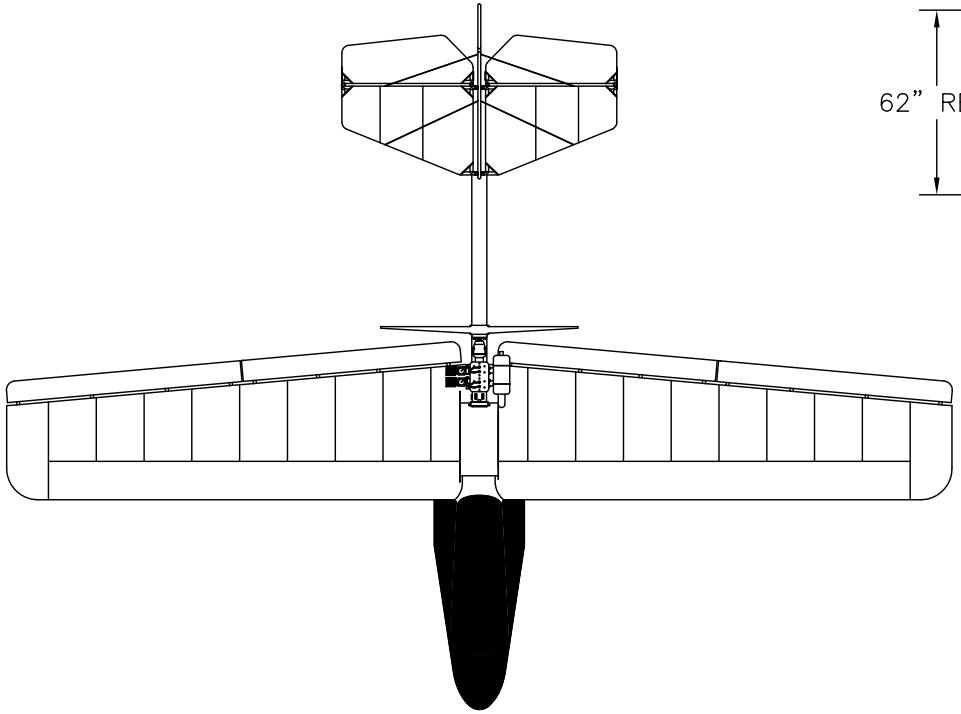
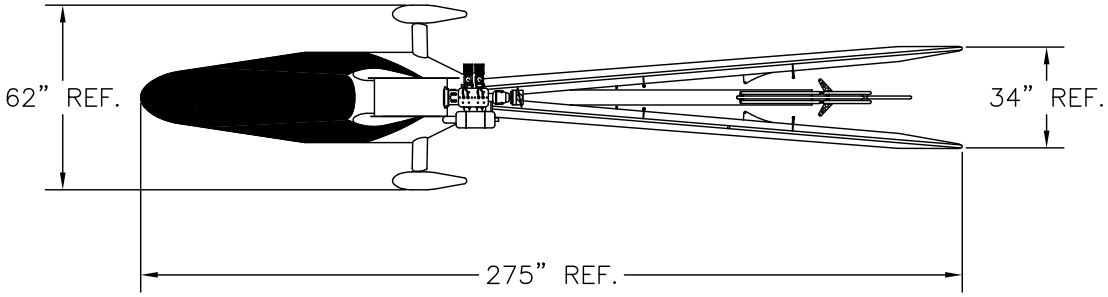
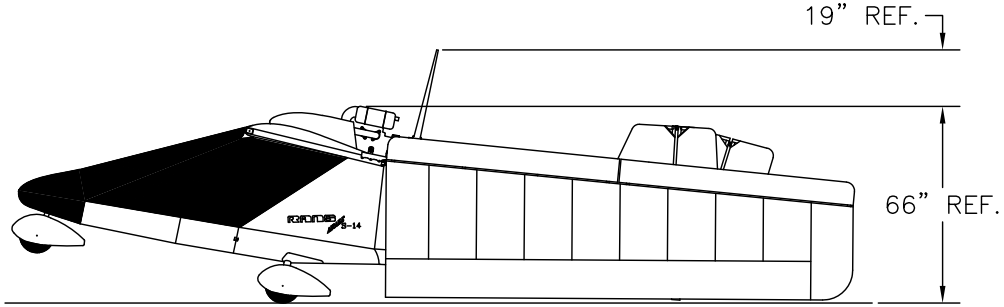
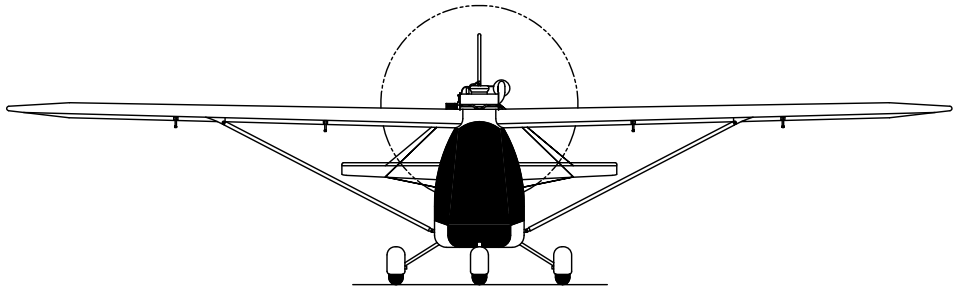
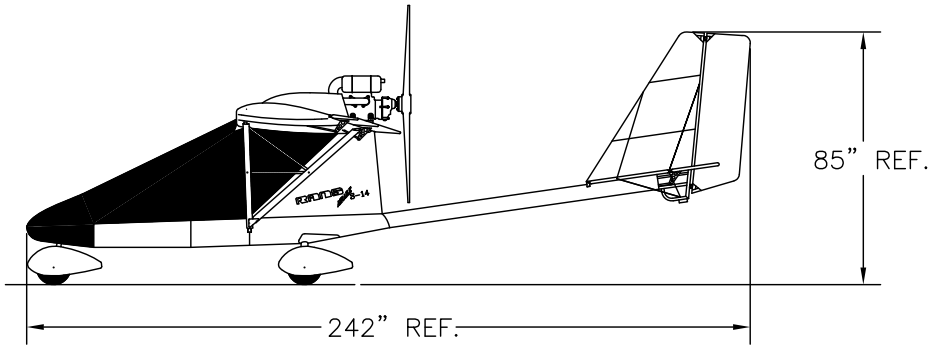
RANS S-14 AIRAILE







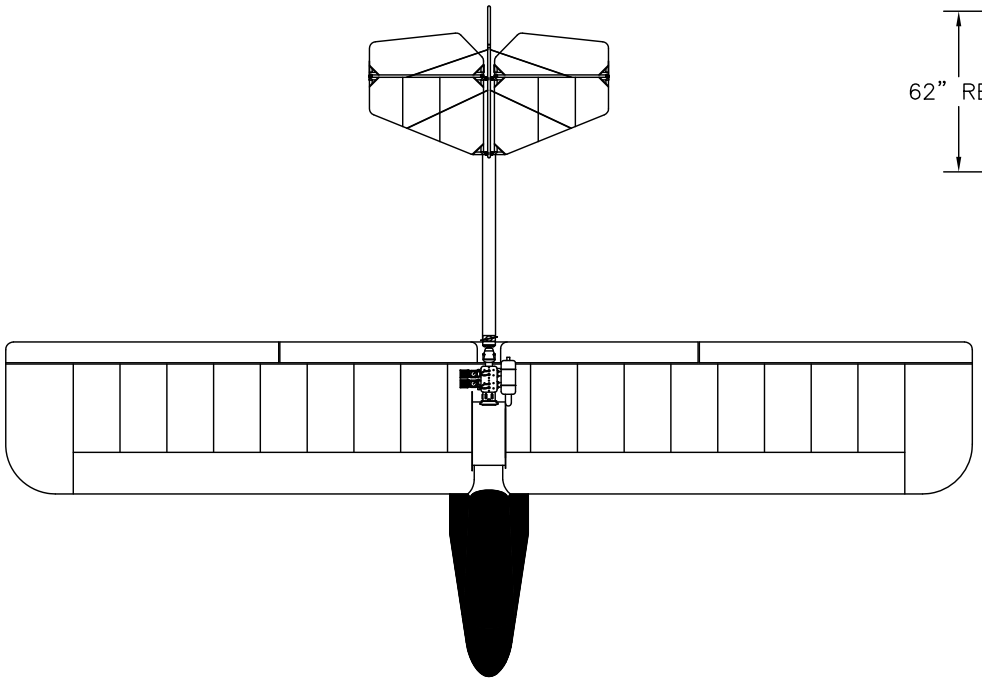


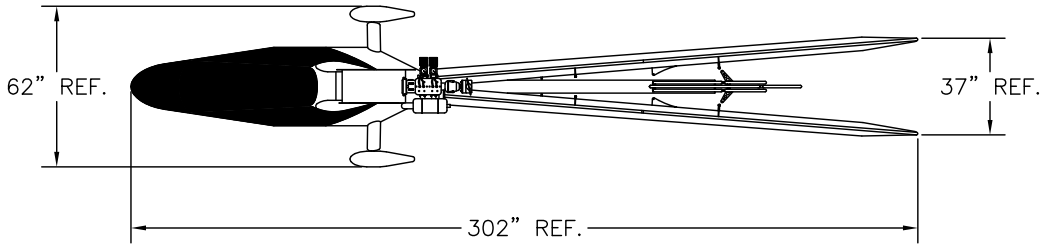


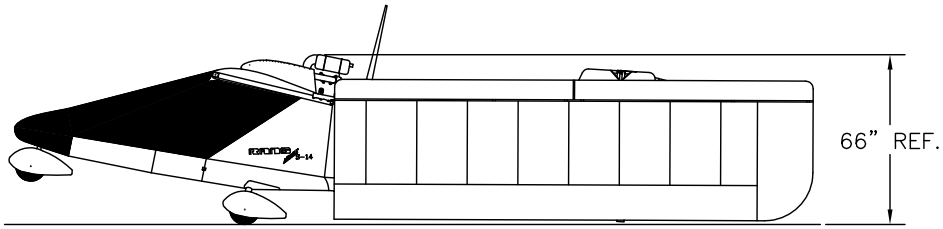
RANS
4600 Highway 183 Alternate
Hays, KS 67601
(785) 625-6346

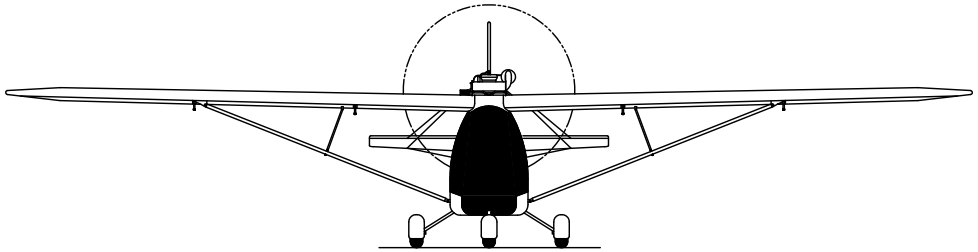
DESIGNED BY:
RANDY SCHLITTER

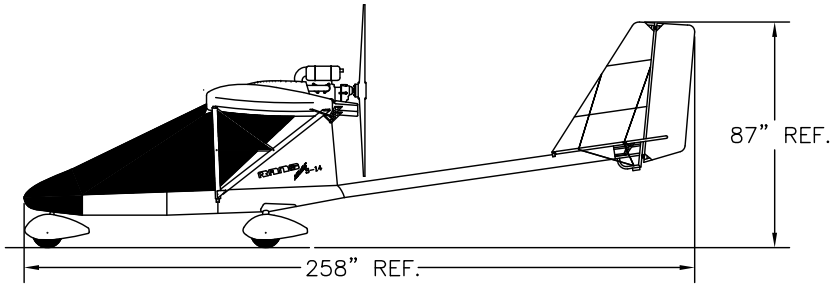
RANS S-14
AIRAILE
139 "LONG WING"









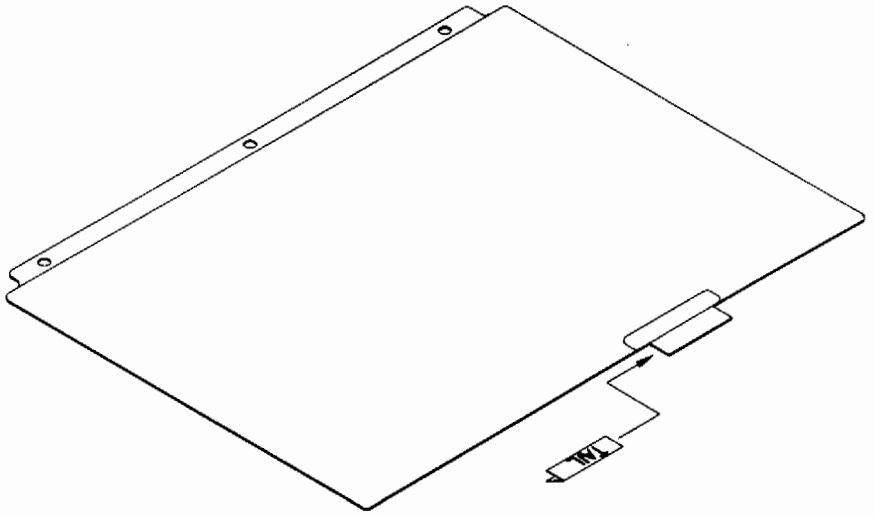


RANS
4600 Highway 183 Alternate
Hays, KS 67601
(785) 625-6346

DESIGNED BY:
RANDY SCHLITTER

S-14 AIRAILE

Your manual is ready for assembly. Separate the sections with the tab inserts listed below. Cut out, fold in half, and insert into tabs. Every section begins with the parts pages (exploded view and a part list) followed by text. Parts pages are assigned with the prefix "00", and the text pages are assigned the prefix "0". Follow the table of contents for the order that the manual should follow.



MD1316

GENERAL DATA GENERAL DATA	CONTROL STICK CONTROL STICK	ENGINE SYSTEM ENGINE SYSTEM	WINGS WINGS
LANDING GEAR / COCKPIT CAGE LANDING GEAR / COCKPIT CAGE	FUSELAGE FUSELAGE	INSTR. PANEL INSTR. PANEL	CG/OPERATIONS CG/OPERATIONS
RUDDER SYS. / FLOORBOARD RUDDER SYS. / FLOORBOARD	TAIL GROUP TAIL GROUP	SEATS SEATS	OPTIONS OPTIONS

S-14 AIRAILE

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Wings	09
C.G. Operations	CG
Options	010

RANS INC.

4600 Highway 183 Alternate
Hays, KS 67601

Technical Support
(785) 625-0069

Parts Department
(785) 625-6346

When calling Technical Support please have the following ready:

- ❑ Aircraft Model
- ❑ Serial Number
- ❑ Engine Model
- ❑ 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 Aircraft
Tool List

This is a partial list of tools that would be helpful when assembling a RANS airplane.

Hand Tools

Pliers
Needle nose pliers
Side cutters
Aviation snips
Hammer
Rubber mallet*
Center punch
Drift pin and punch set
Several small clamps

Safety wire pliers
Linesman pliers
Electrical wire stripers
Pop rivet tool
Click punch
Ball peen hammer
Scratch awl
Screwdriver set
Safety glasses

Wrench set SAE and metric
Ruler and tape measure

Socket set SAE and metric
2 or 4 ft. Level

Adjustable fly cutter*
Set of drill bits
Hack saw

Utility knife
Hole saw*
Files

Power Tools

Electric hand drill
Dremel*
Soldering gun
CD Player*

Small electric grinder*
Bench disk sander*
Heat gun*

Lubricants and Glues

Small can lithium grease
Contact cement
Super glue

Clear silicone
WD 40

* Not a necessary tool but helpful.

RANS S-14
ASSEMBLY SEQUENCE

Fuselage

Floorboard Pre-fit

Rudder Pedal Pre-fit

Complete Superstructure

Install ControlStick & 5/8" Push Pull 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.

Wings

Wing Assembly

Flap & Aileron Assembly

Tail Group

Vertical & Horizontal Stabilizer Assembly

Elevator Assembly

Rudder Assembly

Covering

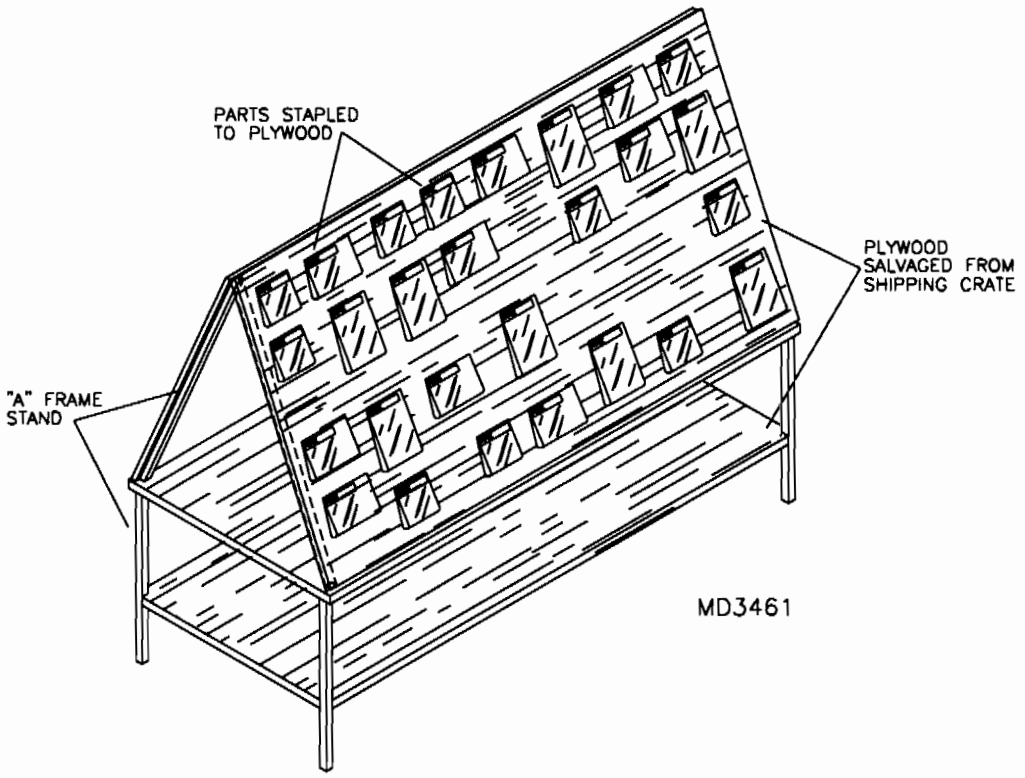
Clear Coating

Final Assembly & Installation of all Parts & Components

MD3632

S-14 AIRAILE GENERAL INFORMATION

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.*



BEFORE BEGINNING: Please read the manual cover to cover. This will speed up your build time considerable. Also refer to the assembly sequecne flow chart.

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

KEEP IT CLEAN!: The pre-sewn skins can soil easily. Wash your hands, tools and work tables. You will notice many of the parts are marked with part numbers. These wipe off with a cloth dampened with acetone or lacquer thinner. **CAUTION**: Do not allow acetone, lacquer thinner or loctite to come in contact with the lexan glazing. These and some other solvents will destroy the lexan.

After drilling holes they will need to be deburred. This is an **IMPORTANT** step and must be performed. Assembly of the parts with burrs can cause stress risers and eventual 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.

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.

FABRICATED PARTS: You will need to fabricate some parts out of the raw stock. These parts will be identified in your assembly manual.

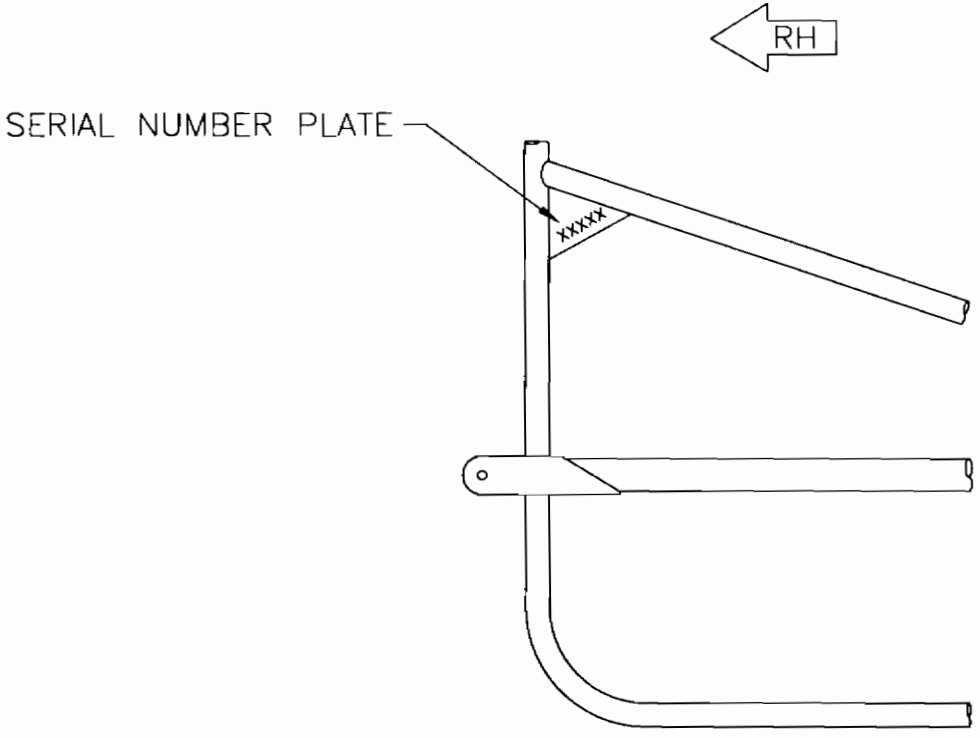
STRUCTURAL STATIONS: Throughout the manual references will be made to structural stations. These are locations of formers or bulkheads from the nose to the tail of the aircraft. Observe the drawing in this section for locations.

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 pliers is also included to install and remove the clecos. The clecos are color coded as to hole size. Silver #40 Copper #30 Gold #11

To use, simply set the cleco in the special pliers, squeeze closed, insert into the hole and release. (Reverse for removal). You will 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.



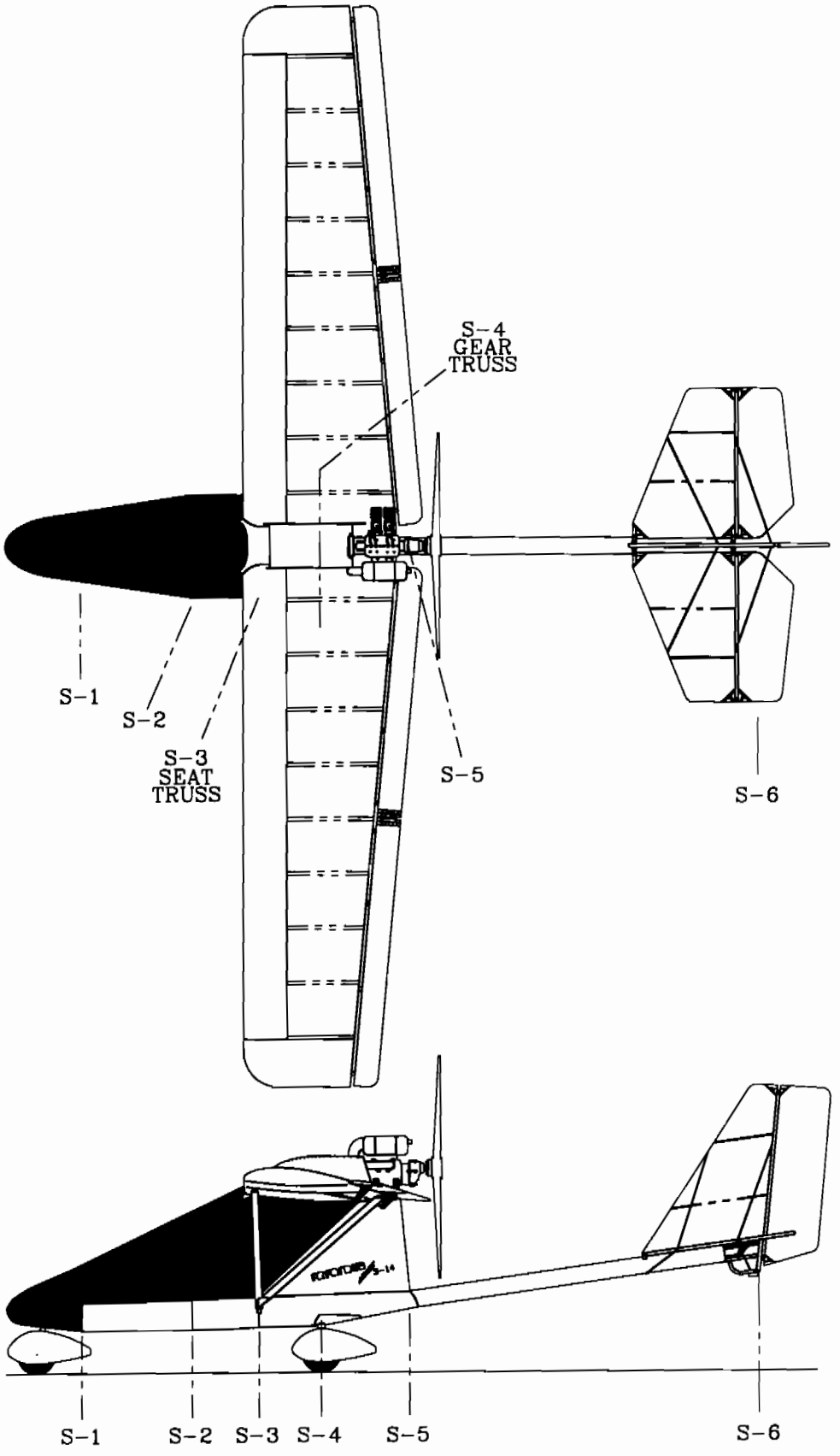
AFT KEEL TUBE SUPPORT GUSSET

RANS S-14 AIRAILE
SERIAL PLATE LOCATION

MD175

RANS AIRAILE S-14

STRUCTURAL STATION LOCATIONS



MD2994

PLACARDS & MARKINGS

Included in your S-14 kit is a decal sheet and gauge marking decal. These should provide you with just about every label/placard the FAA requires. Apply decals as per FAA recommendations. Affix the passenger warning decal to the instrument panel. Not included in you 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 either door's bottom edge. Rivet the metal identifier plate to the tail channel with (2) 1/8" pop rivets just above the lower cinch strap.

For the "N" number use 3" vinyl letters. We use COLE brand, available at most hardware stores. These just stick onto the tail boom, about midway. Make sure the surface is clean before applying. If you aerothane your aircraft, apply the "N" number **AFTER** painting.

WARRANTY INFORMATION

KODIAK RESEARCH, INC.
P.O. BOX N7113
MARLBOROUGH HOUSE
CUMBERLAND ST.
NASSAU, N.P. BAHAMAS

PHONE: (809) 356-5377
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 the 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 requests 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.

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 your, 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 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.

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 HOME BUILT AIRCRAFT?

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

After you obtain the registration of your aircraft, the Registration numbers or marks must be affixed to the aircraft in some permanent fashion. The marks must be legible and have no 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" not 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 multivertical 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 surface.

(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 surfaces.

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 a very nominal fee.

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 thereof.**

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 hourmeter 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 restrictions 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 of 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.

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 WEIGHT 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 SERVICE				
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, SEAT BELTS/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/PANEL 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				

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

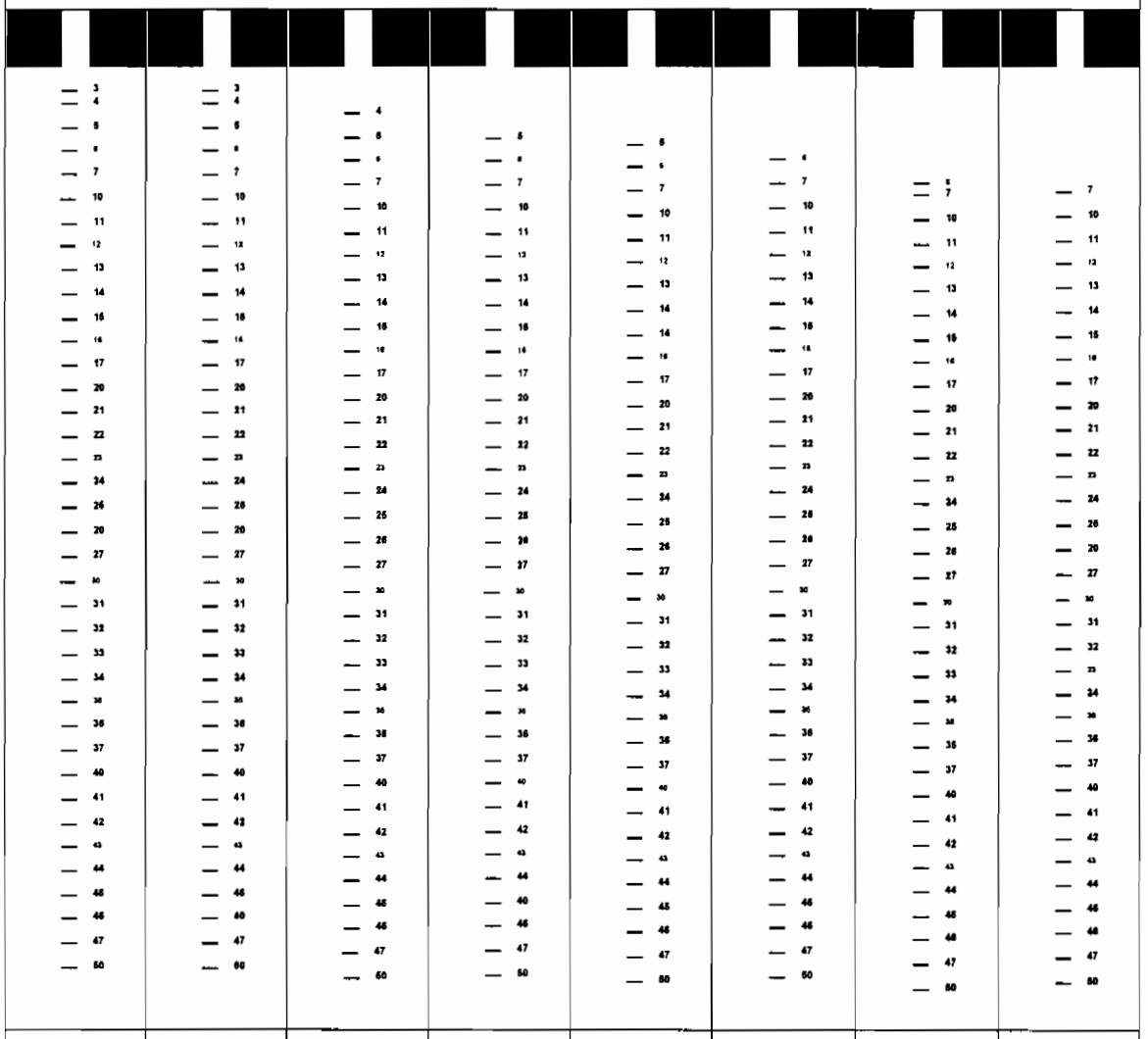
PART IDENTIFICATION

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	1/4	5/16	3/8	7/16	1/2	9/16	5/8

AFFIDAVIT OF OWNERSHIP FOR AMATEUR-BUILT AIRCRAFT

U.S. Identification Number: N12344

Builder's Name: John Q. Amateur

Model: RANS S-9 Serial Number: 1288054

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

Type of Engine Installed (reciprocating, turbopropeller, etc.): Reciprocating

Number of Engines Installed: 1

Manufacturer, Model, and Serial Number of each Engine Installed: Rotax 503 3572333

Built for Land or Water Operation: Land

Number of Seats: 1

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

(Signature of Owner-Builder)

State of: Kansas

County of: Anywhere

Subscribed and sworn to me before this _____ day of _____ , 19_____ .

My commission expires _____.

(Signature of Notary Public)

THIS PAGE IS ONLY A SAMPLE

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

FORM APPROVED
OMB No. 2120-0042

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION-MIKE MONRONEY AERONAUTICAL CENTER
AIRCRAFT REGISTRATION APPLICATION

CERT. ISSUE DATE

UNITED STATES REGISTRATION NUMBER N 1234Y

AIRCRAFT MANUFACTURER & MODEL
RANS S-9

AIRCRAFT SERIAL No.
1288054

FOR FAA USE ONLY

TYPE OF REGISTRATION (Check one box)

☒ 1. Individual ☐ 2. Partnership ☐ 3. Corporation ☐ 4. Co-owner ☐ 5. Gov't. ☐ 8. Non-Citizen Corporation

NAME OF APPLICANT (Person(s) shown on evidence of ownership. If individual, give last name, first name, and middle initial.)

John Q. Amateur

TELEPHONE NUMBER: (913) 888-8888

ADDRESS (Permanent mailing address for first applicant listed.)

Number and street: #1 Build-it Road

Rural Route: P.O. Box:

CITY	STATE	ZIP CODE
Anytown	KS	67601

☐ **CHECK HERE IF YOU ARE ONLY REPORTING A CHANGE OF ADDRESS**

ATTENTION! Read the following statement before signing this application. This portion MUST be completed.

A false or dishonest answer to any question in this application may be grounds for punishment by fine and / or imprisonment (U.S. Code, Title 18, Sec. 1001).

CERTIFICATION

I/WE CERTIFY:

(1) That the above aircraft is owned by the undersigned applicant, who is a citizen (including corporations) of the United States.

(For voting trust, give name of trustee: _____), or:

CHECK ONE AS APPROPRIATE:

a. ☐ A resident alien, with alien registration (Form 1-151 or Form 1-551) No. _____

b. ☐ A non-citizen corporation organized and doing business under the laws of (state) _____ and said aircraft is based and primarily used in the United States. Records or flight hours are available for inspection at _____

(2) That the aircraft is not registered under the laws of any foreign country; and

(3) That legal evidence of ownership is attached or has been filed with the Federal Aviation Administration.

NOTE: If executed for co-ownership all applicants must sign. Use reverse side if necessary.

TYPE OR PRINT NAME BELOW SIGNATURE

EACH PART OF THIS APPLICATION MUST BE SIGNED IN INK.

SIGNATURE	TITLE	DATE
John Q. Amateur	Builder/Owner	3/16/88
John Q. Amateur		

NOTE Pending receipt of the Certificate of Aircraft Registration, the aircraft may be operated for a period not in excess of 90 days, during which time the PINK copy of this application must be carried in the aircraft.

AC Form 8050-1 (12/90) (0052-00-628-9007) Supersedes Previous Edition

AC FORM 8050-1 IS A 3-PART FORM

THIS PAGE IS ONLY A SAMPLE

Form Approved
O.M.B. NO. 2120-0018

U.S Department of Transportation
Federal Aviation Administration

ELIGIBILITY STATEMENT AMATEUR-BUILT AIRCRAFT

Instructions: Print or type all information except signature. Submit original to an authorized FAA representative. Applicant completes Section I thru III. Notary Public Completes Section IV.

I. REGISTERED OWNER INFORMATION

Name(s) John Q. Amateur

Address(es) #1 Build-it Road (No. & Street) Anytown (City) KS (State) 67601 (Zip)

Telephone No.(s) (913)888-8888 (Residence) ( ) (Business)

II. AIRCRAFT INFORMATION

Model RANS S-9

Engine(s) Make Rotax 503

Assigned Serial No. 1288054

Engine(s) Serial No.(s) 3572333

Registration No. N1234Y

Prop./Rotor(s) Make Sterba

Aircraft Fabricated: Plan ☐ Kit ☒

Prop./Rotor(s) Serial No.(s)

III. MAJOR PORTION ELIGIBILITY STATMENT OF APPLICANT

I certify the aircraft identified in Section II above was fabricated and assembled by John Q. Amateur
(Name of Person(s) (Please Print))
for my (their) education or recreation. I (we) have records to support this statement and will make them available to the FAA upon request.

— NOTICE —

Whoever in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or covers up by any trick, scheme, or device a material fact, or who makes any false, fictitious or fraudulent statements or representations, or makes or uses any false writing or document knowing the same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years, or both (U.S. Code, Title 18, Sec. 1001.)

APPLICANT'S DECLARATION

I hereby certify that all statements and answers provided by me in this statement form are complete and true to the best of my knowledge, and I agree that they are to be considered part of the basis for issuance of any FAA certificate to me. I have also read and understand the Privacy Act statement that accompanies this form.

Signature of Applicant *(In Ink)* John Q. Amateur — Date 3/16/88

IV. NOTARIZATION STATEMENT

THIS MUST BE NOTARIZED!

THIS PAGE IS ONLY A SAMPLE

Form Approved
O.M.B. No. 2120-0018

US Department of Transportation
Federal Aviation Administration

APPLICATION FOR AIRWORTHINESS CERTIFICATE

INSTRUCTIONS — Print or type. Do not write in shaded areas; these are for FAA use only. Submit original only to an authorized FAA Representative. If additional space is required, use an attachment. For special flight permits complete Sections II and VI or VII as applicable.

I. AIRCRAFT DESCRIPTION

1. REGISTRATION MARK	2. AIRCRAFT BUILDER'S NAME (Make)	3. AIRCRAFT MODEL DESIGNATION	4. YR MFR	FAA CODING
N1234Y	John Q. Amateur	RANS S-9	88	
5. AIRCRAFT SERIAL NO	**6. ENGINE BUILDER'S NAME (Make)**	**7. ENGINE MODEL DESIGNATION**		
1288054	Rotax	503		
8. NUMBER OF ENGINES	**9. PROPELLER BUILDER'S NAME (Make)**	**10. PROPELLER MODEL DESIGNATION**	**11. AIRCRAFT IS (Check if applicable)**	
1	Sterba	Wood 64 X 34	IMPORT	

II. CERTIFICATION REQUESTED

APPLICATION IS HEREBY MADE FOR: (Check applicable items)

A	1		STANDARD AIRWORTHINESS CERTIFICATE (Indicate category)		NORMAL		UTILITY		ACROBATIC		TRANSPORT		GLIDER		BALLOON
B		X	SPECIAL AIRWORTHINESS CERTIFICATE (Check appropriate items)												
	2		LIMITED												
	5		PROVISIONAL (Indicate class)	1		CLASS I									
				2		CLASS II									
	3		RESTRICTED (Indicate operation(s) to be conducted)	1		AGRICULTURE AND PEST CONTROL	2		AERIAL SURVEYING	3		AERIAL ADVERTISING			
				4		FOREST (Wildlife conservation)	5		PATROLLING	6		WEATHER CONTROL			
				7		CARRIAGE OF CARGO	0		OTHER (Specify)						
	4	X	EXPERIMENTAL (Indicate operation(s) to be conducted)	1		RESEARCH AND DEVELOPMENT	2	X	AMATEUR BUILT	3		EXHIBITION			
				4		RACING	5		CREW TRAINING			MKT SURVEY			
				0		TO SHOW COMPLIANCE WITH FAR									
	8		SPECIAL FLIGHT PERMIT (Indicate operation to be conducted, then complete Section VI or VII as applicable on reverse side)	1		FERRY FLIGHT FOR REPAIRS, ALTERATIONS, MAINTENANCE OR STORAGE									
				2		EVACUATE FROM AREA OF IMPENDING DANGER									
				3		OPERATION IN EXCESS OF MAXIMUM CERTIFICATED TAKE-OFF WEIGHT									
				4		DELIVERING OR EXPORT	5		PRODUCTION FLIGHT TESTING						
				6		CUSTOMER DEMONSTRATION FLIGHTS									
C	6		MULTIPLE AIRWORTHINESS CERTIFICATE (Check ABOVE "Restricted Operation" and "Standard" or "Limited," as applicable)												

III. OWNER'S CERTIFICATION

A. REGISTERED OWNER (As shown on certificate of aircraft registration) — **IF DEALER, CHECK HERE** →

NAME	ADDRESS
John Q. Amateur	#1 Build-it Road Anytown, KS 67601

B. AIRCRAFT CERTIFICATION BASIS (Check applicable blocks and complete items as indicated)

	AIRCRAFT SPECIFICATION OR TYPE CERTIFICATE DATA SHEET (Give No and Revision No.)		AIRWORTHINESS DIRECTIVES (Check if all applicable AD's complied with and give latest AD No.)
	AIRCRAFT LISTING (Give page number(s))		SUPPLEMENTAL TYPE CERTIFICATE (List number of each STC incorporated)

C. AIRCRAFT OPERATION AND MAINTENANCE RECORDS

	CHECK IF RECORDS IN COMPLIANCE WITH FAR 91.173.	TOTAL AIRFRAME HOURS	3 EXPERIMENTAL ONLY (Enter hours flown since last certificate issued or renewed) 0

D. CERTIFICATION — I hereby certify that I am the registered owner (or his agent) of the aircraft described above, that the aircraft is registered with the Federal Aviation Administration in accordance with Section 501 of the Federal Aviation Act of 1958, and applicable Federal Aviation Regulations, and that the aircraft has been inspected and is airworthy and eligible for the airworthiness certificate requested.

DATE OF APPLICATION	NAME AND TITLE (Print or type)	SIGNATURE
3/16/88	John Q. Amateur	John Q. Amateur

IV. INSPECTION AGENCY VERIFICATION

A. THE AIRCRAFT DESCRIBED ABOVE HAS BEEN INSPECTED AND FOUND AIRWORTHY BY (Complete this section only if FAR 21.183(d) applies)

2		FAR PART 121 OR 127 CERTIFICATE HOLDER (Give Certificate No.)	3		CERTIFICATED MECHANIC (Give Certificate No.)
6		CERTIFICATED REPAIR STATION (Give Certificate No.)			
5		AIRCRAFT MANUFACTURER (Give name of firm)			

DATE	TITLE	SIGNATURE

V. FAA REPRESENTATIVE CERTIFICATION

(Check ALL applicable blocks in items A and B)

A. I find that the aircraft described in Section I or VII meets requirements for

		THE CERTIFICATE REQUESTED					
4		AMENDMENT OR MODIFICATION OF CURRENT AIRWORTHINESS CERTIFICATE					

B. Inspection for a special flight permit under Section VII was conducted by.

	FAA INSPECTOR		FAA DESIGNEE					
	CERTIFICATE HOLDER UNDER:		FAR 65		FAR 121, 127 or 135		FAR 145	

DATE	DISTRICT OFFICE		DESIGNEE'S SIGNATURE AND NO		FAA INSPECTOR'S SIGNATURE

THIS PAGE IS ONLY A SAMPLE

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.

	Yes	No
PROPELLER		
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		
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
ENGINE & ENGINE COMPARTMENT		
All stacks in good condition-no cracks or rusted-out areas?		
Carb heat and cabin heat muffs removed and manifold inspected?		
5. Controls		
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		
Secured and safetied?		
All joints inspected for cracks?		
Any bends in mount tubes?		
Bushings in good condition?		
7. Cowlings		
Secured and/or safetied?		
All latches or fastenings working properly?		
Any cracks properly checked or reinforced?		
Cowlings clean?		
8. Power Plant in General		
All necessary safeties, palnuts, locknuts, etc. in place?		
No fuel or oil leaks?		
All accessories secured & safetied?		
FUSELAGE-HULL		
1. Structure		
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		
Properly attached?		
No tears, distortions, or abrasions?		
Any breaks or ruptures properly repaired?		
3. Control System		
Properly secured and safetied?		
Controls stops provided & adjusted?		
All fittings of proper thread & size?		

	Yes	No
FUSELAGE-HULL		
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 throw when aircraft is occupied?		
Controls arranged to minimize danger of blocking by foreign objects?		
Grip properly secured to control stick or wheel?		
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 minimum 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
EXITS		
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?		
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?		

	Yes	No
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		
Fixed Surfaces		
Are all interior fastenings secured and/or safetied?		
Is interior properly weatherproofed?		
Have any mice been inside lately?		
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?		
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?		
Attach Fittings		
Are bolts of proper size installed?		
Are all bolts secured and safetied?		
Have all bolts been examined for wear?		
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?		
Fuel Tanks		
(See Fuselage Section Also)		
Are drains supplied at low point in tank when aircraft is in normal ground position?		

	Yes	No
Fuel overflow drains clear of aircraft - no tendency for overflow to soak into aircraft structure?		
LANDING GEAR		
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!

OK - Kick the tires, add another coat of paint and AWAY WE GO!

S-14 AIRAILE COCKPIT CAGE INSPECTION

The AIRAILE cockpit cage comes pre-painted 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 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 probable from the welding process but unlikely. The super structure is designed to compensate for this small amount of twist if it 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 such is present correct by gently bending back into original alignment. The most likely place for bent tabs will be the four aft triangle shaped tabs welded to the gear truss. These extend at generally a right angle to the truss. Insertion of the tail boom during assembly will further conform alignment.

3. Inspect the frames' paint job. As hard as we try to paint the cage completely there may a light spot here and there. If this is the case use a quality brand spray aerosol to touch up. We use flat black lacquer so nearly any flat black paint will match and be compatible.

4. Inspect the frame for general condition. If your cockpit cage has come through inspection with flying colors you are ready to begin assembly of one of the best pusher planes around!

5. Thread the 1/4" plain nuts all the way onto the (2) 1/4" bolts and screw these bolts into the nose gear steer arm stops.

S-14 AIRAILE MAIN GEAR ASSEMBLY

1. From the parts drawing and list collect the required components for the main gear assembly.

2. Observe the gear legs very closely. You will notice a slight curve to the tubes. This curve must be placed so it is up. To help mark the tubes, lay on a flat surface and affix a strip of masking tape to the curved out side. This will assure proper orientation. Also mark one LH and one RH so after they are drilled you won't get them mixed up.

3. Turn the fuselage cage upside down onto cardboard to protect the finish. Insert the gear legs into each socket (with the curves to the plane's top). Measure each gear leg, they should be of equal length to assure complete insertion. Mark from each side, remove and drill through the gear legs with a 1/4" bit. Use the pre-drilled holes in the sockets for location and guides. Drill from each side and bolt. NOTE: During final assembly apply a "ring" of clear silicon to the opening of the fuselage gear socket.

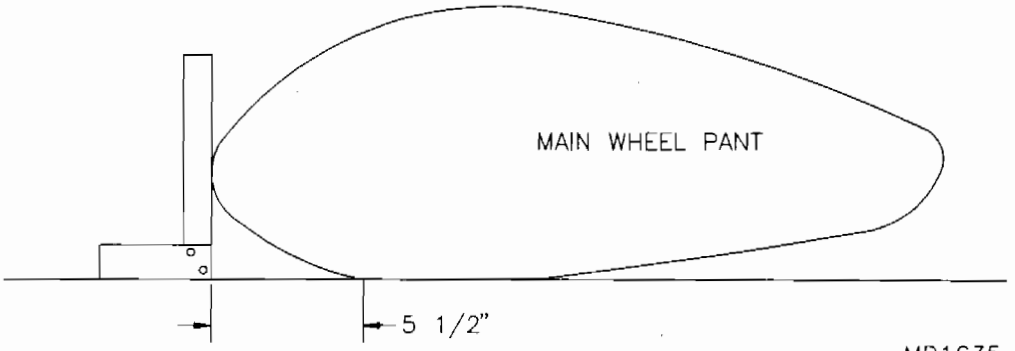
4. Insert the main gear axle sockets onto the gear legs. Measure the total length to assure each socket is equally inserted. If the legs are not of equal extension it is okay to move in/out the main gear axle sockets accordingly. Before drilling and bolting the sockets must be aligned. Temporarily insert the wheel axles into the inner ends of the axle sockets. Clamp a straight board or angle of 56 1/4" length on the sides of the axles to align the two axle sockets. Install the wheels, brake assembly onto the axle and cut off excess inboard. Mark and remove to drill through 3/16". Disassemble the sockets from the legs, apply a ring of silicon to the inside of each socket, insert onto legs and bolt with 1/4" bolts with the heads facing forward.

This completes the main gear assembly. For wheels and brake assembly turn to BRAKES.

MAIN WHEEL PANT INSTALLATION

1. Use the same template as the nose wheel to locate the bottom hole for proper tire clearance. Locate the bottom hole 5 1/2" AFT of the tip of the wheel pant as shown in **Figure 01B-01**. Do not use the dimple molded into the wheel pant.

FIGURE 01B-01



2. Notice that the wheel pants are marked left and right. Make sure that these are installed on the proper side. The difference is on the inside. Each pant has a large reinforced area where that attach tabs of the brake housing are to be positioned. Layout a cardboard template as shown below. Use this template to mark the brake cut outs. See **Figure 01B-02**. Look closely at the sides of the wheel pant. A small X marks the location of the proper axle location through the wheel pant. If your wheel pants are not marked or the X is not visible, locate the template on the inside of the wheel pant flush with the bottom at 12 1/4" AFT of the top to hole center. See **Figure 01B-02A**. Mark around the outside of the template on the outside of the part and cut this section out. Place the template on the outside of the wheel pant in the same location on the opposite side and drill a #11 hole through the hole in the template. If your wheel pant is marked with the X you will need only to drill through #11 at that location for the outside axle location.

FIGURE 01B-02

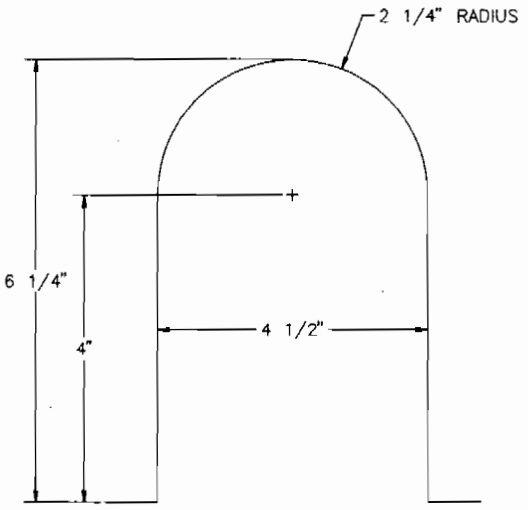
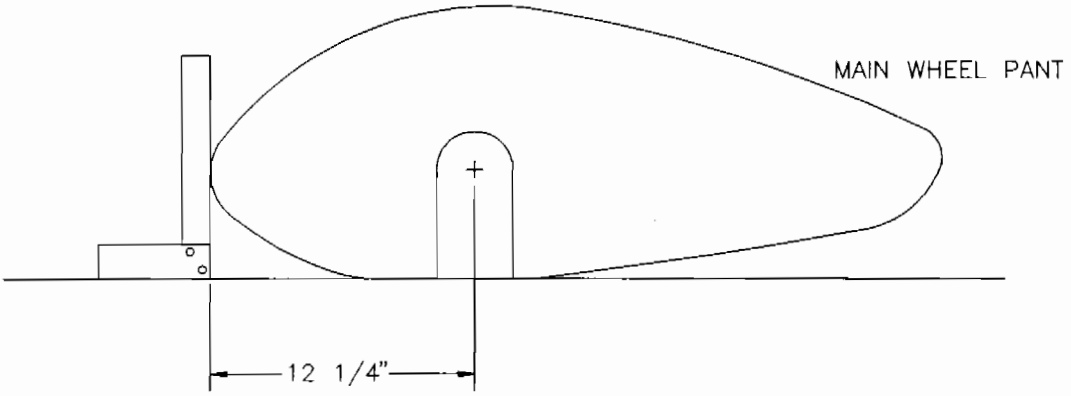


FIGURE 01B-02A



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3. Install the longer axle in the socket using the same procedure outlined in the main gear section of your manual. Make sure the drilled and tapped end is facing out. Slide the wheel pant over the wheel assembly with the tabs on the **OUTSIDE** of the wheel pant and loosely install a bolt into the end of the axle.

4. To align the wheel pant you will need to rotate it so that it matches the nose wheel's angle. If you are working on a level floor you can measure up to a common point on each wheel pant to get the level location. Once you are happy with it's location use the tabs to mark the hole locations in the wheel pants. Slip the wheel pant off and drill the tab holes.

5. Install the nut plates to the outside side if the tabs with the rivet heads to the inside. Slip the wheel pant over the wheel spreading it enough to slip **OVER** the tabs. Install the bolts to check fit. Remove, sand and paint to match.

6. Final installation of the wheel pant requires blue loctite on the axle bolts. Inspect the wheel pants for loose bolts every pre-flight.

S-14 AIRAILE NOSE GEAR ASSEMBLY

1. Select the parts depicted on the parts page for assembly.

2. Locate and clean the unpainted end of the nose gear assembly with a Scotch Brite pad or 400 grit sandpaper. Clean the inside of the swivel tubes located on the cage, where the nose fork strut pivots. This will ensure smooth operation of the nose fork after installed.

3. Insert fork assembly and steer horn on cage. Look closely at the steer horn, you will notice the flattened ends of the horns 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. Before drilling through the nose gear strut square, the steer horn to the nose gear axle. Drill a 3/16" hole through the fork and steer horn assembly. For best accuracy drill from each side pinning one side with the bolt. Remove the fork assembly and steer horn.

4. Apply grease to the nose gear strut and inside the swivel tubes. Slide the steer horn on the fork assembly and place 3/16" bolt in the hole through the steer horn.

5. Assemble the steering system as per the parts drawing. Final adjustment of the steer rods will come after rudder cables are installed. The steer rods should be approximately 13 1/2" from the bolt to bolt. Apply loctite to the 1/4" nuts to secure against vibration.

6. 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. Use the weight of the aircraft to depress the spring to install the bolt. Inspect the bolt for wear. Replace the bolt if it shows signs of grooving.

S-6ES, S-12, AND S-14 NOSE WHEEL PANT INSTALLATION

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

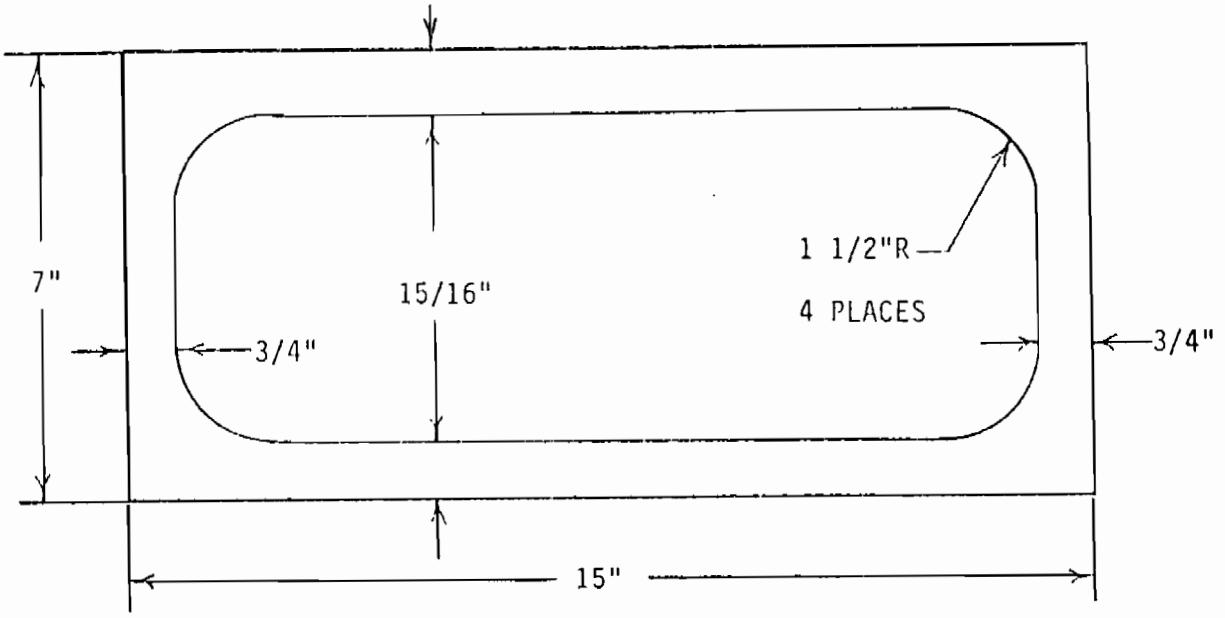


FIGURE-1 WHEEL OPENING TEMPLATE

2. Trim both the forward 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 forward 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 1/2" aft of the tip of the wheel pant as shown in Figure 3.

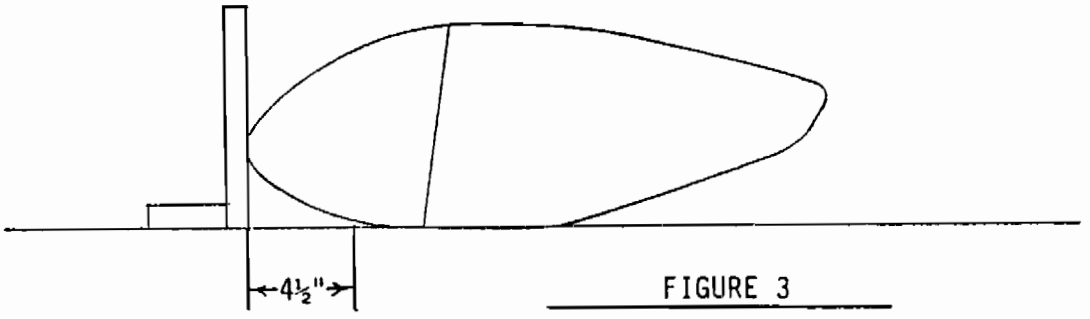


FIGURE 3

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

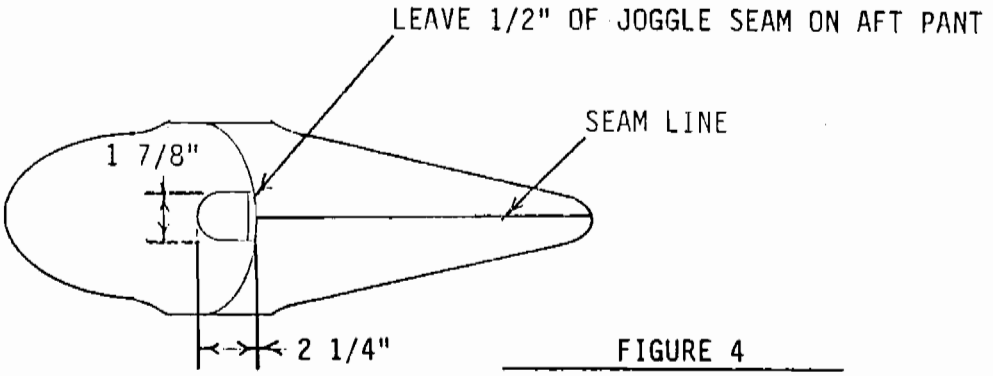


FIGURE 4

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

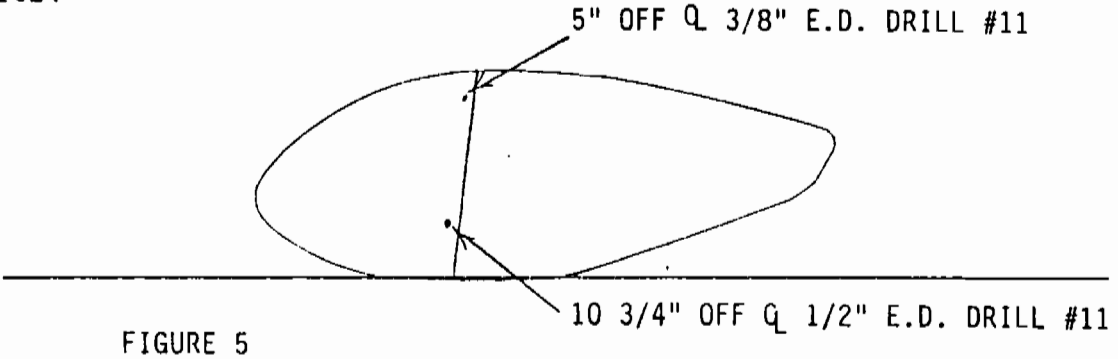


FIGURE 5

6. Pull the cotter pins out of the nose gear fork and tap the two attach sleeves into each end of the axle with the threaded ends facing out. Drill through the inserts and install new cotter pins.

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

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

S-14 AIRAILE BRAKE ASSEMBLY

The toe brake system is cable operated. These cables enter the brake pedals from the **BOTTOM.** Some builders have pointed out that the brakes work by pushing against the cable housing because the stop for the cable housing is on the pivoting brake lever. This is opposite of the norm, however, the function is just the same. If the cable housing was retained in a stationary stop it would still push against the housing to operate, that is simply how cable brakes work no matter how they are hooked up.

1. Select the parts depicted in the brake parts drawing. Construct the left and right brake assemblies as shown in the parts drawing. **NOTE:** The Hegar wheel system is a tubeless tire system.

2. Slip the valve stem through the hole, then while pulling on the cap end push on the large end. We recommend using a 1/4" allen wrench and pushing 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, since the valve stem is a permanent installation and never needs to be removed. To install the tire on the rim, sandwich the tire between the two rim halves, with the tubeless kit between the halves. From the back side of the wheel, install 3 of the 5/16" allens provided in alternate holes to hold the rim halves together. **WARNING:** Do not use the gold washers under the heads of these 3 allens. The washers are to be used on the outside of the wheel **UNDER THE NUTS ONLY.** Otherwise, the wheel will not seat properly and damage will result. Tighten the nuts with the wheel secured on one of the wheel hubs. This will center the rims and align the bolts. Assemble the nose and main wheels, tires and drums to the wheels. Look closely at the main wheel hubs, there is a small machined edge where the drum will rest against. Install the valve stems to three of the wheel halves. Mount the drums to the hubs with the tire in place. Inflate the tires to the recommended pressure of 30 PSI. **CAUTION:** Make sure all bolts are secure before inflating the tires.

3. Cut the cable housing to the following lengths: make two of each, 23" and 38". Consult the parts drawing for cable housing locations. A good side cutters can be used to cut the cable and cable housing to length. The cut should be clean so no burrs will cause wear and eventual failure of the cable. To clean up the end of a poorly cut housing grind the end on a bench grinder or similar tool. Look closely at the end of the cables. The end with the pill shaped stop is the end that will insert into the toe brake assembly. Cut off the other end and insert the cables through the housing, down to the brake assembly.

4. The brake pad assembly will need to be located on the tabs welded to the axle socket. The assembly should ride with the cable stop about 90 degrees to the gear leg, this will allow the brake cable to run into the stop with the least bending. The brake pad assembly must be located centered on the axle to allow the drum assembly to spin freely when the brakes are not applied. **Caution: It is necessary to file a radius on each edge of the cam bolt, this will allow for smoother operation.** See **FIGURE 01E-01.** Lay the wheels flat with the drums facing up. Set the brake pad assembly into each drum. Tie a segment of safety wire from the brake arm to the cable stop to hold the brake pads firm against the drum. Position the brake pads so they are about 1/8" outside the drum. The safety wire must be tight enough to hold the brake pads in the drum. Slip the unit over the wheel axles with cable stop positioned near vertical to allow the least amount of bending in the cable house routing. Using the tabs as guides, drill through the brake pad assembly with a #11 bit and bolt. The wheel should spin freely when the safety wire is released. If your brakes do not spin freely when released it is acceptable to file off the pads where they are contacting the drum. Rotate the wheel several times. This action will mark where the high spots are on the pads. File these down with a metal file until the wheel spins freely. **CAUTION:** Wear a dust particle mask when filing on the brake pads. The pads may contain asbestos. Use 5/8" I.D. washers to properly space the wheel/drum assembly away from the pads when wheel loc nut is tight.

5. Install the cable housing into the stops on the frame and route them to the toe pedals and wheels. Feed the cables into the toe levers and extend them through the housing down to the actuator arms on the brakes. Use the proper hardware to fix the ends and adjust the tension.

6. The brake system will need fine tuning after the aircraft is complete. Adjustments to the cables can be made at each stop and at the adjusting barrel on the brake. Adjust the brakes so the pedals feel even without excessive travel before actuation.

HEGAR WHEEL/BRAKE ASSEMBLY

Assembly of the wheel is as follows:

1. Obtain parts depicted in the drawing.

2. Position rubber "O" ring into machined groove (Part B). Be sure to place rings on both sides of the spacer.

3. Insert valve core into outside rim (Part A).

4. Using the short fasteners (Part D) insert each into the inside rim through the seal. (Be sure every other hole when positioning the bolts.) At this time place the tire over the inside rim/seal assembly and place the outer rim over the fasteners and hand tighten bolts using washers and nuts provided.

5. Notice the larger holes which have been drilled into the wheel hub (Part E). Dark circles have been placed on the drawing to denote each of these holes, and to indicate the path for short fasteners. Place the hub inside the inner rim. Position the hub so the heads of the fasteners are located inside the larger holes, and tighten the bolts.

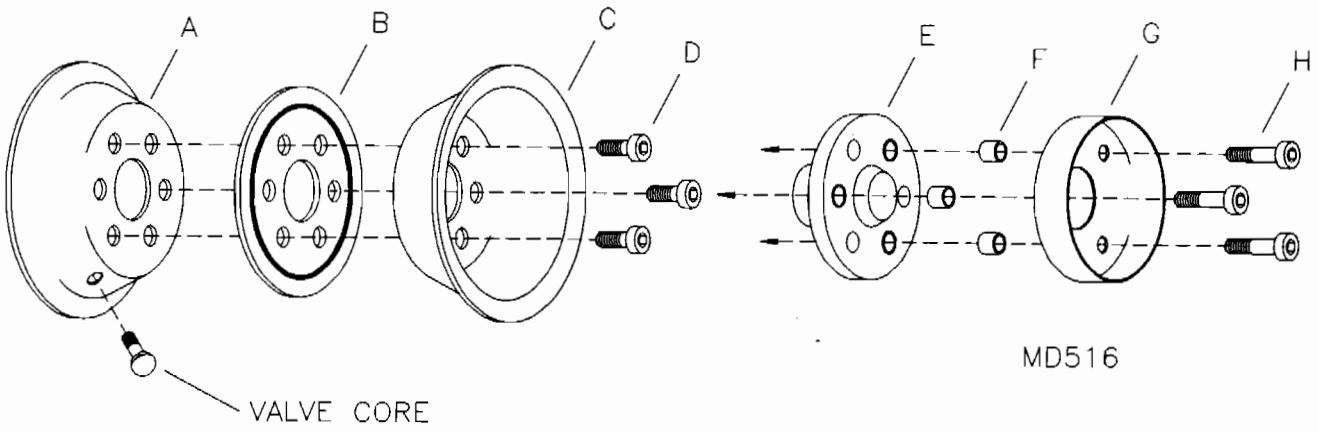
6. Using the large fasteners (Part H), the brake drum (Part G), and the spacer bushings* (Part F) carefully thread the fasteners into the tapped holes on the wheel hub (Part E). Be sure to tighten the large fasteners so to secure properly.

7. Next, position the hub into the inner rim assembly. (Be sure the hub seats itself correctly.) Finally, secure the longer fasteners using the washers and nuts provided.

8. Inflate the tire by standing the tire upright, and pressing downward so to spread the bead and create an air lock. (Repeat procedure for other wheel.)

NOTE: **DO NOT** use silicone on the "O" ring to form a seal!!!

*Spacer bushings are only required when using wheel pants or the Hegar 5" wheels.



S-14 AIRAILE RUDDER PEDAL ASSEMBLY

1. Look closely at the two rudder pedal welded assemblies. Determine the left and right pedals by comparing them to the parts drawing.

2. Slip the spacer bushings over the ends of each rudder pedal.

3. Lightly grease the ends of the rudder pedals and the insides of the welded in place pivot bushings.

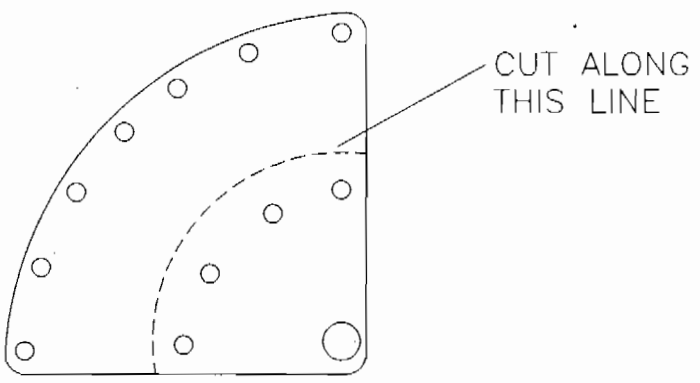
4. Slide the right pedal into the forward set of pivot bushings by inserting one end. Push the pedal into the bushing until the other end is past the other pivot bushing. Slide the pedal into the second pivot bushing. Center the pedal so the ends of the pedal are flush with the pivot bushings. Slide the aluminum sleeves next to the pivot bushings and drill and rivet. Repeat the process for the left pedal.

5. Refer to the nose gear parts drawing for parts selection. Assemble the steering linkages to the steer rods. The steering linkage bolts on the **INSIDE** of the rudder pedal steer horns and to the **BOTTOM** of the steer horn attached to the nose gear column.

6. The rudder cables attach directly to the **OUTSIDE** of the rudder pedal arms. Look closely at the rudder cables, each end has a special tang. Attach the straight three hole tang to the outside of the rudder pedals. Cable tension is adjusted when the rudder is installed by tuning the steer rods. Also, the multi-hole tang on the rudder cables AFT end will allow small length adjustments. The three hole tang on the front end of the rudder cables allows for some tilt adjustment of the rudder pedals themselves. Use this feature to fine tune your seating position. Consult the parts drawing for specific washer and bolt selection and location.

7. Cable keepers at the S-3 will need to be trimmed down for small pulleys. See **Figure 02-1.**

FIGURE 02-1



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S-14 AIRAILE FLOORBOARD INSTALLATION

1. The floorboard comes pre-cut and finished, ready to position and bolt in place. Locate and clamp the floorboard in place. The floorboard should be placed so it is centered and the front edge even with the back edge of the S-1 bottom crossing tube. Drill up from the bottom with a #11 drill bit. **HINT:** Use a wood block placed over the top to prevent splinters. Bolt the floorboard as per the parts drawing.

S-14 AIRAILE CONTROL ASSEMBLY

1. The S-14 control stick pivot is welded into the airframe. Oil the pivot points and work them FWD and AFT until the control stick moves freely.

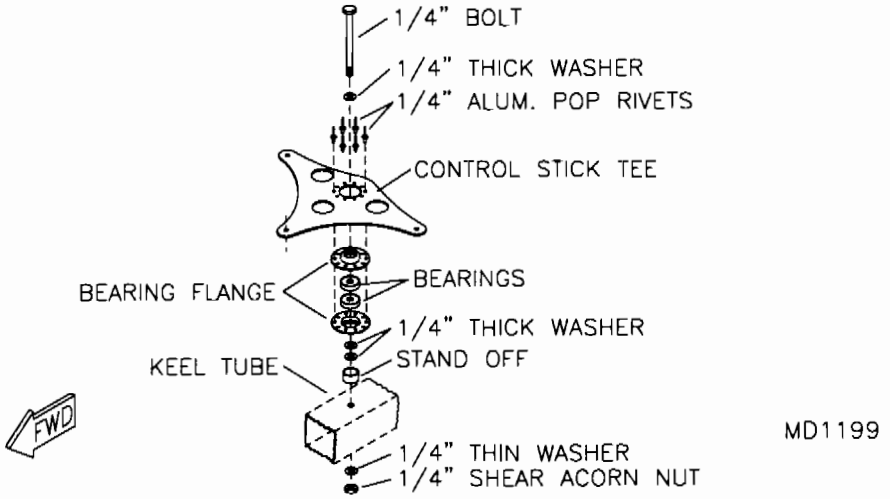
2. Select all the control stick parts as depicted in the parts catalog. Slide on the AFT bearing assembly. Grease the swivel stub on the control stick pivot and slide on the control stick. Make sure the control stick faces AFT. Slide on the second bearing assembly. Install the nyloc nut and test the side to side movement. Adjust the nut until there is no play and the stick moves side to side freely.

3. Soap up the end of the control stick and slip on the grip. Install the end cap.

4. Slide the 5/8" push pull tube FWD fitting onto the 5/8" push pull tube, assemble as per the parts drawing. Ream the control stick bushings (bottom S-2 & S-3 trusses) until the 5/8" push-pull tube will glide freely. **Hint:** Lightly sand the push-pull tube to smooth irregularities in the powder coat. Do not remove the powder coat! Apply grease to the control stick bushings welded to the bottom of the S-2 & S-3 trusses. Insert the 5/8" push pull tube end fitting over the push pull tube with the tang pointing up and then bolt together. Slide the elevator stop sleeve over the FWD end of the 5/8" push pull tube. The elevator stop sleeve will be located, drilled and riveted after the elevators are installed and travel is set. Assemble ½" link tube, rod end to the control stick pivot and 5/8" push pull tube FWD fitting as per the parts drawing. **PLEASE NOTE:** For a rod end to be considered safe it must be screwed in at least 6 turns. Please note the number of turns when adjusting the control stick system. Place the small 1/10" by 1/4" bushing in the eye of the rod end. Bolt the rod end push tube assembly to the control stick pivot.

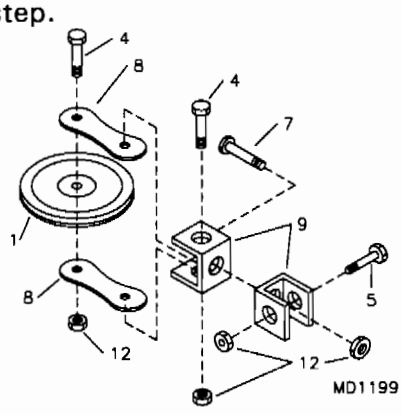
5. Grease the inside of the control tee and roller bearing. Assemble the control tee to the keel tube at the vertical hole located in the keel tube 10 5/16" from the front. Drill out the hole to 1/4". See **Figure 03-05**.

FIGURE 03-05



6. Bolt together four pulley assemblies as per **Figure 03-06**. **PLEASE NOTE:** The small shackles go on the outside of the tangs coming off the pulleys. Leave the bolt through the pulley unfastened so the aileron cables can be inserted as per the next step.

FIGURE 03-06



7. Route the aileron cables as per **Figure 03-07**. Tighten the turnbuckles slightly and test run the system. Check for smooth, free movement. If everything is lined up it will operate with very little friction. If you have a binding or catching, inspect the system for a dragging pulley or gross misalignment. Once you are satisfied that the system is running properly, tighten the cable so it has a low mellow note when strummed. Too much cable tension will be indicated by high system friction. Too little tension will result in play in the system. Find the middle ground by experimenting with the turnbuckles.

FIGURE 03-07

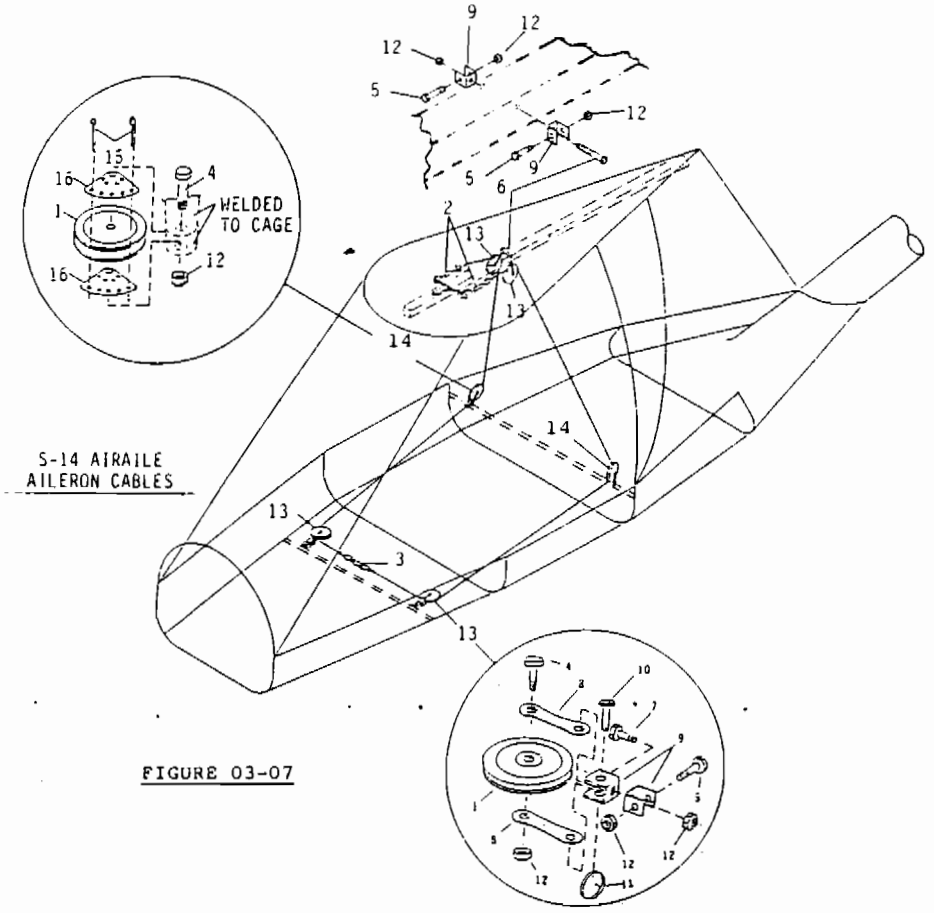


FIGURE 03-07

8. Make sure when you are experimenting with the control system that you pre-flight all connections before flying. **DANGER:** Check control function before flight for proper movement. The right aileron should go up when the stick is pushed right and the left stick should make the left aileron go up.

9. Check the elevator push pull tube for smooth operation. Check by moving the control stick FWD and AFT, it should move freely. Oil all pivot bushings and pillow blocks with a light machine oil. **Caution:** Lube 5/8" push-pull tube with white lithium grease and re-grease as needed.

10. A test run of the aileron and flap system can be performed prior to covering, however, this is not required. Installation of the aileron push pull tubes and flap system is covered in the wing assembly section. See rigging for details on inspection and control movement.

11. Locate the elevator up stop sleeve. It is a piece of 3/4" X .058 aluminum tubing, 3/4" in length. Slip it over the unbent end of the 5/8" push pull tube. Location and riveting of this stop sleeve will be covered in the tail assembly. Slip the unbent end of the 5/8" push pull tube through the guide welded to the lower S-3 carry through. Bolt the 5/8" push pull tube to the control stick assembly with the correct hardware.

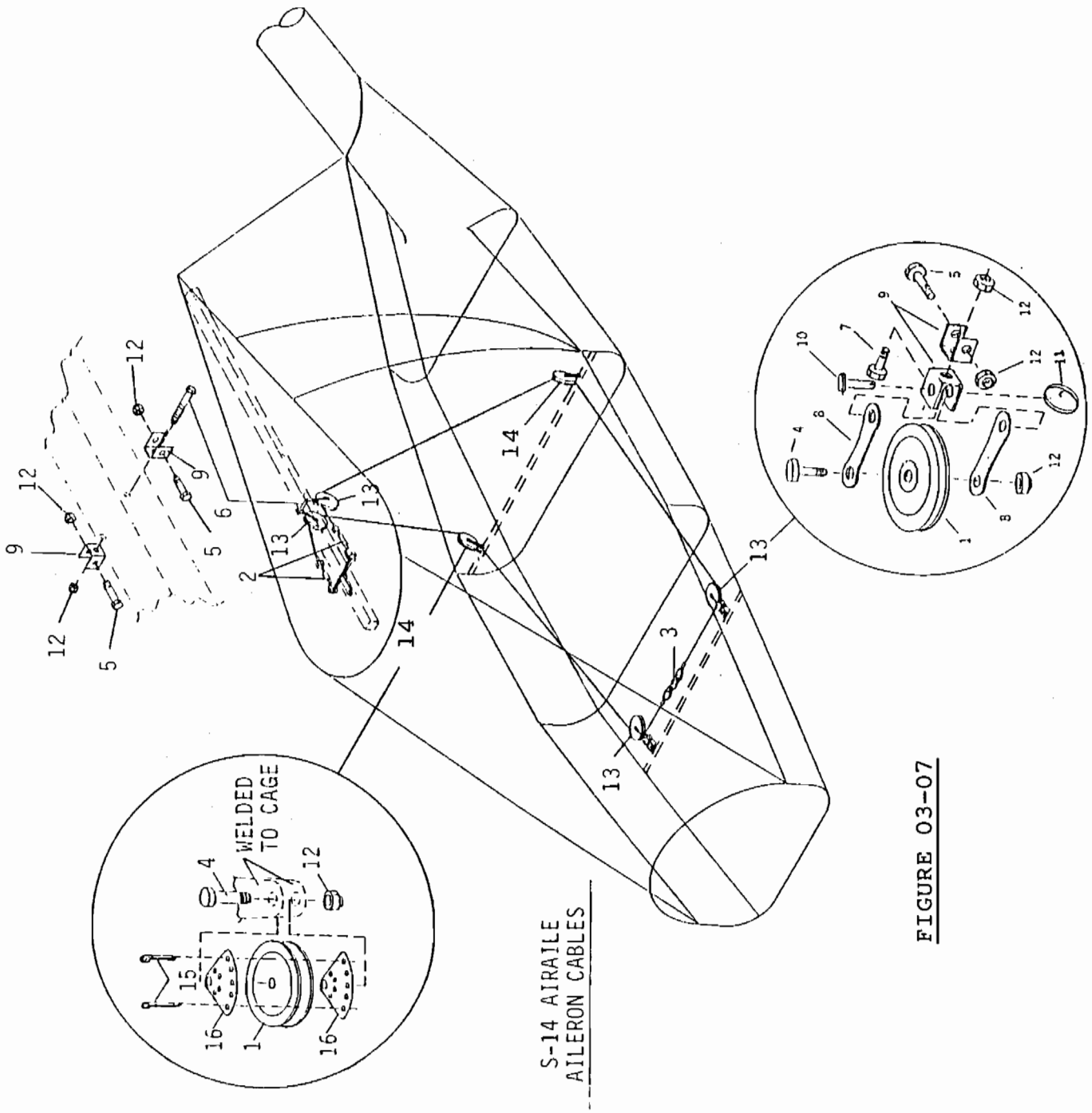


FIGURE 03-07

9. Check the elevator push pull tube for smooth operation. Check by moving the control stick FWD and AFT, it should move freely. Oil all pivot bushings and pillow blocks with a light machine oil.

10. A test run of the aileron and flap system can be performed prior to covering, however, this is not required. Installation of the aileron push pull tubes and flap system is covered in the wing assembly section. See rigging for details on inspection and control movement.

11. Locate the elevator up stop sleeve. It is a piece of 3/4" X .058 aluminum tubing, 3/4" in length. Slip it over the unbent end of the 5/8" push pull tube. Location and riveting of this stop sleeve will be covered in the tail assembly. Slip the unbent end of the 5/8" push pull tube through the guide welded to the lower S-3 carry through. Bolt the 5/8" push pull tube to the control stick assembly with the correct hardware.

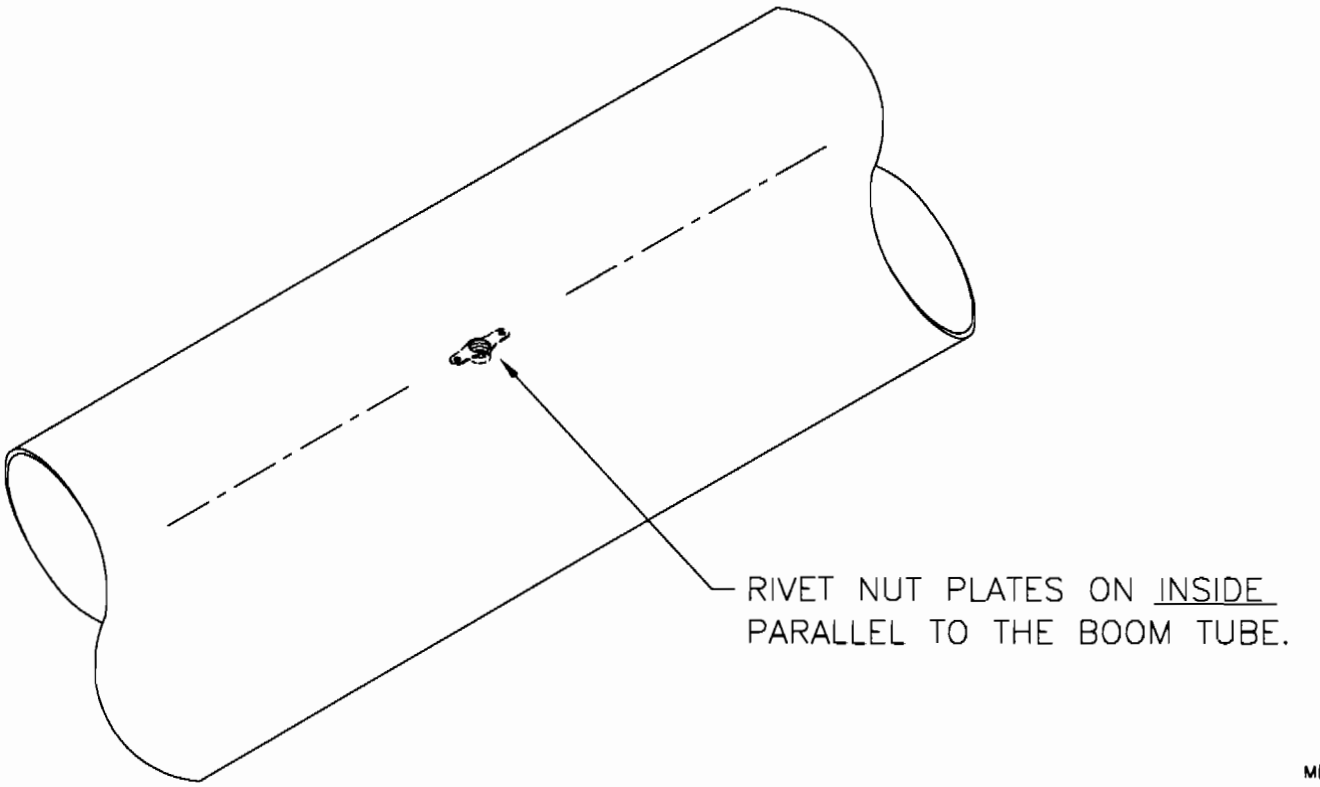
S-14 AIRAILE BOOM & SUPER STRUCTURE ASSEMBLY

At this point the cockpit cage is on its gear. We are now ready to insert the boom into the cage. For your reference the boom and keel are set at five degrees from level at the cockpit cage longerons. The fuselage structure arrives assembled. Thoroughly inspect the cage assembly before continuing.

1. Locate the Lexan plastic strip. Use Contact cement to secure the plastic strip on the inside of the tail boom bracket. This is needed to prevent dissimilar metal corrosion between the tail boom bracket and the tail boom.

2. Look at the boom very closely. You will notice one end has a triangular cut-out and a #11 hole on each side of the cut-out. The cut-out denotes the **BOTTOM** and **FRONT** end of the boom tube. At 18" aft of the front end you will see four #11 holes. The 3/16" nut plates need to be riveted to the **INSIDE** of the boom on all four holes. Take a short 3/16" bolt and reach inside the boom and shove the bolt out one of the holes. Thread a nut plate on the bolt two or three turns. Press the nut flat against the boom tube with the ears in parallel with the tube. Drill through the ear hole with a #40 drill. Cleco one side and drill the other. Repeat the process for the other three holes using the same nut plate and bolt. Clean off any burrs and place the nut plates on the **INSIDE** of the tube over the holes. Rivet the plates in place using #40 aluminum pop rivets. See **Figure 04-02.**

FIGURE 04-02



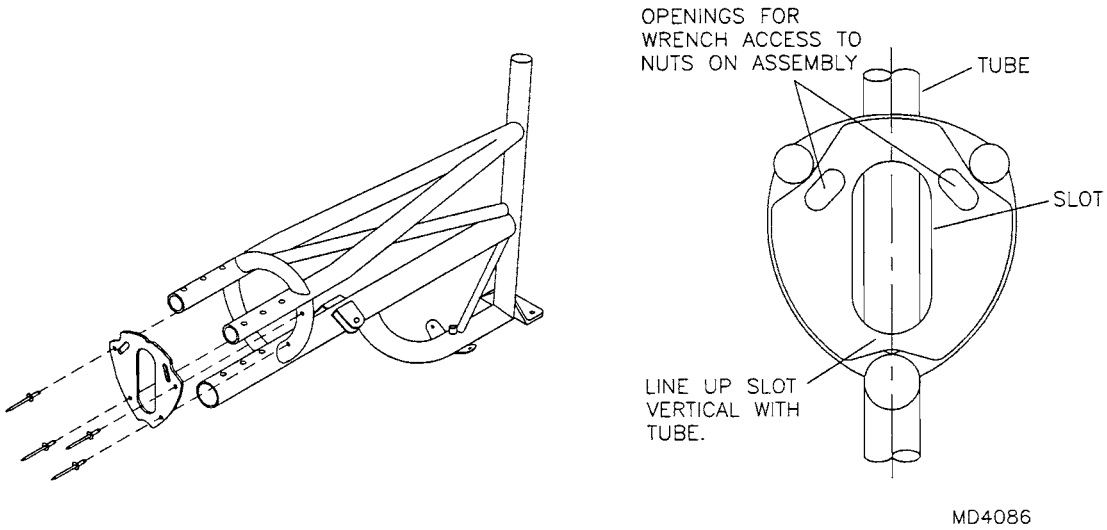
3. Apply a coat of Vaseline to the first 45" of the boom to prevent scratches. Believe it or not Vaseline works best for this. We have tried grease and other lubes with little success.

4. Insert the boom into the fuselage frame with the cut-out end down. Install the two bolts at the seat truss tabs and the four bolts into the nut plates. The boom has been preset to the exact angle at the factory, no adjustment will be needed.

TAIL BOOM EXTENSION INSTALLATION

5. Locate the hardware for the tail boom extension and elevator push pull tube guide shown on the tail boom assembly drawing. Place guide on **forward** side of extension, see **Figure 04-05**. Otherwise it will conflict with push pull tube yoke bolt. Drill and rivet guide in place.

FIGURE 04-05



6. 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 04-06**. Measure 3/8" edge distance on the bottom of the tail boom and drill with a #11. Measure 2" 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 use a segment of small angle stock laid against the boom tube. See **Figure 04-06A**. 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 #40 aluminum rivets. This hole will be the lower forward cable attach point of the horizontal stabilizer. See **Figure 04-06B**.

FIGURE 04-06

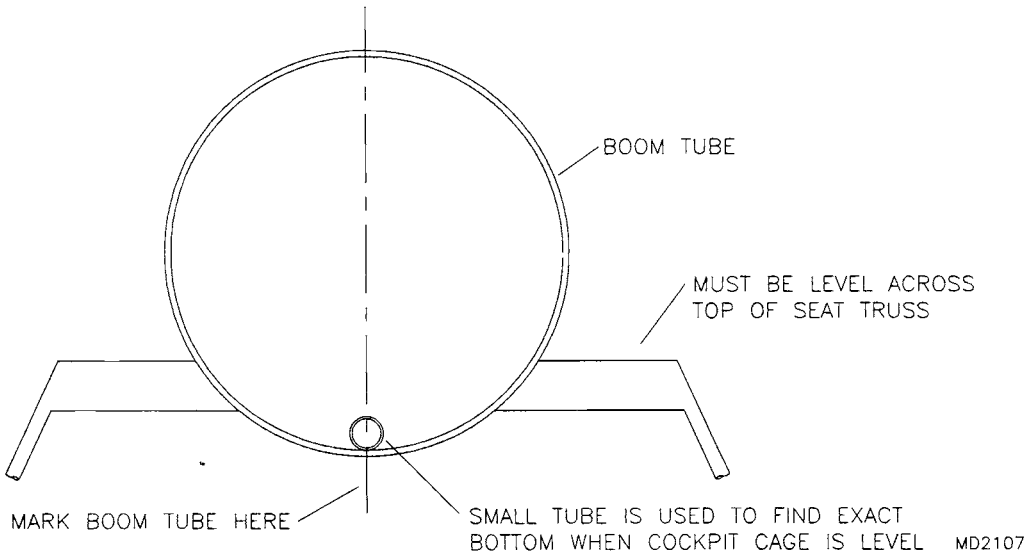


FIGURE 04-06A

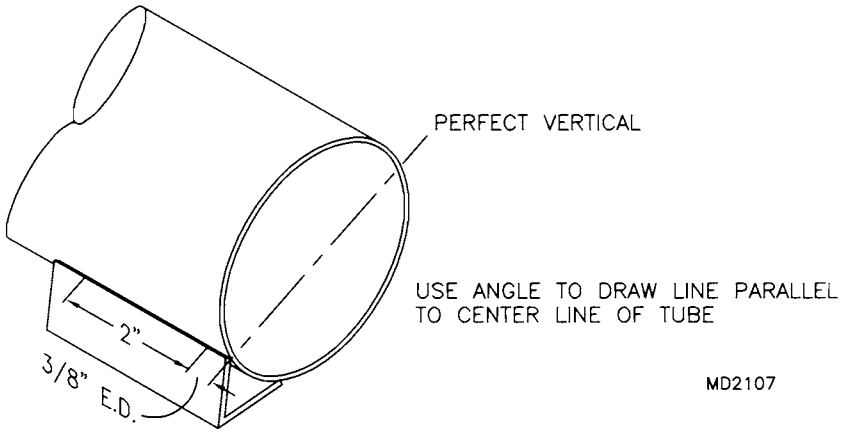
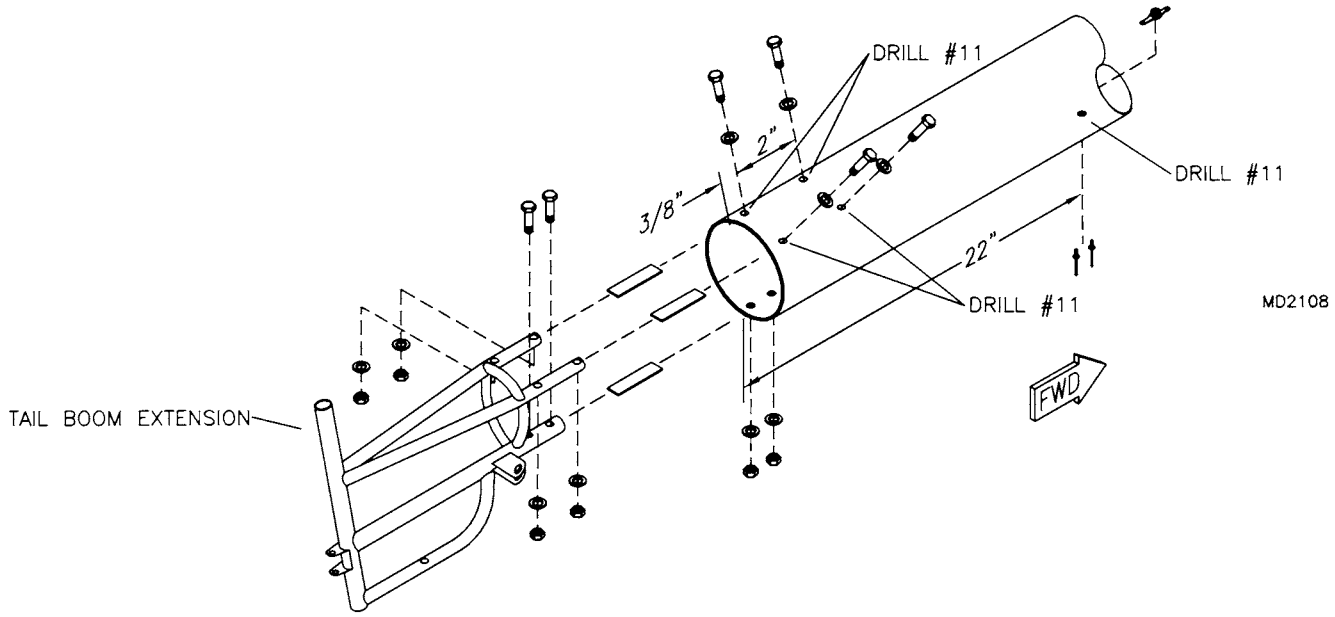


FIGURE 04-06B



7. 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. **HINT:** Place the vertical stabilizer spar in place to enhance sight alignment. Clamp one of the top two 5/8" tubes with a small vise grip type "C" clamp. Re-check the vertical alignment after clamping. Drill the other 5/8" tube using the same dimensions used to drill the bottom of the tail boom. Be sure you are drilling through the center axis of the 5/8" 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. Re-install tail boom extension.

S-14 AIRAILE FULL ENCLOSURE ASSEMBLY

The S-14 arrives with the tube structure assembled and ready for the skins. The tube frame that supports the skin and lexan was assembled in a precise fixture at the factory and requires no adjustment prior to skin assembly.

PLEASE NOTE: Some of the rivets in this assembly are 1/8" stainless steel. They are tough to pull with the normal hand pop rivet guns. We have tried several riveters and found one for $25.00 that will hold up through the building process. Call us if you are in need of a lasting hand riveter. You will need to buy a quart of contact cement to glue the soundproofing in place. We use the Liquid Nail brand, but just about any brand will work.

The Airaile's **NOSE CONE, WINDSHIELD,** and **DOOR PANEL**, are constructed of G.E. Lexan. This polycarbonate material is darn near bullet proof, however, it does not like solvents. Lacquer thinners and acetones will pretty much destroy Lexan in a matter of seconds. So please be careful when working and maintaining your Lexan. A coating of protective material has been applied to the nose cone to save it from scratches while cutting and fitting. This coating will peel off. Wait till the nose cone is installed and the plane is at the airport ready to fly before peeling the coating. If the film doesn't peel easily, use 91 percent Isopropyl Alcohol to remove.

Do not attach the wings at this time. The windshield is easier to install with them removed. In your kit 12 copper colored clecos were included. Clecos are little cylindrical shaped objects about 2" long. They are used to temporarily hold things in place through the rivet holes before installing the rivets. You will find that these will come in handy when assembling the full enclosure.

1. For the pans to fit tight against the frame, the pans need to be pre-formed. This can be done using a simple homemade bending tool. The tool is made from two tubes or wood dowels. See **FIGURE 04A-01.** See **FIGURE 04A-01A** for tool locations for bending. Bend the pans gently with a large soft curve by slipping the tool over and clamping it tight on the pan. Bend the metal slowly and gently against a flat surface by holding the tool at the ends and twisting. Lay a towel or carpet on the table you are bending against. **NOTE:** The #2 pans are right and left, form pans with 1/4" flange down.

2. To install the pans we start at the rear and move forward. The aft most pan will need lots of pre-bending to keep it from becoming a wrestling match, so take the time to bend it to fit. To hold the pans in place, use 2" wide masking tape. Another method is to rivet the #3 and #4 belly pans to each side of the pan with two small #40 rivets. This will hold the pans solidly in place while allowing then to be drilled out when ready to install the upper part of the enclosure. Later, after the top aft panels and the next forward pan is installed, The holes will be drilled for #30 rivets. Do not drill until after the #3 pan and the two aft upper panels are installed.

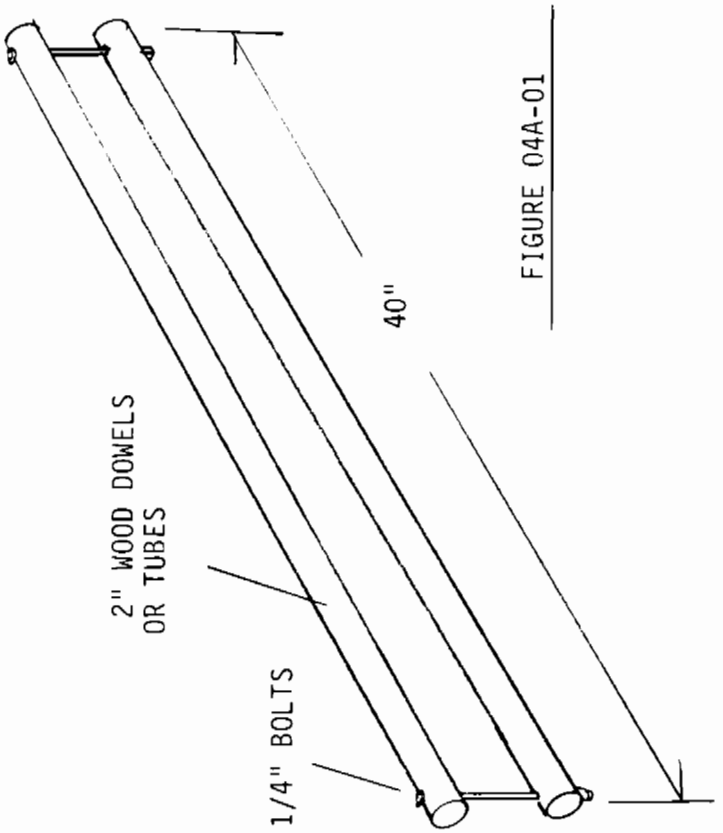


FIGURE 04A-01

BEND BELLY PANS 180° AS SHOWN

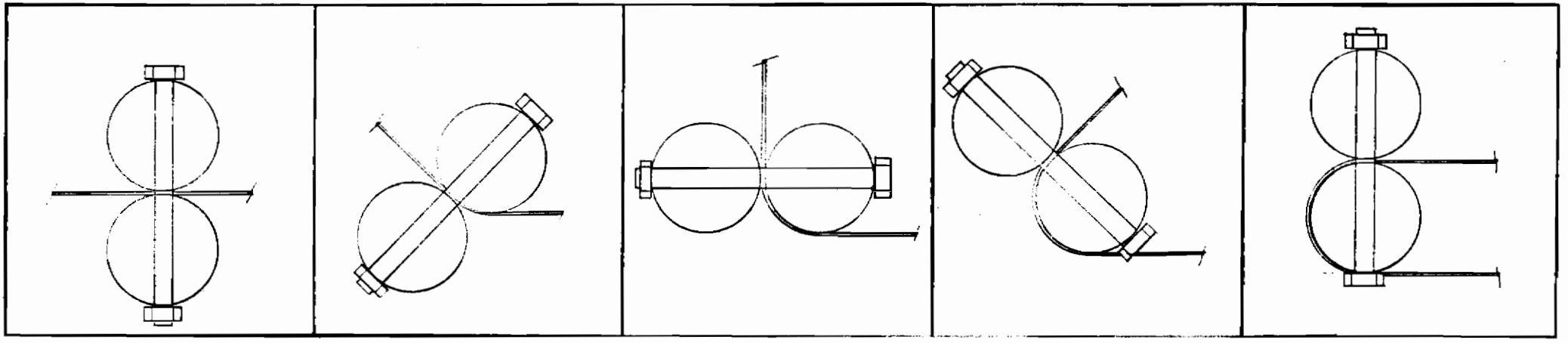
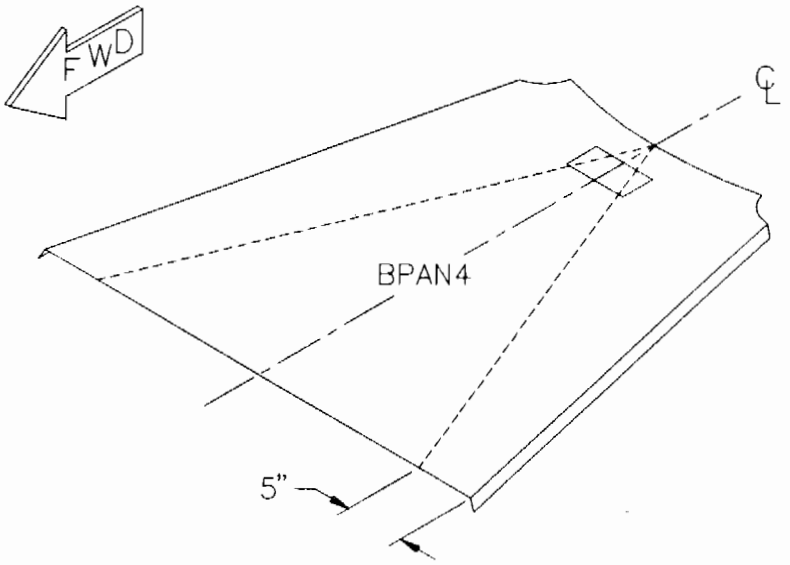
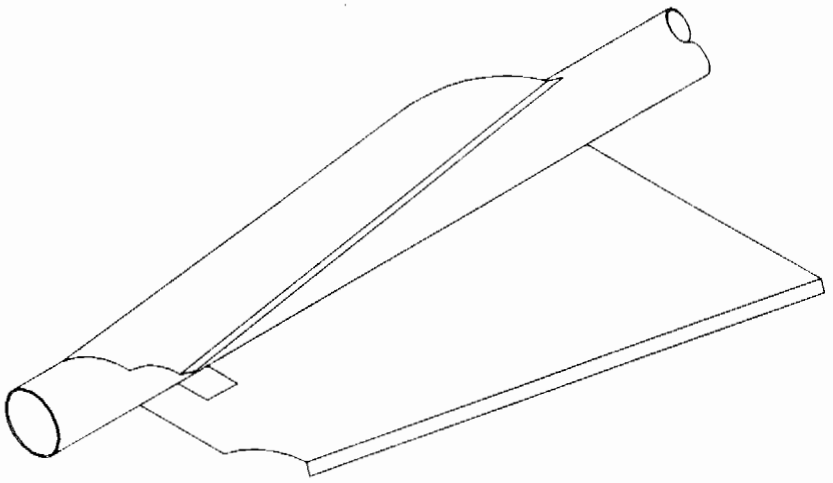


FIGURE 04A-01A

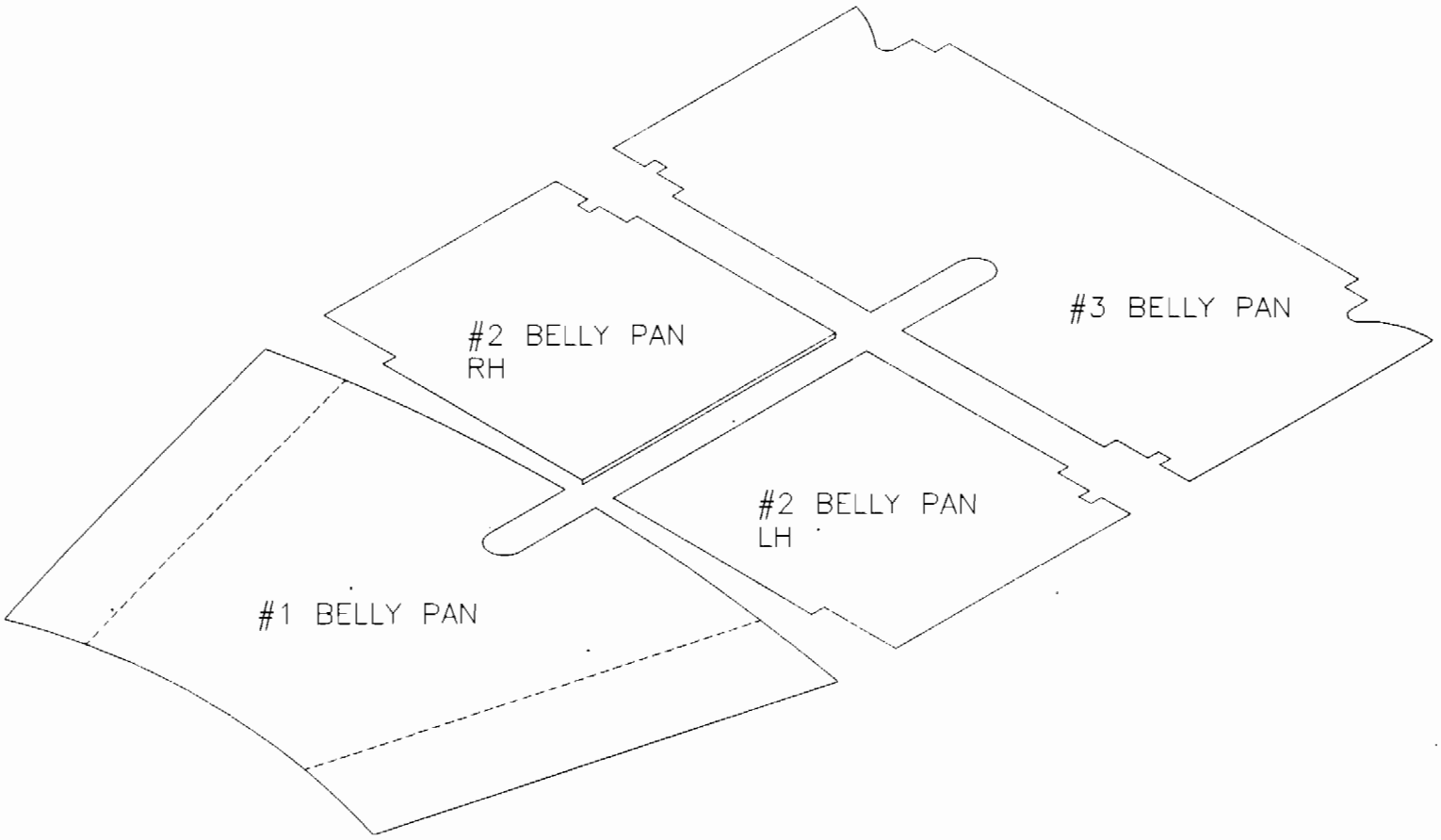


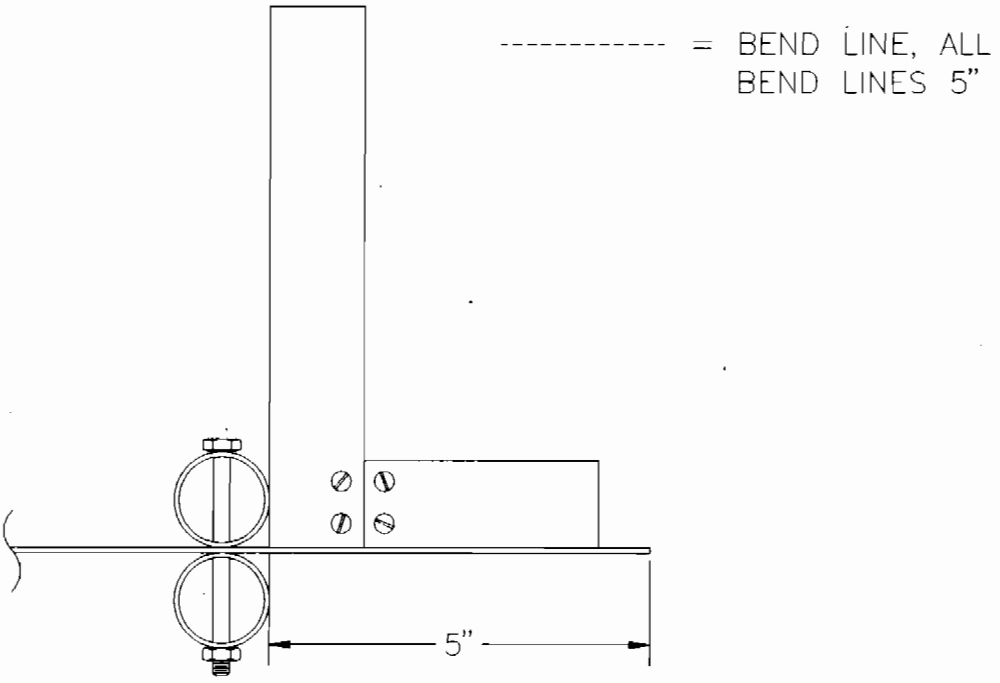
PLACE BENDING JIG ON
BEND LINE AS SHOWN.
ROLL FORWARD EDGE ONLY



ROLL AFT EDGE OF BPAN4 OVER
3" LEADING EDGE SPAR

MD295

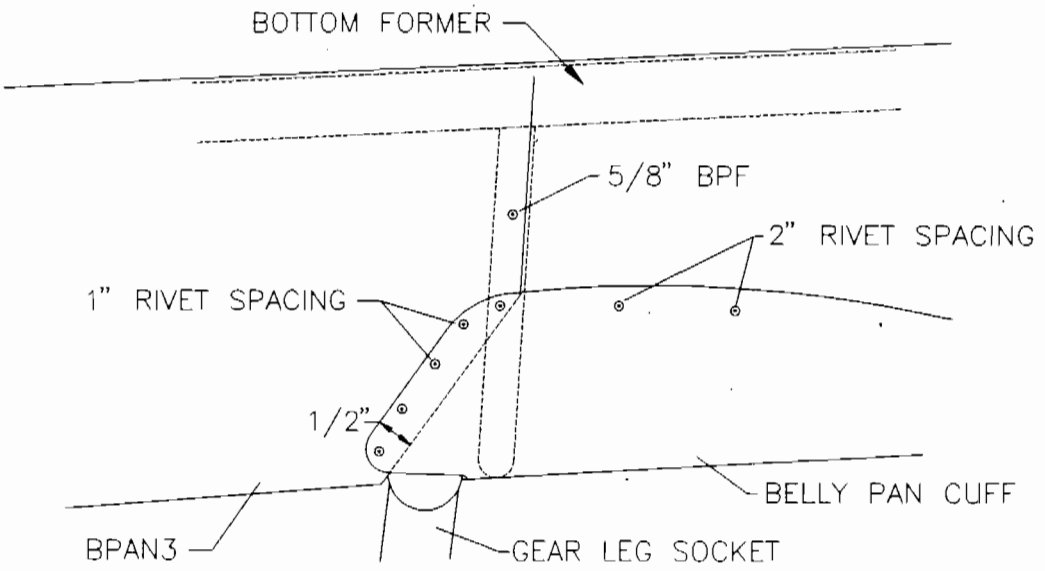

#3 BELLY PAN
#2 BELLY PAN
RH
#2 BELLY PAN
LH
#1 BELLY PAN


---------- = BEND LINE, ALL
BEND LINES 5"
5"

MD1084

3. The #3 pan overlaps the #4 pan by approximately 1/2" to 3/4". The #3 pan will locate itself by wrapping around the gear sockets and strut attach points on each side of the plane. Rivet this pan in place along the pre-located holes on the bottom and sides of the pan. Again, tape the top edge of the belly pan in place, it too is held by the rivets holding the upper aft panel skins. The belly pan cuffs need to be installed next. To pre-bend these, simply roll the cuffs over a 2" tube. Locate the cuffs, as shown in **FIGURE 04A-03.**

FIGURE 04A-03



4. Place the #2 pans (LH/RH) in position by locating around the strut attach point, and making sure the FWD edge of these pans are covering at least half of the S-2 truss, line up inboard edge of #2 pans with slot in #3 pan and keep an equal distance between the left and right hand pans. Then slip the #2 belly pan top channels in place over the longerons. Drill through with #30 and cleco the left side and rivet the right with #30 aluminum pop rivets. Place the #1 belly pan in place and repeat the procedure on the #2 pan. **IMPORTANT**: Do not rivet the left side of pans 1 and 2. These rivets will be installed after the Lexan goes on.

5. Select the proper "Z" strips used to retain the #1 AND #2 pans to the tube frame. Place the "Z" strips over the forward seat truss formers and strut carry through. They should be located and centered on each half of the truss tubes. Layout for three rivets on the front shorter "Z" strip and five on the longer "Z" strips. Drill #30 through the belly pan and "Z" strip and cleco. If you do not have many clecos, use rivets, but please realize they may need to be drilled out if you will be painting or gluing fabric to the pans on the inside.

Gluing fabric to the inside surfaces of the belly pans can be done to really dress up your craft. We usually use fabric on #1 and #2 pans (Paint the aft pans to match). Use contact cement and a quality fabric. Cut the fabric away where it will be lapped over by structure. RANS can supply matching fabrics, or you can go to a furniture store upholsterer for a look at some exciting fabrics that would compliment your craft's skin colors.

6. The lexan parts for the nose cone are thermal formed and arrive rough trimmed. The top nose cone half fits **OVER** the bottom. Look closely, you will notice there is a step molded into the top nose cone. Trim the top nose cone 1/2" **BELOW** the step. **HINT:** Use an aviation tin snips to trim the nose cone parts. The top nose cone has a built in bulkhead on the aft side. When trimming this face of the nose cone, leave 2" of material for the bulkhead. See **FIGURE 04A-06.** The top nose cone, when fully installed, will need to be trimmed to form around the top longerons where they overlap. This can be laid out after the nose cone is assembled and held in place on the aircraft.

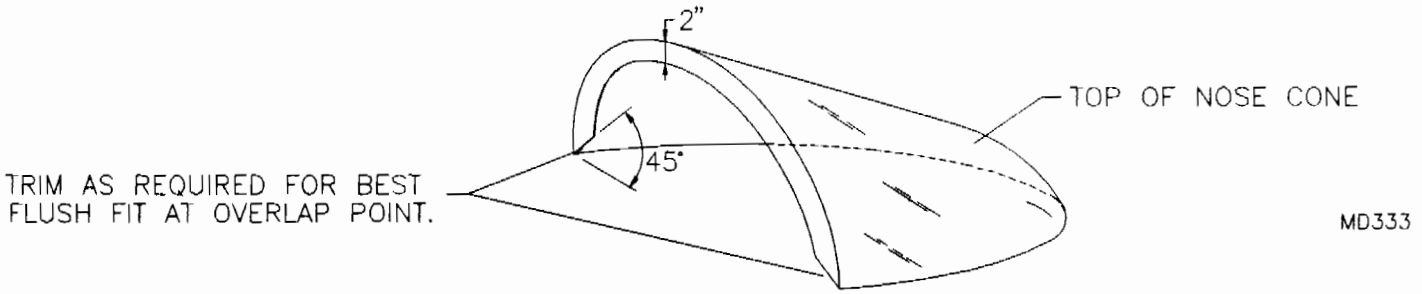


FIGURE 04A-06

7. The bottom nose cone has a very slight step. Trim off the bottom nose cone 1/2" above the molded in step line. Trim off the bottom nose cone's back edge flush with the edge leaving no turned flange. See **FIGURE 04A-07.** Locate and drill #30 holes in the mating strips as shown in **FIGURE 04A-07A.**

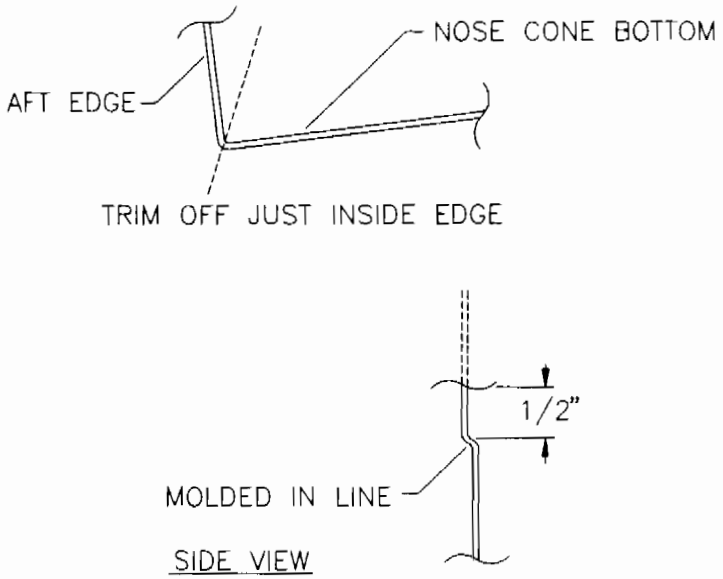


FIGURE 04A-07

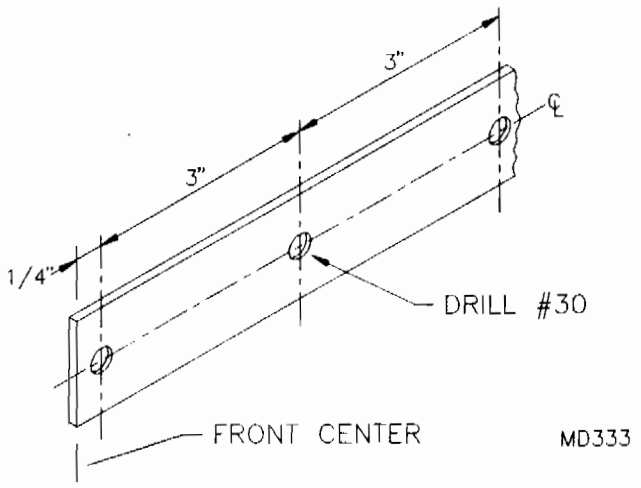


FIGURE 04A-07A

8. Locate and Mark the exact center of the top nose cone by using a tailor's tape. Start the nose cone mating strips at this center point and begin to drill and cleco. Once the mating strips are located on the top nose cone, remove them and tape the two halves together. By pre-locating the mating strips at the top nose cone you will now have a much easier time drilling out the bottom nose cone to match. Drill out the center two holes and cleco the mating strips back in place. Pull on the mating strips as you work them around in order to reduce the chance of bulges between the rivets. When the nose cone is fully fitted and drilled, remove the clecos and clean away any debris. Rivet the halves together using #30 aluminum pop rivets and small 1/8" brass backing washers.

9. The nose cone slips onto the cockpit cage between the belly pan and frame. The nose cone inserts onto the frame until the bottom half is approximately 1 1/2" aft of the forward edge of S-1. This is an approximate because the exact location of the nose cone is determined by two other methods. The first is to make sure that the mating strips are level with the top longerons, the other is to make sure that the distance between the top of the nose cone and the FWD. edge of the keel is 55 1/8". See **FIGURE 04-09.** Start by inserting the nose 1 1/2" into the belly pan, level the mating strips, measure the distance between nose cone and keel, and then move the nose FWD. or AFT. accordingly to achieve the proper dimension.

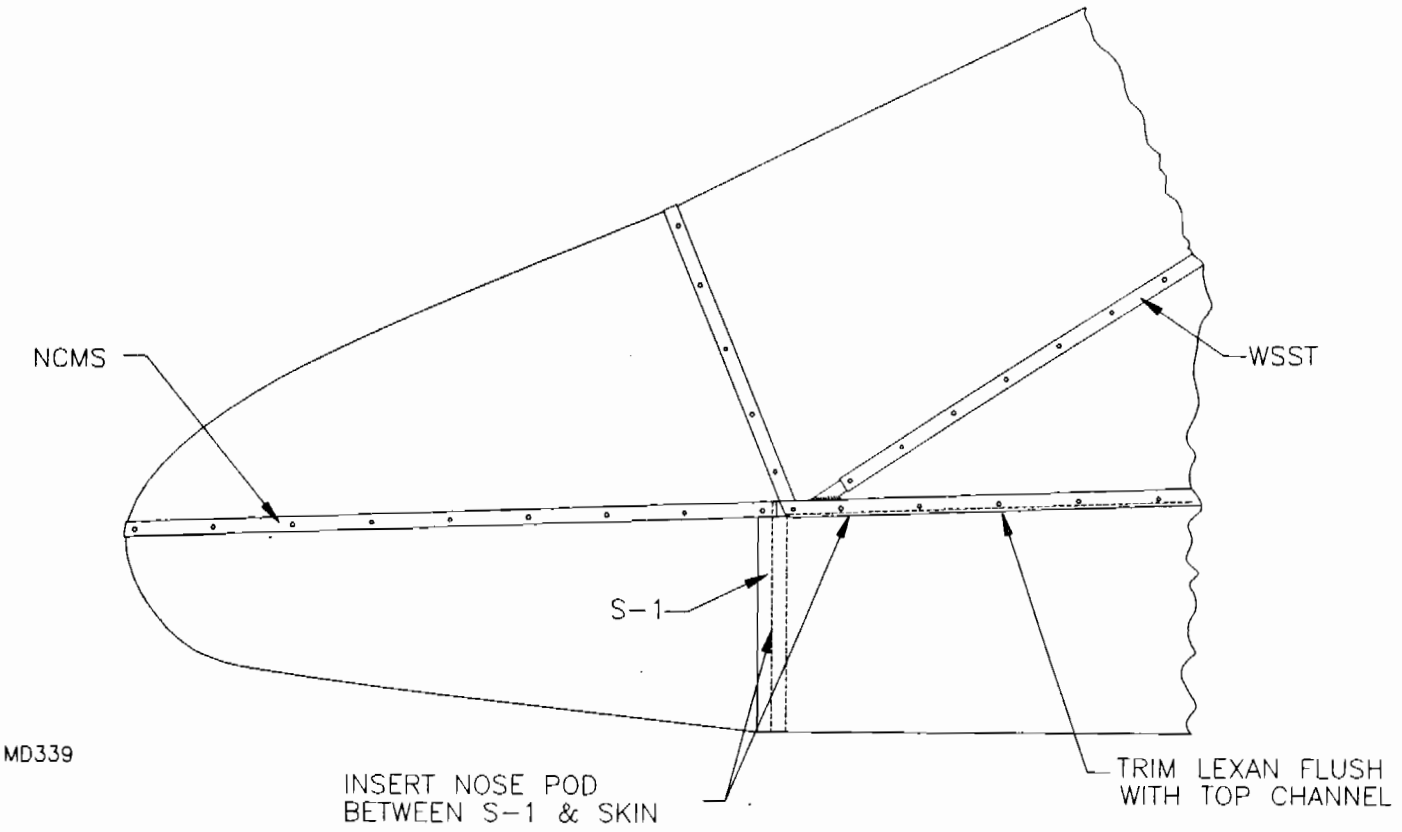
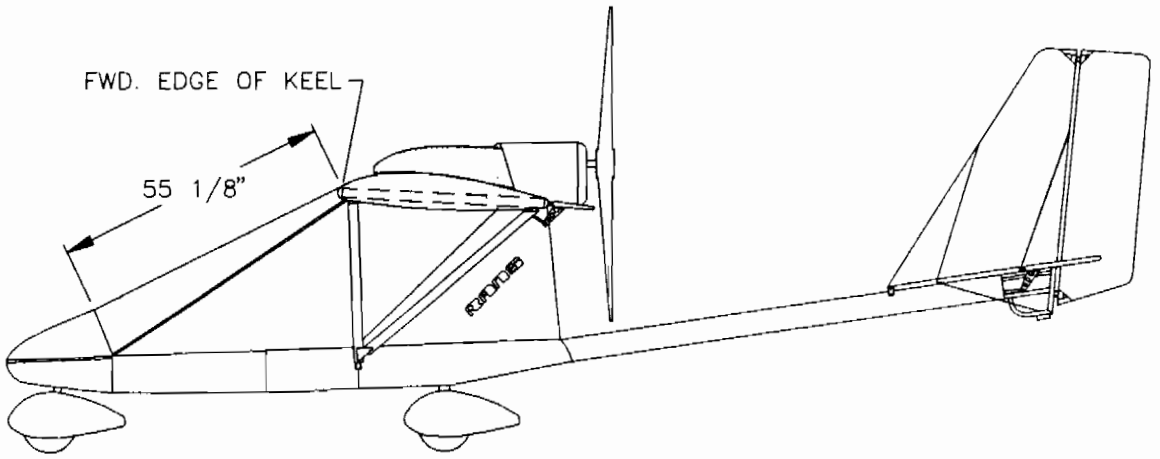


FIGURE 04-09

10. With the nose cone in position, locate the two 5" Z strips that will slip over the bottom of S-1. Drill and cleco these two Z strips in place while always checking the reference dimension in **FIGURE 04-010** be sure that the nose cone is level.



MD340

FIGURE 04-010

FIGURE 04-010

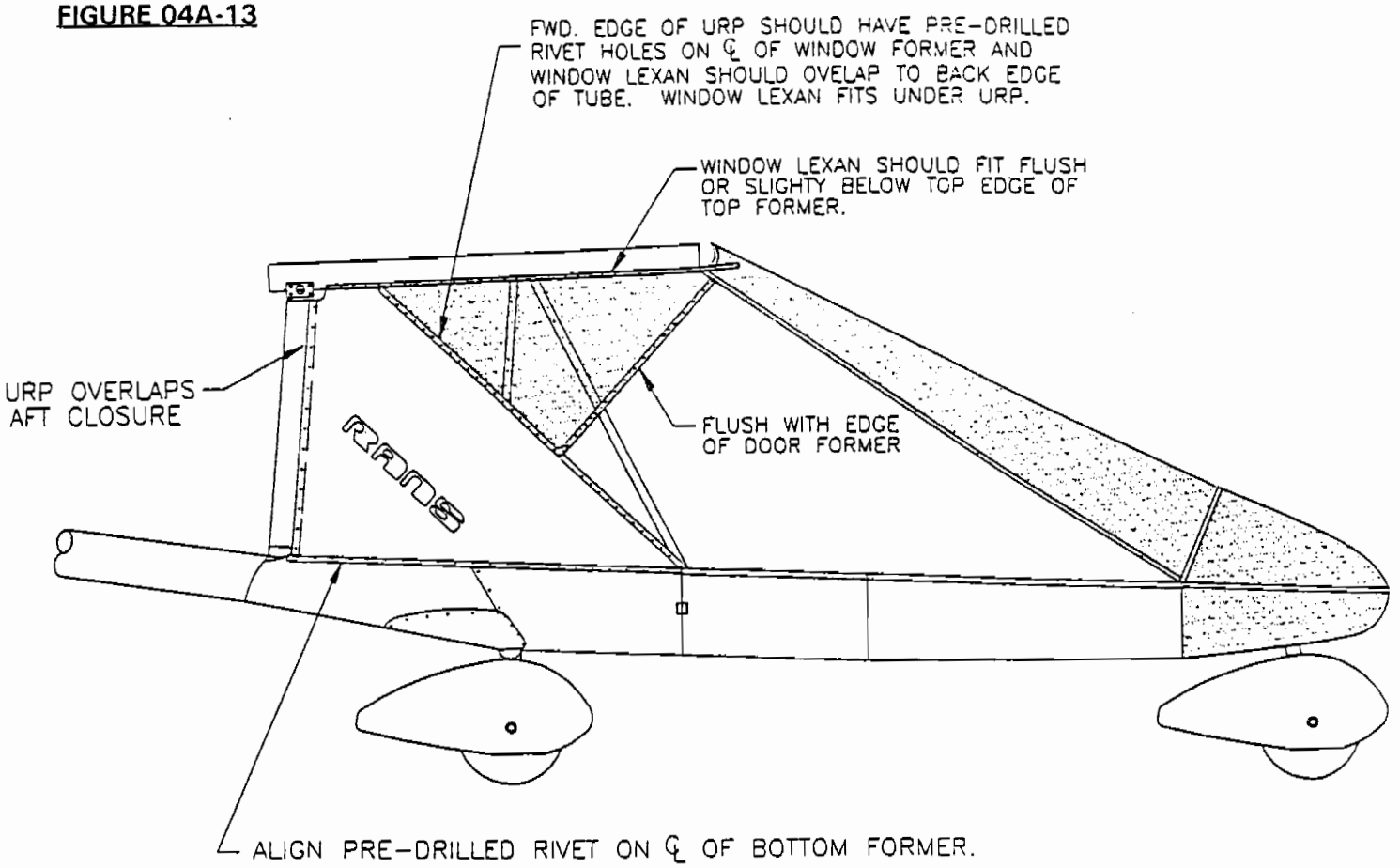
11. The windshield comes pre-cut to shape. A protective paper of plastic is applied to the windshield to protect it during shipping and fitting. Peel the protective layer away from the edges only enough to allow drilling and riveting. Do not peel the rest of this protective layer off until you have the plane at the airport ready to fly.

The windshield is made slightly larger on the left side to allow trimming. Accurate positioning of the windshield is determined by the way it matches the nose cone and top former. To install, position the windshield even with the right side door windshield tube, overlapping the nose cone at least 1/2" to 3/4". The left aft edge slips **UNDER THE SHEET METAL** aft upper panels. The left side's lower edge overlaps the top channels to the outside. The same rivets that retain the top channel also retain the Lexan. You can see through the Lexan to locate and drill these holes. Clamp or tape the windshield to the frame in as many places as possible. Once the windshield is firmly in place on its perimeter structure, mark off the rivet locations every 3", except the left lower edge where you will pick the top channel spacing. Start in the front lower center. Work up the side tubes by starting at the bottom. Please note, the windshield does not lay against or rivet to the top former between the windshield side tubes. See **FIGURE 04A-11** for spacing.

12. Drill #30 and cleco. Move the clecos along as you drill. Once all the holes have been drilled, mark the edges on the side tubes for trimming the Lexan. Leave at least 1/4" from rivet center to edge of Lexan. **HINT:** The best way to trim lexan is to mark where to cut, remove and lay on a flat surface. Score the trim line several times with a utility knife and snap off the excess. For very narrow edges, use square jaw pliers to grip and snap off the excess. Smooth the edges with a file or sanding block. After the windshield has been fully drilled, remove and clean away any debris. Cleco the windshield in place and rivet.

13. Once the windshield has been riveted, the rest of the enclosure needs to be attached. The door former is next to be installed. To do this accurately you must first tape the window lexan and the upper rear panel in place. See **FIGURE 04A-013** for exact locations. If everything is correct, count up the upper rear panel 8 holes and drill #30 for the location of the first rivet in the gusset that attaches the door former. If this hole doesn't seem to be correct, check the location of the two panels and adjust accordingly. Rivet the gusset on the inside of the door former. The top of the door former will nestle nicely in the corner of the WSST and the top former and locate with one #30 rivet from the backside. The center cover will pick up the door former on the outside of the aircraft. The window Lexan will attach in the same manner as the windshield did along the LH side of the airplane. Use 3" rivet spacing along the exterior of the panel and use the pre-drilled holes in the upper rear panels along the aft edge. After the window lexan is in place layout 3" spacing in the center of the aft closure. Drill and rivet the aft closure to the aft strut. Tape the upper rear panels in place and check the fit. Once you are satisfied with the fit of the panel, drill and cleco it in place.

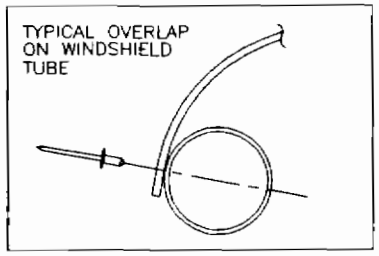
FIGURE 04A-13

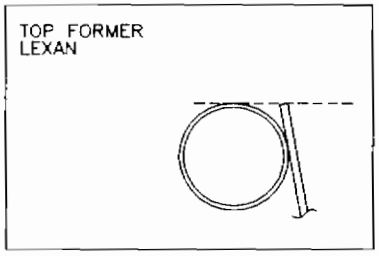


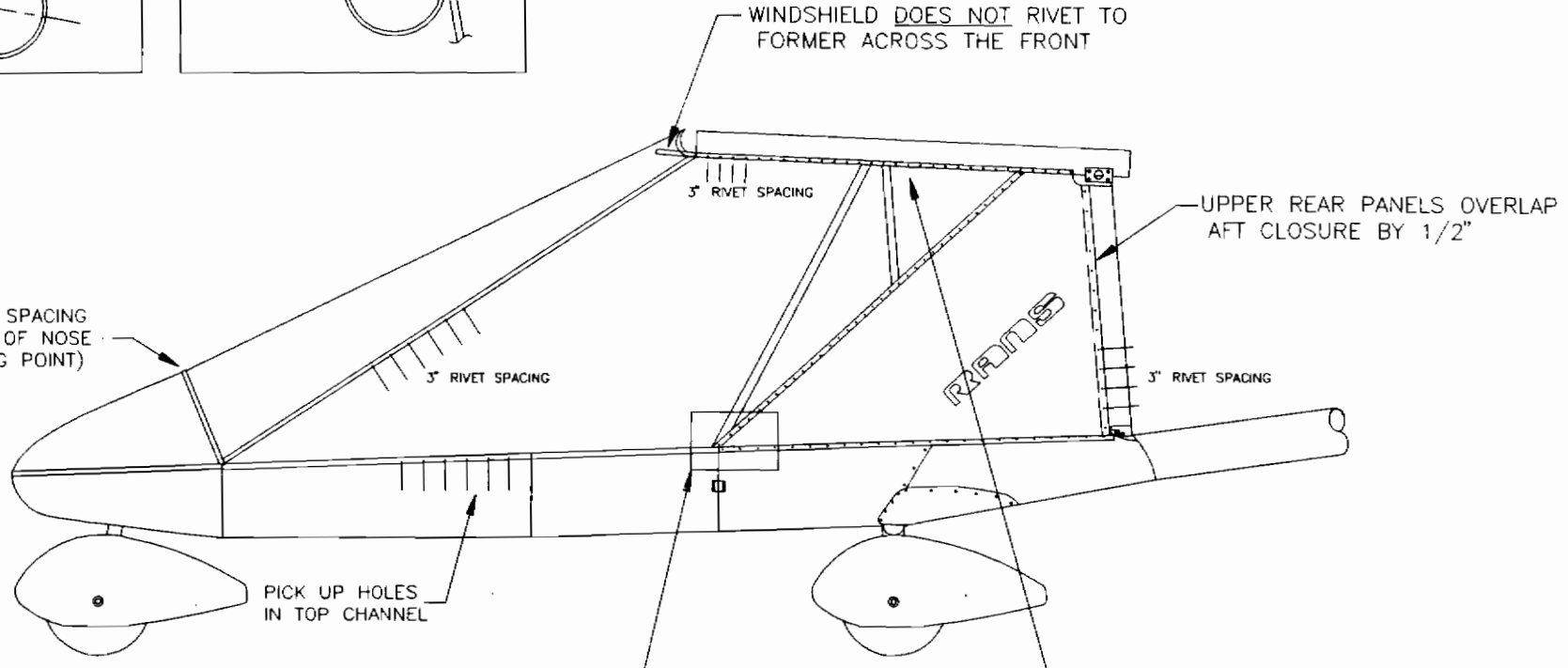
MD341

14. With upper rear panels in place, mark inside perimeter of panels; detach panels and install soundproofing with glue. Cleco panels back in place and rivet. Stabilizer tubes have been included to reduce vibration. **IMPORTANT: If installing Rotax 582, ignore step 15 and refer to 582 cooling system section.**

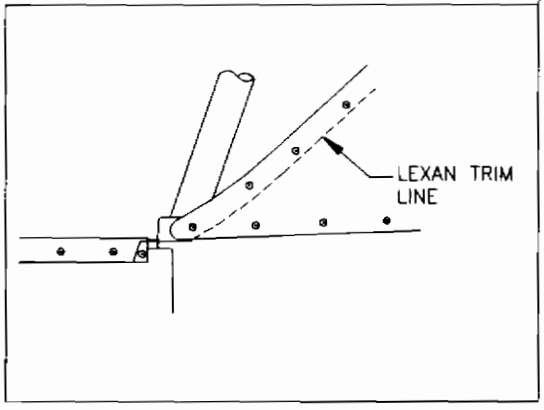
15. Center cover rib attaches to keel with four angle brackets; center rib on keel as in **Fig. 04A-15.** **NOTE:** Use stainless steel rivets to attach rib to keel and aluminum rivets to attach center cover to rib. Center cover's fore/aft placement is determined by fit to windshield; place cover so as to overlap windshield and top former slightly.

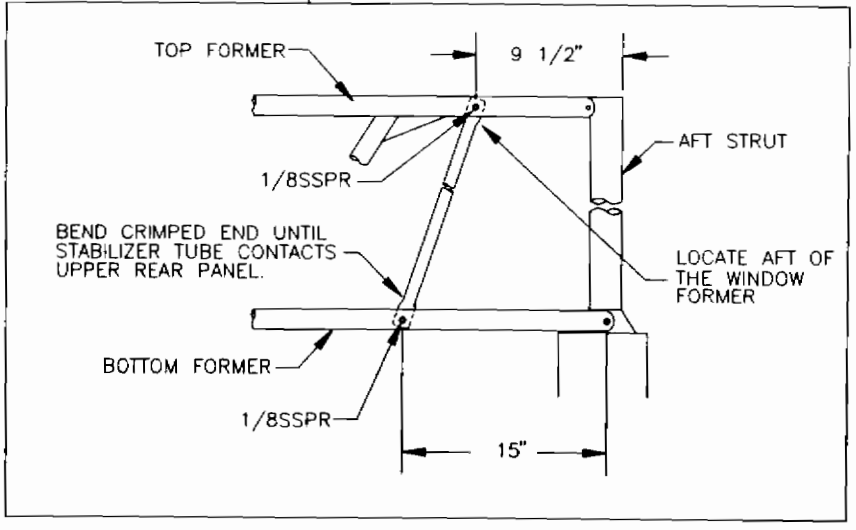

TYPICAL OVERLAP
ON WINDSHIELD
TUBE


TOP FORMER
LEXAN


WINDSHIELD DOES NOT RIVET TO
FORMER ACROSS THE FRONT
3" RIVET SPACING
UPPER REAR PANELS OVERLAP
AFT CLOSURE BY 1/2"
TYPICAL 3" RIVET SPACING
(USE TOP CENTER OF NOSE
CONE AS STARTING POINT)
3" RIVET SPACING
RANS
3" RIVET SPACING
PICK UP HOLES
IN TOP CHANNEL

MD338


LEXAN TRIM
LINE


TOP FORMER
9 1/2"
AFT STRUT
1/8SSPR
BEND CRIMPED END UNTIL
STABILIZER TUBE CONTACTS
UPPER REAR PANEL.
LOCATE AFT OF
THE WINDOW
FORMER
BOTTOM FORMER
1/8SSPR
15"

AFTER PAINTING: Apply the rubber trim to the top edge where it meets with the wing. **HINT:** Use super glue to permanently attach the rubber trim to the Lexan's edge. Peel off plastic protection from the lexan just prior to flight!

16. Use a 2" hole saw to drill an opening for the nose gear. Drill from the bottom looking through the Lexan to locate the hole. Install the nose gear with a thin coat of grease.

17. The belly pan cover is formed from Lexan and can either be attached after the airplane has been painted or it can be painted along with the airplane. To cut out the cover, mark a 3/8" line around the perimeter of the part. Use a pair of snips to cut out the part along this line, then clean up the edge with a file or a sanding block. To attach the cover to the belly of the airplane, simply center it over the cut-outs in Belly Pans 1, 2 and 3. Move the control stick back and fourth to ensure that the end fitting has clearance. Layout 3" rivet spacing around the edge of the part. Drill, cleco, and rivet the part in place.

18. Contour the pitot block to fit the curve on the inside of the nose cone at the front center. A belt sander will make quick work of this job. See **FIGURE 04A-018** for shape and location details.

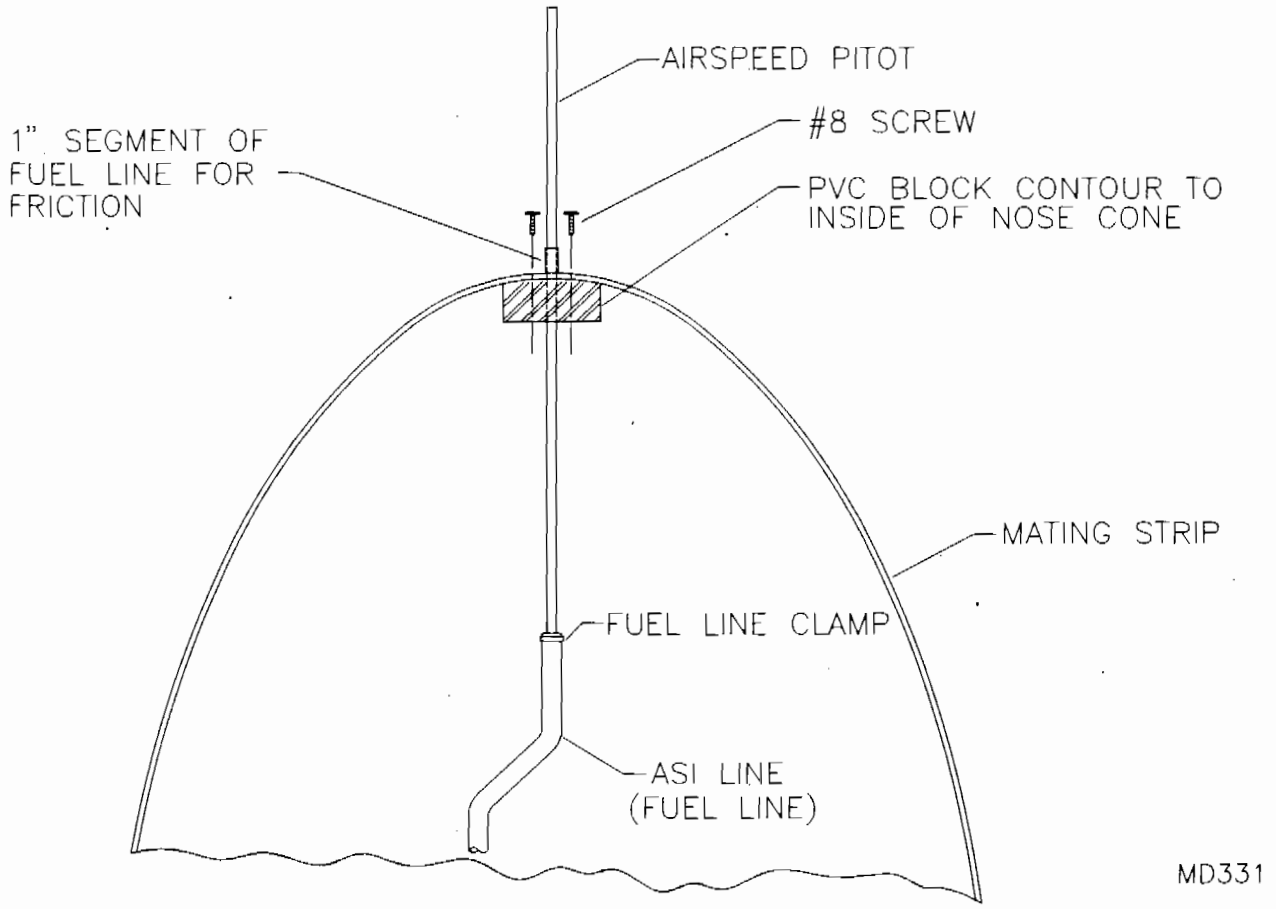
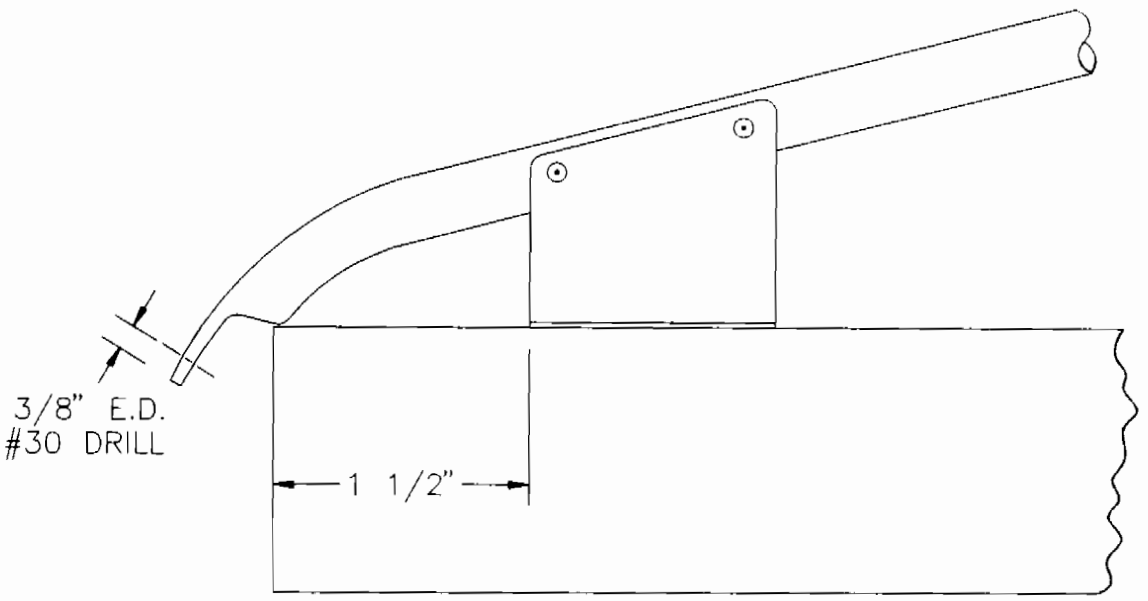


FIGURE 04A-018



DO NOT INSTALL THIS IF 582 ENGINE. SEE RADIATOR/COOLING.

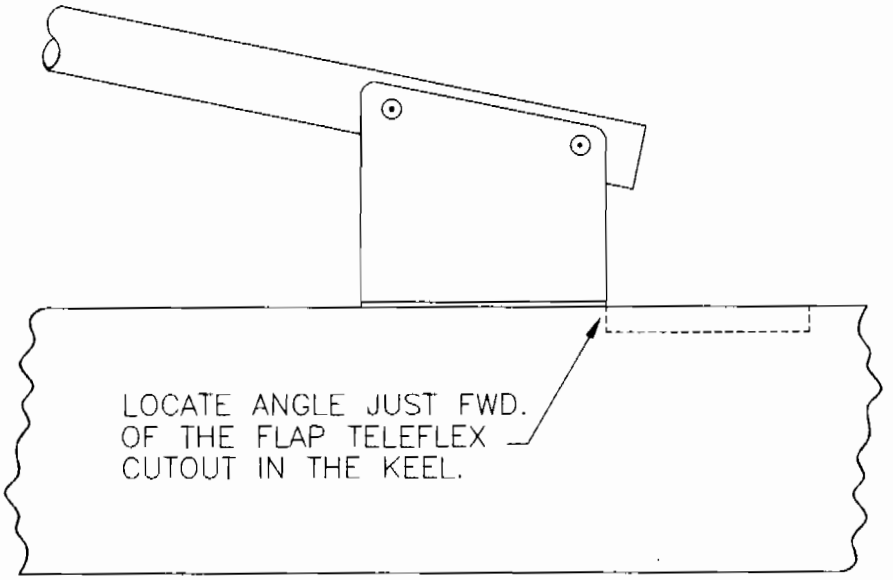


FIGURE 04A-15

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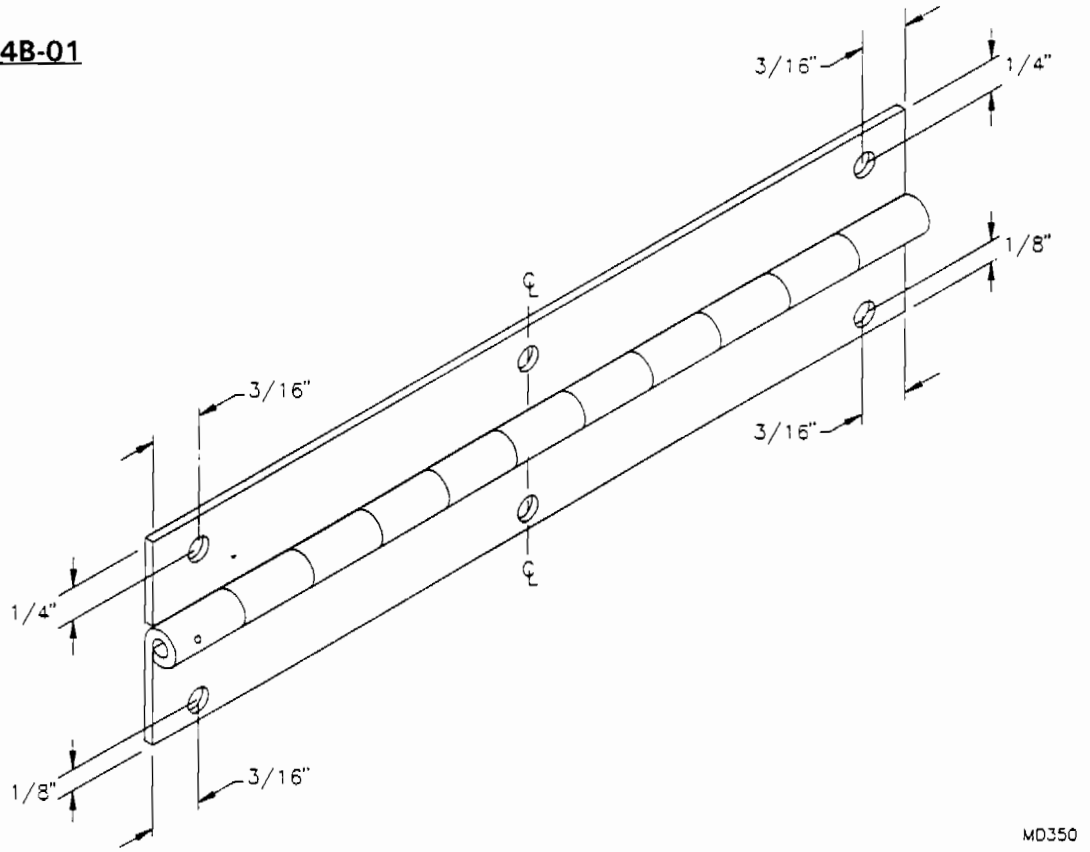
19. Install the airspeed pitot block by drilling two #30 holes 1/2" out board of the two center rivets. Center the block on the inside of the nose cone. Drill into the block with a #30 drill. Install the two #8 X 1/2" pan head screws. After the two screws are installed take the block out one more time and drill a relief where the two center rivets are contacting the PMB. This will allow the block to fit flush and be solidly in place against the pod. Drill the center hole in the block out to 1/4" through the nose cone and mating strip from the inside out. The airspeed pitot will slide into the 1/4" with some friction. If the friction is not enough, slip a small section of fuel line over the probe on the outside.

20. At this point, the fuselage can be prepared for painting. The Lexan needs to be protected from the paint. Use quality masking tape and papers to assure the paint will not affect the Lexan. Take extra care to seal the areas around the lift strut attach points and the door. Over spray inside the cockpit can ruin the windshield and door Lexan.

S-14 AIRAILE DOOR ASSEMBLY

1. Cut three 6 ½" lengths from the piano hinge wire stock and bend each 90° 3/8" from one end; this will serve as a handle for quick removal. File a small radius on the corners to prevent the hinge from snagging clothing while entering or departing the cabin. Drill each side of the hinge flange for three rivets, locating them per **Figure 04B-01.** Replace the hinge pins with the new bent hinge pins. Slip the new pin into the hinge, flush with one end; gravity keeps the pin in place. The hinges should come out easily by hand to allow removal of the door.

FIGURE 04B-01



2. Locate and drill the door hinge tube for the hinges as shown in **Figures 04B-02, 04B-02A, 04B-02B, and 04B-02C**. Locate holes carefully, as this will determine the door fit.

FIGURE 04B-02

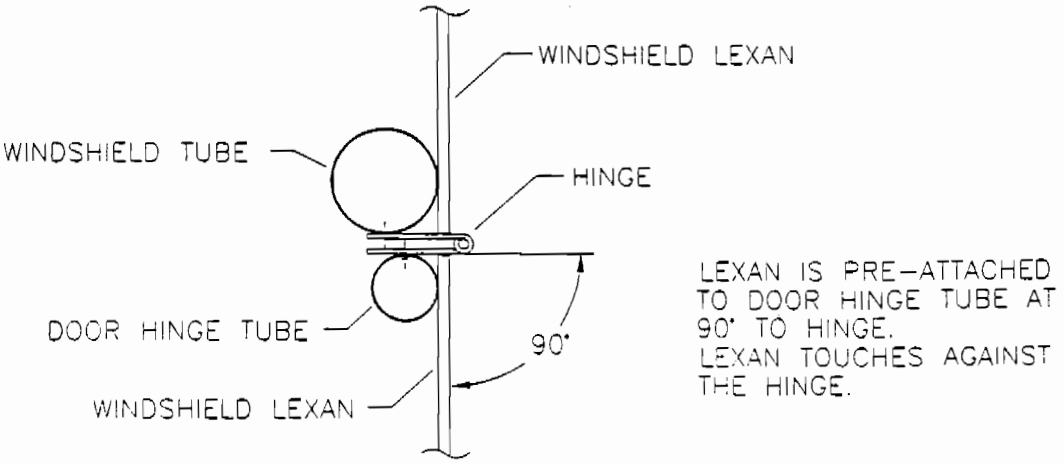


FIGURE 04B-02A

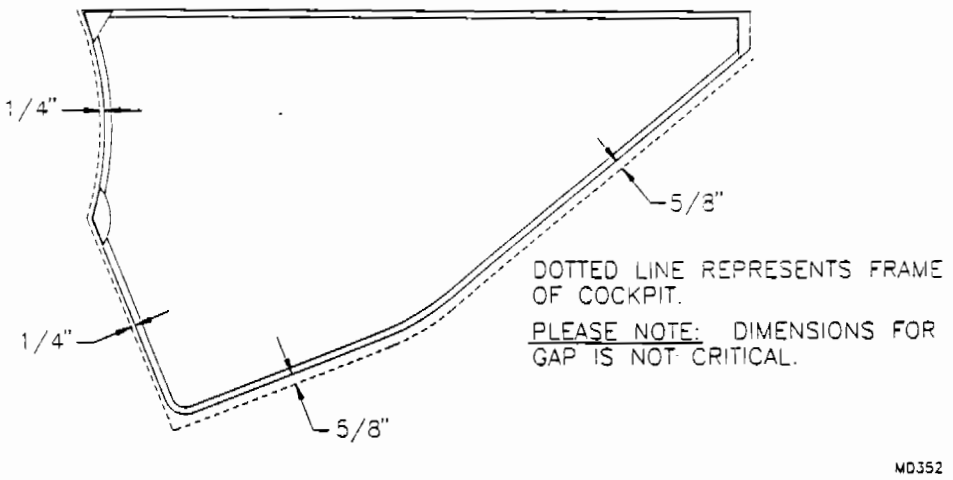


FIGURE 04B-02B

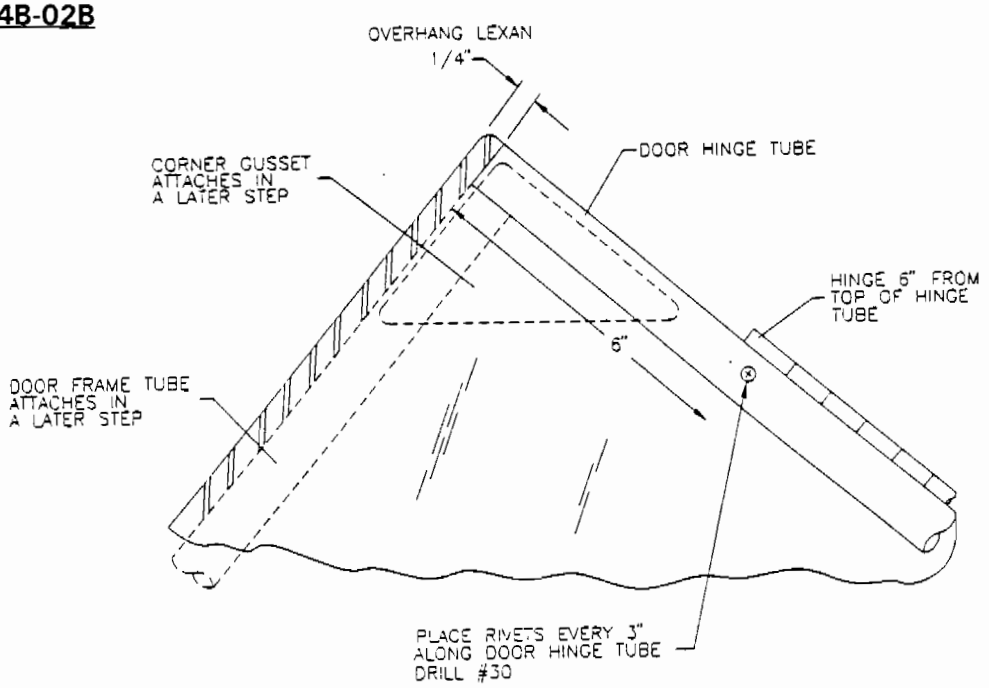
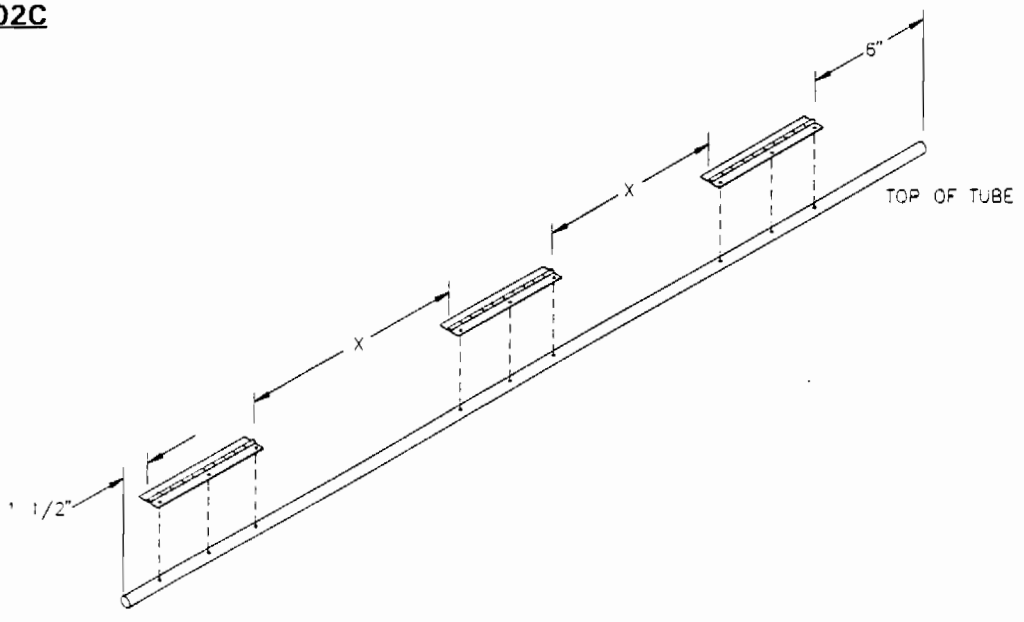


FIGURE 04B-02C



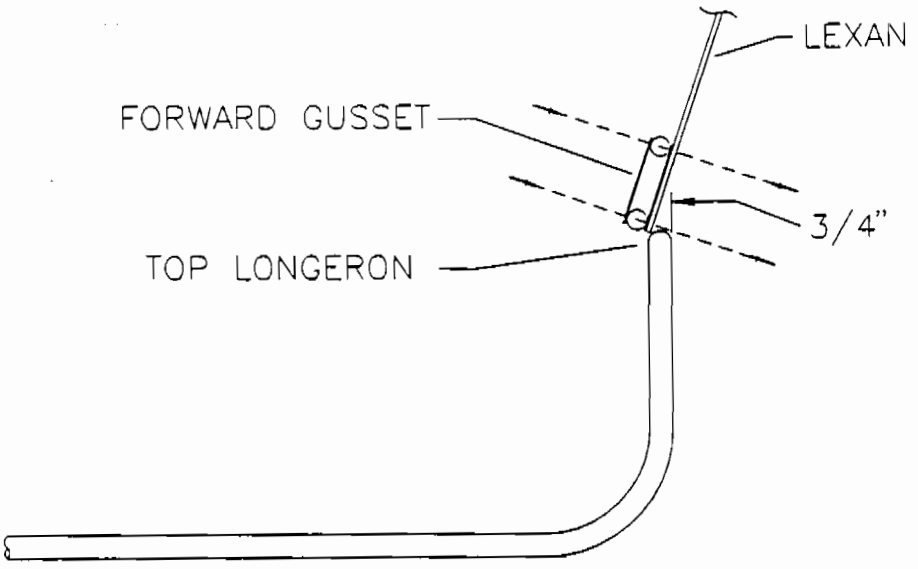
3. Peel back the protective paper from the edges on both sides of the door panel. Attach the Lexan as shown in **Figure 04B-02B**. Note how the Lexan fits up against the hinges and overhangs the top edge by 1/4". Start by locating a #30 hole 6" from the top of the hinge tube. Continue down the hinge tube with this 6" spacing. Install the 1/8" aluminum rivets along the hinge tube's length, but do not rivet the ends until the corner gussets are in place.

4. Attach the door hinge tube to the windshield tube. Locate the hinge tube with a 1/4" gap at the top between the 3/4" door former tube. Refer to **Figure 04B-02**.

5. At this point, the Lexan is attached to the door frame tube and is hanging off the cockpit door opening. Place the door frame tube flush against the hinge. This should establish a 1/4" gap along the two aft door edges and a 5/8" gap across the bottom. These are not critical gaps and may vary. Place the upper corner gusset over the Lexan and tubes to place the holes over the tubes center line.

6. The forward gusset simply slips over the end of the door hinge and door frame tubes. Locate and drill at least two rivets into the end on each side of the gussets. To seal tightly against the side of the cabin, the door frame will need a slight twist set into the front lower corner. This is accomplished by twisting the door bottom 3/4" **INWARD.** Lock in the twist by riveting the forward corner gusset in place. See **Figure 04B-06**.

FIGURE 04B-06

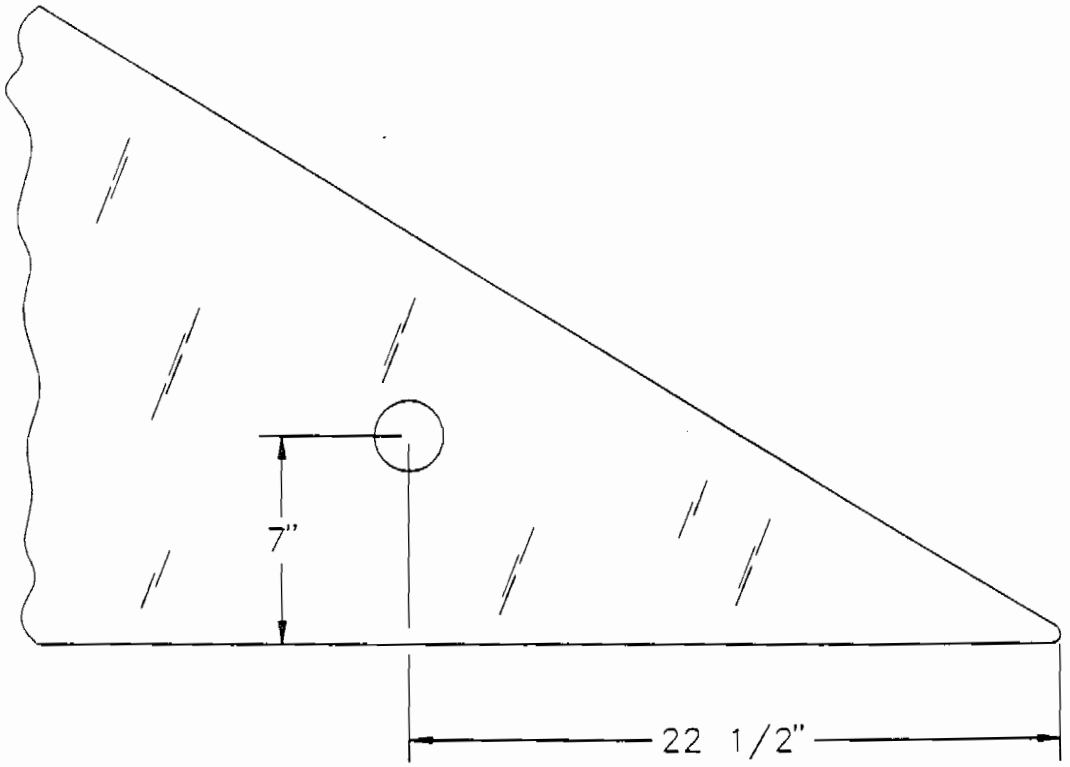


7. After the top upper corner and forward lower gussets have been installed, locate holes every 3" around the door frame.

8. With the door hung in place, mark the aft edges for trimming using masking tape. These edges may not need any trimming if the gaps have been held close to plan. If the aft edge of the door Lexan overlaps the window, you may leave it or trim it off to match the seam fit. For straight trimming, use a straight edge and a utility knife; score the Lexan several times, then snap off the excess using a pliers. Smooth the edges with a file or sanding block. Round the corners with a fine-tooth file or sanding block.

9. Refer to the air vent location in **Figure 04B-09**. Read directions included in the vent package. We use an adjustable fly cutter, so it is important to make a practice hole in scrap material prior to cutting the door. We locate the vents in the lower corner of each door. This location seems to work the best because air circulates over the legs and torso.

FIGURE 04B-09



10. Install door handle gussets; see **Figure 04B-10** and parts drawing. Insert 2" bushings 3/4" into shanks of two handles for exterior installation. Drill #30 holes through handles' shanks, per **Figure 04B-10A**. Chase drill holes on undersides of shanks to 3/16" and insert flange nuts. Drive button head screws through shanks into nuts; apply oil if driving proves difficult.

FIGURE 04B-10

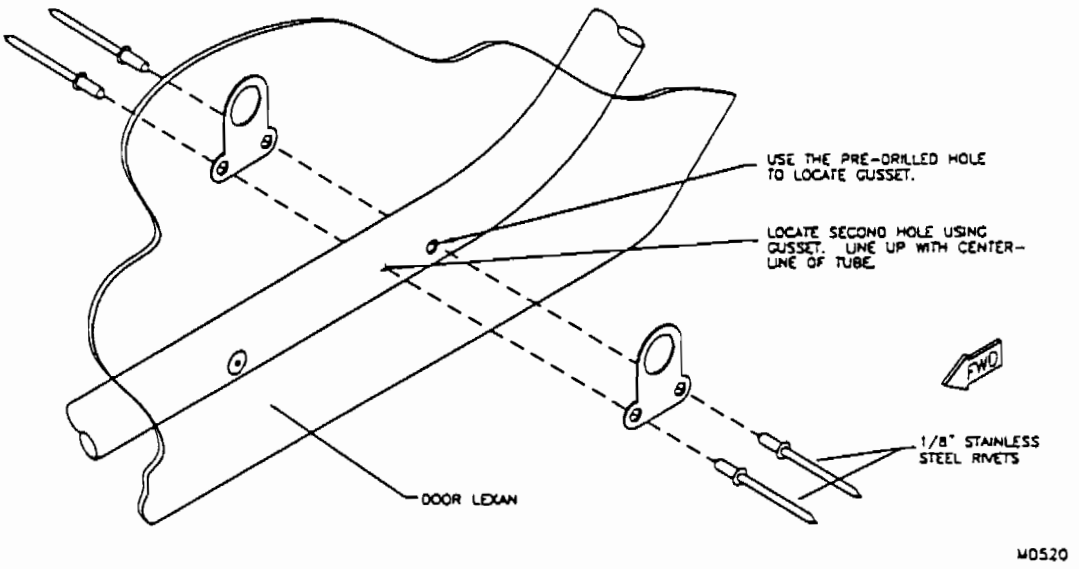
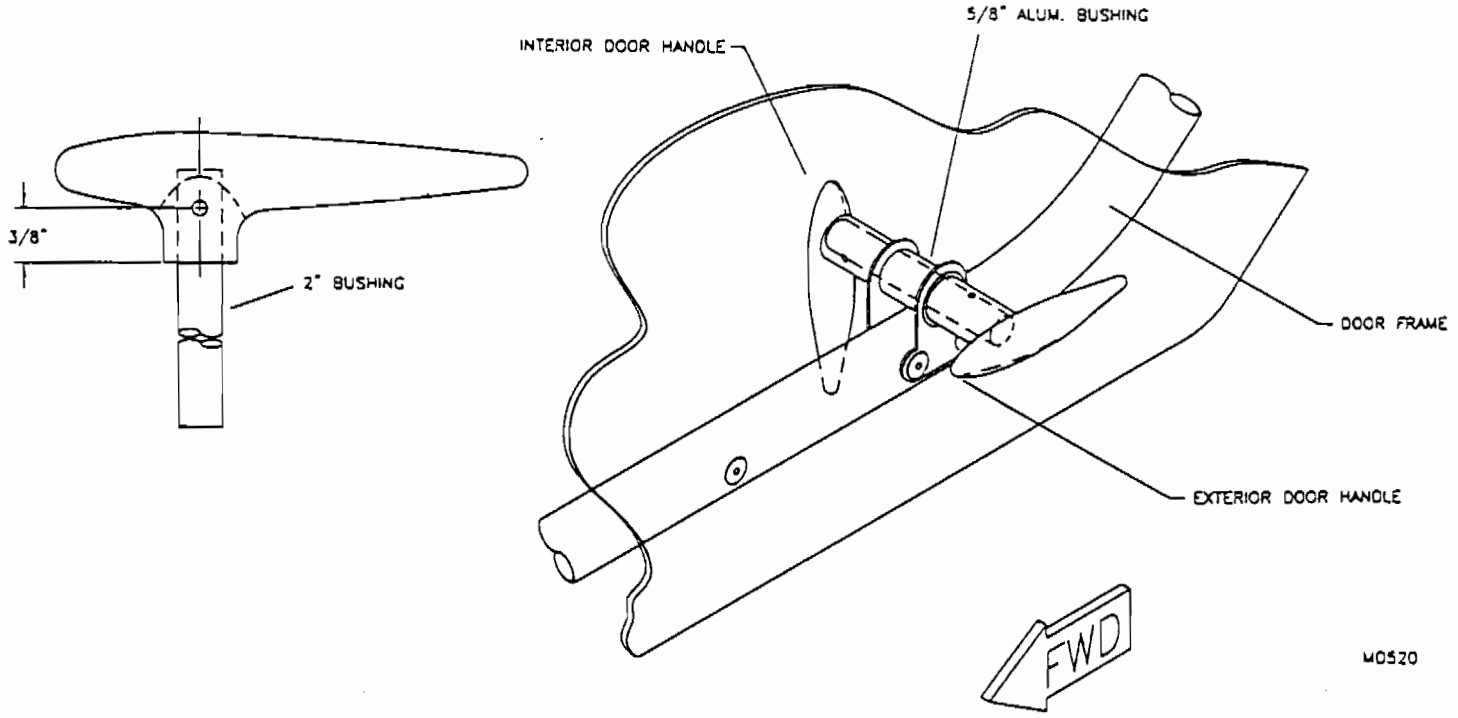


FIGURE 04B-10A



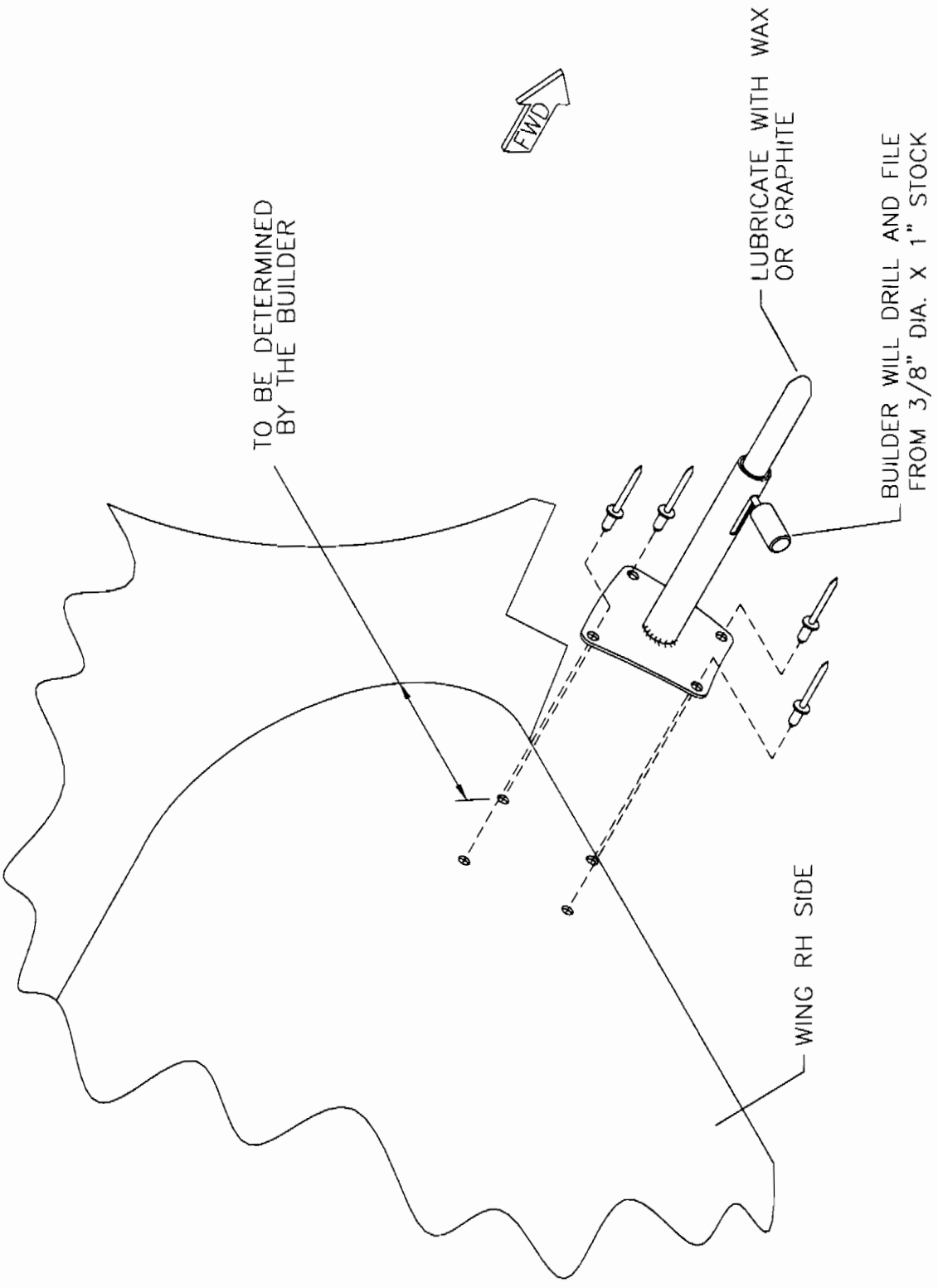
Prepare two more handles for interior; install handles and 5/8" bushings per parts drawing. Orient handles at right angles such that exterior handles parallel longitudinal axis when door is latched; refer to **Figure 04B-10A**. Install nuts and screws to interior handles.

11. Bolt doors in place. Turn handles as if latching to locate rub blocks on door frame; refer to parts drawing. Hold blocks against door frame to test fit; blocks should provide sufficient tension to close doors snugly when latched. If tension is insufficient, bend blocks to bow outward as necessary or trim handles' shanks. Drill through blocks, into longerons, taking care to drill squarely into steel. Rivet blocks in place.

12. Apply the foam rubber strip to all edges except the hinge tube side. If necessary, drill 1/4" holes and install the rubber bumpers to save the Lexan from contacting the windshield and scratching.

13. Install the door up-catch to the leading edge wing spar as shown in **Figure 04B-13**. Use the up-catch as a template to drill the holes through the leading edge with a #30 bit. Bolt the up-catch to the spar with machine screws.

FIGURE 04B-13



NOTE: LOCATION OF THE UP CATCH MAY VARY SLIGHTLY DEPENDING ON THE ORIENTATION OF THE DOOR HINGES. LOCATE CATCH BY OPENING DOOR UNTIL YOU BEGIN TO FEEL A SLIGHT AMOUNT OF PRESSURE. THIS WILL HOLD THE DOOR IN THE UP POSITION AND NOT ALLOW FOR ANY SLOP.

S-14 AIRAILE VERTICAL STABILIZER ASSEMBLY

1. Begin assembly by selecting all the parts shown in the parts drawing. You will be working with the fabric covering for the vertical stabilizer. The fabric can be soiled by sweaty hands and dirty tools. Once it is soiled it will be **VERY** hard to clean the fabric. Make sure your hands and tools are **REALLY** clean before installing the fabric cover. Some builders use white gloves, which makes it a little more trouble but the end result is clean. We stress to clean the tools used in skinning. Spray them down with a strong degreaser type cleaner such as "409". Do it twice, just in case! Handle the fabric by the velco gap seals when you really need to pull.

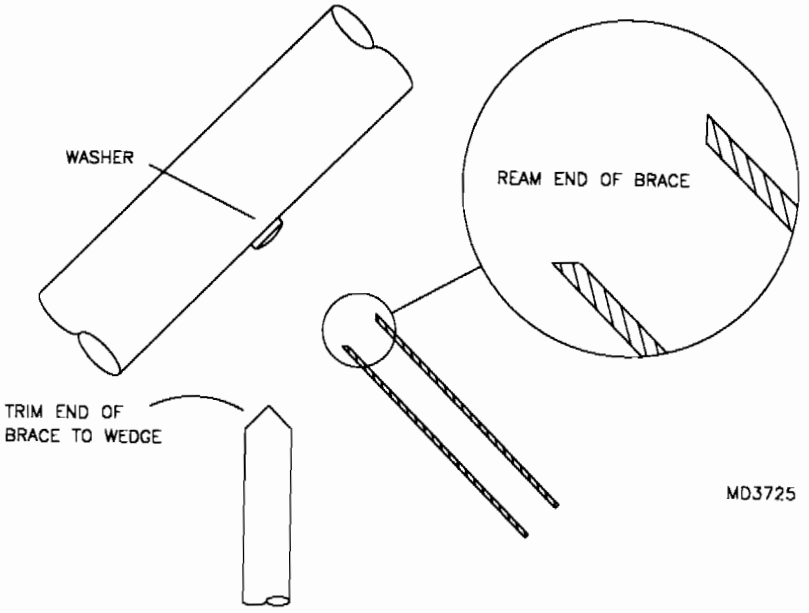
2. Fabricate four 5" doublers from 7/8" x .058 raw stock. Mark a line completely around each doubler at its mid-point. **DO NOT** use pencil; the graphite in the lead may corrode the aluminum. Insert one of the marked doublers into the vertical stabilizer leading edge and one into the vertical stabilizer spar. The remaining two doublers are for the horizontal stabilizers. Slide each doubler until the marked line shows in the cable attach point hole. Drill #40 and rivet 1 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 end caps to top of spar and bottom of leading edge; drill #40 1/8" from ends of tubes and rivet. Rivet 3/16" thick washers to holes along aft side of leading edge, forward side of spar and top of spreader tube; these serve to retain internal braces. Install insert nut into upper end of leading edge. *HINT: Screw insert nut onto ¼" bolt; use bolt to hold insert nut in place while securing to leading edge with 3/16" bolt. Once insert nut is installed, remove ¼" bolt.* Install compression tube fitting to leading edge. Drill out hole near top of spar and in stainless steel hinge to ¼". Bolt hinge, spar and leading edge together.

4. Drill #11 and Cleco forward gussets to bolt hole near bottom of leading edge; drill #11 and Cleco aft gussets to bolt hole near bottom of spar. Locate spreader tube to gussets; forward hole in spreader tube aligns with aft hole in forward gussets and aft hole in spreader tube aligns with forward hole in aft gussets. *Ends of spreader tube must be trimmed to proper angles.* Once trimmed, Cleco spreader tube in place. Drill #30 and rivet forward and aft gussets to leading edge and spar, respectively, and to spreader tube.

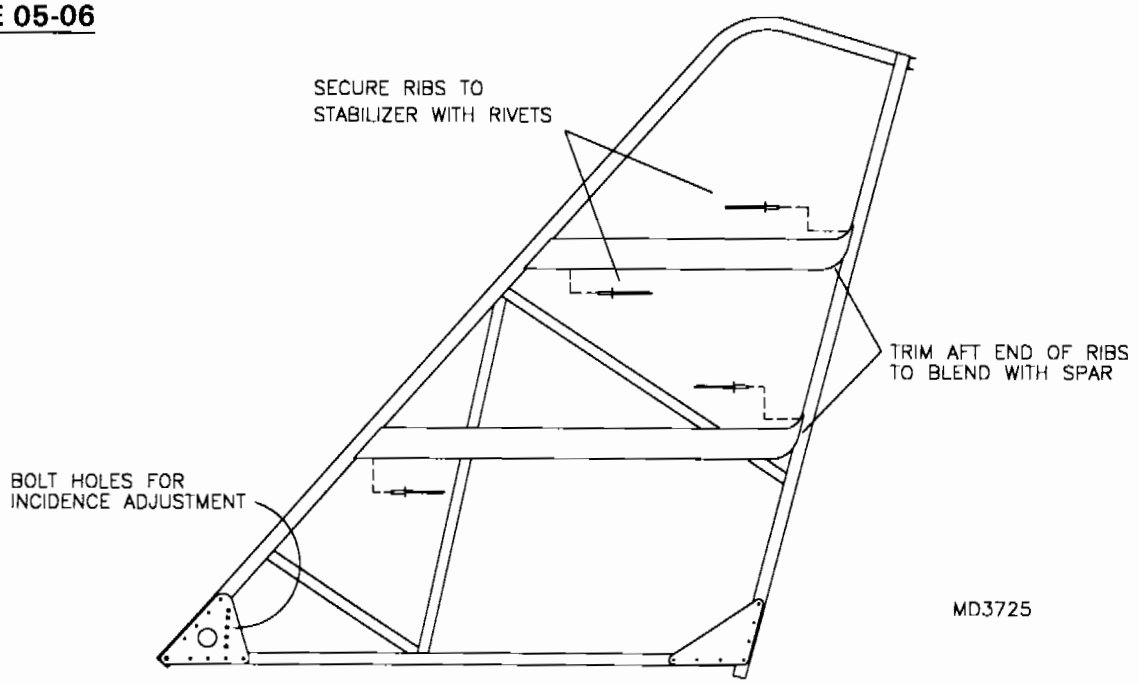
5. Fabricate braces from ½" x .035" aluminum tubing. Upper brace installs to washer on spar and upper washer on leading edge; vertical brace installs to washer on spreader tube and leading edge/upper brace joint; lower brace installs to lower washer on leading edge and spreader tube/vertical brace joint. Cut braces to approximate lengths, test and trim as required. Ends which install to joints must be wedge-shaped; ends which install to washers must be angled and reamed to fit onto washers. *HINT: Use deburring tool to reduce wall thickness.* Braces should fit snugly, snapping into place, but not bowing stabilizer. See **Figure 05-05**.

FIGURE 05-05



6. Cut out and trim ribs. *HINT: Leave small amount of excess when cutting ribs from plastic stock; apply ribs to belt sander, open side down, to remove excess evenly along chord. Rotary grinding bit works well to notch aft end. Use deburring tool or sanding block to smooth.* Edges of finished ribs should be free of burrs which might snag fabric. Trim, radius and sand aft ends of ribs to blend with spar. Slot lower rib accommodate braces. Lower rib locates approximately 14 ¾" from spreader tube and upper rib approximately 28" from spreader tube; drill and rivet. Install braces. See **Figure 05-06**.

FIGURE 05-06

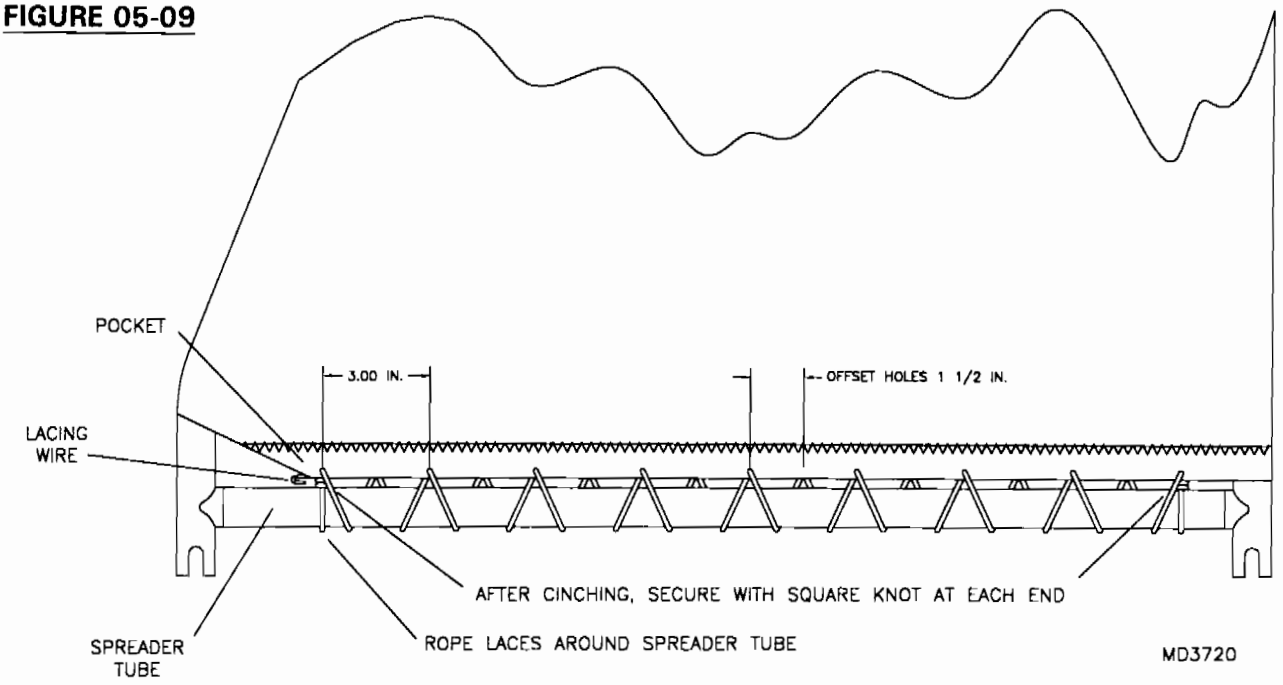


7. At this point you are ready to cover the vertical stabilizer. For the cleanest results, wash your hands and dust off the vertical fin frame work prior to covering.

8. Slip skin onto stabilizer frame.

9. Cut two lacing wires to appropriate length. Bend tips of wires to prevent snagging and insert wires into pocket along sides of stabilizer. Once fully inserted, trim wires or bend back ends. With wires lying along bottom, pierce pocket at three-inch intervals, immediately *above* wire. Offset holes on one side of stabilizer 1 ½" from holes on other side. *HINT: Use soldering iron to pierce skin cleanly.* See **Figure 05-09.**

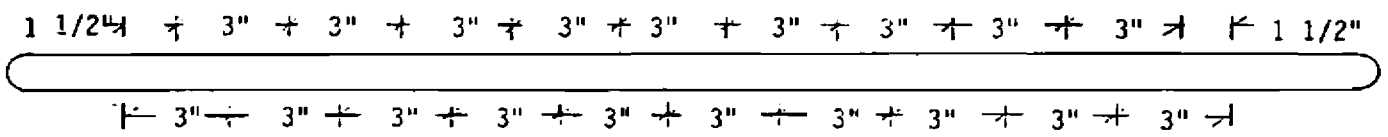
FIGURE 05-09



10. Install lacing rope. *HINT: Melt tip of rope to create rigid tip for easier threading.* Begin at either end of pocket. Lace rope through first hole, around spreader tube and through hole on *other* side of stabilizer; bring rope around spreader tube again, to next hole on *initial* side of stabilizer. Continue thusly until stabilizer is completely laced. Wires distribute load along bottom of pocket, allowing skin to be drawn taut.

11. Once laced through all holes, cinch rope to remove slack, drawing skin tightly across stabilizer frame. When skin is drum-tight, secure with square knots at both ends of rope; trim excess rope. Wrap flap around spreader tube and mate Velcro strips.

RIGHT SIDE



LEFT SIDE

TOP VIEW

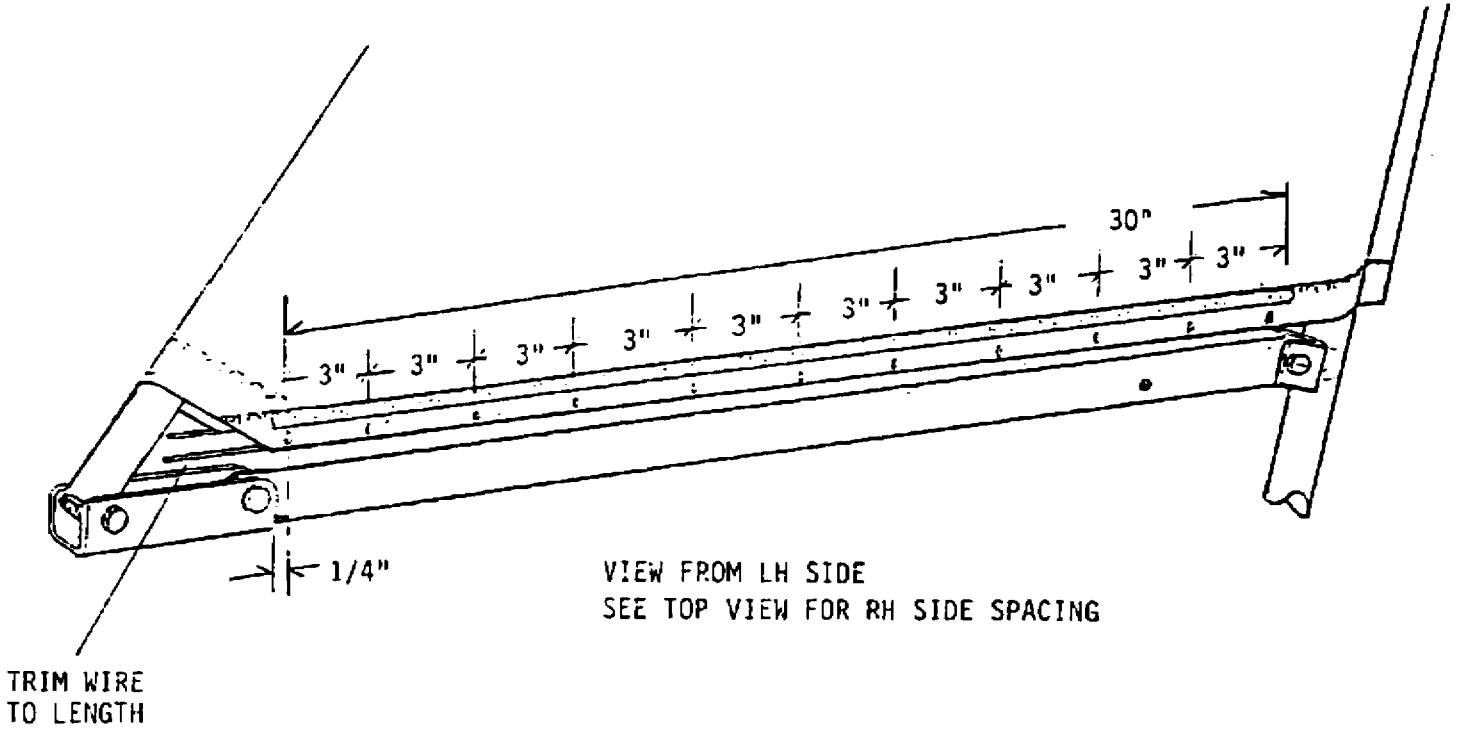


FIGURE 05-011

S-14 AIRAILE HORIZONTAL STABILIZER AND ELEVATOR ASSEMBLY

1. Select the parts depicted on the parts page.

2. Rivet the 3/16" nut plates to the elevator trailing edge (for horn attachment) and to the horizontal stabilizer spar and leading edge.

3. Pre-assemble the TC-1's to their respective locations. Pay close attention to the bolt head orientation. Drill the leading edge and spar tubes out to 1/4" in the locations shown in the parts drawing. Assemble the frame and cut and fit the internal bracing tubes. Cut and fit the internal brace tubes from the 1/2" aluminum tube stock provided as follows:

Part No.	Length	Quantity
TG-IB-D	22 1/4"	2
TG-IB-H15	21"	2
TG-IB-E	13"	2

Refer to details on fitting tubes in the vertical stabilizer section.

4. The horizontal stabilizer features an inverted airfoil. This air foil is made by shaping and gluing the blue foam ribs in place. Refer to **FIGURE 05A-04** for rib locations. **NOTE:** Locate a hole in the inboard most rib as per **FIGURE 05A-04A**. Wrap the ribs in clear packing tape or coat with epoxy to protect from ultraviolet degradation.

Ⓐ = TG-IB-D 22.5"
Ⓑ = TG-IB-H-15 21.0"

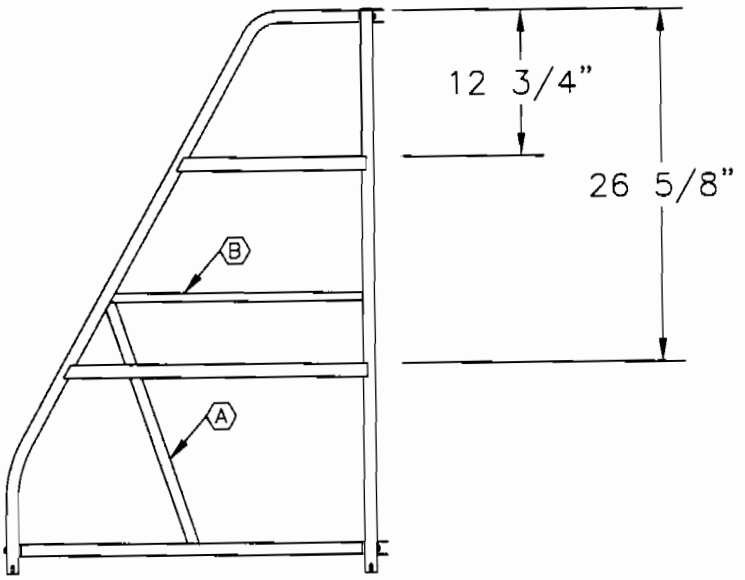


FIGURE 05A-04

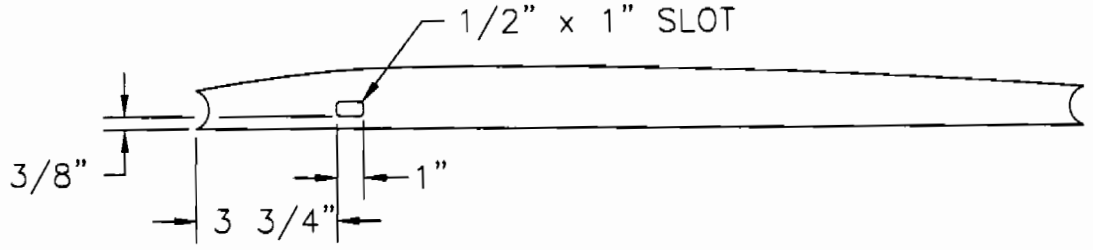


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FIGURE 05A-04A

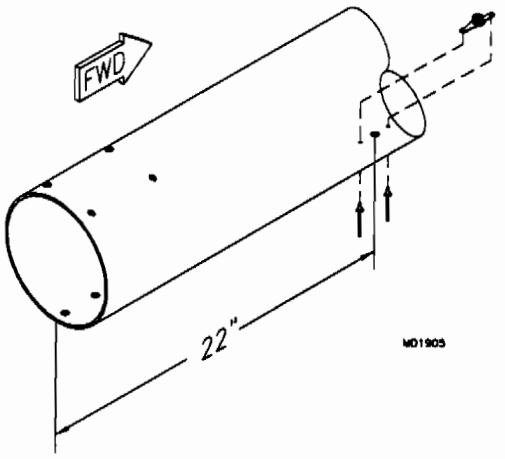
5. Clean everything: tools, table and hands. Use a carpeted floor or work bench for tail covering, using methods shown in the rudder section. Keep the elevator horn installed and insert the internal brace from the elevator top side. Install the lacing cord and wire to the horizontal stabilizer using the same methods discussed in the vertical stabilizer section. Locate holes for the lacing rope about every three inches. **NOTE:** Be sure to install elevator horns LH and RH with the correct edge forward.

6. Poke through the fabric with a hot knife at the cable bolt locations. The tail should be complete and ready for assembly to the fuselage.

7. Drill out the 3/16" holes of four S2-SAB attach brackets to 1/4". Attach the brackets to the bottom spreader tube on the vertical stabilizer. The horizontal stabilizer should fit between the brackets without forcing. If they do not align, it is OK to slot the 1/4" holes fore and aft as required.

8. Drill a #11 hole on the bottom centerline of the tail boom, 22" from its aft end. Locate a 3/16" nut plate over the hole, orienting ears along centerline. Using the nut plate as a guide, locate and drill #40 holes for riveting. Place nut plate against hole inside tail boom and rivet into place with 3/32" aluminum pop rivets. Install hummertangs, as per parts drawing. See **FIGURE 05A-08**.

FIGURE 05A-08



9. The tail cables have a custom-made tang with several holes in one end; these are for adjusting the set of the tail and to tension the cables. Before the cables are set and tensioned, bend the tangs so they line up with the cables; do so after bolting them in place, as per parts drawings. The tang will want to bend at the inner-most hole; try to bend the tangs beyond the holes. Avoid using bare pliers, as this may cause stress risers. Refer to **FIGURE 05A-09**. Set tension by pushing down at the cable/tail intersection; properly tensioned cables will yield a nice low note when strummed. Using this method, it's unlikely you'll get cables too tight; too loose is more likely. Loose cables tend to vibrate and shake in flight. **PLEASE NOTE:** Tension the cables so they are stable in flight.

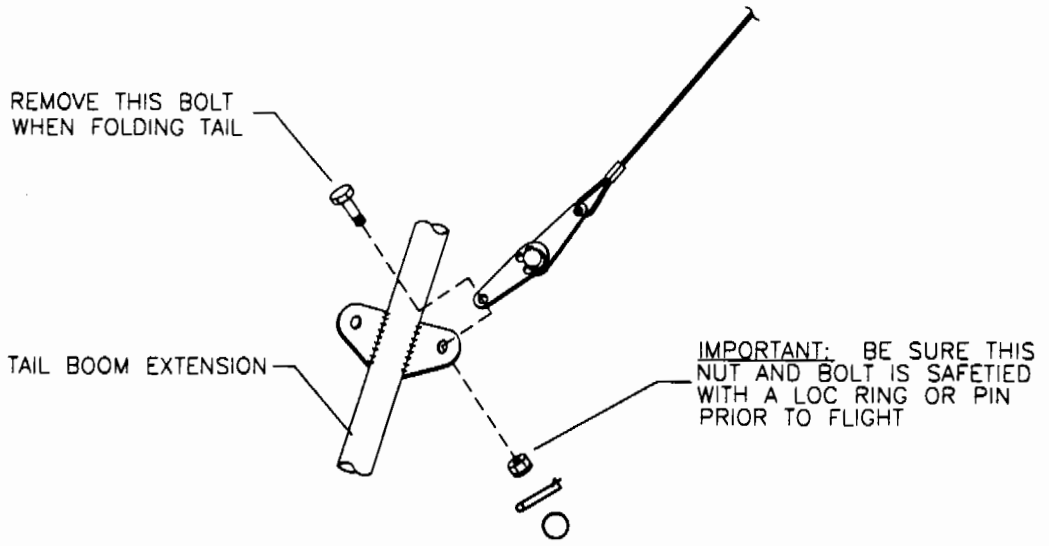
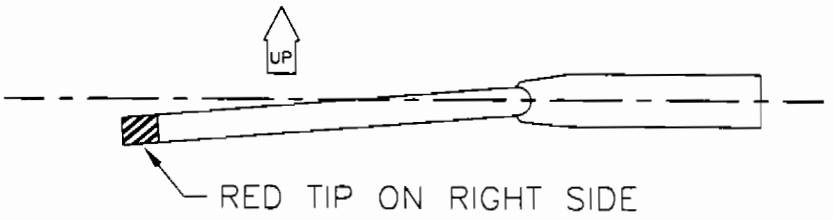


FIGURE 05A-09

10. With the horizontal and vertical stabilizers fitted to the aircraft, bolt elevators into place, horns downward. Check for freedom of movement.

11. Install the 1 1/4" PPT (Push Pull Tube). Apply a film of grease to the PPT and bolt on the yoke with the red tip to the RIGHT of centerline. This is important; the yoke is bent slightly to raise the PPT, allowing it to clear the tail boom extension. See **FIGURE 05A-11**. Please verify proper orientation. **NOTE:** The bolt hole may need chasing with a #11.

FIGURE 05A-11



12. Cut out templates as per **FIGURE 05A-12**. With the control stick forward, against its stop, hold the twenty-degree template to the underside of the horizontal stabilizer and check elevator "down" deflection. Check that deflection is the same for both elevators.

FIGURE 05A-12

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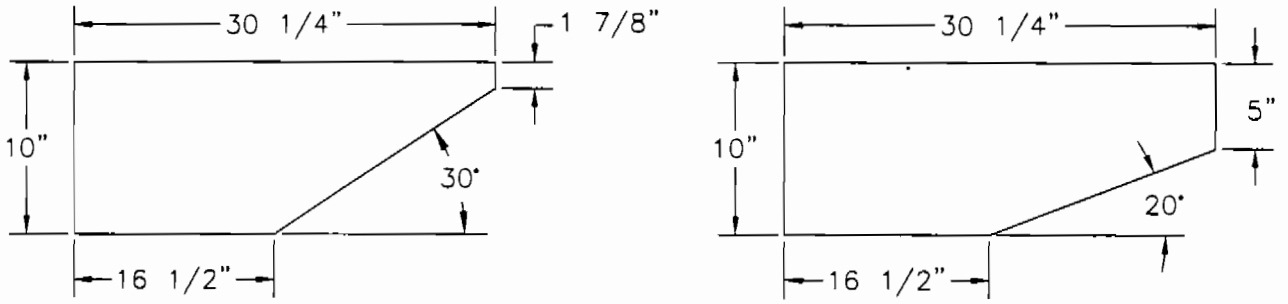


13. The 3/4" X .058 X 1 1/2" aluminum tube that was slipped over the 5/8" PPT during step 12 of the control stick assembly now will be used as an "up" elevator stop. Using the thirty-degree template, hold the elevator in position with the safety belts. Slide the stop against the swivel tube (built into the S-3), drill through the top of the stop and rivet into place with a 1/8" stainless steel rivet.

14. Check the system for proper movement. Be certain the **lock rings** are through the 1/4" bolt attaching the horns to the yoke. *Check this prior to each flight.*

12. Hold the 20 degree template under the elevator flat against the horizontal stabilizer (be sure the control stick is against the stop). Adjust the rod ends until the template fits with both horizontal stabilizer and elevator flat against the template. Check for evenness of the elevators. They should be flat across each other and not one lower or higher than the other.

13. The 3/4" X .058 X 1 1/2" aluminum tube that was slipped over the 5/8" push pull tube during step 12 of the control stick assembly will now be used as an up elevator stop. Using the 30 degree template, hold the elevator in position with the safety belts. Slide the stop against the swivel tube (Built into the S-3) and drill and rivet with the rivet positioned on the top side. **IMPORTANT:** Please use a 1/8" stainless steel rivet. Check the system for proper movement. Be sure the **lock rings** are through the 1/4" bolt attaching the horns to the yoke. (Check this prior to each flight).

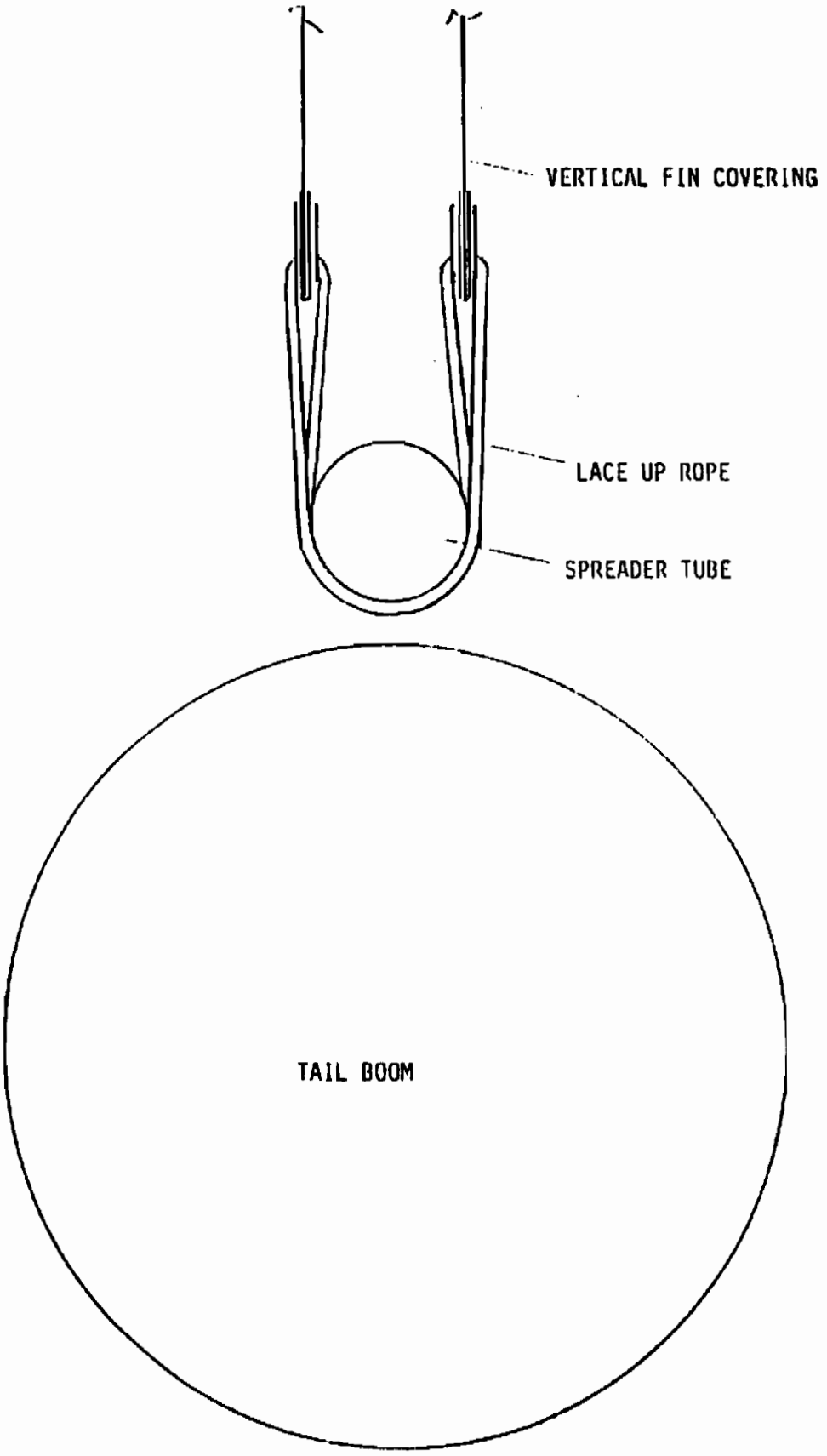


FIGURE 05-011A

S-14 AIRAILE RUDDER INSTALLATION

1. Assembly and skinning of the rudder is shown in the following diagrams. (The tools illustrated can be very helpful in assembly. Build these if you plan on doing more than one aircraft. Otherwise sticks, ropes and whatever can be used to the same effect.) Pre-assemble the TC-1's to their respective locations. Pay close attention to the bolt head orientation. Drill the rudder spar tube out to 1/4" in the locations shown in the parts drawing and rivet the 3/16" nut plate to the spar.

2. Assemble the frame and cut and fit the internal bracing tubes after installing the rivet buttons. Cut and fit the internal brace tubes from the 1/2" aluminum tube stock provided as follows:

Part #	Length	Qty
TG-IB-R	15"	2

Notch one end of each tube as shown in **Figure 05B-02.**

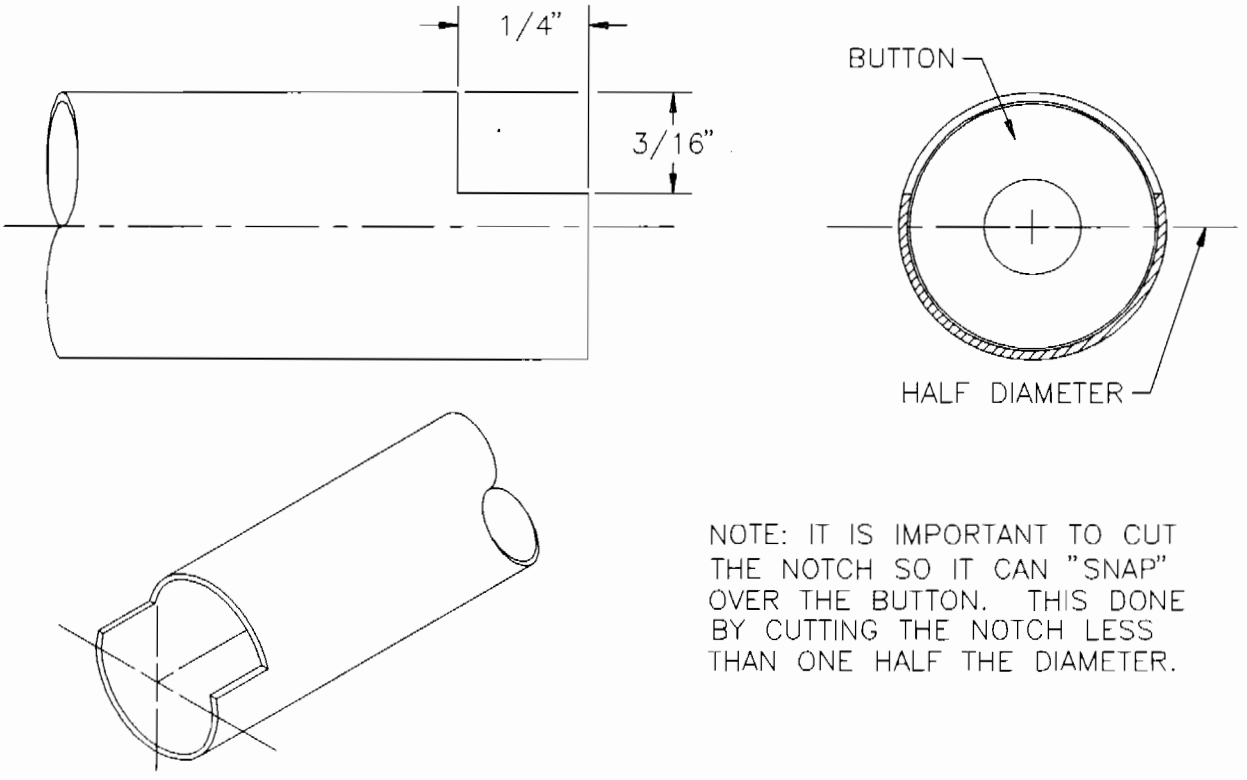
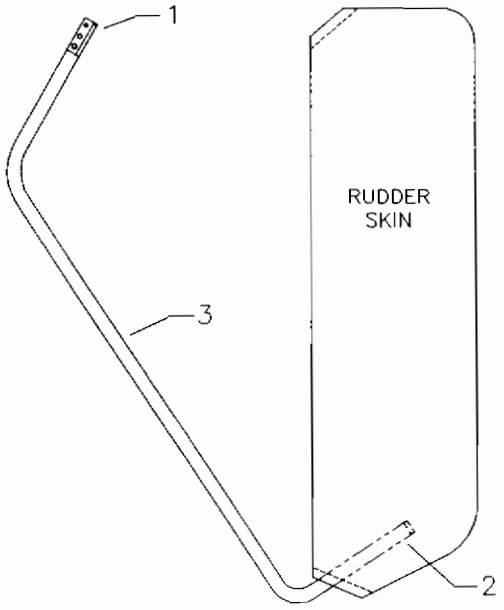


Figure 05B-02

2. Assemble the completed rudder to the vertical stabilizer AFTER it is attached to the tail boom.

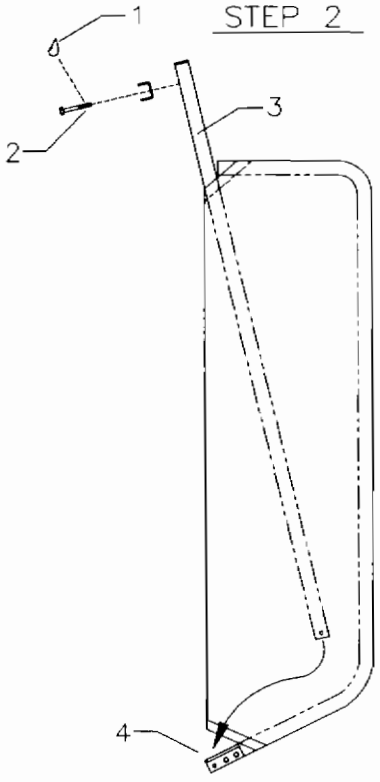
3. Attach the rudder cable tangs to the rudder horns in the best hole for rudder and rudder pedal alignment. IMPORTANT: Bend the rudder cable tangs midway to angle toward the cable pulley. Check for smooth operation. DO NOT over-tighten the tangs to the horns.

STEP 1



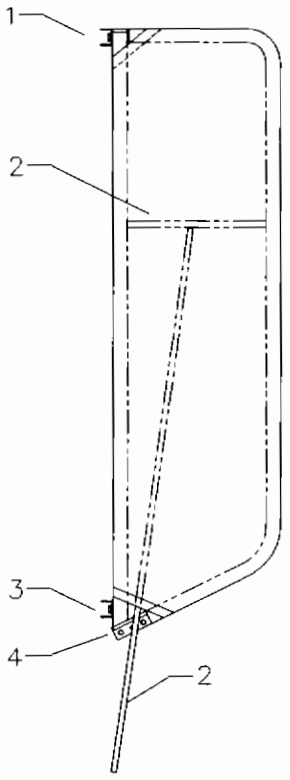
1. ASSEMBLE ONE HALF OF RUDDER HORN.
2. ASSEMBLE END FITTING TC-1.
3. RUDDER TRAILING EDGE

STEP 2



1. LOCTITE THE 1/4" HINGE BOLT.
2. HINGE BOLT AND HINGE
3. RUDDER SPAR
4. INSERT SPAR, POP OVER LOWER END OF TRAILING EDGE USING A LARGE FLAT HEAD SCREWDRIVER FOR A LEVER.

STEP 3



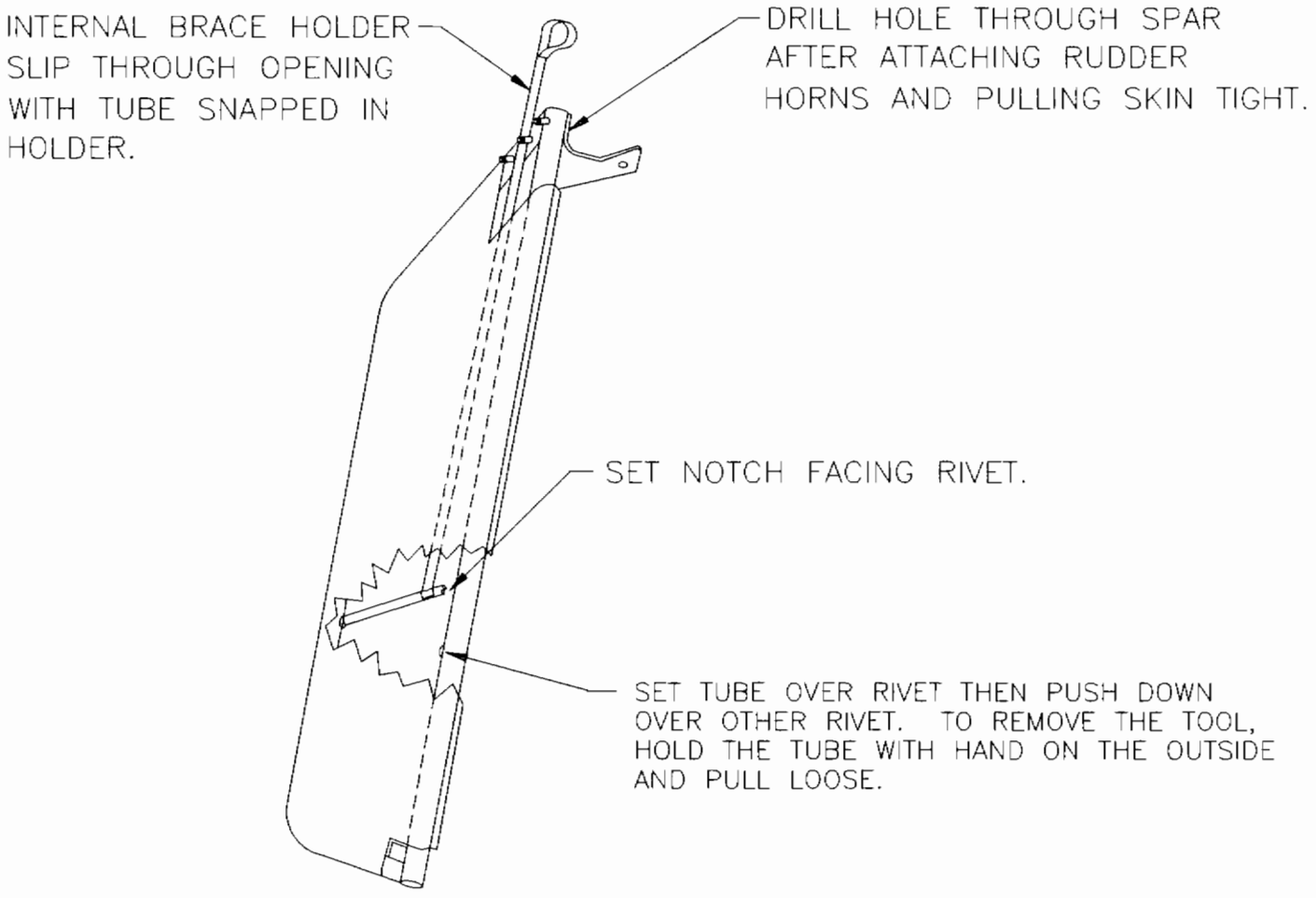
1. TIGHTEN TOP HINGE AND BOLT.
2. PUSH THE INTERNAL BRACES IN PLACE WITH THE NOTCHED END OPEN TO THE "BUTTON". TAPE THE BRACE TO A STICK OR METAL STRAP TO AID INSTALLATION.
3. INSTALL LOWER HINGE AND BOLT.
4. POSITION SPAR FLUSH WITH TRIALING EDGE TUBE AND DRILL. USE HORN AS A GUIDE. INSTALL BOLT TO COMPLETE ASSEMBLY.

MD368

RANS RUDDER ASSEMBLY PROCEDURE

1/30/93

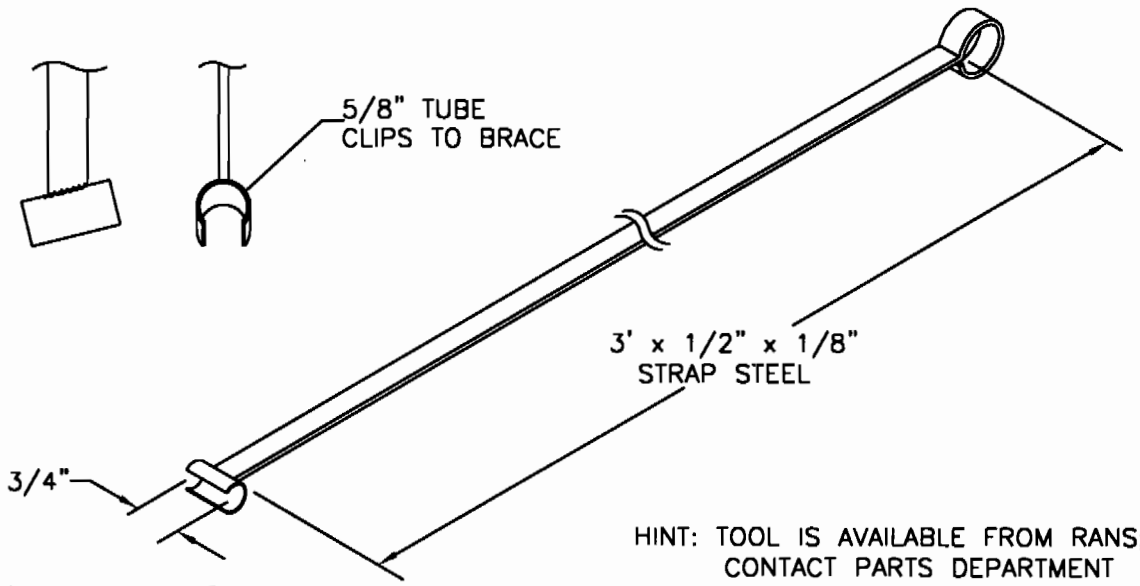
05B-02



RUDDER AND ELEVATOR: INSTALLING BRACES FOR THE S-14 AIRAILE

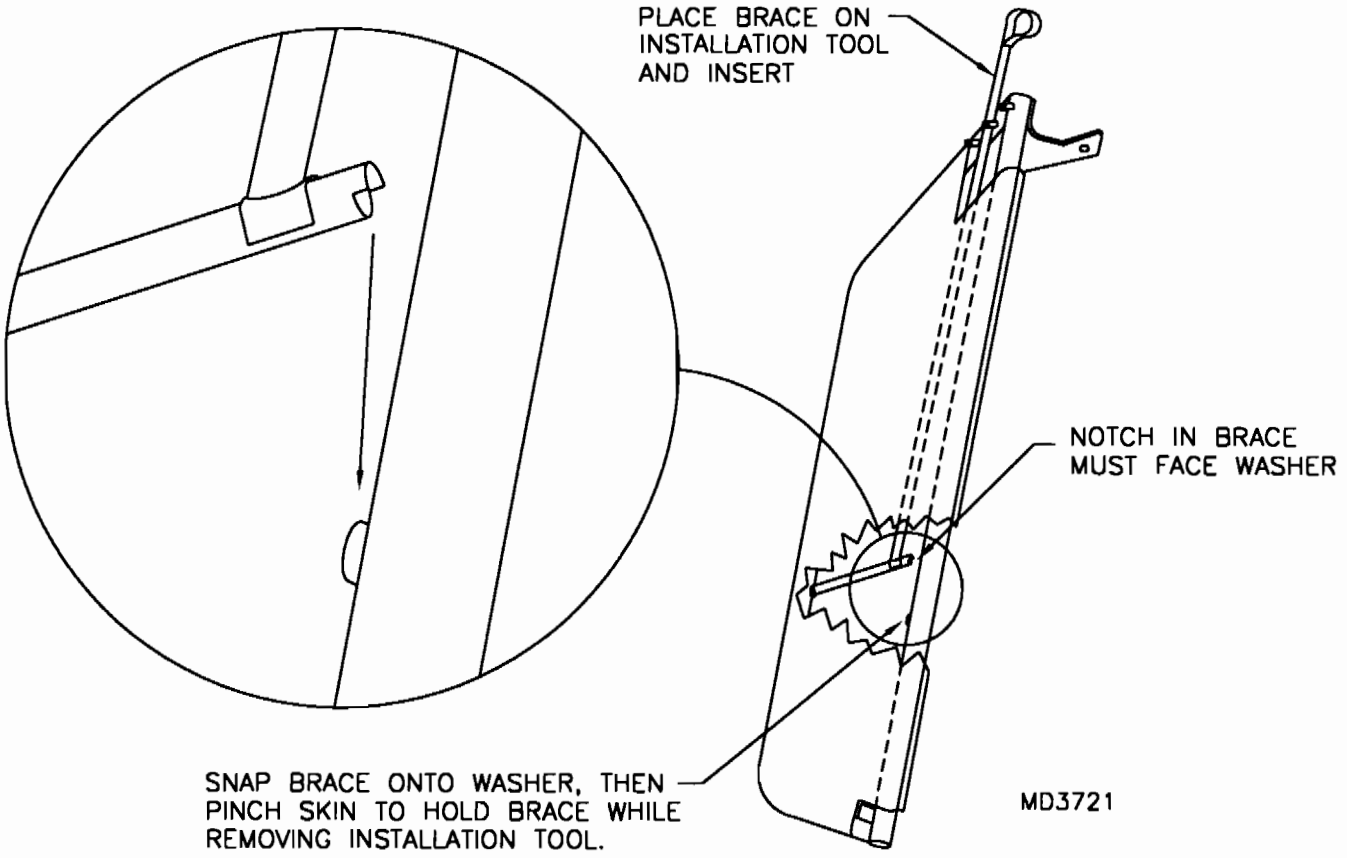
MD110

RANS INSTALLATION TOOL



HINT: TOOL IS AVAILABLE FROM RANS;
CONTACT PARTS DEPARTMENT

CLIP IS FABRICATED FROM
A 5/8" X .058 TUBE WELDED
TO STRAP AT APPROX. 20° ANGLE



S-14 AIRAILE ENGINE MOUNT ASSEMBLY AND ENGINE FUEL PUMP INSTALLATION

At this point the fuselage should be complete with the super structure and keel in place.

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

2. Drill out the three holes to 5/16" in the keel where the mount attaches. Bolt the left and right engine mount angles to the keel with the narrow end facing forward. The engine is installed with down thrust to minimize pitch up and down with power changes. Do not tighten the 5/16" bolts until later.

3. Bolt the lower focal mount plate to the engine mount angles as per **Figure 06-03.**

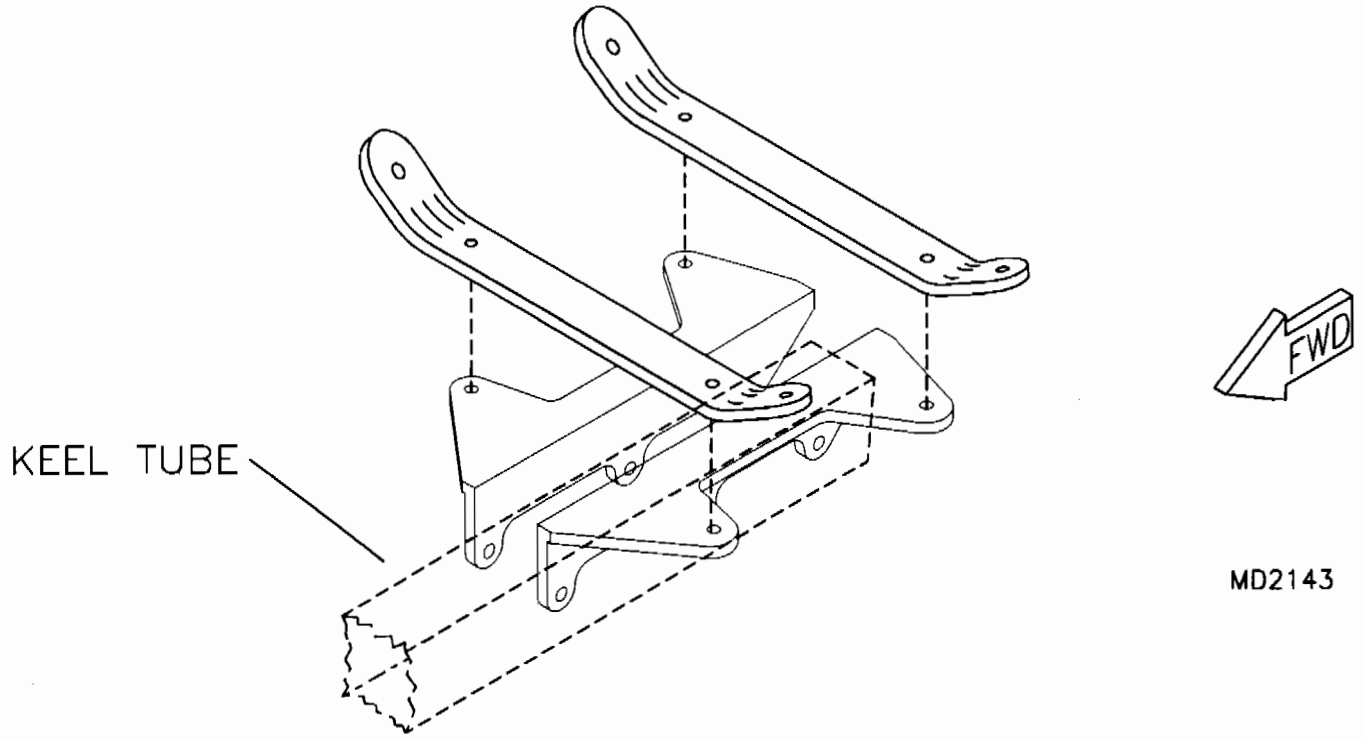


Figure 06-03

4. Assemble the barry mounts and mount plates to the mount angles as per the parts drawing.

5. Install the engine mount plates to the angles. Be sure you assemble the mount with the right number of spacers and washers as per the parts drawing. Tighten down all the bolts and inspect the mount.

6. Before setting the engine on the mount turn to the section on assembly of the muffler mount. The muffler mount and muffler are much easier to install if done on the bench prior to lifting the engine into place. The exhaust manifold will almost always leak at the point it attaches to the engine. It seems the seals alone are not enough, so we recommend applying a good gasket seal such as Permatex Ultra Copper high temp silicone gasket material. Apply very thin layer to each side of the gaskets before installing.

The muffler's ball joints are held together with small springs that attach to hooks welded to the muffler. Try to install these with even tension. They should not be stretched more than 50% of their length. The tension can be adjusted by bending the hooks up or down. After the springs are installed run a loop of safety wire through the spring. This will save the spring from going into the prop should the spring ever break. Also to prevent spring breakage from vibration we recommend applying a bead of silicon caulking along the length of the spring.

7. Put a three stack of 3/8" washers over each mount hole where the engine studs will insert. Use super glue to hold the washers in place. With the muffler installed to the engine use the help of a strong friend to lift the engine into place. Having a friend help you will make this step much safer! Place the engine onto the mount and run on the loc washers and nuts. Torque the engine mount nuts to 15 foot pounds.

8. Inspect all the bolts on the engine mount for security. Check the engine for security. Bolt on the propellor using the proper hardware. Torque the prop bolts to 10 ft. pounds and safety wire as in **Figure 06-08.** Be sure you are bolting the prop on the correct way! Remember this is a pusher.

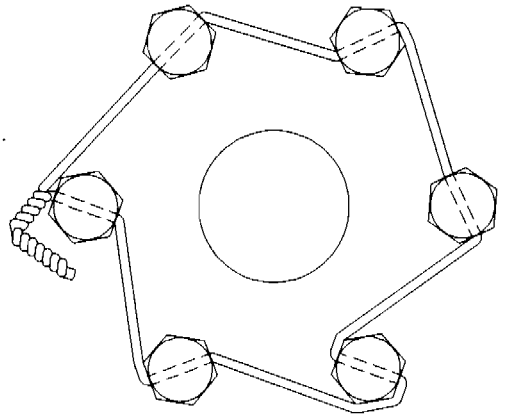


FIGURE 06-08

9. Once the engine has been bolted in place it's time to run all the wiring, fuel lines and cables. Turn to the specific section for the details.

S-14 ROTAX 503 MUFFLER MOUNT INSTALLATION

At this time the engine should have been installed and the exhaust manifold "Y" pipe has been attached to the engine.

1. Select the parts depicted in the parts drawing. The muffler mount uses three of the top 8mm bolt locations to mount the plates. Look at the parts drawing to determine these locations.

2. Unscrew the three existing 8mm bolts that will be replaced by the longer 8mm bolts. Install the forward and aft muffler mount brackets. Use loc washers and apply a drop of blue Loctite to each bolt before insertion.

3. Check the 3/4" holes in the ends of the mounts for burrs. Remove any burrs around the holes edge to prevent wearing of the rubber muffler barry mounts. Insert the barry mounts into the 3/4" holes and assemble the muffler to the mount as shown in Figure 06B-03. The muffler comes with tabs welded to the canister for mounting. Be sure to slip the 3/8" spacer into the barry mount centers before slipping the assembly between the welded on tabs.

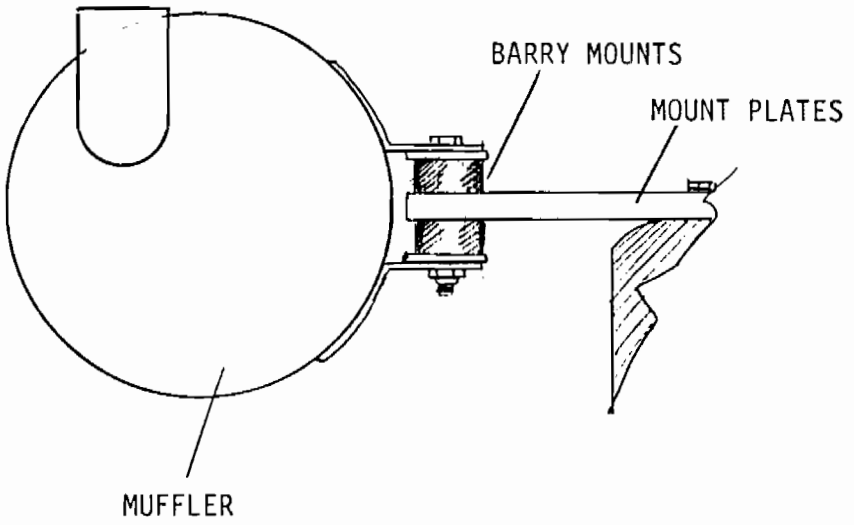


FIGURE 06B-03

4. The muffler is a part under constant stress while in use and under the attack of time and the elements otherwise. It will not last forever, in fact, they don't seem to last much past 100 hours before needing welding or some care. 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.

S-14/582 OIL INJECTION TANK AND MOUNT

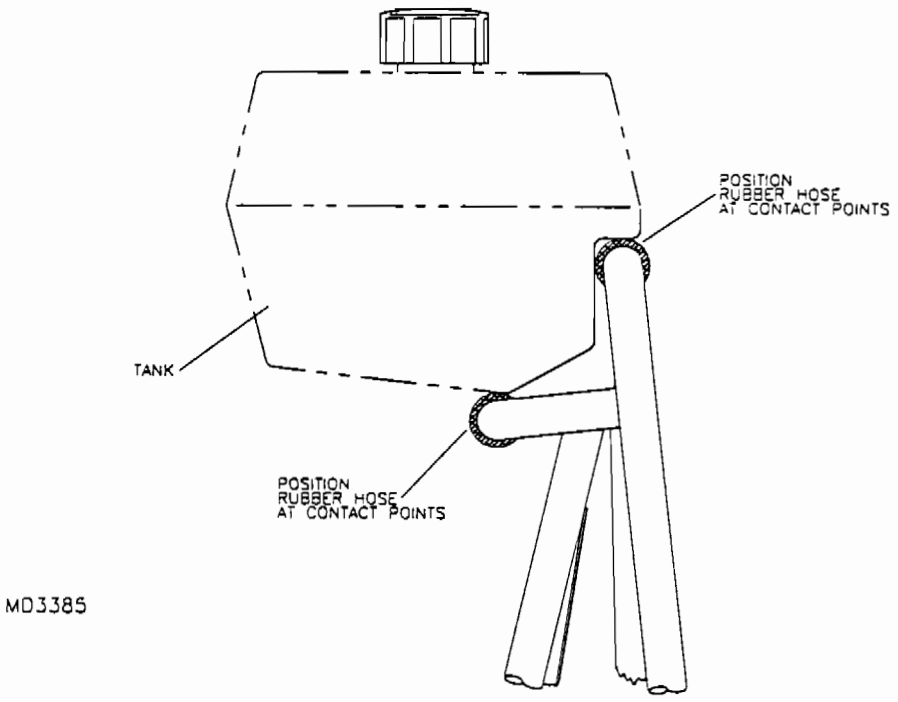
The oil injection tank sits above the engine, supported by the oil tank mount. Refer to Parts Manual.

1. Press 3/4" inch isolators into mount sleeves; press 7/16" isolators into 3/4" isolators (apply a small amount of dish soap to ease assembly). Isolators should be flush with each other and centered within the sleeves.

2. Locate bosses on sides of magneto housing (aft end of engine). Place mount on engine; when properly oriented, sleeves cover both 8mm holes of each boss. Drill out 3/16" washers to accommodate 8mm bolts; slip washers over bolts, apply Loc-tite, insert through isolators and tighten.

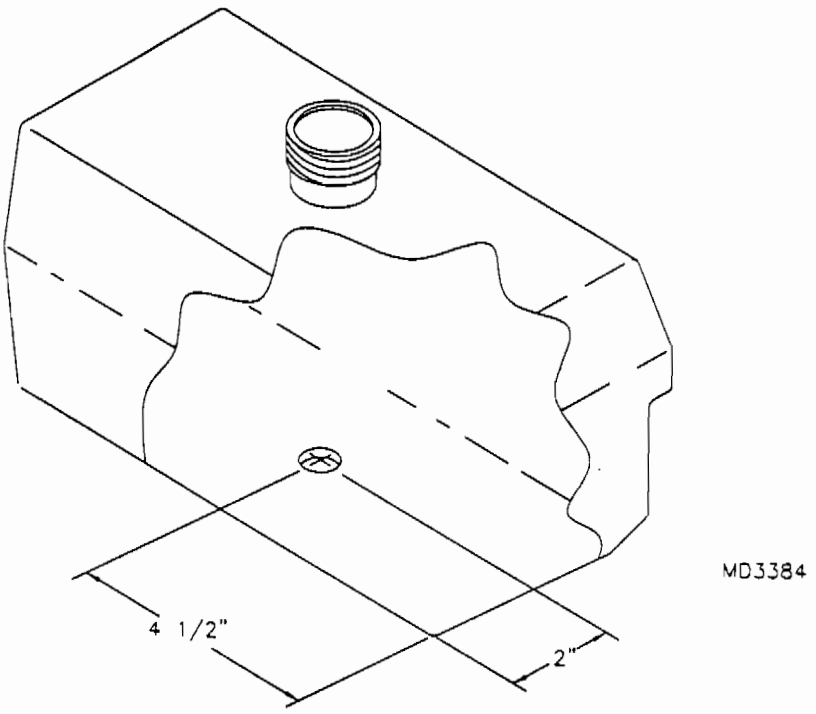
3. Cut 7/16" black fuel line into two 6" segments, split lengthwise and center on cross members of mount, where tank will contact. Refer to **FIGURE 06E-03.**

FIGURE 06E-03



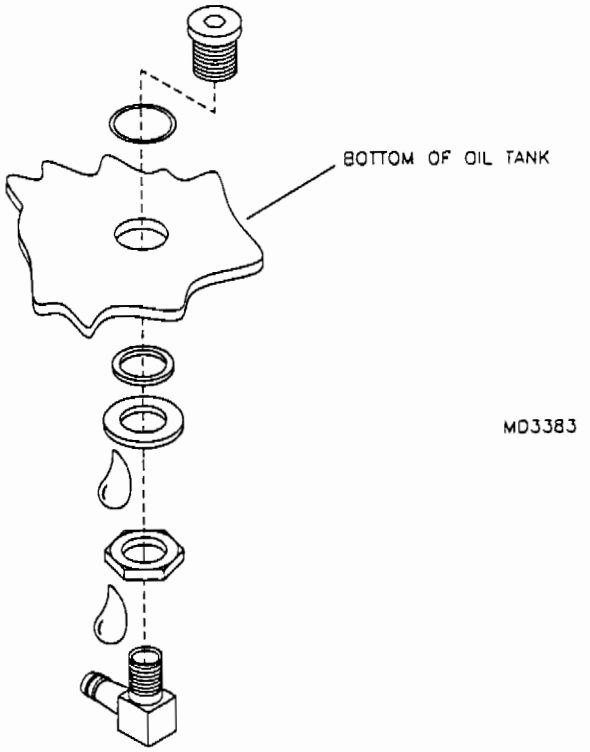
4. Locate and drill a ½" hole in the bottom of oil tank as shown in **FIGURE 06E-04.** Carefully deburr the hole and remove all debris from the tank. Take care not to bevel or enlarge while deburring.

FIGURE 06E-04



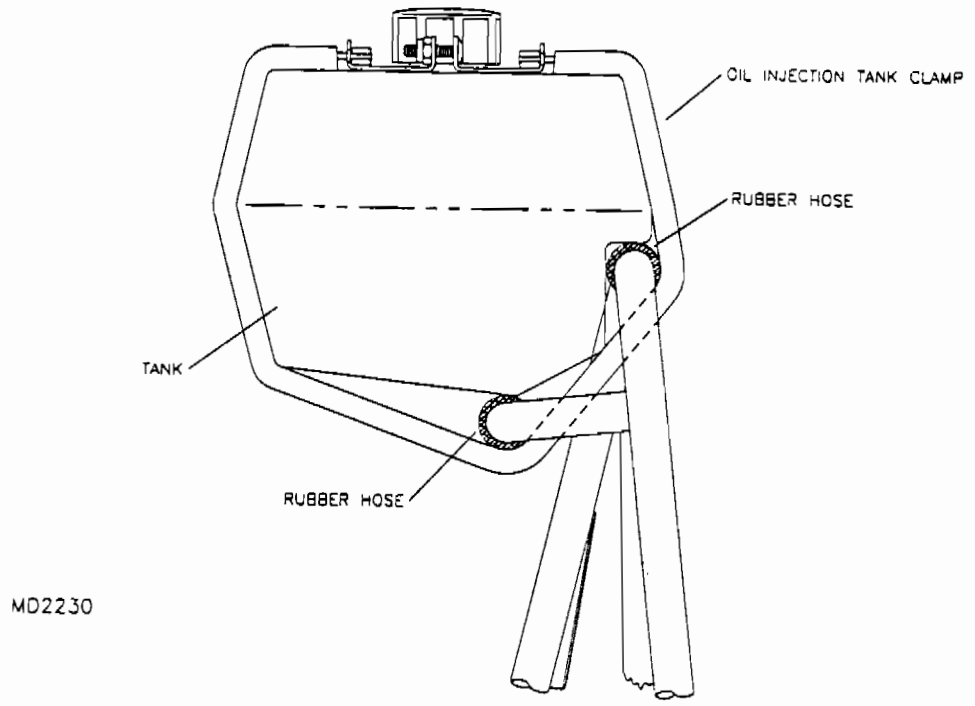
5. Insert a rigid wire (an untwisted coat hanger will do) through the ½" hole and out the filler neck. Install an O-ring on the tank withdrawal fitting and slide the fitting onto the wire. Bend the wire sharply near the end to form a hook to retain the fitting; pull the fitting through the tank and into the ½" hole. Slide a rubber washer and ½" thick washer down the wire and onto the fitting; slide the nut-flared tube bulkhead down the wire, apply Loc-tite and thread onto the fitting. Remove the wire. Insert a 1/4" Allen wrench into the fitting to hold it while tightening the tube bulkhead. *Do not allow the fitting to rotate while tightening; leaks may occur otherwise.* Apply thread sealant or Loc-tite to the 90 withdrawal fitting and install in tank fitting. Again, *do not allow the tank fitting to rotate*. See **FIGURE 06E-05.**

FIGURE 06E-05



6. Install tank on mount as shown in **FIGURE 06E-06** and secure with clamps and hardware as shown in Parts Manual.

FIGURE 06E-06



7. Determine oil line routing and cut the 5/16" fuel line to suit. Fit one segment between the tank withdrawal fitting and the oil filter. **IMPORTANT**: the arrow on the filter case shows the necessary direction of flow; orient the filter accordingly. Fit another segment between the filter and the engine's oil injection pump. Secure connections with small hose clamps.

8. Remove the rubber gasket and plastic baffle from the fuel cap. The plastic baffle will "snap" out of the fuel cap; a screw driver works well for the removal.

Locate and drill a 1/4" hole in the center of the fuel cap as shown in **FIGURE 06E-08**. Install the conduit adjuster assembly in the fuel cap. Apply a small drop of Loc-tite, install the 1/4" plain nut and tighten to secure the assembly to the cap. See **FIGURE 06E-08A**.

FIGURE 06E-08

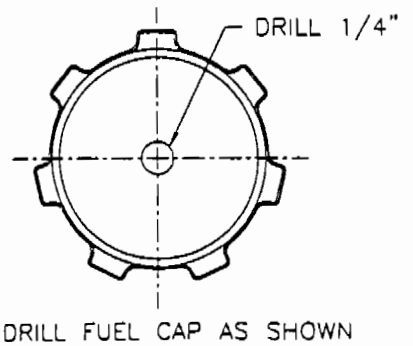
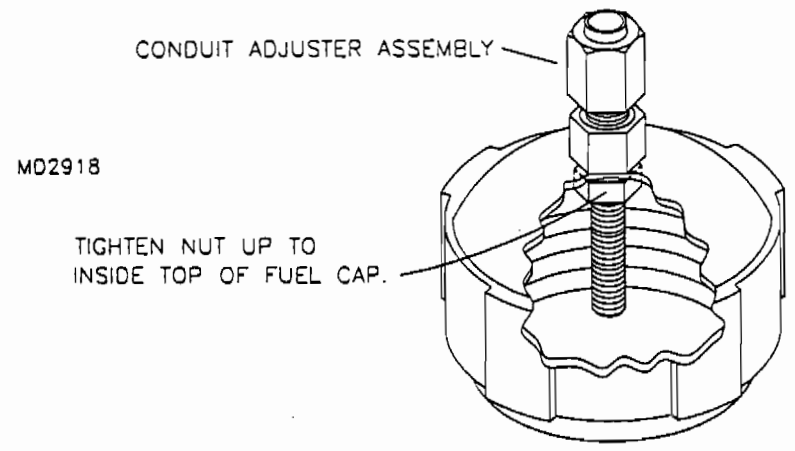


FIGURE 06E-08A



9. With side cutters or file, remove the attach nipples from the plastic baffle, per **FIGURE 06E-09**. Drill a 1/4" hole in the center of the plastic baffle and install into the fuel cap over the adjuster assembly stem. Drill a 1/4" hole in the center of the rubber gasket and install into the cap. Note the orientation of the rubber gasket.

Drill the 1/4" large wood washer as shown in **FIGURE 06E-09A**. Assemble the bead chain to the bead chain retainer sleeve. Install the bead chain and retainer sleeve into the #30 hole in the large wood washer. Install the washer and bead chain into the fuel cap. Install the 1/4" shear nut on the adjuster assembly stem and tighten.

FIGURE 06E-09

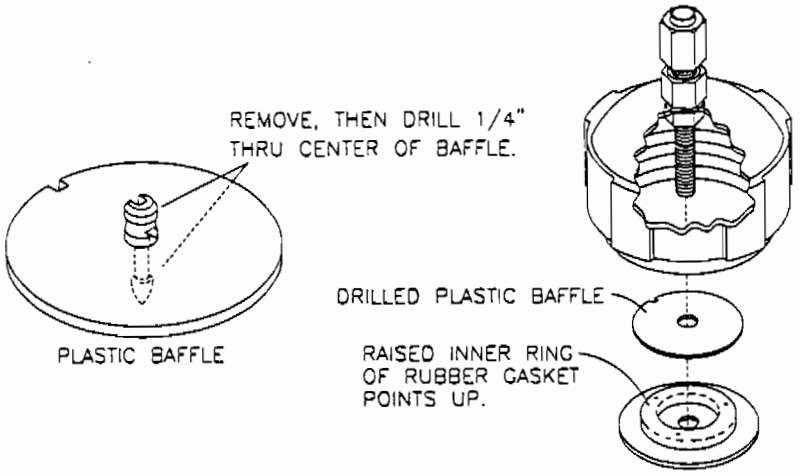
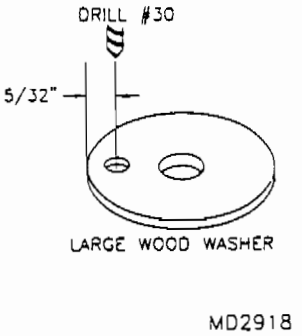


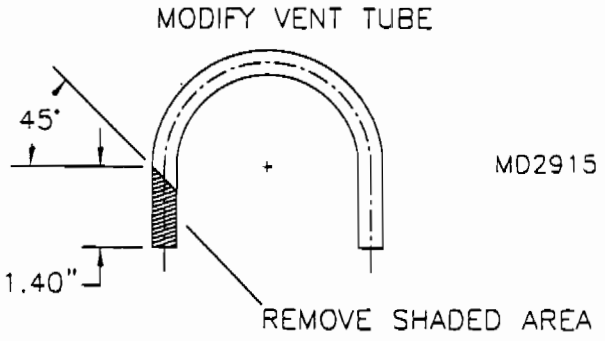
FIGURE 06E-09A



10. Install the bead chain end coupling onto the bead chain. Find the center of the plastic retainer and drill a #30 hole. Using the brass backing washer, rivet the plastic retainer to the bead chain. Refer to the Parts Manual.

11. Modify the vent tube as shown in **FIGURE 06E-11**. Install the vent tube into the adjuster assembly. Install the fuel cap assembly onto the tank and tighten. Position the vent tube so that the 45-degree angle is forward (into the slipstream) and tighten the assembly cap to secure the vent tube.

FIGURE 06E-11



12. Check all clamps and fittings, apply anti-chafe where necessary and secure all lines. **IMPORTANT:** Always check the oil tank and mount before **EACH** flight. An empty oil tank can destroy an engine; **ALWAYS** check the oil level before flying.

NOTE: Builders interested in fitting their ***Rotax 503*** engines with an oil injection system should contact their Rotax engine suppliers.

S-14 AIRAILE ROTAX 582 MUFFLER MOUNT

At this time the engine should have been installed and the exhaust manifold "Y" pipe attached to the engine.

1. Select the parts shown in the parts drawing.

2. Remove the four head nuts shown in Figure 06F-02. Install the stand offs in place of the original nuts. Use a drop of Loctite on each of the stand offs. Torque the stand offs to 160 to 220 inch lbs.

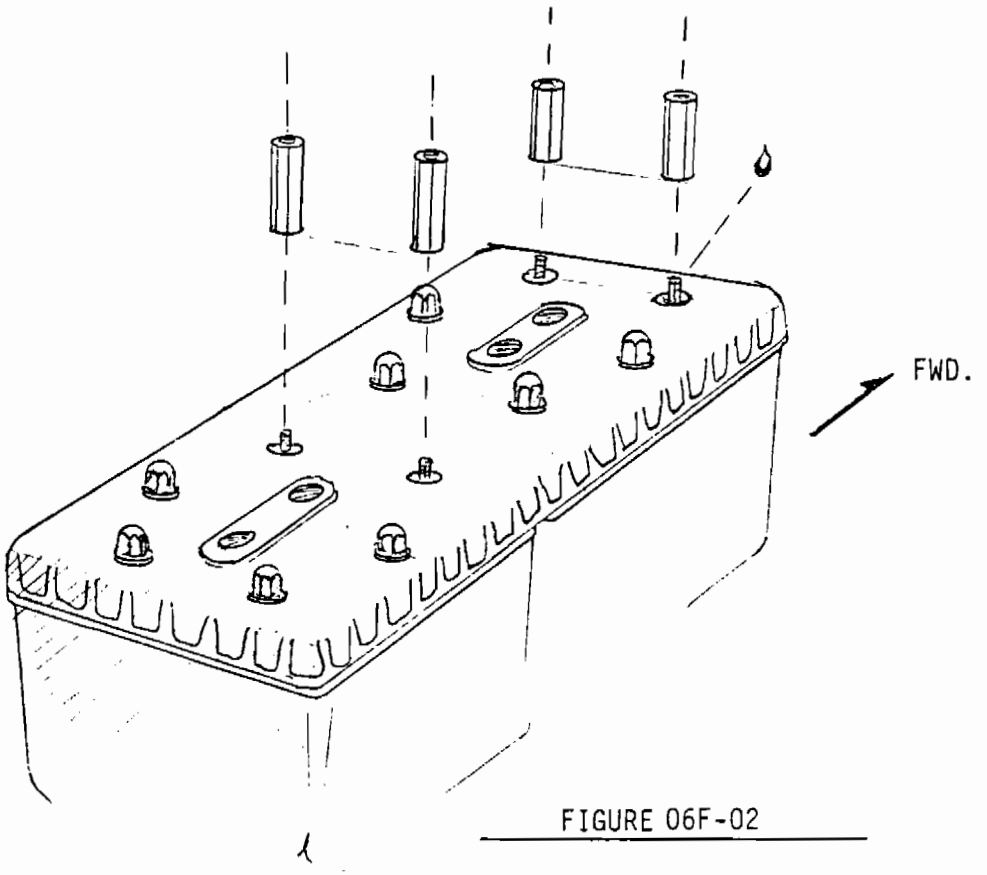


FIGURE 06F-02

3. Bolt the two muffler mount plates to the four stand offs. Use both Loctite and loc washers. Torque these bolts to 160 to 220 inch lbs.

4. Bolt the filler tee and overflow bottle angle mount to the muffler mount plates. Position the angle mount so it's bottom flange points to the engine. During cooling system assembly you will attach the filler tee and overflow bottle.

5. Install the barry mounts to the ends of the muffler mount plates. Slip the 3/8" diameter aluminum spacer inside each of the barry mounts. Install the muffler to the barry mounts as shown in Figure 06F-05.

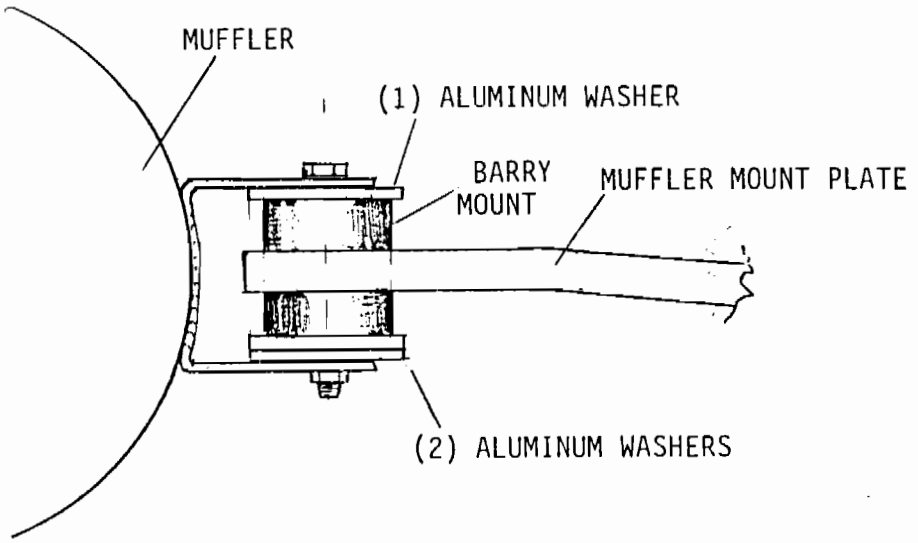


FIGURE 06F-05

6. Place the small muffler elbow pipe between the "Y" pipe and muffler. Retain with the muffler springs provided. You can adjust the fit and tension of the muffler springs by bending the loops welded to the muffler up or down. Install the springs with moderate tension. Over tight springs will have a tendency to break and go into the prop. Also safety wire the springs to the loops. To help dampen vibration apply a bead of silicon lengthwise along the spring.

7. Always inspect the muffler and springs for wear and cracks. Spring or muffler fragments can instantly destroy a prop.

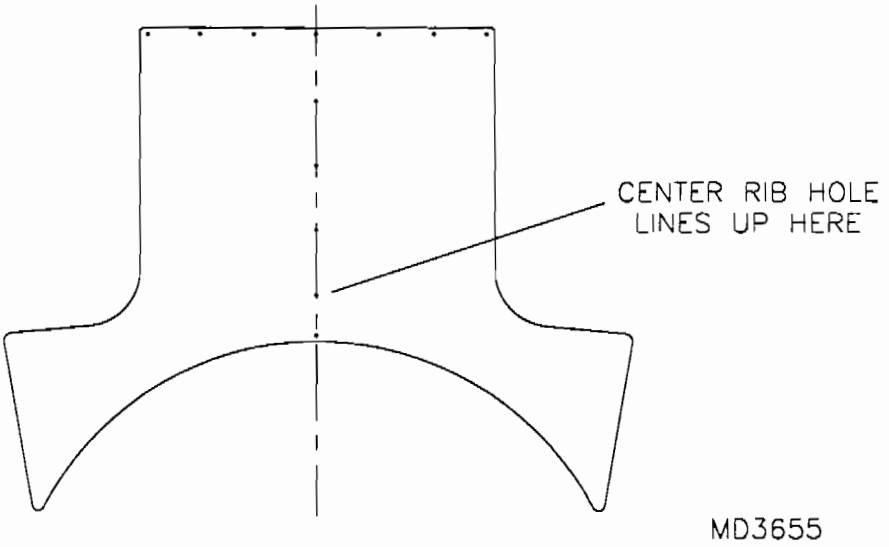
S-14 582 COOLING SYSTEM INSTALLATION

NOTE: To aid installation of center cover, wings should be mounted to fuselage before starting.

1. Select parts depicted in parts drawing. Assemble radiator cowling; cowling may be painted, as well. Install reducer couplings and hoses to radiator inlet and outlet. (Apply blue Loc-tite to hose clamps before tightening.) Install radiator, radiator forward mount and radiator aft mount to cowling. Set aside and install center cover, as follows.

2. Locate and drill #30 hole in flattened forward tip of center rib, maintaining 3/8" E. D. This hole will align with second hole on forward center cover; see **Fig. 06G-02**.

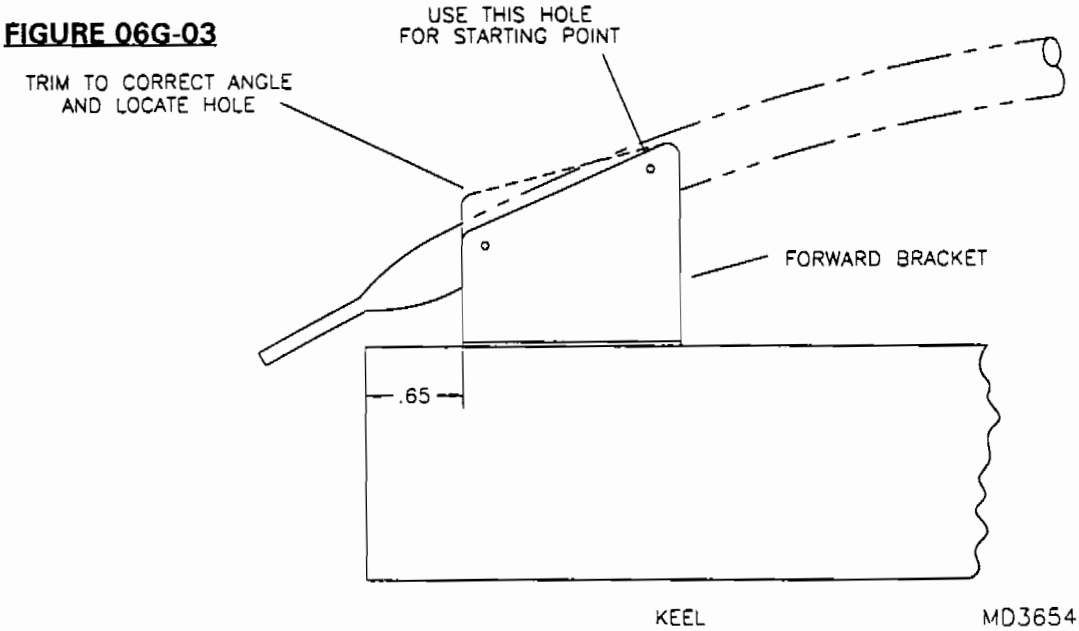
FIGURE 06G-02



Mark centerline of center rib and cleco to forward center cover. Using cover as guide, transfer drill centerline holes through cover into rib with #30 bit. Remove drilled rib from cover.

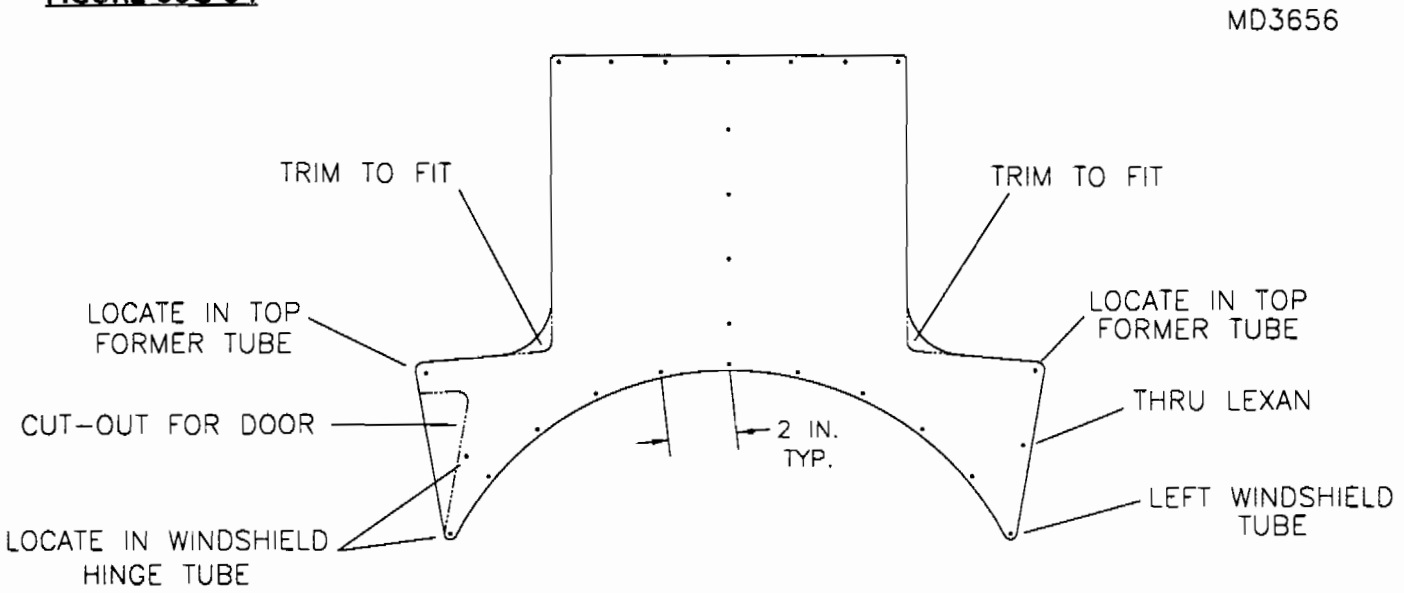
3. Locate LH and RH forward angles on keel, with forward edges of angles .65" back from front of keel; drill and cleco. Cleco center rib through aft holes of forward angles, then drill rib #30 through forward holes and cleco. Mark trim line on forward angles parallel with rib; remove angles and trim accordingly. See **Fig. 06G-03**. After trimming, rivet forward angles to keel and rib to forward angles.

FIGURE 06G-03



4. Cleco forward center cover to center rib; cover's leading edge should overlap windshield. Locate eight holes along center cover leading edge, spaced two inches apart. Drill #30 through cover and windshield; remove center cover. See **Fig. 06G-04.**

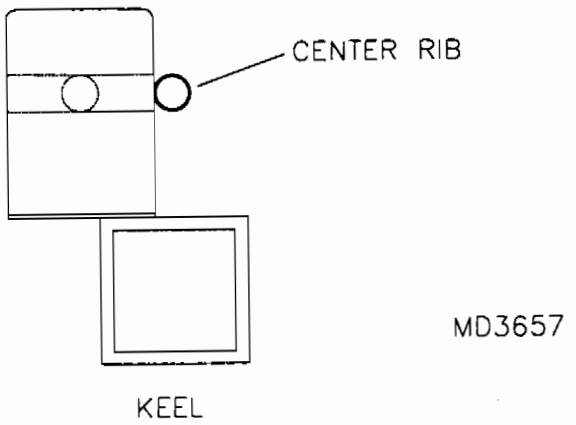
FIGURE 06G-04



5. Place radiator/cowling assembly over wing center section. Place assembly in position that best conforms to wing curvature; this indicates where radiator forward mount should bolt to center rib. Mark bolt location on rib. Verify that center rib has proper wing profile by placing straight edge(s) laterally across wing center section, from one root rib to the other; center rib has proper profile if flush with straight edge at all points along chord. Carefully compress or depress as necessary to match proper profile.

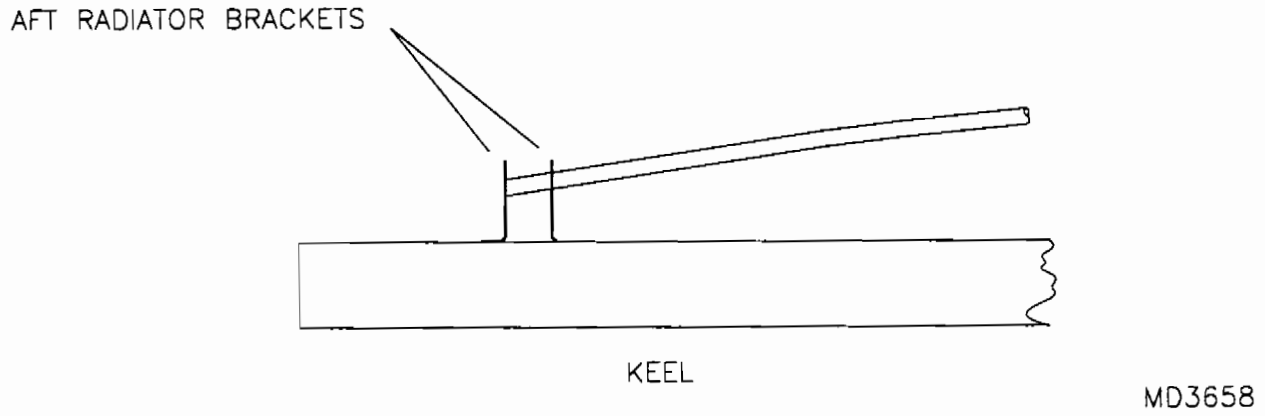
6. Place radiator mount angle atop keel, alongside center rib and against forward side of radiator aft mount; mark location of mount angle on keel. Note height of rib on mount angle; drill ½" hole centered on angle at this height. See **Fig. 06G-06**. Drill out #40 hole below this to ½" to accommodate flap teleflex.

FIGURE 06G-06



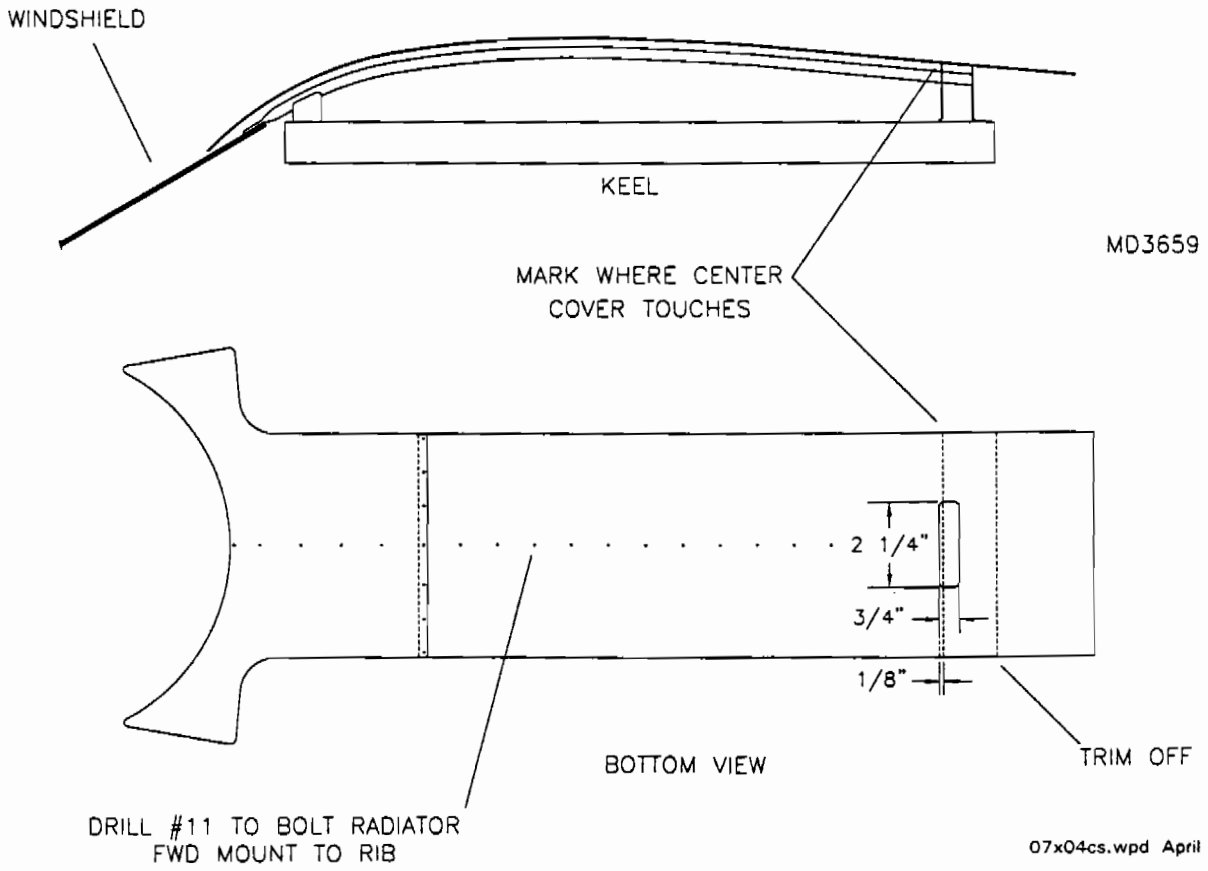
7. Remove radiator/cowling assembly. Slip radiator mount angle onto rib; drill and rivet angle to keel. Place remaining radiator mount angle atop keel, alongside rib, ½" aft of other angle. Mark location of mount angle on keel; mark and cut rib where it meets mount angle and insert center cover plastic fitting in rib. Trim and sand rib and fitting so end fits flush against angle. Drill out lower #40 hole in mount angle to ½" to accommodate flap teleflex; drill and rivet mount angle to keel. Drill #30 through aft mount angle, into plastic fitting; rivet. See **Fig. 06G-07**.

FIGURE 06G-07



8. Cleco aft center cover to center rib as necessary to determine where holes must be located in cover to accommodate radiator forward mount and radiator mount angles. Cut holes in cover at these locations, trim cover as required and debur. See **Fig. 06G-08**. Center covers now may be painted.

FIGURE 06G-08



10. Rivet forward and aft center covers together and cement rubber edging to left and right edges. Cleco completed center cover in place. Remove radiator forward mount from cowling and assemble to center rib with bushing, per parts drawing. Remove radiator aft mount from cowling, center it between radiator mount angles, drill #30 and rivet. Rivet center cover to rib and windshield.

11. Install radiator/cowling assembly to fuselage. Install radiator air dam with rubber edging. Apply Loc-tite to the four mounting bolts of cowling during final assembly.

12. Bolt filler tee and overflow bottle mount angle to muffler mounts. Position filler tee so small nipple is on left side. **See Fig. 06G-12** for location and position.

13. Cut a 2" length, an 18" length and two 20" lengths of radiator hose. Route 20" segment from right radiator inlet to 90-degree copper elbow. Place 2" segment between elbow and top right side on engine. Insert hose spring inside 20" segment to prevent kinking. Route remaining 20" segment from pump to filler tee aft-side inlet. Run 18" segment from forward side of tee to outlet on left side of radiator. Apply Loc-tite to all hose clamps; after initial engine break-in, check clamps for security.

14. Small-diameter blue line is purge and pressure gauge line. A small nipple is brazed to filler tee's left side. Another small nipple comes on engine. This should be installed to aft port on engine. Middle port will be used for water temperature sender; forward-most port is plugged and not used. Cut 1" length of pressure line and install to filler tee nipple. Install small line tee, then line to engine nipple. Run pressure line from small line tee to gauge in panel.

15. Run overflow line from filler tee to coolant recovery bottle's larger tube; smaller tube is for overflow from recovery bottle. Bottle rarely will overfill and overflow line is not required; however, if you wish to install overflow line, use fuel line and route down a cabane, then along gear leg. Refer to electrical section for cooling system schematic.

16. Install temperature sender in middle position on top of engine; route wires to gauge in panel. Place clamps on lines per parts drawing. Double-check security of clamps after initial engine break-in.

Note: Maximum pressure of coolant system is 20 psi; excessive pressure will release coolant. Sudden drop of pressure would indicate loss of coolant or rapid cooling; in either case, caution is advised. Loss of coolant eventually will seize engine. With two-stroke engines, sudden cooling can cause cold seizure. Shock cooling may occur if aircraft enters very cold air; a thermostat will prevent this problem. We highly advise use of thermostats on two-stroke engines.

Cooling System Filling and Operation

Prior to filling, check all connections and clamps for security. Fill system with 50/50 mix of water and anti-freeze. Purge air in cooling system by unscrewing 6mm bolt at top of engine and filling the system until brimming. Also, coolant pump must be purged of air by loosening small hex-head screw on top; tighten clamp and fill to top of filler tee.

Important: You may have to use a large box fan to circulate air over radiator during break-in; fan assures proper cooling during break-in. Once broken in, normal operations should not exceed 200 degrees F even during long, slow taxiing. During break-in, it is normal for some coolant to overflow; this may be due to air bubbles or excessive fluid. Watch temperature and pressure gauges; temperatures should be about 160 to 170 degrees F with pressures under 16 psi. Take hold of radiator hose; if you can hold it for 30 seconds or so, you're getting proper cooling. If you are running at 200 degree or more and coolant is not overflowing, try this test; it may be that the gauge is in error.

Reasons for Poor Cooling

1. Low Coolant Level: Check level and fill. Inspect for leaks. Examine pump; it may be leaking through drive shaft. Check coolant prior to first flight of day.

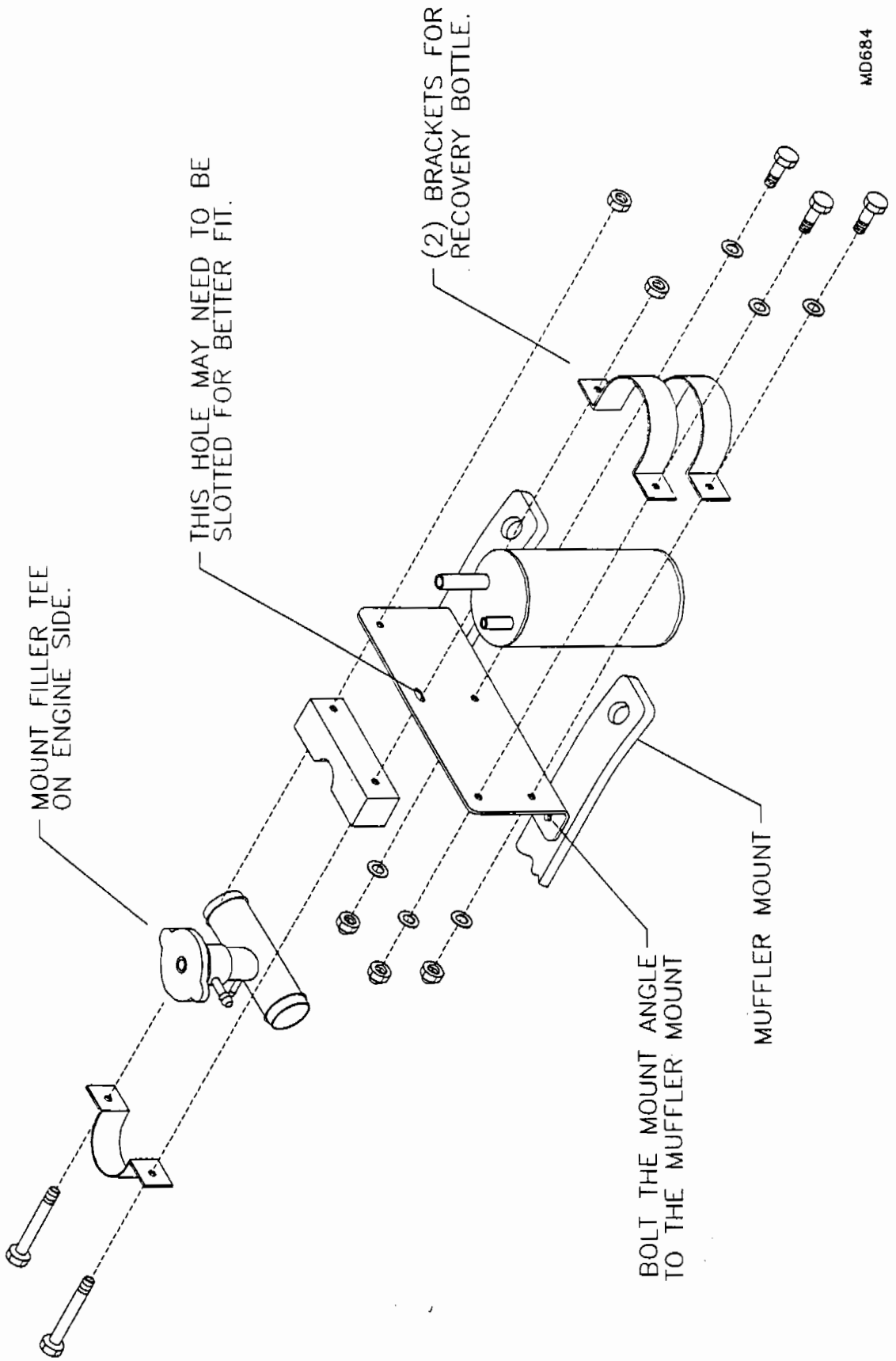
2. Air in Cooling System: Purge air by venting top hose or 6mm bolt on head of engine.

3. Restriction in Hose: Check for kinks, collapsed hose or broken pump impeller.

4. Restricted Air Flow through Radiator: Low-slung position of radiator allows debris to collect in cowling, reducing air flow and cooling. Inspect for debris prior to flight.

5. Improper Filler Cap Pressure: Using cap with less than 15 to 18 psi rating will allow coolant to vent, reducing coolant level. Be certain cap is properly rated.

FIGURE 06G-12



S-14 AIRAILE THROTTLE LEVER INSTALLATION

1. Refer to the parts drawing and select the hardware required for assembly.

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

3. Assemble the friction rod assembly as shown in the parts drawing. The friction block may need a little filing of the friction rod hole in order to work smoothly. Use a 1/4" round file to clean up the hole. Test the throttle action, it should be smooth with minimal effort to operate. Loosen or tighten the bolt through the block to adjust the feel.

4. To hook up the throttle cable you need to unscrew the carb's top plate. Take care not to let the spring inside jettison the plate on to the floor. Remove the spring and cap, then place aside. Look closely at the slider, see the white plastic fitting on the bottom? Underneath this should be the cer-clip that holds the fuel metering pin. Be sure when re-assembling, the cer-clip is **UNDER** the white plastic. Close the throttle cable, slip the little rubber boot over the end first. During re-assembly note where the throttle exits, the cap is not on center. Position the cap so the cable is directly over its slider position.

5. Pull on the free end of the cable to seat the housing into the fitting on top of the carb plate. Then route the cable as shown in **Figure 06C-6.** Drill the back side of the stop tube on the throttle to 3/16" diameter, this allows the cable housing to slide into the tube. **IMPORTANT:** Check the housing closely where you have cut it. A clean cut is a must! The metal coil inside the housing can rub the cable and cause it to break. An unclean cut of the throttle cable housing can also result in sticking of the controls due to the added friction.

6. Next slide the cable through the stop then insert the housing. Insert the cable through the throttle lever and attach a wire stop. **NOTE:** The big hole is on the throttle's forward stop side to eliminate wear. Use loctite to safety. Adjust the throttles to be in perfect sync. They must move exactly the same to assume smooth operations. Assemble the friction rod assembly to the throttle lever as shown in the parts drawing. Rivet a 3/16" nut plate to the **OUTSIDE** of the tab for the stop friction block. Set stops to allow full carb slider travel but no more.

Run double cables for dual carb equipped engines.

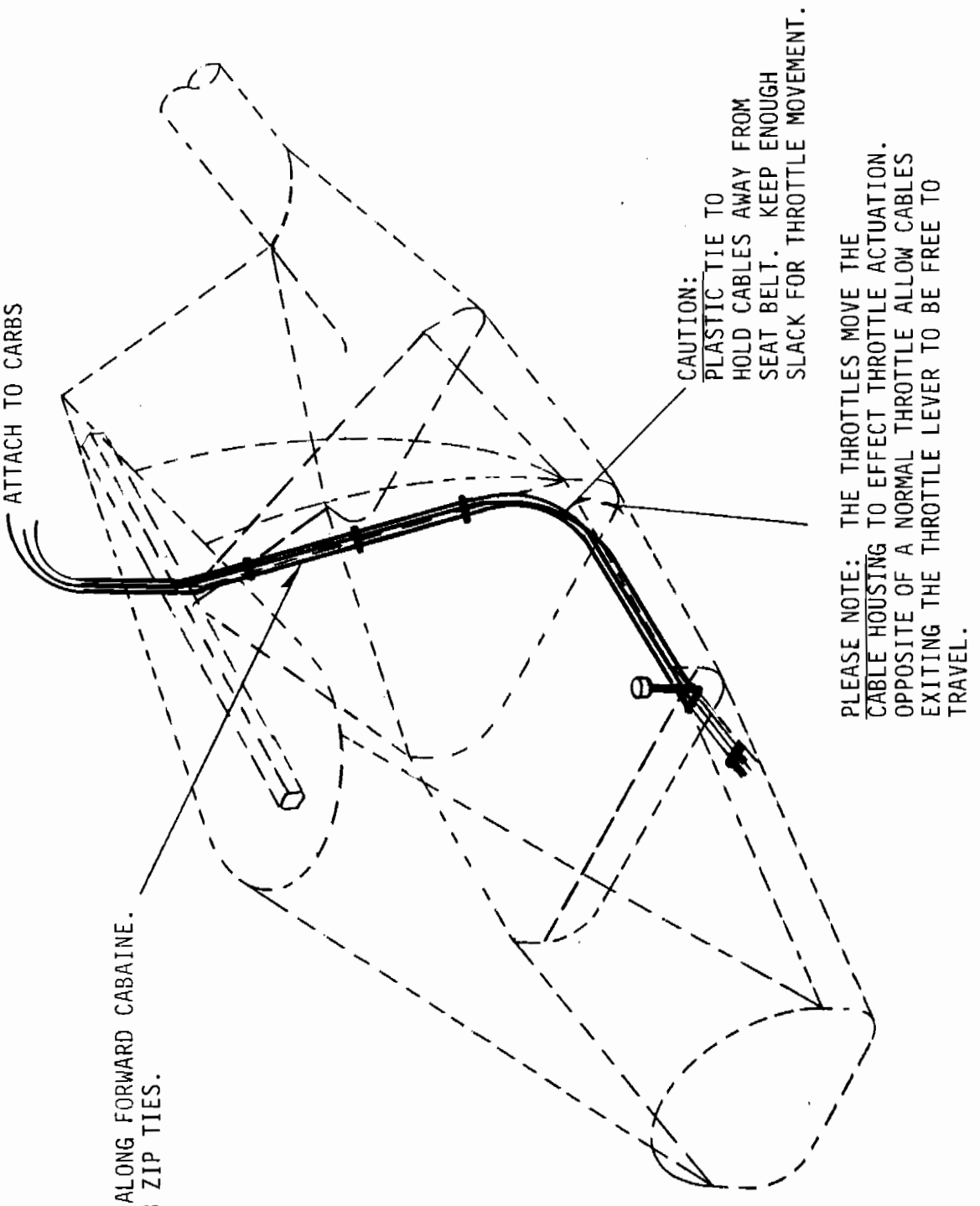


FIGURE 006H-06

S-14 FUEL SYSTEM INSTALLATION

- The standard S-14 Airaile fuel system consists of a single 9 gallon wing tank. Fuel flows from the forward and aft fuel feeds to a common junction at a low point in the cabin. From here a single line returns to the fuel valve and primer bulb near the top of the middle "A" frame. The low point junction is required to keep enough head pressure to assure an even fuel flow from any attitude, no matter the fuel level. An optional second wing tank is available and is also covered in this portion of the manual. Study the parts pages for proper fuel line routing and fitting locations.

1. Locate the fuel tank(s). See the parts pages for part numbers.

2. The fuel tanks are leak tested from the supplier and guaranteed leak proof. You, however, may want to perform a leak test, especially after installing the fittings. If you desire, fill the tank(s) with water and let it sit for approximately 48 hours. Locate three (3) 1/2" diameter holes for the fuel fittings at the locations shown in **Figure 06I-02.** ***IMPORTANT:*** *These measurements are very critical for proper clearance of the Tank Withdrawal Fitting.* ***HINT:*** *A UNIBIT® step drill makes a very clean, accurate hole.* All fittings are located on the inboard side of the wing tank (see parts manual for orientation). Debur all holes. ***NOTE:*** *Mark on the tank the position for the 1/4" Tee (lower sight gauge attachment).* Secure the withdrawal line and Tee to the Root Compression Tube when installing the tank in the wing. ***HINT:*** *Place a wire in the fitting hole and up through the filler neck, slip a withdrawal fitting and o-ring on the wire.* Make a loop in the end of the wire to keep the parts from falling off, then pull the fitting to the hole with the threaded portion out of the tank. Holding the fitting with the threaded portion extended out of the tank, thread on the rubber washer, 1/2" washer and nut with Loctite. Remove the wire. **NOTE:** Use a 1/4" Allen wrench to hold the tank withdrawal fitting while tightening the nut. ***HINT:*** *Hold the metal washer with needle-nose vise grip to prevent rotation while tightening the nut.* Apply sealant to the straight or 90-degree fuel line fittings, and screw into the tank withdrawal fitting until snug. ***CAUTION:*** *Do not tighten to the point the tank withdrawal fitting turns in the tank.* Mark and trim the filler neck to a length of 1 3/8" from the top of the tank using a hacksaw or cut-off wheel and file smooth. See **Figure 06I-02A.** ***CAUTION:*** *Remove* ***ALL*** *shavings and loose debris from the interior of the tank.* Use a vacuum to assist in removal.

FIGURE 06I-02

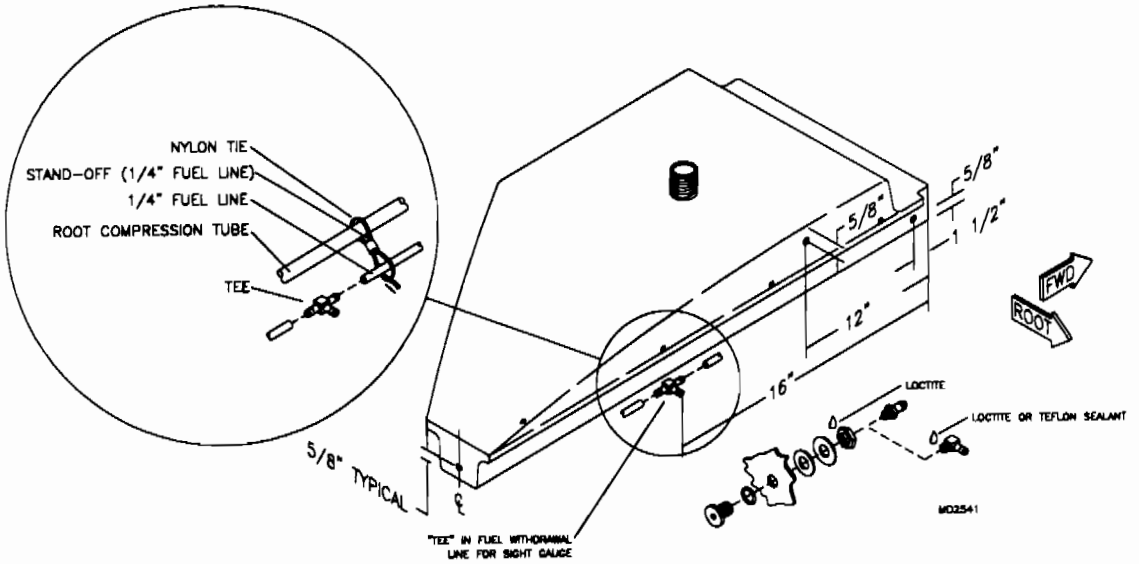
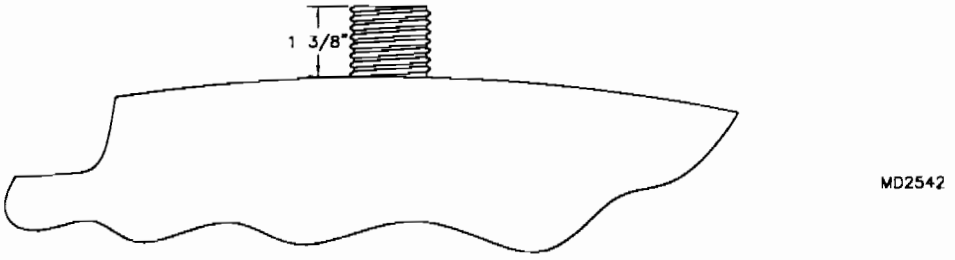


FIGURE 06I-02A



FUEL CAP/VENT ASSEMBLY

3. Remove the rubber gasket and plastic baffle from the fuel cap. The plastic baffle will "snap" out of the fuel cap. A screw driver works well for the removal.

Locate and drill a 1/4" hole in the center of the fuel cap as shown in **FIGURE 06I-03**. Install the conduit adjuster ferrule into the fuel cap. Apply a small drop of loctite and install the 1/4" plain nut and tighten to secure the ferrule into the cap. See **FIGURE 06I-03A.**

FIGURE 06I-03

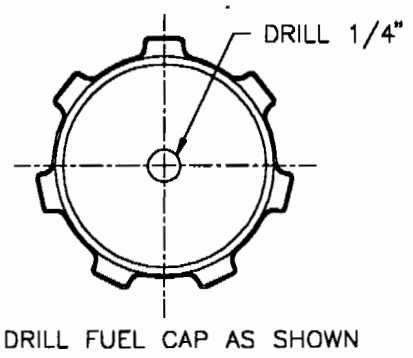
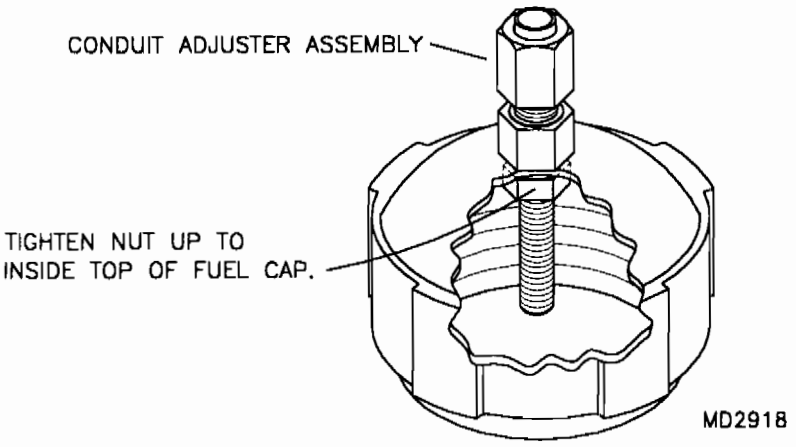


FIGURE 06I-03A



3a. With a side cutters or file remove the attach nipples from the plastic baffle. See **FIGURE 06I-03a.** Drill a 1/4" hole in the center of the plastic baffle and install into the fuel cap over the adjuster ferrule stem. Drill a 1/4" hole in the center of the rubber gasket and install into the cap. Note the orientation of the rubber gasket.

Drill the 1/4" large wood washer as shown in **FIGURE 06I-03a-A.** Assemble the bead chain to the bead chain retainer sleeve. Install the bead chain and retainer sleeve into the #30 hole in the large wood washer. Install the washer and bead chain into the fuel cap. Install the 1/4" shear nut on the adjuster ferrule stem and tighten.

FIGURE 06I-03a

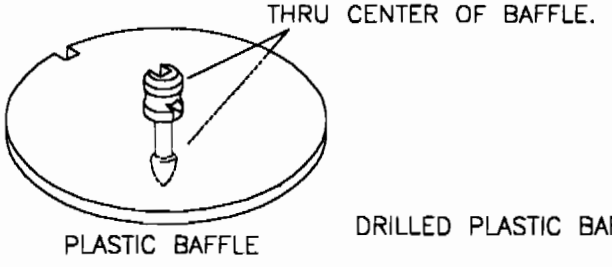
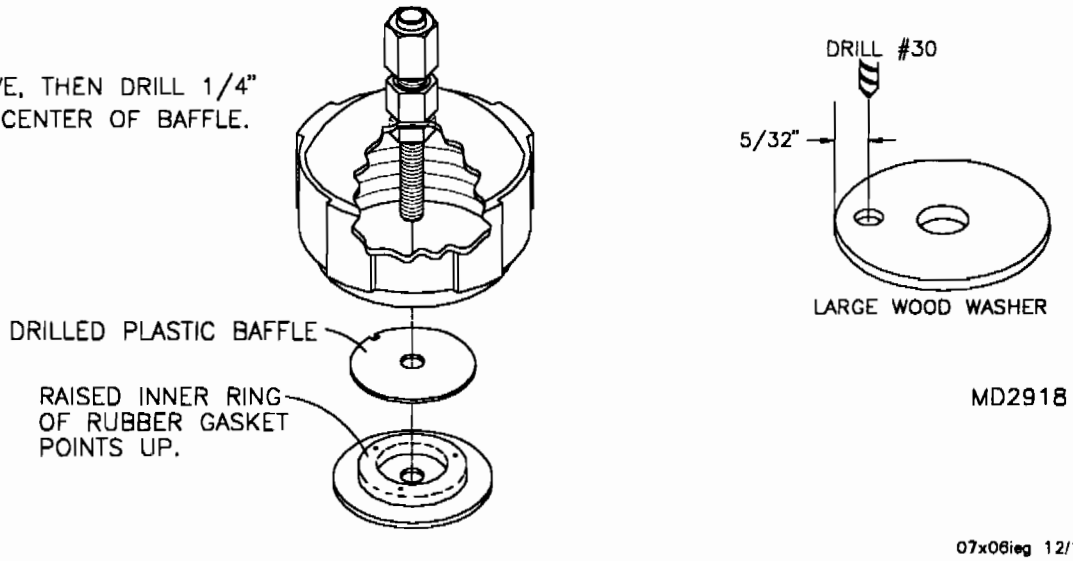


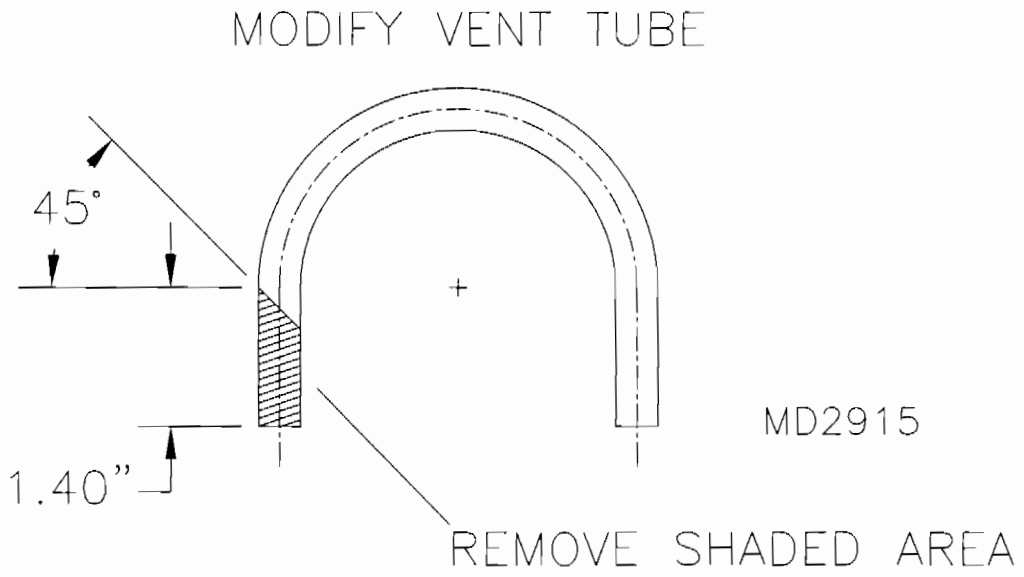
FIGURE 06I-03a-A



3b. Install the bead chain end coupling onto the bead chain. Find the center of the plastic retainer and drill a #30 hole. Using the brass backing washer, rivet the plastic retainer to the bead chain. Refer to the parts drawing.

3c. Modify the vent tube as shown in **FIGURE 06I-03c**. Install the vent tube into the adjuster ferrule. Install the fuel cap assembly onto the tank and tighten. Position the vent tube so that the 45 degree angle is pointing forward (into the slipstream) and tighten the ferrule cap to secure the vent tube.

FIGURE 06I-03c



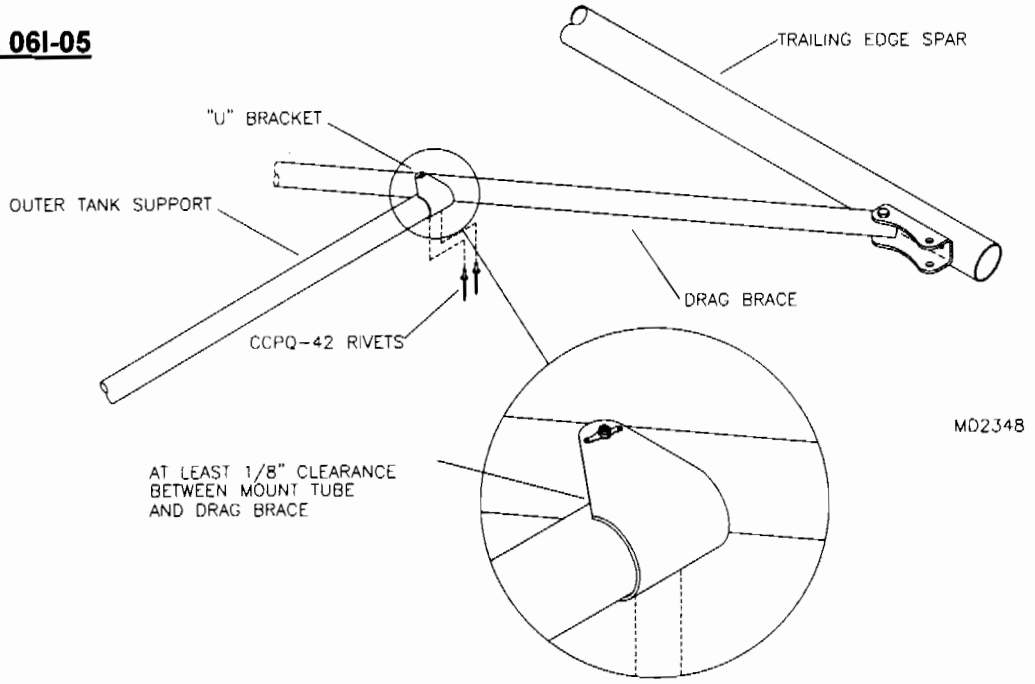
FUEL TANK MOUNTING

4. Locate the parts shown in the parts manual. Make sure that the tank assembly steps shown have been completed before installing fuel tanks into the wing. Rivet an S-2-SAB, using the pre-located hole on the aft side of the leading edge spar at 17" from the inner S2-SAB. This will locate the S2-SAB, which holds the outer tank support in place. Install single-ear nut plate to S2-SAB; refer to parts drawing.

5. **STANDARD WING**

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. 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, install nut plate and bolt to U-bracket. Drill two #30 holes through underside of U-bracket and rivet to tank support. See **FIGURE 06I-05**.

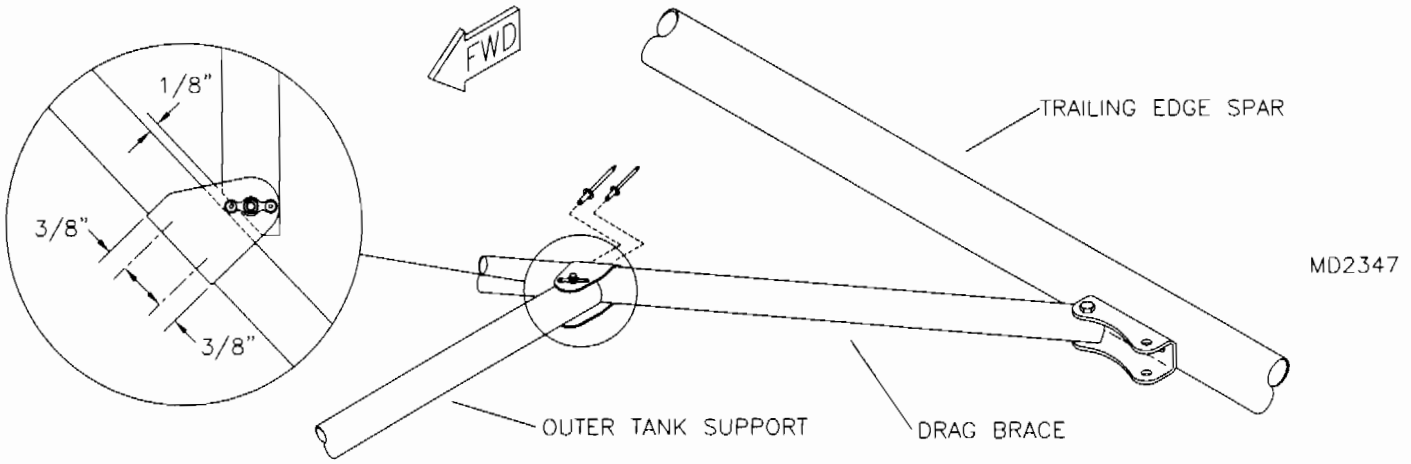
FIGURE 06I-05



OPTIONAL 139 WING

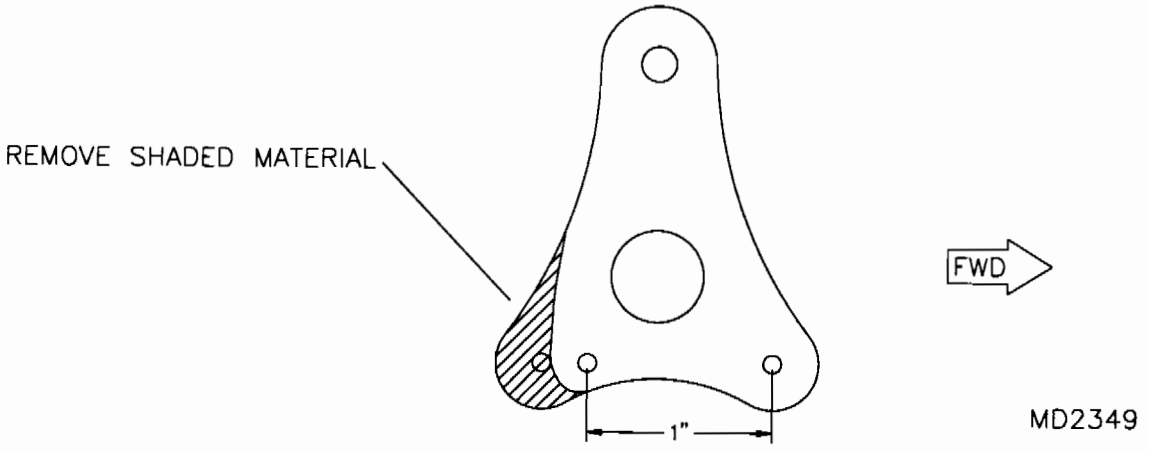
Place tank on wing frame, leaving 1/8" gap between leading edge spar and tank; also allow 1/8" gap between inner compression tube and tank. Bolt forward end of outer tank support to S2-SAB. With tank in position, pull outer tank support parallel to tank, maintaining 1/8" gap. Trim outer tank support diagonally to accommodate drag brace; take care not to trim tube short. Locate U-bracket to drag brace, install nut plate and bolt. Drill two #30 holes through aft side of U-bracket and rivet U-bracket to brace. See **Figure 06I-05A.**

FIGURE 06I-05A



6. Bolt the wing tank mount brackets to the fuel tank using the hardware shown. 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. **NOTE**: For the standard S-14 wing it will be necessary to modify the aft bracket on the **outer tank support.** Modify the bracket as shown in **Figure 06I-06.** Once tank installation is complete, apply loctite to the bolts which hold the tank in place. Repeat for the optional second wing tank, if installing. Route the fuel lines as shown in the parts manual. **HINT**: For now, only tape the fuel lines in position. This will ensure proper routing without wasting zip ties. Zip tie lines in position during final assembly once satisfied with the routing. Be sure to route the fuel lines out the wing near the trailing edge of the wing. This will allow the wing to easily fold.

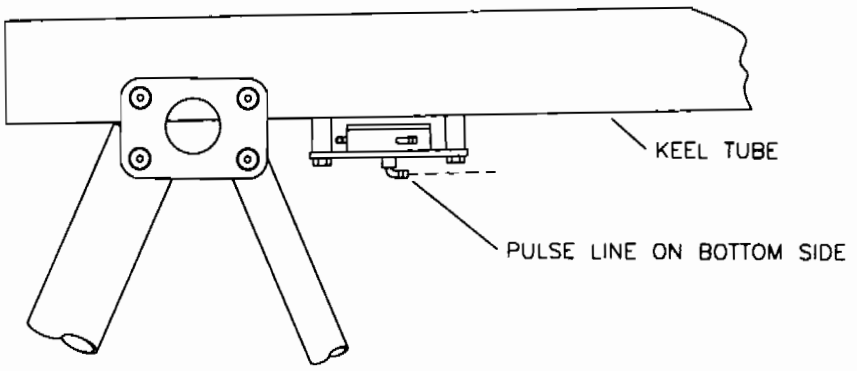
FIGURE 06I-06



FUEL PUMP INSTALLATION FOR THE ROTAX 503 SINGLE AND DUAL CARB AND 582 ENGINES

1. Locate the fuel pump on the bottom side of the keel, 6 ½" FWD of the AFT edge of the keel. See **Figure 06I-01**. The mount holes should be located on the centerline of the keel. Cut the spacer bushings, install the rivnuts and bolt in place.

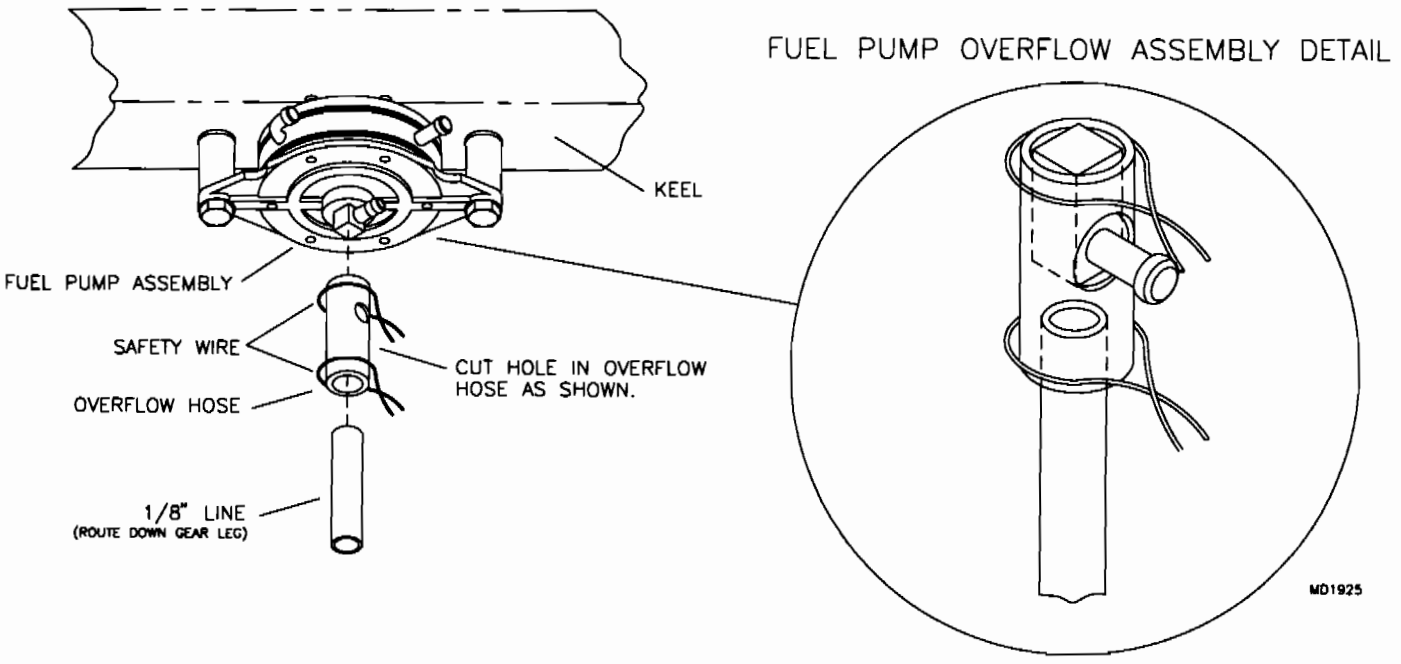
FIGURE 06I-01



2. On the single carb, "Y" the two outputs together that run to the carb. Route the fuel lines accordingly.

3. Fabricate the fuel pump overflow drain as shown in **Figure 06I-03.** Cut a hole in the overflow hose similar to the one shown below. Install the overflow hose onto the 90° fitting as shown. Insert the 1/8" primer line into the overflow hose and safety wire in place. Route primer line down gear leg using zip ties. **HINT**: Zip tie the fuel pump overflow line and the sump drain line to the gear leg at the same time.

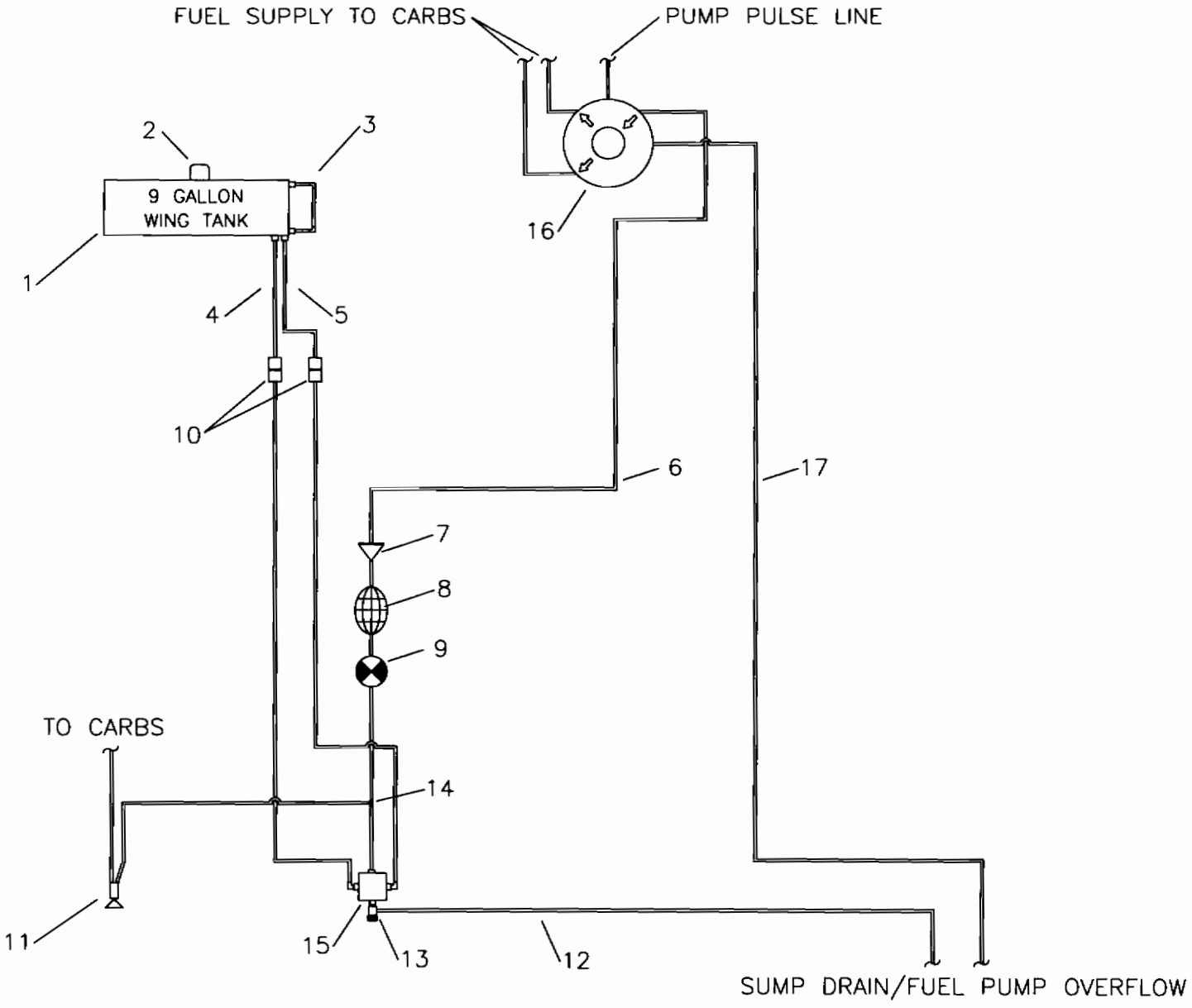
FIGURE 06I-03



S-14 STANDARD SINGLE WING TANK SCHEMATIC

1. Fuel Pump Overflow line
2. Fuel Filler Neck/Cap
3. Fuel Sight Gauge
4. AFT Withdrawal
5. FWD Withdrawal
6. Fuel Line To Pump
7. Fuel Filter
8. Primer Bulb
9. Fuel Shut Off
10. Quick Disconnects (Optional)
11. Primer Pump
12. Fuel Tank Vent Line
13. Fuel Sump Drain
14. Primer Line Tee
15. Fuel Mixer Block
16. Fuel Pump
17. Fuel Pump Overflow

See Schematic next page.



S-14 STANDARD SINGLE WING TANK SCHEMATIC

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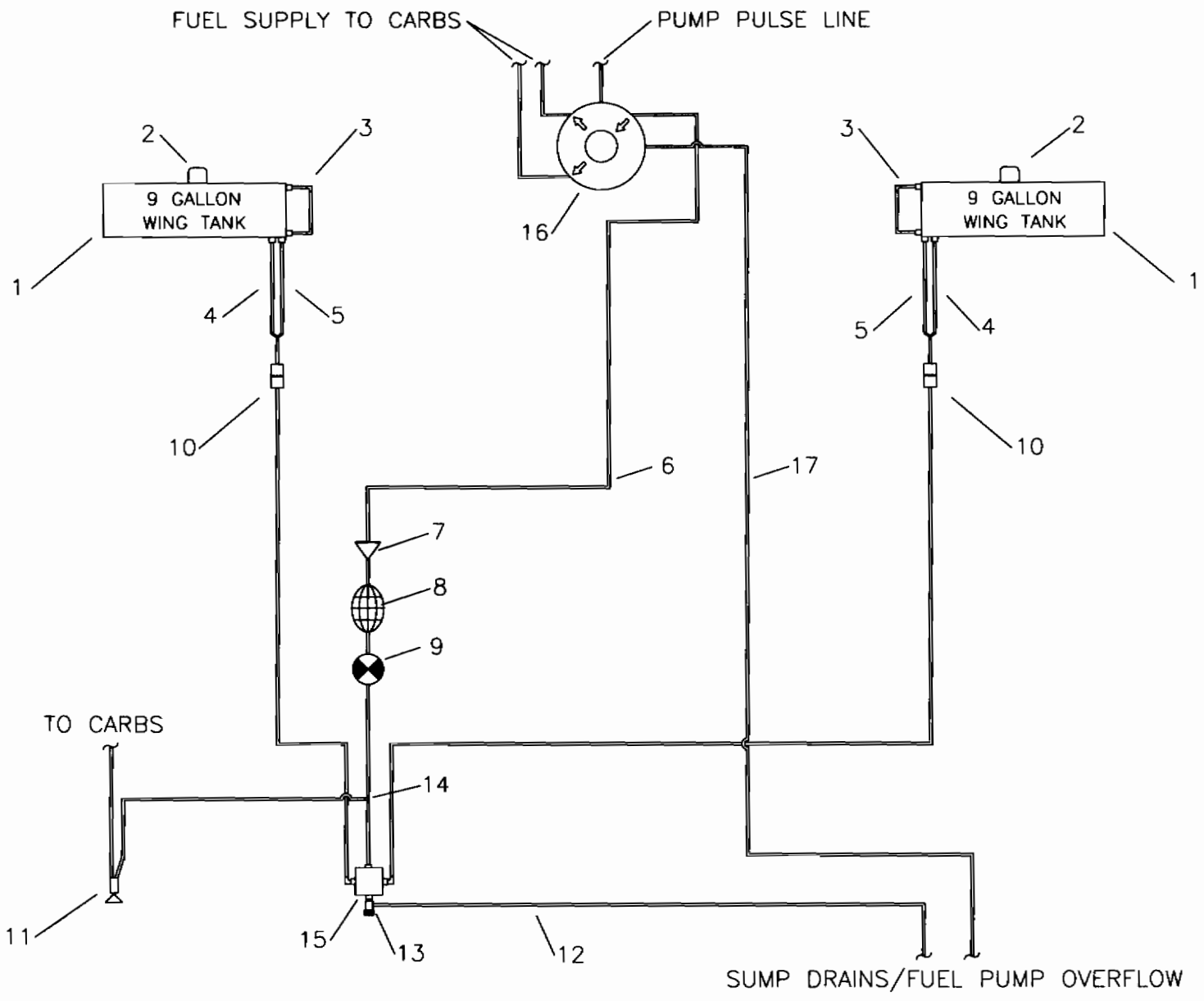
S-14 OPTIONAL DUAL WING TANK SCHEMATIC

1. Fuel Pump Overflow line
2. Fuel Filler Neck/Cap
3. Fuel Sight Gauge
4. AFT Withdrawal
5. FWD Withdrawal
6. Fuel Line To Pump
7. Fuel Filter
8. Primer Bulb
9. Fuel Shut Off
10. Quick Disconnects (Optional)
11. Primer Pump
12. Fuel Tank Vent Line
13. Fuel Sump Drain
14. Primer Line Tee
15. Fuel Mixer Block
16. Fuel Pump
17. Fuel Pump Overflow

See Schematic next page.



S-14 OPTIONAL DUAL WING TANK SCHEMATIC

MD2366

FUEL SYSTEM DRAINING

Water can enter a fuel system and cause dangerous contamination. To prevent this from happening on the S-14 it is recommended to filter the fuel through a chamois or a funnel filter designed to separate and filter water.

Draining the sump on the S-14's fuel system is only a partial measure against water contamination. In either the wing tanks or the cabin tank the fuel withdrawals and drains extend up into the tank about a 1/4". Therefore, the drain is not flush with the bottom of the tank. A small amount of water can remain below this level.

The S-14 fuel system can tolerate small amounts of water with no operational hazard due to the fuel pickups' distance off the bottom of the tank. However, in the case of a large amount of water a special method of removal is required. Fashion a siphon hose from 1/4" fuel line. Install a hand primer bulb in the line to start the siphon. Insert the hose into the tanks low point and siphon. This method is to be used in event of excessive water contamination.

S-14 INSTRUMENT PANEL AND ELECTRICAL SYSTEM ASSEMBLY

When working with the instrument panel it is easy to get mixed up as to which is front and back. To make it easy I will refer to the instrument side, which is the aft side of the panel.

1. Select the parts depicted in the parts drawing.

2. Using the 3/16" aluminum pop rivets, attach two mount angles (ST-16-BENT) at 22 1/2" up from the bottom stub which the windshield support tube fits over. See **Figure 07-02** and **Figure 07-02A.**

FIGURE 07-02

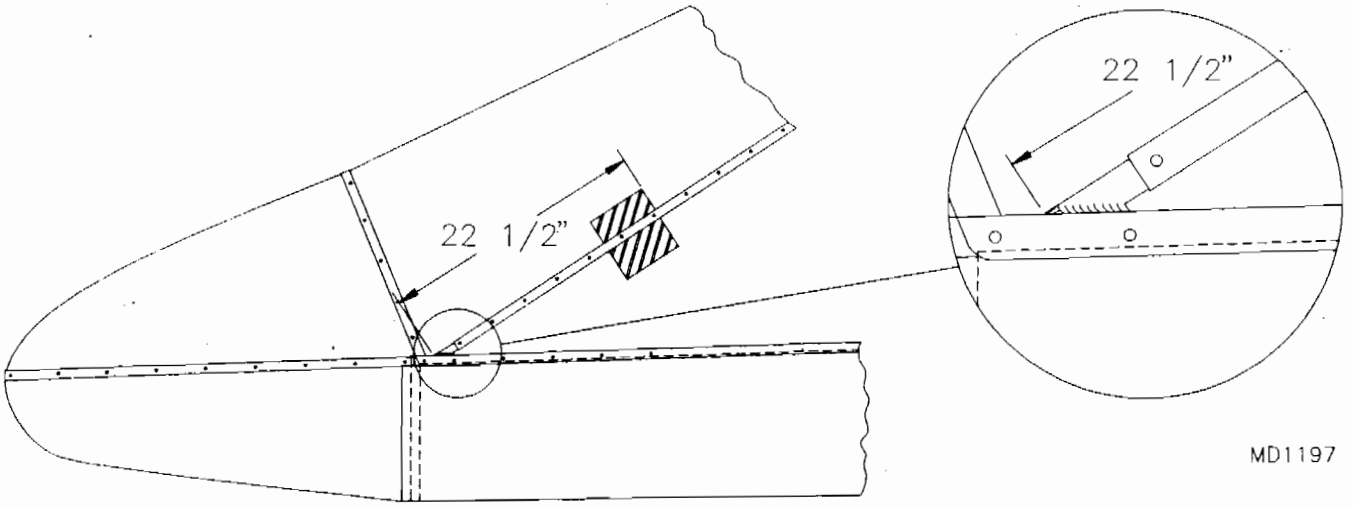
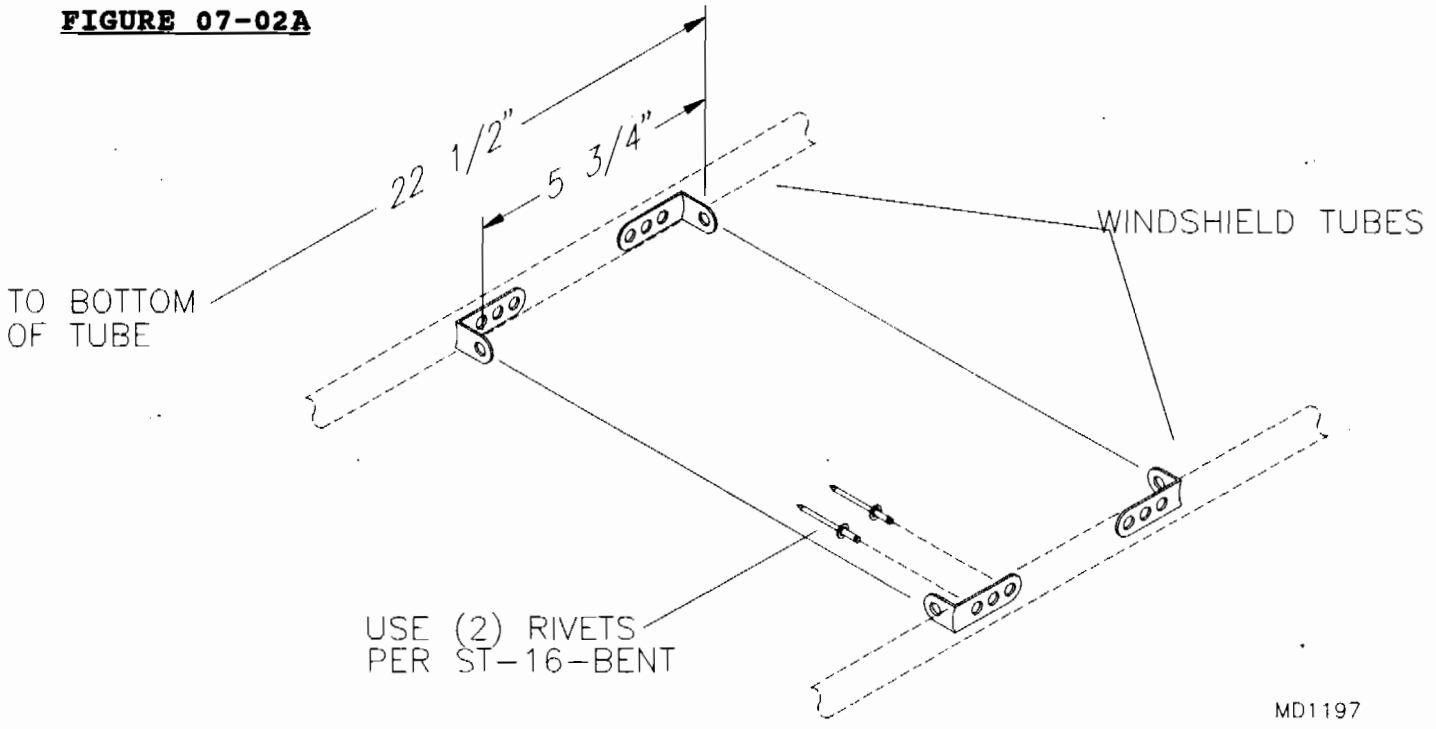


FIGURE 07-02A



3. The instrument panel and forward panel have #40 pilot holes located in the upper corners. Use these to locate the panels position on the ST-16-BENT. The panels locate on the **OUTSIDE** of each tang. **PLEASE NOTE:** Some panels may need a little clearance notch filed on the right side to allow the panel to fit against the tangs properly.

4. The top and bottom covers come with the pilot holes drilled. The shorter cover is the top. Look closely at the covers and you will notice a difference in edge distance on the pilot holes. The edge with the holes furtherest from the edge is the instrument side of the cover. The top and bottom covers locate on the panels with the front flush with the forward panel. This should allow the instrument panel side to have a 1/4" over hang of the cover. Drill through with #40 and rivet the top cover to the panels. Drill through the bottom tabs with the #40, then remove the cover and chase out to #30 all the bottom panel holes. Use the small screws to attach the bottom cover. The bottom cover must remain removeable in order to install and service the instruments.

5. Apply the rubber trim to the instrument panel edges. Use super glue to permanently attach the trim.

6. Refer to the parts page drawing for locations of instruments and switches.

7. The pitot probes assembly is covered under the nose cone assembly in the fuselage section. Static is vented to the cabin. Our speed checks against the time clock show this to be accurate within 3 MPH.

S-14 BATTERY BOX INSTALLATION

1. Collect the parts for the installation of the battery box.

2. Install the three cushion clamps to the left side of the super structure, space these on the cabain tubes so the battery box will fit as shown in the parts list.

3. Run the battery ground cable to the mid cabain super structure hard point.

4. Install the battery after the engine hardware and electrical system have been hooked up.

5. Check all battery connections to make sure the connections are secure and the fittings are tight.

S-14 AIRAILE SEAT ASSEMBLY

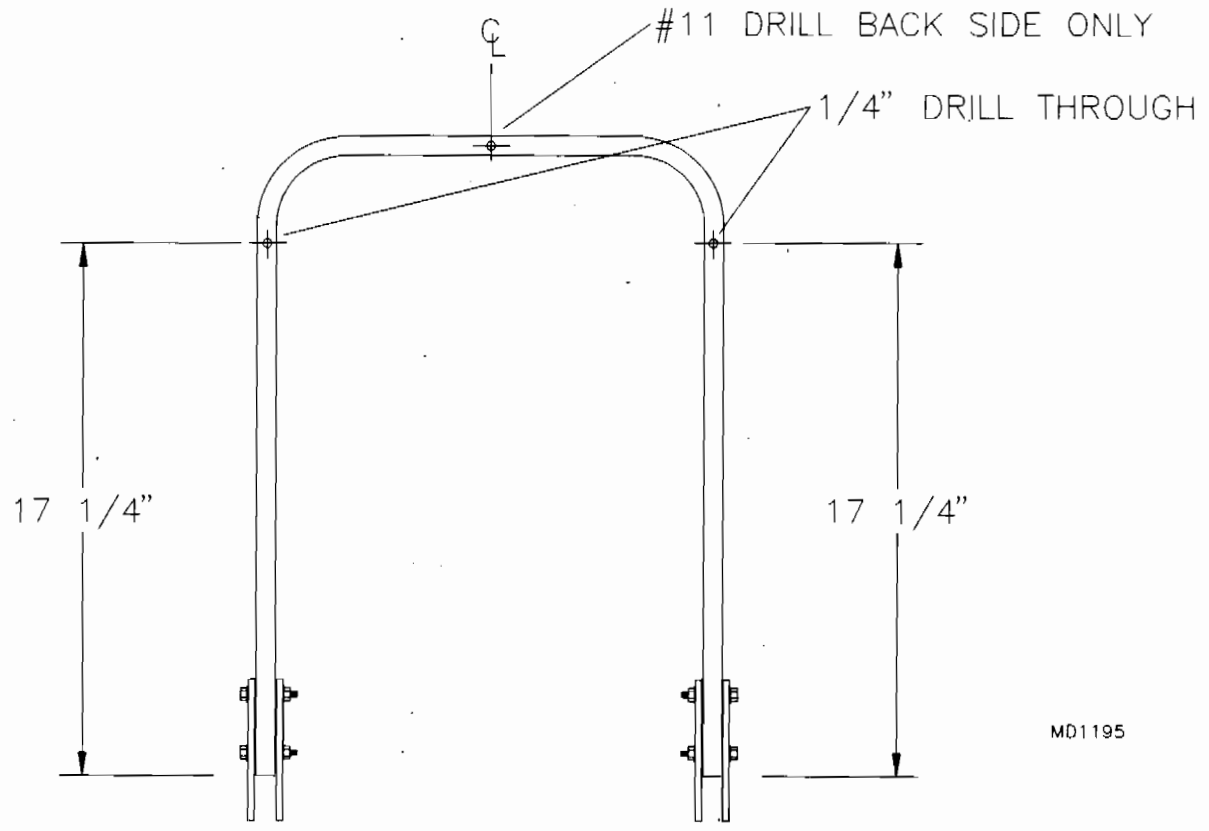
1. Select the parts as shown in the parts drawing.

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. Bolt a set of seat back gussets to each seat back frame. Please orientate bolts so the nuts are facing inward towards each other.

3. Set the seat back frame assembly onto the fuselage seat frame. Position the frame assembly so the gusset's lower open hole is lined up with the bushings welded to the bottom of the built in seat frame. Drill out the gusset to 1/4" diameter. Take a 1/4" clevis pin and test fit through the newly drilled hole. If it is tight, drill out the welded in place bushings with a 1/4" bit. Once the seat has been fitted onto the fuselage frame, it will be necessary to angle the bottom of the seat frame in order to set the seat angle. To do this, place the seat back in the AFT most location bushing on the airframe. Determine how much and what angle to cut so that the seat leans back to where it almost touches the forward cabaine. Cut and recheck the angle until you have accomplished this.

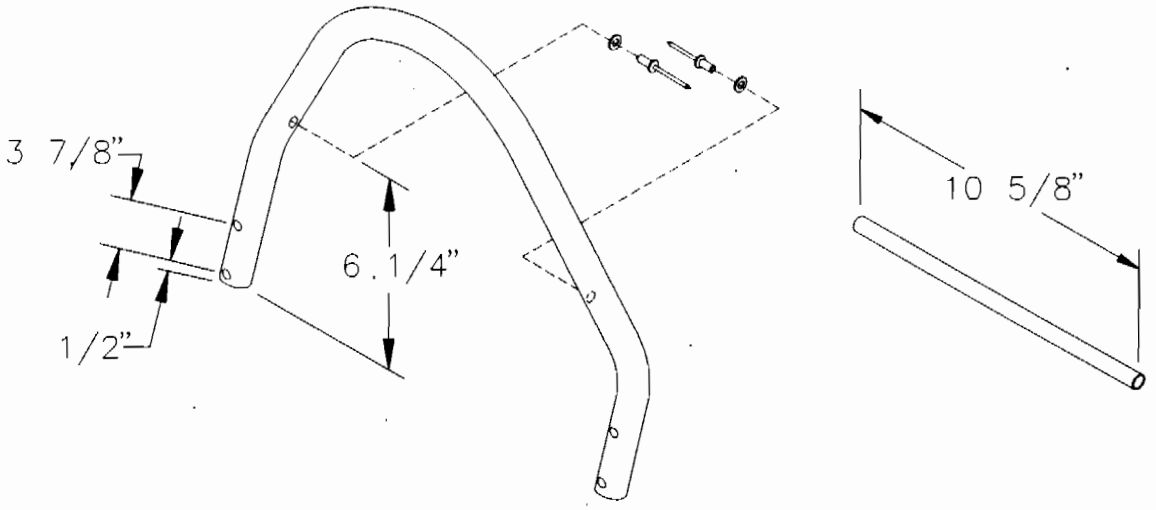
4. Remove the seat, measure and mark up from the lower ends 17 1/4" on the seat frames' **BACK SIDE**. Drill a 1/4" hole through the tubes one side on each side. See **Figure 08-04**. Drill a #11 hole in the back side of the seat frame for the W-HB.

FIGURE 08-04



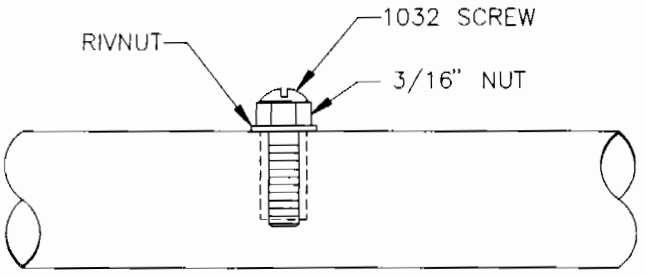
5. Lay out, mark and drill the headrest frame as shown in **Figure 08-05.** Install a 3/16" aluminum pop rivet with thick washers to form "buttons". The "buttons" will serve to hold the headrest internal brace. The headrest internal brace will need to be cut to length and filed to fit after the headrest tube is fitted to the seat back frame. **NOTE:** Cut the tube to 10 5/8".

FIGURE 08-05



6. Install the rivnuts to the two 1/4" holes in the seat back frame. Refer to **Figure 08-06** for details. Bolt the headrest frame to the seat back frame with 3/16" bolts. Drill into the seat frame where the two upper #11 holes are drilled out to 1/4" and install two more rivnuts. Fit the headrest internal brace by filing a slight angle to match the headrest frame. Remove the headrest frame.

FIGURE 08-06



PROCEDURE:

1. FINGER TIGHTEN NUT AND RIVNUT ONTO SCREW.
2. INSERT RIVNUT INTO 1/4" HOLE.
3. TURN NUT THREE TURNS CLOCKWISE WHILE HOLDING SCREW STATIONARY.
4. BACK NUT OFF HALF A TURN AND REMOVE SCREW.

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7. The lower nuts at the bottom of the seat back frame serve to hold the seat back lower tube. Cut two tubes 14" and install the seat back lower tube to the seat frame assembly by spreading the frame apart just enough to slip the tube over the lower bolts and nuts. If the tube does not bottom out against the washers lay the assembly on its side and tap it gently with a mallet.

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

9. Find the locations of the four rivnuts on the seat back frame and melt through with the tip of a soldering iron. Bolt on the headrest frame with the 1/2" tube in place. Slip the headrest cover over the frame and close the velcro. Rivet the W-HB with 3/16" stainless steel pop rivets in the pre-drilled holes. The seat back is ready to install to the airframe, do so after the seat bottom is installed.

10. Take the seat bottom and position it on the fuselage frame. Lace the crossing straps first followed by the front to back straps. Pull these straps as tight as possible without tearing them. **NOTE:** You may need to tighten these straps after a few hours of flying. Loop the extra strap back into the buckle and trim off the excess so only 2" to 3" remain.

11. Attach the seat back to the fuselage frame in the desired location using the 1/4" clevis pins provided. Bolt in the seat support tube using the proper hardware.

12. The armrest is secured to the cockpit cage using two screws. A #11 hole needs to be drilled in the AFT rectangular mount at its halfway point. Temporarily install the flap lever assembly in place and pull the handle to its up most position. Locate the armrest where it clears the flap handle by approximately 1/8" AFT, and flush with the outside of the top longeron. To attach the foam and upholstery, remove the wood frame from the cage and cut the foam to this shape. Lay the upholstery on top of the foam and while pulling it tightly around the bottom of the frame, staple it in place with a good quality staple gun. When completed, install back to airframe.

S-14 AIRAILE TAPERED WING ASSEMBLY

LEADING EDGE SPAR ASSEMBLY

NOTE: Assemble both spars the same but make a LH and a RH. This will be true for the aft spars as well.

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

2. The leading edge spar comes with all the holes pilot drilled. The final hole sizes are called out during assembly. **PLEASE NOTE**: the front side of the spar has four holes, three of which are for the tip bow rivets. The fourth hole on each leading edge spar will be drilled out to 1/4" to hold the static and pitot tubes. Also, the rivet retaining the root doubler denotes the front side.

3. Bolt the long wing channel to the first hole 45 5/8" outboard of the root. Position the channel so the bolted end points to the root. Line up the channel parallel with the spar, drill, and rivet with a 3/16" stainless steel pop rivet through remaining hole. (Only drill through the one side of the spar).

4. Attach the strut attach plates. For best accuracy, lay the strut attach plate against the spar holes and use as a template. In fact it is best to drill through with a 1/4" drill and bolt, then drill the other two holes out to 3/8". When drilling out to 3/8", 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.

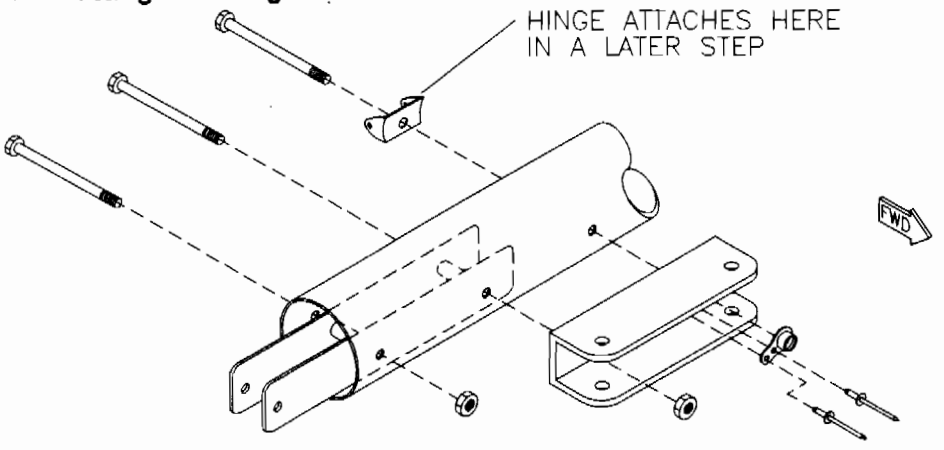
5. At the tip of the leading edge spar on the aft side is a #11 hole located 2 1/2" from the tip end. Rivet an S2-SAB to the spar using a single 3/16" stainless steel pop rivet. **NOTE:** The outboard compression tube (W-IO) will bolt to this bracket and to another S2-SAB that rivets to the aft spar's forward side after the tip extension is installed.

TRAILING EDGE SPAR ASSEMBLY (SPARS HAVE A FRONT & BACK)

6. Bolt a long wing channel to the two #11 holes drilled through the spar at 3 3/4" and 6 3/4" from the root end. **NOTE:** The inner bolt is used to retain the universal hinge bracket, do not tighten till next step.

7. Collect the parts shown in the universal hinge drawing. Cut the bushings to the length specified. Press the bushings into the ends of the bushings on the spar fitting. If the bushings do not press in, glue them in using a dab of J+B weld. Test fit the fitting into the end of the spar. It most likely will need to be ground to contour the spar's inside diameter. Assemble the hinge into the trailing edge spar's inboard end. Use the first and second bolts at the root to attach 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. Rivet a 3/16" nut plate to the front side of the rear spar for the third inboard bolt. This bolt is used as a flap hinge point. The nut plate is required due to wing covering limiting access for nutting. See **Figure 09-07.**

FIGURE 09-07



8. Bolt a long wing channel to the trailing edge spar at the hole 46 5/8" outboard of the root end. Position the unbolted end to the **TIP** side. Line up the channel parallel and drill and rivet with 3/16" stainless steel pop rivets.

9. Drill the three (3) in a row holes following the same procedure as in step 4.

10. From the parts drawing determine the location of the lower hinge bolt and rivet on the front side of the spar a 3/16" nut plate. Position the nut plates so the rivets are parallel with the spars.

INTERNAL BRACE TUBES AND AILERON PUSH PULL TUBE ASSEMBLY (REFER TO CONTROL STICK FOR SELECTION OF PARTS)

11. Refer to wing internal bracing tubes and select the parts for assembly.

12. Install the drag braces and compression tubes. Refer to the parts drawing for part location and number. Before bolting the middle compression tube in place, slip on the aileron bellcrank doubler. The aileron bellcrank doubler is a 3" to 4" tube 1 1/8" in diameter. Bolt the flap compression tubes with the hole for mounting the teleflex retainer closest to the trailing spar.

13. Install the teleflex retainer bracket to the flap compression as shown in the parts drawing. Note the position and orientation of the bracket. Locate aileron push pull tube guide on second outboard compression tube, as per **Figure 09-013**. Install the flap teleflex retainer on the W-FCT tube to the inside. See **Figure 09-013A**.

14. 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. 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 09-014**. Install the aileron bellcranks as shown in **Figure 09-014A**. The bellcrank gusset bolts to the channel bracket's two bolts, then the other hole is located over the compression tube. 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" SSPR. **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 wingtip side of the compression tube for attachment to the short aileron push pull tube.

15. The wing tip bow and spar tips come pre-drilled #11. Insert the tip bow into the spar and cleco. Inspect the fit, the tip bow should be tight against each spar.

16. Rivet the tips to the spars with 3/16" stainless steel rivets. Drill a third hole centered between the two holes provided, and install a third rivet. See **Figure 09-016**.

FIGURE 09-013

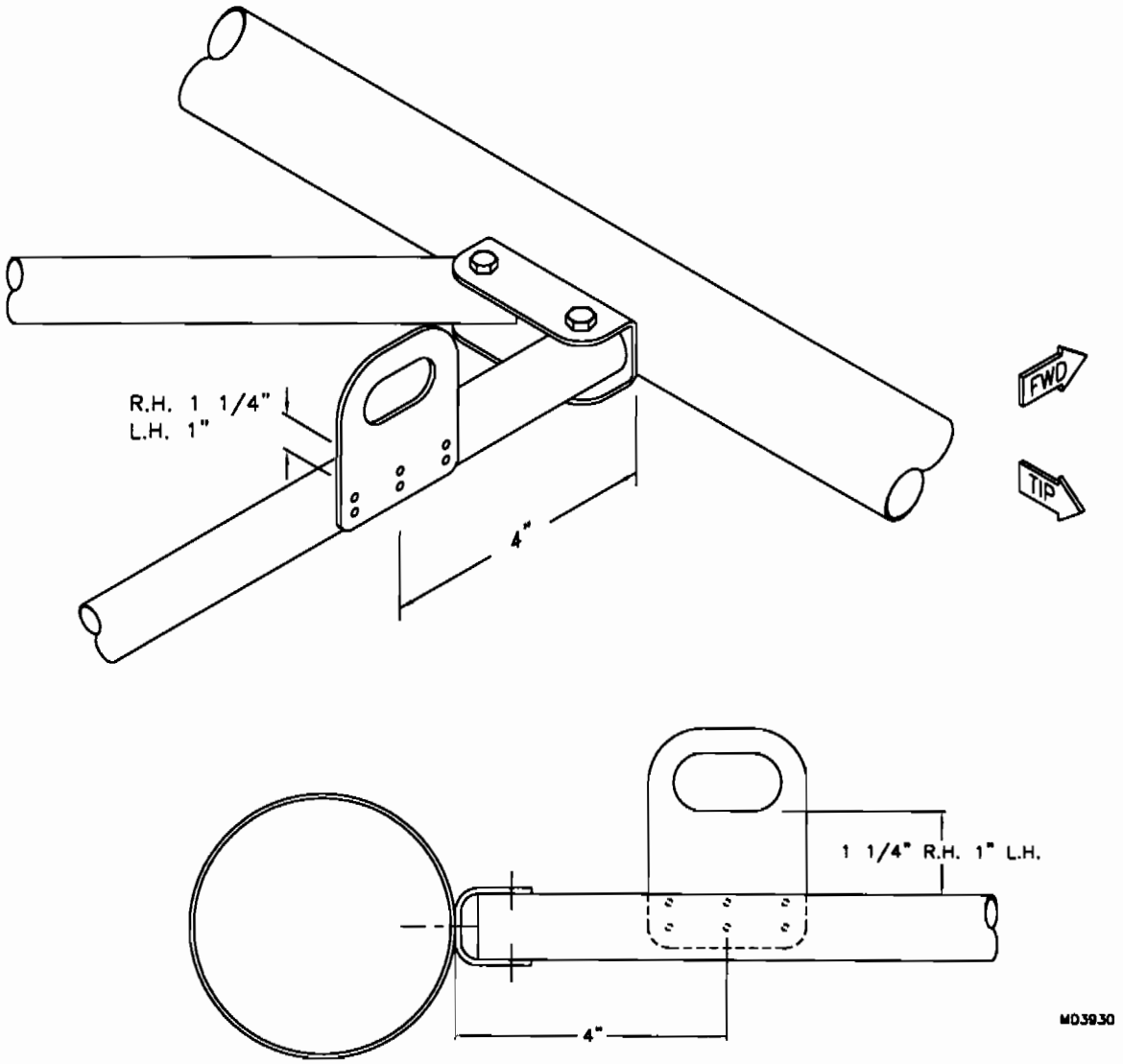


FIGURE 09-013A

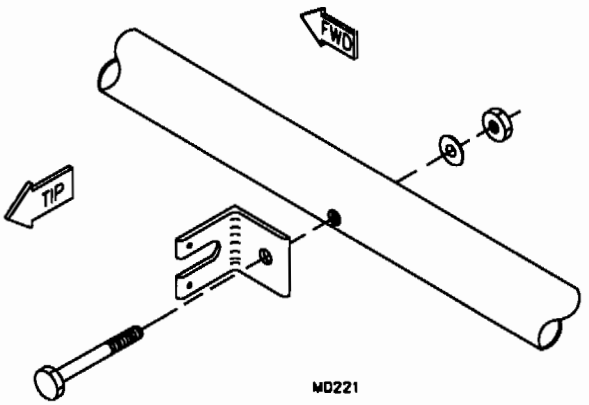
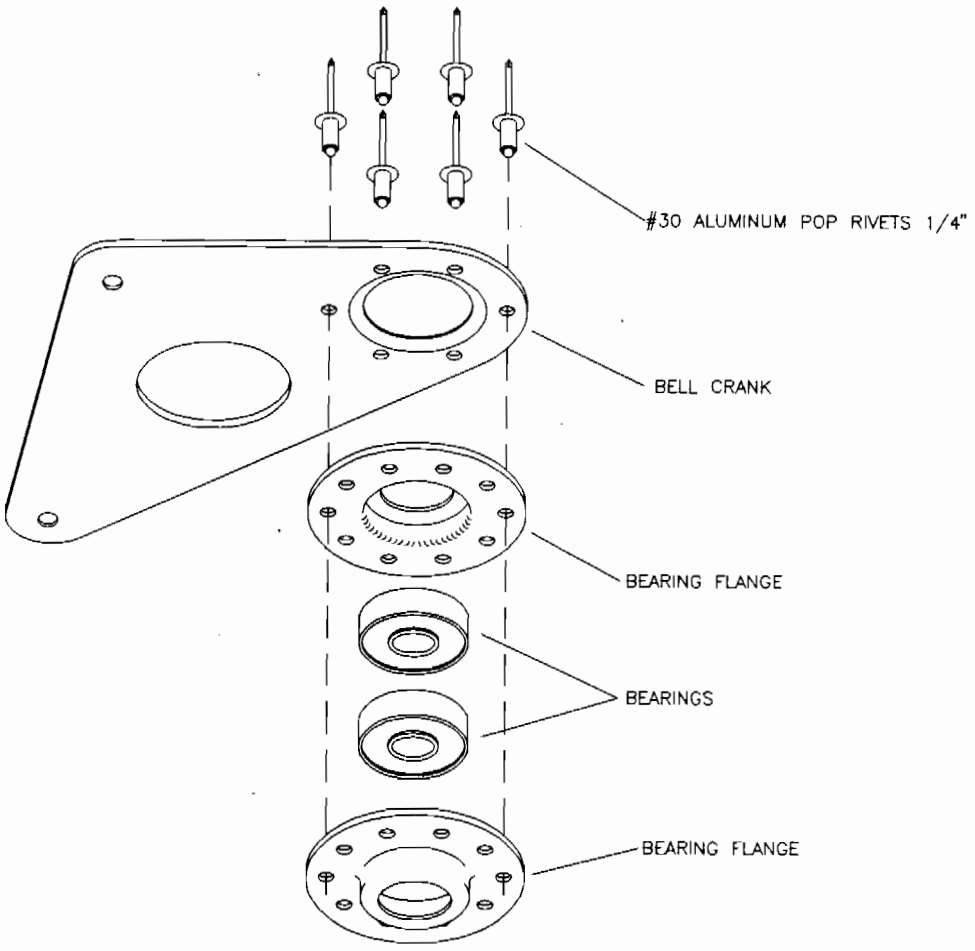


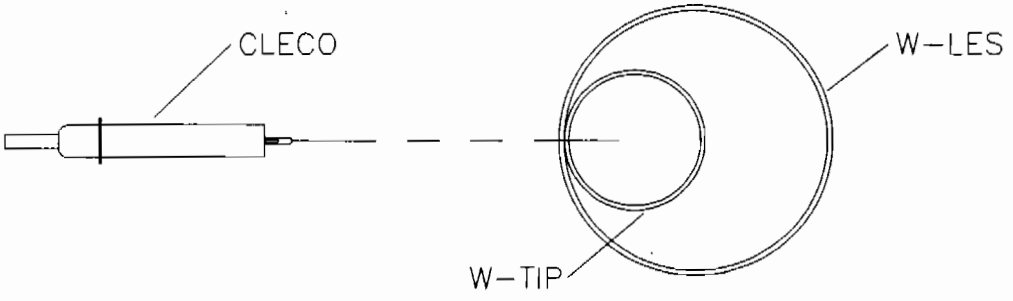
Figure 09-014



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

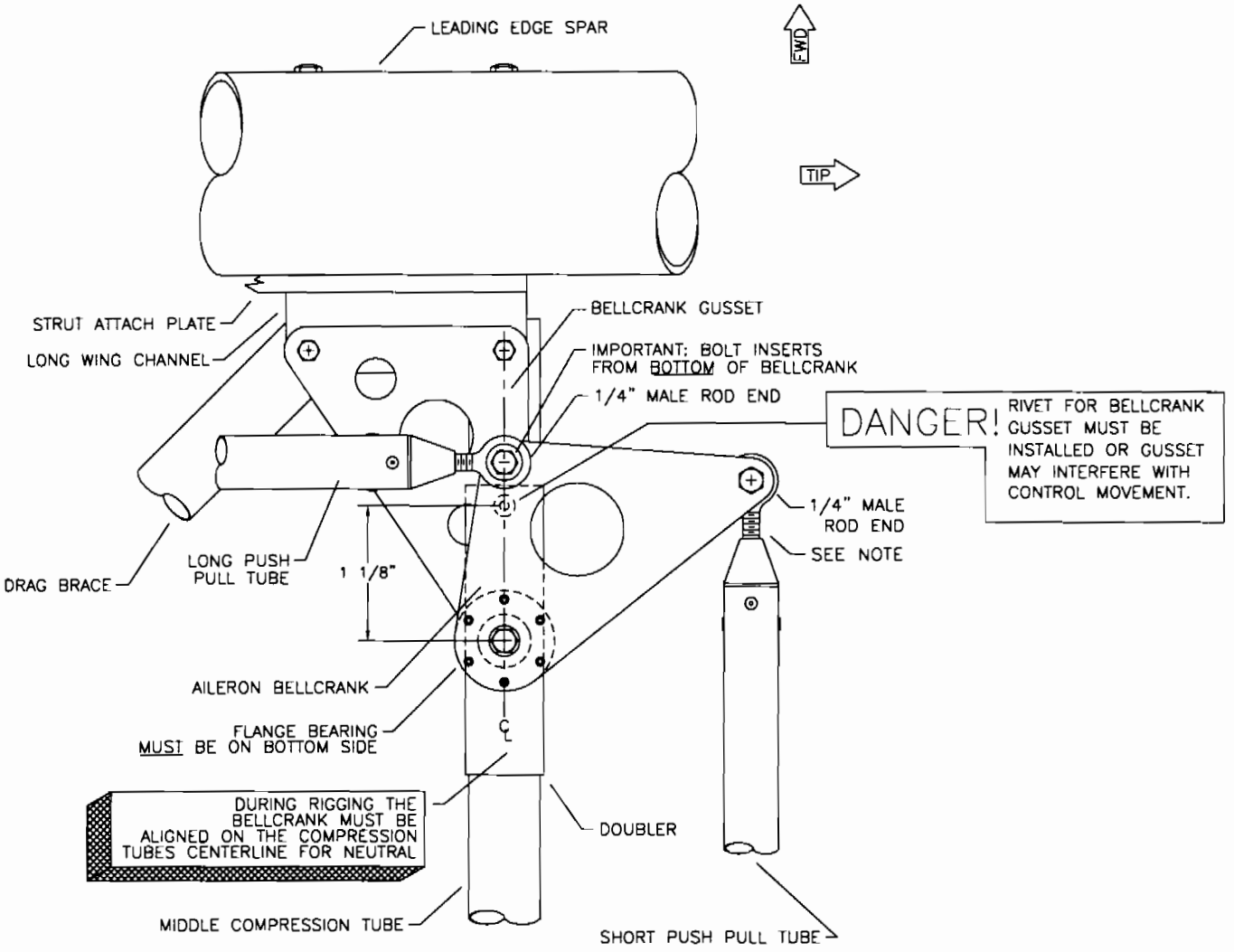
MD1613

FIGURE 09-016



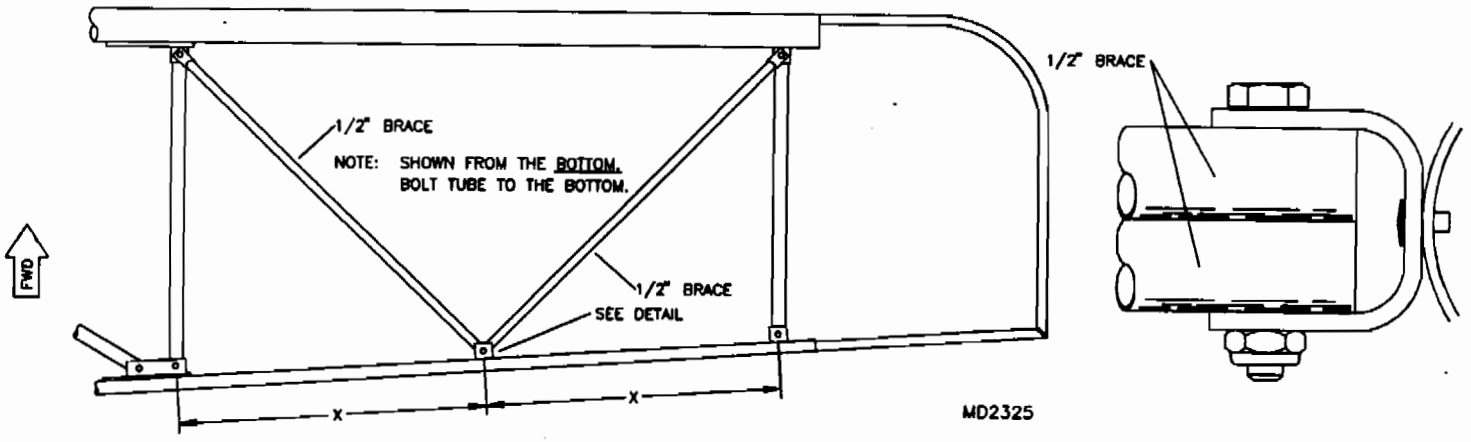
MD1613

Figure 09-014A



17. Install the two 39 1/2" tubes used to stabilize the wing's last bay. The crimped and drilled ends bolt to the leading edge spar S2-SAB's at the strut attach plate and tip. Bolt these tubes to the **BOTTOM** of the brackets as shown in **Figure 09-017**. Locate a 3/16" hole on the trailing edge spar, centered between the long wing channel and the outboard S2-SAB. Rivet the S2-SAB in position using the hardware shown in the parts manual. Drill the brace tubes using the S2-SAB as a guide and bolt in place.

FIGURE 09-017



TURN TO THE FUEL SYSTEM FOR ASSEMBLY DETAILS BEFORE CONTINUING.

In the next section we discuss setting up the ailerons and flaps. You may want to do this with the wings attached, if so turn to root rib assembly followed by struts. This will bring you up to the point where the wings are on the plane fully set to washout and dihedral.

RIGGING THE FLAPS AND AILERONS

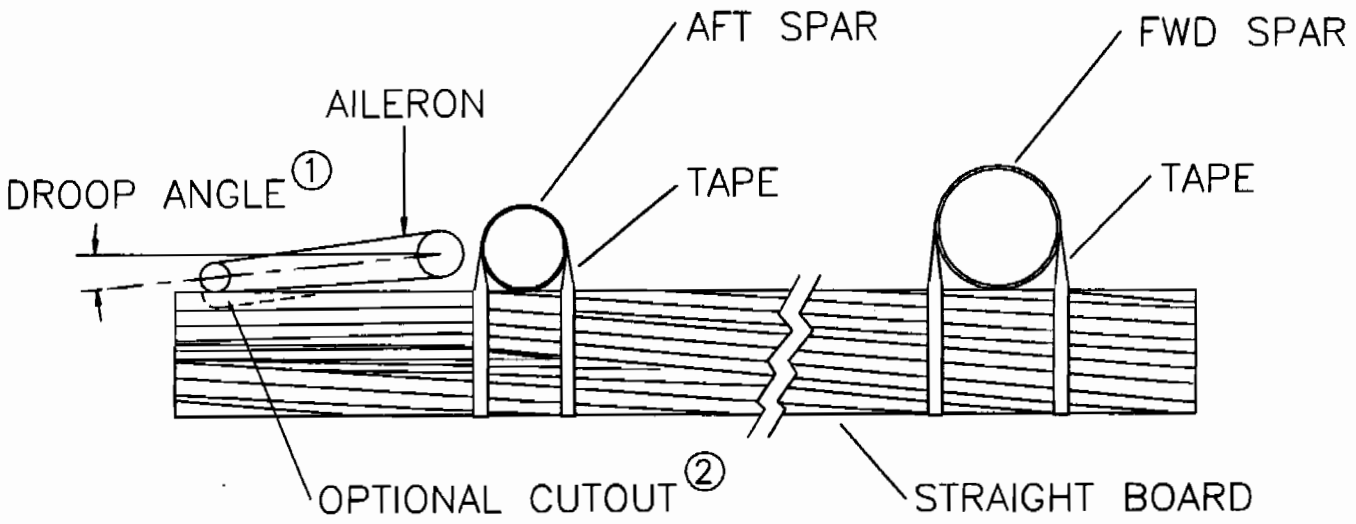
18. To set up the aileron rigging attach the ailerons and flaps to the wing using the hinges. Put the ailerons and flaps on the side of the hinge that gives the best matched fit. Only finger tighten the nuts to the hinge bolts at this time.

19. Apply a drop of blue Loctite and screw the male rod ends into the ends of the push pull tubes until 1/2" of the thread is exposed. Do not install a stop nut on the bellcrank end of the short push pull tube. The short push pull tube is screwed into the rod ends attached to the bellcrank after covering the wing. Install the aileron push pull tubes using the hardware depicted in the aileron push pull tube parts drawing. **IMPORTANT:** The long push pull tube bolts to the **TOP** of the aileron bellcrank. Slip a push pull tube guide over the long push pull tube before bolting to the bellcrank. The guide will be riveted to the second outboard compression tube in a later step. The short push pull tube bolts to the **BOTTOM.**

20. Before beginning rigging of the ailerons check the control stick and control Tee. The control Tee must be centered when the sticks are in neutral. If this is not the case, review rigging instructions for the control stick and Tee under control stick assembly. With the control Tee centered, adjust the long push pull tubes so the bellcranks are in the neutral position. Refer to **Figure 09-014A**. Find two very straight boards at least 60" in length. These will be used to set the droop angle of the flaps and ailerons. The droop angle is shown in **Figure 09-020**. Firmly tape the boards on the bottom of the wing spars. Let the boards overhang off the aft spar at least 8". The aileron trailing edge should rest on the board to set the

proper angle of droop. Adjust the rod ends on the short aileron push pull tube until the aileron is set. **IMPORTANT:** The rod ends must be screwed into the ends of the push pull tubes a minimum of 6 full turns to have acceptable strength for flight loads. Remove the boards once both ailerons are set. Test the system by displacing the control stick side to side. The aileron bellcranks are set up to displace twice as much up as down. You can check this very simply by measuring the difference from the neutral position up and down. If this is not the case it means the bellcrank is not at the neutral point. Refer to **Figure 09-014A** to check for the neutral bellcrank position. Use blue Loctite to keep the push pull tubes on setting. The short push pull tube will be removed to allow installation of the wing covering. After the wing covers are attached apply a drop of blue Loctite to the end of the forward push pull tube. Screw it into the rod end that was left attached to the aileron bellcrank.

FIGURE 09-020



① Drop angle of the aileron and flaps is established when the aileron's trailing edge rests on the board.

PLEASE NOTE: This is the recommended "start" setting. After flight test you may want to droop more for low speed or raise for cruise.

② Cut out guide board 1/4" to 3/8" if lower stall speed is desired.

MD1614

INSTALLING THE ROOT RIB TENSIONING SYSTEM

21. The wing skin is attached and tensioned span-wise using a prefabricated root rib. The root rib comes ready to install with the exception of the holes for the 8x1/2" PHS. Notice that all the prelocated holes are predrilled 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.

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

23. 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 09-023A.** Bolt the brackets to the leading edge spar and the inboard side of the universal hinge on the trailing egde spar as shown in **Figure 09-023.** 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 8x1/2" PHS through the wing skin and predrilled holes in the root rib. Use a icepick or a small awl to transfer the predrilled holes from the root rib through the wing skin edge webbing. Start installing the 8x1/2" 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 3/8" from the inside edge of the "L" brackets. **Caution: Do not overtighten the tensioning bolts. Stop when the skin is tight, if within 3/8" of the bracket.**

FIGURE 09-023

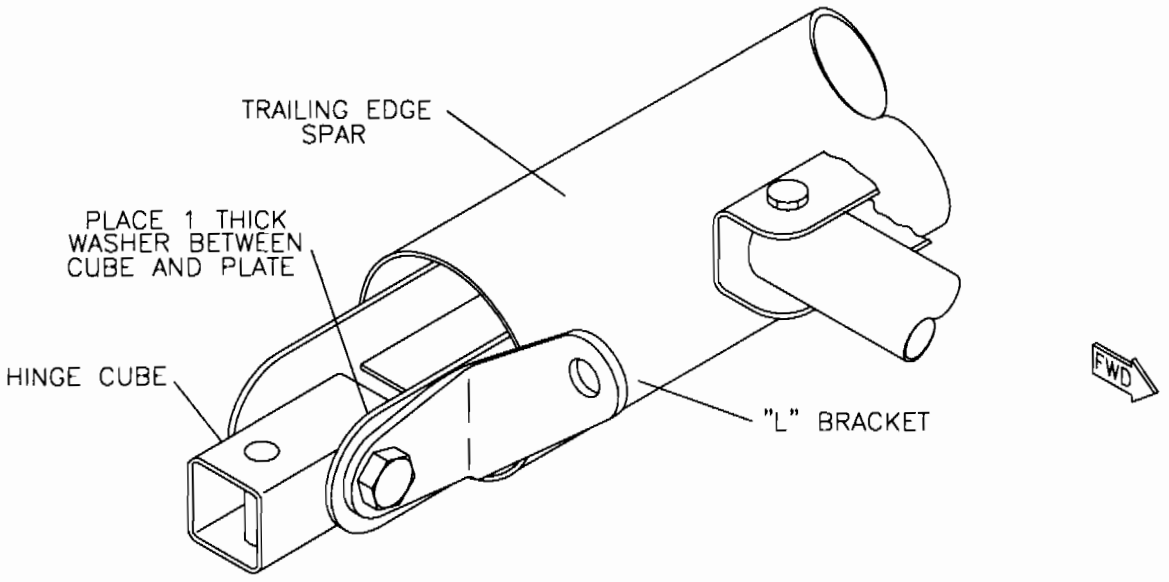
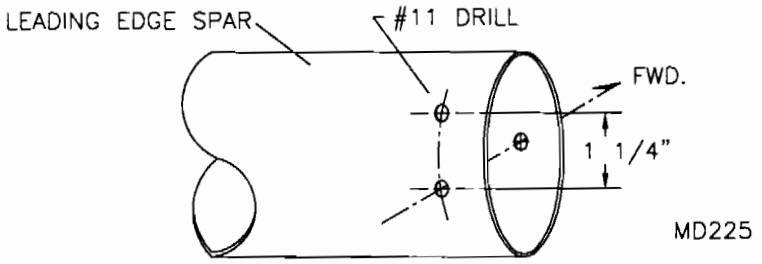


FIGURE 09-023A



S-14 STRUT INSTALLATION AND SETTING THE WING WASH OUT

PLEASE NOTE: It is assumed that the wings are assembled but not covered and the fuselage is sufficiently complete to accept the struts.

With the help of a friend or two step ladders, or similar devices about the height of the main spar carry through, bolt the wings to the fuselage. Hold up the tips with the ladders.

1. Select the parts depicted in the strut parts drawing.

2. Select the two 75 3/8" lengths of strut material and locate and drill a 5/16" hole 5/8" in from one end and a 1/4" hole ½" from the other end. A second hole will be drilled in the 1/4" hole end - this will become the "top" end. Use the templates to locate the exact position of the holes crosswise on the struts. See **Figure 09A-02**. See **Figure 09A-02A** for the hole locations. Assemble the fittings to each end as per the parts drawing, installing gusset plates using **Figure 09A-02B** for a reference. **NOTE:** Drill out the fitting to 5/16" as required. Rivet the gusset plates to the forward lift strut with 3/16" stainless steel pop rivets.

FIGURE 09A-02

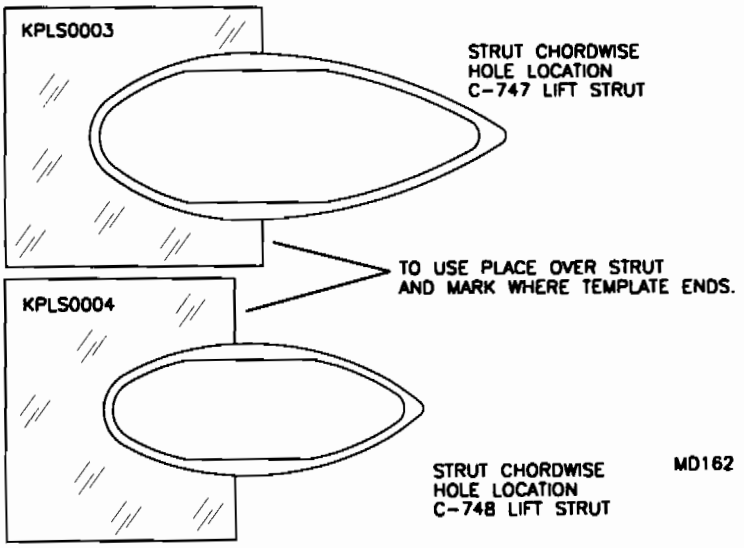


FIGURE 09A-02A

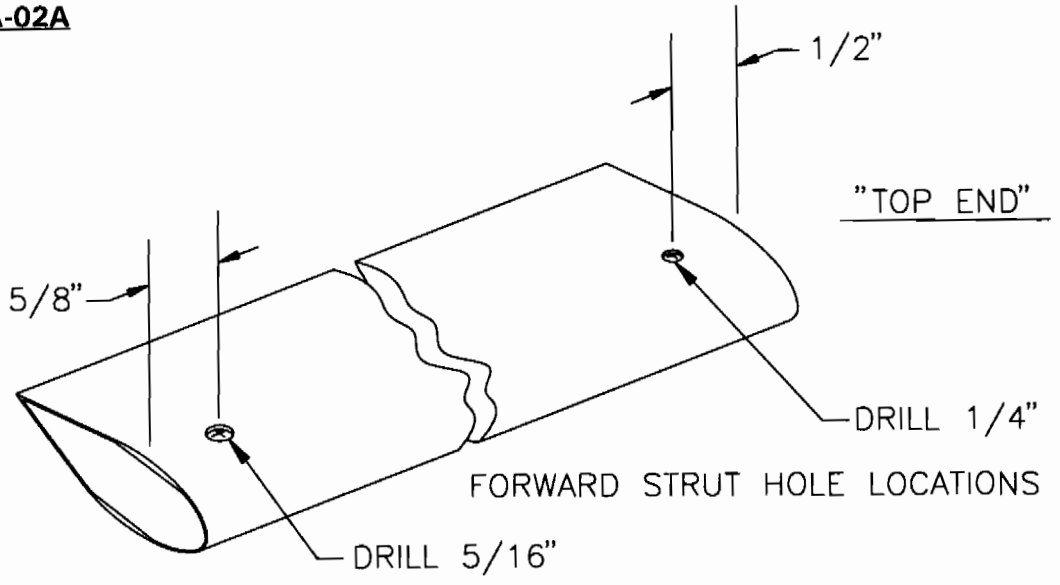
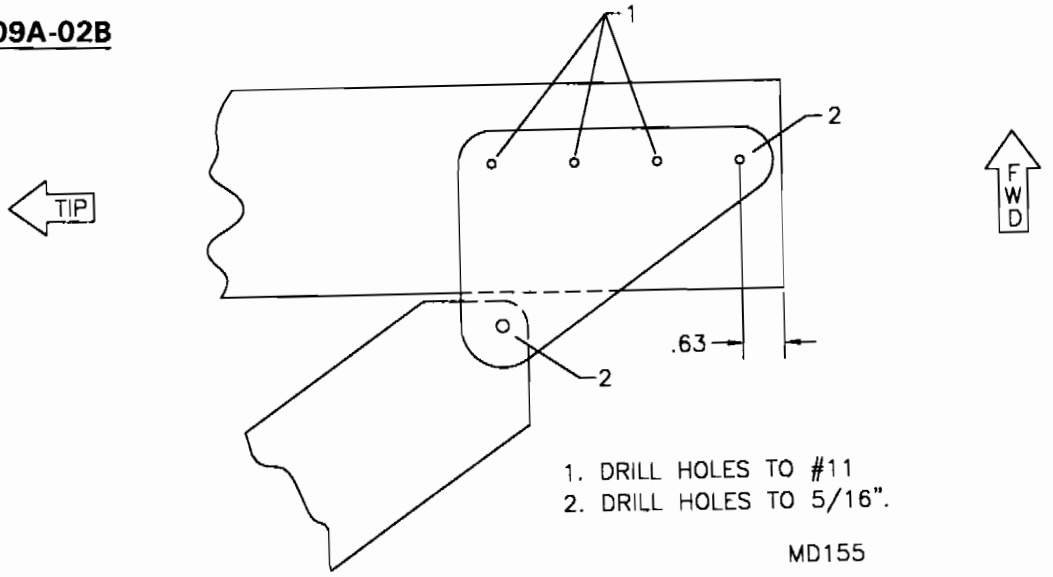
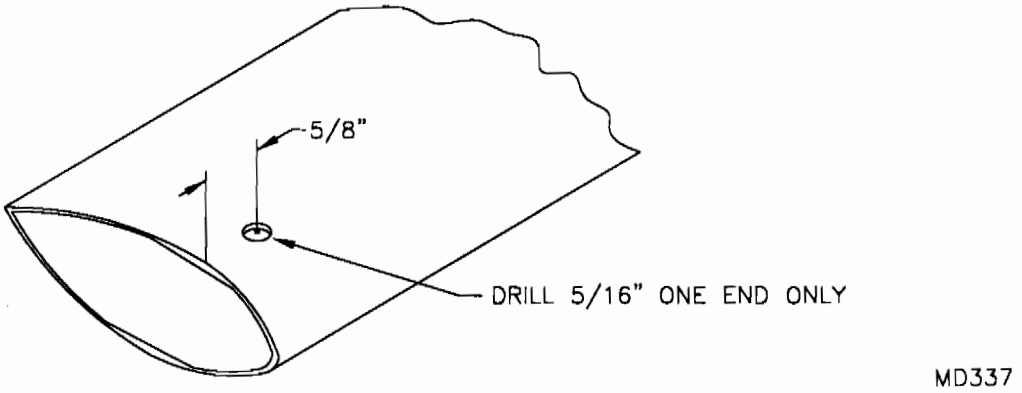


FIGURE 09A-02B



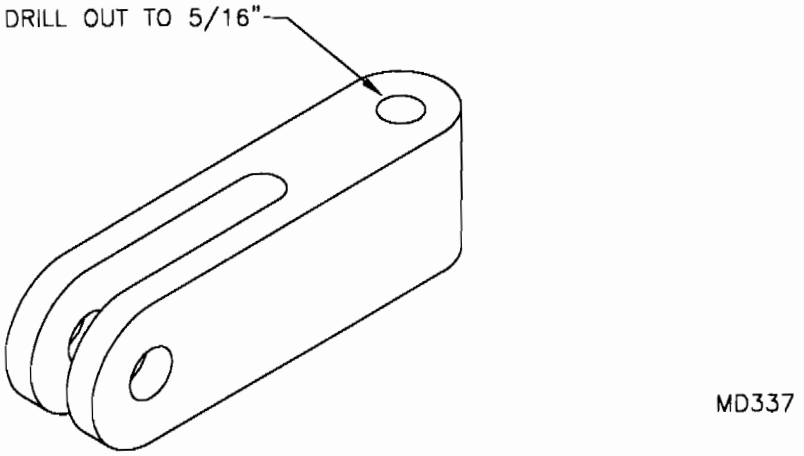
3. Select the aft lift struts, they should be 77 5/8" in length. **NOTE:** For adjustable lift struts, cut the strut to 75 7/8". Drill the aft lift struts, on one end only, to a diameter of 5/16" at an edge distance of 5/8". See **Figure 09A-03**. Be sure to use the hole locator to position the hole on the strut crosswise.

FIGURE 09A-03



4. The aft strut connector needs to be drilled out to 5/16" before being bolted in place. See **Figure 09A-04**.

FIGURE 09A-04



5. Bolt the fittings into the aft lift strut top ends. Place washers on each side to center the fitting in the strut.

6. Bolt the forward lift struts in place with the aft lift strut gussets pointing aft. The forward lift struts automatically set the dihedral.

7. Use the template from **Figure 09A-02** to mark a line for several inches at the strut's lower end showing the chordwise location for the holes. Rough trim the lower end of the strut to the shape shown in **Figure 09A-07**. **NOTE:** To trim and drill the **ADJUSTABLE LIFT STRUTS** use **Figure 09A-07A** as a trimming guide. Bolt the aft lift struts to the wing and place the unshaped and undrilled end between the gussets. **PLEASE NOTE:** The wash out will be set by twisting the wing. The proper twist lifts the rear spar higher than the forward. 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. Use the template for **Figure 09A-02** to mark a line for several inches at the strut's lower end showing the chordwise location of the hole.

FIGURE 09A-07

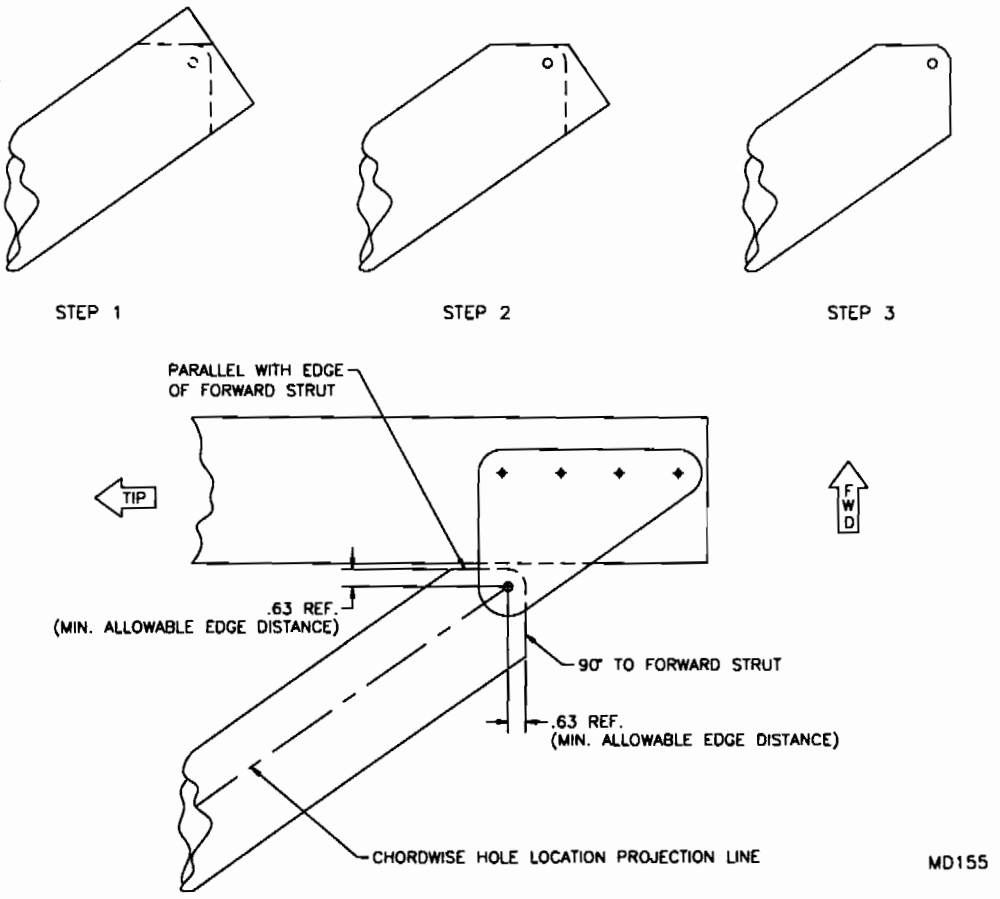
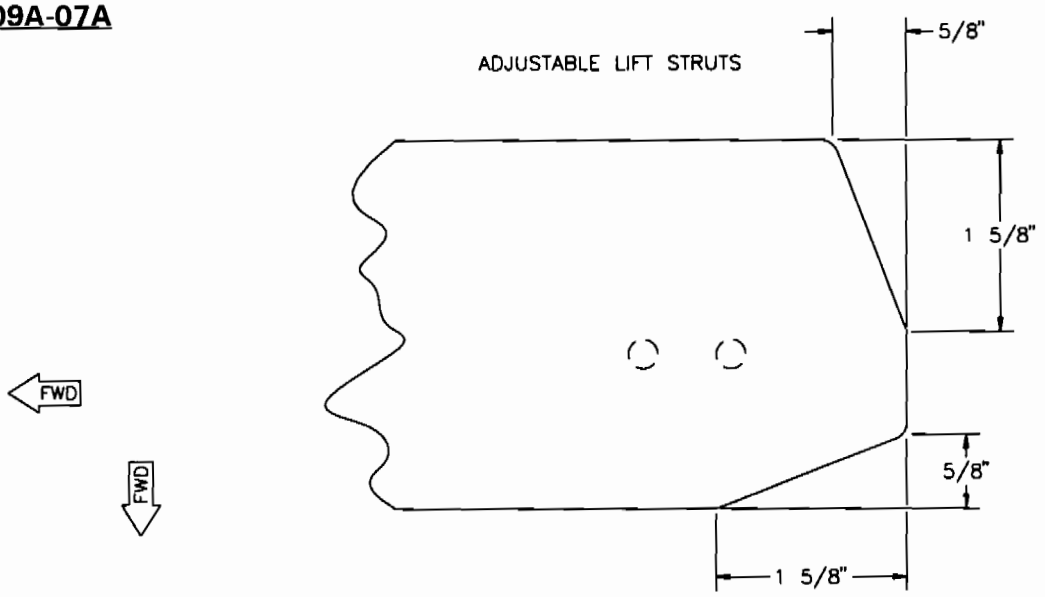


FIGURE 09A-07A

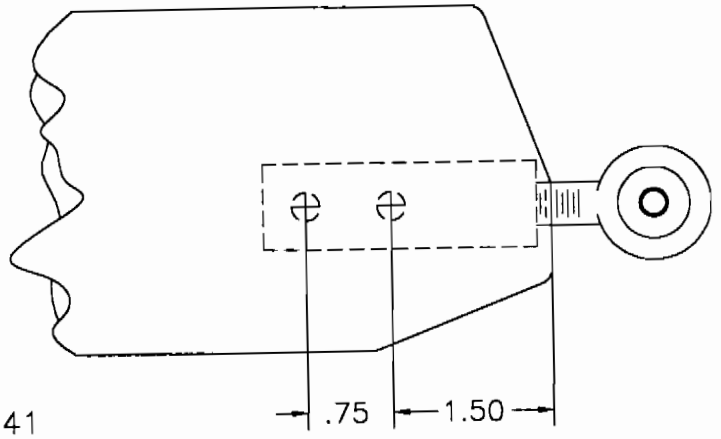


TRIM LOWER END OF EACH AFT LIFT STRUT AS SHOWN.

MD171

8. For the adjustable lift strut option, refer to **Figure 09A-08** for the dimensions to use as a guide in setting up the rear lift strut. 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 struts. If a gap exists, this action may crack the struts. Instead, use the .020 shim material to insure a tight fit. See **Figure 09A-08A**.

FIGURE 09A-08



ADJUSTABLE LIFT STRUT NOTES:

A. The forward strut sets up with the same fittings as a non-adjustable strut. Use the joggled gussets.

B. Cut the aft strut to 75 7/8" length.

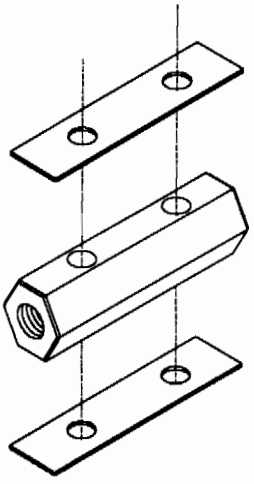
C. Trim the lower end of the aft strut using **Figure 09A-07A** as a guide.

D. Install the adjuster block as shown above.

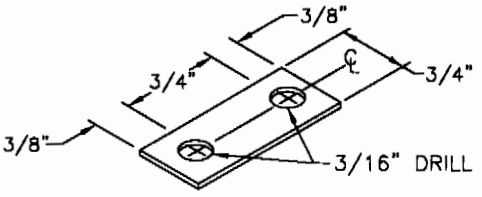
E. Hook up the strut and adjust the eyebolt.

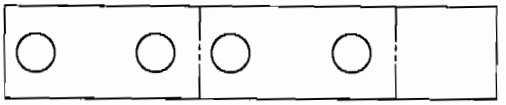
FIGURE 09A-08A

S-14 AIRAILE LIFT STRUT SHIMS



OPTIONAL ADJUSTABLE STRUT SHIM 116 WING



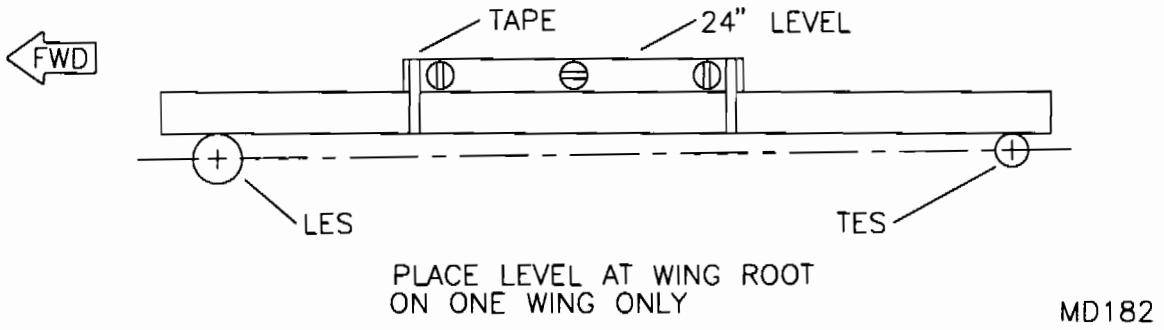


HINT: DRILL HOLES IN SHIM STRAP THEN CUT TO LENGTH. MAKE AS REQUIRED.

MD453

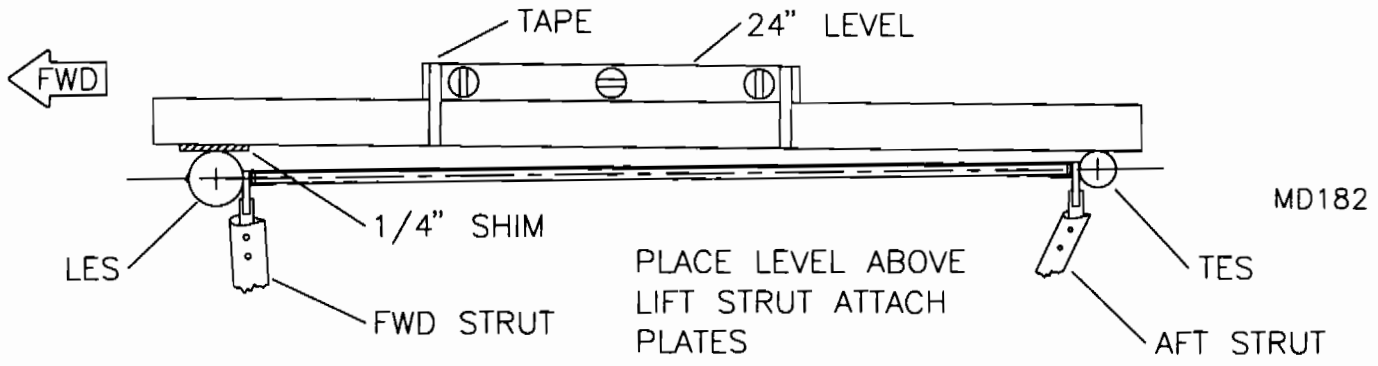
9. Make a rigging level by taping a 2 foot level to a straight 50" long, 1" x 3/4" board. Place the level on top of the wing at the root. The level should be held against each spar. Raise the main gear until it reads level. **CAUTION:** Block the wheels to prevent rolling. Double check the level prior to step #10. See **Figure 09A-09**.

FIGURE 09A-09



10. Cut out a scrap of 1/4" plywood 6" x 2" and nail or screw it to one end of the straight edge. Place the rigging device just outboard of the right wing's struts with the 1/4" block over the leading edge spar. 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. Mark the fitting with a pencil at the location of the lower end of the strut. (Remove the pencil marks afterwards or the graphite will cause corrosion.) Use the gusset fitting to line up on the mark and the chordwise marks to drill the bolt hole. Drill out to 5/16", then assemble. Be sure to place the anti-crush bushing on the inside of the aft strut lower fitting. See **Figure 09A-10**.

FIGURE 09A-10



11. Go directly to the other wing's outboard strut location and set the wing. It is not required and can even result in an improper setting if another level reference is taken from the other wing root.

12. If everything was done accurately, the aircraft will not have any tendency to drop a wing in a stall or drift in heading. If these bad manners are prevalent, the wings may not be set properly. It's a simple matter of installing and drilling a new aft lift strut connector. Otherwise, it could be unequal flap or aileron settings. Raise or lower the flaps as required. (Example: If the plane pulls to the right, lower the RH flap slightly or raise the left). Do not forget to consider engine alignment if the plane does not fly straight. (See engine.) Now turn to wing covering in the covering section.

S-14 AIRAILE 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.

Smooth out any wrinkles or fold lines in the wing skins with a household electric iron. An older iron with a heavy sole works best. 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. Be careful of heat setting as too high of heat can not only melt skin, but can leave areas discolored. A hot air gun or model airplane heat gun used for shrinking mono-coat works great for the stubborn areas. ***CAUTION:*** *Be very careful!! Hot air guns create very high temperatures and can melt through Dacron very easily and very quickly.* ***HINT:*** *Angle the hot air gun to blow across the skin rather than directly at it and keep the nozzle moving.*

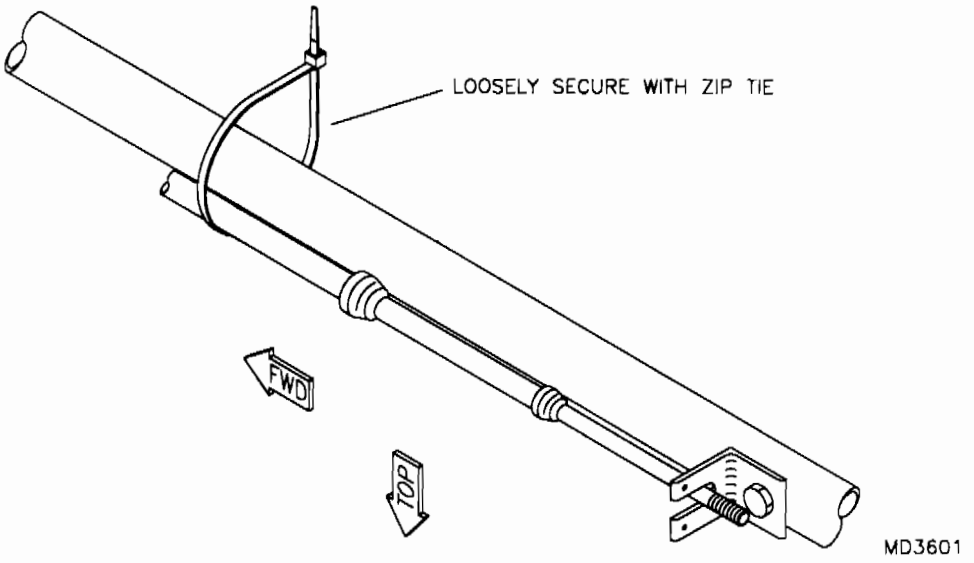
Plastic or Vinyl tape from any hardware or automotive store will work well for "Anti-Chafe" tape. We use 3-M Clear Weather Sealing Polyethylene Tape or All-Weather Polyethylene Repair Tape.

S-14 AIRAILE WING COVERING

The wings should be removed from the fuselage for covering. The wings should be complete including the root rib installation. Set the wings on sawhorses. Use saw horses about 30" to 32" high. This makes the job much easier.

1. Do **NOT** remove the flap Teleflex from the inside of the wing. Use a zip tie to loosely retain the Flap Teleflex Cable to the compression tube before covering. See **Figure 09B-01**. Attach the cable to the retainer and safety wire in final assembly. An access zipper is located near the Flap Teleflex exit. Use this access to place the Teleflex in the retainer after covering.

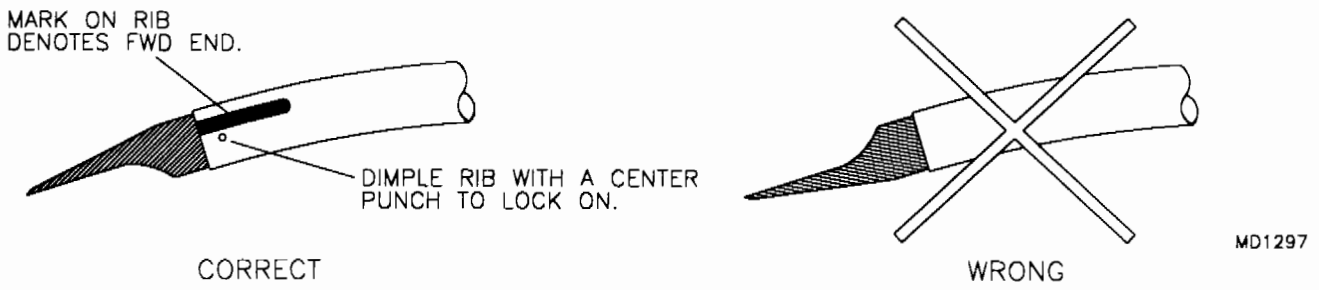
FIGURE 09B-01



2. The short aileron push-pull tubes must be removed, leaving the rod end attached to the bellcrank. Be sure to use a jam nut on the rod end for the short push pull tube. If you have not already done so, Loctite the jam nut on the long 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 screw it to the bellcrank.

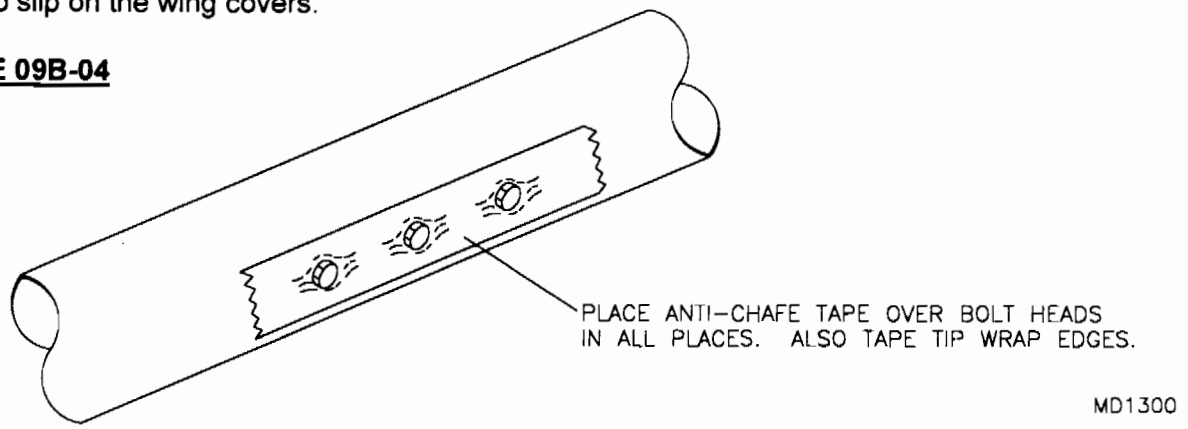
3. Assemble the top and bottom ribs by installing the rib tips. Install the duckbill shaped rib tips into the forward end of the top ribs and both ends of the bottom ribs. Note that the mark on one end of the bottom rib denotes the forward end of the rib. Dimple the ribs with a center punch to secure the tip fittings. Clean the mark off before insertion. See **Figure 09B-03**.

FIGURE 09B-03



4. Tape over all bolt heads with a good grade of plastic tape. See **Figure 09B-04**. It will make it much easier to slip on the wing covers.

FIGURE 09B-04



Before skinning the wing please inspect for completion and proper assembly, using the following check list.

A. Teleflex for flaps installed? ***IMPORTANT***: *Do not tie wrap the Teleflex cables to the wing tubes.* These must be allowed to remain loose inside the wing for best operation and make replacement easier.

B. All bolts properly installed with nuts tight?

C. Inspect all rivets, fittings, and nut plates. Make sure all hinge point nut plates are installed.

D. Inspect the push pull tubes for proper installation. On push pull tube systems the rod end for the bellcrank to aileron push pull tube must be installed before covering. It is best to have set up the wing skin less and rigged the flaps and ailerons on push pull tube models.

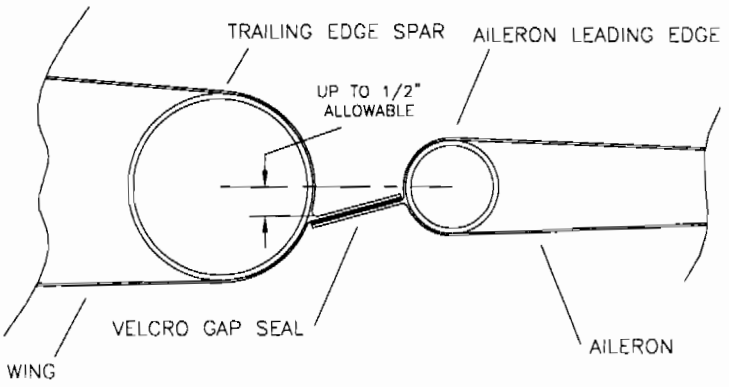
E. Standard wing – Outboard rib spacer installed? 139 wing – Built-up rib installed?

F. Fuel lines installed and clamped with at least 3 feet protruding from trailing edge of wing.

G. Jury strut bracket installed and orientated correctly on 139 wing?

5. 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. Do **NOT** force it!! Stop pulling about 12" from the root rib. The trailing edge Velcro gap seal should line up on centerline of the trailing edge spar. Up to 1/2" below centerline is acceptable. See **Figure 09B-05**. With the wing upside down, slit the first rib pocket on the bottom from the root as per **Figure 09B-05A** and install a top rib. Now pull the skin on the frame as far as possible. Back out the 1/4" bolts that retain the root rib so the skin will reach the root end of the root rib. ***Hint:*** *Fabricate temporary tensioning bolts.* See **Figure 09B-05B**.

FIGURE 09B-05



ERROR OF NO MORE THAN 1/2" BELOW AFT CENTERLINE OF T.E. SPAR IS ACCEPTABLE

FIGURE 09B-05A

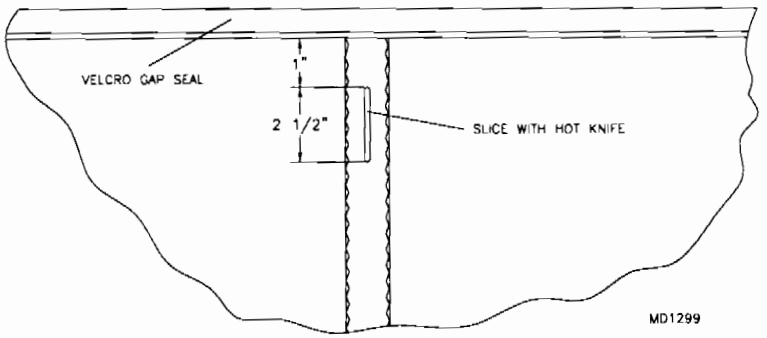
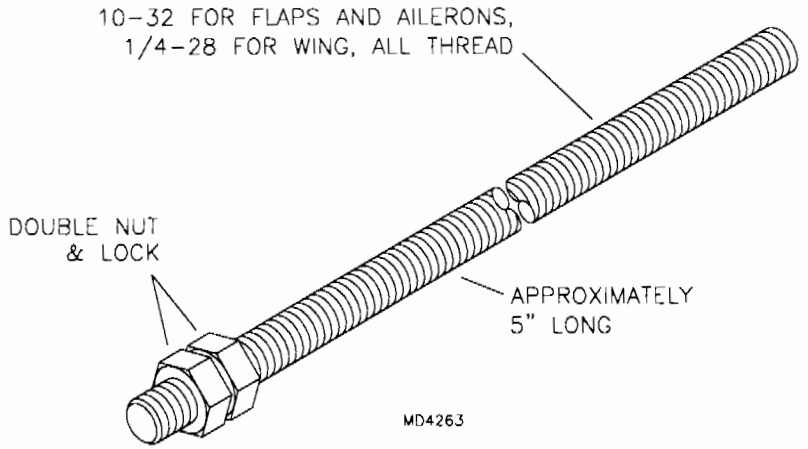
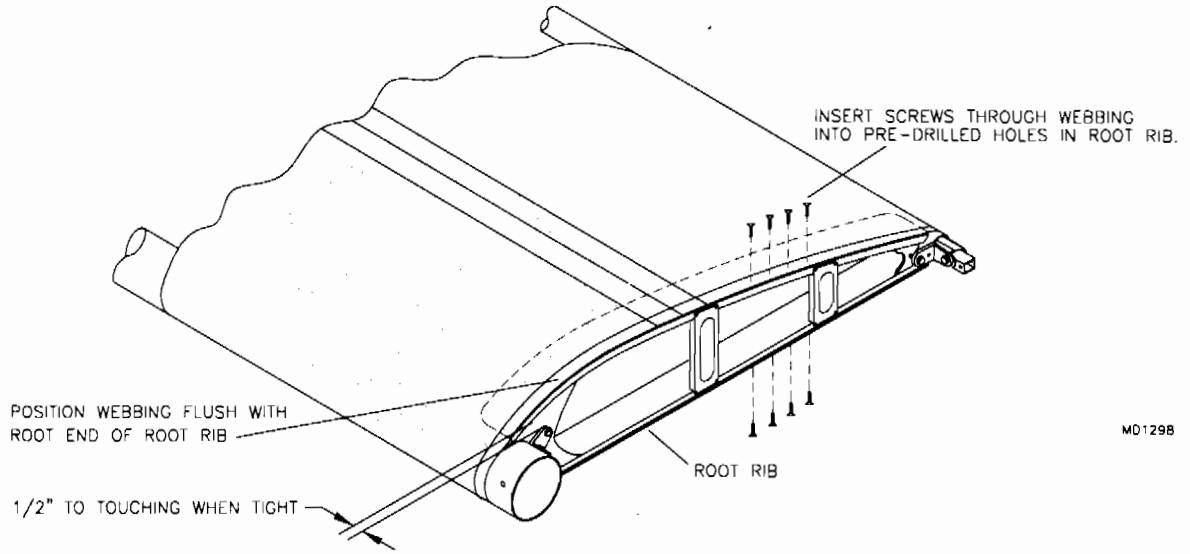


FIGURE 09B-05B



6. Secure the skin to the root rib by installing the proper screws through the webbing of the skin into the pre-drilled holes in the root rib. See **Figure 09B-06**. Tension the skin by evenly tightening the two 1/4" tensioning bolts until the root rib is from within 1/2" to touching the "L" brackets.

FIGURE 09B-06

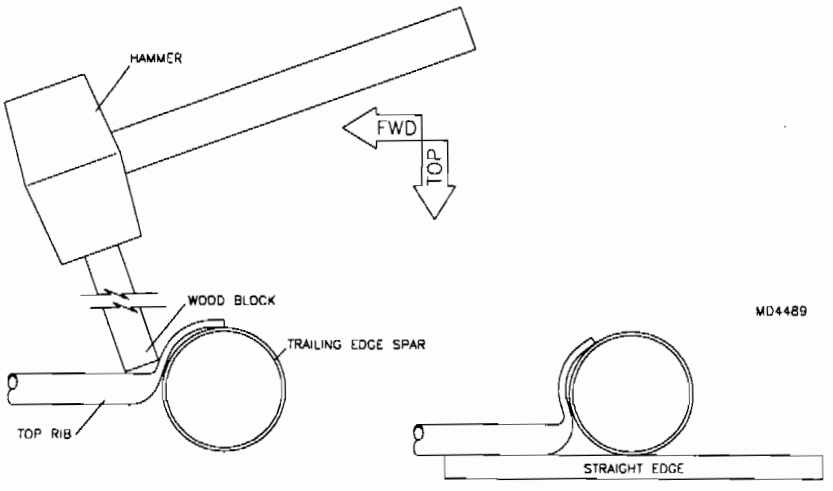


7. With the wing upside down, cut a slit for each rib pocket. ***NOTE:*** *Only cut on the bottom surface of the wing.* Refer back to **Figure 09B-05A**.

8. With the wing upside down, install the top ribs through the slits made in the bottom pockets. ***IMPORTANT:*** *Be sure the ribs insert into the sewn pockets.* ***NOTE:*** *They should push in with a good degree of pressure.* Use a small mallet and gently tap in place. A short scrap of lumber works as an excellent driving ram. That sound you're hearing is not the stitches ripping but the 2-way tape popping loose. This is perfectly normal and does not affect the strength of the skins. The ribs do drive in hard, but be careful of the last one near the wing tip. It may try to jam under the tip wrap. If it does, push the fabric from the bottom at the leading edge to help it line up. ***PLEASE NOTE:*** *In some places rivets or nut plates may hang up the aft curve of the rib. Simply move the rib to either side to clear.*

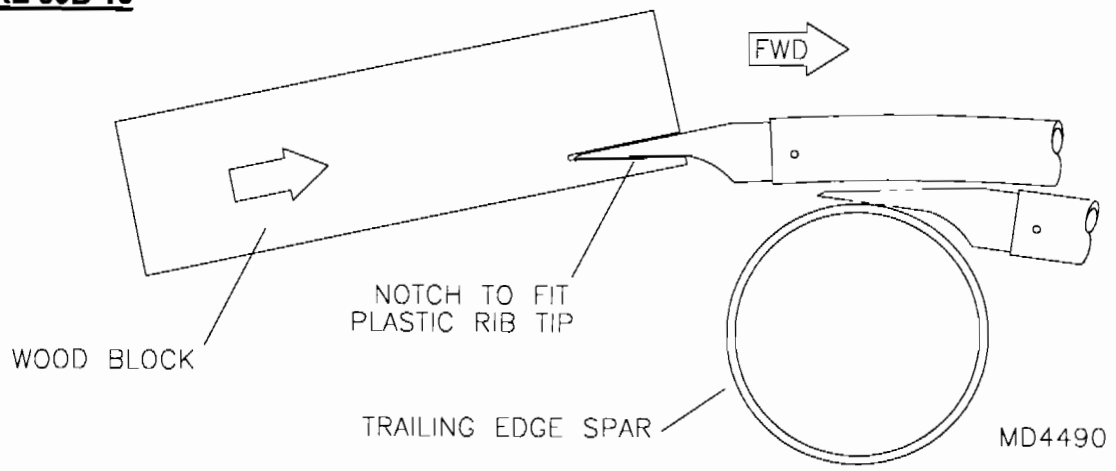
9. The aft end of the top ribs must be rotated into place against the aft spar. Using a small block of wood and a hammer, push the rib aft and toward the top skin. See **Figure 09B-09**. This will rotate the top of the rib inline with the aft spar and allow the bottom rib to set against the spar.

FIGURE 09B-09



10. Install the bottom ribs the same way, except to get them started insert the rib upside down, this will help the tip slide into the pocket, then turn it right side up (tip curve down). Push the rib into place. ***HINT:*** *Make a push block from wood.* See **Figure 09B-10**. The bottom rib tip will lie against the bottom of the trailing edge spar sealing shut the slit made for rib insertion. Top rib removal is done by making a tool from an old screwdriver. Heat and bend the end into a 90 degree hook. Use the tool to reach up inside the slit to grab a rib and pull it out. Always remove the bottom rib first.

FIGURE 09B-10

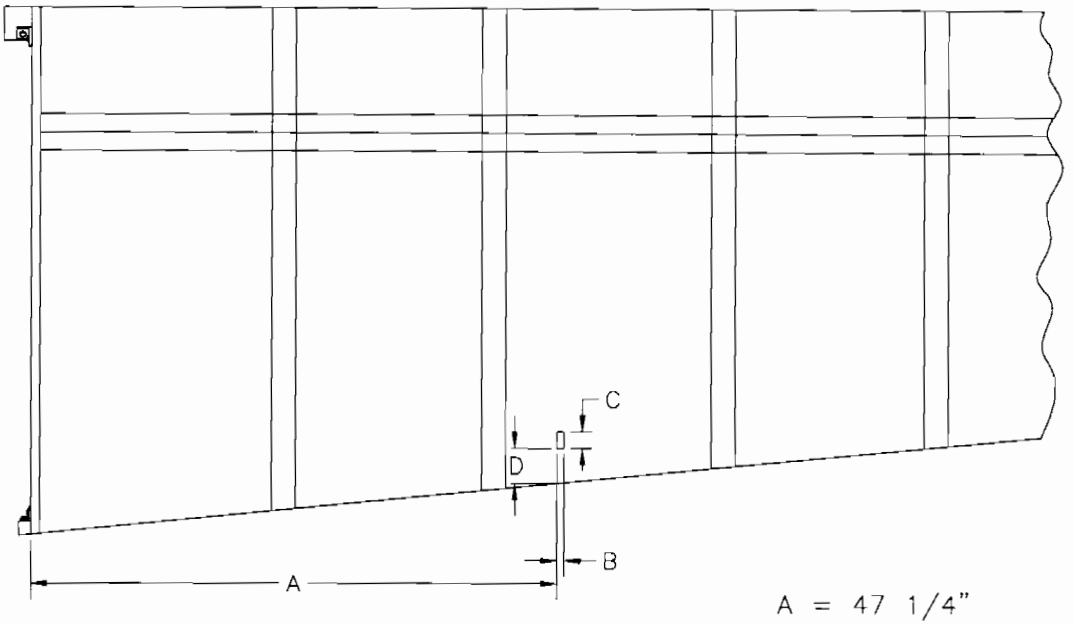


11. Smooth out any wrinkles or fold lines in the wing skins with a household electric iron. Be careful not to melt the skins. 350 degrees is the maximum temperature used. After 350 degrees the cloth will stop shrinking and start stretching. A hot air gun or model airplane heat gun used for shrinking mono-coat works great for the stubborn areas. ***CAUTION:*** *Be very careful!! Hot air guns create very high temperatures and can melt through Dacron very easily and very quickly.* ***HINT:*** *Angle the hot air gun to blow across the skin rather than directly at it and keep the nozzle moving.*

12. Make cut outs around the fuel tank filler, strut attach plates and jury strut tabs by following around the protrusion with a hot knife. Re-shrink the surrounding skin as needed. Locate and cut holes for the flap and aileron exits. ***IMPORTANT:*** *The location of the push rod exit holes for the flaps and ailerons differs on the standard and 139 wing options.* If you are building a standard wing see **Figure 09B-12.** If you are building the 139 wing see **Figure 09B-12A.** This is a very important step. Please be sure to examine the proper figure. The standard wing is the one that tapers. The 139 is the larger straight wing. Cut open each zipper. ***NOTE:*** *If applying clear-coat, cut the exit holes and zippers after clear-coat is dry.*

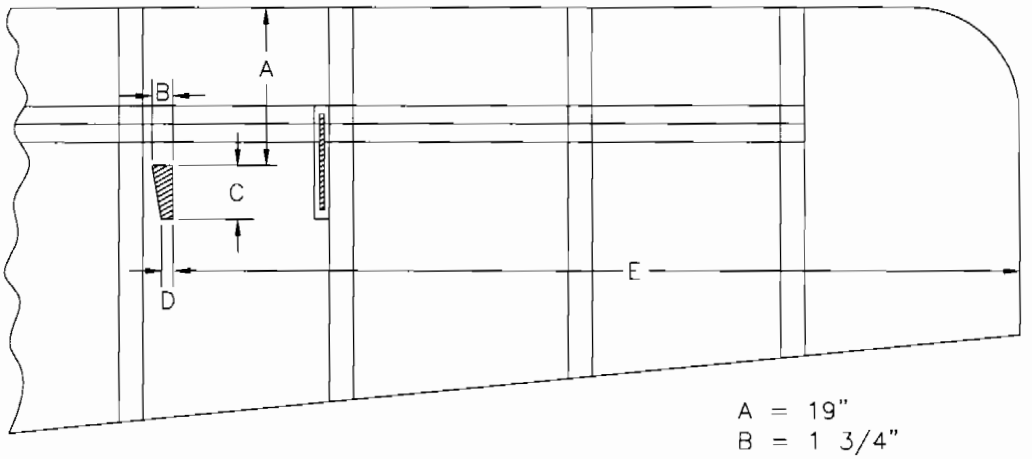
FIGURE 09B-12

FLAP TELEFLEX EXIT LOCATION



A = 47 1/4"
B = 1/2"
C = 1"
D = 2 1/2"

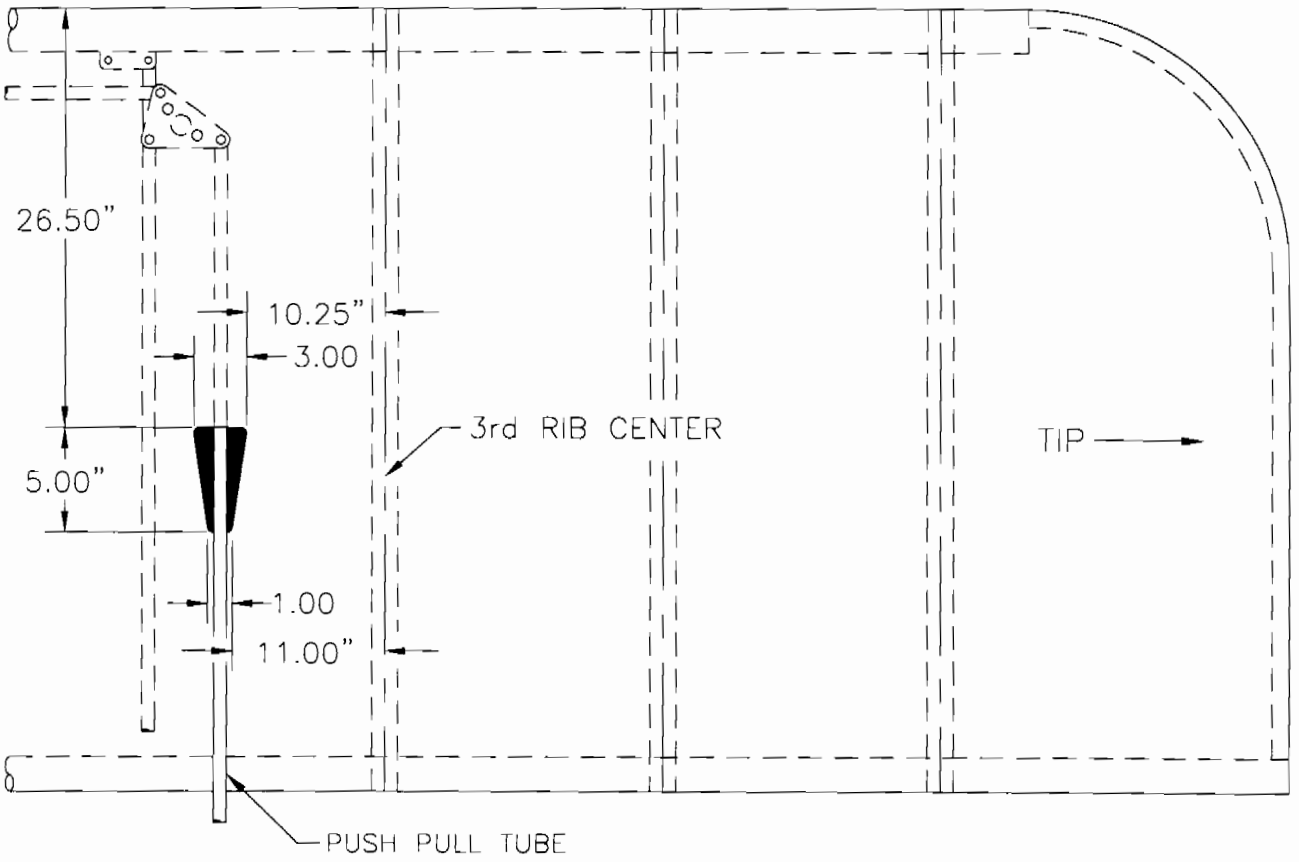
AILERON PUSH PULL TUBE EXIT LOCATION



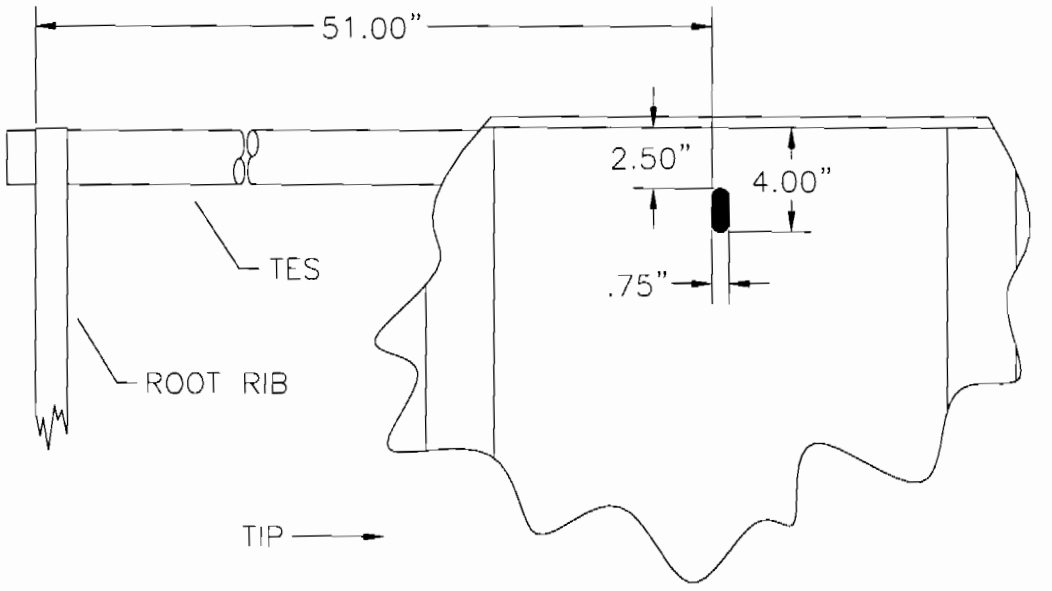
MD375

A = 19"
B = 1 3/4"
C = 5 1/4"
D = 1"
E = 62"

FIGURE 09B-12A



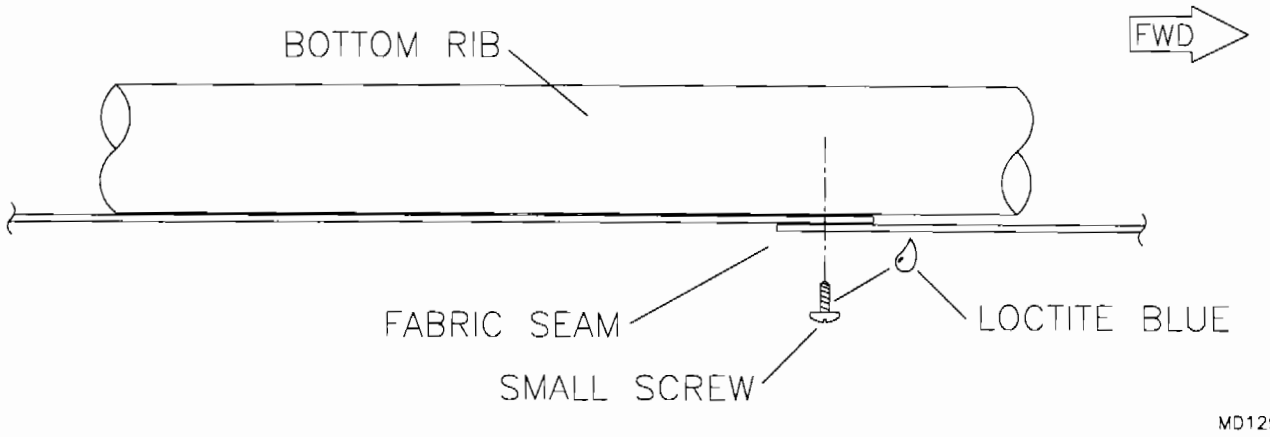
AILERON PUSH PULL TUBE EXIT



FLAP TELEFLEX EXIT

13. If clear-coat will **NOT** be applied to the wing, then to prevent the bottom rib from sliding out, it is required to install a small screw. Locate this screw through the bottom fabric on a seam where the fabric is doubled, such as one of the stripes. Drill a #40 hole through the fabric and rib. Place a small amount of Loctite on the screw and install. See **Figure 09B-13**.

FIGURE 09B-13



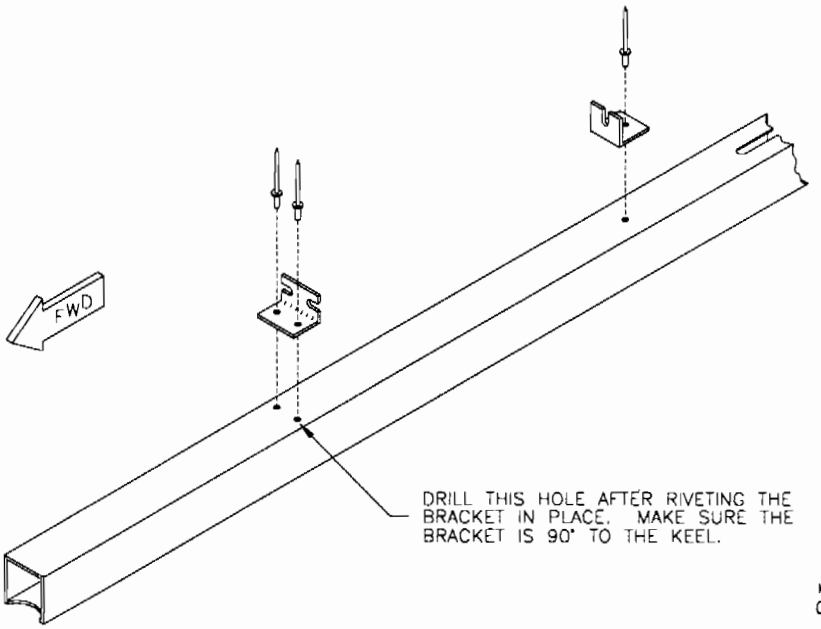
S-14 AIRAILE AILERON AND FLAP ASSEMBLY

14. Select the components shown on the parts pages for the Ailerons and Flaps.

15. Bolt the flap lever unit in between the seat to the mount provided. ***PLEASE NOTE**: The forward bolt inserts from below for elevator push tube clearance.*

16. Locate the single and double slot Teleflex retainers in the locations shown in **Figure 09B-16**. ***NOTE:** Only one of the two holes required to mount the double slot Teleflex retainer is pre-drilled.*

FIGURE 09B-16

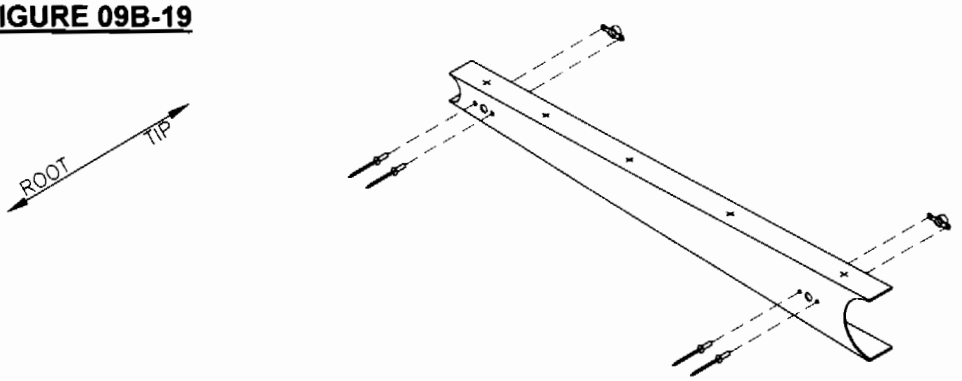


17. Route the Teleflex cable from the flap lever so it loops up between the two aft cabaines and into the retainer. Safety wire it in place with a figure 8 loop of wire. Bolt the dual Teleflex retainer aft to the Teleflex. Include the bent 90 degree hummertang (bolt to Teleflex with long end out).

18. Drill out the small hole in the double Teleflex retainer to #30. Hook the flap retainer spring between the double Teleflex retainer and the Teleflex.

19. Rivet the 3/16" nut plates to all hinge holes in the flaps and ailerons. Rivet two 3/16" nut plates to the inside of each aileron flap root rib. See **Figure 09B-19**.

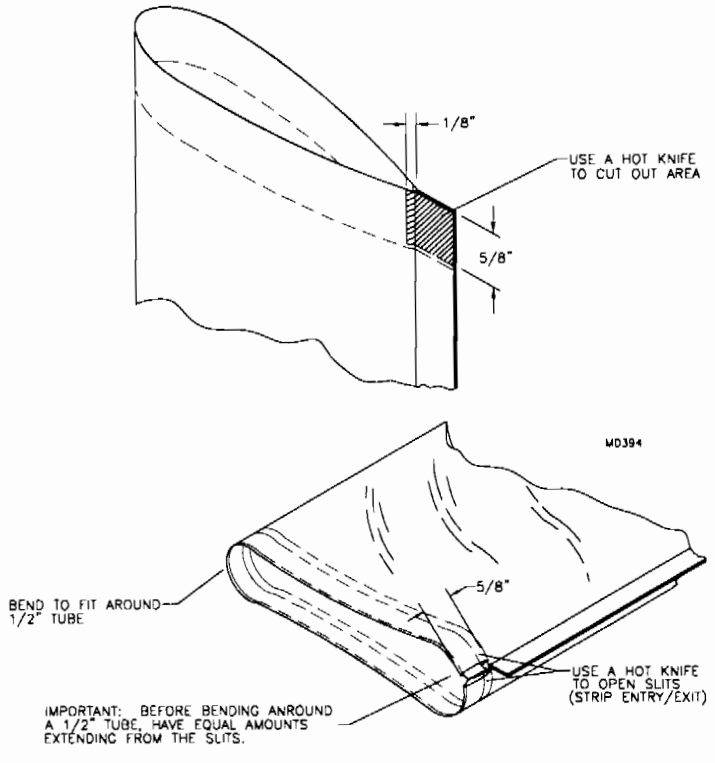
FIGURE 09B-19



MD382

20. Cut a small notch in the pocket end of the cover. Cut a notch back from the Velcro on each side slightly less wide than the pocket. Do not cut into the stitches. See **Figure 09B-20**. This will allow entry and exit of the aluminum strip. With the strip inserted, and equal amounts extending out of the fabric, bend it at the point where the trailing edge of the aileron or flap will contact the strip.

FIGURE 09B-20



21. Slip the pre-sewn skins over their respective frames. The skins will fit tight but they will go on. Some helpful methods appear in the following paragraph.

22. Brace the opposite end against a wall to push against as you pull on the skin. After about halfway on, pull the skin down from the top. This will scrunch it up, but now you will have less tension to pull against. In extreme cases where the skin is too tight (it will be evident by the bowing in of the trailing edge between ribs) file off the ribs at the buttons a little. ***BE CAREFUL**: It is very easy to remove too much material.*

23. With the fabric pulled down as far as possible, install the tension rib in the fully extended position. ***Hint:*** *Fabricate temporary tensioning bolts. Refer back to* ***Figure 09B-05B.*** Rivet fabric to each side of the rib with five evenly spaced rivets. See **Figure 09B-023**. Turn the screws tight to tighten the fabric. The proper amount of tension is reached when the rib bottoms against the 1/2" tube. See **Figure 09B-023A** for a view of the finished product. Note how the metal strip is trimmed and formed around the spar. Rivet to the spar with two #40 aluminum pop rivets.

FIGURE 09B-023

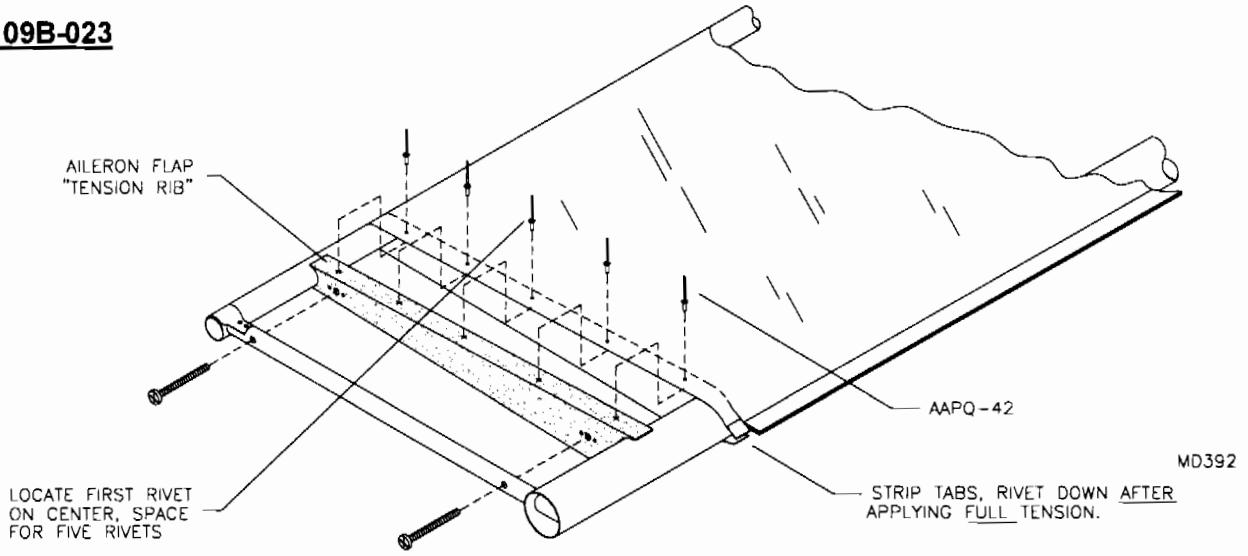
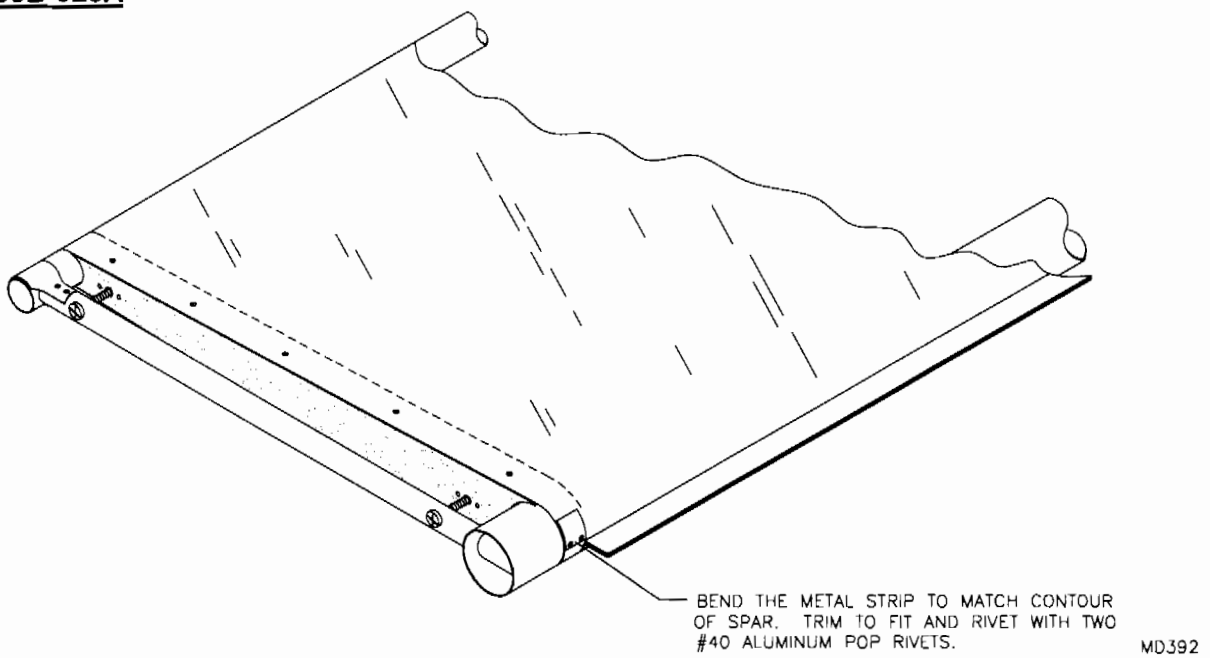
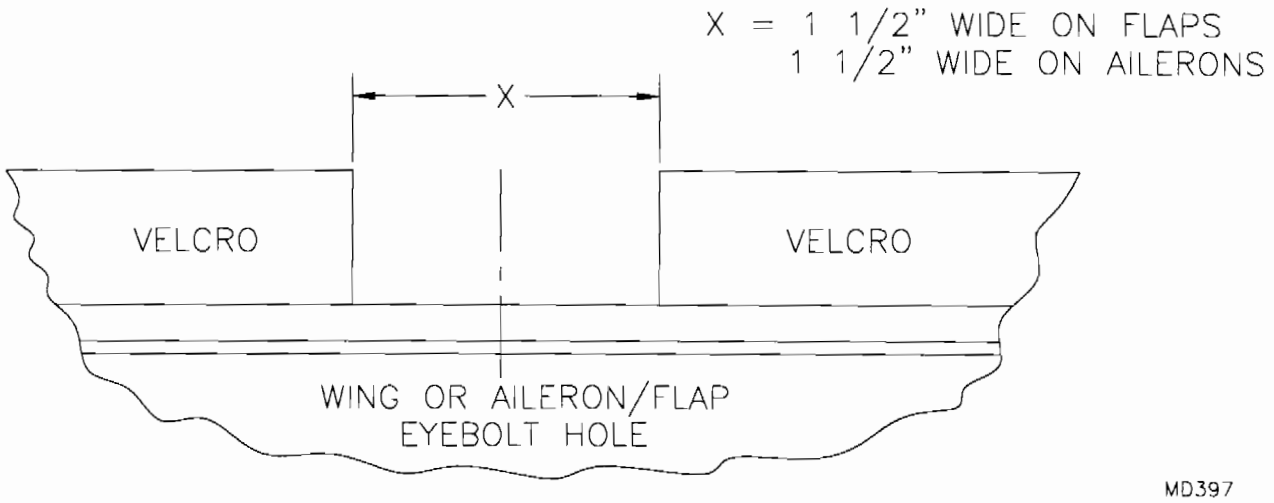


FIGURE 09B-023A



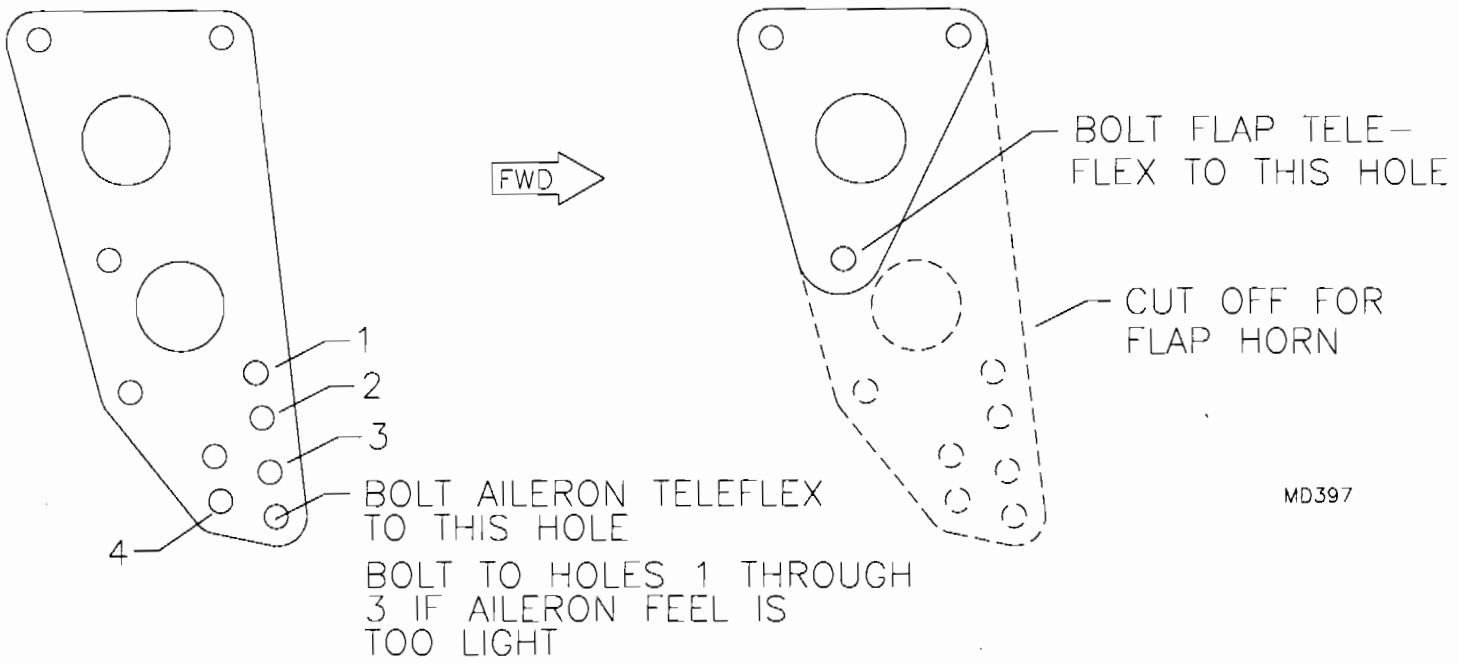
24. Melt through the hinge points and horn attach angle bolt holes. At each hinge point cut out as shown in **Figure 09B-024**. ***BE CAREFUL**: Do not cut into the stitching.*

FIGURE 09B-024



25. Bolt the horn attach angles to each control surface. Bolt control horns to attach angles. See **Figure 09B-025** for part orientation and trimming instructions. On standard (taper) wings, set attach angles parallel to wing ribs. On 139 (long) wings, set attach angles 90 degrees to the spars. ***HINT:** Place masking tape around the trailing edge where the attach angle is orientated.* Mark the oval attach angle hole on the masking tape. Slip the aileron clip over the trailing edge and align with the oval mark. Be sure the clip is tight against the trailing edge. Melt a hole through the skin using the clip as a guide. Remove the masking tape. Insert the 1/4" x 1/2" spacer bushing between the clip (inside the skin) and bolt. Bolt the horns to the angles as per the parts drawing.

FIGURE 09B-025



ATTACHING FLAPS AND AILERONS TO THE WINGS

PLEASE NOTE: *Do this section after wings are attached, rigged, and covered.*

26. Install the hinges on the ailerons, flaps, and trailing edge of the spars. The Velcro gap seal on the wing should be cut out for the hinges the same as on the ailerons and flaps.

27. Bolt the surfaces to the wing, shimming as required with washers. The hinges should work freely without excessive play. Safety the hinges with cotter pins. Snip off the pins and roll them back over the nuts. ***HINT:*** *Use a light oil to lubricate the hinges.* The ailerons should be free enough to drop down from their own weight.

28. See wing covering for directions on how to cut the bottom of the wing skins for the flap Teleflex cable and aileron push pull tube exits. Attach the Teleflexes to each flap horn via the rod end connectors. Screw the push pull tube into the rod end that was left attached to the aileron bellcrank during wing assembly. Screw a rod end into the other end of the aileron push-pull tube and attach it to the aileron horn.

RIGGING

29. The flaps and ailerons should have been set in the Wing Assembly section to be flat across the bottom of the wing, using a slight amount of droop. ***IMPORTANT:*** *Be sure the rod ends are screwed into the end fittings at least 10 turns.* Check the ailerons for full movement. The stop at the control stick should be screwed in as much as possible and still keep the stick inside the cockpit at full side to side deflection. The ailerons are designed to have twice as much up as down. Adjust so there is 30 degrees up and 15 degrees down. If not, try adjusting the rod ends. The control sticks should be centered when the ailerons are in neutral. Use the rod ends and the aileron cable turnbuckles to position the sticks. The system should operate with very little friction, and the only noise will be the plastic guides rubbing on the push pull tubes. There should be no play in the system. Check the cable tension. If there is play, this is a sign of too little tension. High friction is an indication of too much tension. Work with the system until it runs smoothly. Experiment with the cable tension until it feels right. The cables should have a nice low mellow note when strummed. Flying the aircraft will further reveal rigging problems. There may be a tendency to pull to one side. This is usually remedied by adjusting the flaps. Often one flap will be slightly lower than the other. This will cause a turn tendency away from the low flap. The stick most likely will need to be centered. Fly the plane hands off to see if it tracks straight and the stick is in the middle. Make the adjustments in small increments. Be careful! Make sure the ailerons are hooked up correctly; the right aileron goes **UP** when right stick is applied. This sounds obvious, and it is nearly impossible to hook up the S-14's ailerons backwards, but stranger things have happened.

AIRCRAFT COVERING SAFETY TIPS FOR DACRON SKINS

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 preflight inspections. During preflight 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 or hangaring.

Life expectancy varies with latitude. The closer to the equator you are, the more intense UV rays 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.
Clear-coatings can help extend useful life. Clear-coat 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!

S-14 AIRAILE 139 WING ASSEMBLY

LEADING EDGE SPAR ASSEMBLY

NOTE: Assemble both spars the same but make a LH and RH. This will be true for the AFT spars as well.

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

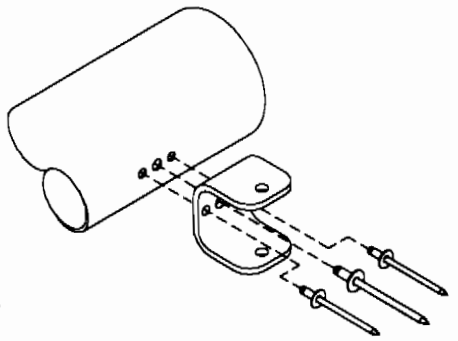
2. The leading edge spar comes with all but one of the holes pilot drilled. The final hole sizes are called out during assembly. **PLEASE NOTE:** The front side of the spar has four (4) holes for the tip bow rivets. The 5th hole goes through the spars, but is not used on the S-14 Airaile.

3. Bolt the long wing channel to the first hole 55" outboard of the root. 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 holes. (Only drill through one side of the spar.)

4. Drill out the three holes in a row 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" spar holes out to 3/8". **NOTE:** Drill from each side, (not from one side) through 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 catalog.

5. Rivet an S2-SAB to the spar using a single 3/16" stainless steel pop rivet. Drill a #30 hole on each side of the 3/16" rivet. Rivet with a 1/8" stainless steel pop rivet. See **Figure 09C-05**. **NOTE:** The outboard compression tube (W-IO) 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. Rivet an S2-SAB to the spar with a single 3/16" stainless steel pop rivet.

FIGURE 09C-05



MD997

TRAILING EDGE SPAR ASSEMBLY (SPARS HAVE A FRONT & BACK)

NOTE: The front side of the spar has three (3) holes near the outboard end for riveting the spar tip.

6. Bolt a long wing channel to the #11 hole drilled through the spar 6 3/4" from the root end. The unbolted end should point inboard. Line up the channel parallel and drill and rivet with one (1) #12 stainless steel pop rivet.

7. Collect the parts shown in the universal hinge drawing. Make and insert the bushings into the bushing fittings. Press the bushings into the ends of the bushings on the spar fitting. If the bushings do not press in, glue them in using a dab of J & B Weld. Test fit the fitting into the end of the spar. If most likely will need to be ground to contour the spar's inside diameter. Assemble the hinge into the trailing edge spar's inboard end. Use the first and second bolts at the spar's 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.

8. 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 up the channel parallel and drill and rivet with 3/16" stainless steel pop rivet.

9. Drill the three holes in a row following the same procedure as in step 4.

10. From the parts drawing determine the location of the lower hinge bolt and rivet on the front forward inboard side of the spar a 3/16" nut plate. Position these nut plates parallel with the spars. Also, rivet two (2) nut plates to each trailing edge spar tip in the side with the 1 3/8" hole.

11. Slip the trailing edge spar tip into the spar. **DO NOT RIVET.** Assembly of the wing tip bow is required before riveting the tip.

AILERON PUSH PULL TUBE ASSEMBLY (REFER TO CONTROL STICK FOR SELECTION OF PARTS)

12. Refer to wing internal bracing tubes and select the parts for assembly.

13. Install the drag braces. **NOTE:** Install the W-DBR. Before bolting the middle compression tube in place, slip on the (CS-CTD) aileron bellcrank doubler. The aileron bellcrank doubler is a 3" to 4" tube 1 1/8" in diameter. Bolt the flap compression tubes with the hole for mounting the teleflex retainer closest to the trailing spar. **PLEASE NOTE:** The shorter tube (W-MC) bolts in position at the strut attach plate.

14. Install the jury strut tab using an AN3-16A bolt and a 3/16" tensile nut. The tab 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 tab before slipping on the wing covering!

15. Install the teleflex retainer bracket to the flap compression as shown in the parts drawing. Note the position and orientation of the bracket. Locate aileron push pull tube guide on second outboard compression tube, as per **Figure 09C-15**. Install the flap teleflex retainer on the W-FCT tube to the inside. See **Figure 09C-15A**.

16. 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. 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 09C-16**. Install the aileron bellcranks as shown in **Figure 09C-16A**. The bellcrank gusset bolts to the channel bracket's two bolts, the other hole is located over the compression tube. Starting from the bottom, drill out to 1/4" through the compression tube, doubler and gusset. 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 gussets 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 09C-15

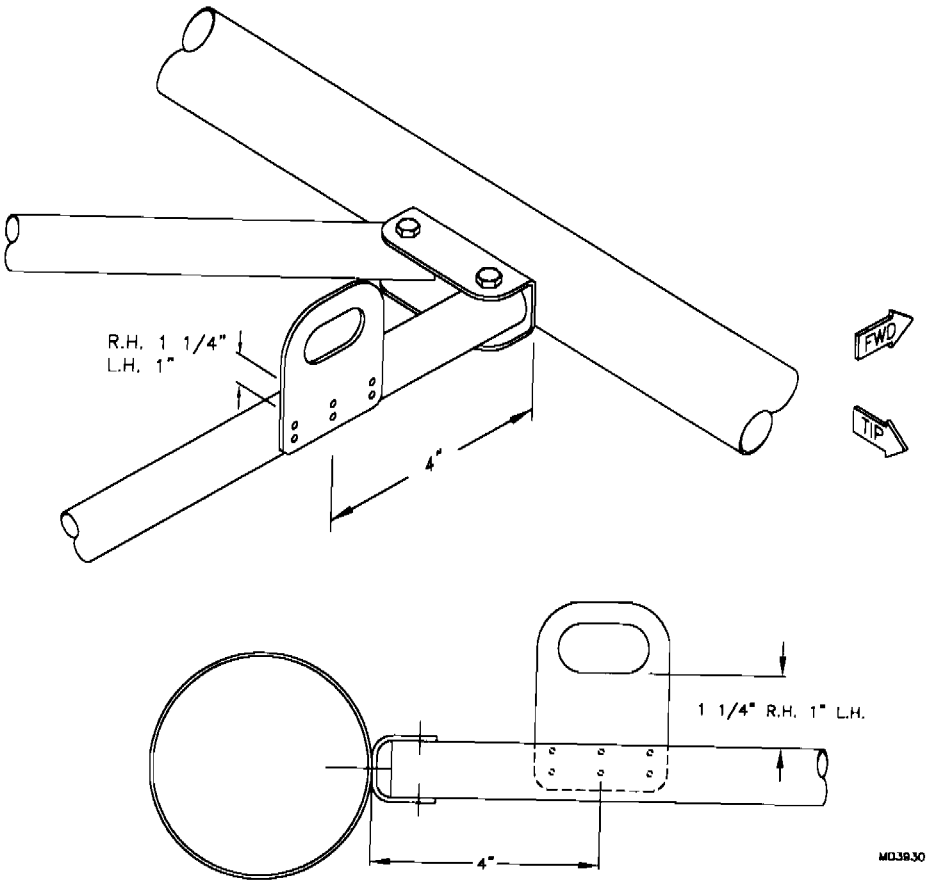


FIGURE 09C-15A

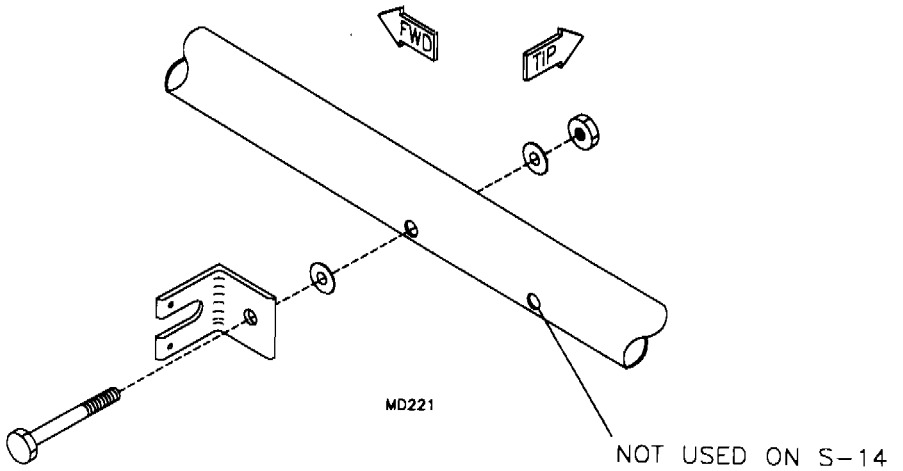
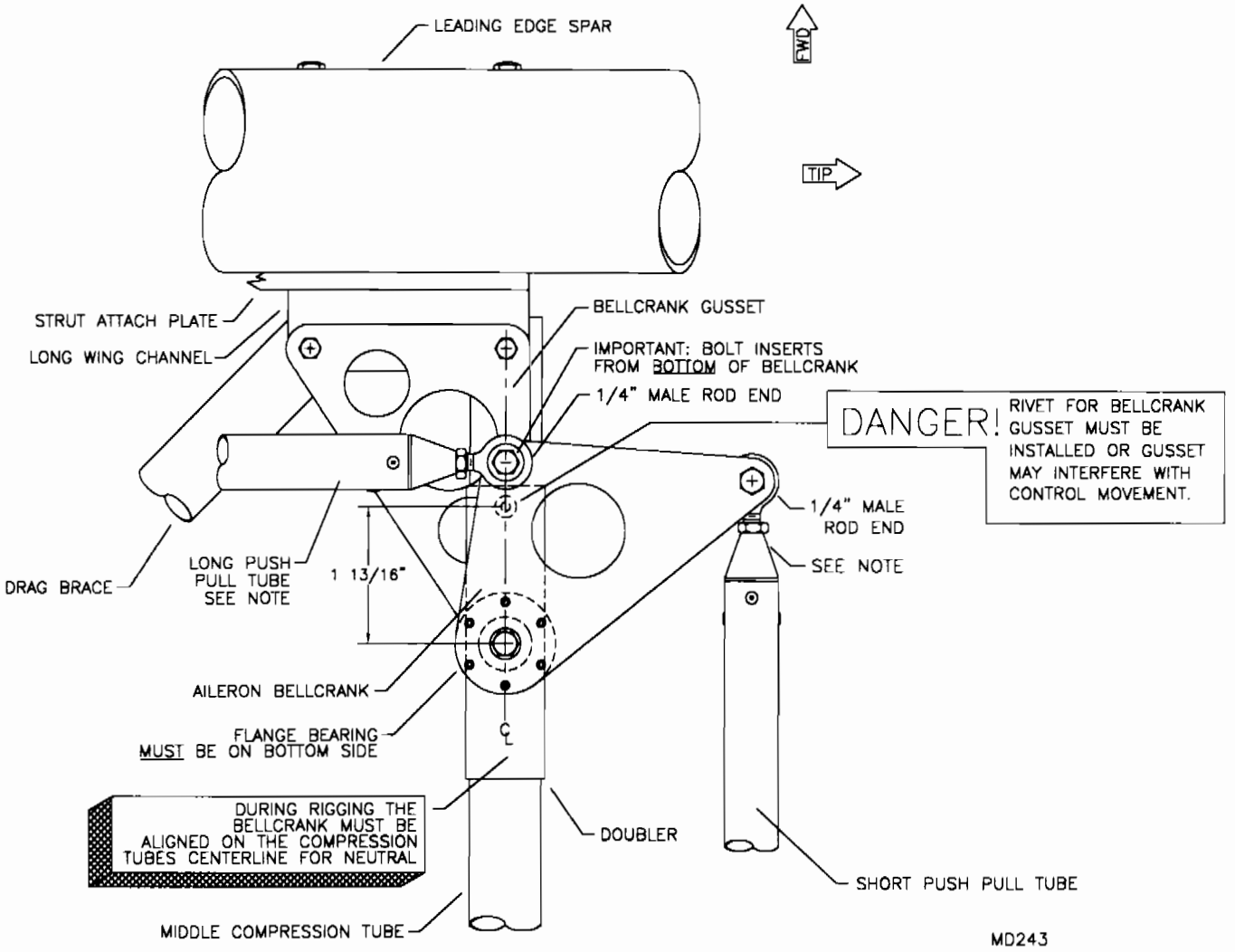


FIGURE 09C-16A



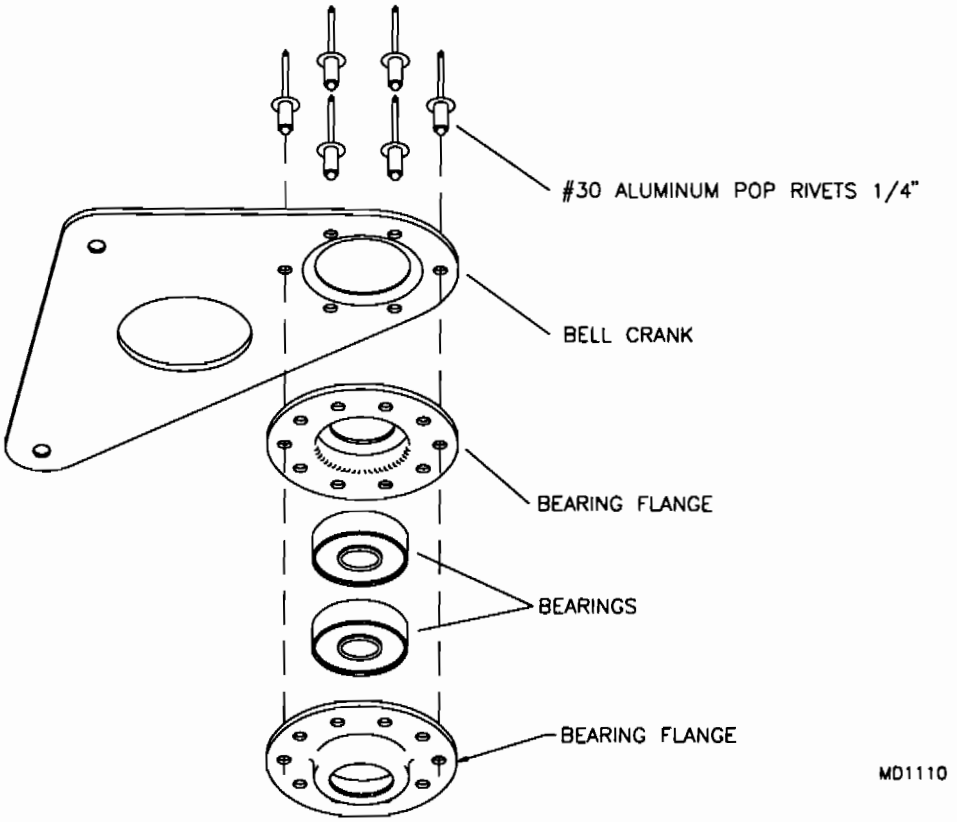
IMPORTANT: SMALL FLANGE ON GUSSET MUST POINT DOWN

CAUTION: ROD ENDS MUST BE TURNED IN AT LEAST 10 TURNS.

NOTE: STOP NUT OR BOTTOM OUT PUSH PULL TUBE ON BELLCRANK DURING FINAL ASSEMBLY. 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.

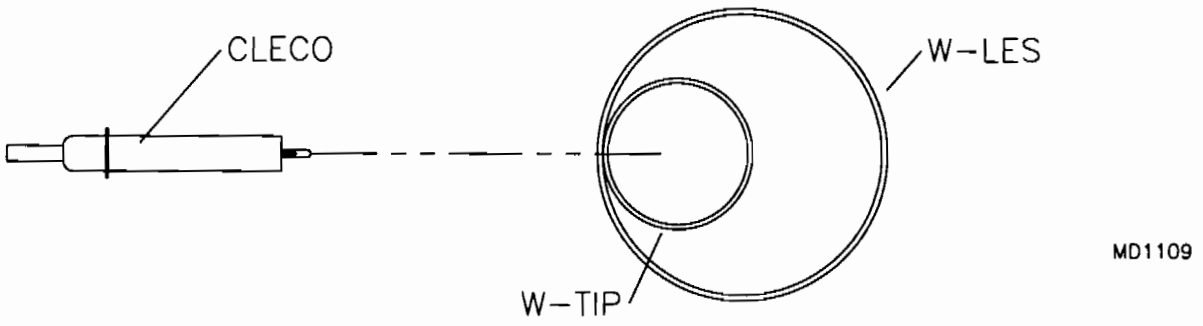
FIGURE 09C-16

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



17. Insert the tip bow's drilled end into the leading edge spar so the tip bow's hole lines up with the fourth inboard hole and then cleco in place. **IMPORTANT:** The tip bow must be flat against the spar on the inside. See **Figure 09C-17.**

FIGURE 09C-17



18. Line up the bow parallel with the spar and drill through the remaining three (3) holes and cleco.

19. File and fit the tip bow's other end into the trailing edge spar's extension. See **Figure 09C-19.** Use the 2" tube with the 1 3/8" half hole to mark the tip end. The tip end should enter the rear spar approximately 90 degrees. About 1 ½" of it will have to be trimmed off the fitted end of the tip. Rivet with (3) 1/8" stainless steel pop rivets in the narrow flange through the spar and wide flange through the tip tube. Refer to **Figure 09C-19A.**

FIGURE 09C-19

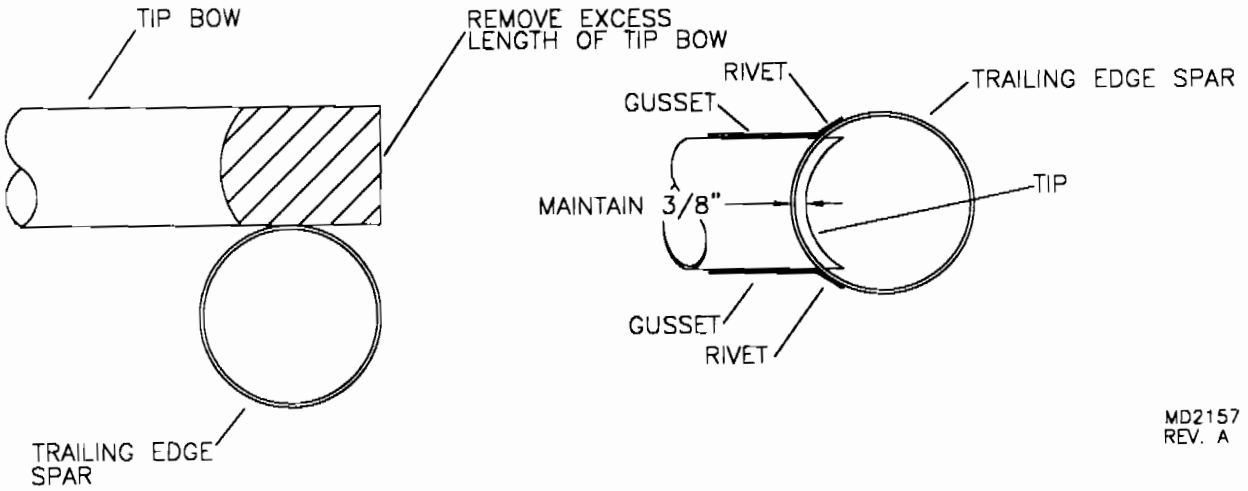
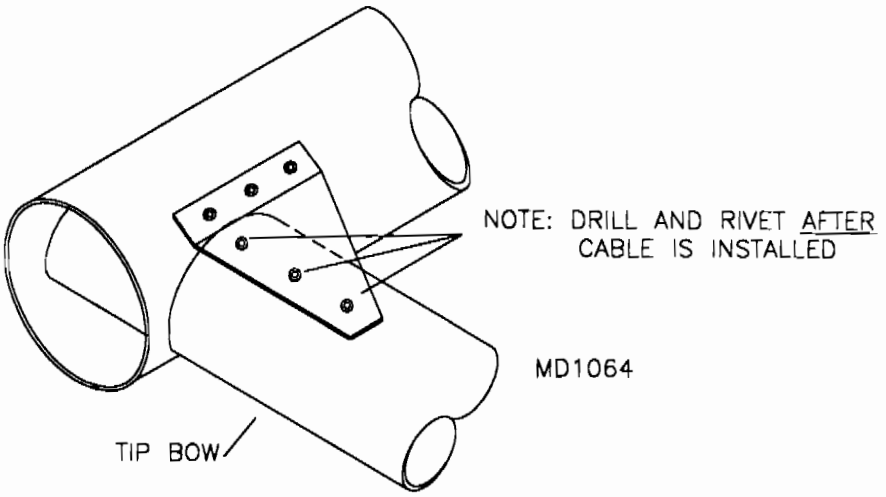
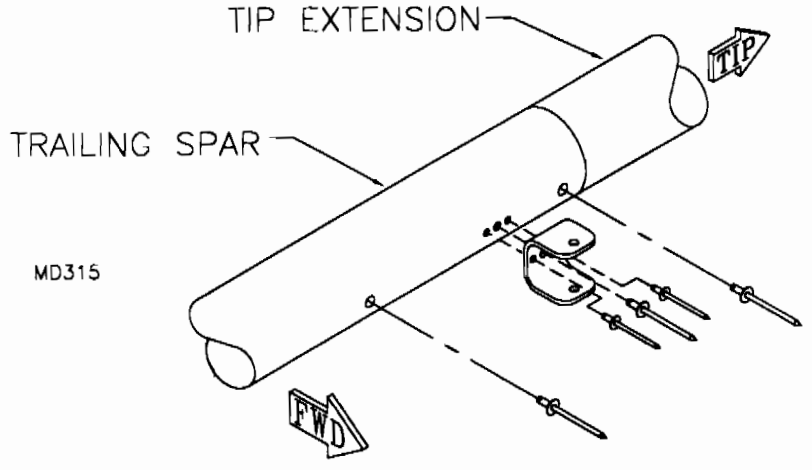


FIGURE 09C-19A



20. Once the tip bow is secure, rivet the tip extension to the spar with two (2) 3/16" stainless steel pop rivets. Locate them on the **FRONT** side of the spar. **CAUTION:** These rivets must be stainless steel pop rivets. **DO NOT** use aluminum pop rivets. Install rivets as shown in **Figure 09C-20**. **NOTE:** After the extension is riveted, drill through the doubler and rivet the S2-SAB's trailing edge spar on the spar's **FRONT** side. There should be a #11 hole located 3 3/4" inboard of the TES splice. Drill a #30 hole on each side of the 3/16" rivet in the S2-SAB and install the 1/8" stainless steel pop rivets as shown in Figure 09C-20. **CAUTION:** These rivets must be stainless steel. Do **NOT** use aluminum rivets.

FIGURE 09C-20



21. Shape the tip wraps into half round curves by pressing them over the 3" and 1 3/8" tubes where they are to be installed. Shape the wraps so they flow into the tip without bulges. Rivet the tip wraps to the leading edge spar and tip bow with four (4) 1/8" stainless steel pop rivets. Overlap the tip wrap onto the spar about 3/8".

22. Install the W-WC-50 and W-WC-58 cables used to stabilize the wing tip's last two bays. The W-WC-50 is installed by bolting the shorter cable between the AFT spar's S2-SAB at the strut plate, and the S2-SAB bracket at the outboard inner compression tube. The W-WC-58 cable is also bolted to the S2-SAB bracket on the outboard inner compression tube and to the wing tip corner gusset. See **Figure 09C-22**.

First, bolt the thimble end of the **SHORT** cable to the S2-SAB at the AFT strut plate using an AN3-16A bolt, plastic washer, 1/4" X .028 X 3/16" bushing, and a 3/16" shear nut. Fabricate the bushings by drilling the raw stock out to #11 and then cutting to length. See **Figure 09C-22A**. Now insert the AN3-16A bolt up through the other S2-SAB and the compression tube (threads up) and place the adjustable tang of the short cable on the bolt. Place the tang of the **LONG** cable on the bolt using the hole nearest the tang end. Pull the cable taunt and mark the hole location on top of the wing corner gusset and drill a 3/16" hole. Remove the nut retaining the tang ends of the cables and slip off the tangs. Next, bolt the thimble end of the long cable to the **UNDERSIDE** of the wing tip corner gusset using the AN3-4A bolt, #10 SS Washer, 1/4" X .028 X 3/16" bushing, and 3/16" shear nut. See **Figure 09C-22B**. Place the tangs of both cables back on the bolt. Using the hole in the adjustable tang tension the tip to 1/8" "bow". Use a straight edge to measure. Place the washer and shear nut back on the bolt and secure. See **Figure 09C-22**.

FIGURE 09C-22

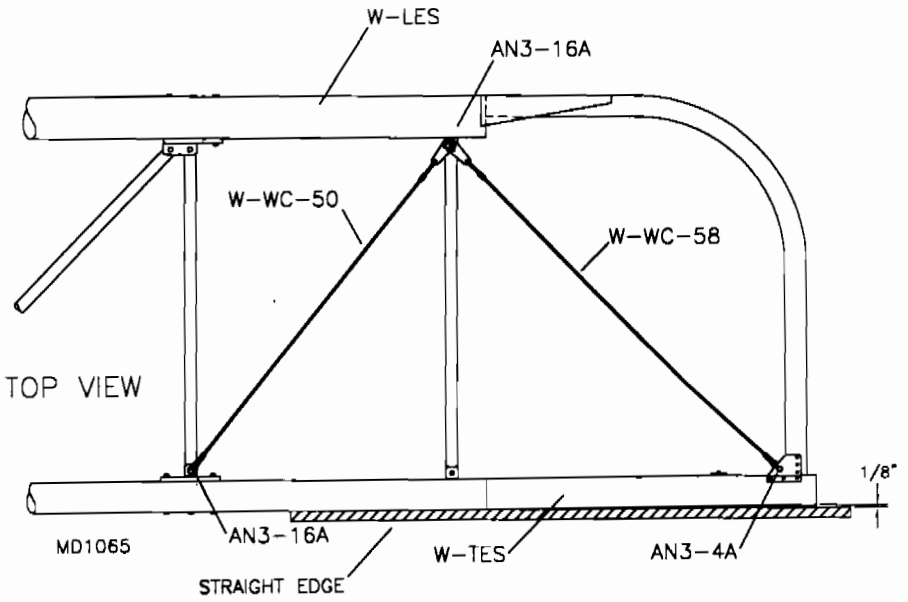
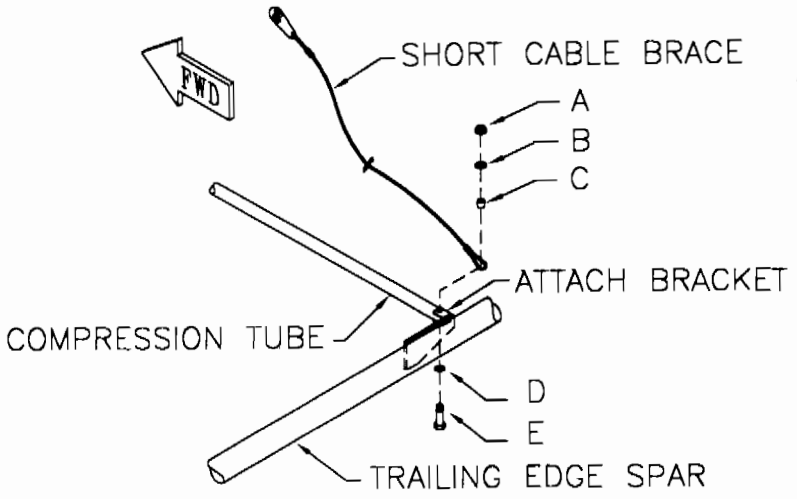
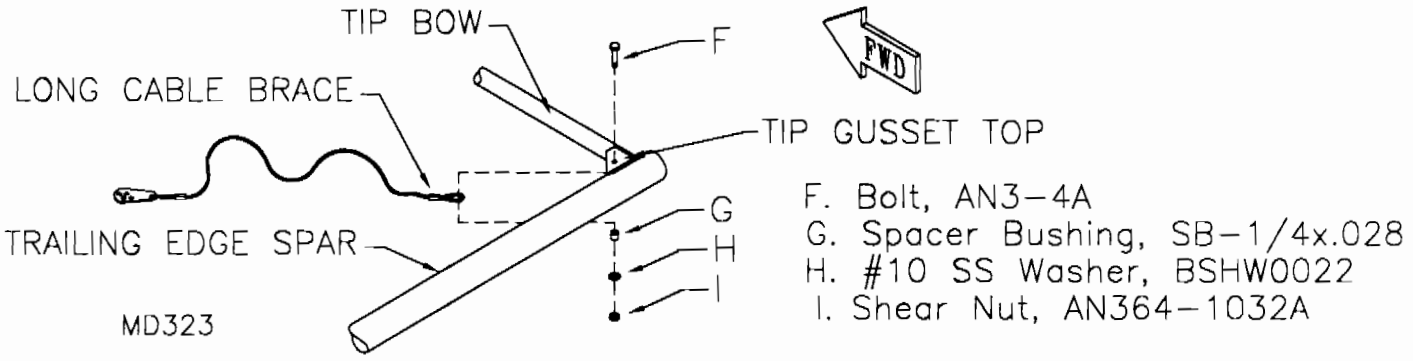


FIGURE 09C-22A



A. Shear Nut, AN364-1032A
B. #10 SS Washer, BSHW0022
C. Spacer Bushing, SB-1/4x.028
D. Thick Washer, AN960-10
E. Bolt, AN3-16A

FIGURE 09C-22B



BUILT-UP RIB INSTALLATION

26. A built-up rib needs to be installed to the outer most compression tube. Insert the duckbill shaped end fittings into both ends of the Tension Top Rib. Dimple the ribs with a center punch to secure the end fittings. Refer to **Figure 09C-26**. Place the Root Rib used for the opposite wing between the spars at the tip, up against the inside of the outer most compression tube. Use the root rib as a "contour guide" to place the four (4) tension rib supports. **NOTE:** Open side of supports must face aft. See **Figure 09C-26A** and **Figure 09C-26B**. The end fitting should fit tight against the spars. Drill #11 the underside of the Top Tension Rib to slip over the compression tube aft bolt. Drill #30 the support ribs and cleco. Remove Root Ribs once the tension ribs are fitted with support ribs. Debur and rivet.

FIGURE 09C-26

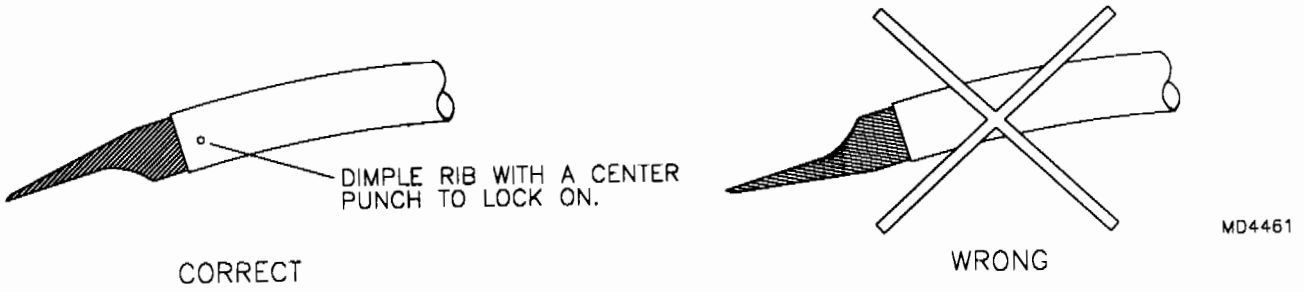


FIGURE 09C-26A

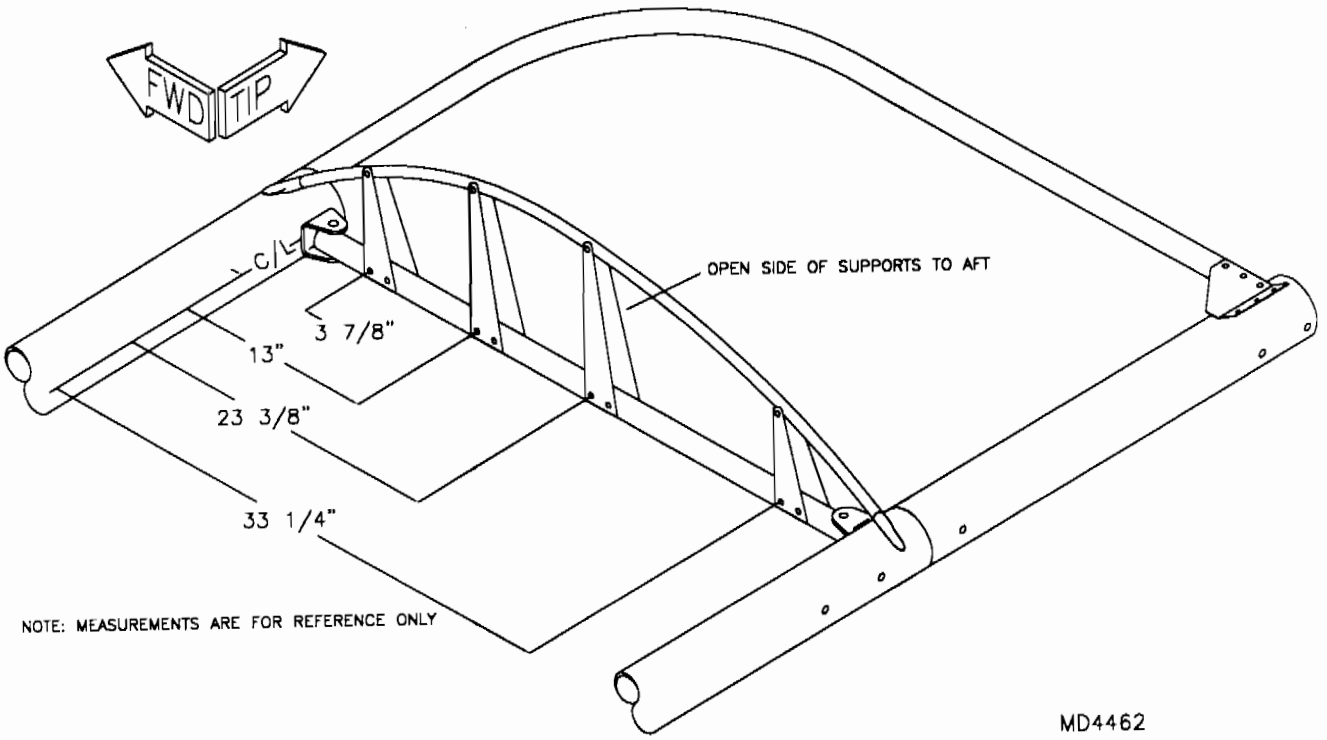
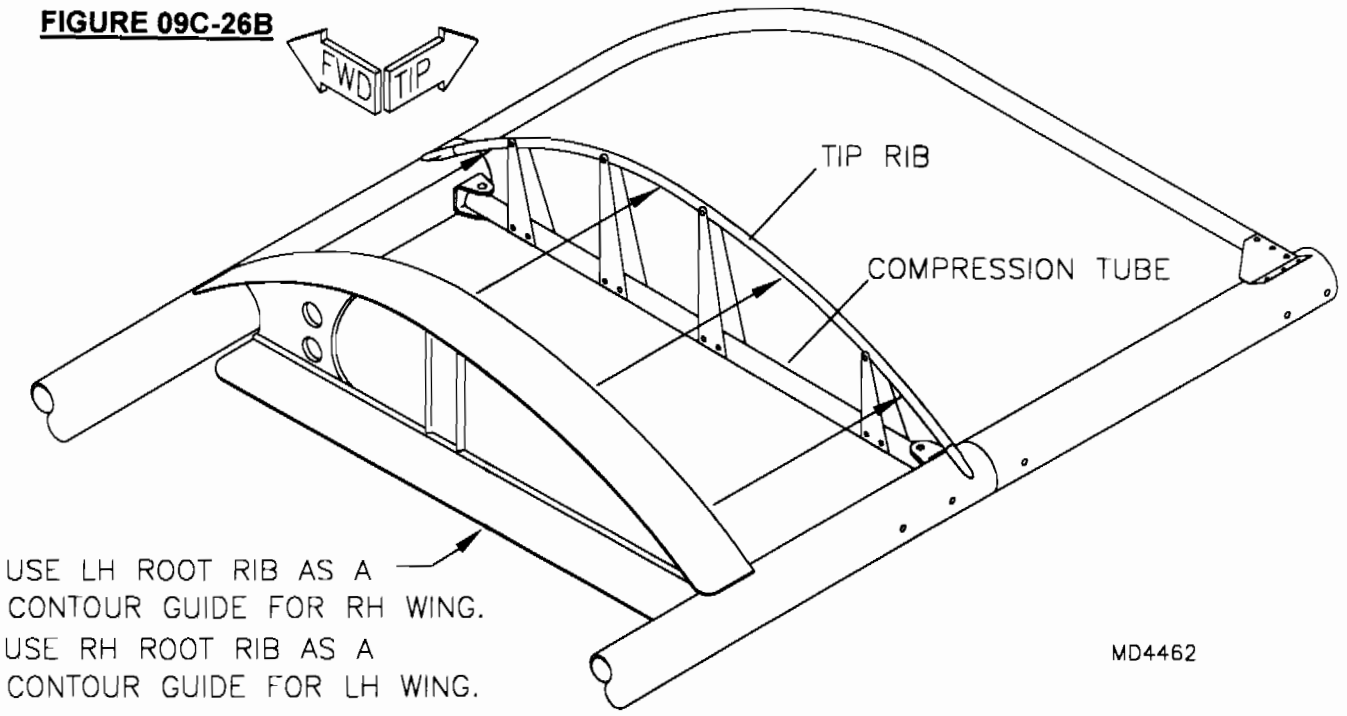


FIGURE 09C-26B



TURN TO THE FUEL SYSTEM FOR ASSEMBLY DETAILS BEFORE CONTINUING.

In the next section we discuss setting up the ailerons and flaps. You may want to do this with the wing attached, if so, turn to the root rib assembly followed by the strut assembly. This will bring you up to the point where the wings are on the plane setup with the correct washout and dihedral.

RIGGING THE FLAPS AND AILERONS

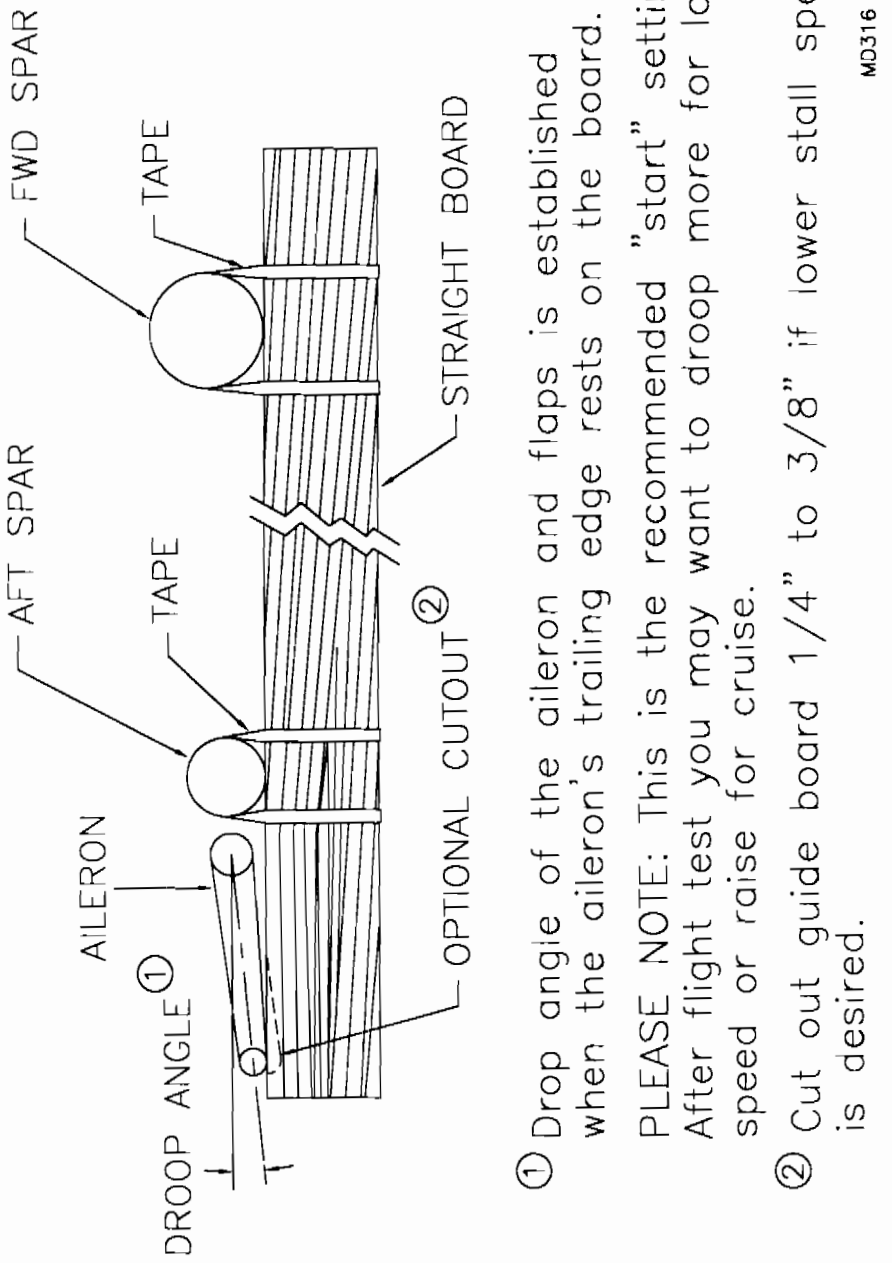
27. To set up the aileron rigging, attach the ailerons and flaps to the wing using the hinges. Put the ailerons and flaps on the side of the hinge that gives the best matched fit. Only finger tighten the nuts to the hinge bolts at this time.

28. Apply a drop a blue loctite and screw the male rod ends into the ends of the push pull tubes until bottomed out on the threads. The short push pull tube is screwed into the rod ends attached to the bellcrank after covering the wing. Install the aileron push pull tubes using the hardware depicted in the aileron push pull tube parts drawing. **IMPORTANT:** The long push pull tube bolts to the **TOP** of the aileron bellcrank. Slip a push pull guide over the long push pull tube before bolting to the bellcrank. The guide will be riveted to the second outboard compression tube in a later step. The short push pull tube bolts to the **BOTTOM**.

29. Before beginning rigging of the ailerons check the control stick and control tee. The control tee must be centered when the sticks are neutral. If this is not the case review rigging instructions for the control stick and tee under control stick assembly. With the control tee centered adjust the long push pull tubes so the bellcranks are in the neutral position. Refer to **Figure 09C-16A**. Find two very straight boards at least 60" in length. These will be used to set the droop angle of the flaps and ailerons. The droop angle is shown in **Figure 09C-29**. Firmly tape the boards on the bottom of the wing spars. Let the boards overhang off the AFT spar at least 8". The aileron trailing edge should rest on the board to set the proper angle of droop. Adjust the rod ends on the short aileron push pull tube until the aileron is set. **IMPORTANT:** The rod ends must be screwed into the ends of the push pull tubes a minimum of 10 full turns to have acceptable strength for flight loads. Remove the boards once both ailerons are set. Test the system by displacing the control stick side to side.

The aileron bellcranks are set up to displace twice as much as up as down. You can check this very simply by measuring the difference from neutral position up and down. If this is not the case it means the bellcrank was not at the neutral point. Refer to **Figure 09C-16A** to check for the neutral bellcrank position. Use blue loctite to keep the push pull tubes in this setting. The short push pull tube will be removed to allow installation of the wing covering. After the wing covers are attached, apply a drop of blue loctite to the end of the forward push pull tube. Screw it into the rod end that was left attached to the aileron bellcrank.

FIGURE 09C-29



S-14 AIRAILE 139 WING LIFT STRUTS

INSPECTION OF THE AIRFOIL LIFT STRUTS

RANS airfoil lift struts are made of extruded aluminum. Extrusion of this nature are sensitive to deformation. Cracks and splits can occur along the length of the strut if the ends are compressed beyond the materials limits. Over tightened bolts can cause cracking. A compression bushing or fitting thick 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 prior to use. Inspect the strut 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.

Minor nicks and scratches can and should be sanded out with 250, 350, and finally 400 grit wet or dry sandpaper. Sanding out such defects is an effective way of restoring the strut to a safe full strength status. Any nicks or scratches that need more than light sanding are cause for rejection.

Once the struts are in service only continued inspection is required for maintenance. Anodized strut material is resistant to corrosion and needs little care. However, non anodized material will corrode in salt air environment and needs to be protected inside and out. External protection can be effected using epoxy paints or another high grade finish. The inside of the strut can be protected with paint by pouring a quantity of paint inside the tube and rotating to cover the entire inside surface.

Include strut inspection in with your pre-flight.

S-14 AIRAILE 139 WING INSTALLATION & SETTING WING WASH OUT

1. Select the parts depicted in the struts part drawings. **NOTE:** Aft adjustable lift strut must be cut to length.

FIGURE 09D-01

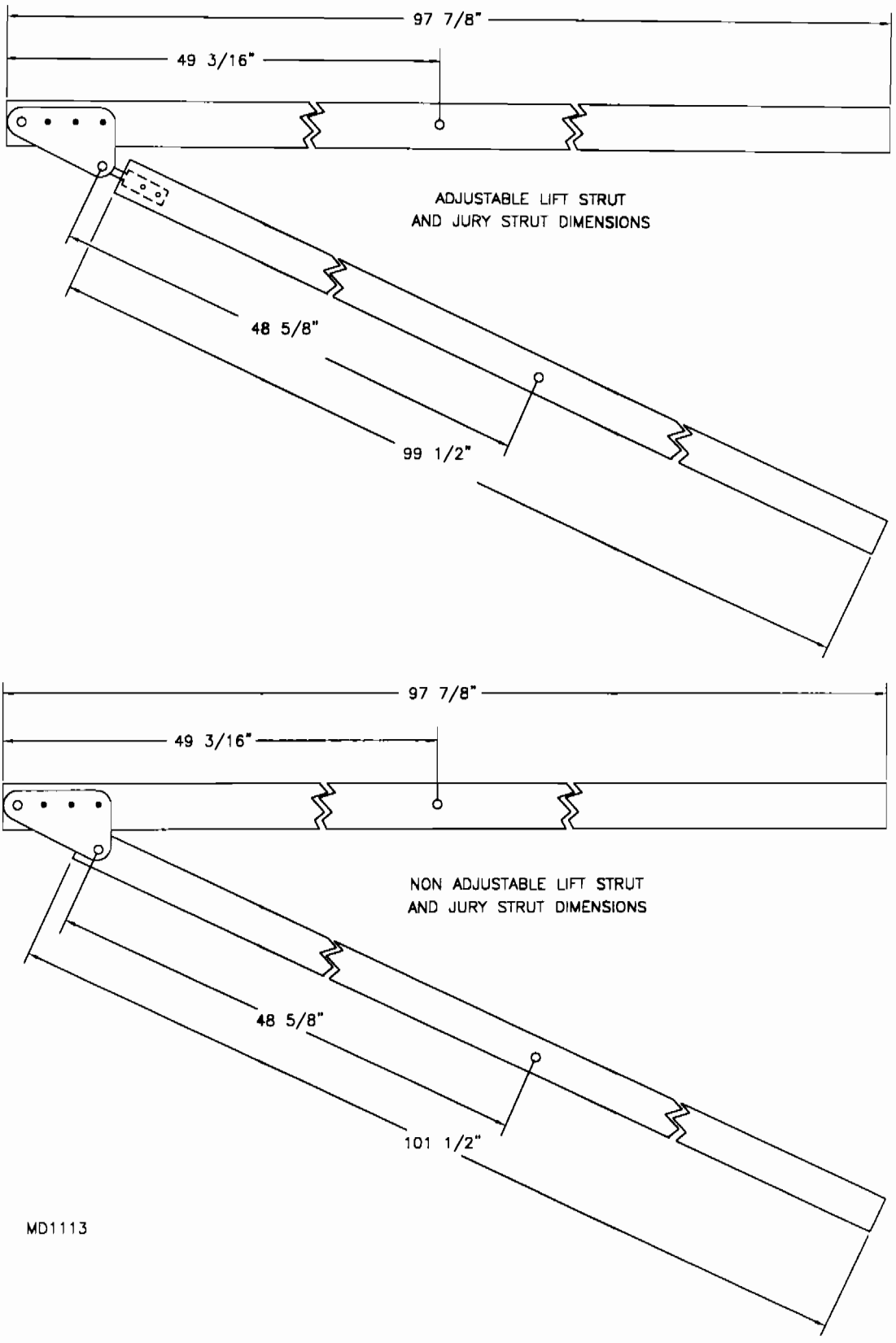
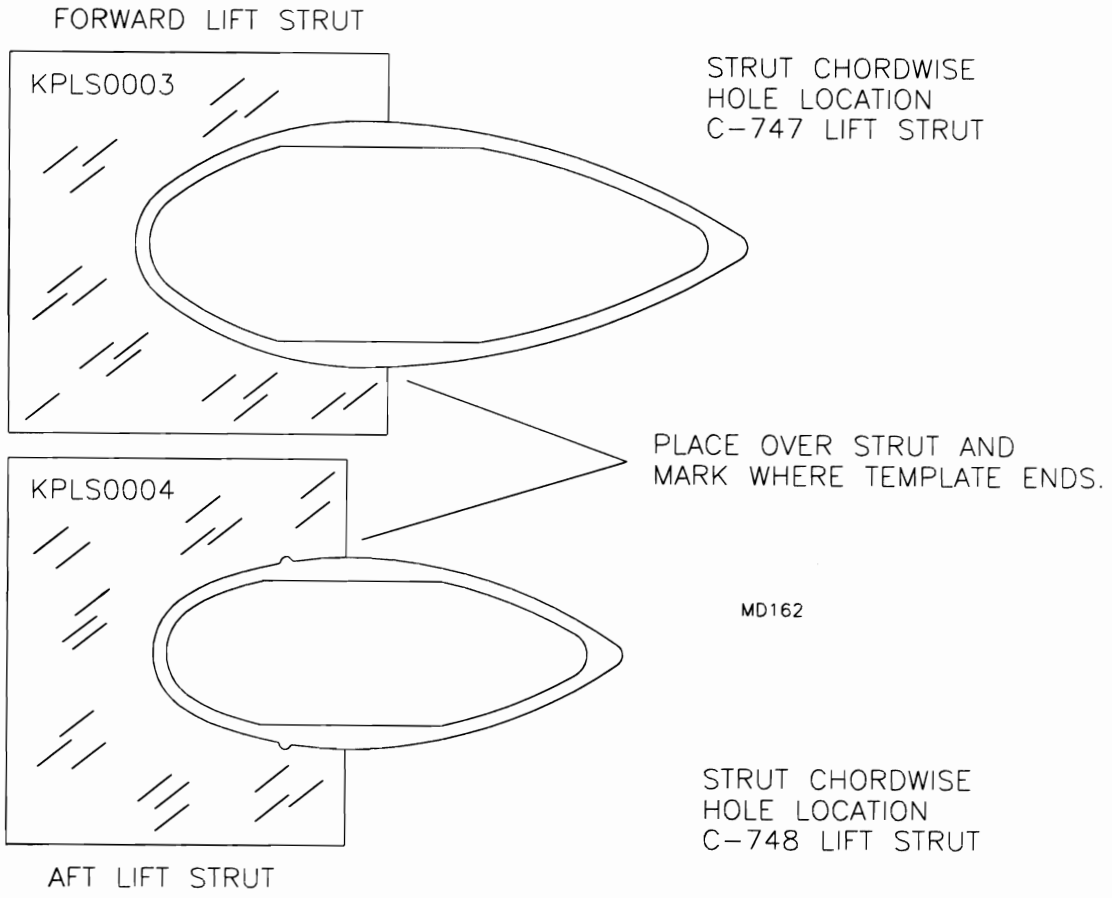


FIGURE 09D-01A



2. Take the two 97 7/8" lengths of strut material and locate and drill a 5/16" hole 5/8" in from one end and a 1/4" hole 1/2" from the other. A second hole will be drilled in the 1/4" hole end, this will become the "top" end. Use the templates in **Figure 09D-01A** to locate the exact position of the holes cross wise on the struts. See **Figure 09D-02** for the hole locations. 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. Instead, use the .020 shim material to insure a tight fit. At the root fittings of the lift strut washers or shims may be required. See **Figure 09D-02A** for guidelines to make these shims. Assemble the fittings to each end as per the parts drawings. To install the gusset plates use **Figure 09D-02B** for reference. **NOTE:** Drill out the fitting 5/16" as required. Rivet the gusset plates to the forward lift strut with 3/16" stainless steel pop rivets.

FIGURE 09D-02

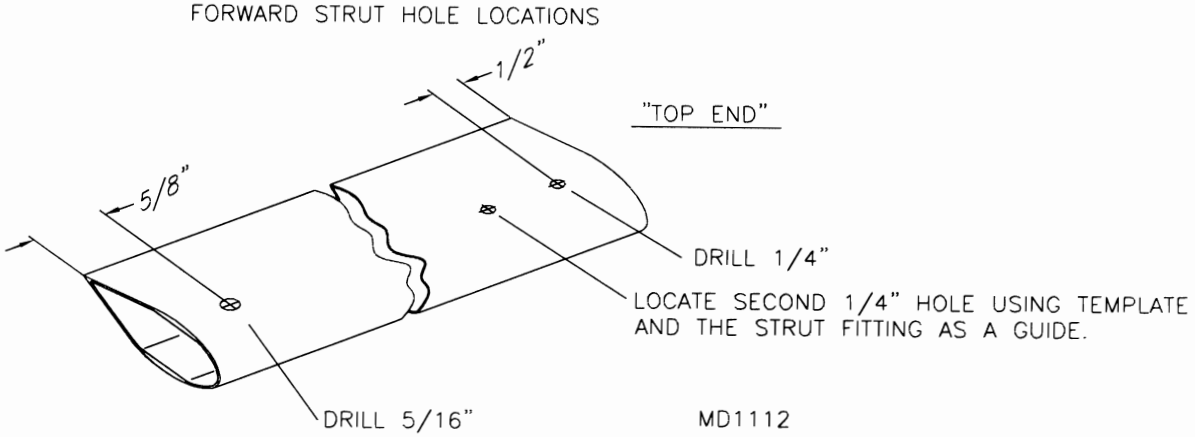
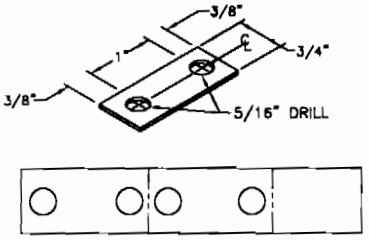


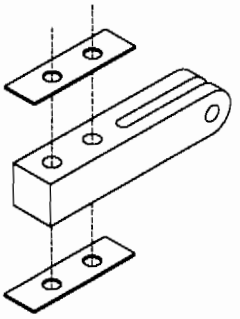
FIGURE 09D-02A

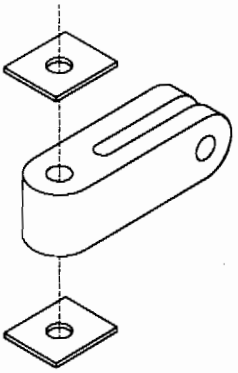
S-14 139 WING LIFT STRUT SHIMS

UPPER FWD STRUT SHIM

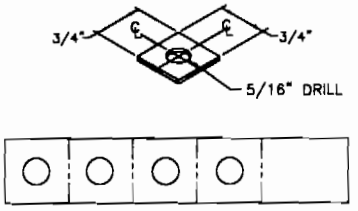


HINT: DRILL HOLES IN SHIM STRAP THEN CUT TO LENGTH. MAKE AS REQUIRED.

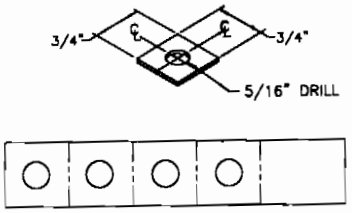


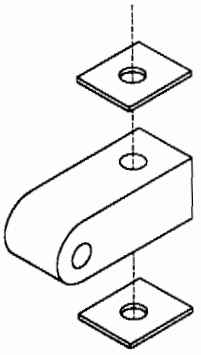


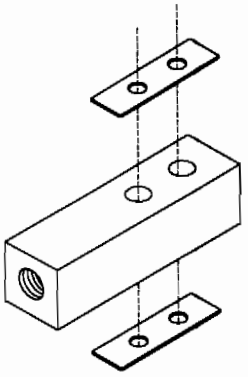
UPPER AFT STRUT SHIM



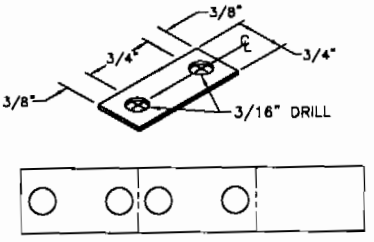
LOWER FWD STRUT SHIM





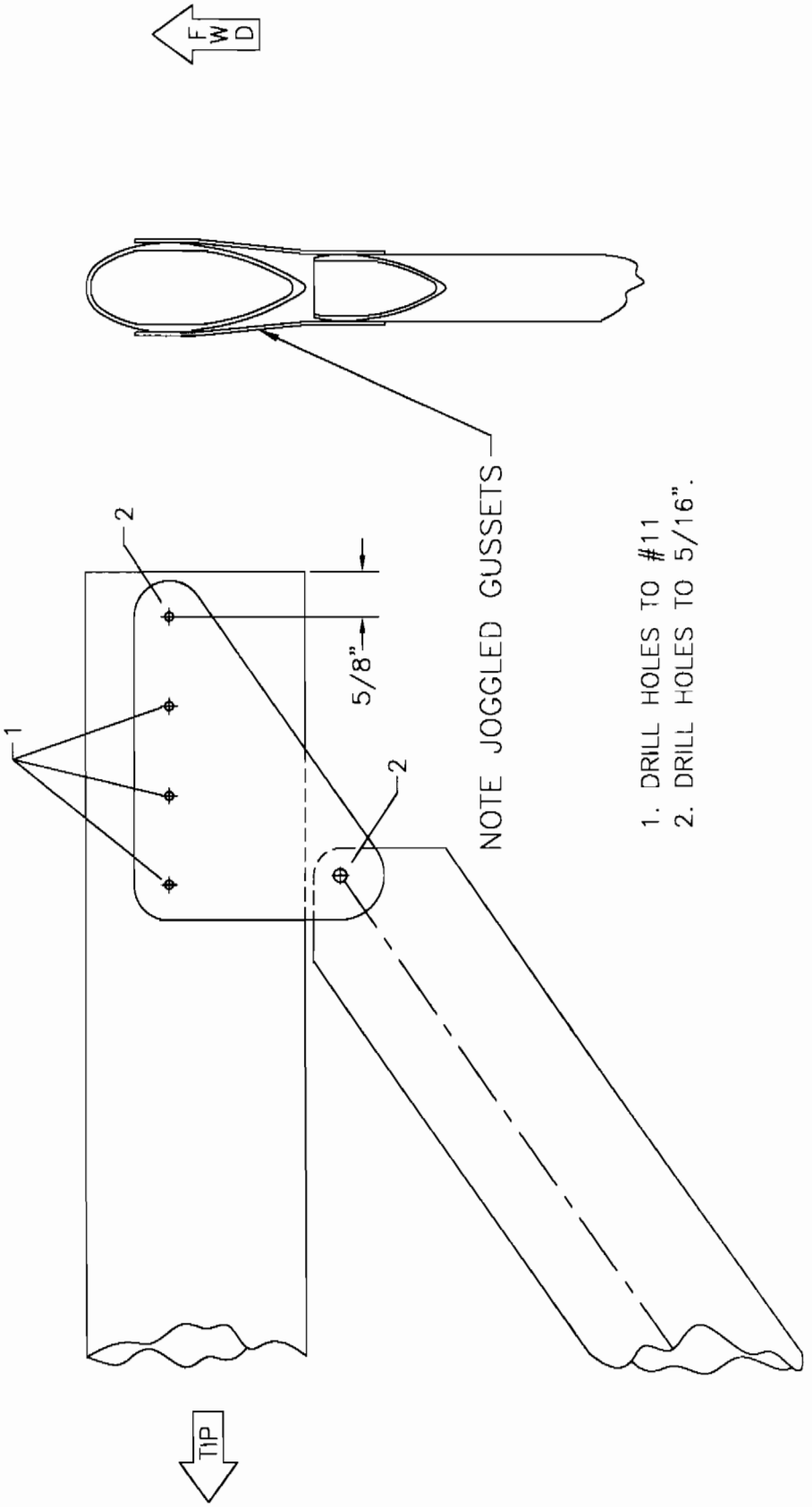


OPTIONAL ADJUSTABLE STRUT SHIM



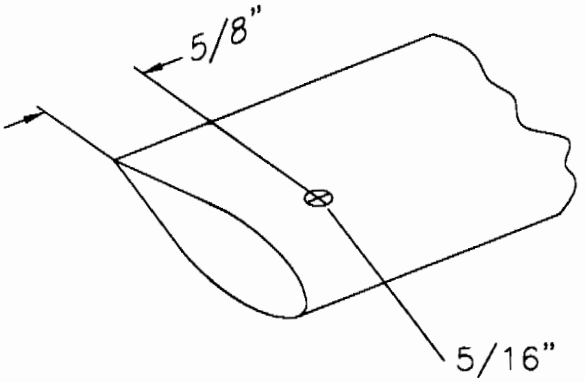
MD1114

FIGURE 09D-02B



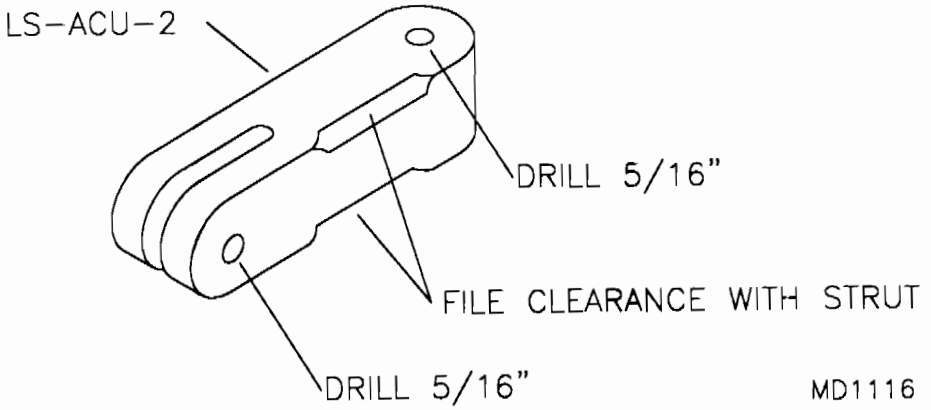
3. Select the AFT lift struts, they should be 101 2" in length. Drill the AFT lift struts on one end only to a diameter of 5/16" at an edge distance of 5/8". See **Figure 09D-03**. Be sure to use the hole locator to position the hole on the strut chordwise.

FIGURE 09D-03



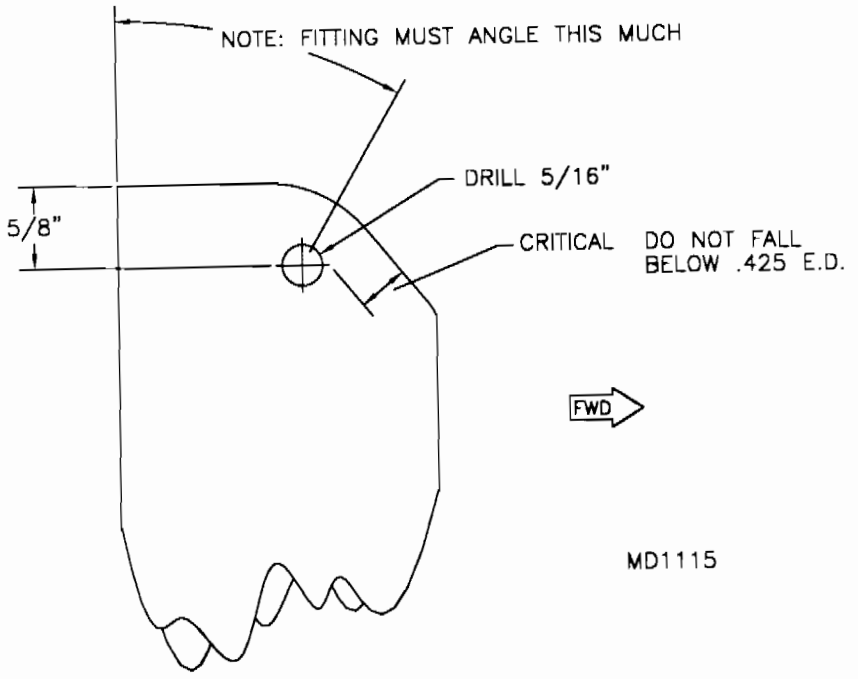
4. Drill out the two #11 holes to 5/16", see **Figure 09D-04**.

FIGURE 09D-04



4A. Trim the AFT lift strut top end as shown for fitting clearance in **Figure 09D-04A**.

FIGURE 09D-04A



5. Bolt the fittings into the AFT lift strut top ends. Place the washers on each side to center the fitting in the strut.

6. Bolt the FWD lift struts in place with the AFT lift strut gussets pointing AFT. The FWD lift struts automatically set the dihedral.

7. Use the template shown in **Figure 09D-01A** to mark a line for several inches at the strut's lower end showing chordwise location for the hole. Rough trim the lower end of the strut to the shape shown in **Figure 09D-07**. **NOTE:** To trim and drill the **ADJUSTABLE LIFT STRUTS** use **Figure 09D-07A** as a trimming guide. Bolt the AFT lift struts to the wing and place the undrilled end between the gussets. **PLEASE NOTE:** The wash out will be set by twisting the wing. The proper twist lifts the rear spar higher than the forward. 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. Install the anti-crush bushing inside the lower AFT strut. **IMPORTANT:** 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. Instead, use thin washers or file the crush bushing to insure a tight fit.

FIGURE 09D-07

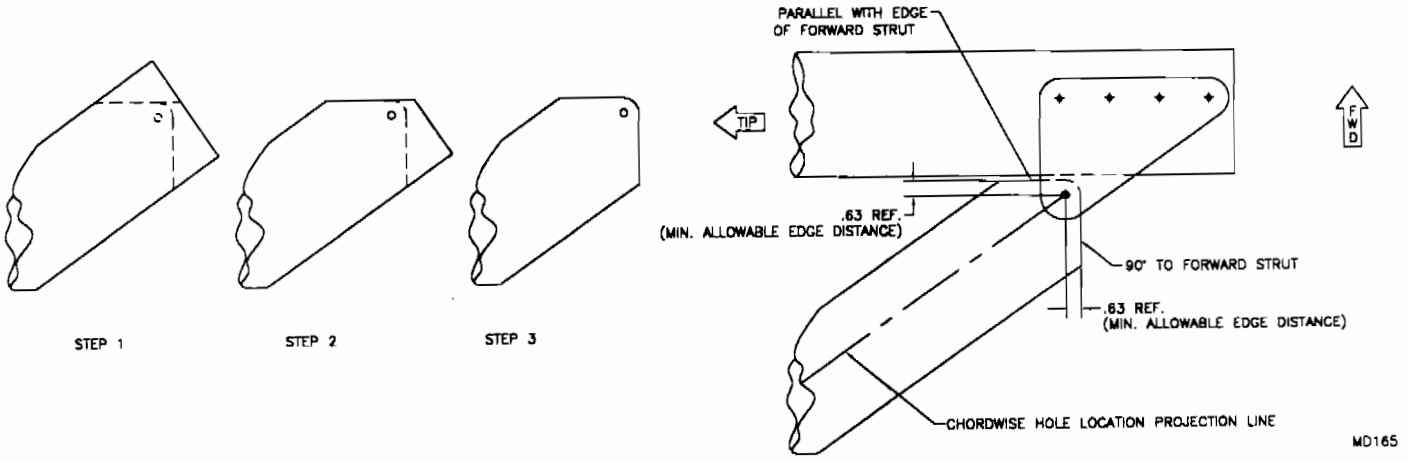
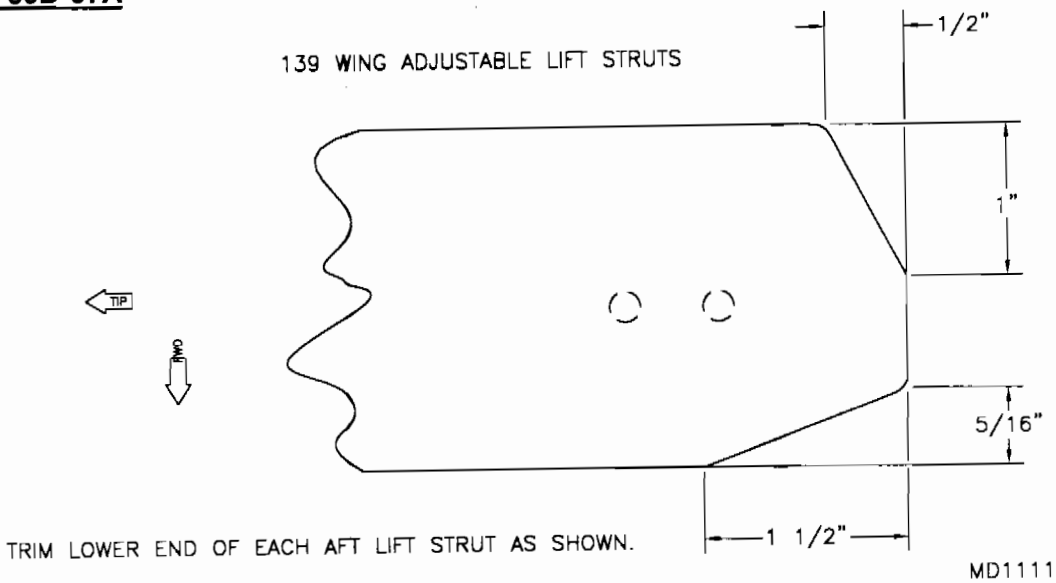
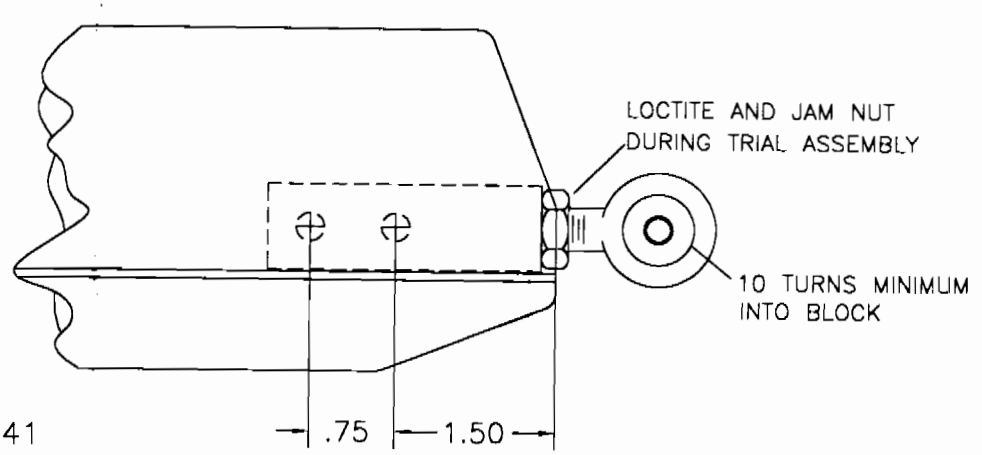


FIGURE 09D-07A



8. For the adjustable lift strut option refer to **Figure 09D-08** for dimensions to use as a guide in setting up the rear lift strut.

FIGURE 09D-08



NOTES:

A. FWD strut sets up with the same fittings as standard. Must have joggled gussets.

B. Cut AFT strut to length.

C. Trim lower AFT strut (use Figure 09D-07A as a guide).

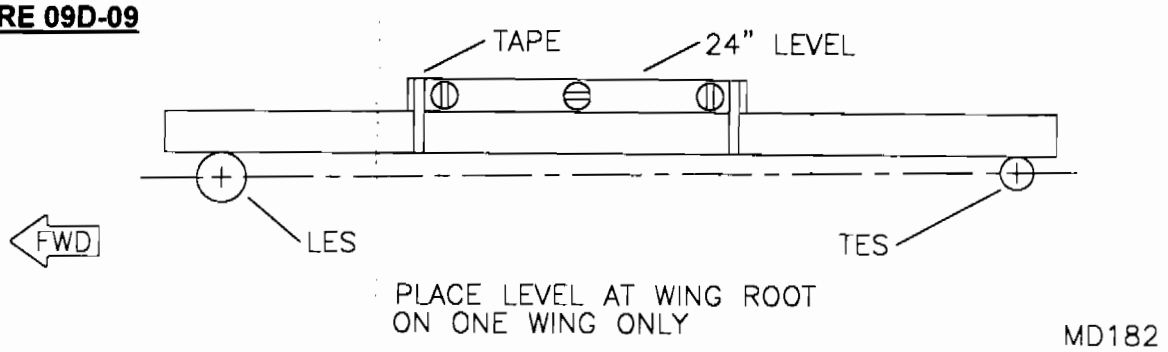
D. Install the upper strut connector as normal.

E. Install the adjustor block as shown.

F. Hook up the strut and adjust the eyebolt.

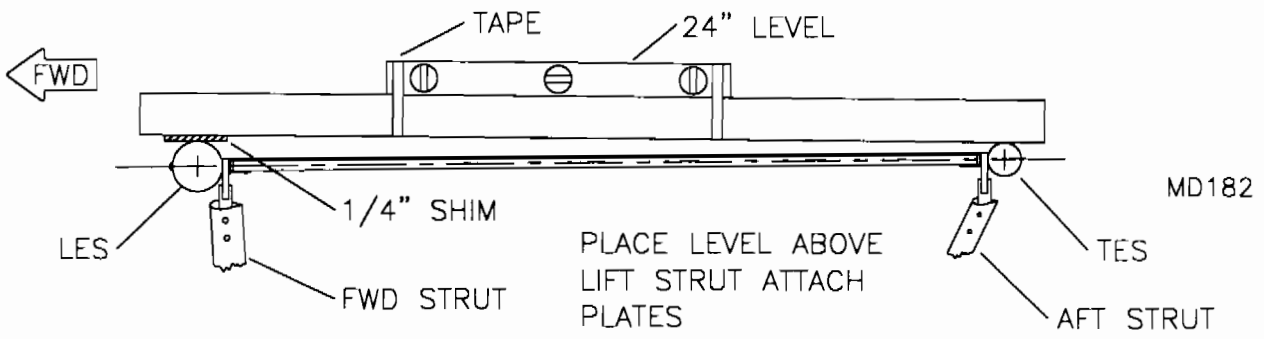
9. Make a rigging level by taping a 2 foot level to a straight 50" long, 2" X 3/4" board. Place the level on the wing's topside at the root. The level should be held against each spar. Raise the main gear until it reads level. **CAUTION:** Block wheels to prevent rolling. Double check the level prior to step 10. See **Figure 09D-09**.

FIGURE 09D-09



10. Cut out a scrap of 1/4" plywood 6" X 2" and nail or screw it to one end of the straight edge. Place the rigging device just outboard of the right wing's strut with the 1/4" block on top of the FWD spar. See **Figure 09D-10**. This will set the "wash out". Move the AFT spar up or down as required to obtain a level reading. Use a vise grip "C" clamp to hold the setting. Check for accuracy before drilling. Mark on the fitting with a pencil where the lower end of the strut is. Use the gusset fitting to line up on the mark and the chordwise marks to drill the bolt hole. Drill 5/16", then assemble. Be sure to place the anti-crush bushing on the inside of the AFT strut lower fitting. Remove the pencil marks afterwards or the graphite will cause corrosion.

FIGURE 09D-10



11. Go directly to the other wing's outboard strut location and set the wing. It is not required and can even result in an improper setting if another level reference is taken from the other wing root.

12. Locate a 1/4" hole through the AFT lift strut for the jury struts eyebolt 48 5/8" from the **lower** 5/16" **bolt center**. Use the template to locate chordwise on the strut **Figure 09D-01A**. See **Figure 09D-01** for overall dimensions covering both non adjustable and adjustable lift strut and jury strut dimensions.

Locate a 1/4" hole through the FWD lift strut for the jury struts eyebolt 49 3/16" from the **lower end** of the FWD strut. Use the template to locate chordwise of the strut **Figure 09D-01A**. See **Figure 09D-01** for overall dimensions covering both non-adjustable and adjustable lift strut and jury strut dimensions.

13. Collect the parts called out in the parts list for the jury strut. It is assumed the aircraft is assembled with the wings and struts on.

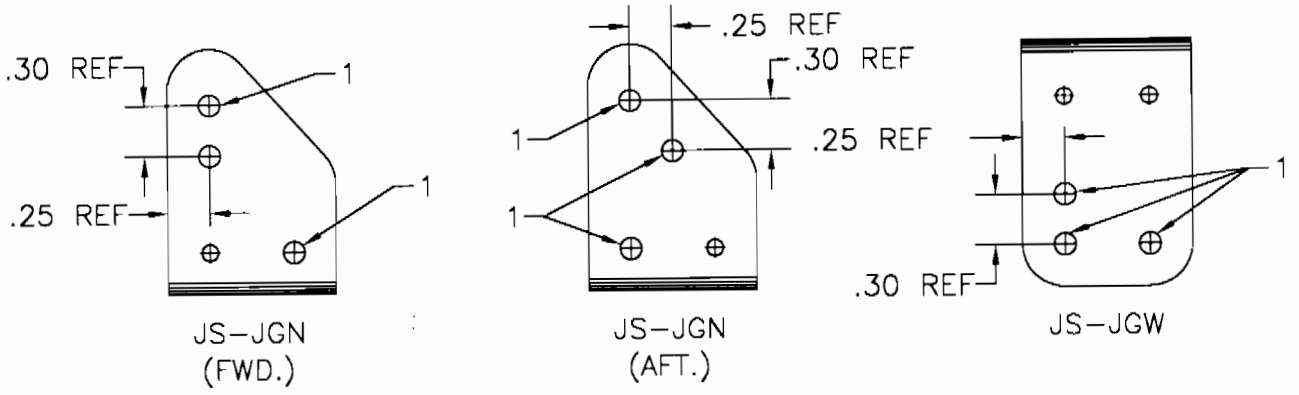
14. For standard non adjustable struts cut the tubing provided for the jury struts to the following lengths.

(2)	26 3/8" X 2" X .035 6061-T6	Diagonal Jury Strut
(2)	15 3/8" X 2" X .035 6061-T6	Forward Jury Strut
(2)	21" X 2" X .035 6061-T6	Cross Jury Strut

15. Drill out the holes to #30 as shown in **Figure 09D-15**.

16. Bolt the eyebolts to the struts with the flanges 90 degrees to the aircraft centerline. Be careful not to over tighten.

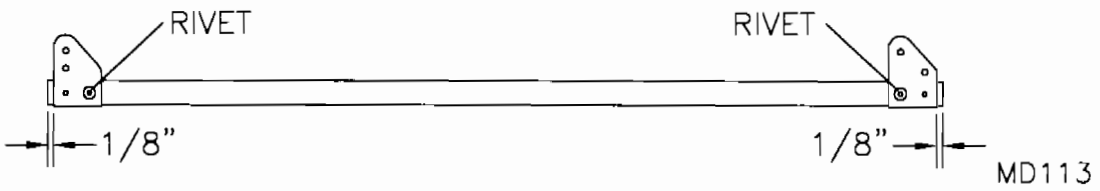
FIGURE 09D-15



17. Insert the aluminum bushings into the ends of the two crossing tubes. Retain the bushings by making a slight dimple on the tube with a punch.

18. 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 1/8" from the gussets. See **Figure 09D-18**. Rivet the gussets to the tube via the #30 holes using #30 stainless steel pop rivets.

FIGURE 09D-18



19. Cotter pins are used to retain the clevis pins to the crossing tube via the smaller undrilled holes in the gussets. Drill through the bushing insert with a #40 bit.

20. To fold: remove the quick pin and fold toward tip.

21. If everything was done accurately the aircraft will not have any tendency to drop a wing in a stall or not hold heading. If these bad manners are prevalent and it is discovered, the wings are not set properly. It is a simple matter of installing and drilling a new AFT lift strut connector. Otherwise, it could be unequal flap or aileron settings. Raise or lower the flaps as required. (EXAMPLE: If the plane pulls to the right lower the right hand flap slightly or raise the left.) Do not forget to consider engine alignment of the plane does not fly straight. (See engine.) Turn to covering the wings in the covering section.

JURY STRUT FAIRINGS

The builder will cut the fairings to length and trim to fit, the tighter the better. Consult the adjacent drawing and Table 1 to determine the proper fairing length for your airplane.

Two #40 rivets should also be installed on the inboard side of each fairing to prevent rotation.

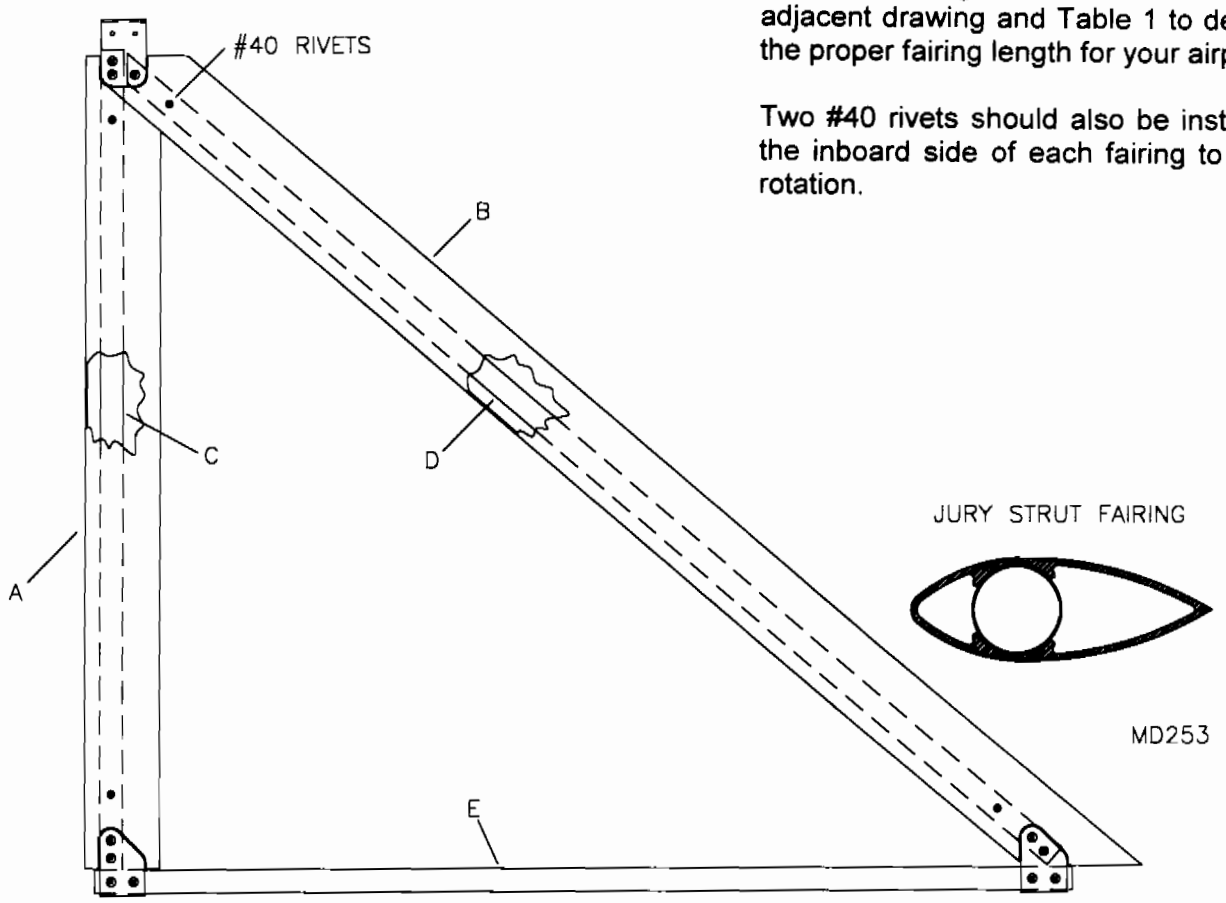
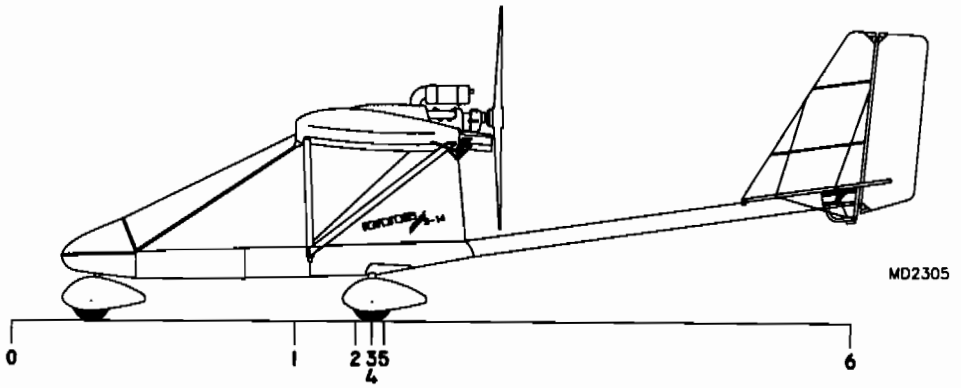


TABLE 1
JURY STRUT FAIRING DIMENSIONS

RANS AIRCRAFT	A	B	TOTAL PER SIDE
139 Wing	16"	27"	43"

TABLE 2
JURY STRUT DIMENSIONS

RANS AIRCRAFT	C	D	E	TOTAL PER SIDE
139 Wing	15.38"	26.38"	21.00"	62.76"



N_____	
DATE WEIGHED	
ENGINE TYPE	
C.G. CONDITION	
EMPTY WEIGHT	
MTOW (447)	675 LBS.
MTOW (503)	750 LBS.
MTOW (582)	775 LBS.

RANS S-14 AIRAILE
WEIGHT AND BALANCE

ACCEPTABLE C.G. 101" TO 110" FROM DATUM 0.
DATUM = 24" AHEAD OF CENTER OF NOSE WHEEL
AIRCRAFT IN LEVEL ATTITUDE.

BECAUSE THE S-14 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 NOSE WITHIN 1" OF THE FLOOR. ASSUMING THE FLOOR IS LEVEL, THIS WILL PUT THE S-14 IN THE REQUIRED FLIGHT LEVEL ATTITUDE. THE DATUM OCCURS 24" AHEAD OF THE NOSE GEAR AXLE. IF YOU ADD A NEW ITEM, MEASURE THE ARM FROM THIS POINT. OTHERWISE 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-14 IS NOT CURRENTLY EQUIPPED WITH A BAGGAGE COMPARTMENT. IF SUCH A CARGO SPACE IS DESIRED, PLEASE LOCATE IT AS RECOMMENDED.

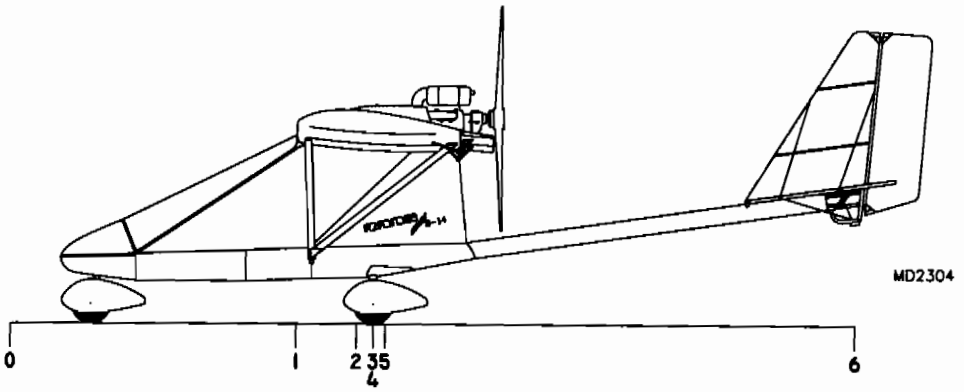
#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT	140	85"	11900
2	CABIN FUEL *	50	103"	5150
3	MAIN GEAR LEFT	221	108"	23868
4	MAIN GEAR RIGHT	221	108"	23868
5	WING TANK	45	109"	4905
6	TAIL (STD. WING ONLY)	34	232"	7888
	TOTAL=	711	TOTAL=	77579

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}}$ = C.G. $\qquad \frac{77579}{711} = 109.11"$

#	ITEM	WEIGHT	ARM	
1	PILOT		85"	
2	CABIN FUEL *		103"	
3	WING TANK		109"	
4	MAIN GEAR LEFT		108"	
5	MAIN GEAR RIGHT		108"	
6	TAIL (STD. WING ONLY)		232"	
	TOTAL=		TOTAL=	

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

* OR 50LB. BAGGAGE



N_____	
DATE WEIGHED	
ENGINE TYPE	
C.G. CONDITION	
EMPTY WEIGHT	
MTOW (447)	775 LBS.
MTOW (503)	850 LBS.
MTOW (582)	875 LBS.

RANS S-14 AIRAILE (139 WING)
WEIGHT AND BALANCE

ACCEPTABLE C.G. 101" TO 110" FROM DATUM 0.
DATUM = 24" AHEAD OF CENTER OF NOSE WHEEL
AIRCRAFT IN LEVEL ATTITUDE.

BECAUSE THE S-14 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 NOSE WITHIN 1" OF THE FLOOR. ASSUMING THE FLOOR IS LEVEL, THIS WILL PUT THE S-14 IN THE REQUIRED FLIGHT LEVEL ATTITUDE. THE DATUM OCCURS 24" AHEAD OF THE NOSE GEAR AXLE. IF YOU ADD A NEW ITEM, MEASURE THE ARM FROM THIS POINT. OTHERWISE 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-14 IS NOT CURRENTLY EQUIPPED WITH A BAGGAGE COMPARTMENT. IF SUCH A CARGO SPACE IS DESIRED, PLEASE LOCATE IT AS RECOMMENDED.

#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT	140	85"	11900
2	CABIN FUEL *	50	103"	5150
3	MAIN GEAR LEFT	221	108"	23868
4	MAIN GEAR RIGHT	221	108"	23868
5	WING TANK	45	109"	4905
6	TAIL (139 WING ONLY)	31	248"	7688
	TOTAL=	708	TOTAL=	77379

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}}$ = C.G. $\frac{77379}{708}$ = 109.29"

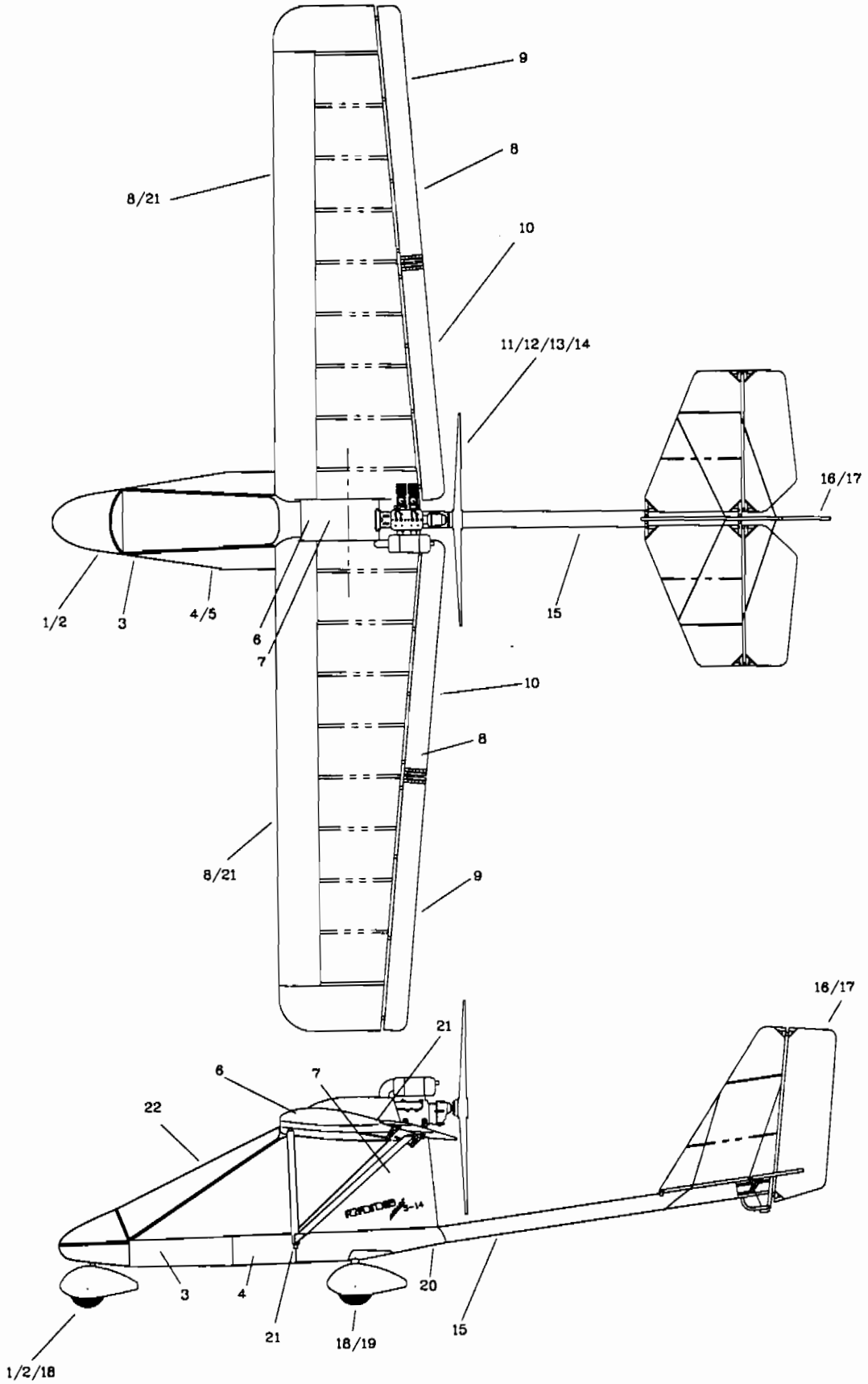
#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT		85"	
2	CABIN FUEL *		103"	
3	MAIN GEAR LEFT		108"	
4	MAIN GEAR RIGHT		108"	
5	WING TANK		109"	
6	TAIL (139 WING ONLY)		248"	
	TOTAL=		TOTAL=	

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

* OR 50LB. BAGGAGE

S-14 AIRAILE PRE-FLIGHT INSPECTION

STANDARD 116 WING & OPTIONAL 139 WING



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 rudder pedals for freedom of movement. Oil the pedals with a light machine oil.

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

5. Check the seat for secure attachment to the frame and position.

6. Inspect the starter rope for wear.

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

8. Check wing spars for bends, dings or deformation.

9. 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.

10. Check flaps for function and condition of hinges. Check the rod ends, they must be threaded on at least six (6) turns.

11. Check the condition of the prop, look for cracks, nicks and dings. Keep the prop clean and the finish up.

12. Inspect the engine mount for integrity, look over the rubber mounts for wear. Keep clean of oil and fuel. Check all bolts for tightness.

13. Check the carbs for security. Check the clamps around the rubber boots. 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.

14. The muffler is a constant 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.

15. Check the tail boom for nicks, dings and dents (dings are smaller than dents).

16. Look over the tail for wear, tear and freedom of movement. Oil the hinges with a light machine oil.

17. 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.

18. Check the tire pressure.

19. Check the main landing gear leg for bends and broken bolts. Inspect the gear socket for damage. Look for bent or compressed tubes.

20. Check the boom collar for a tight fit. Look for cracks in the small tabs welded to 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.

21. Check the strut connections and the integrity of the fittings. Check for hole elongation on all these fittings and rivets.

22. Check the general condition and function of all items in the cockpit. Check the trim wheel and flap lever, lightly grease the small rollers.

ENGINE OPERATION

Provided with your aircraft is a well-written manual from the engine distributor, intended to promote safe and reliable operation of your engine. We urge you to read and fully understand this manual. In addition, you may find the following information helpful.

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 ignition switch up for on. Grab the start handle and pull briskly. The best position to pull start the S-14 Airaile is standing on the right 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 pulls may be needed. Be sure the ignition is on (switch up). Let it idle a moment and then advance the throttle slowly. **NOTE:** After the engine warms up 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. For liquid cooled engines it is recommended to use the Rotax thermostat. This will properly warm the engine and be your best line of defense against a cold seizure.

Check 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. 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!

REASONS FOR POWER LOSS

FOULED PLUG. *Never take off with a fouled plug.* This will be indicated by a sluggish throttle, lack of RPM and roughness. Two-strokes do not unfoul their plugs; they only get worse. So flying to "clear it out" may result in a power loss and a forced landing.

WORN PLUG. Again, throttle and RPM are not normal. Replace with a fresh properly gapped plug. Plugs should be replaced every 25 hours.

CLOGGED AIR FILTER. Spit back, the tendency at low RPM's for the engine to throw fuel out of the carb and into the air filter causes the engine oil to eventually clog the filter. The situation worsens rapidly because the more clogged the air filter becomes the more fuel that spits back. This can occur on a Airaile about every 40 hours. Therefore, it is recommended to clean and re-oil (with air filter only) the filter on a periodic basis. Soak the filter in clean raw gas. Then rinse and let dry thoroughly. Re-oil when dry as per the air filter oil instruction. **NOTE:** The filter oil is K & N brand and is available at most motorcycle shops.

OBTAINING MORE RPM

Due to variations in propellers and engines you may not obtain proper T.O. RPM's. We recommend at least 6000 plus RPM's. Rotax recommends for best engine performance that a full throttle ground static run up should indicate between 6100 and 6400 RPM.

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.

INSPECTION OF ENGINE SYSTEMS

Inspect the Following:

Cracked parts.
Missing or bent bolts and loose nuts.
Elongated holes or cracks at mount plates.
Deteriorated rubber mounts.
General condition.

Carburetor and Throttle:

Position (90 degrees to cylinder).
Clamp tightness.
Throttle and choke cable wear.
Smooth throttle and choke action.
Loose or missing bolts and screws.
General condition.

Muffler:

Spring tension.
Cracks in manifold and welds.
Worn or broken mount brackets.
General condition.

Fuel System:

Leakage anywhere in the system.
Cracked, worn or ruptured fuel lines.
Firm connections.
Fuel pump integrity.
Leaky primer pump/lines.
Fuel tank integrity.
Fuel filter clogs.
General condition.

S-14 AIRAILE OPERATIONS
STANDARD 116 WING & OPTIONAL 139 WING

PRE-FLIGHT: Refer to the pre-flight section of this manual.

STARTING: Refer to the engine operations section of this manual.

TAXIING: Taxiing the S-14 Airaile is easy even in a 25 mph wind. The direct linkage to the steerable nosewheel enhances the ground handling making tight turns a snap.

If the wind is strong, learn to use it to your advantage. Taxiing into the wind with forward stick will increase nosewheel 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-14 Airaile can taxi in winds up to 25 mph. Operations in 35 mph winds have been conducted.

Flying in high winds above 35 mph is also possible. However, this capacity should be only as a means to get out of a situation not to invite one.

FLYING A HIGH THRUST LINE PUSHER

The S-14 exhibits special characteristics due to it's 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 noticed at low speeds. **CAUTION:** During approach to landing avoid high rates of sink, usually a result of flying too slow. If you are too slow and the sink rate is too 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 down tendency is the pitch **UP**. This occurs at **ANY** airspeed when **SUDDEN** reduction on throttle us 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 S-14 Airaile it soon will become second nature to you about these little handling quirks. 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 to live with trait, and one that is hard to design out completely without making some other major trade offs, like prop diameter for one.

TAKING OFF

A normal take off in the S-14 is performed with no 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. Use the trim wheel to ease the work load.

Short or soft field take offs in the S-14 are performed with full flaps and back stick. This will result in the shortest 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

Best rate of climb speed is approximately 60 MPH.

BEST ANGLE OF CLIMB

The S-14 has such a steep angle of climb when climbing at the best rate that it will be a rare case to use best angle climb. In any case, the best angle of climb is accomplished with full flaps and an airspeed between 35 and 45 mph. **CAUTION:** Stalling at 200 to 300 ft. above ground level in this attitude may be impossibly 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-14 will exhibit a wide range of power settings at which one can cruise. Typically loaded with a gross of 750 lbs the best cruise should come in around 5500 with an indicated airspeed of 90 to 95 mph. This is for a 582 powered plane with wheel pants and gear leg fairings.

5000 RPM

5000 RPM will yield the best economy cruise with speeds near 75 mph. This will give the most actual range since the fuel burn will around 3.5 gph.

5500 RPM

5500 RPM would be considered the top of the efficient cruise. GPH is near 4.3.

6200 RPM

Bumping the RPM up to 6200 will yield approximate speeds of 103 mph. Continuous operation at the top of the power band is not recommended. This will greatly shorten the life of your engine, plus waste the most fuel. Avoid this power setting if possible.

STALLS:

To describe the stall properties of an aircraft we use a lot of words having no real universal measure. One man's impression of gentle may be to another a tiger! To compound the matter, each plane can have its own little traits, even if it is a mass produced kit. The subtleties of aerodynamics is just that way, so please approach your stall test with caution. It is highly recommended to take your S-14 to a safe altitude to explore the stall.

The S-14 has a well pronounced pre-stall buffet. The buffet usually occurs at 5 mph above the stall. The actual stall break will vary with entry, but typically the break is mild. A relaxing of back pressure will accomplish recovery. The power on stall has a less definite break, with more of a mush.

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.

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.

Flaps will add the tendency to pitch over more rapidly in both power on and off stalls.

SPINS:

The S-14 spin traits are what I call text book. Entry calls for a fully stalled condition with full deflection of stick and rudder. The first turn is slow but by the second turn things are at full speed. Rotation is 180 degrees per second. To most, this will seem fast. Recovery is crisp, within 40 degrees of recovery input. The S-14 can be spun and recovered with the precision of a fine aerobatic plane. Recovery is typical; opposite rudder to stop rotation, then break the stall and gently level off. The attitude is 70 to 80 degrees nose down, with a 300 ft loss of altitude per rotation.

Spins with partial of full flaps is not recommended. It is easy to exceed the flap extension speed during spin recovery.

NORMAL & STEEP BANKS:

well coordinated 60 degree steep banks are easy to perform. Adverse yaw is low, with very light and balanced stick pressures. The S-14 is a delight to bank!

LANDINGS:

The Airaile is one of the easiest to land planes around, but only if you understand it! What is special about landing an Airaile over conventional aircraft is the fact it is a pusher with low weight. That means there is a lot less energy in the reserve for the approach and flare. A normal landing is performed with no flaps at an approach speed of 50 to 55 mph. Flaps can reduce the approach speeds to 40 to 45 mph.

The plane is flown right 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. In other words the S-14 is landed without a big flare. There are a couple of good reasons for this. One is rotation clearance is close and the beginning Airaile pilot will have a tendency to scrap the tail. Good thing we provide a tail skid! The other reason is related to the low energy. A heavy GA plane will "coast" longer in ground effect, and if you are used to GA planes you will be surprised how quickly the energy fades. If you are used to a high drag ultra light you may be amazed at how well the S-14 floats! By no means does this make the S-14 a bear to land, it is merely the nature of the beast.

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 the stops 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 touchdown line up the aircraft to the runway holding the upwind wing down. The Airaile's trike gear is very forgiving in crosswinds. Touch downs off of center line up to 10 degrees have been conducted without problems.

We can't tell you everything about flying your Airaile. You will acquire the knowledge of your aircraft as your hours in it increase. Each machine 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 **ALWAYS** do a thorough pre-flight.

APPROVED MANEUVERS:

Stalls, all types except Whip Stalls.
Falling Leaf at low power settings (below 4,000 rpm).
Chandelles.
Lazy Eights.
Spins up to 3 turns at low power settings and without flaps only!

ALL AEROBATIC MANEUVERS EXCEPT THOSE APPROVED ARE PROHIBITED!

ASI MARKINGS FOR THE STANDARD 116 WING:

Paint or attach the appropriate colored range indicator arcs on your ASI for the following speeds:

White Arc	38 mph to 70 mph (Stall to maximum flap extension speed)
Green Arc	42 mph to 85 mph
Yellow Arc	85 mph to 120 mph
Red Line	120 mph

ASI MARKINGS FOR THE OPTIONAL 139 WING

Paint or attach the appropriate colored range indicator arcs on your ASI for the following speeds:

White Arc	33 mph to 65 mph (Stall to maximum flap extension speed)
Green Arc	36 mph to 75 mph @ 875 lbs.
Yellow Arc	75 mph to 110 mph
Red Line	110 mph

SPECIAL OPERATIONAL CONSIDERATIONS

Position of Ignition Switch Up is for on, down is for off.

Flight Maneuvers That Induce Negative Load may cause fuel leakage through the vent cap and 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 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 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 re-clamp.

Fuel Shut-Off Valve must be **ON** for flight. **ALWAYS** check it. There is enough fuel retained in the system past the valve to permit a take-off followed by a dead stick landing!

Slow the aircraft in severe turbulence (Refer to the speeds listed below). **AVOID** descending at high rates of speed from high altitudes into unknown conditions. A shear layer may be present at a lower level causing turbulence. Remember, high speeds and severe turbulence may accelerate airframe fatigue and shorten your aircraft's effective service life.

TURBULENCE AIRSPEEDS	116 WING	139 WING
Maximum turbulent air penetration speed is:	85 mph	75 mph
Maximum flap extension speed is:	70 mph	65 mph

KEEP ALL CONTROL surface hinge points and other moving parts well oiled. Use a light machine oil.

SPECIAL SECTION OF FLAP OPERATIONS

IN GENERAL

The flap equipped S-14 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, however take-off/landing distances are longer and speeds are higher. Pay close attention to the recommended flight speeds called out in this section.

The first notch of flaps is used to moderately shorten take-off rolls. Our tests show (1) notch for T.O. is the best. Further flaps have a tendency to increase T.O. distance. The maximum flap extension speed is 70 mph with the standard 116 wing and 65 mph with the optional 139 wing. It is allowable to extend a notch at a time. **EXAMPLE:** 65 mph-1st notch, 55 mph-2nd notch, 45 mph-3rd notch. You'll find that this will give you much smoother approaches with less flap lever pressure.

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 the maximum flap extension (vfe) speed during such approaches...be wary of this.

CAUTION: Inspect the flap lever catches for wear every 100 hours. Keep the rollers lubricated.

PROHIBITED: Spins with flaps extended any degree but 0.

TRAILERING & TOWING PRECAUTIONS

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 wing 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.

DISASSEMBLY FOR TRANSPORT:

The distance, terrain, weather and type of trailer will determine how much disassembly you must do to transport your S-14 Airaile. Usually, we simply remove the wings and hang them on the wall of an enclosed trailer.

FOLDING THE WINGS

One of the nice features of the S-14 is the folding wings. The small tapered wings are easy and quick to fold, however, it is recommended to have a helper. Folding the tail is required only if your trailer is too narrow to accommodate the width.

1. Place wing chocks on the tail if not folding tail.

2. Remove the aileron push rod bolt. This is the single bolt that connects the two aileron push rods at the tee.

3. Un-clip the flap teleflexes from the slotted stops on top of the keel. Make sure the flap teleflexes are free.

4. Check the security of the fuel caps. Please note it is recommended to fold the wings with low or no fuel.

5. Remove the pins at the lift strut to fuselage connection, leaving the fitting inserted in the attach plates.

6. Remove the leading edge pins and swing the wing away then down, flat against the sides of the plane. You will need to hold on to the lift struts as you swing the wing away.

7. Set the wing in the tail chocks and secure the leading edge and tip of each wing. You are now ready to roll the plane into the trailer.

Naturally, disassembly is reverse of the assembly with the exception of those items you decide to leave assembled (tail group, etc.)

CAUTION: Be **VERY** careful when disassembling and transporting your craft not to gouge, scratch or bend the wing struts. The bolts that retain the jury struts can gouge the struts if no packing is used between them. Avoid any method of dismantling or packing that can cause such damage to any part.

MAINTENANCE

COVERING:

The S-14 Airaile is covered with a 3.9 oz. per square yard Dacron Sailcloth. This dyed to color material will last several years. If the plane is stored out of direct sunlight while not in use. Ultraviolet light is the main reason for loss of skin strength. The telltale signs of aging skin are;

1. Color fading
2. Embrittlement
3. Easily torn with rips likely to enlarge.

To preserve your covering there is now a clear coating that can be sprayed on. The effectiveness on life span extension is considerable. However, clear coat or not, the best preservative is indoor storage out of weather and sunlight.

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.

KEEPING YOUR ROTAX ENGINE CARBON FREE

The Rotax manual as well as the following information outlines some excellent procedures to assure reliable operations. However, in the real world the method suggested for carbon removal is only a half-way measure. True, removing the cylinder heads and scraping the dome and piston top will prevent carbon from fouling the plugs. But we go one step further, by removing the cylinders and then the pistons. Why? To clean the ring grooves. For the first 200 hours it is **VERY** important to clean the rings and pistons every 50 hours. Sounds tough but it's not bad if you're careful (and easier than fixing

airframes). Use an aluminum scraper and be careful when removing the rings not to bend them or get them mixed up. Do one piston and reassemble it to the rod then do the other. You'll be surprised at the carbon build up! If you don't see stuck rings or carbon don't clean it! You're a lucky one, but do inspect it regardless. After 200 hours you may opt to go to 65 hours instead of 50. You will know by the condition of the engine from previous inspections. A ring stuck by carbon build up can cause seizures because of blow by and localized hot spots. The piston skirt heats and swells until it sticks. Carbon free rings will assure this potential failure is eliminated.

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.

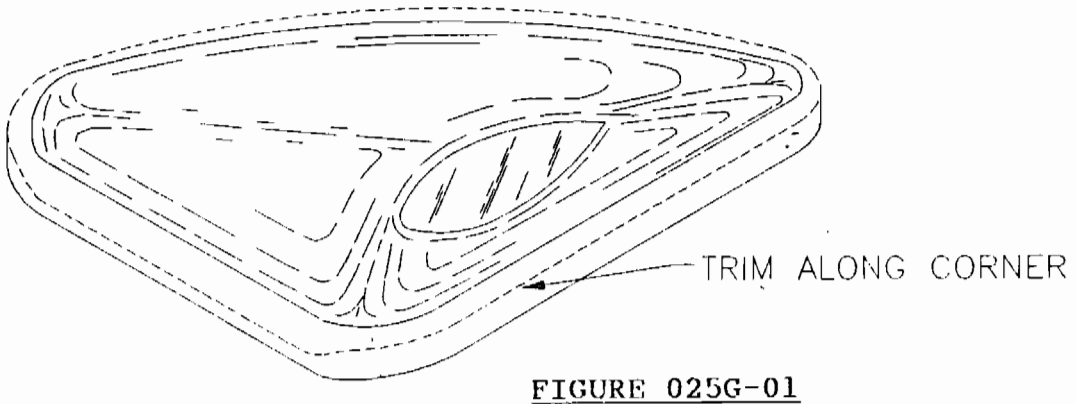
Since each kit-built aircraft is unique, each builder should expect his aircraft's performance to be unique. The prudent builder will determine carefully the weight and balance parameters of his plane before its first flight. He'll familiarize himself with its flying characteristics during the flight 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.

FILLET FAIRINGS INSTALLATION INSTRUCTIONS

TRIMMING

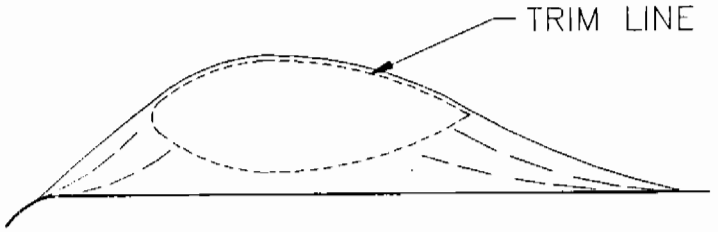
1. The fillet fairings are made of a thermoformed lexan and need to be trimmed out carefully before beginning installation. The trim line for these fairings is actually molded into the fairings by trimming right along the corner where the mold drops straight down. See **FIGURE 025G-01.** Use a pair of aviation snips to rough trim, then a file or small sanding block to clean up the edges.



MD317

FIGURE 025G-01

2. There is also an airfoil shape that matches the strut material molded into the fairings. This will need to be trimmed out to fit snug over the strut. See **FIGURE 025G-02.** Do this by first trimming slightly inside the line, then test fit over the strut and file out accordingly until a nice snug fit is achieved.



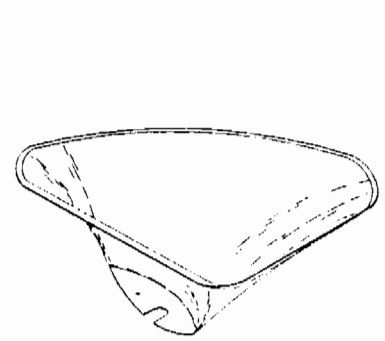
MD317

FIGURE 025G-02

3. Also molded into the fairing is a small indentation that is the location for the small screw that will later secure the fairing. This needs to be drilled to #40.

INSTALLING THE FAIRINGS

4. You are now ready to begin the installation process for the fairings. First unbolt the strut fitting from the strut attach plate and let the strut drop down. Next, Slip the fairing over the strut and slide it down until it hits the bolt that attaches the strut fitting to the strut. Mark an approximate centerline of this bolt, then remove the fairing and cut out a slot as shown in FIGURE 025G-04.



NOTE: LEFT SIDE SHOWN

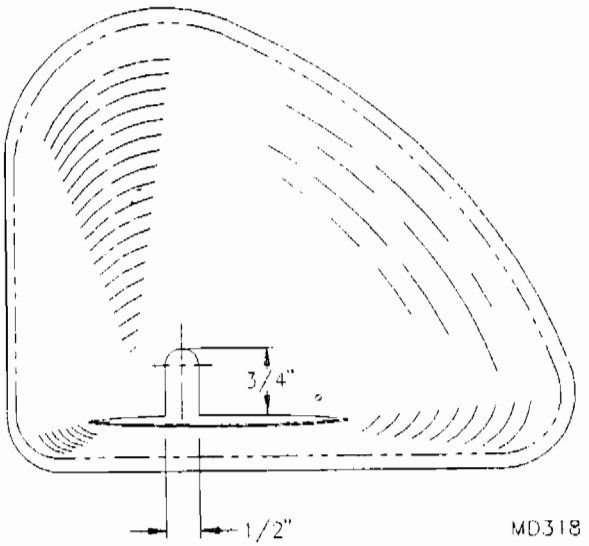


FIGURE 025G-04

5. After the slot has been cut out and filed neatly, reinstall the fairings and slide it down past the bolt. Bolt the strut back in place but do not tighten until the fairing has been fit and the foam tape applied, tape application will be covered later. Push the fairing back up past the top bolt until it fits tight against the wing. Check the fit of the fairing to make sure there are no gaps around the perimeter. It is possible that the fairing may need to be twisted slightly to align with the leading edge of the wing. This can be accomplished by removing the fairings and opening up the strut hole just slightly. Once you are happy with the fit of the fairing, drill through the pre-located #40 hole into the strut. Install the screw and tighten to check fit. If everything checks out, remove the fairing and apply the foam tape provided to the perimeter of the fairing and reinstall. Important: Do not use any form of loc-tite to secure the screw. Loc-tite attacks lexan and will destroy your fairing.

TROUBLE SHOOTING

6. If the fairing does not want to fit tight against the leading edge spar, a simple fix is to add an extra screw on the forward side of the bolts in order to push the fairing up tight.

7. If the fairing seems to be sticking forward of the leading edge you will need to remove the fairing and file out the strut hole along its forward point, reinstall the fairing and slot the #40 hole accordingly. Remove the fairing, apply tape and reinstall.