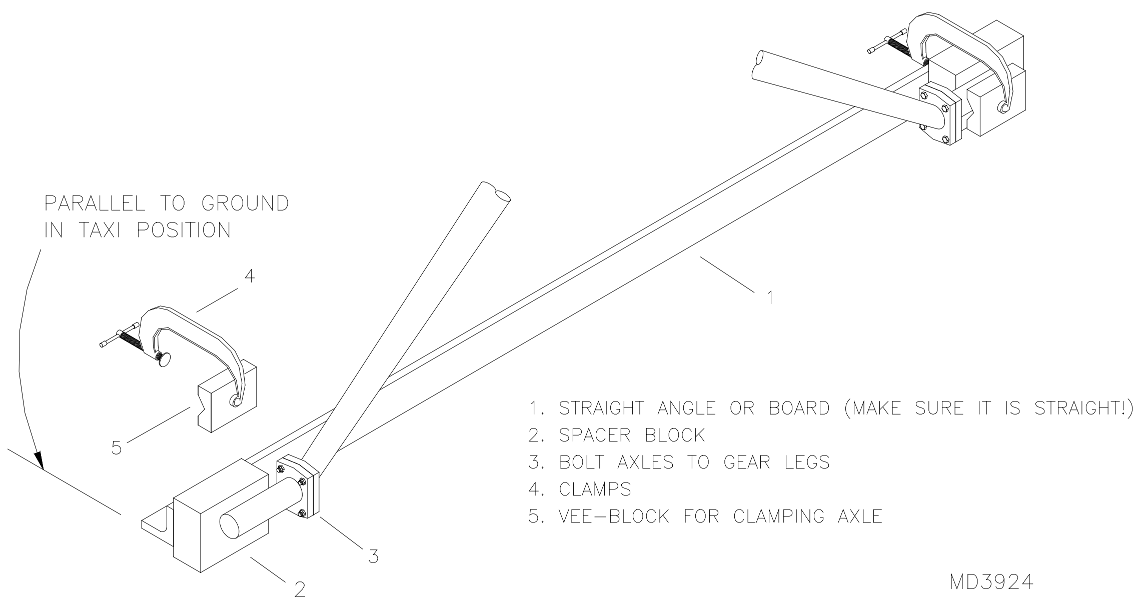
FIGURE 01A-03A



4. **IMPORTANT:** Fuselage must be in taxi position before setting main gear toe-in. Set up the gear to have exactly zero degrees of toe-in with the nose gear on the ground (skip forward and install the nose gear at this time, if you have not done so).

5. Assemble the axles to the gear leg assembly. Axle and wheel installation is covered in Wheel and Brake Assembly. With gear legs properly inserted, set axles straight by fabricating the alignment jig shown in **FIGURE 01A-05**. **NOTE:** *Aligning the gear legs requires the fuselage to be in the taxi position.* **HINT:** *Temporarily install the wheels and block the fuselage to the same height, then remove the wheels for setting the gear.* **IMPORTANT:** For proper alignment, the base of the angle must be parallel to the floor.

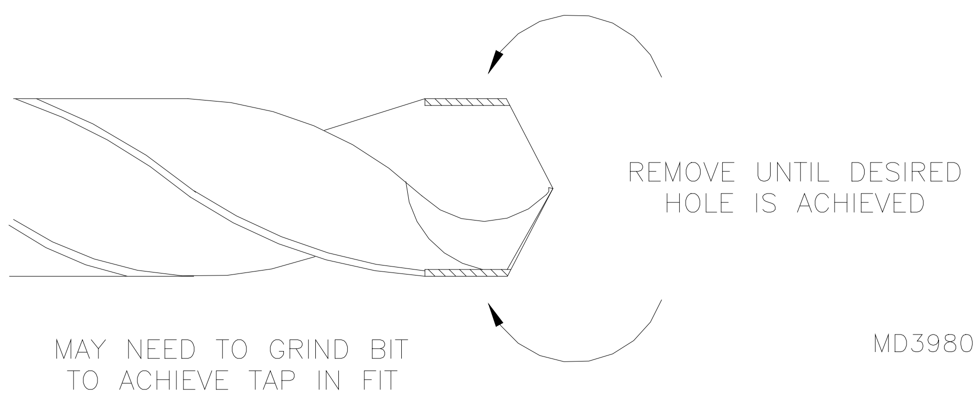
FIGURE 01A-05



6. With the gear legs properly set, use the pre-drilled hole in the fuselage socket as a drill guide. Drill #11 from each side to mark each gear leg (Do **NOT** drill through). A 90º drill attachment will be required.

7. Remove the gear leg and finish drilling from each side in a drill press. Use a slow speed and plenty of cutting fluid to keep the metal cool. **HINT:** *A "V-block" will be of great help in drilling straight.* After drilling #11, step drill to 5/16". **IMPORTANT:** *Modify the 5/16" bit, if needed to obtain a tight fit on the bolts.* See **FIGURE 01A-07**. ***NOTE:*** *You may also use the alternative method below for steps 7 & 8.*

FIGURE 01A-07



8. Insert the gear leg back into the fuselage socket and align the holes. Transfer drill 5/16" the socket and gear leg. The gear legs are final installed after the fuselage is covered and painted.

7 & 8 ALTERNATIVE METHOD: *Remove the gear leg and finish drilling from each side in a drill press with a V-block. After drilling thru #11, drill out to 1/4". Step drill hole in the gear socket to 1/4". Insert the gear leg back into the fuselage socket and align the holes. Transfer drill 7.8 mm, through the socket and the gear leg. Ream with a 0.3115" ream.* ***IMPORTANT:*** *It is recommended to run the ream completely through. Do* ***NOT*** *pull the ream back. Remove gear legs for fuselage covering.*

9. Install the gear legs using the hardware called out in the parts drawing. The wheel axles should be 90º to the aircraft centerline. **HYDRAULIC BRAKES ONLY:** *If not it is possible to shim under the 4 attach bolts to correct alignment.*

10. Axle and wheel installation will be covered in Wheel and Brake Assembly.

WHEEL AND HYDRAULIC BRAKE ASSEMBLY
STANDARD & TUNDRA

NOTE: If installing Main Gear Wheel Pants, refer to **MAIN WHEEL PANT INSTALLATION,** later in this section, before proceeding.

1. Bolt caliper mount, fairing mount bracket and axle to the gear leg assembly as per parts drawing. Assemble the wheel and brake kit as per parts manual and manufacturers instructions. With the aircraft in a level attitude the brake assembly will be orientated to the aft and slightly downward. **CAUTION:** *Be sure to safety wire the bolts holding the brake disk.* The standard tire pressure should be approximate 25 psi. Tundra tires should be inflated to 9 PSI for hard surface, and 10 to 15 PSI for soft fields. To install wheel assembly, the outer brake pad removes via the 1/4" retainer bolts. Loctite and safety wire these bolts in final assembly.

2. Clean and pack the tapered wheel bearings. The tapered roller bearings are oiled from the factory for rust prevention, but not greased. The roller bearings should be cleaned, dried and then packed with suitable grease. Packing grease without first removing the oil will dilute the wheel grease, causing it to run out past the seal and not lubricate properly.

3. Slip the bearings and wheel / tire assembly back onto the axle. Install the castle nut and washer. Tighten the castle nut to manufactures specifications or bearing failure may result. Secure with the large cotter pin. Wrap Teflon tape on the threads of the brake fitting and install the fitting into the caliper. The fitting should face forward. At this point it is suggested to test fit the gear leg fairings so that they are ready for paint.

IMPORTANT INFORMATION: MATCO mfg wheels using tapered roller bearings are equipped with Timken bearings utilizing integrated grease seals on the bearing cone to ensure the longest possible life. The torqueing procedure for bearings with these type seals is different than for tapered roller bearings without them. A common torqueing technique for bearings *without integrated seals* is to tighten the axle nut until the wheel stops spinning freely and then back off to the nearest locking feature. THIS TECHNIQUE WILL NOT WORK ON A BEARING WITH AN INTEGRATED SEAL. The reason for a different torqueing technique is that the grease seal produces some drag and makes the wheel feel somewhat stiff when rotated. Reducing the axle nut torque until the wheel spins freely will allow the grease seal and the bearing cone to improperly rotate with the wheel (the cone must not rotate relative to the axle). The higher rolling drag is completely normal for this bearing and allows for longer bearing life since the seal will keep most contaminants out. Timken specification state, for example, that the two 1.25 inch tapered roller bearing used on the WE51 will produce 18-26 inch pounds of torque (drag) when properly installed. A light coating of grease on the seal will help reduce the drag on initial installation. The drag will also reduce after the bearings have been installed and the seal relaxes in the bore. It is important that the axle nut torque be sufficient to keep the seal from rotating with the wheel. With the bearings cleaned, dried, greased, and inserted in the wheel, the axle nut should be tightened until all play is out of the assembly. Rotate the wheel back and forth while tightening the nut to help seat the bearings. When all play is out of the assembly, and the wheel rotates freely, tighten to the next castle slot and insert the cotter pin. The rubber seal on the tapered roller bearing will remain stationary while the wheel rotates around it. If the seal is spinning on the axle, the nut should be tightened further until the seal stops spinning with the wheel.

MAIN WHEEL PANT INSTALLATION
HYDRAULIC BRAKES

1. Press the Axle Extender into the axle until bottomed on the Axle Extender shoulder. Drill #30 through the extender using the pre-drilled axle holes as a guide. Complete Wheel and Brake assembly.

2. Make a template as shown in **Figure 01C-02** from poster board to mark the bottom hole for wheel clearance. Locate the hole 5 1/2" aft of the forward nose of the wheel pant as shown in **Figure 01C-02A.** Do not use the dimple molded into the wheel pant for hole location.

FIGURE 01C-02

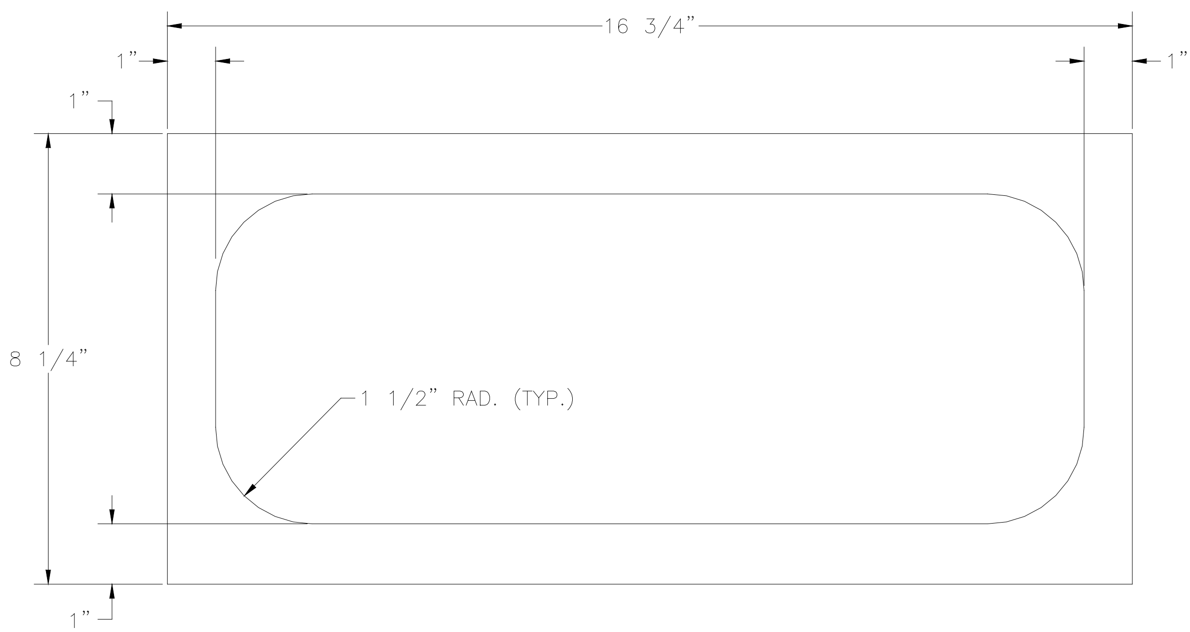
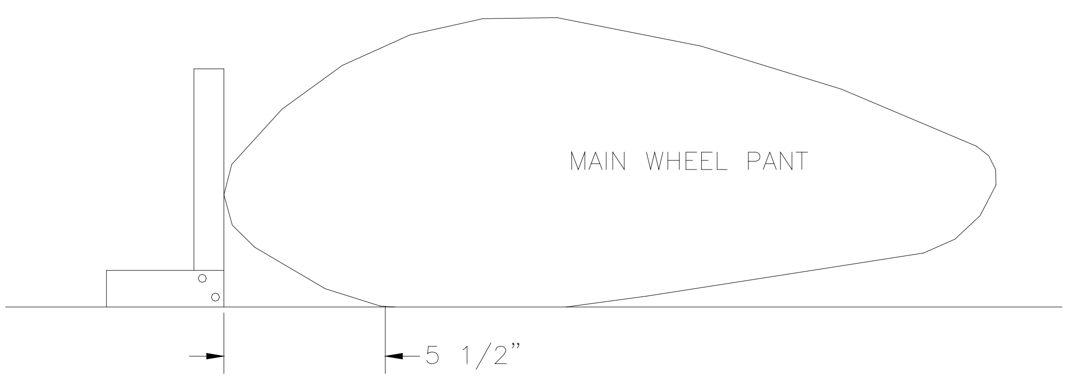


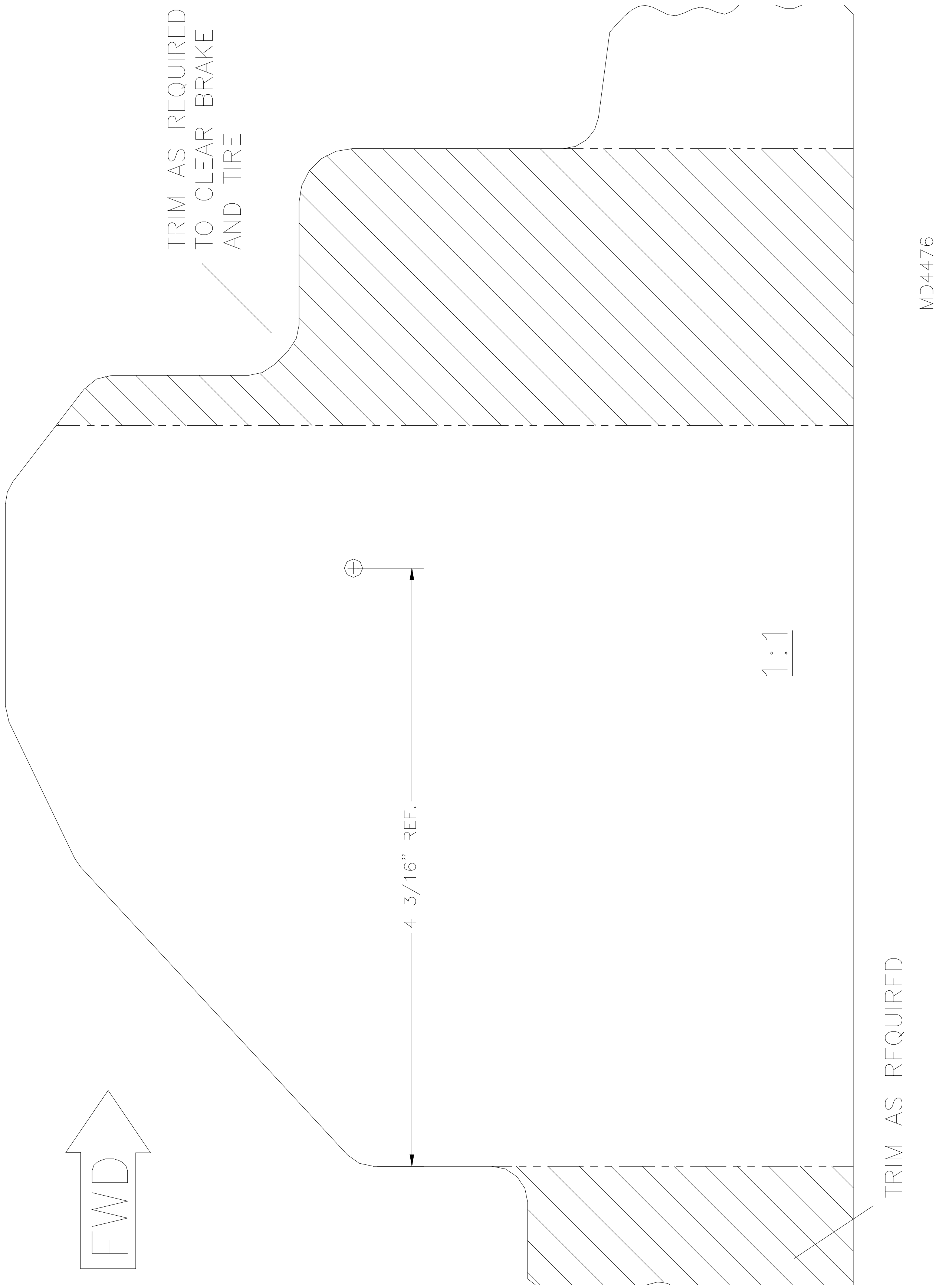
FIGURE 01C-02A



3. Make a template out of poster board as shown in **Figure 01C-03** for the brake cutout. The location of center should be 1/2" directly below the dimple on the wheel pant. Mark the wheel pant using the template. Remove the material using a fine blade jigsaw or Dremel with Reinfiorced Cut-off Wheel. **BE SURE** to make a right and a left wheel pant. The bolt hole on the outside of the wheel pant should also be 1/2" directly below the dimple on the wheel pant. Drill the outside hole to #11. If no dimple is present, locate the wheel pant with 3/4" to 1" clearance from the top of the tire. **HINT:** Place a small wood block on top of the wheel. Be sure the wheel is centered in the opening.

4. The main gear wheel pants will need to be leveled off of the nose wheel pant. Set aside the main gear wheel pants until installation of nose gear pant is complete.

FIGURE 01C-03



NOSE GEAR ASSEMBLY

1. Select the parts depicted in the parts manual.

2. Slip the valve stem through the hole, then while pulling on the cap end push on the large end. **HINT**: Use a 1/4" allen wrench and push it down the center of the valve. A small amount of silicone sealer may be used around the sealing neck of the stem to insure against leakage. **NOTE:** The Hegar wheel system is a tubeless tire system. The wheel halves seal with "O" rings. Place the rubber "O" rings into the groves on each side of the seal plate. Be sure "O" rings, wheel halves, grooves, and seal plates are free of debris. To install the tire on the rim, sandwich the tire between the two rim halves, with the seal plate in between the rim halves. Bolt the hub kit together with tire in place using the hardware shown. Inflate to the pressure required to seat the tire to the rim, then deflate to desired pressure. **CAUTION:** Make sure all bolts are secure before inflating the tire.

3. Clean the unpainted end of the nose gear assembly with a Scotch Brite pad or 400 grit sandpaper. Clean the inside of the nose gear socket on the cage. Test fit the fork into the socket. Sand until it inserts completely and turns freely. Test fit the steer horn over the nose gear column.

4. Drill the two holes for steering linkage in the steer horn out to 1/4". Lightly grease the bearing assembly and install on the nose gear strut. Lightly grease the nose gear column and sockets. Insert the fork assembly and steer horn into the nose gear socket. Look closely at the steer horn. Notice the arms of the horn are welded on at an angle. Install the steer horn so the arms of the horn are level with the top longerons of the cage. Temporarily slip in the nose wheel axle. Before drilling through the nose gear strut, make sure the steer horn is parallel with the nose gear axle. Drill a 3/16" hole through the fork and steer horn assembly. For best accuracy drill from each side. Remove the fork assembly and steer horn.

5. Assemble the steering system as per the parts manual. Leave the steering linkages unattached from the steer horn at this point. Installation and adjustment of the steer rods will come after the rudder pedals and cables are installed.

6. With tire and rim located inside fork slip the axle into position. Be sure to locate a wheel bushing on each side of the hub. Center axle and drill #30 holes for cotter pin insertion as shown in the parts manual. Locate hole in line with the center of the fork tube. Install cotter pins.

7. Install the 1/4" plain nut and bolt to the steer horn as shown in the parts manual. This will function as the rudder stop settings.

8. If the nose spring becomes "sticky" it will most likely be from dirt or lack of grease. To service remove the strut, disassemble, clean, and apply fresh grease. Push down on the nose of the aircraft to depress the spring and install the bolt. Inspect the bolt for wear. Replace the bolt if it shows signs of grooving.

NOSE GEAR ASSEMBLY
TUNDRA TIRES

1. Select the parts depicted in the parts manual.

2. Insert tube into tire. Bolt left and right rims together with tire and tube in place using the hardware shown. Shift the outside wheel as necessary to align stem. Make sure not to pinch the tube while bolting hubs together. **HINT**: Use a blunt screwdriver or other tool to keep tube from locating between hubs during assembly. Inflate to the pressure required to seat the tire to the rim, then deflate to desired pressure. **CAUTION:** Make sure all bolts are secure before inflating the tires.

3. Clean the unpainted end of the nose gear assembly with a Scotch Brite pad or 400 grit sandpaper. Clean the inside of the nose gear socket on the cage. Test fit the fork into the socket. Sand until it inserts completely and turns freely. Test fit the steer horn over the nose gear column.

4. Drill the two holes for steering linkage in the steer horn out to 1/4". Lightly grease the bearing assembly and install on the nose gear strut. Lightly grease the nose gear column and sockets. Insert the fork assembly and steer horn into the nose gear socket. Look closely at the steer horn. Notice the arms of the horn are welded on at an angle. Install the steer horn so the arms of the horn are level with the top longerons of the cage. Temporarily slip in the nose wheel axle. Before drilling through the nose gear strut, make sure the steer horn is parallel with the nose gear axle. Drill a 3/16" hole through the fork and steer horn assembly. For best accuracy drill from each side. Remove the fork assembly and steer horn.

5. Assemble the steering system as per the parts manual. Leave the steering linkages unattached from the steer horn at this point. Installation and adjustment of the steer rods will come after the rudder pedals and cables are installed.

6. With tire and rim located inside fork slip the axle into position. Be sure to locate a wheel bushing on each side of the hub. Center axle and drill #30 holes for cotter pin insertion as shown in the parts manual. Locate hole in line with the center of the fork tube. Install cotter pins.

7. Install the 1/4" plain nut and bolt to the steer horn as shown in the parts manual. This will function as the rudder stop settings.

8. If the nose spring becomes "sticky" it will most likely be from dirt or lack of grease. To service remove the strut, disassemble, clean, and apply fresh grease. Push down on the nose of the aircraft to depress the spring and install the bolt. Inspect the bolt for wear. Replace the bolt if it shows signs of grooving.

NOSE GEAR ASSEMBLY
AERO-TRAINER TIRES

1. Select the parts depicted in the parts manual.

2. Insert tube into tire. Bolt left and right rims together with tire and tube in place using the hardware shown. Shift the outside wheel as necessary to align stem. Make sure not to pinch the tube while bolting hubs together. **HINT**: Use a blunt screwdriver or other tool to keep tube from locating between hubs during assembly. Inflate to the pressure required to seat the tire to the rim, then deflate to desired pressure. **CAUTION:** Make sure all bolts are secure before inflating the tires.

3. Clean the unpainted end of the nose gear assembly with a Scotch Brite pad or 400 grit sandpaper. Clean the inside of the nose gear socket on the cage. Test fit the fork into the socket. Sand until it inserts completely and turns freely. Test fit the steer horn over the nose gear column.

4. Drill the two holes for steering linkage in the steer horn out to 1/4". Lightly grease the bearing assembly and install on the nose gear strut. Lightly grease the nose gear column and sockets. Insert the fork assembly and steer horn into the nose gear socket. Look closely at the steer horn. Notice the arms of the horn are welded on at an angle. Install the steer horn so the arms of the horn are level with the top longerons of the cage. Temporarily slip in the nose wheel axle. Before drilling through the nose gear strut, make sure the steer horn is parallel with the nose gear axle. Drill a 3/16" hole through the fork and steer horn assembly. For best accuracy drill from each side. Remove the fork assembly and steer horn.

5. Assemble the steering system as per the parts manual. Leave the steering linkages unattached from the steer horn at this point. Installation and adjustment of the steer rods will come after the rudder pedals and cables are installed.

6. With tire and rim located inside fork slip the axle into position. Be sure to locate a wheel bushing on each side of the hub. Center axle and drill #30 holes for cotter pin insertion as shown in the parts manual. Locate hole in line with the center of the fork tube. Install cotter pins.

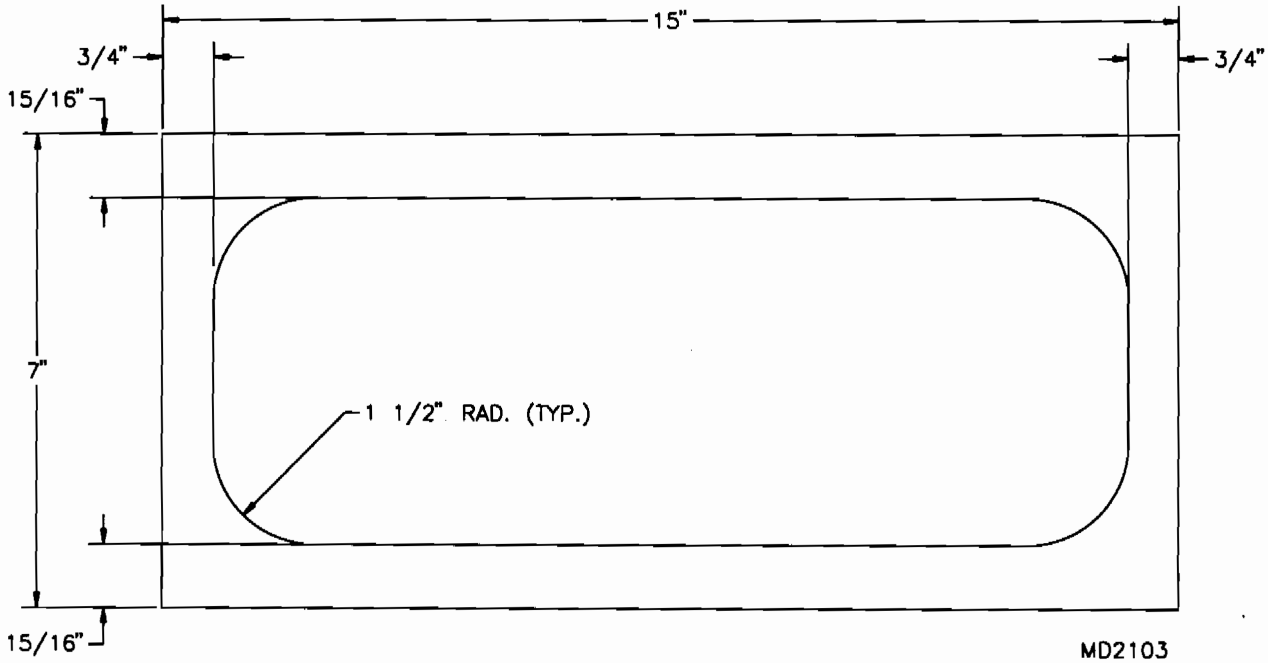
7. Install the 1/4" plain nut and bolt to the steer horn as shown in the parts manual. This will function as the rudder stop settings.

8. If the nose spring becomes "sticky" it will most likely be from dirt or lack of grease. To service remove the strut, disassemble, clean, and apply fresh grease. Push down on the nose of the aircraft to depress the spring and install the bolt. Inspect the bolt for wear. Replace the bolt if it shows signs of grooving.

NOSE GEAR WHEEL PANT ASSEMBLY

1. Fabricate the illustrated template from a piece of cardboard or poster board as shown below in **Figure 01-01.**

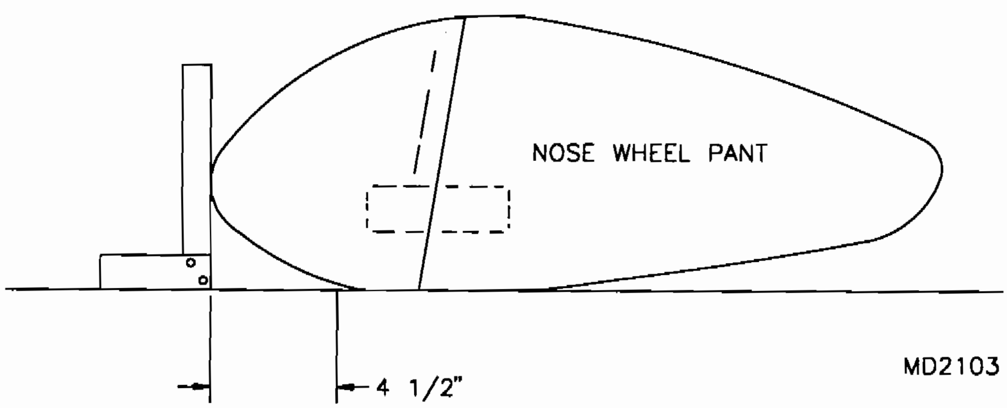
FIGURE 01-01



2. Trim both the FWD and AFT pieces of the nose wheel pant down to their gel coat line along the joggle and overlap seam.

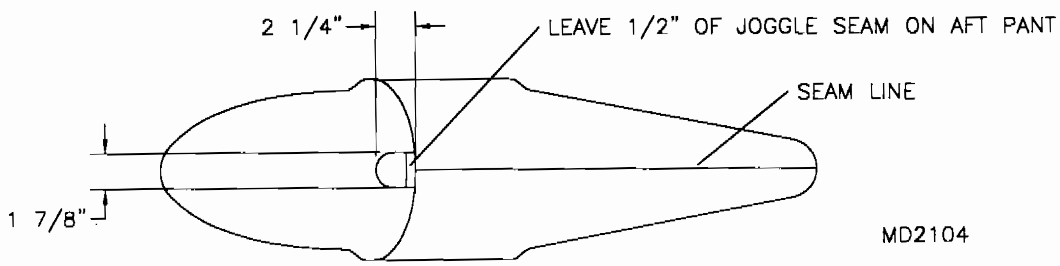
3. Slip the AFT section of the wheel pant inside the FWD section and tape together with wide masking tape. Use this template to mark and trim the wheel hole in the wheel pant for proper tire clearance. The wheel hole will need to begin 4 ½" AFT of the nose of the wheel pant as shown in **Figure 01-03.**

FIGURE 01-03



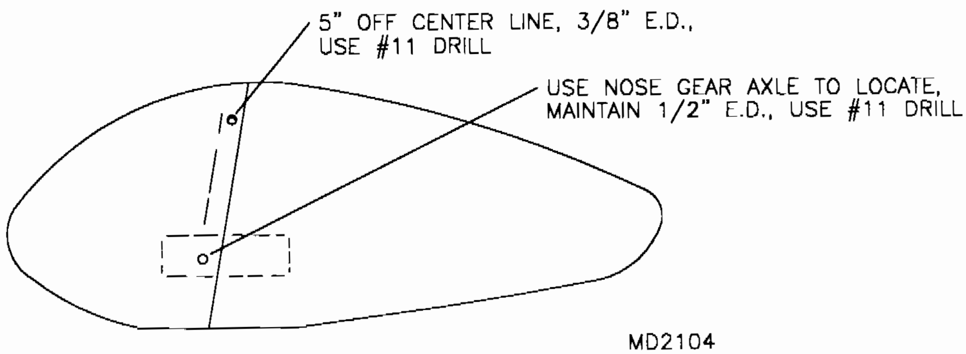
4. Using the seam line on the AFT pant for the center line mark and cut out as shown in **Figure 01-04**. A good tool to use for cutting is a portable jig saw. Finish trimming is easy with a drum sander on a power drill.

FIGURE 01-04



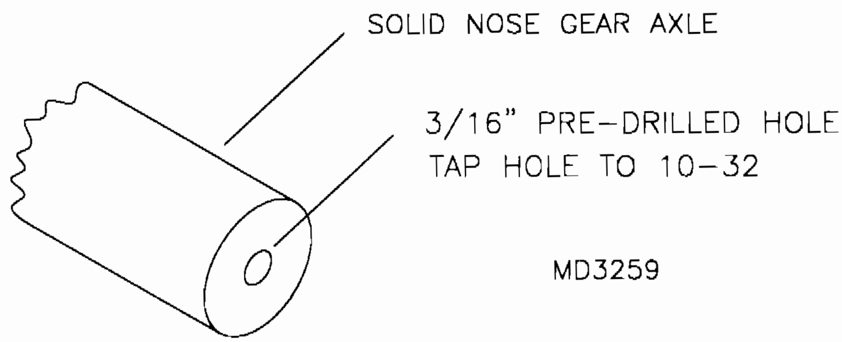
5. Locate four #11 holes in the pant while they are taped together. Mark and drill as shown in **Figure 01-05**. Install nut plates to the inside of the top AFT section to retain the upper bolts.

FIGURE 01-05



6. Using a 10-32 tap, tap the 3/16" pre-drilled hole in each end of the nose gear axle. Refer to **FIGURE 01-06**.

FIGURE 01-06



7. Refer to the parts drawing and cut out and install the rubber edging as shown. After painting, use a quick setting super glue to retain the rubber parts to the wheel pants.

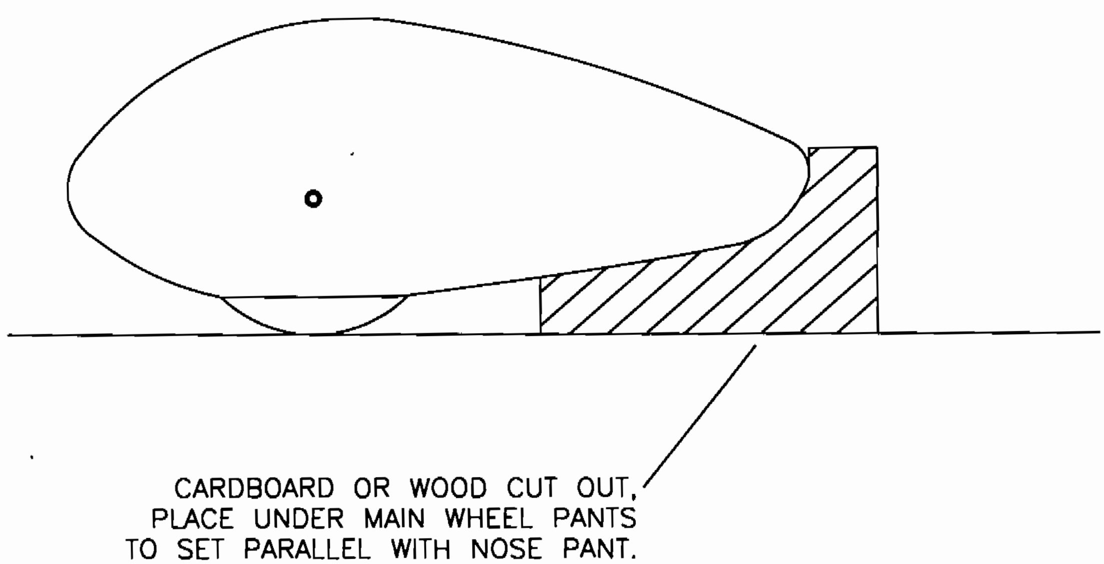
8. Sandwich the two halves around the tire and slip them into place. Locate hardware and check fit carefully. Trim if necessary.

9. To paint the wheel pant it will be required to sand, fill and prime the parts. Start sanding using a good grade of wet or dry paper of at least 320 grit. After sanding you may notice a few imperfections appearing in the gel coat. These can be filled with lacquer putty or a two part body putty. Prime the parts using a two part epoxy primer. Finish coat with the color of your choice.

Main Wheel Pant Installation

10. Turn back to your specific wheel/brake/tire assembly in the parts manual. Slip main wheel pant into position. With the bolt and washer in the outside hole, position main wheel pant parallel with nose wheel pant and mark the two inside attach holes using the tabs on the axle socket as guides. See fixture idea in **Figure 01-10.** Drill 3/16" and install hardware as shown in parts manual (main wheel pant installation details are shown in the Fuselage Assembly section of the parts manual under specific setups).

FIGURE 01-10



SUPER STRUCTURE

NOTE: For the super structure assembly it is recommended that the builder obtain two (2) 2' foot levels for simultaneous reading of tail boom and keel alignment. It is also advisable to mark one end of the levels as aft and keep them oriented to the rear of the plane at all times. This will help eliminate any errors due to the level's inconsistencies.

1. Locate the parts shown in the parts manual.

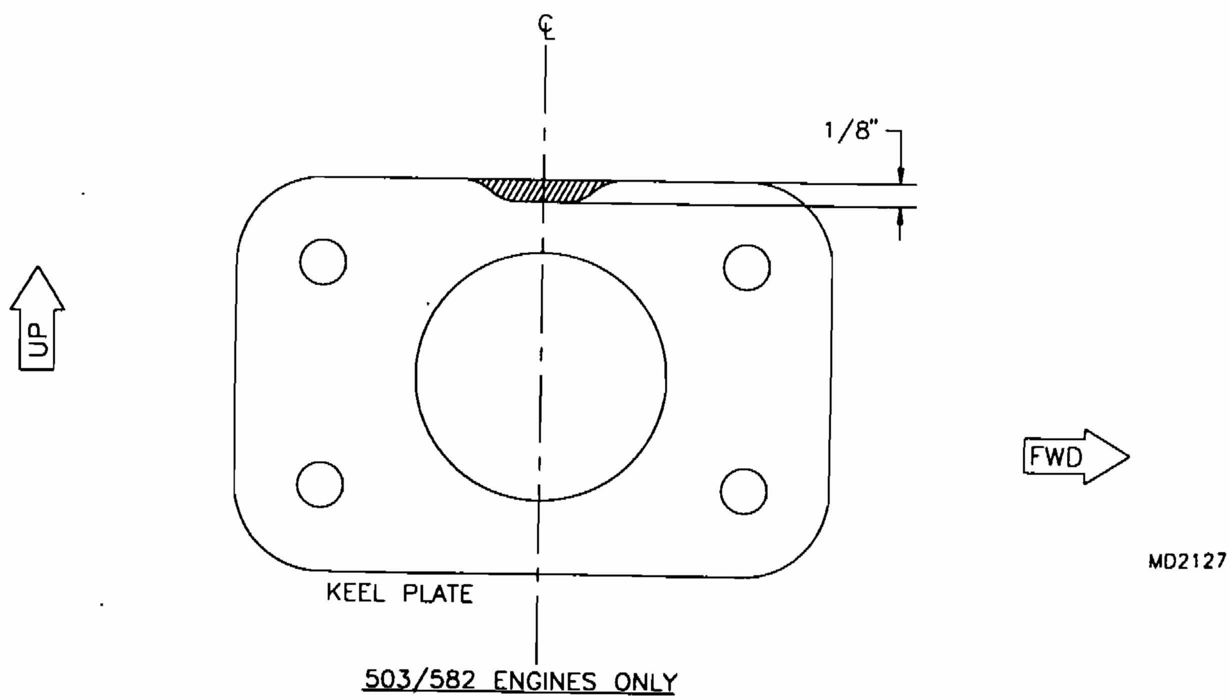
2. Size drill the bottom end of the forward strut to match the specified bolt on the parts list. **NOTE**: The bottom is denoted by an angle cut on the end of the strut. The angle cut also identifies the back of the strut. Drill the top end of the strut to 1/4". With the forward strut in position, drill the keel and forward strut out to 3/8" at the forward strut attach point. Install the forward strut into the keel using the hardware shown. Include the bushing and U-brackets as shown on the assembly drawing. The bushing will go completely through the keel and forward strut. Assemble with the 3/8" washer on each side of the forward strut as shown in the parts manual. **HINT**: Super glue the 3/8" washers together that install between the keel and the forward strut.

3. Install the forward set of keel plates. Install the middle and forward cabanes between the keel plates as shown. Size drill as required for the specified bolts.

503/582 Only

4. If installing a **503** or **582**, notch the remaining four keel plates as shown in **Figure 05-04**. Install the four keel plates with the notch upward. The notch is required to clear the engine mount angles. Install the 2" aft strut between the keel plates. Do not install the aft cabanes at this point.

FIGURE 05-04



912 Only

4. If installing a **912** locate the engine mount angles shown on the super structure-912 parts page. Attach the engine mount angles to the keel using the hardware shown. Size drill as required. Install the aft strut between the engine mount angles as shown. Do not install the aft cabanes at this point.

5. Set the keel aside until a later step.

TAIL BOOM HANDLING AND CARE

The Airaile features a tail boom as the primary structure to retain the tail. Simple in design and rugged in nature, the tail boom will last the life of the airframe. However, it must be respected. By its very nature the boom is venerable to corrosion, nicks, gouges, dents, and scratches. Any of these in sufficient amounts or depth can render your tail boom unsafe. Inspect your tail boom during pre-flight for any abnormalities.

Check annually the boom's inside surface for corrosion with a powerful flashlight. If you live in a sea-air environment, you may want to consider alodining or epoxy priming the boom's inside wall before assembly. The interior of the boom can be coated with either material simply by pouring it inside the tube and rolling the tube. Slant the boom a bit so it runs to the other end. Expect a mess!

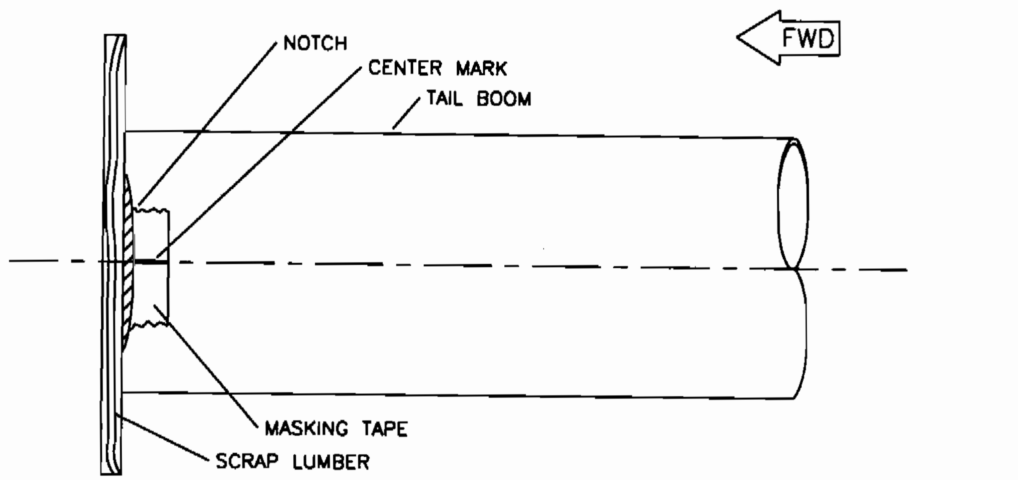
Inspecting the interior of your boom will reveal a doubler about 1/4 of the boom's length from the forward end of the boom. This has been glued in place under pressure with structural epoxy. Inspect the doubler for separation annually by visually checking the edges of the doubler for gaps or black oxide. Black oxide will be present if there has been movement of the doubler.

Place a protective pad over the boom, near the collar, when working on the engine (Boom pads are available from our parts department). This way a dropped wrench will not cost you a new boom. Knowing what keeps your boom safe, will keep you safe too!

TAIL BOOM ASSEMBLY

1. Locate the parts shown in parts manual. Look at the tail boom very closely. You will notice one end has a slight notch. Take a small flat board approximately 7" X 7" in size. Place this board over the notched end of the boom tube. The flat surface of the board will show the notch to be 1/4" deep. **HINT:** Apply a small piece of masking tape to the notched end. With the board held against the notched end, mark the boom where the middle of the notch occurs. This mark will be used to line up the top of the boom to the cage. See **Figure 01-05**.

FIGURE 01-05

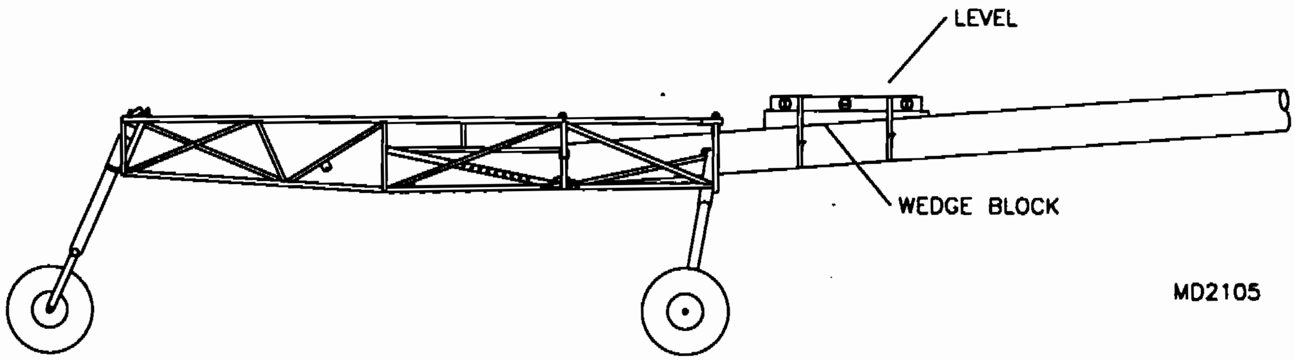


2. For the tail boom to be set at the proper angle the cockpit cage must be set level across the cage and length wise. The level reference is the top longeron between S-2 and S-3. Use wood blocks under the main wheels as needed to obtain the required level reading at the longeron. The longerons are the top **OUTSIDE** tubes that make up the frame's top perimeter. A straight edge in between the top longerons of S-2 and S-3 in conjunction with a level will indicate if the cage is level across. After establishing that the cage is level in both directions, block the wheels so they will not roll.

3. In order to prep the fuselage for boom insertion, tweak the four tabs at S-4 and the two tabs at S-3 until they will clear the tail boom upon insertion. To protect the booms finish, place vinyl or electrical tape inside the truss where the boom contacts.

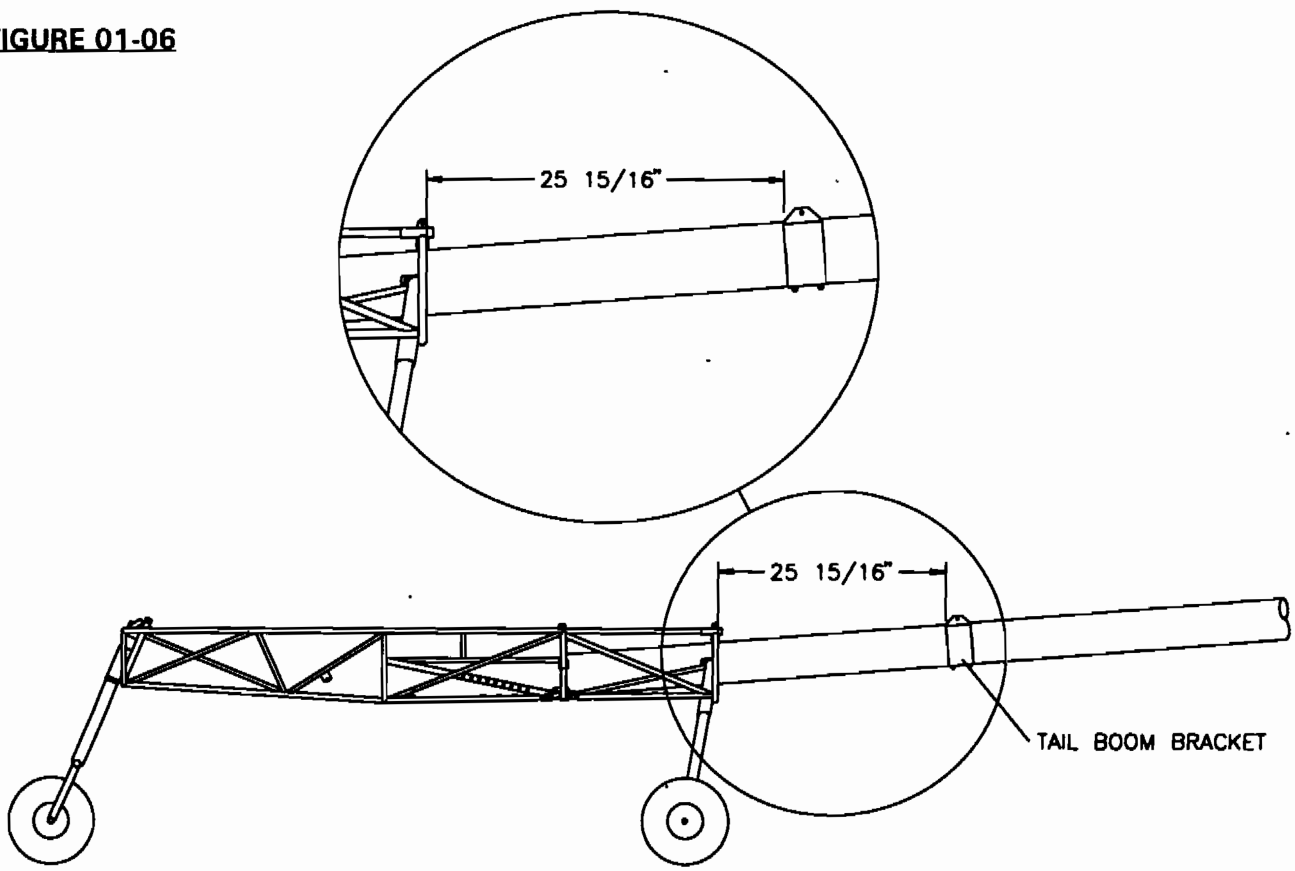
4. Have a saw horse or similar stand with a soft cloth ready to support the tail end of the boom. Use the cloth to protect the paint on the boom. The stand should be a height of at least 34". Carefully insert the boom into the cage structure. Do not twist the boom during insertion. Twisting may unnecessarily scratch the boom. Be sure the boom is inserted with the notched end up and to the front. The boom should be inserted so it touches against the AFT seat truss tube. Locate the supplied boom angle template. Tape the angle template in place along with a level. See **Figure 01-04**. Move the stand back and forth to achieve the correct angle. It is very important to do this step accurately. This will determine the primary horizontal tail incidence angle. Measure from the strut attach tangs on the fuselage to the end of the tail boom on each side to determine if the tail boom is straight. Adjust boom until the measurements are equal. Once correct placement of the tail boom is achieved, secure the stand and tail boom in position. **DO NOT** drill the tail boom at this point.

FIGURE 01-04



6. Locate tail boom bracket and the plastic strip. Use contact cement to secure the plastic strip on the inside of the tail boom bracket. This will allow the tail boom bracket to slide into position without scratching the paint on the tail boom. It is also needed to prevent dissimilar metal corrosion between the tail boom bracket and the tail boom. **Note:** Do not install the bolts for the tail boom bracket until it is in the correct location. Slide the tail boom bracket onto the tail boom at exactly 25 15/16" from the aft edge of the gear truss to the front edge of the bracket. See **Figure 01-06.**

FIGURE 01-06

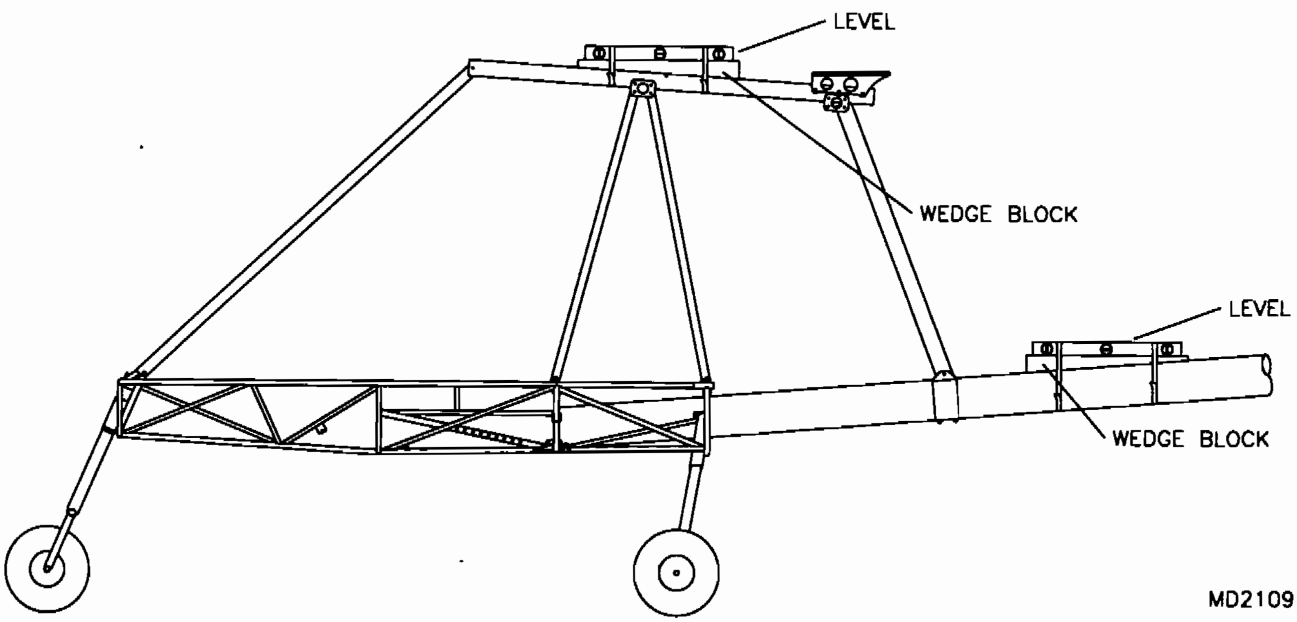


Attaching Keel To Fuselage Cage

1. Locate the keel over the fuselage cage. Insert the aft strut in between the tangs on the tail boom bracket and loosely bolt in place. Place the forward cabanes in the tangs at S-3 and the middle cabanes in position at S-4. **NOTE:** It is not necessary to have the triangle plates in position at this time. **DO NOT** drill the forward cabanes at this time. Locate the forward strut over the 3/4" square tube behind the nose gear socket. The bushing extending out each side of the square tube will need to be filed to match the inside radius of the forward strut. If the notch on the back of the forward strut does not completely clear the 3/4" square tube it will need to be trimmed to prevent rubbing. After establishing proper fit, loosely bolt forward strut in place.

2. Tape keel template and level in place on top of keel as shown in **Figure 01-02. IMPORTANT:** It is crucial for the tail boom to still be in proper position. Please re-check. The keel should be moved fore/aft slightly until "level" is achieved. Sight down the tail boom to ensure that the tail boom bracket is centered on boom tube. Once in position tighten the bolts in the forward and aft struts. Verify both levels for proper tail and keel orientation.

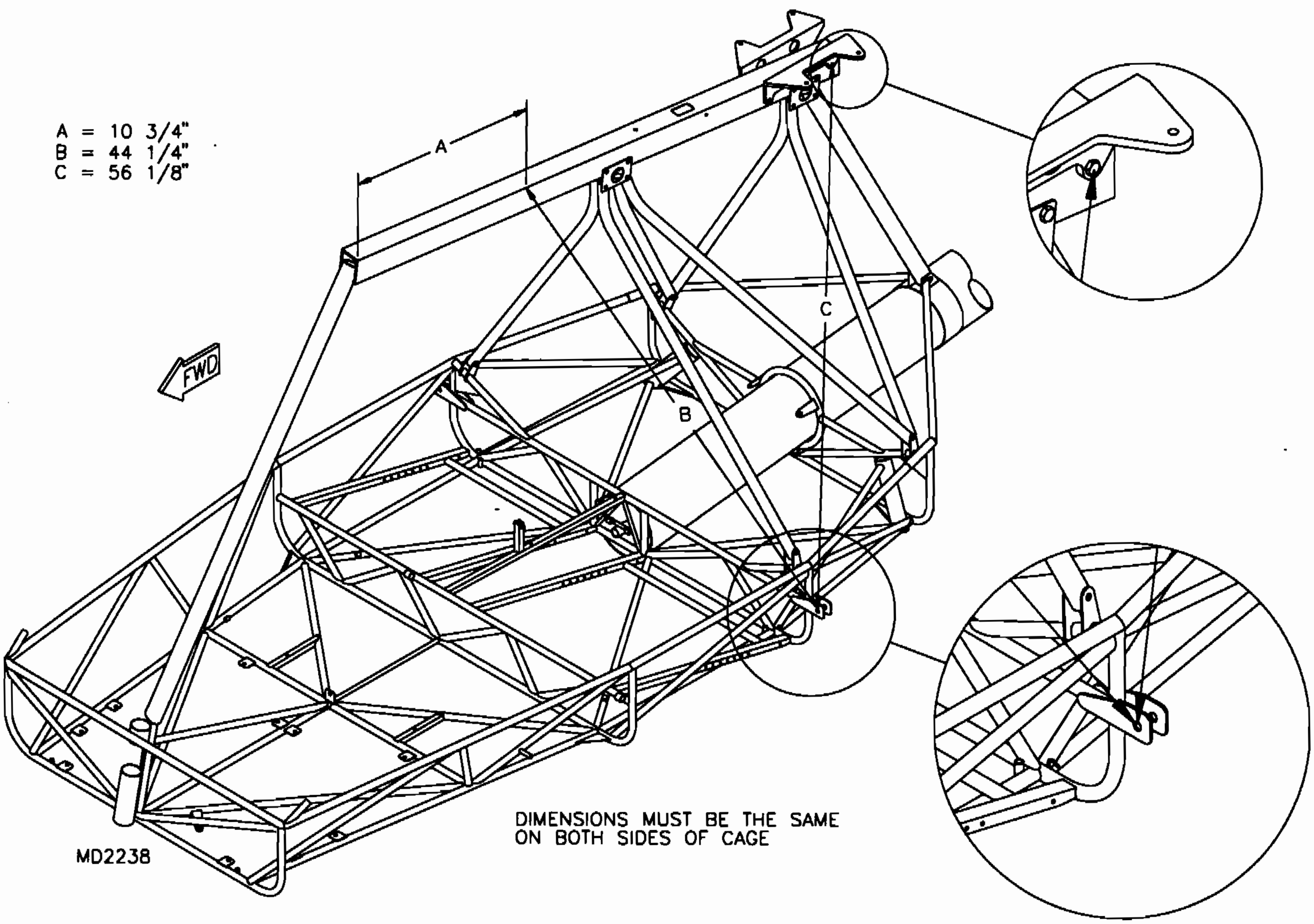
FIGURE 01-02



3. Clamp the forward cabanes in place between the S-3 tangs. **NOTE**: Vise-Grip type "C" clamps work well. Cover clamp ends with tape to prevent paint scratching. Draw a line perpendicular to the keel, through the hole approximately 10 3/4" from the forward end of the keel. Measure for lateral symmetry by placing a long 5/16" bolt in the strut attach points and measuring to the top of the keel at the mark. See **Figure 01-03.** A dimension of 44 1/4" is typical, but not absolute. The important thing is for both sides to be equal. Adjust forward cabanes until symmetry is achieved. A second measurement for keel symmetry should be taken from the strut attach tangs to the aft engine mount hole on each side. A distance of 56 1/8" is typical. It is only important that the measurements be equal and your reference points are the same side to side. **RE-CHECK ALL MEASUREMENTS AND ANGLES AT THIS TIME.** When completely satisfied that everything is correctly located, mark and drill the

forward cabanes #11 using the tangs as a guide. 11/16" edge distance on the holes is typical. Pin in place with an AN3 bolt. Drill out tang and cabane to 1/4" after checking all angles. Bolt in place with hardware shown.

FIGURE 01-03



4. Before drilling holes in the tail boom please **RE-CHECK** all dimensions. Drill the six tail boom hole locations using the tangs as a guide. **DO NOT** let the tail boom move during the drilling process. Cleco each hole after drilling to help hold the boom in position.

5. The middle cabanes rest between the triangle plates, inside the tangs welded to the gear truss. See **Figure 01-05. RE-CHECK** the keel and boom angles with the middle cabanes clamped in position. After verification, mark and drill 3/16" holes using the tangs as a guide. Drill out the tang and cabane to 1/4" and bolt in place. Locate the top hole of the triangle plate along the centerline of the middle cabane. Drill out to 3/16" using the triangle plate as a guide and bolt in place using hardware shown. After size drilling the upper end of the aft cabanes, bolt to the keel as shown in the super structure drawing. Install the aft cabanes Trim the cabane as required to position the aft hole of the triangle plate on the centerline of the cabane. See **Figure 01-05A.** Drill and cleco in place.

FIGURE 01-05

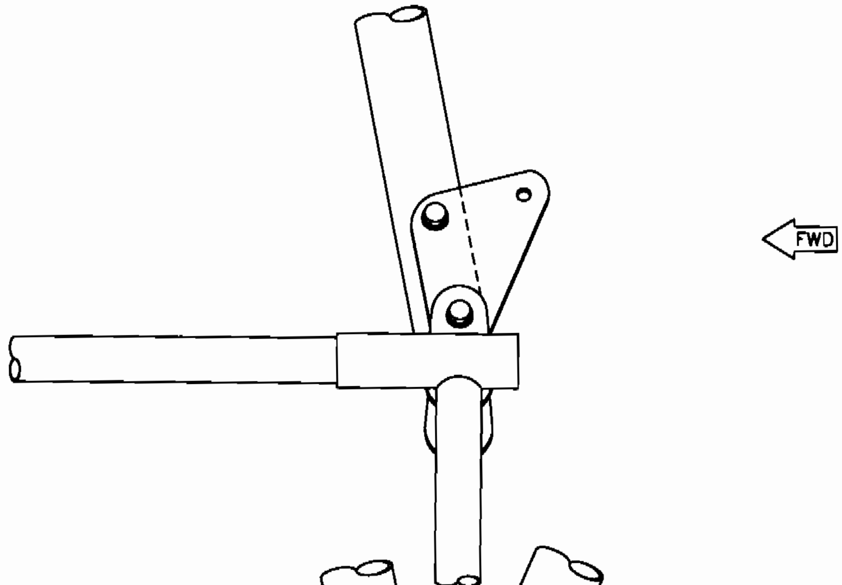
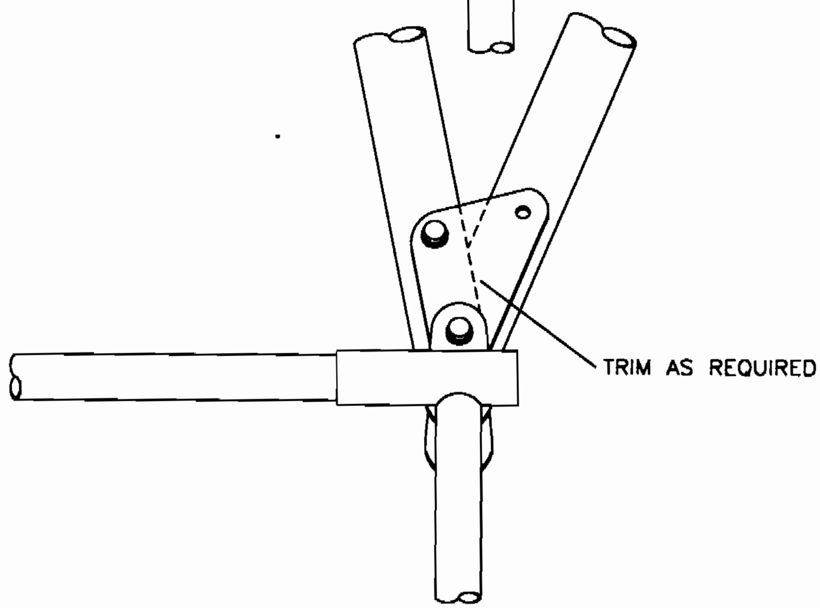


FIGURE 01-05A

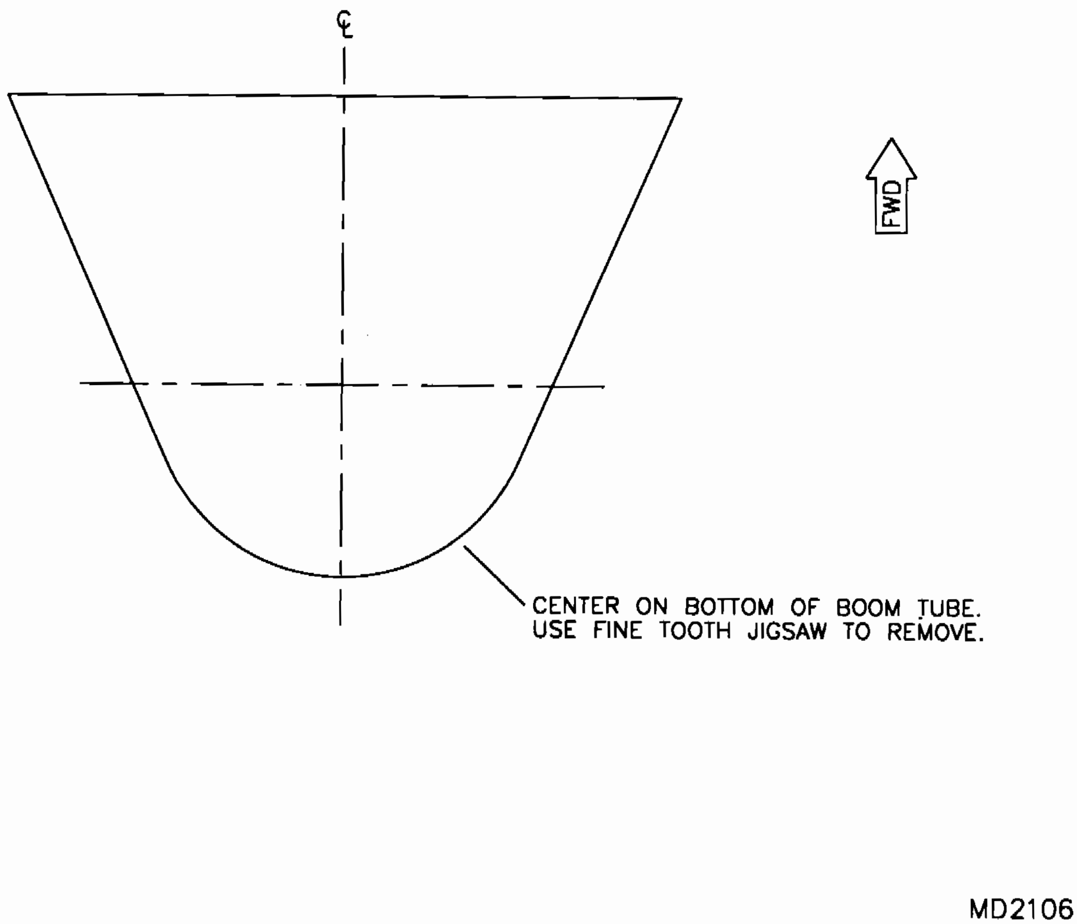


6. Locate the lower tail braces shown on the super structure assembly drawing. The tail braces attach to the bolt at the lower end of the aft strut. They will need to be trimmed to length. Slip the forward end of the tail brace into the fuselage cage. Remove material from the forward end as required to allow the tail brace to line up with the bolt in the boom collar. **NOTE:** Cut the tail braces so they are inserted into the cage as far as possible. Bolt the tail braces to the boom collar. Locate two #30 stainless steel rivets at the forward end of the tail brace. The rivets pass through the top longeron and into the tail braces as shown in the parts manual. Maintain enough E.D. between S-4 and the hole location on the inside of the cage to insert your particular rivet gun.

7. Remove the tail boom from the cage. Install the nut plates as shown on the tail boom assembly parts page for the holes drilled in the boom at this point. Locate the bottom center of the boom. This is done by measuring from the holes for the forward bolts around the boom and marking center. Be sure to mark the side opposite the notch. Once exact bottom of the boom is found, mark the boom using the template shown in **Figure 01-07**. Using a fine tooth jig saw remove the material from the bottom center of the boom. Re-insert the tail boom into the cage and bolt into position using hardware shown.

When bolting the tail boom into the fuselage cage **DO NOT** use the bolt to bend the tabs into position. Instead, if necessary, space the tabs as required with washers.

FIGURE 01-07

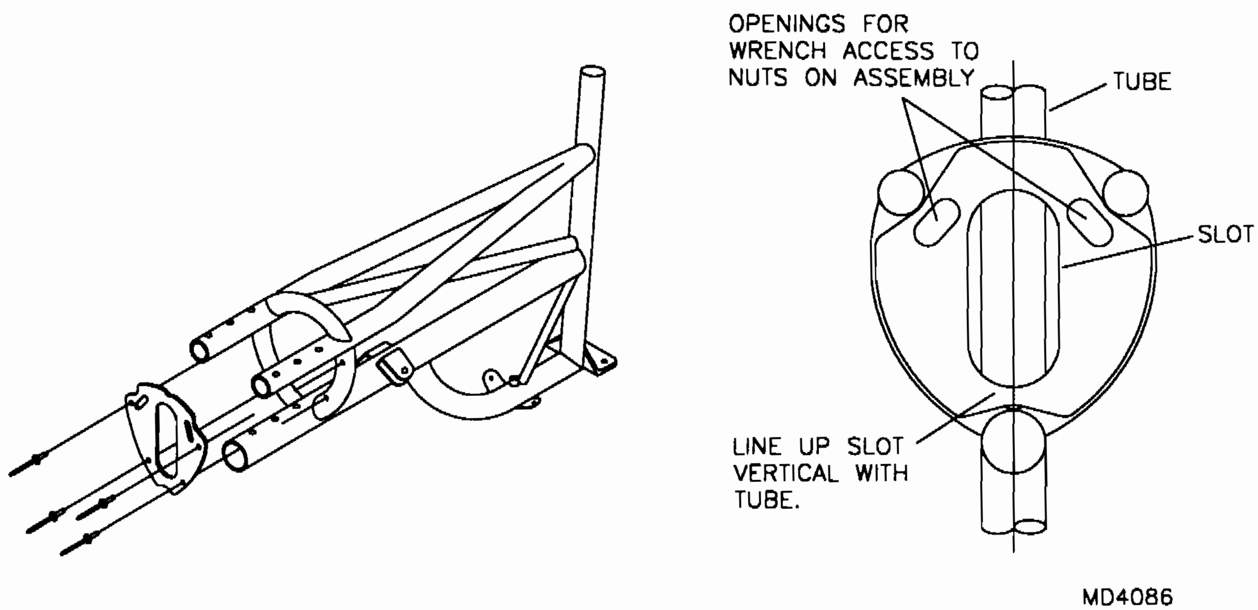


TAIL BOOM EXTENSION INSTALLATION

PLEASE NOTE: *The vertical stabilizer is used to properly set the tailboom extension in place. Please advance to tail assembly. Use the vertical stabilizer without the covering to avoid soiling skin.*

1. Locate the hardware for the tail boom extension and elevator push-pull tube guide shown on the tail boom assembly drawing. Place guide on <u>forward</u> side of extension, see **Figure 01-01**. Otherwise it will conflict with push-pull tube yoke bolt. Drill and rivet guide in place.

<u>FIGURE 01-01</u>



2. Check to see if the cockpit cage is still level from side to side. Once level, the exact bottom of the tail boom must be found. Do so by placing a scrap piece of aluminum tubing into the end of the tail boom. Gravity will pull the tubing to the bottom center (provided the frame is level). Check for lateral level across the seat truss. Place a mark on the bottom of the tail boom. See **Figure 01-02**. Measure ⅜" edge distance on the bottom of the tail boom and drill with a #11. Measure two inches from the first hole center and drill another hole in the exact bottom of the tail boom. To assure centerline location of the second hole lay a segment of small angle stock against the boom tube. See **Figure 01-02A**. These two holes will be used to secure the tail boom extension to the tail boom. Also measure 22" forward from the aft edge of the tail boom on the exact bottom. Mark and drill a #11 hole. Install a 3/16" nut plate using 3/32" aluminum pop rivets. This hole will be for the lower forward cable attach point of the horizontal stabilizer. See **Figure 01-02B.**

<u>FIGURE 01-02</u>

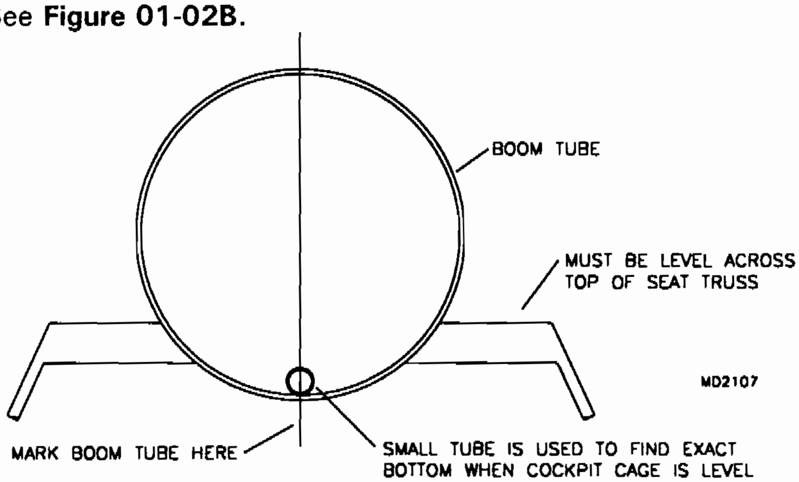


FIGURE 01-02A

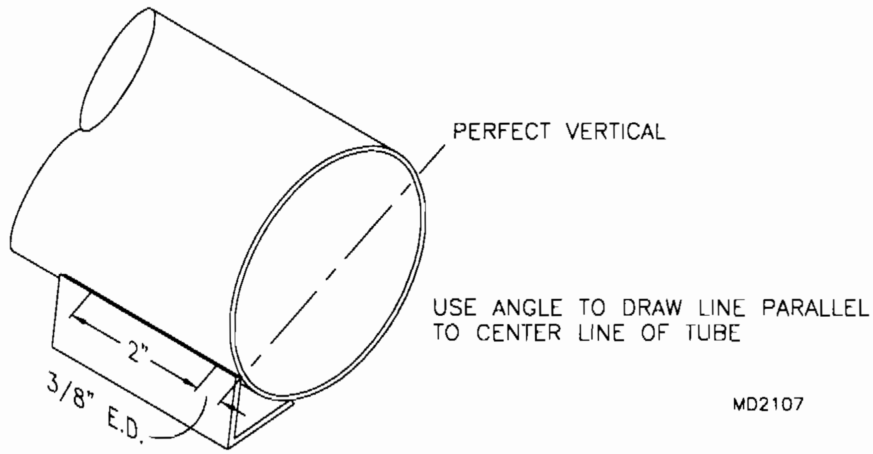
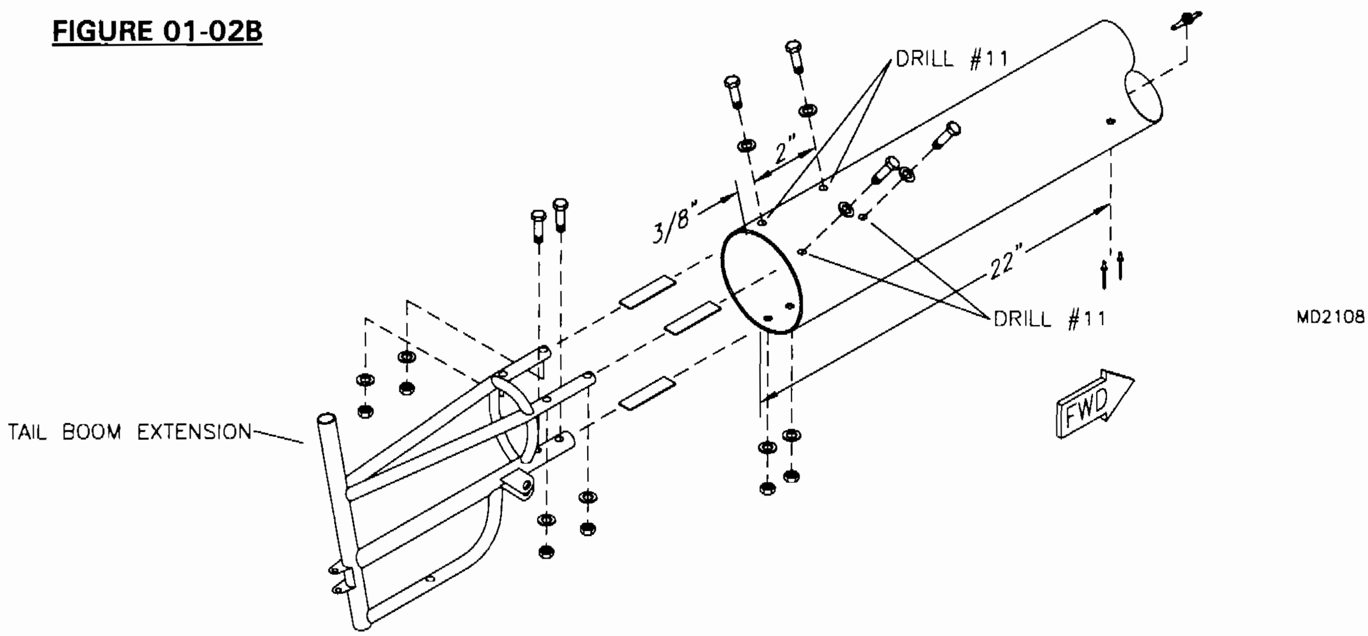


FIGURE 01-02B



3. Insert the tail boom extension and install the hardware in the bottom two holes. Tighten the two lower bolts. Sight down the tail boom to ensure the alignment of the tail boom extension is square with the rest of the airplane. Cleco the horizontal stabilizer boom brackets to the front lower corner of the vertical stabilizer. Slip the unit over the end of the tail boom extension. The vertical fin should rest on the tailboom parallel to the boom with the attach brackets flat on the boom. Adjust the tailboom extension up and down to effect this. Sight from above to check if the tailboom extension is parallel to centerline. Sight from the rear to check vertical alignment with cage. The fin should be parallel to the cage vertically.

4. Clamp one of the top two ⅝" tubes with a small vise grip type "C" clamp. Re-check the vertical alignment after clamping. Drill the other ⅝" tube using the same dimensions used to drill the bottom of the tail boom. Refer to **Figure 01-02B.** Be sure you are drilling through the center axis of the ⅝" tube of the tail boom extension and not off to one side. Install the proper hardware then drill and bolt the other side. Remove the bolts retaining the tail boom extension and install the strips of tape as shown. This will prevent dissimilar metal corrosion. Be sure the the nut plate, 22" from the end of the tail boom, for forward cable attach point is installed before final tail boom installation.

SKID BLOCK INSTALLATION

1. Locate the parts shown in the parts manual.

2. Install the skid block to the tail boom extension as shown. Make sure to orient the skid block facing forward.

TAIL WHEEL INSTALLATION

1. Locate the parts shown in the parts manual.

2. The tailwheel comes pre-assembled. Install the tailwheel using the parts shown in the parts manual.

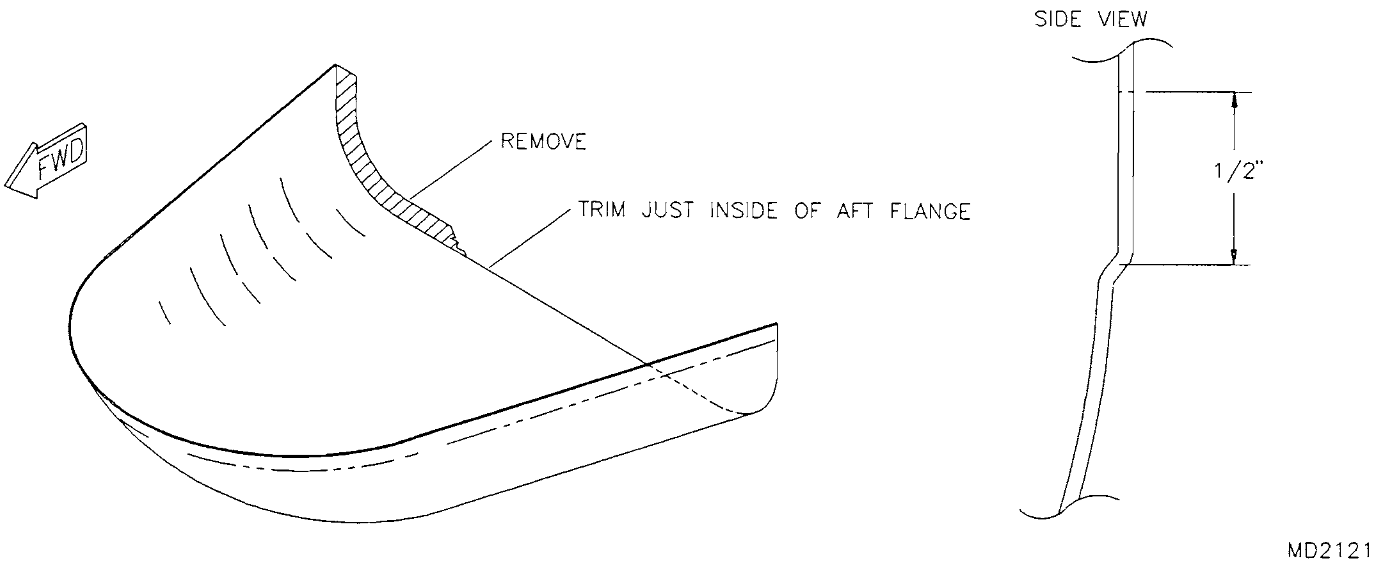
All variations of the S-12 enclosure are covered under the Fuselage Enclosure heading of the manuals. If you purchased the entire full enclosure, all section details under the Fuselage Enclosure heading will need to be completed except those designated Mini-pod only. The sections move in order no matter which enclosure system you purchased; whether, Mini-pod or Full Enclosure, or any combination of the two. If you purchased the standard S-12 (Mini-pod windshield) only the sections pertaining to your purchase should be completed. Skip sections which do not pertain to your purchase; however, remember the sections still follow sequence.

NOSE POD ASSEMBLY - MINI-POD

1. Locate the parts shown in the parts manual.

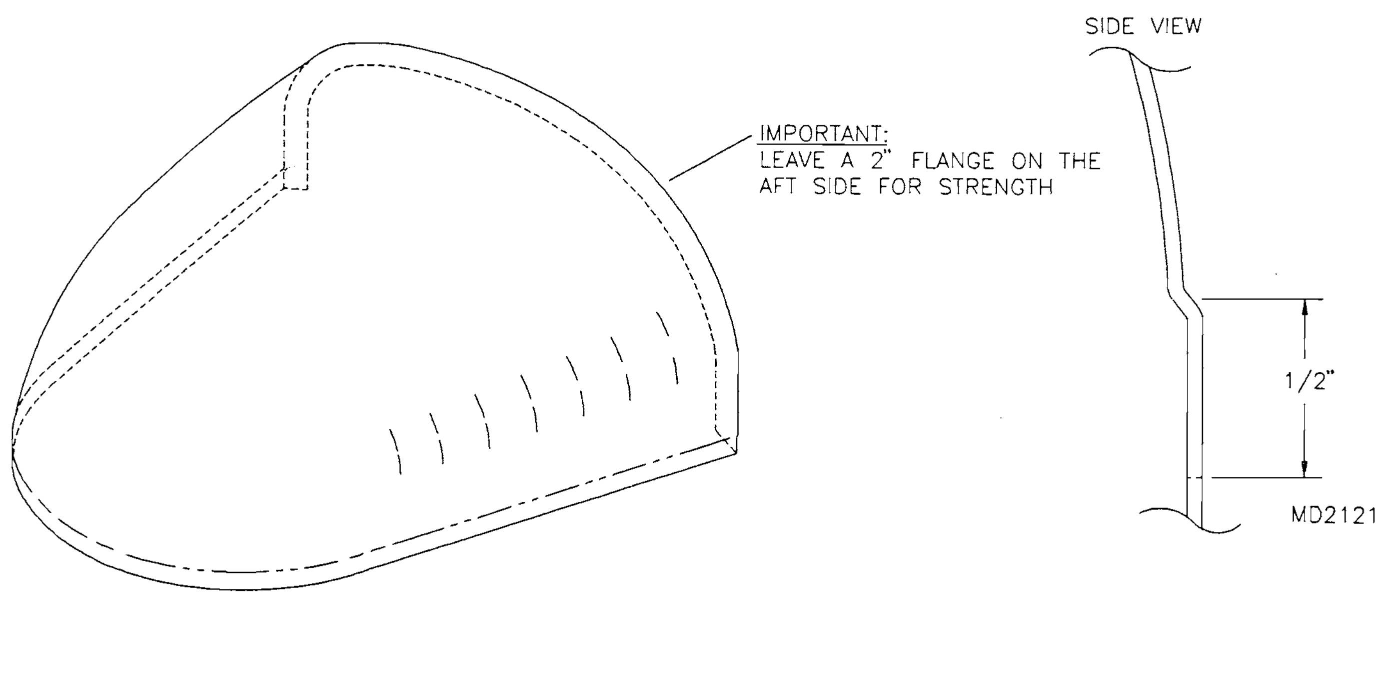
2. Mark and trim the nose cone bottom ½" above the molded step. Trim the back out of the nose cone bottom just along the curvature of the pod. See **Figure 02-02.** Aviation snips work well for trimming out the nose cone. Smooth edges with #80 sand paper and sanding block.

FIGURE 02-02



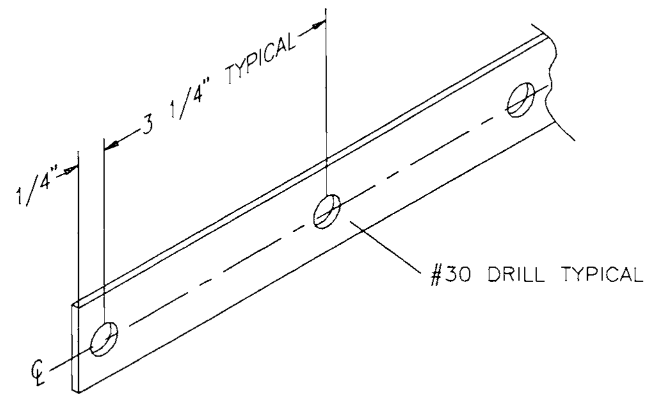
3. Trim the nose cone top ½" below the molded step. Trim the back out of the nose cone top leaving a 2" flange for rigidity. See **Figure 02-03.** Sand edges smooth with #80 sand paper and sanding block.

FIGURE 02-03



4. Mark and drill #40 holes in the two nose cone mating strips as shown in **Figure 02-04.**

FIGURE 02-04



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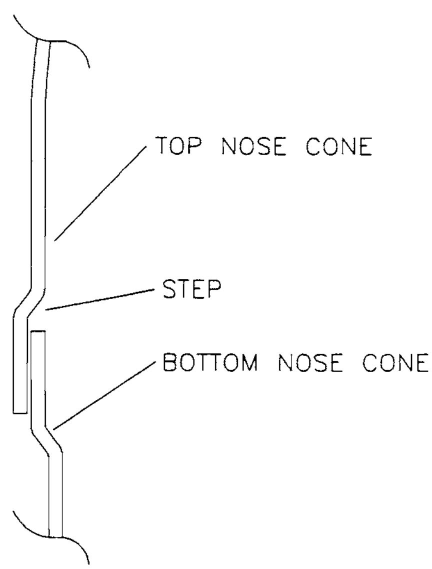
5. Locate the center mark on the front edge of the nose cone top. Lay the mating strip in place, starting at the center mark on the nose cone top. The top edge should be flush with the step in the lexan. Starting from the center, drill #40 and cleco using the mating strip as a guide. Keep the mating strip tight against the lexan during drilling. Move progressively to the aft edge of the pod. Repeat this process for the other side of the nose cone top.

6. Place the top and bottom nose cones together with the top overlapping the bottom at the step. See **Figure 02-06.** Center the pods together using the marks at front center. Starting from the center, drill #40 into the nose cone bottom using the top cone as a guide. **Cleco** after each hole is drilled. Clamp the aft edges of the cones together using padded vise-grips or "C" clamps to ease the drilling process.

FIGURE 02-06



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7. With the pod halves and mating strips clecoed together, drill all holes #30 for perfect pod alignment. Remove mating strips and debur. Drill the holes in the top and bottom **nose cones** to #28 and debur. Reassemble and rivet together using hardware shown. **BE SURE** to include the brass washers on the inside of the pod assembly as shown in the parts manual. **Paint Options:** The mating strips can be painted to match the belly pans prior to riveting or after assembly. If painted post assembly, be sure the solvents in the paint will not affect the lexan.

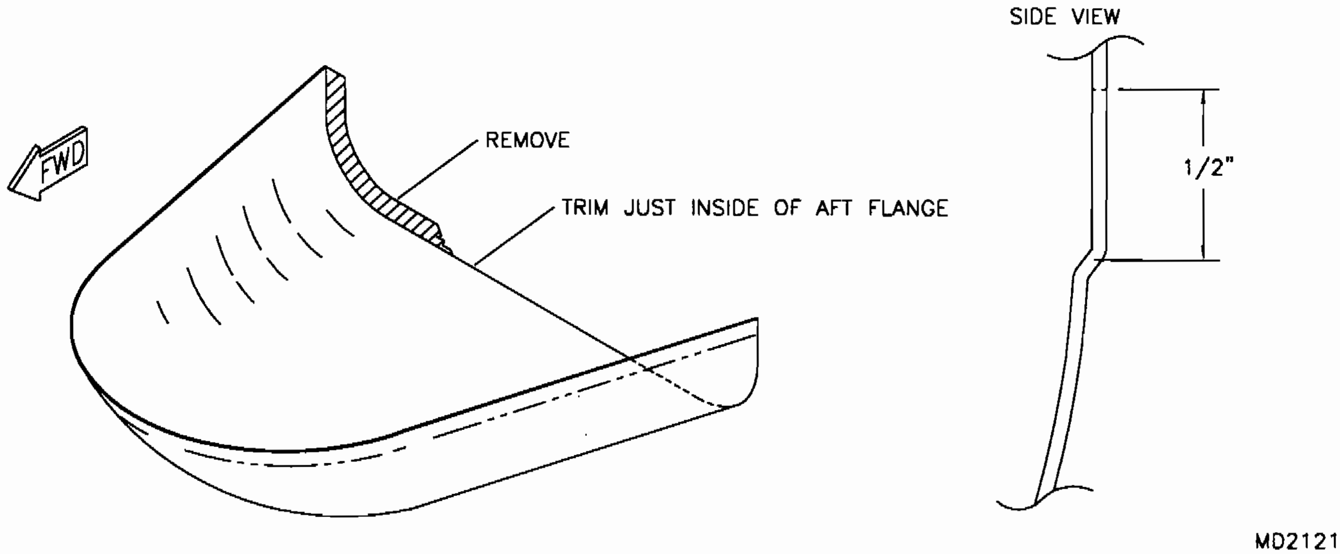
- Set the pod assembly aside until a later step.

NOSE POD ASSEMBLY - PARTIAL OR FULL ENCLOSURE

1. Locate the parts shown in the parts manual.

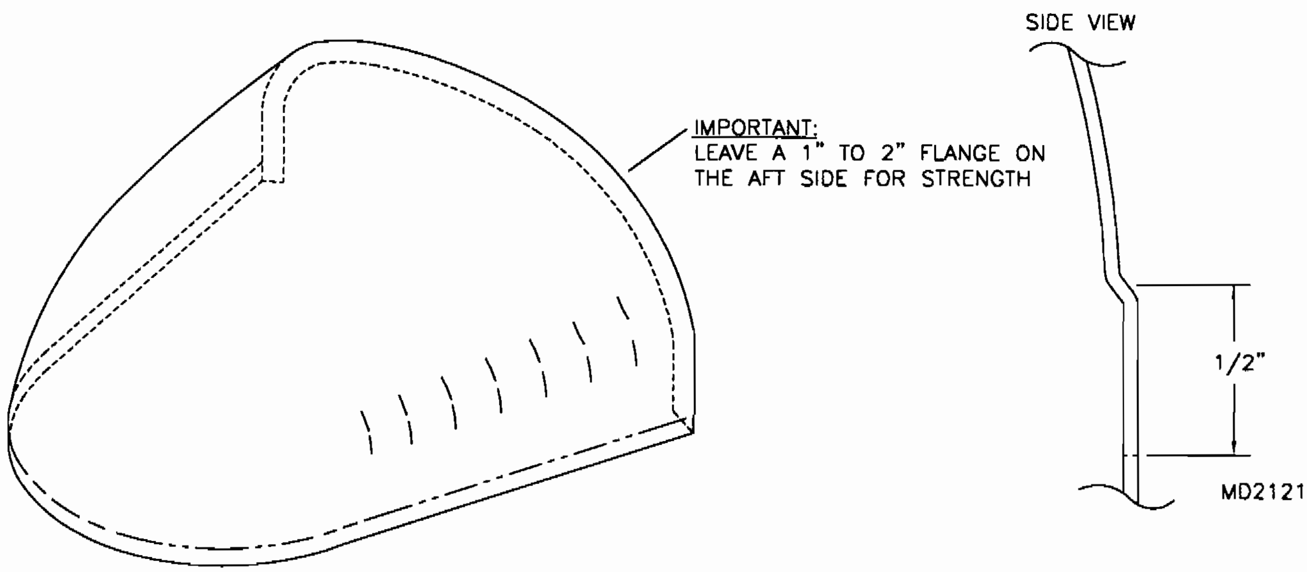
2. Mark and trim the nose cone bottom ½" above the molded step. Trim the back out of the nose cone bottom just along the curvature of the pod. See **Figure 02-02.** Aviation snips work well for trimming out the nose cone. Smooth edges with #80 sand paper and sanding block.

FIGURE 02-02



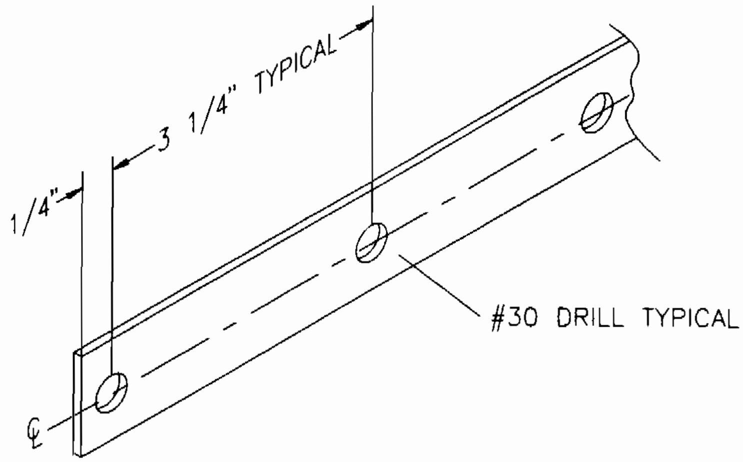
3. Trim the nose cone top ½" below the molded step. Trim the back out of the nose cone top leaving a 1" to 2" flange for rigidity. See **Figure 02-03.** Sand edges smooth with #80 sand paper and a sanding block.

FIGURE 02-03



4. Mark and drill #40 holes in the two nose cone mating strips as shown in **Figure 02-04.**

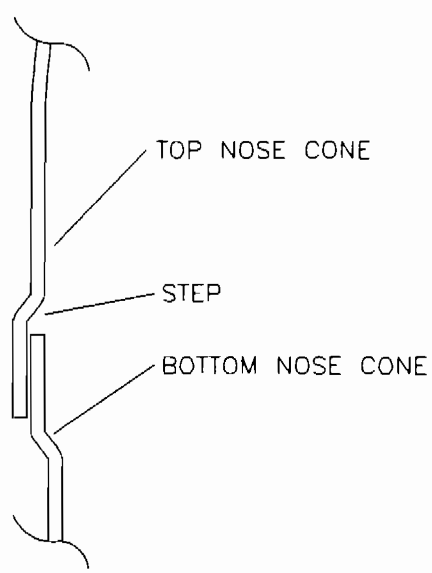
FIGURE 02-04



5. Locate the center mark on the front edge of the nose cone top. Lay the mating strip in place, starting at the center mark. The top edge should be flush with the step in the lexan. Starting from the center, drill #40 and cleco using the mating strip as a guide. Keep the mating strip tight against the lexan during drilling. Move progressively to the aft edge of the pod. Repeat this process for the other side of the nose cone top.

6. Place the top and bottom nose cones together with the top overlapping the bottom at the step. See **Figure 02-06.** Center the pods together using the marks at front center. Starting from the center, drill #40 into the nose cone bottom using the top cone as a guide. **Cleco** after each drill. Clamp the aft edges of the cones together using padded vise-grips or "C" clamps to ease the drilling process.

FIGURE 02-06

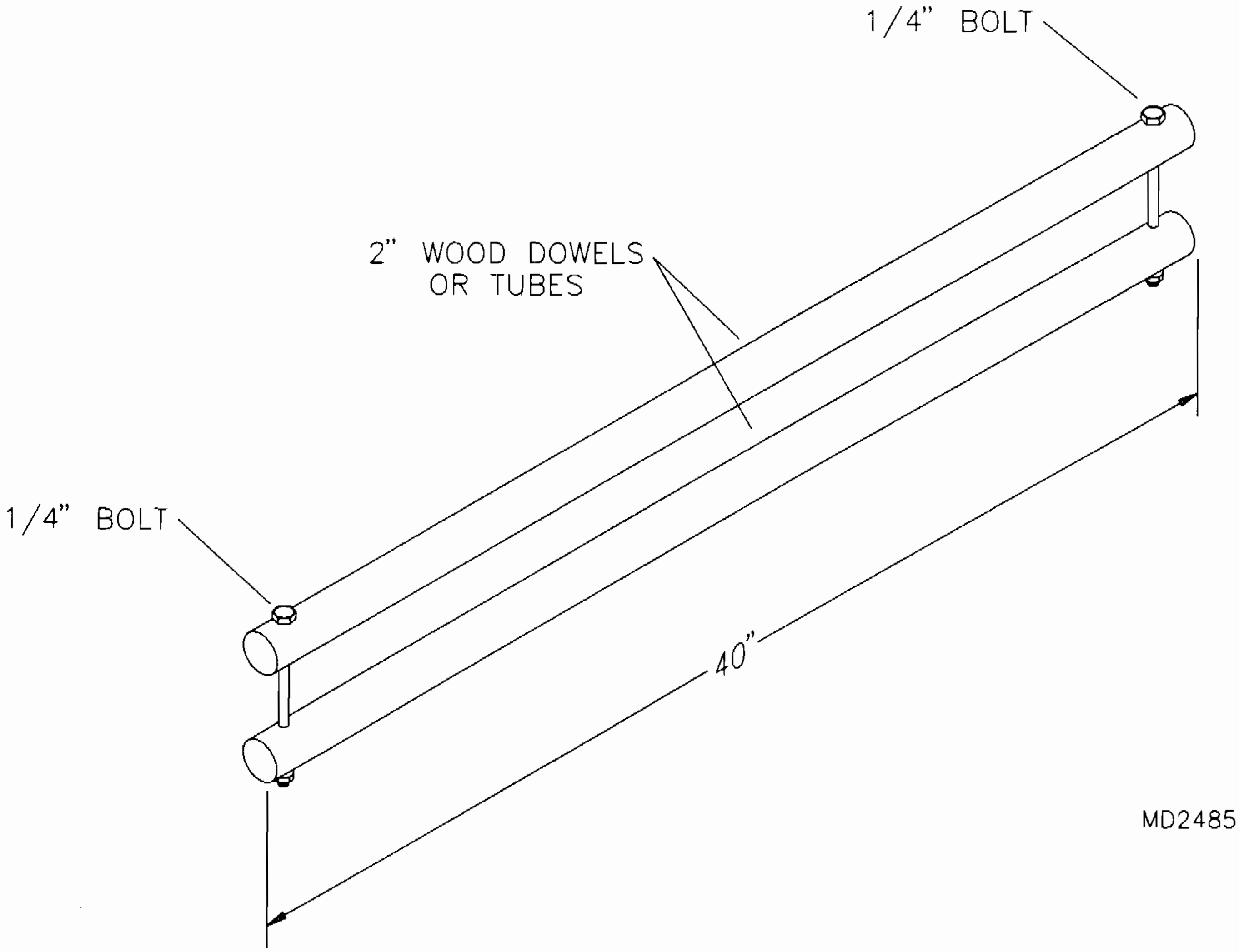


7. With the pod halves and mating strips clecoed together, drill all holes #30 for perfect pod alignment. Remove mating strips and debur. Drill the holes in the top and bottom **nose cones** to #28 and debur. Reassemble and rivet together using hardware shown. **BE SURE** to include the brass washers on the inside of the pod assembly as shown in the parts manual. **Paint Options:** The mating strips can be painted to match the belly pans prior to riveting or after assembly. If painted post assembly, be sure the solvents in the paint will not affect the lexan.

- Set the pod assembly aside until a later step.

Fabrication of Belly Pan Forming Tool

Fabricate the belly pan forming tool from either 2" wood dowels or 2" tubing as shown below. It will be used to form the belly pans during installation.



#4 BELLY PAN INSTALLATION
(Full Enclosure only)

- Page ahead to #1 Belly Pan installation if only installing a stock mini-pod.

➤ **Please** read and study the entire Fuselage Enclosure section of the manuals before beginning assembly of the full enclosure.

1. Locate the parts shown in the parts manual. It is best to work with #3 and #4 belly pans simultaneously.

2. Mark belly pan #4 as shown in **FIGURE 02-02. DO NOT** bend the belly pan directly on the line. The 5 ¾" edge distance is used to reference the bending tool location when used in conjunction with a framing square. See **FIGURE 02-02A.** The belly pan forming tool will actually locate just to the **INSIDE** of the 5 ¾" mark. Bend the belly pan using the sequence shown in **FIGURE 02-02B.**

FIGURE 02-02

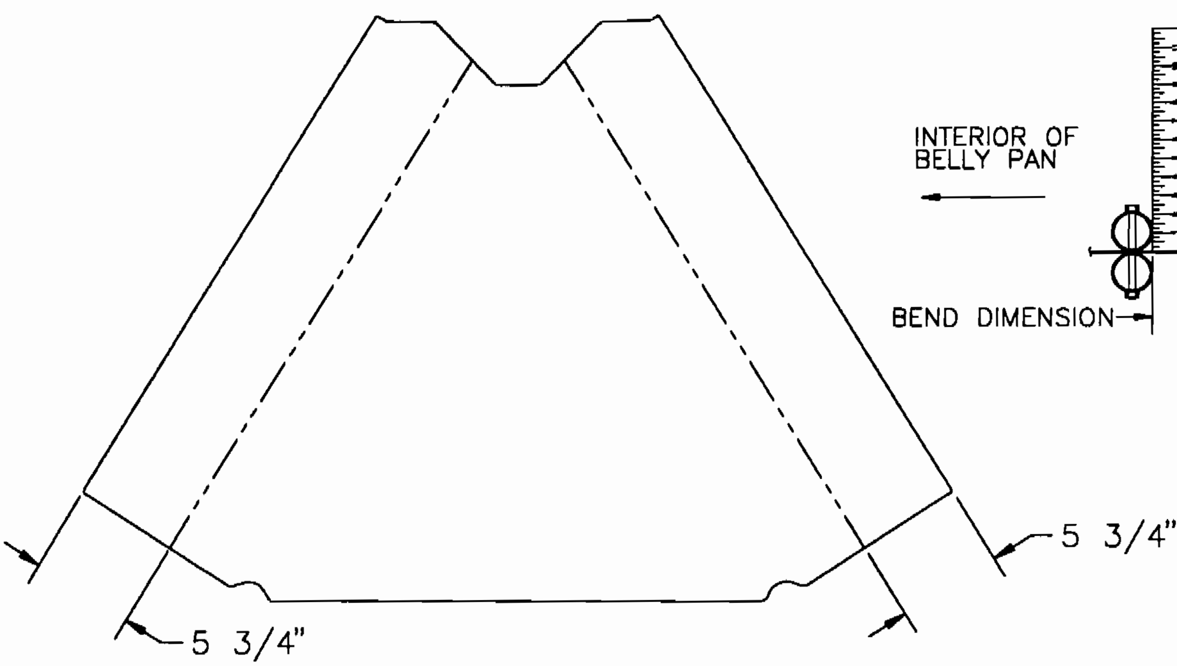


FIGURE 02-02A

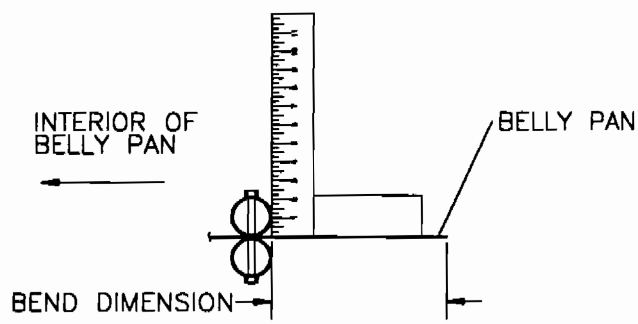


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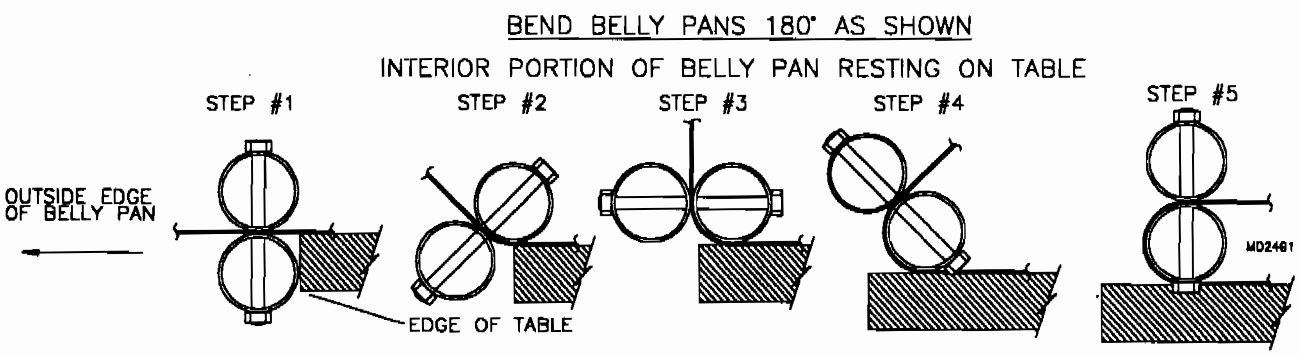
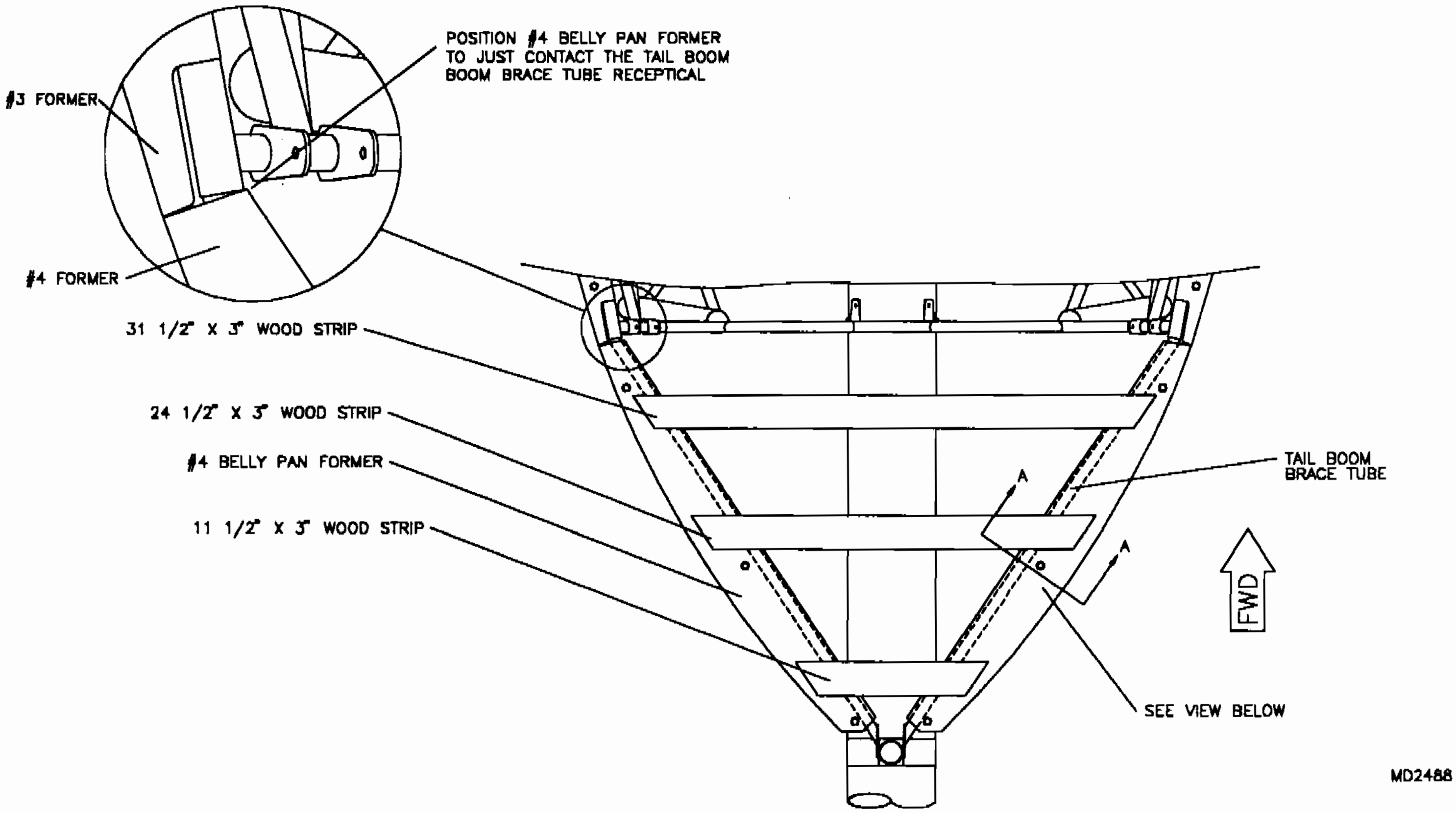
FIGURE 02-02B



09X020FE.

3. Using a **STRAIGHT** 1"x 3" piece of lumber, fabricate the wood strips shown in **FIGURE 02-03.** The wood strips are used to align and secure the belly pan formers. The cut angle on the end of the strips is not critical; just make sure they will not interfere with the belly pan.

FIGURE 02-03



4. Using the cushioned clamps and appropriate hardware (refer to the parts manual), bolt the #4 belly pan formers onto the top side of the tail boom brace tubes. Note the orientation of the cushioned clamps. Refer to **FIGURE 02-04**. Position the former so that the forward edge of the former just contacts the aft end of the tail boom brace tube receptacle. Refer to **FIGURE 02-03**. Clamp the wood strips in place as shown in **FIGURE 02-04** and **FIGURE 02-04A.** The clamps and strips will be removed when the enclosure is completed.

FIGURE 02-04

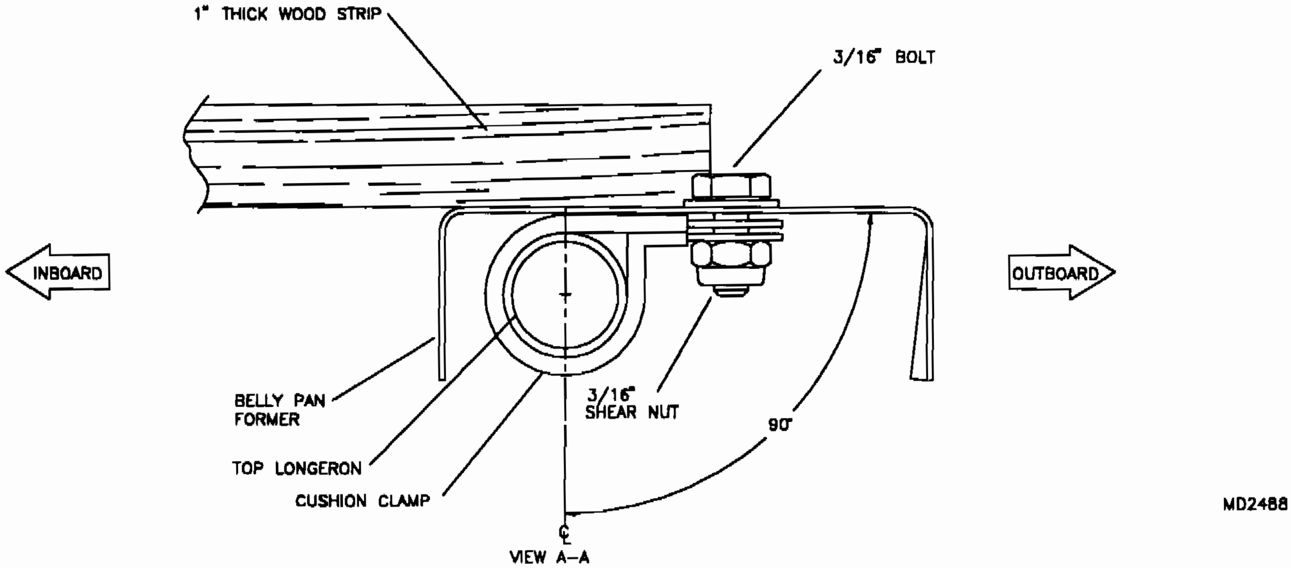
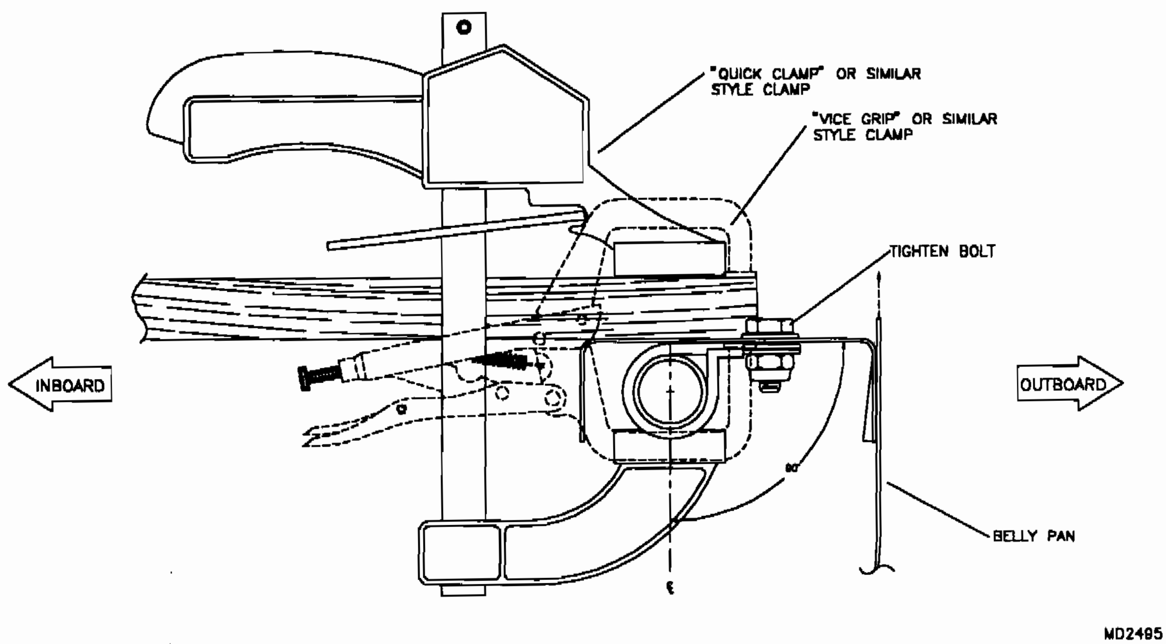
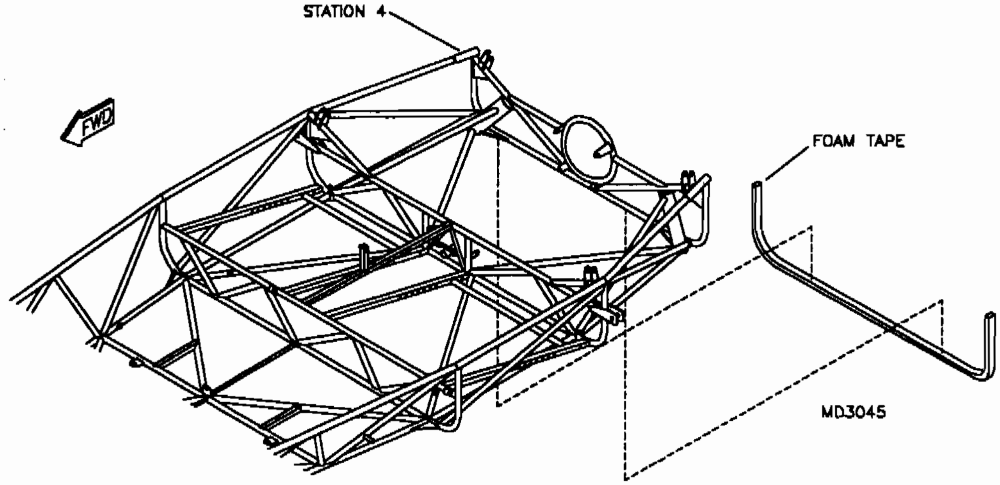


FIGURE 02-04A



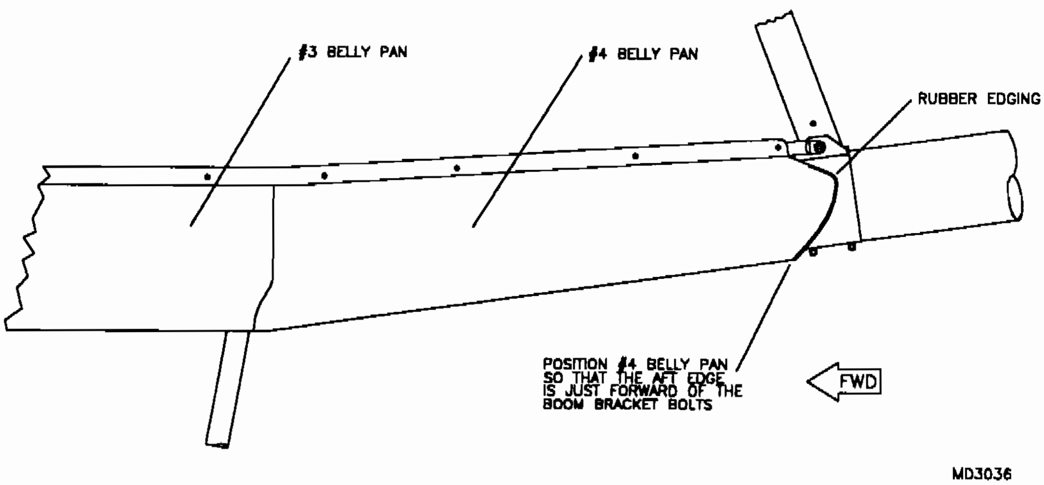
5. Apply the 3/16" x 3/8" foam tape to the bottom side of the station 4 bottom cross tube. Extend the foam tape up the sides of the cross tube to prevent the belly pan from chafing. See **FIGURE 02-05.**

FIGURE 02-05



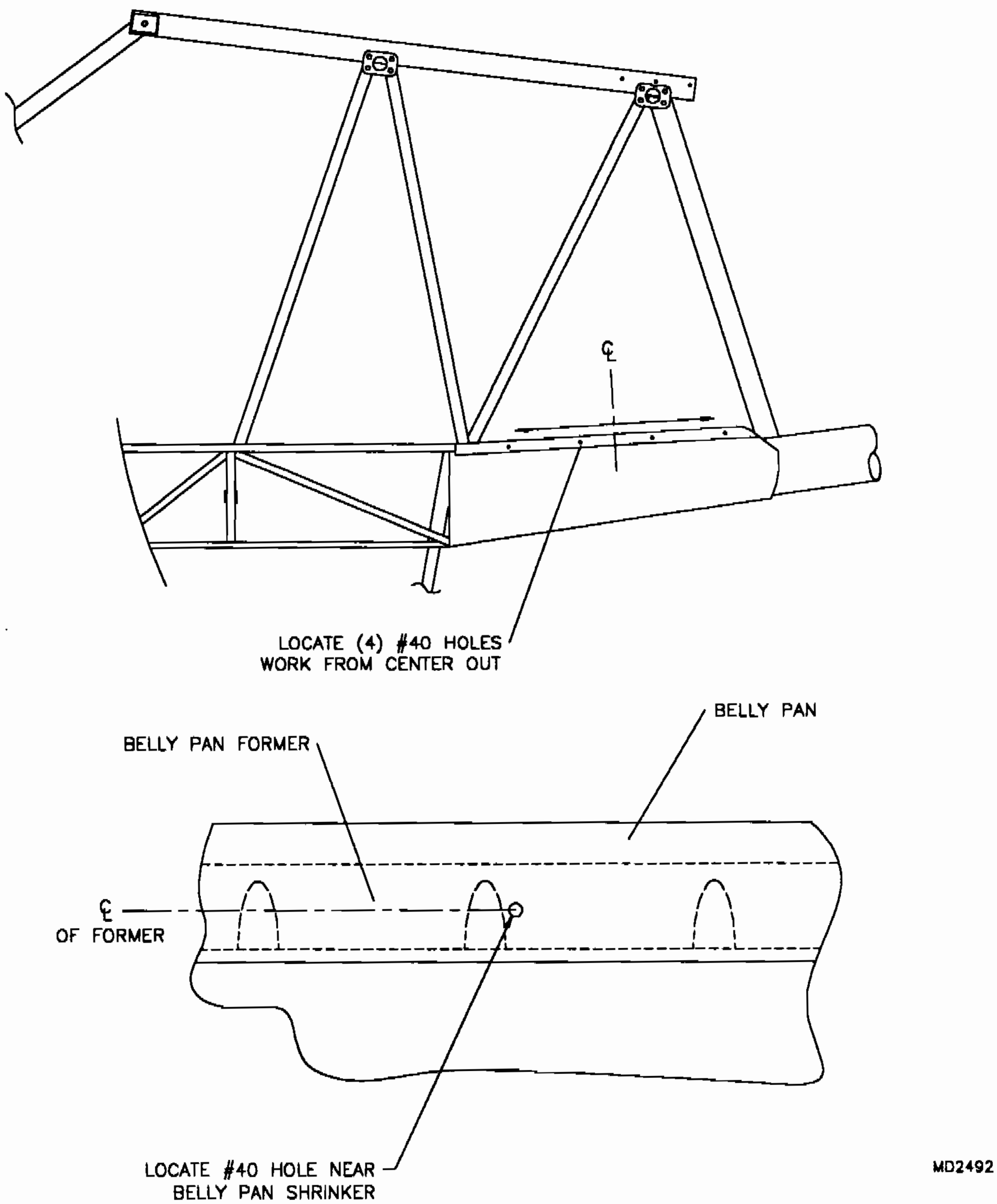
6. Temporarily install the rubber edging to the aft edge of the #4 belly pan (DO NOT glue in place until after painting and in final assembly). Slip the belly pan in position and temporarily secure in place with 2" wide masking tape. Make sure that the bottom edge of belly pan is held flat against S-4 and the aft edge is positioned just forward of the bolts which retain the boom collar. See **FIGURE 02-06**. Pull the pan up on each side to prevent any sagging. It is normal to have approximately ½" of belly pan overhang above the belly pan formers.

FIGURE 02-06



7. When properly positioned, locate and drill four #40 holes in the belly pan and former near the pressed in shrinkers as shown in **FIGURE 02-07**. This will space them apart from the pilot holes in upper panels. Drill the center holes first and work toward the forward and aft edges. See **FIGURE 02-07.** With one side clecoed in place check for any "wrinkles" or "dimples" in the bottom of the pan. Adjust the other side if necessary. A small amount of bulging between rivet holes along the top edge of the pan (where it contacts the formers) is acceptable and will disappear once the upper panels are installed. When satisfied with the fit, pull the belly pan up tight and drill and cleco the opposite side. After the belly pan has been correctly located and locked in place, trim off the excess material so that the top of the belly pan is flush with the top of the belly pan formers. Retain the belly pan to the former with clecos only at this time. Rivet the belly pan to the former during final assembly.

FIGURE 02-07



#3 BELLY PAN INSTALLATION

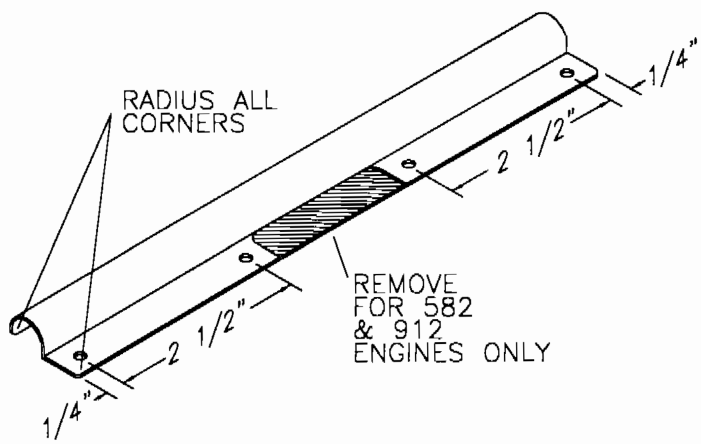
- Page ahead to #1 Belly Pan installation if only installing a stock mini-pod.

NOTE: If you are installing a 582 or 912 engine refer to the engine cooling system section for the installation of the radiator. Radiator and scoop placement must be determined before installing the #3 belly pan. The nut plates for mounting the radiator must be installed to the mount tabs prior to final installation of the #3 belly pan.

1. Locate the parts shown in the parts manual for #3 belly pan installation.

2. Mark, trim, and drill the two "Z" strips as shown in **FIGURE 02-02.** Note that if you are installing a 503 engine you do not need to cut the center notch.

FIGURE 02-02



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3. Pre-form the #3 belly pan using the belly pan forming tool and the dimensions shown in **FIGURE 02-03. DO NOT** bend the belly pan directly on the line. The 5 ¾" edge distance is used to reference the bending tool location when used in conjunction with a framing square. See **FIGURE 02-03A.** The belly pan forming tool will actually locate just to the inside of the 5 ¾" mark. Bend the belly pan using the sequence shown in **FIGURE 02-03B.**

FIGURE 02-03

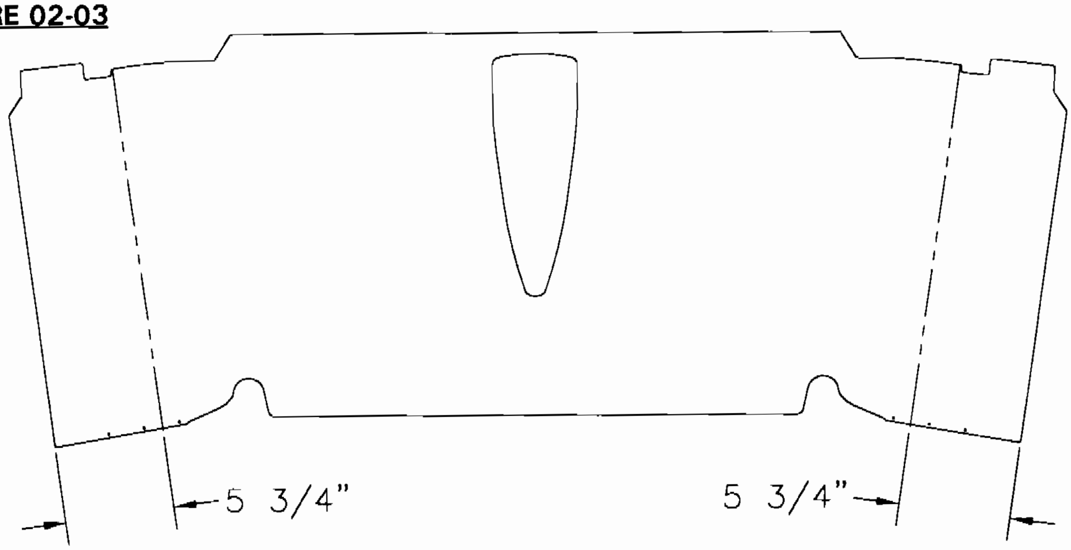

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FIGURE 02-03A

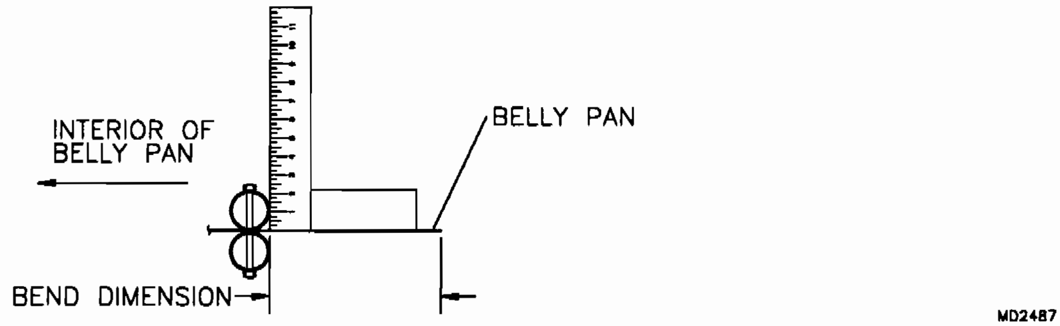
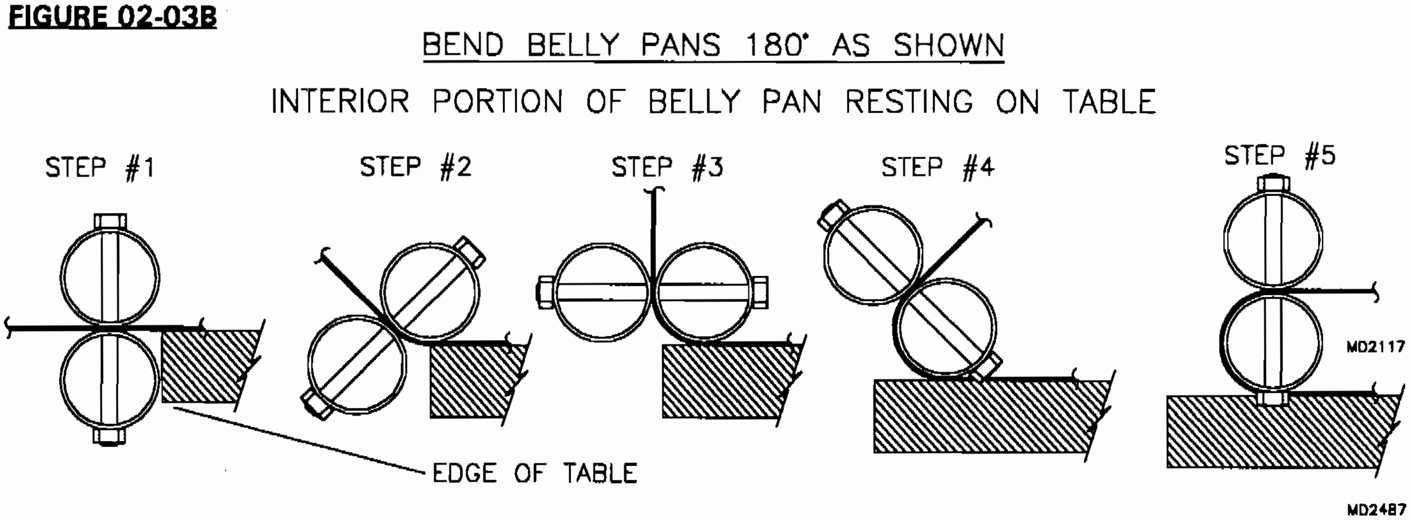


FIGURE 02-03B



4. Cleco the gussets to the belly pan formers. Notice that there is a left and right gusset corresponding to the left and right belly pan formers. Also note the orientation of the gussets. Remove one cleco at a time and using a #30 drill bit transfer drill through the gusset and former. Rivet as you go using the correct rivet and riveting from the under side of the former. Refer to the parts drawing.

5. Apply the foam tape to the bottom side of the station 3 bottom cross tube. Extend the foam tape up the sides of the fuselage to prevent chaffing.

Using the cushioned clamps and the appropriate hardware, bolt the #3 belly pan formers to the fuselage. Fabricate the wooden strips shown in **FIGURE 02-05.** Clamp the wooden strips to the top of the formers as shown in **FIGURE 02-05A** and tighten the cushioned clamps.

FIGURE 02-05

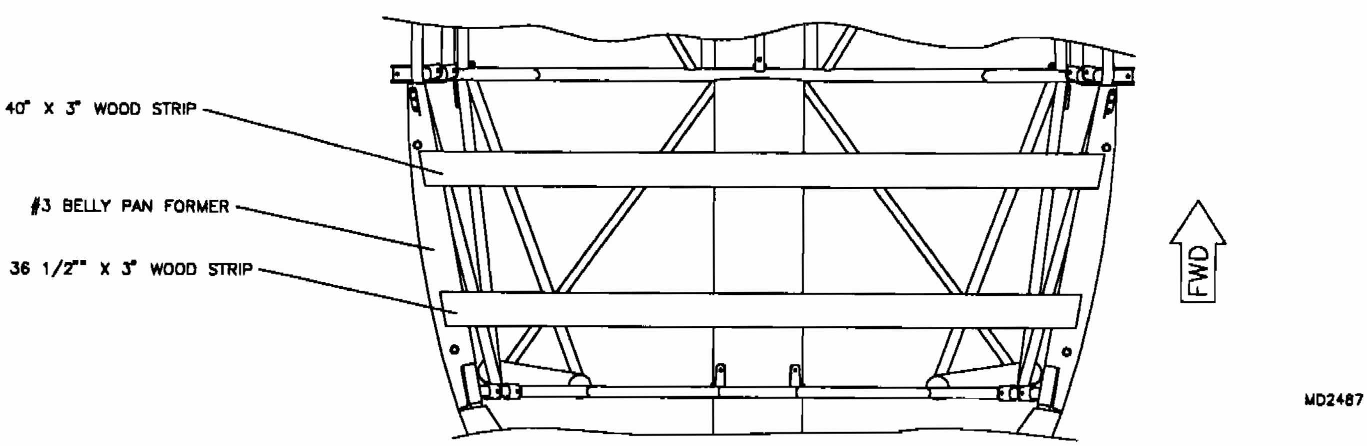
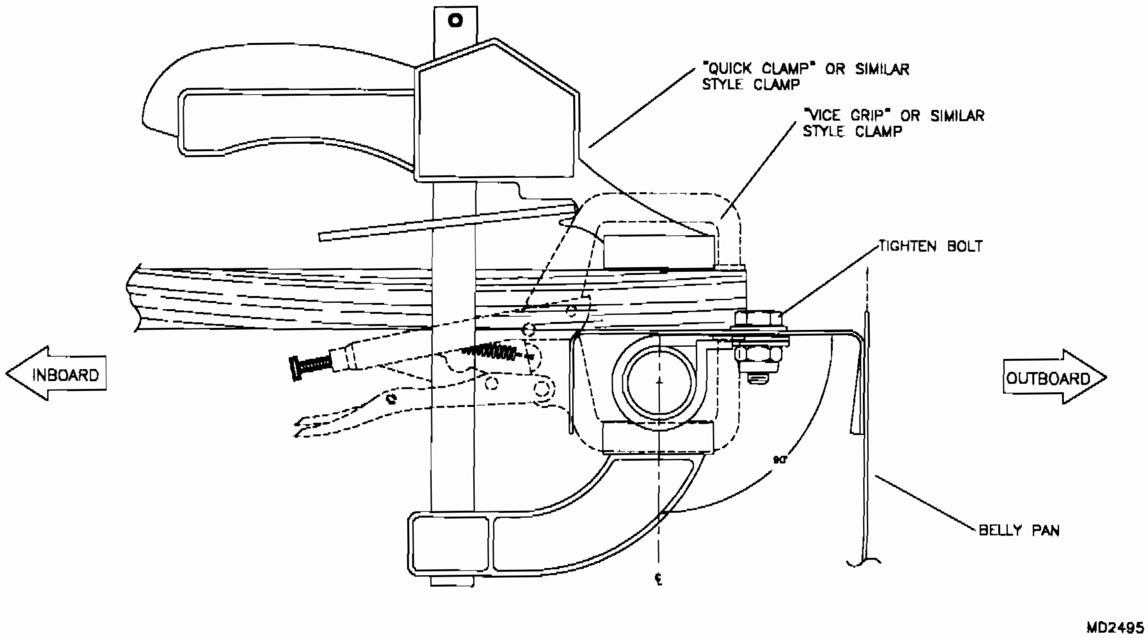
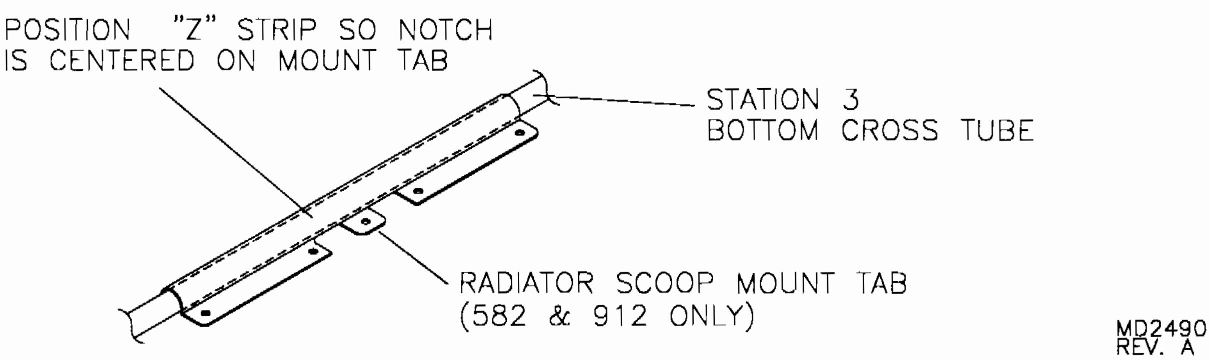


FIGURE 02-05A



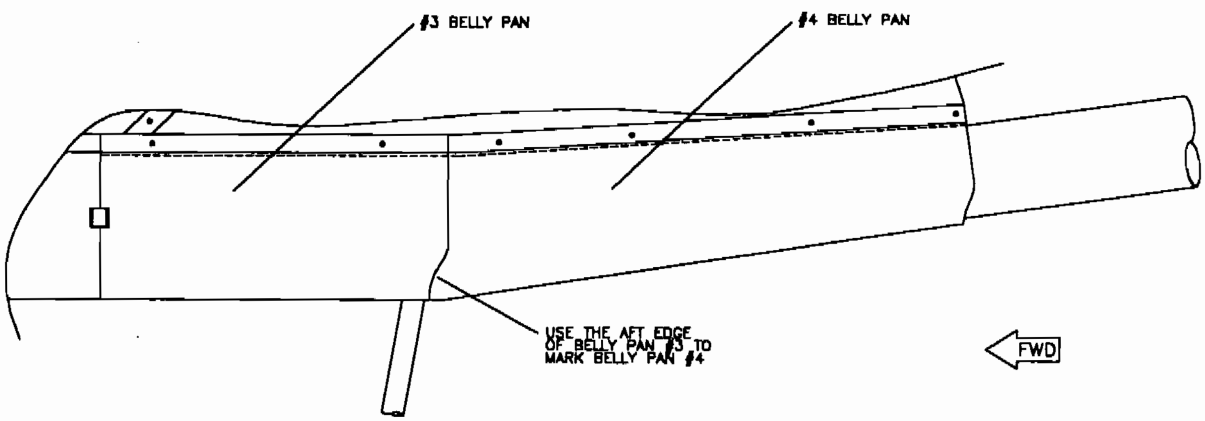
6. Temporarily tape the #3 belly pan in place, and check the fit. Position the belly pan so that it overlaps the station 3 bottom cross tube to at least the halfway point of the tube and so that the cutouts on each side are centered around the lift strut attach tangs. The #3 belly pan overlaps #4. Tape along the bottom seam between #3 and #4 belly pans to hold the pans tight together. Place the "Z" strips over the station 3 bottom cross tube just inboard of each gear leg socket with the flange of the strip on the forward side of the tube. If installing the 582 or 912 engine, it is important to have the notch in the "Z" strip centered over the radiator scoop mount tab. Refer to **FIGURE 02-06**. Using a scrap piece of wood, hold the belly pans tight against the bottom of the fuselage and using the pre drilled "Z" strips as a guide, transfer drill through both belly pans. Cleco as you go. **IMPORTANT:** If you are installing belly pan #4, it is important that the "Z" strips retain both pans. Pull the # 3 pan up tight on each side to prevent any sagging. Retape as necessary. Do not rivet the "Z" strips at this time.

FIGURE 02-06



7. With belly pan #3 secured, and using the aft edge as a guide, mark belly pan #4 along the side and bottom contour. See **FIGURE 02-07**. Remove #3 belly pan and trim only the lower contour of #4 belly pan to a minimum overlap (approximately 1/8") . This will allow #3 belly pan to be pulled up tight against #4 belly pan with a minimum gap. Only trim along the lower contour. The top of the pan must underlap #3 belly pan far enough to pick up the pre-drilled holes.

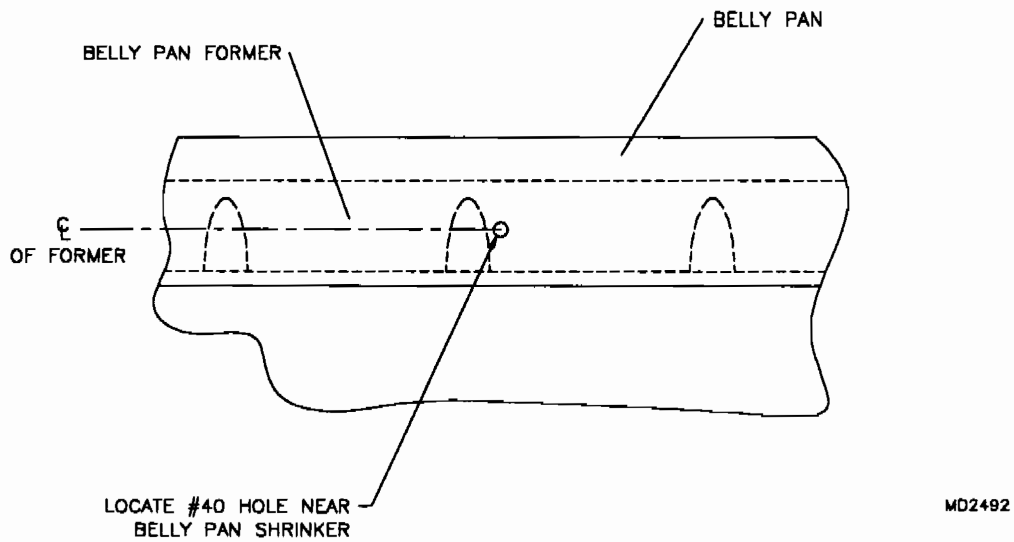
FIGURE 02-07



8. Reposition the #3 belly pan and pull up tight on each side. Locate and drill two #40 holes in each side to retain the belly pan to the top former. Locate the #40 holes near the forward and aft end of the belly pan and near one of the shrinkers in the former. Refer to the parts drawing and to **FIGURE 02-08**. Cleco in place. With the belly pan in position and free of wrinkles, mark and trim off the excess aluminum at the top of the pan so that it is flush with the top of the belly pan formers.

Before installing the upper enclosure, replace the clecos with #40 rivets. These rivets will hold the belly pans in position while the upper panels are fit. If you choose to pre-fit all panels prior to performing any interior finishing, these rivets may need to be installed, drilled out and then installed again during final assembly. During final assembly, install the side rivets and final rivet the "Z" strips.

FIGURE 02-08



BOOM SEAL INSTALLATION

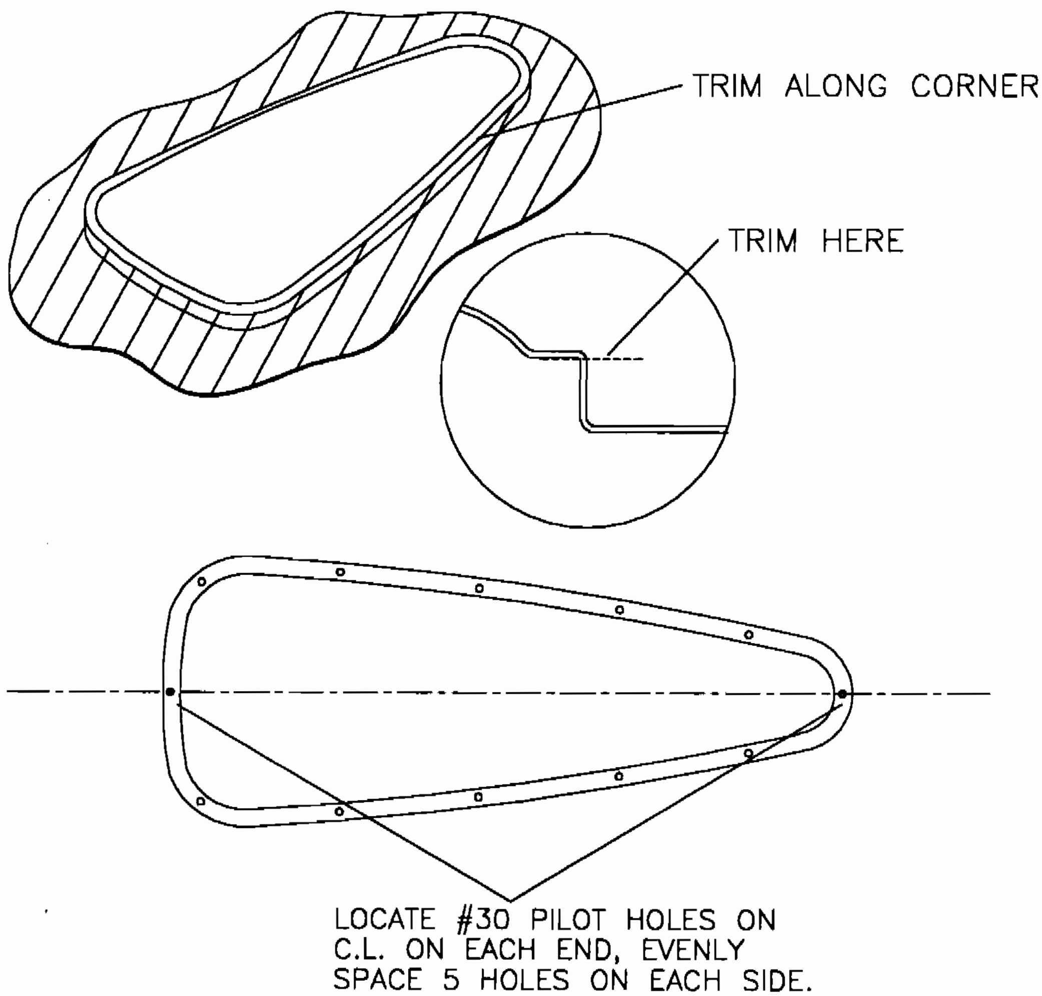
- Page ahead to #1 belly pan installation if only installing a stock mini-pod.

➤ **Important:** If installing a 582 or 912 engine on a mini-pod or partial enclosure, the boom seal attaches to the radiator top panel. Install the boom seal now if this is the case. All **full** enclosures have the boom/seal attached to #3 belly pan.

1. Locate the parts shown in the parts manual.

2. Trim the edge of the boom seal and locate #30 holes as shown in **Figure 02-02.** Center the cover under the hole on the bottom side of the #3 belly pan. Locate holes using the boom seal as a guide and rivet in place.

<u>**FIGURE 02-02**</u>



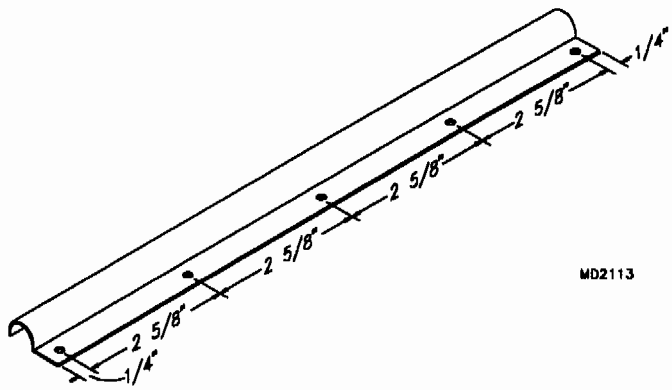
#2 BELLY PAN INSTALLATION

• Page ahead to #1 Belly Pan installation if only installing a stock mini-pod.

1. Locate the parts shown in the parts manual.

2. The "Z" strips for the aft edge of the #2 belly pan are 11" long. Mark and drill five (5) #40 holes in each "Z" strip as shown in **Figure 02-02.**

FIGURE 02-02



3. Mark belly pan #2 as shown in **Figure 02-03. DO NOT** bend the belly pan directly on the line. The 4 3/4" E.D. is used to reference the bending tool location when used in conjunction with a framing square. See **Figure 02-03A.** The belly pan forming tool will actually locate just to the inside of the 4 3/4" mark. Bend the belly pan using the sequence shown in **Figure 02-03B.**

FIGURE 02-03

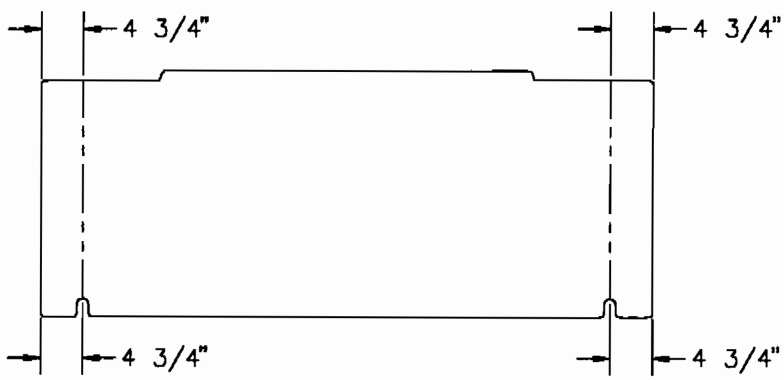


FIGURE 02-03A

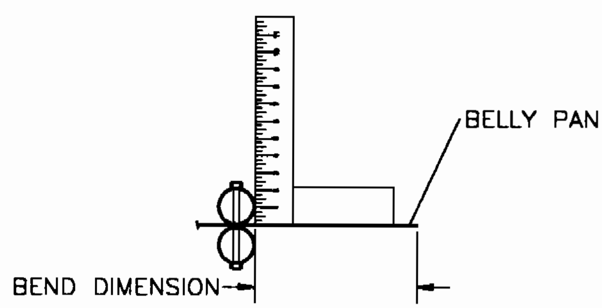


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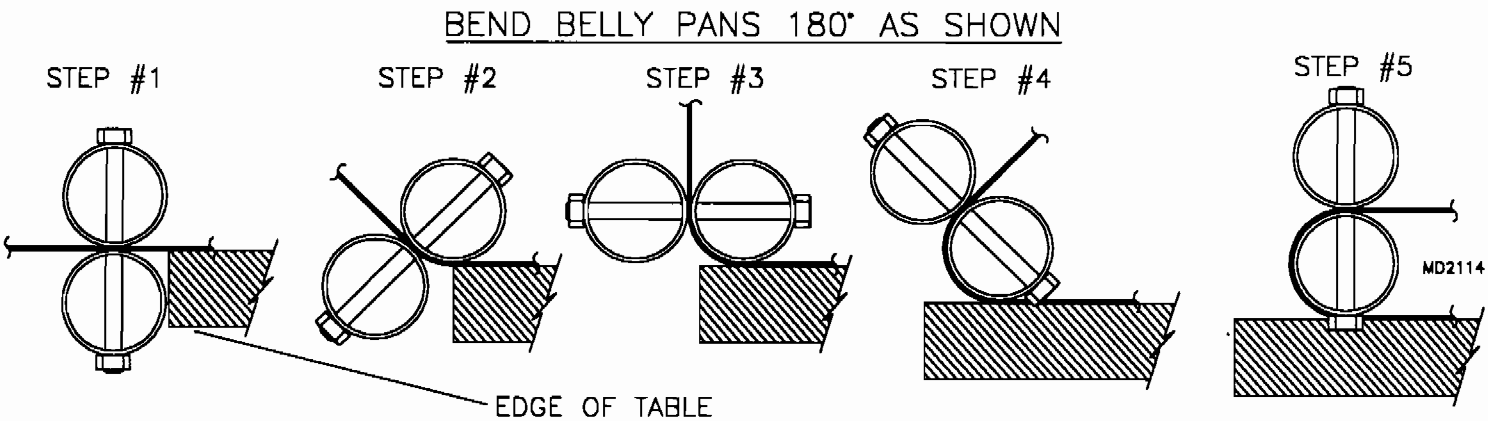
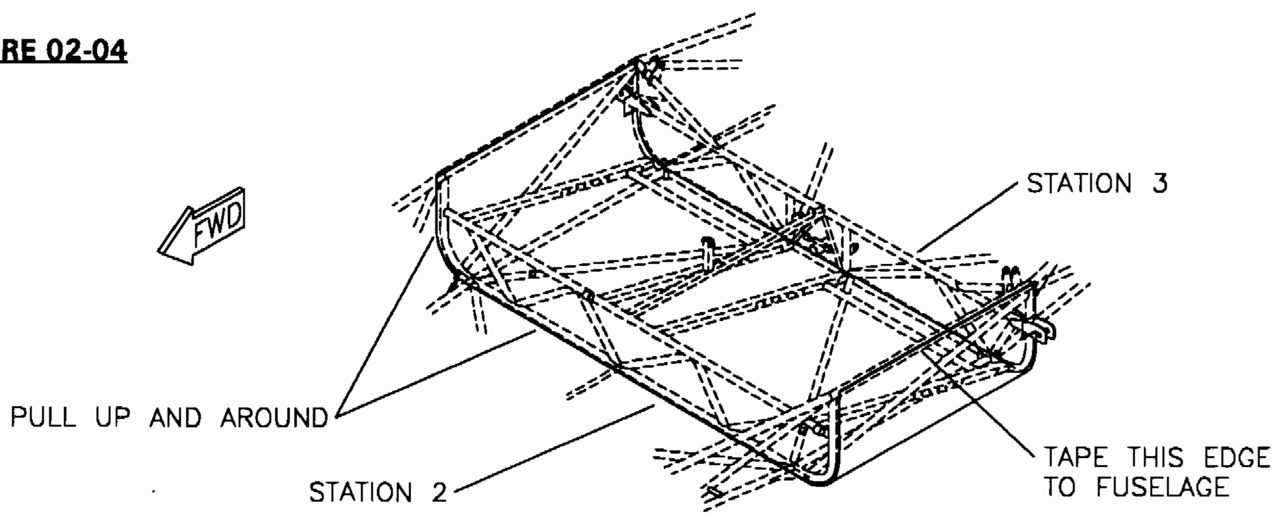
FIGURE 02-03B



4. Position the belly pan on the bottom side of the fuselage cage between S-2 and S-3. Center the notch on the aft edge of the belly pan around the strut attach point at S-3. The forward and aft edges of the belly pan should sit approximately on the center of the tubes forming the forward and aft seat trusses (S-2 and S-3). Tape belly pan in position using 2" masking tape along the top longeron of the fuselage cage. See **Figure 02-04.** From the other side of the cage, pull the belly pan into position around the strut attach point and tape into position. The belly pan may seem small at first, but it is designed to fit tight against the cage. Keep working with the pan to achieve the tightest fit possible centering from side to side during the installation.

FIGURE 02-04



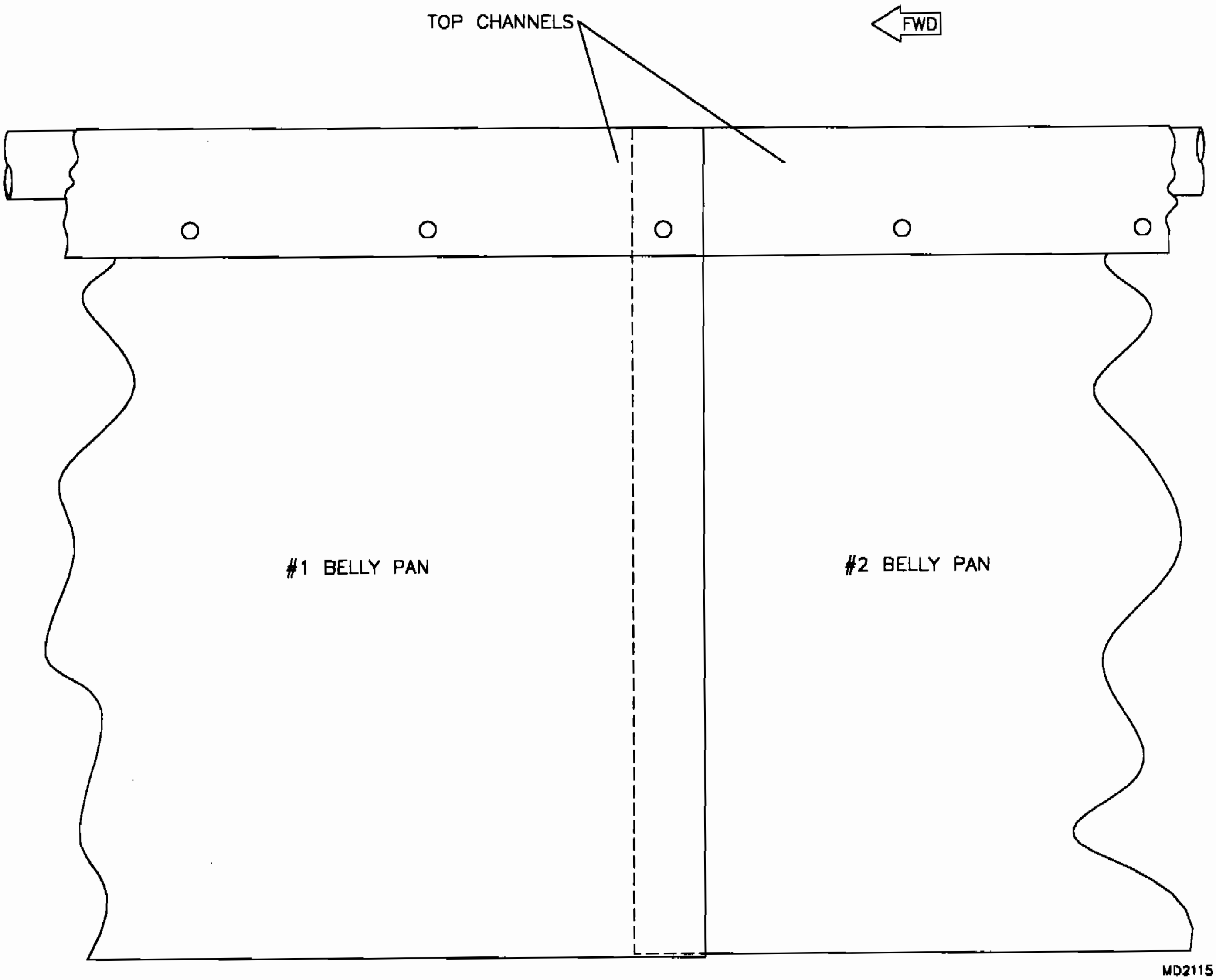
NOTE: It is best at this point to page forward to the #1 belly pan installation. Follow the #1 belly pan instructions to the point where it is also completely taped into position. This will ensure a much better fit of the entire belly pan assembly.

5. Place the "Z" strips drilled earlier in position along the S-3 aft seat truss as shown in the parts manual. Center the "Z" strip and clamp in place along with the belly pan (if installing a full enclosure, make sure #3 belly pan is in place while installing and drilling "Z" strips). Drill the belly pan #40 from the top using the "Z" strip as a guide. Drill from the center and cleco to ensure the best fit. <u>HINT</u>: A long drill bit will come in handy for this step. Bits of 6" or more can be purchased at most hardware stores.

6. Move forward to the S-2 truss and place the four "Z" strips into position. **At this point the #1 belly pan should be taped into position overlapping the #2 belly pan (see note above).** Again drill and cleco #40 from the center, moving outward. Make sure to keep the belly pans tight against the bottom of the cage when drilling. After drilling #40 from inside the cage, size drill to #30 from the bottom side of the cage.

7. Now that the bottom of the pan is secured in place, it may be necessary to reposition the sides of the pan if any sags became evident. Reposition and tape in place if required. Place the top channel along the edge of #2 belly pan over the tape. Line the forward end of the top channel up with the aft edge of the #1 belly pan. **Before drilling the #2 belly pan along the top channel it is important to have the top channel for the #1 belly pan fit in place also.** The top channels of #2 belly pan and #1 belly pan should butt together. See **Figure 02-07.** Drill the belly pan #40 using the channel as a guide. After all top channels are located correctly, size drill all holes #30.

FIGURE 02-07

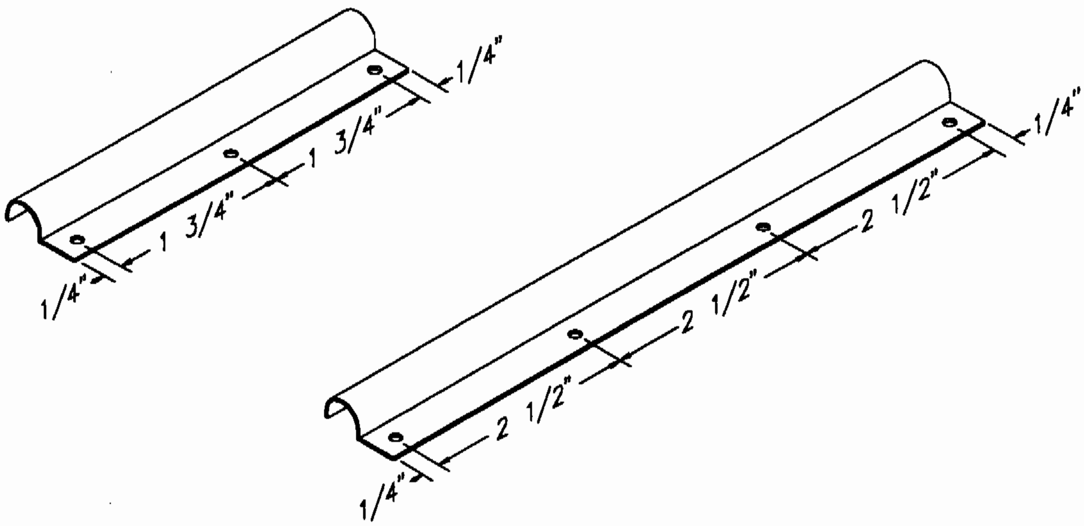


#1 BELLY PAN INSTALLATION

1. Locate the parts shown in the parts manual.

2. Mark and drill to #40, the four "Z" strips for the aft edge of the #1 belly pan as shown in **Figure 02-02.**

FIGURE 02-02



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3. Mark belly pan #1 as shown in **Figure 02-03. DO NOT** bend the belly pan directly on the line. The E.D. is used to reference the bending tool location when used in conjunction with a framing square. See **Figure 02-03A.** The belly pan forming tool will actually locate just to the inside of the E.D. mark. Bend the belly pan using the sequence shown in **Figure 02-03B.**

FIGURE 02-03

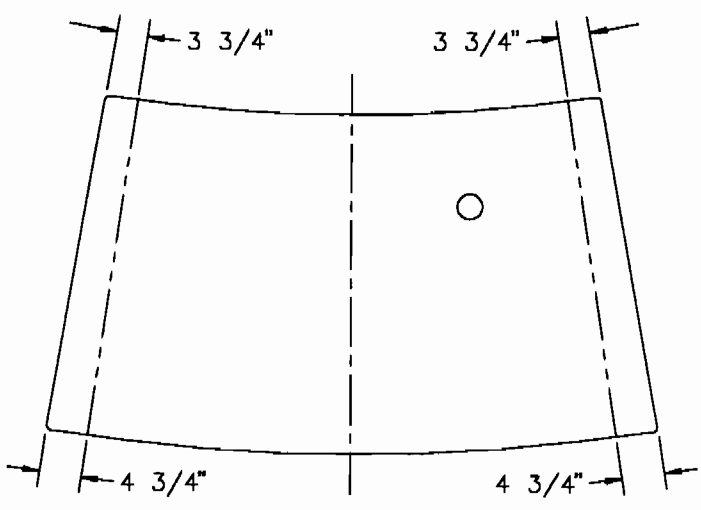

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FIGURE 02-03A

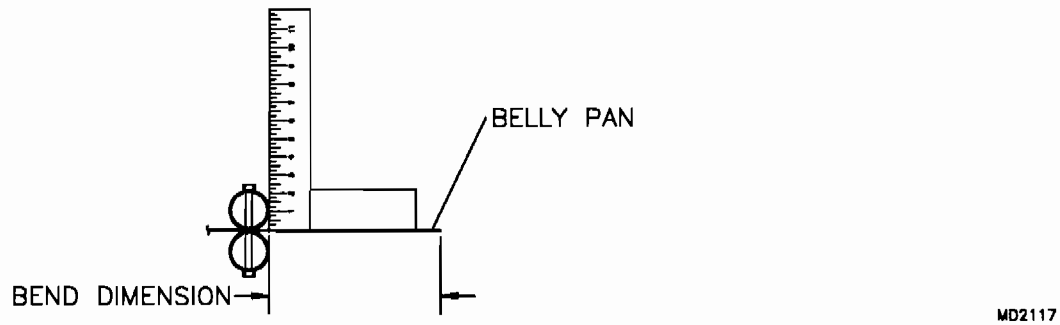
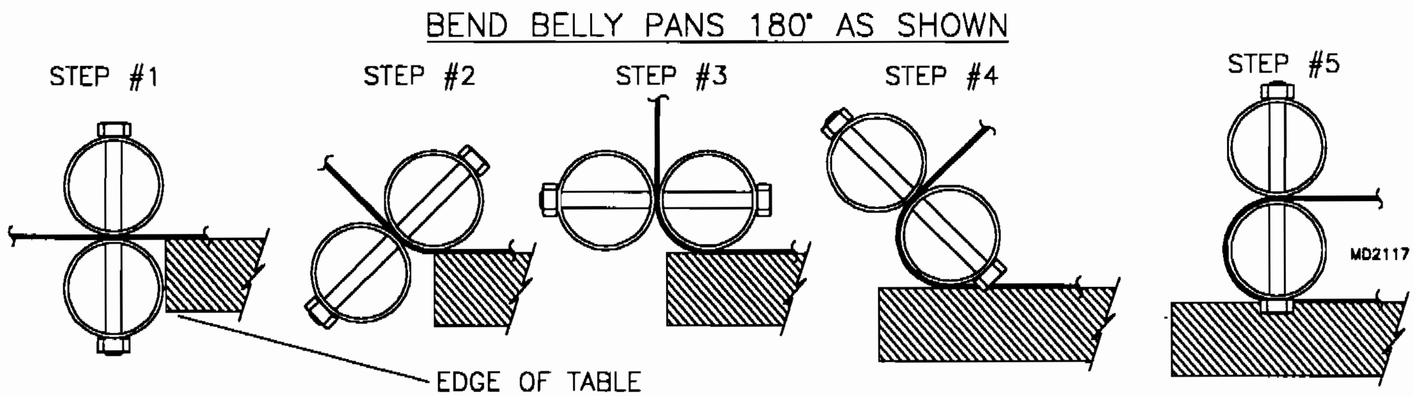
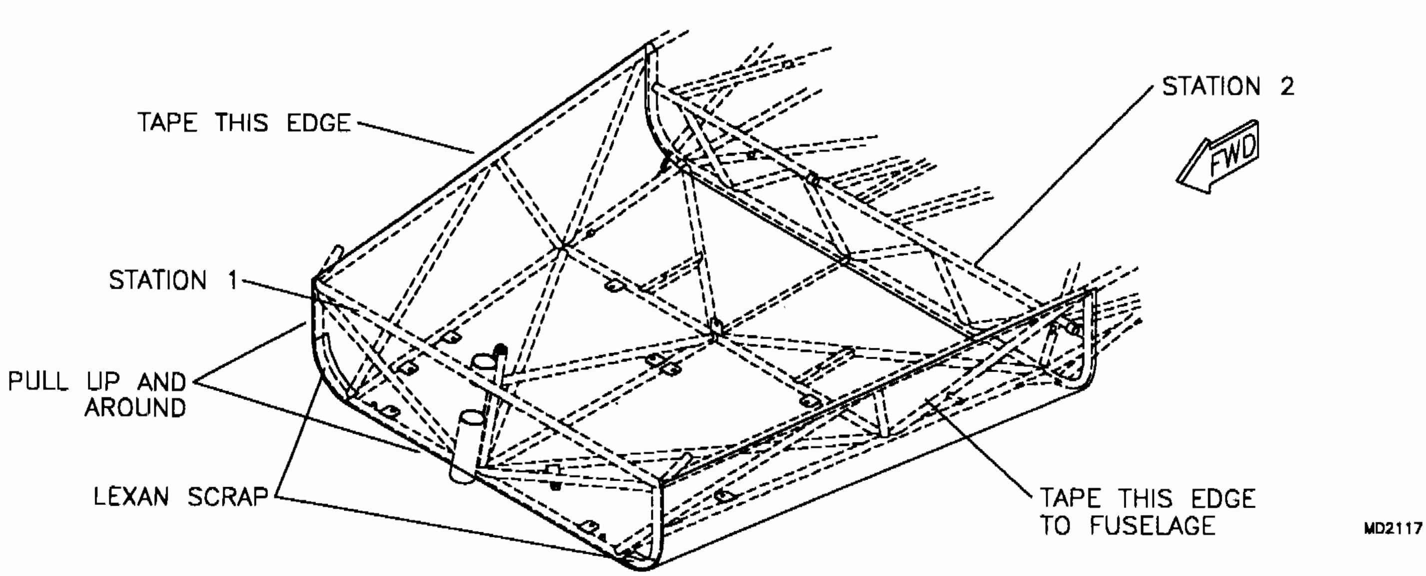


FIGURE 02-03B



4. Tape two lexan scraps cut from the nose pod to the inside of the bend radius at the forward edge of the #1 belly pan. This will simulate the pod assembly and ensure that the #1 belly pan is located properly. Position the belly pan on the bottom side of the fuselage cage between S-1 and S-2. The belly pan should be flush with the front of S-1. Tape belly pan in position using 2" masking tape along the top longeron of the fuselage cage. See **Figure 02-04.** From the other side of the cage, pull the belly pan into position around the strut attach point and tape into position. The belly pan may seem small at first, but it is designed to fit tight against the cage. Keep working with the pan to achieve the tightest fit possible centering from side to side during the installation.

FIGURE 02-04



5. Place the "Z" strips drilled earlier in position along the S-2 forward seat truss as shown in the parts manual. Center the "Z" strips between the diagonals of S-2 and clamp in place along with the belly pan. Drill the belly pan #40 from the top using the "Z" strip as a guide. Drill from the center and cleco to ensure the best fit. **HINT**: A long drill bit will come in handy for this step. Drill bits of 6" or more can be purchased at most hardware stores.

6. Move forward to the S-1 truss and drill two (2) 3/16" holes using the tabs on the aft of S-1 as a guide. Make sure to keep the belly pan tight against the bottom of the cage when drilling. Temporarily bolt in place using the hardware shown.

7. Now that the bottom of the pan is secured in place, it may be necessary to reposition the sides of the pan if any sags became evident. Reposition and tape in place if required.

8. Place the top channel along the edge of #1 belly pan over the tape. Drill the belly pan #40 using the channel as a guide. After both top channels are located correctly, size drill all holes #30.

CENTER COVER ASSEMBLY - WITH MINI-POD

NOTE: Standard Dacron Covering or Optional Dope & Fabric Covering.

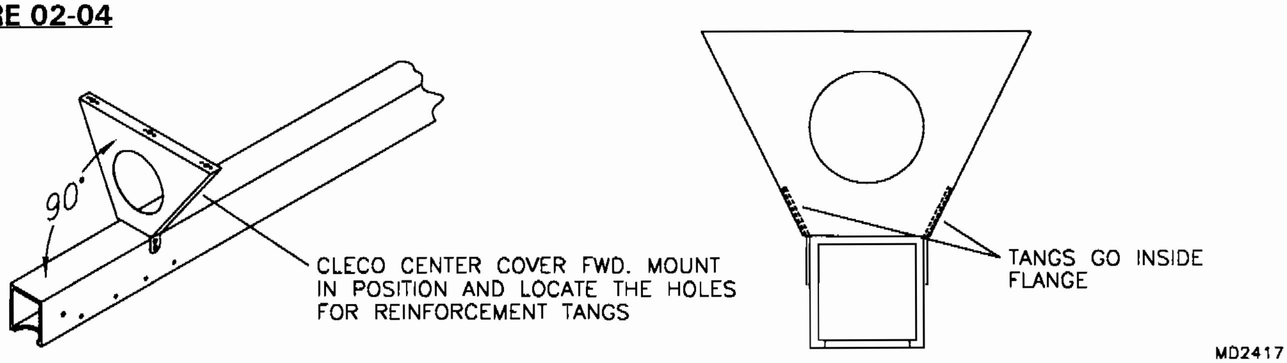
1. Locate the parts shown in the parts manual. If desired, paint the parts which make up the center cover. Only test fit if painting is planned.

2. Cleco in place the center cover aft mount using the two pre-located holes in the keel. Mark and size drill using the holes in the aft mount as a guide. Repeat for other side.

3. Install nut plates into the eight aft-most holes on the center cover bottom mount. Cleco the center cover bottom mount to the keel. Drill holes using the bottom mount as a guide.

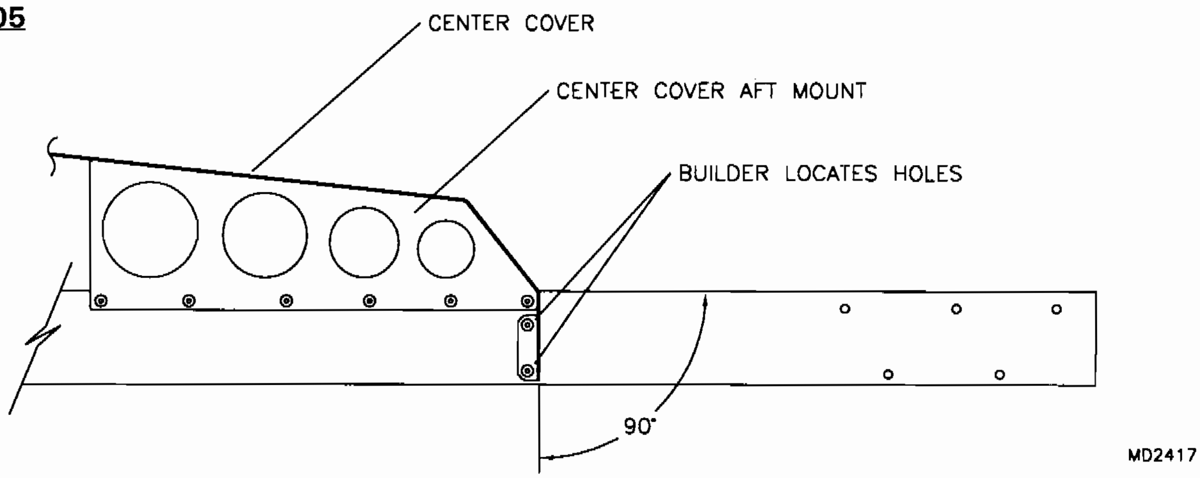
4. Rivet the reinforcement tangs to the center cover forward mount as shown in **Figure 02-04.** Cleco the center cover forward mount to the top of the keel. Using a square, set the center cover forward mount 90° to the keel tube. Mark and drill hole locations for the reinforcement tangs with the center cover forward mount perpendicular to the keel. Drill to the specified rivet size.

FIGURE 02-04



5. Install the center cover aft mounts using the hardware shown in the parts manual. Place the center cover aft wrap in position on the mounts and cleco in place. Locate the aft holes in the keel with the aft edge of the center cover wrap as shown in **Figure 02-05.** Do not drill the forward three holes in the aft wrap at this point. It is best to drill the center cover forward wrap **AFTER** the wing has been installed. Install the ¼ turns and receptacles as shown in the parts manual. Install the center cover forward wrap during final assembly. This will ensure a perfect fit with the wing.

FIGURE 02-05



CENTER COVER ASSEMBLY - WITH FULL ENCLOSURE

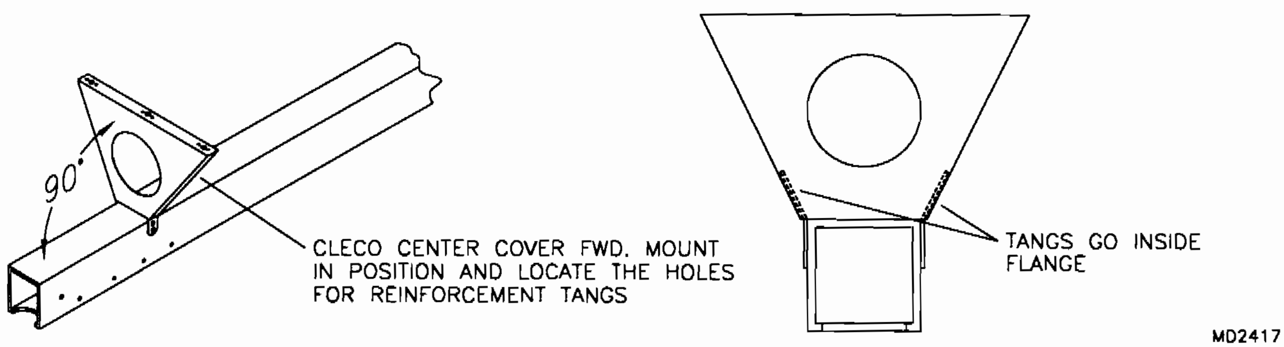
NOTE: Standard Dacron Covering or Optional Dope & Fabric Covering.

1. Locate the parts shown in the parts manual. If desired, paint the parts which make up the center cover. Only test fit if painting is planned.

2. Cleco in place the center cover aft mount using the two pre-located holes in the keel. Mark and size drill using the holes in the aft mount as a guide. Repeat for other side.

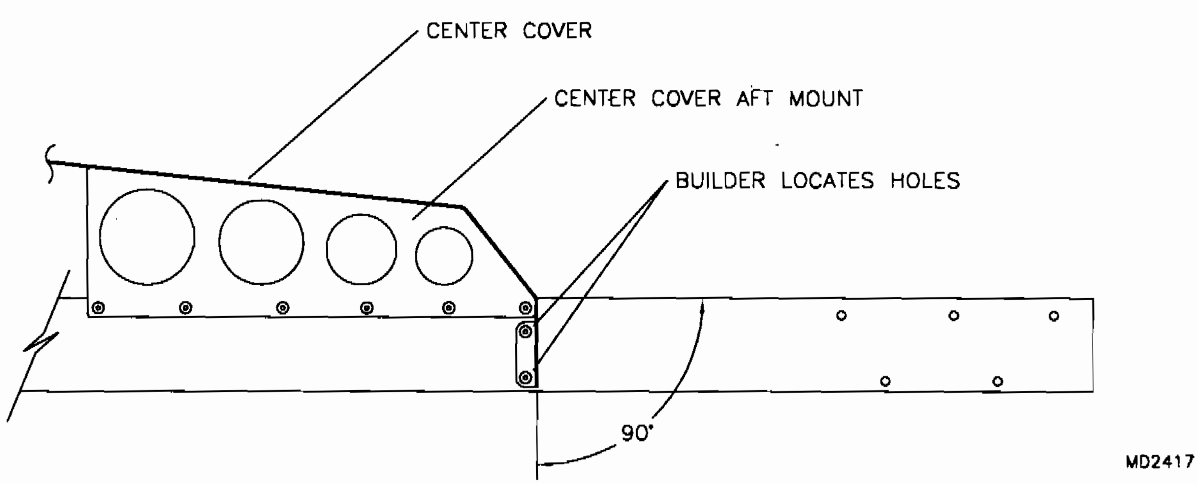
3. Rivet the reinforcement tangs to the center cover forward mount as shown in **Figure 02-03.** Cleco the center cover forward mount to the top of the keel. Using a square, set the center cover forward mount 90° to the keel tube. Mark and drill hole locations for the reinforcement tangs with the center cover forward mount perpendicular to the keel. Drill to the specified rivet size.

FIGURE 02-03



4. Install the center cover aft mounts using the hardware shown in the parts manual. Place the center cover aft wrap in position on the mounts and cleco in place. Locate the aft holes in the keel with the aft edge of the center cover wrap as shown in **Figure 02-04.** Do not drill the forward three holes in the aft wrap at this point. It is best to drill the center cover forward enclosure **AFTER** the wing has been installed. Install the ¼ turns and receptacles as shown in the parts manual. Instructions for installing the center cover forward enclosure will be given during windshield installation.

FIGURE 02-04

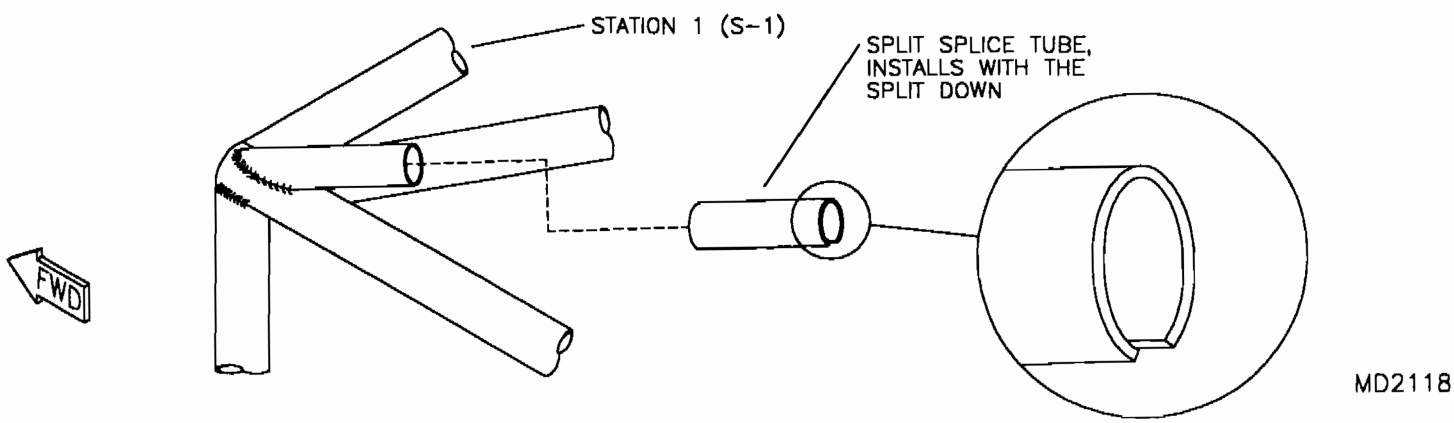


MINI-POD WINDSHIELD INSTALLATION

1. Locate the parts shown in the parts manual.

2. Slip the mini-pod windshield top and side tubes together using the builder fabricated splice tubes. Splice tubes should be cut from ½" x .035. The bottom two tubes are 2 ½" in length and the top two tubes are to be cut 2" in length. The 2 ½" tubes will need to be split lengthwise to allow for insertion into the fuselage cage. Slip entire assembly on the windshield support tubes welded to the fuselage cage at S-1. Make sure the side tubes are butted against the windshield support tubes on the cage. The splice tubes at the cage need to be oriented with the split down. See **Figure 02-02.**

FIGURE 02-02

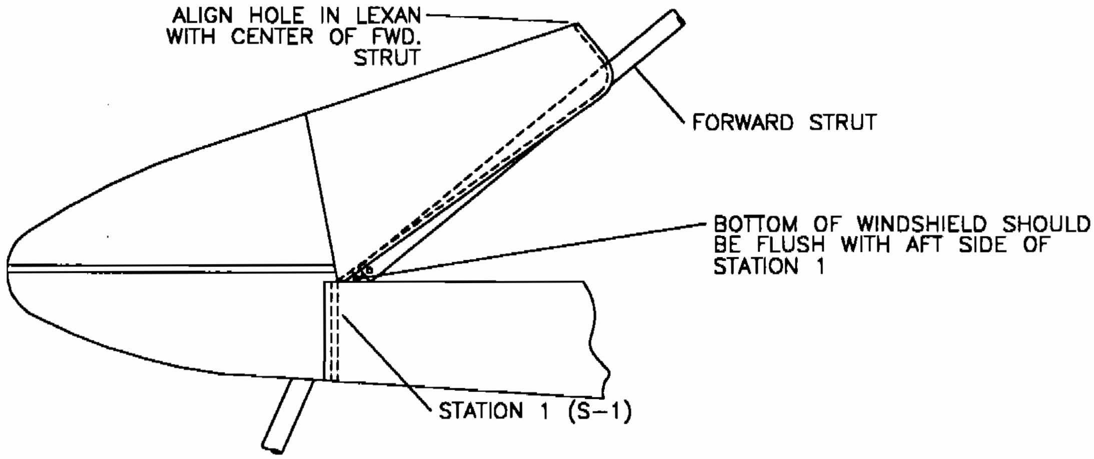


3. Rivet together the mini-pod frame support. Locate the frame support on the forward strut so that the top tube rest in the cradle of the frame support. Make sure the frame support is perpendicular to the fuselage cage and that the mini-pod side tubes are slid all the way down on the windshield support tubes welded to the fuselage cage. Drill three holes on each side of the forward strut using the mini-pod frame support as a guide. Rivet in place using the hardware shown.

POD INSTALLATION

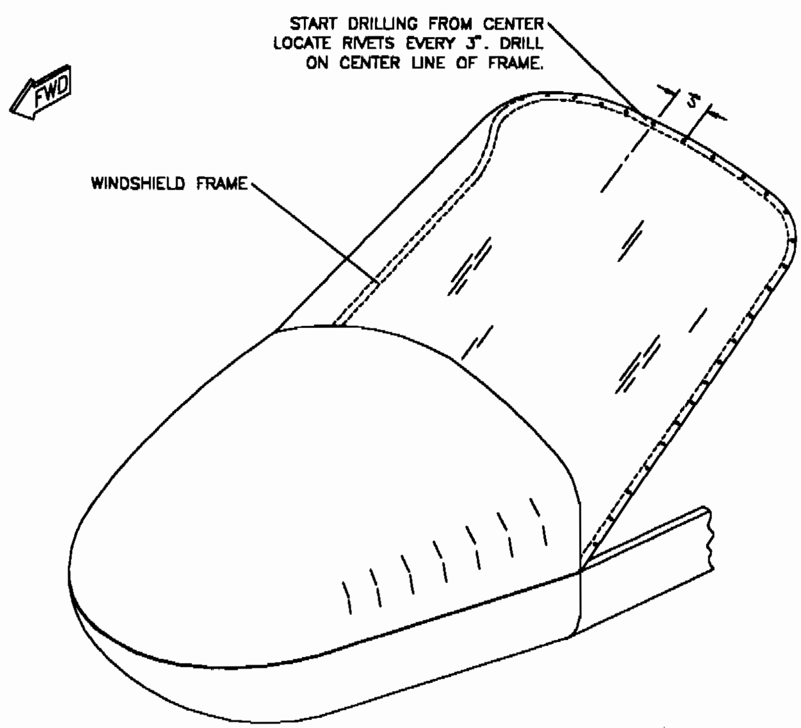
1. Measure the top tube and mark center. Center the top tube in the mini-pod frame support. Drill #30 using the frame support as a guide and cleco in place. With the pod in place, use the pre-cut windshield to set the pod angle. Align the top hole in the windshield with the center of the top tube and the bottom of the windshield to be flush with the back side of S-1. See **Figure 02-01.** Locate a hole for the nose fork to pass through once the pod location is finalized. Size this hole large enough for the fork bearing to pass through.

FIGURE 02-01



2. Adjust pod until windshield mates with the step molded into the pod. Make sure that the 2" flange is still flush with the aft edge of S-1. Drill center hole in pod #30 using windshield as a guide. Cleco in place. Drill the holes in the edge of the windshield and mini-pod as shown in **Figure 02-02.** Remove the windshield and drill the #30 holes to #28. **DO NOT** rivet the windshield in place at this time. Once everything is in place, locate two evenly spaced #30 holes in the bottom tube of S-1. Drill up from the bottom through the #1 belly pan and the lexan of the nose pod. Install two #30 rivets upon final assembly to secure pod in place.

FIGURE 02-02



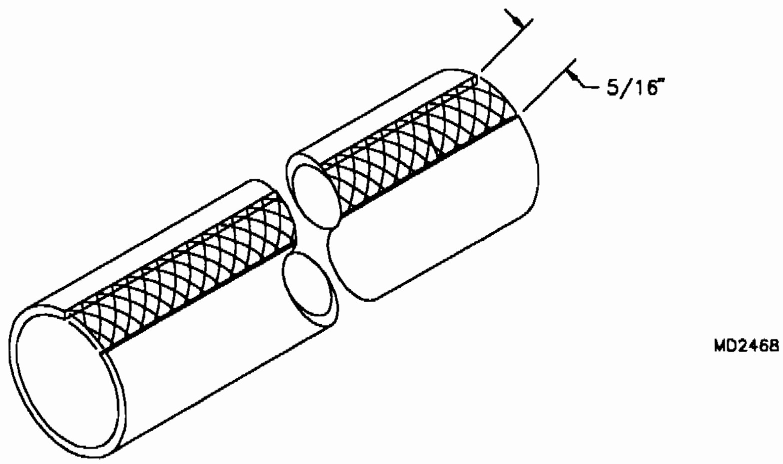
WINDSHIELD INSTALLATION

- If installing a mini-pod only do not complete this section.

1. Locate the parts shown in the parts manual.

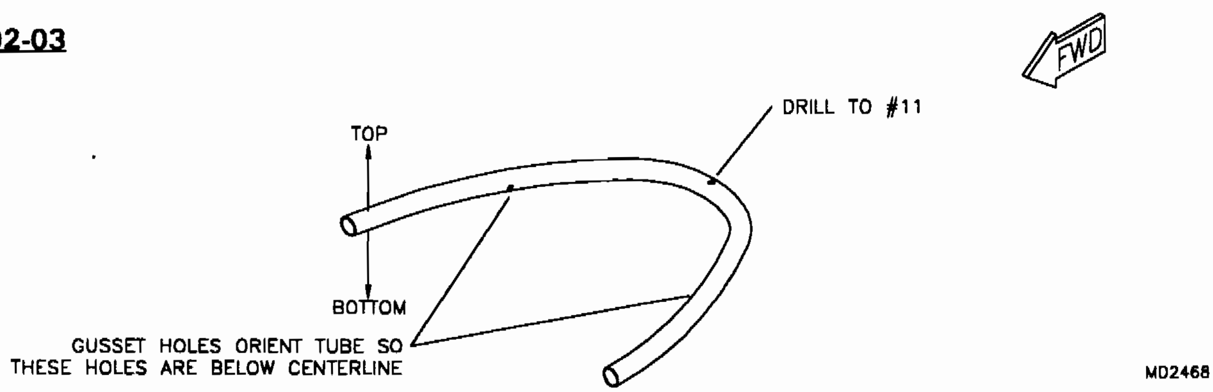
2. Use a hack saw to remove 5/16" of material from splice tube as shown in **Figure 02-02**. Cut splice tube into three equal length pieces. Debur and radius corners.

FIGURE 02-02



3. Locate the three pieces that make up the top former hoop. The aft hoop has three pre-located holes as shown in **Figure 02-03**. The vertical hole in the center needs to be drilled to #11 for attachment to the keel tube. The two pilot holes located on the inside of the hoop are for location of the gussets used on the full enclosure formers. Notice that these two holes are located slightly off centerline of the tube. Orientate the hoop so the inside pilot holes are below the centerline of the tube. If not installing a full enclosure at this time, make sure the tube is oriented correctly in case a full enclosure is installed at a later date.

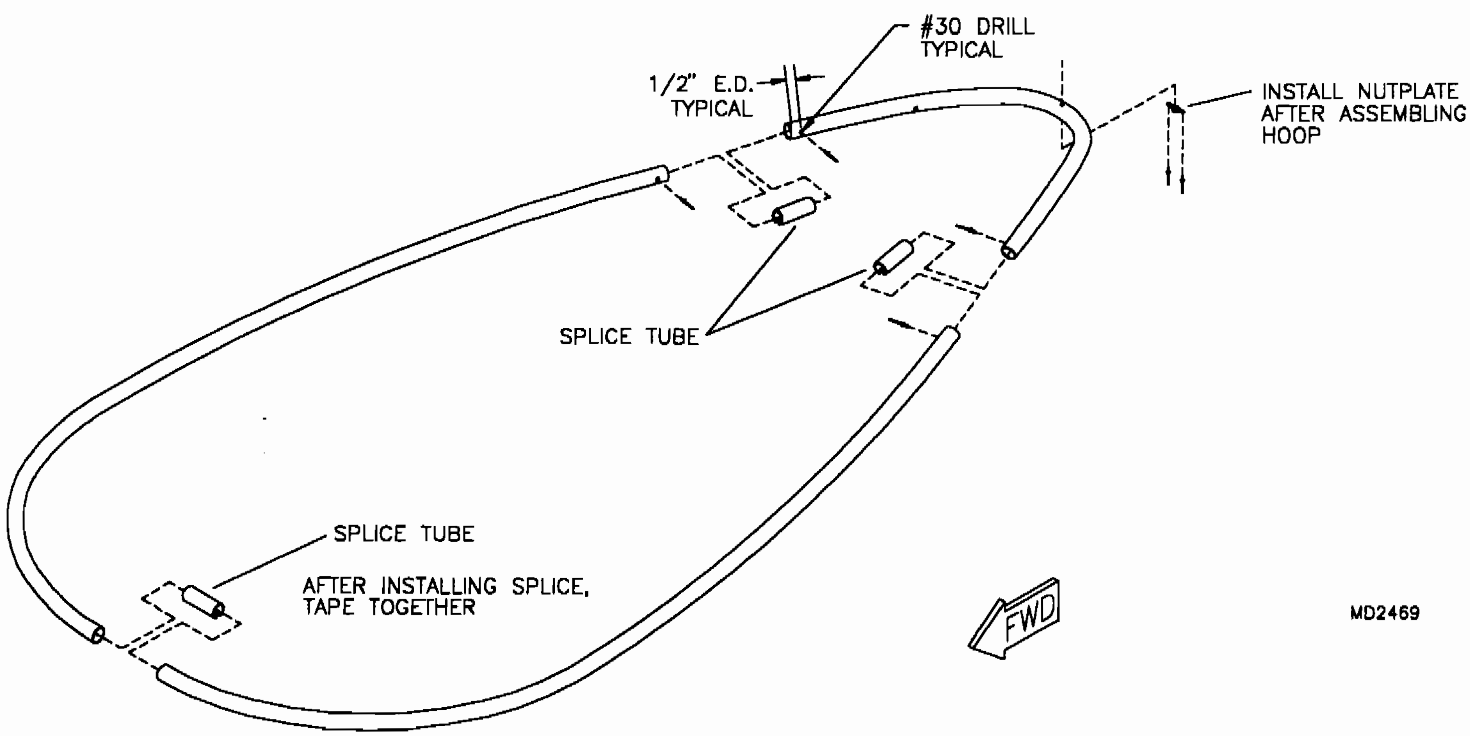
FIGURE 02-03



4. The left and right top formers also have a pilot hole drilled on the inside of each. These pilot holes are for the gussets that attach the windshield side tubes and are located slightly below centerline. These parts are labeled left and right, but double check them. Orient the top three formers as shown in **Figure 02-04** and insert the splice tubes fabricated earlier. Make sure the splice tubes are inserted

evenly into each end of the former tubes with the slot down. Place the top former assembly on a flat surface. Drill #30 holes at ½" E.D. on the inside of the assembly at each aft splice tube location. Install the rivets shown.in the parts manual. Only tape the forward splice together at this time. It will be held together by the top former support once installed. Install the nut plate to the bottom of the aft hoop vertical hole using the hardware shown.

FIGURE 02-04



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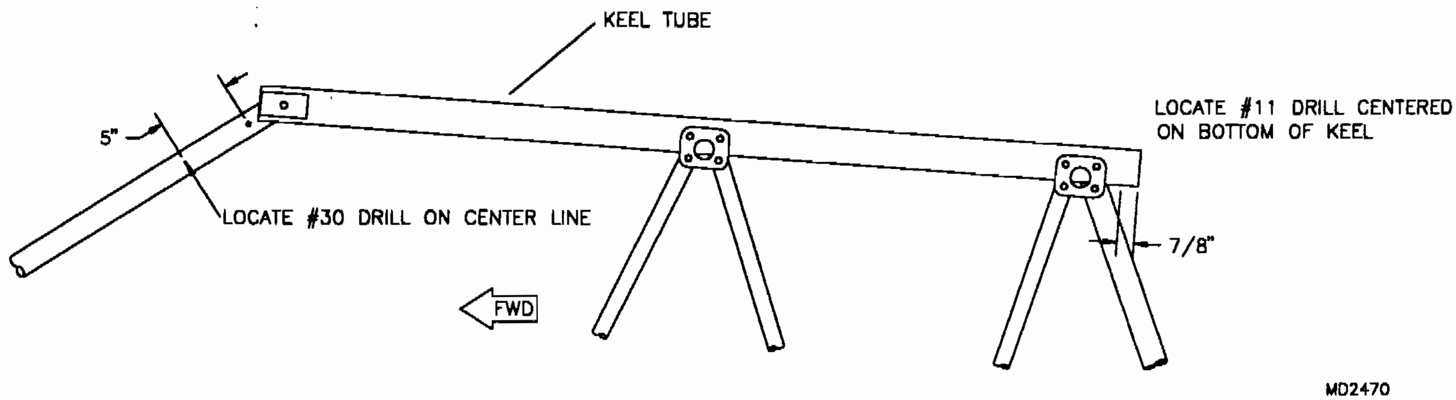
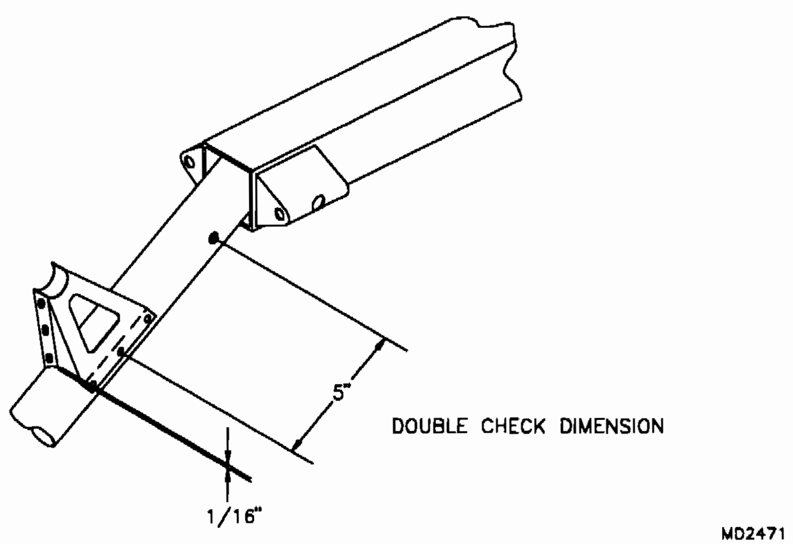
5. Locate the top former supports. Size drill the three holes in each flange to #30. Rivet the top former supports together; size drilling as required. If you intend to paint the gussets later, only cleco in place at this time; otherwise, rivet in place. Measure 5" from the 3/16" pop rivet along the length of the strut and mark a line on each side. On the centerline of the bottom of the keel measure 7/8" forward and mark the location as shown. Remove the aft strut, drill #11 into the bottom of the keel, debur, and install the aft strut. See **Figure 02-05.**

FIGURE 02-05



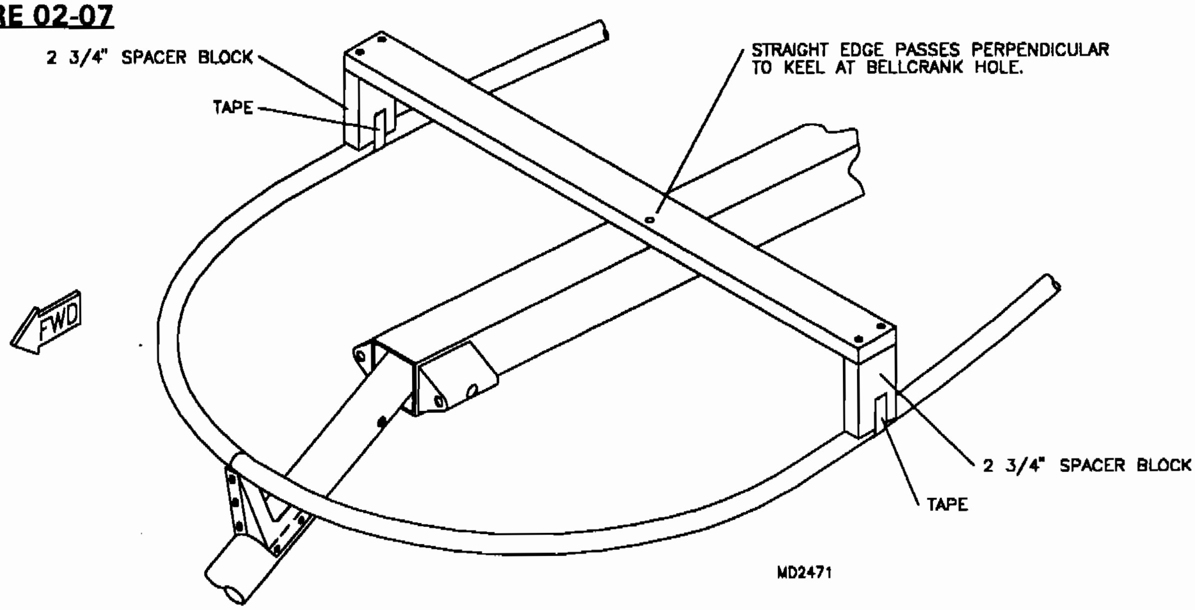
6. Rivet together and install the top former supports to forward strut using the line marked as a reference. Cleco to the strut if this part is to be painted. The pilot holes in the supports should rest on centerline of the forward strut. This should create a 1/16" gap between supports and the forward strut. See **Figure 02-06.** This is critical so that the supports will not chafe the forward strut.

FIGURE 02-06



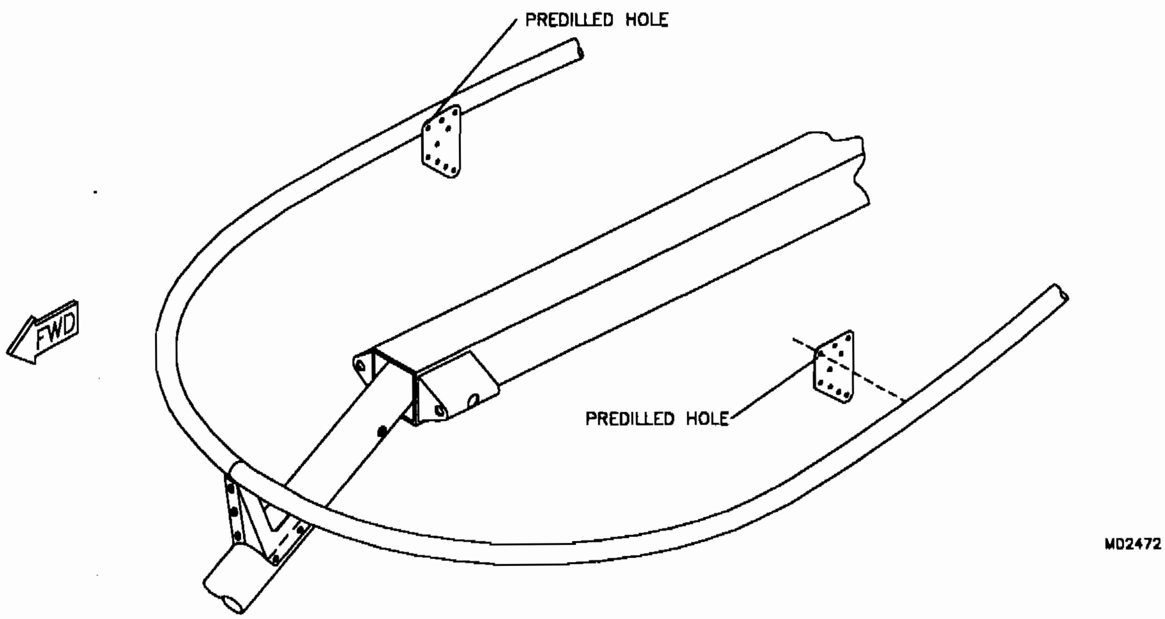
7. Install assembled top former hoop into supports and bolt to bottom side of keel. Center the joint of the top formers in the top former supports. Cut spacer blocks and install straight edge and blocks as shown in **Figure 02-07.** *This jig is not required if installing a partial enclosure to a finished aircraft. Simply make sure the top former is level with the wings.* Drill #30 into top formers using the support as a guide and rivet in place. Leave straight edge and spacer blocks in place until after windshield side tubes have been installed.

FIGURE 02-07



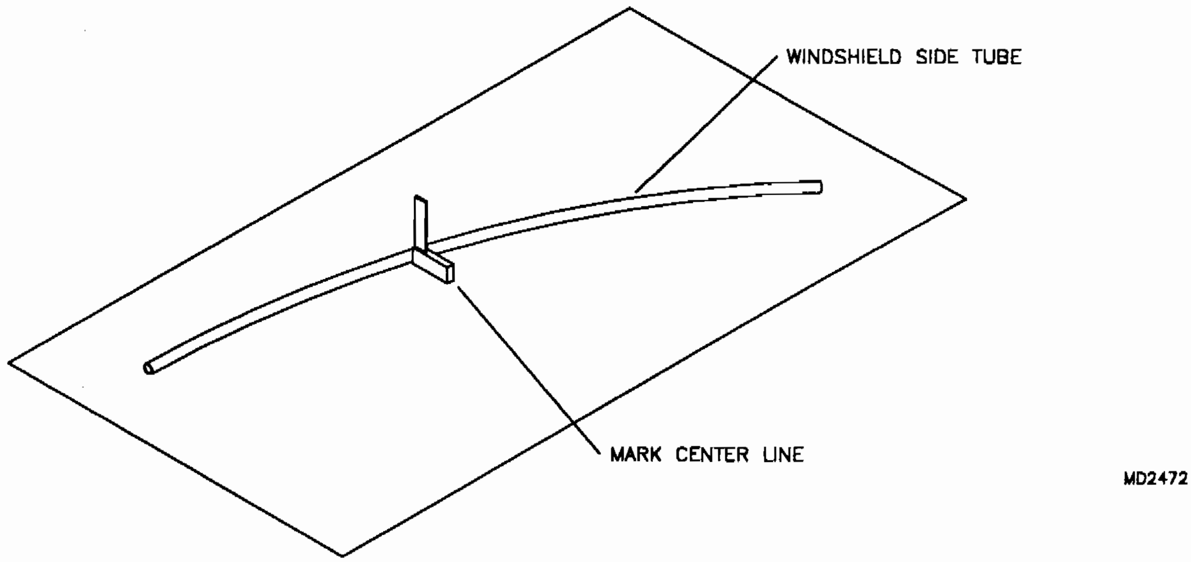
8. Install gussets to the pre-drilled holes in the top formers. The pre-drilled holes locate the forward most hole in the gusset. The bottom of the tube is designated by a short black mark. Make sure gussets are oriented as shown in **Figure 02-08.** To ensure best alignment of gussets, do not drill aft gusset holes in top former until side tubes are fit in place.

FIGURE 02-08



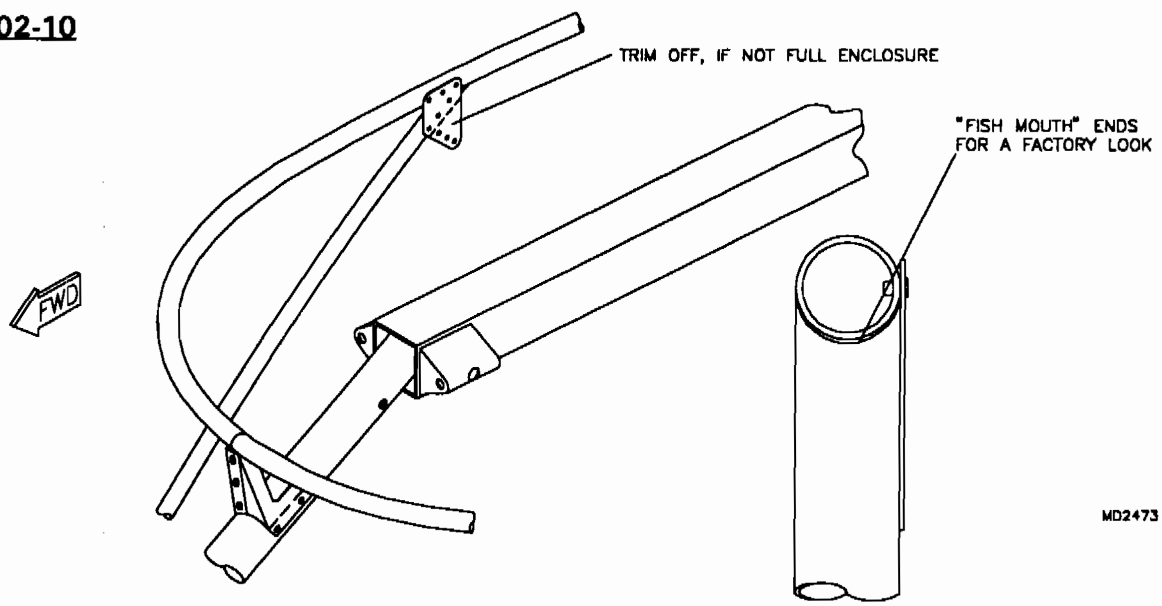
9. The windshield side tubes have a slight arc formed into them at the bottom. This end will plug into the stubs welded on the cage. To properly orientate the side tubes, lay them on a flat surface. Using a small square, mark the inside centerline at the top of the tube with a "swiping" motion. See **Figure 02-09.** The centerline will line up with the pre-drilled holes in the top gusset.

FIGURE 02-09



10. Install the side tubes over the splice tubes in the stubs on the cage. Orientate centerline mark to correspond with the pre-drilled holes in top gusset. Mark the tube to mate with the top former. Cut tube to the required angle and test fit in place. Once satisfied with the fit, drill through the tube on the centerline using the gusset as a guide and cleco in place. Optional fitting of the tubes to give a "factory look" is to leave the side tubes about 1/4" long and "fishmouth" the tube to match the top former. See **Figure 02-10**

FIGURE 02-10



11. Insert nose pod assembly inside of #1 belly pan. Insert the pod until back edge of top pod is flush with the back side of the station 1 top tube and the mating strips are approximately level with the top longerons. Using a taylor's tape, find the center of the pod and mark with a black marker.

12. Measure out from the top former splice 1½" each way on the top formers and mark. Install windshield lexan in place lining up the three pre-drilled holes with the marks placed on the top of the pod and top formers. This will align top pod and windshield correctly. See **Figure 02-12.** Once correctly located, drill #40 and cleco in place. Peel back the protective covering on the lexan windshield along the perimeter and the area that the top formers cross. Pull windshield down tight against pod at top formers and tape securely to side tubes. Check the fit of the pattern to the molded joggle of the pod. Alter pod location slightly or trim the lexan windshield to fit. The windshield pattern should fit flush with the edge of the side tube. If there is any overlap it can be more easily removed after all holes have been drilled and clecoed in place. Layout approximately 3" rivet spacing along pod, sided tubes, and top formers as shown in the illustration. Trim windshield as necessary. Use a sanding block with 80 grit sandpaper to clean up all edges of the lexan. Drill all holes in lexan out to #28. Debur and rivet windshield in place using the rivets shown. Make sure to include 1/8" washers as shown in the parts manual.

FIGURE 02-12

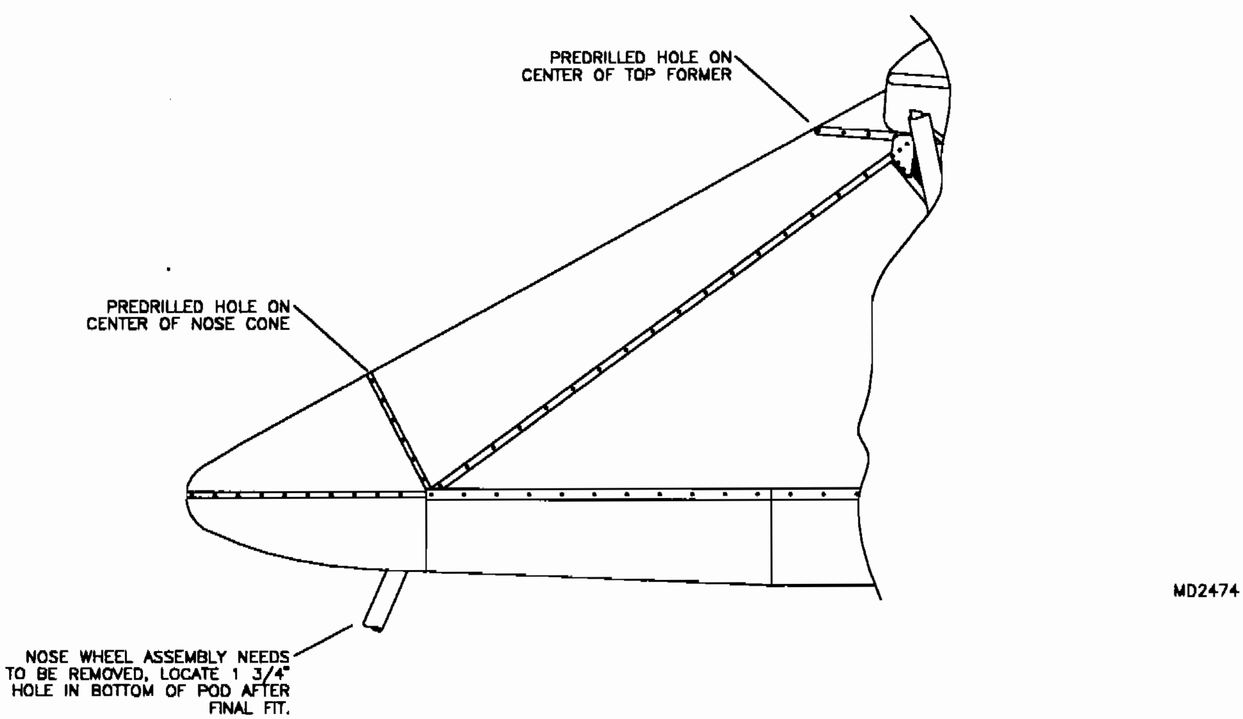
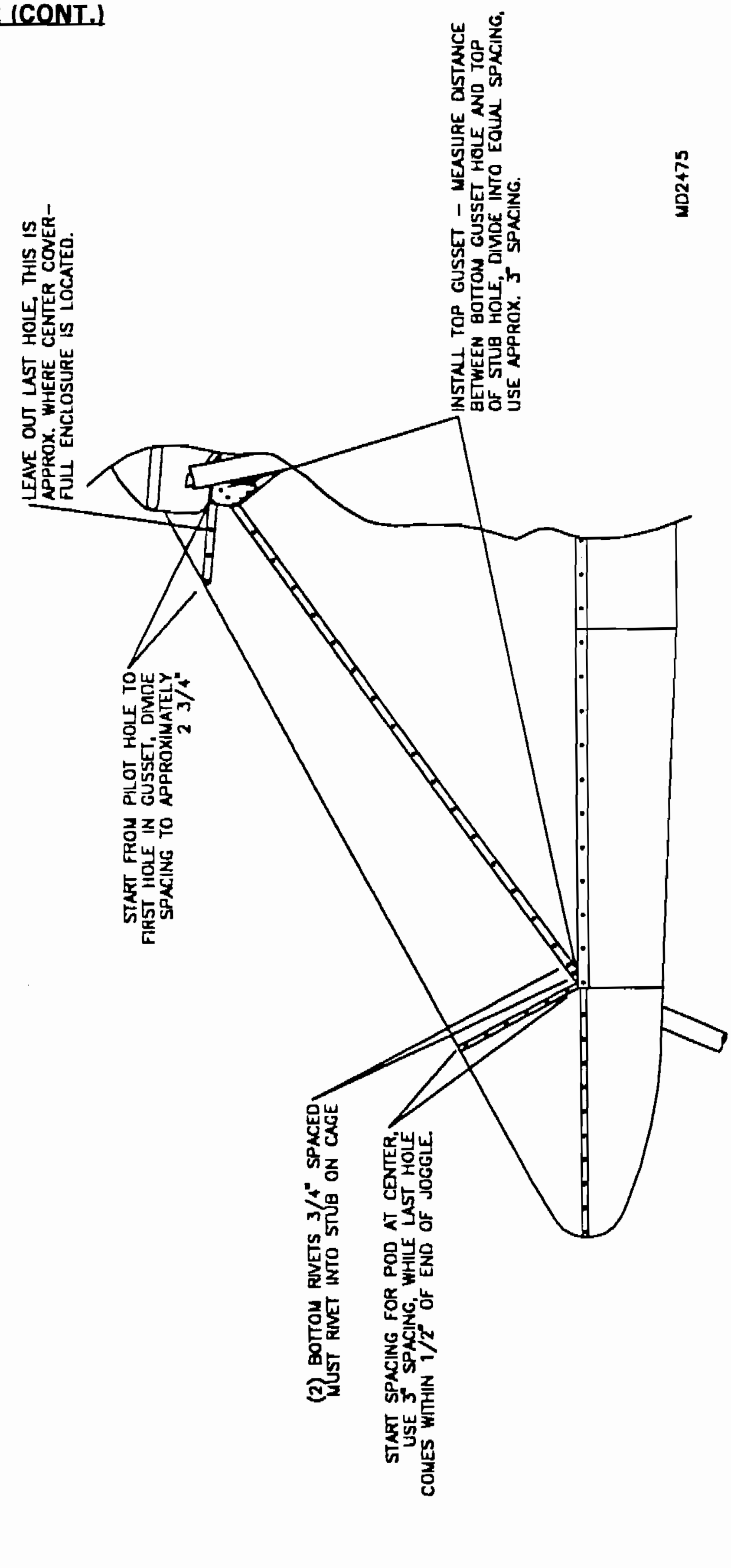
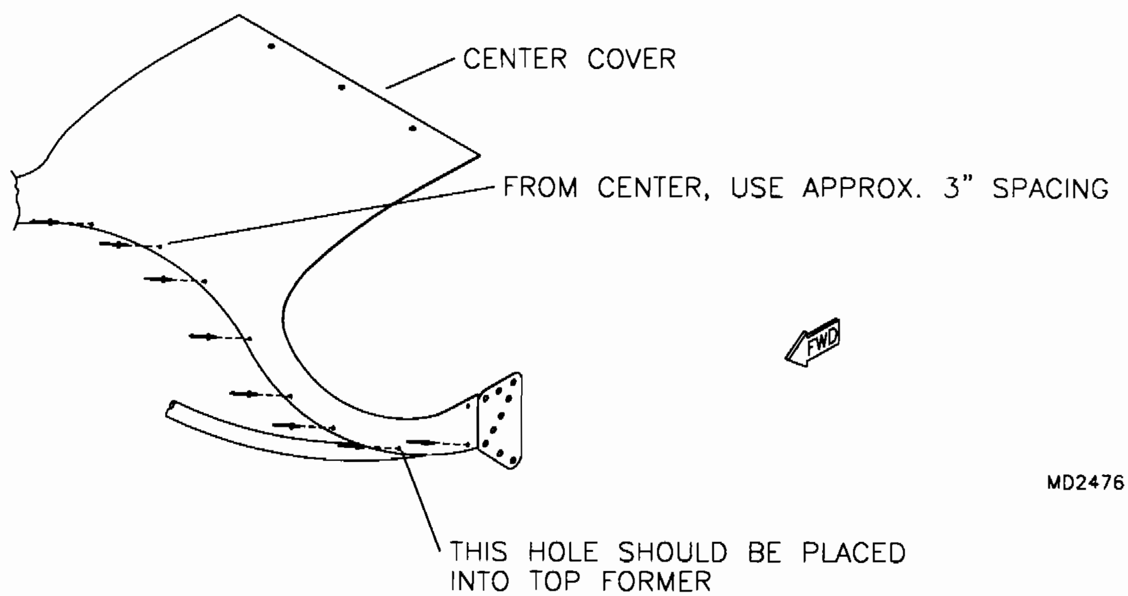


FIGURE 02-12 (CONT.)



13. **The wings must be in place for proper installation of center cover forward enclosure. This is preferably done during trial assembly/rigging or can be done after the wings have been skinned and clear coated.** The forward enclosure should contour to the wing's shape with a ¼" gap to allow for rubber edging. It should also fit flush with the edge of the top gussets. See **Figure 02-13.** Trim part to the approximate size, layout holes, drill, and debur. Remove center cover forward enclosure and drill lexan only out to #28. Make sure to include the washers inside the lexan. Install the ¼ turn fasteners and rubber edging. Test fit rubber edging during trial assembly/rigging. Pull the rubber edging lengthwise during the gluing process to achieve the best seal.

FIGURE 02-13



14. Clean the top of the formers with isopropyl alcohol in preparation for foam seal installation. Install foam seal to the top of the top formers from the forward gusset to the aft end of keel.

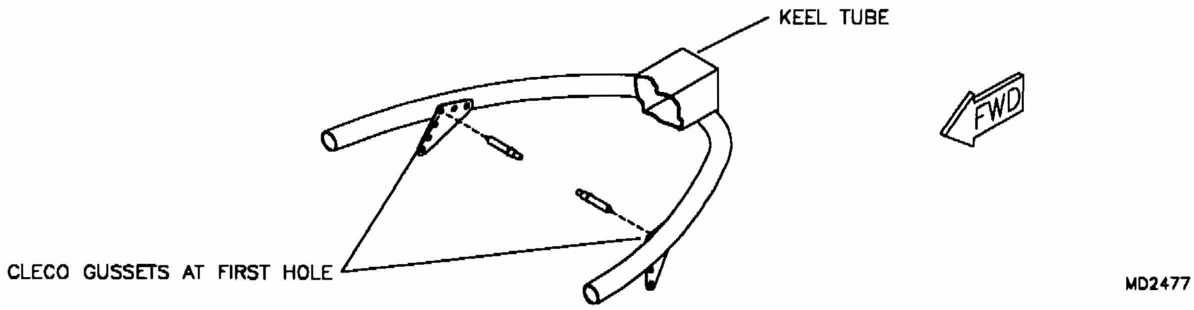
NOTE: With Optional Dope & Fabric Covering, Center Cover FWD Wrap will need to be trimmed to fit.

AFT ENCLOSURE INSTALLATION

1. Locate the parts shown in the parts manual.

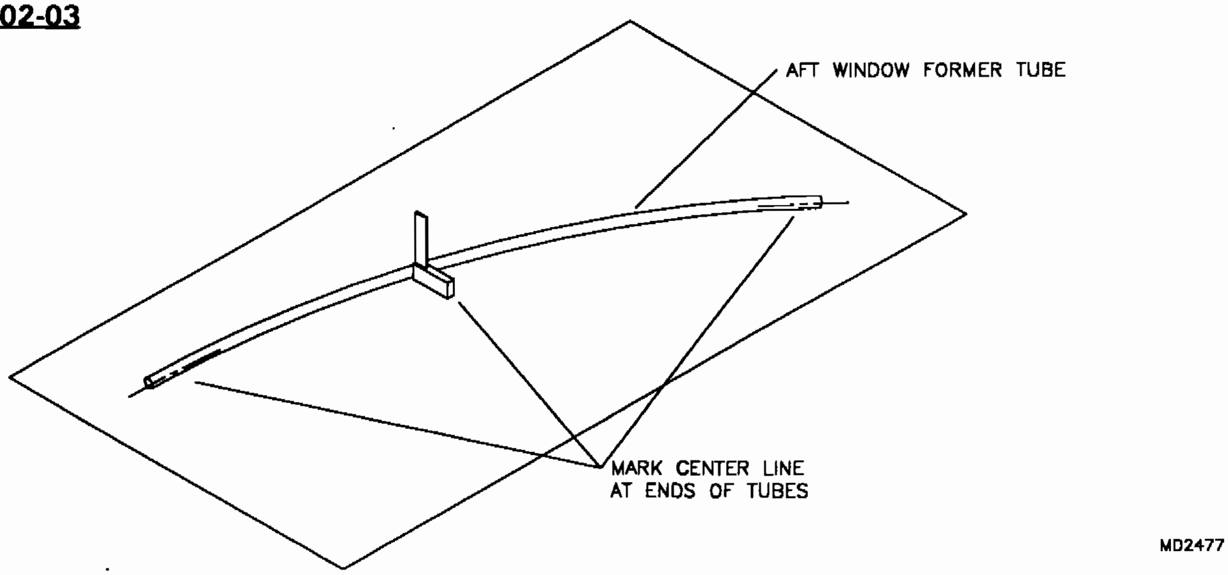
2. Cleco aft gussets to the pre-located holes on the aft top former. This locates the forward hole in the gusset see **Figure 02-02.** The other two holes should be parallel with the centerline of the tube, but it is best not to drill these holes until after fitting window former.

FIGURE 02-02



3. Locate aft window formers. There is a small black mark on one end of the tube to designate the top of the tube. It is very critical to locate the top of the tube. Incorrect orientation of the aft window formers will not allow the enclosure to be assembled correctly. Lay the formers on a flat surface and use a square to mark centerline of the tube on each end. See **Figure 02-03.** The centerline should be in line with the holes in the top and bottom gussets. The bottom gusset was riveted to #3 belly pan former previously.

FIGURE 02-03



4. Hold the window former in position and mark the required angle. Each end needs to be trimmed to fit in place. Make sure that the marked centerline corresponds with the holes in the gussets. If desired, cut tubes about 1/4" longer than required and file a "fishmouth" in the top of the window former to fit neatly against the top former. See **Figure 02-04.** Once tube is fit in place, rotate the gusset to the optimum position and drill the other two holes into the top former-aft. Drill and cleco aft window formers using one hole in each gusset. Make sure to drill on centerline of the tubes. Clamp two straight boards across the aft window formers to align them. See **Figure 02-04A.** Drill the remaining holes using the gusset as a guide. Size drill all holes, debur, and rivet the gussets. Do not remove the clamps and boards until attaching door former tubes.

FIGURE 02-04

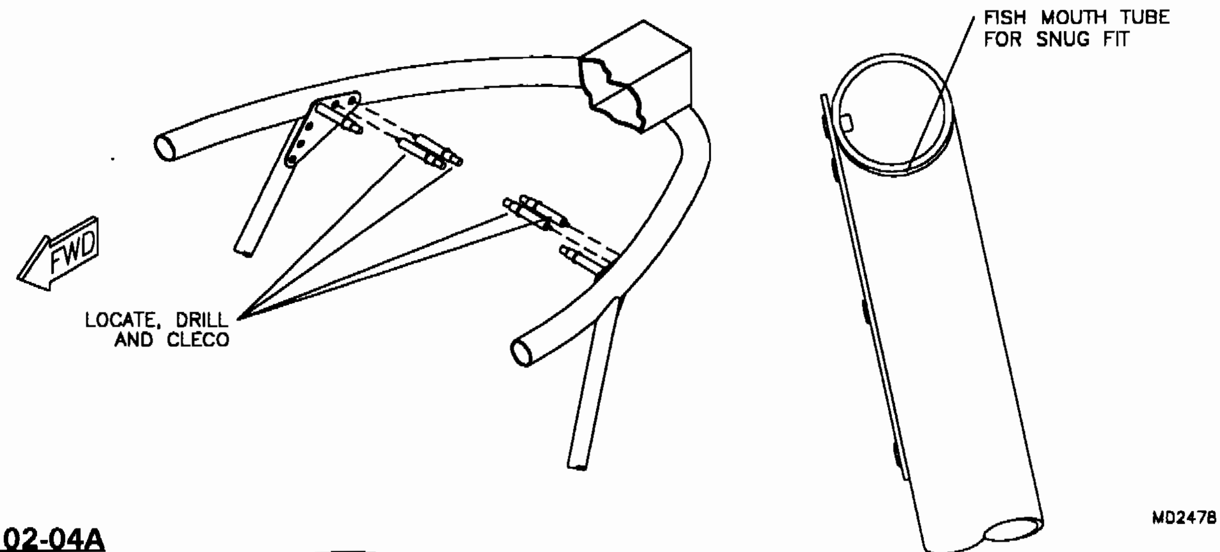
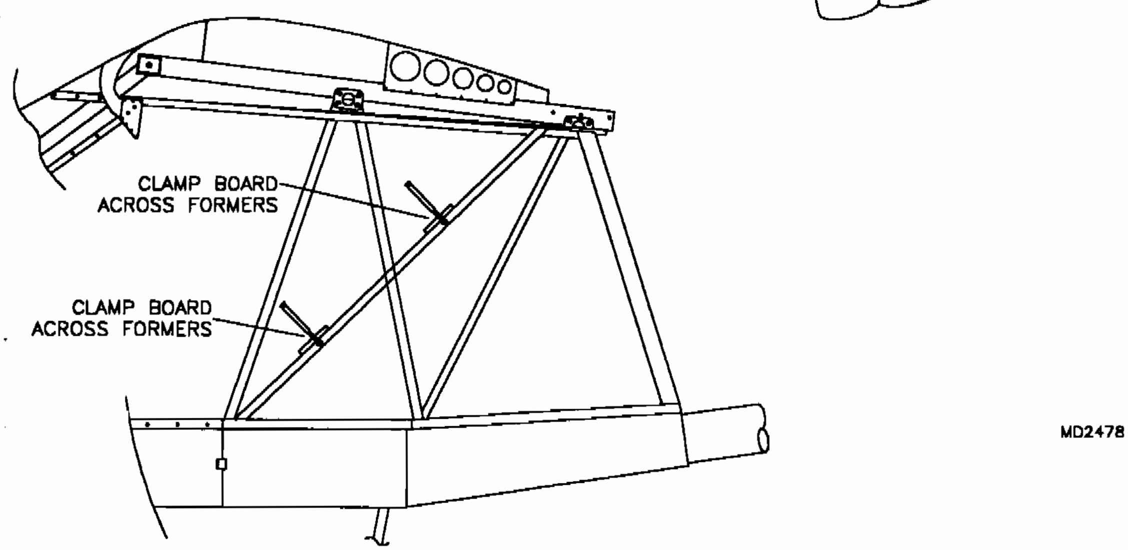
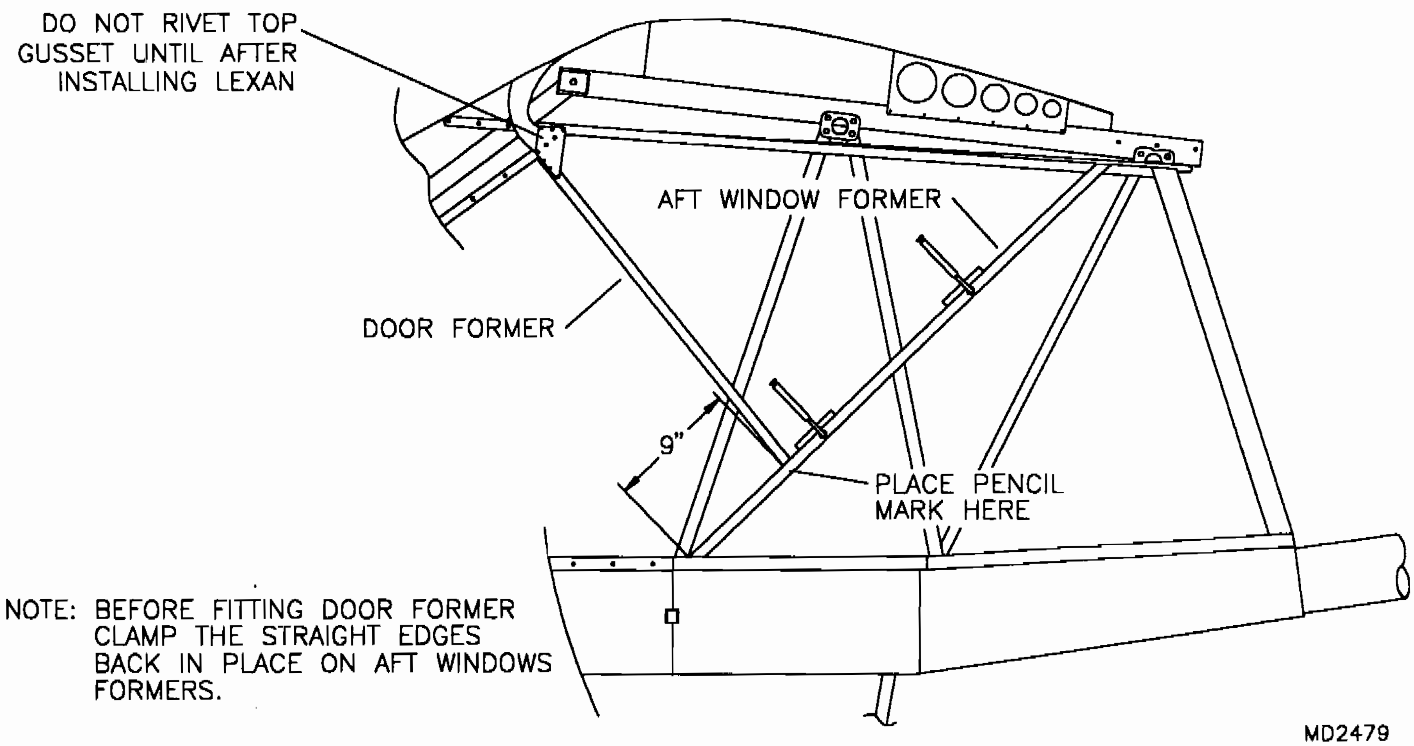


FIGURE 02-04A



5. Locate the door formers shown in the parts manual. There should be a small black mark on one end of the tube to designate the top of the tube. Lay the formers on a flat table top and use a square to mark the centerline of the side of the tube on each end. This centerline should line up with the holes in the gusset already used to connect the top former to the windshield side tube and the gusset that will connect the door former to the aft window former. Mark a line exactly 9" up from belly pan #3's former on the aft window former. This will be the forward edge of the door former tube. See **Figure 02-05.** Before fitting door former clamp the straight edges back in place on aft window formers.

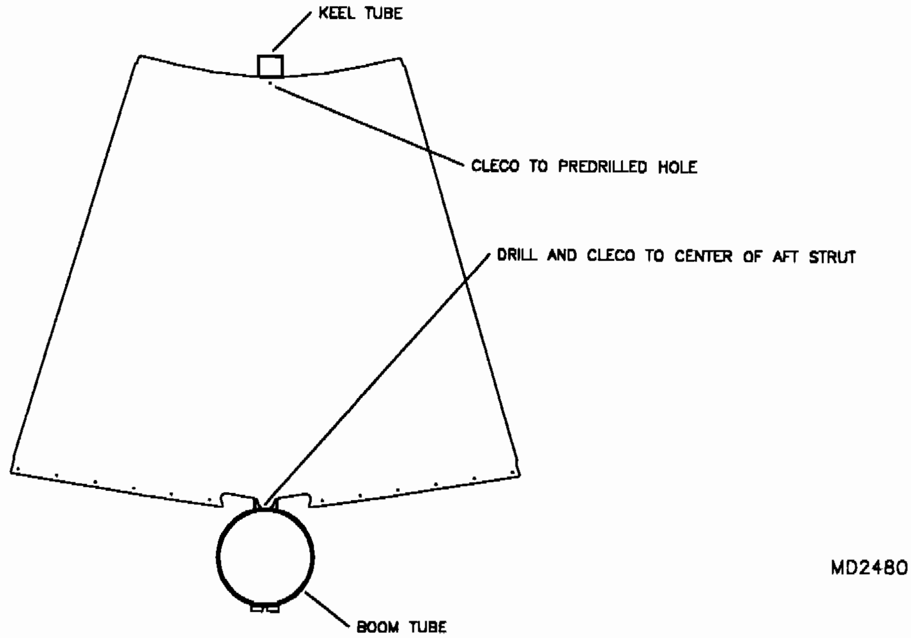
FIGURE 02-05



6. Hold door former in place with the marked centerline in line with the top gusset holes and the bottom of tube at the 9" pencil mark. Mark and cut tube as required to fit. If desired, leave each end of tube about 1/4" long and file a cup to rest neatly around each tube. Once tube is fit into place drill one of the holes in the top gusset and cleco. Refer to parts list for the correct gusset to connect the lower end of the door former to the aft window former. Line gusset up with the marked centerline on the door former and centerline of aft window former. Drill and cleco one hole in each tube. Double check alignment of gusset and top and bottom of former. When satisfied with fit; size drill all holes, debur, and rivet the inside gussets.

7. Set the aft enclosure in place. Cleco the center hole on top of the aft enclosure into the pre-drilled center hole in the top former-aft. Drill and cleco lower center hole in the center of the aft strut. See **Figure 02-07.** Pull each edge of the panel into place, keeping the pre-drilled holes centered along the top former. Pull tight and drill #40 into the top former-aft using the aft enclosure as a guide. Work from the aft strut forward. Cleco each hole during the drilling process. Holes will eventually be drilled out to #30. Any aluminum which extends above the top former when the panel is in place should be trimmed flush with the top former. Mark a line along the bottom of the top former-aft and the top of #4 belly pan formers. This will establish the location of the sound proofing which will be glued to the inside of the enclosure in a later step.

FIGURE 02-07



8. Locate the upper panels shown in the parts manual. These parts are pre-shaped to match the curvature of the full enclosure. Make sure to orientate upper panels correctly. Hold upper panel in place as shown in **Figure 02-08.** Apply masking tape along aft window former and the vertical seam between the upper panel and the aft enclosure. Along the bottom of the upper panel count forward, starting with the aft hole, seven holes. This hole should locate at the overlap of #3 and #4 belly pans. Drill #40 and cleco once the panel is correctly located. See **Figure 02-08A.** Work forward and aft from this seventh hole. Push down tightly and pull on panel while drilling to avoid any bulging between upper panel and the belly pan. Make sure that the upper panel and the aft enclosure are taped together properly and that the pre-drilled holes along aft window former stay on centerline. The panel may want to drift slightly as holes are drilled. If any small "puckers" are left between rivets, add extra rivets to pull upper panel tight.

9. With the upper panel clecoed in place along the bottom seam and forward edge of panel still taped to the aft window former, drill #40 and cleco along the aft seam between the upper panel and the aft enclosure. Start from the bottom and move upward. Cleco in place after each hole. If any "puckers" are left in between locations once all holes have been located, add a hole between the existing rivets. **DO NOT** drill holes along aft window former. These will be drilled out only after aft window has been inserted. After panel is located, place a mark along the inside perimeter of the panel using a marker. Mark along bottom of top former, the inside flange of the aft enclosure, the top side of belly pan formers, and the aft edge of the aft window former. This will be used to reference the location of the sound proofing. Drill all holes in upper panel and aft enclosure out to #30. Remember, **DO NOT** drill holes along aft window former. The holes in the aft window former will be drilled once the lexan is set in place. Remove panels and debur holes. Test fit sound proofing to make sure it will fit inside marker lines. Prep aluminum surface with 80 grit sandpaper and wipe down with acetone before gluing. Use a quality contact cement to glue sound proofing onto panels. If the sound proofing pieces appear oversized, it is possible to draw the material into position; likewise, it is possible to stretch the pieces to reach the marker lines if they appear undersized. Glue rubber edging to inside vertical flange on aft enclosure. Re-install all panels. Follow the sequence to rivet panels into place that was described during drilling of panels.

FIGURE 02-08

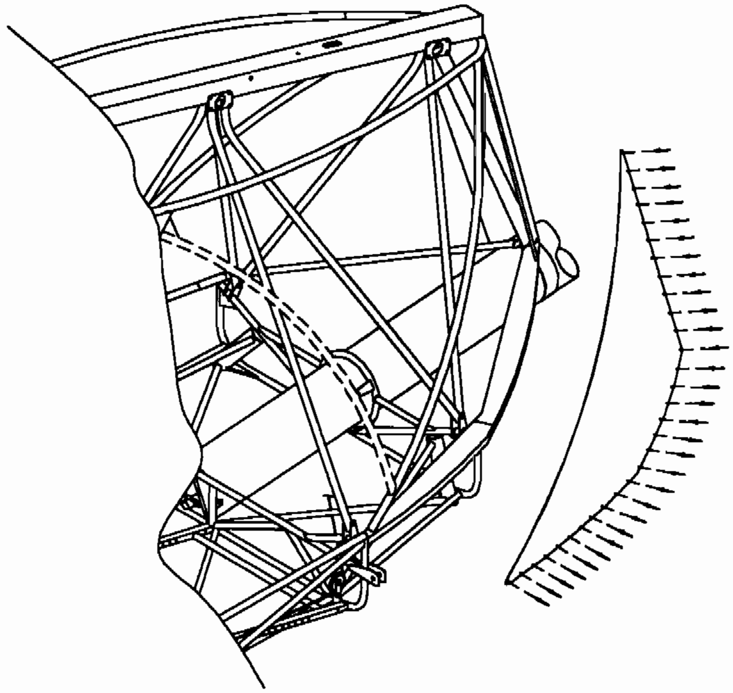
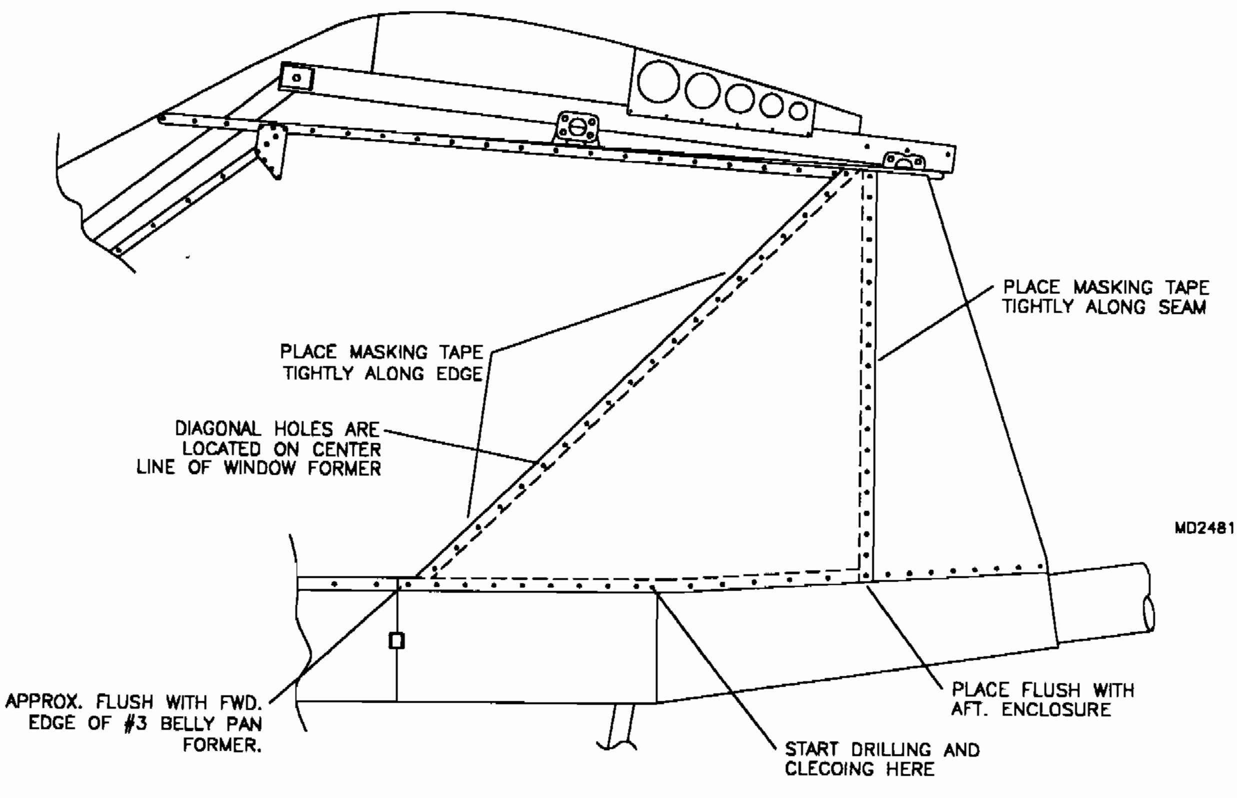


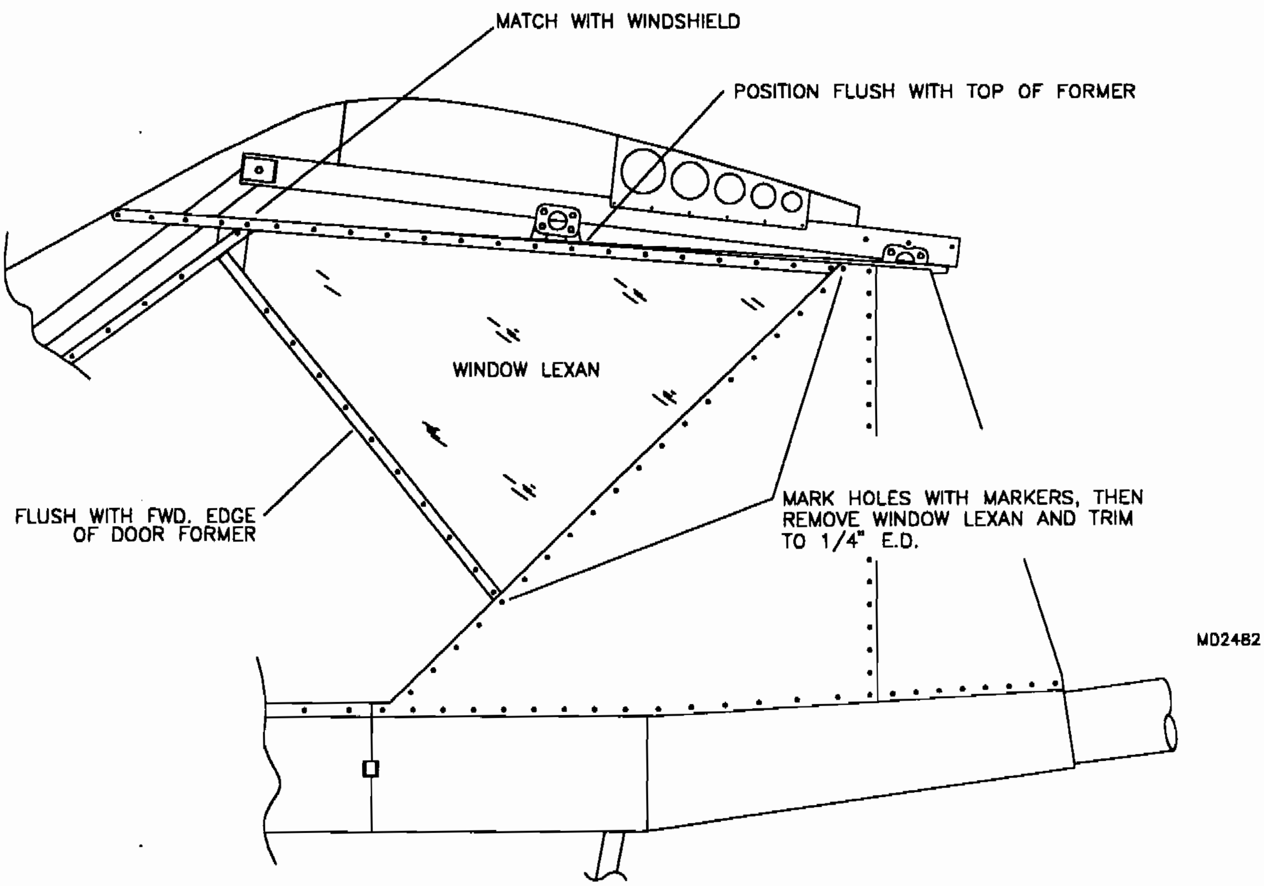
FIGURE 02-08A



- With all of the aluminum panels permanently installed it is a good time to do any exterior painting of the fuselage. However, prior to painting, pre-fit the aft windows. Remove aft windows, mask, and paint.

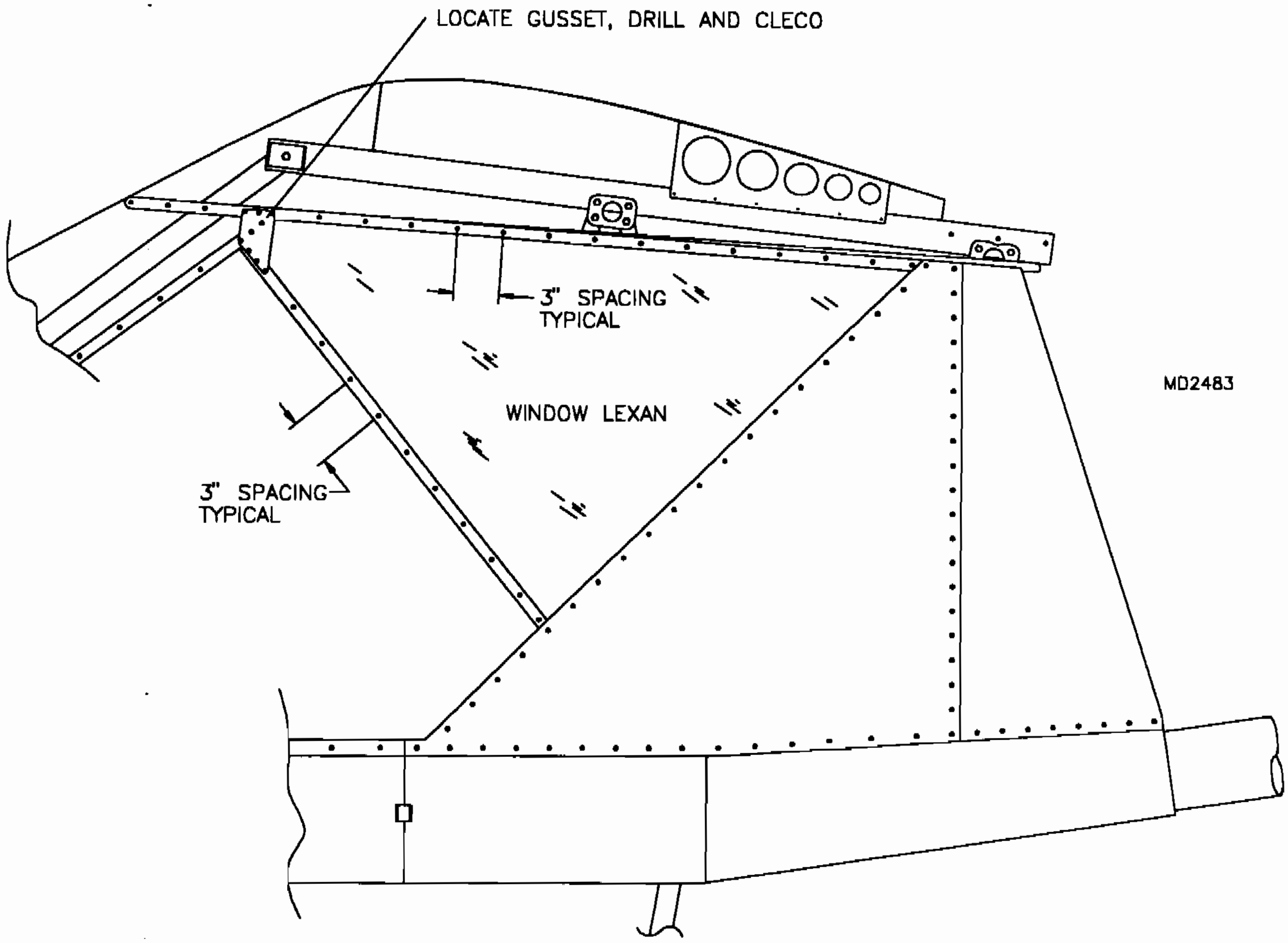
10. Locate aft windows. Slip window in position under upper panels. Align window to be flush with forward edge of the door former tube. Top of window should line up flush with the top of the top formers at the aft most point and mate with the windshield at forward point (Re-install windshield if it has been removed). Once satisfied with fit, use a marker to mark hole locations along aft window former using the upper panel as a guide. Remove pattern and trim aft edge of window leaving 1/4" aft of marker dots. See **Figure 02-10.** Re-install window and tape in place along top former and door former. Drill out all holes along aft edge of window first. Start from the approximate middle of the former and work in both directions (cleco during the drilling process). Remember if you have not painted yet, you may want to do so before permanently installing aft windows. Press down firmly in between holes in order to fit panel as tight as possible. It is normal to have a slight amount of bulging between rivet holes which can be hidden nicely with a small silicone bead after window has been riveted in place.

FIGURE 02-10



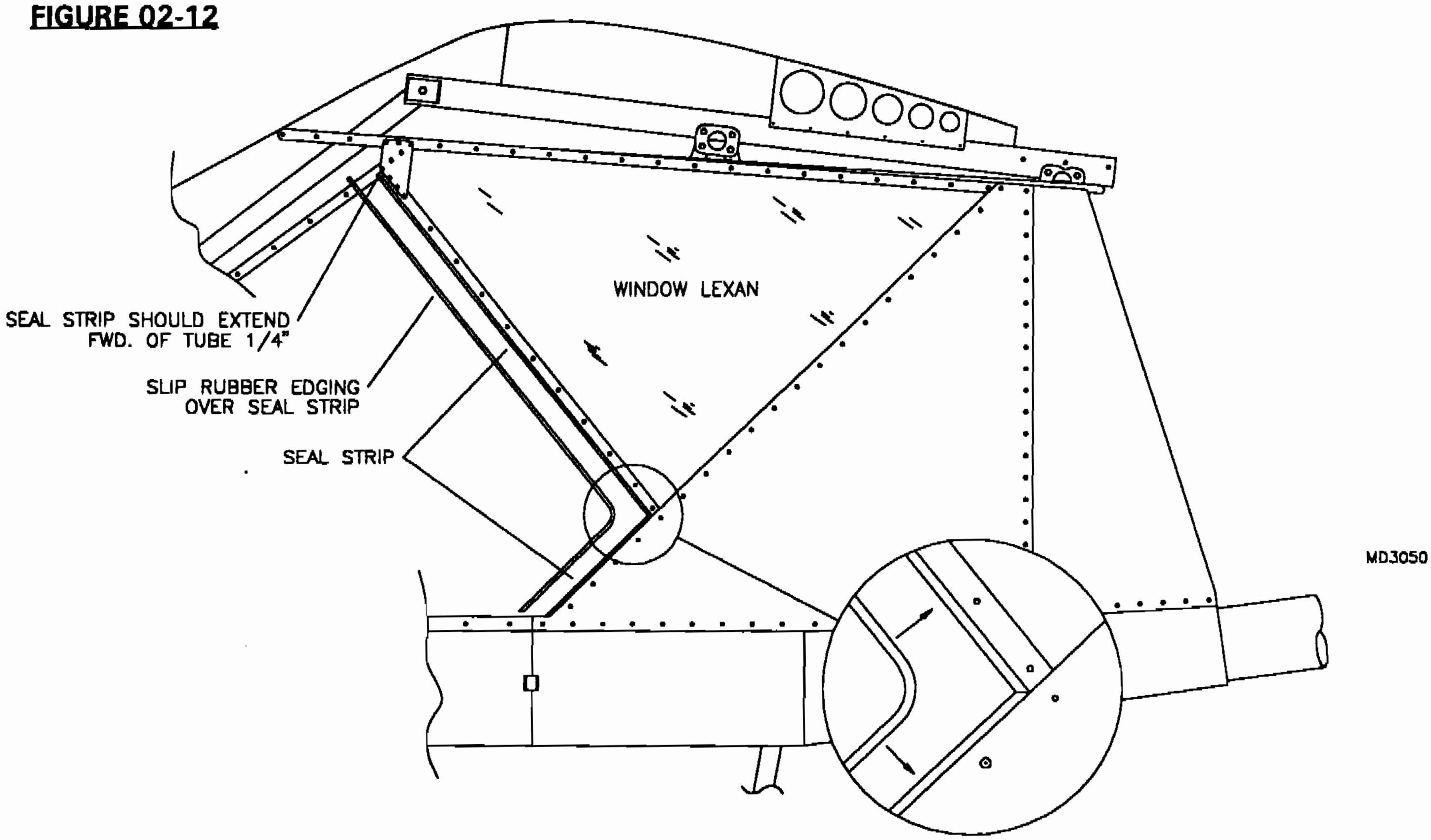
11. Re-install outside forward gusset on windshield, transfer drill through gusset into aft window and door former. Layout approximately 3" rivet spacing along top former and door former as shown in **Figure 02-11.** Drill and cleco in place.

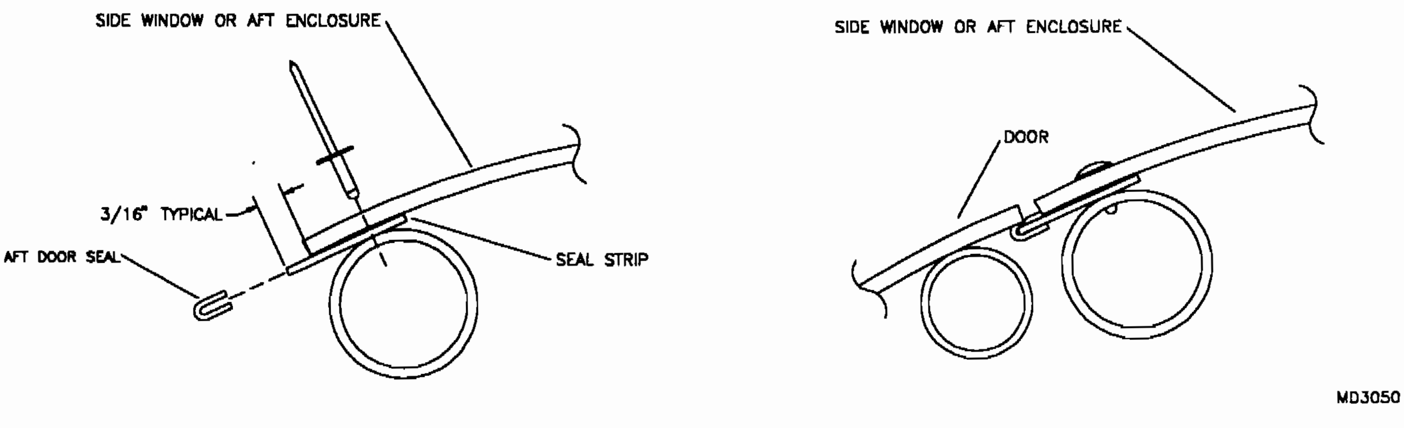
FIGURE 02-11



12. Locate the seal strips. These strips will need to be cut to underlay the aft window along the door former and the upper panel along the aft window former. Fit these in place so they protrude 1/4" on each spot. Transfer drill through existing holes. See **Figure 02-12.** Once final riveted, glue small rubber edging to these strips. These strips seal the aft edge of the door.

FIGURE 02-12





13. Verify that all holes in the aft window have been drilled #30. Remove aft window. Drill all holes in lexan out to #28. Debur thoroughly. Debur formers and seal strips. Paint seal strips and gussets if desired. Re-install aft window and rivet in place using the same sequence used to drill.

FULL DOOR ASSEMBLY

- Windshield should be completely installed for proper fit and installation of door assembly.

1. Locate the parts shown in the parts manual.

2. Select the two formed hinge parts and the stainless steel hinge pin. Cut the formed hinge on a bandsaw as shown in **Figure 02-02.** Cut six equal lengths of hinge pin 3" long. Form the end of the pin in a vise as shown in **Figure 02-02A.** Layout and drill each hinge half as shown in **Figure 02-02B. Notice:** Hole locations are different for the formed hinge halves. Be sure to correctly locate holes as shown. Radius all corners and debur. Install hinge pins to join the six hinges as shown in **Figure 02-02A.**

FIGURE 02-02

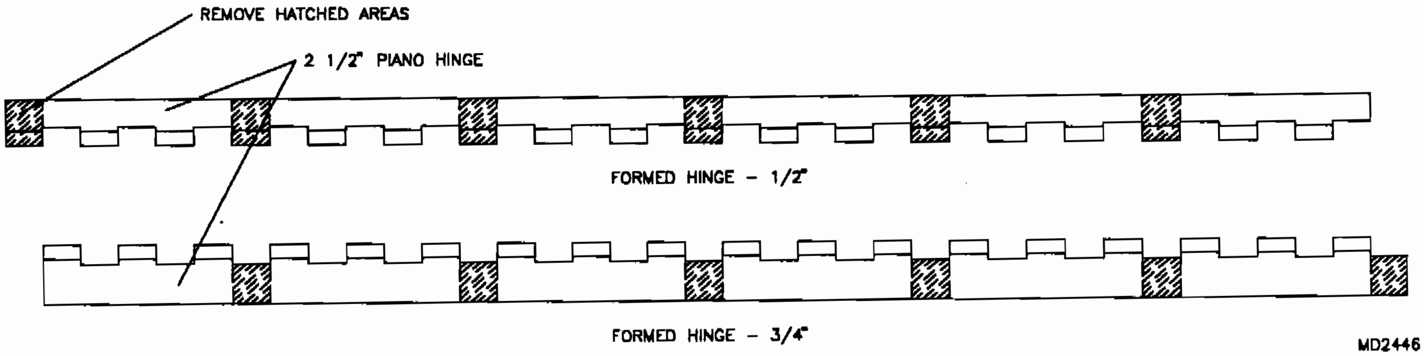


FIGURE 02-02A

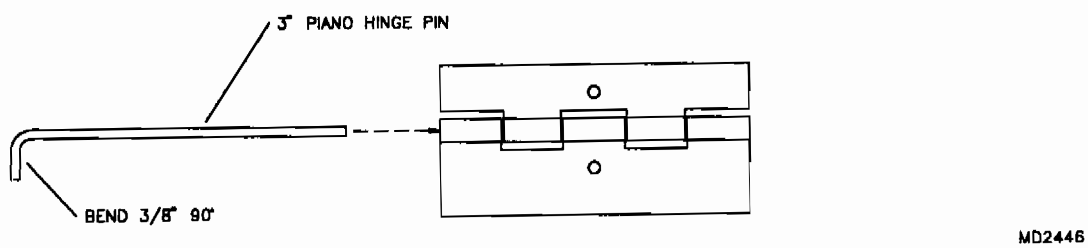
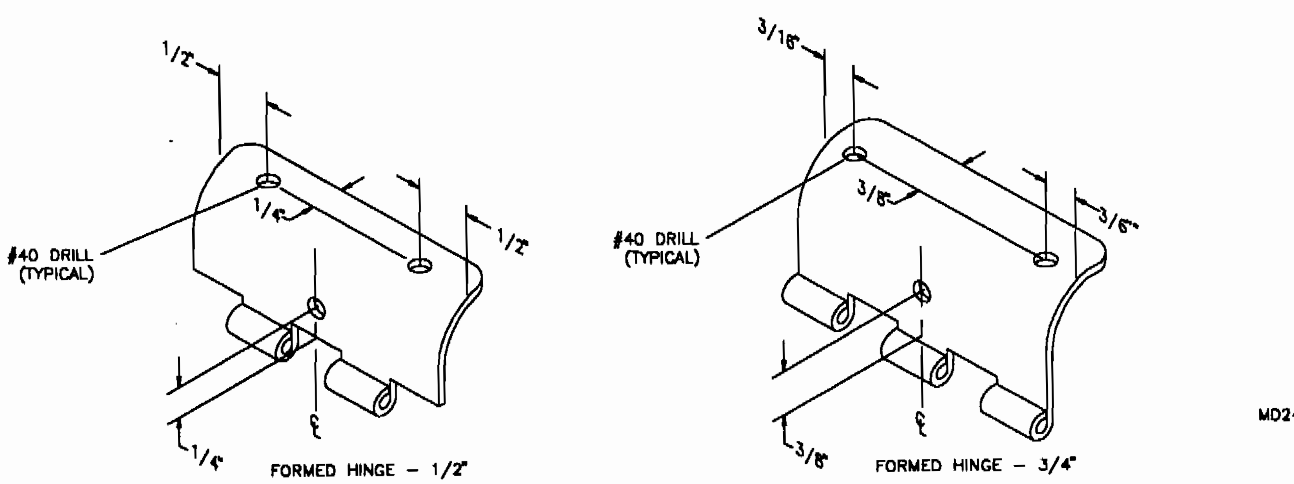


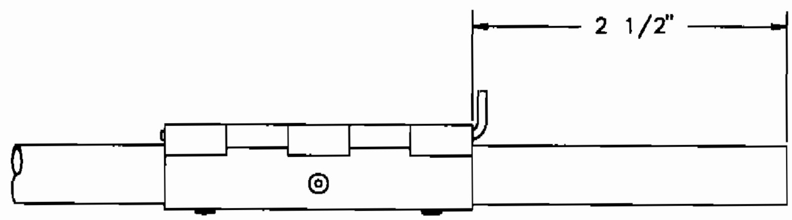
FIGURE 02-02B



09X020FE.

3. Locate the door hinge tubes. Measure down 2 ½" from one end on each tube. Attach one hinge set at this point by drilling through holes located in earlier step. See **Figure 02-03.** This will be the top hinge point on each door. Make sure to orientate these to be a left and a right door. After drilling, debur and rivet in place.

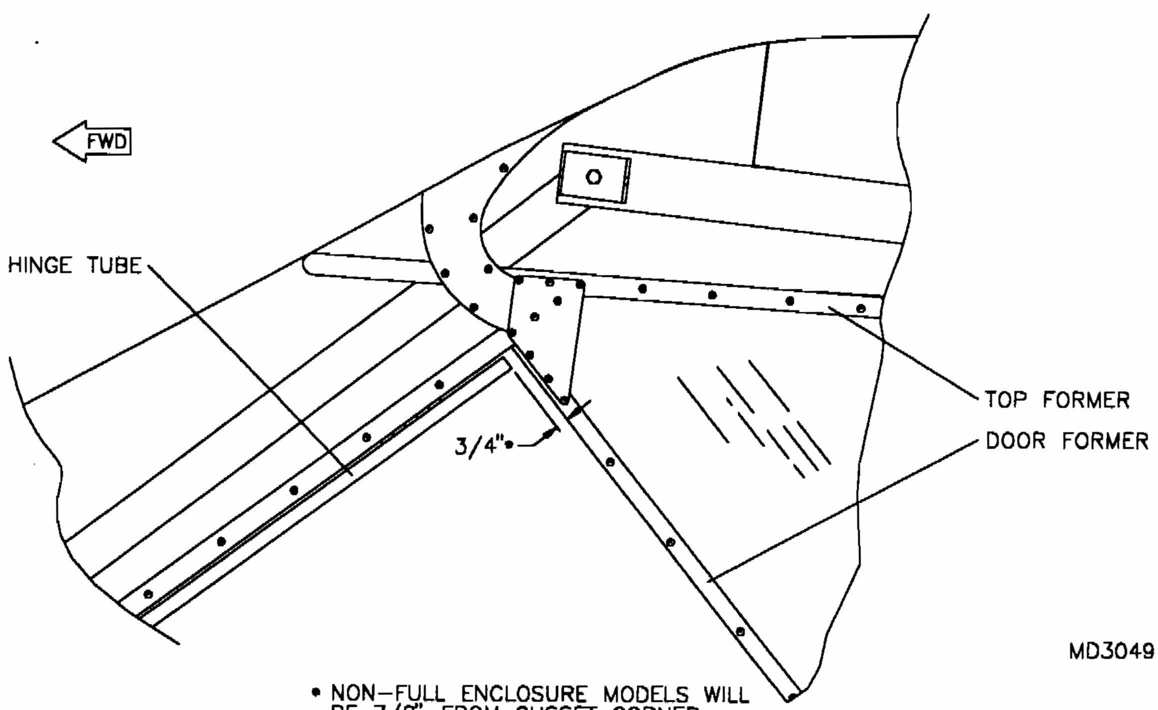
FIGURE 02-03



MD3049

4. Temporarily tape a scrap of lexan in place on hinge tube, tightly against the hinge. Clip 3/4" formed hinge section onto windshield side tube 3/4" down from the intersection of the windshield side tube and the door former. See **Figure 02-04.** If not installing a full enclosure, this will be approximately 7/8" down from the bottom of the top gusset. Using a scrap block of wood, rotate hinge around the 3/4" tube until the two surfaces of lexan align with each other. See **Figure 02-04A.** Transfer drill through #40 holes using a #30 drill bit. Cleco in place and check fit. Once the top hinge has been located, use masking tape to hold hinge in the closed position.

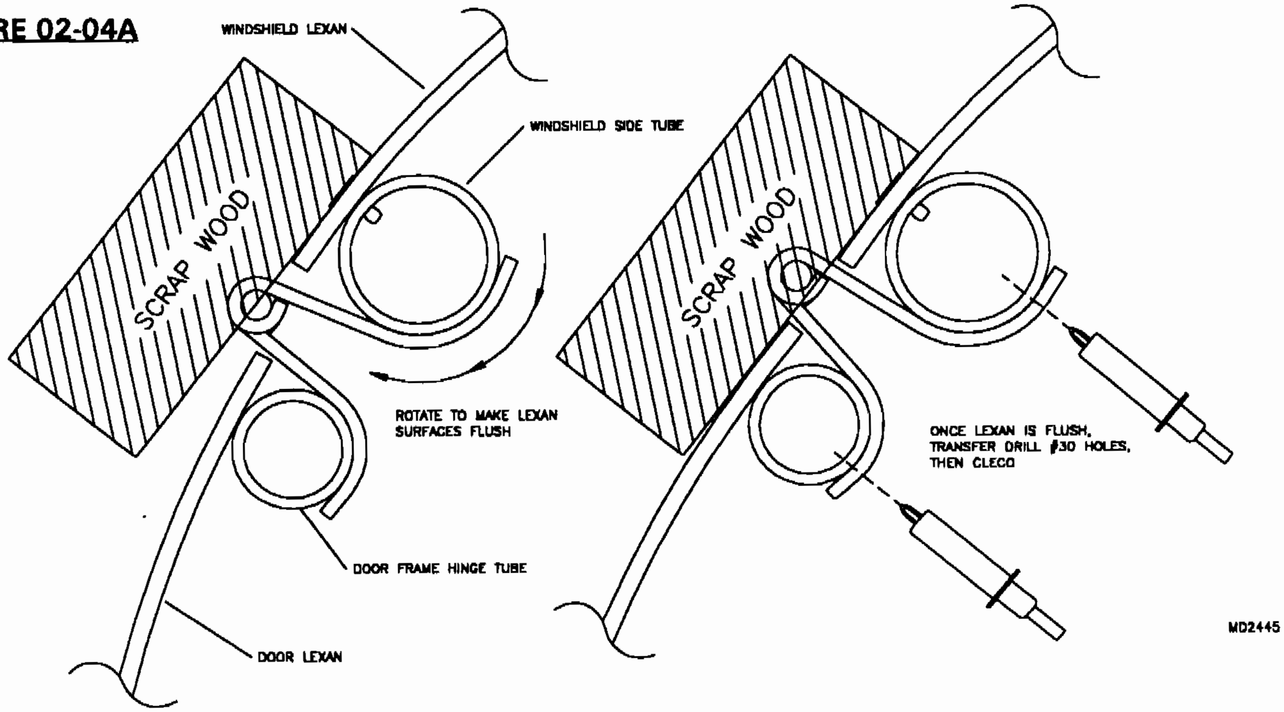
FIGURE 02-04



MD3049

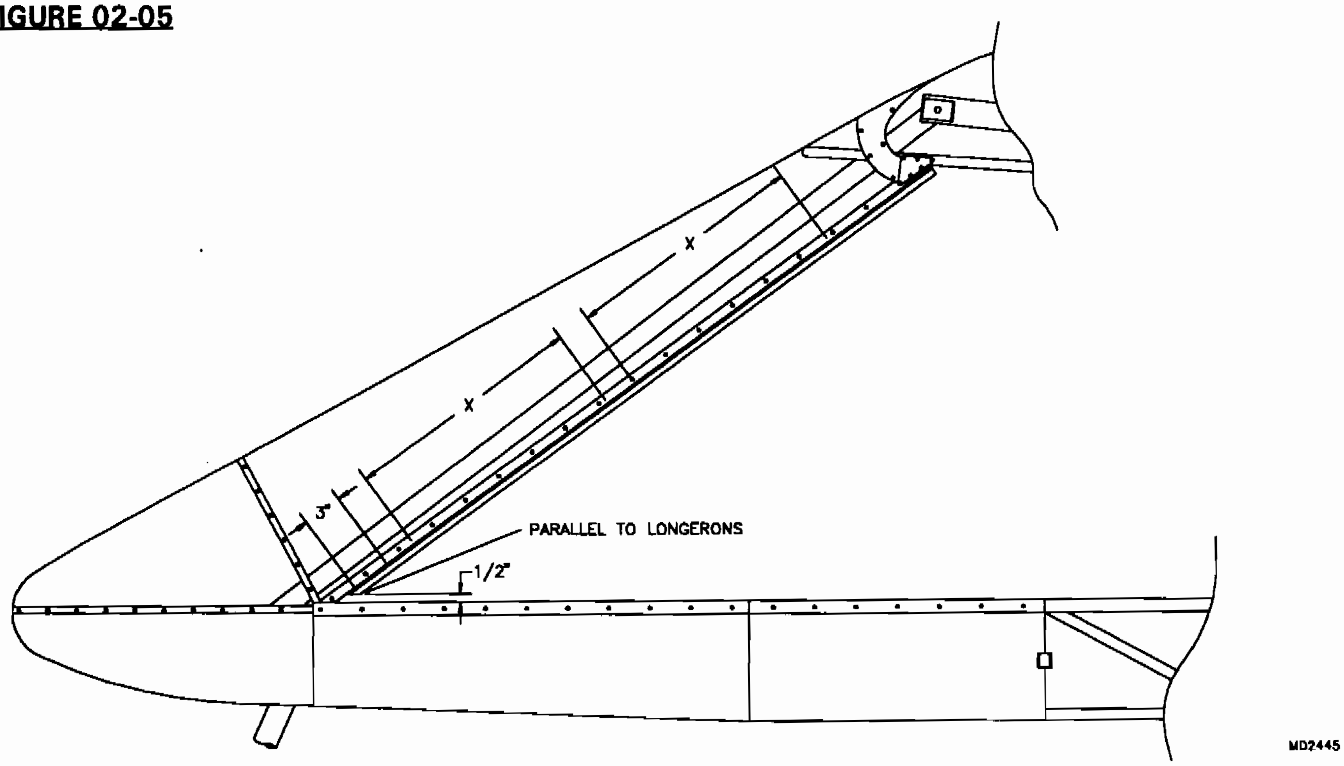
• NON-FULL ENCLOSURE MODELS WILL BE 7/8" FROM GUSSET CORNER

FIGURE 02-04A



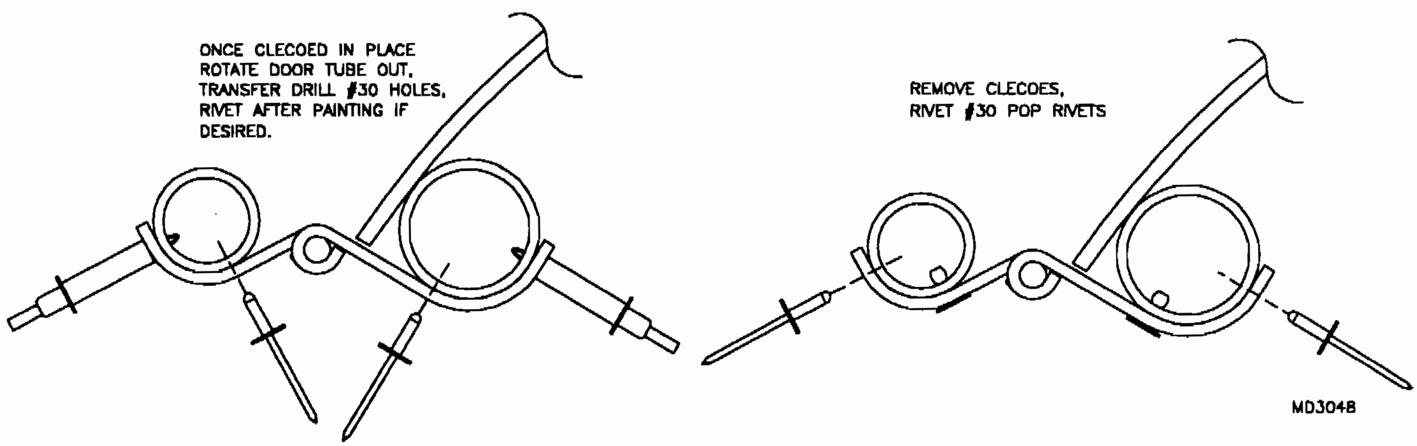
5. Mark and cut the lower end of the hinge tube as shown. See **Figure 02-05.** After cutting, measure up from the bottom of the tube approximately 3" and mark the location. This is the bottom point of the lower hinge. Tape hinge in place. Center the third hinge in between the upper and lower hinges and tape in place. Using the same scrap of lexan and small wood block, rotate each hinge to align with windshield. Transfer drill all exposed holes to #30 and cleco in place.

FIGURE 02-05



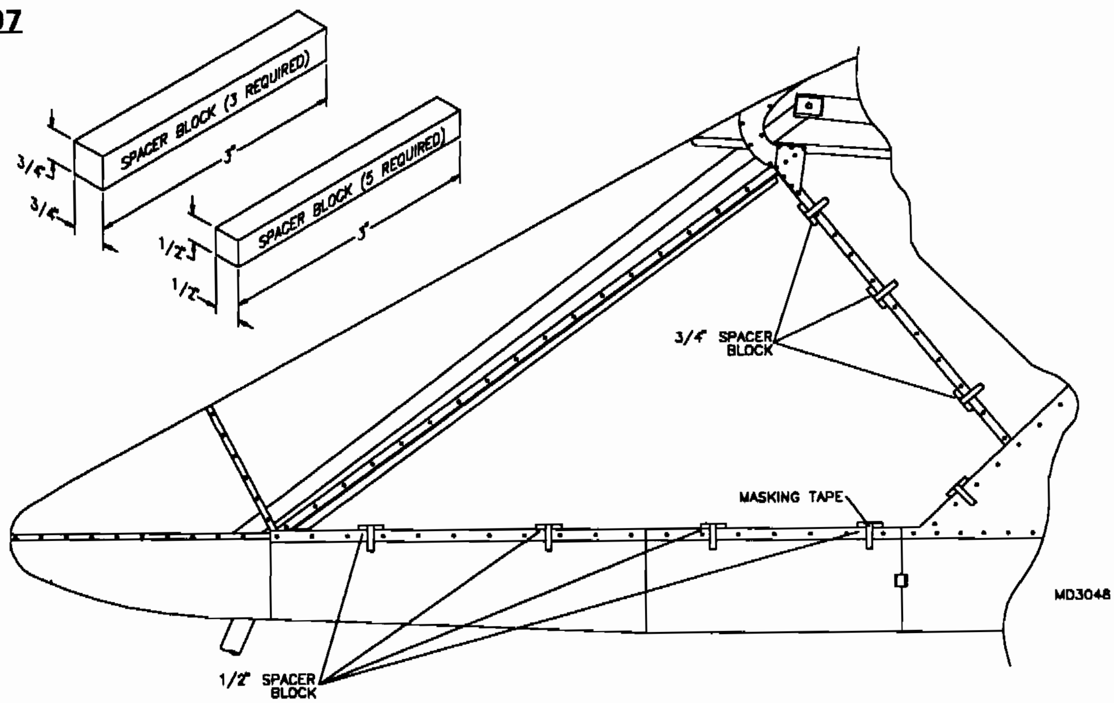
6. After all exposed holes are drilled, open the hinges and drill the inside holes. See **Figure 02-06.** Remove hinges and debur all holes. Paint or powder coat hinges at this time. Re-install and rivet hinges in place.

FIGURE 02-06



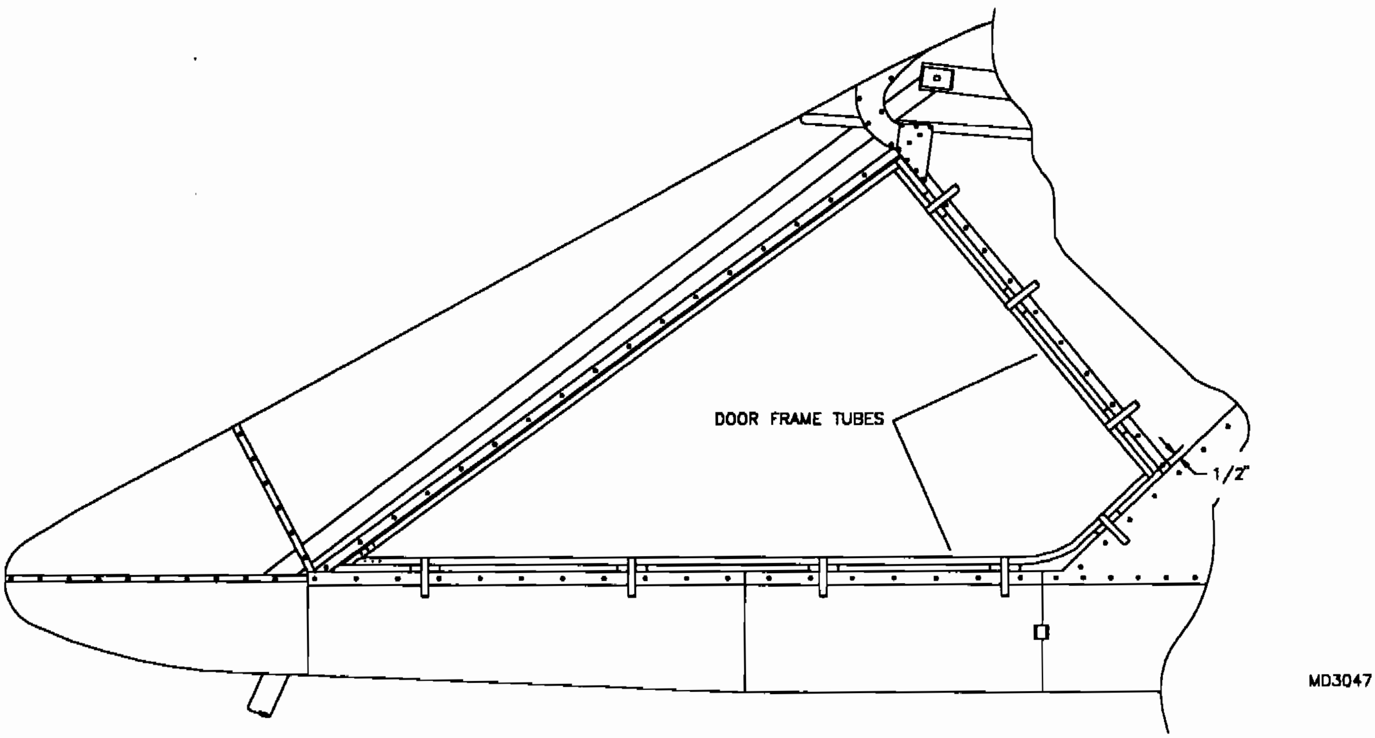
7. Cut five spacer blocks out of ½" plywood and three out of 3/4" plywood or equivalent material as shown in **Figure 02-07.** These will be used to space the upper and lower frame tubes around the perimeter of the door opening. Tape the spacer blocks along the perimeter of the door opening using masking tape as shown in **Figure 02-07.** .

FIGURE 02-07



8. Fit the upper and lower frame tubes into position as shown in **Figure 02-08.** "Fish mouth" the ends of the tubes to rest together for a quality look. Tape these in place after cutting and filing to fit.

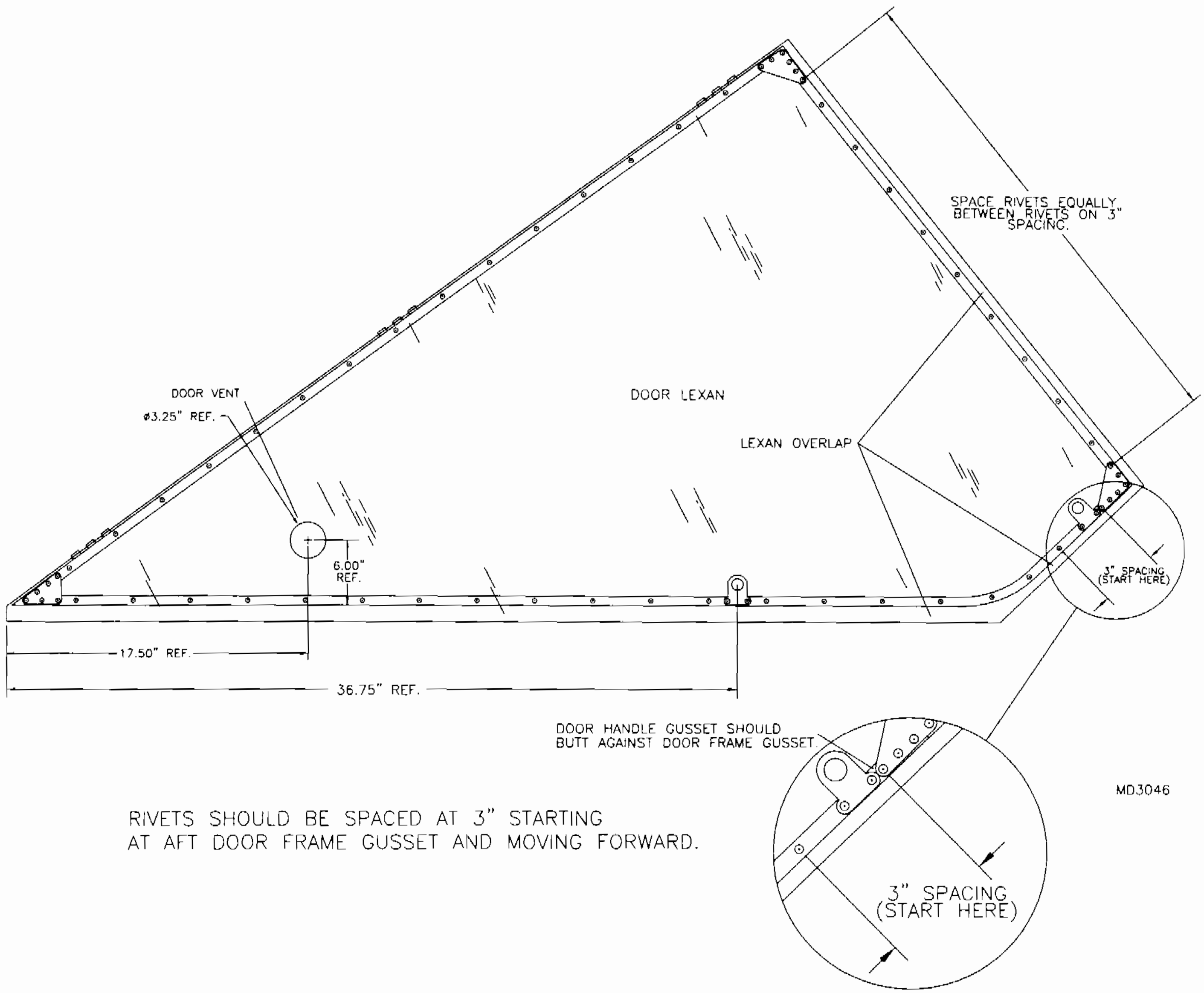
FIGURE 02-08



9. With the frame tubes held into place and flush with the perimeter surface of the door opening, align, drill, and cleco the three outside gussets as shown in the parts manual. With the outside gussets clecoed in place, align the inside gussets, drill, and cleco.

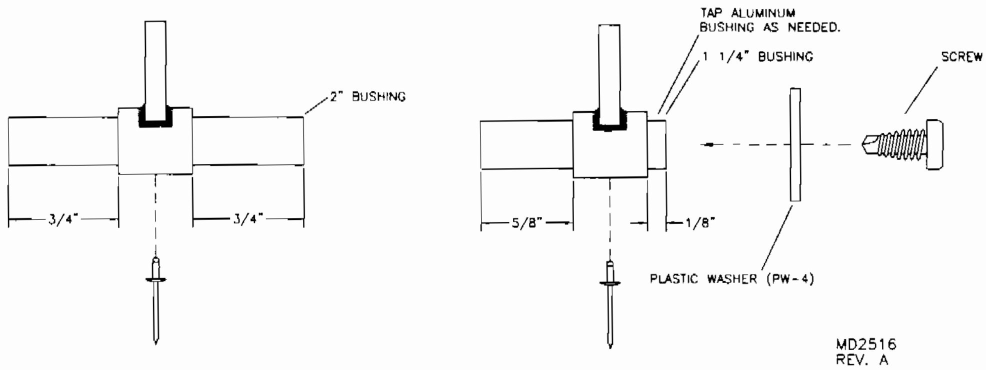
10. Remove the outside gussets. Tape the door lexan in place over the door frame. Mark out the perimeter of the frame with a marker and remove the protective covering in areas over the door frame. Be careful to place the lexan to match with aft window and upper panel or slightly overhang so it can be trimmed to fit later. See **Figure 02-10.** Lexan should fit tight against all three hinges to create an even gap between the door and windshield. If the lexan does not fit correctly, lay a line with masking tape, trim with snips, clean up with a 80 grit sanding block, and re-install. It is best to custom trim the remainder of the door's perimeter after the lexan has been riveted into place. Transfer drill through the lexan at the gussets. Make sure to hold the lexan tight against the frame. Layout hole spacing as shown. Layout and drill door handle gussets as shown at this time. See **Figure 02-10.** Drill all holes #30, remove lexan, and drill holes in lexan out to #28. Debur lexan and aluminum. Re-install and rivet in place using the hardware shown in the parts manual. Trim lexan to have a 1/16" gap along aft window and upper panel **AFTER** door handle hardware has been installed.

FIGURE 02-10



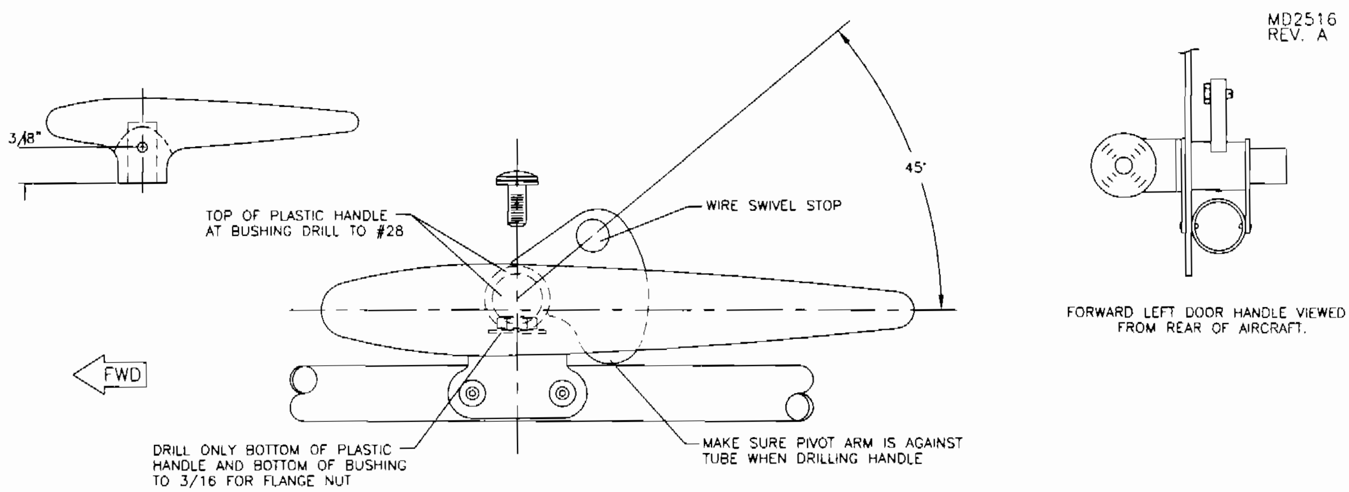
11. Drill Lexan door out to 3/8" using each of the door handle gussets as a guide. Locate door handle bushing. Cut two bushings 2" long and two more 1 1/4" long. Locate the pivot arms. Fabricate the assemblies shown in **Figure 02-11** (two of each).

FIGURE 02-11



12. Use the two previous assemblies to locate the inside door handle gussets on each door handle location. Only cleco gussets in place. Remove gussets and debur all parts. Locate the wire/swivel stop assemblies shown in the parts manual. Install the wire swivel stops into each pivot arm and reinstall the pivot arm assembly into the door. **Warning:** Failure to install the wire swivel stops at this time will require the removal of several rivets later. Please install the wire swivel stops now. See **Figure 02-12.** Install the inside gussets using the hardware shown. Drill each of the plastic door handles as shown in **Figure 02-12.** Install outside set of door handles to the forward door handle assembly. Orientate the handle and pivot arm as shown in **Figure 02-12.** Once satisfied with the angle of the handle and pivot arm, drill through bottom pilot hole #30 and cleco in place. Re-check orientation; if satisfied, carefully drill the top hole in the handle. Be sure not to scar the door Lexan. Remove clecos and carefully drill handle and bushing to #28. Remove handle assembly and drill bottom of plastic handle and bottom of bushing out to 3/16. See **Figure 02-12.** Press flange nut in place. Re-install with correct hardware. Use needle nose pliers to hold flange nut from rotating when tightening button head screw.

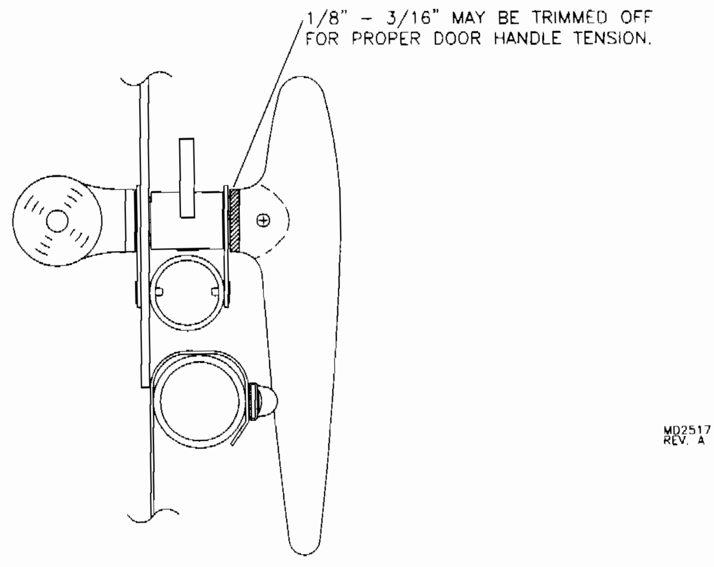
FIGURE 02-12



FWD LEFT HAND DOOR HANDLE
VIEWED FROM OUTSIDE OF AIRCRAFT

13. Install the inner door handle on the forward set of handles. Orientate the inner handle perpendicular to the outside handles. Use the inner handle to hold the rub block in place. It is typical that the inner door handle will need to be trimmed down 1/8" to 3/16" to set the correct tension on the door handle. See **Figure 02-13.** Once satisfied with the tension on the handle, carefully drill in the same sequence as the outside handle and bolt inner handle in place. If more tension is desired after handle has been installed, space rub block out with small washers. Center rub block, with everything in proper orientation. Drill into top longeron of fuselage cage, debur, and rivet in place with proper hardware.

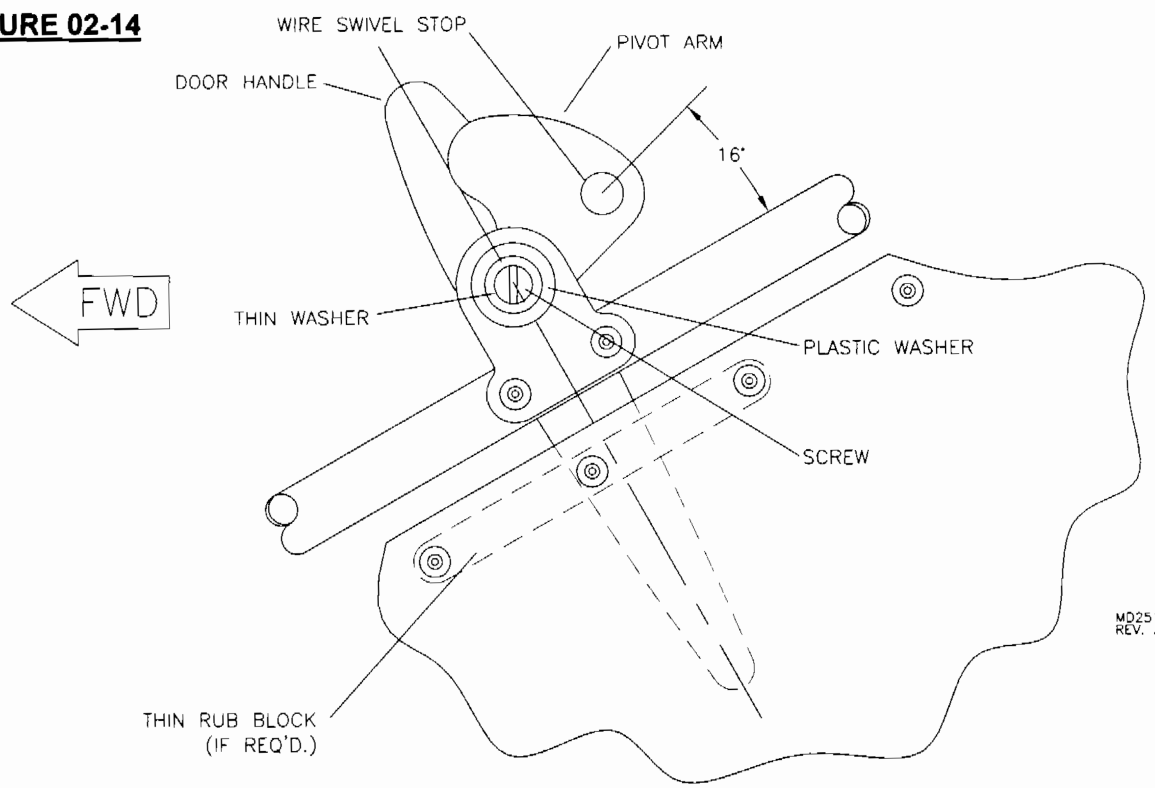
FIGURE 02-13



FORWARD LEFT DOOR HANDLE VIEWED
FROM REAR OF AIRCRAFT.

14. Install inner handle on aft set of handles. It may be necessary to remove a small amount of the handle to ensure that the back edge of the door is pulled in tight when handle swings in place against the aft window former. Once satisfied with the tension of the door orientate pivot arm as shown in **Figure 02-14.** Carefully drill in the same sequence as the forward set of handles then bolt handle in place. If more tension is desired after handle has been riveted in place, fabricate a thin plastic rub block and install on the aft window former or use a heavy duty plastic tape if only minor adjustment is required.

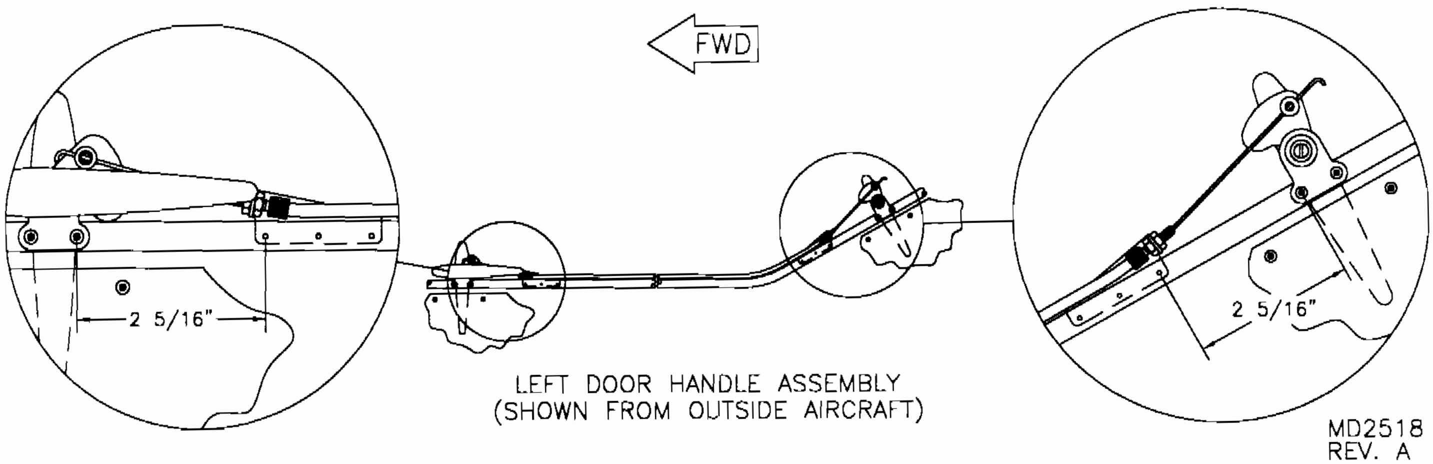
FIGURE 02-14



AFT LEFT HAND DOOR HANDLE
SHOWN FROM OUTSIDE AIRCRAFT

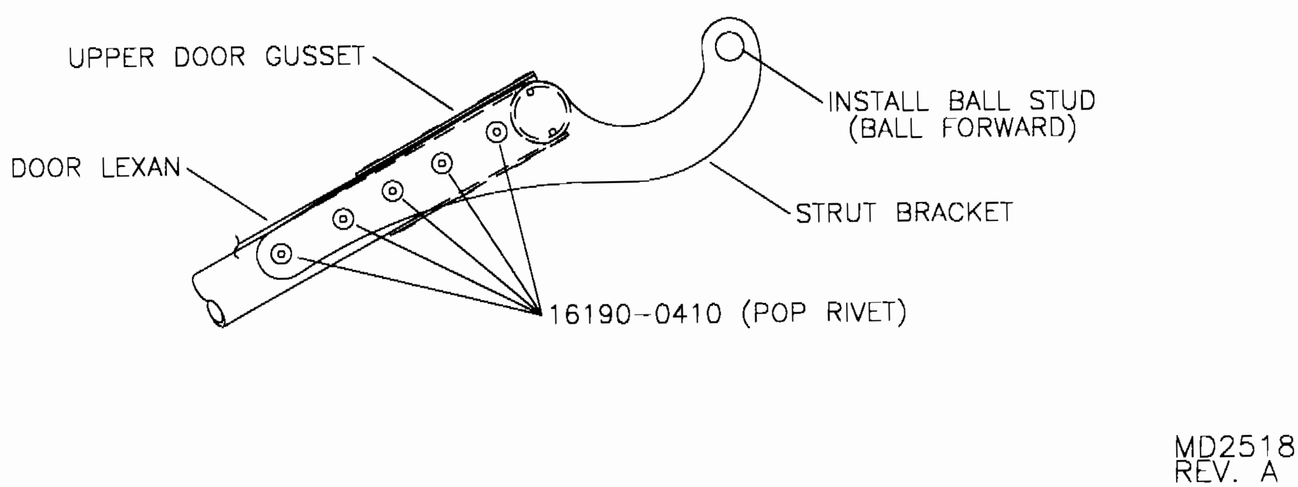
15. At this point both sets of door handles should be installed and when rotated into their latched positions the door should fit tight around the perimeter of its opening. Refer to drawing below and locate the appropriate housing mount bracket as specified. Drill, debur, and rivet these in place. The cable ferrule nut assemblies will need to be drilled out to 1/4" for the link tube to fit. Once drilled, install cable ferrules. The link tube is manufactured slightly long on each end. Determine the best location, mark, trim, and install link tube in place. See **Figure 02-15.** Use the nuts on each ferrule assembly to ensure link tube is locked in place. Cut stainless steel rod to approximate length and install through wire swivel stops and link tube. Close door and orientate both handles in their locked position and tighten wire swivel stops. When satisfied with door handle fit, trim off the excess wire and bend over ends. **Note:** Rubbing the wire against a wax candle can help in making the operation smooth.

FIGURE 02-15



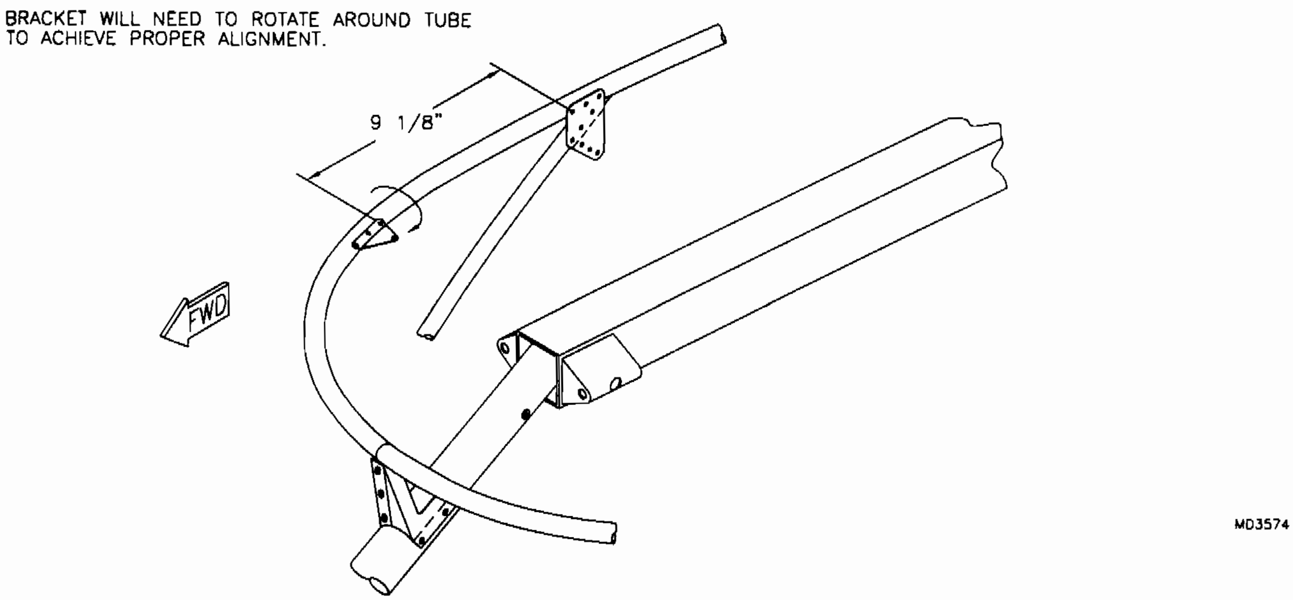
16. Refer to parts drawing and locate all parts and hardware necessary for gas strut installation. Open door fully or remove hinge pins and remove door. Locate lift bracket flush with hinge tube as shown in **Figure 02-16.** Drill, debur, and rivet in place using the rivets shown in the parts manual. Install the ball stud on the lift bracket. Make sure ball is facing forward.

FIGURE 02-16



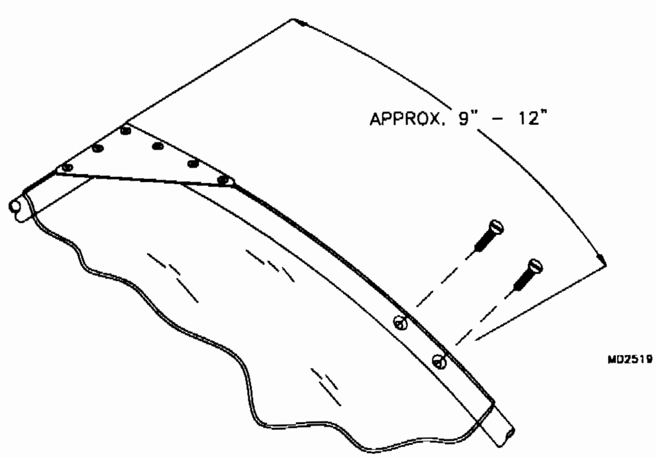
17. Drill bottom hole in each mount bracket for top end of strut to 5/16". Bolt the two brackets together with the ball stud. Make sure ball end is installed aft. Reference forward rivet in the gusset that attaches the top former to the windshield side tube. Measure around the inside of the top former 9 1/8" forward of this rivet. See **Figure 02-17.** The first hole in the top mount bracket should line up at this point. This hole should also be slightly below centerline of the tube for best installation. Note that this dimension if for reference only. **Test the installation first** by attaching gas strut to the door-lift bracket at the mount brackets. Close and latch the door. Fully compress the gas strut (this may require a helper). The strut should be compressed to within 1/4" of its full travel. Once the best location is determined, remove the strut and drill the required holes. Debur and rivet brackets in place with the correct hardware. Open door, install strut, and test operation.

FIGURE 02-17



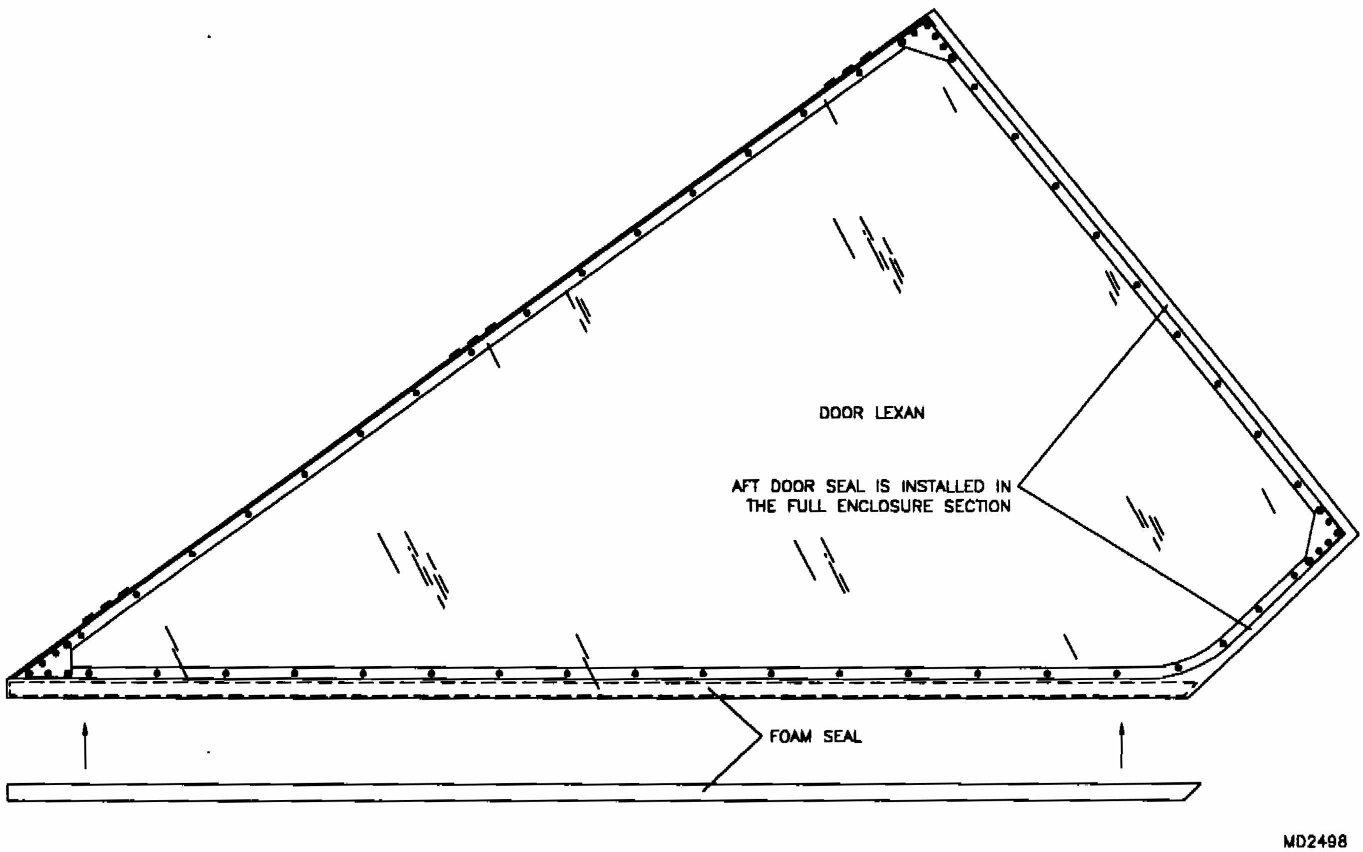
18. Locate upper door handles and hardware. The handle is located between 9" and 12" from the top of the door. See **Figure 02-18.** Locate handle between rivets. Drill #11 through lexan and door frame. Use a 100° countersink bit to carefully countersink holes for a flush mount. Install handle using hardware shown in the parts manual.

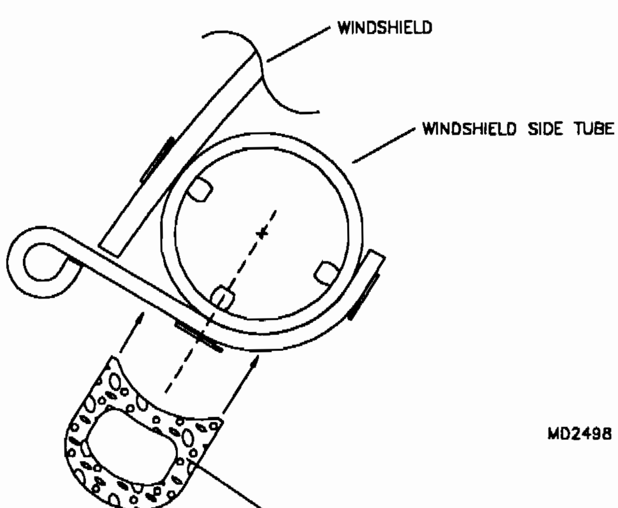
FIGURE 02-18



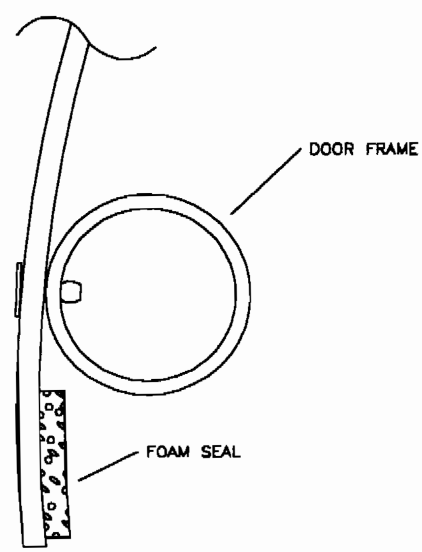
19. Install the foam seals as shown in **Figure 02-19.** Always prep surfaces with isopropyl alcohol before installing seals. **Warning: Do not** use any other type of solvent to clean lexan other than isopropyl alcohol. Other chemicals will most likely "Haze" or fracture the lexan.

FIGURE 02-19





UPPER DOOR SEAL



LOWER DOOR SEAL

HALF DOOR ASSEMBLY

- Windshield should be completely installed for proper fit and installation of door assembly. If installing half doors onto a fully enclosed aircraft, the top corner of the door frame and lexan will have to be trimmed to fit door opening. Pay careful attention to notes dealing with this.

1. Locate the parts shown in the parts manual.

2. Select the two formed hinge parts and the stainless steel hinge pin. Cut the formed hinge on a bandsaw as shown in **Figure 02-02.** Cut six equal lengths of hinge pin 3" long. Form the end of the pin in a vise as shown in **Figure 02-02A.** Layout and drill each hinge half as shown in **Figure 02-02B. Notice:** Hole locations are different for the formed hinge halves. Be sure to correctly locate holes as shown. Radius all corners and debur. Install hinge pins to join the six hinges as shown in **Figure 02-02A.**

FIGURE 02-02

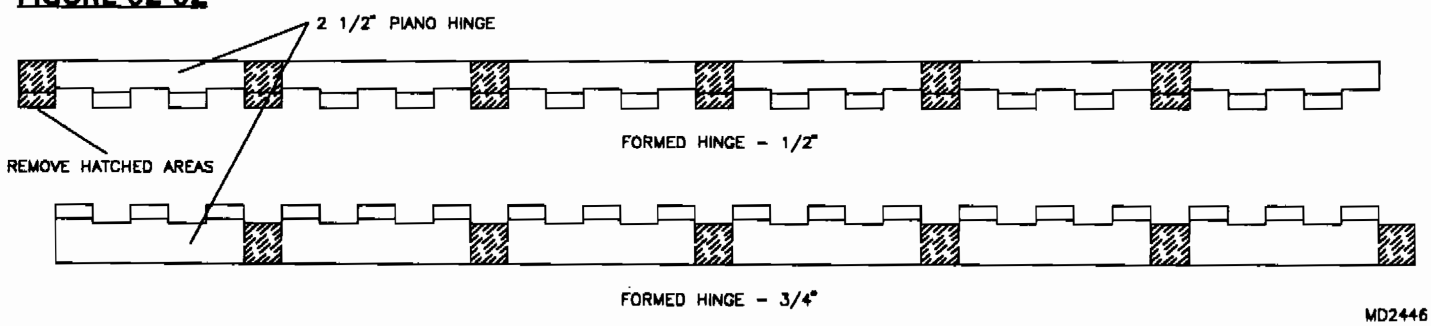


FIGURE 02-02A

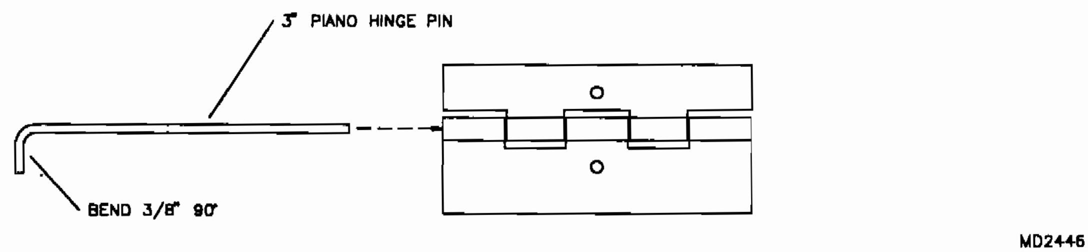
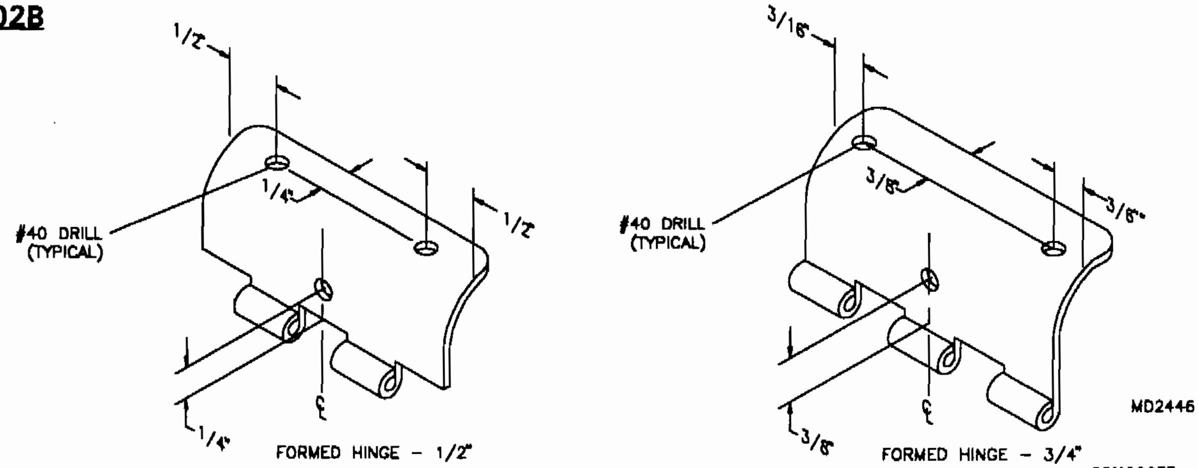


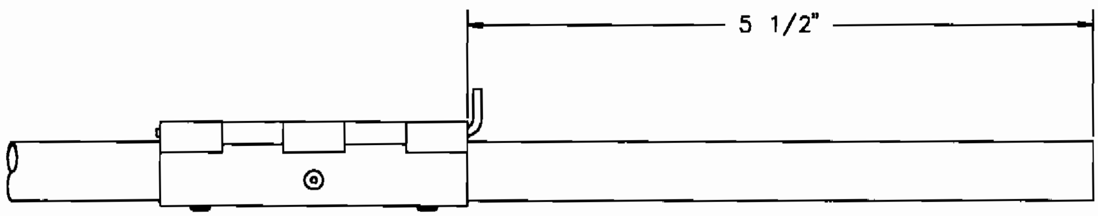
FIGURE 02-02B



09X020FE.

3. Locate the door hinge tubes. Measure down 5 ½" from one end on each tube. Attach one hinge set at this point by drilling through holes located in earlier step. See **Figure 02-03.** This will be the top hinge point on each door. Make sure to orientate these to be a left and a right door. After drilling, debur and rivet in place.

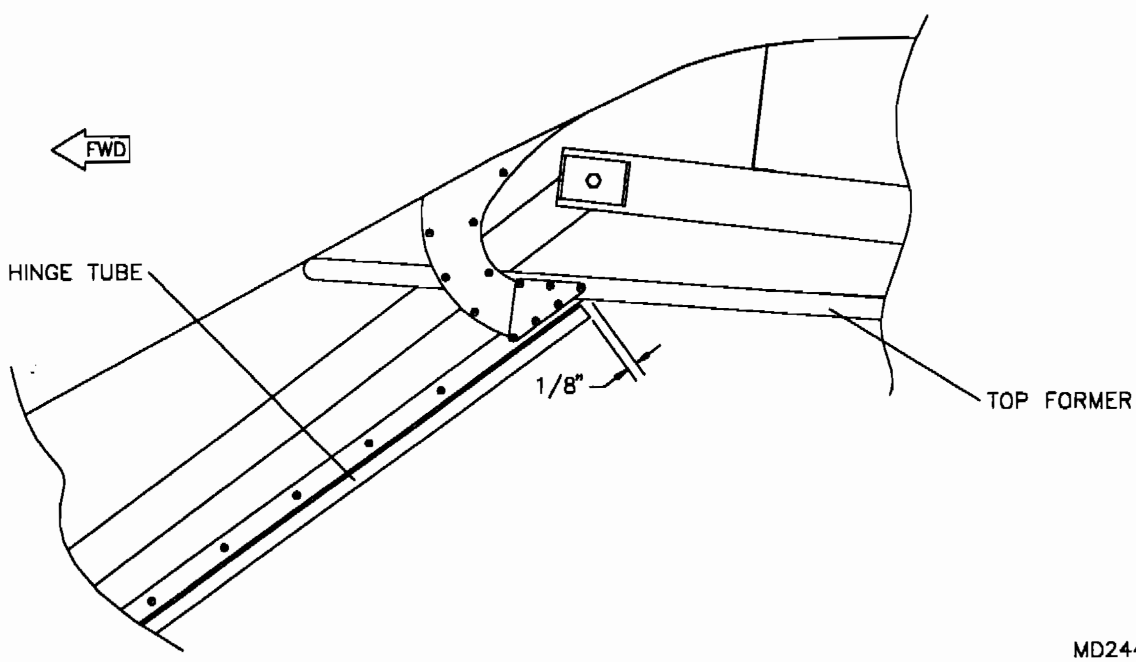
FIGURE 02-03



MD2448

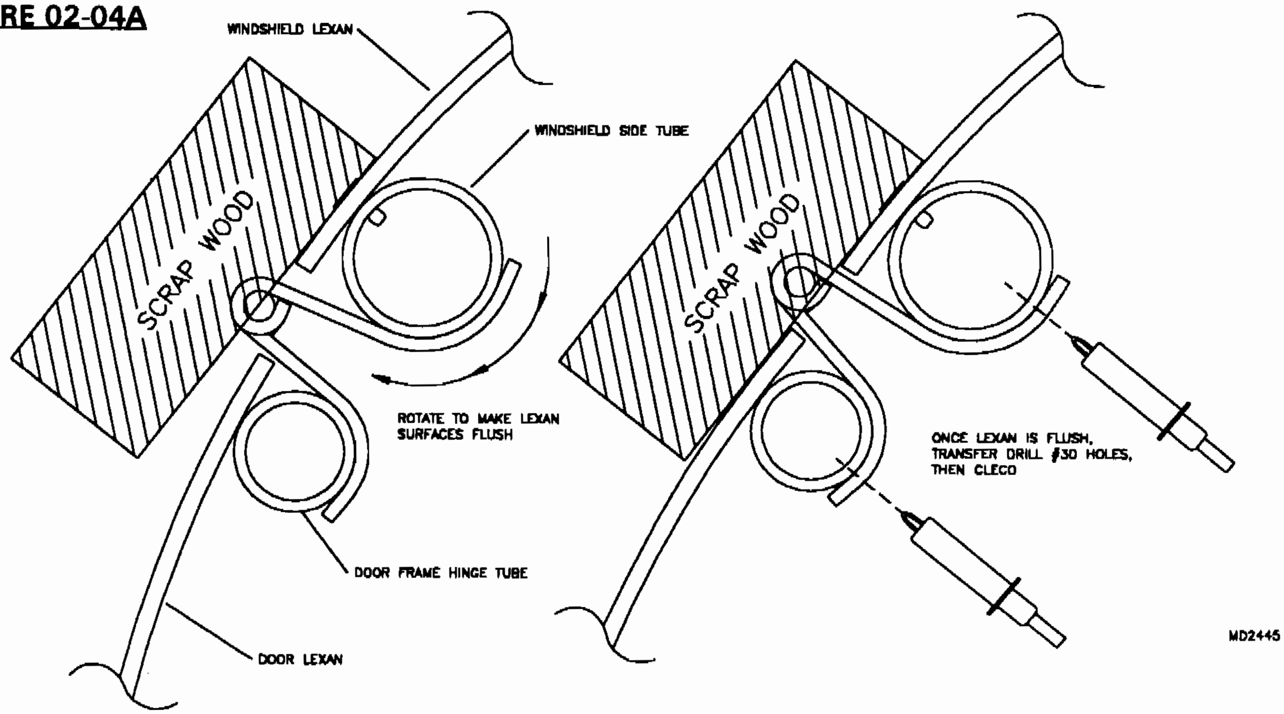
4. Temporarily tape a scrap of lexan in place on the hinge tube tightly against the hinge. Clip 3/4" formed hinge section onto windshield side tube leaving approximately 1/8" gap at top as shown in **Figure 02-04.** If installing half doors onto a full enclosure, cut the hinge tube to have an 1/8" clearance on the top of the door opening. Use the existing top hinge point established during full door assembly. Using a scrap block of wood, rotate hinge around 3/4" tube until the two surfaces of lexan align with each other. See **Figure 02-04A.** Transfer drill through #40 holes using a #30 drill bit. Cleco in place and check fit. Once the top hinge has been located, use masking tape to hold the hinge in the closed position.

FIGURE 02-04



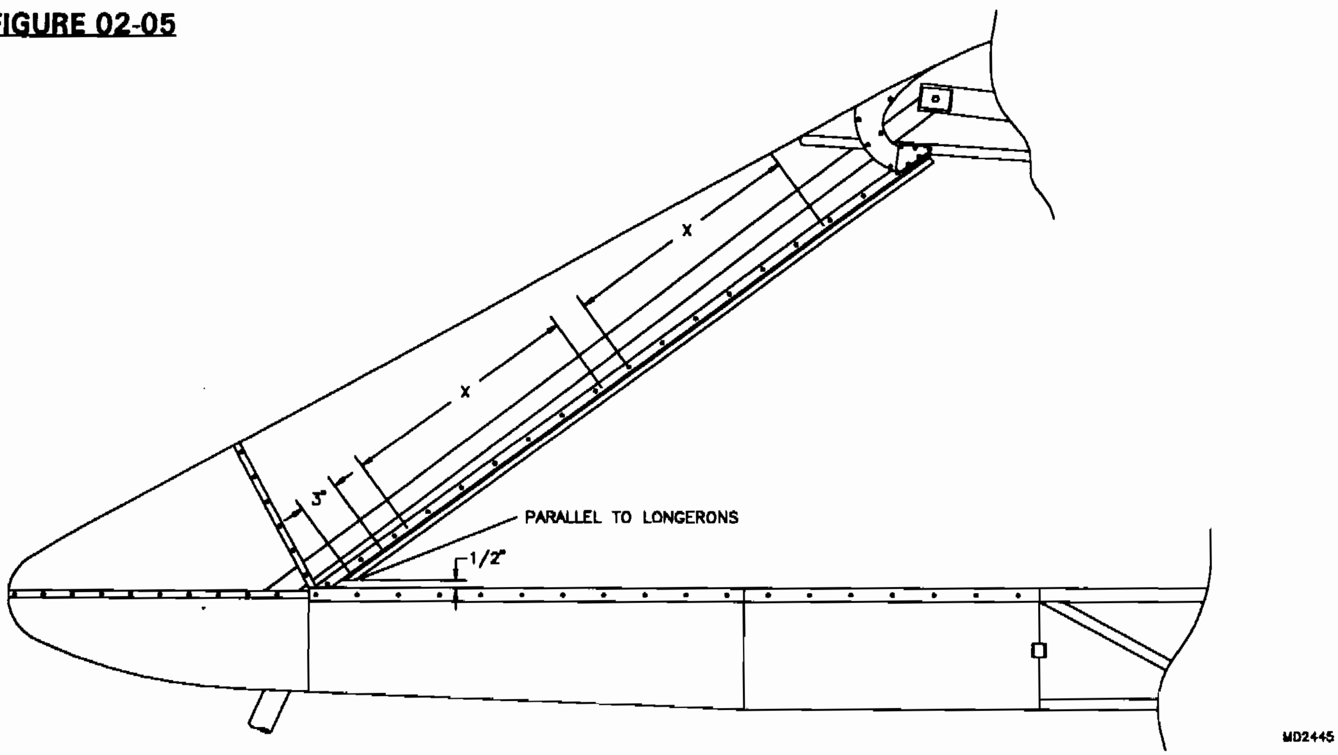
MD2448

FIGURE 02-04A



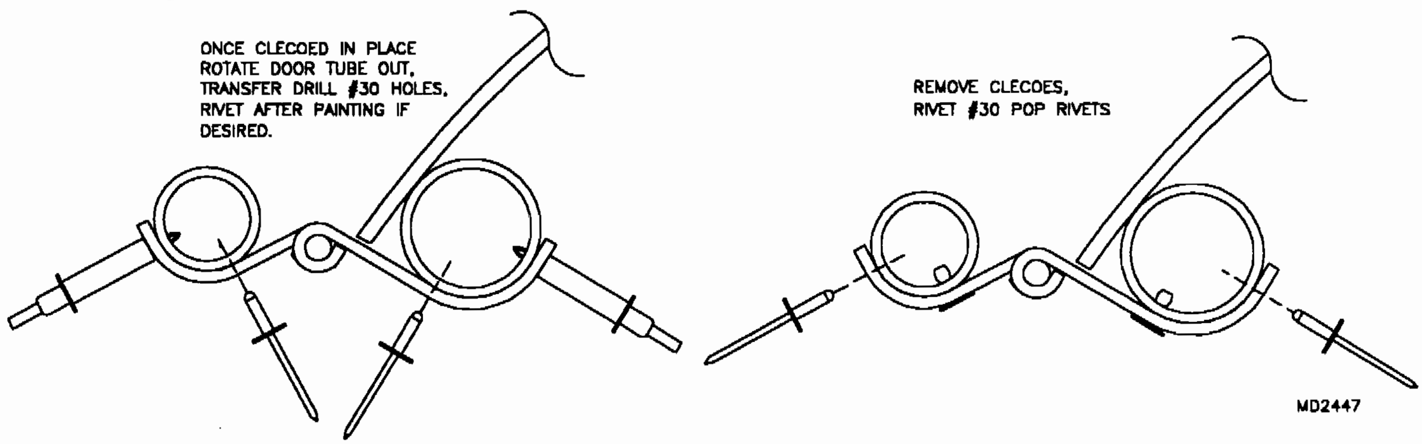
5. Mark and cut the lower end of the hinge tube as shown. See **Figure 02-05.** After cutting, measure up from the bottom of the tube approximately 3" and mark the location. This is the bottom point of the lower hinge. Tape hinge in place. Center the third hinge in between the upper and lower hinges and tape.in place. Using the same scrap of lexan and small wood block, rotate each hinge to align with windshield. Transfer drill all exposed holes to #30 and cleco in place. Once again, if you are installing half doors on a fully enclosed aircraft use the existing hinge locations.

FIGURE 02-05



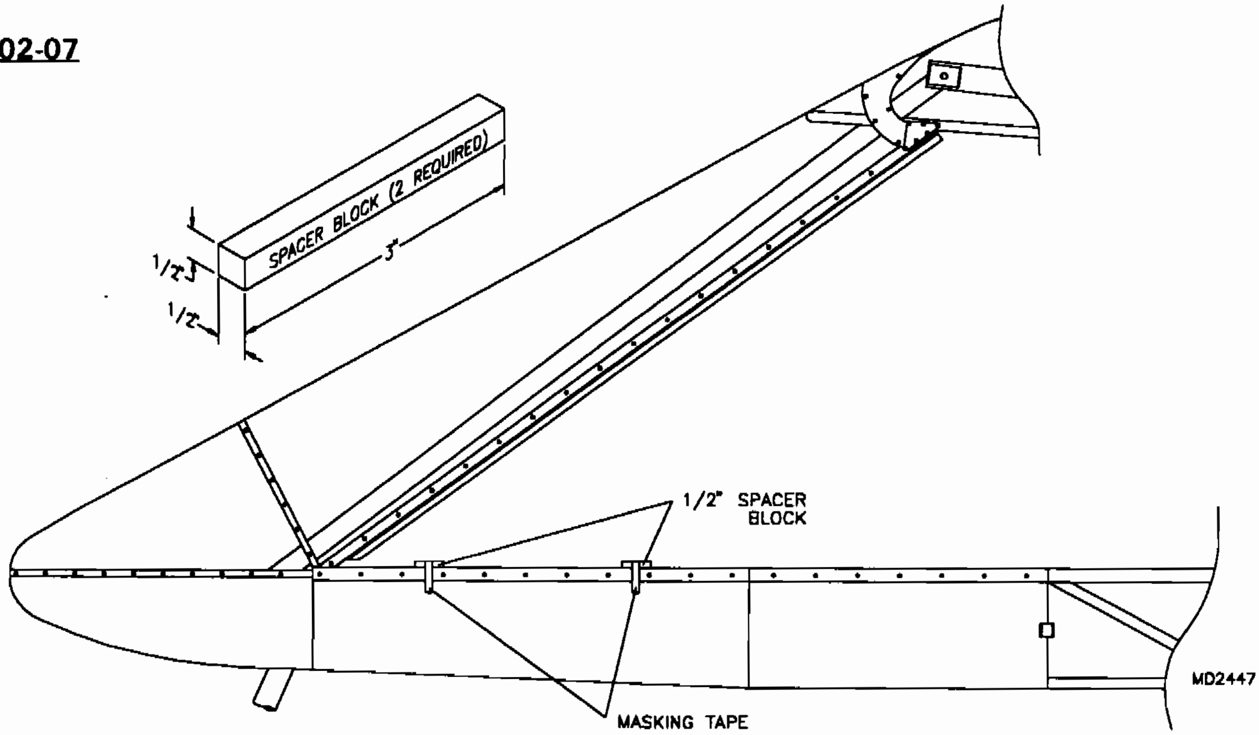
6. After all exposed holes are drilled, open the hinges and drill the inside holes. See **Figure 02-06.** Remove hinges and debur all holes. Paint or powder coat hinges at this time. Re-install and rivet hinges in place.

FIGURE 02-06



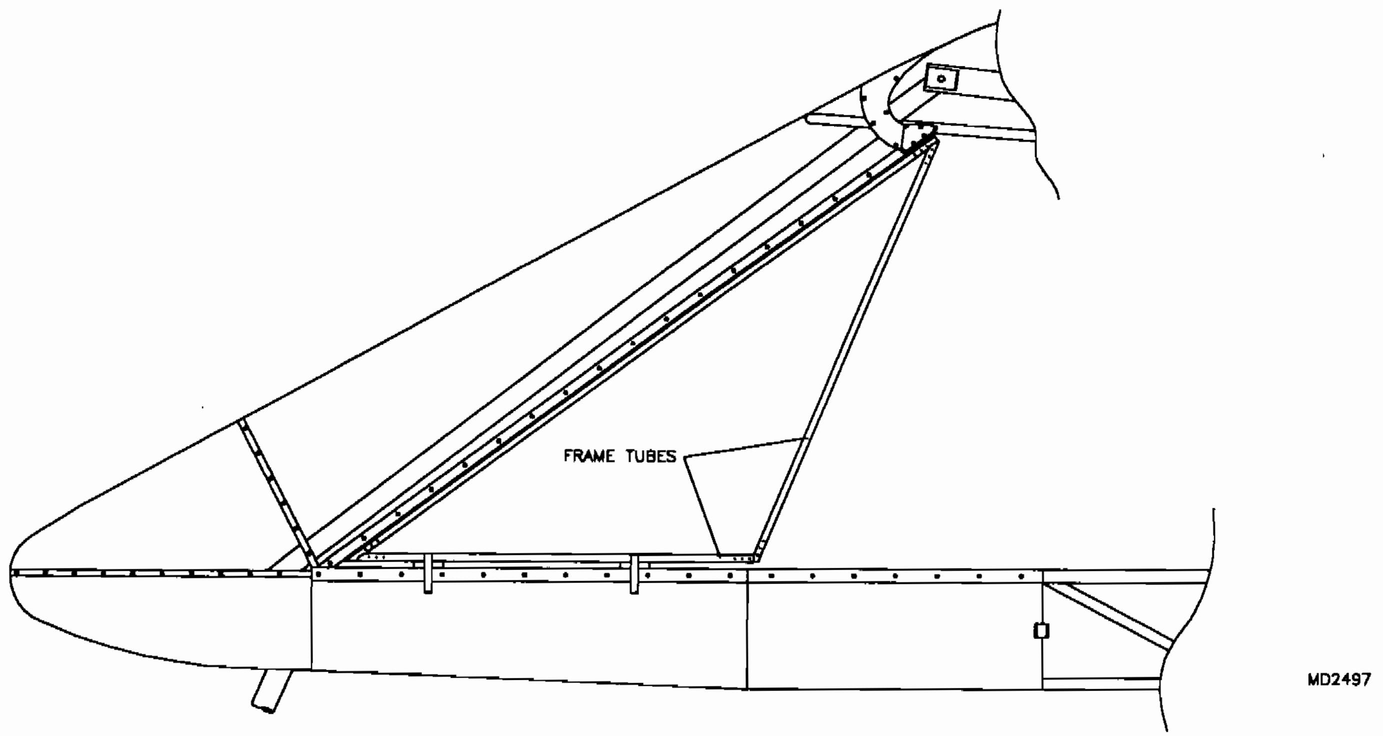
7. Cut two spacer blocks out of ½" plywood or equivalent material as shown in **Figure 02-07.** These will be used to space the lower frame tube along the bottom of the door opening. Tape the spacer blocks along the bottom of the door opening using masking tape as shown in **Figure 02-07.**

FIGURE 02-07



8. Fit the frame tubes into position as shown in **Figure 02-08.** "Fish mouth" the ends of the tubes to rest together for a quality look. Tape these in place after cutting and filing to fit.

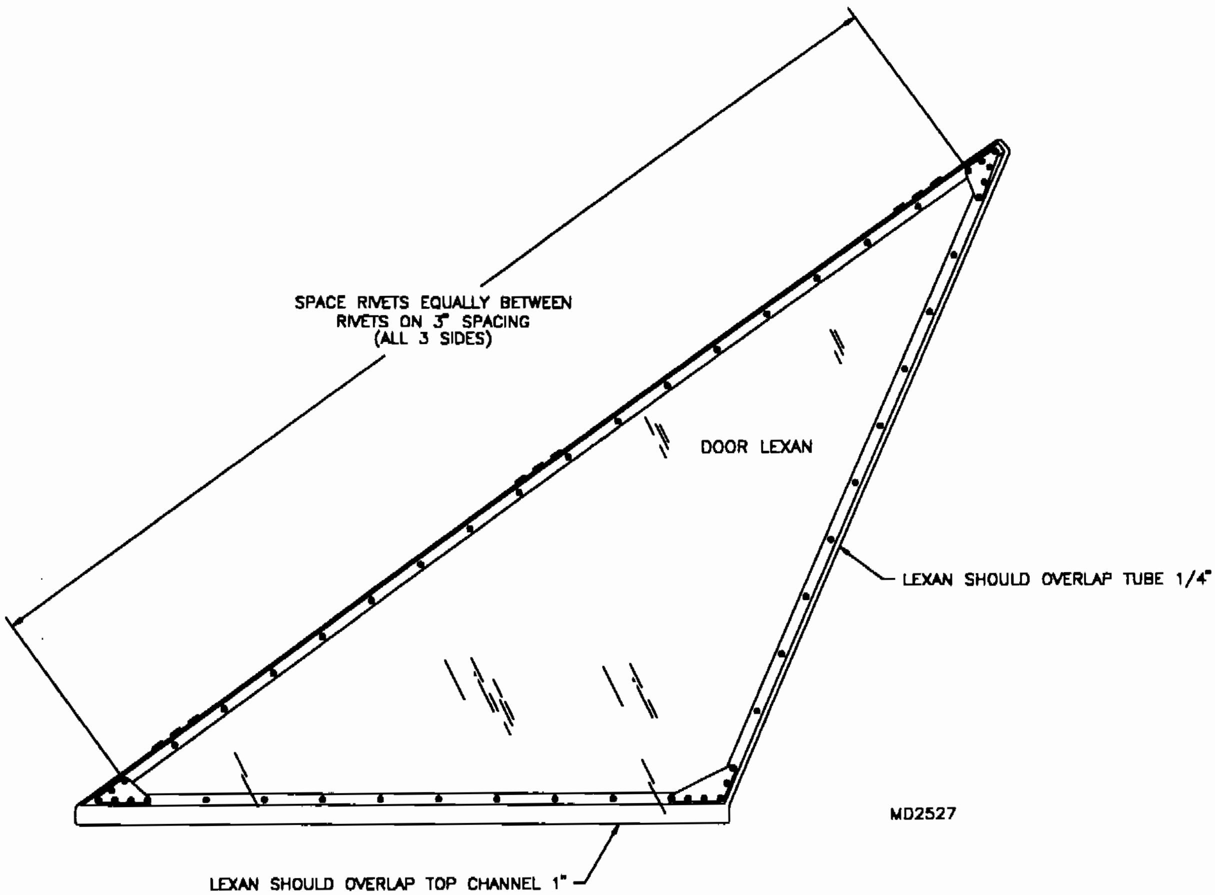
FIGURE 02-08



9. With the frame tubes held into place and flush with the perimeter surface of the door opening, align, drill, and cleco the three outside gussets as shown in the parts manual. With the outside gussets clecoed in place; align the inside gussets, drill, and cleco.

10. Remove the outside gussets. Tape the door lexan in place over the door frame. Mark out the perimeter of the frame with a marker and remove the protective covering in areas over the door frame. Be careful to place the lexan so it overhangs the frame tube by 1/4" on the aft edge and a 1" overlap on the cage longerons. See **Figure 02-10.** Lexan should fit tight against all three hinges to create an even gap between the door and windshield. If the lexan does not fit correctly, lay a line with masking tape, trim with snips, clean up with a 80 grit sanding block, and re-install. Transfer drill through the lexan at the gussets. Make sure to hold the lexan tight against the frame. Layout hole spacing as shown. Drill all holes #30, remove lexan, and drill holes in lexan out to #28. Debur lexan and aluminum. Re-install and rivet in place using the hardware shown in the parts manual.

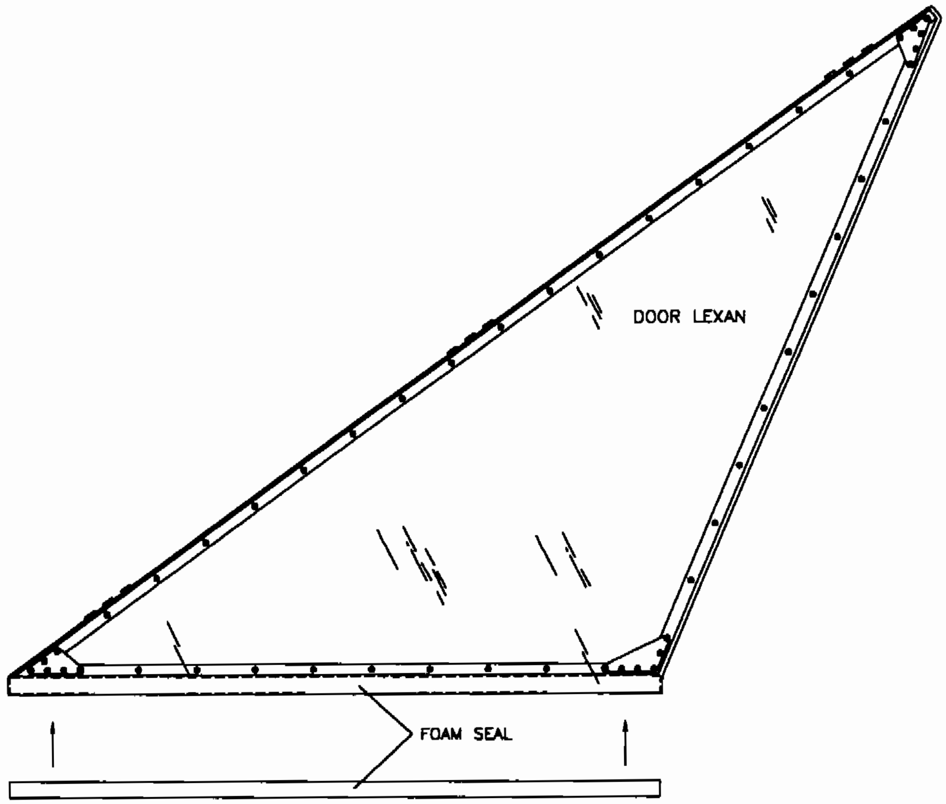
FIGURE 02-10

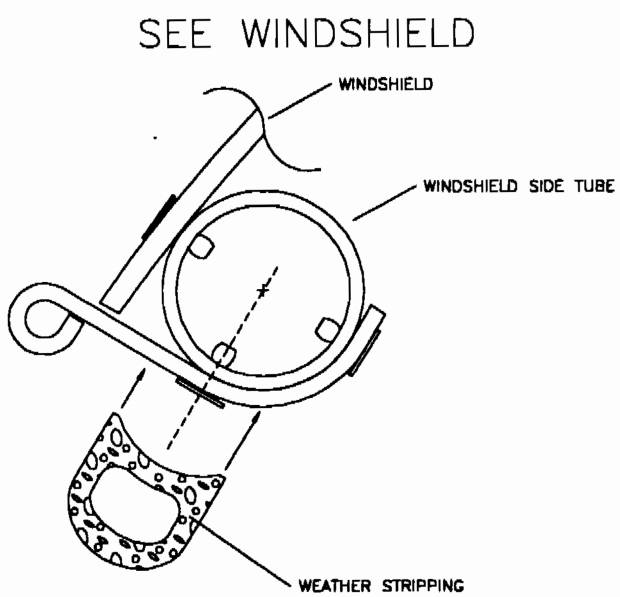


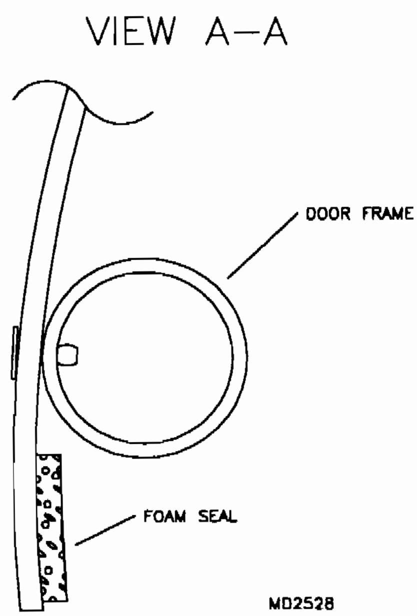
11. Determine the best location for door catch assembly. The door catch should be located as far aft as possible along lower part of the frame tube without interfering with throttle operation. Drill #11 hole through frame tube and lexan at best location. Refer to parts drawing for necessary hardware and install. Addition or subtraction of plastic washers may be necessary to achieve proper tension of catch.

12. Install the foam seals as shown in **Figure 02-19.** Always prep surfaces with isopropyl alcohol before installing seals. **Warning: Do not** use any other type of solvent to clean lexan other than isopropyl alcohol. Other chemicals will most likely "Haze" or fracture the lexan.

FIGURE 02-11







CABANE/STRUT FAIRING INSTALLATION
- 503 PARTIAL ENCLOSURE

1. Locate the parts shown in the parts manual.

2. Slip the cabane fairings around each aft cabane on the super structure. Cleco a rivet strip to the outside of each fairing. Clip the other side of the fairing inside of the rivet strip and cleco in place. Insert the top and bottom plastic ribs into each fairing. Make sure each rib is tight against the aft cabane and flush with the end of the fairing. Drill #40 through pilot holes on each end of the fairing and cleco the ribs in place.

3. To secure each fairing to the aft cabane, first make sure it is located approximately 1/2" up from the triangle bracket at the bottom of the cabane. Make sure the fairings are parallel to each other by measuring from the tip of each fairing at the top and the bottom. This dimension should be equal. To ensure that the fairing is parallel to the slip-stream, measure from the top of each fairing to the aft strut. This dimension should be equal on each side. Once happy with the fairing locations, locate (4) #30 holes through each fairing into the aft cabanes. These holes should be located approximately 1" up and 1" down on the outside of the fairing and 4" up and 4" down on the inside of the fairing. Try to locate these holes at the point where the fairing best fits against the aft cabane. This should avoid any puckers or dimples in the fairings. Always double check all dimensions in between drilling each hole. Only cleco each hole at this time. Once all holes are drilled remove fairings, debur, paint (if desired) and re-install with correct hardware.

4. To install the aft strut fairing, first mark a line between the centers of the (2) 3/16 stainless steel pop rivets on either side of the strut. This will be a reference line for drilling. Slip the aft strut fairing around the aft strut on the super structure. Cleco the rivet strip to one side of the fairing. Clip the other side of the fairing inside of the rivet strip and cleco in place. Line up the (4) pre-drilled pilot holes on each side of the fairing with the reference line on the strut (the fairing should be centered in between the rivets vertically). Clamp in place but do not drill at this time. Mark a clearly visible centerline on each of the plastic ribs. Insert the rib into fairing on front side of the strut. Push the ribs in place until their center lines line up with the pre-drilled holes in the fairing. The ribs should be tight against the aft strut. Drill #40 through the pilot holes on each rib location and cleco in place. Loosen clamps and apply a slight amount of pressure to the fairing to ensure that the ribs are tight against the aft strut. Make sure the fairing is centered and drill each pilot hole #30 into the aft strut. **Always** double check all dimensions in between drilling each hole. Only cleco at this time. Once all holes are drilled, remove fairings, debur, paint (if desired) and re-install with the correct hardware.

FLOW FENCE INSTALLATION
- 503 FULL ENCLOSURE

1. Locate the parts shown in the parts manual.

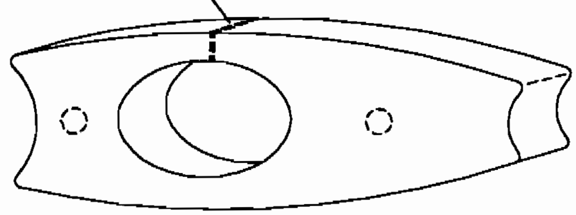
2. Cleco the left and right vertical fence halves together. Insert the bottom two ribs and cleco in place. Insert the top rib and mark the bend location for the tab on the aft end. Remove rib, bend tab to the approximate angle and re-install. Use 2" masking tape to attach the fence to the aft side of the enclosure. Center the fence assembly between top and bottom rivets on the aft enclosure. Make sure the fence is parallel to the centerline of the aircraft by viewing from the tail and referencing the tail boom and the keel tube. Once happy with fit, drill #30 through each pilot hole on each flange of fence into the aft enclosure. **Always** double check the alignment of fence after drilling each hole. Only cleco at this time. Remove the fairing, drill all holes #30, debur, re-assemble and rivet together with the correct hardware. Fence can now be painted (if desired) and installed to aircraft.

CABANE/STRUT FAIRING INSTALLATION - 582 PARTIAL ENCLOSURE

1. Locate the parts shown in the parts manual.

2. Place the ribs on the proper tubes. If you do not want to remove the cabane or 2" strut tube. Cut a slit in the ribs and slip over the tubes. See **Figure 02-02.**

FIGURE 02-02



3. Slip the cabane fairings around each aft cabane on the super structure. Cleco a rivet strip to the outside of each fairing. Clip the other side of the fairing inside of the rivet strip and cleco in place. Insert the top and bottom plastic ribs into each fairing. Make sure each rib is tight against the aft cabane and flush with the end of the fairing. Drill #40 through pilot holes on each end of the fairing and cleco the ribs in place.

4. To secure each fairing to the aft cabane, first make sure it is located approximately 1/2" up from the triangle bracket at the bottom of the cabane. Make sure the fairings are parallel to each other by measuring from the tip of each fairing at the top and the bottom. This dimension should be equal. To ensure that the fairing is parallel to the slip-stream, measure from the top of each fairing to the aft strut. This dimension should be equal on each side. Once happy with the fairing locations, locate (4) #30 holes through each fairing into the aft cabanes. These holes should be located approximately 1" up and 1" down on the outside of the fairing and 4" up and 4" down on the inside of the fairing. Try to locate these holes at the point where the fairing best fits against the aft cabane. This should avoid any puckers or dimples in the fairings. Always double check all dimensions in between drilling each hole. Only cleco each hole at this time. Once all holes are drilled remove fairings, debur, paint (if desired) and re-install with correct hardware.

5. To install the aft strut fairing, first mark a line between the centers of the (2) 3/16 stainless steel pop rivets on either side of the strut. This will be a reference line for drilling. Slip the aft strut fairing around the aft strut on the super structure. Cleco the rivet strip to one side of the fairing. Clip the other side of the fairing inside of the rivet strip and cleco in place. Line up the (4) pre-drilled pilot holes on each side of the fairing with the reference line on the strut (the fairing should be centered in between the rivets vertically). Clamp in place but do not drill at this time. Mark a clearly visible centerline on each of the plastic ribs. Insert the rib into fairing on front side of the strut. Push the ribs in place until their center lines line up with the pre-drilled holes in the fairing. The ribs should be tight against the aft strut. Drill #40 through the pilot holes on each rib location and cleco in place. Loosen clamps and apply a slight amount of pressure to the fairing to ensure that the ribs are tight against the aft strut. Make sure the fairing is centered and drill each pilot hole #30 into the aft strut. **Always** double check all dimensions in between drilling each hole. Only cleco at this time. Once all holes are drilled, remove fairings, debur, paint (if desired) and re-install with the correct hardware.

FLOW FENCE INSTALLATION
- 582 FULL ENCLOSURE

1. Locate the parts shown in the parts manual.

2. Cleco the left and right vertical fence halves together. Insert the bottom two ribs and cleco in place. Insert the top rib and mark the bend location for the tab on the aft end. Remove rib, bend tab to the approximate angle and re-install. Use 2" masking tape to attach the fence to the aft side of the enclosure. Center the fence assembly between top and bottom rivets on the aft enclosure. Make sure the fence is parallel to the centerline of the aircraft by viewing from the tail and referencing the tail boom and the keel tube. Once happy with fit, drill #30 through each pilot hole on each flange of fence into the aft enclosure. **Always** double check the alignment of fence after drilling each hole. Only cleco at this time. Remove the fairing, drill all holes #30, debur, re-assemble and rivet together with the correct hardware. Fence can now be painted (if desired) and installed to aircraft.

CABANE/STRUT FAIRING INSTALLATION - 912 PARTIAL ENCLOSURE

1. Locate the parts shown in the parts manual.

2. Slip the cabane fairings around each aft cabane on the super structure. Cleco a rivet strip to the outside of each fairing. Clip the other side of the fairing inside of the rivet strip and cleco in place. Insert the top and bottom plastic ribs into each fairing. Make sure each rib is tight against the aft cabane and flush with the end of the fairing. Drill #40 through pilot holes on each end of the fairing and cleco the ribs in place.

3. To secure each fairing to the aft cabane, first make sure it is located approximately 1/2" up from the triangle bracket at the bottom of the cabane. Make sure the fairings are parallel to each other by measuring from the tip of each fairing at the top and the bottom. This dimension should be equal. To ensure that the fairing is parallel to the slip-stream, measure from the top of each fairing to the aft strut. This dimension should be equal on each side. Once happy with the fairing locations, locate (4) #30 holes through each fairing into the aft cabanes. These holes should be located approximately 1" up and 1" down on the outside of the fairing and 4" up and 4" down on the inside of the fairing. Try to locate these holes at the point where the fairing best fits against the aft cabane. This should avoid any puckers or dimples in the fairings. Always double check all dimensions in between drilling each hole. Only cleco each hole at this time. Once all holes are drilled remove fairings, debur, paint (if desired) and re-install with correct hardware.

4. To install the aft strut fairing, first mark a line between the centers of the (2) 3/16 stainless steel pop rivets on either side of the strut. This will be a reference line for drilling. Slip the aft strut fairing around the aft strut on the super structure. Cleco the rivet strip to one side of the fairing. Clip the other side of the fairing inside of the rivet strip and cleco in place. Line up the (4) pre-drilled pilot holes on each side of the fairing with the reference line on the strut (the fairing should be centered in between the rivets vertically). Clamp in place but do not drill at this time. Mark a clearly visible centerline on each of the plastic ribs. Insert the rib into fairing on front side of the strut. Push the ribs in place until their center lines line up with the pre-drilled holes in the fairing. The ribs should be tight against the aft strut. Drill #40 through the pilot holes on each rib location and cleco in place. Loosen clamps and apply a slight amount of pressure to the fairing to ensure that the ribs are tight against the aft strut. Make sure the fairing is centered and drill each pilot hole #30 into the aft strut. **Always** double check all dimensions in between drilling each hole. Only cleco at this time. Once all holes are drilled, remove fairings, debur, paint (if desired) and re-install with the correct hardware.

FLOW FENCE INSTALLATION
- 912 FULL ENCLOSURE

1. Locate the parts shown in the parts manual.

2. Cleco the left and right vertical fence halves together. Insert the bottom two ribs and cleco in place. Insert the top rib and mark the bend location for the tab on it's aft end. Remove rib, bend tab to the approximate angle and re-install. Use 2" masking tape to attach the fence to the aft side of the enclosure. Center the fence assembly between the top and bottom line of rivets on the aft enclosure. Make sure the fence is parallel to the centerline of the aircraft by viewing from the tail and referencing the tail boom and the keel tube. The fence will be drilled and riveted after the horizontal fence has been located and check fit.

3. Cleco the left and right horizontal fence halves together. Insert all three ribs in their correct location and cleco in place. Install onto the aircraft by slipping the forward section of the fence inside the lower opening on the vertical fence. Make vertical adjustments to the vertical fence if necessary. The horizontal fence should slide into the vertical fence until the top flange on the horizontal fence intersects the aft flange on the vertical fence. Use a 2" masking tape to attach fence to tail boom. Make sure the fence is parallel to the centerline of the aircraft by viewing from the top and tail.

4. Once happy with the fit of both fences, drill #30 through all pilot holes into the aft enclosure, tail boom, and the overlapping area between the two fences. **Always** double check the alignment of the fence after drilling each hole. Only cleco fences in place at this time. Remove fairings, drill all holes to #30, debur, re-assemble and rivet together with current hardware. **Note:** Be sure to use the 1/8" stainless steel rivets for the four aft rivets on the horizontal fence. The fence can now be painted (if desired) and installed onto the aircraft.

MAIN GEAR LEG FAIRING INSTALLATION

1. Locate the parts shown in the parts manual.

2. Install the rubber edging to the top and bottom of the gear leg fairing as shown. **DO NOT** glue in place at this time.

3. Remove the main gear from the fuselage. Slip the fairing down onto the gear leg until the slot rests around the axle. Re-install gear leg to check the fairing fit. If gear leg fairing is tight, it may be necessary to file the lower slot. If the top of the fairing does not match the fuselage perfectly the rubber edging can be adjusted during the gluing process to fit snug against the fuselage.

4. Install the grommet as shown. The brake cable housing will be routed out this hole during final assembly.

5. Re-install the main gear.

NOSE GEAR STRUT FAIRING INSTALLATION

1. Locate the parts shown in the parts manual.

2. Install the rubber edging and grommet as shown.

3. Remove the nose gear from the fuselage. Remove the bolt which holds the spring in place as shown.

4. Install the nose fairing mounts into the lower fairing mount. The nose fairing mounts "sandwich" between the forward and aft wheel pant halves.

5. Slip the lower and upper fairings in place and assemble as shown in the parts manual. If necessary reinsert the nose gear into the cage and use the weight of the plane to help reinstall the bolt.

6. Reinstall the main gear and install rubber edging on upper end of upper fairing as shown in the parts manual.

7. When installing fairing for the final time (painted or not), place a small amount of grease between the upper and lower fairings for smoother operation.

FLOORBOARD INSTALLATION

1. Locate the parts shown in the parts manual.

2. Place the floorboard in the fuselage cage. The forward edge of the floorboard should be flush with the aft edge of the S-1 truss. Center from side to side and clamp in place. From the bottom, drill 3/16" holes in the floorboard's perimeter using the tabs as guides. Place a wood block above each hole while drilling to prevent the floorboard from splintering. There are six perimeter holes and two along the cutout which hold the floorboard in position. The two forward tabs on the side tubes are for rudder pedal locations. They will be drilled in a later step. See the parts manual for details. Place a bolt in each hole after drilling to prevent the floorboard from accidentally moving.

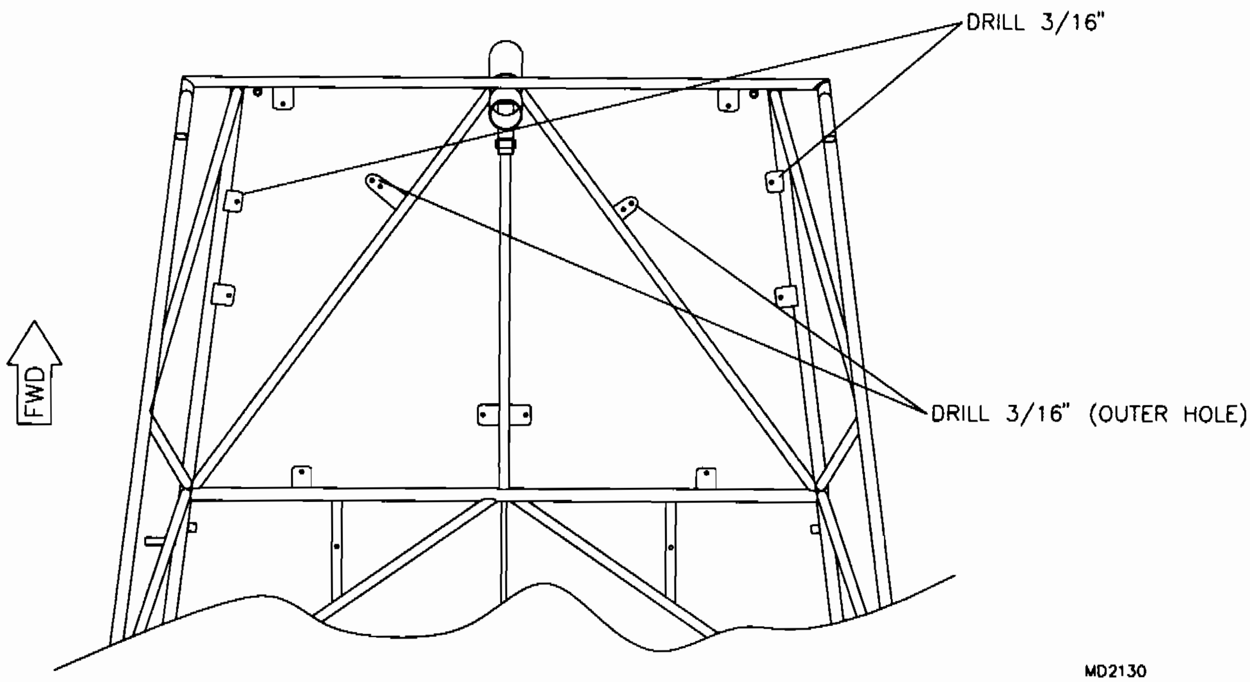
3. Remove the floorboard and install 3/16" nut plates to all perimeter tabs. Temporarily re-install floorboard using hardware shown.

RUDDER PEDALS WITHOUT TOE BRAKES

1. Locate the parts shown in the parts manual.

2. With the floorboard bolted in place, drill the four rudder pedal attach holes using the tabs as a guide. The center tabs use the outer most position. **DO NOT** drill through the inner hole on the center section tangs. See **Figure 03-02.**

FIGURE 03-02



3. Remove the floorboard and install the nut plates to the rudder attach tabs shown in the parts manual. The single ear nut plates go on the center tabs. Re-install the floorboard.

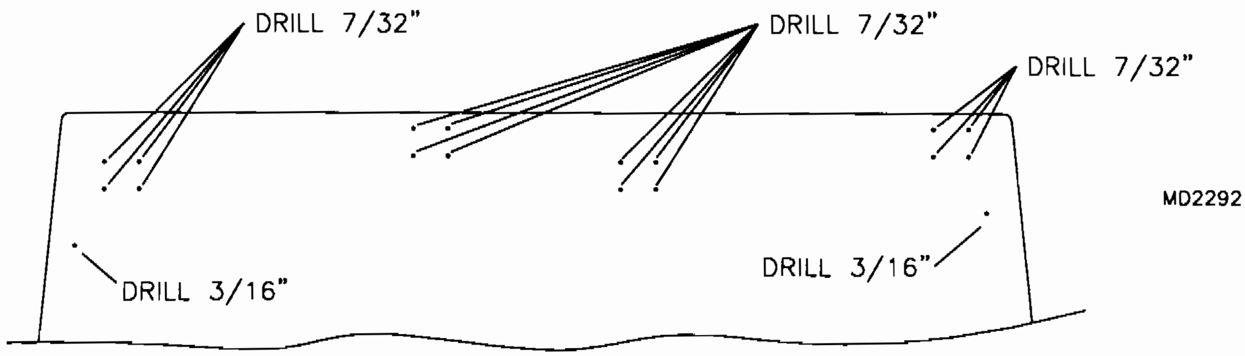
4. Install rudder pedals using the hardware shown. **HINT**: Install the clevis pins into the end of the rudder pedals before installing the pedals. Hold the pedals vertical and drop the pin in place. Make sure to orient the rudder pedals with the steering linkage nuts facing inward on the two center pedals as shown in the parts manual.

5. Clevis pins installed in the outermost pedals will be utilized in the rudder cable system section of the manual.

RUDDER PEDALS WITH HYDRAULIC TOE BRAKES

1. Drill the wear plate as shown in **Figure 03-01**. With the floorboard bolted in place, drill the outside holes (approximately 5 ½" from the front of the fuselage cage) for the rudder pedals to 3/16" using the tabs as guides. Temporarily clamp the wear plate in place on the floorboard. Use 3/16" bolts in the two outer rudder pedal holes to assure proper alignment. Drill the two inner rudder pedal holes through the floorboard and wear plate using the tabs on the diagonals as a guide. **NOTE**: The outer holes of the tabs on the diagonals should be used as guides for drilling. Remove the floorboard and install nut plates to the rudder pedal tabs. The single eared nut plates go on the diagonals.

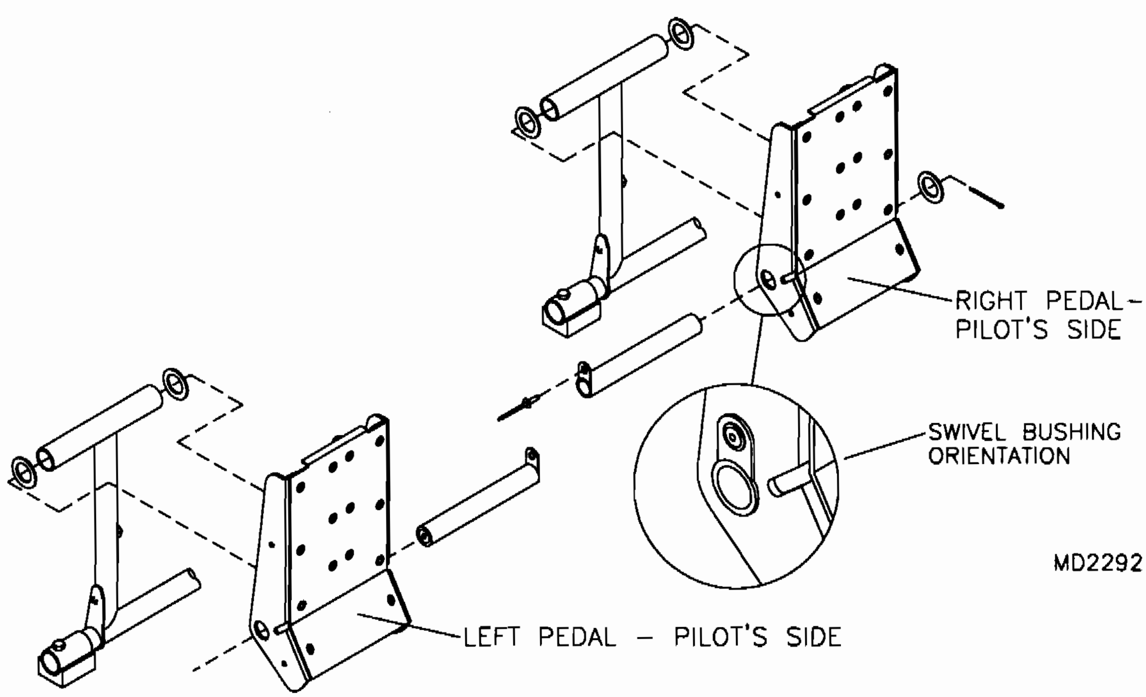
FIGURE 03-01



2. Rivet together the upper toe pedal assembly as shown in the parts manual. Size drill to 1/8" as required. Be sure to debur all holes before final assembly of the upper toe pedal.

3. Install the toe pedal assembly to the rudder pedals by sliding the swivel bushings in place. See **Figure 03-03**. Be sure to include the ½" plastic washers between the rudder pedals and the toe pedal assembly. **NOTE:** The outside swivel bushings contain a insert nut. Drill this insert nut out to 5/16". Make sure these swivel bushings face the outside of the airframe on the outermost pedals. Line up the tangs on the end of each swivel bushing with the toe pedal assembly and drill the edge of the toe pedal to 3/16" using the swivel bushings as a guide.

FIGURE 03-03



RUDDER CABLE SYSTEM

1. Locate the parts shown in the parts manual.

2. Route the thimble end of the rudder cable down the tail boom by using the elevator push-pull tube as an arm. **HINT**: temporarily tape the cables to the push-pull tube and route down the tail boom from the aft end.

3. Start from the rudder pedals and work towards the end of the tail boom assembling pulleys as shown. **NOTE**: The pulleys must be assembled with the cable in position since the end fittings on the cable will not allow the cable to be fed through afterwards. Assemble pulleys and shackles exactly as shown. Install loc rings and cotter pins where shown.

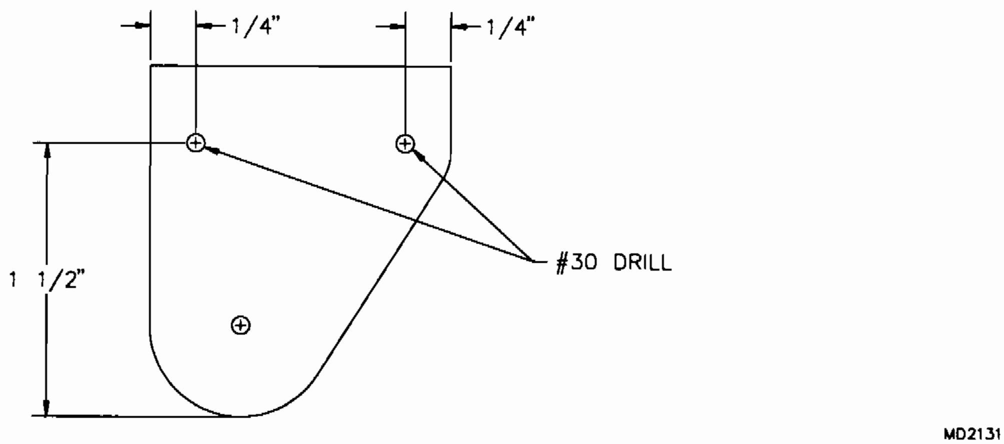
4. Tape cables to tail boom extension until the Trial Rigging and Assembly section of the manual.

BRAKE SYSTEM - HAND BRAKE

1. Locate the parts shown in the parts manual.

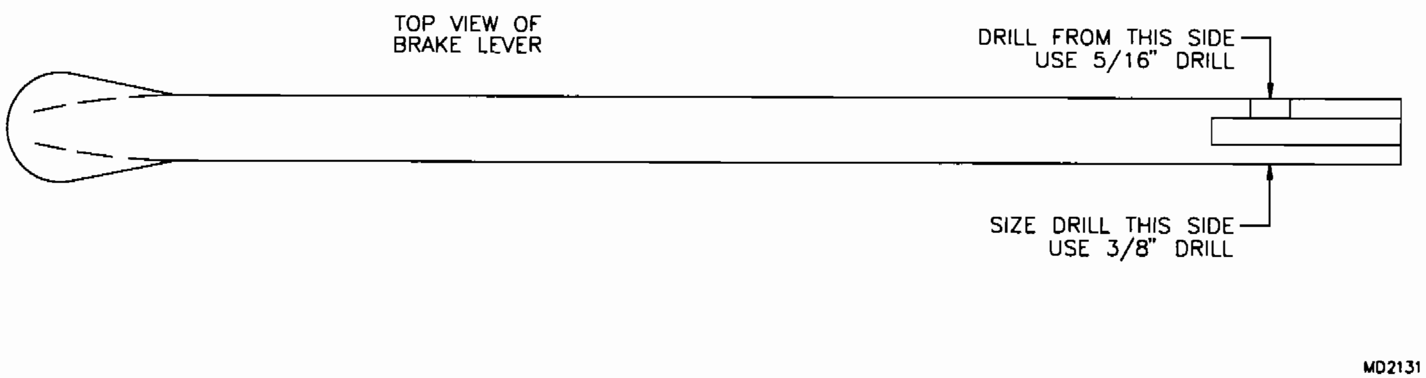
2. Install the brake lever mount tube onto the fuselage cage as shown. Drill two #30 holes in the "U" bracket per side. See **Figure 03-02.** With the attach bracket bolted in place, bolt the aft end of the brake lever mount tube in position. Bolt the "U" bracket to the fuselage cage straddling the brake lever mount tube. With the brake lever mount tube tight against the top of the "U" bracket, drill the mount tube #30 using the "U" bracket as a guide.

FIGURE 03-02



3. The brake lever top hole will need to be drilled out to 3/8". Drill through the brake lever with a 5/16" bit starting from the side with the hole. Drill completely through the handle. Finish drill the handle to 3/8". This will allow insertion of the bushing and wire attach rod. See **Figure 03-03.**

FIGURE 03-03



4. Bolt brake lever into place in the brake lever bracket. Install the entire assembly to the brake lever mount tube. **NOTE**: One cable ferrule/nut assembly comes with the brake lever bracket. The other one comes separately. Assemble the unit as per the parts drawing. Brake lever assembly location can be adjusted to suit the pilot. **WARNING**: Make sure that the brake lever will not be in conflict with the passenger seat throttle.

5. Fabricate one 11/16" long bushing from the 3/8" x .058 tubing in the raw stock kit. This bushing will be used in the top hole of the brake lever to center the wires and allow the attach rod to pivot freely.

6. Drill two #40 holes in the wire attach rod as shown in **Figure 03-06.** Install into top hole of brake lever as shown in the parts manual. See the assembly detail shown in **Figure 03-06A.**

FIGURE 03-06

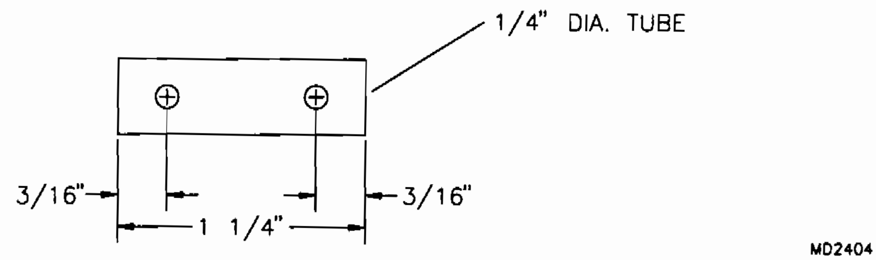
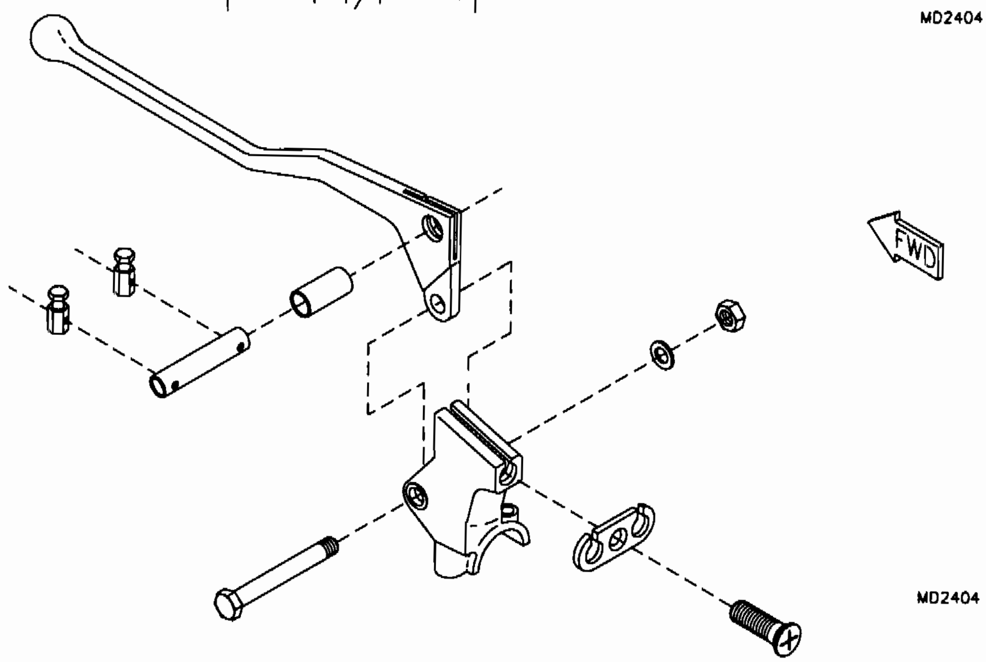


FIGURE 03-06A



7. Insert brake cable through hand brake mechanism and secure with wire stop/screws as shown. With cable housing in place around brake cable, route cable through cage and down main gear leg. Route cable to have as few bends as possible. The straightest and shortest route will give the best braking performance. With the housing in place, safety wire the housing into the ferrules. Loop the wire around the housing and the ferrule nut and pull in the center to hold the housing tight in the ferrule. attach brake cable to the brake actuation arm using the hardware shown. Brake cable adjustment is best made on a completed airframe.

8. Install velcro parking brake strap.

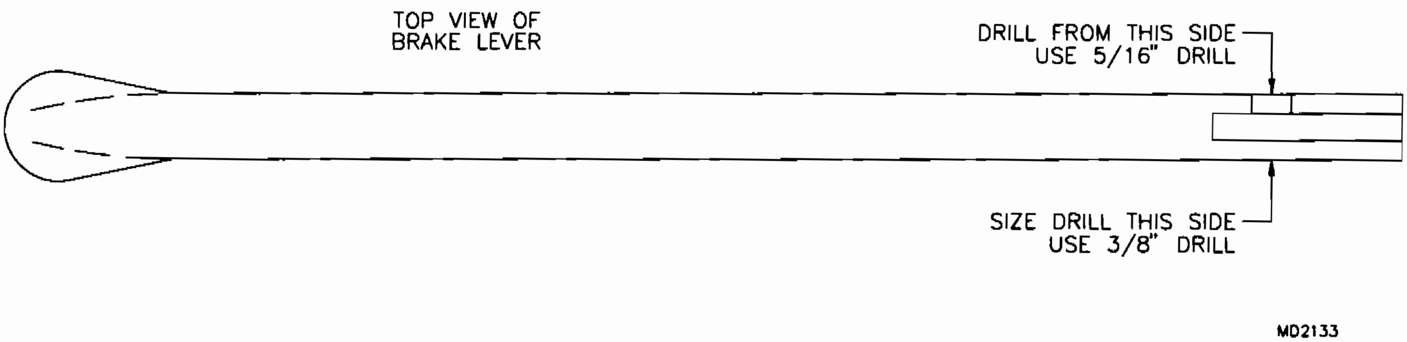
BRAKE SYSTEM - HAND BRAKE WITH INFLIGHT ADJUSTABLE FLAPS

NOTE: If installing the hand brake with inflight adjustable flaps, page forward to the Flap System Assembly. Once the flap mechanism is installed in the fuselage, return to hand brake installation.

1. Locate the parts shown in the parts manual.

2. The brake lever top hole will need to be drilled out to 3/8". Drill through the brake lever with a 5/16" bit starting from the side with the hole. Drill completely through the handle. Finish drill the handle to 3/8". This will allow insertion of the bushing and wire attach rod. See **Figure 03-02.**

FIGURE 03-02



3. Bolt brake lever in place in the brake lever bracket. Install the entire assembly to the flap actuation lever. **NOTE:** One cable ferrule/nut assembly comes with the brake lever bracket. The other one comes separately. Assemble the unit as per the parts drawing. Brake lever assembly location can be adjusted to suit the pilot. **WARNING**: If rotating handle to a pilot desired position, make sure that the brake lever will not be in conflict with the passenger seat throttle.

4. Fabricate one 11/16" long bushing from the 3/8" x .058 tubing in the raw stock kit. This bushing will be used in the top hole of the brake lever to center the wires and allow the attach rod to pivot freely.

5. Drill two #40 holes in the wire attach rod as shown in **Figure 03-05.** Install into top hole of brake lever as shown in the parts manual. See the assembly detail shown in **Figure 03-05A.**

FIGURE 03-05

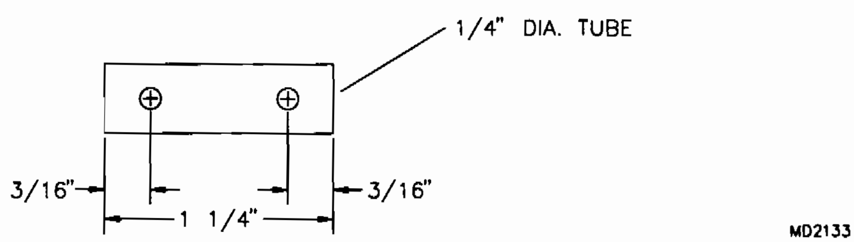
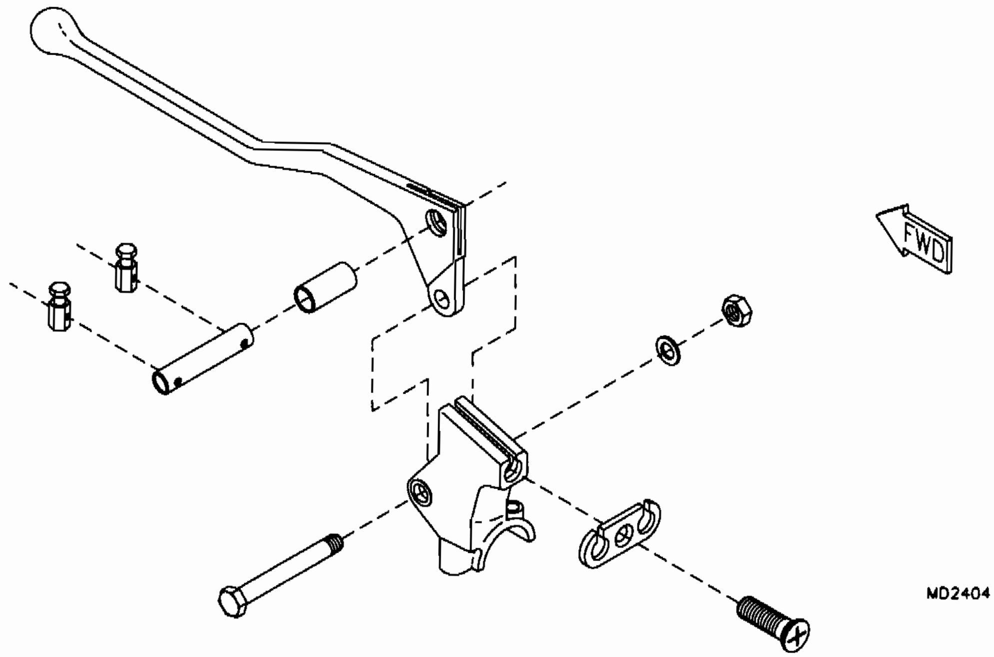


FIGURE 03-05A



6. Insert brake cable through hand brake mechanism and secure with wire stop/screws as shown. With cable housing in place around brake cable, route cable through cage and down main gear leg. Route cable to have as few bends as possible. The straightest and shortest route will give the best braking performance. With the housing in place, safety wire the housing into the ferrules. Loop the wire around the housing and the ferrule nut and pull in the center to hold the housing tight in the ferrule. attach brake cable to the brake actuation arm using the hardware shown. Brake cable adjustment is best made on a completed airframe.

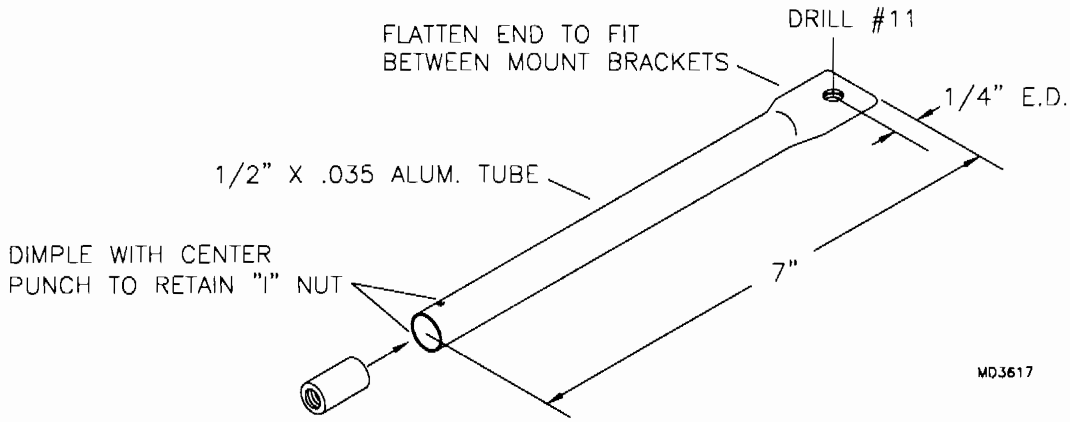
7. Install velcro parking brake strap.

S-12 BRAKE SYSTEM
SINGLE HYDRAULIC TOE BRAKES

NOTE: For single system, install master cylinders to the pilots side only.

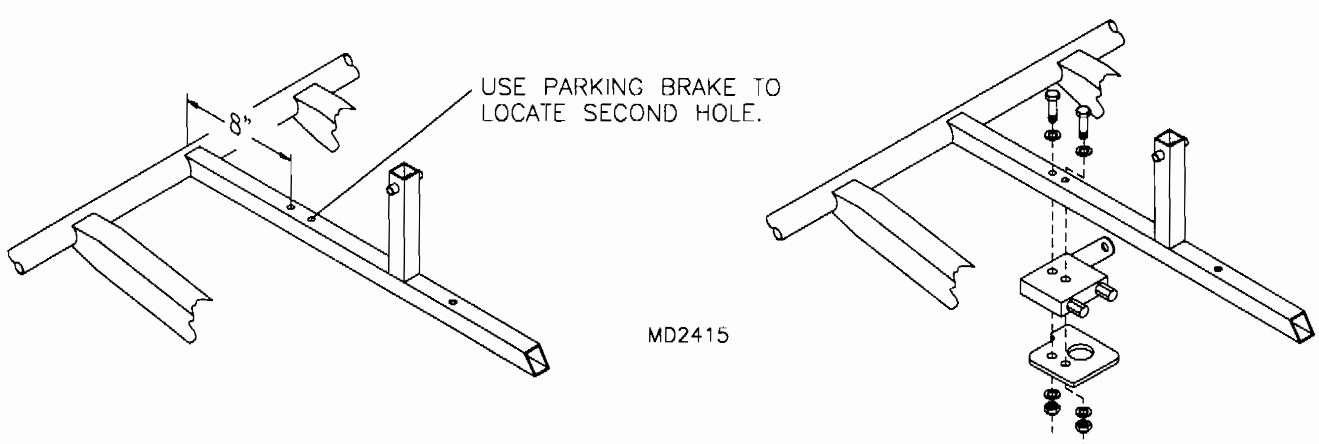
1. Apply loctite to the machine screws and Install the brake mount brackets using the hardware shown. Attach the "U" bracket to the rudder pedal-cylinder attach brackets. Install the lower end of the master cylinders into the brake mount brackets. Attach the upper end of the cylinders to the "U" brackets as shown in the parts manual. Fabricate and install the rudder pedal link rods on the passenger side. Refer to **FIGURE 03-01**.

FIGURE 03-01



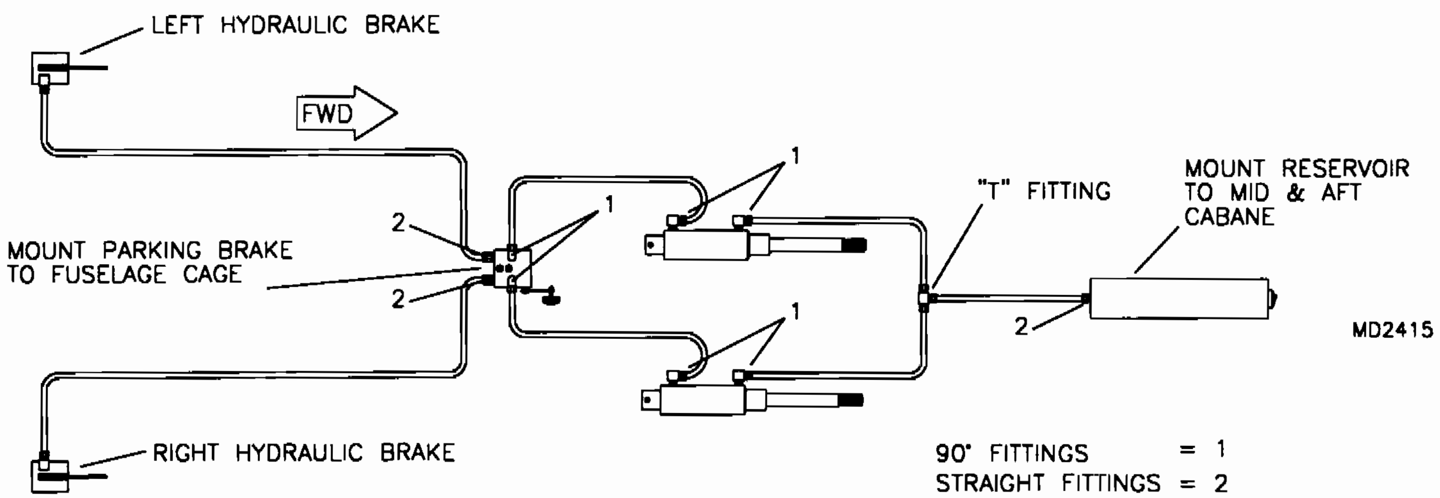
2. Fabricate the reservoir mount strap using the raw stock provided. Refer to the parts manual. Mount the reservoir to the mid and aft cabanes lower end. See parts page. Locate and drill a #11 hole 8" from the front of the forward seat truss on the ½" square tube between the seat rails. See **FIGURE 03-02.** Install the parking brake and parking brake stop plate using hardware shown. Trim the threads on the park brake knob to the correct length and install.

FIGURE 03-02



3. Using teflon tape (builder supplies) install the fittings and route the lines as shown in **FIGURE 03-03.** During final assembly fill the system from the reservoir down. Open the bleed valves on the caliper assembly until fluid exits; close valve and continue to fill system. Fill the reservoir to approximately 3/4 full. Air in the line should be removed by working the pedals. Air should work its way toward the reservoir. It may take some patience to remove all air from the lines. **WARNING**: Brake fluid is corrosive and will remove paint and melt plastic. **IMPORTANT**: Use only aircraft grade brake fluid. Automotive brake fluid will destroy the seals in the system.

FIGURE 03-03

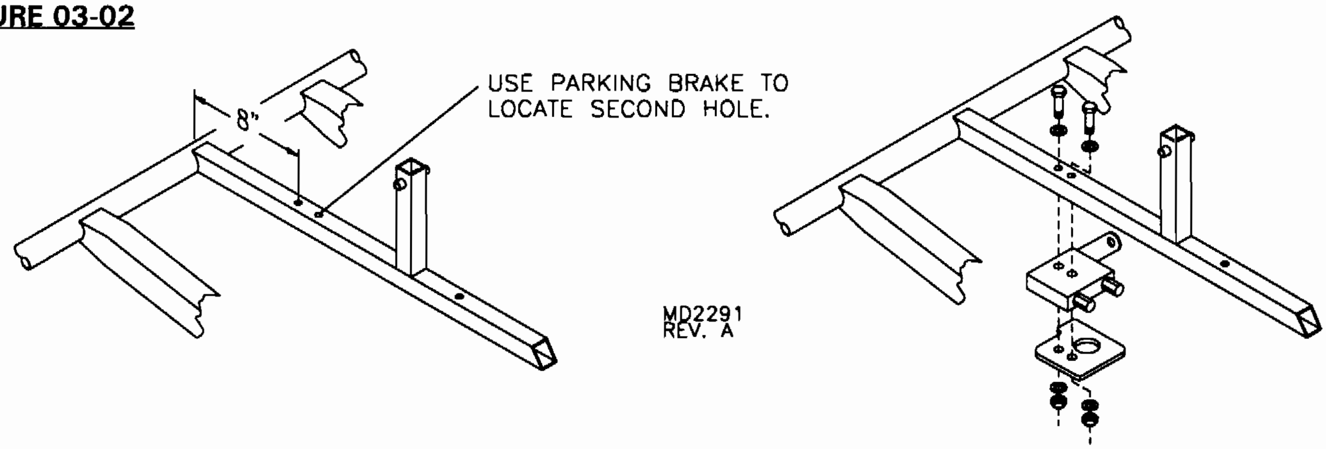


S-12 BRAKE SYSTEM
DUAL HYDRAULIC TOE BRAKES

1. Transfer drill through the floorboard at the brake mount attach locations using the wear plate as a guide. Apply loctite to the machine screws and Install the brake mount brackets using the hardware shown. Attach the "U" bracket to the rudder pedal-cylinder attach brackets. Install the lower end of the master cylinders into the brake mount brackets. Attach the upper end of the cylinders to the "U" brackets as shown in the parts manual.

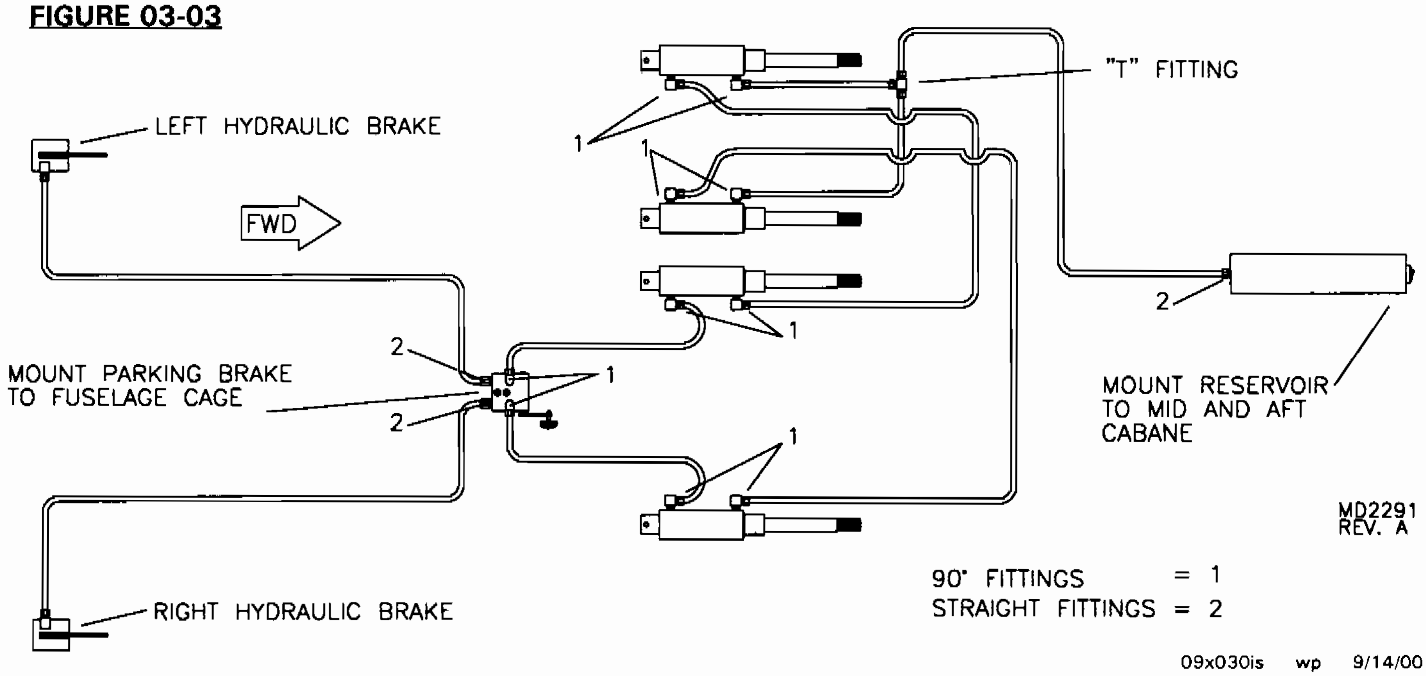
2. Fabricate the reservoir mount strap using the raw stock provided. Refer to the parts manual. Mount the reservoir to the mid and aft cabanes lower end. See parts page. Locate and drill a #11 hole 8" from the front of the forward seat truss on the ½" square tube between the seat rails. See **Figure 03-02.** Install the parking brake and parking brake stop plate using hardware shown. Trim the threads on the park brake knob to the correct length and install.

<u>FIGURE 03-02</u>



3. Using teflon tape (builder supplies) install the fittings and route the lines as shown in **Figure 03-03.** During final assembly fill the system from the reservoir down. Open the bleed valves on the caliper assembly until fluid exits; close valve and continue to fill system. Fill the reservoir to approximately 3/4 full. Air in the line should be removed by working the pedals. Air should work its way toward the reservoir. It may take some patience to remove all air from the lines. **<u>WARNING</u>:** Brake fluid is very corrosive and will remove paint and melt plastic

<u>FIGURE 03-03</u>

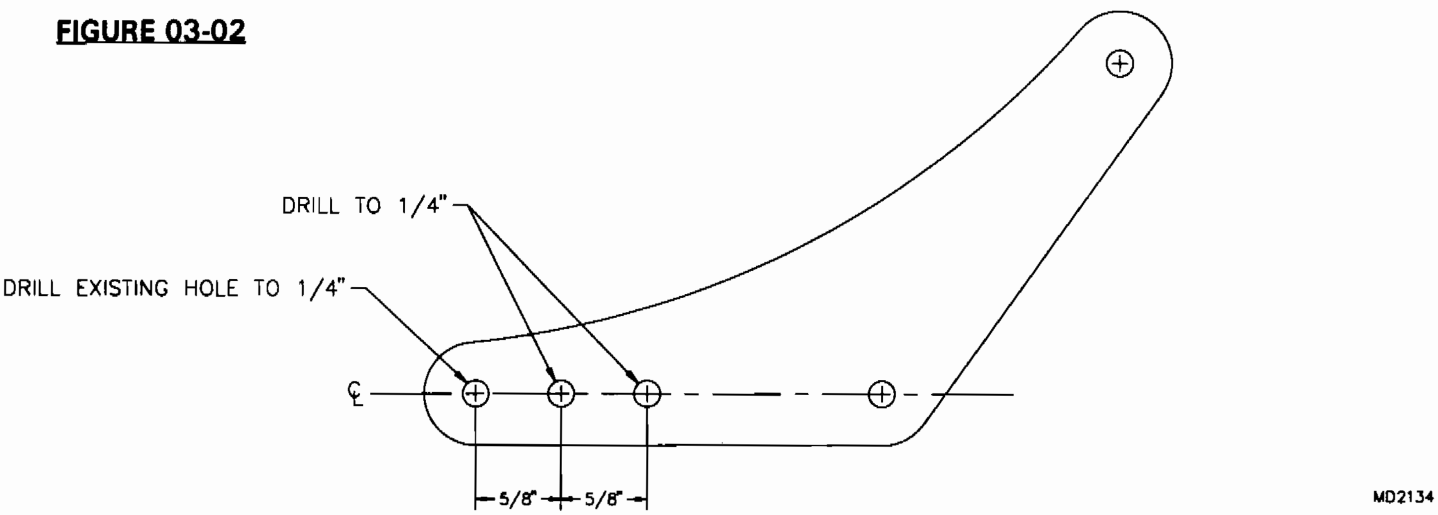


SEAT ASSEMBLY

1. Locate the parts shown in the parts manual.

2. The doublers have been installed in the seat prior to lumbar bend but they need to be drilled. Drill through with a #11 bit using the frame as a guide. If more seat positions are desired in both tilt and fore-aft movement, drill the two extra holes in the seat gusset as shown in **Figure 03-02.** Bolt a set of seat back gussets to each seat back frame. Orientate bolts so the nuts are facing inward towards each other.

FIGURE 03-02



3. Slip the seat frame into position in the fuselage cage. Measure the distance between the gussets at the lower bolt. This length will determine the length of the seat back lower tube. Cut the seat back lower tube to the measured length, out of ½" x .035 from the raw stock kit. Insert in place by springing open the seat back frame.

4. Slip seat back cover in place over seat back frame assembly. Route straps around lower side of the seat back lower tube and into buckles on back of cover. Tighten straps. Excessive force could deform the seat back lower tube. **NOTE:** If installing headrest, do not put cover on seat back frame until rivet nuts have been installed (see headrest assembly).

5. Set the seat back frame assembly onto the fuselage seat frame. Position the frame assembly so the gusset's lower hole is lined up with the holes of the seat tube in the fuselage cage. Chase drill 1/4" through all holes in the gussets and seat tubes to ensure easy adjustment. Take a 1/4" clevis pin and test fit through the newly drilled hole. Repeat for all seat positions.

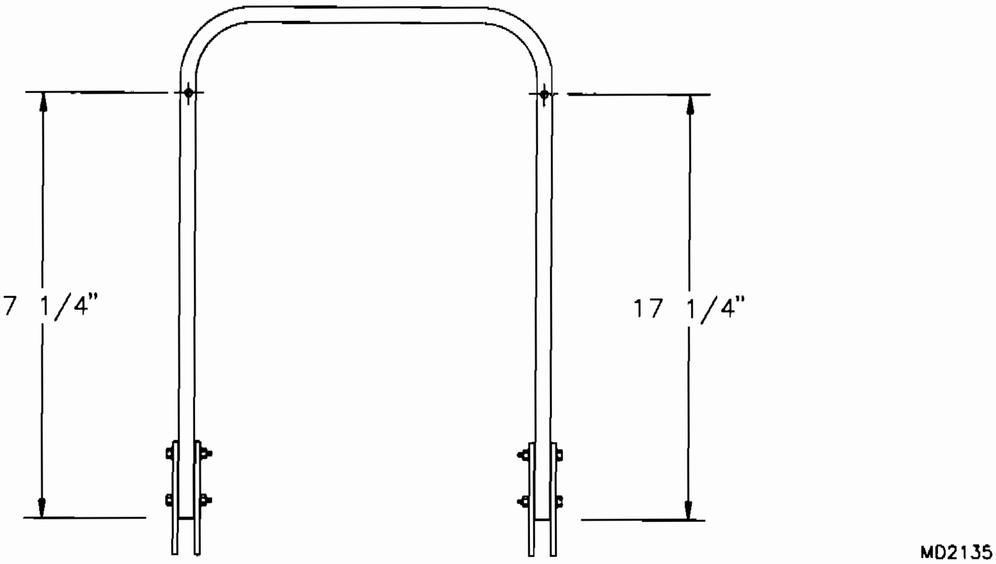
6. Place seat bottom cover in position. Lace the crossing straps first, followed by the front to back straps. Pull these straps tight. **NOTE:** It may be necessary to tighten these straps after the first few hours of flying. Loop the extra strap back into the buckle and trim off the excess so only 2" to 3" of strap material remains.

7. Repeat the above step for the second seat.

HEADREST ASSEMBLY

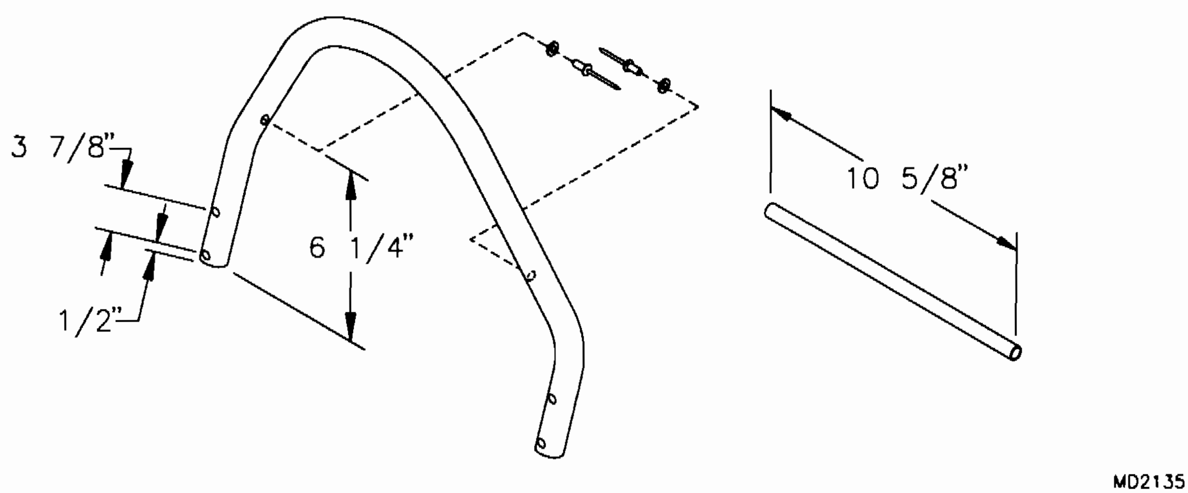
1. Remove the seat back from the fuselage cage. Mark the aft side of the frame 17 1/4" from the lower end of the seat back frame on the centerline of the tube. See **Figure 03-01**. Drill through the aft side of the seat back frame tube using a 1/4" drill bit. **<u>DO NOT</u>** drill completely through the tube, only the aft side.

<u>FIGURE 03-01</u>



2. Mark and drill the headrest frame as shown in **Figure 03-02**. Install 3/16" aluminum pop rivets with thick washers to form "buttons" as shown in the figure. The "buttons" will serve to hold the headrest internal brace. The headrest internal brace will need to be cut to 10 5/8" and filed to fit after the headrest tube is fitted to the seat back frame. Cut headrest internal brace from ½" x .035 tubing provided in the raw stock kit.

<u>FIGURE 03-02</u>



3. Install the rivet nuts in the other 1/4" holes in the seat back frame. Bolt the headrest frame to the seat back frame with 3/16" bolts. Drill #11 into the seat frame using the top holes in the headrest frame as a guide. Remove the headrest frame and drill the holes in the seat back frame to 1/4". Install two more rivet nuts in the seat back frame. Fit the headrest internal brace by filing a slight angle to match the headrest frame.

4. Slip the seat back cover over the frame with the map pocket to the back. Lace the straps around the seat back lower tube and through the buckles. Pull the straps tight.

5. Find the locations of the four rivet nuts on the seat back frame. Melt through with the tip of a soldering iron or hot knife. Bolt on the headrest frame to the seat back with the ½" tube in place. Slip the headrest cover over the frame and close the velcro.

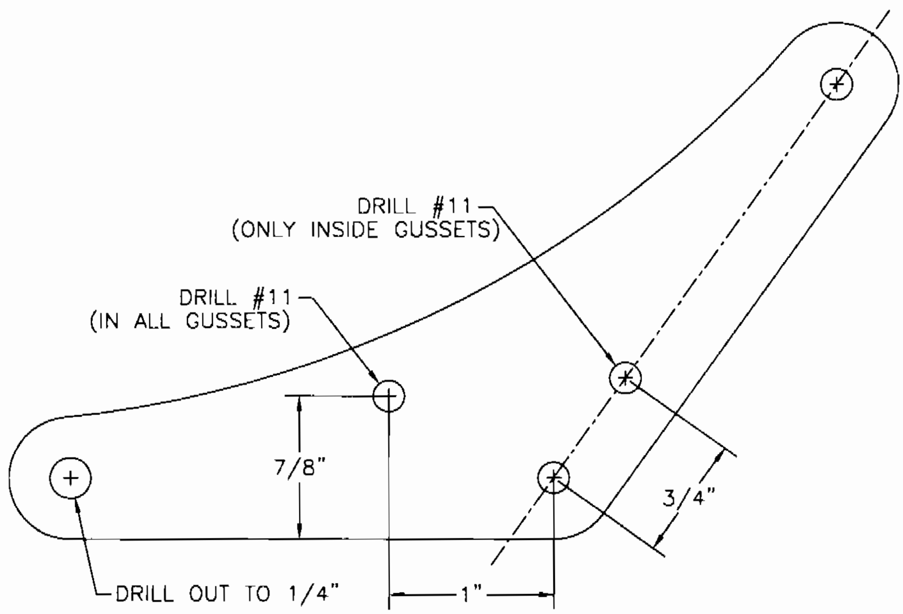
6. Attach the seat back to the fuselage frame in the desired location using the 1/4" clevis pins provided.

OPTIONAL FLIP-UP SEAT ASSEMBLY

1. Locate the parts shown in the parts manual.

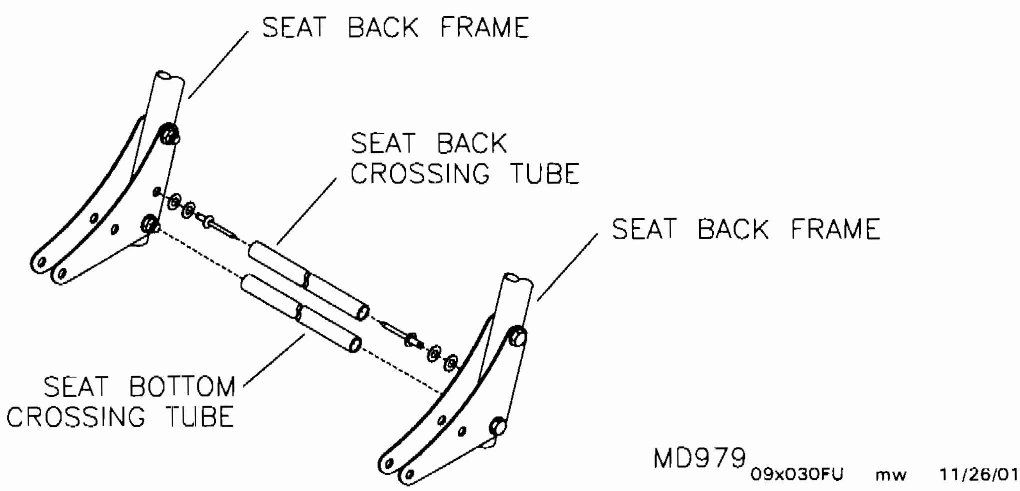
2. The doublers have been installed in the seat back frame prior to lumbar bend but they need to be drilled. Drill through with a #11 bit using the frame as a guide. Drill the seat gussets and deburr. Refer to **Figure 03-02A**. Bolt a set of seat back gussets to each seat back frame. **<u>NOTE:</u>** The gussets with the extra hole go on the inside of the seat frame. Orientate bolts so the nuts are facing inward towards each other.

<u>FIGURE 03-02A</u>



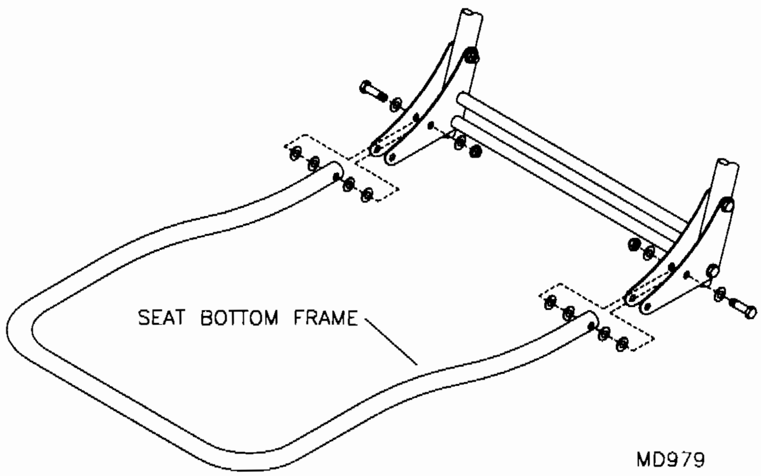
3. Rivet a "button" (3/16" thick washers) to the inside of each seat gusset as shown in **Figure 03-03A**. This button will serve to retain the brace tube that supports the seat back bottom edge. The lower brace tube is retained by the bolts at the lower end of the gusset, also shown in **Figure 013-03A**. The lower brace tube is used to retain the seat bottom aft edge. Slip the seat frame into position in the fuselage cage. Measure the distance between the gussets at the lower bolt. This length will determine the length of the seat brace tubes. Cut the brace tubes to the measured length.
Insert the brace tubes by spreading the frame apart just enough to slip the tube over the nuts and buttons. If the tube does not bottom out against the gusset lay the assembly on its side and tap it gently with a mallet.

<u>FIGURE 03-03A</u>



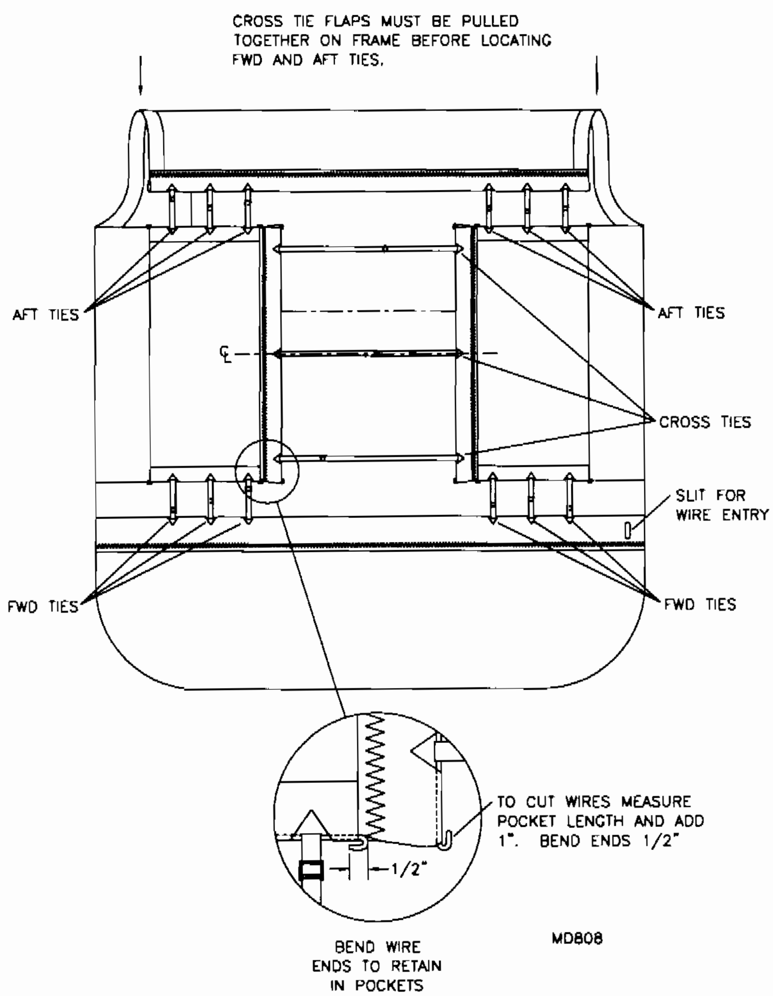
4. Assemble the bottom seat frame between the seat gussets. See **Figure 013-04A**.

FIGURE 03-04A



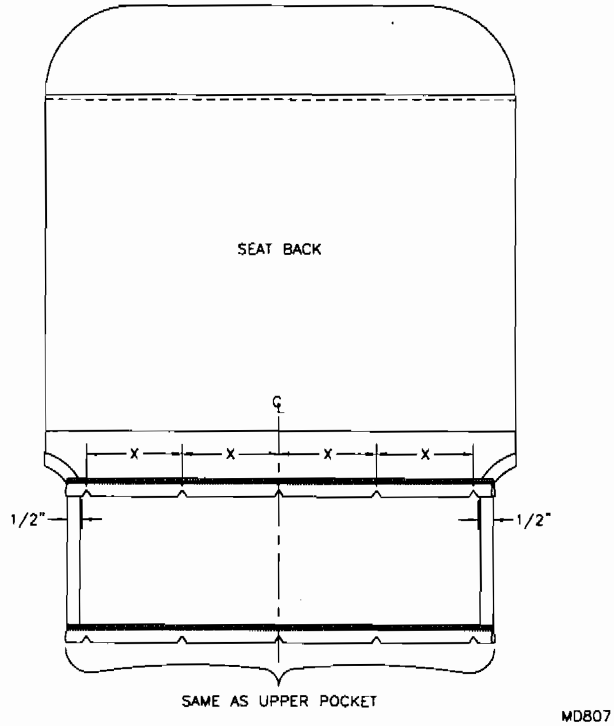
5. Slip the seat bottom onto the frame with the flaps facing down. Study **Figure 03-05A** for wire and zip tie placement. Use a hot knife or scissors to cut the notches. The seat bottom aft flap goes around the tube that is retained by the bolts. Do not pull the tie around the flap all the way tight. They must be a little loose to allow the seat bottom to fold down flat.

FIGURE 013-05A



6. Slip the seat back onto the frame with the pocket side to the aft. Study **Figure 03-06A** for notch locations. The seat back flap wraps around the remaining tube. Cut to length and bend the ends of the wires the same way as done for the bottom. Pull the zip ties tight once the fabric is in place.
NOTE: If installing headrest, do not put cover on seat back frame until rivet nuts have been installed (see headrest assembly).

FIGURE 013-06A



7. Set the seat assembly onto the fuselage seat frame. Position the frame assembly so the gusset's lower hole is lined up with the holes of the seat tube in the fuselage cage. Chase drill 1/4" through all holes in the gussets and seat tubes to ensure easy adjustment. Take a 1/4" clevis pin and test fit through the newly drilled hole. Repeat for all seat positions.

8. Repeat the above step for the second seat.

SEAT BELT ASSEMBLY

1. Locate the parts shown in the parts manual.

2. Install the seat belts as shown in the parts manual. The lap belts bolt to the hole approximately 3 3/4" aft of the seat back holes. Note the orientation of the bolts. Refer to the parts drawing. The shoulder belts mount to the forward cabane top bolt as shown in the parts manual.

3. This seat belt design allows for quick exit out of both lap and shoulder belts simply by opening the buckle.

4. To use, pull belts over lap and shoulder and adjust. To exit, un-clip lap belt. **IMPORTANT:** The shoulder belt must pass over your **INSIDE** shoulder (in either seat) then diagonally across your chest to the lap belt attach point. Always make sure that seat belts are properly positioned and snug prior to and during entire flight.

CONTROL STICK MOUNT AND ASSEMBLY

1. Locate the parts shown in the parts manual.

2. Drill out the bottom hole in **ONE** of the control sticks to 1/4" diameter. The other control stick has a 3/16" bolt inserted and does not need to be drilled.

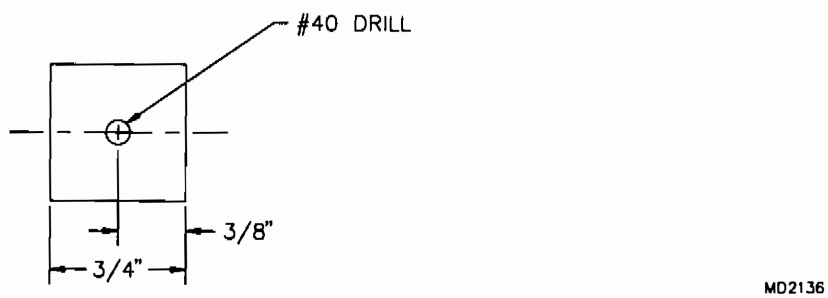
3. Bolt the control stick torque tube to the square tubes welded into the cockpit cage, so that the pre-drilled hole is on the **FRONT** side of the torque tube. Use the pillow block's second hole as a guide to locate and drill a 3/16" hole through the square tube for the second hole. Bolt control stick torque tube assembly in place. With the torque tube bolted in place, check for smooth operation. If binding occurs it may be necessary to slot the hole in the square tube of the fuselage. If side-to-side play exists, slot the holes to pull the pillow blocks outward.

4. Remove any powder coat over spray at pivot points of the control stick assembly. Grease the inside of the connect tube pivot bushing, the bearings, and the outside of the control stick torque tube's pivot stubs. Slip the control sticks onto the torque tube with the washers and bearings in the order shown in the parts drawing. Install the 3/4" nut until it removes all the play in the stick, but is not tight enough to cause binding.

5. Assemble and install the link tube as shown in the parts manual. The bolt in the center of the link tube holds the aileron cable in place and will be installed in the next step. Adjust the sticks parallel using the rod end. The fixed end of the link tube uses a 1/4" diameter bushing slightly taller than the link tubes bushing to allow the bolt to be tightened and not bind the bushing. Fabricate the bushing using the 1/4" aluminum tube provided. Measure the link tube bushing and add 1/32" for the inner bushing cut length. It should measure approximately 21/32". Apply grease to this bushing prior to assembly. The 3/16" bolt must be tight to hold the alignment, but the link tube must swivel freely.

6. Fabricate the two bushings shown in **Figure 03-06** from 3/4" x .058 included in the raw stock kit.

FIGURE 03-06



7. Slip the 3/4" long aft elevator stop onto the aft end of the 5/8" push-pull tube. Slip the push-pull tube into the swivel bushing. Attach the 5/8" push-pull tube to the control stick torque tube via the male rod end as shown in the parts manual. Use the 1/4" plain nut to lock in place. The other bushing will be installed before attaching the 1 1/4" push-pull tube. Both bushings will be drilled and riveted in position during Trial Assembly and Rigging.

AILERON CABLE SYSTEM ASSEMBLY

1. Locate the parts shown in the parts manual.

2. Drill the forward hole in the control stick tee to 1/4". Chamfer the control stick tee to allow the bearing flange to seat properly. Assemble the control stick tee as shown in the exploded view in the parts manual. **NOTE**: In some instances it may be necessary to install a washer between the bearings if they are loose inside the bearing flanges. Assemble the control tee to the keel tube at the vertical hole located 10 5/8" from the front of the keel tube. Drill out the hole in the keel tube to 1/4". Be sure to include the stand off and washers as shown.

3. Assemble and install pulleys as shown in the parts manual. Fabricate the 1/4" x .028 bushings that go between the tangs at S-3 from the material provided in the raw stock kit. Cut these bushings to 3/8" long. **BE SURE** to build the cable into the pulleys. The cable cannot be fed through once the pulleys are assembled. Install cable keepers and cotter pins where shown.

4. Attach turnbuckles and cable to control stick tee. Adjustments will be made during the Trial Rigging and Assembly section of the manual.

FLAP SYSTEM ASSEMBLY

S-12XL FLAP LEVER ASSEMBLY

1. Fabricate the following bushings in the appropriate lengths:

Qty.	Length	Tube Size
1	7/8"	1/4" X .028
2	3/8"	3/8" X .058
2	9/16"	1/4" X .028

2. Press the plastic caps into each end of the 3/4" flap trip release tube.

3. Screw the rod end onto one end of the 7ft. teleflex cable. Using the plastic shim, teleflex retainer and 9/16" long bushings, bolt this end of the teleflex to the right inside flap lever side plate as per the parts drawing. Note that the S2-SAB bolts to the lower hole. Bolt the 7/8" bushing into the side plates top hole.

4. Bolt the flap lever between the two side plates with the welded tab facing down. Tighten the flap lever pivot bolt so it is snug, but still allows the lever to pivot freely. Slip the spring into the flap lever tube and install the flap trip release tube.

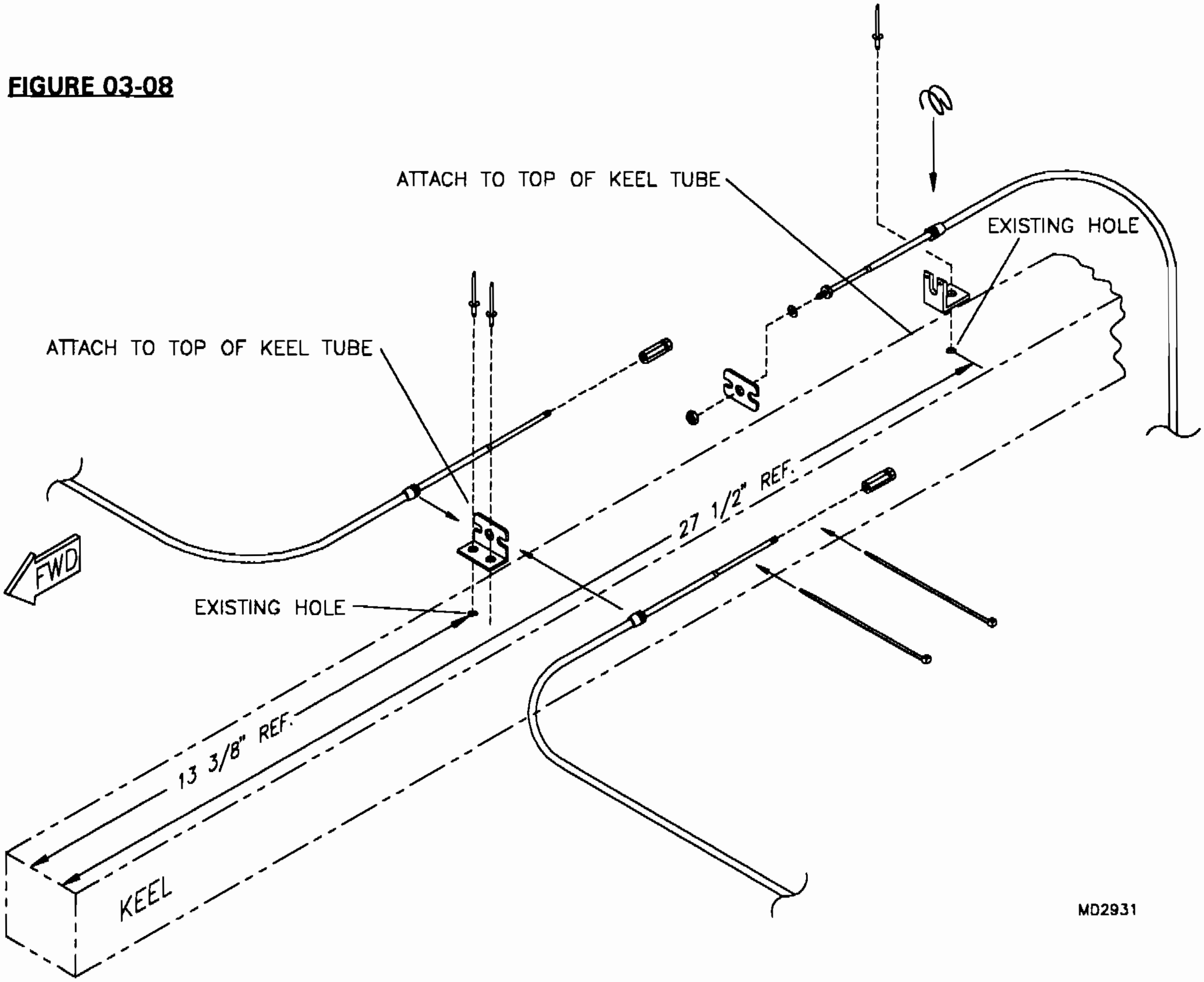
5. Depress and rotate the flap trip release tube until the 1/4" hole is lined up with the slot. Install the bolt and 3/8" diameter bushings into the flap lever and trip release tube. The bushings act as rollers and will ride against the flap lever sides. Tighten the bolt to the point the bushings still roll. Apply a light grease to the rollers for the best action. Test operate the lever by pulling up on the lever, then depressing the flap release tube return.

6. Bolt the rod end to the right hand side of the welded tab on the flap lever. The exact adjustment of the rod end on the teleflex will be determined when adjusting the flaps.

7. Install the flap lever assembly into the cockpit by slipping the forward part of the assembly over the attach fitting located between the seats on the airframe. Refer to the parts drawing. Using the hole in the S2-SAB as a guide, mark the hole location onto the steel mount tube. Pivot the flap lever assembly up and drill the #11 hole. Pivot the flap lever assembly down and bolt the S2-SAB to the mount tube.

8. Route the teleflex through the slots in the keel. Install the flap forward dual teleflex retainer. Use the hole approximately 13 3/8" from the front of the keel on the right side to locate one side of the dual teleflex retainer. Position the dual teleflex retainer perpendicular to the keel and drill the second #11 hole. Attach the teleflex retainer to the pre-drilled hole located approximately 27 ½" from the front of the keel. Install the flap lever teleflex into the retainer and secure with safety wire. Note the orientation of both retainers. See **FIGURE 03-08**.

FIGURE 03-08



9. Install the aft dual teleflex retainer onto the flap teleflex and secure with the **TENSILE** nut. The jam nut is supplied on the teleflex. It is important that this jam nut be in place prior to installing the dual teleflex retainer. After the wings are installed, slip each flap teleflex into the forward retainer on the keel. Install the flap nuts and insert them into the aft retainer. Secure the teleflexes into the retainers with nylon ties or safety wire.

10. Rig the flaps by adjusting the rod ends and tensile nuts. Both flaps should be even when viewed from the front or aft center. To properly rig the flaps, all three teleflex cables may require adjustment. It may also be required to trim off the ends of the teleflex cables where they attach to the horns. During flight testing, if the aircraft tends to roll to the right or left, flap adjustment may be required. Refer to the rigging section for further instructions.

11. Slip the flap cover over the handle to cover up the roller ratchet section of the lever. Use the conveniently located pockets to store items such as an intercom box or a flashlight.

THROTTLE ASSEMBLY

1. Locate the parts shown in the parts manual.

2. Insert the throttle knobs over each end of the throttle levers. Position the throttle knobs so the small horizontal hole in the knob is 90° to the center line of the aircraft. Be sure the knobs are inserted all the way onto the throttle lever. Drill through the knob from each side with a number 30 drill. Press in the roll pin to retain the knob to the lever.

3. Use a Scotch Brite pad or 400 sandpaper and clean the powder coating off the ends of the throttle lever where it fits into the bushings on the cage. Clean the bushings on the forward seat truss where the throttle lever installs. The left side of the throttle is the side with the arm extending below the lever to receive the friction rod and throttle retention block. When installing the throttle make sure it is orientated correctly.

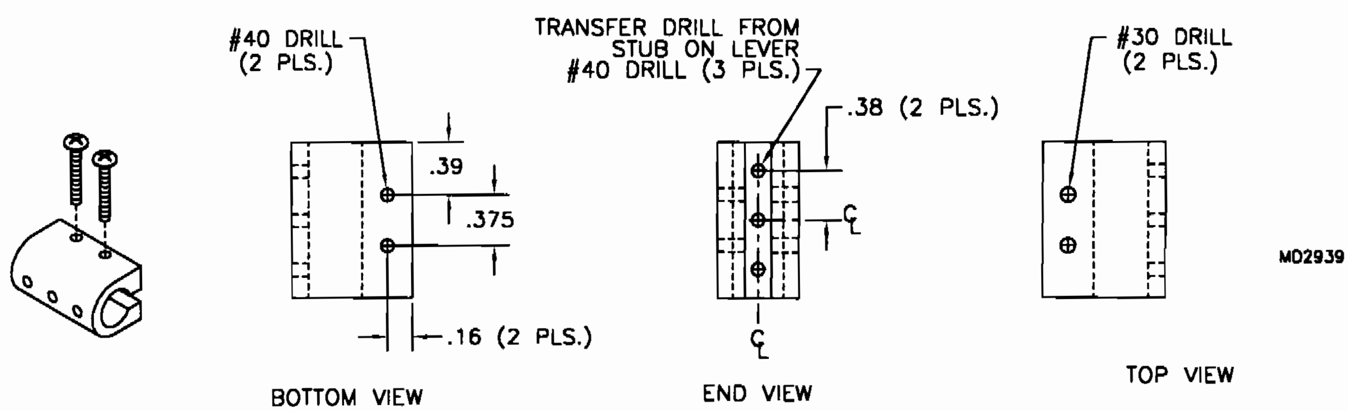
4. Grease bushings on the cage and the ends of the throttle lever. Install the throttle lever by sliding the right end of the lever far enough into the right bushing to get by the left bushing. Once past the bushing, pull the throttle lever back into position inside the left bushing. Slide the stop ring on the right side against the right bushing and hold and drill with 3/32" bit. Install a small cotter pin.

5. Install the nut plate on the outside of the friction block. Bolt the friction block to the mount tab with the hardware shown. The mount tab is a 1" square tab welded to the small diagonal tube just ahead of the throttle.

6. Assemble the friction rod mechanism into the friction block as shown in the parts manual. Be sure to place friction block with slot facing down, or friction rod will hit throttle stop. With the friction rod in place, mark and trim the small stub on the throttle arm to ensure perfect alignment with the friction block. Install hardware shown. Use a 1/4" round file to clean up the hole. Test the throttle action, it should be smooth, requiring minimal effort to operate. Loosen or tighten the bolt through the block to adjust the feel.

7. Drill the throttle retention block as shown in **Figure 03-07**. Now slide the block onto the stub on the throttle lever and tighten the machine screws so that the holes in the retention block are 90 degrees to the throttle lever. Transfer drill through the stub on the throttle lever into the throttle retention block. Pilot drill completely through the throttle retention block from top to bottom with a #40 drill bit. Drill out the top of the throttle retention block **ONLY** to #30. The machine screws will self tap into the bottom if done properly. Tighten down the screws so that the retention block is lined up with the throttle cable holes. The block is used to retain the cable **HOUSING(S)**.

FIGURE 03-07

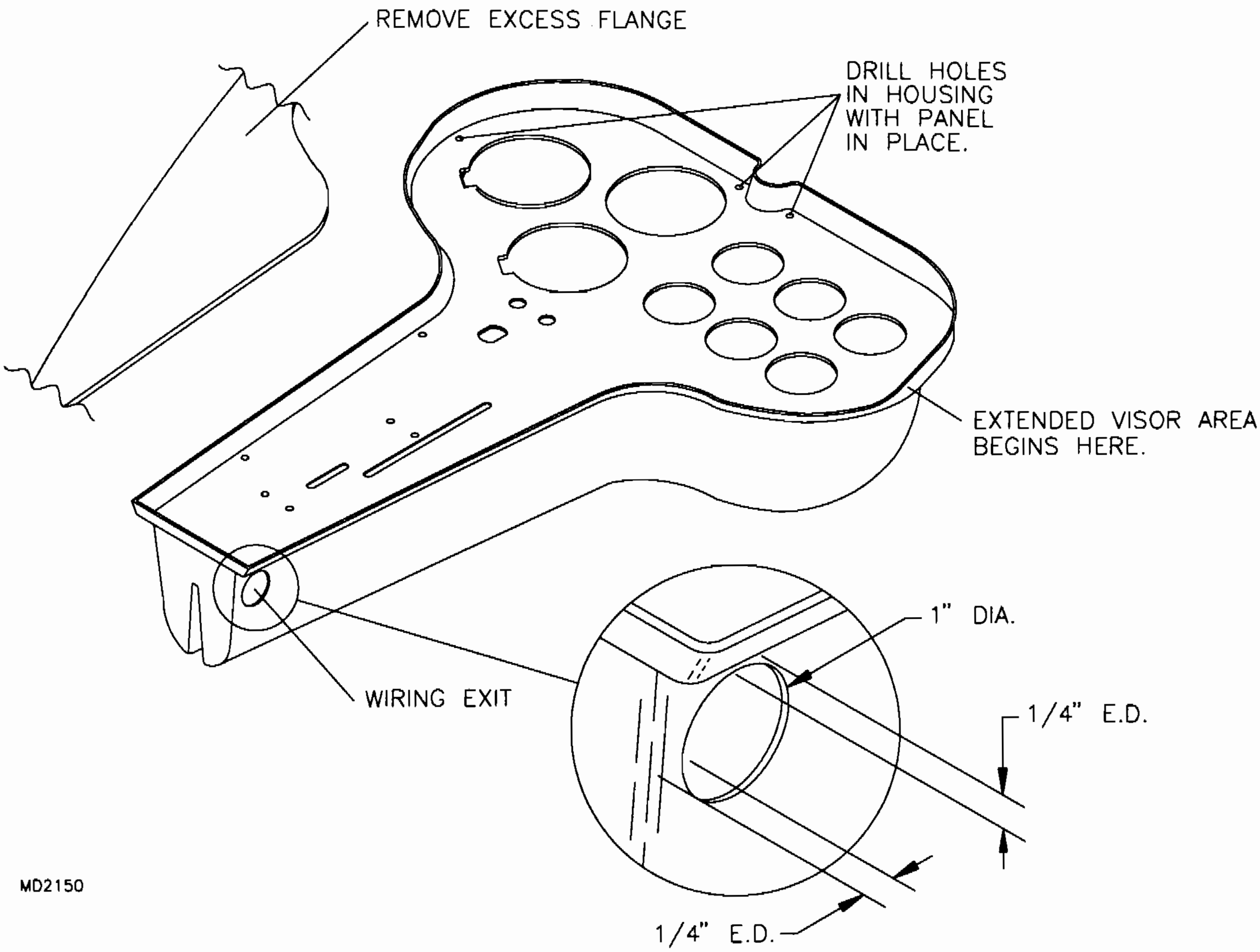


INSTRUMENT PANEL ASSEMBLY
503/582 WITHOUT PANEL MOUNTED PITCH TRIM

1. Locate the parts shown in the parts manual.

2. Trim the instrument panel housing to the edge of the flange. Use aviation snips or a jig saw to rough cut the panel, then final sand with #80 to achieve the desired finish (Trim Loc will be applied to the edge of the flange during final assembly). The housing should be trimmed so that the instrument panel sets into the perimeter flange with approximately 3/8" of the lip remaining. The top edge of the housing flange acts as a visor and should be left to extend further than the sides and bottom. Close examination of the housing will reveal the extended lip around the top. See **Figure 03-02.**

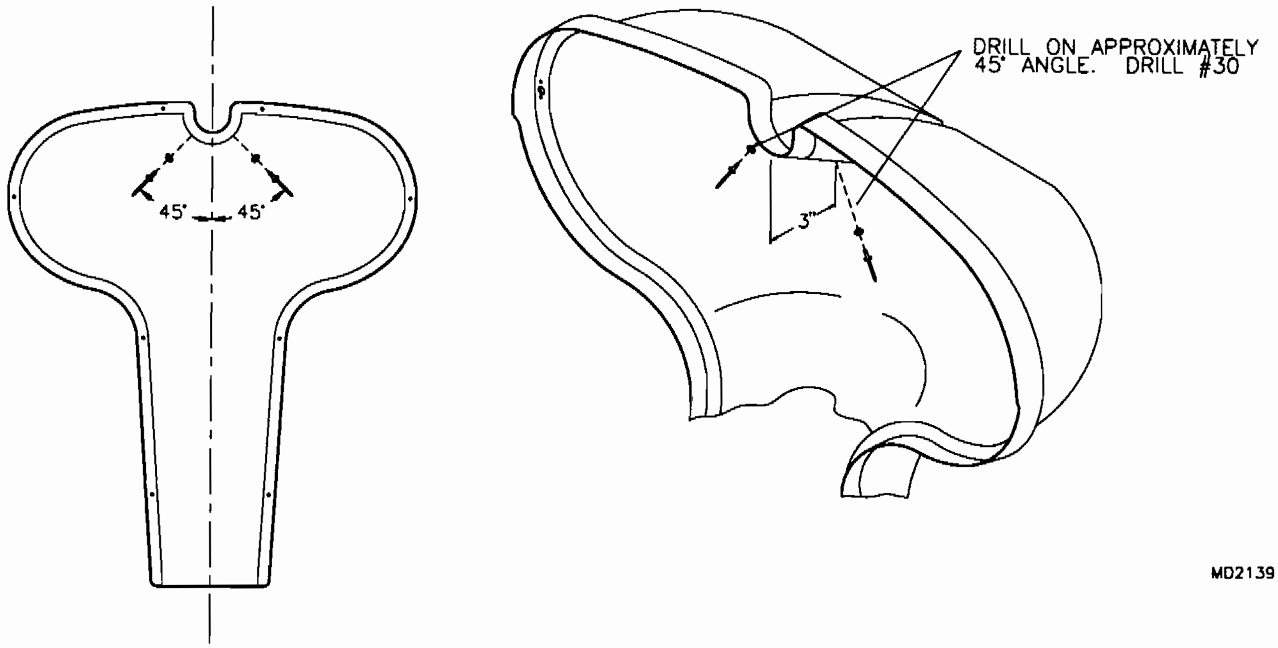
FIGURE 03-02



3. Using the instrument panel as a guide, locate and drill the nut plate holes in the housing. See the parts manual for nut plate locations and part numbers. Drill and rivet the nut plates in place using a #40 drill bit and the aluminum pop rivets shown. Temporarily install instrument panel into housing.

4. At approximately 3" from the front lip of the housing drill two (2) #30 holes (one on each side) in the area of the housing that mounts to the forward strut. Drill these holes at approximately 45 degrees. Make sure that mini-pod frame support bracket is in position on the forward strut to ensure correct location of these holes. See **Figure 03-04**. Cut a 1" hole on the lower right of the panel housing for instrument wiring. See the parts manual for approximate hole location.

FIGURE 03-04



5. Set the housing in place. Mark the location where the fuselage tab hits the bottom side of the panel housing. Cut a slot in the panel housing allowing the housing to sit over the tab. See the parts manual for approximate location. **NOTE**: It is recommended to have the mini-pod frame support (fit in the Fuselage Enclosure section of the manual) in place, since the instrument panel housing wraps around the frame support. Mark the two hole locations on the forward strut. While marking the holes be sure not to distort the shape of the housing. This could cause the instrument panel not to line up properly with the nut plates. Rivet in place as shown in the parts manual. Be sure to include the washers under the rivets as shown. Drill a 1" hole in the base of the panel housing for routing of pitot and static lines. Drill this hole off-center to the right. Make sure to go through the floorboard, missing the center tube of the fuselage cage. Install screws through the base of the housing as shown in the parts manual.

6. Upon final assembly, install the static/pitot mount onto the belly pan as shown in the #1 Belly Pan Assembly section of the manual. Install the pitot and static tubes into the mount. Cut the static tube into two equal lengths (approximately 7 ½" each). The open end of the static tube becomes the pitot tube.

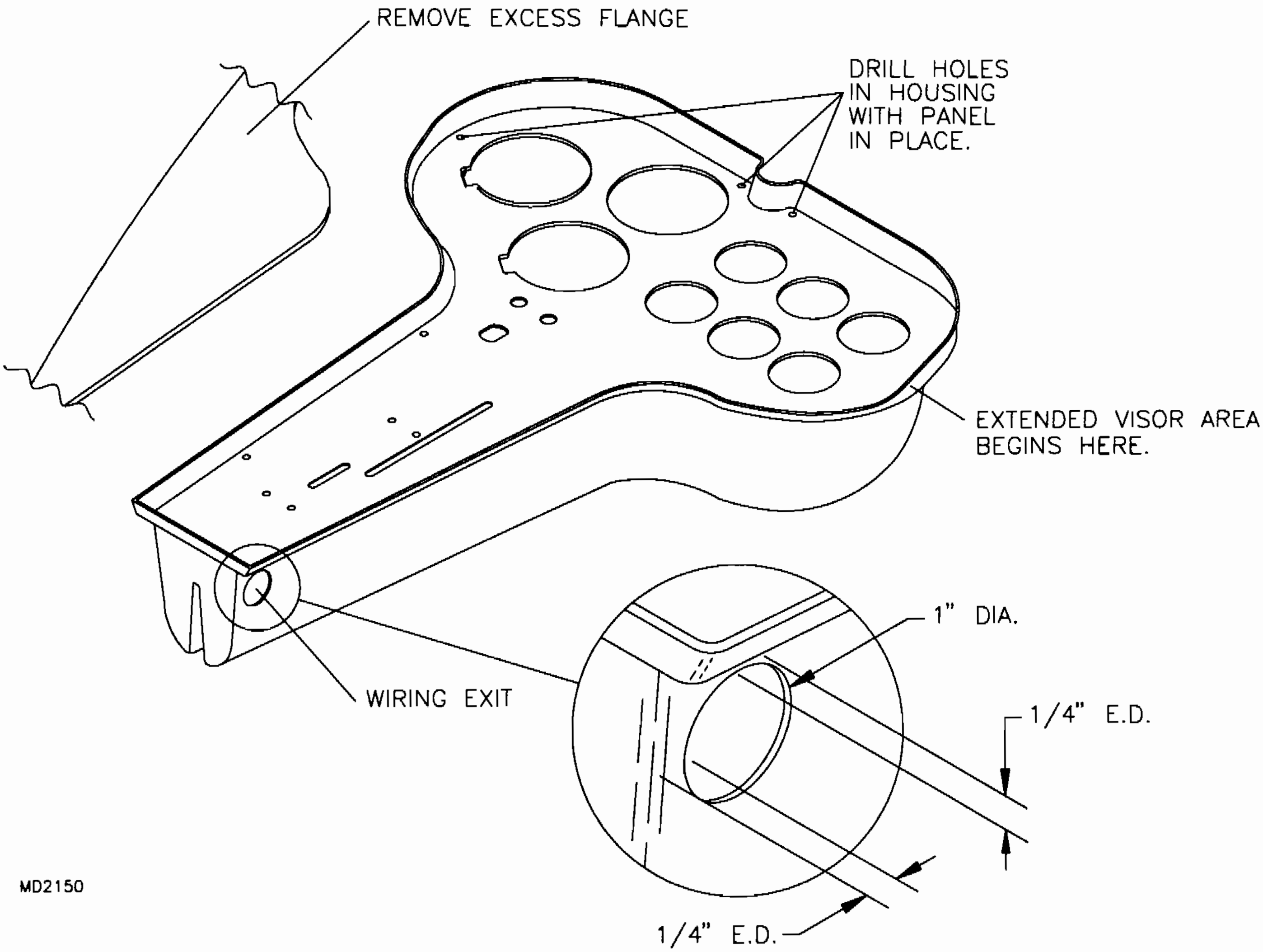
7. Install trim loc. Trim loc does not need to be glued; only pressed into place.

INSTRUMENT PANEL ASSEMBLY
503/582 WITH PANEL MOUNTED PITCH TRIM

1. Locate the parts shown in the parts manual.

2. Trim the instrument panel housing to the edge of the flange. Use aviation snips or a jig saw to rough cut the panel, then final sand with #80 to achieve the desired finish (Trim Loc will be applied to the edge of the flange during final assembly). The housing should be trimmed so that the instrument panel sets into the perimeter flange with approximately 3/8" of the lip remaining. The top edge of the housing flange acts as a visor and should be left to extend further than the sides and bottom. Close examination of the housing will reveal the extended lip around the top. See **Figure 03-02.**

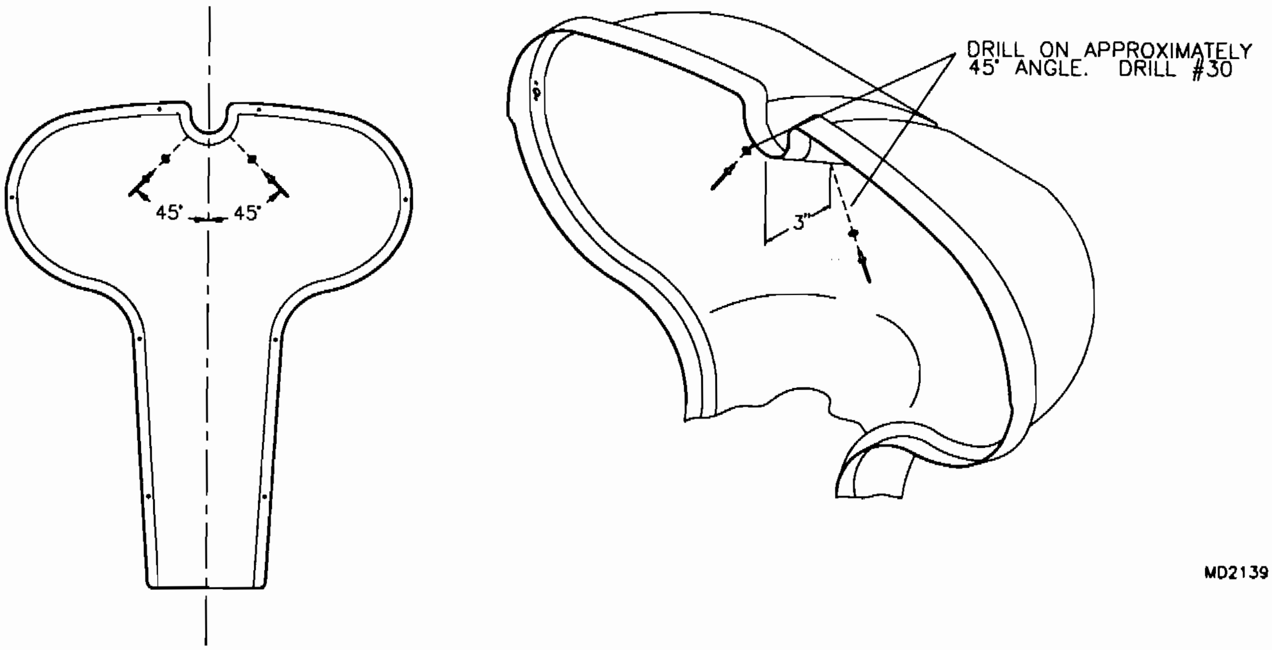
FIGURE 03-02



3. Using the instrument panel as a guide, locate and drill the nut plate holes in the housing. See the parts manual for nut plate locations and part numbers. Drill and rivet the nut plates in place using a #40 drill bit and the aluminum pop rivets shown. Temporarily install instrument panel into housing.

4. At approximately 3" from the front lip of the housing drill two (2) #30 holes (one on each side) in the area of the housing that mounts to the forward strut. Drill these holes at approximately 45 degrees. Make sure that mini-pod frame support bracket is in position on the forward strut to ensure correct location of these holes. See **Figure 03-04.** Cut a 1" hole on the lower right of the panel housing for instrument wiring. See the retrofit instrument panel assembly drawing for approximate hole location.

FIGURE 03-04



5. Set the housing in place. Mark the location where the fuselage tab hits the panel. Cut a slot in the panel which allows the panel to sit over the tab. See parts manual for details. **NOTE**: It is recommended to have the mini-pod frame support (fit in the Fuselage Enclosure section of the manual) in place, since the instrument panel housing wraps around the frame support. Mark the two hole locations on the forward strut. While marking the holes be sure not to distort the shape of the housing. This could cause the instrument panel not to line up properly with the nut plates. Rivet in place as shown in the parts manual. Be sure to include the washers under the rivets as shown. Drill a 1" hole in the base of the panel housing for routing of pitot and static lines. Drill this hole off-center to the right. Make sure to go through the floorboard, missing the center tube of the fuselage cage. Install screws through the base of the housing as shown in the parts manual.

6. Upon final assembly, install the static/pitot mount onto the belly pan as shown in the #1 Belly Pan Assembly section of the manual. Install the pitot and static tubes into the mount. Cut the static tube into two equal lengths (approximately 7 ½" each). The open end of the static tube becomes the pitot tube.

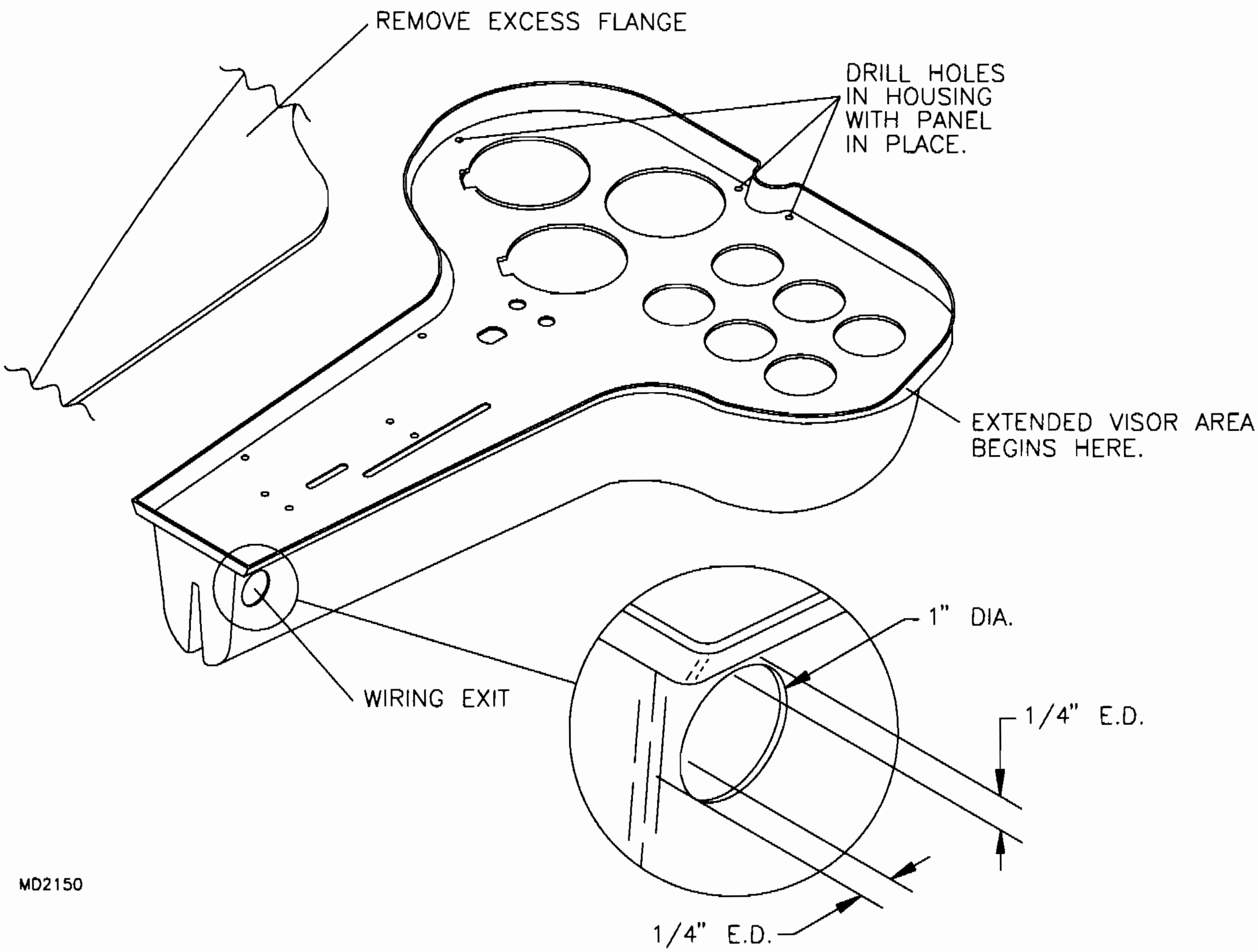
7. Install trim loc. Trim loc does not need to be glued; only pressed into place.

INSTRUMENT PANEL ASSEMBLY
912

1. Locate the parts shown in the parts manual.

2. Trim the instrument panel housing to the edge of the flange. Use aviation snips or a jig saw to rough cut the panel, then final sand with #80 to achieve the desired finish (Trim Loc will be applied to the edge of the flange during final assembly). The housing should be trimmed so that the instrument panel sets into the perimeter flange with approximately 3/8" of the lip remaining. The top edge of the housing flange acts as a visor and should be left to extend further than the sides and bottom. Close examination of the housing will reveal the extended lip around the top. See **Figure 03-02.**

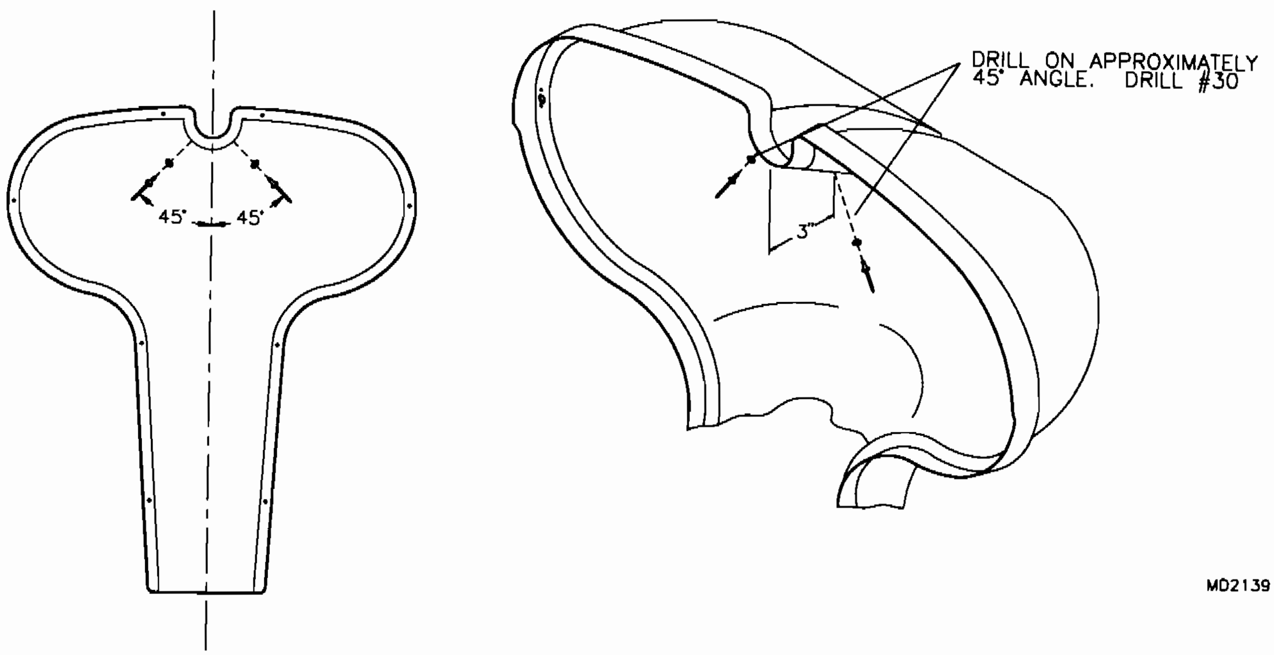
FIGURE 03-02



3. Using the instrument panel as a guide, locate and drill the nut plate holes in the housing. See the parts manual for nut plate locations and part numbers. Drill and rivet the nut plates in place using a #40 drill bit and the aluminum pop rivets shown. Temporarily install instrument panel into housing.

4. At approximately 3" from the front lip of the housing drill two (2) #30 holes (one on each side) in the area of the housing that mounts to the forward strut. Drill these holes at approximately 45 degrees. Make sure that mini-pod frame support bracket is in position on the forward strut to ensure correct location of these holes. See **Figure 03-04.** Cut a 1" hole on the lower right of the panel housing for instrument wiring. See the retrofit instrument panel assembly drawing for approximate hole location.

FIGURE 03-04



5. Set the housing in place. Mark the location where the fuselage tab hits the panel. Cut a slot in the panel which allows the panel to sit over the tab. See parts manual for details. **NOTE**: It is recommended to have the mini-pod frame support (fit in the Fuselage Enclosure section of the manual) in place, since the instrument panel housing wraps around the frame support. Mark the two hole locations on the forward strut. While marking the holes be sure not to distort the shape of the housing. This could cause the instrument panel not to line up properly with the nut plates. Rivet in place as shown in the parts manual. Be sure to include the washers under the rivets as shown. Drill a 1" hole in the base of the panel housing for routing of pitot and static lines. Drill this hole off-center to the right. Make sure to go through the floorboard, missing the center tube of the fuselage cage. Install screws through the base of the housing as shown in the parts manual.

6. Upon final assembly, install the static/pitot mount onto the belly pan as shown in #1 Belly Pan Assembly section of the parts manual. Install the pitot and static tubes into the mount. Cut the static tube into two equal lengths (approximately 7 ½" each). The open end of the static tube becomes the pitot tube.

7. Install trim loc. Trim loc does not need to be glued; only pressed into place.

TRIM WHEEL ASSEMBLY
PANEL MOUNT

1. Locate the parts shown in the parts manual.

2. Install the trim wheel to the instrument panel using 1/8" rivets shown. Route the trim cable out the hole drilled in the panel housing for the wiring exit. Route cable to right side of fuselage, then diagonal between the forward and aft seat trusses and inside the tail boom. When routing the trim cable avoid sharp bends, kinks, or conflict with other moving parts. During final assembly attach cable to trim wheel assembly as shown in the parts manual.

3. The trim cable will be attached to the elevator trim tab in a later step.

TRIM WHEEL ASSEMBLY
FLAP LEVER MOUNT

1. Locate the parts shown in the parts manual.

2. Attach the trim wheel assembly to the flap lever assembly as shown. Attach the trim cable to the wheel assembly as shown. Route the cable up the tail boom.

3. The trim cable will be attached to the elevator in a later step.

STROBE BOX MOUNT

1. Locate the parts shown in the parts manual.

2. Install the strobe box to the S-1 truss as shown on the parts drawing. Make sure to mount the strobe box far enough to the left to clear the steering horn and linkages.

3. Strobe box will be wired in a later section.

S-12XL VERTICAL STABILIZER FRAME ASSEMBLY

PLEASE NOTE: The tail boom must be assembled to the fuselage prior to this step. The rudder must also be assembled with or without the covering installed. Refer to the applicable sections for assembly instructions.

1. Select all the parts shown in the vertical stabilizer parts drawing.

2. Fabricate four 6" doublers from 7/8" x .058 raw stock. Mark a line completely around two of the 6" doublers at its mid-point. **DO NOT** use pencil; the graphite in the lead may corrode the aluminum. Insert one of the marked 6" doublers into the vertical stabilizer leading edge. Slide the doubler until the marked line shows in the cable attach point hole (This hole is approximately 35 1/8" from the lower end). Drill #40 and rivet 2 1/4" below the cable attach point hole. Using a #11 bit and the holes as a guide, drill into the doubler from each side at the cable attach point.

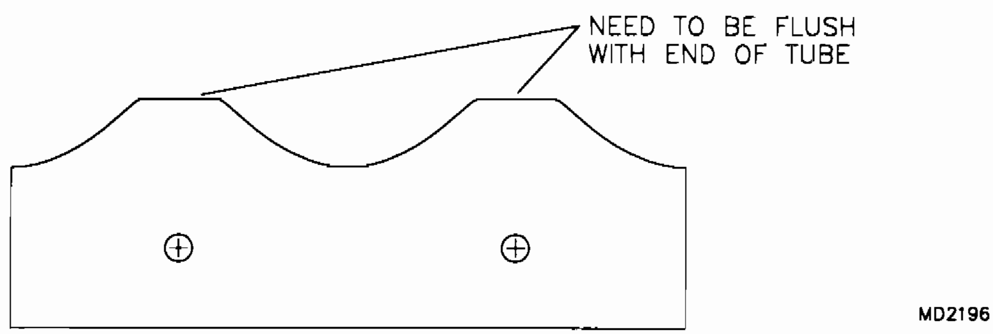
3. Install the other marked 6" doubler in the vertical stabilizer trailing edge. Drill #40 and rivet 2 1/4" below the cable attach point hole. Drill doubler out to 3/16" on each side using vertical stabilizer T.E. as a guide.

4. Install the unmarked 6" doublers flush with each end of the vertical stabilizer spreader tube. Drill and rivet the doublers in place as shown in the parts manual. Note that there is a forward and aft end to the spreader tube. The forward end has two #40 holes located approximately 1 9/16" and 3" from the end of the tube.

5. Install the nut plate at the top hinge location of the vertical stabilizer trailing edge.

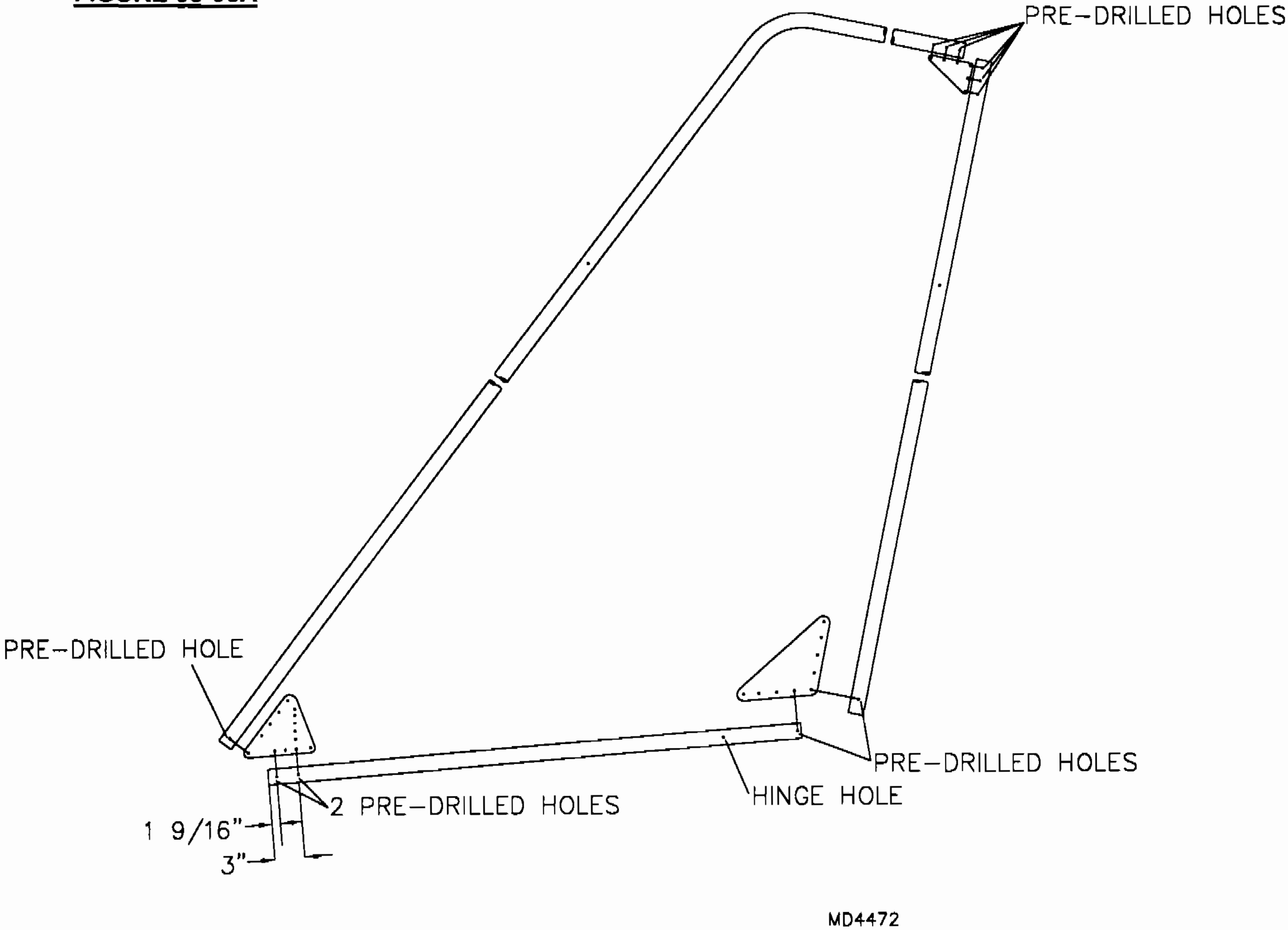
6. Assemble the vertical fin frame using parts shown in the parts manual. "Fish mouth" the top end of the vertical stabilizer leading edge using the paper template shown in **FIGURE 05-06** as a reference. The fwd & aft end of the spreader tube will need shaping to allow the holes to align with the corner gussets. Cleco together to check fit. Refer to **FIGURE 05-06A**.

FIGURE 05-06



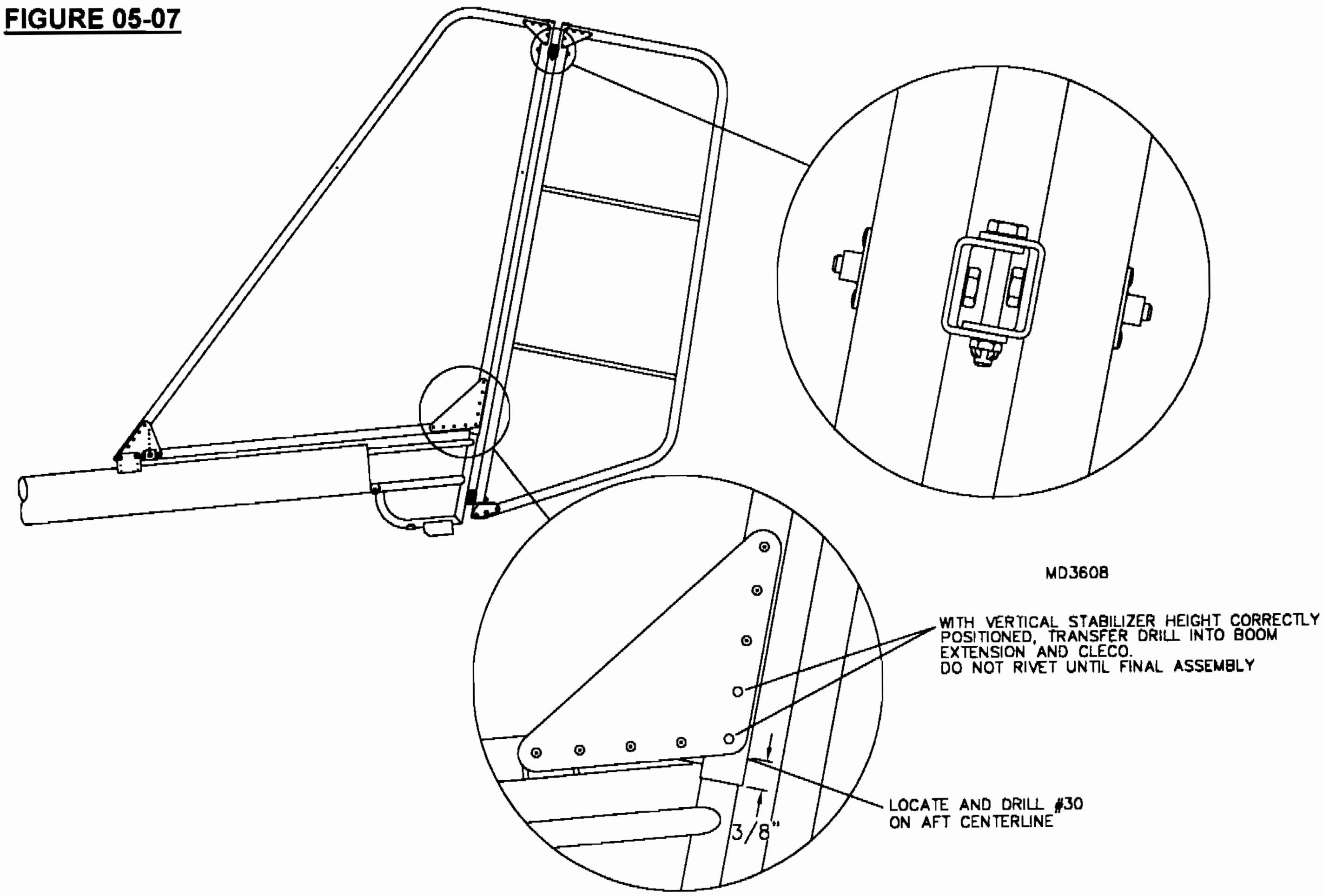
"FISH MOUTH TEMPLATE"

FIGURE 05-06A



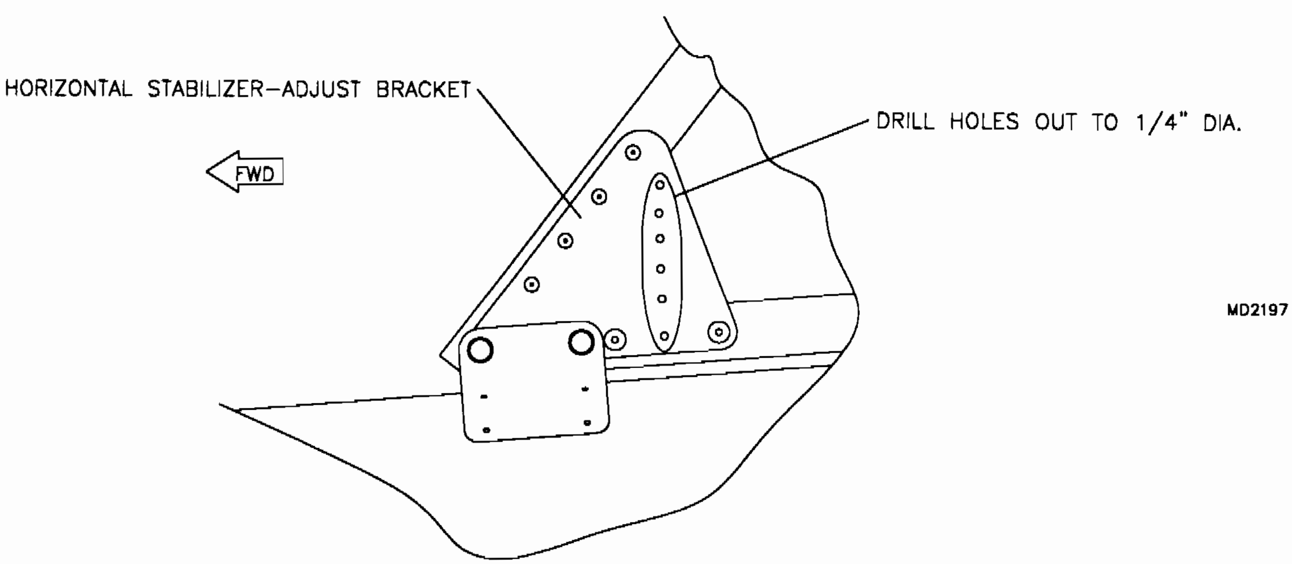
7. **Use the rudder to set the height of the vertical stabilizer. Assemble the rudder as shown in the rudder frame assembly section of the parts manual. Return to this step upon completion of the rudder.** Install the hinge bracket to the trailing edge of the vertical stabilizer. Slip the vertical stabilizer in place over tail boom extension. Bolt the rudder to the vertical stabilizer. **NOTE:** The rudder hinges sit on top of the hinges located on the vertical stabilizer. See **FIGURE 05-07.** Adjust the vertical stabilizer as required and bolt the lower rudder hinge to the tail boom extension. With the rudder bolted in place and the vertical stabilizer in line with the tail boom, drill through the tail boom extension using the **bottom corner** holes in the trailing edge gusset as a guide. Drill from both sides and cleco. Locate and drill a #30 hole through the trailing edge spar and boom extension on aft centerline 3/8" up from the lower end of the trailing edge spar.

FIGURE 05-07



8. With the trailing edge clecoed in place, align the leading edge with the center of the tail boom and drill the tail boom #11 using the boom brackets as a guide. **CLECO** after drilling each hole. See **FIGURE 05-08**. Drill the horizontal stabilizer-adjust bracket as shown in **FIGURE 05-08**. Also drill the spreader tube to 1/4" where required by the horizontal stabilizer-adjust bracket.

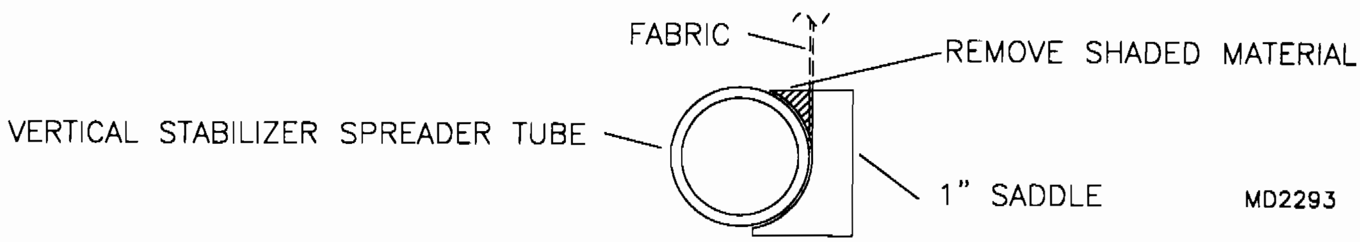
FIGURE 05-08



9. Fabricate the bushing which goes in between the adjust brackets. The bushing should fit flush with the outside of the adjust brackets. Install the forward pair of "U" brackets.

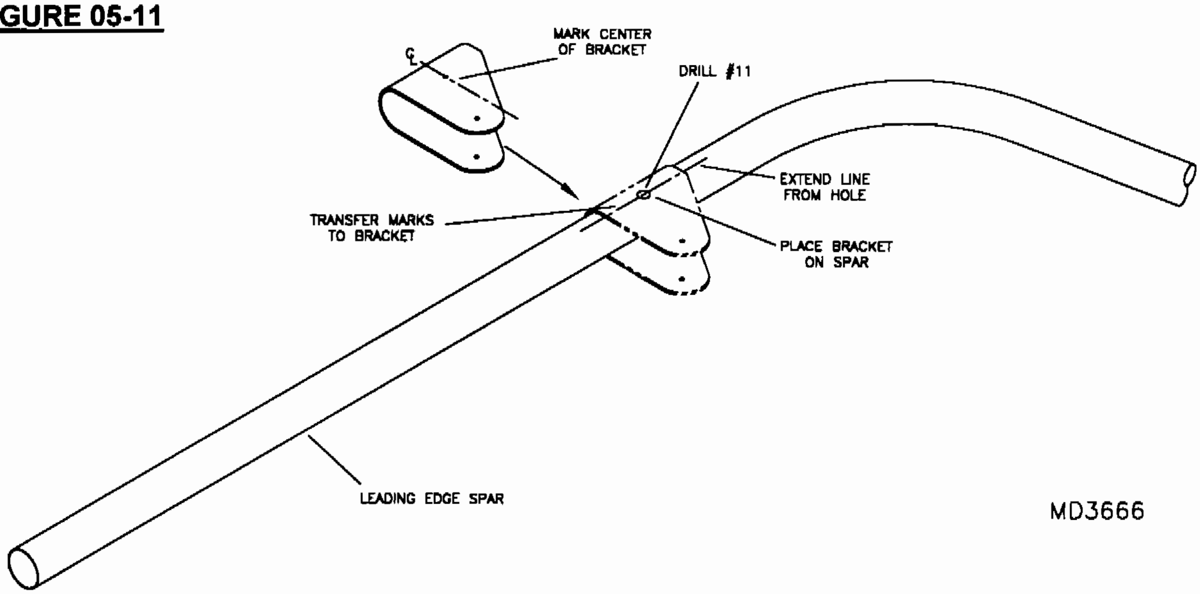
10. Drill a remaining pair of "U" brackets to1/4" where they attach to the spreader tube. After the fabric is on, install aft pair of "U" brackets and 1" saddles as shown in the parts manual. **<u>NOTE</u>:** It will be necessary to file the top of the saddle at the point where it contacts the fabric of the vertical stabilizer during final assembly. File as required, preventing chafing or puncturing of the fabric. See **FIGURE 05-10.**

<u>FIGURE 05-10</u>



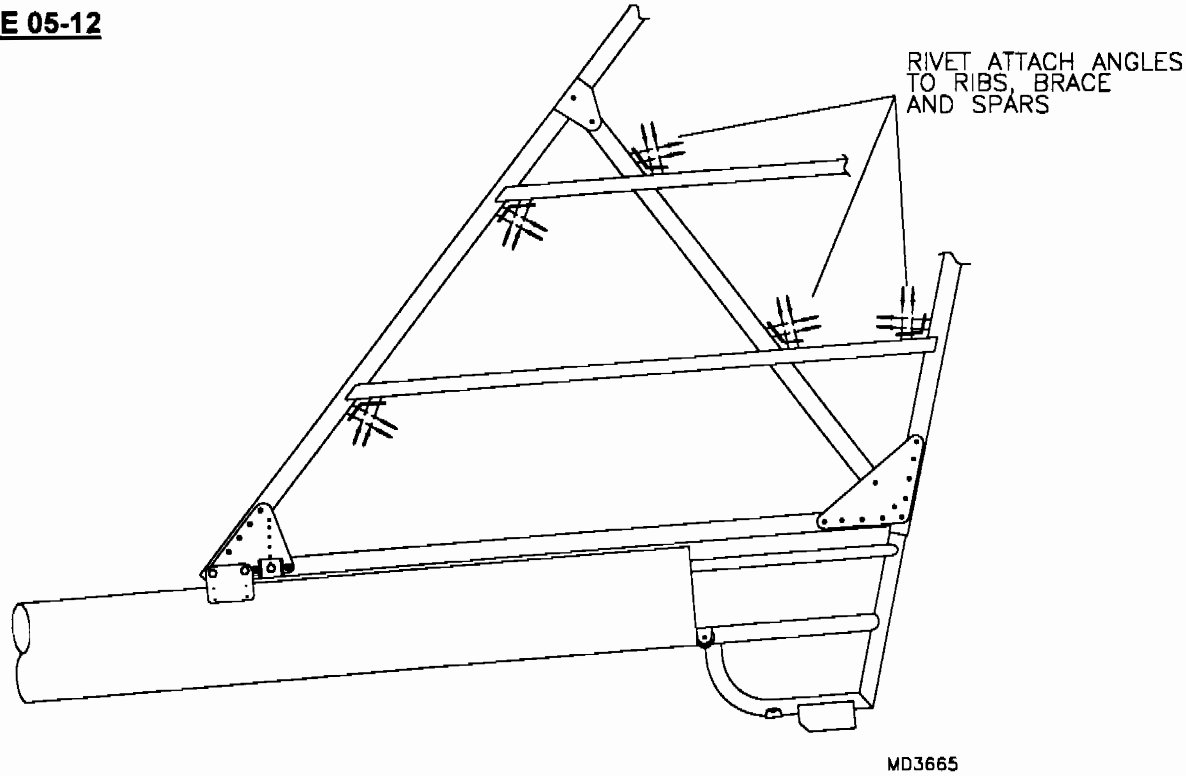
11. Mark a line extending both directions from the cable attach hole on the leading edge spar. Locate and mark the center of the U-bracket as shown in **FIGURE 05-11**. Slip the U-bracket onto the leading edge at the cable attach point so that the mark is centered over the hole. Note the orientation of the U-bracket. Make sure the U-bracket is tight against the spar and mark the upper and lower end of the U-bracket where the line on the spar extends. Transfer this mark to the center mark and drill #11. Temporarily bolt the U-bracket to the spar.

<u>FIGURE 05-11</u>



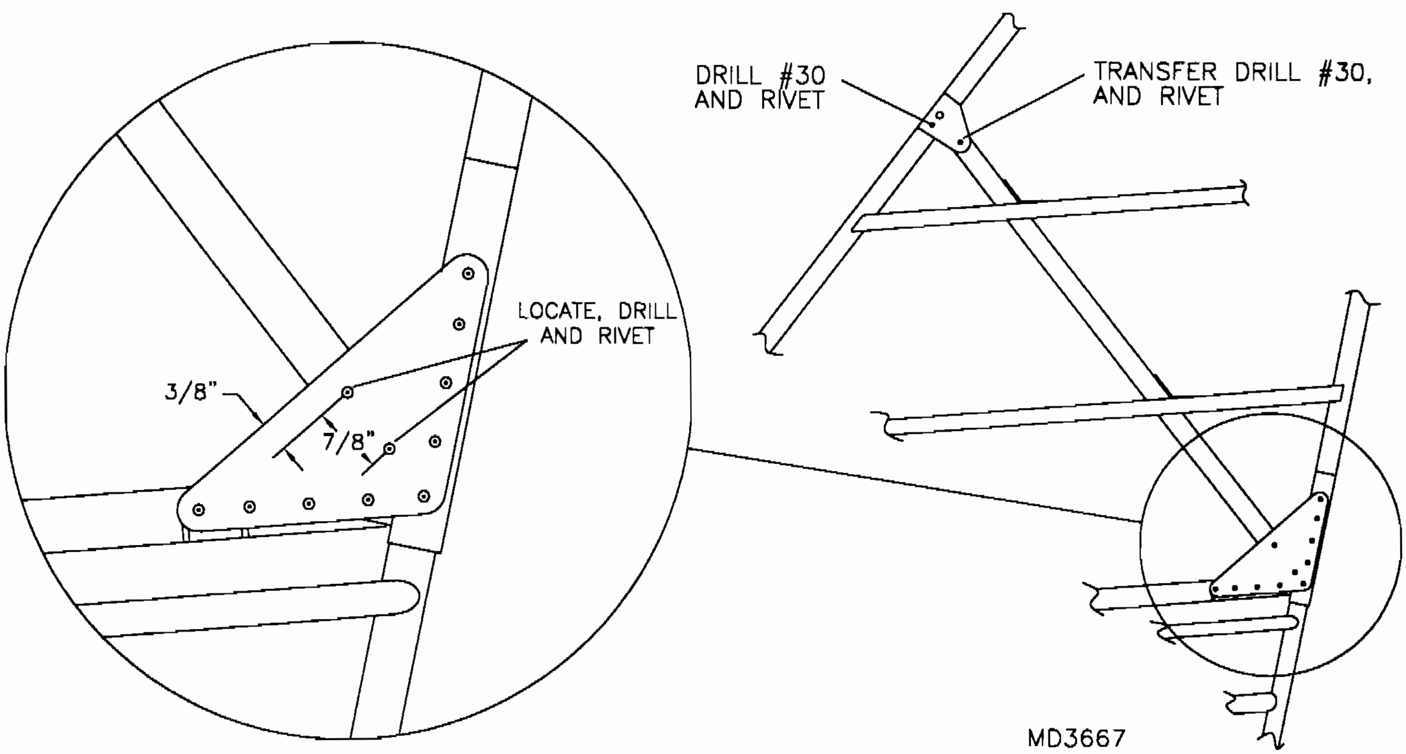
12. Fabricate the aluminum brace tube from the raw stock provided. Refer to the parts manual. Remove one clecoed aft gusset. Contour the lower aft end of the brace to fit into the corner formed by the spreader tube and the trailing edge spar. Contour the upper end to fit against and match the angle of the leading edge spar. Remove the vertical stabilizer from the boom and remove the spreader tube. Once fitted, remove the brace tube and slip the ribs over the tube and position on vertical fin. **<u>NOTE:</u>** Straighten the ribs with fluting pliers. The leading edge and spar are pre-drilled for the rib attach tangs. Install the aluminum brace through the ribs to fit between the U-bracket and the lower aft gussets. Install the spreader tube. If necessary, slightly elongate the holes in the ribs for brace and rib alignment. Install the Attach Angles to the ribs and brace as shown in the parts manual. Refer to **FIGURE 05-12.**

FIGURE 05-12



13. Transfer drill #30 through both sides of the U-bracket into the brace tube and rivet. Locate and drill two #30 holes through the lower aft gussets into the brace tube and rivet as shown in **FIGURE 05-13**. Locate, drill and place a rivet through both sides of the U-bracket into the leading edge spar. This will keep the U-bracket from shifting during covering. Remove the bolt in the U-bracket. Install all rivets and bolts.

FIGURE 05-13



S-12XL HORIZONTAL STABILIZER FRAME ASSEMBLY

1. Locate the parts shown in the parts manual.

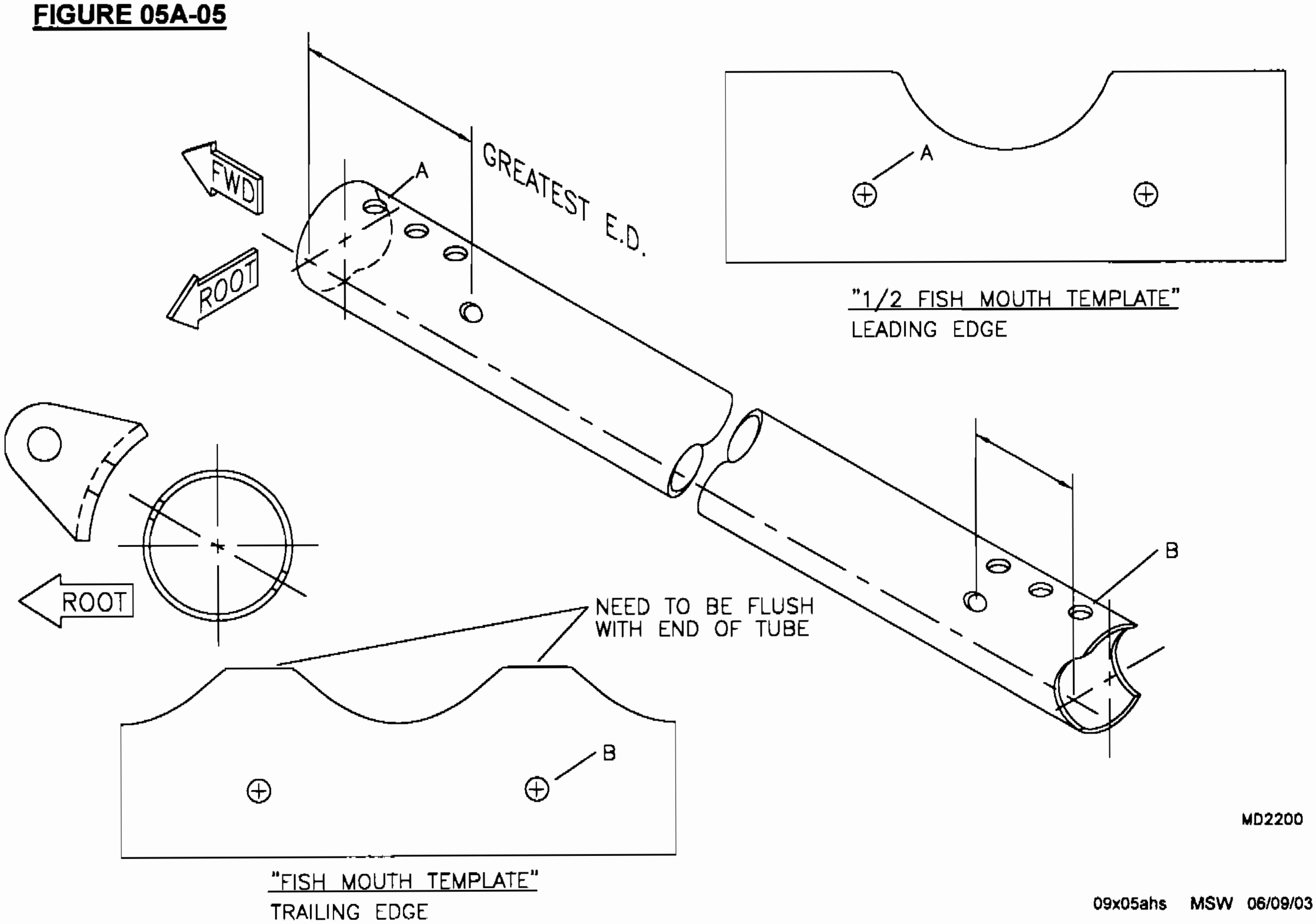
2. Fabricate two (2) 10" doublers and two (2) 6" doublers from 7/8" x .058 raw stock. Mark a line completely around each 6" doubler at its mid-point. Insert a 6" doubler into the horizontal stabilizer leading edge. Slide the doubler until the marked line shows in the cable attach point hole. Locate and drill a #40 hole 2 1/4" inboard of the cable attach point to hold each doubler in place. Install rivets as shown.

3. Install the remaining 10" doublers in the horizontal stabilizer trailing edge. Drill a #40 and rivet at a location 3 1/4" inside the cable attach point hole to hold the doubler in place. Drill doubler out to #11 on each side at the cable attach point using the horizontal stabilizer trailing edge as a guide.

4. Drill pre-located hinge bolt holes along spreader tube and trailing edge spar to #11. Locate nut plates to appropriate sides, creating left and right spreader tubes. See **FIGURE 05A-05**. Transfer-drill #40 through nut plate ears, deburr and rivet in place.

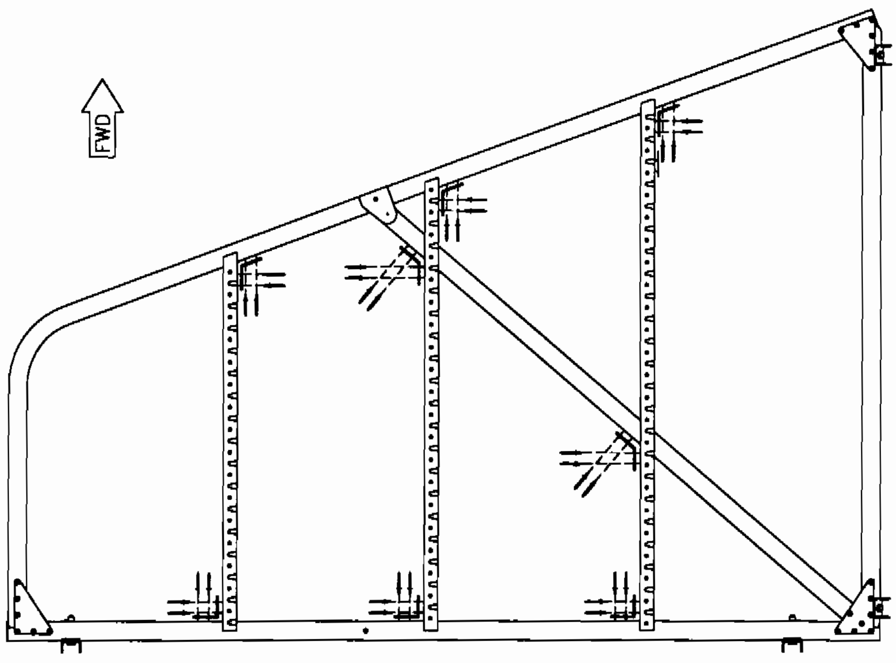
5. Assemble the outer framework for the horizontal stabilizer. Cleco only at this time. "Fish mouth" both ends of the horizontal stabilizer spreader tube and the outboard end of the leading edge; see parts drawing. The ends should be "fish mouthed" using the templates shown in **FIGURE 05A-05**. As a reference, check fit as you file. **IMPORTANT:** Orientation of the spreader tube is critical. There is a left and right horizontal stabilizer spreader tube. The holes should be oriented so that the stainless steel hinges will sit above the centerline of the spreader tube and the hinge hole with the greatest edge distance should be forward. See **FIGURE 05A-05.** Make sure to orientate the forward template properly. Material on the forward end should be removed from the side that faces the tip. **HINT:** A drum sander attachment for a hand drill works well for forming the desired shape. Drill as required. Assemble using the parts shown in the parts manual.

FIGURE 05A-05



6. Refer to the vertical stabilizer assembly and follow the same procedure for installing the U-bracket, aluminum brace and ribs. Be sure to rivet the inboard aft gussets and the U-bracket to the brace tube. See **FIGURE 05A-06**. Refer to **FIGURE 05A-06** for rib location. The holes for the attach angles are pre-located.

FIGURE 05A-06



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S-12XL ELEVATOR ASSEMBLY

- **The elevator assembly must be put together in conjunction with skinning of the elevator.**

1. Locate the parts shown in the parts manual.

2. Install the nut plates to the elevator trailing edge and leading edge as shown. Install the buttons to the leading and trailing edges.

3. Assemble elevator frames using the parts depicted in parts manual. "Fish mouth" the top of the trailing edge using the template shown in **FIGURE 05B-03.** The leading edge's inboard/outboard end is determined by the location of the hinge holes. The outboard hinge hole is at approximately 3 ½" and the inboard is at approximately 3". Verify proper orientation by holding against the horizontal stabilizer frames. Control horn and fabric orientation will determine left and right. Assembly will be the same for the elevator frames. Install gussets as shown. Size drill as required by the rivets specified. Both gussets can be riveted to the leading edge's outboard end, but not to the trailing edge. The elevator will have to be **disassembled** to be covered after trial assembly and rigging. Attach control horn to elevator; orienting one for the right and one for the left elevator assembly. On the inboard gussets, **DO NOT** drill the two aft holes on the trailing edge until after covering. See **FIGURE 05B-03A.**

FIGURE 05B-03

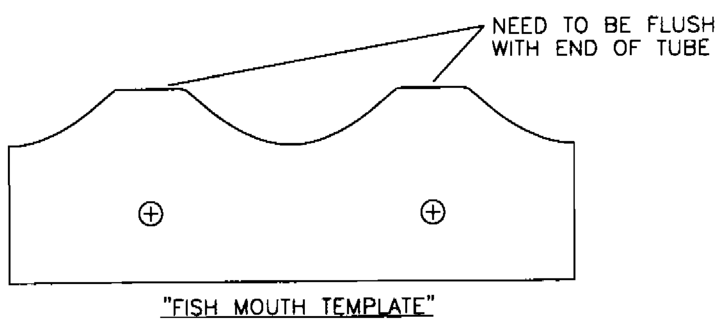
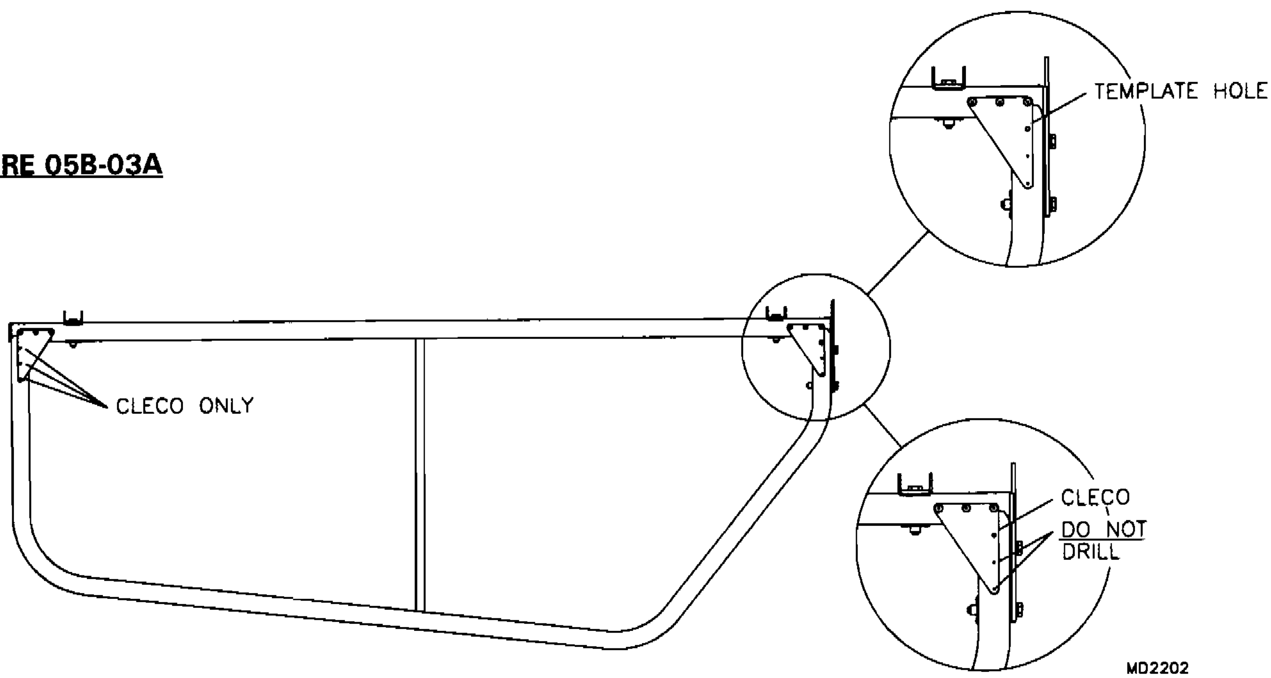
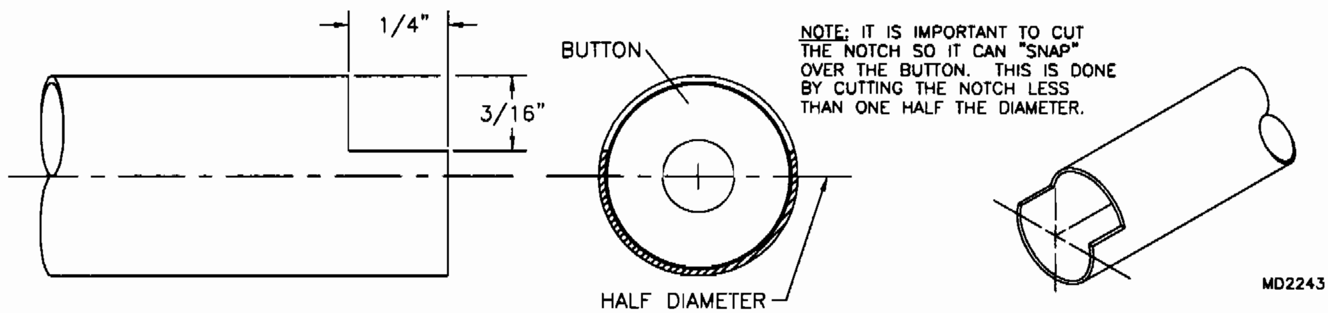


FIGURE 05B-03A



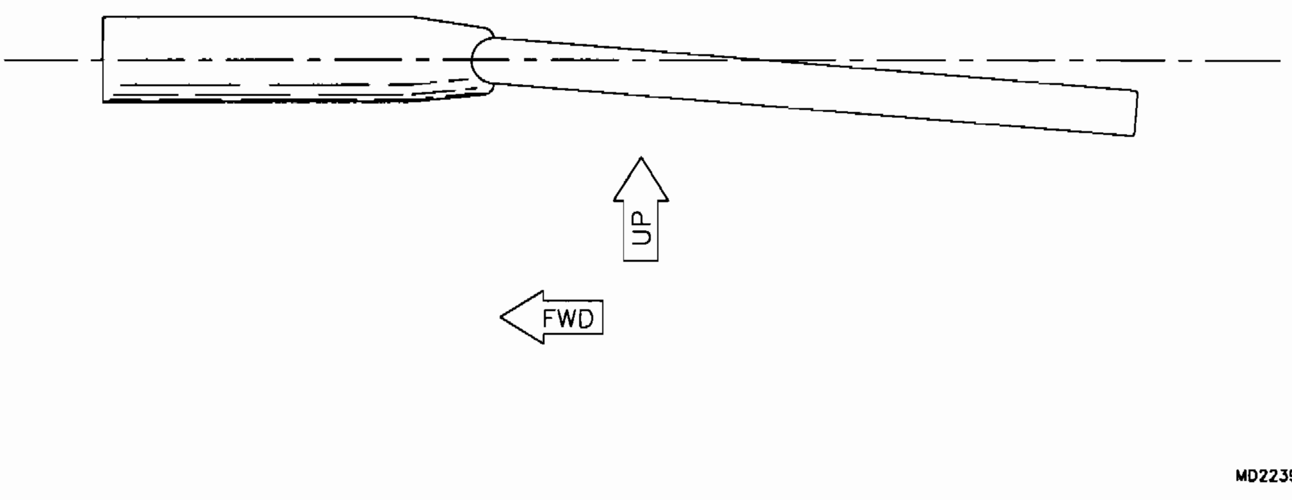
4. Cut the internal brace from ½" x .035 to a length of 15 5/8" It should have a slight notch on one end so it will "snap" into position on the button. See **FIGURE 05B-04.** Test fit the internal brace; final installation will be done in the covering section.

FIGURE 05B-04



5. Assemble the male rod ends to the elevator yoke. Drill the hole in the notched end of the 1 1/4" push-pull tube to 1/4" (the notched end is the front). Slip the foam rubber insulator onto the middle of the push-pull tube. Use epoxy to hold the foam insulator in position. Slide the push-pull tube into position in tail boom. At the front of the boom (aft seat truss), install the 1/4" bolt through the push-pull tube and the 5/8" push-pull tube. Secure with hardware shown. Make sure to slip the forward and aft elevator stops in position over the 5/8" push pull tube. Set the location of the forward stop during Trial Assembly and Rigging. Fabricate the forward and aft stops from 3/4" x .058 by 3/4" long. Install the elevator yoke with the angle down as shown in **FIGURE 05B-05**, using the hardware shown.

FIGURE 05B-05



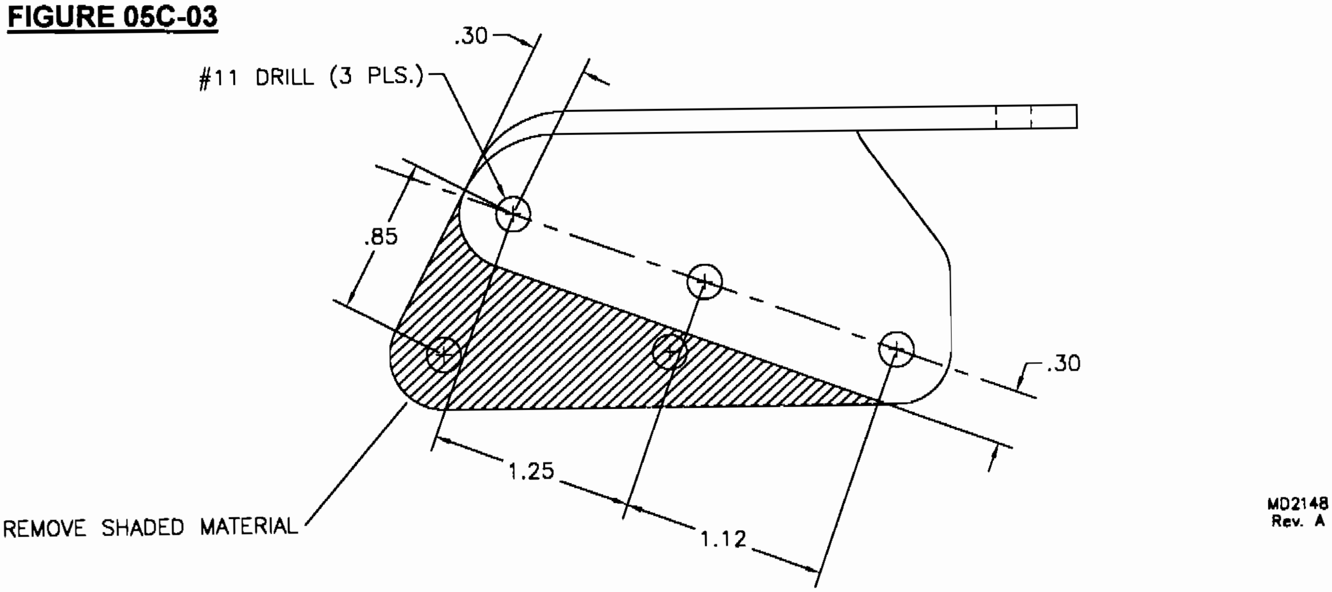
S-12XL RUDDER ASSEMBLY

1. Locate the part shown in the parts manual.

2. Drill the holes at the rudder hinge locations to #11. Install the nut plates to the rudder hinge hole locations on the rudder leading edge.

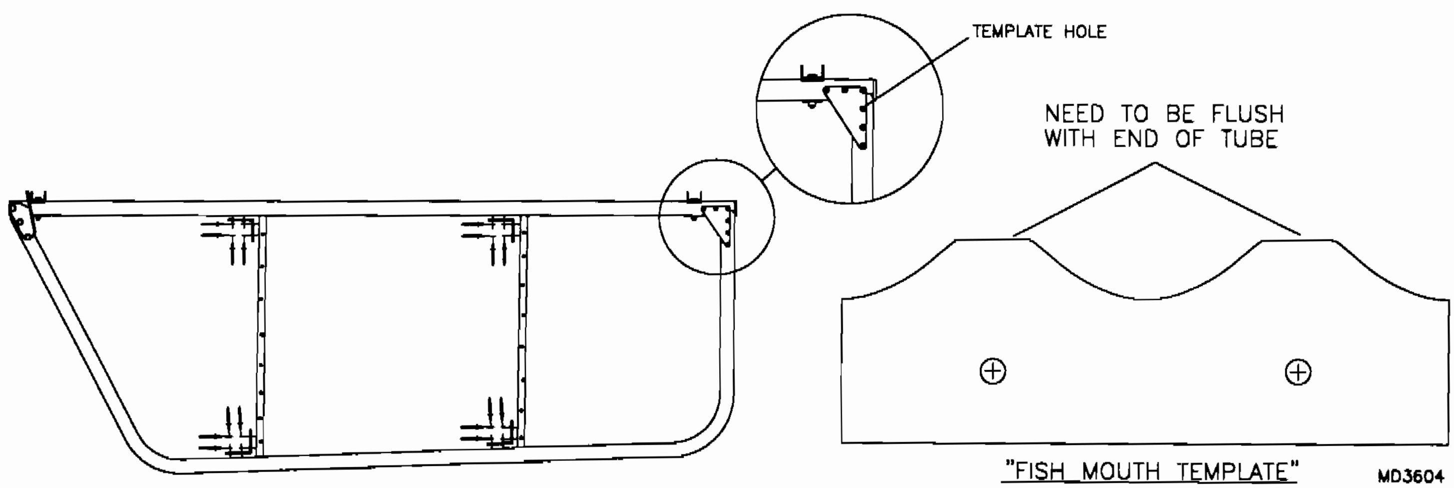
3. Modify the rudder horns as shown in **FIGURE 05C-03.**

FIGURE 05C-03



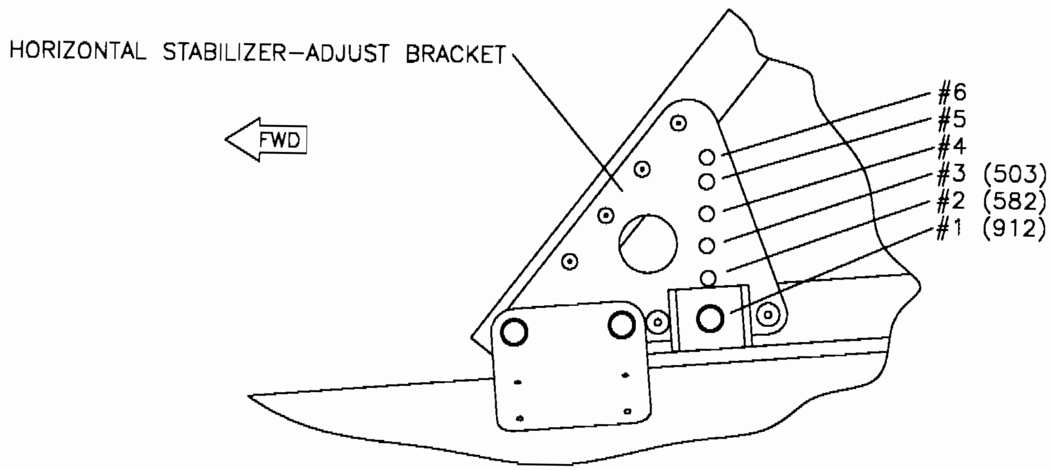
4. Attach the rudder trailing edge to the rudder leading edge using the hardware shown. Fish mouth the top of the trailing edge using the template shown in **FIGURE 05C-04.** Locate and drill #11 the pre-located holes in the leading and trailing edges for the rudder horns. Attach the rudder horns. It may be necessary to file a slight angle on the bottom of the rudder trailing edge. Size drill holes as required for the hardware shown. Refer to **FIGURE 05C-04** for the internal rib locations. The holes for the attach angles are pre-located. Install the ribs using the hardware called out in the parts manual.

FIGURE 05C-04



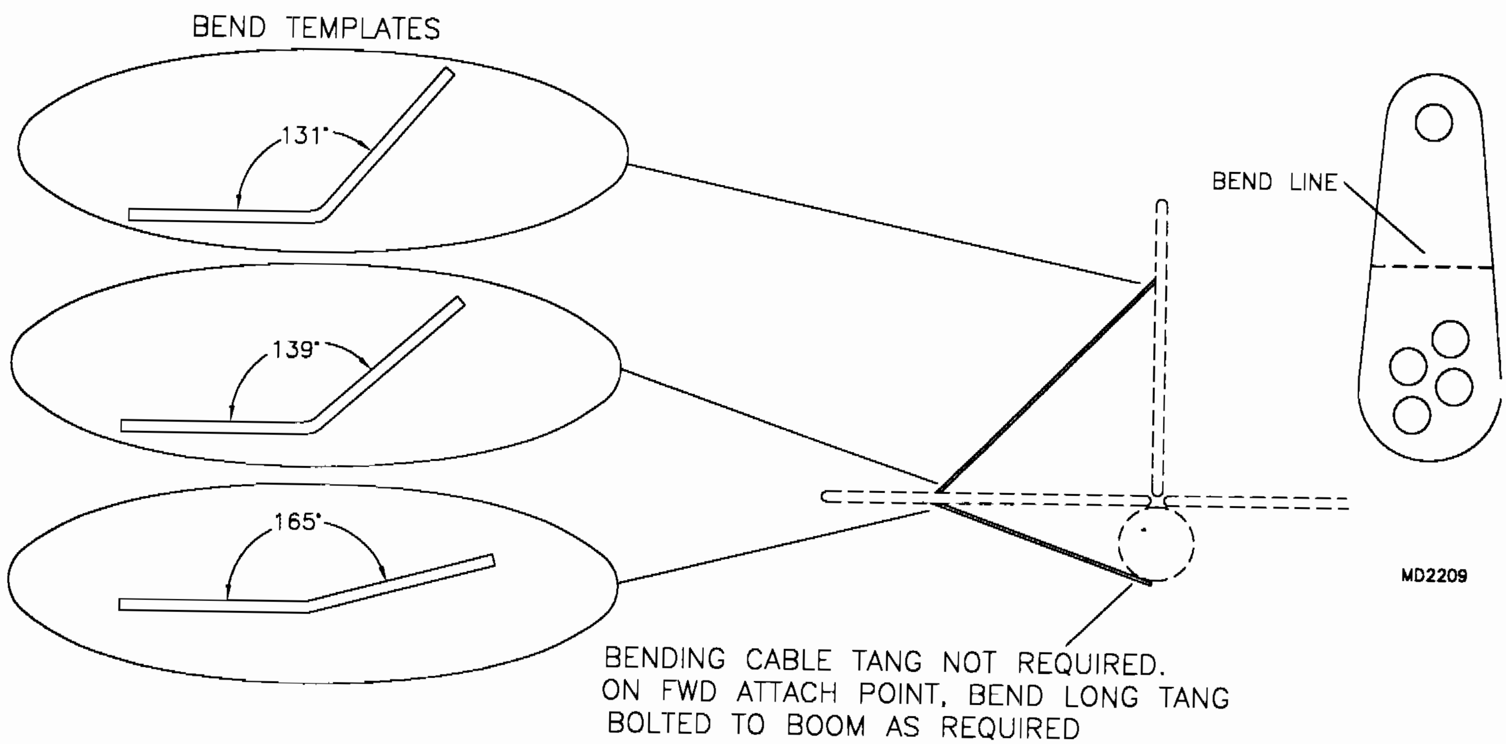
S-12XL TAIL CABLE ASSEMBLY

NOTE: The vertical and horizontal stabilizers will need to be attached to the tail boom before setting up the tail cables. Use saw horses and spacers or an adjustable "T" stand to hold the horizontal stabilizers level. Make sure that the fuselage cage is level from side to side. The recommended incidence for each engine is shown below. The set of top forward cables provided will adjust to the bottom three holes. If flight-testing reveals a need to use the top three holes, shorter cables may be purchased from the RANS parts dept.



1. Select the parts shown in the parts manual. The adjustor tang on each end of the cable assemblies will need to be formed to the approximate angle shown below. Do this with padded Vise-Grips or a padded bench vise. Be careful not to scar or dent the adjustor tang. Hold cable tang against the appropriate template and bend to the approximate angle. The bend should be made as indicated in **FIGURE 05D-01.**

FIGURE 05D-01

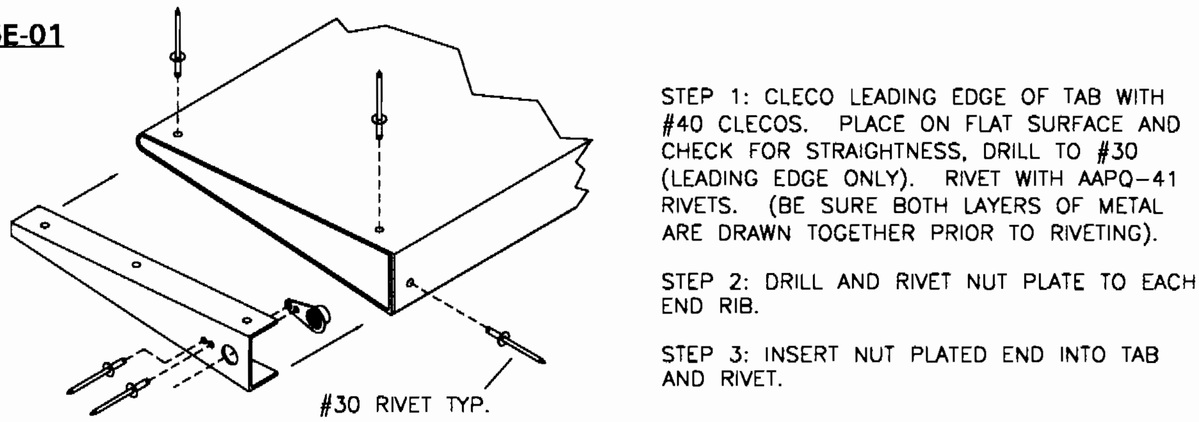


2. Using the hardware shown, bolt the cables in place using the hole 2nd from the end of the cable. Bolt the two tangs to the bottom of the tail boom using the pre-installed nut plate. Hook up all cables before tightening bolts. Make any adjustments necessary to hold the horizontal stabilizers level at the vertical stabilizer. Also make sure to keep the vertical stabilizer in line with the aft strut of the super structure. Gently push down on the horizontal stabilizers to let the lower cables reach the tail boom. Once all bolts are installed, tighten nuts and check surfaces. Cables should be tight without causing any deformation for the tail surfaces. When disassembling for covering mark the holes on the tangs to ease final assembly.

S-12XL MECHANICAL TRIM TAB SYSTEM

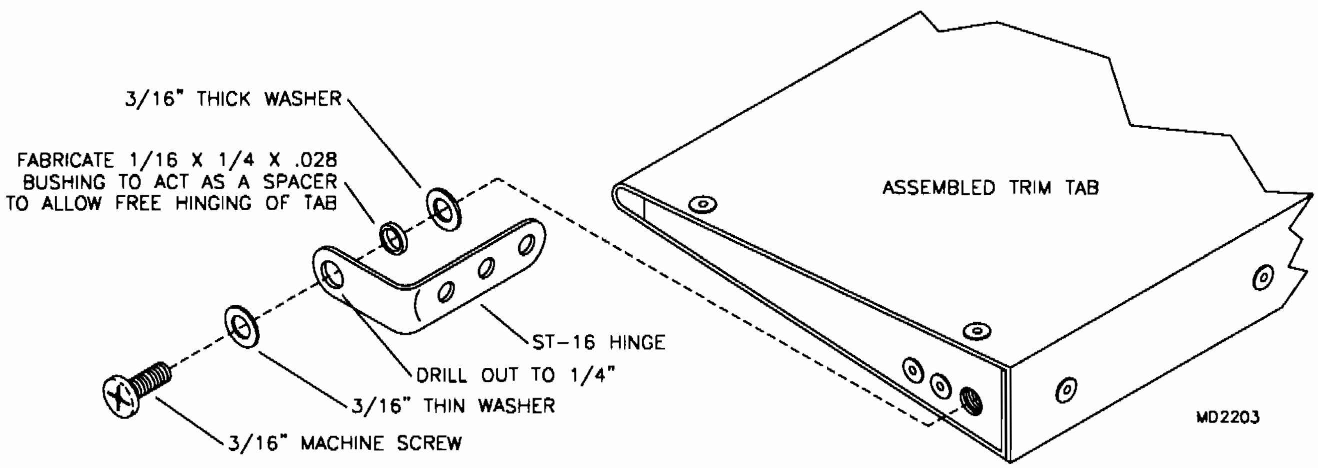
1. Assemble the trim tab per **FIGURE 05E-01**.

FIGURE 05E-01



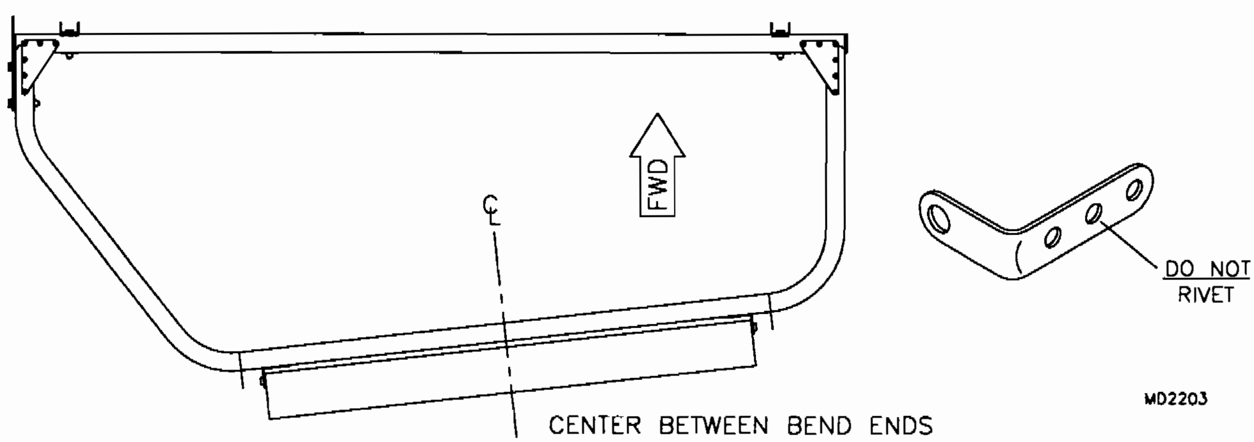
2. Temporarily install hinges to the trim tab, per **FIGURE 05E-02**.

FIGURE 05E-02



3. With the hinges installed to the trim tab, use the trim tab as a guide to mark the trailing edge of the right elevator. Locate two holes centered on the trailing edge of the elevator as marked. Remove the hinges from the trim tab. Cleco the hinges to the elevator and transfer-drill the remaining holes into the trailing edge. *Only two holes are required to attach each hinge to the elevator.* See **FIGURE 05E-03.**

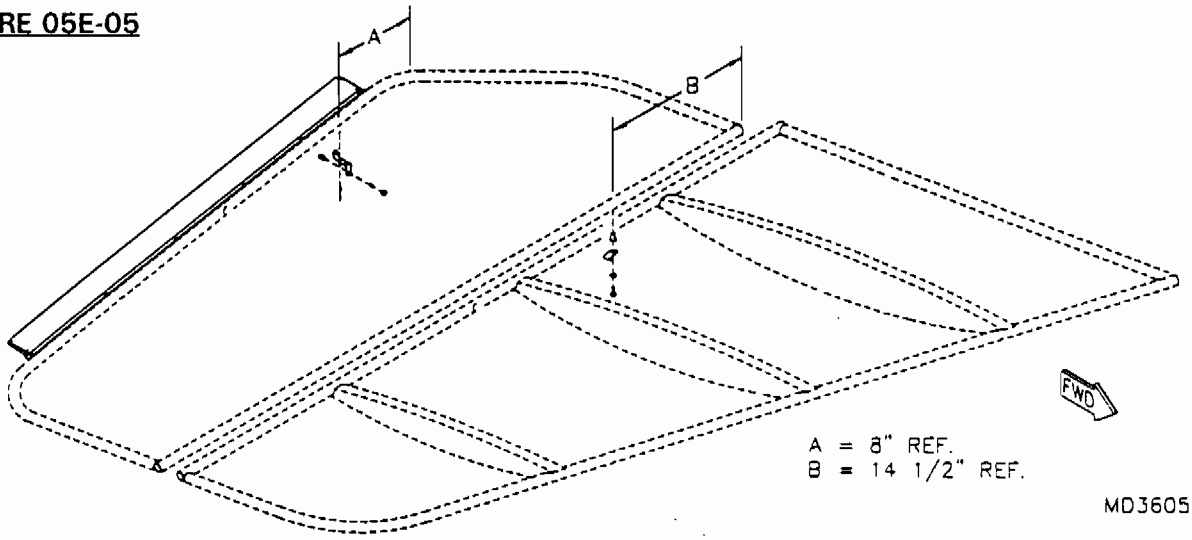
FIGURE 05E-03



4. Temporarily rivet the hinges to the elevator with one rivet per hinge. Drill out the rivet to remove the hinge prior to covering. Install the trim tab and check for free movement.

5. Locate the hole in the leading edge of the elevator for the clamp as shown. See **FIGURE 05E-05.** Drill hole to 1/4" and install rivet nut. Bolt clamp to rivet nut using hardware shown. Refer to the parts drawing.

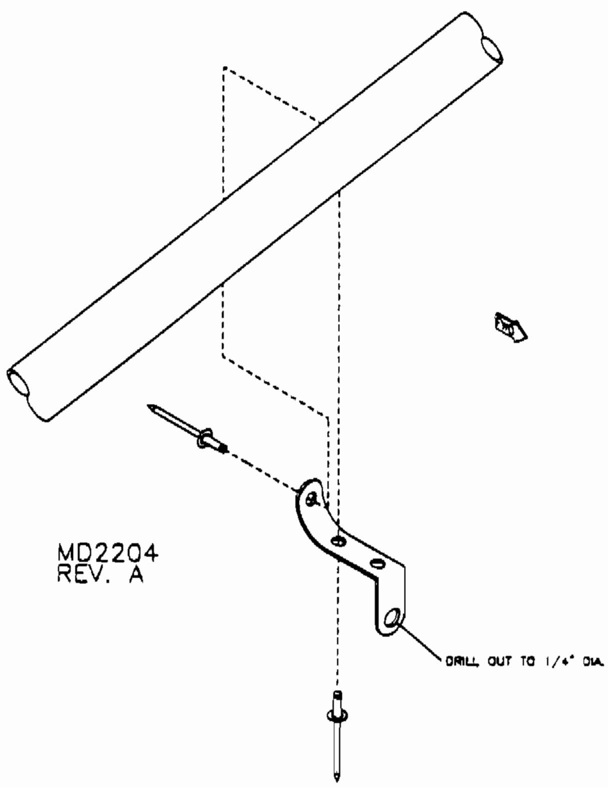
FIGURE 05E-05



6. Route the cable out the end of the tail boom to the clamp on the elevator. Refer to the parts drawing.

7. Drill out the cable housing stop bracket to 1/4" diameter, to accept cable stop fitting as shown in **FIGURE 05E-07. Note:** Use safety wire to secure the cable housing to the cable housing stop bracket as shown in **FIGURE 05E-07.**

FIGURE 05E-07



S-12XL GROUND-ADJUSTABLE TRIM TAB

8. Mounted to the elevator, the trim tab is used to adjust stick pressure; usually, it is set to maintain level flight "hands off" at a particular cruise power setting. Mounted to the rudder, the trim tab may be used to adjust rudder pedal pressure; most often, it is set to eliminate the need to "hold rudder" to maintain heading in level flight at a particular cruise power setting.

Initially, the trim tab may be taped to the trailing edge of the control surface. Bend the tab as desired and secure to one side of the trailing edge with masking tape. Test fly to determine the need to increase or decrease deflection. Once satisfied, remove tape and rivet tab to trailing edge spar.

S-12XL Wing Assembly

LEADING & TRAILING EDGE SPAR ASSEMBLY

NOTE: Assemble both spars the same but make one **LEFT** and one **RIGHT**.

1. Select the necessary parts as shown in the parts drawing.

2. The leading edge spar comes with all but one of the holes pilot drilled. The final hole sizes are called out during assembly. **PLEASE NOTE:** The front side of the spar has four (4) holes for the tip bow rivets. Disregard the 5th hole in from the tip, it is used for the static and pitot probes on the S-6ES Coyote II.

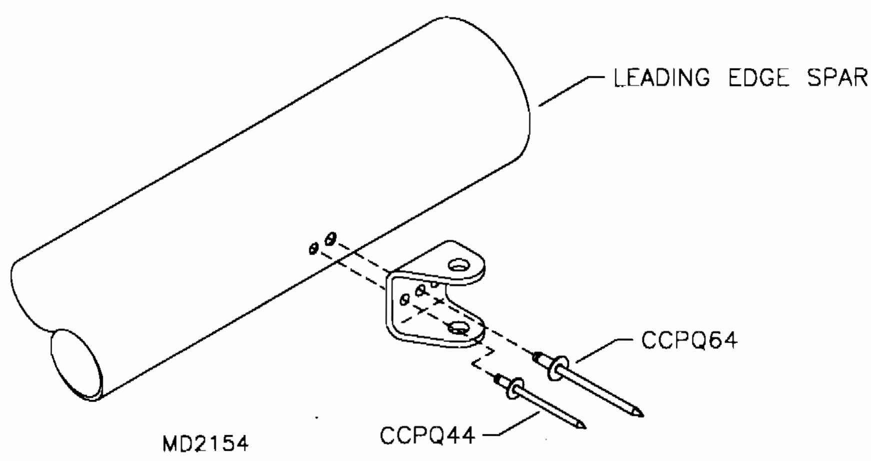
3. Drill out the root hole of the leading edge spar to 3/8" to accept the wing attach pin. (Drill from each side). In the next hole outbound rivet an S2-SAB to the spar with a single 3/16" stainless steel pop rivet.

4. Bolt the long wing channel to the first hole 55" outboard of the root using the parts shown on the leading and trailing edge spar drawing. Position the channel so the unbolted end points to the **root**. Line up the channel parallel with the spar and then drill and rivet with a 3/16" stainless steel pop rivet through the remaining hole. (Only drill through one side of the spar.)

5. Drill out the three holes in a row (approximately 107" from the root) to 3/8". For best accuracy, lay the strut attach plate against the spar holes and use it as a template. In fact, it is best to drill through with a 1/4" drill, bolt the plate to the spar, then drill the other two holes out to 1/4". Remove the strut plate and drill existing 1/4" holes out to 3/8". **NOTE:** Drill from each side, not from one side through to the other. Debur and install the 3/8" X 3" bushings, 1/4" bolts, strut attach plate and wing channel as shown in the parts drawing.

6. Locate the #11 hole on the leading edge spar's inside (or AFT side), 3 3/4" inboard of the tip end of the spar. This hole should be radially in line with the other holes. Rivet the S2-SAB to the spar using a single 3/16" stainless steel pop rivet. Drill a #30 hole on each side of a 3/16" rivet. Rivet with a #30 stainless steel pop rivet. See **FIGURE 06-06**. **NOTE:** The outboard compression tube will bolt to this bracket and another S2-SAB rivets to the AFT spar's forward side in the same location after the tip extension is installed.

FIGURE 06-06



TRAILING EDGE SPAR ASSEMBLY

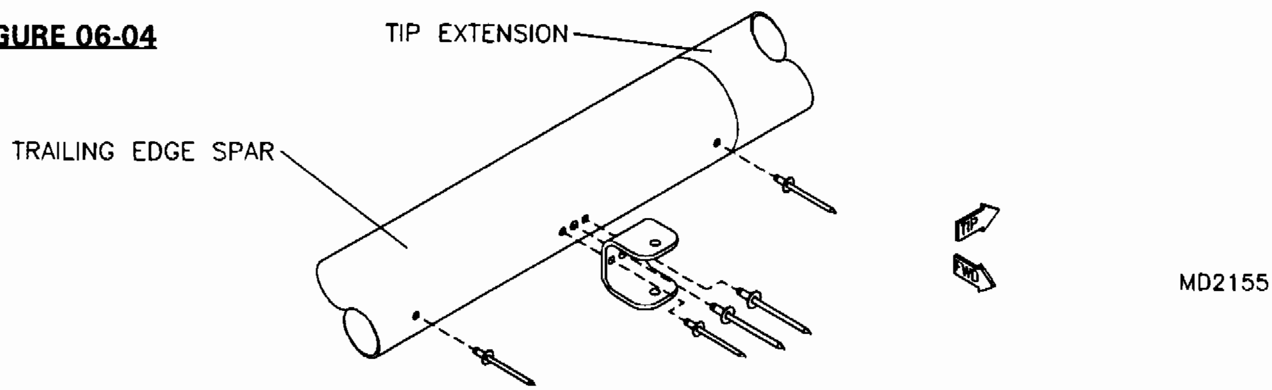
1. Bolt a long wing channel to the #11 hole drilled through the trailing edge spar, 6 3/4" from the root end. The unbolted end should point toward the **root**. Line up the channel parallel and drill and rivet with a 3/16" stainless steel pop rivet.

2. Bolt a long wing channel to the trailing edge spar at the hole 53" outboard of the root on the same side as the inboard channel. Position the unbolted end to the TIP side. Line the channel up parallel, drill and rivet with 3/16" stainless steel pop rivets.

3. Drill the three holes in a row, starting at approximately 107" from the root, for the aft strut plate out to 3/8". Debur and install the 3/8" X 2" bushings, 1/4" bolts, strut attach plate and S2-SAB as shown in the parts drawing.

4. Slip the trailing edge spar tip into the spar. Be sure that the hinge holes in the tip extension are radially in line with the holes in the trailing edge spar (Make sure that the large hole in the end of the tip extension is pointing forward). Drill the holes in the tip extension using the holes in the T.E. spar as guides. It is wise to cleco each hole as you go. Rivet the tip extension to the spar with three 3/16" stainless steel pop rivets. The middle hole is used to attach the S2-SAB at this time using the stainless steel pop rivet shown in the parts manual. Drill a #30 hole on each side of the 3/16" rivet and install the 1/8" stainless steel pop rivets shown in the parts manual. See **Figure 06-04**. CAUTION: These rivets must be stainless steel pop rivets. DO NOT use aluminum pop rivets.

FIGURE 06-04



5. From the parts drawing determine the location of the inboard most hinge location and rivet a 3/16" nut plate on the forward side of the spar. NOTE: This is the hole closest to the long wing channel at the root end of the T.E. spar. Refer to the parts drawing to determine the location of the remaining hinge locations and rivet a 3/16" nut plate to each. HINT: Use the flap and aileron leading edge spars to verify each location. Also, rivet the nut plate to each trailing edge spar tip extension on the side with the 1 3/8" hole. This nut plate will serve to hold the outboard hinge for the aileron.

UNIVERSAL HINGE ASSEMBLY

1. Collect the parts shown in the universal hinge drawing. Make and insert the bushings into the bushings' fittings. Press the bushings into the ends of the bushings on the spar fitting. Test fit the fitting into the end of the spar. It most likely will need to be ground to contour the spar's inboard end. Use the first and second bolts at the spars root to attach the fitting. The bolt that attaches the hinge cube is used to attach one "L" bracket. The "L" bracket is used for the root rib tensioning system. Only finger tighten the bolt at this time. The "L" bracket will be attached in a later step.

INTERNAL STRUCTURE

1. Locate the parts shown in the parts manual.

2. Install the four compression tubes using the hardware shown in the parts manual. Before bolting the middle compression tube in place, slip on the compression tube doubler. The compression tube doubler is a 4" tube 1 1/8" in diameter. Bolt the flap compression tubes with the hole for mounting the flap hardware closest to the trailing spar.

3. Install the drag braces. **NOTE:** Filing may be necessary on W-DBR at the trailing edge end to clear the bolt coming through the long wing channel (Repeat if necessary on the W-DB).

4. Install the W-WC-51 and W-WC-59 cables used to stabilize the wing tip's last two bays. The W-WC-51 is installed by bolting the shorter cable between the AFT spar's S2-SAB at the AFT strut plate, and the S2-SAB bracket at the outboard compression tube. The W-WC-59 cable is also bolted to the S2-SAB bracket on the outboard compression tube and to the wing-tip corner gusset. See **Figure 06-04**. First, bolt the thimble end of the **SHORT** cable to the S2-SAB at the AFT strut plate using an AN3-16A bolt, a plastic washer, a 1/4" X .028 X 3/16" bushing and a 3/16" shear nut. Fabricate the bushings from raw stock. See **Figure 06-04A**. Now insert the AN3-16A bolt up through the S2-SAB on the leading edge spar and the compression tube (threads up) and place the adjustable tang of the short cable on the bolt (Adjust cable to be tight). Place the adjustable tang of the LONG cable on the bolt using the hole nearest the tang end and leave the thimble end hanging loose at this time.

FIGURE 06-04

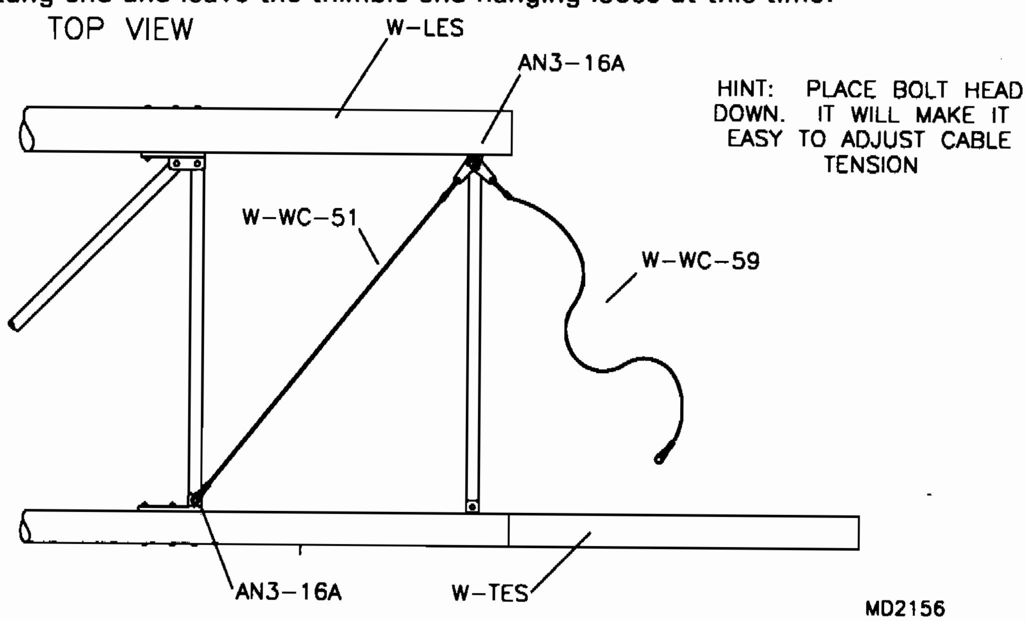
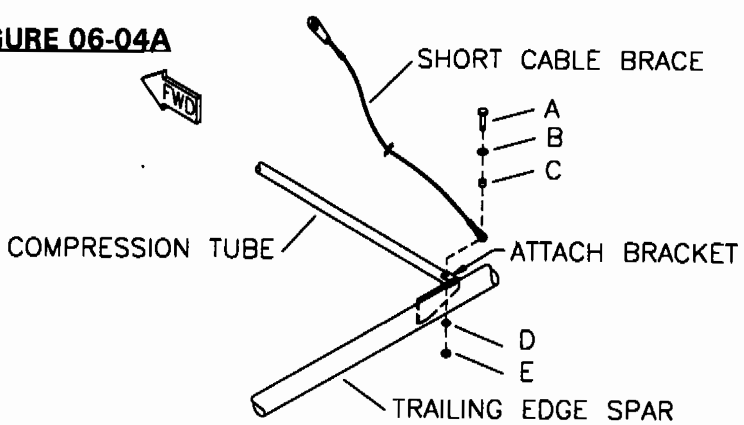


FIGURE 06-04A



A. Bolt, AN3-16A
B. Plastic Washer, PW-3
C. Spacer Bushing, SB-1/4x028
D. Thick Washer, AN960-10
E. Shear Nut, AN364-1032A

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5. Install the jury strut bracket. The bracket is attached to the long wing channel's outboard hole on the LES. Look closely at the drawing of the spars for location and position. **IMPORTANT:** Double check the position of the jury strut bracket before slipping on the wing covering! Locate aileron push pull tube guide on second outboard compression tube, as per **Figure 06-5**. Install the flap teleflex retainer on the W-FCT tube to the inside. See **Figure 06-5A.**

FIGURE 06-05

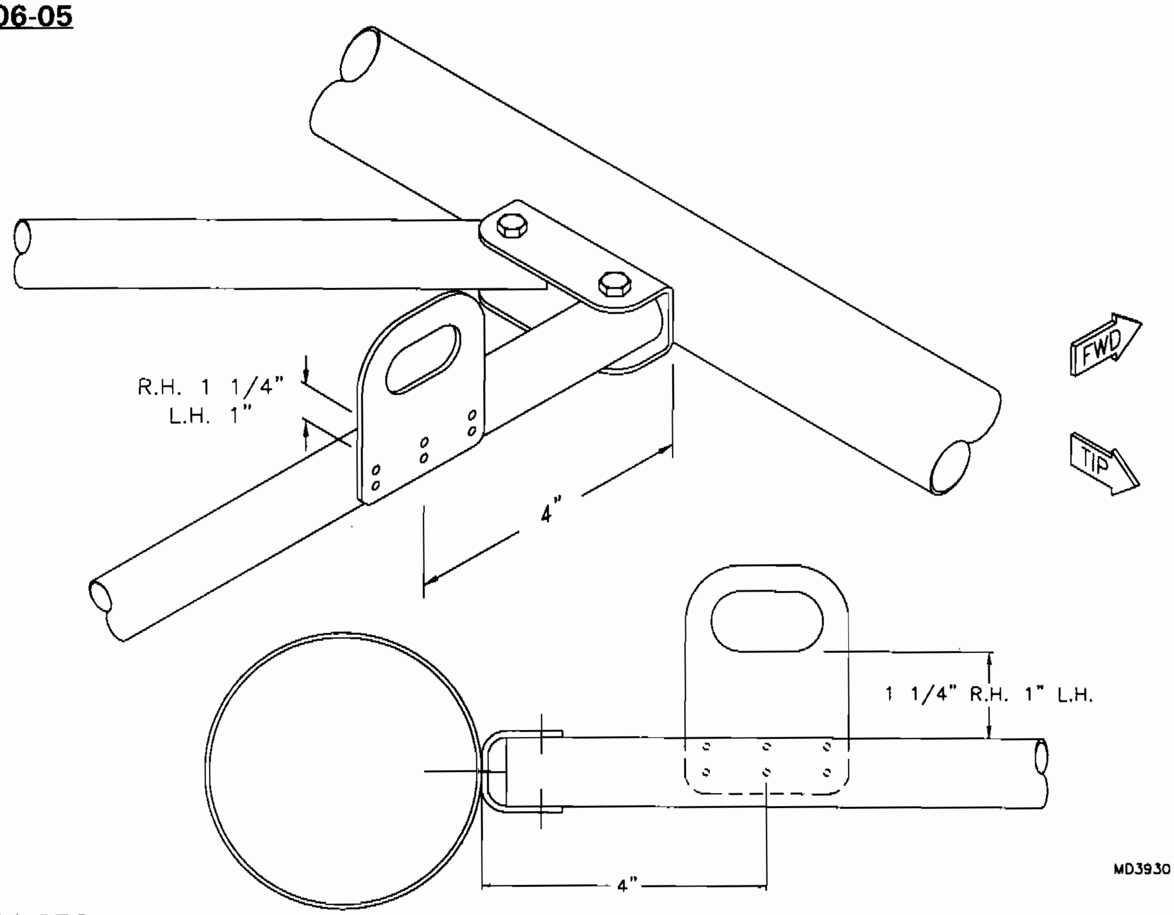
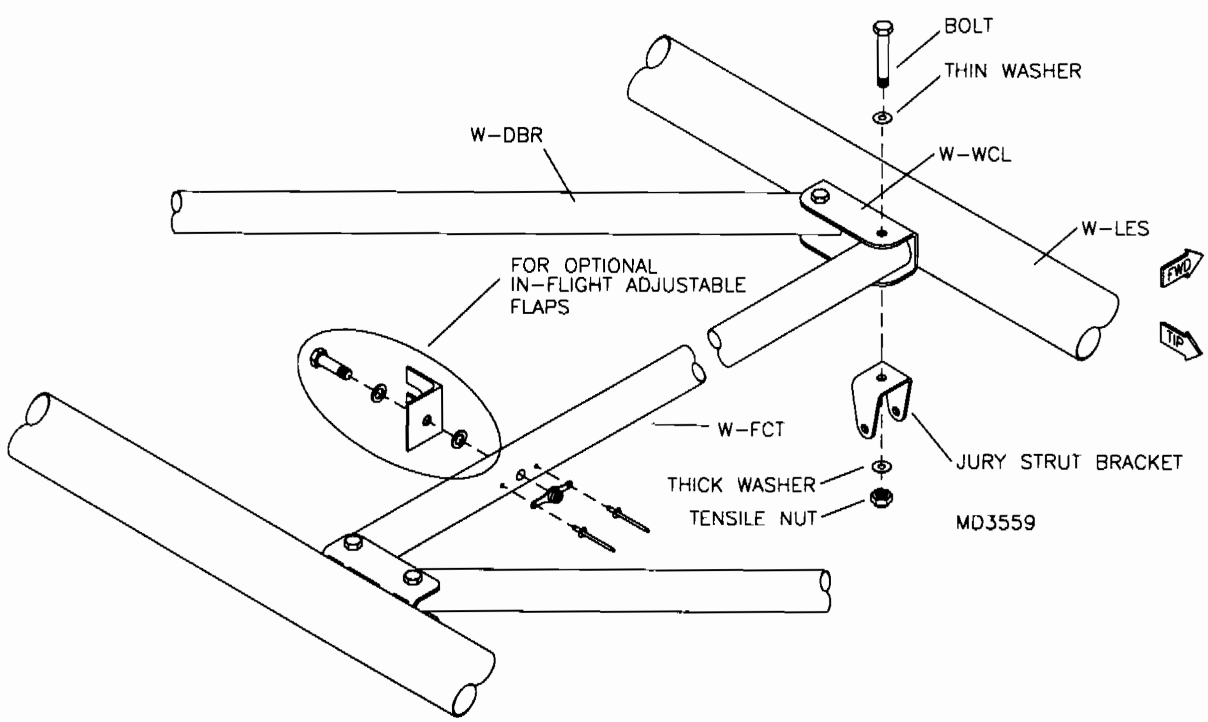
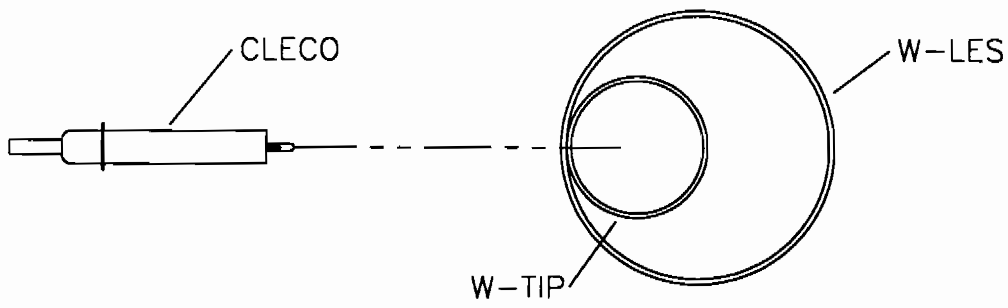


FIGURE 06-05A



6. Insert the tip bow's drilled end into the leading edge spar so that the tip bow's first hole lines up with the **FOURTH** inboard hole on the LES and cleco. **IMPORTANT:** The tip bow must be flat against the spar on the inside. See **Figure 06-06**.

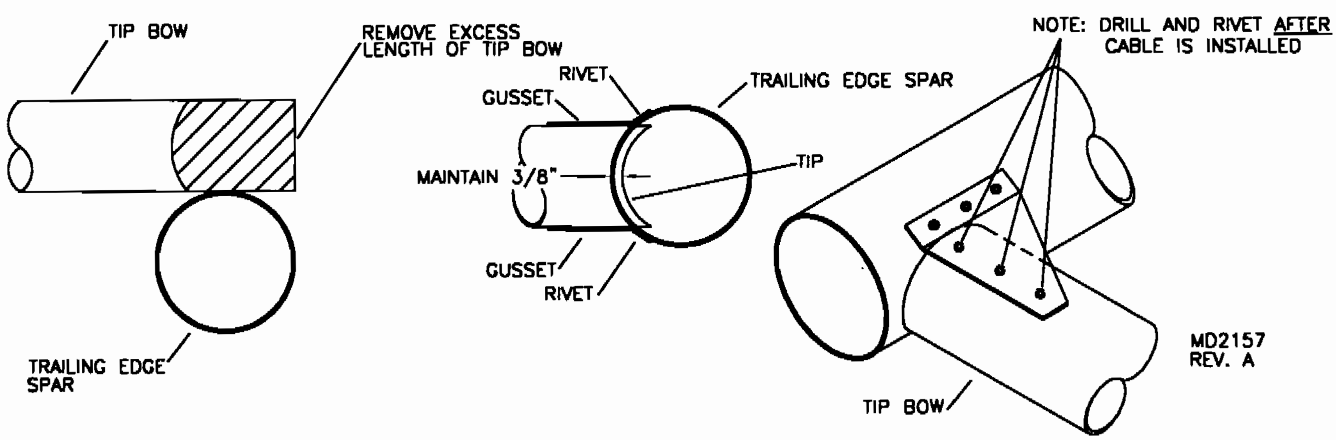
FIGURE 06-06



7. Line up the bow parallel to the spar and drill through the remaining three (3) holes. Cleco each hole before drilling the next..

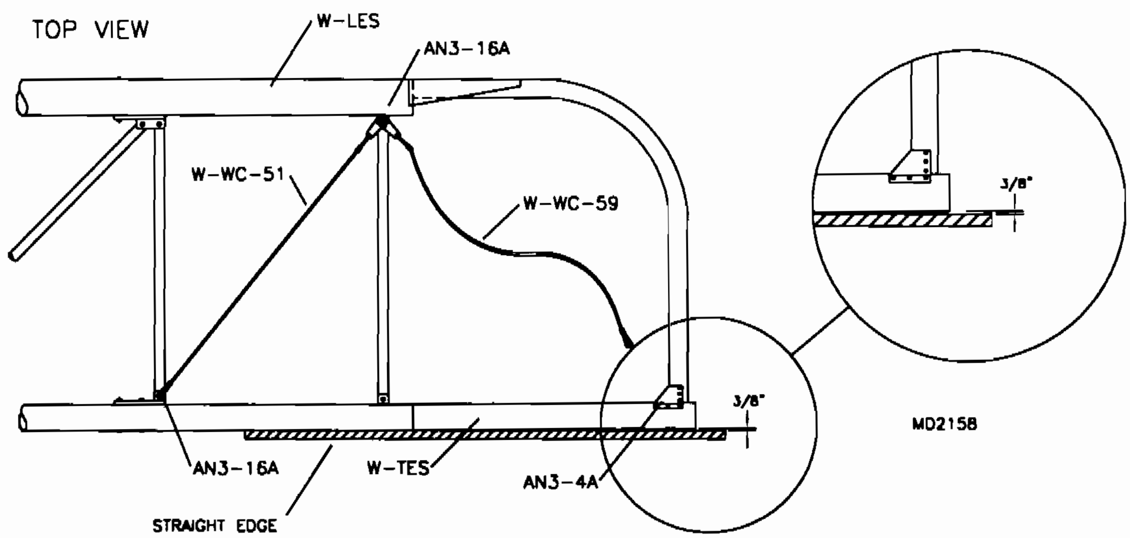
8. Place the aft end of the tip bow on top of the trailing edge spar tip extension. Determine the amount of the tip bow to be removed and file and fit the tip bow's aft end into the trailing edge spar's tip extension. See **Figure 06-08**. Use the 2" tube with the 1 ⅜" half hole to mark the tip end. Approximately 1 ½" of the tip bow will have to be trimmed off. Rivet the top gusset to the trailing edge spar with (3) ⅛" stainless steel pop rivets. **DO NOT** drill or rivet the tip tube to the gusset until the tip cable is installed. If done prior to cable installation the wing tip skins will not fit properly.

FIGURE 06-08



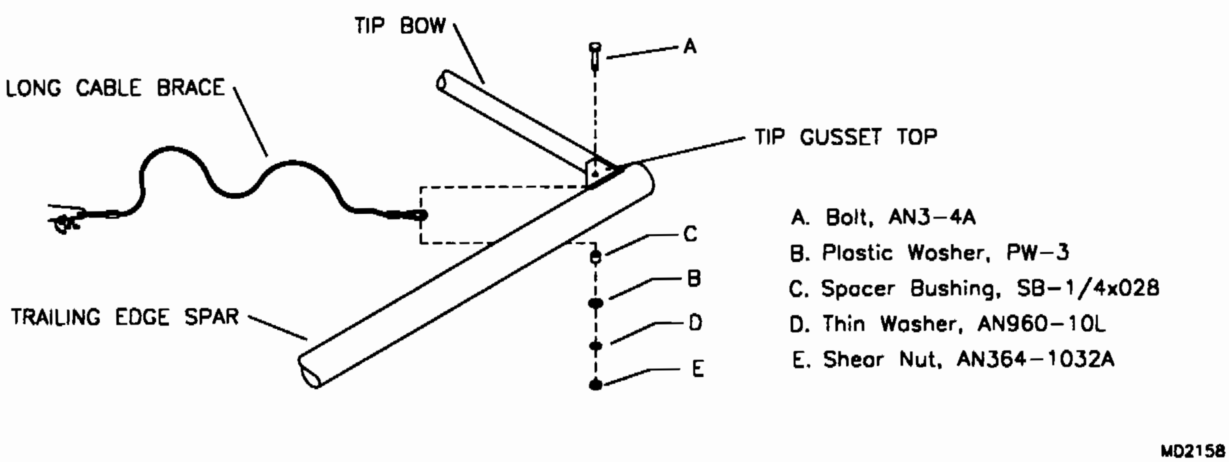
9. Establish approximately a ⅜" forward bow in the trailing edge tip extension. The bow will be straightened by the wing skin. See **Figure 06-09**. Clamp or tape a straight edge in place before drilling the gusset for the cable attach nut. Cable tension can be adjusted at the tang's end or by twisting the cable. Sight down the front of the LE spar and tip bow to ensure that they are in line. After double checking proper alignment, drill and rivet the (3) ⅛" stainless steel pop rivets into the gusset and tip bow. Make sure that the tip bow is not allowed to move during the drilling process.

FIGURE 06-09



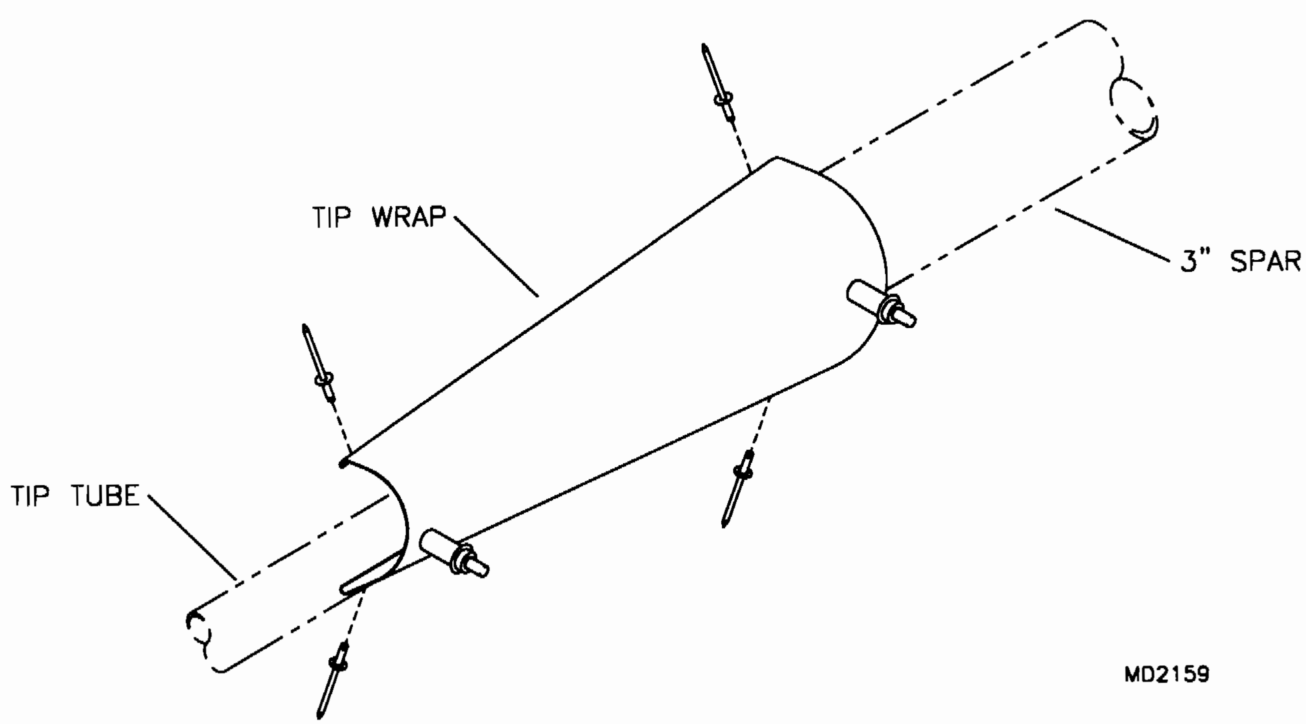
10. Pull tight the thimble of the outer cable toward the gusset and mark the hole location. NOTE: Make sure to locate the hole in the gusset with enough distance from the trailing edge and tip bow to allow for the bolt and nut assembly to fit freely. Cable length can be adjusted at the tang end. Drill a 3/16" hole in this location. Using an AN3-4A bolt, a plastic washer, a ¼" X .028 X 3/16" bushing and a 3/16" shear nut attach the long wing cable to the gusset. See **Figure 06-10**. Set proper tension by using the multi-hole tang or twisting the cable. The cable should be as tight as possible without effecting the ⅜" tip bow set earlier. Now flip the wing over and attach the bottom wing tip gusset using (6) ⅛" stainless steel pop rivets.

FIGURE 06-10



11. The tip wraps are shaped into half round curves. Overlap the tip wrap onto the spar about ⅜". See **Figure 06-11**. Center the tip wrap and drill to #40 hole size. Cleco the tip wrap in place. This is only to assist in alignment, do not rivet the outside two holes of the tip wraps. Be careful when working the tip wraps, the sheet metals edges are very sharp. The wraps should be formed close enough to shape so that they lay against the spar without springing back. Working from the middle, pull the wrap together using tape to hold everything together. Rivet the tip wraps to the leading edge spar and tip bow with four (4) ⅛" stainless steel pop rivets. **NOTE:** After removing the tape a slight amount of bending may be necessary to achieve a pleasing shape.

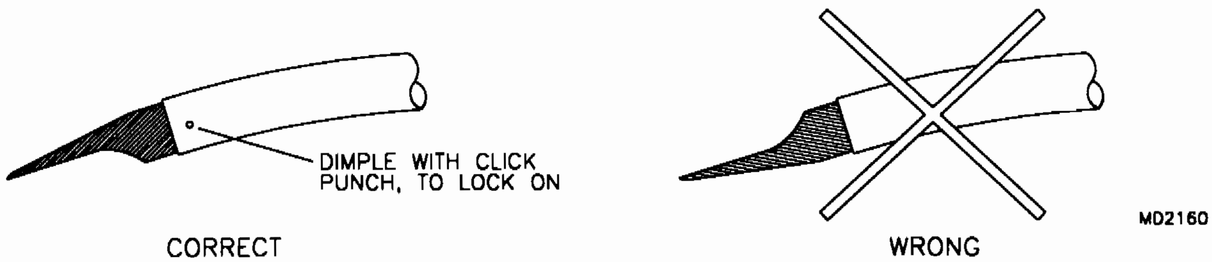
FIGURE 06-11



OUTBOARD RIB ASSEMBLY

1. Locate the parts shown in the parts manual. Install the rib tips as shown in the parts manual. Dimple as shown in **Figure 06-01**. The one on the top should cup down and the two on the bottom should cup upward.

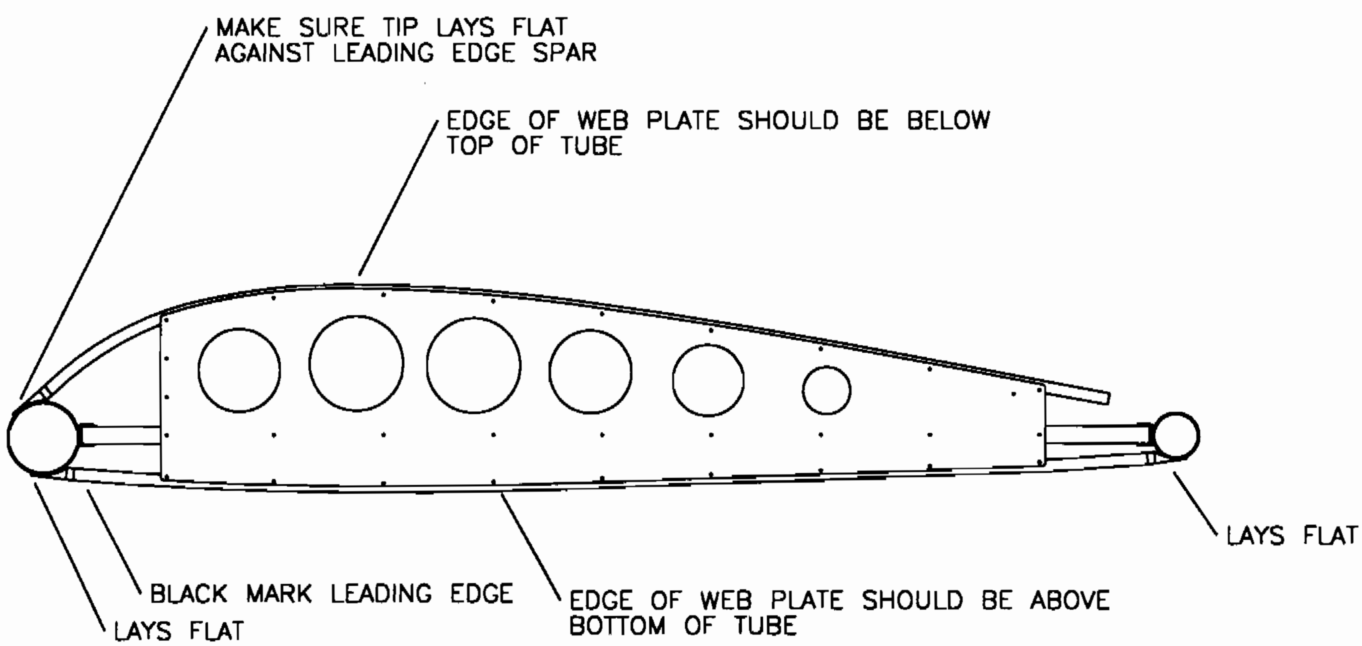
FIGURE 06-01



2. Cleco the outer rib-web plates in place along the outer compression tube. Cleco the web cap in place between the two web plates. The web cap goes at the front of the web plates using the prelocated holes. See **Figure 06-05.**

3. Clamp the outboard rib top tube in position between the two web plates. The centerline of the top tube should be in line with the holes in the web plates. See **Figure 06-03.** Clamp in position. Make sure that the forward rib tip is in position on the leading edge spar. The aft end of the top tube will over hang the web plates approximately 2 ¼". Drill #30 and rivet in place.

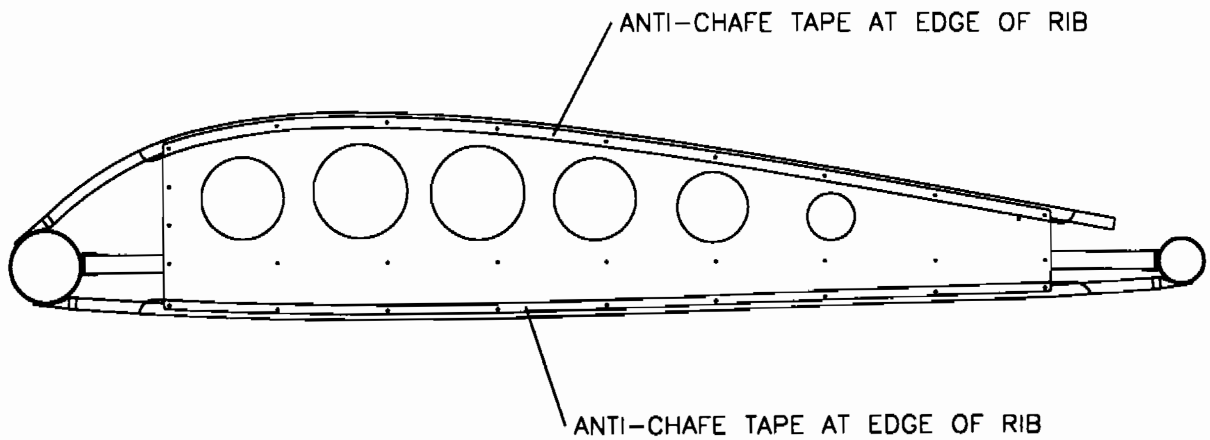
FIGURE 06-03

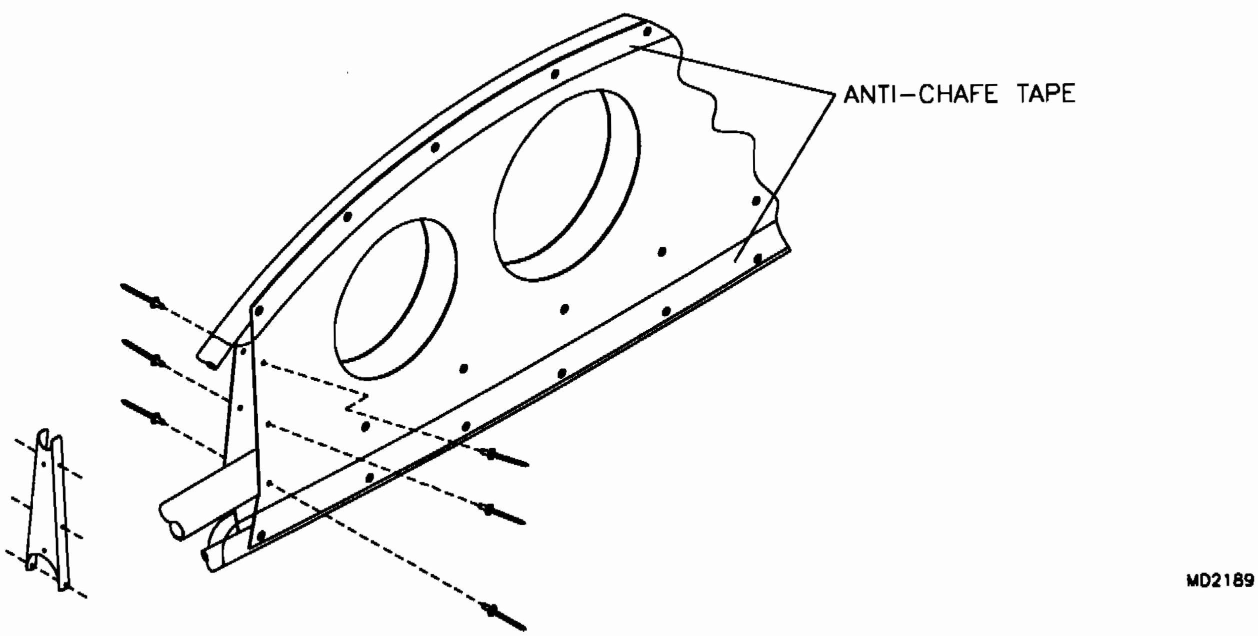


4. Clamp the outboard rib bottom tube in place with the ribs tips touching the leading and trailing edge spars. Again the centerline of the tube should line up with the holes in the web plate. Drill and rivet in place.

5. Install anti-chafe tape to the top and bottom of the rib to protect the wing skin from chafing. Plastic or vinyl tape from any hardware or automotive store will work well as anti-chafe tape. We use 3M Clear Weather Sealing Tape. See **Figure 06-05.**

FIGURE 06-05





ROOT RIB TENSIONING SYSTEM

The wing skin is attached and tensioned span-wise using a pre-fabricated root rib. The root rib comes ready to install with the exception of the holes for the 8x½" PHS. Notice that all the prelocated holes are pre-drilled to a #40. Drill these to a #28 and debur any rough edges. This rib is attached to the wing through two "L" brackets and bolts. These bolts are threaded into the root rib. When the bolts are tightened the root rib moves inboard pulling the wing fabric tight.

1. Collect all the parts depicted in the parts manual.

2. Place the root rib in wing with the wing skin flush to the inboard side of the root rib. Prepare the leading edge spar as shown in **Figure 06-03A.** Bolt the brackets to the leading edge spar and the inboard side of the universal hinge on the trailing edge spar as shown in **Figure 06-03**. Thread the bolt and washer through the bracket and root rib into the hole provided. Install the nut and washer on the inside of the root rib. **Note:** Do not tighten the bolts at this point. Line up the wing skin and velcro so they are properly centered on the trailing edge spar and the entire wing. Install the 8x½" PHS through the wing skin and pre-drilled holes in the root rib. Use a icepick or a small awl to transfer the pre-drilled holes from the root rib through the wing skin edge webbing. Start installing the 8x½" PHS screws in the center of the root rib, working to the end of the rib. The root rib is curved inboard to assure the rib will be straight when installation is complete. Flip the wing and repeat on the bottom side. When screws are installed, begin to tension bolts. Tighten to ⅜" from the inside edge of the "L" brackets. **Caution: Do not over tighten the tensioning bolts. Stop when the skin is tight, if within ⅜" of the bracket.**

FIGURE 06-03

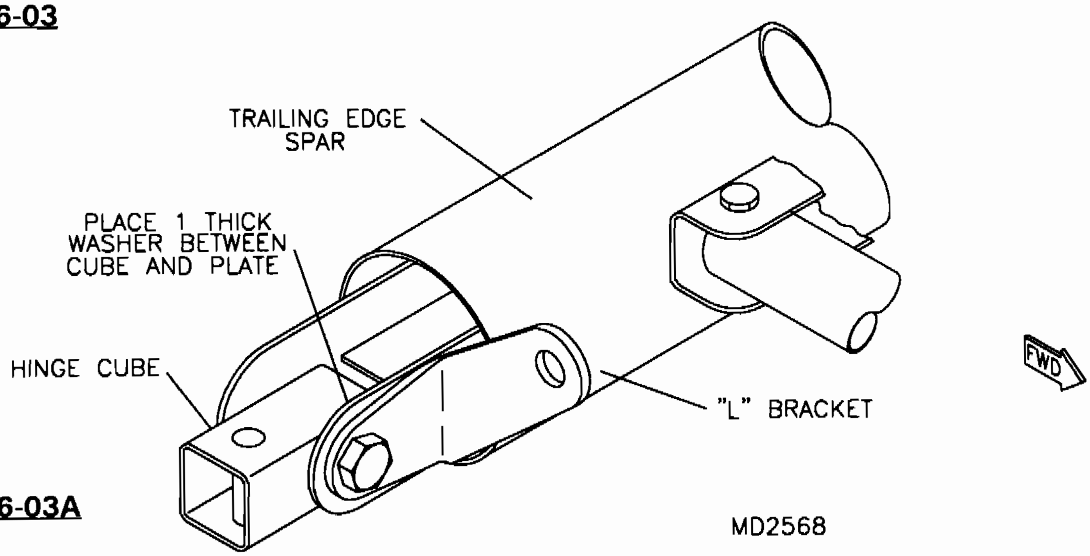
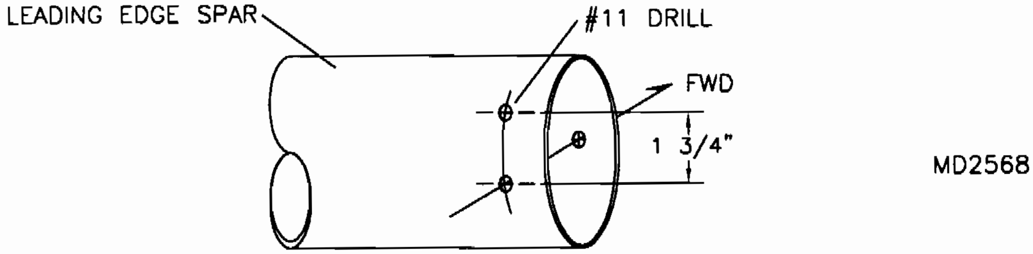


FIGURE 06-03A



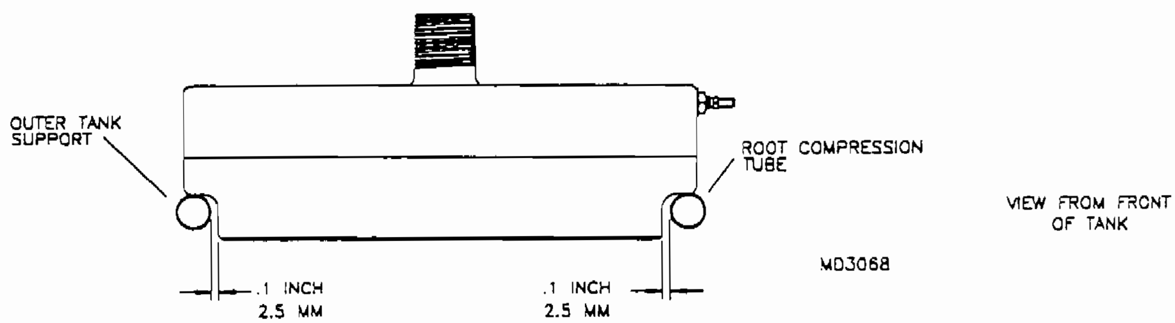
FUEL TANK MOUNT - SINGLE WING TANK

1. Locate the parts shown in the parts manual. Make sure that the tank assembly steps shown in the engine section have been completed before installing fuel tank into wing.

2. On the aft side of the leading edge project a centerline mark from the S2-SAB on the inner compression tube to a point approximately 16" outboard. This will locate the centerline for the S2-SAB which holds the outer tank support in place.

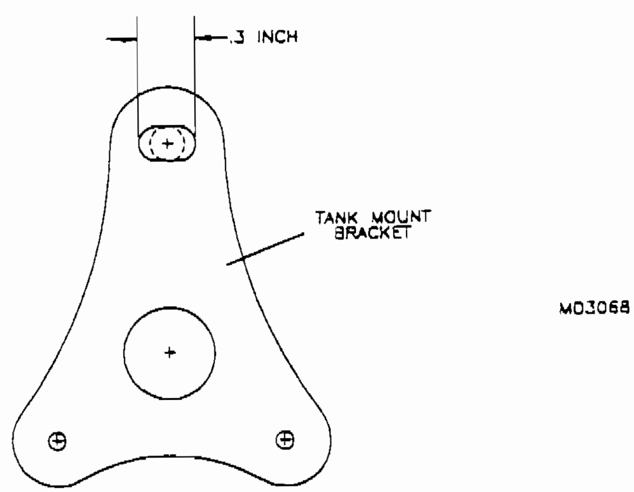
3. Place tank on wing frame, leaving 1/8" gap between leading edge spar and tank; also allow 1/8" gap between inner compression tube and tank. Locate S2-SAB on leading edge spar's centerline, leaving 1/8" gap between it and outboard side of tank. NOTE: When locating S2-SAB, check that tank withdrawal fittings will clear inner compression tube once tank is in position. If necessary, S2-SAB may be moved slightly outboard, allowing tank to be positioned farther from compression tube; if doing so, ensure that tank remains properly supported. Drill #11 and rivet S2-SAB to spar and install single-ear nut plate to S2-SAB; refer to parts drawing. Bolt forward end of outer tank support to S2-SAB. With tank in position, pull outer tank support parallel to tank, maintaining 1/8" gap. Trim outer tank support diagonally to accommodate drag brace; take care not to trim tube short. Locate U-bracket to drag brace, transfer-drill #11 through aft end of outer tank support using U-bracket as guide, install nut plate to U-bracket and bolt tank support to U-bracket. Drill two #30 holes through aft side of U-bracket and rivet U-bracket to brace. See **FIGURE 06-03**.

FIGURE 06-03



4. Slot the upper hole in the tank mount brackets as shown in **FIGURE 06-04**. Bolt the wing tank mount brackets to the fuel tank so that the bolt is in the middle of the slot. Notice that the bent bracket bolts to the aft of the fuel tank on the inboard side. Using the tank mount brackets as a guide, drill the brackets and inner compression tube out to #30. Install the rivets shown in the parts manual. Repeat this for the outer tank support. Once tank installation is complete, apply loctite to the bolts which hold the tank in place.

FIGURE 06-04



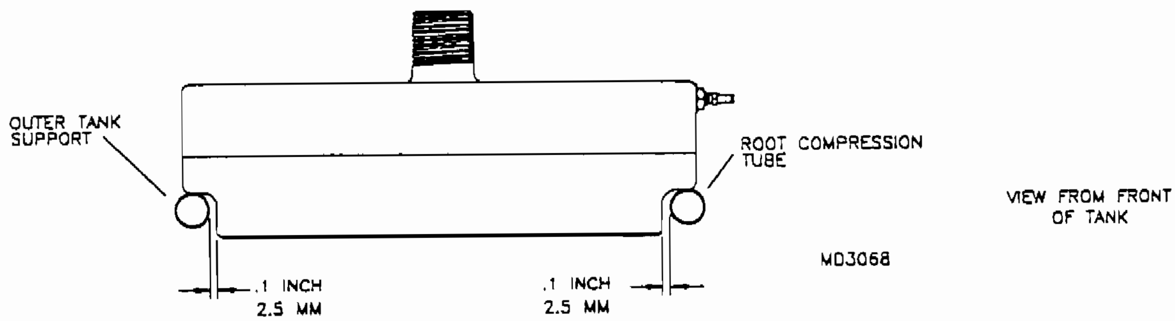
FUEL TANK MOUNT - DUAL WING TANKS

1. Locate the parts shown in the parts manual. Make sure that the tank assembly steps shown in the engine section have been completed before installing fuel tanks into wing.

2. On the aft side of the leading edge project a centerline mark from the S2-SAB on the inner compression tube to a point approximately 16" outboard. This will locate the centerline for the S2-SAB which holds the outer tank support in place.

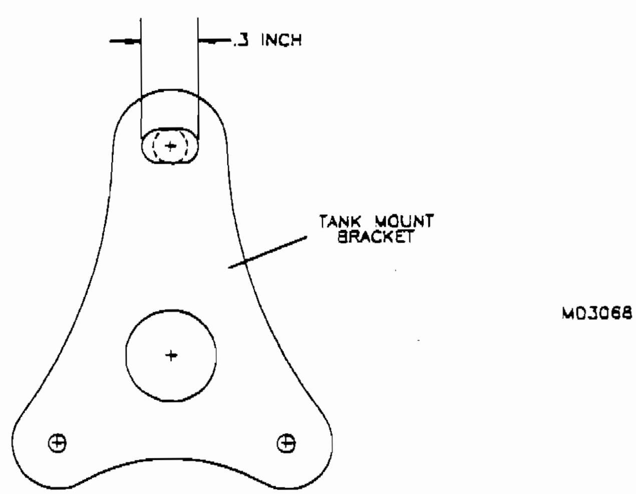
3. Place tank on wing frame, leaving 1/8" gap between leading edge spar and tank; also allow 1/8" gap between inner compression tube and tank. Locate S2-SAB on leading edge spar's centerline, leaving 1/8" gap between it and outboard side of tank. NOTE: When locating S2-SAB, check that tank withdrawal fittings will clear inner compression tube once tank is in position. If necessary, S2-SAB may be moved slightly outboard, allowing tank to be positioned farther from compression tube; if doing so, ensure that tank remains properly supported. Drill #11 and rivet S2-SAB to spar and install single-ear nut plate to S2-SAB; refer to parts drawing. Bolt forward end of outer tank support to S2-SAB. With tank in position, pull outer tank support parallel to tank, maintaining 1/8" gap. Trim outer tank support diagonally to accommodate drag brace; take care not to trim tube short. Locate U-bracket to drag brace, transfer-drill #11 through aft end of outer tank support using U-bracket as guide, install nut plate to U-bracket and bolt tank support to U-bracket. Drill two #30 holes through aft side of U-bracket and rivet U-bracket to brace. See **FIGURE 06-03**.

FIGURE 06-03



4. Slot the upper hole in the tank mount brackets as shown in **FIGURE 06-04**. Bolt the wing tank mount brackets to the fuel tank so that the bolt is in the middle of the slot. Notice that the bent bracket bolts to the aft of the fuel tank on the inboard side. Using the tank mount brackets as a guide, drill the brackets and inner compression tube out to #30. Install the rivets shown in the parts manual. Repeat this for the outer tank support. Once tank installation is complete, apply loctite to the bolts which hold the tank in place.

FIGURE 06-04



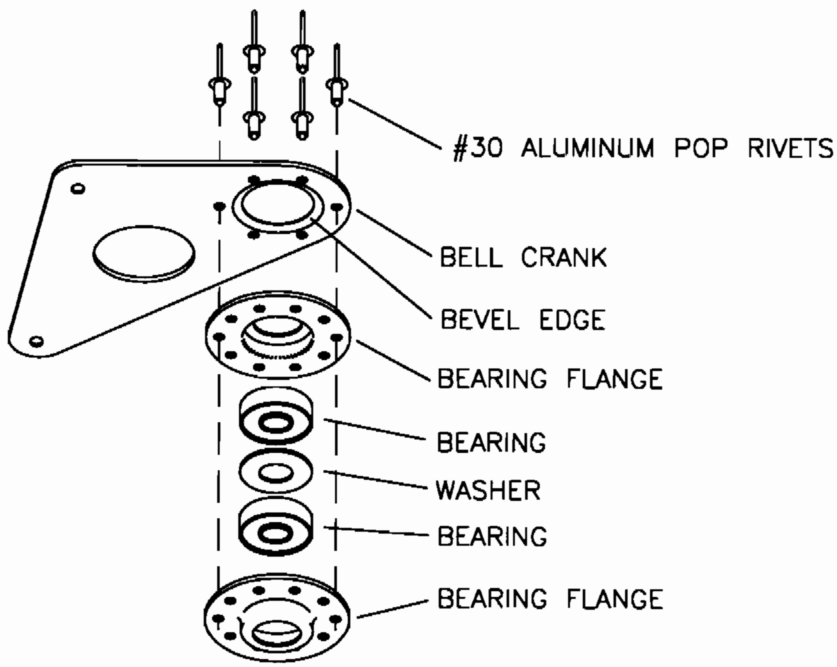
5. Repeat for the second wing tank.

AILERON PUSH-PULL SYSTEM

1. Locate the parts shown in the parts manual.

2. Drill out the 3/4" hole on the bellcrank to 7/8". It will be necessary to bevel the hole's inside edge to allow the bearing to fit flat against the bellcrank. Place the flange bearing in the bellcrank hole. **NOTE:** It may be necessary to place a washer between the bearings to remove play in the bellcrank assembly. Test fit washers of different thickness to determine the least amount of play. Drill and rivet **EVERY OTHER HOLE** in the flange bearing for **A TOTAL OF SIX HOLES** (see Control Stick). Pay close attention to which side of the bellcrank the bearing rivets to and make one for the left and one for the right. See **Figure 06-02.** Install the aileron bellcranks as shown in **Figure 06-02A**. The bellcrank gusset bolts to the long wing channel's two bolts, the other hole is located over the compression tube doubler. Starting from the bottom, drill out to 1/4" through the compression tube, gusset, and doubler. From this 1/4" hole drill a #30 hole 1 13/16" FWD towards the channel bracket and rivet the gusset to the tube and doubler using a 1/8" stainless steel pop rivet. **IMPORTANT:** Install the bellcrank gussets with the small flange pointing **DOWN**. Install the aileron bellcrank with the bearing on the **UNDERSIDE** of the bellcrank. The longer arm of the bellcrank should be to the wing tip side of the compression tube for attachment to the short aileron push-pull tube.

FIGURE 06-02



ATTACH FLANGE BEARING WITH
(6) #30 ALUMINUM POP RIVETS.
MAKE A LEFT AND RIGHT BELLCRANK.

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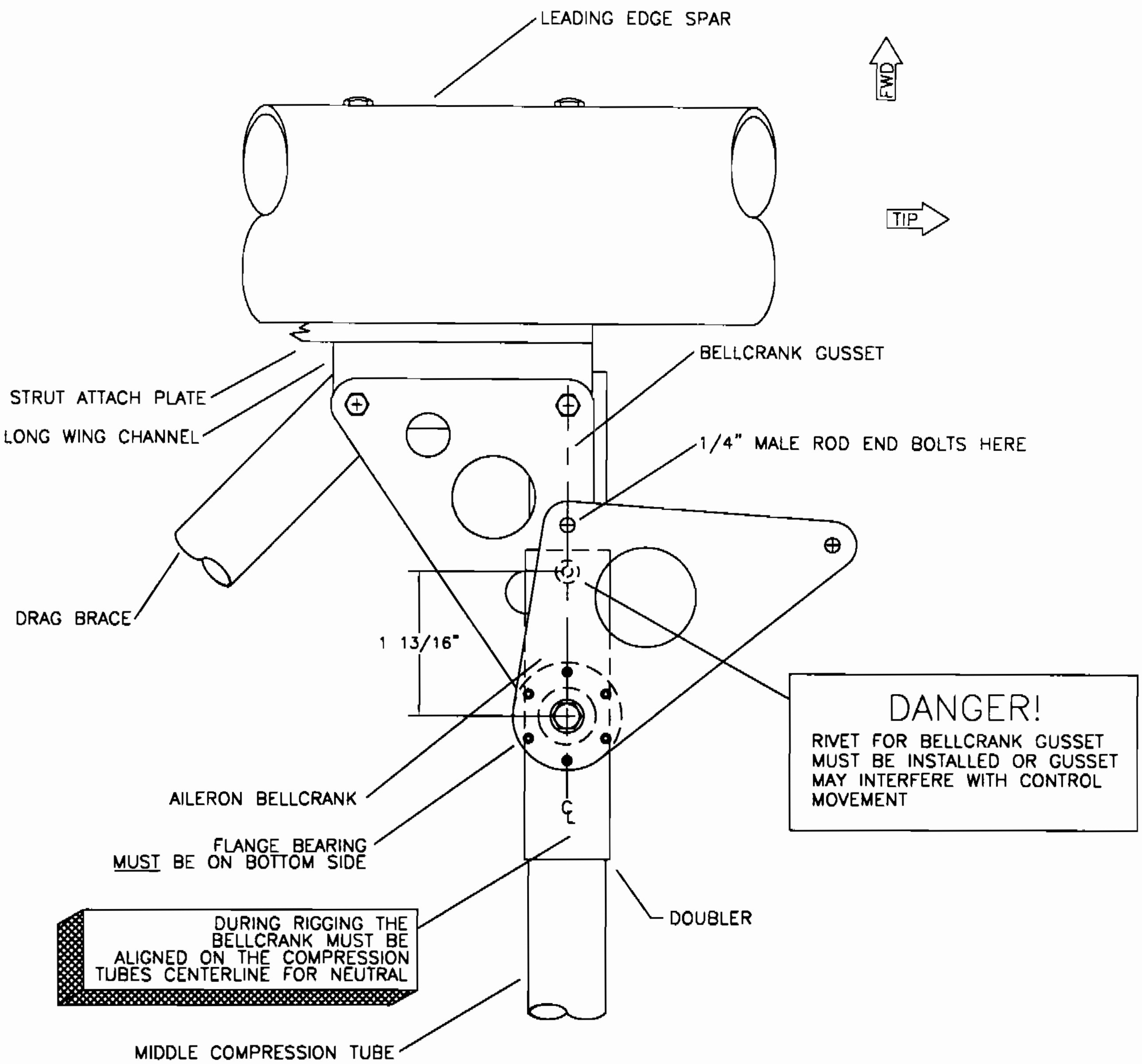
FIGURE 06-02A



IMPORTANT: SMALL FLANGE ON GUSSET MUST POINT DOWN

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NOTE: DO NOT STOP NUT. THE ROD END IS LEFT ATTACHED TO THE BELLCRANK AFTER COVERING THE WING THE AILERON PUSH PULL TUBE IS INSERTED THROUGH THE EXIT HOLE IN THE WING AND SCREWED INTO THE ROD END.

3. Assemble the push-pull tubes as shown in the parts manual. Slip the push-pull tube end fitting into position and rivet. Use the tube as a drill guide. Size drill as required to install the rivets shown. Install all male rod ends shown. Be sure to install the ¼" plain ("jam") nuts on the inboard end of the 109" ppt and the aft end of the 42 ⅛". Install the push-pull tubes to the aileron bellcrank using the hardware shown. Slip the push-pull tube guide in place over the long ppt. Do not attach the guide to the compression tube at this time. It will be attached during trial assembly and rigging. Tape the push-pull tubes into approximate position.

STROBE MOUNT

1. Locate the parts shown in the parts manual.

2. Cut the ½" hole in the trailing edge spar as shown on the parts page. Mark and drill a 1/8" hole on the top and bottom center of the trailing edge spar 3/8" from the end of the spar. Slip the navigation light tip mount into the trailing edge spar and transfer drill. **DO NOT** rivet the tip mount in place at this time. It will need to be installed after the wing skin is installed.

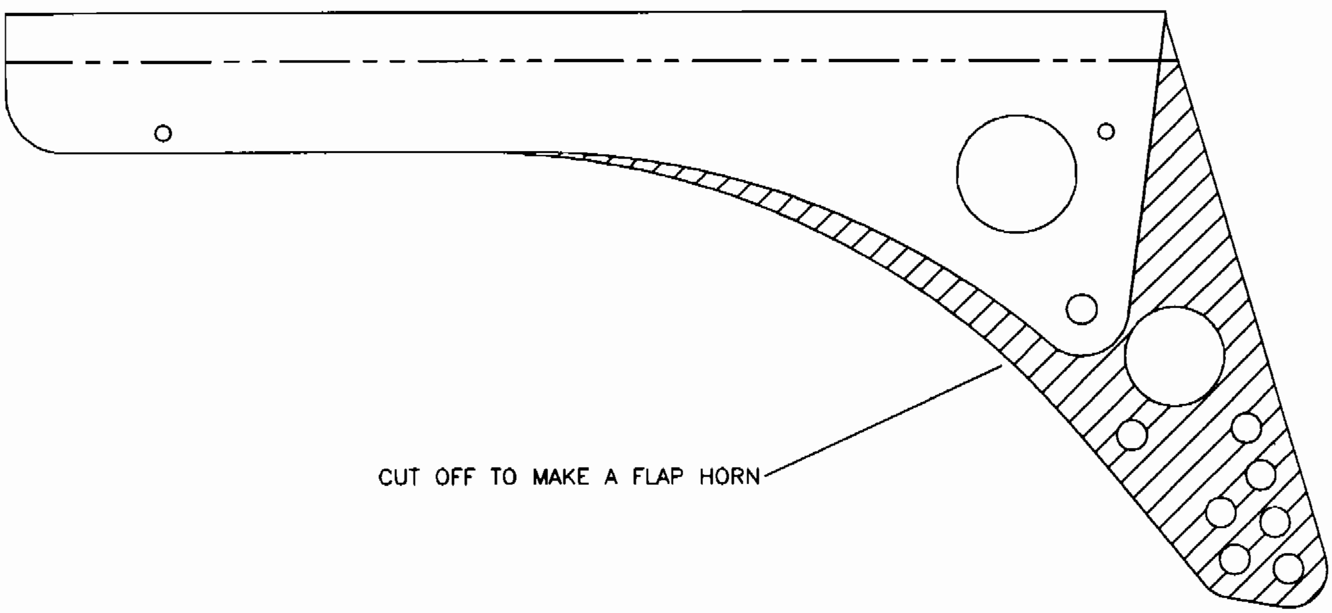
3. Wire routing can be done within the strobe. Attach the ground to the light internally using the screw shown: Wire routing should be done during final assembly. Wires hanging out the end of the spar will be in the way during covering and clear coating.

FLAP FRAME ASSEMBLY

1. Locate the parts shown in the parts manual. Thoroughly debur all flap/aileron ribs to prevent chafing of fabric.

2. Size drill the holes in each rib to #30. Modify the flap/aileron horn attach angle as shown in **Figure 06-02.** Be sure to make one left and one right. **Only make two flap horns. The remaining two horns will be used for the ailerons and should NOT be modified.**

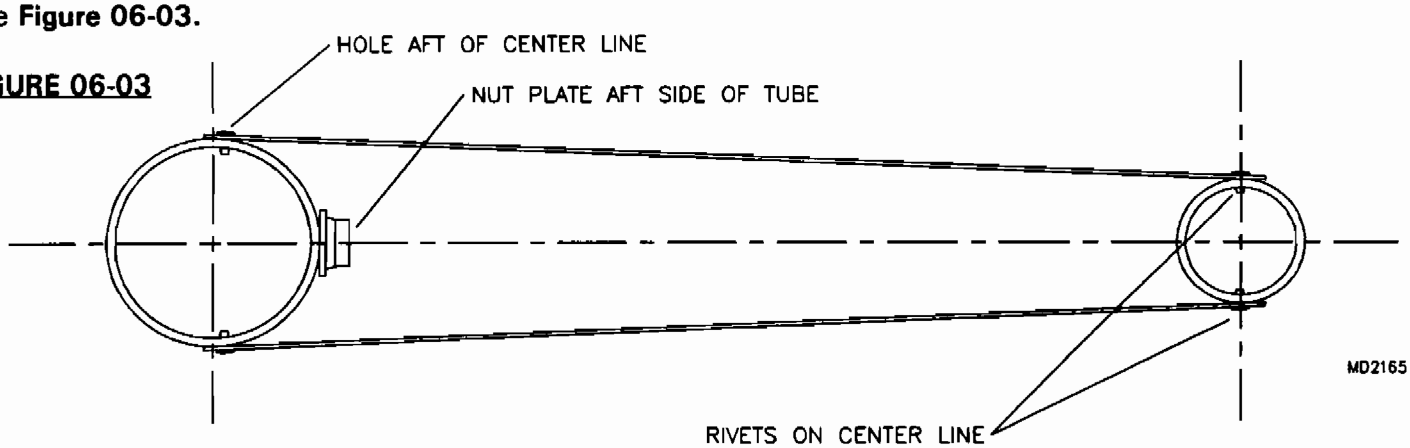
FIGURE 06-02



MD2165

3. Install the three nut plates to the aft side of the flap spar assembly. Notice that the holes located along the spar are not on the centerline. The holes for the ribs are located just behind centerline of the spar for perfect rib alignment. Make sure that before installing nut plates, forward and aft is determined. See **Figure 06-03.**

FIGURE 06-03



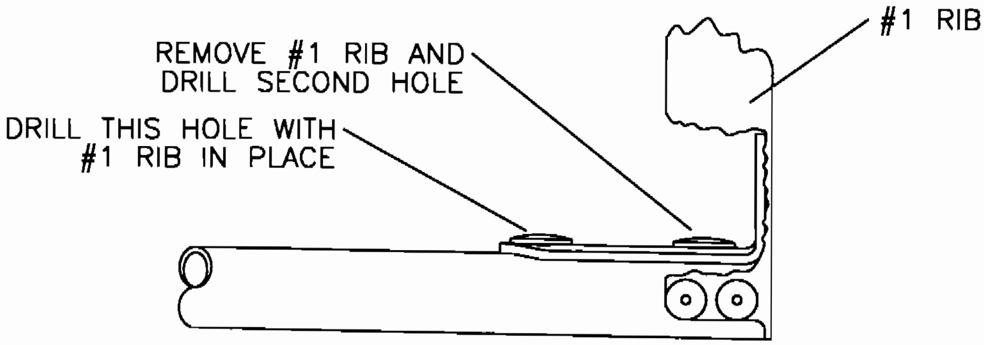
MD2165

4. Test fit the end ribs. Notice that the end ribs (#1 & #7) will only locate on one end of the spar. It may be necessary to file a small amount off the end of the spar to align the holes in the rib. **DO NOT** "drift" the holes in order to make the ribs align. Cleco in place.

5. Install the five center ribs. Notice that the flap tapers spanwise; therefore, the ribs must be in sequence according to the parts manual. The ribs should be oriented to "open" toward the small end of the flap. Make sure before riveting that the ribs #2 - #6 face the small tapered end of the flap. Rivet the five ribs in place on the leading edge spar.

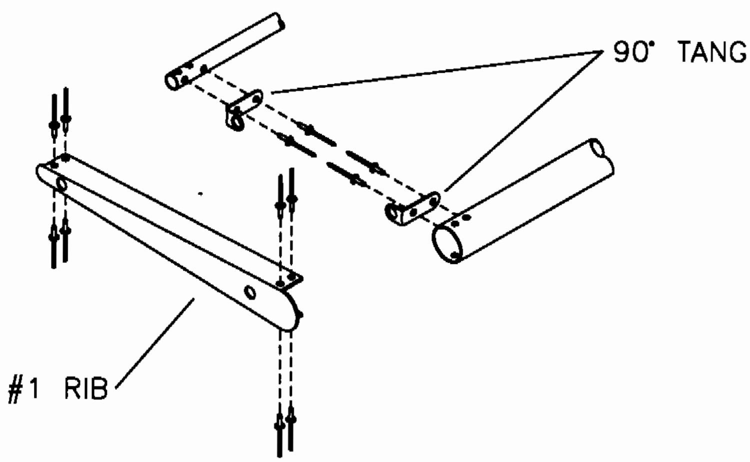
6. With the end ribs clecoed in position, check to see if the ribs are "square" to the flap spar assembly using a small framing square. Cleco the 90° tang in position inside the #1 flap/aileron rib. Cleco from the end of the flap. Align the opposite side of the tang with the flap spar assembly. Mark the two holes shown in **Figure 06-06**. Drill the hole which is easily reached with the #1 rib in place. Remove the #1 flap/aileron rib and drill the remaining hole for the rivets specified. Rivet the multi hole tang in place. See **Figure 06-06A.**

FIGURE 06-06



MD2191

FIGURE 06-06A



MD2191

7. Rivet the two end ribs in place on the flap spar assembly. Insert the trailing edge spar into the ribs. Center the trailing edge spar with the holes in the **end** ribs. Size drill as required and cleco in place. Check for "square" of the end ribs. Place a long straight edge against the trailing edge spar and clamp in place. It is not important for the trailing edge to be "seated" into the mouth of each rib, but it is important for the trailing edge to be straight. Drill and cleco in place.

8. Cleco the multi-hole tang in place along the trailing edge as before. Mark and drill as required for the rivet specified. Rivet the entire assembly together. Drill out the hole in the flap spar assembly for location of the flap/aileron horn attach angle. Temporarily attach flap/aileron horn attach angles to the flaps. The attach angles will be used during Trial Assembly and Rigging; then removed for covering.

9. Remove any sharp edges on ribs or spars with a file. Install plastic tape over all edges and rivets to protect the fabric skins.

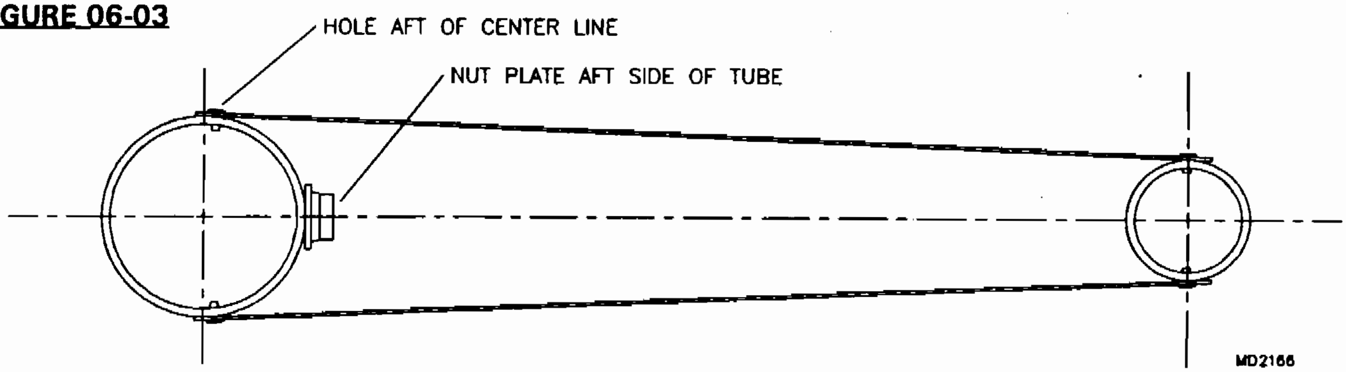
AILERON FRAME ASSEMBLY

1. Locate the parts shown in the parts manual. Thoroughly debur all flap/aileron ribs to prevent chafing of fabric.

2. Size drill the holes in each rib to #30.

3. Install the three nut plates to the aft side of the aileron spar. Notice that the holes located along the spar are not on the centerline. The holes for the ribs are located just behind centerline of the spar for perfect rib alignment. Make sure that before installing nut plates, forward and aft is determined. See **Figure 06-03.**

FIGURE 06-03



4. Test fit the end ribs. Notice that the end ribs (#1 & #7) only locate on the proper end of the spar. It may be necessary to file a small amount off the end of the spar to align the holes in the rib. **DO NOT** "drift" the holes in order to make the ribs align. Cleco in place.

5. Install the five center ribs. Notice that the aileron tapers spanwise; therefore, the ribs must be in sequence according to the parts manual. The ribs should be oriented to "open" toward the small end of the aileron. Make sure before riveting that the ribs #2 - #6 face the small tapered end of the aileron. Rivet the five ribs in place on the leading edge spar.

6. With the end ribs clecoed in position, check to see if the ribs are "square" to the aileron spar assembly using a small framing square. Cleco the 90° tang in position inside the #1 flap/aileron rib. Cleco from the end of the aileron. Align the opposite side of the tang with the aileron spar. Mark the two holes shown in **Figure 06-06.** Drill the hole which is easily reached with the #1 rib in place. Remove the #1 flap/aileron rib and drill the remaining hole for the rivets specified. Rivet the multi hole tang in place. See **Figure 06-06A.**

FIGURE 06-06

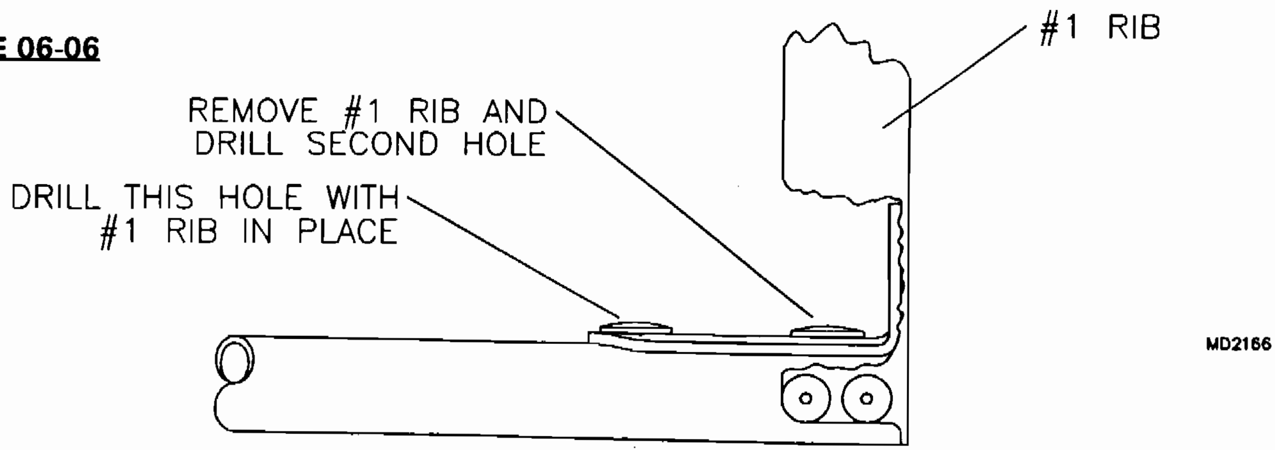
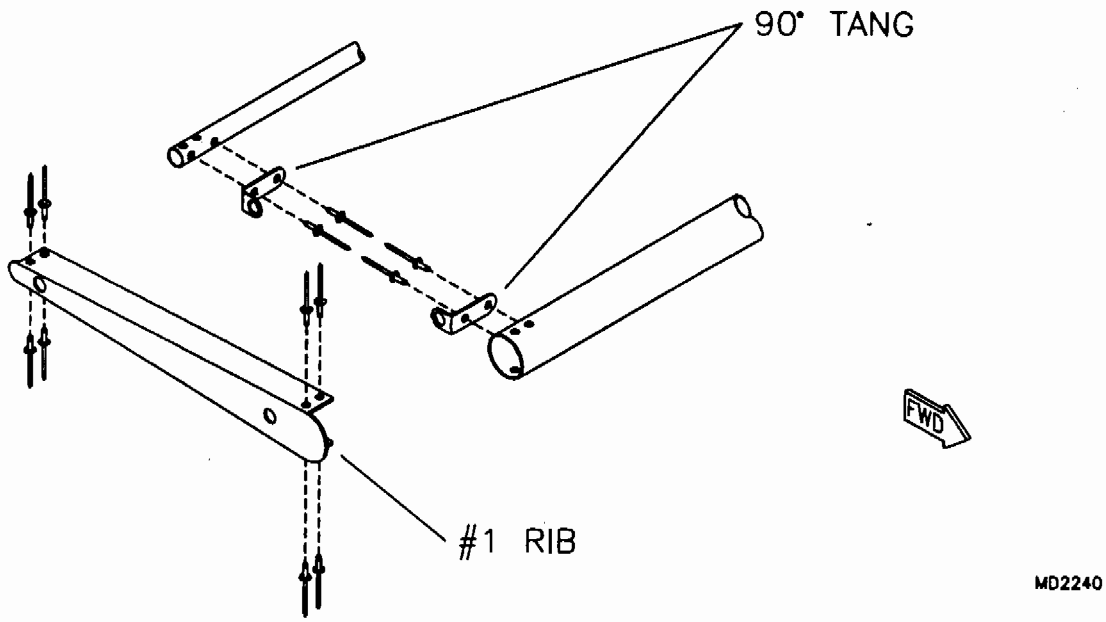


FIGURE 06-06A



7. Rivet the two end ribs in place on the aileron spar assembly. Insert the trailing edge spar into the ribs. Center the trailing edge spar with the holes in the **end** ribs. Size drill as required and cleco in place. Check for "square" of the end ribs. Place a long straight edge against the trailing edge spar and clamp in place. It is not important for the trailing edge to be "seated" into the mouth of each rib, but it is important for the trailing edge to be straight. Drill and cleco in place.

8. Cleco the multi-hole tang in place along the trailing edge as before. Mark and drill as required for the rivet specified. Rivet the entire assembly together. Drill out the hole in the flap spar assembly for location of the flap/aileron horn attach angle. Temporarily attach flap/aileron horn attach angles to the flaps. The attach angles will be used during Trial Assembly and Rigging; then removed for covering.

9. Remove any sharp edges on ribs or spars with a file. Install plastic tape over all edges and rivets to protect the fabric skins. It is important that the tape be installed to all areas that could cause chafing. **IMPORTANT**: Be sure not to use dark colored tape; it will show through light colored skins. It is best to use clear plastic tape.

FLAP SYSTEM - GROUND ADJUSTABLE

1. Locate the parts shown in the parts manual.

2. Install the fixed flap mount to the compression tube as shown in the parts manual. After trial assembly and rigging this will be removed for covering.

FLAP SYSTEM - IN FLIGHT ADJUSTABLE

1. Locate the parts shown in the parts manual.

2. Bolt the flap teleflex retainer to the compression tube as shown in the parts manual. The teleflex cable will be routed during trial assembly and rigging.

S-12XL LIFT STRUT ASSEMBLY - NON-ADJUSTABLE

This section describes the assembly and installation of the non-adjustable lift struts. It is required to mount the wings in this section. It is important to assemble the strut type that you purchased. Unless you purchased the optional adjustable lift struts, you will be installing the non-adjustable lift struts. If installing the adjustable lift struts, go to the next section.

RANS airfoil lift struts are made of extruded aluminum. Extrusions are sensitive to deformation. Cracks and splits can occur along the length of the strut if the ends are compressed beyond the material limits. Over tightened bolts can cause cracking. A compression bushing or fitting large enough to equal the struts inside diameter should be used. Remove any of the burrs that may be on the ends of the tubing before cutting bushings to fit.

Each and every piece of airfoil strut material is inspected two times before shipment to assure you of a quality product. However, we are not infallible, therefore, we encourage you to inspect the material for any form of deformation and surface imperfection. Deeply grooved struts should not be used and returned to the factory for replacement. The surface should look and feel smooth.

Dents and nicks can occur during shipping. The strut material is very thick skinned and resistant to dents. If dents are present they will usually be large enough to require rejection of the material.

Once the struts are in service, continued inspection is the only required maintenance action. Anodized strut material is resistant to corrosion and needs little care. Include strut inspection in your pre-flight check.

1. Locate the parts shown on the parts drawing.

2. Drill and debur the four (4) AFT lift strut gussets as per **FIGURE 06L-02**. Drill Aft Upper Lift Strut Connectors as shown in **FIGURE 06L-02A**. **IMPORTANT:** Test drill a scrap metal piece to test fit 5/16" bolt. Bolt fit must be tight, for all 5/16" holes, see **FIGURE 06L-02B**. Use of a drill press is recommended when drilling the strut connectors.

FIGURE 06L-02

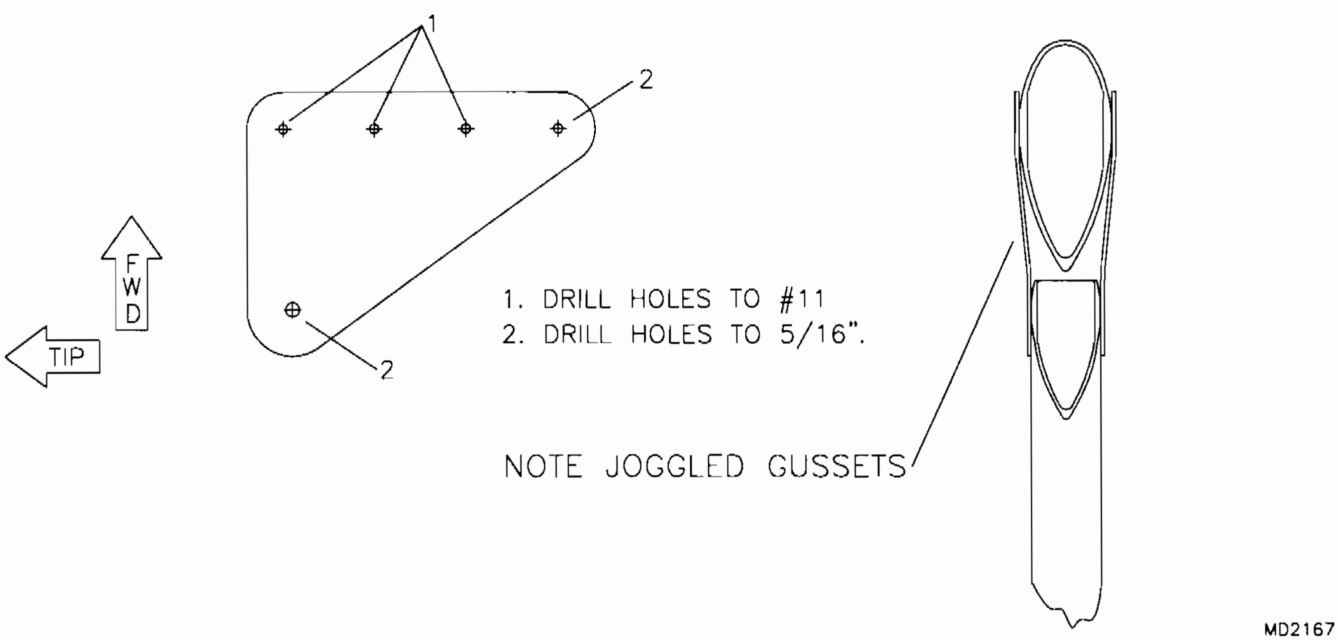


FIGURE 06L-02A

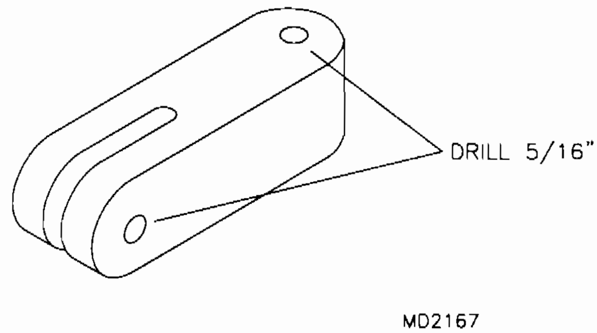
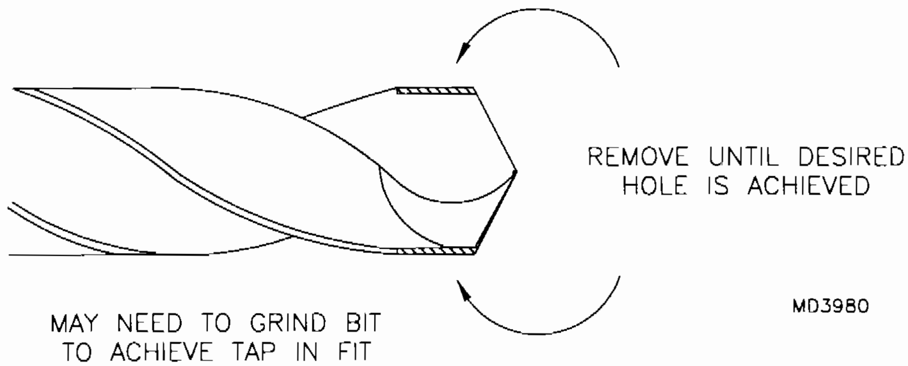


FIGURE 06L-02B



3. Take the two forward struts and locate and drill a 5/16" hole 5/8" from each end. Drill a 1/4" hole for the jury strut 48" from the end. See **FIGURE 06L-03.** Use the template shown in **FIGURE 06L-03A** to locate and drill from the forward edge of the strut. Drill from each side. Assemble the fittings to each end as per the parts drawing. Use the solid rounded aluminum fitting for the main strut attachment. Look closely at these parts, there is a left and right. Install the corresponding fitting to the appropriate strut. Assemble the strut as shown in **FIGURE 06L-03B**

FIGURE 06L-03

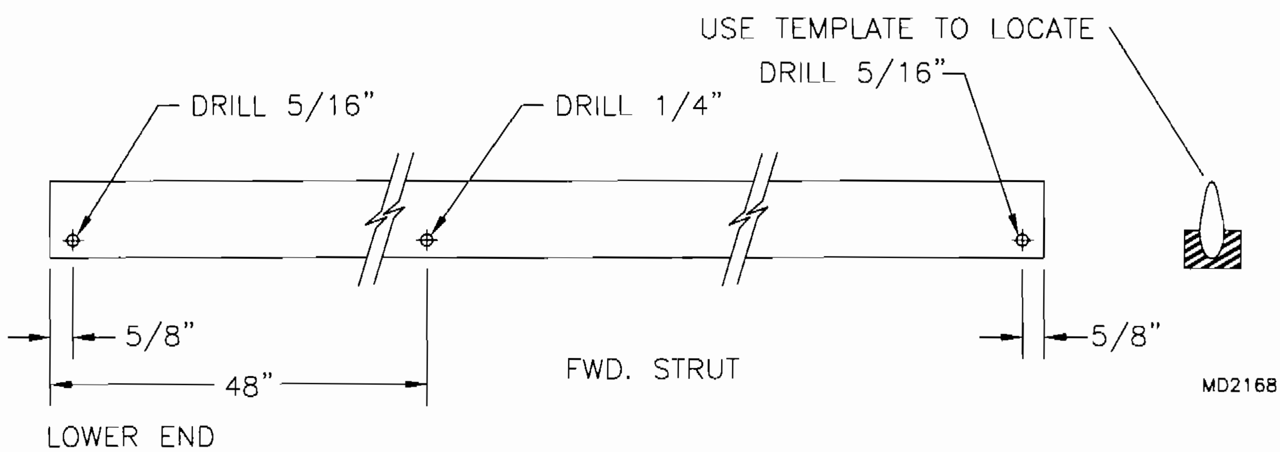


FIGURE 06L-03A

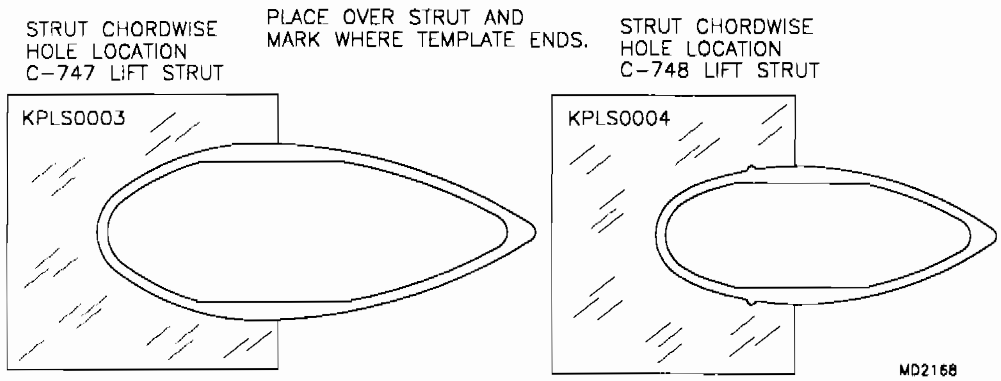
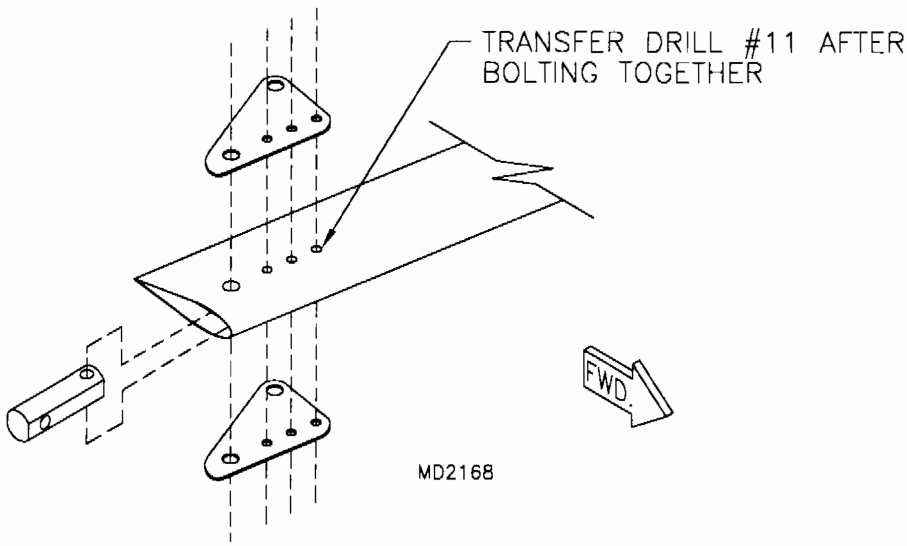


FIGURE 06L-03B



4. Cut, drill, and profile the AFT lift struts on **ONE** end only. Profile the **TOP** end as per **Figure 06L-04**. **DO NOT** drill the lower end of the aft lift strut until wings are set in place. **PLEASE NOTE:** Some rough cutting of the lower end will be required to allow the strut to fit deep enough into the gussets. Drill a 1/4" hole 49 3/4" from the **UPPER** end of the aft lift strut for the jury strut as shown in **Figure 06L-04A.**

FIGURE 06L-04

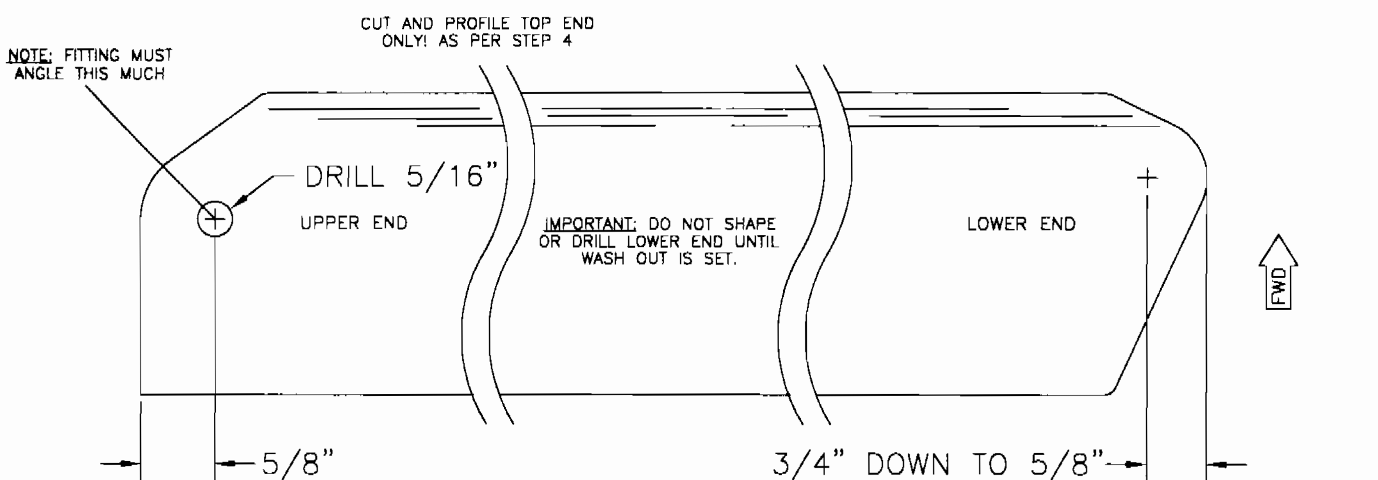
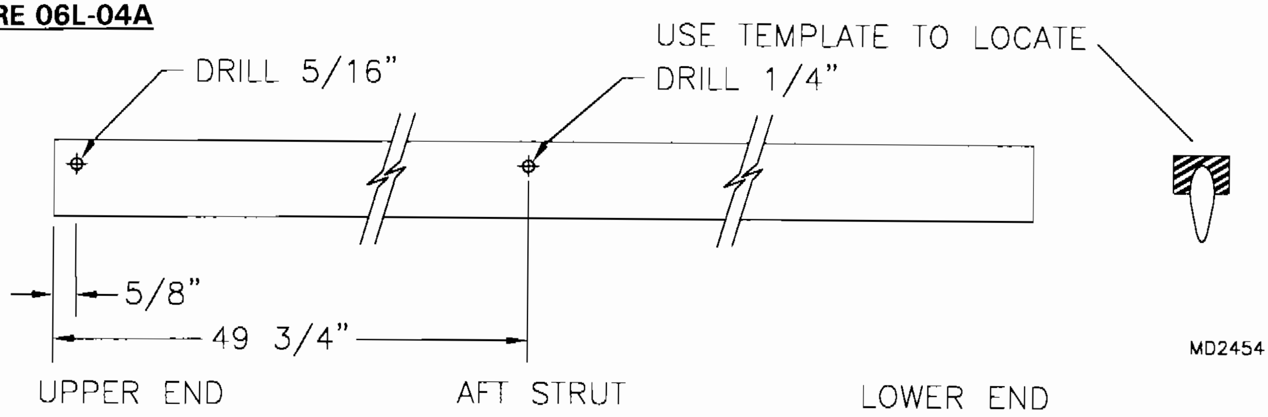
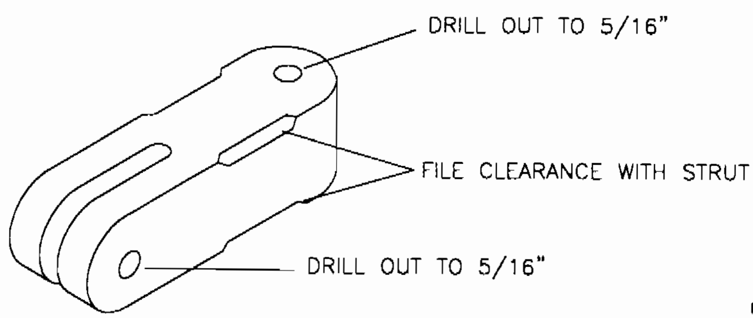


FIGURE 06L-04A



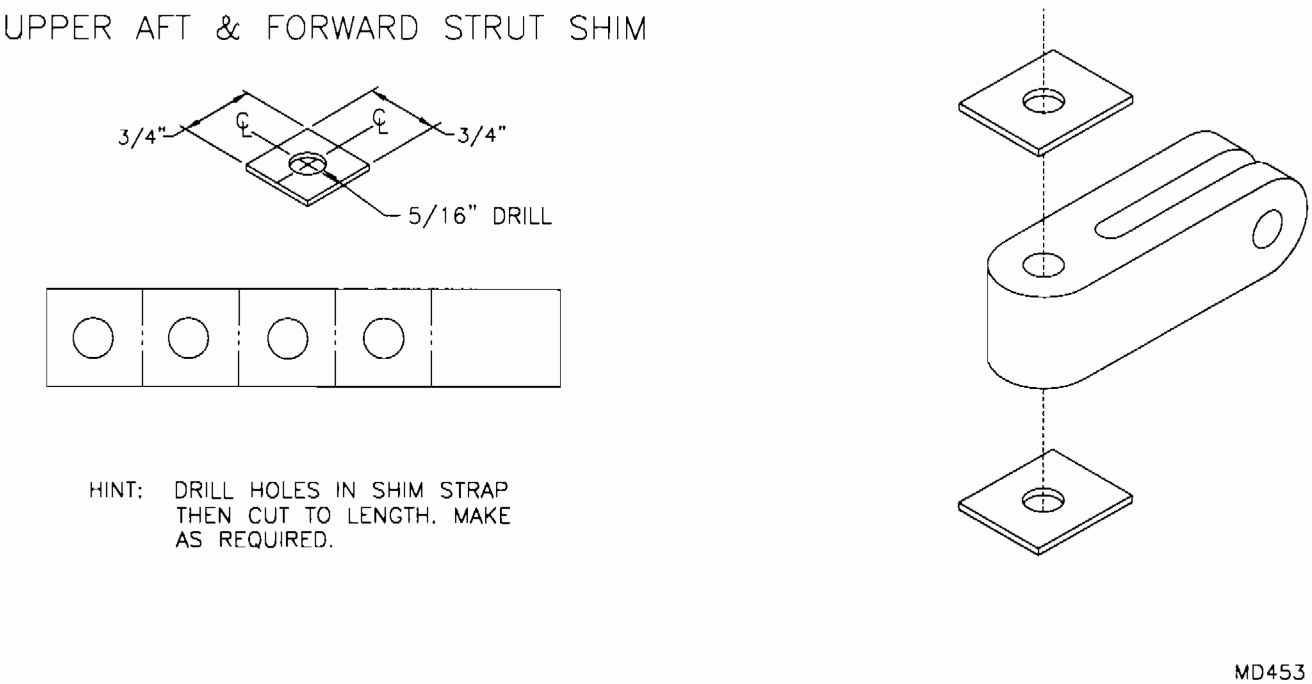
5. File the Aft Upper Lift Strut Connectors and file clearance into the fitting as required to fit into the strut at the required angle. Angle the line as shown in **FIGURE 06L-05**. Drill the holes in the fitting out to 5/16". Bolt the fittings into the AFT lift strut top ends.

FIGURE 06L-05



6. **IMPORTANT:** Due to dimensional variation in extruded material it may be required to shim the fittings. No gap should exist between the fittings and the struts. If there is a gap, it should **not** be eliminated by tightening down the bolts. If a gap exists this action may crack the struts. Use the .020 shim material to insure a tight fit. See **FIGURE 06L-06.**

FIGURE 06L-06

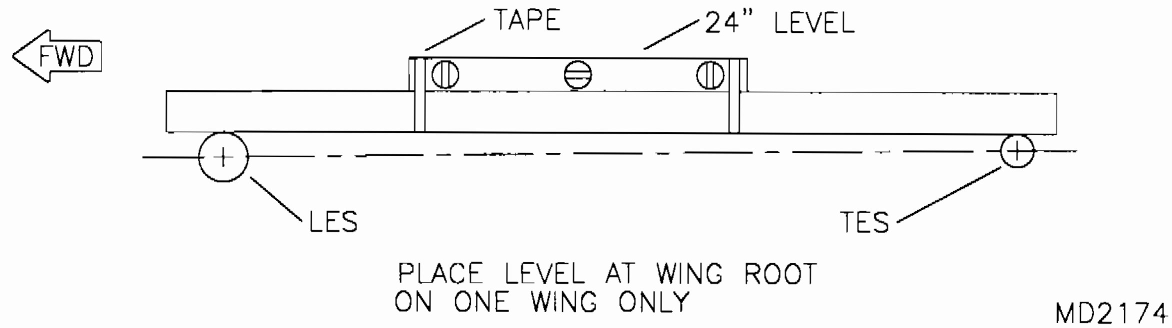


6. Using a friend or a couple of step ladders to support the end of the wing, bolt the wings to the fuselage. Use the hardware shown in the leading and trailing edge spar assembly portion of the parts manual. Bolt the forward lift strut in position between the forward strut attach plate and the fuselage cage using the hardware shown. The forward lift strut will automatically set the dihedral.
Bolt the forward lift struts in place with the AFT lift strut gussets pointing AFT. This will automatically set the dihedral.

7. Bolt the AFT lift struts to the wing and place the un-drilled end between the gussets. **PLEASE NOTE:** Twisting the wing and **RAISING THE AFT SPAR** will set the wash out. The AFT strut will be clamped and drilled at the gusset once the wash out is set. The gusset will act as a drill guide. Using the small template, mark a line for several inches at the strut's lower end showing chordwise location for the hole. Place masking tape on either side of the strut's ridge to protect the strut. Carefully file the ridge smooth, as needed, to clear the Aft Lift Strut Gusset.

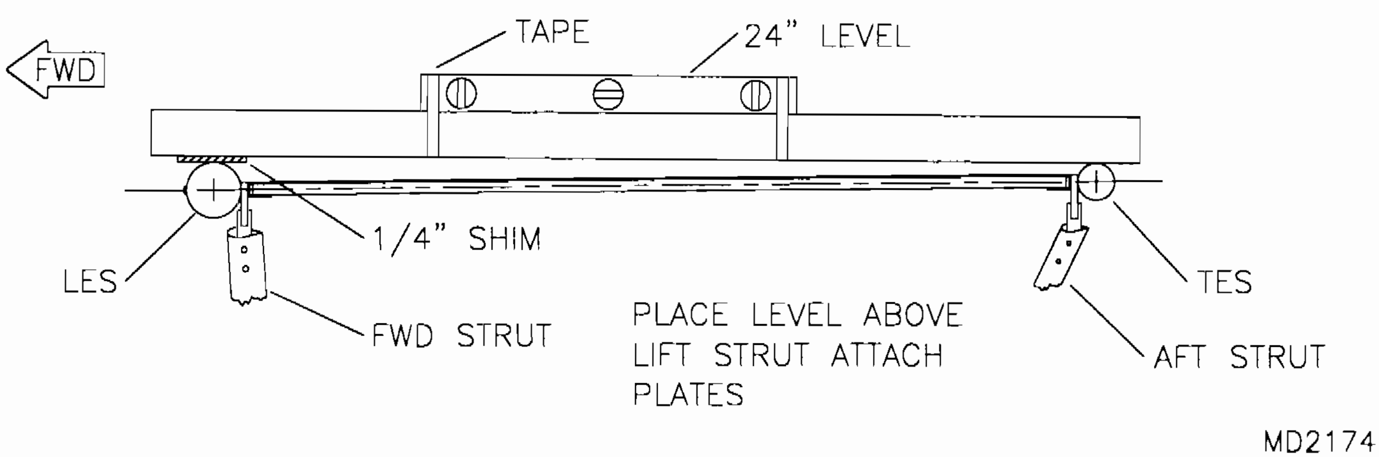
8. Make a rigging level by taping a 2-foot level to a straight edge 50" long. Place the level on the top of the spars at the wing root. Raise the mains or remove the nose wheel to obtain a level reading at the root. See **Figure 06L-08**. **CAUTION:** Block wheels to prevent rolling.

FIGURE 06L-08



9. Cut out a scrap of 1/4" plywood 6" X 2" and nail or screw it to the forward end of the straight edge. Place the straight edge above the lift strut attach plates. The 1/4" shim is placed between the level and forward spar. See **Figure 06L-09**. This will set the "wash out". Move the AFT spar up or down as required to obtain a level reading. Use a vise grip type "C" clamp to hold the setting. Check for accuracy before drilling. Use the gusset fitting to line up on the chordwise marks on the strut and drill 5/16", and then assemble. Do **NOT** forget to insert the anti-crush bushing and washers inside the aft strut before final bolting. Do **NOT** re-zero level at root, go directly to the opposite wing and set washout now.

FIGURE 06L-09



S-12XL LIFT STRUT ASSEMBLY - ADJUSTABLE

This section describes the assembly and installation of the adjustable lift struts. It is required to mount the wings in this section. It is important to assemble the strut type that you purchased. Unless you purchased the optional adjustable lift struts, you will be installing the non-adjustable lift struts. If installing the non-adjustable lift struts, go to the previous section.

RANS airfoil lift struts are made of extruded aluminum. Extrusions are sensitive to deformation. Cracks and splits can occur along the length of the strut if the ends are compressed beyond the material limits. Over tightened bolts can cause cracking. A compression bushing or fitting large enough to equal the struts inside diameter should be used. Remove any of the burrs that may be on the ends of the tubing before cutting bushings to fit.

Each and every piece of airfoil strut material is inspected two times before shipment to assure you of a quality product. However, we are not infallible, therefore, we encourage you to inspect the material for any form of deformation and surface imperfection. Deeply grooved struts should not be used and returned to the factory for replacement. The surface should look and feel smooth.

Dents and nicks can occur during shipping. The strut material is very thick skinned and resistant to dents. If dents are present they will usually be large enough to require rejection of the material.

Once the struts are in service, continued inspection is the only required maintenance action. Anodized strut material is resistant to corrosion and needs little care. Include strut inspection in your pre-flight check.

1. Locate the parts shown on the parts drawing.

2. Drill and debur the four (4) AFT lift strut gussets as per **FIGURE 06M-02.** Drill Aft Upper Lift Strut Connectors as shown in **FIGURE 06M-02A. IMPORTANT:** Test drill a scrap metal piece to test fit 5/16" bolt. Bolt fit must be tight, for all 5/16" holes, see **FIGURE 06M-02B**. Use of a drill press is recommended when drilling the strut connectors.

FIGURE 06M-02

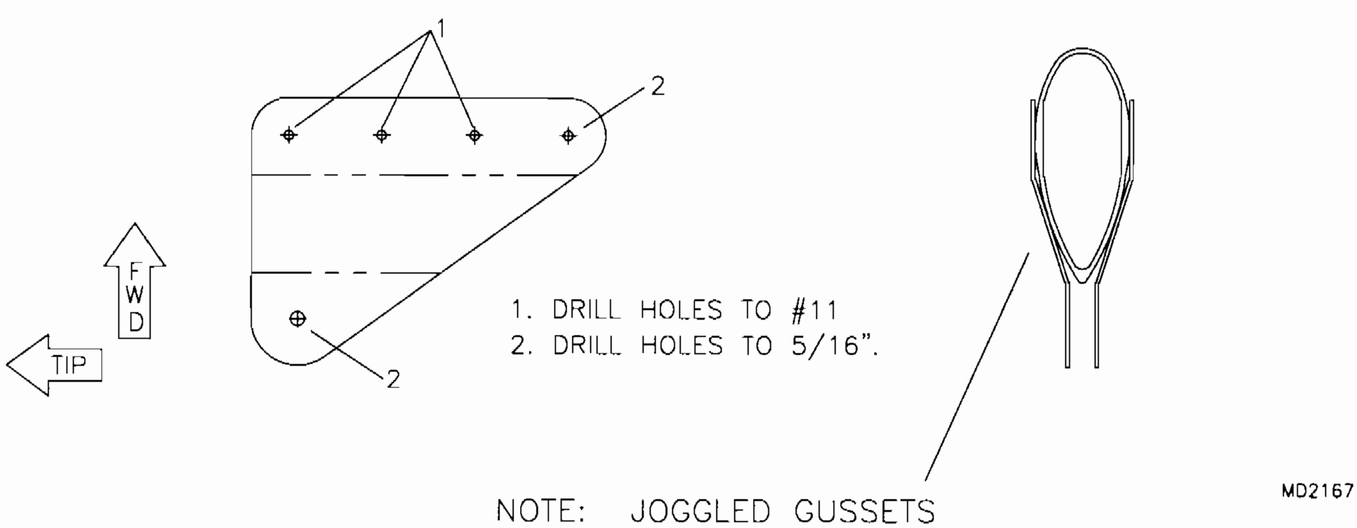


FIGURE 06M-02A

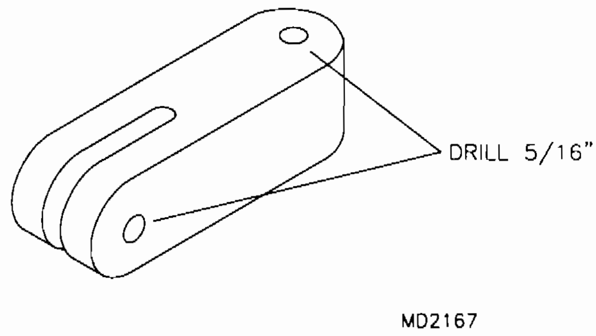
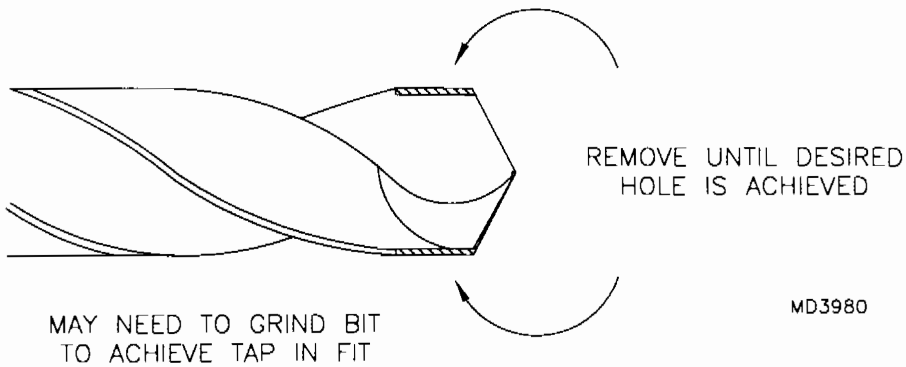


FIGURE 06M-02B



3. Take the two forward struts and locate and drill a 5/16" hole 5/8" from each end. Drill a 1/4" hole for the jury strut 48" from the end. See **FIGURE 06M-03.** Use the template shown in **FIGURE 06M-03A** to locate and drill from the forward edge of the strut. Drill from each side. Assemble the fittings to each end as per the parts drawing. Use the solid rounded aluminum fitting for the main strut attachment. Look closely at these parts, there is a left and right. Install the corresponding fitting to the appropriate strut. Assemble the strut as shown in **FIGURE 06M-03B**

FIGURE 06M-03

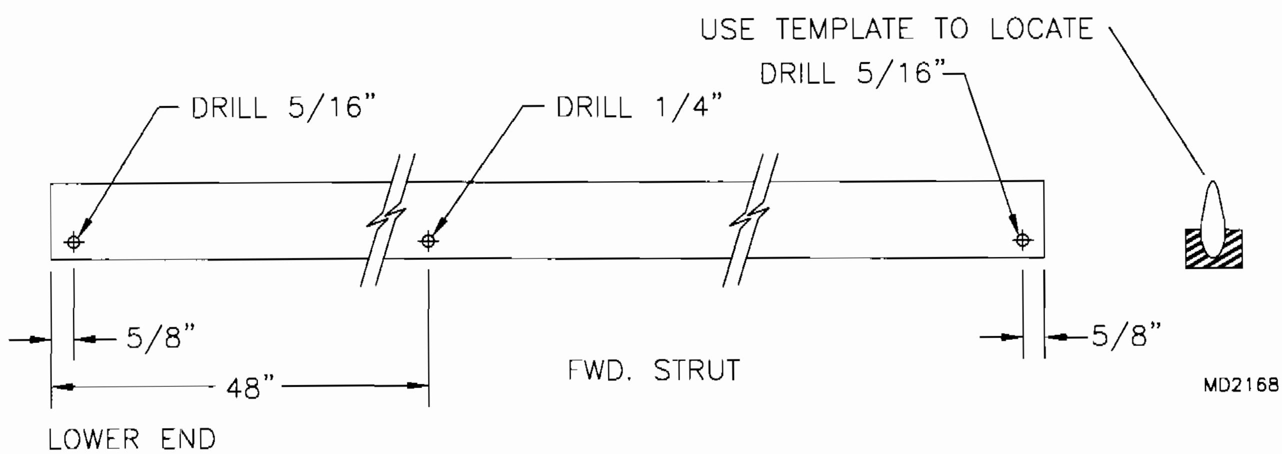


FIGURE 06M-03A

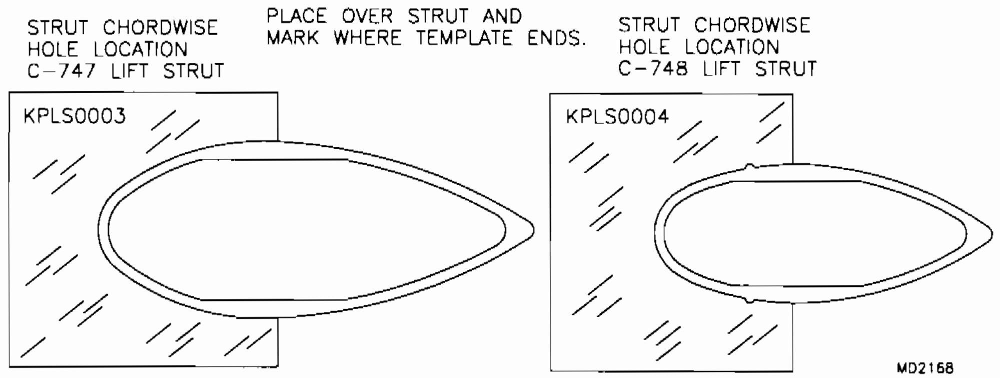
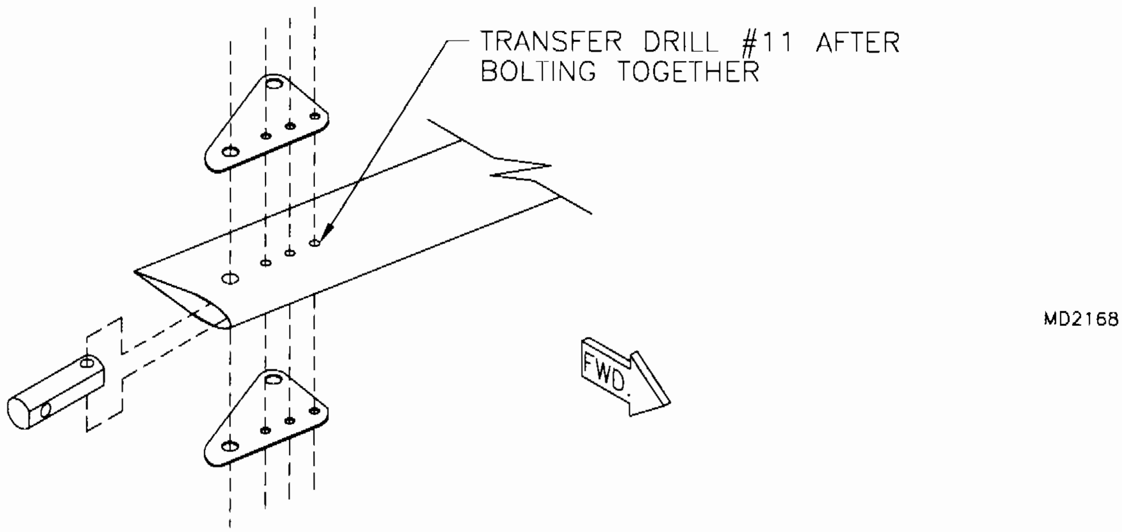


FIGURE 06M-03B



4. Cut the aft struts to the length given in **FIGURE 06M-04.** Drill and shape the **TOP** end as per **FIGURE 06M-04A**.

FIGURE 06M-04

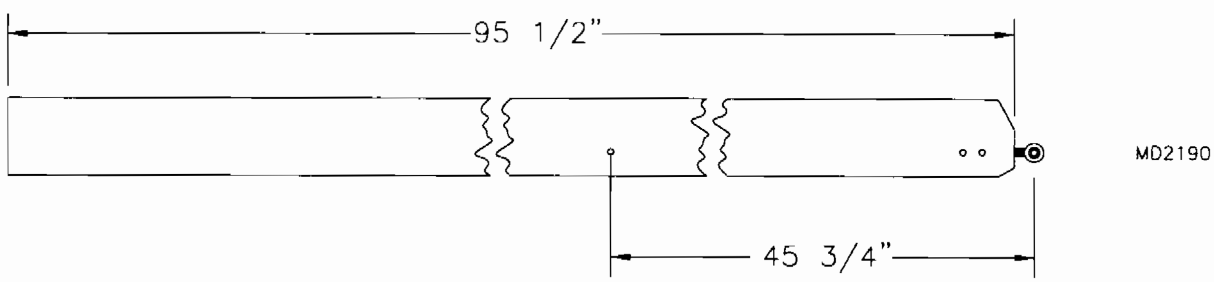
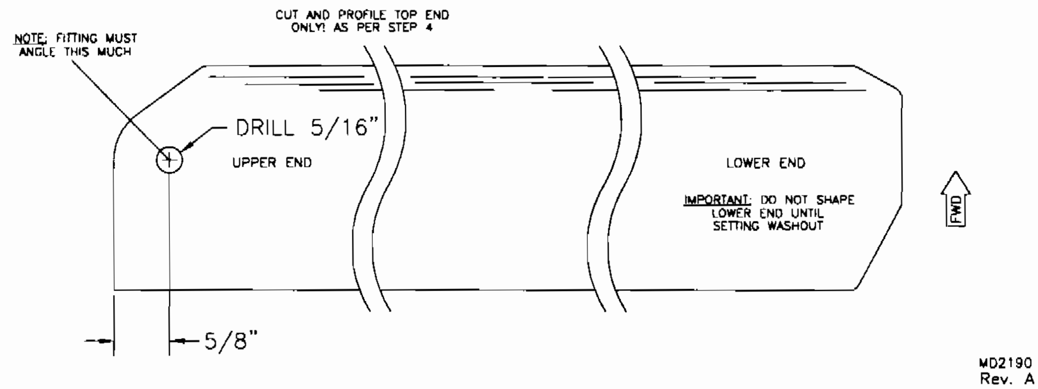
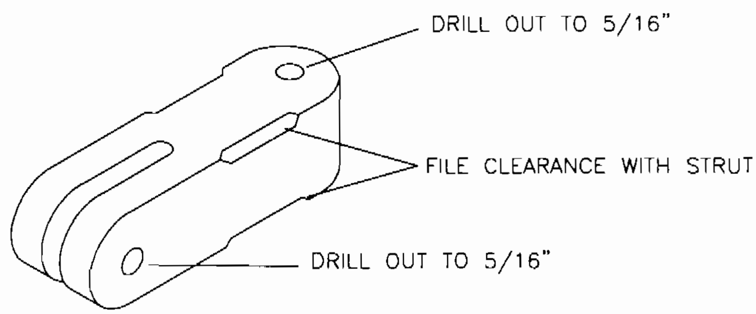


FIGURE 06M-04A



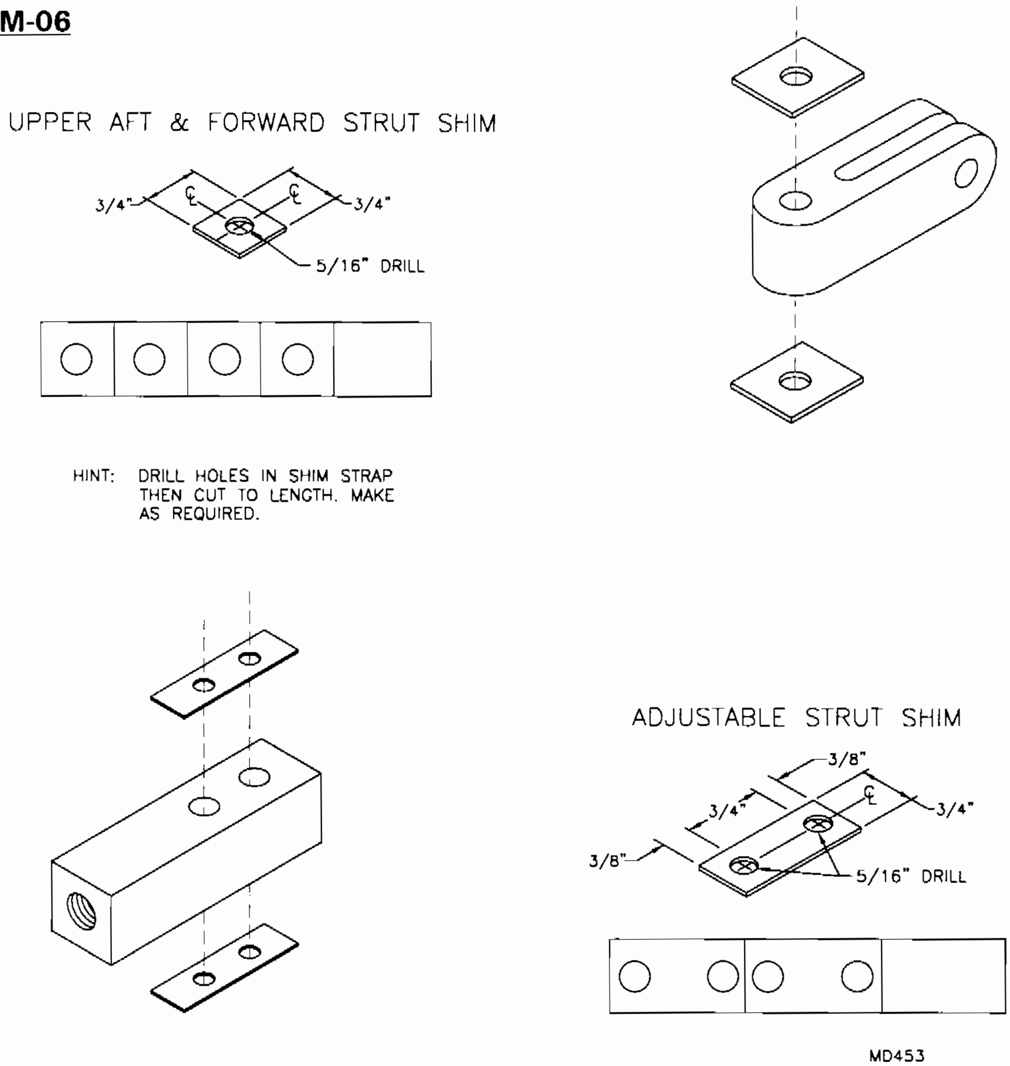
5. File the Aft Upper Lift Strut Connectors and file clearance into the fitting as required to fit into the strut at the required angle. Angle the line as shown in **FIGURE 06M-05**. Drill the holes in the fitting out to 5/16". Bolt the fittings into the AFT lift strut top ends.

FIGURE 06M-05



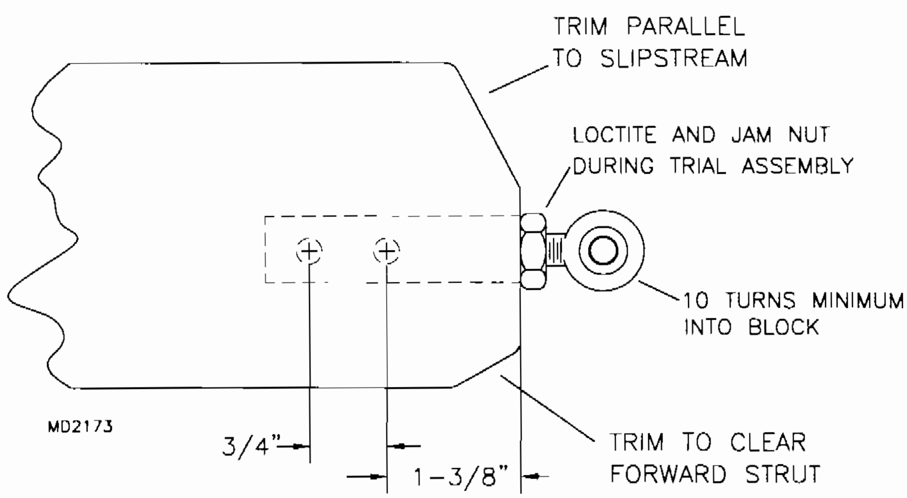
6. **IMPORTANT:** Due to dimensional variation in extruded material it may be required to shim the fittings. No gap should exist between the fittings and the struts. If there is a gap, it should **not** be eliminated by tightening down the bolts. If a gap exists this action may crack the struts. Use the .020 shim material to insure a tight fit. See **FIGURE 06M-06.**

FIGURE 06M-06



7. Drill the lower end of the aft lift strut as shown in **FIGURE 06M-07.** Install the adjustor end using the hardware shown. Fabricate and install shims if necessary. Install the rod-end with jam-nut into the adjustor end.

FIGURE 06M-07

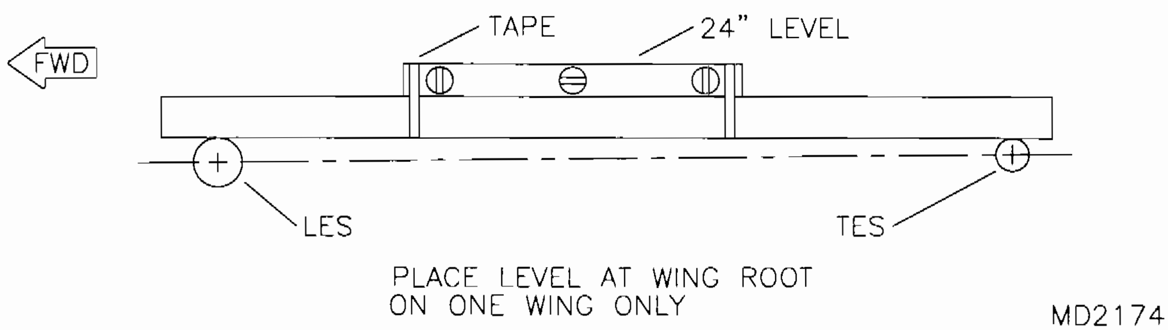


8. Using a friend or couple of stepladders to support the end of the wing, bolt the wings to the fuselage. Use the hardware shown in the leading and trailing edge spar assembly portion of the parts manual. Bolt the forward lift strut in position between the forward strut attach plate and the fuselage cage using the hardware shown. Bolt the forward lift struts in place with the AFT lift strut gussets pointing AFT. This will automatically set the dihedral.

9. Bolt the AFT lift struts to the wing and temporarily bolt the rod-end between the gussets. **PLEASE NOTE:** Twisting the wing and **RAISING THE AFT SPAR** will set the wash out. **IMPORTANT:** Apply Loctite to the rod-end threads before installing into the adjustor end.

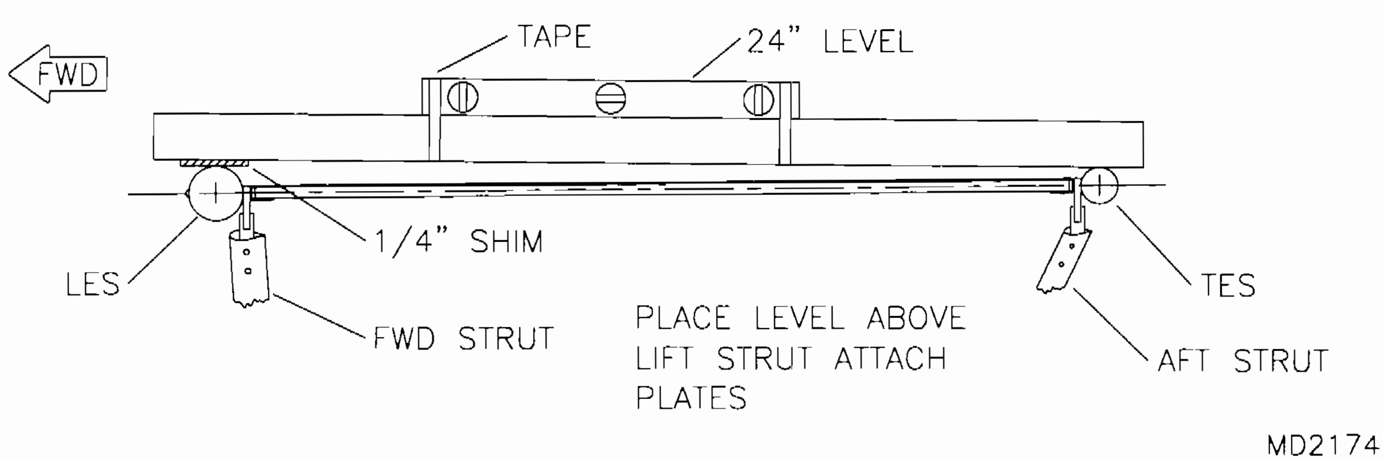
10. Make a rigging level by taping a 2-foot level to a straight edge 50" long. Place the level on the top of the spars at the wing root. Raise the mains or remove the nose wheel to obtain a level reading at the root. See **FIGURE 06M-10. CAUTION:** Block wheels to prevent rolling.

FIGURE 06M-10



11. Cut out a scrap of 1/4" plywood 6" X 2" and nail or screw it to the forward end of the straight edge. Place the straight edge above the lift strut attach plates. The 1/4" shim is placed between the level and forward spar. See **FIGURE 06M-11**. This will set the "wash out". Move the AFT spar up or down by adjusting the rod-end in or out until a level reading is obtained. **WARNING:** The rod-end must be at least **ten (10) full turns** into the adjustor end. Final bolt the rod-end and lock with the jam-nut. Do not re-zero level at root, go directly to the opposite wing and set washout now.

FIGURE 06M-11



JURY STRUT ASSEMBLY

IMPORTANT: If installing jury strut fairings, **DO NOT** rivet the jury struts to the gussets during their assembly; cleco only.

1. Locate the parts shown in the parts manual.

2. Make sure that the correct washout is set as described in the lift strut section of the manual before proceeding to jury strut assembly.

3. Cut the three jury struts to lengths shown in **Figure 06-03.** These are **reference** dimensions only. Filing will be necessary to make a perfect fit. Cut two of each length; one set for each wing. Drill the gussets as shown in **Figure 06-03A.**

FIGURE 06-03

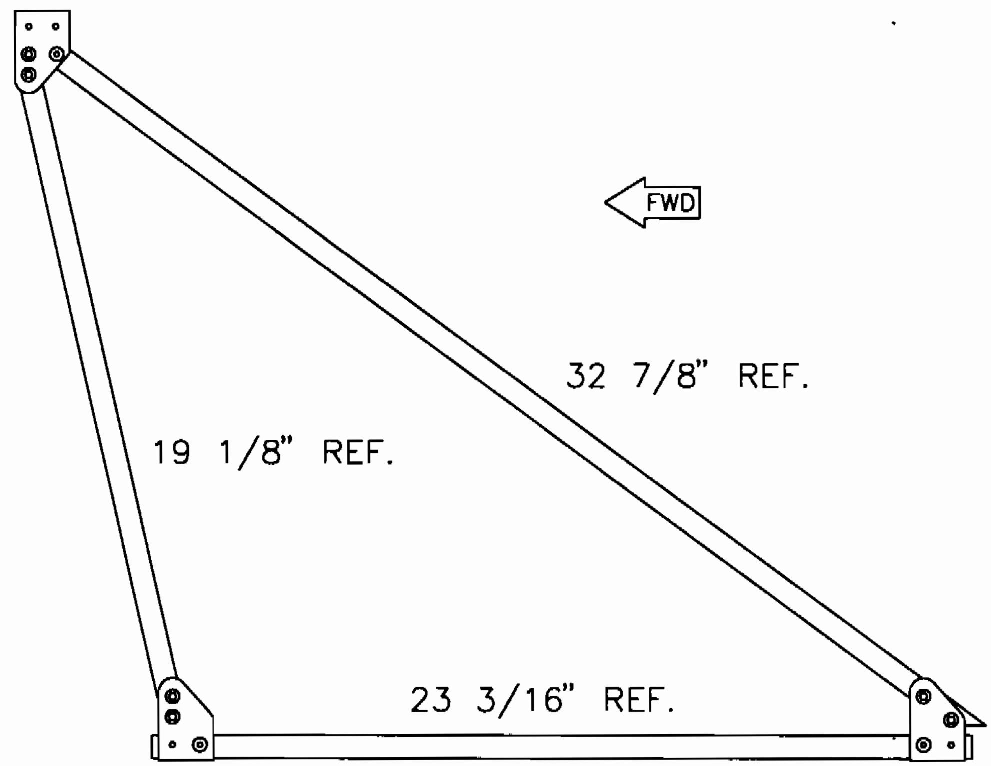
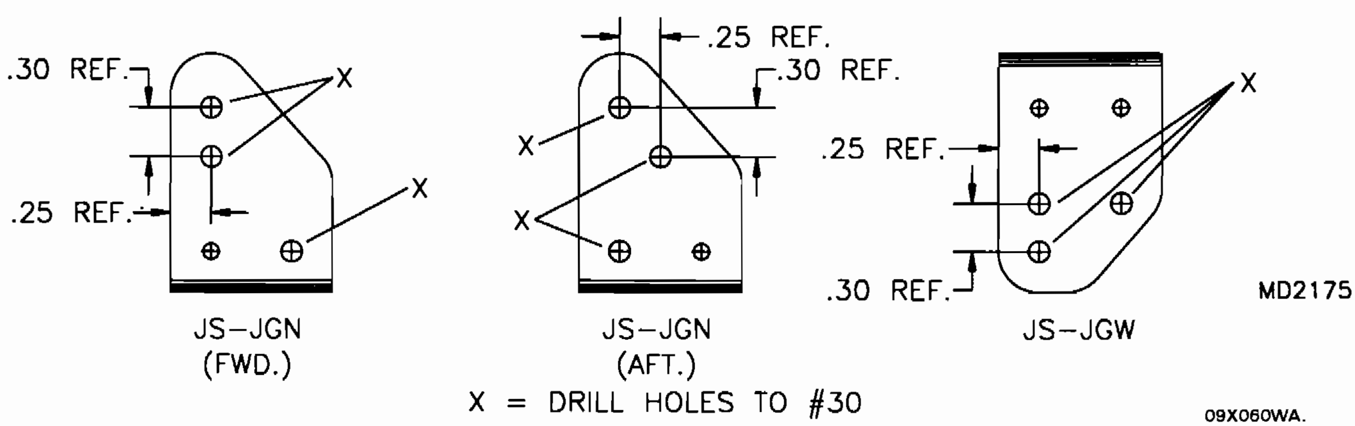


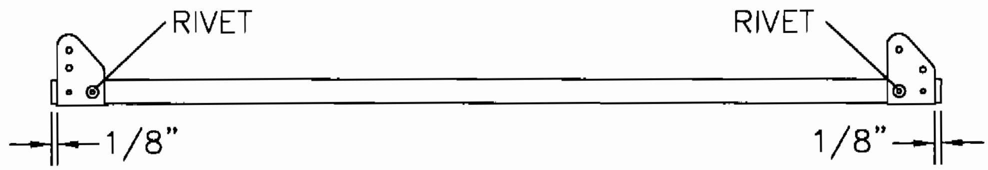
FIGURE 06-03A



09X060WA.

4. Test fit the 23 3/16" cross strut between the eye bolts. It should fit snug. Cut/file as required to achieve a tight fit between the eye bolts. Insert the drilled bushing aluminum inserts into each end of the cross strut. Dimple the end of the tubes with a punch to hold in place. The gussets will need to line up with each other on the crossing tubes. Lay the assembly on a flat table. Extend the ends of the tubes ⅛" from the gussets. See **Figure 06-05**. Cleco the gussets to the tube via the #30 holes using #30 stainless steel pop rivets.

FIGURE 06-04

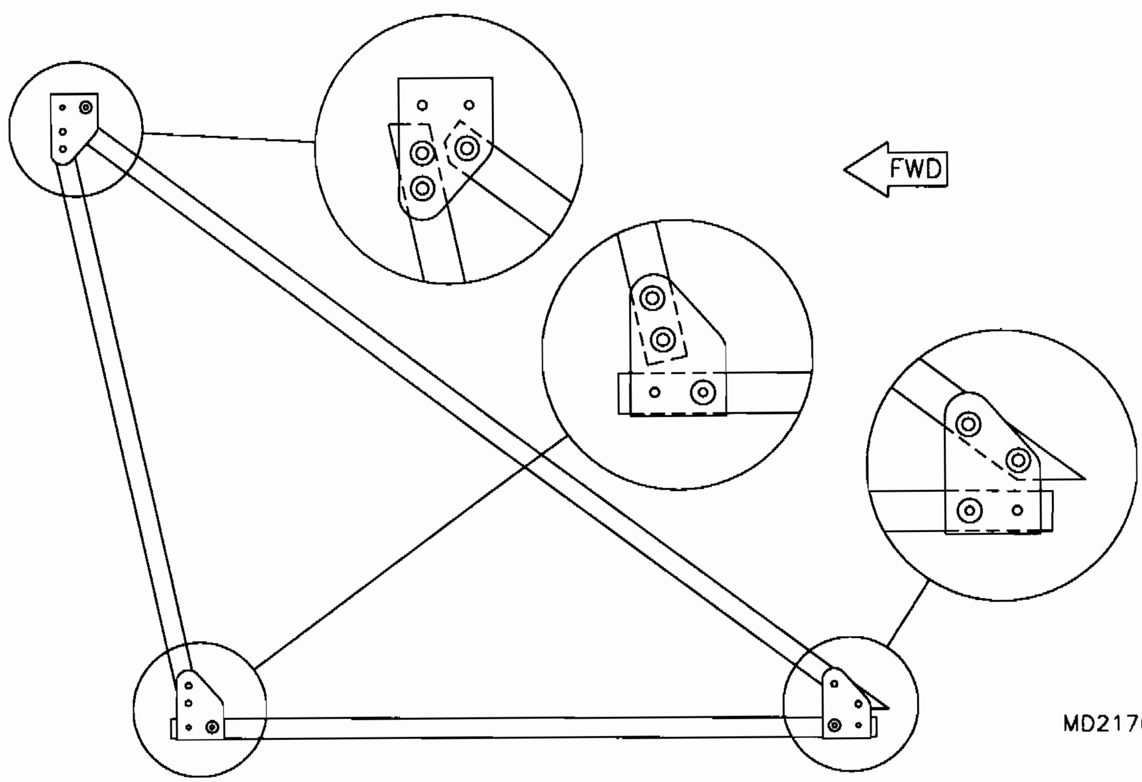


MD2176

5. Install the gusset shown in the parts manual to the jury strut bracket bolted to the leading edge spar. Install the forward jury strut in place. Cut/trim as required. It will be necessary to angle cut the top end of the forward jury strut. Drill #30 using the gusset as a guide and cleco in place. See **Figure 06-05.**

6. Install the diagonal jury strut. Angle cut as required to maintain sufficient edge distance for drilling. Cleco in place. Refer to **Figure 06-05.** Drill the holes shown below into the gussets and tubes. Hole locations in the gussets should be on the centerline of the tube. Debur all holes and rivet the jury strut assembly in place.

FIGURE 06-05



MD2176

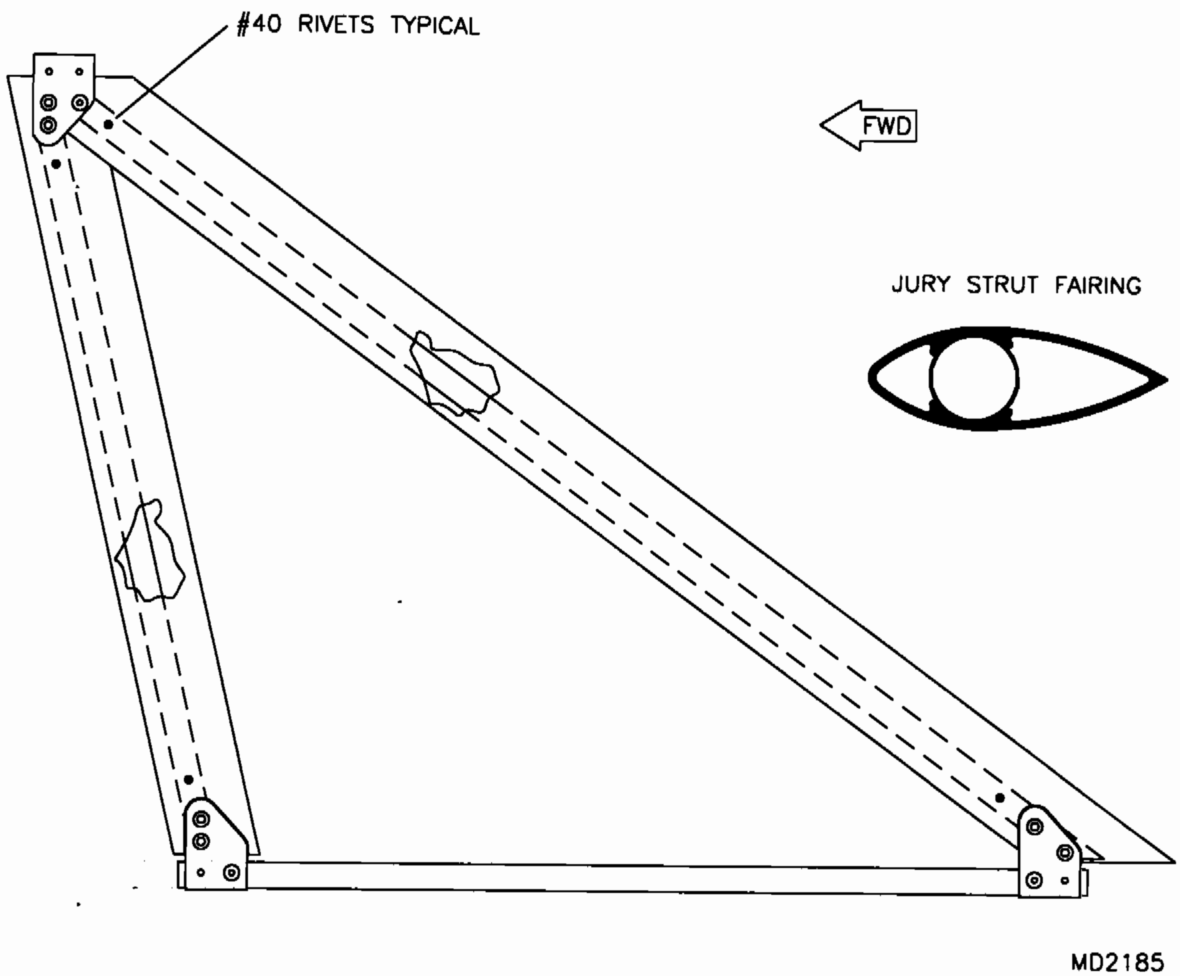
JURY STRUT FAIRING INSTALLATION

1. Locate the parts shown in the parts manual.

2. Slip the jury strut fairings in position. Use a Dremel tool or snips and a file to shape the jury strut fairings to fit tightly against the gussets as shown in **Figure 06-03.**

3. Once the jury strut fairings are riveted in place, permanently install the jury struts as shown in **Figure 06-03.**

FIGURE 06-03



FLAP FILLET INSTALLATION

1. Locate the parts shown in the parts manual.

2. Slip ribs into the outer wrap and cleco in place. Rivet the two internal ribs in place. Drill and rivet the leading edge using 1/8" pop rivets shown in the parts manual.

3. Bolt holes used to attach the flap fillet will be drilled during trial assembly and rigging.

Trial Assembly and Rigging

1. At this point the wings and tail surfaces should be installed to the airframe. If not, do so at this time. Attach all control surfaces: ailerons, flaps, elevator, rudder. There will be no need to install cotter pins in the castle nuts at each surface since they will need to be removed for covering.

2. Install the push-pull tubes to the ailerons. Attach to aileron control horn and to the control tee at the keel.

3. Attach the flap teleflexes (if installing in-flight adjustable flaps) to the retainers in the wing. Attach the teleflexes to the flap control horn. Route the teleflexes as shown in the flap system - in-flight adjustable detail of the parts manual.

4. Attach the rudder cables to the rudder control horns using the hardware shown in tail group frame assembly. Set the stop screws on the steer horn to achieve the maximum deflection of the rudder without contacting the elevator and lock in place using the plain nuts.

5. Neutral position of the ailerons and flaps should be adjusted as shown. Start working from the control stick and move outward. Center the control sticks, then move up to the control tee. Center the control tee; adjust the turnbuckles as required. With the control stick and control tee centered move out to the bellcranks. Center the bellcranks by adjusting the push-pull tubes. The bellcrank is centered when the forward bolt is centered above the compression tube as shown in **Figure 07-05.** Once the bellcranks are centered adjust the ailerons. Use two straight edges taped in position at the inboard end of the ailerons to set the neutral position as shown in **Figure 07-05A.** **__WARNING__:** The rod end's threads must be at least 6 full turns into the push-pull tube's end fittings. With the ailerons adjusted into position, adjust the flaps to match. Use the fixed flap mount for the ground adjustable type or the rod ends on the in-flight adjustable style. Rod ends on the flap teleflexes must be turned in a minimum of six full turns. With the ailerons set to neutral, locate, drill, and rivet the push-pull tube guides in position on the flap compression tube as shown in the wing frame assembly section of the manual.

__FIGURE 07-05__

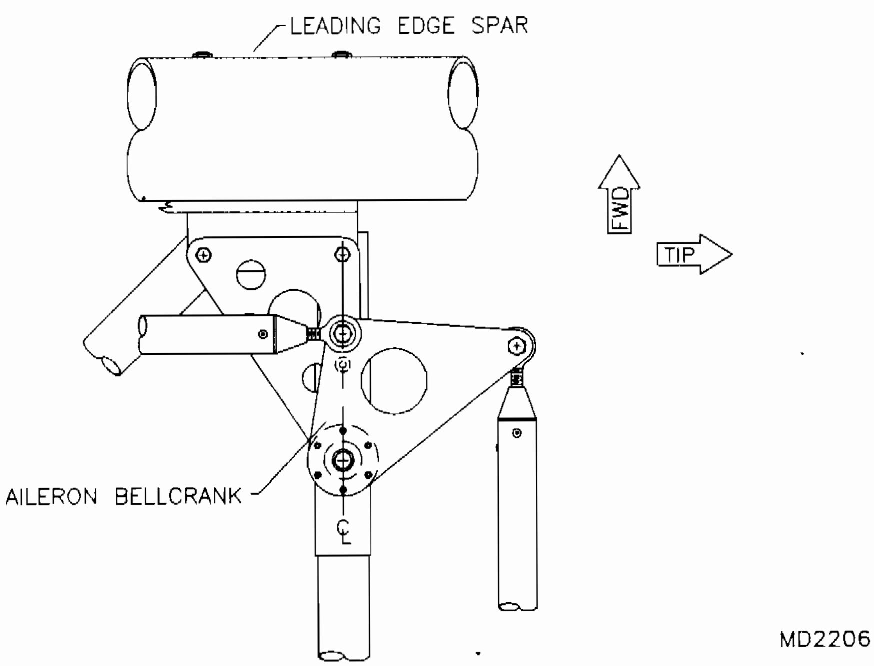
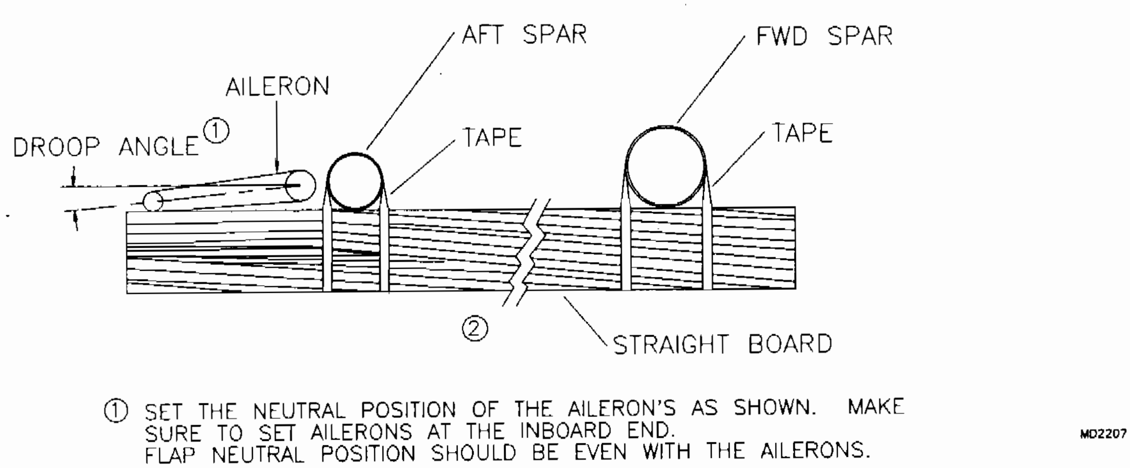
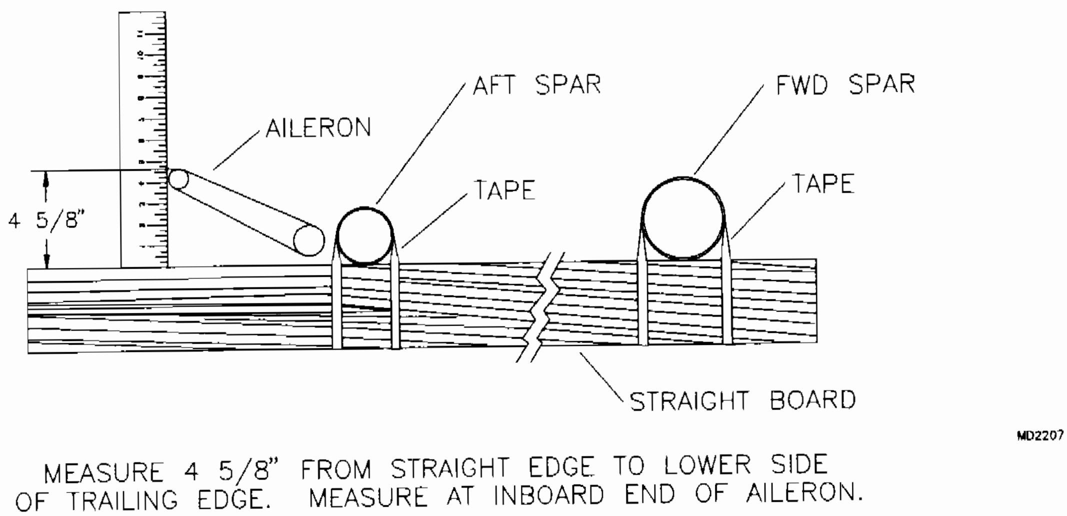


FIGURE 07-05A



6. Adjust the throw of the ailerons at the inboard end until each aileron has a maximum up deflection as shown in **Figure 07-06.** Be sure to take this measurement at the inboard end of the aileron.

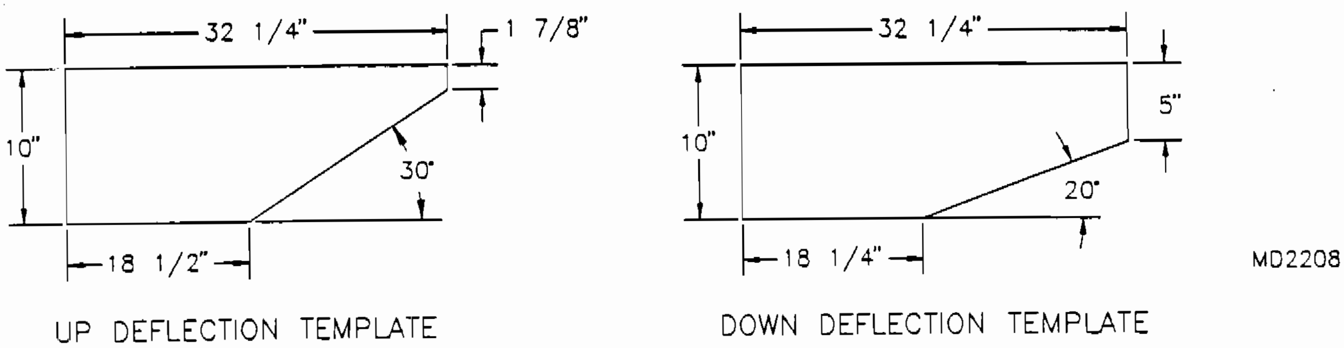
FIGURE 07-06



7. Once all surfaces are set as described above, lock the "jam" (plain) nuts in position with loctite to save the settings for final assembly.

8. Install the elevator to the horizontal stabilizer. Attach the elevator yoke to the elevator horns using the hardware shown in the tail group frame assembly section. Fabricate the templates from scrap cardboard or poster board as shown in **Figure 07-08** to set the up and down elevator throws.

FIGURE 07-08



9. With the elevator throws established, set the stops on the push-pull tube by drilling and installing rivets to the stop bushings. See elevator assembly for part numbers and quantities.

S-12XL COVERING

GENERAL COVERING NOTES

Before removing skins from their protective packaging it is important to wash all oil and dirt from hands. Wash hands thoroughly before handling any of the Dacron covers. A **new,** inexpensive set of cotton gloves worn by the builder is recommended for handling of the skins; especially if clear coating is desired.

You can smooth out any wrinkles or fold lines in the skins with a hot air gun. Be careful not to melt the skins. 350 degrees is the maximum temperature used. After 350 degrees the cloth will stop shrinking and start stretching. A model airplane heat gun used for shrinking Mono-Kote works great. An electric iron works also, but can leave areas discolored so be careful of the heat setting. An older iron with a heavy sole works best.

Plastic or Vinyl tape from any hardware or automotive store will work well for "Anti-Chafe" tape. We use 3-M Clear Weather Sealing Polyethylene Tape or All-Weather Polyethylene Repair Tape.

TAIL GROUP DACRON COVERS AND HARDWARE

COVERING THE VERTICAL STABILIZER

1. Remove the stabilizer from the tail boom. Remove the stainless steel hinge from the trailing edge of the vertical stabilizer. A pair of padded sawhorses works well to support framework while slipping covering into position.

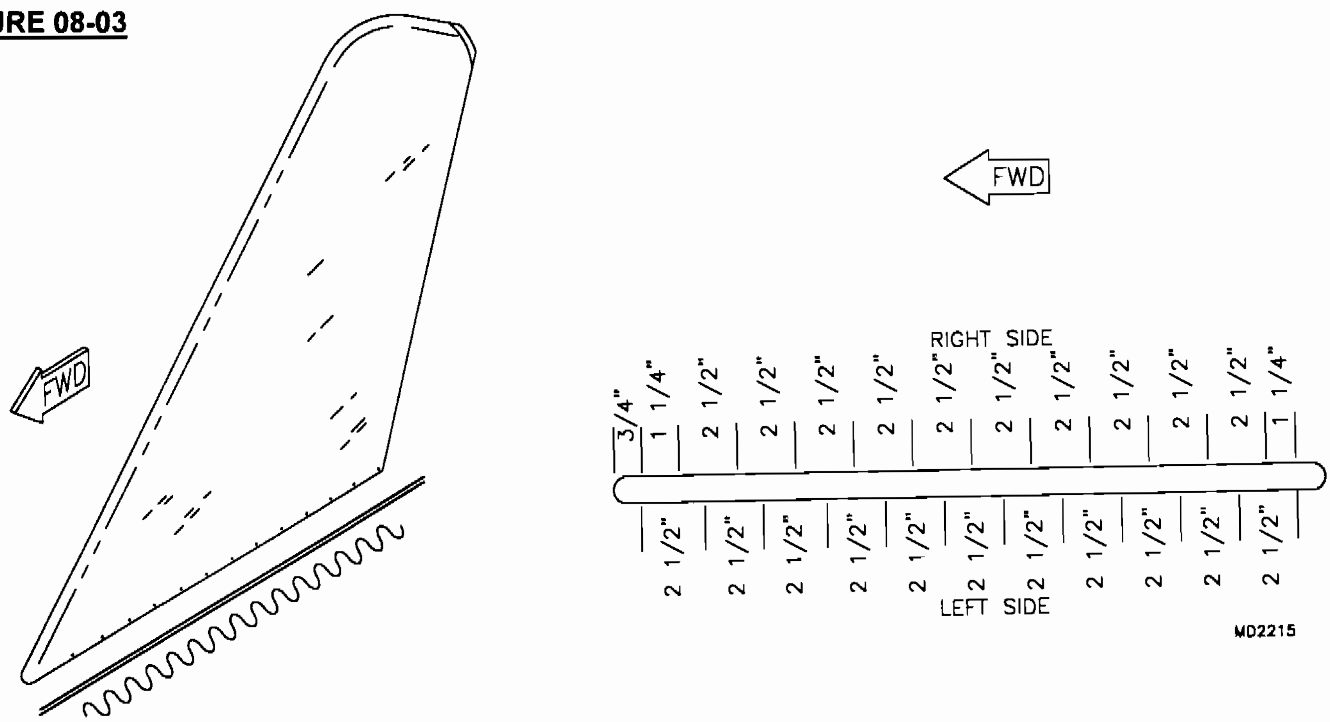
2. Pre-covering Checklist:

___ Doublers installed in leading and trailing edges.
___ Doublers installed in spreader tube.
___ All gussets riveted and rivet heads seated properly.
___ Hinge location nut plate installed.
___ Spreader tube drilled for horizontal stab attachment.
___ Adjust bracket riveted and size drilled as required.
___ Internal brace and U-bracket riveted in place.
___ Cable attach holes drilled to #11.
___ Aluminum ribs riveted in place.
___ Entire surface is clean. Remove part # stickers and marks of any kind.

Make sure to complete the above checklist prior to installing covering.

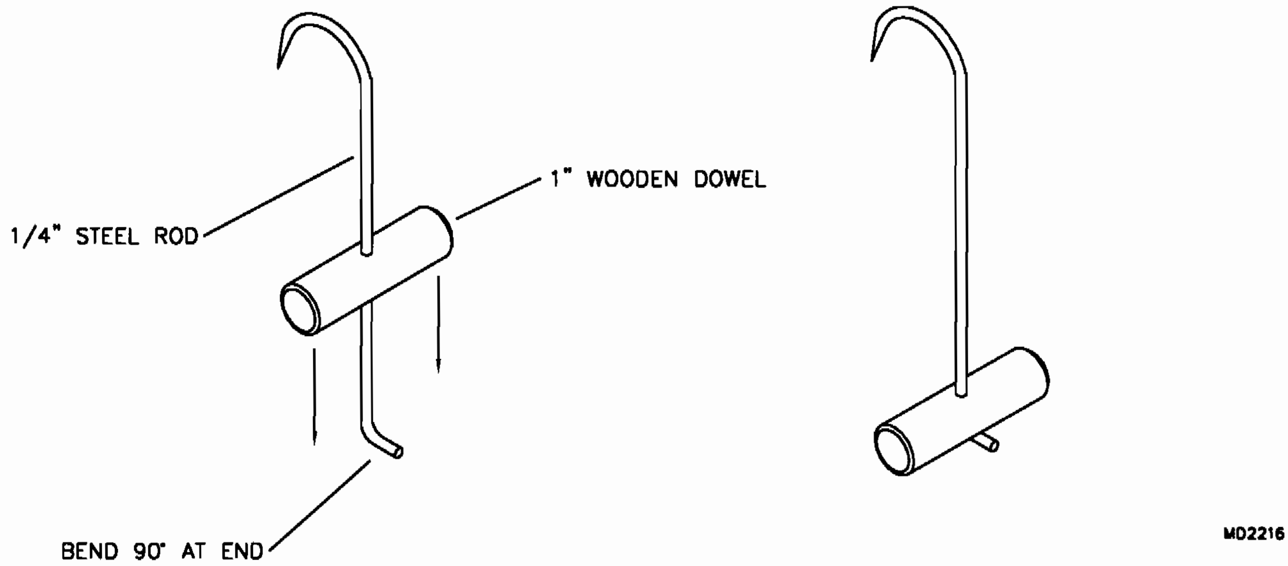
3. Locate the Dacron cover and hardware shown in the parts manual. Slip the vertical stabilizer Dacron cover into position. Pull the cover as far down onto the vertical stabilizer as possible. Slip the 1/16" wire into each pocket on the bottom edge of the Dacron cover. Using a hot knife, locate holes as shown in **Figure 08-03.** Refer to the Rudder Covering Section for details on securing the wire in the pockets.

FIGURE 08-03



4. Start by tying the lacing rope off on either end of the pockets. Lace from side to side. Tension the rope as you go. Make sure Velcro seam stays centered along the trailing edge as you go. **HINT:** *Fabricate a small hook out of 3" steel rod (not supplied) as shown in* ***Figure 08-04.***

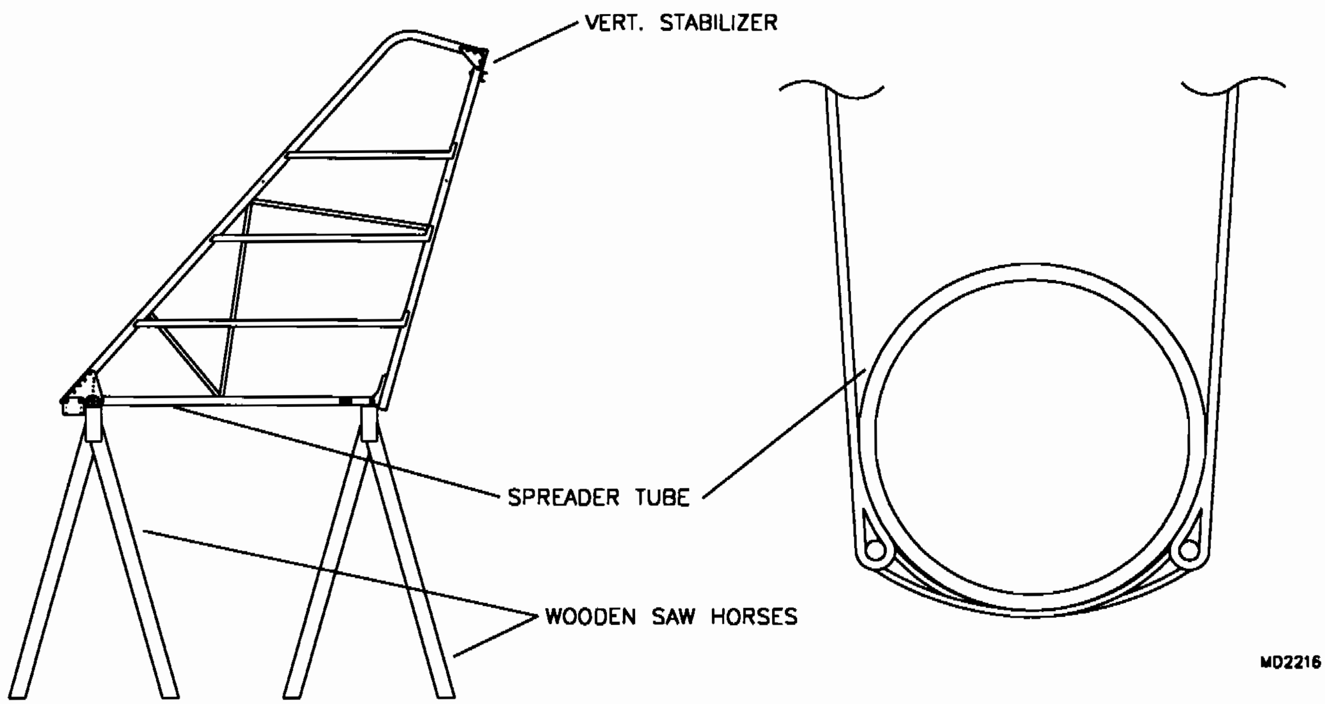
FIGURE 08-04



5. With the lacing rope tied at both ends, set the surface on two saw horses. This will allow pulling from the bottom. See **Figure 08-05.** Use the hook to pull on the lacing rope, working from front to back and vice-versa. Pull till skin is tight and free from wrinkles. The lacing wires should at least be beginning to wrap around the bottom of the tube as shown in **Figure 08-05A.** It is best if the pockets meet in the middle, but this will not always be the case. Different colors of fabric will have varied stretch ratios. After skin is tight, tie lacing rope at the ends and cut excess off using with a hot knife.

FIGURE 08-05

FIGURE 08-05A



6. The surface is now ready for clear coating (if desired). Make sure fabric is clean. The surface can be clear coated after attached to the boom or separate by using a stand. Better coverage is likely to be achieved if the surface is painted on a stand. Contact the RANS parts dept. for information on the clear coating video and wing pivot stands.

COVERING THE HORIZONTAL STABILIZER

1. The horizontal stabilizer should be removed from the airframe. Remove the stainless steel hinges from the trailing edge and root of the horizontal stabilizer. A pair of padded sawhorses works well to support framework while slipping covering into position.

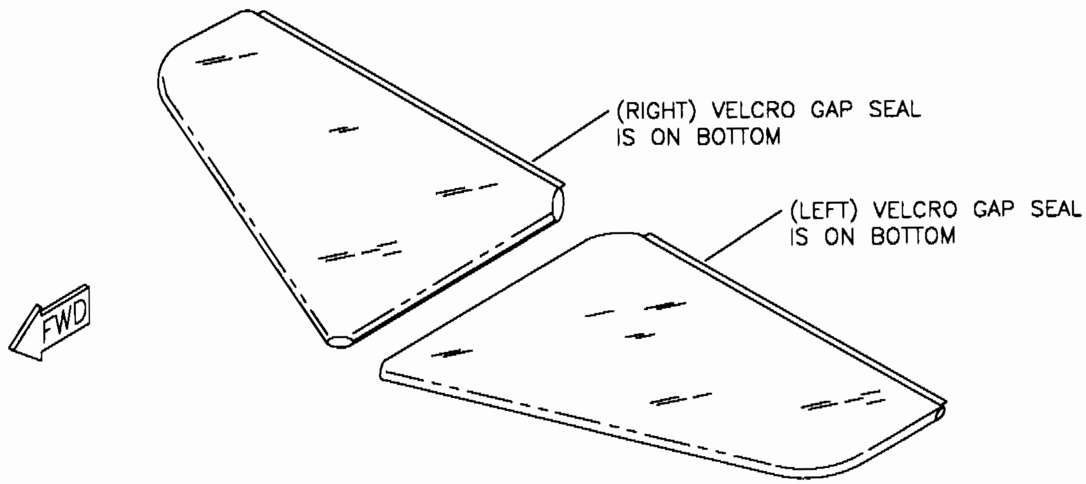
2. Pre-covering Checklist:

___ Doublers installed in leading and trailing edges.
___ All gussets riveted and rivet heads seated properly.
___ Hinge location nut plates installed.
___ Internal brace and U-bracket riveted in place.
___ Cable attach holes drilled to #11.
___ Aluminum ribs riveted in place.
___ Entire surface is clean. Remove part # stickers and marks of any kind.

Make sure to complete the above checklist prior to installing covering.

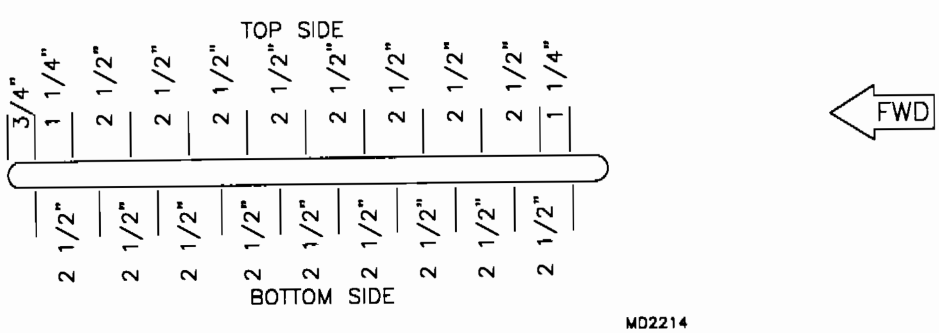
3. Locate the parts shown in the parts manual. The Velcro edge on the Dacron covers will determine left and right. Make sure these are oriented properly. See **Figure 08-03.**

FIGURE 08-03



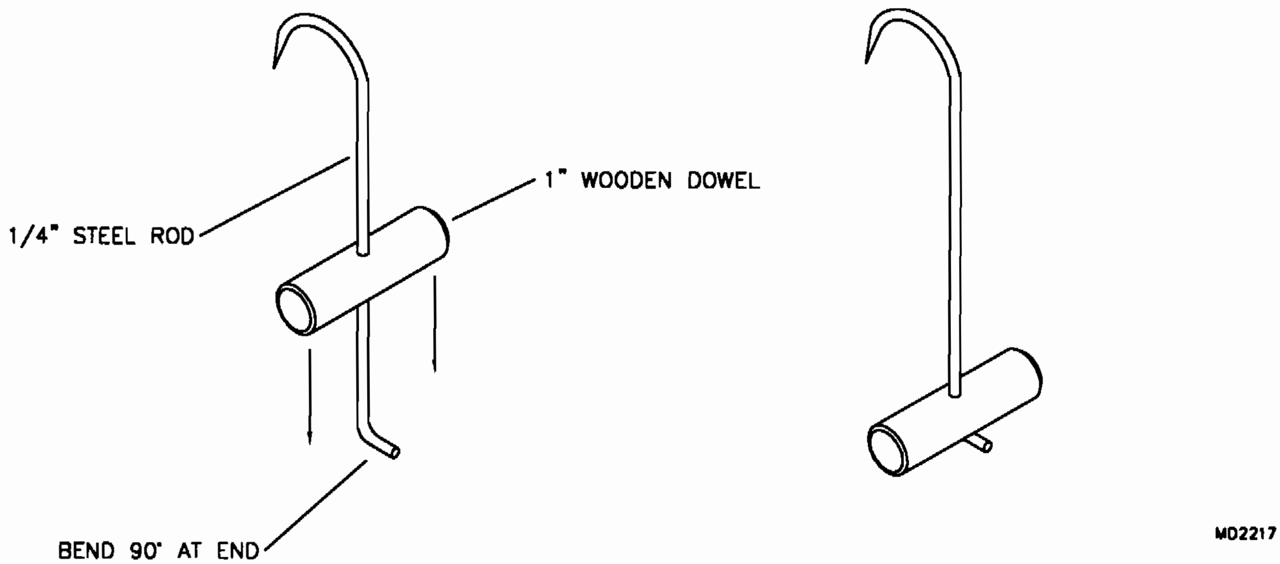
4. Slip the vertical stabilizer Dacron cover into position. Pull the cover as far down onto the vertical stabilizer as possible. Slip the 1/16" wire into each pocket on the bottom edge of the Dacron cover. Using a hot knife, locate holes as shown in **Figure 08-04.** Refer to the Rudder Covering Section for details on securing the wire in the pockets.

FIGURE 08-04



5. Start by tying the lacing rope off on either end of the pockets. Lace from side to side. Tension the rope as you go. Make sure Velcro seam stays centered along the trailing edge as you go. **HINT:** *Fabricate a small hook out of 3" steel rod (not supplied) as shown in* ***Figure 08-05.***

FIGURE 08-05



6. With the lacing rope tied at both ends, set the surface on two saw horses. See **Figure 08-06.** This will allow pulling from the root. Use the hook to pull on the lacing rope, working from front to back and vice-versa. Pull till skin is tight and free from wrinkles. The lacing wires should at least be beginning to wrap around the bottom of the tube as shown in **Figure 08-06A.** It is best if the pockets meet in the middle, but this will not always be the case. Different colors of fabric will have varied stretch ratios. After skin is tight, tie lacing rope at the ends and cut excess off using a hot knife.

FIGURE 08-06

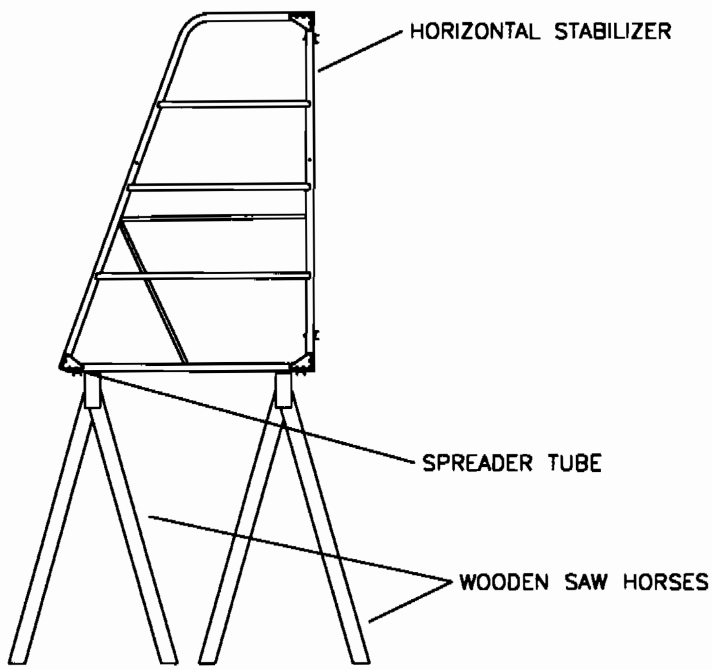
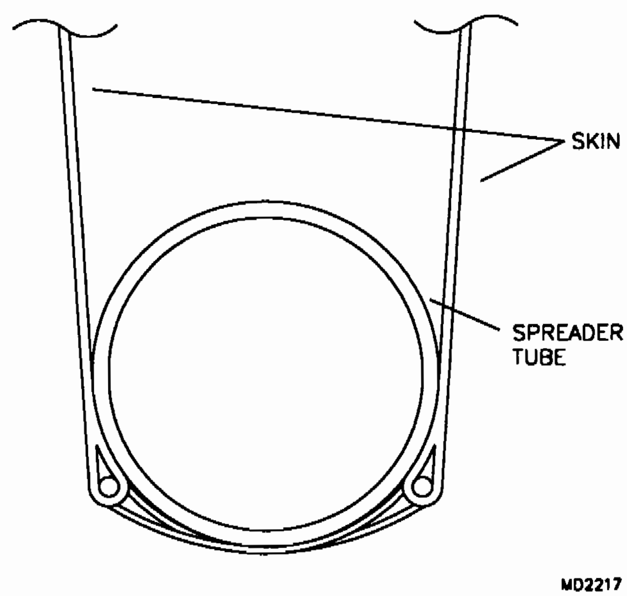


FIGURE 08-06A



7. The surface is now ready for clear coating (if desired). Make sure fabric is clean. The surface can be clear coated after attached to the boom or separate by using a stand. Better coverage is likely to be achieved if the surface is painted on a stand. Contact the RANS parts dept. for information on the clear coating video and wing pivot stands.

COVERING THE ELEVATOR

1. Locate the elevator Dacron covers. Remove all hinge brackets from the elevator. Remove the elevator horns **HINT**: A large clean table works well for covering.

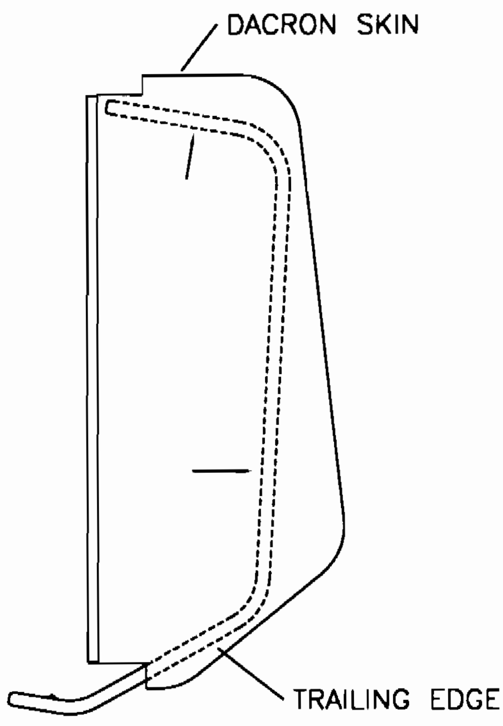
2. Pre-covering checklist:

   ___ Gussets riveted to out board leading edge only
   ___ Hinge location nut plates installed.
   ___ Internal braces fit snug.
   ___ Nut plates installed for elevator horn attachment.
   ___ Entire surface is clean. Remove part # stickers and marks of any kind.

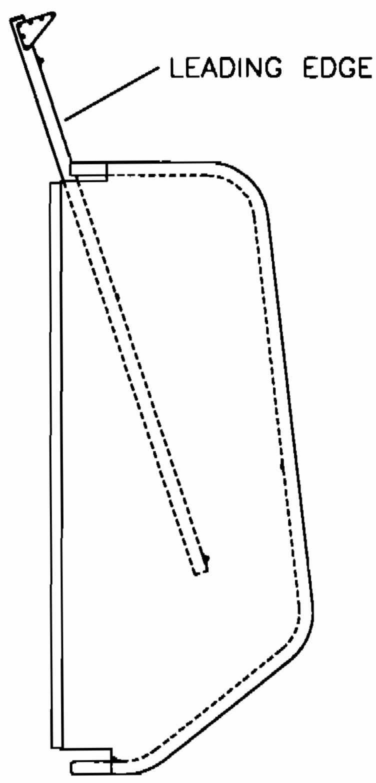
Make sure to complete the above checklist prior to installing covering.

3. Remember that the orientation of the velcro will determine the right and left elevator skin. Refer back to the illustration shown in the horizontal stabilizer covering. Follow the step by step illustrations for covering of the elevator as shown in **Figure 08-03**. The two special tools used in covering the elevators are detailed after the covering illustrations.

FIGURE 08-03

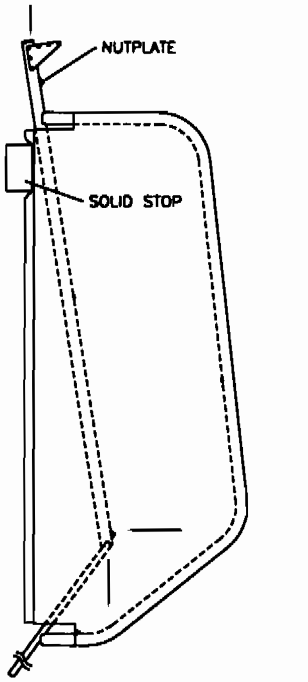


① SLIDE ELEVATOR TRAILING EDGE INTO DACRON COVER.



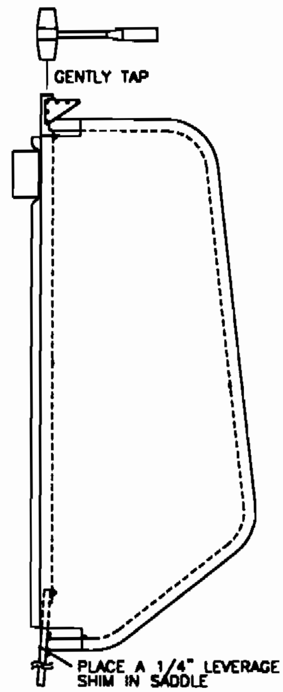
② WITH OUTBOARD GUSSETS RIVETED ON LEADING EDGE. SLIDE ELEVATOR LEADING EDGE INTO FABRIC. ROTATE SPAR TO CLEAR OUTBOARD NUT PLATE.

FIGURE 08-03 (CON'T)



③ SECURE A 3/4" LEVERAGE TUBE (NOT SUPPLIED). THIS CAN BE A HEAVY WALL STEEL OR ALUMINUM TUBE. INSERT INTO LEADING EDGE TO PULL LEADING EDGE INTO POSITION.

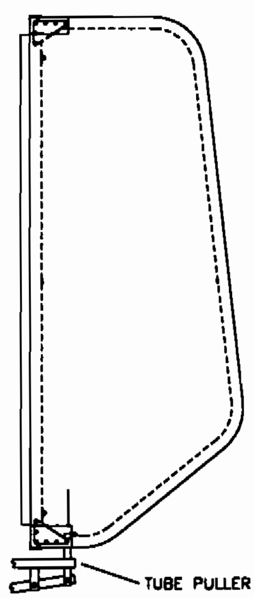
ONCE IT IS PULLED TIGHTLY AGAINST FRONT EDGE OF FABRIC, LIGHTLY TAP ON OUTBOARD END OF LEADING EDGE UNTIL IT BOTTOMS OUT ON TRAILING EDGE OF THE ROOT.



④ LEVERAGE TOOL INSERTED INTO LEADING EDGE APPROX. 1 1/2".

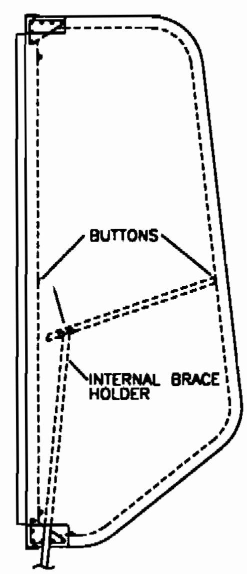
PULL ON LEVERAGE TUBE WHILE A HELPER TAPS LEADING EDGE INTO POSITION.

CLECO OUTBOARD GUSSETS INTO POSITION ON TRAILING EDGE.



⑤ WHILE HOLDING OUTBOARD OF ELEVATOR, USE TUBE PULLER TO PULL TRAILING EDGE INTO POSITION AND CLECO, PRE-DRILL HOLES IN TRAILING EDGE.

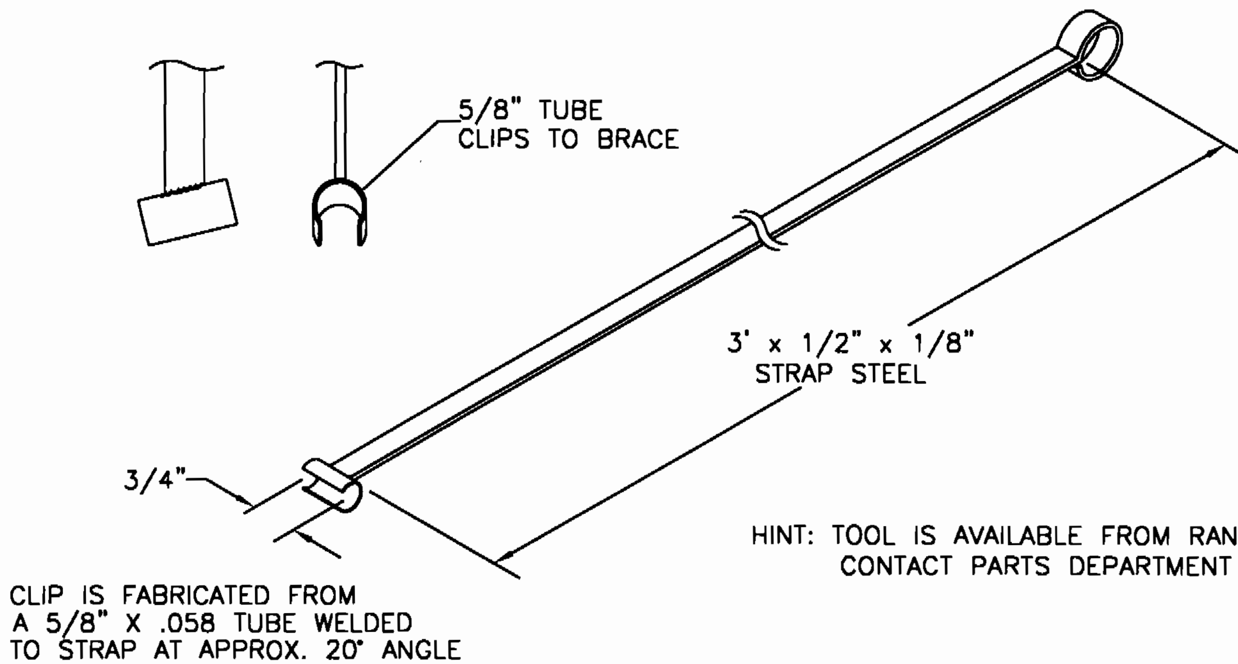
DRILL AND CLECO AFT TWO HOLES IN TRAILING EDGE USING GUSSET AS A GUIDE.



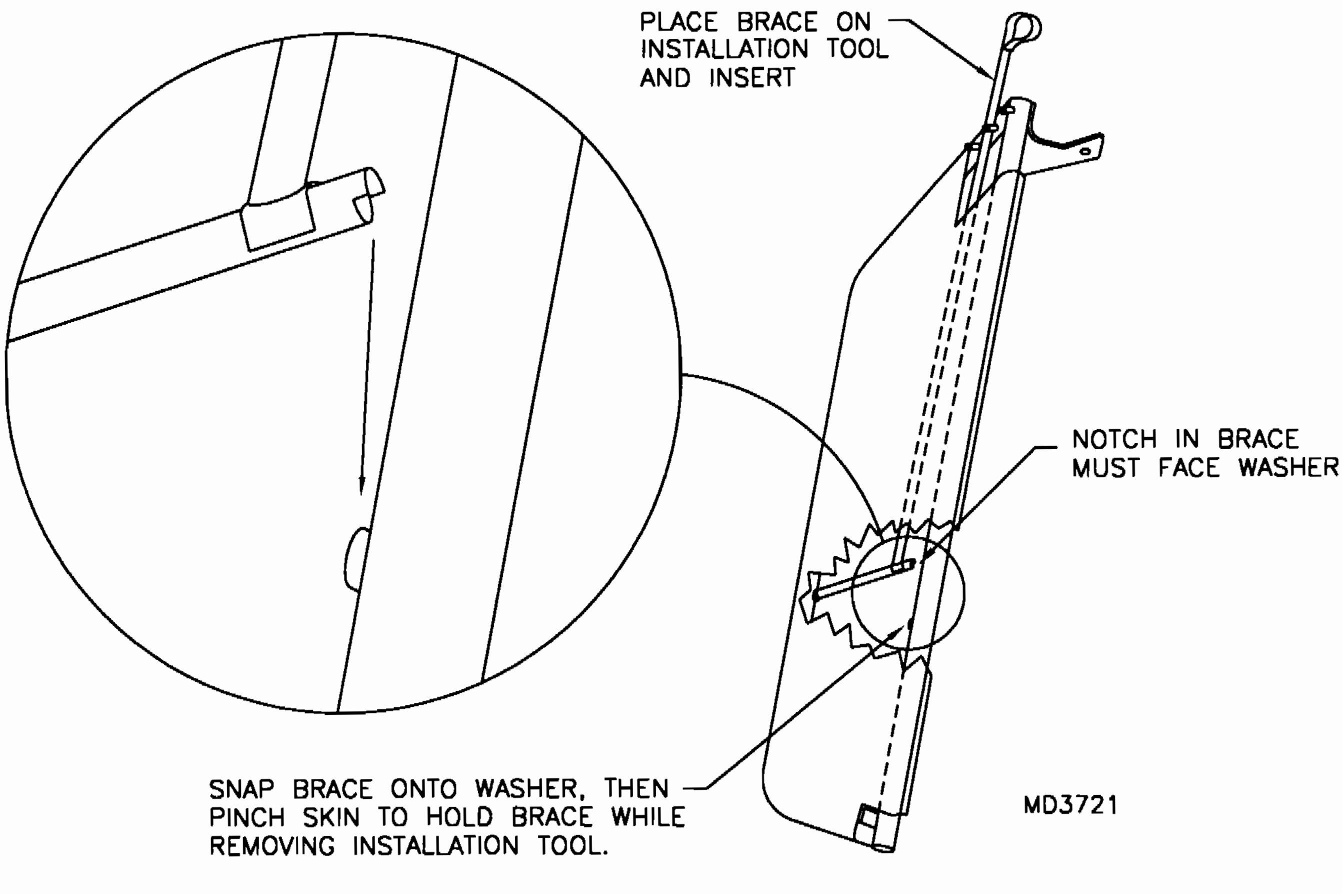
⑥ PUSH THE INTERNAL BRACE INTO POSITION BRACE WITH THE NOTCHED END OPEN TO THE BOTTOM, USE THE TOOL DETAILED ON THE NEXT PAGE OR ATTACH TO STEEL STRAP IN A SIMILAR FASHION. MAKE SURE BRACE IS SNAPPED IN POSITION SECURELY.

FIGURE 08-03 (CON'T)

RANS INSTALLATION TOOL



HINT: TOOL IS AVAILABLE FROM RANS;
CONTACT PARTS DEPARTMENT



COVERING THE RUDDER

1. Remove the rudder from the vertical stabilizer. Remove all hinges.

2. Pre-covering checklist:

___ Gussets riveted and heads seated properly.
___ Hinge nut plates installed.
___ Rudder horns modified and installed.
___ Internal ribs riveted in place.
___ Entire surface is clean. Remove part # stickers and marks of any kind.

Make sure to complete the above checklist prior to covering.

3. Locate Dacron cover and hardware shown in the parts manual. Slip the rudder Dacron cover into position. Pull the cover as far down as possible. Slip the 1/16" lacing wires into each pocket and bend the forward end over as shown in **FIGURE 08-03.** Using a hot knife locate holes as shown in **FIGURE 08-03A** in the lacing wire pocket.

FIGURE 08-03

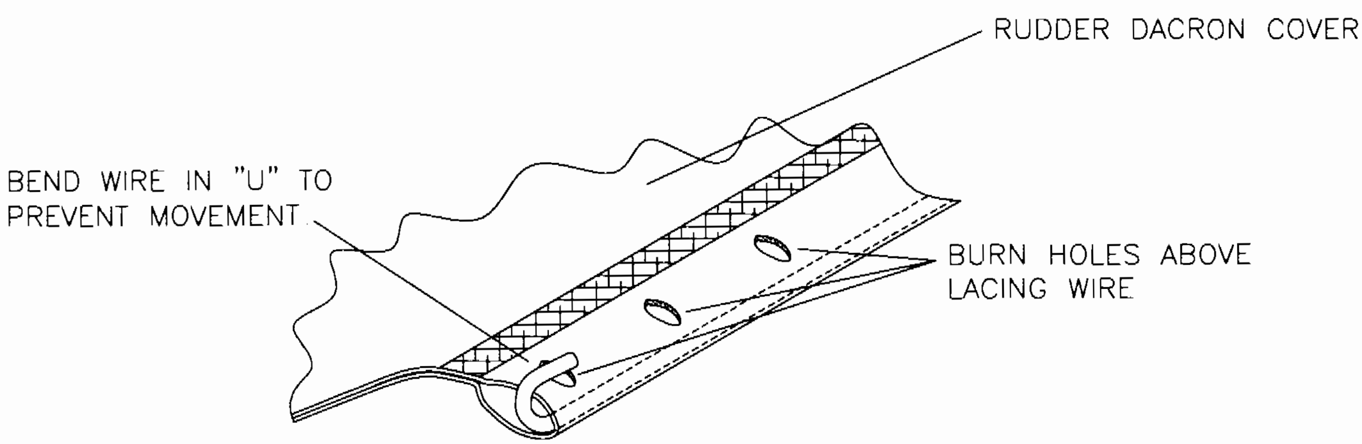
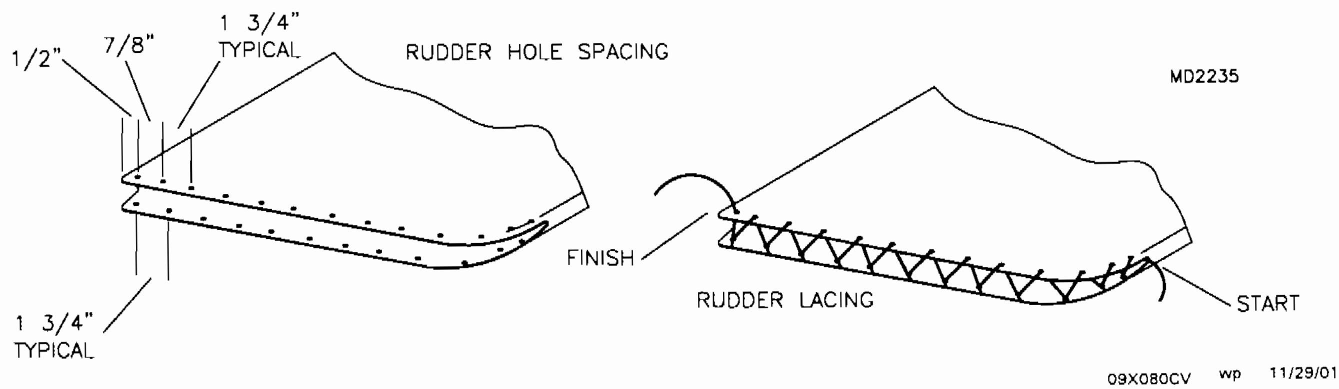


FIGURE 08-03A



4. Lace the cover in the same manner as the vertical and horizontal stabilizers. Use the hook to pull the cover tight. Make sure the velcro seam stays centered on the leading edge of the rudder. When satisfied with the fit, tie off and trim the ends of the lacing cord.

5. Trim the rudder lacing cap as shown in **FIGURE 08-05**. Position the cap on the rudder, covering the lacing cord. Trim the forward end to fit around the rudder horns. Check for a snug, uniform fit against the skin. It may be necessary to re tie or adjust the lacing knot in order to obtain the proper fit. Locate and drill the mounting holes as shown in **FIGURE 08-05A**. Attach the lacing cap using the screws provided. **NOTE:** The lacing cap may be painted to match the rest of the aircraft.

FIGURE 08-05

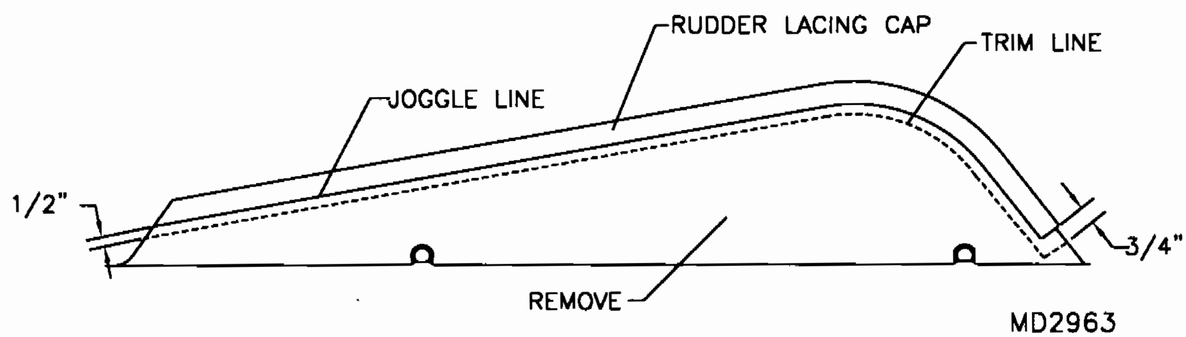
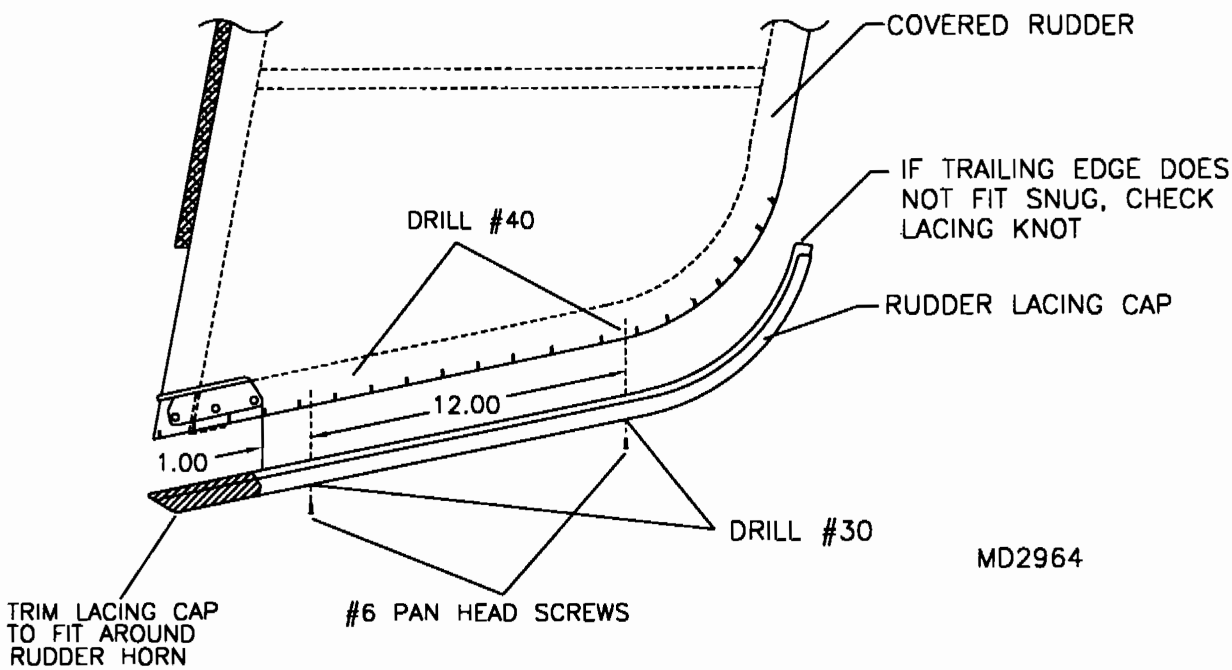


FIGURE 08-05A



AILERON & FLAP COVERING

1. Remove the ailerons and flaps from the wings. Remove all hinge brackets.

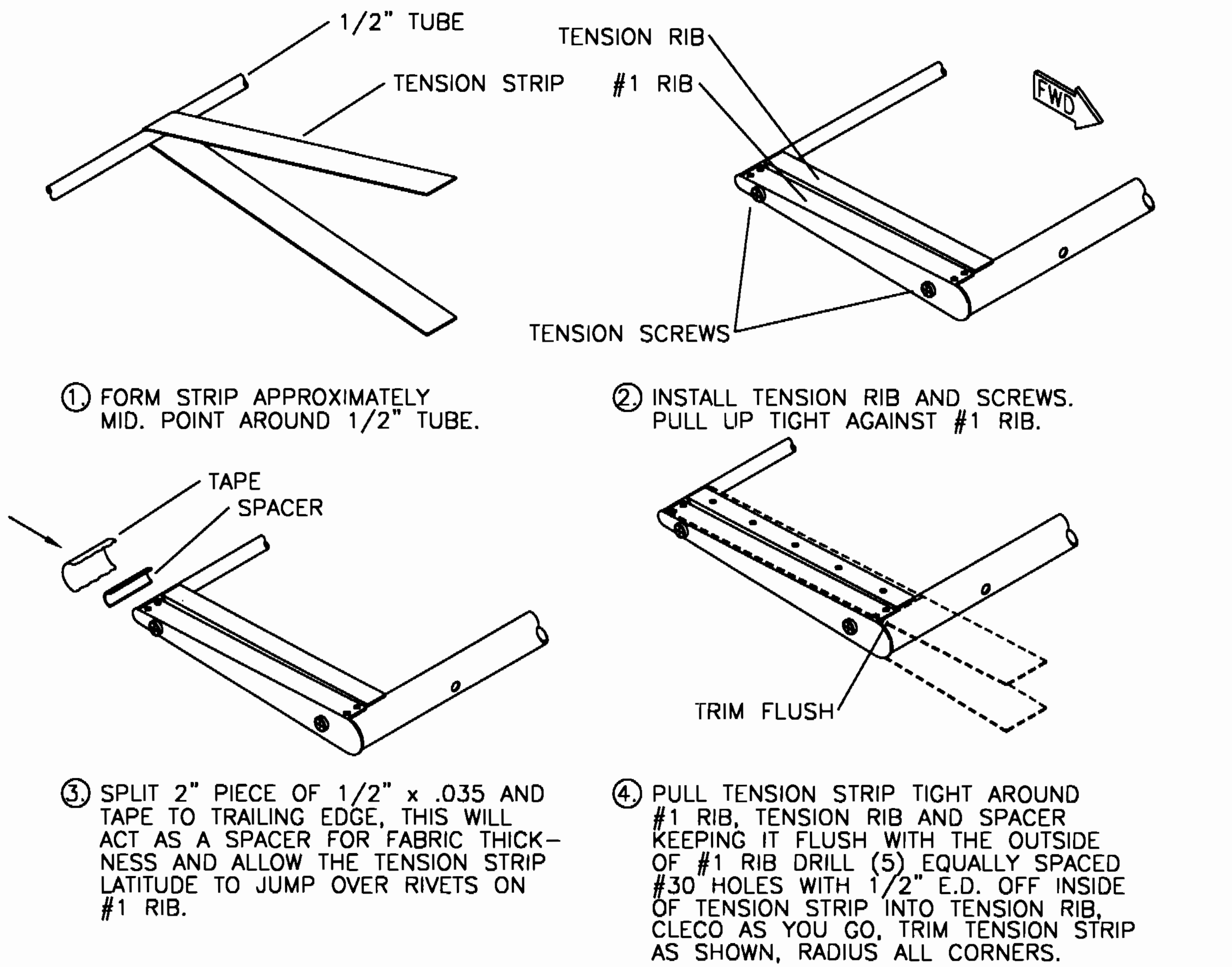
2. Pre-covering checklist:

___ Hinge location nut plates installed.
___ All rivets seated properly.
___ Anti-chafe tape placed over all ribs and rivets on leading and trailing edge.
___ Nut plates installed on back side of tension rib.
___ Holes drilled, but hardware removed for attach angles.
___ Entire surface is clean. Remove part # stickers and marks of any kind.

Make sure to complete the above checklist prior to installing covering.

3. Locate aileron/flap tension strip. This strip will need to be formed around the trailing edge and pre-drilled as shown in **Figure 08-03.**

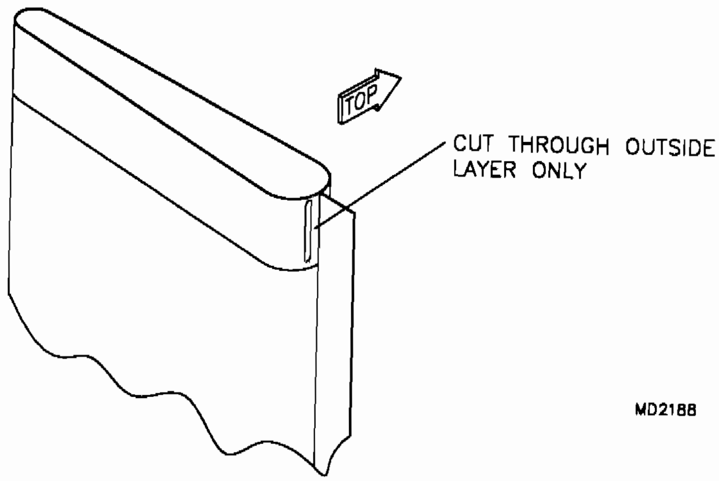
FIGURE 08-03



4. Locate Dacron covers. The Dacron covers for the ailerons and flaps are exactly the same except for the orientation of the Velcro gap seal. Since both surfaces are exactly the same the left aileron can be used for a right flap and vise-versa. Be careful when covering the flaps and ailerons. Think about the position of each surface on the aircraft and be sure that the Velcro faces upward.

5. The open end of each surface has a pre-sewn pocket. This needs to be cut open on the bottom side of each surface. Remember the bottom is the side without the Velcro. See **Figure 08-05.** Use a hot knife and cut through outside layer only.

FIGURE 08-05



6. Select the surface to cover first, either a flap or aileron. Push the pre-drilled tension strip into the pocket through the bottom slit. Be careful that the tension strips and Velcro are oriented properly. Pull the fabric skin over the end of the surface. Pull the fabric as far into position as possible. Slide the tension into the mouth of the pocket. Use an ice pick to locate the holes in the tension strip. Once holes are located, hot knife them to size and install the rivets shown in the parts manual.

7. Using a good quality screwdriver, begin to tension the fabric by tightening the tension bolts. A power drill with a screwdriver bit can be used to tension the ribs, but be careful not to strip the heads of the screws. **HINT:** Fabricate temporary tensioning bolts as shown in the **Wing Covering Section**. Remove the temporary bolts after the skin is tight, and replace with the bolts referred to in the parts manual. A small amount of machine oil can be used on the threads of the tension screws to aid in tightening. The fabric should pull all the way down, until the tension rib touches the #1 rib. Due to sewing variances the tension rib may not completely reach the #1 rib. A small flat head screwdriver may be used to assist the fabric and tension strip over the rivet on the #1 rib.

8. Use the template fabricated in the tail group to locate each hinge hole location and cut away the Velcro gap seal.

9. The surfaces should now be ready for clear coating (if desired). It is highly recommended to at least apply a clear coating to seal the fabric. This will ensure top performance. Also, other products may be available to seal the fabric. Check with supply houses for possible alternatives. It is best to clear coat the flaps and ailerons while attached to the wings. For more information on clear coating contact the RANS parts department for the RANS clear coating video and clear coating supplies.

WING DACRON COVERS AND HARDWARE

1. Locate the parts shown in the parts manual. The wings should be removed from the fuselage for covering. Set the wings on saw horses. Use the saw horses about 30" to 32" high. This makes the job less of a back bending effort! The wings should be complete including the root rib installation. Remove all the hinge brackets until after covering. Use the checklist below to ensure that the wings are ready for covering.

2. Pre-covering Checklist:

___ All nut plates installed for hinge brackets.
___ All wing fittings, brackets, tubes, and bolts in place and secure.
___ Control system installed and checked for proper operation. Push-Pull tube guide installed.
___ Flap Teleflex routed and secured if installing In-Flight Adj. Flaps.
___ Fuel tank mounted and inspected. Fuel line clamped, routed, and secured.
___ All rivet mandrels checked for protrusion. Mandrel should not protrude past rivet head. File if necessary.
___ Tip wraps riveted securely in place.
___ Tensioning root rib installed properly, with skin attach holes pilot drilled.
___ Entire surface is clean; remove any pencil or marker.
___ "Anti-chafe" tape is installed at all points where fabric could rub. (Bolt heads, joints, tip wraps, etc)

3. Do not attach the flap Teleflexes to the retainers or they will protrude and inhibit slipping on the covering. Leave the Teleflex cables in the wing secured to the flap compression tube, then pull through the fabric after wing is covered. Use the zippers to reach inside to place the flap cable on the retainer. Safety wire or use a zip tie wrapped around the flap cable and compression tube to safety the cable to the retainer.

4. The short aileron push pull tubes should be removed, leaving the rod end attached to the bellcrank. Do not use a jam nut on the rod end for the short push pull tube. It is not required and would be quite difficult to install after covering. Leave the long push pull tube connected and inside the wing. If you have not already, Loctite the jam nut on the long push pull tube at the bellcrank, see Trial Assembly and Rigging. After the wing is covered and the short push pull tube at the bellcrank. After the wing is covered and the short push pull tube opening is cut into the wing, we will Loctite the end of the short push pull tube and thread it back into the rod end.

5. Assemble the top and bottom ribs by inserting the tips as shown in **Figure 08-05. NOTE:** The top and bottom tip ribs are different than the rest of the ribs. Mark these to keep them from being mislocated. The top and bottom tip ribs also get plastic fittings inserted into the ends Insert the contour fittings to point away from the curve of the rib. Insert the duck bill shaped tips into both ends of the bottom ribs. The forward end of each rib has a small black mark. Make sure all ribs are oriented properly. Dimple the tube with a prick punch to lock the contour and tip fittings in place. Reshape the top ribs contour fitting as shown in **Figure 08-05A**. This will greatly ease the rib insertion and removal process.

FIGURE 08-05

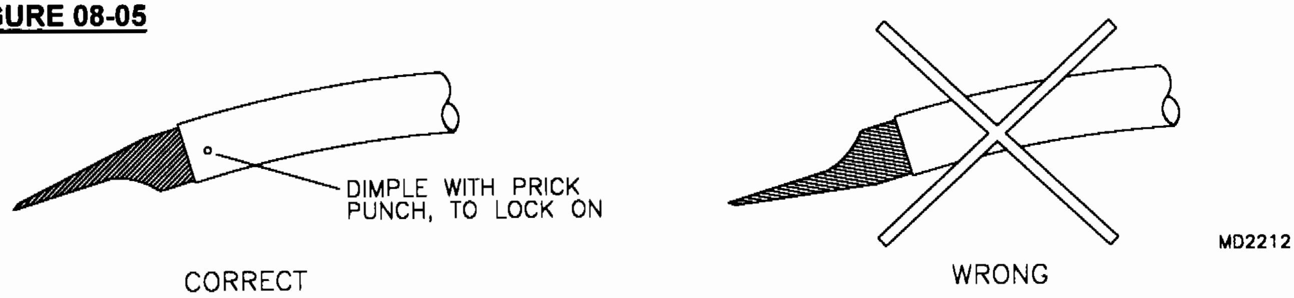
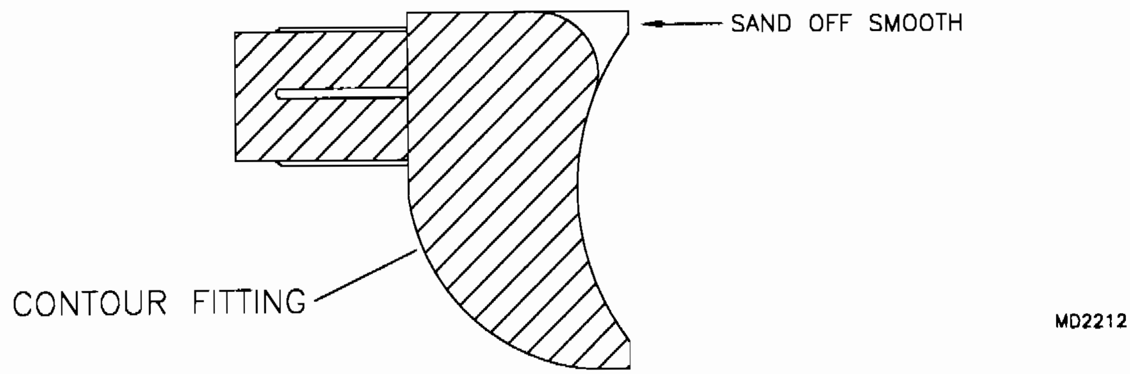
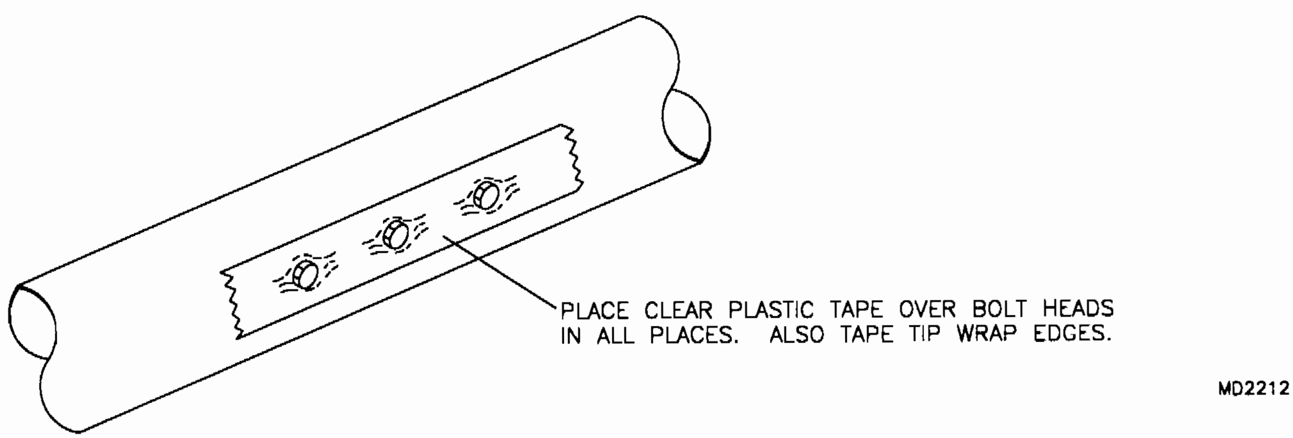


FIGURE 08-05A



6. Tape over all bolt heads with anti-chafe tape. See **Figure 08-06**. This will make it easier to slip on the wing covers.

FIGURE 08-06



7. Remove the wing cover (LH or RH) from the box and lay it on top of the wing frame, bottom side up, leading edge forward and the root end at the tip. Pull the open end over the frame. Have a helper feed it over the end while you pull it on. Go slowly <u>**DO NOT**</u> force it on. If it becomes stopped or hard to pull, look to see where it is hung up. Pull the skin on the frame as far as possible to install it on the root rib. Back out the 1/4" bolts that retain the root rib so the skin will reach the rib. <u>**HINT:**</u> Fabricate temporary tensioning bolts. Refer to **Figure 08-07**. Make sure that the Velcro trailing edge is on the centerline of the trailing edge spar. Attach the Dacron cover to the root rib with the screws provided as shown in **Figure 08-07A**. Once the screws are installed the bolts are tightened until the proper tension is achieved. The root rib should be within 1/4" or touching the "L" brackets when the skin is fully tightened.

FIGURE 08-07

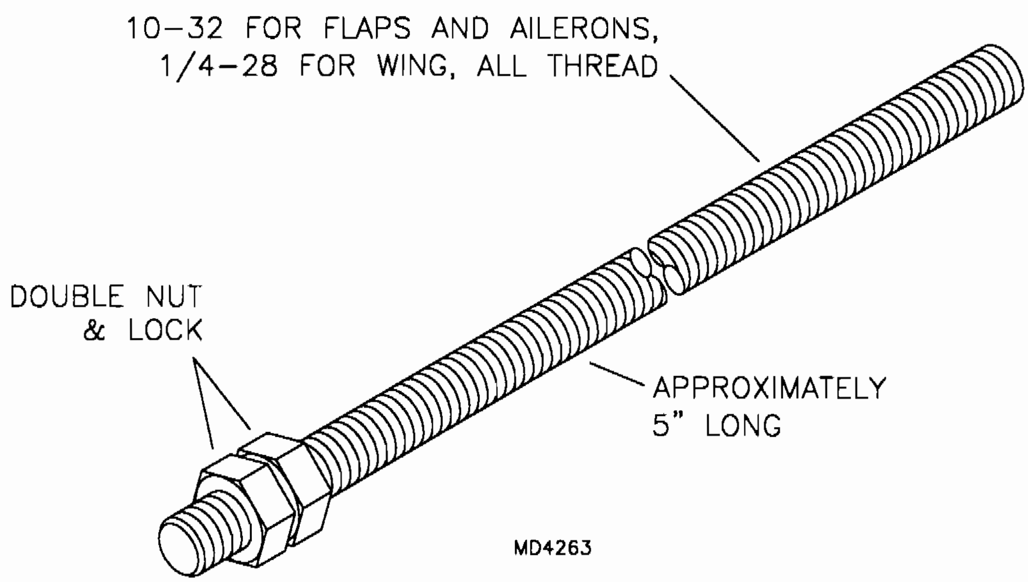
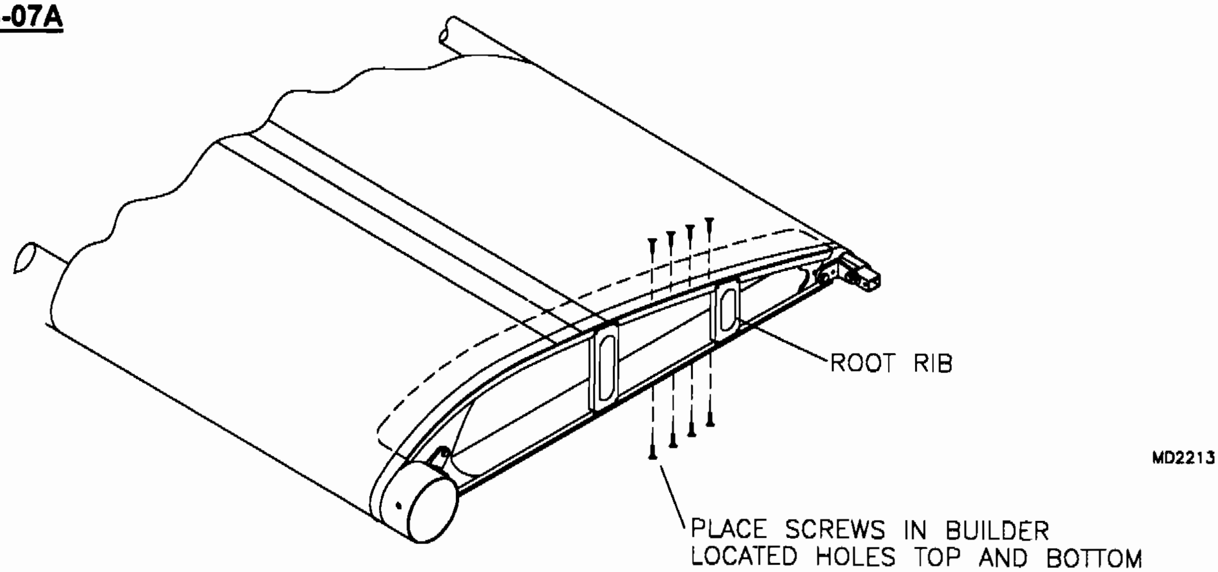
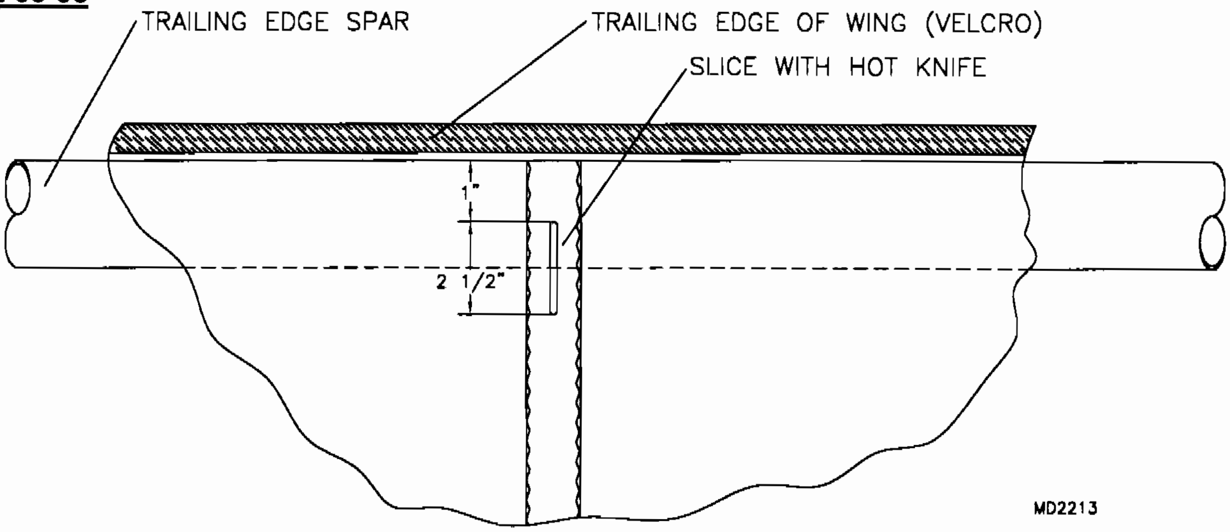


FIGURE 08-07A



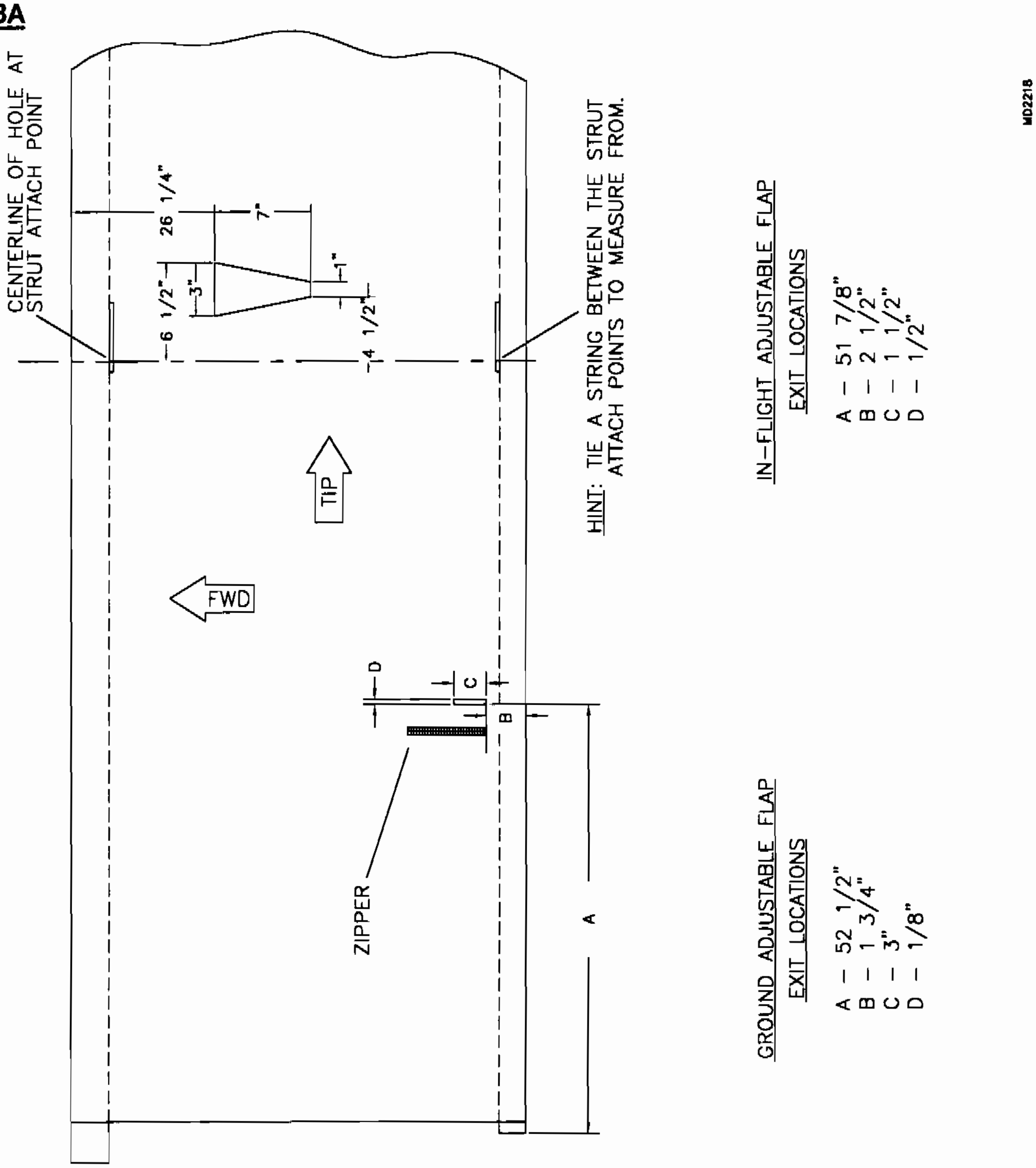
8. Make a slit for each rib pocket as shown in **Figure 08-08**. Make cut outs around the strut attach plates and jury strut tabs by following around the protrusion with a hot knife. Locate and cut additional holes for the flap and aileron exits as shown in **Figure 08-08A**. Cut open the fabric underneath each zipper.

FIGURE 08-08



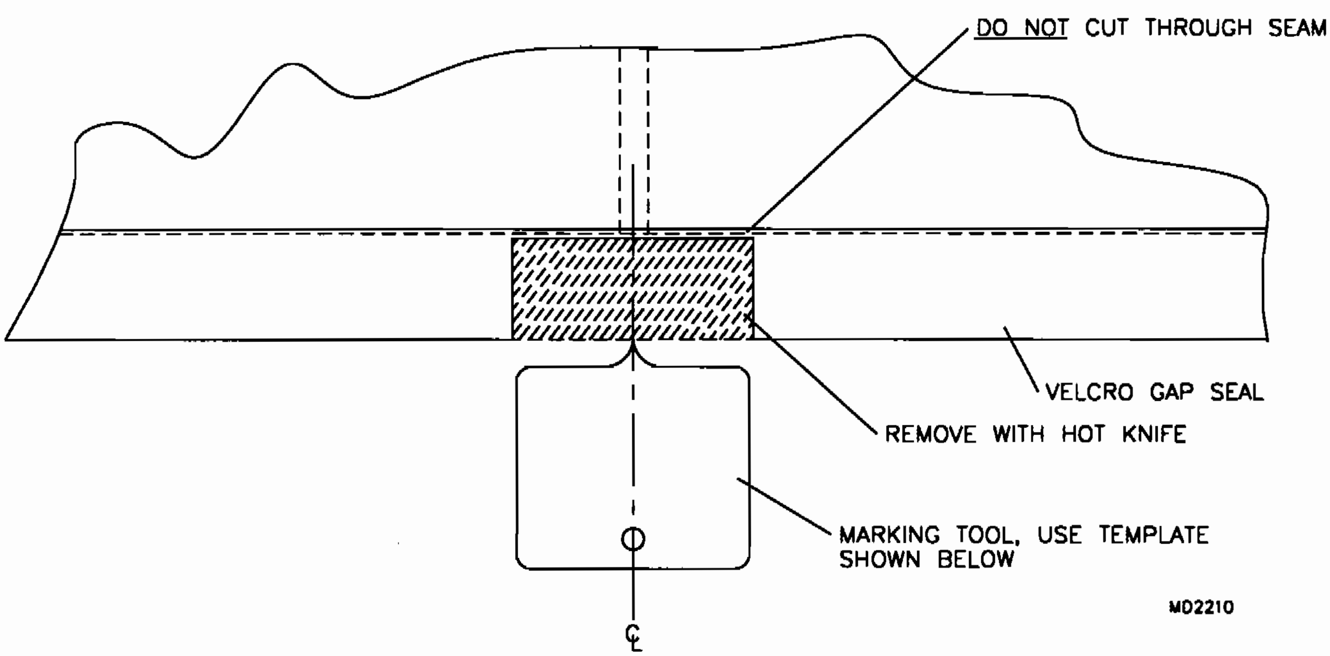
WING DETAIL SHOWN FROM BOTTOM

FIGURE 08-08A

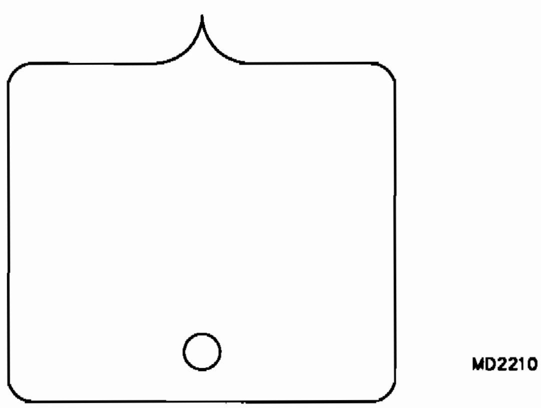


9. Install the top ribs through the slits made in the bottom pockets. **NOTE:** They should push in with a good degree of pressure. Use a mallet and gently tap into place. A short scrap of lumber works as an excellent driving ram. That sound you're hearing is not the stitches ripping but the two way tape popping loose. This is perfectly normal and does not effect the strength of the skins. Install the bottom ribs the same except to get them started insert the rib upside down this will help the tip slip into the pocket, then turn it right side up (curve down). The bottom rib tip will lay against the bottom of the trailing edge spar sealing shut the slit made for rib insertion. **PLEASE NOTE:** Rib removal is done by making a tool from an old screwdriver. Heat and bend the end into a 90 degrees hook. Use the tool to reach up inside the slit to grab a rib and pull it out. Always remove the bottom rib first. Poke holes with the hot knife for aileron and flap hinge bolts. Cut away the velcro gap seals the same as it was done on the flaps and ailerons. Make the template shown below as a guide to remove material for hinge locations. Use a hot knife to remove velcro. **CAUTION**: Do not cut into the stitching of the trailing edge. See **Figure 08-09.**

FIGURE 08-09



10. You can smooth out any wrinkles or fold lines in the wing skins with a hot air gun. Be careful not to melt the skins. 350 degrees is the maximum temperature used. After 350 degrees the cloth will stop shrinking and start stretching. A model airplane heat gun used for shrinking Mono-kote works great. An electric iron works also, but can leave areas discolored so be careful of the heat setting.



WING FAIRINGS IN DEVELOPMENT

TO BE RELEASED FOR PRODUCTION AT A LATER DATE

WING FAIRING INSTALLATION

WING FAIRINGS IN DEVELOPMENT

TO BE RELEASED FOR PRODUCTION AT A LATER DATE

PAINTING ALUMINUM SURFACES

Aluminum surfaces such as belly pans, center covers, mating strips, and etc. should be painted as below. **NOTE**: Always follow the manufacturers recommendations on ventilation and respartiory equipment.

The RANS process is as follows:

1. "Scuff" the surfaces using medium Scotch-Brite to help the primer adhere.
2. Clean surfaces using lacquer thinner.
3. Apply two coats of self etching primer (we use Dupont Variprime) according to the manufacturers recommendations.
4. Apply the paint chosen. It is recommended to use paint from the same manufacturer as the primer you applied to ensure chemical compatibility. If you are satisfied with the finish, painting can be the last step.
5. Clear coat if even more gloss and protection is desired (we use Dupont 7600S Clear coat for aluminum surfaces).

CLEAR COATING DACRON COVERED SURFACES

Wing and tail surfaces will benefit greatly from the UV protection a clear coat of polyurethane can provide. A complete RANS clear coating video, including useful tips learned from many years of clear coating dacron skins, is available from the RANS parts department. The basic method is briefly described below.

The RANS process is as follows:

1. Clean the dacron skins with lacquer thinner.
2. Remove any frayed or excess threads using a razor blade.
3. Remove any dust particles by using a high pressure air nozzle (approximately 100psi) and a tack cloth.
4. Apply an adhesion promoter (we use Dupont 222S Mid-coat adhesion promoter) according to the manufacturers recommendations.
5. Apply two coats of clear. Apply the second after the first is dry to the touch. In this step we use:

   4 parts Dupont 7800S Chroma Clear
   1 part Dupont 7895S Activator-Reducer

   Let these two coats dry 24 hours.
6. Sand with 400 wet sand paper. Always use water when sanding. Do not sand the stitching of the fabric; instead use a scuff pad to go around the stitches. Remove any residue with a tack cloth.
7. Apply two more coats of clear. In this step we use:

   4 parts Dupont 7800S Chroma Clear
   1 part Dupont 7895S Activator-Reducer
   ½-¾ oz. Dupont 1075S Low-temp Reducer. This quantity will depend on the type of flow you desire. Use ¾ oz. to obtain thinner flow or ½ oz. to have a slightly thicker flow.

   Let these two coats dry 48 hours before handling.

- For even more information on clear coating call the RANS parts dept. for information on the RANS clear coating process video.

Trailering & Towing Precautions

If the building of your S-12 did not take place at the airport it is time to transport it there for final assembly. These suggestions should help when transporting your Airaile.

The distance, terrain, weather, and type of trailer will determine how much care you must take to transport your S-12 Airaile. Usually we hang the wings on the wall of an enclosed trailer. We chock and tie down the landing gear to prevent movement of the fuselage. Any surface that could rub, should be covered with a towel or soft cloth to protect its finish. Please make sure that every thing is secured in place to prevent damage to the aircraft.

When towing long distances on an open trailer remove the tail surfaces. Highway speeds and gust loads can cause undue loads on the tail group. Make certain the wings and tail components are secure and will not catch the wind underneath. Tie down the wing at the ends about 2 ft in and in the middle.

CAUTION: If you must tow tail first with the tail group assembled lock the rudder and the elevators with a control lock. Haul like this only in moderate surface winds and drive below 35 mph. This method works fine for a few miles like to the flying site but is not suited for long hauls. Be **VERY** careful when disassembling and transporting your craft not to gouge, scratch, or bend the wing struts. The nuts that retain the jury struts can gouge the struts if they are not the capped type. Avoid any method of dismantling or packing that can cause such damage to any part.

Final Assembly

At this point it is time to attach all parts permanently to the airframe. All enclosure options should be installed and riveted in place as shown in their appropriate section of the manual. Wings and controls should be re-attached to the fuselage as in trial assembly and rigging. Install all tail surfaces as done earlier. Remember to attach tail cables using the holes marked earlier. Re-assemble everything that was removed for painting or clear coating (if paint or clear coat was applied) according to the appropriate section of the parts manual. Check and re-check every connection on the entire airframe. Check attachment of all surfaces. Check for cotter pins where required. Make sure that all engine components are safety wired in place.

INSTALLING THE WINGS

1. Locate all hardware to install the wings as shown in the wing assembly section of the parts manual. At this point you will need a helper to set the wings in position. Slip the root of the wing into position, being careful not to bend or deform the center cover forward and aft wraps. Attach the leading and trailing edge's to the super structure using the hardware shown in the parts manual. Attach the struts to the wing then raise the wing just enough to attach the lower end of the strut to the fuselage cage using the hardware shown in the wing assembly section of the parts manual. Repeat for the opposite wing.

2. Attach the push-pull tubes to the control stick tee. Lock the push-pull tubes in place with the plain nuts shown in the aileron push-pull system section of the parts manual. Install safety wire to the turnbuckles attached to the control stick tee (it may be necessary to remove safety wire and adjust turnbuckles after initial flights). Be sure to install the cotter pins to secure the castle nuts at each aileron and flap hinge location.

3. If installing in-flight adjustable flaps, route flap teleflex cables to the flap dual teleflex retainer

and assemble as shown in the flap system assembly section of the parts manual. Be sure routing does not conflict with the control stick tee. Safety in place with the zip ties shown.

INSTALLING THE TAIL SURFACES

1. Install the vertical stabilizer as shown in the tail group frame assembly. Install the horizontal stabilizers using the hardware shown. Install the tail cables using the holes marked in trial assembly and rigging. If you removed the rudder and elevators, re-install using the hardware shown. Be sure to install the cotter pins to secure the castle nuts at each hinge location.

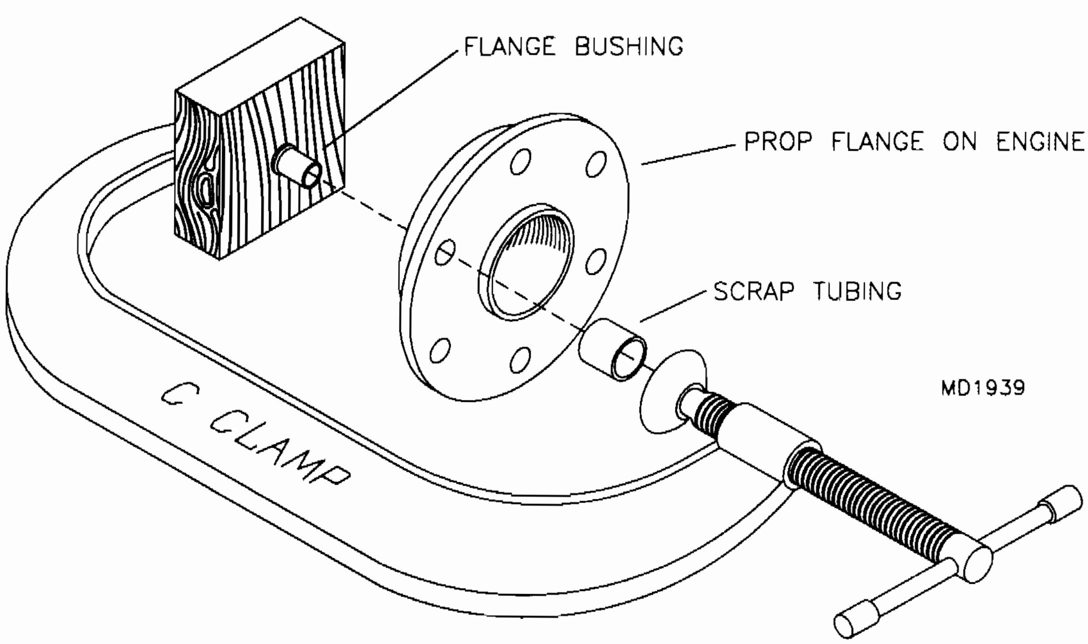
2. Install the rudder cables to the rudder control horns using the hardware shown. Be sure to install cotter pins into the castle nuts. Attach the rod ends to the elevator horns and lock in place using the plain nuts.

INSTALLING THE PROPELLER

IMPORTANT: Minimum prop clearances vary between prop Manufacturers. These minimum clearances **MUST** be adhered to. Contact your prop manufacturer for the minimum allowable clearance. The minimum clearence for the Tennessee wood prop provided standard with the kit is 3".

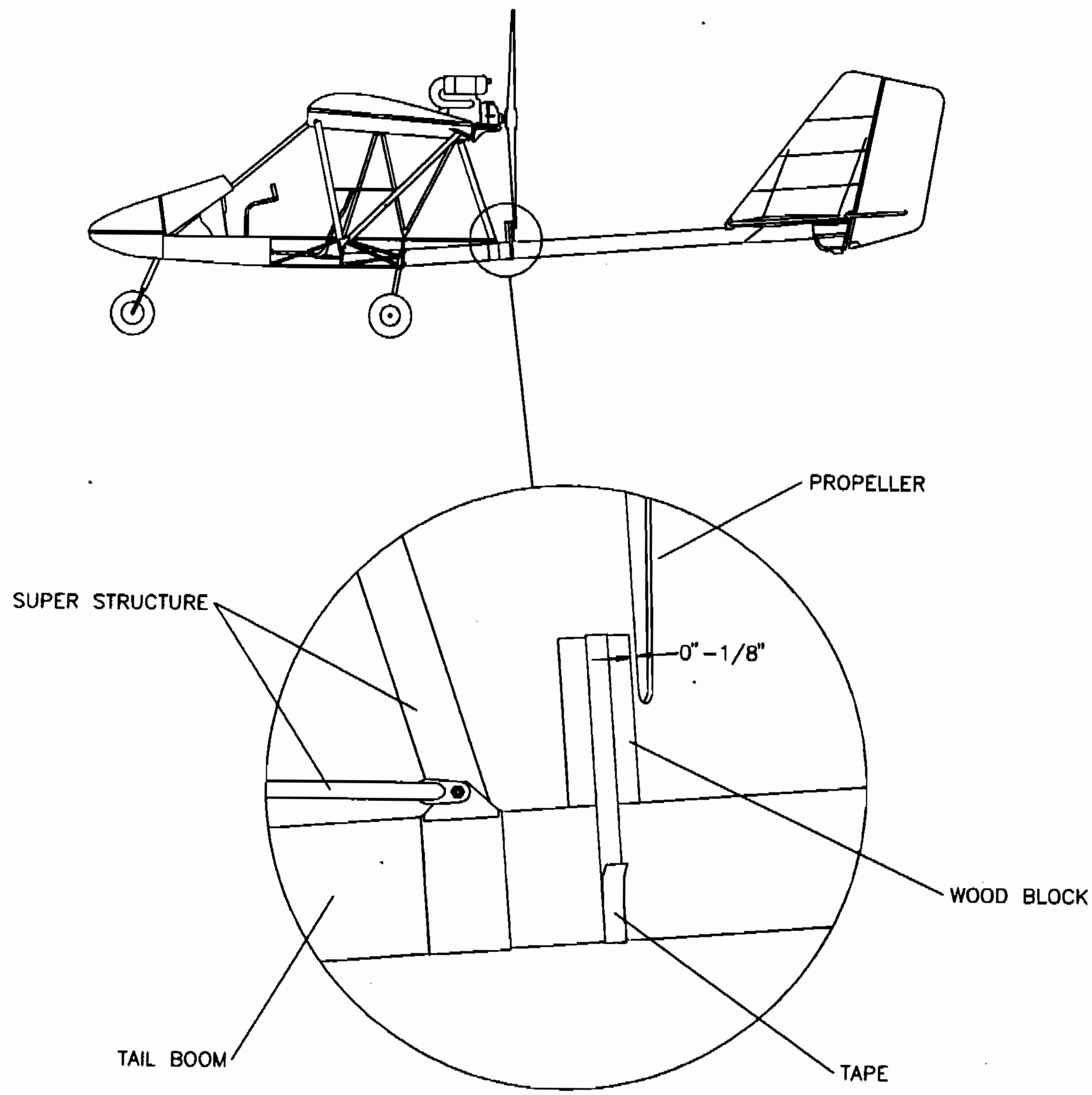
1. Install the prop set-up which you purchased according to the parts manual. For 912 installations, an easy way to install the flange bushings is to insert the flange bushings from the aft side of the prop flange. Use a "C" clamp to completely seat the bushings into the flange. Use a small wood piece between the mouth of the clamp and the aluminum flange bushing to protect them from being damaged. **HINT:** A heavy layer of tape on the mouth of the clamp may be used instead of a wooden block. On the forward side of the prop flange use a deep well socket or a scrap piece of tubing approximately 1" x 3/4" x .058 over the flange bushings to allow them to seat as the "C" clamp is tightened. See **Figure 10-01**.

FIGURE 10-01



2. Install the prop and crush plate as shown in the parts manual. Torque bolts to the prop manufacturer's recommended specifications. Check prop tracking by measuring from the prop to a wood block taped to the boom. See **Figure 10-02.** Rotate the propeller 180° and check the track of the second blade. Prop tracking should be within 1/8". If not, try loosing the prop bolt and re-torquing.

FIGURE 10-02



MD2233

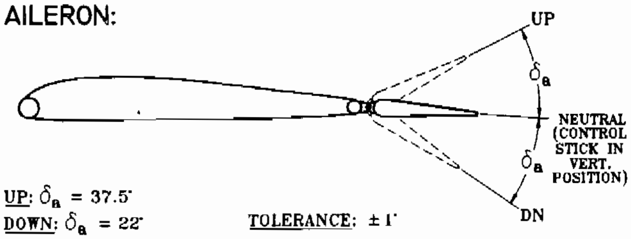
CHECKING RIGGING AND SYMMETRY

Use the chart below to verify throws and alignment prior to operation.

S-12 AIRAILE (95)

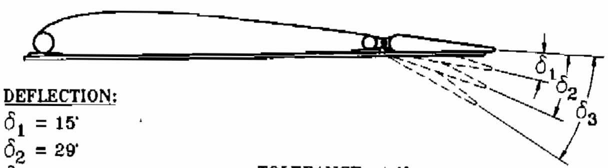
MD2261

AILERON:



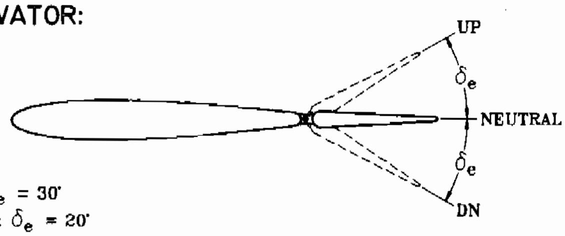
UP: δ_a = 37.5°
DOWN: δ_a = 22°
TOLERANCE: ± 1°

FLAP:



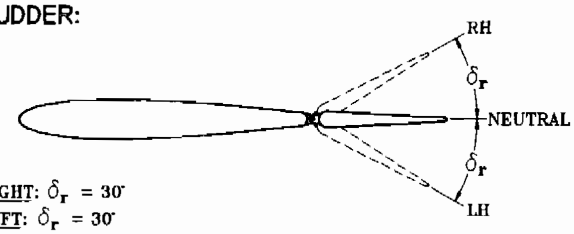
DEFLECTION:
δ_1 = 15°
δ_2 = 29°
δ_3 = 44°
TOLERANCE: ± 1°

ELEVATOR:



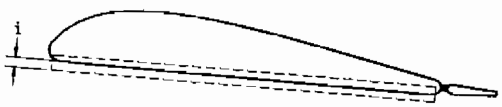
UP: δ_e = 30°
DOWN: δ_e = 20°

RUDDER:



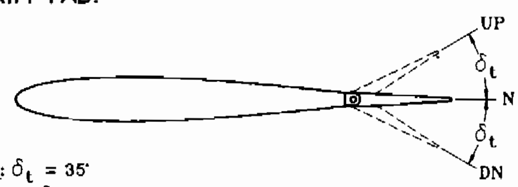
RIGHT: δ_r = 30°
LEFT: δ_r = 30°

WING INCIDENCE:



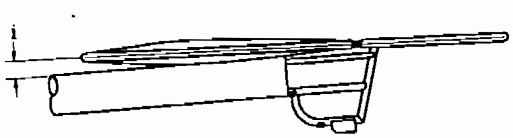
i: = 1.5°

TRIM TAB:



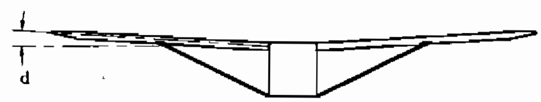
UP: δ_t = 35°
DOWN: δ_t = 37°

TAIL INCIDENCE:



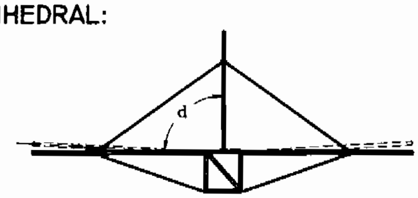
i: = 5°

WING DIHEDRAL:



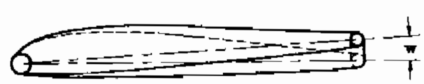
d: = 2°

TAIL DIHEDRAL:



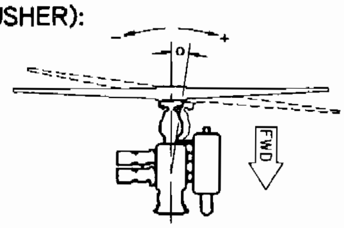
d: = 89°

WING WASH-OUT:



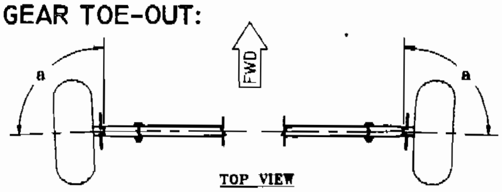
w: = 1.5°

ENGINE (PUSHER):



o: = 0°

LANDING GEAR TOE-OUT:



a: = 90°

FINAL INSPECTION

Listed below are two checklists. One is a sample checklist for condition inspection from the FAA and the other is an EAA safety checklist. These should be very helpful in getting your airplane signed off by the FAA inspector and ensuring that your airplane is safe for operation.

APPENDIX 1. SAMPLE CHECKLIST FOR A CONDITION INSPECTION

AC 90-89

AIRCRAFT IDENTIFICATION:

TYPE/SN. ____________ ENGINE MODEL/SN. ____________

N NUMBER ____________ PROPELLER MODEL/SN ____________

A/F TOTAL TIME ____________ ENGINE TOTAL TIME ____________

OWNER ____________ PROPELLER TOTAL TIME ____________

	BUILDER		INSPECTOR	
GENERAL:	Sat	Unsat	Sat	Unsat
REGISTRATION/AIRWORTHINESS/OPERATING LIMITATIONS				
AIRCRAFT IDENTIFICATION PLATES INSTALLED				
EXPERIMENTAL PLACARD INSTALLED				
WEIGHT AND BALANCE/EQUIPMENT LIST				
WINGS:				
REMOVE INSPECTION PLATES/FAIRINGS				
GENERAL INSPECTION OF THE EXTERIOR/INTERIOR WING				
FLIGHT CONTROLS BALANCE WEIGHTS FOR SECURITY				
FLIGHT CONTROLS PROPER ATTACHMENT (NO SLOP)				
FLIGHT CONTROL HINGES/ROD END BEARINGS SERVICEABILITY				
FLIGHT CONTROLS PROPERLY RIGGED/PROPER TENSION				
INSPECT ALL CONTROL STOPS FOR SECURITY				
TRIM CONTROL PROPERLY RIGGED				
TRIM CONTROL SURFACES/HINGES/ROD END BEARINGS SERV.				
FRAYED CABLES OR CRACKED/FROZEN PULLEYS				
SKIN PANELS DELAMINATE/VOIDS (COIN TEST)				

POPPED RIVETS/CRACKED/DEFORMED SKIN				
FABRIC/RIB STITCHING/TAPE CONDITION				
LUBRICATION				
WING ATTACH POINTS				
FLYING/LANDING WIRES/STRUTS FOR SECURITY				
CORROSION				
FLIGHT CONTROL PLACARDS				
INSPECT FIREWALL FOR DISTORTION AND CRACKS				
INSPECT RUDDER PEDALS AND BRAKES FOR OPERATION AND SECURITY				
INSPECT BEHIND FIREWALL FOR LOOSE WIRES AND CHAFFING LINES				
CHECK CONTROL STICK/YOKE FOR FREEDOM OF MOVEMENT				
CHECK FLAP CONTROL OPERATION				
CHECK CABLE AND PULLEYS FOR ATTACHMENT AND OPERATION				
PERFORM FLOODLIGHT CARBON MONOXIDE TEST				
ENSURE THE COCKPIT INSTRUMENTS ARE PROPERLY MARKED				
INSPECT INSTRUMENTS, LINES, FOR SECURITY CHECK/CLEAN/REPLACE INSTRUMENT FILTER				
INSPECT COCKPIT FRESH AIR VENTS/HEATER VENTS FOR OPERATION AND SECURITY				
INSPECT SEATS, SEATBELTS/SHOULDER HARNESS FOR SECURITY AND ATTACHMENT				
CORROSION				
EMPENNAGE/CANARD:				
REMOVE INSPECTION PLATES AND FAIRINGS				
INSPECT CANARD ATTACH POINTS FOR SECURITY				
INSPECT VERTICAL FIN ATTACH POINTS				
INSPECT ELEVATOR/STABILIZER ATTACH POINTS				
INSPECT HINGES/TRIM TABS/ROD ENDS FOR ATTACHMENT AND FREE PLAY (SLOP)				
INSPECT EMPENNAGE/CANARD SKIN FOR DAMAGE/CORROSION				
INSPECT ALL CONTROL CABLES, HINGES AND PULLEYS				
INSPECT ALL CONTROL STOPS				
ENGINE:				
PERFORM COMPRESSION TEST #1 ________ #2 ________ #3 ________ #4 ________ #5 ________ #6 ________				
CHANGE OIL AND FILTER (CHECK FOR METAL)				
INSPECT IGNITION HARNESS FOR CONDITION AND CONTINUITY				
CHECK IGNITION LEAD CIGARETTES FOR CONDITION/CRACKS				

CLEAN AND GAP SPARK PLUGS				
CHECK MAGNETO TIMING/POINTS/OIL SEAL/DISTRIBUTOR				
INSPECT ENGINE MOUNT/BUSHINGS				
CHECK LANDING LIGHT OPERATION				
CHECK POSITION LIGHTS OPERATION				
CHECK ANTI-COLLISION LIGHT FOR OPERATION				
INSPECT ALL ANTENNA MOUNTS AND WIRING FOR SECURITY				
CHECK ALL GROUNDING WIRES (ENGINE TO AIRFRAME, WING TO AILERON/FLAP, ETC)				
INSPECT RADIOS/LEADS/WIRES FOR ATTACHMENT & SECURITY				
INSPECT CIRCUIT BREAKERS/FUSES PANELS FOR CONDITION				
OPERATIONAL INSPECTION:				
VISUAL INSPECTION OF THE ENGINE/PROPELLER				
ALL INSPECTION PANELS AND FAIRINGS SECURE				
PERSONNEL WITH FIRE BOTTLE STANDING BY				
BRAKE SYSTEM CHECK				
PROPER FUEL IN TANKS				
ENGINE START PROCEDURES				
OIL PRESSURE/OIL TEMPERATURE WITHIN LIMITS				
VACUUM GAUGE CHECK				
MAGNETO CHECK/HOT MAG CHECK				
IDLE RPM/MIXTURE CHECK				
STATIC RPM CHECK				
ELECTRICAL SYSTEM CHECK				
COOL DOWN PERIOD/ENGINE SHUT DOWN				
PERFORM OIL, HYDRAULIC, AND FUEL LEAK CHECK				
PAPERWORK:				
AIRWORTHINESS DIRECTIVES				
RECORD FINDINGS AND SIGN OFF INSPECTION AND MAINTENANCE IN LOGBOOKS				

EAA Safety Check List

Spend some time with your plane and this check list before those first flights. Thirty minutes with a pencil here may be worth the rest of your life.

PROPELLER

	Yes	No
1. Blades		
Laminations not separated?	☐	☐
Breaks scratches, nicks tipping?	☐	☐
Loose rivets in tipping?	☐	☐
Drain holes in tip clear?	☐	☐
2. Hub		
Any cracks or corrosion?	☐	☐
Hub properly seated and safetied?	☐	☐
3. Control Mechanism		
Oil leaks?	☐	☐
Worn bearings?	☐	☐
Secure?	☐	☐
4. Attachment		
All bolt & nut threads undamaged?	☐	☐
All bolts & nuts secured & safetied?	☐	☐
5. Spinner		
Cracks?	☐	☐
Properly secured?	☐	☐
Is spinner chafing into prop?	☐	☐

ENGINE & ENGINE COMPARTMENT

	Yes	No
1. Fuel System		
All lines of approved type?	☐	☐
All strainers clean?	☐	☐
All lines secured against vibration?	☐	☐
Gascolator bowl at low point in system when aircraft is in normal ground position?	☐	☐
Fuel drains operative?	☐	☐
All connections properly tightened?	☐	☐
2. Oil System		
All lines of approved type?	☐	☐
All lines secured against vibration?	☐	☐
Oil tank has no cracks or leaks?	☐	☐
Tank properly secured & safetied?	☐	☐
All plugs & strainers cleaned & safetied?	☐	☐
3. Ignition-Electrical System		
All wiring proper type and gauge?	☐	☐
All fastenings secured & safetied?	☐	☐
Magnetos properly grounded?	☐	☐
Spark plugs cleaned & undamaged?	☐	☐
Spark plugs properly torqued?	☐	☐
Engine grounded to airframe?	☐	☐
Starter/generator secured?	☐	☐
4. Exhaust Manifold		
Secured and safetied?	☐	☐
All gaskets in good condition?	☐	☐

	Yes	No
All stacks in good condition-no cracks or rusted-out areas?	☐	☐
Carb heat and cabin heat muffs removed and manifold inspected?	☐	☐

5. Controls

	Yes	No
All secured and safetied?	☐	☐
No excessive play in any linkages?	☐	☐
No interference between any control and the structure throughout the full operating range?	☐	☐
Carb heater gate open & close fully?	☐	☐

6. Mount

	Yes	No
Secured and safetied?	☐	☐
All joints inspected for cracks?	☐	☐
Any bends in mount tubes?	☐	☐
Bushings in good condition?	☐	☐

7. Cowlings

	Yes	No
Secured and/or safetied?	☐	☐
All latches or fastenings working properly?	☐	☐
Any cracks properly checked or reinforced?	☐	☐
Cowlings clean?	☐	☐

8. Power Plant in General

	Yes	No
All necessary safeties, palnuts, locknuts, etc. in place?	☐	☐
No fuel or oil leaks?	☐	☐
All accessories secured & safetied?	☐	☐

FUSELAGE-HULL

1. Structure

	Yes	No
All welds sound?	☐	☐
All tubing straight and uncracked?	☐	☐
No rust or corrosion?	☐	☐
All attach fittings sound, no cracks, elongation of holes or worn threads?	☐	☐
All rivets properly installed?	☐	☐
Inspection openings for all vital areas?	☐	☐
Fuselage properly drained, that is, no built-in moisture traps?	☐	☐
Firewall of proper fireproof material?	☐	☐

2. Cover

	Yes	No
Properly attached?	☐	☐
No tears, distortions, or abrasions?	☐	☐
Any breaks or ruptures properly repaired?	☐	☐

3. Control System

	Yes	No
Properly secured and safetied?	☐	☐
Controls stops provided & adjusted?	☐	☐
All fittings of proper thread & size?	☐	☐

FUSELAGE-HULL

	Yes	No
All pulleys of proper diameter for bends, proper size for cable, and guarded?	☐	☐
All cable of proper size (1/8" min) and condition?	☐	☐
Any parts in system subject to rotation for any reason properly secured and safetied?	☐	☐
Return springs on rudder pedals?	☐	☐
No interference between any control part (cable, tube or linkage) and any other part of the structure throughout full control movement?	☐	☐
Adequate room for full control throwwhen aircraft is occupied?	☐	☐
Controls arranged to minimize danger of blocking by foreign objects?	☐	☐
Grip properly secured to control stick or wheel?	☐	☐

	Yes	No
4. Electrical System		
All grommets, particularly in firewall, snug fitting and in good condition?	☐	☐
All wires of proper gauge, insulated, and secured?	☐	☐
Wires do not rest on abrasive surfaces?	☐	☐
Battery installation of sufficient strength?	☐	☐
Battery properly ventilated and drained?	☐	☐
No corrosion at or around battery or its vents?	☐	☐
Fuses of adequate amperage?	☐	☐
5. Fuel System-Tanks		
Drains properly located to discharge clear of aircraft?	☐	☐
All outlets properly screened?	☐	☐
Breather inlets clear?	☐	☐
Fuel shut-off valve installed?	☐	☐
Fuel shut-off valve easily reached by pilot?	☐	☐
All fuel lines of proper approved type?	☐	☐
All fuel lines secured against vibration?	☐	☐
Is tank located so that sufficient head is available in maximum climb with minmum fuel? Placard if necessary?	☐	☐
Has tank sufficient expansion area?	☐	☐
Any tank overflow discharge clear of hazardous areas on aircraft?	☐	☐
Is tank support sufficient to meet strength requirements?	☐	☐
Does tank clear surrounding structure?	☐	☐
Do tank supports minimize strain and chafing?	☐	☐

To insure its safe construction and operation, and to further emphasize the vital necessity for thorough consideration of every item which goes into your airplane, the following working check-list should be used, and it is suggested that it be made a part of the aircraft records.

	Yes	No
<u>EXITS</u>		
1. Can aircraft be cleared rapidly in case of emergency?	☐	☐
Are special precautions available during test period, such as jettisonable doors or canopy?	☐	☐
If parachute is to worn, does it clear all controls?	☐	☐
Baggage Compartment		
1. Are walls and floors of sufficient strength to withstand flight loads?	☐	☐
Can anything escape from baggage compartment by accident?	☐	☐
Cabin-Cockpit		
1. Instruments		
Are all instruments functioning and accurate?	☐	☐
Are all instruments marked, max pressures, temperatures, speeds?	☐	☐
Are all vital instruments easily visible to pilot?	☐	☐
2. Flight-Engine Controls		
Are all engine controls marked or easily identifiable?	☐	☐
Are all engine controls smooth in operation, without excessive resistance, and easily available to pilot?	☐	☐
Are all flight controls arranged so that jamming by dropped gloves, etc. is impossible?	☐	☐
3. Fuel Systems		
Are all gas valves easily reached by pilot?	☐	☐
Are all gas valves marked ON, OFF, LEFT, RIGHT?	☐	☐
Are all gas valves in such a position that accidental operation is impossible or guarded in such a way that accidental operation is impossible?	☐	☐

	Yes	No
4. Seats		
Are seats of sufficient strength for maximum flight loads contemplated?	☐	☐
Does seat "flex" enough at any time to interfere with flight controls?	☐	☐
5. Safety Belts and Shoulder Harness		
Is installation and attachments of sufficient strength to meet 9G forward load minimum?	☐	☐
Does attachment connect directly to primary structure?	☐	☐
Are belts and harness in top condition?	☐	☐
Is belt of correct size, that is, no long over-tongue?	☐	☐
Is a separate belt and shoulder harness supplied for each occupant?	☐	☐
6. Heating-Ventilation		
Is cabin or cockpit in negative pressure area and liable to suck in exhaust fumes?	☐	☐
Is any provision made for ventilating cabin other than normal leakage?	☐	☐
7. Windshield-Windows		
Are windshield and windows of recognized aeronautical materials?	☐	☐
Is windshield braced against positive or negative pressures in flight, either by design or extra bracing?	☐	☐

WING-TAIL SURFACES

	Yes	No
1. Fixed Surfaces		
Are all interior fastenings secured and/or safetied?	☐	☐
Is interior properly weatherproofed?	☐	☐
Have any mice been inside lately?	☐	☐
2. Movable Surfaces		
Are stops provided, either at wing or somewhere else in the control system?	☐	☐
Are all hinges and brackets sound?	☐	☐
Are all hinge pins secured and safetied?	☐	☐
Is there any excessive play in hinges?	☐	☐
Is there any excessive play in control cables or tubes?	☐	☐
3. External Bracing		
Is the interior of all struts weather protected?	☐	☐
Are all adjustable fittings locked, secured, and safetied?	☐	☐
Are struts undamaged by bends or dents?	☐	☐
Are all wires serviceable with proper end fittings?	☐	☐
4. Attach Fittings		
Are bolts of proper size installed?	☐	☐
Are all bolts secured and safetied?	☐	☐
Have all bolts been examined for wear?	☐	☐
5. Flight Control Mechanism		
All cables and tubes unbroken or unbent & with proper end fittings?	☐	☐
All control attachments secured and safetied?	☐	☐
All pulleys free from interference and guarded?	☐	☐
All torque tubes and bell cranks in good condition?	☐	☐
No interference with fuselage or wing structure throughout full control travel?	☐	☐
6. Fuel Tanks (See Fuselage Section Also)		
Are drains supplied at low point in tank when aircraft is in normal ground position?	☐	☐
Fuel overflow drains clear of aircraft - no tendency for overflow to soak into aircraft structure?	☐	☐

7. LANDING GEAR

	Yes	No
Properly lubricated?	☐	☐
Proper oleo inflation?	☐	☐
Shock cords or springs in good condition?	☐	☐
All attach fittings uncracked and sound?	☐	☐
All bolt holes not elongated?	☐	☐
All attach bolts secured and safetied?	☐	☐
Brake lines in good condition?	☐	☐
Brakes operating properly?	☐	☐
Correct hydraulic fluid in lines?	☐	☐
Wheels uncracked?	☐	☐
Tires unworn & properly inflated?	☐	☐
Excessive side play in wheel bearings?	☐	☐

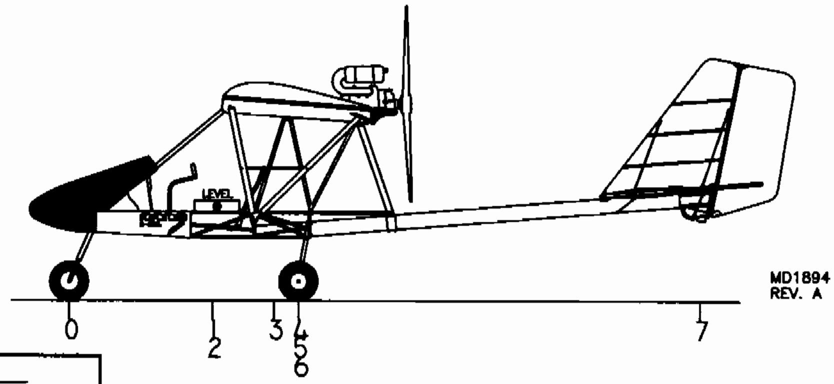
GENERAL

ALL BOLTS WHEREVER POSSIBLE, HEAD UP AND FORWARD.

All exterior fastenings visible from cockpit or cabin should have safetied end toward pilot, wherever possible.

A complete walkaround inspection of the aircraft should be accomplished to check that every bolt visible on the exterior is secured and safetied. That there is no visible structural damage. That all inspection panels and covers are in place and attached. That all parts of the aircraft are in proper alignment.

DON'T FORGET TO PUT IN ENOUGH GAS PRIOR TO THAT FIRST FLIGHT - GROUND RUNNING AND TAXI TESTS CAN USE UP A LOT MORE THAN YOU THINK!



RANS S-12XL AIRAILE
WEIGHT AND BALANCE

N______________	
DATE WEIGHED	
ENGINE TYPE	
GROSS WEIGHT	
EMPTY WEIGHT	
USEFUL LOAD	
C.G. CONDITION	
MTOW (503)	920 LBS.
MTOW (582)	975 LBS.
MTOW (912)	1100 LBS.

ACCEPTABLE C.G. 68.0" TO 73.0" FROM DATUM 0.
DATUM = 0 @ CENTER OF NOSE WHEEL (AIRCRAFT IN LEVEL ATTITUDE).
LEVEL REFERENCE TO BOTTOM OF DOOR.

BECAUSE THE S-12XL IS A PUSHER THE TAIL WILL REST ON THE GROUND WHEN EMPTY. TO PROPERLY DETERMINE THE CENTER OF GRAVITY THE TAIL MUST BE ELEVATED TO SIMULATE LEVEL FLIGHT. SET THE TAIL ON A SAW HORSE OR STAND HIGH ENOUGH TO BRING THE BUBBLE ON THE LEVEL TO THE CENTER. USE THE ARM MEASUREMENTS FOR THE ITEMS SHOWN ON THE WEIGHT AND BALANCE TABLE. THE CHART INCLUDES A LOCATION FOR BAGGAGE EVEN THOUGH THE S-12XL IS NOT CURRENTLY EQUIPPED WITH A BAGGAGE COMPARTMENT. IF SUCH A CARGO SPACE IS DESIRED PLEASE LOCATE AS RECOMMENDED.

#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT	150	49"	7350
2	PASSENGER	0	49"	0
3	BAGGAGE*	0	70"	0
4	WING TANK 9 GAL.	6	78"	468
5	MAIN GEAR LEFT	198	78"	15444
6	MAIN GEAR RIGHT	205	78"	15990
7	TAIL	24	214"	5136
	TOTAL=	583	TOTAL=	44388

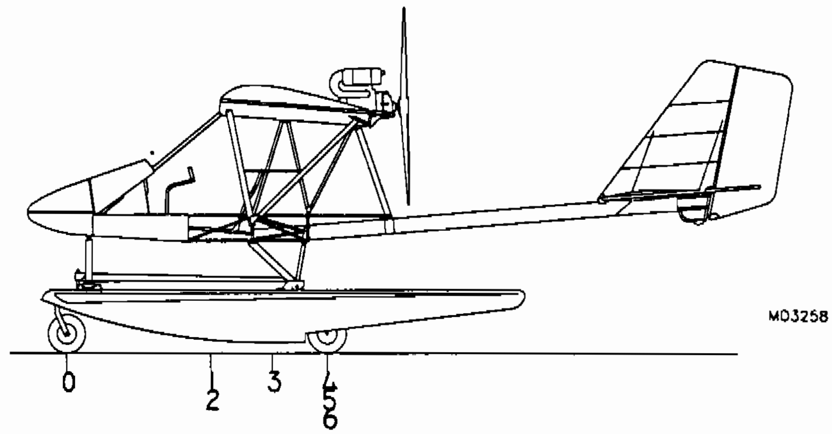
$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}}$ = C.G. $\frac{44388}{583} = 76.13$

NOTE: FORWARD BALLAST MAY BE REQUIRED FOR SINGLE PILOT OPERATION. YOU MUST OPERATE WITHIN THE ABOVE C.G. ENVELOPE.

#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT		49"	
2	PASSENGER		49"	
3	BAGGAGE *		70"	
4	WING TANK 9 GAL.		78"	
5	MAIN GEAR LEFT		78"	
6	MAIN GEAR RIGHT		78"	
7	TAIL		214"	
	TOTAL=		TOTAL=	

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}}$ = C.G. ________ =

*MAX. BAGGAGE 25 LBS.



N______________	
DATE WEIGHED	
ENGINE TYPE	
GROSS WEIGHT	
EMPTY WEIGHT	
USEFUL LOAD	
C.G. CONDITION	
MTOW (503)	920 LBS.
MTOW (582)	975 LBS.
MTOW (912)	1100 LBS.

RANS S-12XL AIRAILE ON PUDDLEJUMPER FLOATS WEIGHT AND BALANCE

ACCEPTABLE C.G. 68.0" TO 73.0" FROM DATUM 0.
DATUM = 0 @ CENTER OF NOSE WHEEL (AIRCRAFT IN LEVEL ATTITUDE).
LEVEL REFERENCE TO BOTTOM OF DOOR.

#	ITEM	WEIGHT	ARM	MOMENT
0	NOSE GEAR	24	10.9"	5136
1	PILOT	150	49"	7350
2	PASSENGER	0	49"	0
3	BAGGAGE *	0	70"	0
4	WING TANK 9 GAL.	6	78"	468
5	MAIN GEAR LEFT	198	78"	15444
6	MAIN GEAR RIGHT	205	78"	15990
	TOTAL=	583	TOTAL=	44388

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}}$ = C.G. $\frac{44388}{583} = 76.13$

NOTE: FORWARD BALLAST MAY BE REQUIRED FOR SINGLE PILOT OPERATION. YOU MUST OPERATE WITHIN THE ABOVE C.G. ENVELOPE.

#	ITEM	WEIGHT	ARM	MOMENT
0	NOSE GEAR		10.9"	
1	PILOT		49"	
2	PASSENGER		49"	
3	BAGGAGE *		70"	
4	WING TANK 9 GAL.		78"	
5	MAIN GEAR LEFT		78"	
6	MAIN GEAR RIGHT		78"	
	TOTAL=		TOTAL=	

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}}$ = C.G. ________ =

*MAX. BAGGAGE 25 LBS.

ENGINE TESTING & BREAK-IN

Secure the aircraft in a safe area to test run the engine. Tie a strong rope to the tail boom extension. Secure the other end to a parked vehicle or a secure ground anchor. Fuel the aircraft and drain the sumps. ***SECURE YOUR AIRPLANE BEFORE STARTING THE ENGINE.***

Prior to starting the engine and performing the break-in run, it is necessary to provide adequate air flow through the radiator. If it so happens that there is a nice breeze blowing at the time of your run up, simply point the aircraft into the wind allowing the radiator scoop to catch the airflow. If the airflow is not sufficient place a box fan directly in front of the radiator scoop to force air through the radiator. Another method is to place the end of a garden hose in the scoop and allow a stream of water to run through the cooling fins of the radiator.

Follow the engine manufactures starting and break in procedures for your engine. The best position to pull start the Airaile is standing on the left front side facing the engine. Try to pull the rope straight. Pulling to the side wears out the rope. Check the gauges for the proper readings as per the engine manual. If the readings are not right ***STOP THE ENGINE*** and investigate. It may be faulty gauges, then again it may not. If you have problems with starting and testing the engine, please call our technical line. Do not risk flying on an engine that is not reading in the green!

Vibration when the engine is at idle should be low enough that the instruments are steady. If you have a high vibration level take action to rectify. The engines we use are generally smooth in operation, however, some adjusting may be required. The 912 usually needs the carbs balanced right off. Use a mercury balancer to fine tune.

CHECKING STATIC RPM

Prior to the first flight, determine the engine's static RPM; this is the speed it develops when stationary and fully throttled. An acceptable static RPM indicates that the engine is operating at or near full potential and should not over-speed during the first flight.

First, calibrate the engine tachometer to make certain it's accurate. Determine the propeller's RPM with a *light tach* (a hand-held device which measures propeller rotation with infrared pulses) and compare the reading to the tachometer's, taking into account the engine's gear reduction ratio. The tachometer supplied with your RANS kit is equipped with a calibration knob; refer to the manufacturer's instructions.

Once satisfied with the tachometer, run the engine with the throttle fully open; be certain the tail is tied down and the main gear is chocked. For the two-stroke Rotax 503 and 582, acceptable static RPM is usually about 6000 to 6200; for the four-stroke 912, it's usually 5000 to 5200. (A number of factors influence this, including the number of propeller blades, their length and pitch.) Ideal static RPM would render an *in-flight* RPM just below red line with the throttle fully open at sea level.

A high static RPM may indicate that the propeller is pitched too finely (the blades take too small a bite of air). This prevents the propeller from performing most efficiently and may allow the engine speed to exceed red line in flight. If the blades are adjustable, increase pitch; refer to the manufacturer's instructions. If the blades are fixed, contact the manufacturer.

A low static RPM may indicate that the propeller is pitched too coarsely (the blades take too large a bite). This also prevents the propeller from performing most efficiently and induces excessive load on the engine. If the blades are adjustable, decrease pitch; if fixed, contact the manufacturer. If finer pitch does not raise maximum engine speed to an acceptable RPM, another problem may be indicated.

WARNING: Attempting flight with too much or too little propeller pitch may have severe consequences. Conduct flights only with sufficient power output!

Knowing the ideal static RPM allows you to check the health of the engine during a full-throttle run-up prior to takeoff. Once you've become familiar with the in-flight performance of the engine and have adjusted the propeller, you'll know better what the tachometer should indicate during run-up.

PRE-FLIGHT INSPECTION

1. Start the inspection in the same place every time to develop a pattern. This will lead to a more thorough pre-flight. Starting with the nose, check the nose gear for proper inflation and movement. Try to jiggle the wheel side to side to gauge bearing wear.

2. Inspect the nose gear steering linkage for play or looseness.

3. Check the floorboard and rudder pedals for freedom of movement. Oil the pedals with a light machine oil.

4. Move the throttle; check for proper movement and friction. Adjust the friction by tightening the bolt through the friction block.

5. Check the seats for secure attachment to the frame.

6. Check center cover for a tight fit to the wing.

7. Inspect the starter rope for wear.

8. Look over the cabanes for dings, bends, cracks or deformation.

9. Check the wing spars for bends, dings or deformation.

10. Inspect the aileron for movement and hinge condition. Oil hinges with a light machine oil. Check the hinge bolts for security and cotter pins. Check the rod ends, be sure the rod ends are threaded on at least six (6) turns.

11. Check flaps for function and condition of hinges. Check the rod ends, they must be threaded on at least six (6) turns.

12. Check the condition of the prop, look for cracks, nicks and dings. Keep the prop clean and the finish up.

13. Inspect the engine mount for integrity and look over the rubber mounts for wear. Keep clean of oil and fuel. Check all bolts for tightness.

14. Check the carbs for security. Check the clamps around the rubber boots. Check the boots for cracks. Check the throttle connections and fuel lines. Safety wire on the air filters. Clean the filters with raw gas and re-oil **LIGHTLY** with a recommended oil.

15. The muffler is a source of worry on a pusher. If any parts break off they take out the prop. So be extra careful, really look over all the items in the engine area.

16. Check the tail boom for nicks, dings, and dents.

17. Look over the tail for wear, tears, and freedom of movement. Oil the hinges with a light machine oil.

18. Check the tail cables for tightness. Look closely at the thimbles for wear. Sometimes the thimbles will wear through and start cutting into the cables.

19. Check the tire pressure. Inflate to the recommended psi.

20. Check the main landing gear leg for bends and broken bolts. Inspect the gear socket for damage. Look for bent or compressed tubes.

21. Check the collar for a tight fit. Look for cracks in the tabs welded to top of the collar. Check bolts for tightness. Look for hole elongation in the struts by moving the boom up and down and looking at the bolt connections.

22. Check the strut connections and the integrity of the fittings. Check for hole elongation on all these fittings and rivets.

23. Check for general condition and function of all items in the cockpit. Check the trim wheel and flap lever. Oil it with a light machine.

S-12 AIRAILE OPERATIONS

PRE-FLIGHT

Refer to the pre-flight section above.

STARTING

Position the aircraft into the wind and chock the main wheels to prevent rolling. To maneuver the aircraft into position lift the tail at the strut connect points. Avoid lifting at the tips of control surfaces. **CAUTION:** Winds above 15 mph may cause the aircraft to lift off when empty. Have an assistant sit in the plane or help hold it down at the wing strut connect points. Never hold a strut in the middle.

Drain the fuel sump. Squeeze the primer bulb until it is solid and pump the primer at least 6 pumps (if first start or if it's been 30 minutes since the last start). Close the throttle (pull back to close). Flip the ignition switch up for on. Grab the start handle and pull briskly. The best position to pull start the Airaile is standing on the left front side facing the engine. Try to pull the rope straight. Pulling to the side wears out the rope. If you flood the engine it will feel "soft". Open the throttle 1/4 way and pull through. Several pulleys may be needed. Be sure the ignition switch is on (switch up). Let it idle a moment and then advance the throttle slowly. **NOTE:** After the engine warms up for 2 minutes, close the throttle. It should idle at 2,000 RPM. If not refer to the engine manual for details on setting the idle. If you encounter starting difficulties refer to the engine manual for probable causes and solutions. **CAUTION:** In cold weather allow at least a 2 minute warm-up before applying take-off power.

Check the throttle action. There should be no sluggish response from mid range to top end. Do not rapidly pump the throttle. This is not a motorcycle! It is an airplane with a big fly wheel. The propeller in the case of an airplane. Jockeying the throttle will only accelerate wear on the engine and make its reliability questionable. Be smooth with the throttle and it will respond when you need it! Refer to the engine break-in section of this manual.

TAXIING

Taxiing the S-12 Airaile is easy and even in a 25 mph wind. The direct linkage to the steerable nose wheel enhances the ground handling making tight turns a snap.

If the wing is strong learn to use it to your advantage. Taxiing into the wind with forward stick will increase nose wheel traction and enhance steering. Taxi slow or you may start flying.

During downwind taxiing hold the stick neutral. Make small steering corrections and taxi slow.

In the hands of a skillful pilot the S-12 Airaile can taxi in winds up to 25 mph. Operations in 35 mph winds have been conducted with two on board.

Flying in high winds above 35 mph is also possible. However, this capacity should be used only as a means to get out of a situation not to invite one.

Notes on Flying a High Thrust Line Pusher

The S-12 Airaile exhibits special characteristics due to its pusher configuration. Because of the high thrust line there is a tendency for the nose to pitch **DOWN** with application of power. This presents no problem if you are aware of it. Get in the habit of adding a slight amount of back pressure when applying power. The tendency will be more noticeable at low speeds. **CAUTION:** During approach to landing avoid high rates of sink, usually a result of flying slow. If you are to slow and the sink rate is to high, a sudden burst of power will be required to recover, at this point the tendency to pitch down will be the greatest. The danger is if you are too low you may not have room to recover from the pitch over. Fly the approach at adequate speeds and you will avoid any problems associated with a high thrust line.

The other side of the pitch tendency is the pitch **UP**. This occurs at **ANY** airspeed when **SUDDEN** reduction on throttle is made. Again, the only phase of flight where this would be critical is during landing. The proper action is to add the right amount of **FORWARD** pressure.

As you fly the Airaile it soon will become second nature to you about these little handling characteristics. Just remember to tell your buddy before you turn him loose with your plane, especially if he has not flown a pusher. As pushers go the Airaile is average in these thrust line related properties. As you will see it is a very easy trait to live with.

TAKING OFF

A normal take off in the S-12 is performed with two notches of flaps. Hold the control stick in neutral, apply full power at around 35 to 45 mph, apply just enough back pressure to rotate the plane to fly off. Avoid over rotation, this will only scrape the tail skin and will not enhance the take off. If you are near gross there will be considerable back pressure required.

A soft field take off in the S-12 is performed with full flaps and back stick. This however will not result in a short ground roll. The need for a soft field take off will be very rare because of the Airaile's low gross weight. Our testing shows the short field take off can be used for all take offs.

CLIMBING

BEST RATE OF CLIMB

To gain the best climb out of the S-12 slowly retract the flaps once clear of all obstacles and let the plane obtain its best climb speed. This should be between 50 and 60 mph.

BEST ANGLE OF CLIMB

The S-12 has such a steep angle of climb when climbing at the best rate that it will be a rare case to use best angles of climb. In any case the best angle of climb is accomplished with full flaps and an airspeed between 40 and 50 mph. CAUTION: The angle of climb is around 40 to 45 degrees, a power loss within 200 to 300 ft above ground level in this attitude may be unlikely to recover from. It is recommended to use a lesser angle until a safe altitude is reached.

CRUISE FLIGHT

By nature of design the S-12 will exhibit a wide range of power settings at which one can cruise. Typically loaded with a gross of 785 lbs the best cruise should come in around 5500 with an indicated airspeed of 60 to 65 mph. This is for a partial fairing equipped plane. The open cockpit will reduce all cruise speeds by 5 to 7 mph. 5500 rpm would be considered the middle cruise and will yield the best fuel burn to airspeed ratio. The gallons per hour should be around 4.3 at this setting. Bumping the rpm up to 6200 should yield a 70 to 75 mph cruise with a 5.5 gph.

At the other end of the cruise scale is the slow cruise. Because of the higher angle of attack the fuel to mph ratio is not so good. This is more of a loitering speed then a cruise because it really is too slow to get anywhere. Slow cruise is around 50 mph with the power at 5000 rpm. An interesting way to use the slow cruise is in conjunction with thermals, this can net a lot higher speed then the 50 mph and it is a lot more fun! When you feel a thermal lifting the plane, apply a little forward stick and take advantage of the "down hill" effect the thermal affords. Try to hold your altitude within 500 ft in consideration of VFR FAR's.

STALLS

The S-12 Airaile has a very mushy, mellow, undramatic power off stall. The power on stall is even more indefinite. It is highly recommended to take your S-12 Airaile to a safe alltitude to explore the stall. Because the stall is so docile you will need to learn the feel of the plane in the stalled mode in order to be proficient in stall recognition. Learn the other signs of a stall such as mushy or limp control feel and high sink rates.

If held in the power off stall the craft will develop a healthy sink rate, which is easily checked with a release in back pressure. If solo the power on stall may never happen, the plane will simply assume a very nose high attitude and mush along level or even climb at 200 to 300 feet a minute. At gross it is a different story, the plane still will not exhibit a sharp break, but it will enter a high sink rate mush. All types of stalls in the Airaile are quickly recovered from with very little loss in altitude.

SPINS

The Airaile has demonstrated the ability to recover from spins; however, due to the unique nature of kit built planes and spins, it is prohibitted to perform spins..

NORMAL & STEEP BANKS

The Airaile's 31 foot span wing retains energy very well in turns. It is easy to perform well coordinated 60 degree steep banks. The only real trick is to learn to lead in and out of the bank with the rudder. It will take very little rudder due to the Airaile's good roll coupling.

Normal banks up to 30 degrees will yield the fast roll rate. After 30 degrees the roll rate will start to slow due to the pendulum stability. Roll rate will also slow after 80 mph due to the increase in air pressure on the ailerons.

LANDINGS

The Airaile is one of the easiest planes to land, but only if you understand it! What is special about landing an Airaile over conventional aircraft is the fact that it is a pusher with low weight and high drag. That means there is a lot less energy the approach and flare. A normal landing is done with three nothes of flaps at an approach speed of 50 to 55 mph. The plane is flown down to the runway at a fairly shallow angle of descent. Once established over the runway at about one to two feet power is reduced and the plane is allowed to settle onto the runway. Flare as required (in other words the S-12 Airaile is landed without a big flare).

CROSSWINDS

Crosswind landings with the Airaile have been performed in winds up to 20 mph at 90 degrees. To successfully operate in high crosswinds authoritative action is required from the pilot. In other words do not be afraid to use the rudder and ailerons to get the results.

The recommended crosswind take off is to hold full aileron into the crosswind and rudder as required. It is always better to have all the aileron in and have to take it out then to try and bring a wing down once it has started up. Hold the nose down until the rotation speed is reached, this will increase directional control. Holding the nose down is especially important when flying solo because there is less weight on the nose gear. Once air born let the controls neutralize and obtain and hold best climb speed.

Landing in a crosswind requires a little airmanship as well. The recommended method is to fly the approach at the crab angle caused by the wind. Just before touch down line up the aircraft to the runway holding the upwind wing down. The Airaile's trike gear is very forgiving in crosswinds.

We can not tell you everything about flying your Airaile. You will become more familiar with your Airaile as you build time. Each aircraft is a little different. This information is intended as a guide line and not to be taken as the Bible. Please approach the flight testing of your Airaile with the common sense and respect it deserves. Be careful and fly safe and **<u>ALWAYS</u>** do a thorough pre-flight.

APPROVED MANEUVERS

Stalls, all types except Whip Stalls, cross control stalls.
Falling Leaf at low power settings (below 4,000 rpm).
Chandelles.
Lazy Eights.
Steep turns up to 60°

ALL AEROBATIC MANEUVERS ARE PROHIBITED!

ASI MARKINGS

Apply the appropriate colored arcs on your ASI for the following speeds:

White Arc . . . . 28 mph to 65 mph (stall to maximum flap extension speed)
Green Arc . . . . 40 mph to 70 mph
Yellow Arc . . . . 70 mph to 100 mph
Red Line . . . . 100 mph

Maximum turbulent air penetration speed is 50 mph.
Maximum flap extension speed is 65 mph.

SPECIAL OPERATIONAL CONSIDERATIONS

POSITION OF IGNITION SWITCH

Up is for on, down is for off.

FLIGHT MANEUVERS THAT INDUCE NEGATIVE LOAD

Flight maneuvers that induce negative load may cause momentary fuel starvation due to the negative G's on the float style carburetor. Avoid low level abrupt pull ups followed by an abrupt dive.

WARNING: SECURE ANY FORM OF CARGO

Secure any form of cargo and be careful of clothing articles falling into any part of the aircraft's working mechanisms. Jamming of the controls may result. Always wear the safety belt and shoulder harness to be sure these also do not interfere with the controls.

CHECK THE CARBURETOR

Check the carburetor during pre-flight for clamp security. After a few hours the fuel/oil mix will lubricate the rubber intake manifold. It is then possible for the carburetor or carburetors to rotate into a position that may cause fuel overflow and possible fuel starvation. Remove, clean and reclamp.

FUEL SHUT OFF VALVE

The fuel shut off valve must be **ON** for flight. **ALWAYS** check it. There's enough fuel retained in the system past the valve to permit a take-off followed by a dead stick landing!

CONTROL SYSTEM TRAVEL: Body sizes vary. Please make sure seat adjustment allows full control stick travel. Make adjustments to the seat or sticks as required.

AVOID descending at high rates of speed from high altitudes into unknown conditions. A shear layer may be present at a lower lever causing turbulence. Remember, high speeds and severe turbulence may accelerate airframe fatigue and shorten your aircraft's effective service.

Flap Operations

The flap equipped S-12 Airaile has a wider speed envelope but this is only realized through proper flap usage. Please take the time to become thoroughly familiar with the aircraft and procedures before attempting any maximum performances, take offs or landings. The aircraft functions well without using flaps only take off/landing distances are longer and speeds are higher. Pay close attention to the recommended flight speeds called out in this section.

Our tests show (2) notches for T.O. is the best. Further flaps have a tendency to increase T.O. distance. The maximum flap extension speed is 65 mph. Although it is allowable to extend to full flaps at 65 mph, it is actually better technique to extend a notch at a time. **EXAMPLE:** 65 mph-1st notch, 55 mph-2nd notch, 45 mph-3rd notch. You'll find this gives you much smoother approaches with less flap lever pressure. For reference 1st notch/15 degrees, 2nd notch/29 degrees, 3rd notch/44 degrees.

The second flap setting is used more or less as a transition to full flaps on landing. The third notch of flaps is going to yield steeper, slower approaches and the shortest landing roll. Typically a 45 mph approach speed in a 20 degree nose low attitude is desired. **CAUTION:** It is very easy to exceed 65 mph, the maximum flap extension (vfe) speed during such approaches...be aware of this!

POWER OFF STALLS		BANK		
FLAPS		0	30	60
	0	33	39	45
	15	34	38	44
	29	32	36	42
	44	27	35	40

POWER ON STALLS		BANK		
FLAPS				
	0	22	25	27
	15	20	23	26
	29	20	23	24
	44	20	23	24

Performance based on standard day gross weight of 875 lbs.

CAUTION: Inspect flap lever catches for wear every 100 hours. Keep roller lubricated.

PROHIBITED: Spins with flaps extended any degree but 0.

FLIGHT TESTING BY RANDY J. SCHLITTER

Flight testing a brand new aircraft can become quite involved, especially if there are problems with controls, engines or rigging. The approach one should take is to start with a competent pilot, sufficient runway and ideal weather. Flight time in the type of plane you are to test is ideal. This can be obtained at the factory or from a nearby willing owner.

A large amount of common sense should be on hand. The obvious is sometimes lost in the excitement. So keep your cool, to keep your head.

The exact path you take to flight testing can be tailored to your experience and airport. To help you design your approach to flight testing here is a brief synopsis of my approach. Please use this as a suggestion and not the bible.

"The airport we use features 6500 ft. of all weather runway. Off each end is acceptable overruns of another 1000 ft. Plus the fields nearby offer suitable landing sites. The main thing is our airports long runway gives us plenty of room to fast taxi."

"During the fast taxi it is determined if the plane is directionally controllable. Also some feel for pitch and roll can be established. A lot is happening fast, so several runs may be needed to digest the information. I'm looking for anything and everything to AVOID flight. In other words I don't ignore the signs of trouble and think my enthusiasm will fix it. I did that once and it nearly killed me! I want this plane to earn it's place in the sky. Sugar coatings now will only mean more trouble later. After the fast taxi I get out of the plane and look her over, this is mainly to create a space in time to keep relaxed. A test pilot's best friend is his self discipline. Whatever you need to do ritual wise to keep the discipline is fair game."

" The next phase will be crow hops. Here we really start learning about the plane. In fact it is amazing what she'll tell in these brief moments of flight. I can predict stall speed and sometimes stall behavior, just from a crow hop."

" The crow hops grow longer and higher as information confirms the control function. This is where the long runway starts to pay off. From the flights down the runway at above the wing span we learn the full landing nature of the plane, we also by now have a pretty good feel for its control response, and whether or not it is "right". That is where experience in type will help. If this is your first exposure to the plane it will be tough to know if the feel is right, however you should at this point know if it is drastically wrong! If the engine is revving in the redline and you are barely able to climb, something big is wrong. In other words we are developing a sense of performance this new machine may have. That performance should not be far from the expected values, if it is then something may be drastically wrong. To keep me from contradicting myself I write down the numbers I'm getting. Don't try this while flying down the runway, do it at the end of the run. You will be surprised later when you read it back. Your memory at this point is not the most accurate recorder! Also, write down what you actually see and not what you want to see on the gauges. Try to remain objective at this point, after the flight testing is over you will have earned your bragging rights."

" After flying down the runway enough to confirm engine health and that the controls are okay it is time to take another break. This time we inspect everything and do another pre-flight. The next objective is what I call the maiden flight. During this flight we will leave the safety of the runway. It is a critical phase of flight; the runway will be left behind while we climb to a safe height. During this phase of flight keep a landing site in mind. Wear a parachute if your plane is not ballistic equipped, we will be flying high enough to use it. This is not the fly fast low by the waving crowd flight...that comes much much later. Remember baby steps!"

" The maiden flight is designed to learn the main things about the plane: climb performance, moderate cruise speed (later I check out the top end at much higher altitudes), control at moderate cruise, and slow flight. The plane should be climbed to at least 3000 ft. above ground level. Here we in theory have enough height to bail out. The main idea is to advance slowly, getting to know what the new plane can and cannot do."

" As an amateur builder it is your responsibility to establish the performance numbers. However precise the kit may be, it is still possible to have variations in performance. Establish the critical V speeds through actual flight test. Record them in your flight log. The following V speeds are what I feel the most important:

Vr rotation
Vlof lift off speed
Vy best rate of climb
Vx best angle of climb
Vc cruise at 65% power
Vs stall clean
Vso stall speed landing configuration
approach speed should be 1.3 of Vso.

"As the testing continues you may notice slight trim or rigging problems, such as a yaw to the left or right, or the ball sets off to the side in level flight, or it won't maintain level flight. It is best to fine tune the plane until it flies ball centered and level. This is considered perfect rig. In perfect rig you will achieve the optimum cruise speeds, so it is worth the effort. The problem with such fine tuning is that it is easy to get confused as to what effects what. I have complied a little trouble shooting chart to help with the mystery of perfect rigging." RJS RANS, Inc. Test Pilot

POST FLIGHT ADJUSTMENTS

To properly correct a rigging problem the symptom must be correctly analyzed. This is done by establishing the plane in level straight flight, then releasing the controls. The test must be done in calm air. Write down what is happening, that way you make corrections in the right direction. Make adjustments in ½" and 1" turn increments. Isolate the problem, make and correct one axis at a time. If for instance you adjust the wing twist and add a little rudder trim, you may end up chasing the problem rather than solving it!

YAWS LEFT OR RIGHT

This is fairly rare in our planes and is usually caused by engine or rudder offset. The rudder may not be going to a free state due to friction or mis-rigging at the rudder pedals. Adjust the rudder pedals so they are straight with rudder. In some cases it may be necessary to add a slight offset (twist) to the vertical stabilizer. This can be done using the adjustable tangs on the tail cables to offset the leading edge of the vertical stabilizer. Be careful not to affect the position of the horizontal stabilizers when adjusting the vertical fin. Remember if you are holding left rudder the leading edge of the vertical stabilizer will need to move to the right. Stalls should be conducted after rigging adjustment to check for wing drop. If the plane flies straight and level but drops a wing in the stall, check your feet and hands, you must be pushing and little rudder or holding in some aileron!

WING LOW

If the plane flies wing low with very little or no tendency to yaw or roll to the low wing, the wing is washed out to much on the OPPOSITE wing. To correct wash in the OPPOSITE wing. Do so in ½" to 1" turn increments. It is always best to wash in because this means more threads will be holding on the rod end. Once the wings fly level the ball should be centered, in this rig you will achieve the best cruise possible (provided pitch is in trim).

This can also be a low flap on the opposite wing, but then a little roll should be present. Check the flaps for position during flight. Both the ailerons and flaps should be straight and together in level flight. When adjusting the flaps you may run out in travel. In this case it is okay to cut off the end of the teleflex 3/16" and remove the jam nut.

ROLL LEFT OR RIGHT

Roll and yaw can be hard to separate. If the wing rises before the nose yaws then the mis-rigging is in the aileron or the flap. Wing twist can induce roll but it will only lift the wing so far. A true roll tendency will keep right on going until the plane is in a steep bank. It will be the flap that induces the roll, because the ailerons should fly free in the slipstream, unless you are holding the stick again!

To correct, make sure all trailing edge surfaces are flying straight. The flaps and ailerons need to be a seamless surface. Adjust accordingly. See wing low for a tip on gaining more flap inward adjustment.

NOSE UP OR NOSE DOWN

This can be adjusted by moving the leading edge of the horizontal stabilizer up or down. If the plane flies nose down; the leading edge of the horizontal should be moved down one hole position. Likewise nose up flight should be adjusted by moving the horizontal stabilizer position up one hole.

Minor adjustments can be made using the supplied trim tab if necessary. Install according to the illustrations in the parts manual. If you have in-flight trim adjust as required. After your 40 hour sign off from the FAA, and you begin to carry passengers, it may be desired to use the supplied trim tab or reposition the horizontal stabilizers due to the added weight.

If you have a nose down or nose up problem that the above trim steps can not handle at any cruise speed, then there is a big weight and balance problem. Check your weight and balance sheet.

THE FINISH

Well here we are with a finished and flying plane. Stand back for a moment and take a long look. Remember the moments of confusion and frustration? They faded and the joy of crafting a fine airplane has superseded. You have just done something man has dreamed of since the beginning of time, you've flown. Not only that, but in a plane you made! That my fellow aviator is a feeling that sticks with you a long time. Enjoy this newborn wonder and above all keep it safe. We want you around for the next fly in!

CREATING A PILOT OPERATING HANDBOOK

Most pilots are accustomed to flying light planes with comprehensive pilot operating handbooks. This is a result of the standardization required by FAA certification, the fruit of which is fleets of identical aircraft for which specific checklists, procedures and performance figures may be published.

This section includes much information on the operation, limitations and performance of RANS aircraft; however, the nature of kit-built aircraft makes it impossible to publish *specific* checklists and procedures applicable to *all* examples of a particular model. This is because the builder, as manufacturer of the aircraft, has the freedom to assemble, equip and modify his machine as he wishes. The result is fleets of aircraft that share the same name and designation, but vary somewhat in operation and performance.

The builder should consider carefully all aspects of the engine, airframe and equipment when developing checklists and procedures for his plane. For example, he might begin the preflight inspection by opening the cabin and checking that the magnetos are off; this would ensure the engine cannot start if the propeller were moved. With the cabin open, he also might drain fuel from the sump, allowing any water trapped in the system to escape. He then might begin a walk-around, moving about the ship in a logical, straightforward manner, checking the presence, security and condition of hardware and components.

With the walk-around completed, he might seat himself in the aircraft and consider the checks necessary for a safe and mechanically sound engine start. This will depend largely on the specifics of the engine, fuel, ignition and electrical systems he has installed. Again, a straightforward, logically-flowing checklist should be developed that addresses the particulars of his machine.

The same care should go into development of a pre-takeoff checklist. Of particular importance is a proper engine run-up to check the health of the power plant. An essential checklist item often given short shrift is that of free and correct movement of control surfaces; this is particularly important for aircraft that fold or disassemble.

Considerable forethought should be given to potential emergencies. What steps should be taken to deal with balked landings, engine failures or fires? How might these steps vary according to the phase and conditions of flight? Consideration of contingencies now is likely to mean faster, more appropriate reaction to urgent or emergency situations, should they arise.

Since each kit-built aircraft is unique, each builder should expect his aircraft's performance to be unique. The prudent builder will determine carefully the weight and balance parameters of his plane before its first flight. He'll familiarize himself with its flying characteristics during the flight test phase, cautiously exploring its capabilities and limitations while heeding the designer's words of advice. The U. S. Government, the Experimental Aircraft Association and other publishers offer a wealth of information on flight preparation and testing. As a first step, the builder might refer to the FAA's AC-90-89A, "Amateur-Built Aircraft Flight Testing Handbook."

By applying suitable checklists and procedures to his plane and operating it within reasonable limits, the builder helps ensure his safety as well as the reliability and longevity of his airframe, power plant and components.

MAINTENANCE

ENGINE MAINTENANCE

All engine care and maintenance should be done according to the Rotax manual which comes with your engine. **HINT:** Oil changes are done by using an oil pump to draw used oil from the reservoir. You can purchase a hand powered pump from an automotive parts store.

MUFFLER

The muffler is a part under constant stress while in use and under the attack of time and the element otherwise. Mufflers can develop cracks and shed chunks of metal that will shatter the prop. That is never a welcome event! Therefore, it is vital to always inspect the condition of the muffler and springs before flying. Really learn to **LOOK** at the muffler, as well as other items on and around the engine that could break off and damage the prop.

NOSE GEAR

Service the nose gear socket at least once a year. Remove the nose fork assembly from the fuselage cage and regrease the nose gear sockets. Disassemble the nose gear fork and apply fresh grease to the spring area. Re-install bolt by depressing the fork. See the parts manual for nose gear assembly details. Harsh environments (dust, mud, water, etc.) may increase the frequency that nose gear service should be done. Check to see if the nose gear is "sticky" during normal pre-flight.

COVERING

Safety is a personal responsibility. You, as the owner, operator, and chief pilot are responsible for the airworthiness of your aircraft. Ultimately you control the life and monitor the level of safety through pre-flight inspections. During pre-flight check for the following:

A. Fabric rot.
B. Thread wear and broken stitches. (Open ends lead to premature seam separation.)
C. Chafing and hangar rash.
D. Fading.

Watch your fabric for signs of fading. The number one sign of ultraviolet damage is a lightening in the color of the fabric. The Dacron used to cover your aircraft was originally designed for sailboats. Sailors typically stow away their sails after a hard days sailing. Extend your fabric life by using a field storage cover, hangar, clear coating, or a combination of all these.

Life expectancy of the fabric varies with latitude. The closer to the equator you are, the more intense UV rays you get. Also, there are indications that due to environmental factors, like ozone depletion, the amount of solar radiation penetrating the atmosphere is increasing. A conservative estimate on the life span of untreated 3.9 Dacron is 350 exposure hours. Controlled exposure can extend life of untreated sailcloth to 10 years.

Coatings can help extend useful life. Clear coating can double the life of a covering. The disadvantage of this type of process is that the skins become a permanent part of the aircraft. Should a skin need removing for repairs, etc. the coatings may crack and peel giving you a molting snake skin effect.

As mentioned earlier, storage methods can increase life. Tarps and fitted covers are recommended for outside storage. If available, shade hangars are better and fully enclosed hangars are best.
Extend the life of good fabric by making repairs.

A. Check for growth of minor rash and pin holes.
B. For small cuts or holes 2" or less, sew with a baseball stitch then apply sail tape or a glue patch.
C. Medium sized cuts or holes 2" to 6" can be repaired by applying an adhesive patch and hand stitching.
D. Large rips and holes and/or blown out panels 6" or larger should be examined by a professional repair service.

TESTING FABRIC

A. ***FADE FACTOR:*** Compare the top and bottom surfaces of your wing. Top surfaces of a considerably lighter shade are a cause for concern.

B. ***FINGER POKE TEST:*** Poke the top surface of your wing. A finger poke won't go through good fabric.

C. ***FABRIC TESTER:*** This involves standardized testing with a calibrated scale.
Max: The maximum value for new fabric is 25#.
Min: The minimum safe values are 12# or 15# depending on surface tested.

WHEN IN DOUBT, THROW IT OUT, LIVE TO FLY AGAIN TOMORROW!

CORROSION and WASHING YOUR PLANE

Using the garden hose to wash the outside of your plane may seem like a great idea, however this is a practice avoided at the factory. We simply never let the plane get to the point it needs hosing. Instead, the exterior of the plane is cleaned using a product called Brilliance. This mild cleaner works great on all surfaces including the Lexan. For the oil or exhaust stains, we use 409 or Fantastic. These clean very effectively without apparent damage to the paint.

If your plane is open air like an Airaile or Stinger and you do use a hose to wash it down, you may be causing a future corrosion problem. In the case of any open cockpit plane with the tail sitting low, it is possible for water to collect inside the elevator push pull tube. This will rust away the elevator yoke and corrode the push pull tube also.

Even leaving the plane in the rain can allow moisture to collect in the elevator yoke. Please avoid the practice of spraying water into the cockpit area of your plane, open cockpit or not, this is a practice that will lead to corrosion problems and part replacement.

If you suspect your aircraft of corrosion problems, inspect all areas where water may collect, such as the elevator yoke area.

AIRFRAME UP KEEP

The aluminum and steel structure is designed to last for many years. However, constant abuse through hard landings and high speed flight in rough air could fatigue key structural elements. To inspect the airframe, look for cracks, hole elongation, flecking of anodizing (indicating bends or overloads), bent, dented or corroded tubing and any signs of misalignment or distortion. Consult your dealer or the factory if your inspection reveals trouble or in the event of accidental damage beyond your capabilities of repair.

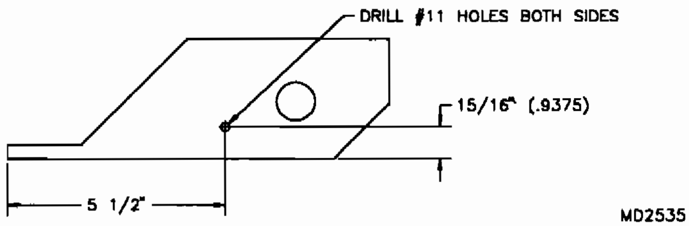
NOTE: Before you start all the components of this float system have been coated for protection against the elements. No additional painting is required. Maintain the finish by rinsing with fresh water and toweling dry.

PUDDLE JUMPER FLOATS
FLOAT MOUNT ASSEMBLY

1. Refer to the parts located on the float mount assembly drawing. Install the upper forward fittings into the fuselage supports using the correct hardware. **Note:** Orientation of the fittings depend on whether it is a left or right strut. Insert the PVC inserts into the forward cross brace centered on the pre-located holes. Transfer drill the inserts 1/4" using the cross brace as a guide. Trial assemble the forward fuselage supports to the forward cross brace and to each other.

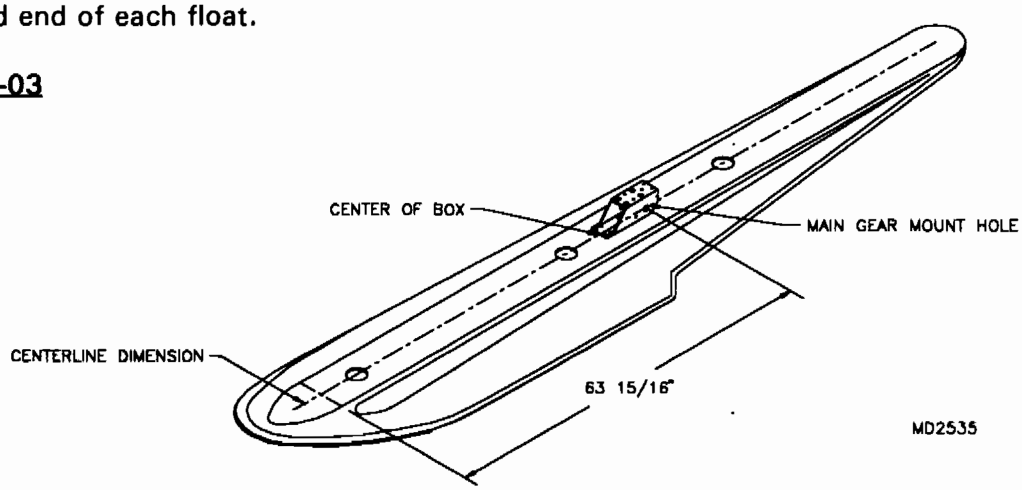
2. Locate the two main gear mounting blocks supplied with your floats. Drill a #11 hole at the location shown in **FIGURE 14-02** below. This will be the mount hole for the upper guide.

FIGURE 14-02



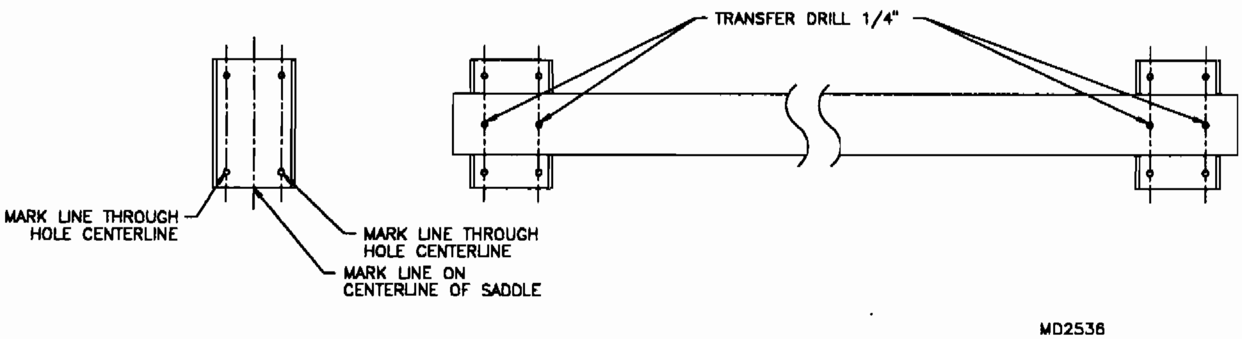
3. Bolt the main gear mounting blocks in place on each float using the stainless steel hardware supplied with them. Measure from the center of the main gear mount hole forward 63 15/16" from each side of the mount blocks and place a reference pencil line on each float. See **Figure 14-03**. Next mark a centerline on each float by referencing the mount block and a small centerline dimple located at the forward end of each float.

FIGURE 14-03



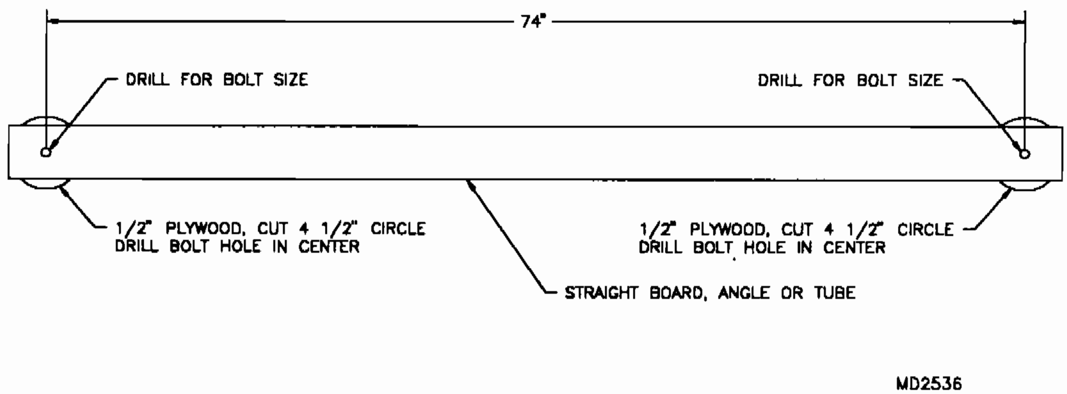
4. Locate the two forward cross brace saddles. Mark a centerline between each set of holes as shown in **FIGURE 14-04**. Also measure and mark a centerline on each saddle. On a flat bench, place the forward cross brace into the saddles with the outermost holes centered on the outside centerline mark. Punch and transfer drill each saddle 1/4" using the cross brace as a guide.

FIGURE 14-04



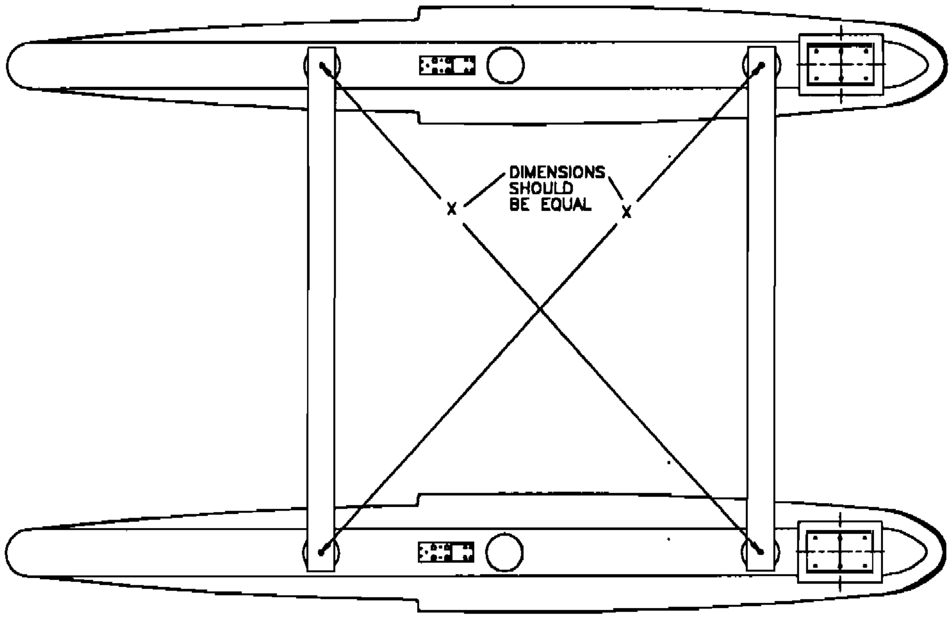
5. The aft cross brace cannot be drilled and bolted in place until after the main gear leg and socket have been aligned and bolted in place. Because of this we recommend fabricating **two** simple jigs to help hold the floats parallel and square to each other during installation onto the airframe. See **FIGURE 14-05.** These jigs will hold the floats exactly 74" apart and cross measuring from bolt center to bolt center will keep the floats square.

FIGURE 14-05



6. Align both floats approximately 74" from center to center and insert jigs into the forward and aft access holes. See **FIGURE 14-06.** Place pre-drilled saddles on the floats lined up on the centerline marks. Cross measure from bolt center to bolt center on jig. This measurement should be equal. Double check saddles by placing the cross brace in place. Once satisfied, transfer drill through all six holes in each saddle. After drilling, place a pencil mark ½" forward and ½" aft of each saddle. Remove saddles. Locate the float-doubler plates. Center these between the two pencil marks centered on the floats. Scribe two opposite corner holes from the inside of the floats while holding these plates stationary. Remove plates, line up saddles and transfer drill the remaining four holes.

FIGURE 14-06

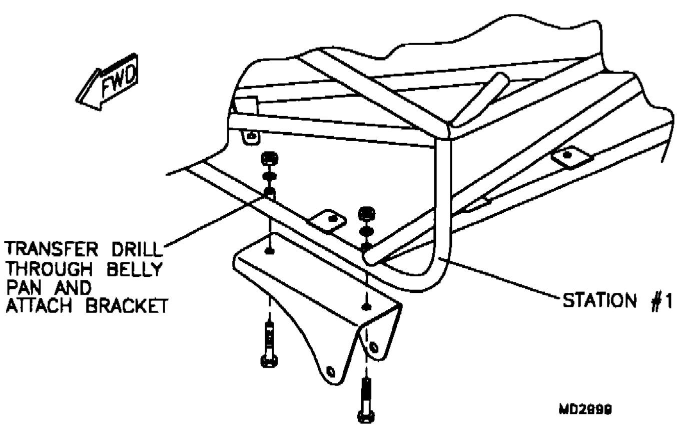


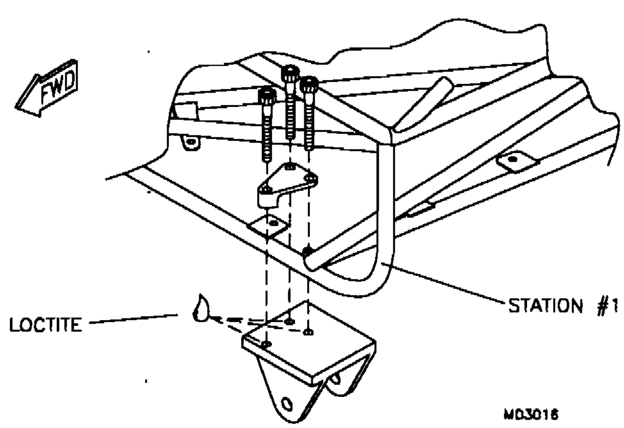
7. Note the serial number of your aircraft. The appropriate forward attach brackets have been provided to match your airframe. Refer to the parts drawing.

Install the machined aluminum brackets to the float bushings located on the aft side of Station 1 using the correct hardware. Belly pan #1 will need two 1/4" holes drilled through at the float bushing and the second hole in the bracket. Refer to **FIGURE 14-07** for assembly details of this bracket.

Remove the nose gear from it's socket and replace with the nose gear insert. Make sure the insert pivots freely but is not sloppy and is flush with the top nose gear ring. Once satisfied with the fit, drill the nose gear insert for the steer horn bolt and install the previous hardware. Bolt the previously assembled forward structure into the U-brackets with the correct hardware.

FIGURE 14-07





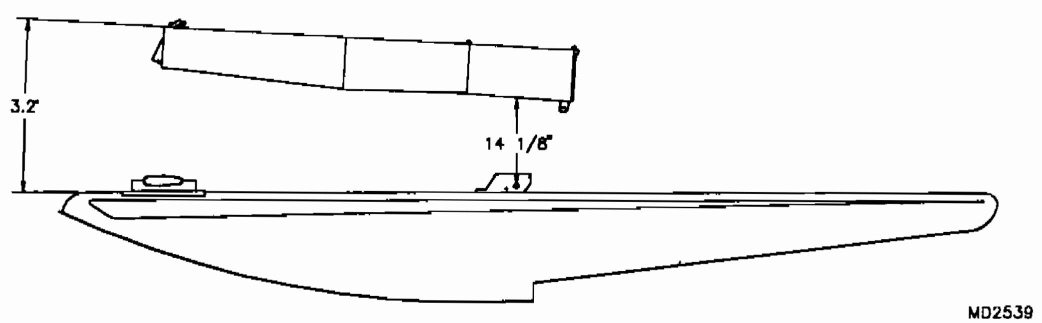
8. Lift the aircraft to a height that allows the floats to be placed underneath. Supports should be placed underneath the wings at the strut attach points. **Do not** place excessive weight on the tailboom; only use it to balance the aircraft. Remove the existing main gear from the aircraft.

9. Locate the float main gear socket, socket clamp, and aft cross brace. Slip the socket clamp inside the main gear mounting blocks and slide the socket through the block and the clamp from the inside. Remove the aft alignment jig and spread the floats enough to slide the aft cross brace in place. Re-install jig. **Do not drill the cross brace and socket clamp until after the main gear legs have been set.**

10. Slide the two floats, with the jigs still in place, underneath the aircraft. Line up the forward structure with the saddles and doubler plates and bolt in place with the correct hardware.

11. The tail of the aircraft will need to be raised or lowered until a reference dimension of 14 1/8" is achieved from the aft cross brace up to the bottom of the fuselage cage. See **FIGURE 14-011**. Another good check is to level a protractor on the floats, then dial in 3.2° on the longeron between S-2 and S-3. Before inserting, drilling, and bolting the main gear legs in place, check that the alignment jigs are still square. Look to see that the fuselage cage is level across and with the floats and that the aircraft is centered on the floats. To properly center the aircraft, measure from the small centerline dimples at the aft end of each float to the strut attach points and to a common reference point on the tail group.

FIGURE 14-011



12. With all reference dimensions and angles checked, slide the main gear legs into the fuselage cage. Rotate until they line up with tabs on the main gear socket. The gear leg should line up on centerline with the holes in the tabs. A small amount of material may need to be ground off the bottom end of the gear leg for proper alignment. With gear legs in place and all reference dimensions and angles checked, transfer drill gear legs 1/4" using the tabs on the sockets as a guide. Drill from each side to ensure accuracy. Locate the four float mounting brackets. Bolt one of these to the front side of the gear leg socket that was just drilled. Drill the gear leg sockets in the fuselage cage using the same procedure and bolt in place. Center the cross brace between sockets, align pre-drilled holes with socket tube centers and check to make sure airfoil is aligned with slip stream. Size drill, debur and bolt in place.

13. Bolt the other two float mounting brackets to the bushings located just forward of S-3. Make sure to include a rod end with each. Refer to the parts drawing. Rotate the mounting bracket in line with the bottom mounting bracket. Check alignment with a straight edge. A small amount of tweaking may be necessary to achieve perfect alignment. Remove top bracket, install the airfoil shaped fuselage support over the bottom bracket, slide top bracket inside fuselage support and bolt back in place. Line up pre-drilled holes with brackets. Sight from front and back of aircraft to ensure support is lined up with the slip stream, and drill each hole through mounting bracket. Bolt in place with correct hardware.

14. Install the nose gear retract assembly onto the forward cross brace with the correct hardware. Thread the anti-torque rods onto the rod ends bolted to the aft float bushings. Make sure to include jam nuts. Thread rod end into the opposite end of rods and adjust so they install with only a slight amount of tension. Once installed, tighten jam nuts securely.

PUDDLE JUMPER FLOATS
MAIN GEAR RETRACTION SYSTEM

1. Locate parts shown in the parts manual.

2. Install the upper and lower guides into each mounting block. Check fit the lock plate. It should slide between the guides without any friction. Adjust accordingly. Check fit the main gear guide block. A small amount may need to be sanded off the bottom to allow the lock plate to work properly.

3. Install the lock cylinder mount angle into the mounting block (orientated as per parts drawing). The mount angle should mount up against the washers on the forward most mount block attach bolts. Transfer drill 3/16" through the mount blocks and floats using the angles as a guide. Install the backing plate on the inside of the float and bolt with the correct hardware. Assemble the shackle to the lock plate. Replace the mount nut on the air cylinder with the stainless steel nut supplied and bolt the cylinder in place. Install the jam nut and clevis onto the cylinder and bolt into the shackle. The clevis may need a small amount of adjustment in or out to achieve proper locking. This should be checked when the entire system is being checked.

4. Bolt the retract cylinder in place on the main cylinder mount. Thread the jam nut and female rod end in place on the cylinder. Slide the stainless steel bolt through the clevis and double nut it to the main gear retraction leg. The clevis will move back and forth on the shoulder of the bolt as the gear travels up and down. Align the main cylinder mount on the center of the float. Make sure the cylinder is mounted far enough aft to clear the locking plate. Once satisfied with the location, transfer drill 1/4" through the floats and bolt in place making sure to include the backing plate.

5. Assemble the wheels, tires, and tubes. The bushing supplied with the axles will need to be cut into two equal length bushings to center the wheel in the aft retraction leg. Install wheel and cotter pin in place.

PUDDLE JUMPER FLOATS
NOSE GEAR ASSEMBLY

1. Locate the parts shown in the parts manual.

2. Clean any excess paint or rough spots in the nose gear socket using a rotary file or drum sander. Check fit nose gear strut. It should fit tight but pivot freely. Once satisfied with the fit, grease the strut and install. Install steer horn on top of the strut, align parallel with station 1 truss and with the nose gear strut in neutral position and transfer drill 3/16" through the strut using the steer horn as a guide. Drill from each side of the steer horn to ensure accuracy. Make sure the bolt is installed from the aft side of the horn.

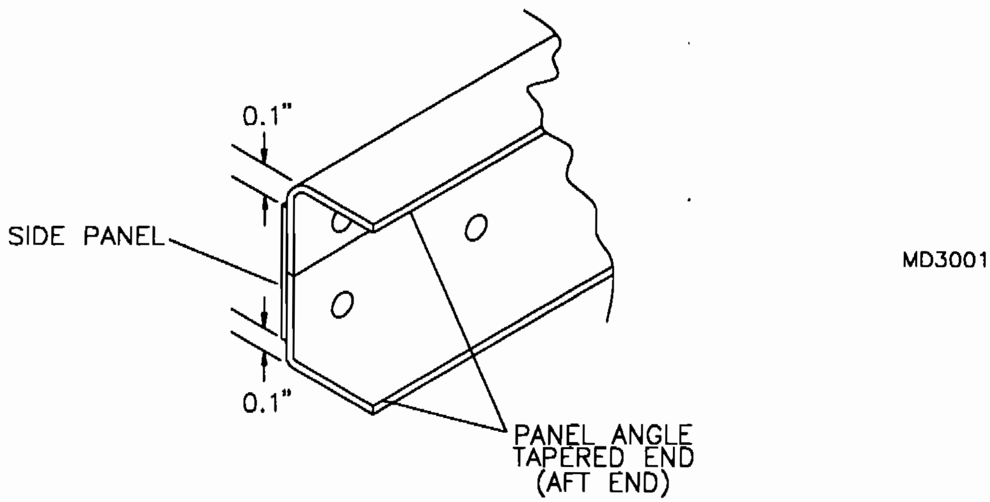
3. Assemble the rim, hub, drum, and tire. Assemble the brake mechanism as per the included sheet. Insert the brake assembly into the brake drum and hold in place by locking the brake arm in place with safety wire or a zip tie. This will ensure the pads are centered on the drum. Slip the brake assembly over the stub or the bottom of the strut and up against the two tabs. Align the brake assembly so the arm is approximately parallel to the ground. Drill the brake assembly using the tabs as a guide and bolt in place with the correct hardware. If the brake pads rub slightly on the drum after installation, a small amount of filing on the brake pads is recommended. Install a washer and lock nut to secure the wheel in place. Installation of the retraction cable, steering cables, and the lock rod will be covered in their appropriate sections.

PUDDLE JUMPER FLOATS
BOX ASSEMBLY

1. Select the components shown in the parts drawing for the float box assembly.

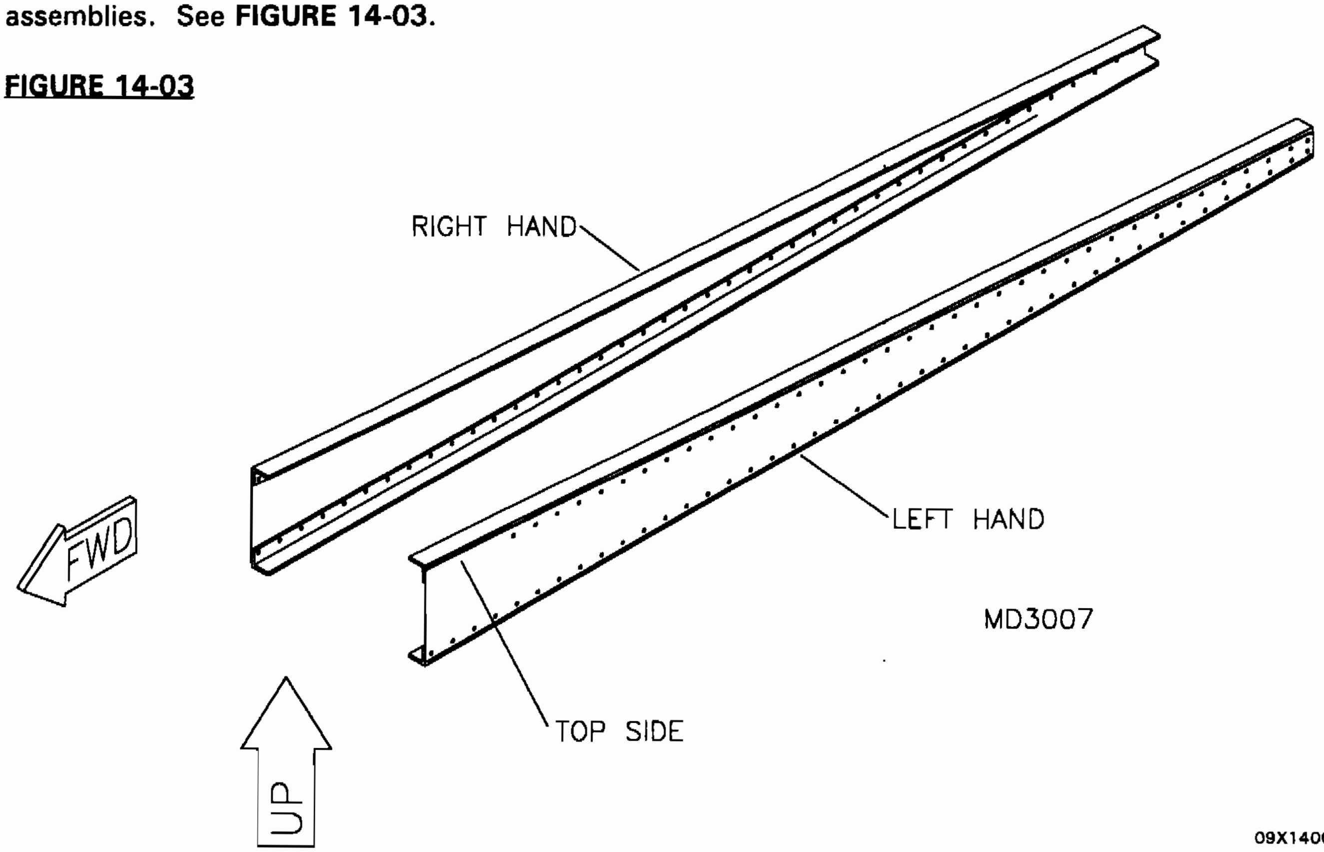
2. The four corner angles come with the aft ends tapered and a left and right pair. Place the angles so the tapered ends meet on the aft end of the side panels as shown in **FIGURE 14-02**. Drill and cleco both side panels to the angle sets. **NOTE**: The side panels are not drilled at the forward end **top** edge, this will be drilled when fitting the attach lugs.

FIGURE 14-02



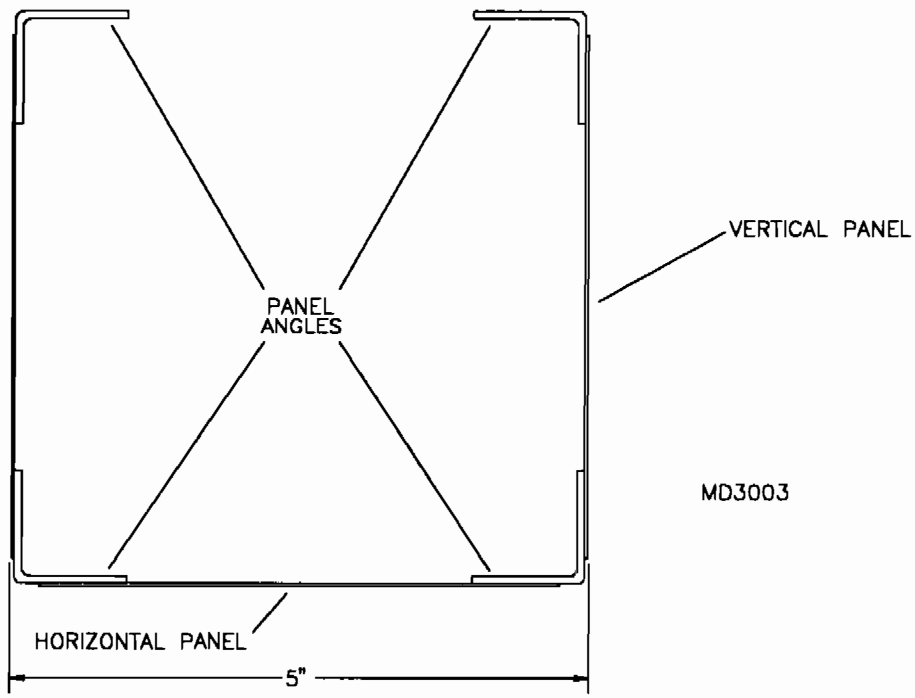
3. Debur the holes in the angles and rivet the side panels to the angles making two mirror assemblies. See **FIGURE 14-03**.

FIGURE 14-03



4. Clamp the bottom panel in place. Adjust so the box will be exactly 5" wide. See **FIGURE 14-04.** Drill and cleco, debur then rivet. **NOTE**: The bottom panel is not drilled on the ends. The ends will get drilled during fitting the lugs to the nose gear and aft cross beam. This is also true for the top.

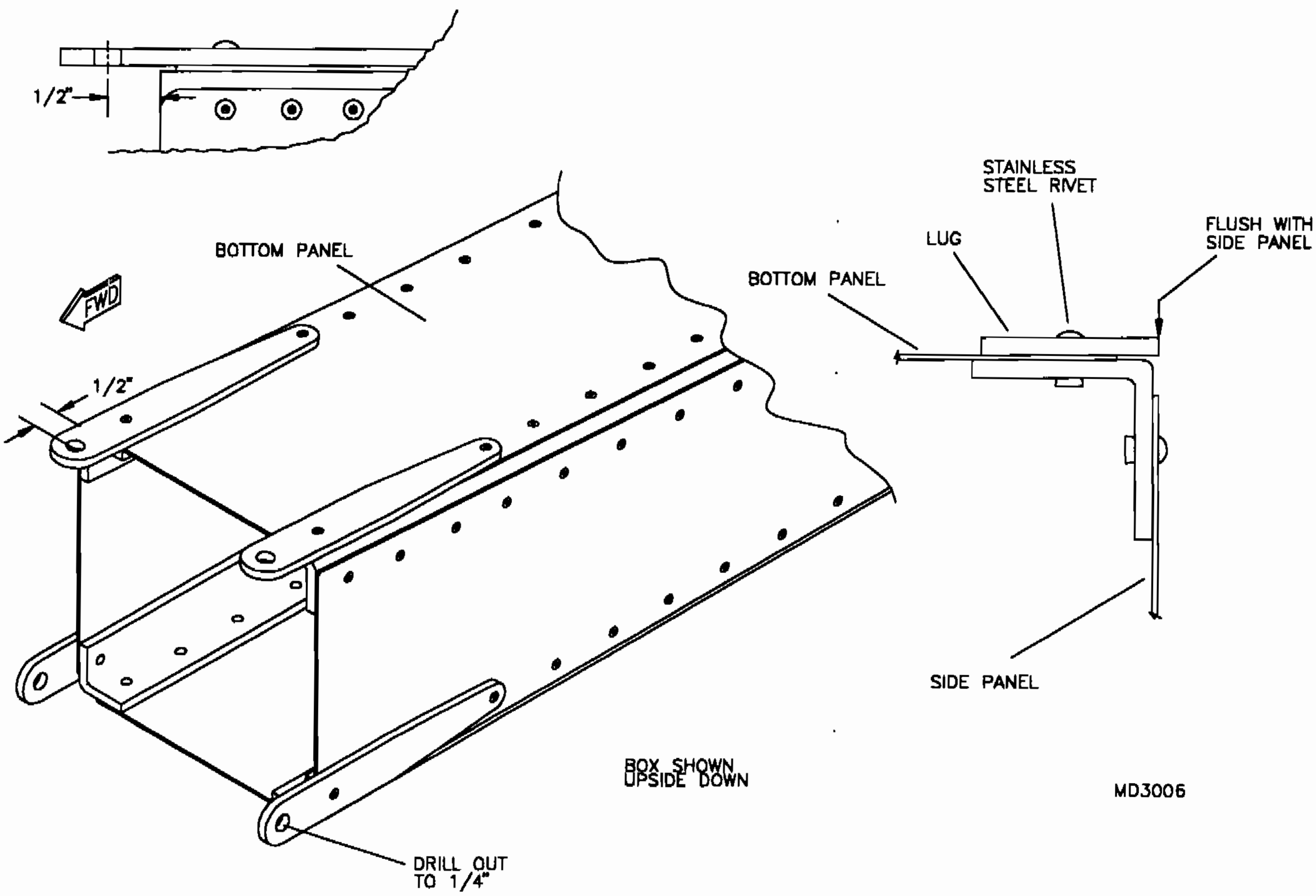
FIGURE 14-04



5. Clamp the top panel in place with the same 5" width. Drill, cleco, debur and rivet. The top panel will need the top forward holes located. Use the same rivet spacing as the pre-drilled holes. The top panels aft end will get the holes located when fitting the lugs.

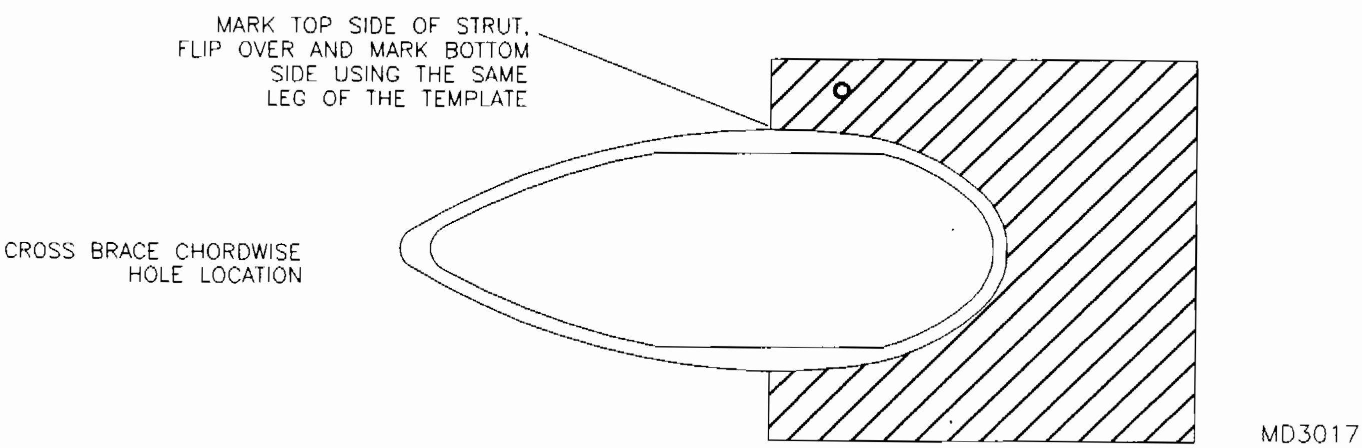
6. Flip the box upside down and place the 2 lugs on the bottom forward end as shown in **FIGURE 14-06.** Drill, debur, and rivet with stainless rivets. Drill the lugs out to 1/4". The lugs extend 1/2" past the edge of the box to the center of the hole.

FIGURE 14-06



7. On the bottom of the nose gear mount are two drilled and tapped holes for the 1/4" bolts. Bolt the box in place on the nose gear and clamp the box to the aft cross beam. The box should match the 5" width of the nose gear mount. The aft end of the box should be on the center of the cross beam. In this position, locate the two bottom aft lugs on the cross beams highest point (camber of the streamline tubes) and drill 1/4" through the cross beam and lugs. **HINT**: The holes must be straight through the cross beam. Use the template provided to help locate the holes. See **FIGURE 14-07**.

FIGURE 14-07



8. Bolt the lugs to the beam. Line them up on the box with the same overhangs as done on the bottom front and drill, debur and rivet with stainless steel rivets.

9. Apply loctite and bolt the two remaining lugs to the top sides of the nose gear mount with 3/16" bolts. Line them up with the edge of the box, drill, debur and rivet with stainless steel rivets.

10. Remove and paint the box assembly.

PUDDLE JUMPER FLOATS
STEER CONTROL SYSTEM

1. Locate the parts shown in the parts manual.

2. Replace the forward control stick torque tube mount bolt with the eyebolt called for on the parts list. Assemble the pulleys and cable keepers as shown, making sure to include the cables as assembling. Attach the eyebolts on the lower end of the cables to the steer horn on the nose strut. Slide the steer horn onto the nose gear insert flush with its bottom. Drill and bolt the steer horn in place aligned with the nose gear-steer horn already in place. Attach the top end of the cables to the steer horn as shown on the parts drawing. The top part of the cables **SHOULD** cross. Adjustment of the cable tension should be made with 40 lbs. placed on the forward cross brace.

PUDDLE JUMPER FLOATS
NOSE GEAR RETRACTION SYSTEM

1. Locate the parts shown in the parts manual.

2. Assemble the two cylinder clamps and the cylinder onto the forward strut just aft of the instrument panel. If you are installing onto a mini-pod style aircraft, you must drill a 1 1/8" clearance hole centered on this cylinder through the mini-pod frame support (See parts drawing). Thread the jam nut and clevis onto the cylinder and attach nosewheel retract cable into clevis with correct hardware.

3. Loosely bolt the pulley to the pulley mount brackets and clip into place around the nose gear bottom collar. Make sure to include cable keepers. Run the cable through the pulley and attach to the tab on the nose gear strut. Slide the pulley mount brackets up or down the nose gear collar until the cable is aligned parallel to the cylinder. Once happy with its location, clamp in place, drill 3/16", debur, and bolt in place with the correct hardware. To adjust the cable tension, move the cylinder clamps up the forward strut and tighten.

4. Install the lock cylinder mount bracket in place as per the parts drawing. The spacing between the mount holes should determine its location. Make sure it clears the nose gear-steer horn and is perpendicular to the station 1 top or bottom truss tube. Assemble the shackle and lock rod as per the parts drawing. Exact adjustment of the lock rod should take place after the air system is installed.

PUDDLE JUMPER FLOATS
VALVE, TANK AND COMPRESSOR INSTALLATION

1. Locate the parts shown in the parts manual.

2. Locate the valve in an easily accessible location below the flap handle. Use the hardware provided to secure in place.

3. Bolt the air tank and compressor in place as shown on the parts drawing. On partial and fully enclosed models, "Z" strips that retain the belly pans will need to be notched out to install the cushioned clamps. Use the compressor as a guide to locate the mount holes.

PUDDLE JUMPER FLOATS
RETRACTION SYSTEM SCHEMATIC

1. Locate the parts shown in the parts manual.

2. Install all fittings to their appropriate cylinders. Route and secure all air lines neat and out of the way of any control systems.

3. Install the pressure gauge, switch, and indicator light into the instrument panel. Wire according to the schematic.

4. When testing the retraction system, note that the nose wheel retract cylinder has adjustable fittings. These are used because it takes less pressure to retract the nose gear than the main gear. Adjust accordingly. Test all locks and retract mechanism and make any necessary adjustments.

PUDDLE JUMPER FLOATS
OPERATIONS, TESTING, FLYING

OPERATION

The forward valve controls the locking mechanism. The aft valve controls the raising and lowering of the main gear. Make sure that the system contains at least 80psi of pressure before attempting to raise or lower the gear. The system will automatically shut off at 120psi, but it is recommended to manually shut off the compressor at 100psi.

RAISE GEAR: Lift the forward valve to unlock the wheels. Lift the aft valve to raise the main gear. Press down the forward valve to lock the gear in the up position.

LOWER GEAR: Lift the forward valve to unlock the wheels. Press down the aft valve to lower the main wheels. Press down the forward valve to lock the wheels in the down position.

UPKEEP: Keep the up/down locks clean. Lubricate them with silicon or WD-40 in areas where the locks slide or pivot. Inspect for signs of internal corrosion in the form of blisters in the finish. Use an ice pick to press against steel or aluminum parts. If the "prick" test should penetrate, the part or parts require replacement. Parts such as the tail boom extension are **HIGHLY** susceptiable to internal corrosion. Check this area often. Replace **ANNUALLY** if in salt water. Inspect the cockpit cage and all steel tube parts for blister and use the "prick" test.

NOTE: It is a good idea to familiarize yourself with the orientation of the gear and locks in the raised and lowered positions. This should be visually checked before each landing to ensure proper gear location.

TESTING / FLYING

We assume since you have purchased floats you are a float rated pilot. We also assume you will approach the task of testing on ground, water and air with the same common sense and logic that has allowed you to survive as a pilot this long. At this point we wish you luck and remind you to be careful and don't drown! Remember flying is filled with risk and float planes more than double the danger!

GEAR-UP LANDINGS ON LAND

In the event of a gear extension failure, place the gear in the up position and land on a suitable surface such as grass. **CAUTION**: Wet grass will add considerable length to the roll. Plan a distance equal to wheels with no brakes.

After landing, the gear can be extended by placing the valves to lower gear and close the locks. Leave the compressor on. Lift the plane at the jury strut high enough to drop the gear on that side. Lift the nose gear and hand extend the nose gear. Lift the nose of the plane at the front cross beam on the side of the un-extended gear. Taxi to parking. Inspect, clean and lube the locks.

S-12XL OPTIONAL INSTRUMENT PANEL INSTALLATION

NOTE: The thermal-formed panel housing is molded as one piece. At first glance, one might think the housing is too wide for the panel. Actually, the housing must be cut in half. Each side then rotates 90 degrees towards each other. The cut, rolled edge of the housing is against the instrument panel face. Presto, it now fits perfect.

1. Both left and right halves of the instrument panel housing must be cut and trimmed from the vacuum-formed stock supplied with your kit. Carefully separate the halves by cutting down the groove between the housing halves. Once separated, trim all excess material from the housing halves, leaving no flashing. See **FIGURE 014A-01**. Note that the left half of the housing incorporates a joggled flange, which accepts the right half; to fit properly, all edges should be trimmed square and sanded smooth. The exception is the outer edge of the housing. By cutting down the center of the groove, a nice rolled edge will result. Refer to **FIGURE 014A-01A**. Cut a 1" hole near the base of the right half of housing for instrument wiring; see parts manual for approximate location.

FIGURE 014A-01

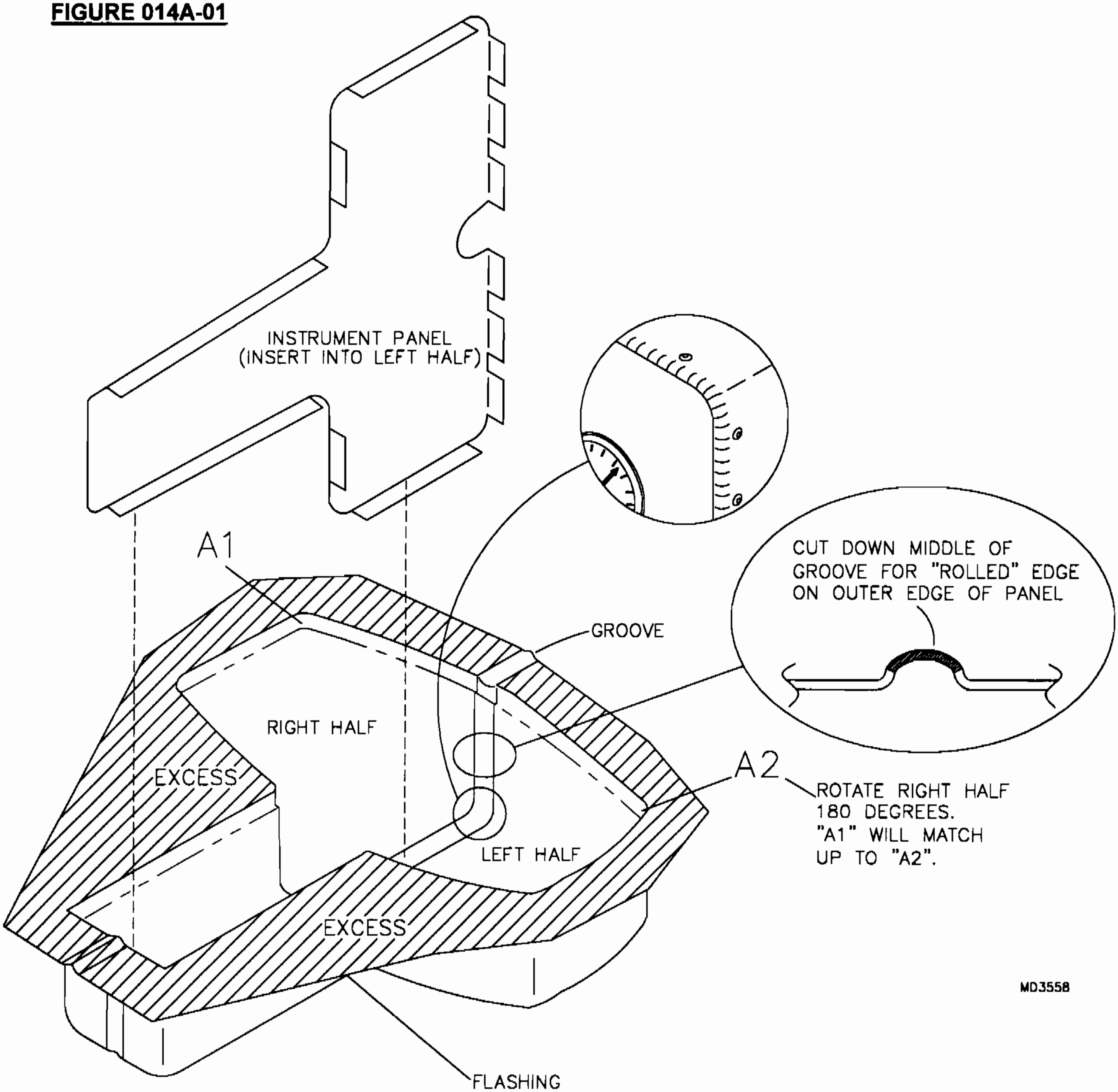
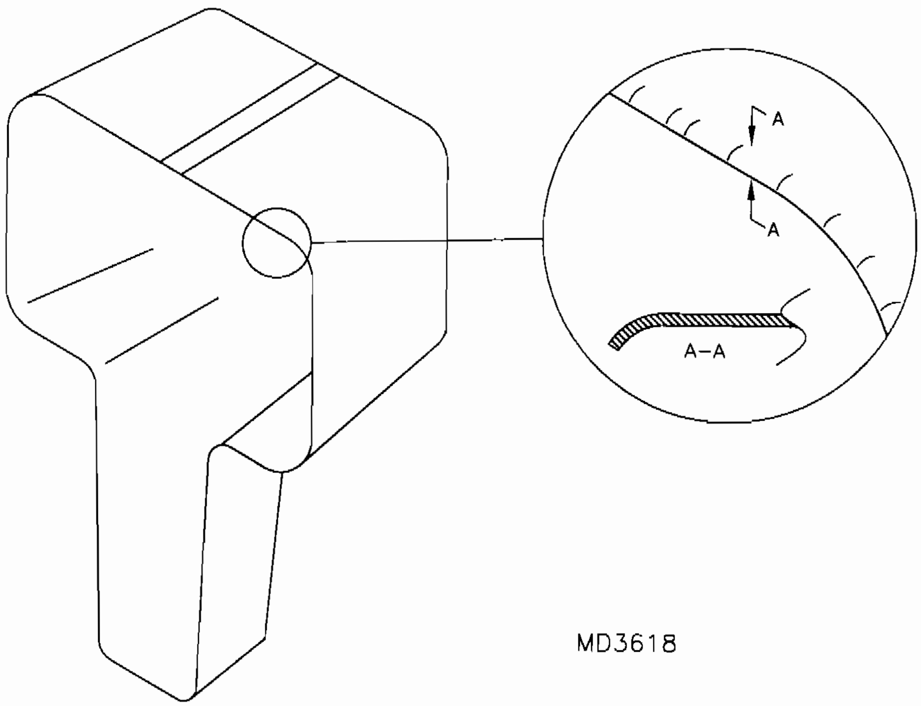


FIGURE 014A-01A



2. Install the nut plate and attach angle to the tab in the center of the station two bottom cross tube. Attach the nut plate to the instrument panel. Refer to the parts manual. Position the instrument panel into the fuselage so that it is standing vertical between the mount angle and the forward strut. Bend the mount tang to match the angle between the forward strut and instrument panel. Bolt tang to panel. Transfer drill through the tang into the forward strut and rivet. Install instruments, gauges, etc. and complete wiring.

3. Position the housing halves around the instrument panel. Mark and trim a notch in each half for the forward strut to exit. Mate the halves around the instrument panel using the hardware shown in the parts manual

NOTE TO S-12XL/503 BUILDERS: Builders interested in fitting their ***Rotax 503*** engines with an oil injection system should contact their Rotax engine suppliers.

S-12 OPTIONAL D&F WING INTERNAL STRUCTURE

1. Locate the parts shown in the parts manual.

2. Install the four compression tubes using the hardware shown in the parts manual. Before bolting the middle compression tube in place, slip on the compression tube doubler. The compression tube doubler is a 4" tube 1 1/8" in diameter. Bolt the flap compression tubes with the hole for mounting the flap hardware closest to the trailing spar.

3. Install the drag braces. Note bolt orientation. Only finger tighten nuts at this time. The bolts will have to be removed later to allow the installation of the ribs. **NOTE:** Filing may be necessary at the trailing edge end to clear bolts.

4. Install the W-WC-51 and W-WC-59 cables used to stabilize the wing tip's last two bays. The W-WC-51 is installed by bolting the shorter cable between the AFT spar's S2-SAB at the AFT strut plate, and the S2-SAB bracket at the outboard compression tube. The W-WC-59 cable is also bolted to the S2-SAB bracket on the outboard compression tube and to the wing-tip corner gusset. See **FIGURE 014C-04**. First, bolt the thimble end of the **SHORT** cable to the S2-SAB at the AFT strut plate using an AN3-16A bolt, a plastic washer, a 1/4" X .028 X 3/16" bushing and a 3/16" shear nut. Fabricate the bushings from raw stock. See **FIGURE 014C-04A**. Now insert the AN3-16A bolt up through the S2-SAB on the leading edge spar and the compression tube (threads up) and place the adjustable tang of the short cable on the bolt (Adjust cable to be tight). Place the adjustable tang of the LONG cable on the bolt using the hole nearest the tang end and leave the thimble end hanging loose at this time.

FIGURE 014C-04

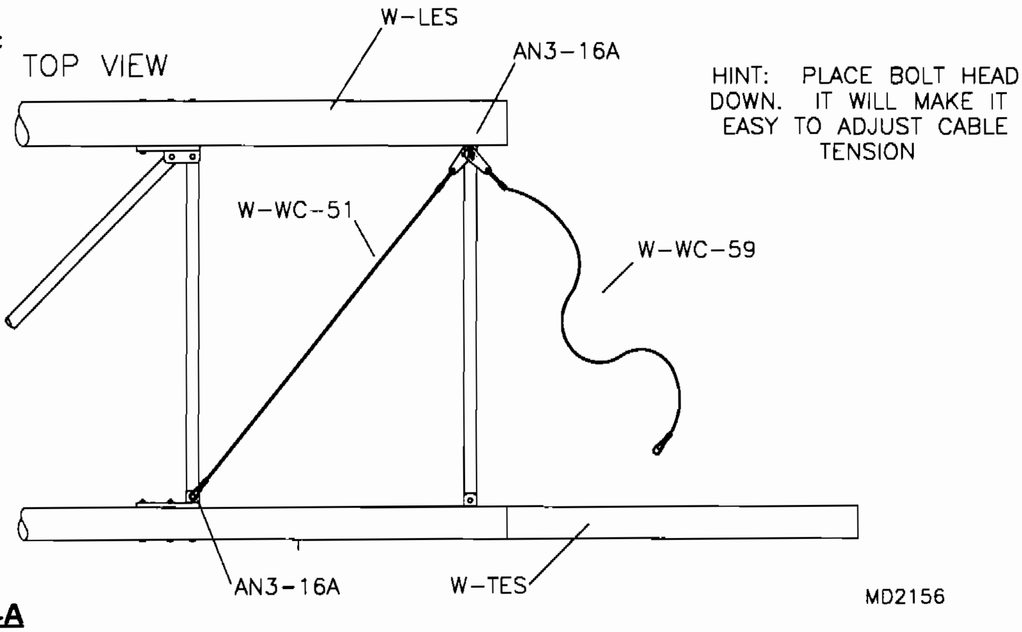
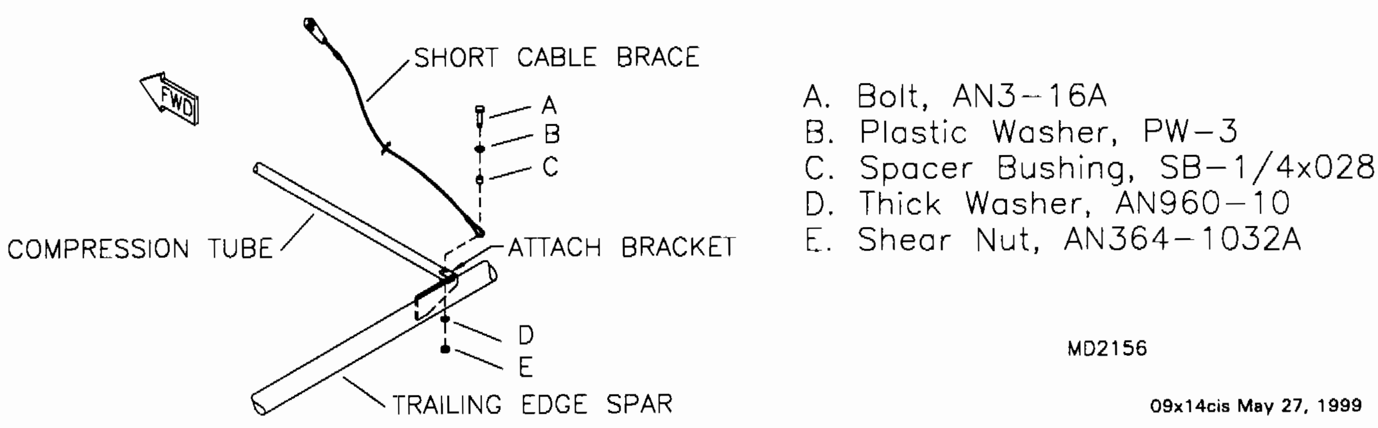


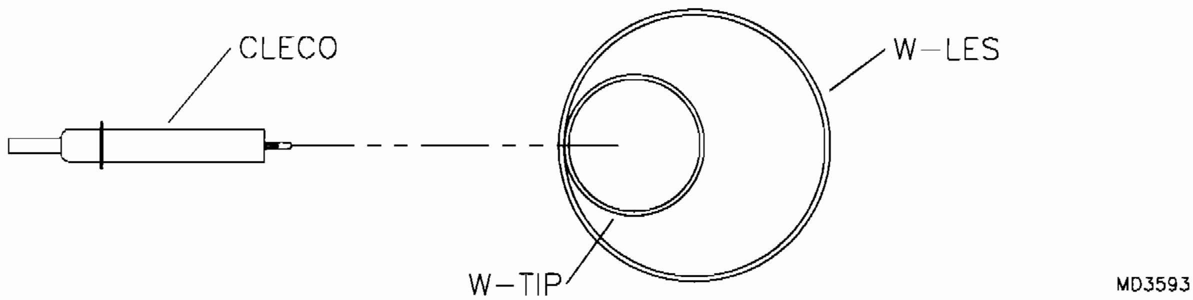
FIGURE 014C-04A



5. Install the jury strut bracket. The bracket is attached to the long wing channel's outboard hole on the LES. Look closely at the drawing of the spars for location and position. **IMPORTANT:** Double check the position of the jury strut bracket before covering!

6. Insert the tip bow's drilled end into the leading edge spar so that the tip bow's first hole lines up with the **FOURTH** inboard hole on the LES and cleco. **IMPORTANT:** The tip bow must be flat against the spar on the inside. See **FIGURE 014C-06.**

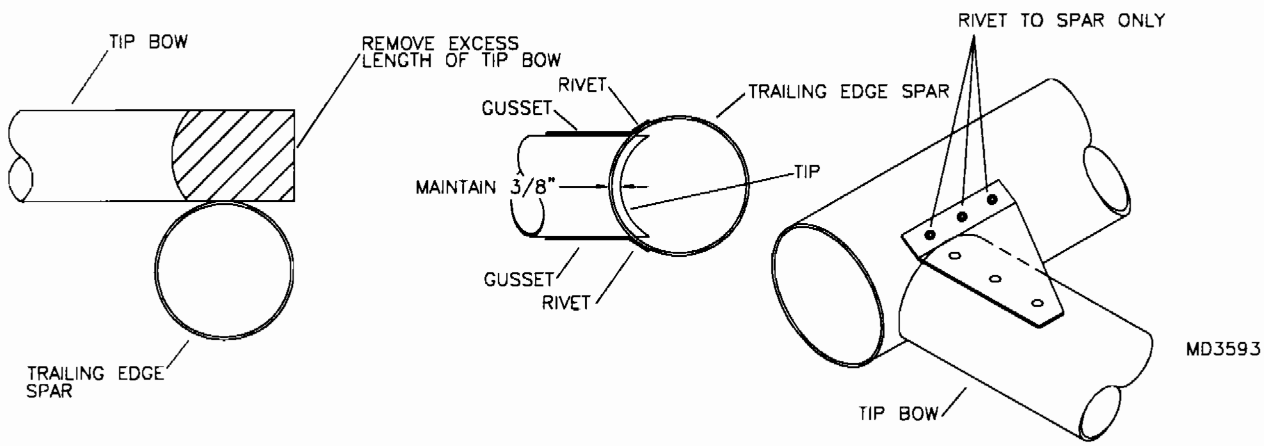
FIGURE 014C-06



7. Line up the bow parallel to the spar and drill through the remaining three (3) holes. Cleco each hole before drilling the next..

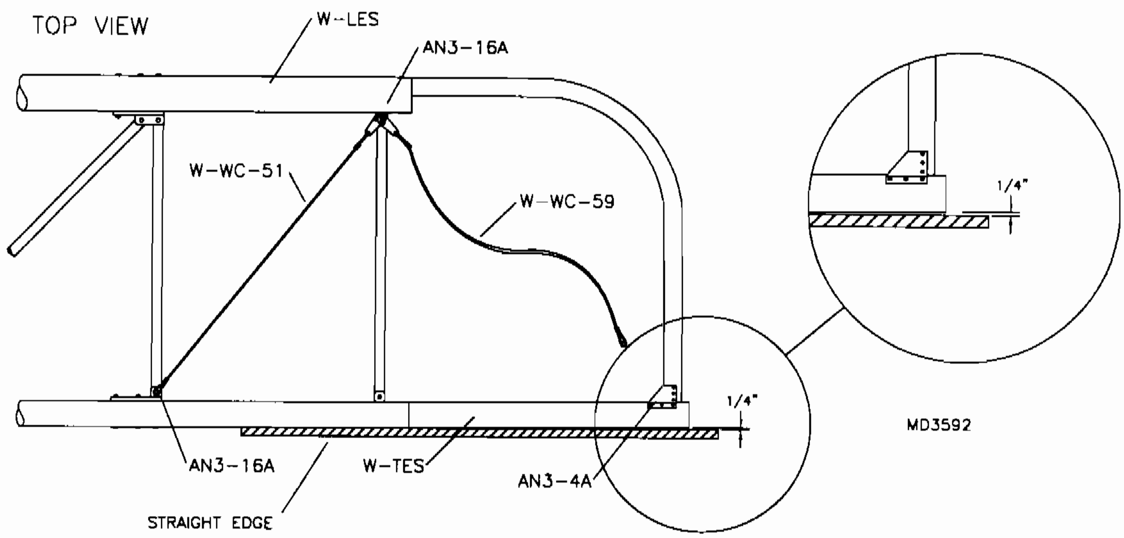
8. Place the aft end of the tip bow on top of the trailing edge spar tip extension. Determine the amount of the tip bow to be removed and file and fit the tip bow's aft end into the trailing edge spar's tip extension. See **FIGURE 014C-08.** Use the 2" tube with the 1 3/8" half hole to mark the tip end. Approximately 1 ½" of the tip bow will have to be trimmed off. Rivet the top gusset to the trailing edge spar with (3) 1/8" stainless steel pop rivets. **DO NOT** drill or rivet the tip tube to the gusset until the tip cable is installed. If done prior to cable installation the wing tip skins will not fit properly.

FIGURE 014C-08



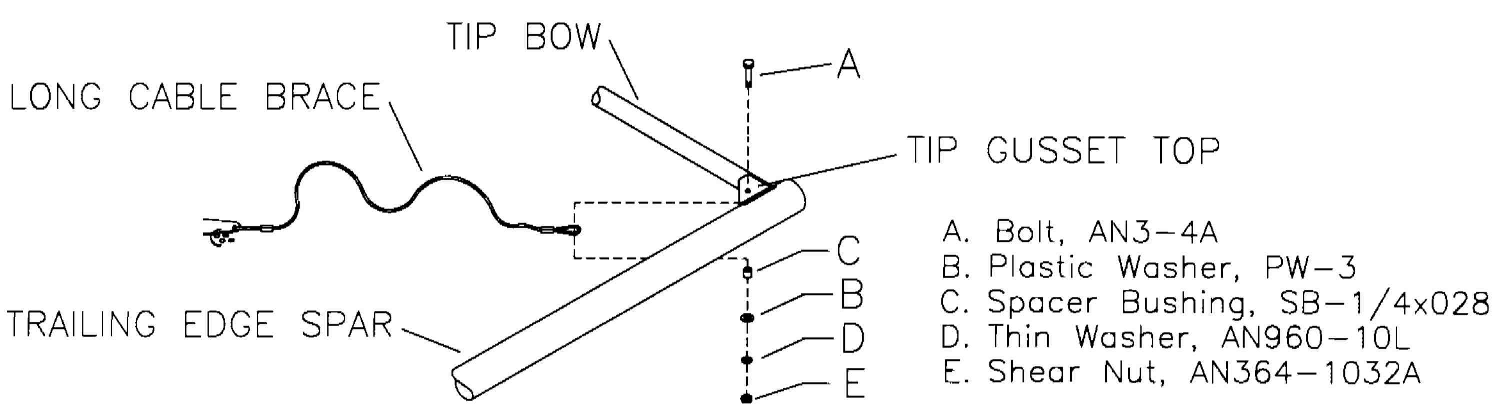
9. Establish approximately a 1/4" forward bow in the trailing edge tip extension. The bow will be straightened by the wing skin. See **FIGURE 014C-09**. Clamp or tape a straight edge in place before drilling the gusset for the cable attach nut. Cable tension can be adjusted at the tang's end or by twisting the cable. Sight down the front of the LE spar and tip bow to ensure that they are in line. After double checking proper alignment, drill and rivet the (3) 1/8" stainless steel pop rivets into the gusset and tip bow. Make sure that the tip bow is not allowed to move during the drilling process.

FIGURE 014C-09



10. Pull tight the thimble of the outer cable toward the gusset and mark the hole location. **NOTE:** Make sure to locate the hole in the gusset with enough distance from the trailing edge and tip bow to allow for the bolt and nut assembly to fit freely. Cable length can be adjusted at the tang end. Drill a 3/16" hole in this location. Using an AN3-4A bolt, a plastic washer, a 1/4" X .028 X 3/16" bushing and a 3/16" shear nut attach the long wing cable to the gusset. See **FIGURE 014C-10**. Set proper tension by using the multi-hole tang or twisting the cable. The cable should be as tight as possible without effecting the 1/4" tip bow set earlier. Now flip the wing over and attach the bottom wing tip gusset.

FIGURE 014C-10

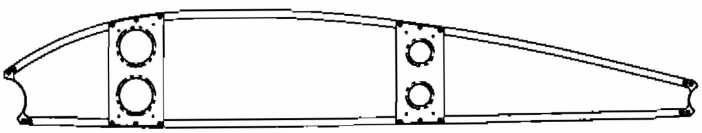


MD3592

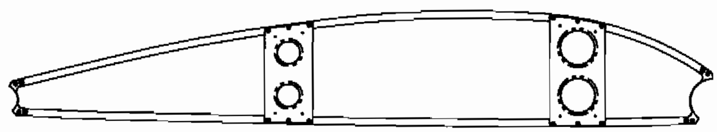
S-12 OPTIONAL D&F WING RIB ASSEMBLY AND INSTALLATION

BEGINNING NOTE: The design of our wing rib is such that it will be necessary to assemble both left and right hand ribs as well as several special ribs. All of these ribs can be assembled in the same rib jig simply by reversing the jig backing plate and inner jig. The special ribs are distinguished by either the location, or the design of the compression plates and will also be right and left hand. Study the exploded view drawing now and familiarize yourself with the wing ribs. Take special note of the root rib compression plate orientation. Refer to the chart below for quantities of each.

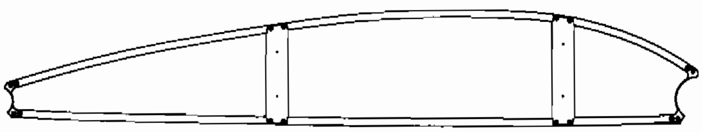
S-12 WING RIB CHART



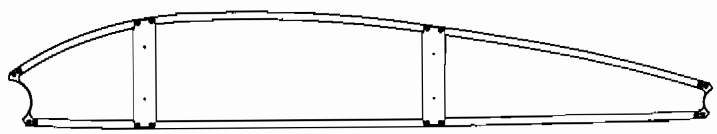
MAIN RIB, LEFT HAND – (8) REQ'D.
(2 USED IN THE LEFT HAND WING, POSITION #7 & 8. 6 USED IN THE RIGHT HAND WING POSITION #2,3,4,6,9 & 10)



MAIN RIB, RIGHT HAND – (8) REQ'D.
(2 USED IN THE RIGHT HAND WING, POSITION #7 & 8. 6 USED IN THE LEFT HAND WING POSITION #2,3,4,6,9 & 10)



ROOT RIB, LEFT HAND – (1) REQ'D.



ROOT RIB, RIGHT HAND – (1) REQ'D.

#1 RIB, LEFT HAND – (2) REQ'D.
(2 USED IN THE LEFT HAND WING, POSITION #1 & 5.)

#1 RIB, RIGHT HAND – (2) REQ'D.
(2 USED IN THE LEFT HAND WING, POSITION #1 & 5.)

MD3596

1. Prior to assembling the ribs, it will be necessary to assemble the rib jig. Gather all parts for the rib jig as per the parts drawing. You will note that some of the parts in the jig will have to be fabricated from the plywood removed from your shipping crate. Begin the jig assembly by cutting the jig backing plate out of the plywood from your shipping crate to the same dimensions as the outer jig. See **FIGURE 014C-01**. Verify the dimensional accuracy of the jig cord by measuring the jig and comparing it to the assembled wing frame. Correct any variations by lightly sanding or adding shims to the jig at the rib clip locations. Screw the outer jig board to the backing plate. Dry assemble one complete rib, with the exception of the rib compression plates. Take note, that while the bottom rib does look almost symmetrical, there is a forward and aft end. The forward end will be designated with a black mark on the rib. Also note that there is a top and bottom to both the forward and aft rib clips. See **FIGURE 014C-01B**. Do not drill any holes or pop any rivets into the rib assembly at this time. **NOTE:** Make sure that the bottom rib is positioned with equal edge distance to the hole in the rib clip on each end. Place the assembled rib on the plywood backing plate within the outer jig board. Insert the inner plywood jig into the rib. The inner piece should lock into its correct position by compressing against the rib and the outer jig board. Some minor sanding to the jig may be required to obtain the proper fit. If so, sand only the outer jig. **NOTE:** there should be a small gap between the inner jig and the forward and aft rib clip. Use a tapered wood dowel pressed between the inner jig and the aft and forward rib clips to retain the clips in there correct position. See **FIGURE 014C-01A**.

FIGURE 014C-01

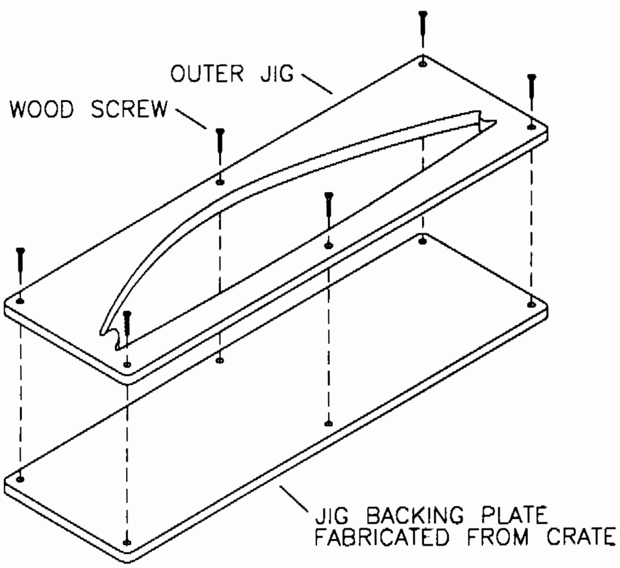


FIGURE 014C-01A

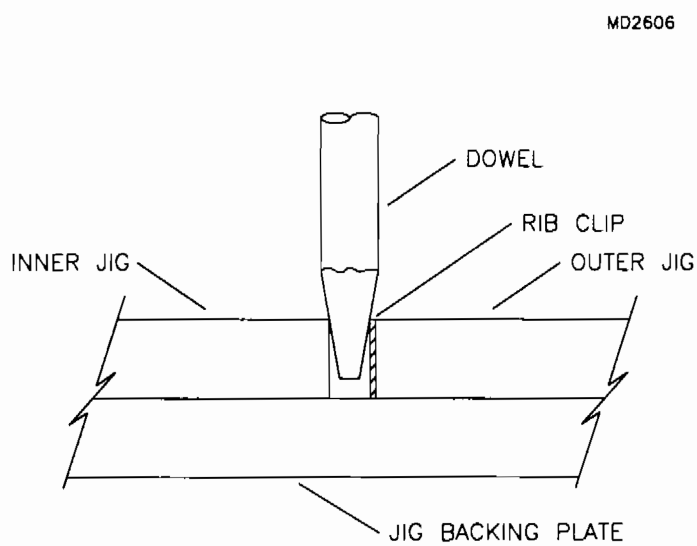
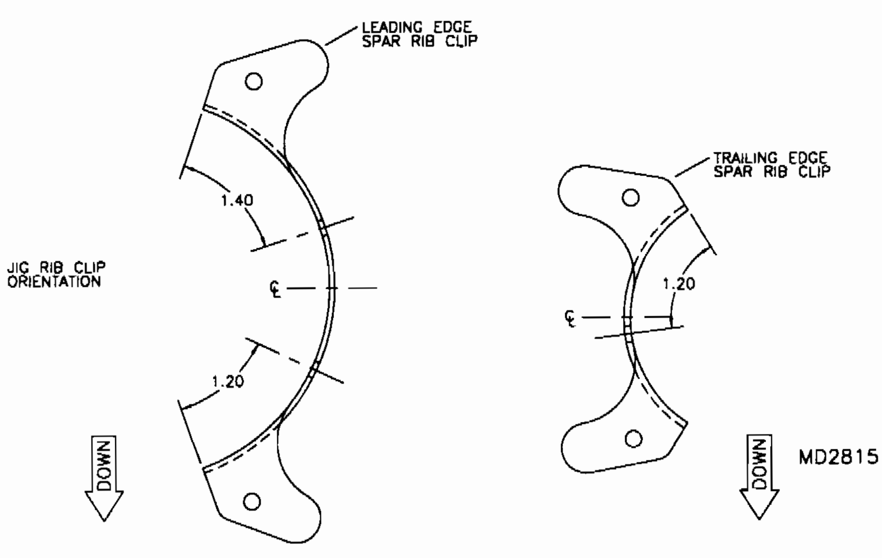


FIGURE 014C-01B



2. Position the forward and aft rib compression plates on the jig so that the top and bottom rivet holes are on centerline of the rib. There will be four predrilled holes in the inner jig at this location to pick up the tooling holes in the compression plates. The side flanges of the plates should be in the up position. Once satisfied with the position of the compression plates, from the 1/8" stainless rod provided cut twelve pins 5/8" long. Round the ends and press them into the tooling holes through the plates and into the predrilled holes in the jig. This will lock the plates into there correct position. The pins should be driven in as straight as possible to allow removal of the compression plates. See **FIGURE 014C-02**. After installing the eight pins, screw the inner jig in place and remove the forward and aft compression plates.

Locate the forward and aft compression plates for the root rib and follow the same procedure as before for locating the 1/8" pins. The root rib compression plates will only have two pin locations.

Remove the root compression plates and follow the same procedure for locating the #1 rib compression plates. See **FIGURE 014C-02A**.

FIGURE 014C-02

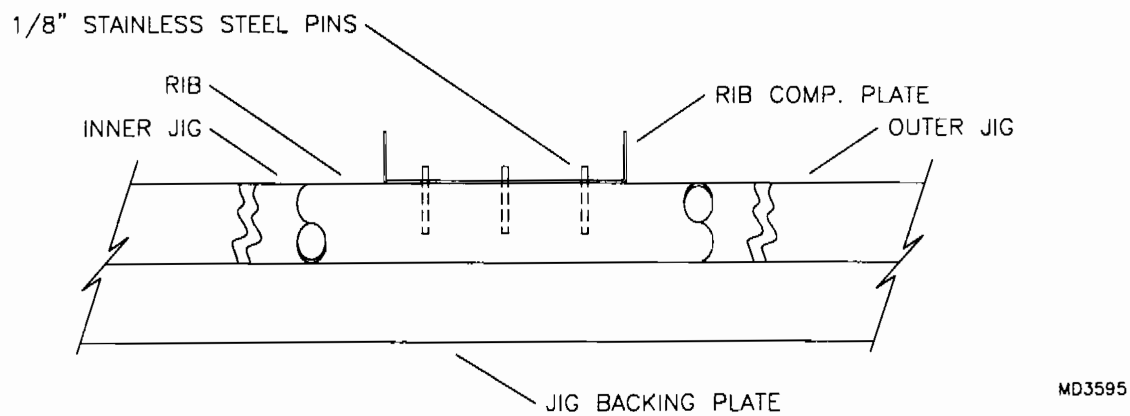
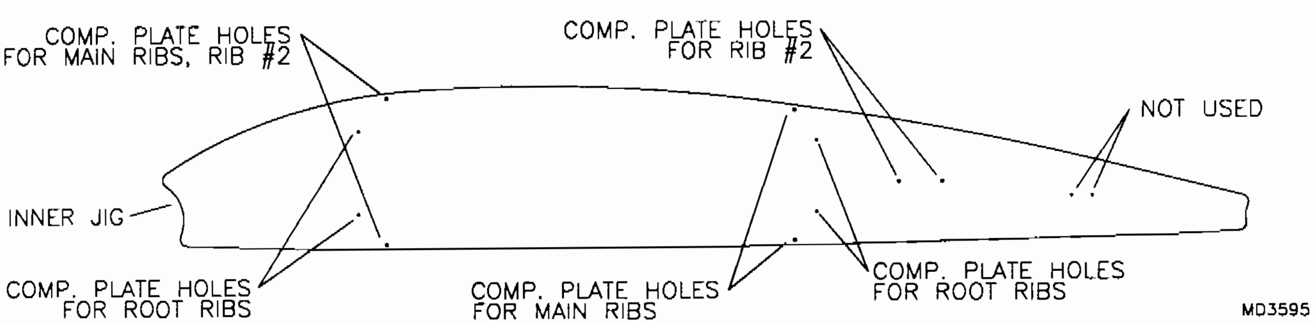


FIGURE 014C-02A



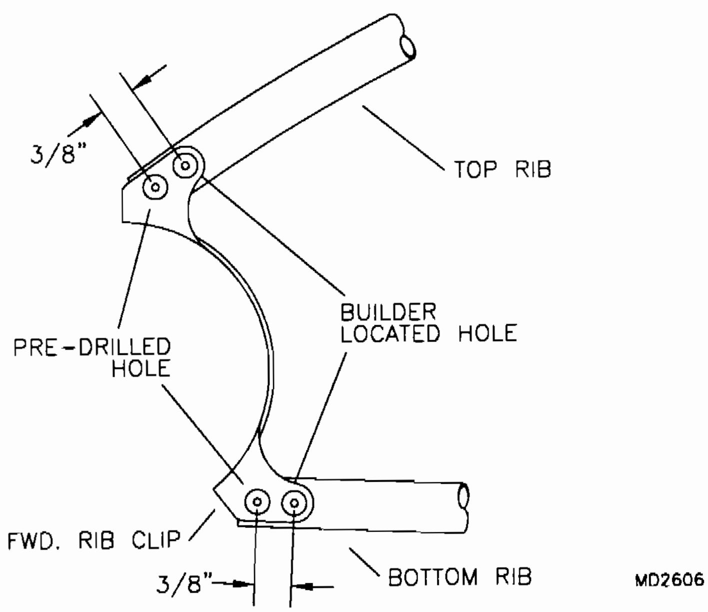
3. With the jig completely assembled and one complete set of rib components in place, transfer drill with a #30 drill bit through the predrilled hole in each rib clip into the rib and rivet. Locate the second hole 3/8", center hole to center hole from the first, and on center line of the rib, click punch, drill and rivet. See **FIGURE 014C-03**. Drill and rivet in place both the forward and aft compression plates. Remove the rib assembly from the jig. Drill and rivet the opposite side rib clips, following the same procedure used on the first side. Verify the rib fit by installing it into the assembled wing frame. The fit should be snug without bowing the rib assembly. Make any necessary adjustments before continuing. Assemble all ribs for this side of the jig (right or left hand for a total of 11 ribs). Be aware that three of these ribs will take either a different compression plate (root rib), or a plate in a different location (#1 rib). See rib chart and refer to the parts drawing.

Remove the jig backing plate and install on the other side of the inner and outer jig. Be sure to maintain top and bottom and end orientation of jig. Assemble another set of 11 ribs on this side of the jig following the same procedure as before.

SPECIAL INSTRUCTIONS: when assembling the two root ribs, drill, but do not rivet the compression plates into place. After riveting the forward and aft rib clips into place, remove the rib from the jig and rivet the opposite side of the rib clips. Rivet the left hand compression plates to the right hand rib and the right hand compression plates to the left hand rib. This will orientate the plates so that the flanges of the plate are pointed to the tipboard side of the rib. Refer to the parts drawing and the rib chart.

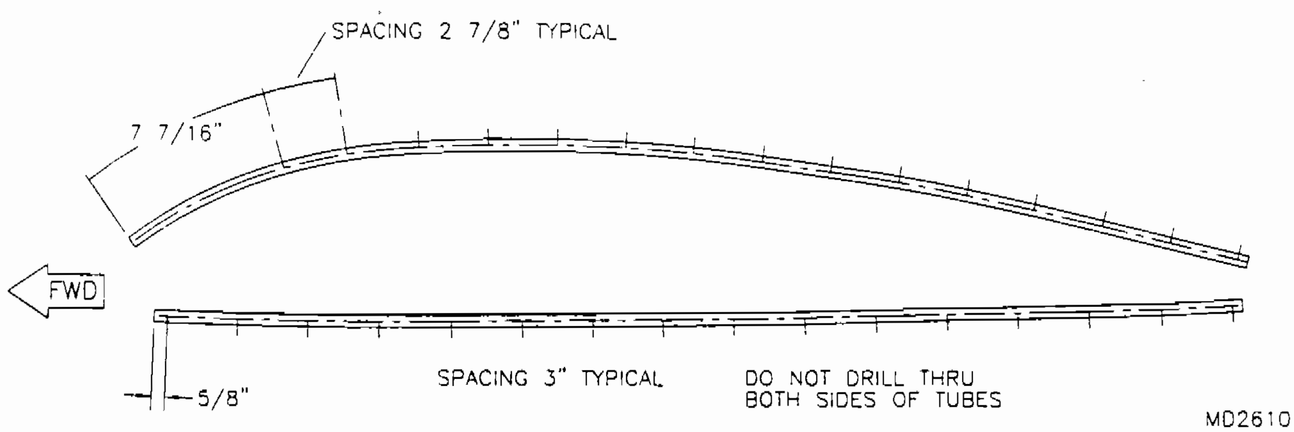
Lay the root ribs on a flat work surface, position the root rib close outs on the **ROOT SIDE** of the root rib. The close outs will, for the most part, position themselves. Once the root close outs are correctly positioned, transfer drill with a #30 drill bit through the predrilled holes in the close outs and into the top and bottom ribs. Use clecos to retain the close outs in position. After all hole locations have been drilled, remove the close outs. The close outs will be installed after the close outs are painted, and the wings are covered and painted.

<u>**FIGURE 014C-03**</u>



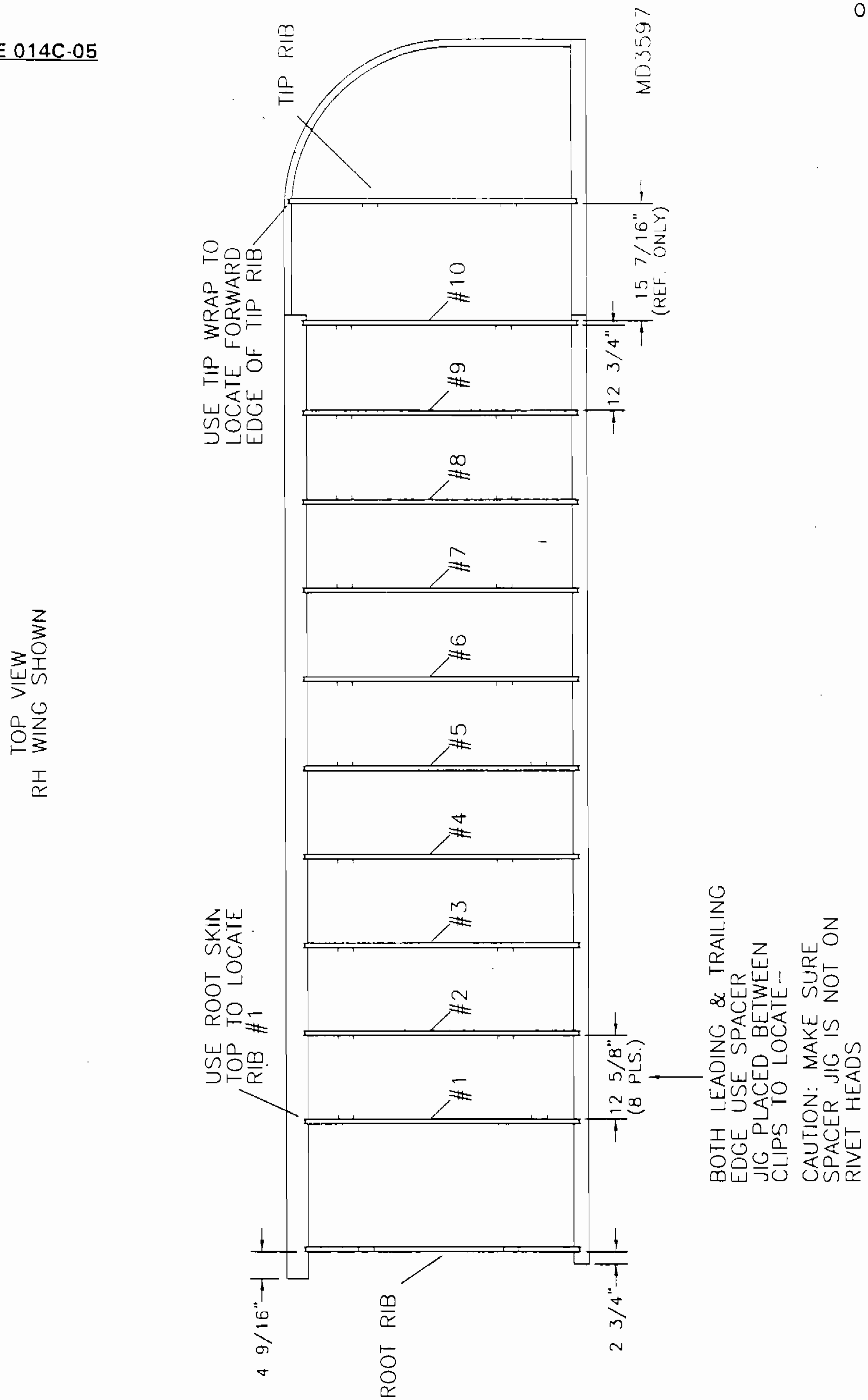
4. Lay out and mark the hole pattern onto each rib as shown in **FIGURE 014C-04. DO NOT** drill the root or #1 rib. Both of these ribs will be drilled during the installation of the top and bottom root skins. It is important that these holes be on top centerline of the top rib, and on bottom centerline of the bottom rib. After marking the hole locations, click punch and drill to a #30 <u>through one side of the tube only.</u>

FIGURE 014C-04



5. After assembling two complete sets of ribs, begin installing the ribs into the wing, using only clecos to retain them at this time. Refer to **FIGURE 014C-05** and mark both the leading and trailing edge spars as shown. Refer to the parts drawing for the proper location and orientation of each rib. Install the root rib, drill and cleco in place. Use the root skin top and bottom to position rib #1. Drill and cleco. Fabricate a spacing jig using a piece of wood cut to 12 5/8". Use this jig to locate the position of each rib. Remove one end of each drag brace to allow room for a rivet gun. Remove the bolt from the aft end of the outer tank support to move the root drag brace. Transfer drill and rivet ribs in place. Ribs at the doubler near the jury strut and lift strut use longer rivets. Bolt and tighten both drag braces in place. **NOTE:** The tip rib will be installed after the leading edge wrap and tip wrap have been positioned.

FIGURE 014C-05



6. Cleco the root close outs in place and mark the location of the fuel sight gauge fittings on the close outs. Drill the sight gauge holes to 5/8". This completes the rib assembly and installation.

7. Install the long aileron push pull tube.

S-12 OPTIONAL D&F, WING RIB & SHEET METAL INSTALLATION

1. The top and bottom root skins are pre drilled at the factory. **NOTE:** There is a left and right hand as well as a top and bottom side to the top and bottom root skins.

To assemble the stiffeners to the top root skin, cleco the stiffeners to the **BOTTOM SIDE** of the root skin top. Transfer drill using a #30 drill bit through both the root skin top and the stiffener. Remove the stiffeners Debur and rivet them to the skin using the specified rivets. Refer to the parts drawing.

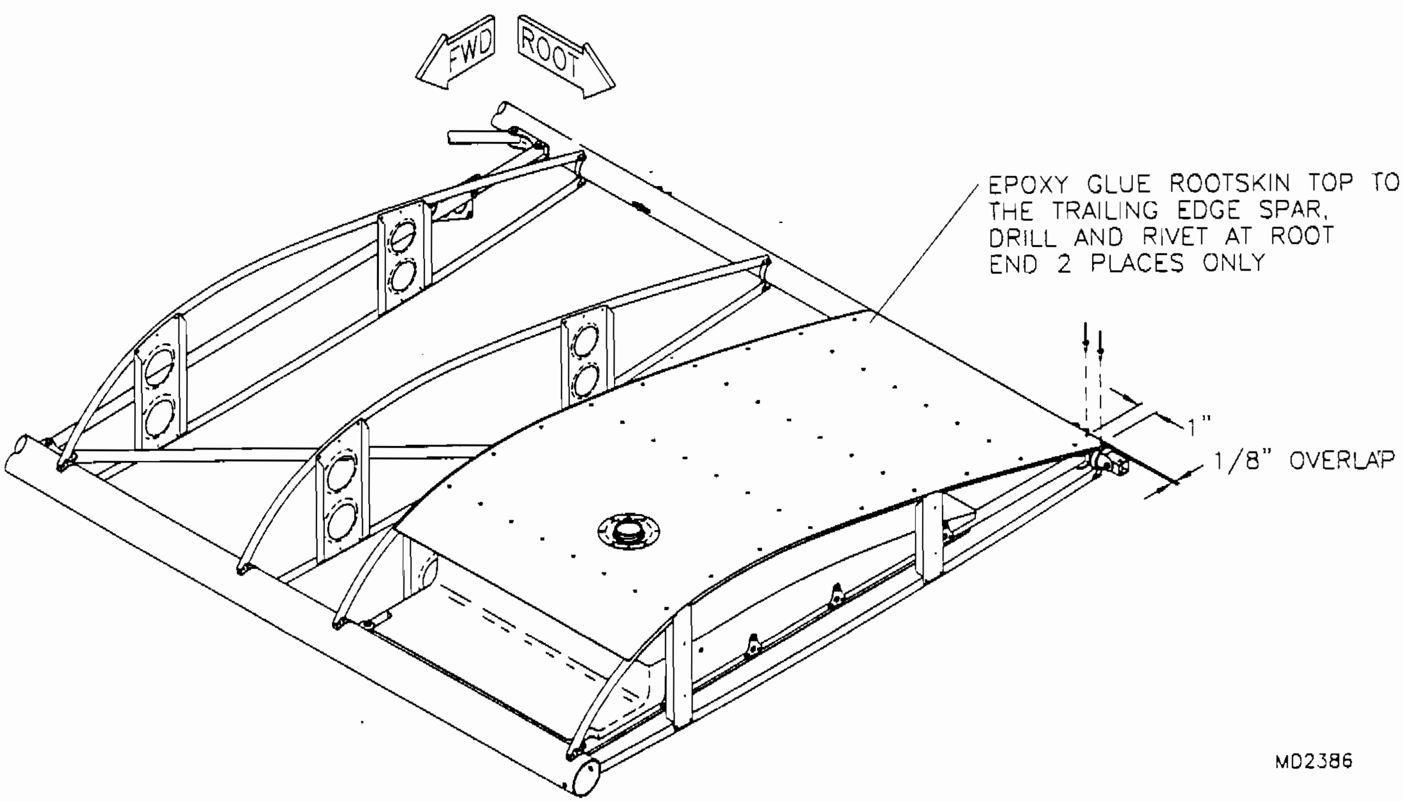
Position the top root skin so that the rivet holes are on centerline of the ribs. The root skin should extend past the top centerline of the trailing edge spar by 1/8". The fuel tank filler neck should be nearly centered in the hole. Transfer drill using a #30 drill bit through the root skin top into each rib, use clecos to retain the skin.

It is important to note that only two holes are drilled in the root of the trailing edge spar. DO NOT locate or drill any other holes in the spar, structural damage to the spar will result.

Using the aft edge of the root skin as a guide, mark a line on the trailing edge spar. After all holes have been drilled, remove the root skin, Debur and remove all shavings. Remove the anodizing on the trailing edge spar in the contact area **ONLY**. Rough up the 1/8" contact area of the root skin. **NOTE:** if you have opted to pop rivet in place of rib lacing, prior to riveting the root skin in place, apply double stick tape to the top of the second rib. When riveting the skin in place, only rivet to the root rib. The rivets in the second rib will be installed after the wing is covered. Rivet the root skin top everywhere but the last 3 rivets in each rib near the trailing edge. These rivets will be installed after the aft edge is bonded to the spar.

With the root skin riveted in place, position the scupper so that it is centered around the fuel filler neck. With a #30 drill bit transfer drill through the perimeter holes in the scupper into the root skin. **CAUTION:** When drilling the scupper, use a drill stop to prevent drilling into the fuel tank. Cleco in place only, at this time. The painted scupper will be installed final, after the wings are covered and painted. See **FIGURE 014C-01**.

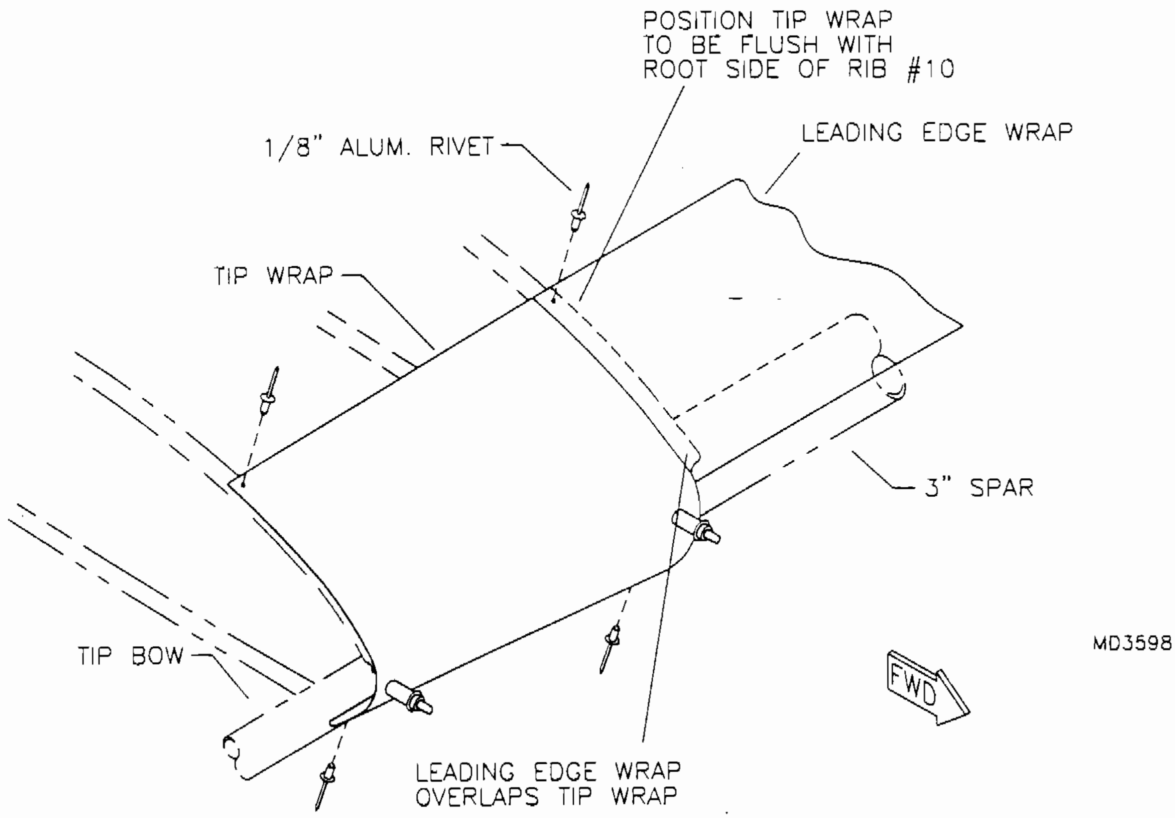
FIGURE 014C-01



2. Install the bottom root skin following the same procedure for the top. **NOTE:** The bottom root skin does not have stiffeners. Again, if you are using the optional pop rivets to retain the covering, do not rivet the skin to the second rib until after covering. Bond the top and bottom root skins to the trailing edge spar at this time, or bond them with the leading edge wrap. Refer to paragraph 7 for bonding instructions.

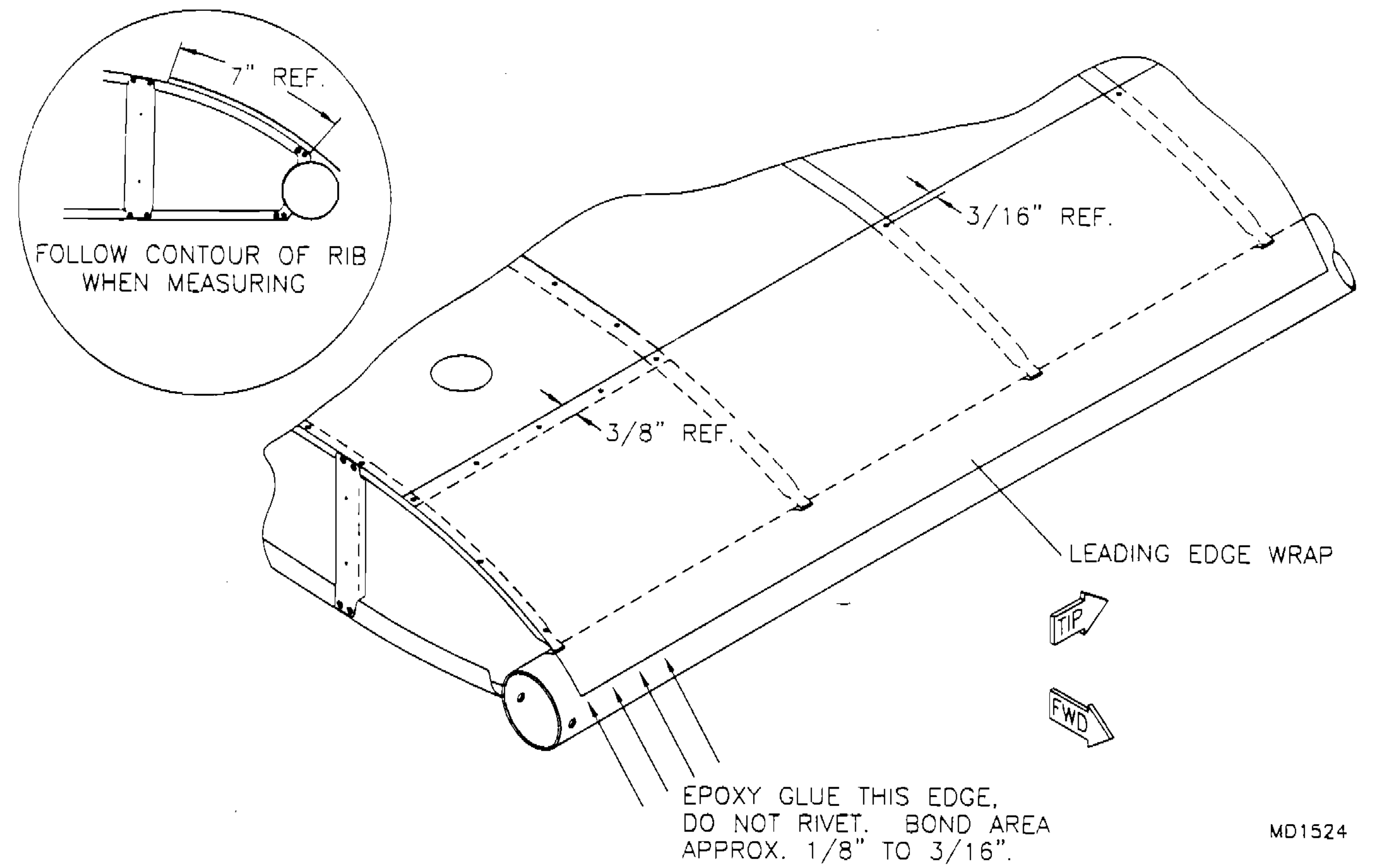
3. Position the tip wrap around the spar and tip bow as shown in **FIGURE 014C-03**. Using a #40 bit, transfer drill through the two forward holes into the spar and tip bow. Cleco in place. Pull the underside of the tip wrap tight agains the tip bow and spar. Drill and rivet. Maintain a 1/4" edge distance.

FIGURE 014C-03



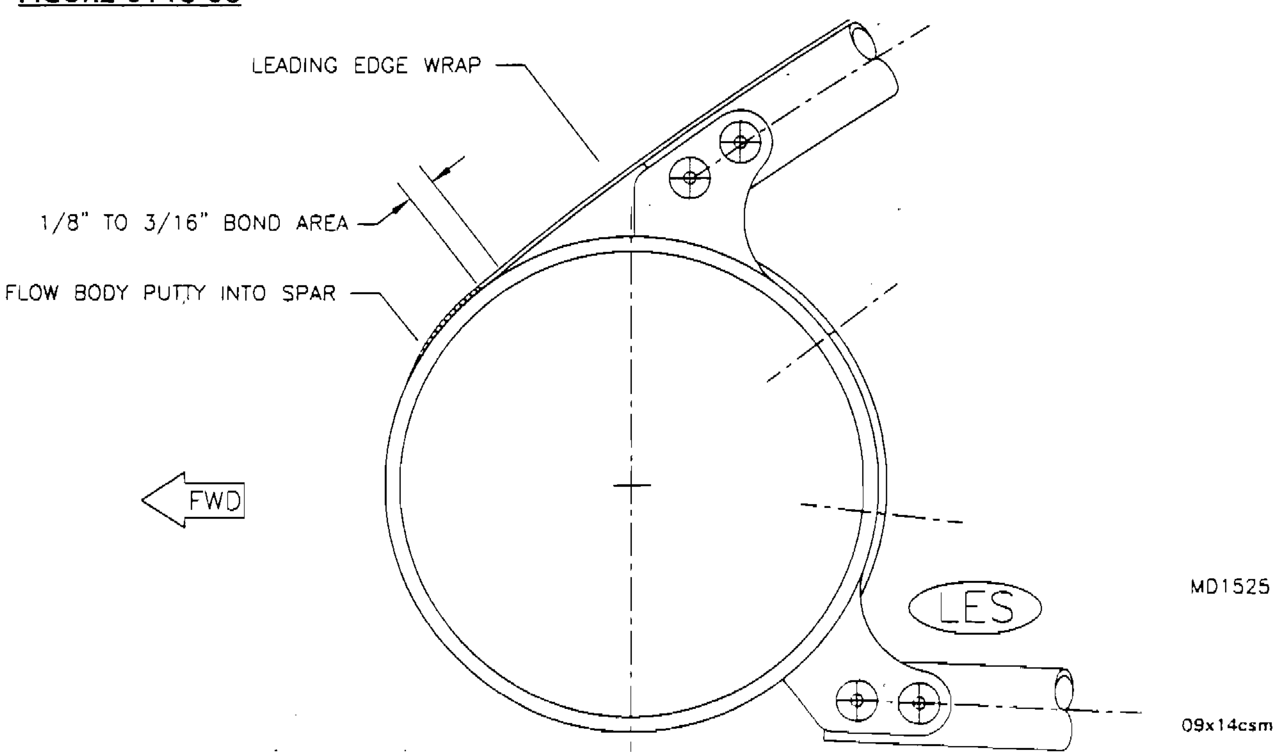
4. Unroll each leading edge wrap and lay it carefully in the position illustrated in **FIGURE 014C-04**. Fit the wrap so that it is flush with the outer radius of the root rib. Mark and trim off any excess length at the tip. The tip end should also be flush with the outer radius of rib #10.

FIGURE 014C-04



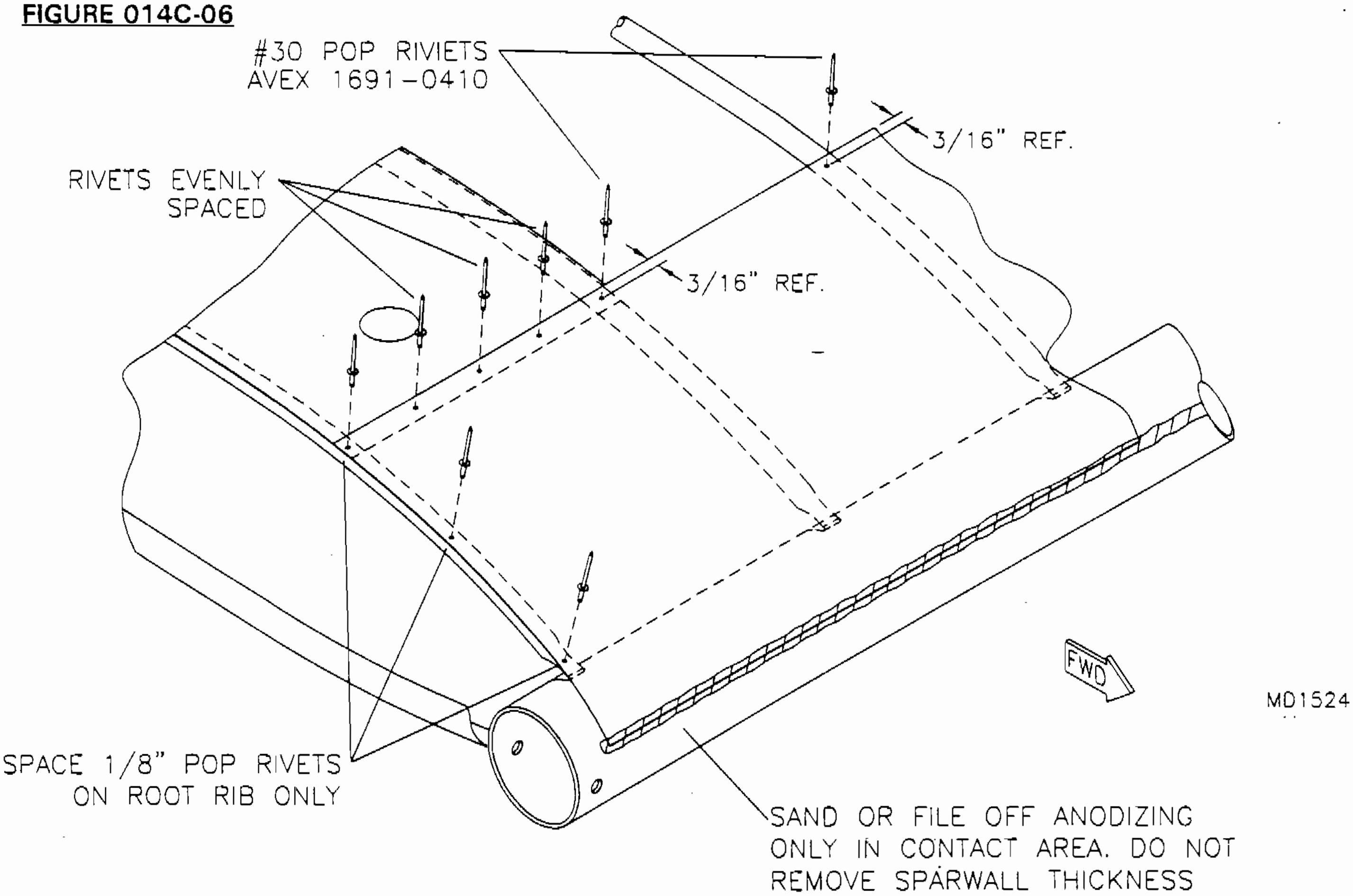
5. Take special note of the forward and aft position of the leading edge wrap. The 7" measurement is a reference measurement from the forward end of the top rib, and is measured following the top centerline contour of the rib. The wrap should overlap the root skin top approximately 3/8". In its correct position, the leading edge wrap should flow into the leading edge spar and contact it with only an 1/8" or less bond area. See **FIGURE 014C-05**.

FIGURE 014C-05



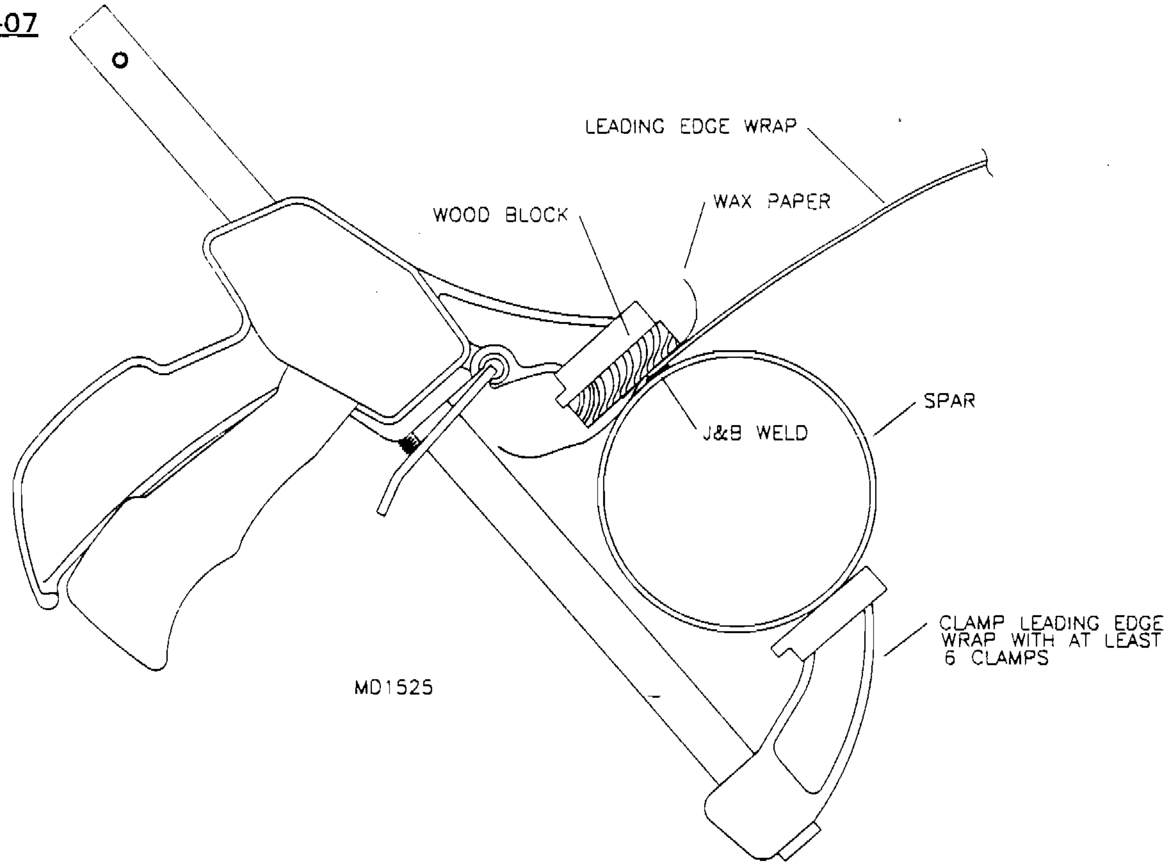
6. With the leading edge wrap correctly positioned, locate and drill a #30 hole through the leading edge wrap aft edge and into each rib on centerline. Maintain a 3/16" edge distance. Refer to **FIGURE 014C-06**. Note that the upper aft edge of the tip wrap will be drilled on rib #10. With the leading edge wrap
clecoed in position to the top ribs, pull the wrap down tight against the ribs. Using the wrap as a guide, mark a line along the length of the spar. Remove the wrap, carefully file away the anodizing in the area that the wrap bonds to the spar **ONLY**. Use 80 grit sandpaper to rough up the bond area on the leading edge wrap. See **FIGURE 014C-06**.

FIGURE 014C-06



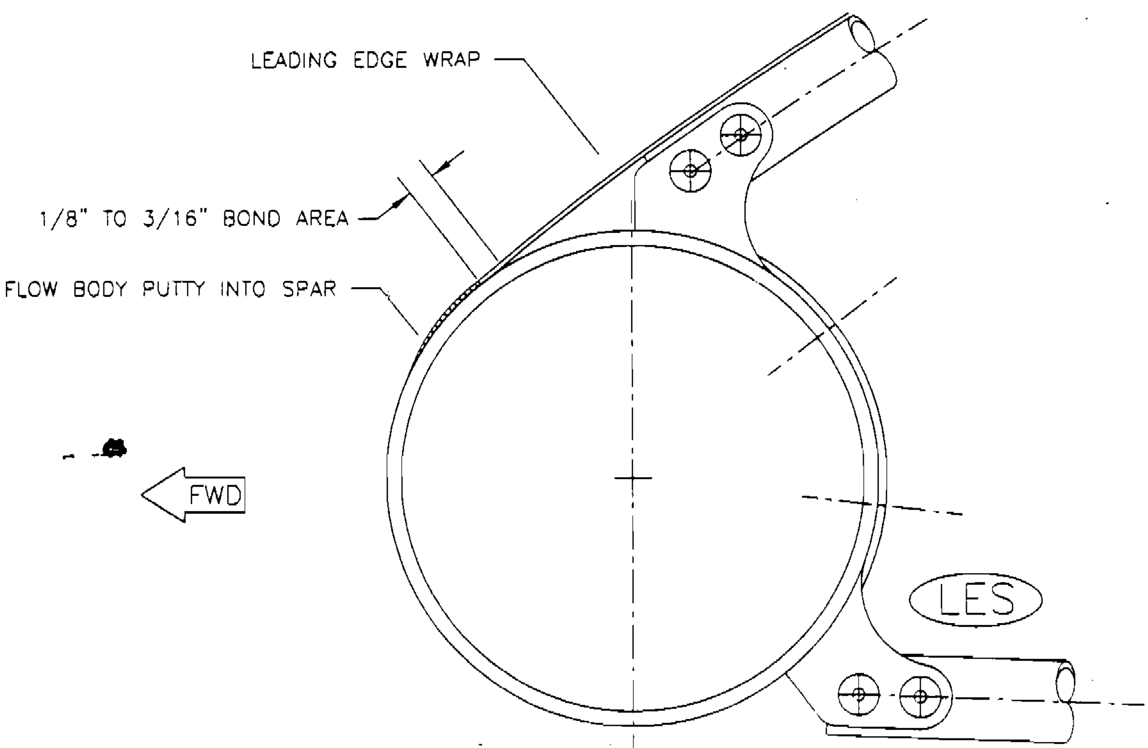
7. Cleco the leading edge wrap in place on the wing. Use the J&B Epoxy to bond the wrap to the spar. **IMPORTANT:** the wrap is retained to the spar with **ONLY** the epoxy, it is important that you make a good bond between the wrap and the spar. **DO NOT** drill or install any rivets into the spar. **HINT:** an easy method for applying the J&B Epoxy to the spar is to mix a sufficient amount of epoxy and put into a small plastic bag. Cut a small hole in the plastic bag and squeeze out a small bead of epoxy for the length of the spar in the bond area. Use a long straight board (1x2x144") and several (6 min.) "C" clamps (or similar devices, we prefer stanley cushioned quick clamps) to retain the wrap in position until the epoxy cures. A piece of wax paper between the board and the wrap will prevent the board from being bonded to the wrap. Placement of the board and clamps on the wrap when clamping is critical so as not to deform the wrap. Clamp only to the bonded area. See **FIGURE 014C-07**.

FIGURE 014C-07



8. After the epoxy has cured, remove the clamps and board. Clean off any excess epoxy from the wrap and spar. Remove the clecos retaining the leading edge wrap to the ribs and rivet with the correct rivets. Use a small amount of body putty to form a smooth transition from the wrap to the spar. See **FIGURE 014C-08**. Rivet the wrap to each rib.

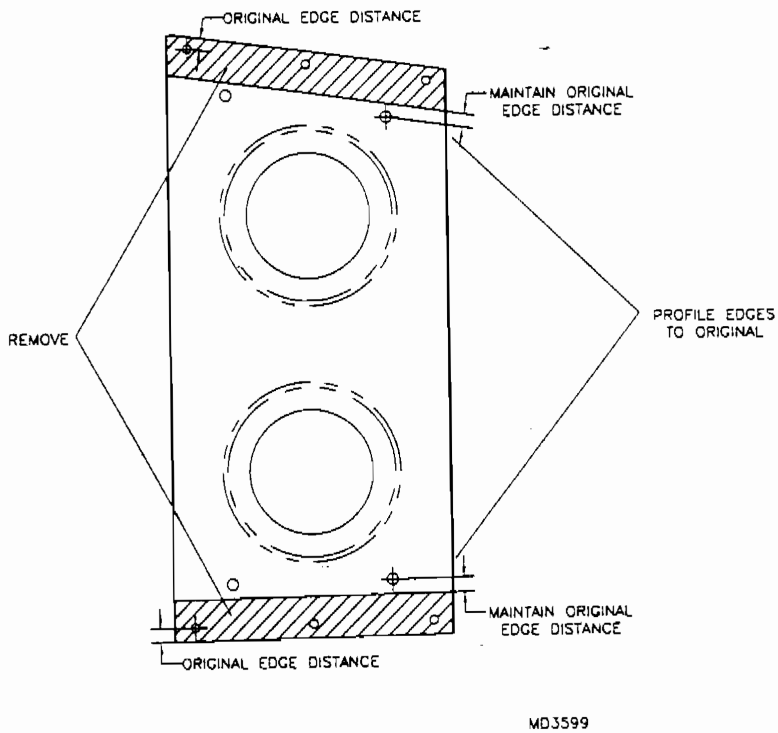
FIGURE 014C-08



9. Refer back to **FIGURE 014C-05** for the reference dimension to locate the aft end of the tip rib. Position the trailing edge clip so that it radially in line with the others. Place the top rib into the clip. Position the forward edge so the outer most radius is flush with the outer edge of the tip wrap. Verify the trailing edge clip position. The tip rib should be parallel to rib #10. Drill and rivet the trailing edge clip to the spar. With the top rib in place, position the tip ribs leading edge clips on both sides of the top rib. Align for best position. Note that the holes in tabs which attach to the tip bow should be on centerline of the bow. Also note that some trimming of the rib may be necessary. Drill and rivet the clips to the top rib. Install the bottom rib in between the forward and trailing edge clips. Note that there is a forward and aft end to the rib. The forward end will have a black mark on it. Position so that the camber of the rib is straight down. Some trimming of the rib may be required. When best position has been achieved. Drill and rivet the rib to the clips. Drill and rivet the forward clips to the tip bow.

10. Modify the forward compression plate as shown in **FIGURE 014C-010**. Use the reference dimensions shown in **FIGURE 014C-05** to position both the forward and aft compression plates. Note the orientation of the plates. The attach holes should fall on centerline of both the top and bottom ribs. Adjust for and aft if necessary. Transfer drill and rivet. Drill and rivet the upper aft end of the tip wrap the top ribs.

FIGURE 014C-010



11. With the wings bottom side up, measure forward 3 3/4" from the aft edge of the leading edge wrap and mark on the under side of each rib. Starting with the second rib from the root measure the distance between each rib. Cut the raw stock tubing (½"x.028) to fit between each rib. Position each piece of tubing centered on the marks. Locate each gusset as shown in **FIGURE 014C-011**. Transfer drill through the gusset into each rib and rivet the gussets to the ribs. Holding each support tube in place, transfer drill through the gussets into each support tube and rivet in place. See **FIGURE 014C-011A**. **NOTE:** Fabricate the end gussets as shown in **FIGURE 014C-011B**.

FIGURE 014C-011

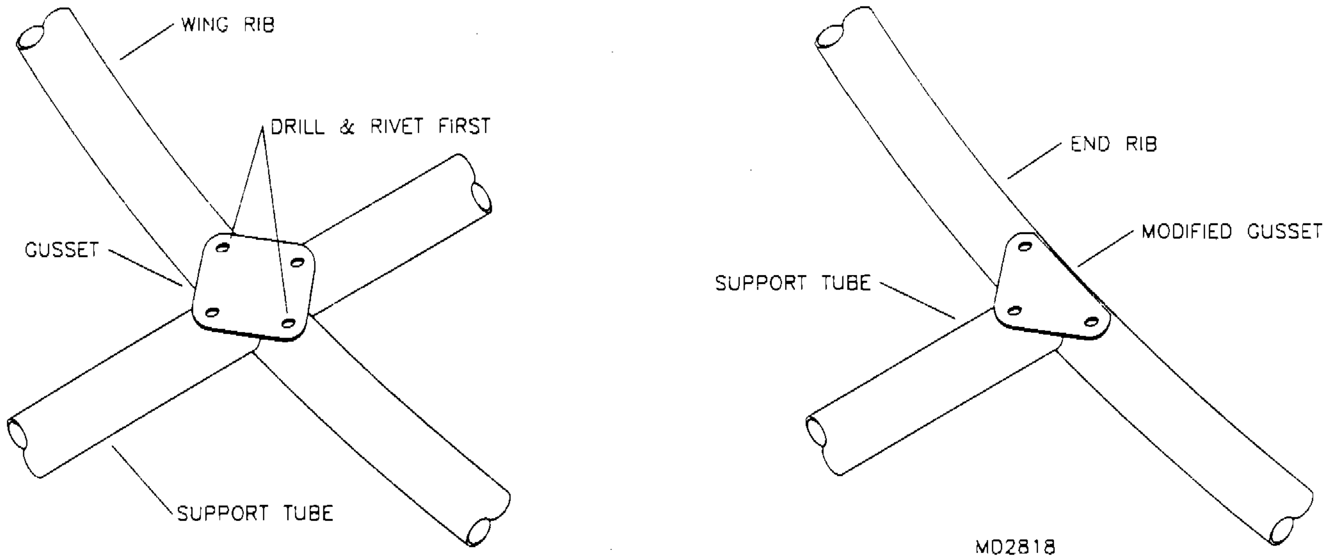


FIGURE 014C-011A

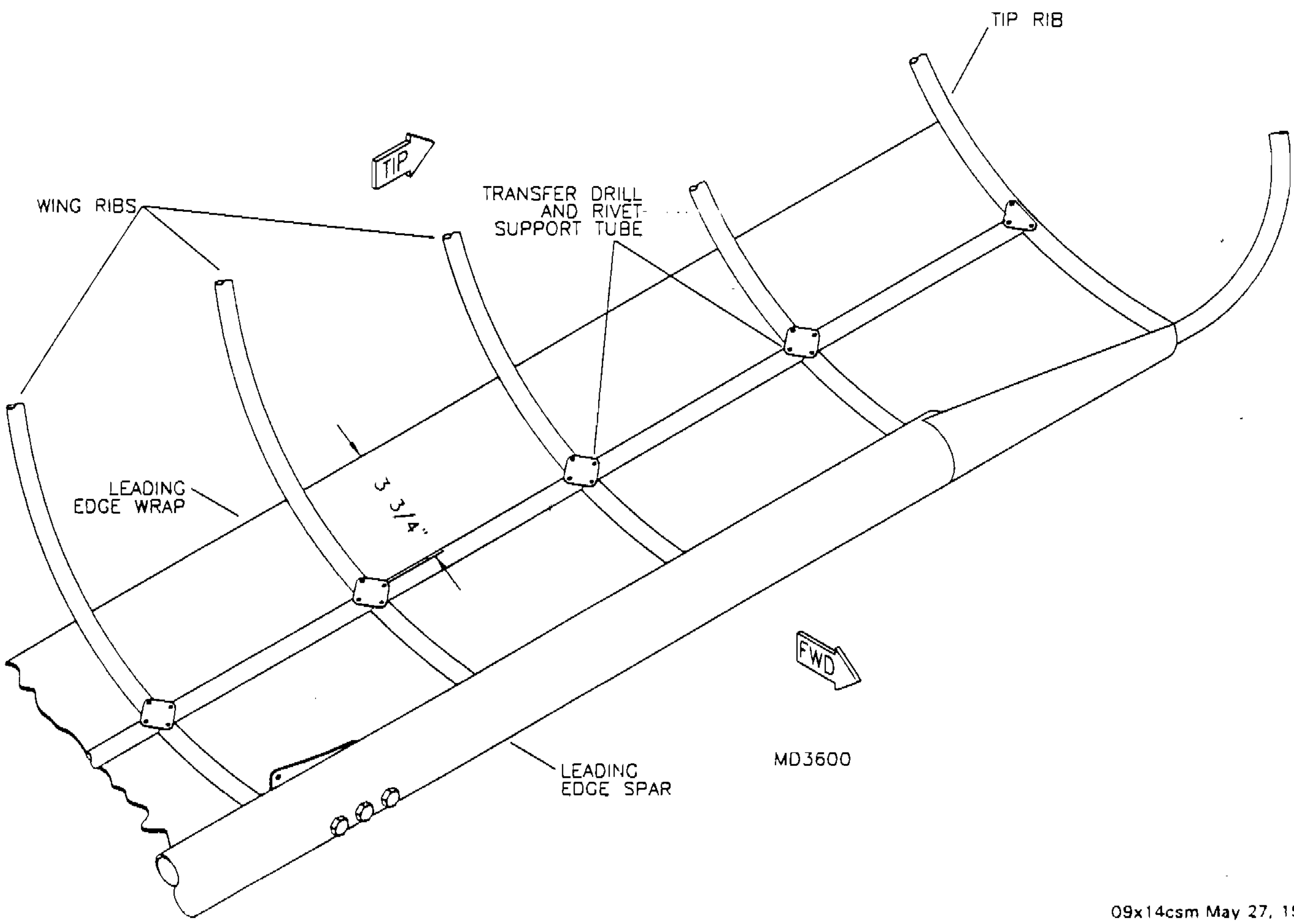
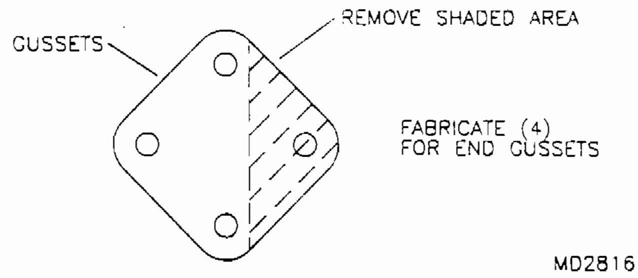
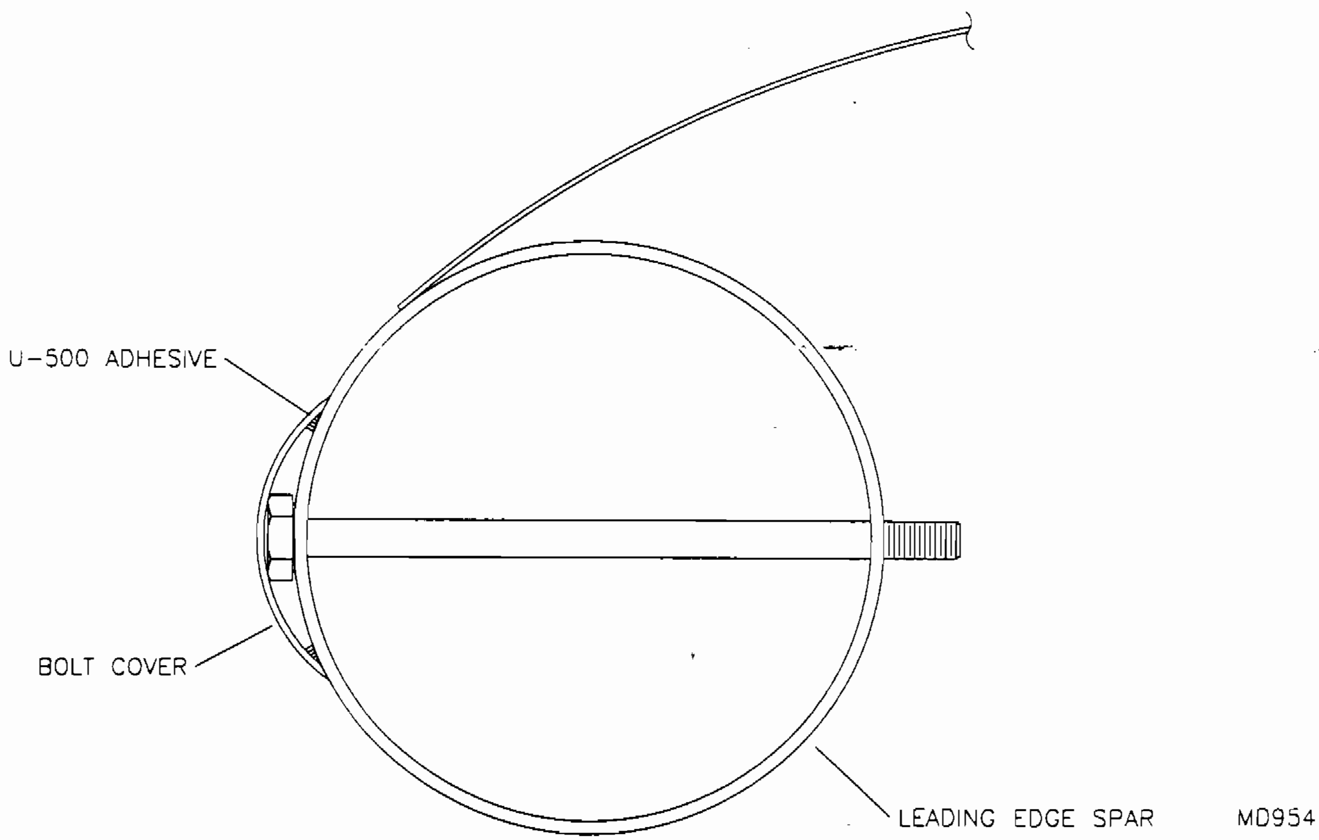


FIGURE 014C-011B



12. Trim the bolt cover as shown in **FIGURE 014C-12**. Use the U-500 adhesive provided in your kit to bond the cover to the spar. If you prefer, rather then mixing up a small quantity of glue at this time, install the bolt cover when covering the wings.

FIGURE 014C-12



S-12 OPTIONAL D&F COVERING SUPPLIES

GENERAL

ADDITIONAL SUPPLIES REQUIRED TO COVER THE S-12S

Pinking Sheers
Regular Scissors
Razor Blades
2" Brushes
Containers for Glue and Solvents
Saw Horses or "A" frame pivot stands
Methyl Ethyl Ketone (MEK)

Neatness and cleanliness during the covering process will reflect in the finished product. Adequate ventilation is a must. A supplementary covering manual has been supplied in your kit. Read this manual completely prior covering your aircraft. This manual explains the basics of covering.

Throughout this section we will be referring to sizing material. Sizing material is U-500 adhesive thinned to water like consistency. Keep a container of sizing material handy and apply it to the fabric where ever a straight cut is to be made. Allow the sizing material to dry before making the cut. This will keep the fabric from fraying.

NOTE: The use of poly brush is strongly recommended as explained throughout this section. However this is left to the discretion of the builder. Poly brush is a builder supplied item.

WINGS

NOTE: Prior to covering the wings, review the following check list making sure that everything is in place prior to covering.

WING PRE COVER CHECKLIST

_______ Aileron push pull tube Installed
_______ Flap Teleflex Cables Installed
_______ Static & Pitot Lines Installed
_______ Fuel Lines Installed & Clamped
_______ All Nut Plates Installed
_______ Jury Strut Bracket Installed
_______ Hole Drilled In Tip Bow For Pivot Stand (optional)
_______ Remove All Marks & Clean Entire Wing
_______ Top & Bottom ribs drilled

1. Position the wing top side up on saw horses or other suitable work surface. **HINT:** We use two "A" frame stands with pivots so the wing can rotate and be locked in any position. You may consider purchasing or building such a device. Contact the factory for information. If you are using such a stand, it is acceptable to drill a 1/4" diameter hole through the tip bow for a pivot pin.

2. Scotch brite all sheet metal surfaces and clean with acetone. Apply one coat of U-500 to the sheet metal. With the wing top side up and level, roll out and cut the top layer of fabric so that it extends approximately 6" on each end of the wing. Pull as much of the fabric to the trailing edge of the wing as possible leaving enough fabric on the leading edge to wrap around the spar. Trim off the excess fabric. Save these scraps, they will be used to cover smaller parts.

Refer to the supplementary covering manual and mix up a quantity of adhesive. Bond the fabric to the trailing edge spar and trim as shown in **FIGURE 014C-02**. Bond the fabric to the leading edge spar pulling light tension into the fabric as you go. Refer to **FIGURE 014C-02**. Bond the fabric to the tip bow and the upper root rib pulling in light tension. Trim fabric as shown in **FIGURE 014C-02A**. With the perimeter attached to the wing structure iron out any wrinkles or puckers in the bond area. Apply a coat of U-500 adhesive to all sheet metal areas. Pre tension the top skin. Refer to the supplementary covering manual. **CAUTION:** Do not bring the top skin to final tension until the bottom skin has been pre tensioned. Apply sizing material around the filler neck. Using a razor blade cut the opening for the filler neck.

FIGURE 014C-02

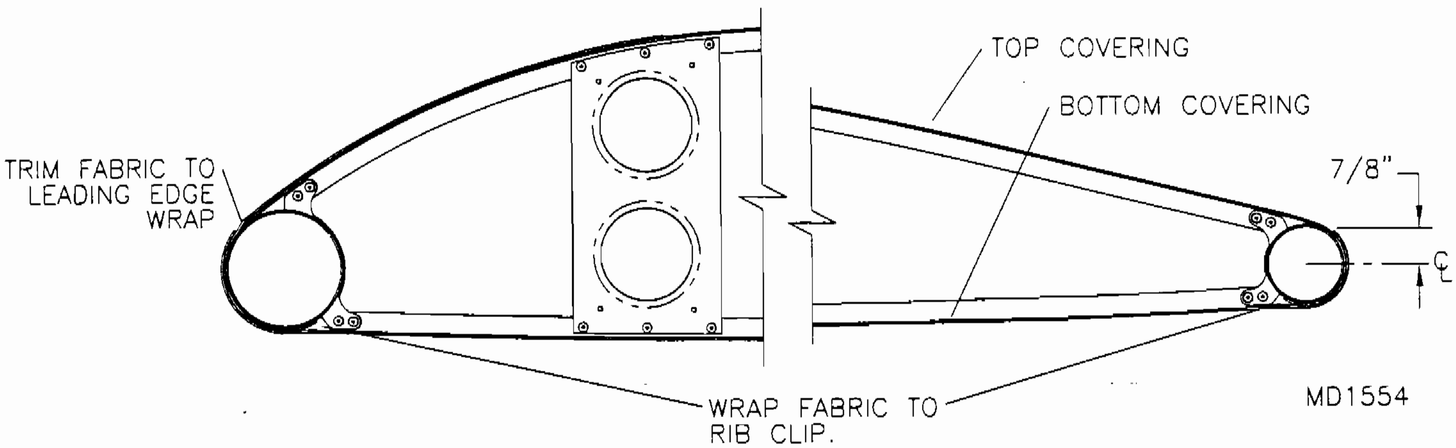
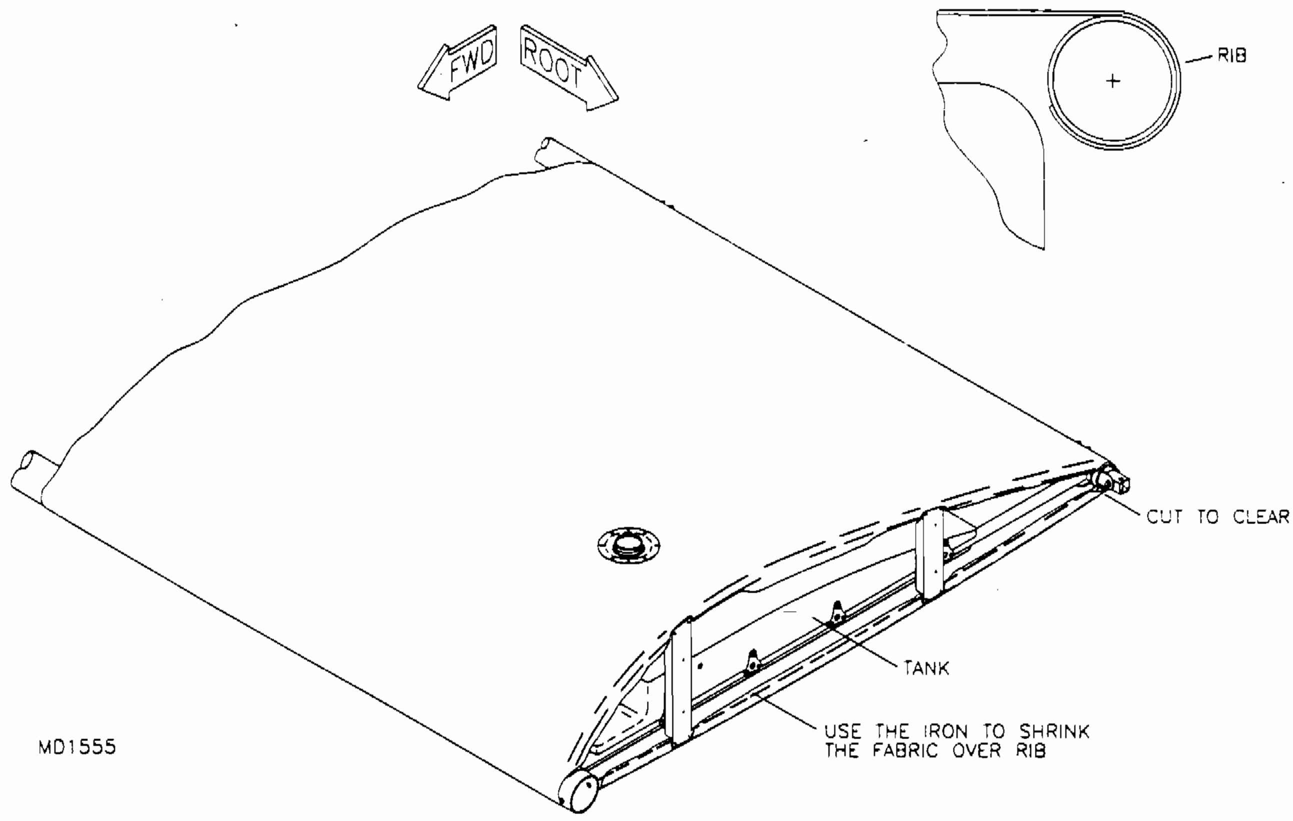


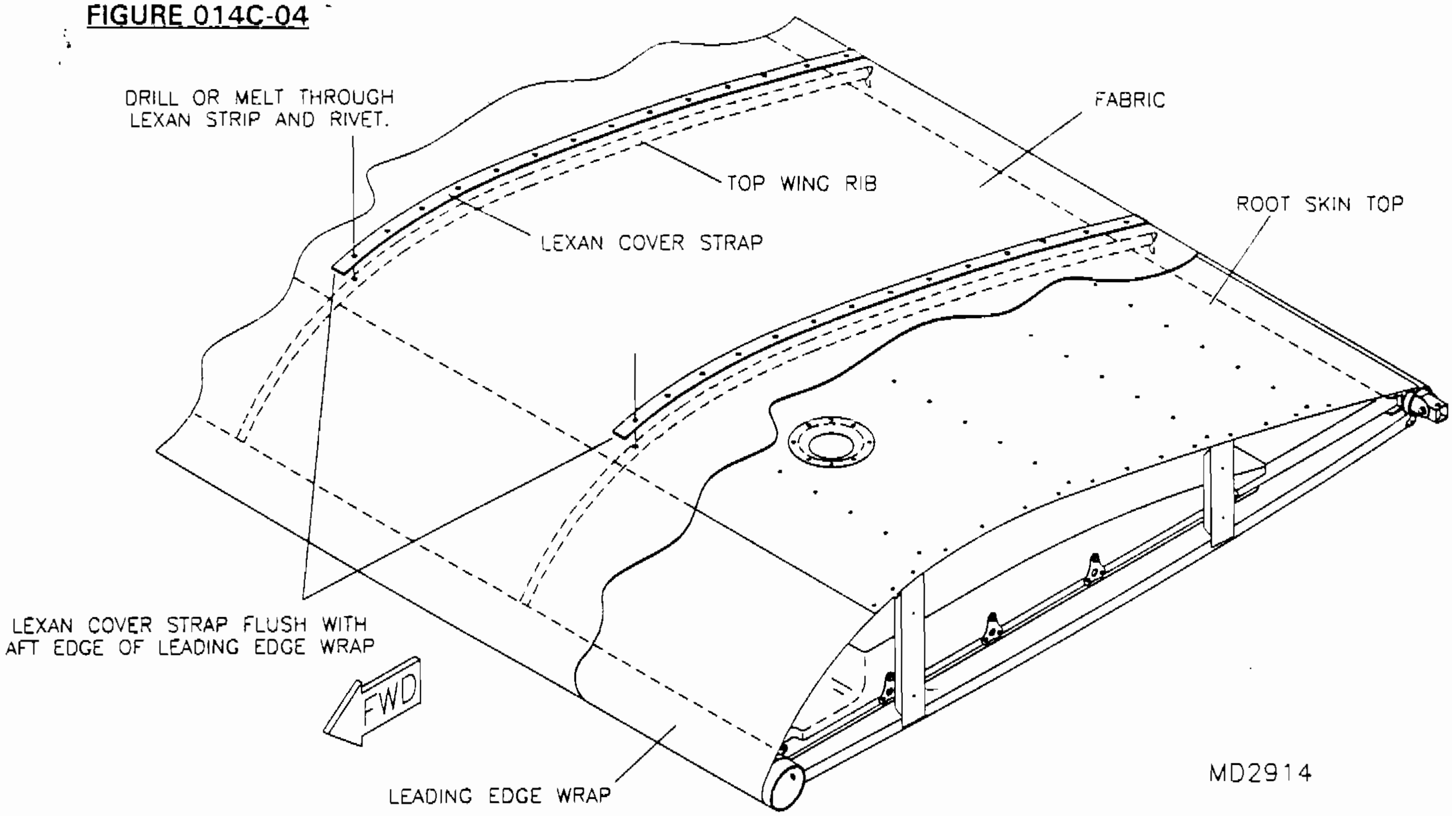
FIGURE 014C-02A



3. With the top fabric pre tensioned, position the wing bottom side up. Roll out and cut the bottom layer of fabric. Following the same procedure as before, bond the bottom fabric to the wing frame and pre tension. Refer to **FIGURE 014C-02** for trimming the lower fabric. Size and cut the fabric around the lift strut attach plates, jury strut bracket and door upcatch. Final tension the top and bottom fabric.

4. Position the wing top side up. Place the top cover strap so that the forward end is flush with the aft edge of the leading edge wrap and centered on the rib. Using a hot knife with a pointed tip or soldering iron melt through the cover strap and fabric into the first hole in the rib and rivet. Pull light tension into the strap, melt through the second hole and rivet. Continue this pattern for the length of the rib. See **FIGURE 014C-04**. Rotate the wing to the bottom side and follow the same procedure for installing the bottom cover straps. The bottom cover straps cover the full length of the rib. Refer to the covering section for completion of the surface tapes and patches.

FIGURE 014C-04

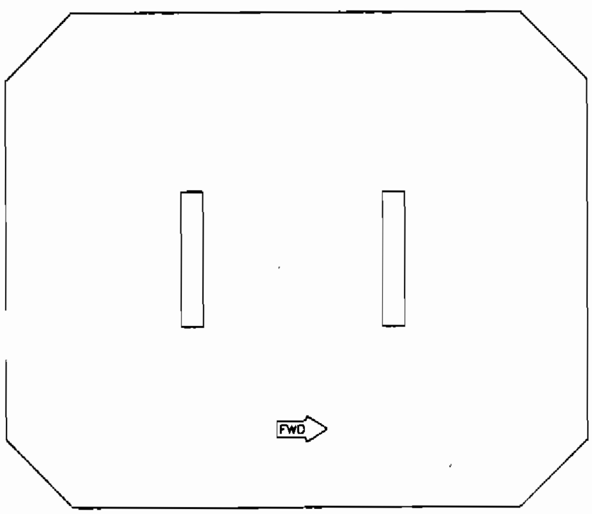


5. Refer to the following templates and fabricate the lexan pieces using the .020 lexan raw stock provided. Using the U-500 adhesive bond the lexan parts to the fabric in there respective locations. See **FIGURE 014C-05**. Cut the 2" pinked surface tape to length and bond over the lexan as shown in **FIGURE 014C-05**.

TEMPLATES

2. LEADING EDGE STRUT PLATE LEXAN REINFORCEMENT (.020 LEXAN) (QTY. 4)

1. JURY STRUT LEXAN REINFORCEMENT (.020 LEXAN) (QTY. 2)



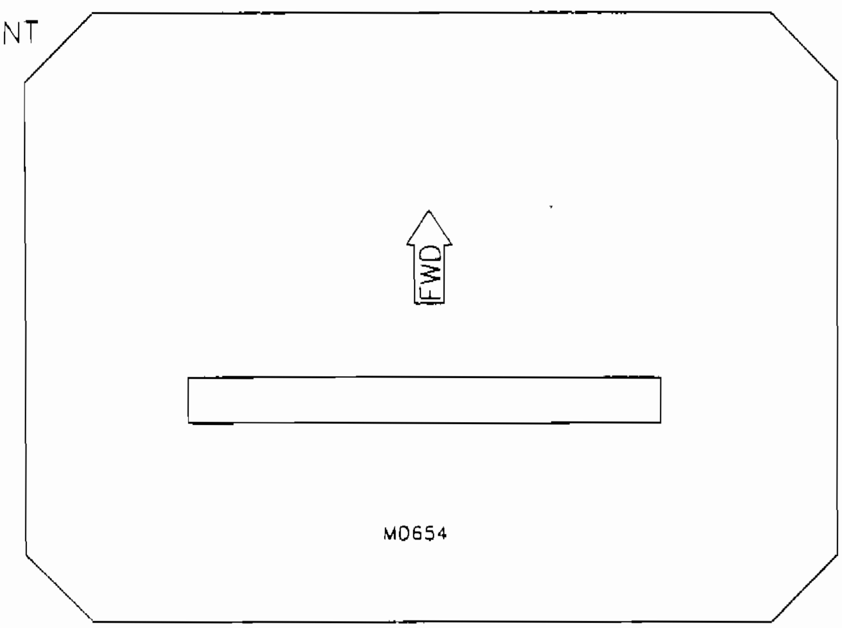
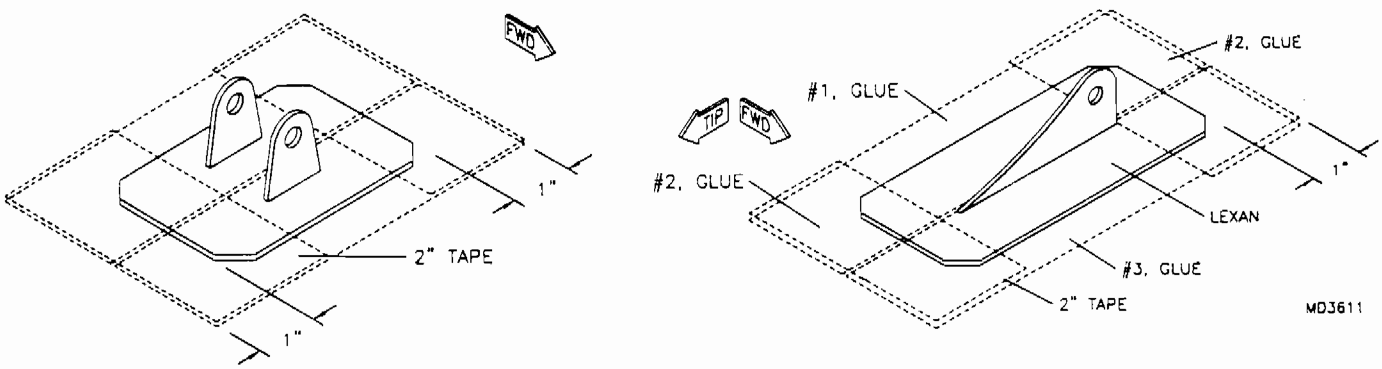
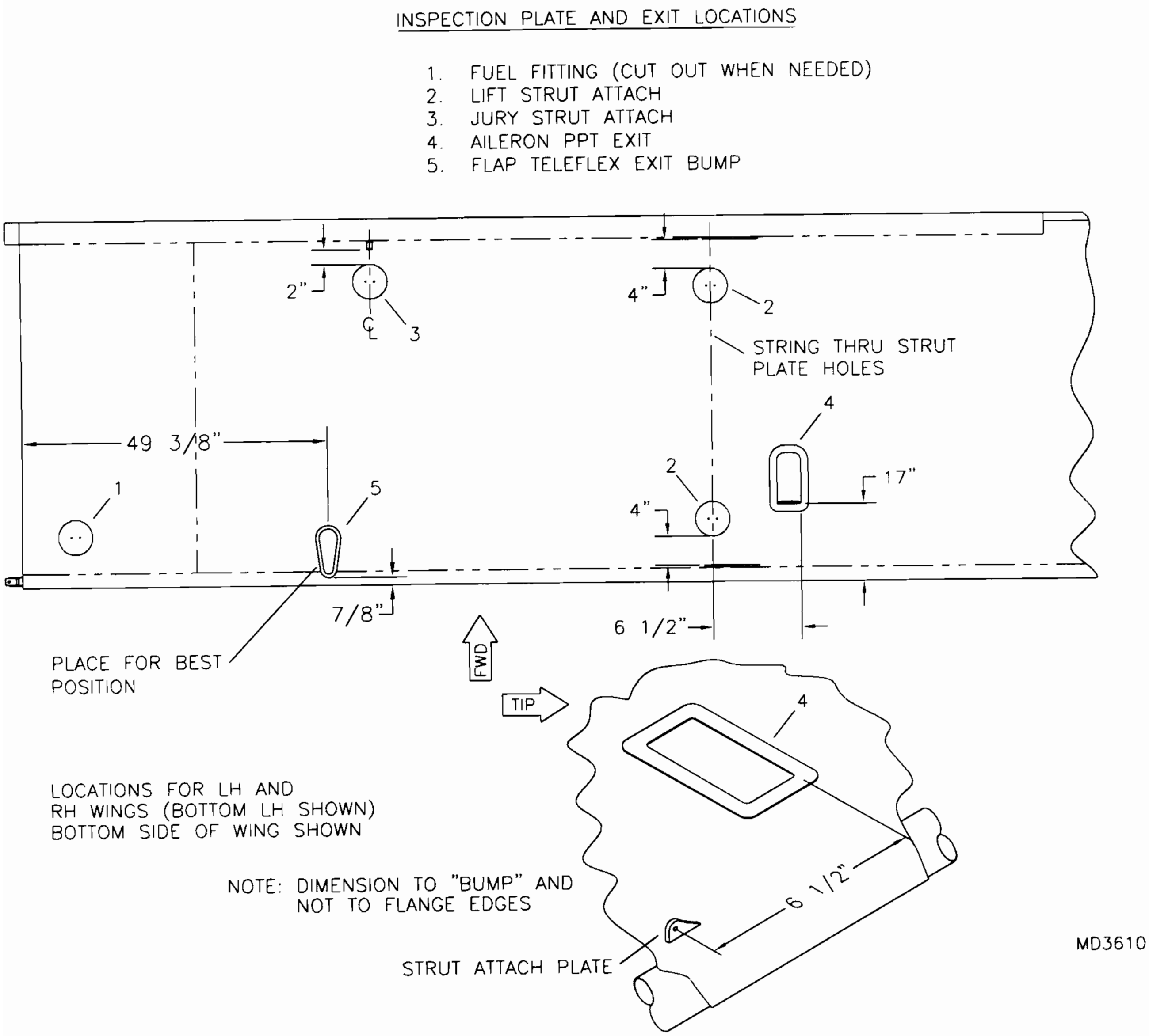


FIGURE 014C-05



6. Layout and mark the inspection ring, flap teleflex exit and the aileron push pull tube exit locations as shown in **FIGURE 014C-06**. Using a pinking shears, cut out fabric patches 1" larger then the flap teleflex exit fairing ring, aileron push pull tube exit fairing ring and inspection rings. Bond the inspection and exit rings to the fabric in there respective locations. Glue the patches over the rings.

FIGURE 014C-06



7. Cut to length and glue the 2" and 4" surface tape in place. Refer to **FIGURE 014C-07** and the following text.

TOP RIBS - 2" tape - centered on each rib starting flush with the aft edge of the leading edge wrap and ending on aft centerline of the trailing edge spar.

BOTTOM RIBS - 2" tape - centered on each rib starting at the forward centerline of the leading edge spar and ending on aft centerline of the trailing edge spar flush with the top rib tape.

LEADING EDGE WRAP - 2" tape - glue spanwise from root rib to tip rib centered on the aft edge of the leading edge wrap.

TOP & BOTTOM ROOT RIB - 2" tape - centered on rib wrapping around to the interior side starting at the forward centerline of the leading edge spar and ending on aft centerline of the trailing edge spar.

TOP & BOTTOM TIP RIB - 2" tape - centered on rib starting at centerline of leading edge spar and ending on centerline of the trailing edge spar.

TRAILING EDGE SPAR & TIP BOW - 2" tape - centered on aft centerline of the trailing edge spar over lapping the lower fabric seam by 1/8" to 1/4" starting flush with the root end of the spar and ending at the tip wrap on the leading edge of the tip bow.

LEADING EDGE SPAR - 4" tape - centered on the forward centerline of the leading edge spar starting flush with the root end and ending by tapering the tape down to 2" through the tip wrap flush with the 2" tip bow tape. See **FIGURE 014C-07A**.

FIGURE 014C-07

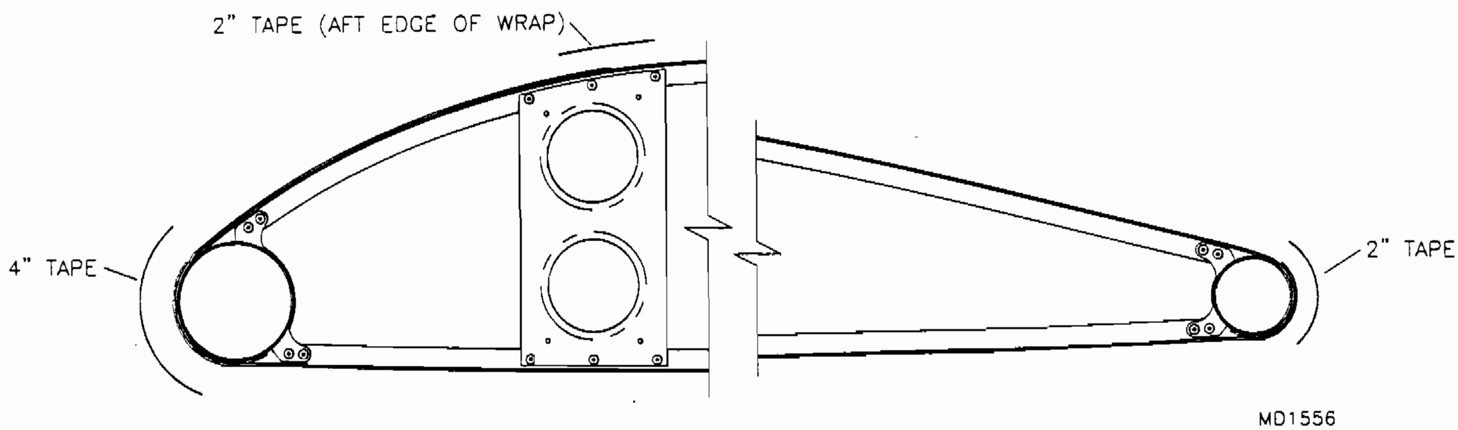
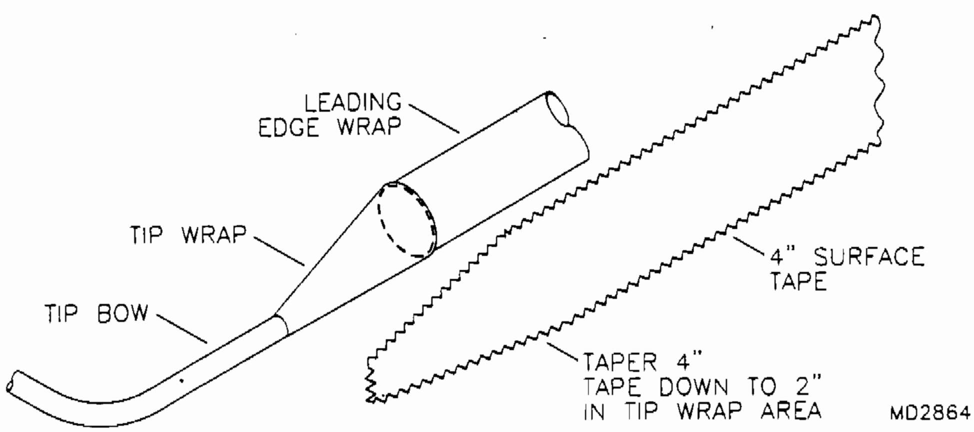


FIGURE 014C-07A



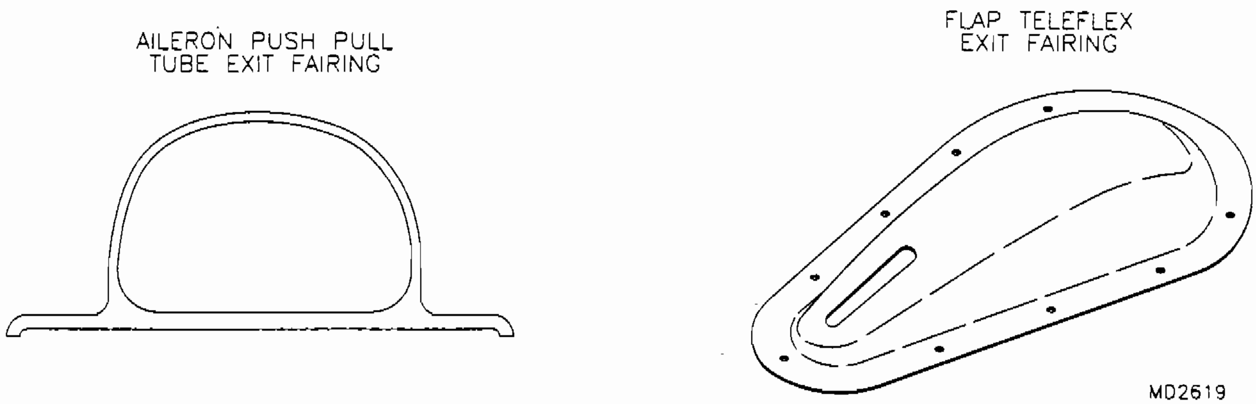
8. Use an iron to shrink out any wrinkles or puckers in the surface tape and patches. **NOTE:** Do not apply heat to the full width of the tape. Tape distortion will occur. Heat the edges or the center allowing one to cool before heating the other. Use the iron to smooth and bond all pinked edges on the tape and patches.

9. Coat all surface tape and patches with thinned U-500 adhesive, concentrating on dry spots and flowing the glue into the pinked edges. Do not apply glue beyond the pinked edges. The edge of the glue will be seen after painting.

10. Brush a coat of poly brush over the entire surface of the fabric. Avoid applying poly brush over the U-500 adhesive. Avoid runs and drips developing on the inside of the fabric.

11. Trim the aileron push pull tube exit fairing and the flap teleflex exit fairing as shown in **FIGURE 014C-11**. Using #40 drill bit, pre drill the attach holes in the outer flange of the fairings. The hole locations are distinguished by a small recessed dimple. Position the fairings over the lexan rings on the wing. Trim the outer perimeter of the fairings to match the rings. With the fairings positioned correctly, transfer drill through the fairings and into the rings with a #40 drill bit. Remove the fairings and drill only the holes in the fairings to #30. Paint the fairings as per the rest of the aircraft. Refer to the flap and aileron section for final installation.

FIGURE 014C-11



FLAPS & AILERONS

PRE COVER CHECK LIST

______ Hinge Holes Drilled To #11
______ Control Horn Holes Drilled To #11
______ Nut Plates Installed

1. Cover the flaps and ailerons following the same procedures used previously. Apply two inch surface tape to the complete perimeter of both the flaps and ailerons.

TAIL GROUP - COVERING

PRE-COVER CHECKLIST

HORIZONTAL STABILIZER

- ____ All nut plates installed (hinge points, attach points)
- ____ All tubes, gusseted, riveted and secured
- ____ #40 holes drilled in rib flanges.
- ____ Clean assembly

VERTICAL STABILIZER

- ____ All nut plates installed (hinge points, attach points)
- ____ All tubes, gusseted, riveted and secured
- ____ #40 holes drilled in rib flanges.
- ____ Clean assembly

ELEVATORS

- ____ All nut plates installed (hinge points, horn attach point)
- ____ All tubes, gusseted, riveted and secured
- ____ Trim tab cable housing hole located
- ____ Trim tab cable housing attach point riveted
- ____ #40 holes drilled in rib flanges.
- ____ Clean assembly

RUDDER

- ____ All nut plates installed (hinge points)
- ____ Rudder horns pre-drilled (not attached)
- ____ All tubes, gusseted, riveted and secured
- ____ #40 holes drilled in rib flanges.
- ____ Clean assembly

1. Cover all tail surfaces following the same procedures as before. Prior to applying the surface tape cut 2" long segments from the .020 lexan strips. Position these at the center point of each rib on both sides. Using the same procedure as on the wings, rivet the strips to the ribs using the #40 pre drilled holes. Apply two inch surface tape to all ribs and complete perimeter.

S-12 OPTIONAL D&F GAP SEAL INSTALLATION

1. Install the flap and aileron gap seal prior to attaching the teleflex and push pull tube. The PVC gap seal material can be used in it's natural white color or painted. Use the same paint and primer as used on the fabric. If you plan on painting the gap seals, use small self tapping screws to pre fit the gap seal prior to painting. The screws may be used in place of the rivets for permanent assembly. If you want to use rivets for final assembly, be sure to use a screw smaller in diameter than the rivet during fit up of the gap seal.

Use several pieces of masking tape to retain the flap and aileron out of the way. See **FIGURE 014C-01**. Measure the distance between the hinges and cut the gap seal to length with 45 degree miters on each end. See **FIGURE 014C-01A**.

FIGURE 014C-01

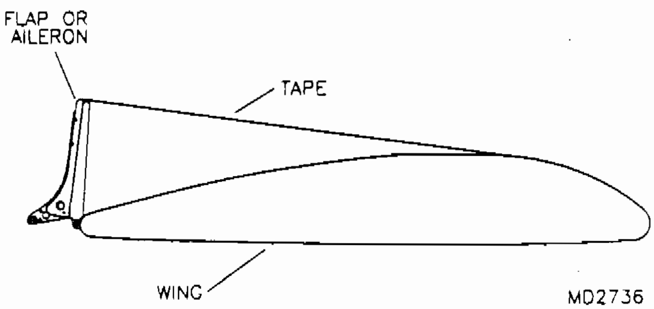
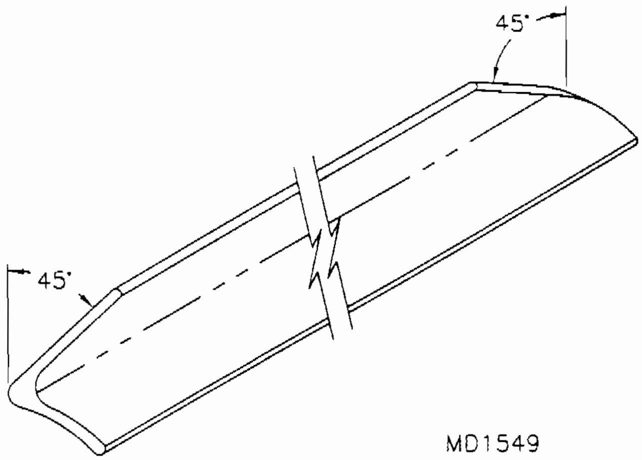
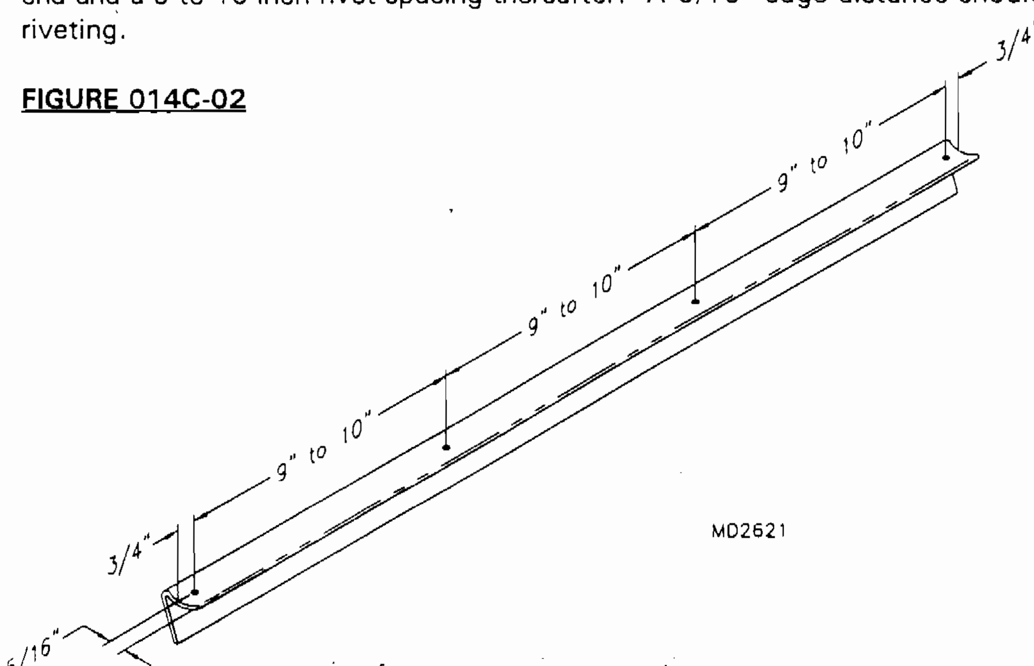


FIGURE 014C-01A



2. With a #40 drill bit, pre-drill each piece of gap seal as shown in **FIGURE 014C-02**. Hole and rivet locations for each piece of gap seal will vary according to length. Maintain a 3/4" edge distance on each end and a 9 to 10 inch rivet spacing thereafter. A 5/16" edge distance should be maintained to allow for riveting.

FIGURE 014C-02



3. Position the gap seal so that it is centered between the hinges and lined up with the hinge line. See **FIGURE 014C-03**. **HINT:** Use two way tape to hold seals in position. In areas where bolt heads will not allow the gap seal to rest flat against the trailing edge spar, either cut away the concaved side of the gap seal or drill a 5/8" hole to allow clearance of the bolt head. See **FIGURE 014C-03A**.

FIGURE 014C-03

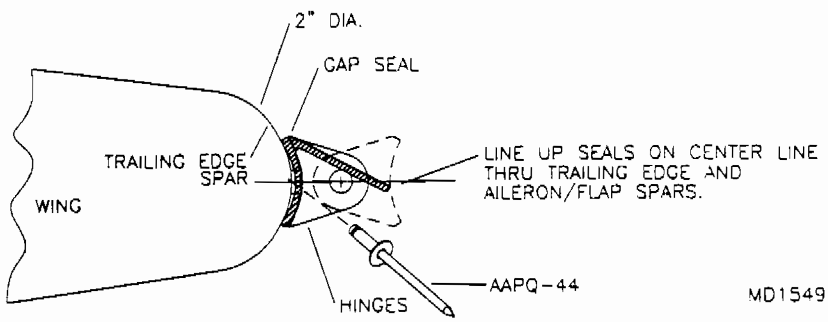
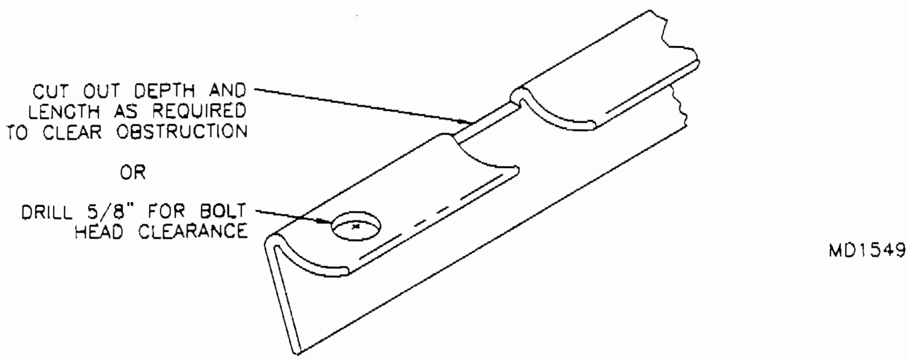


FIGURE 014C-03A



4. With a #30 drill bit, transfer drill through the gap seal and into the trailing edge spar and cleco in place. When all holes have been drilled, remove the gap seal, debur and remove all shavings. If you have chosen to paint your gap seal screw the gap seal in place, otherwise, install rivets.

For best performance install the gap seal even in the short segments at the wing root and tip.

5. The flaps and ailerons must move freely without rubbing on the gap seals. Final fit the gap seal by filing, sanding, or planeing until proper clearance is obtained. A miniature wood plane works great to shave off excess material. If painting the seals, after proper clearance is achieved, unscrew and scratch or stamp a number into each seal, in order from the left hand tip to the right hand tip. This will help when re-installing to place the seals in the correct locations.

CONNECTING THE FLAPS/AILERONS & SPADE ASSEMBLIES

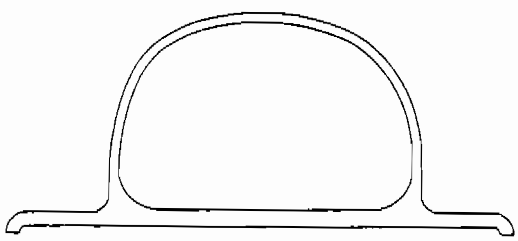
6. With a sharp razor blade, cut out the openings for both the flap teleflex and the aileron push pull tube on the bottom side of the wing. Use the inside edge of the lexan rings as a trim guide.

Working through the flap teleflex opening, pull the teleflex cable through the opening and install the teleflex retainer bracket. Refer back to the wing-main structure parts drawing for hardware call out.

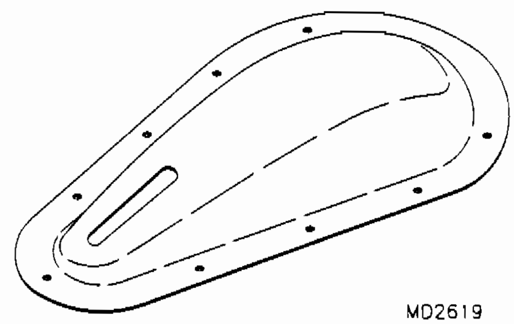
Position the flap teleflex exit fairing over the lexan ring on the wing. Refer to the covering section for details on trimming the exit fairing. Determine where the teleflex cable will exit the fairing and cut a small slot in the fairing at this location. Refer to **FIGURE 014C-06**. Slide the fairing over the teleflex and fasten to the ring using the #4 X 1/4 screws called out in the parts drawing. Install the female rod end on the teleflex and attach to the flap horn.

FIGURE 014C-06

AILERON PUSH PULL
TUBE EXIT FAIRING



FLAP TELEFLEX
EXIT FAIRING



7. Follow the same installation procedure for installing the gap seal to the horizontal stabilizer and vertical stabilizer trailing edge spars.

S-12XL OPTIONAL TAIL CABLE ASSEMBLY

1. Select the parts shown in the parts manual. During final assembly of flaps to wing and rudder to vertical fin. Include the hummertangs as shown in **FIGURE 14D-01**. Bolt one end of the tail cables to the bent hummer tangs attached to the top rudder hinge. Bolt the forward end of the cables to the tangs attached to the middle hinge of the flaps. Adjust (bend) hummertangs to match the angle of the cables. Tension the cables using the adjustable tangs on each end of the cable. The cables should be tight without distorting the tail surfaces. Refer to **FIGURE 14D-01**.

FIGURE 14D-01