KASPERWING 1-80 MOTORGLIDER

ASSEMBLY AND CONSTRUCTION MANUAL

TABLE OF CONTENTS

INTRODUCTION: CONGRATULATIONS! YOU HAVE WAITED LONG AND PATIENTLY FOR YOUR KASPERWING AND BEFORE WE GET INTO THE STEP BY STEP ASSEMBLY INSTRUCTIONS, I WOULD FIRST LIKE TO GIVE YOU A FEW BASIC CONSTRUCTION TIPS. THE PARTS FOR YOUR AIRCRAFT WERE FABRICATED FROM THE HIGHEST QUALITY AIRCRAFT GRADE MATERIALS USING STATE OF THE ART PRODUCTION TECHNIQUES AND PROCEDURES AND WE HAVE GONE TO GREAT EXTREMES DESIGNING THE KASPERWING WITH THE PILOT/BUILDER IN MIND. PLEASE DO NOT ATTEMPT TO MAKE ANY MODIFICATIONS OR DESIGN CHANGES TO YOUR WING WITHOUT FIRST CONSULTING THE FACTORY AS THIS COULD COMPROMISE THE STRUCTURAL OR AERODYNAMIC QUALITIES OF THE WING AND RESULT IN AN UNSAFE AIRCRAFT. IF YOU SHOULD DISCOVER AN PART OR PARTS OF YOUR WING WHICH YOU BELEIVE COULD USE IMPROVEMENT, PLEASE CONTACT US AS WE ARE CONSTANTLY SEARCHING FOR WAYS TO IMPROVE THE DESIGN. GIVE YOUR KASPERWING THE SAME AMOUNT OF RESPECT AND CONSIDERATION YOU WOULD GIVE TO A "PIPER", "CESSNA-150" OR A "BOEING 747", AS IT IS JUST AS MUCH A "REAL AIRPLANE" AND NOT A TOY. MISTAKES IN CONSTRUCTION OR OPERATION CAN HAVE JUST AS SERIOUS CONSEQUENCES AS IN LARGER AIRCRAFT. WHEN ASSEMBLING YOUR WING BE SURE TO USE PROPER TOOLS FOR THE PROPER JOB. NEVER ATTEMPT TO HAMMER OR DRIVE A BOLT OR PART INTO POSITION BY USING FORCE! STOP AND FIND OUT WHAT THE OBSTACLE IS BEFORE PROCEEDING. TRY TO ORGANIZE YOUR TIME AND WORKSPACE PRIOR TO BEGINNING CONSTRUCTION AND HAVE ALL TOOLS AND EQUIPMENT PRESENT BEFORE STARTING WORK. WORK SAFELY AND EFFICIENTLY, NOT SPORADICALLY. IT IS BETTER TO DEVOTE FIVE-EIGHT HOUR PERIODS TO THE JOB THAN SPENDING TEN-FOUR HOUR PERIODS AS YOU WILL TEND TO FORGET LESS BETWEEN EPISODES.

READ THE CONSTRUCTION MANUAL COMPLETELY FROM COVER TO COVER ONCE, IN ORDER TO FAMILIARIZE YOURSELF WITH THE PROJECT AND THEN BEGIN WORKING YOUR WAY THROUGH THE STEPS GLANCING AHEAD A PAGE OR TWO AT A TIME. WORK SLOWLY AND METHODICALLY. DO NOT ATTEMPT TO TAKE SHORT CUTS AS THIS MAY CAUSE YOU MUCH GRIEF AND WASTED TIME. FOLLOW THE SEQUENCE EXACTLY!

INTRODUCTION CONTINUED: IT WILL HELP TO FIND A LARGE OPEN WORKSPACE ABOUT 20'x40', DRY, FLAT AND PREFERABLY INSIDE. IF NON IS AVAILABLE, IT IS POSSIBLE TO ASSEMBLE THE UNDERCARRIAGE, SPARS, ETC. IN A SMALL LIVING ROOM BUT FOR FINAL ASSEMBLY MORE SPACE IS REQUIRED. BELOW IS A LIST OF THE TOOLS AND ITEMS NEEDED TO COMPLETE CONSTRUCTION:

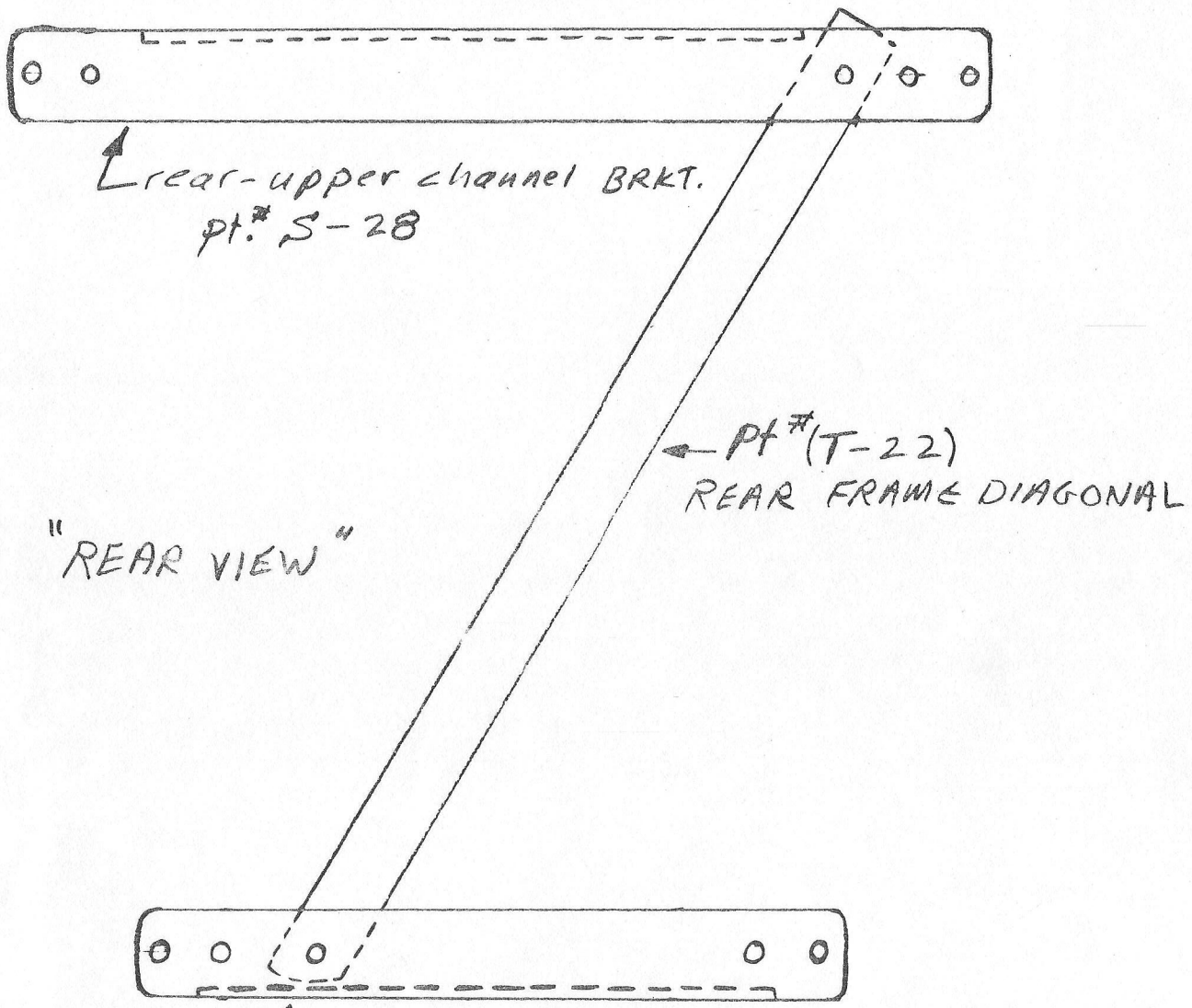
BOX OR OPEN END WRENCHES:
9/16", 1/2", 7/16", 3/8"
1 - 1/4" OR 3/8" DRIVE RATCHET WRENCH
1/4" OR 3/8" DRIVE SOCKETS:
9/16", 1/2", 7/16", 3/8"
1 - SMALL HAMMER OR WOOD MALLET
1 - SHARP CENTER PUNCH
1 - ELECTRIC DRILL MOTOR - 1/4"
DRILL BITS: 1/8", 3/16", 7/32",
1 - TAPE MEASURE RULER
1 - POP RIVET GUN
1 - PAIR PLIERS OR VISE GRIPS.
1 - SET CABLE CUTTERS OR DIKES
1 - HEAT SHRINK GUN OR SOURCE OF OPEN FLAME

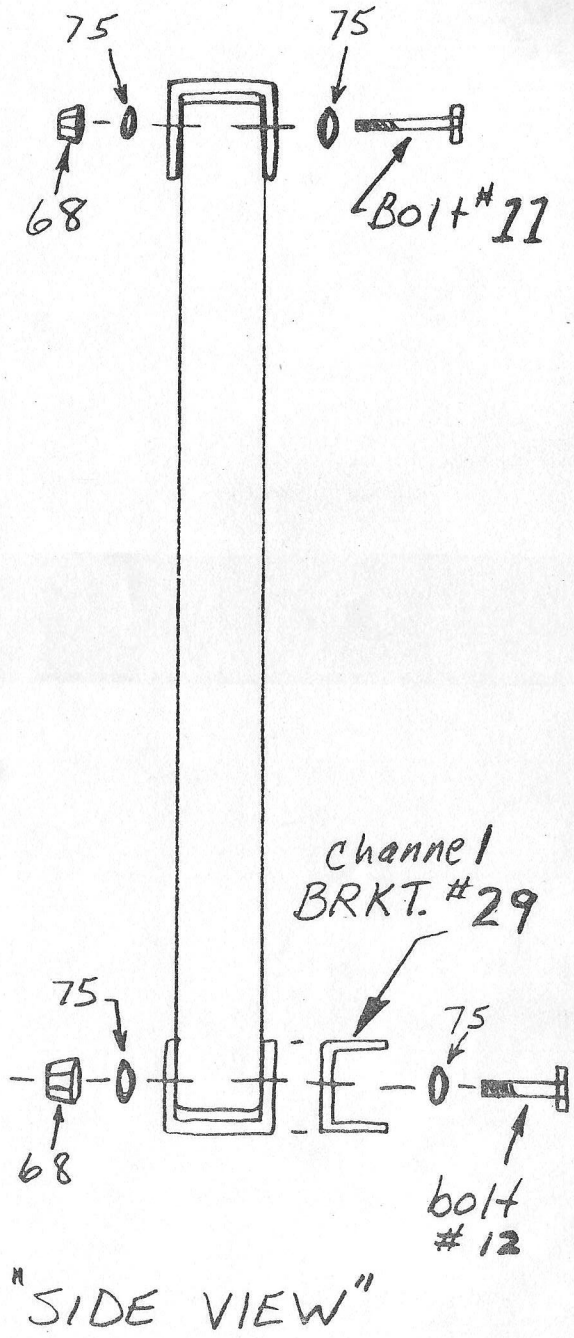
1 - STRAIGHT EDGE
1 - 1/4" STEEL ROD ABOUT 12" LONG
1 - KNIFE OR CABLE STRIPPER
1 - ELECTRICIANS CRIMPING TOOL
1 - MARKING PEN OR PENCIL
1 - MEDIUM FLAT TIP SCREWDRIVER
1 - LARGE PHILLIPS SCREWDRIVER OR IMPACT DRIVER
1 - SOLDER GUN WITH HEAT CUTTING TIP OR HOT KNIFE.
1 - SMALL FLAT FINE TOOTH FILE.
1 - PINT, WELDWOOD CONTACT CEMENT OR EQUIVALENT.
1 - DISPOSABLE BRUSH
1 - SWAGING TOOL - (SUPPLIED WITH KIT)

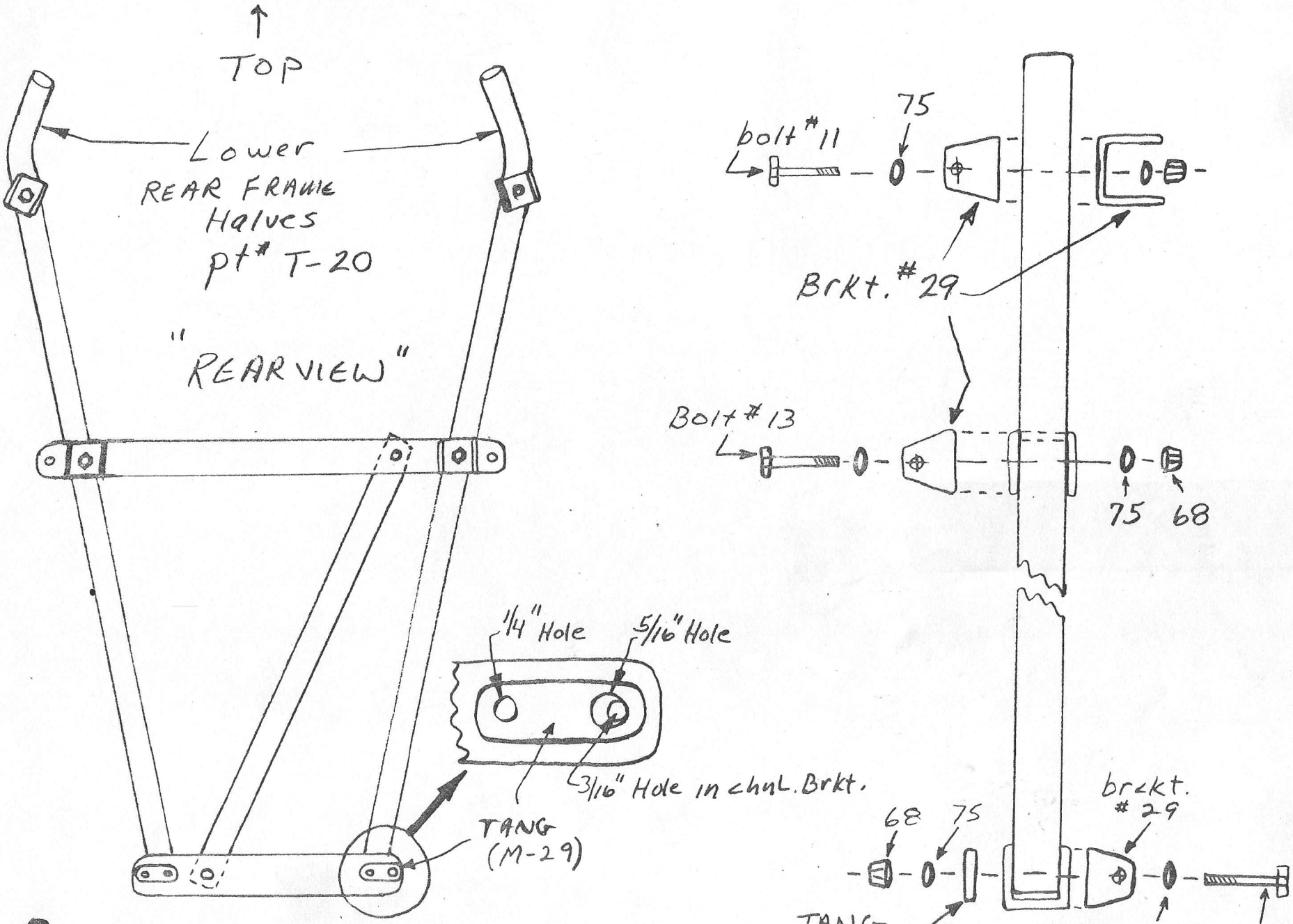
THE ABOVE LIST CONTAINS ALL THE BASIC TOOLS REQUIRED. THERE MAY BE OTHERS WHICH YOU MIGHT FIND HELPFULL THAT ARE NOT CONTAINED IN THIS LIST. PLEASE INFORM US IF YOU SHOULD DISCOVER ANY.

NOW THAT YOU HAVE GATHERED ALL YOUR TOOLS TOGETHER, INVENTORIED ALL YOUR PARTS AND THOROUGHLY STUDIED THE ASSEMBLY MANUAL, TURN TO STEP* 1 AND BEGIN.

STEP #1. BEGIN CONSTRUCTION OF LOWER-REAR FRAME ASS'Y. BY ATTACHING CHANNEL BRACKETS AND REAR FRAME DIAGONAL BRACE TOGETHER AS SHOWN.

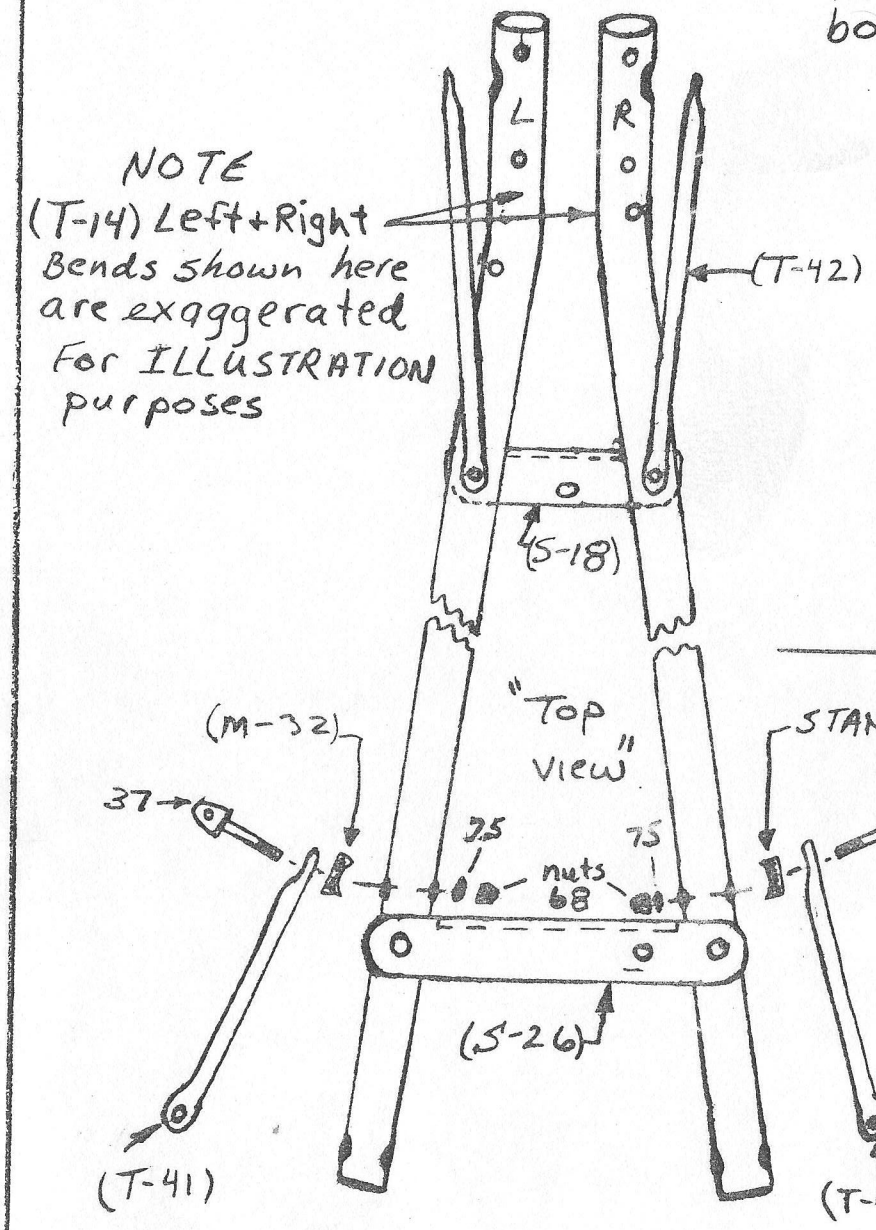


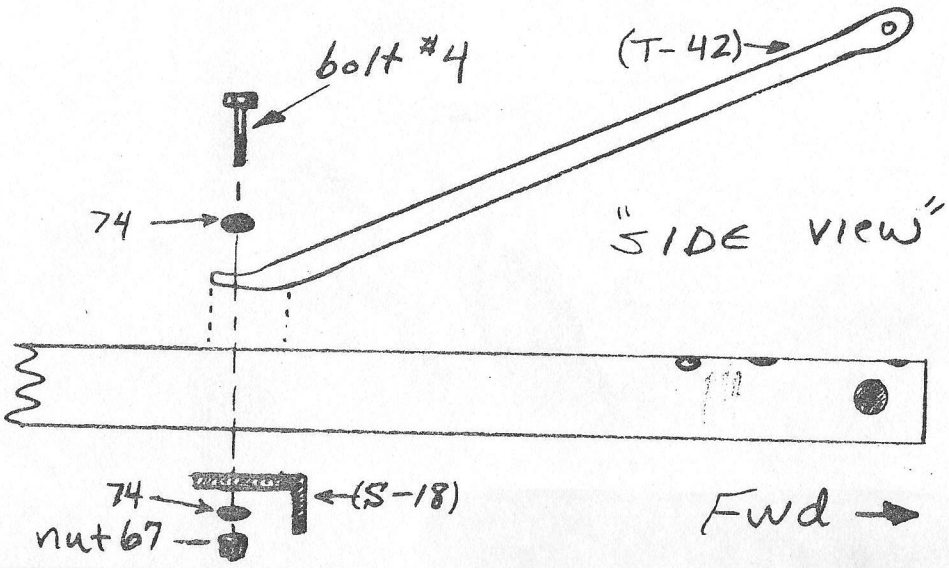


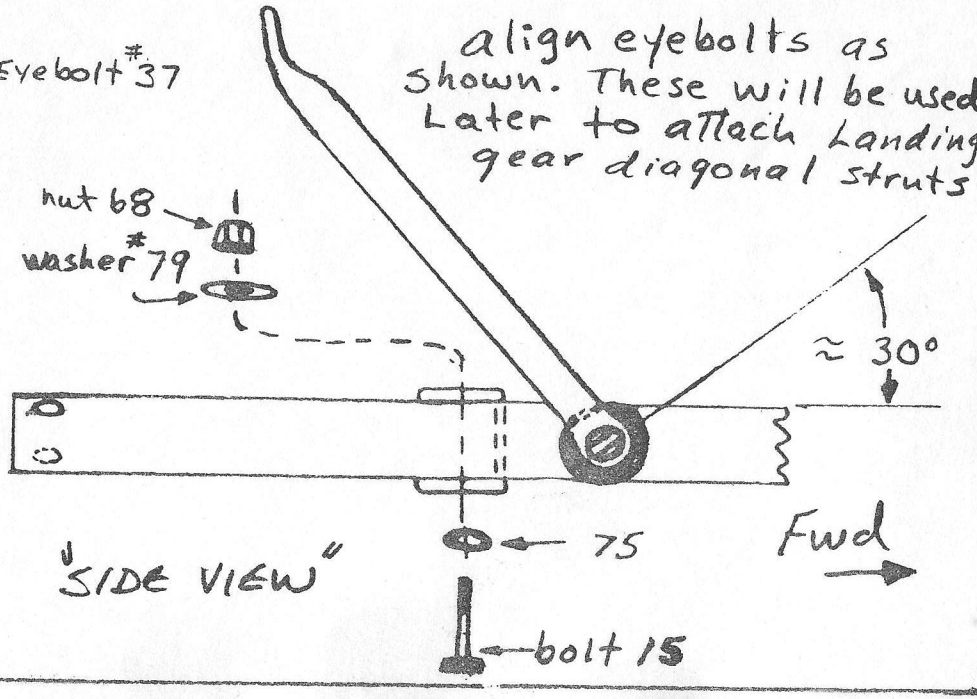


2. Place Lower-rear Frame Halves in position and INStall with proper bolts, nuts, Tangs and channel brackets as shown.

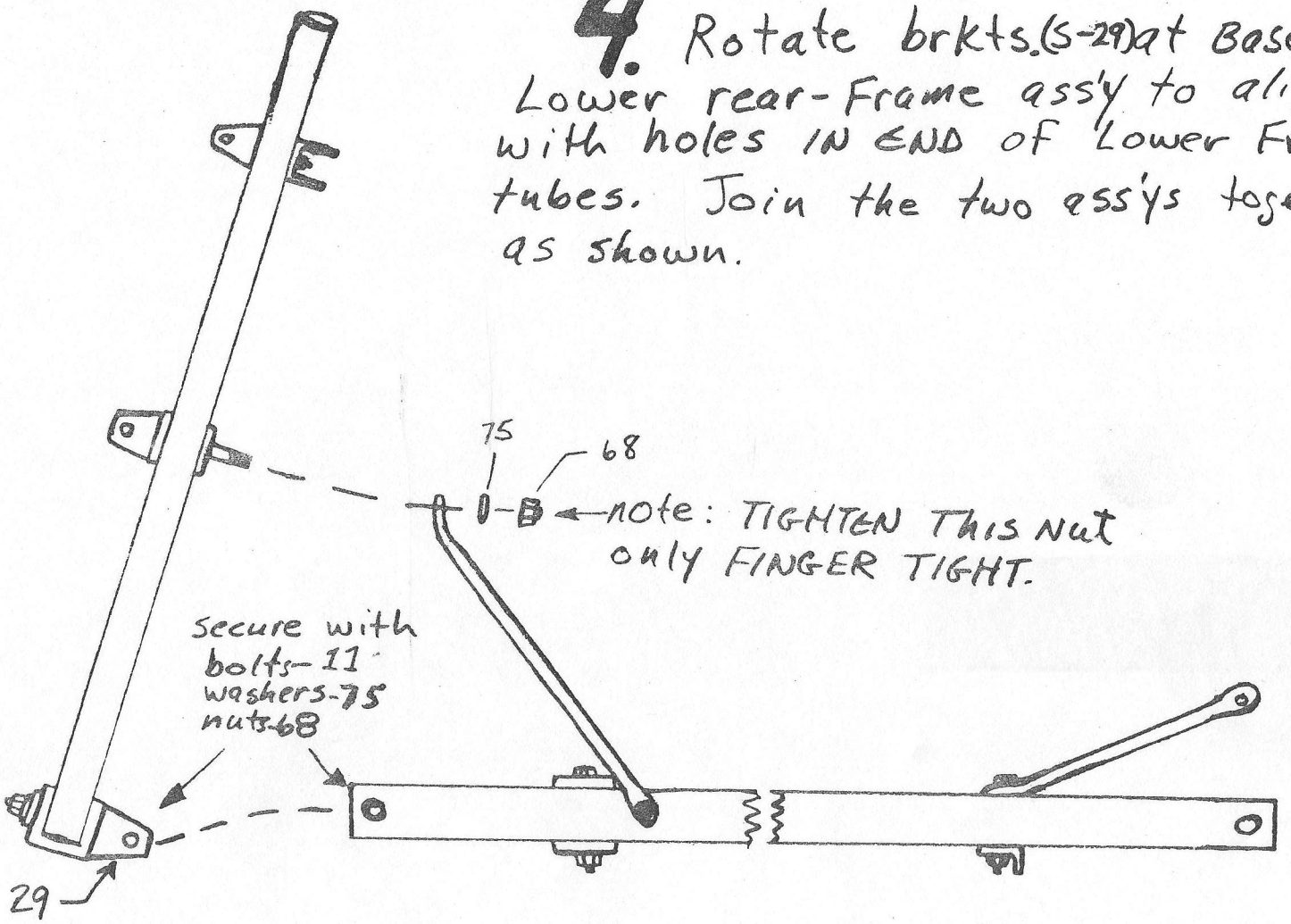
3. assemble Lower Frame Tubes (T-14), FRONT-Lower Channel bracket (S-26), pull start bracket (S-18), Front-INNER FRAME strut (T-42) and rear-Lower inner-Frame strut (T-41) as shown. note: Tighten bolts only enough to hold parts in position.



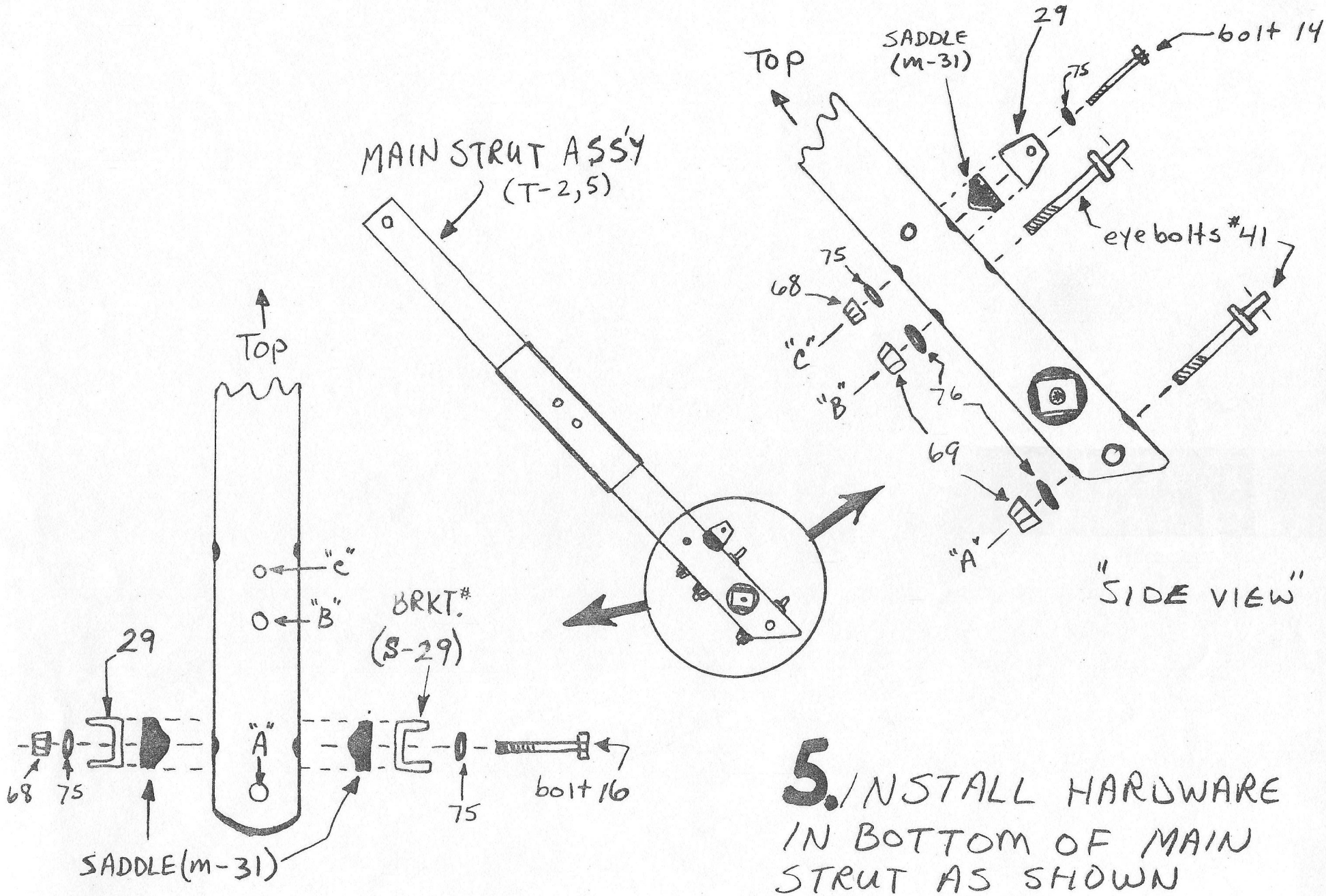




4. Rotate brkts.(5-29) at Base of Lower rear-Frame ass'y to align with holes IN END of Lower Frame tubes. Join the two ass'ys together as shown.

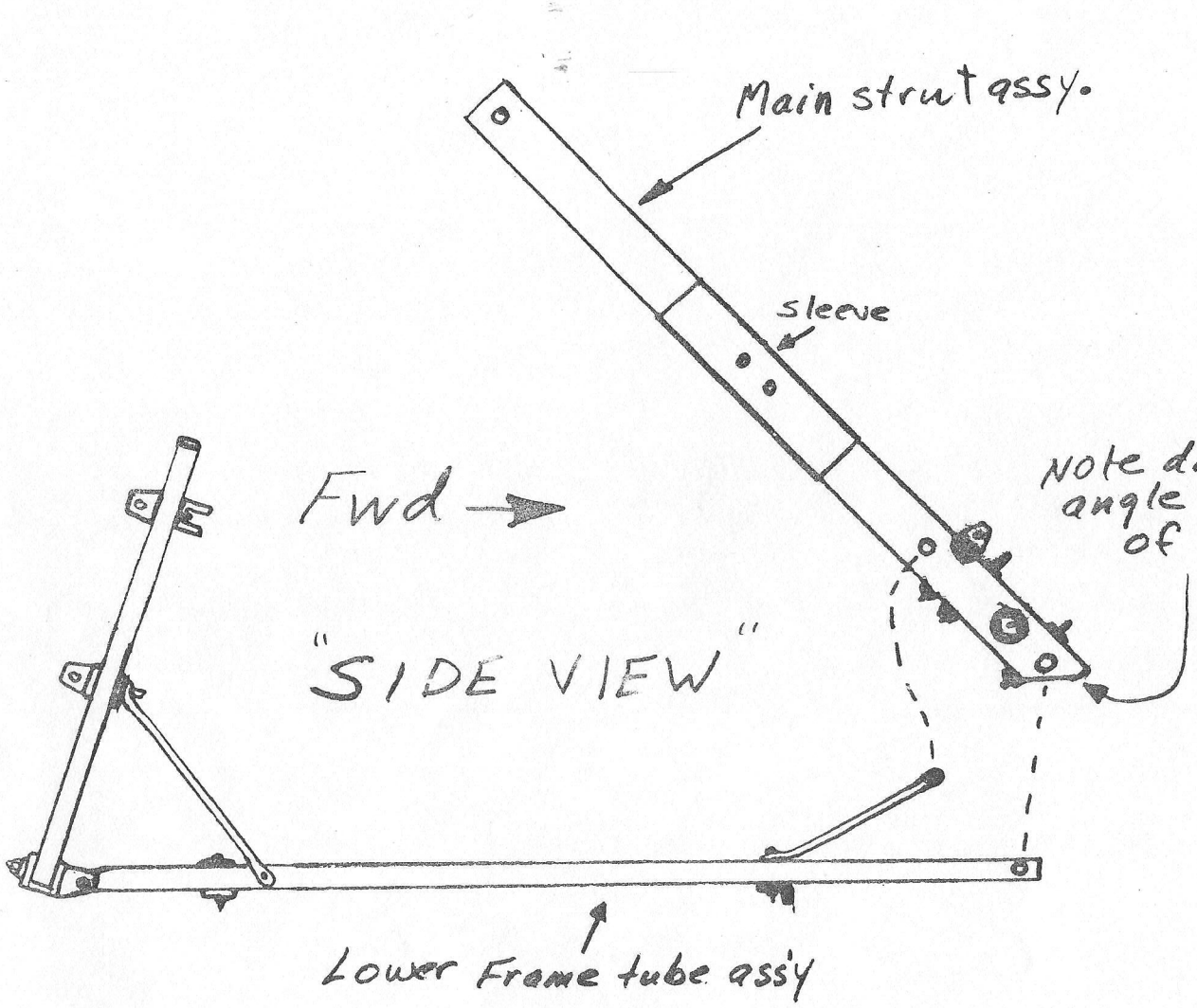


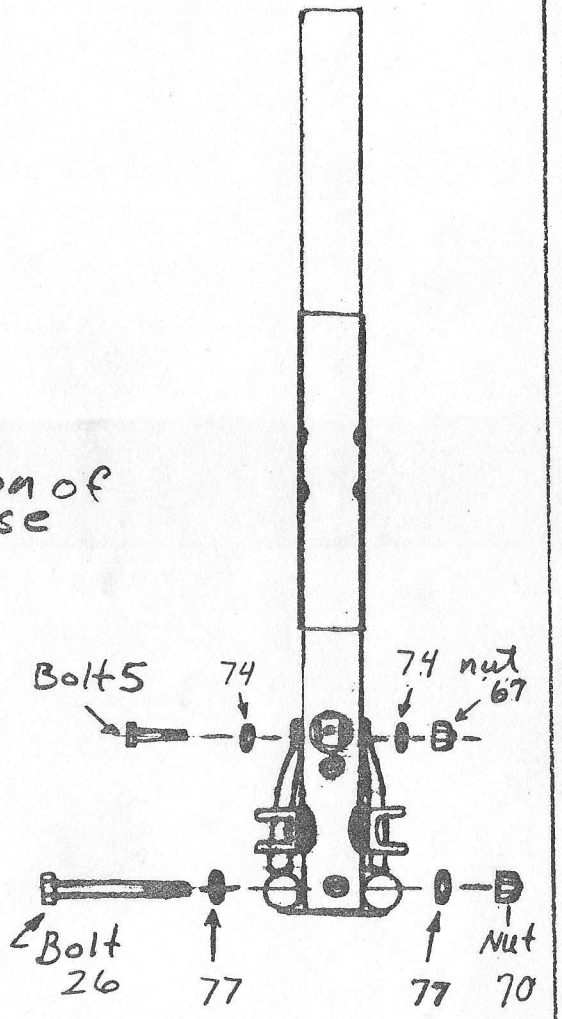
use a center punch to align holes in bracket and tube



5. INSTALL HARDWARE IN BOTTOM OF MAIN STRUT AS SHOWN

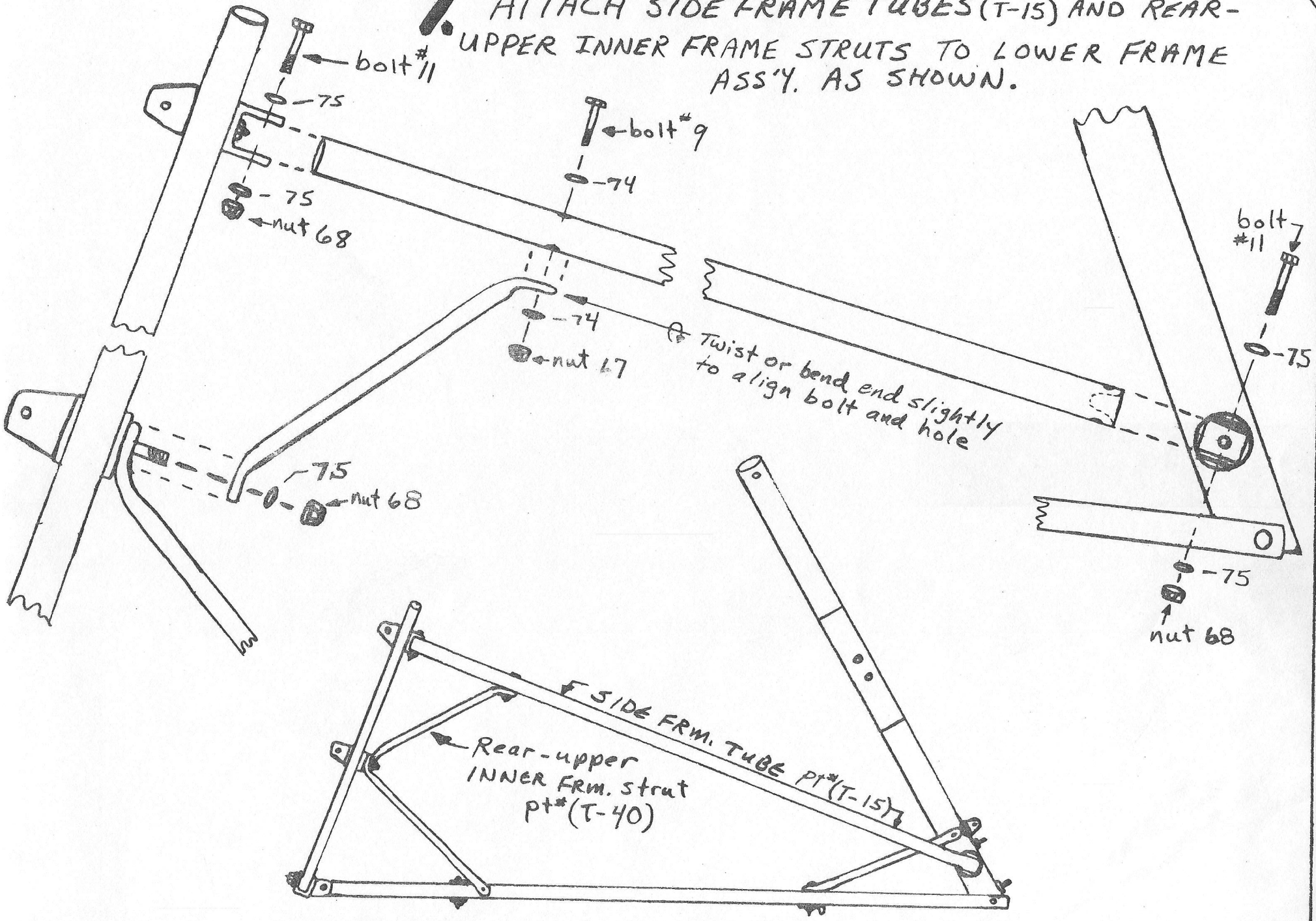
6. CONNECT LOWER FRAME TUBE ASS'Y TO MAIN-STRUT AND SLEEVE ASS'Y USING PROPER BOLTS, NUTS, AND WASHERS AS SHOWN. TIGHTEN BOLTS #5 AND #26 SNUG.





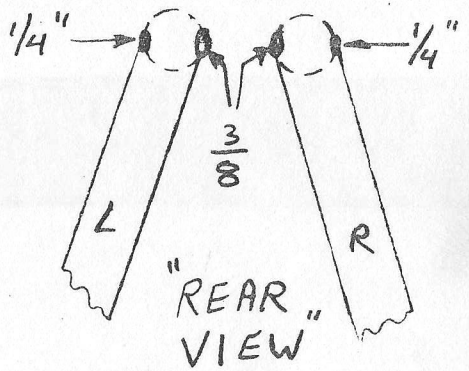
"Front VIEW"

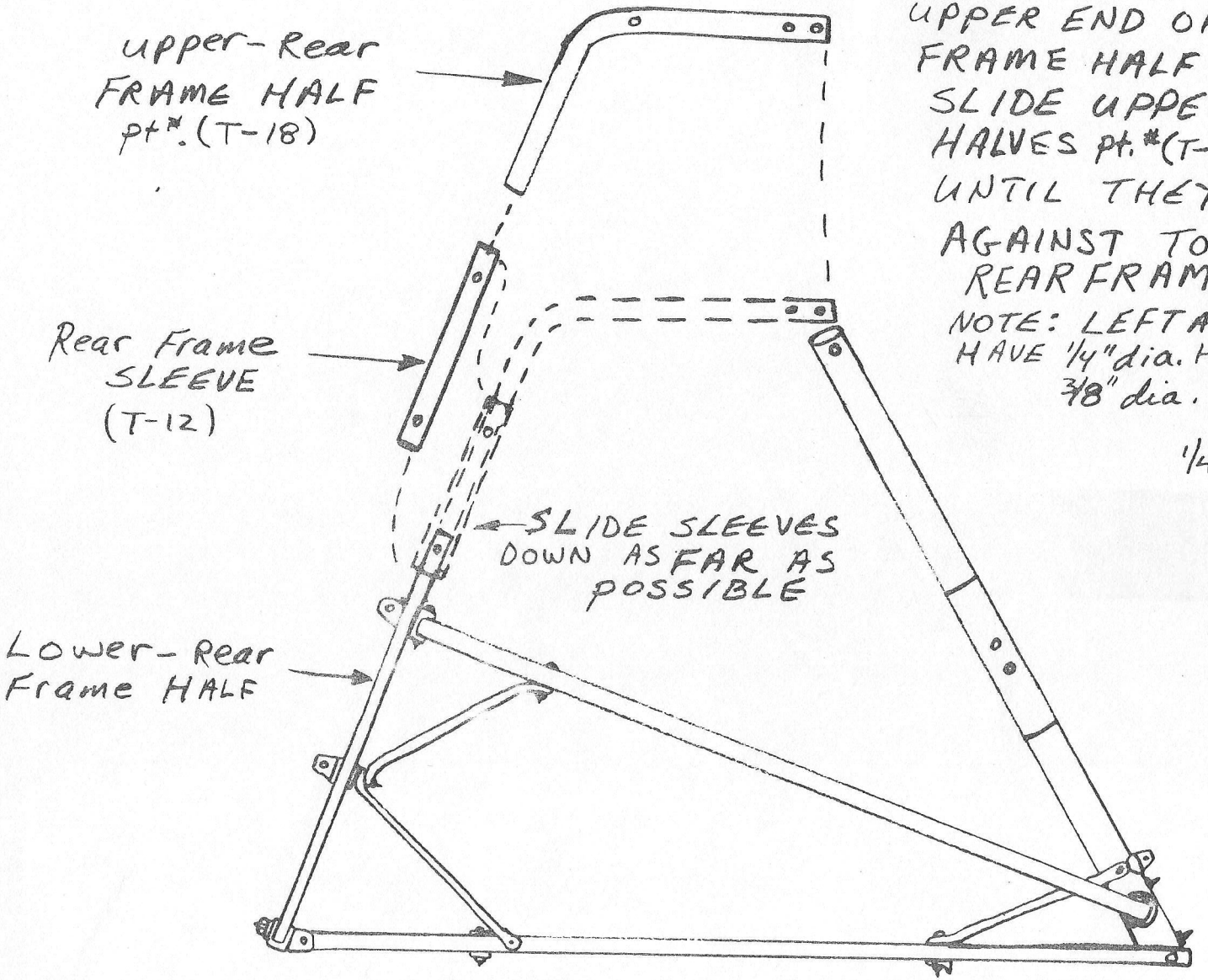
7. ATTACH SIDE FRAME TUBES (T-15) AND REAR-UPPER INNER FRAME STRUTS TO LOWER FRAME ASS'Y. AS SHOWN.



8. POSITION REAR FRAME SLEEVES, pt#(T-12) OVER UPPER END OF LOWER-REAR FRAME HALF TUBES AS SHOWN. SLIDE UPPER-REAR FRAME HALVES pt.#(T-18) INTO SLEEVES UNTIL THEY BOTTOM OUT AGAINST TOP END OF LOWER-REAR FRAME HALF.

NOTE: LEFT AND RIGHT FRAME ½'s HAVE ¼" dia. Holes outside 3/8" dia. Holes INSIDE

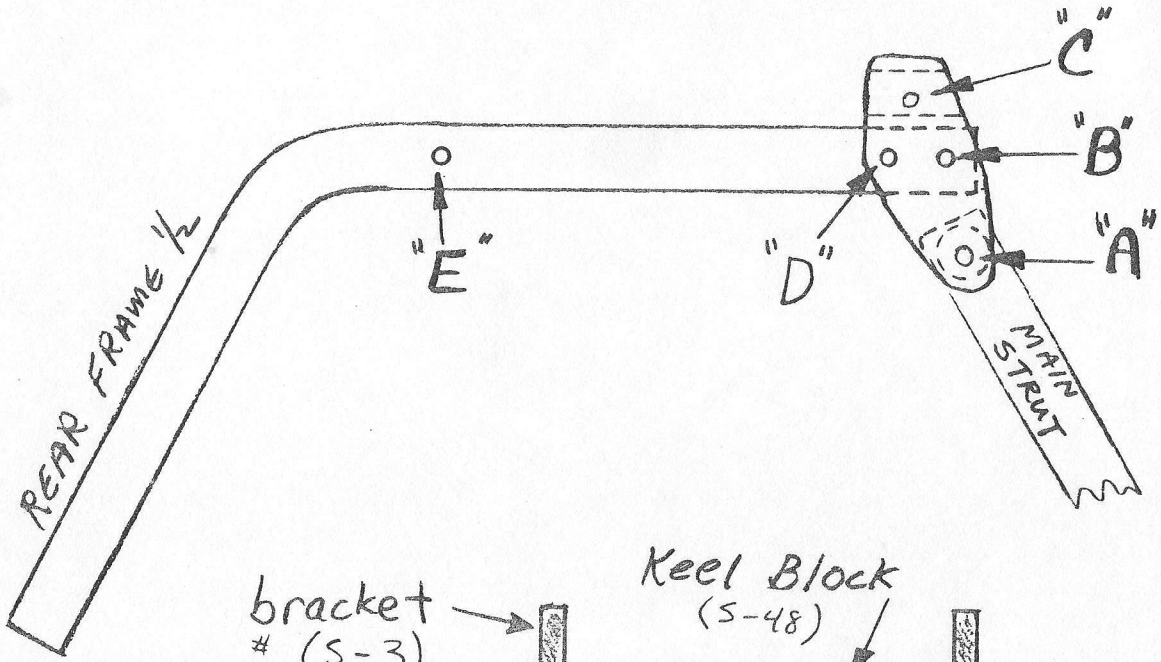


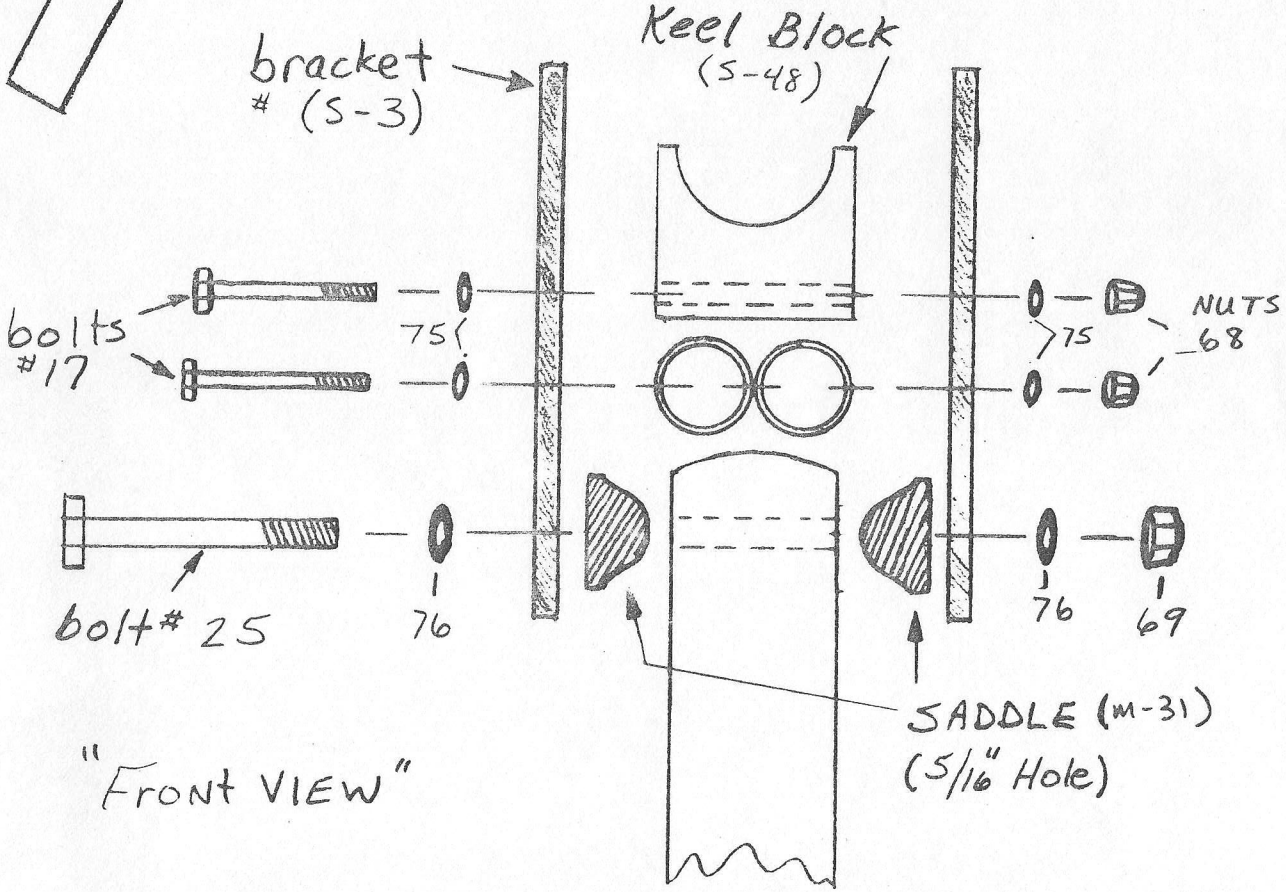


9. ATTACH UPPER-REAR FRAME ½ to MAINSTRUT ASS'Y. BY ASSEMBLING KEEL BLOCK (S-48) MAIN STRUT BRACKETS (S-3) and saddles as SHOWN.

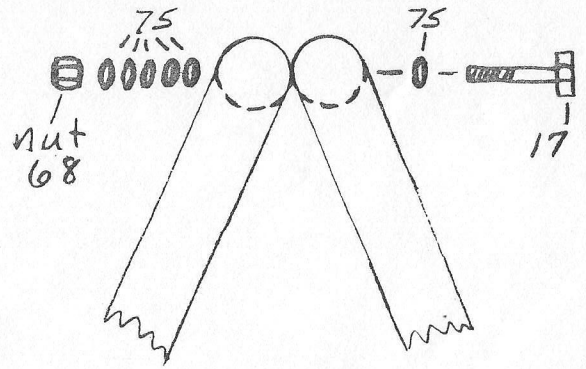
INSTALL BOLTS IN HOLES "A", "B", + "C" ONLY. TIGHTEN UNTIL SNUG.

INSTALL A THIRD BOLT # 17 WITH EXTRA WASHERS AS SHOWN IN HOLE "E" AND TIGHTEN UNTIL SNUG.





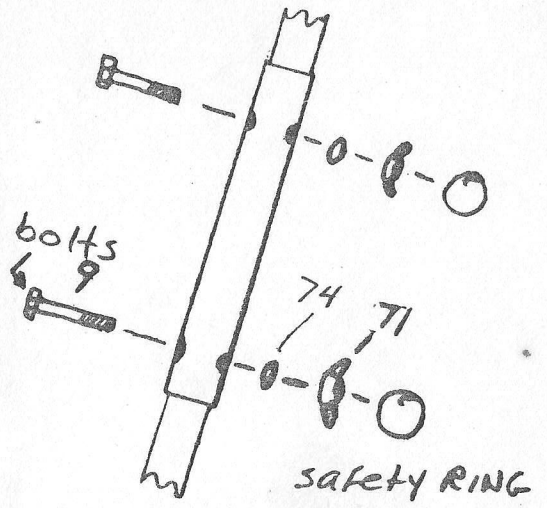
"FRONT VIEW"

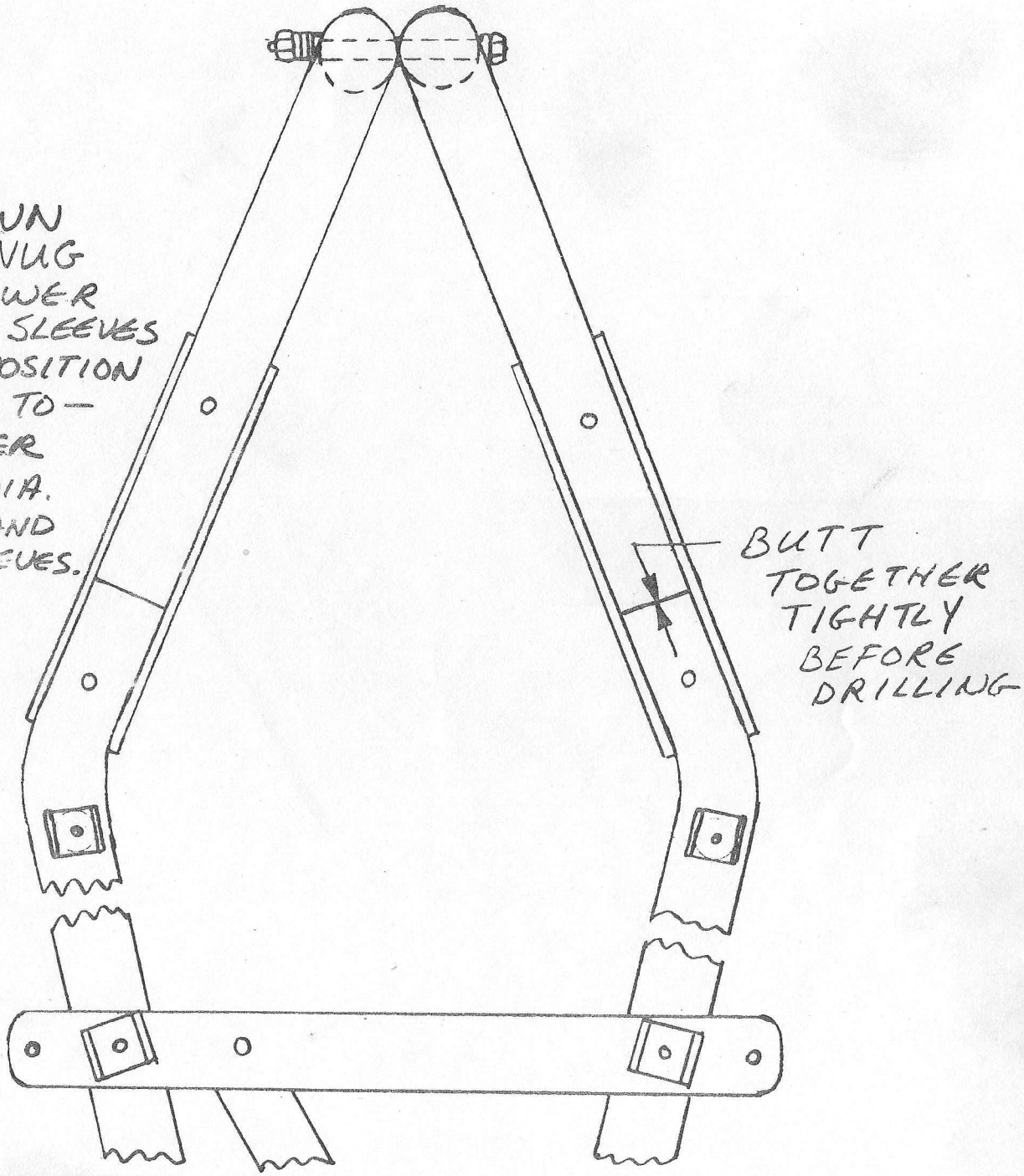


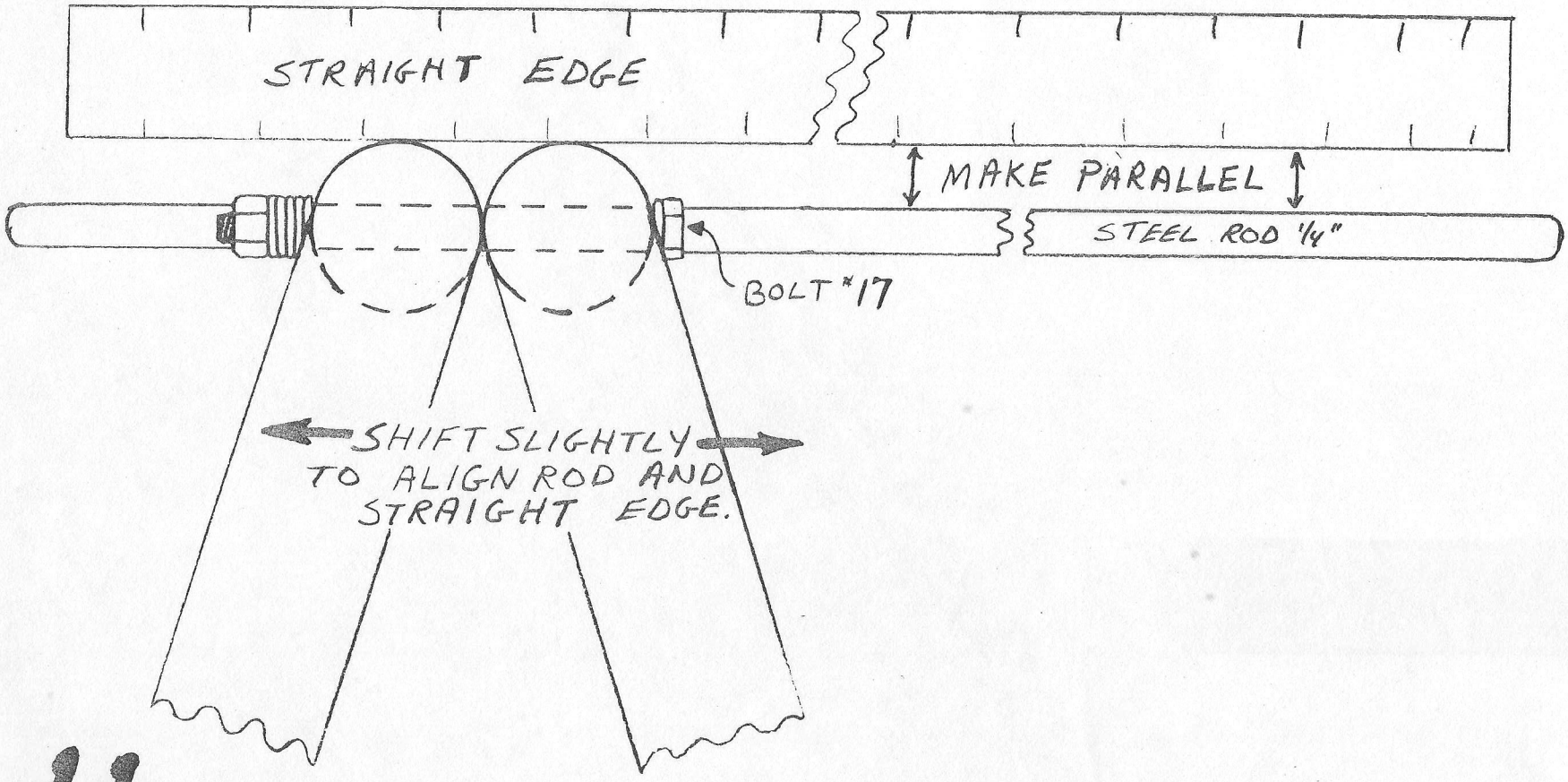
REAR VIEW UPPER REAR FRAME

10.

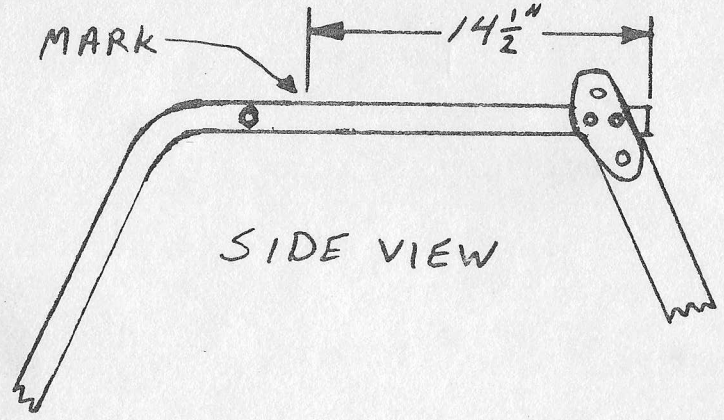
SLIDE SLEEVES DOWN UNTIL THEY BECOME SNUG AGAINST CURVE OF LOWER FRAME TUBE. ROTATE SLEEVES UNTIL HOLES ARE IN POSITION SHOWN. TIGHTLY BUTT TOGETHER UPPER AND LOWER FRAME 1/2's. DRILL 3/16" DIA. HOLES THROUGH FRONT AND BACK OF REAR FRAME SLEEVES. SECURE SLEEVES WITH BOLTS, WINGNUTS AND SAFETY RINGS AS SHOWN



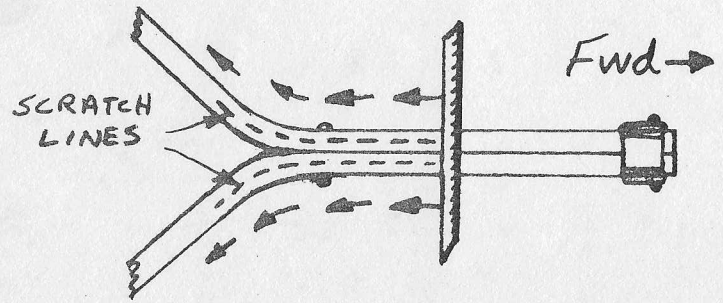




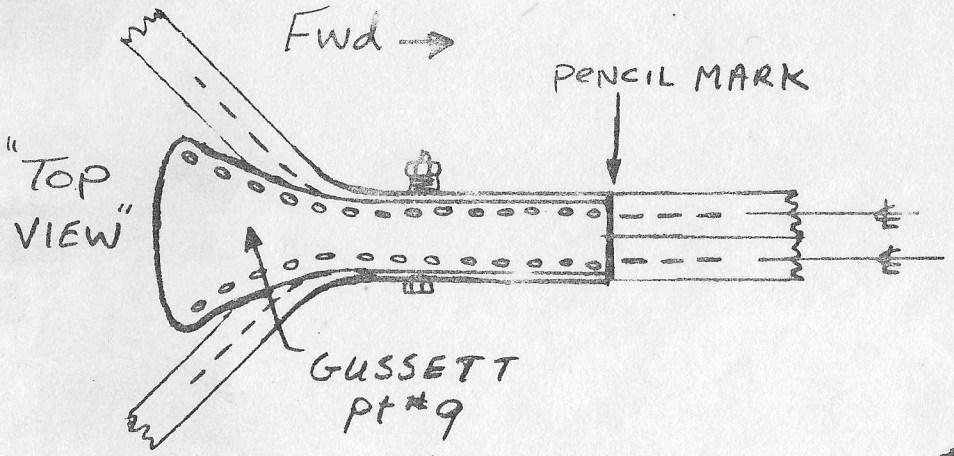
11. PLACE A 1/4" DIA. STEEL ROD ABOUT 12"-15" LONG (AVAILABLE AT MOST HARDWARE STORES) THROUGH FRONT OF FRAME AT HOLE "D". LAY A RULER OR STRAIGHT EDGE ACROSS TOP OF REAR FRAME ASS'Y DIRECTLY OVER BOLT #17 IN HOLE "E". SHIFT REAR FRAME TUBES SLIGHTLY FROM SIDE TO SIDE UNTIL STRAIGHT EDGE AND 1/4" ROD ARE ALIGNED PARALLEL TO EACH OTHER. THIS WILL GUARANTEE THAT ALL 3 HOLES "B", "D", AND "E" THROUGH REAR FRAME 1/2 TUBES WILL BE IN ALIGNMENT. WHEN STRAIGHT EDGE AND ROD HAVE BEEN ALIGNED, TIGHTEN BOLT #17 TO HOLD TUBES SECURELY IN POSITION.



12. MEASURE BACK 14½" FROM FRONT OF FRAME AS SHOWN AND PLACE A PENCIL MARK.

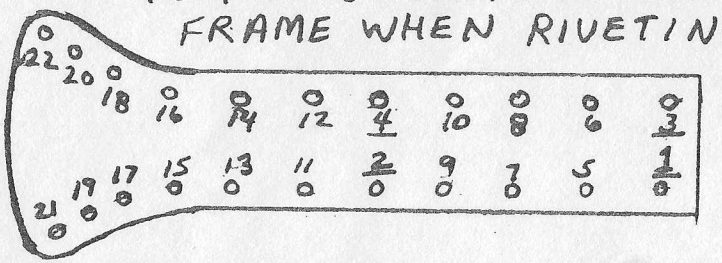


LAY A STRAIGHT EDGE ACROSS TOP OF BOTH FRAME TUBES, SCRATCH LINES ON TUBES AS SHOWN



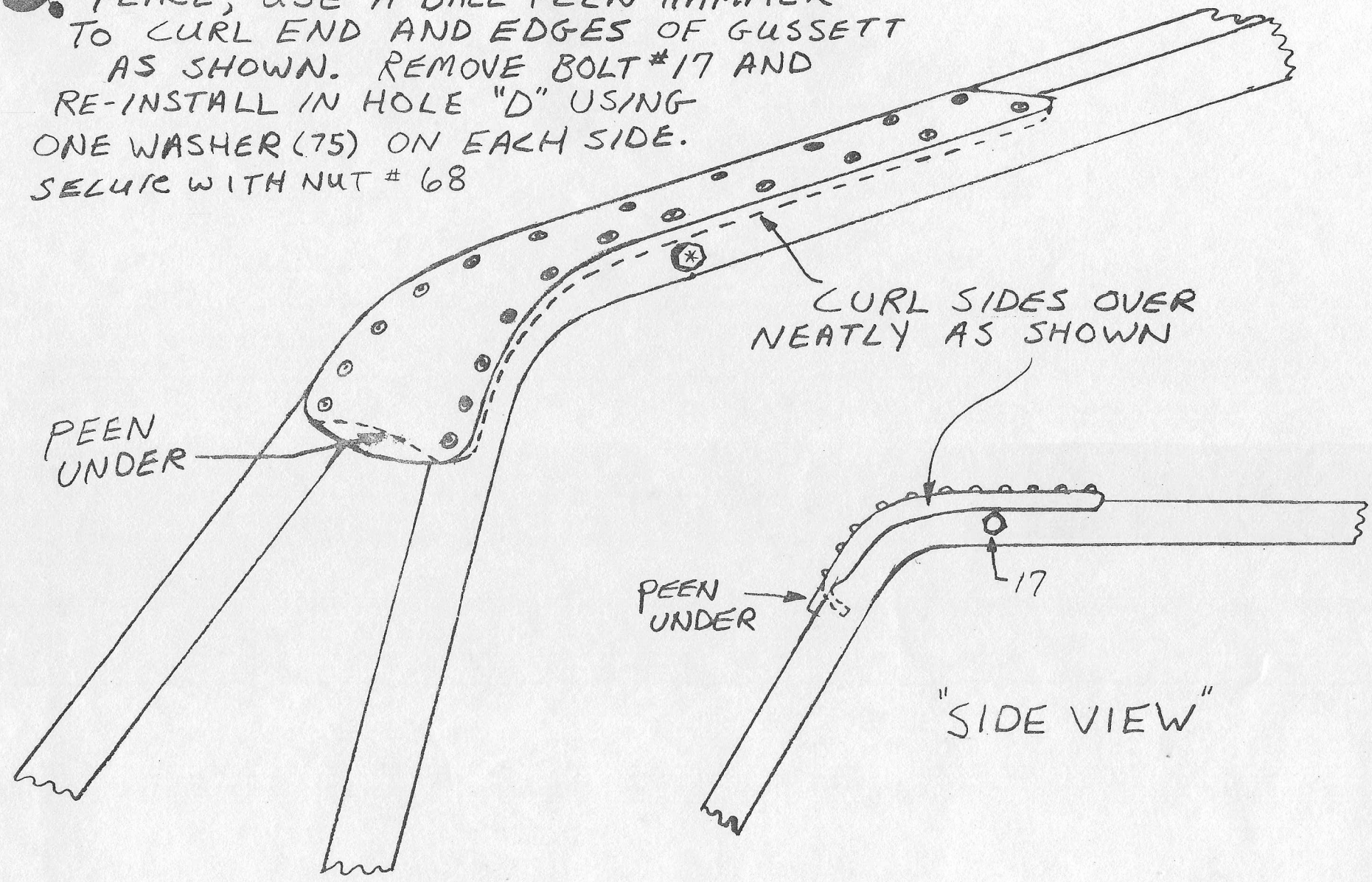
ATTACH WITH 1/8" pop rivets (pt#64)

ALIGN GUSSETT (5-9) SO THAT HOLES ARE CENTERED OVER MARKS PLACED ON TUBES WITH STRAIGHT EDGE. DRILL 1/8" HOLES AND POP RIVET GUSSETT INTO PLACE USING SEQUENCE AS SHOWN. BE SURE TO PULL GUSSETT TIGHT AGAINST FRAME WHEN RIVETING AROUND CURVE.



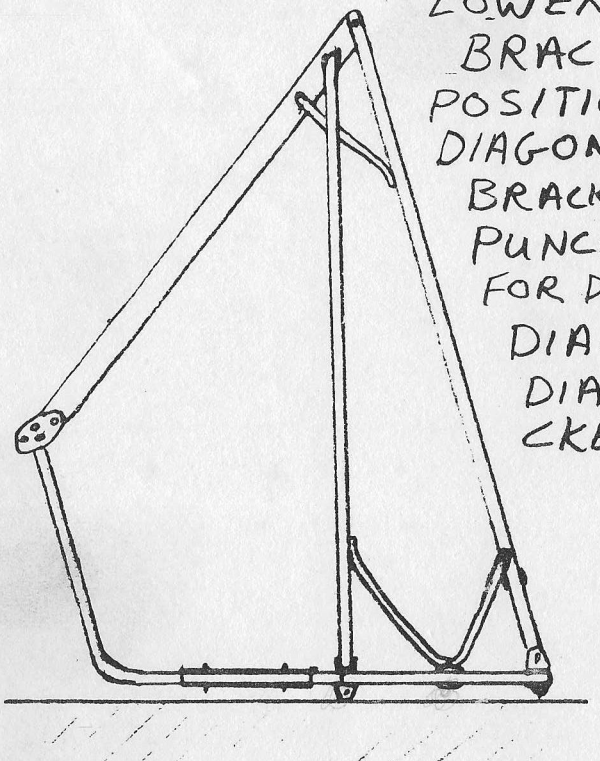
NOTE: ALWAYS USE A CENTER PUNCH PRIOR TO DRILLING

13. AFTER RIVETING GUSSETT INTO PLACE, USE A BALL PEEN HAMMER TO CURL END AND EDGES OF GUSSETT AS SHOWN. REMOVE BOLT #17 AND RE-INSTALL IN HOLE "D" USING ONE WASHER (75) ON EACH SIDE. SECURE WITH NUT # 68

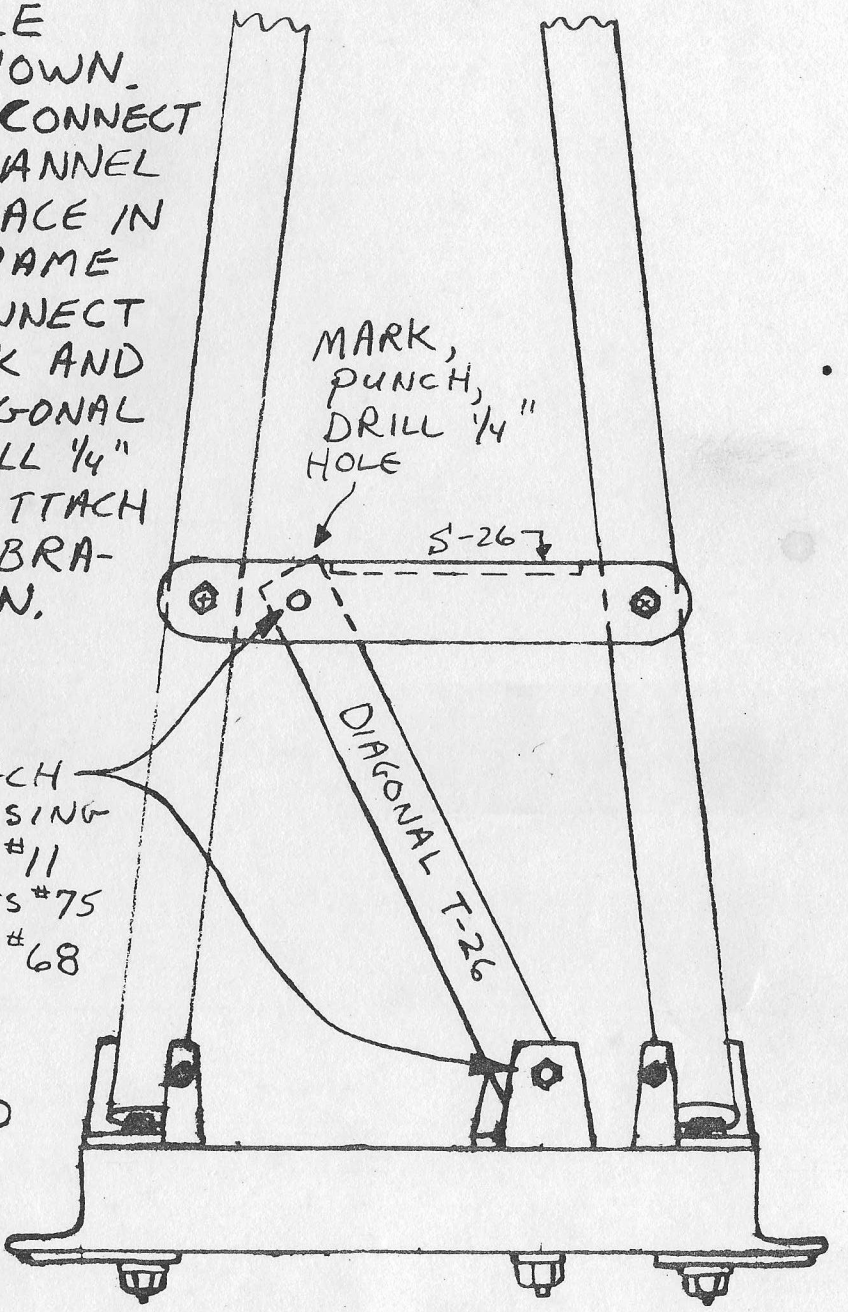


14.

PLACE FRAME ON WORKTABLE OR FLOOR IN POSITION SHOWN. TEMPORARILY DISCONNECT LOWER-FRONT CHANNEL BRACKET (S-26). PLACE IN POSITION LOWER FRAME DIAGONAL (T-26). RE-CONNECT BRACKET (S-26). MARK AND PUNCH END OF DIAGONAL FOR DRILLING. DRILL ¼" DIA. HOLE AND ATTACH DIAGONAL TO BRACKET AS SHOWN.



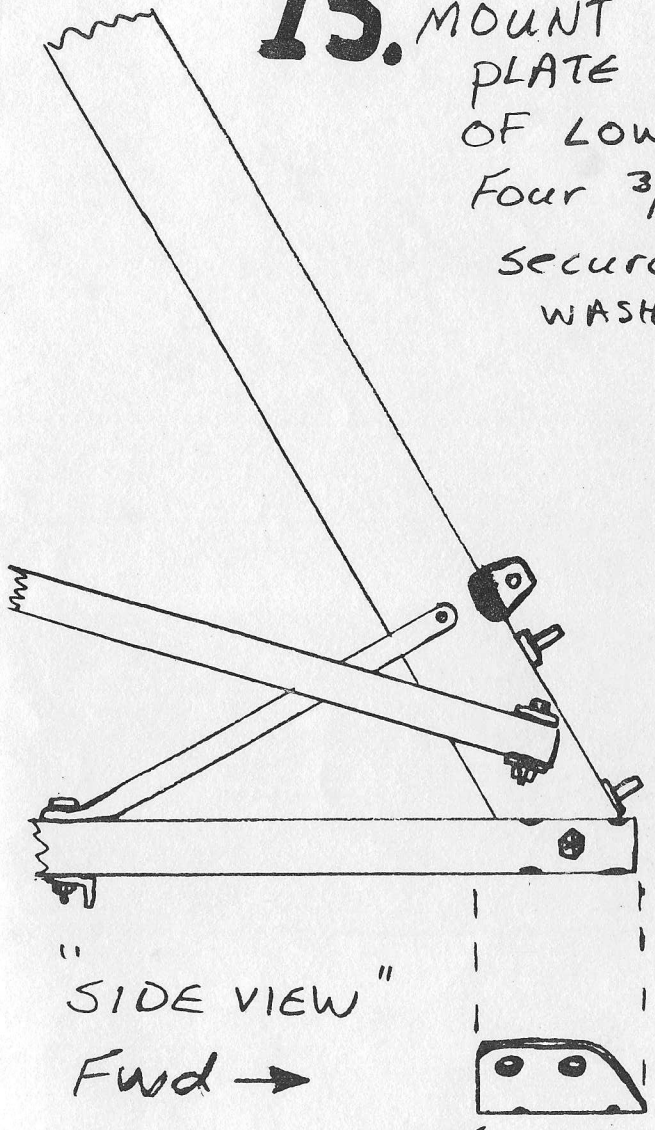
"SIDE VIEW"

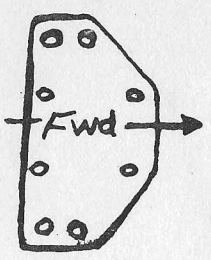


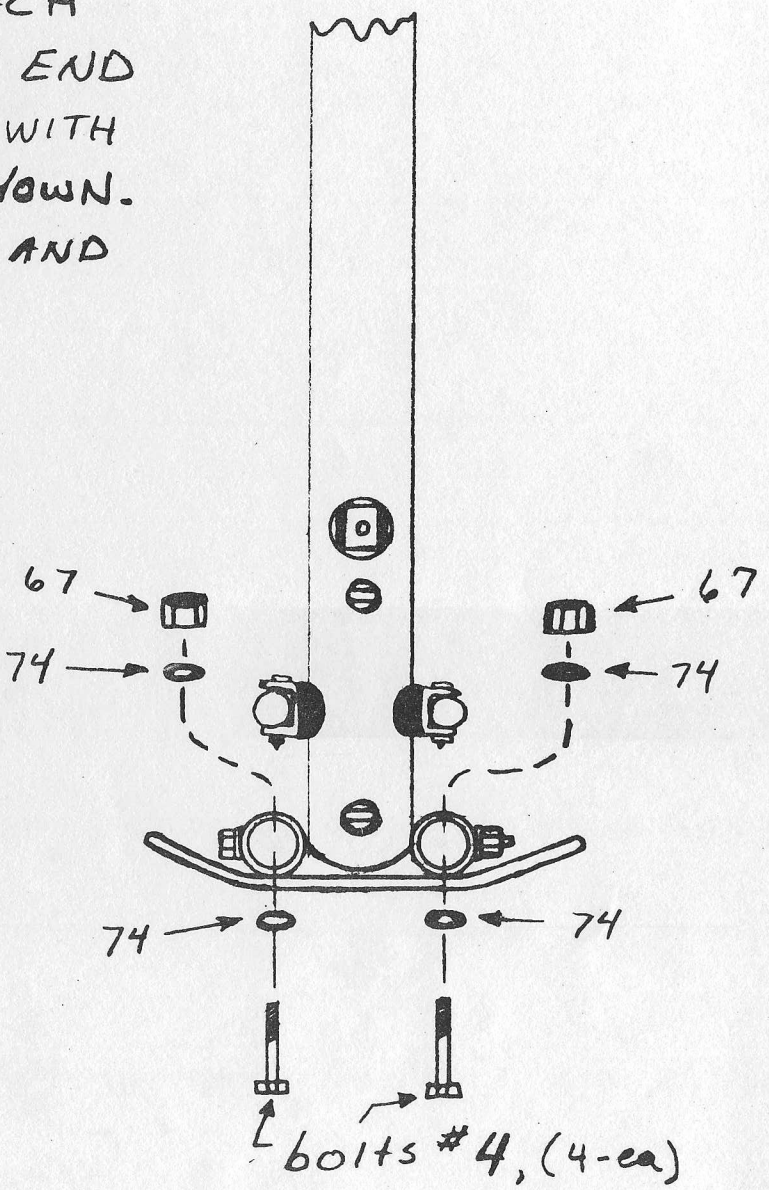
"BOTTOM VIEW"

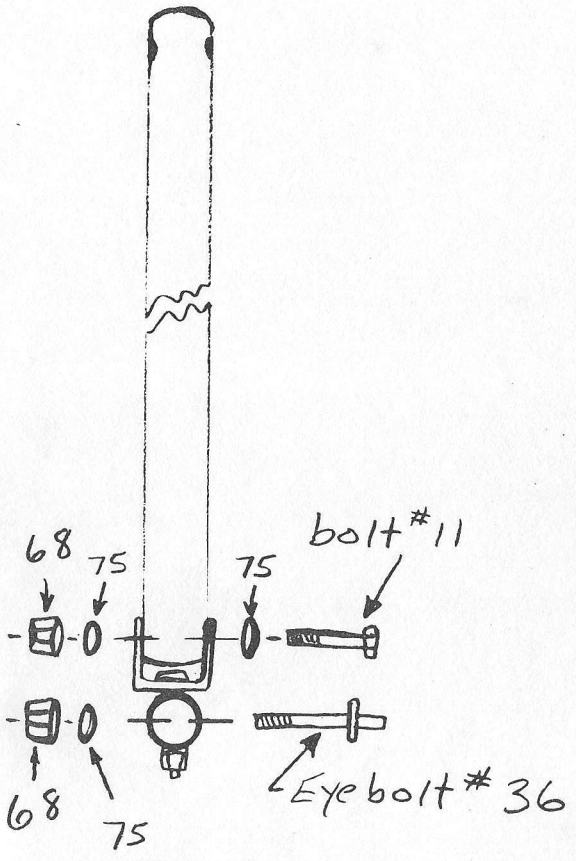
NOTE: TIGHTEN DIAGONAL END IN BRACKET BEFORE DRILLING. HOLD LOOSE END OF DIAGONAL CAREFULLY IN POSITION WHEN DRILLING.

15. MOUNT FLYING WIRE ATTACH PLATE ON BOTTOM-FRONT END OF LOWER FRAME TUBES WITH Four 3/16" DIA. BOLTS AS SHOWN. secure with proper nuts AND WASHERS.



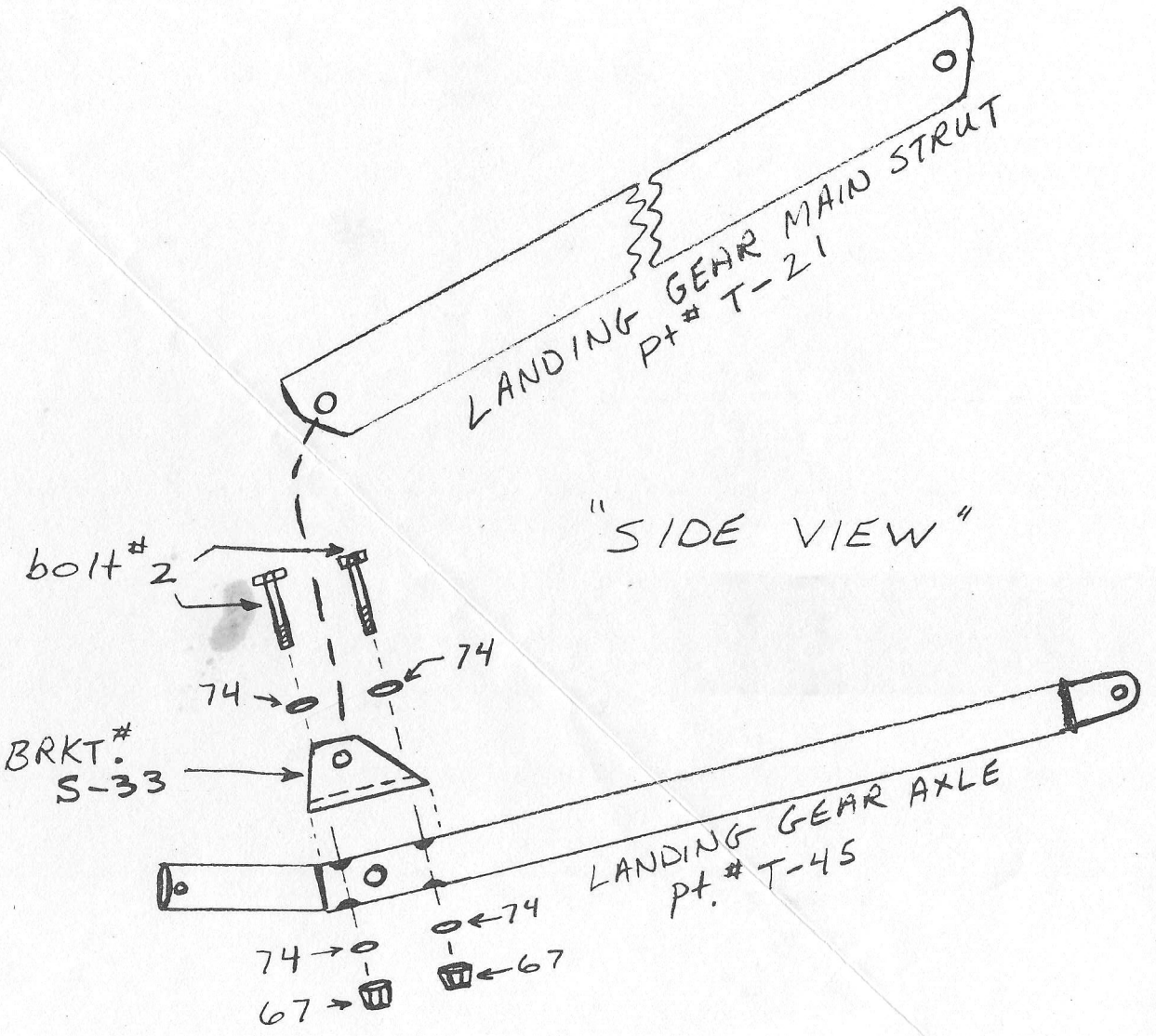






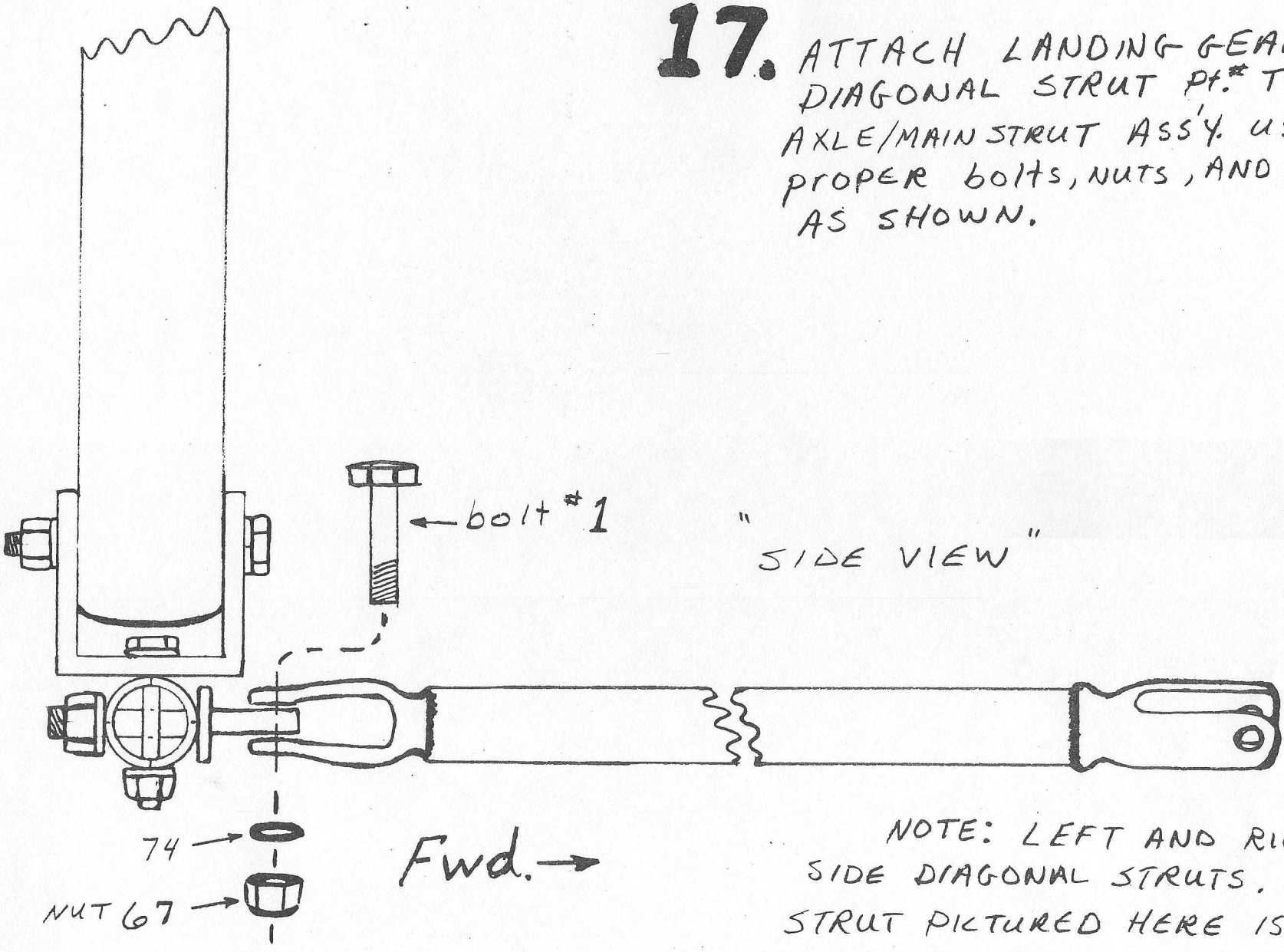
Fwd. →

"END VIEW"



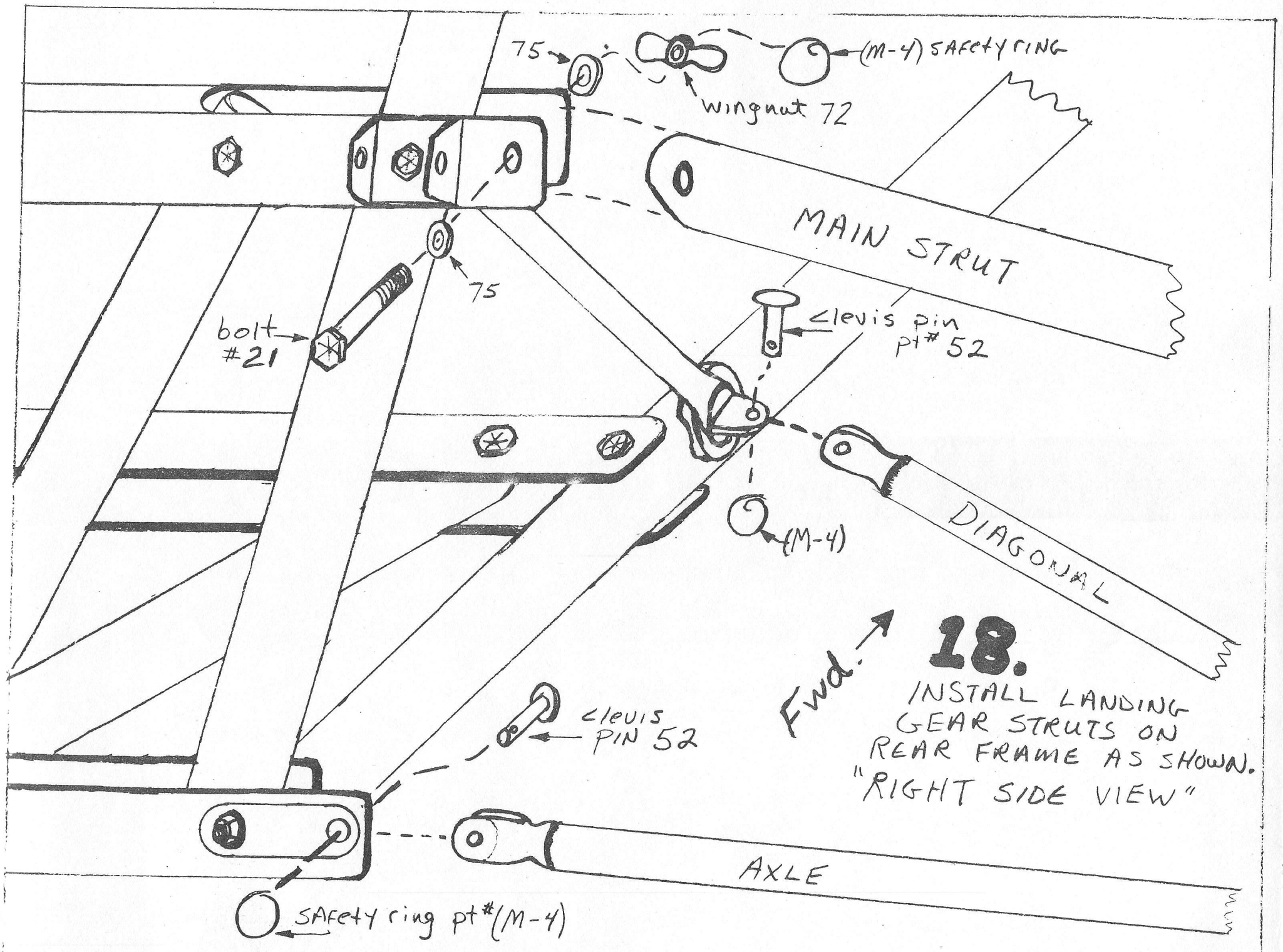
16. ATTACH LANDING GEAR AXLES AND MAIN STRUTS TOGETHER USING PROPER NUTS, BOLTS, AND BRACKETS AS SHOWN.

17. ATTACH LANDING-GEAR DIAGONAL STRUT Pt.# T-46 to AXLE/MAIN STRUT ASS'Y. USING PROPER bolts, NUTS, AND WASHERS AS SHOWN.



"SIDE VIEW"

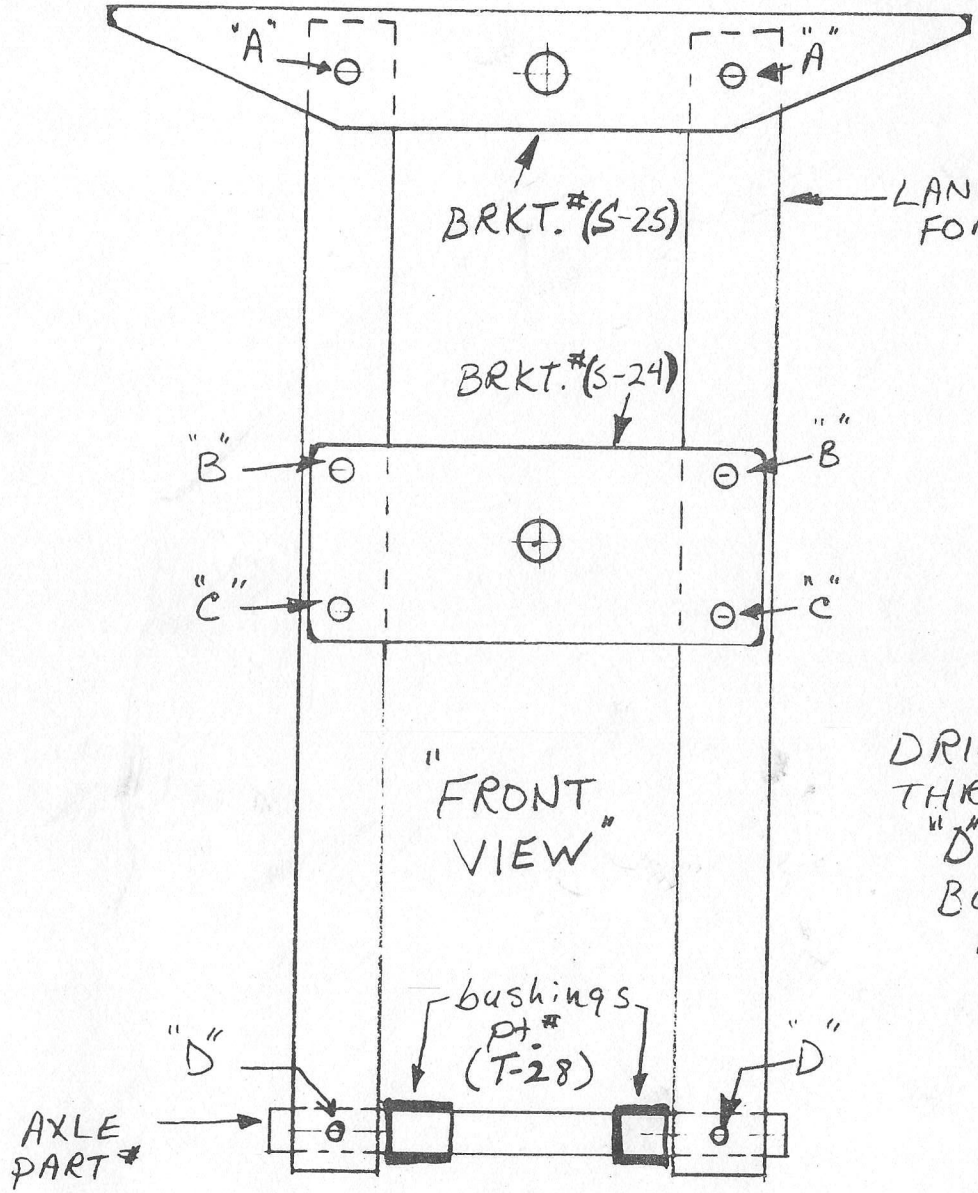
NOTE: LEFT AND RIGHT SIDE DIAGONAL STRUTS. STRUT PICTURED HERE IS RIGHT DIAGONAL STRUT.

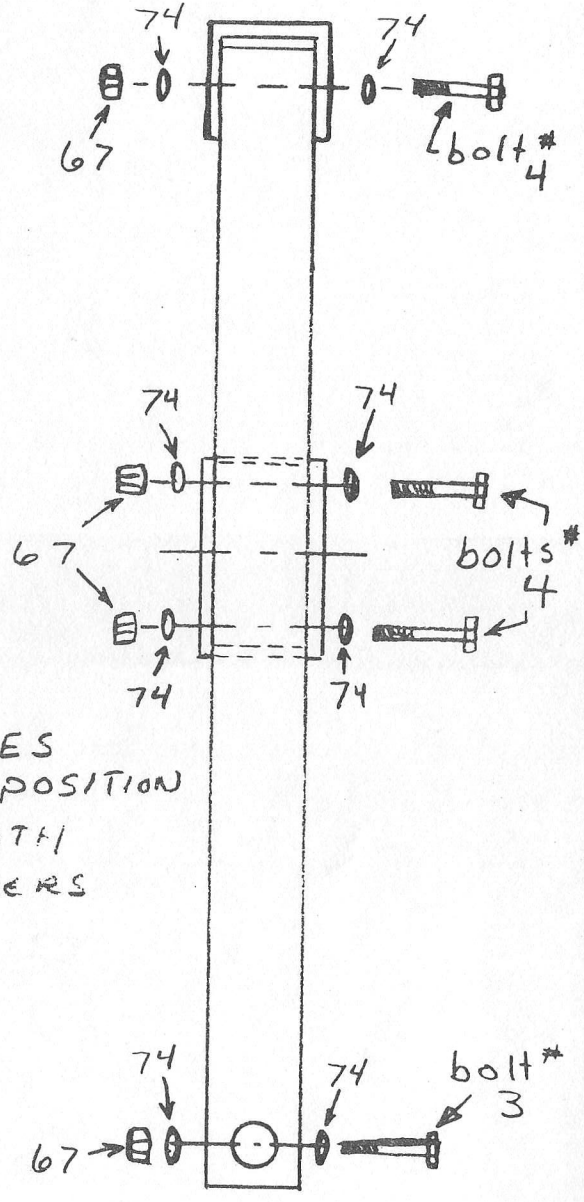


18. INSTALL LANDING GEAR STRUTS ON REAR FRAME AS SHOWN. "RIGHT SIDE VIEW"

19.

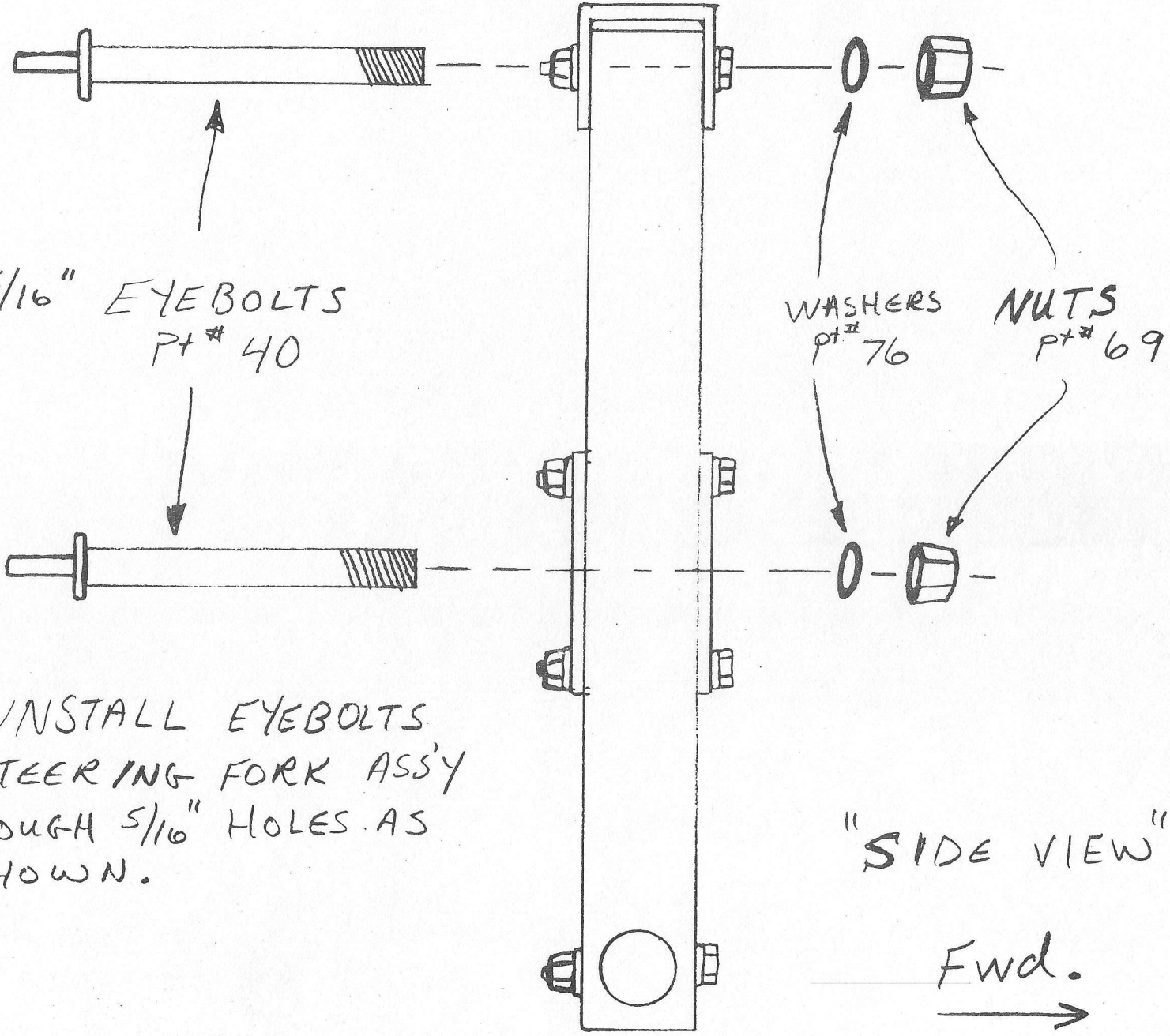
ASSEMBLE STEERING FORK ASS'Y BY PLACING TUBES AND BRACKETS IN POSITION AS SHOWN. INSTALL BOLTS IN HOLES "A", "B" & "C", AND SECURE WITH NUTS AND WASHERS.



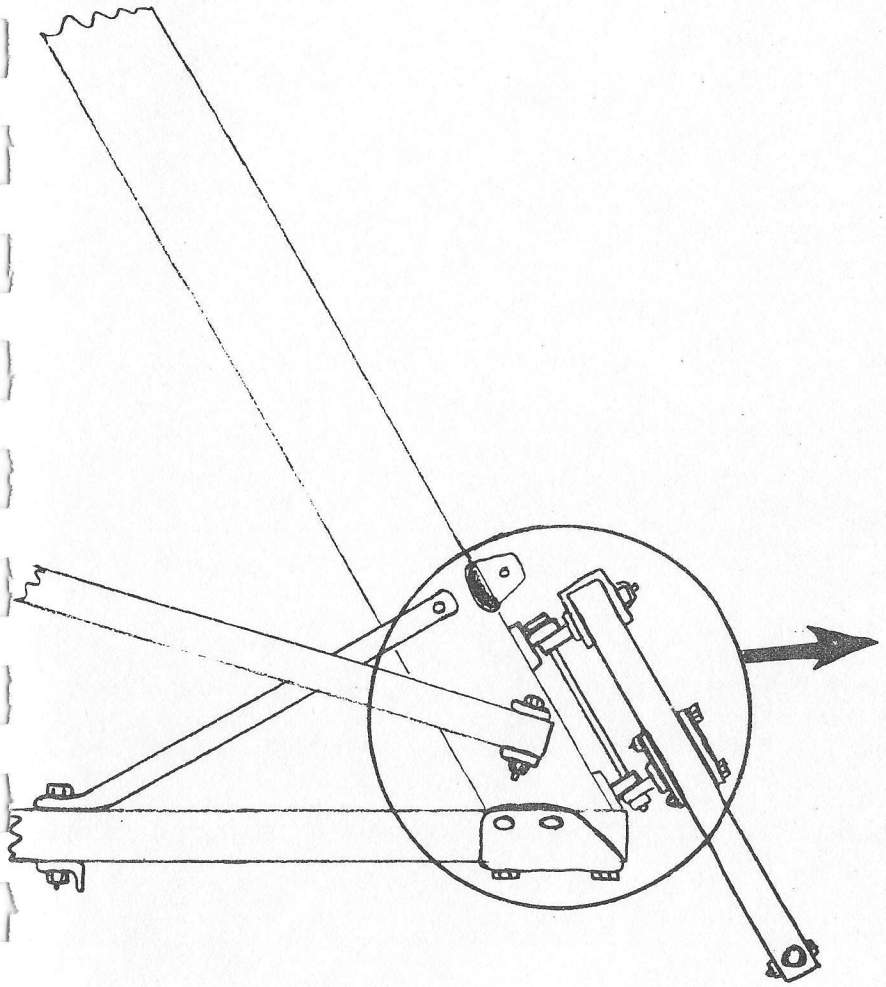


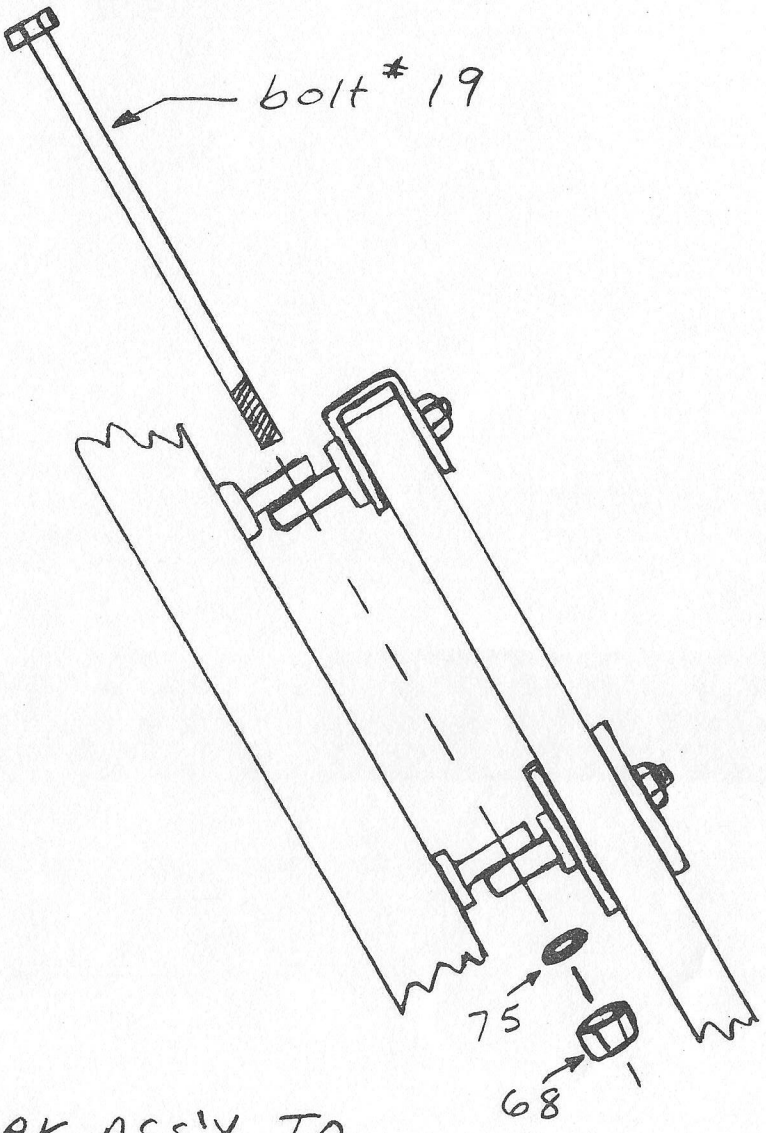
DRILL 3/16" DIA. HOLES THROUGH AXLE AT POSITION "D" AND SECURE WITH BOLTS, NUTS, & WASHERS AS SHOWN.

"SIDE VIEW"



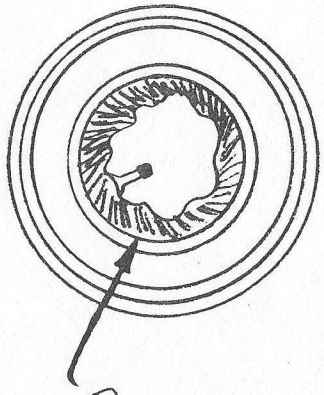
20. INSTALL EYEBOLTS IN STEERING FORK ASS'Y THROUGH 5/16" HOLES AS SHOWN.

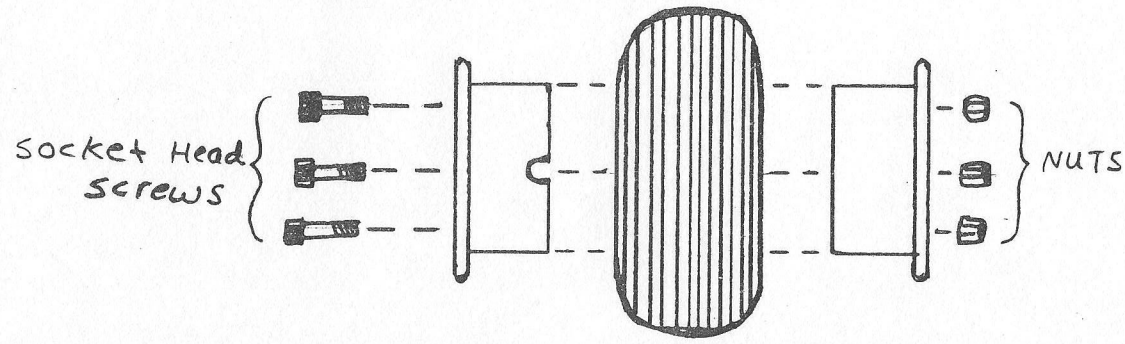




21. ATTACH STEERING FORK ASS'Y TO BOTTOM OF MAIN STRUT AS SHOWN. TIGHTEN NUT # 68 UNTIL SNUG SO THAT FORK DOES NOT FLOP FROM SIDE TO SIDE. DO NOT OVERTIGHTEN.

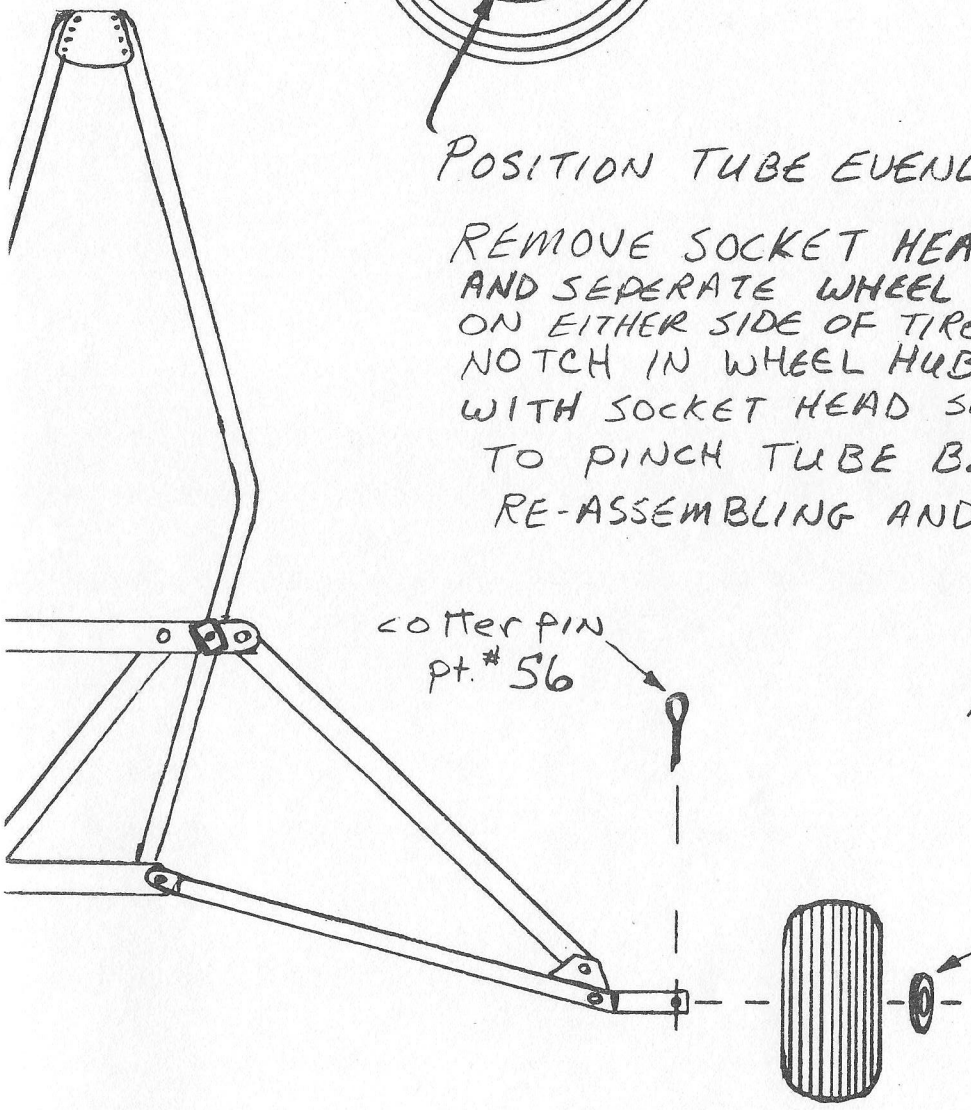
22.





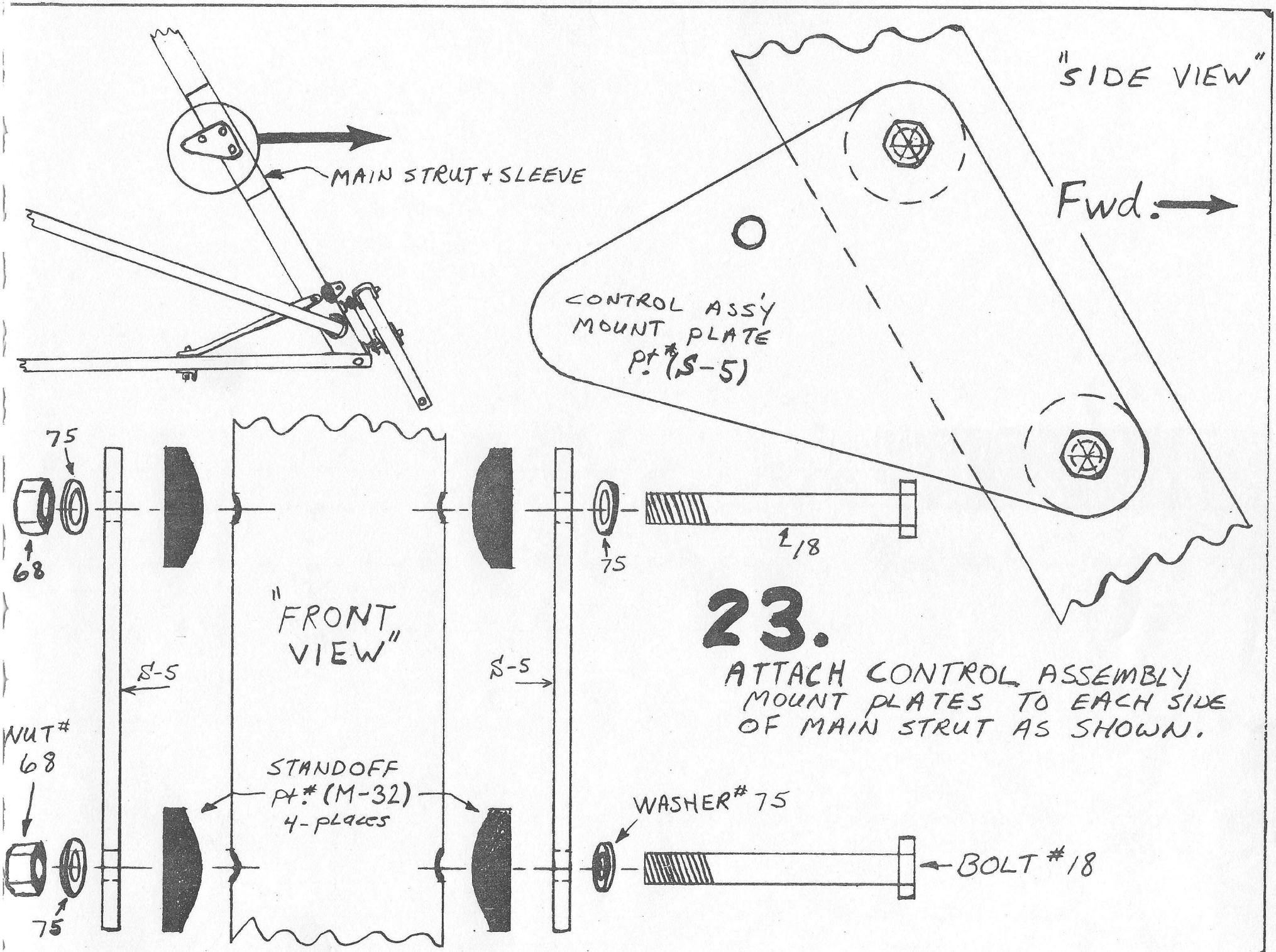
POSITION TUBE EVENLY INSIDE TIRE

REMOVE SOCKET HEAD SCREWS FROM WHEEL HUBS AND SEPERATE WHEEL HALVES. RE-ASSEMBLE WHEEL HALVES ON EITHER SIDE OF TIRE AND TUBE. ALIGN VALVE STEM WITH NOTCH IN WHEEL HUB. BOLT TOGETHER WHEEL HALVES WITH SOCKET HEAD SCREWS AS SHOWN. BE CAREFULL NOT TO PINCH TUBE BETWEEN WHEEL HALVES WHEN RE-ASSEMBLING AND TIGHTENING SCREWS.



MOUNT WHEELS ON STEERING FORK ASS'Y. AND REAR AXLES AS SHOWN. SECURE WHEELS ON REAR AXLES WITH LARGE WASHER AND COTTER PIN. BEND COTTER PIN AFTER INSTALLATION!

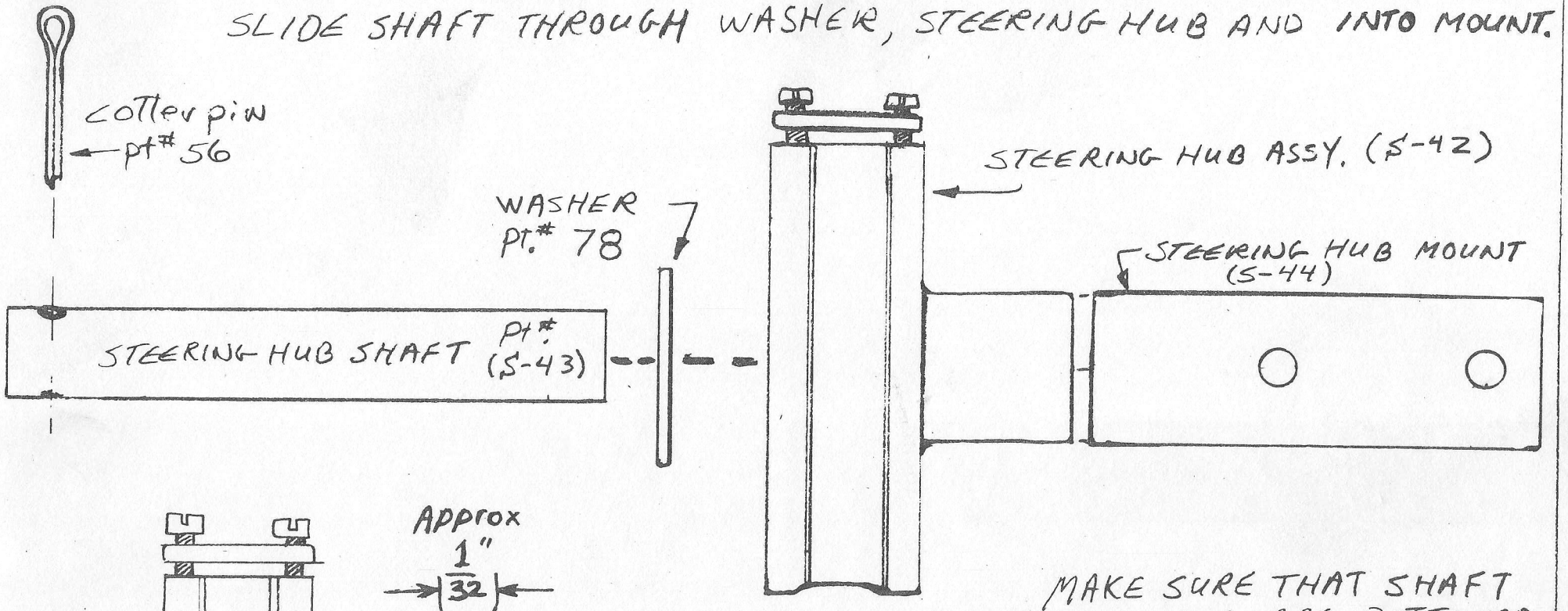
INFLATE TIRES TO ABOUT 10-15 psi
DO NOT OVER INFLATE!

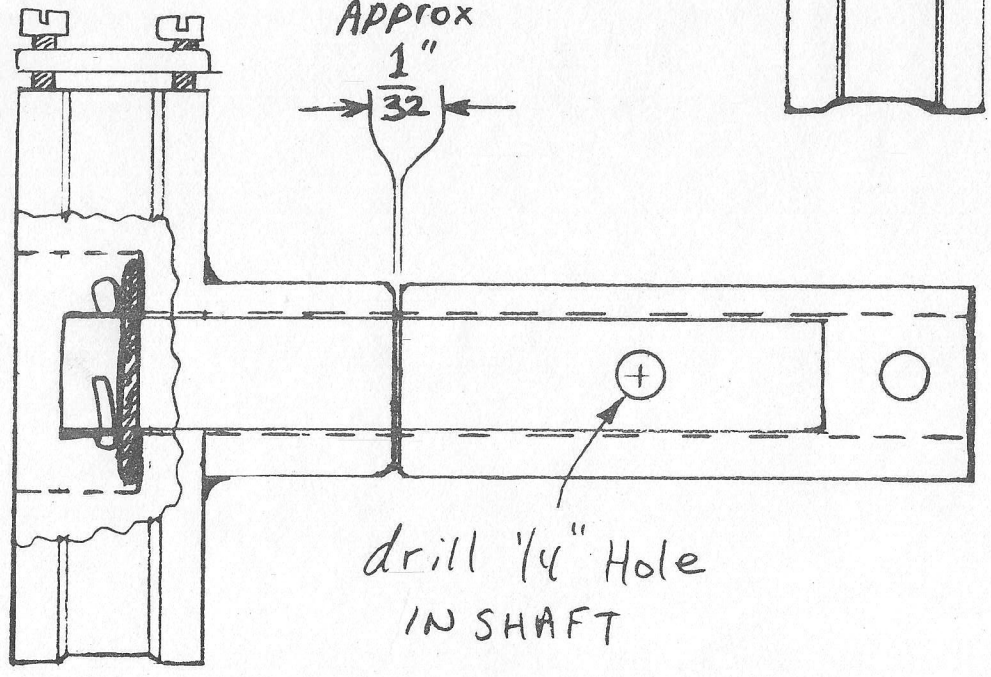


23.

ATTACH CONTROL ASSEMBLY MOUNT PLATES TO EACH SIDE OF MAIN STRUT AS SHOWN.

24. ASSEMBLE MISC. STEERING COMPONENTS AS SHOWN. INSTALL COTTER PIN IN SHAFT END AND BEND ENDS OVER. SLIDE SHAFT THROUGH WASHER, STEERING HUB AND INTO MOUNT.

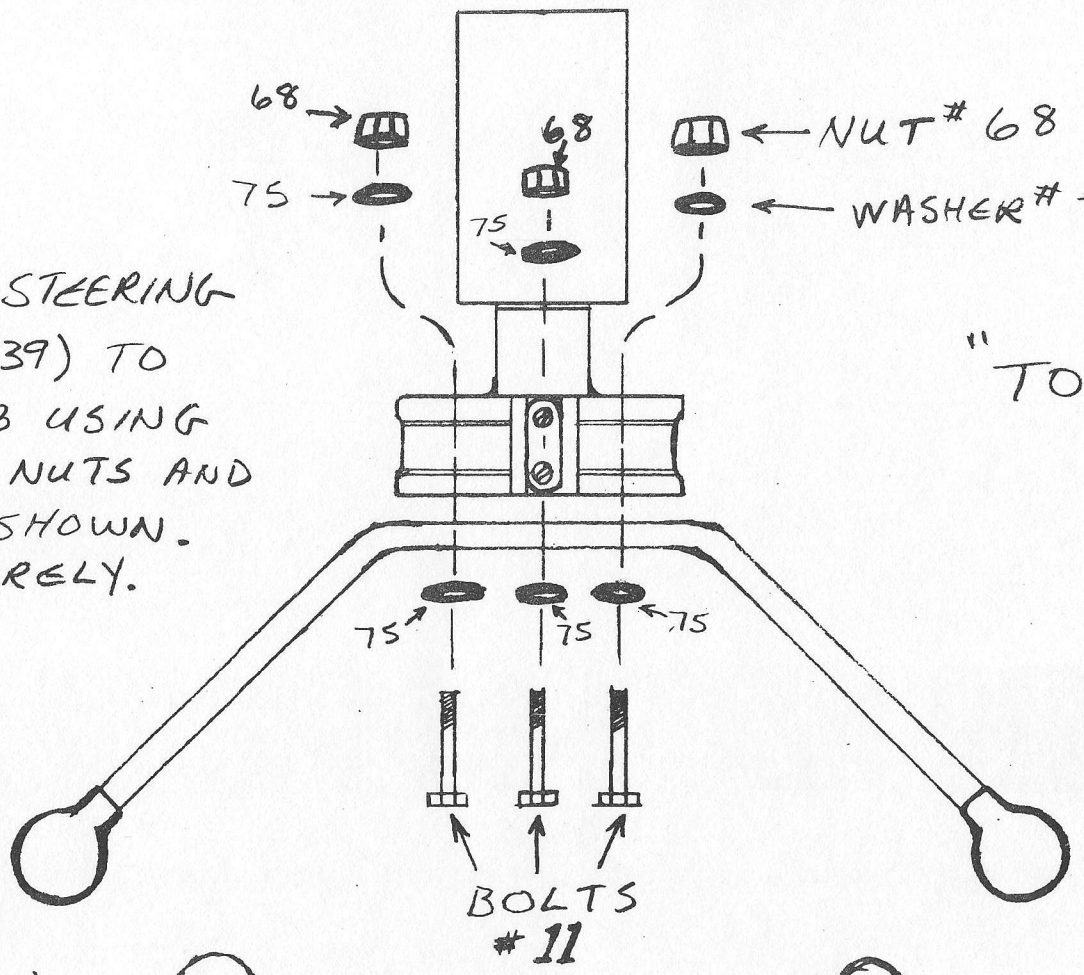




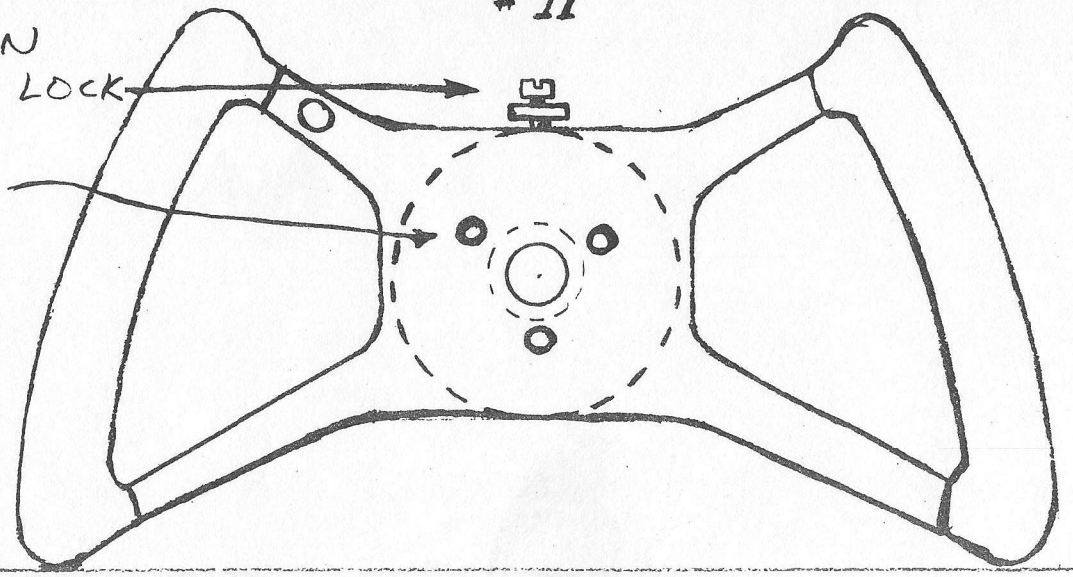
MAKE SURE THAT SHAFT AND WASHER ARE BOTTOMED OUT IN STEERING HUB. LEAVE ABOUT 1/32" of clearance BETWEEN STEERING HUB AND MOUNT SO THAT STEERING HUB CAN ROTATE FREELY WITHOUT BINDING. DRILL 1/4" DIA. HOLE THROUGH SHAFT AS INDICATED.

25.

ATTACH STEERING WHEEL (PT.# M-39) TO STEERING HUB USING PROPER BOLTS, NUTS AND WASHERS AS SHOWN. TIGHTEN SECURELY.

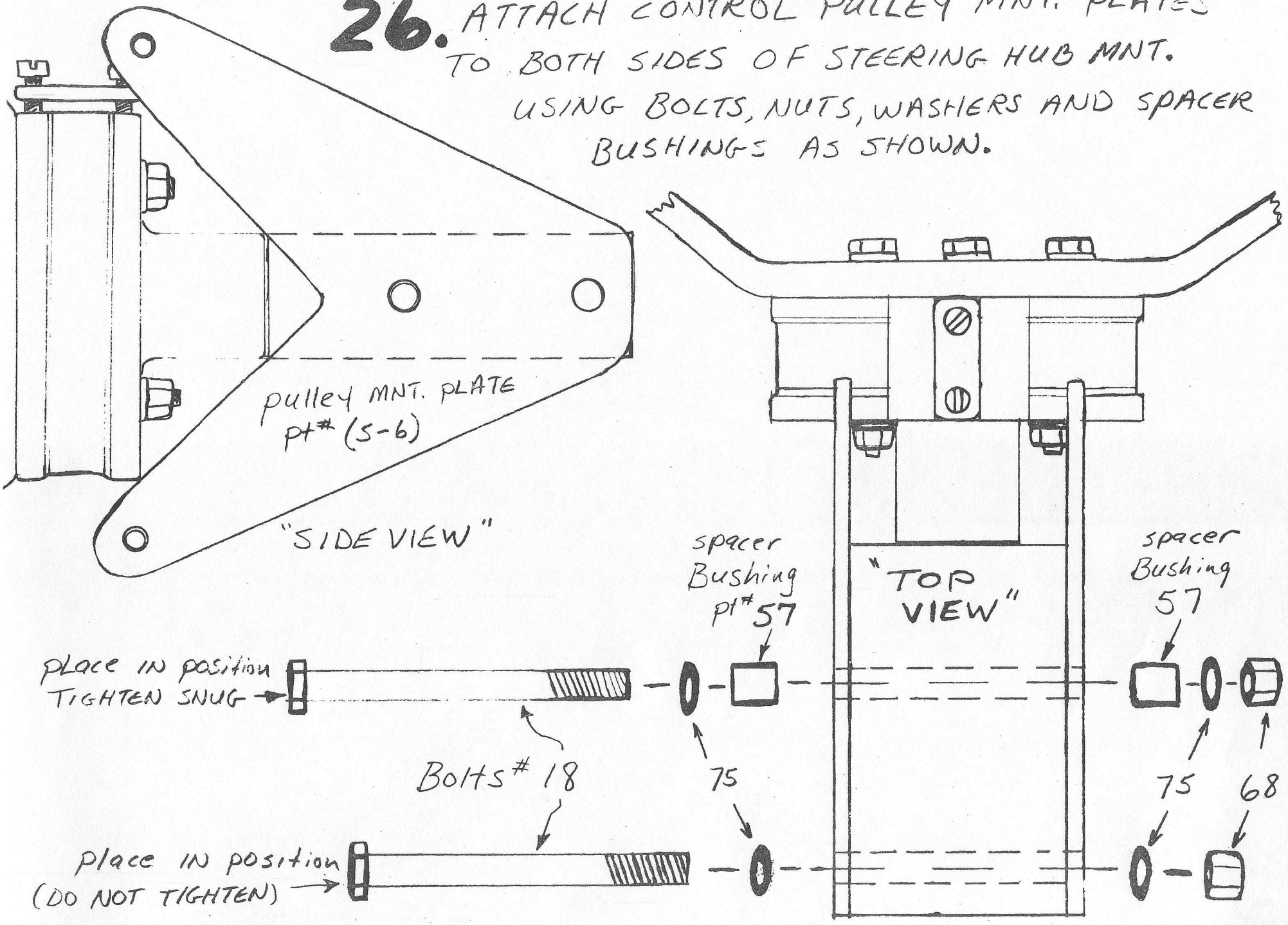


NOTE POSITION OF STEERING HUB LOCK TAB AND HOLE PATTERN IN HUB AND WHEEL.

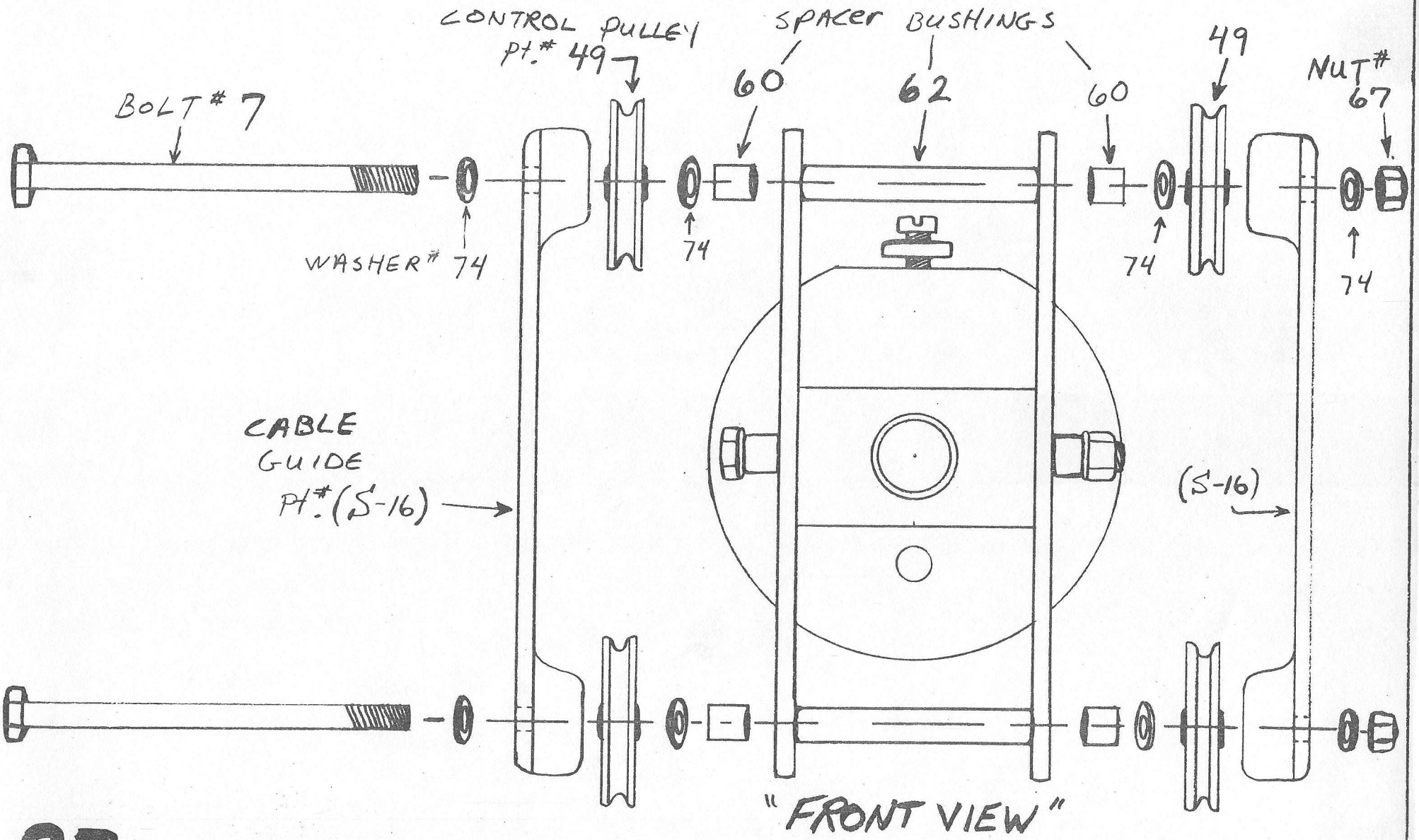


"REAR VIEW" (LOOKING Fwd.)

26. ATTACH CONTROL PULLEY MNT. PLATES TO BOTH SIDES OF STEERING HUB MNT. USING BOLTS, NUTS, WASHERS AND SPACER BUSHINGS AS SHOWN.



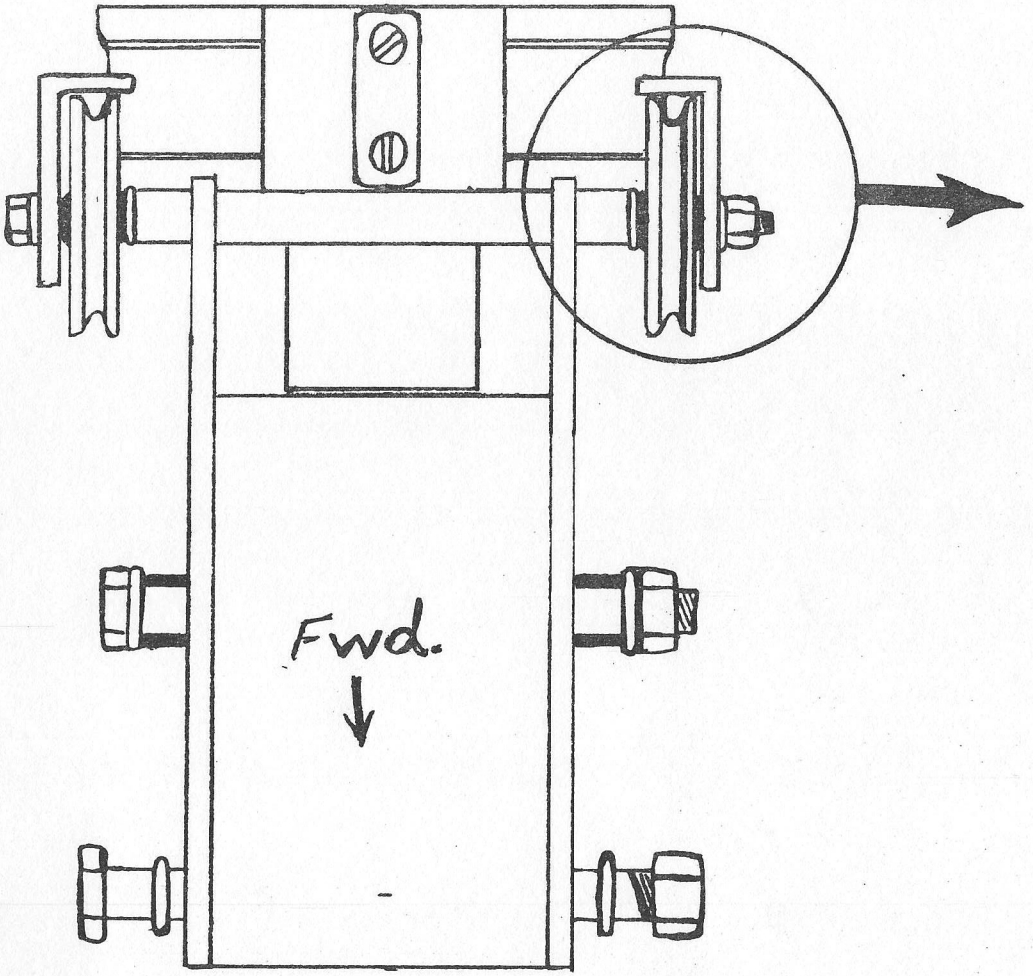
(NOTE: STEERING WHEEL NOT SHOWN FOR CLARITY)

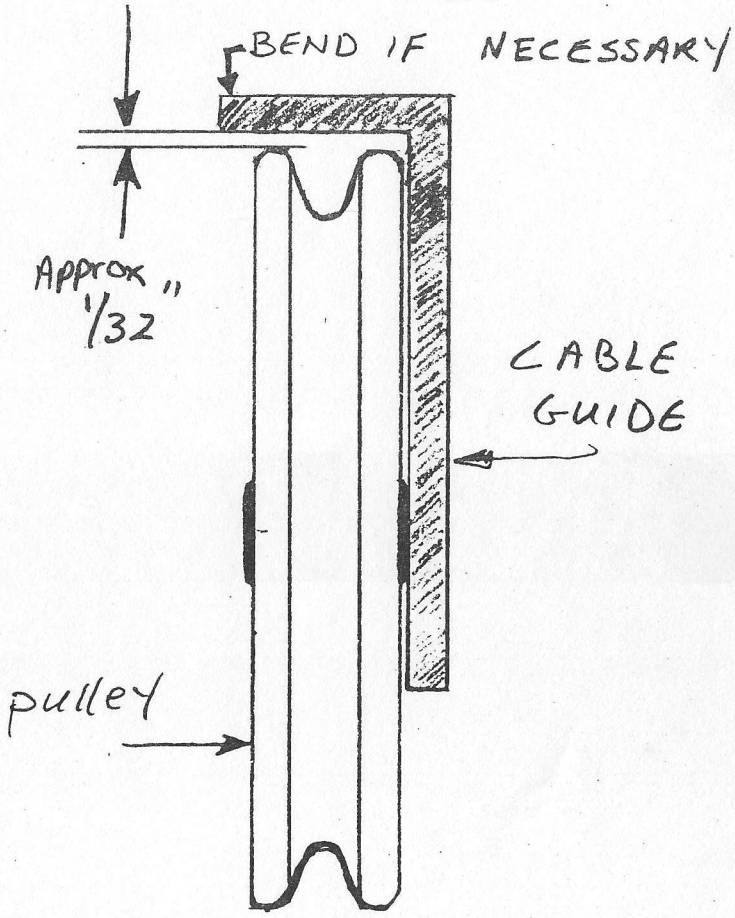


27. ASSEMBLE CABLE GUIDES, CONTROL PULLEYS AND SPACER BUSHINGS ON STEERING HUB ASSEMBLY USING BOLTS, NUTS AND WASHERS AS SHOWN.

28. CHECK CLEARANCE BETWEEN PULLEYS AND CABLE GUIDES. IF CLEARANCE IS GREATER THAN 1/32", BEND EDGE OF GUIDE TO ADJUST DISTANCE.

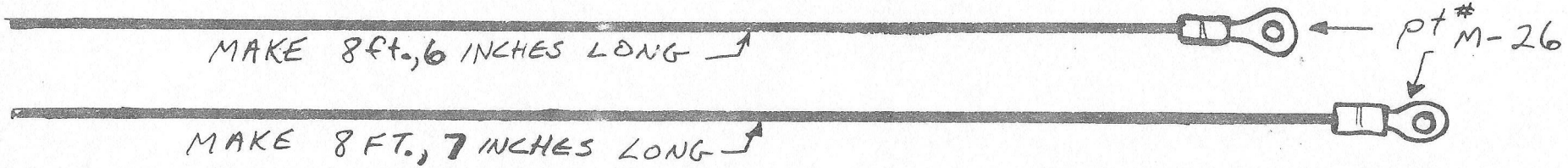
"TOP VIEW"



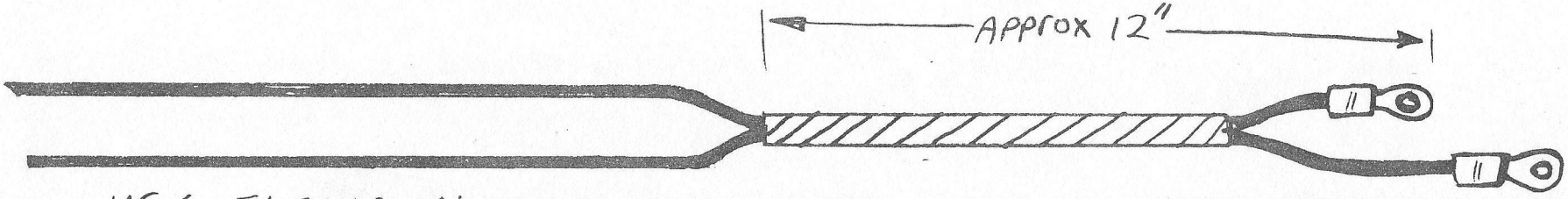


ENLARGED "TOP VIEW"

29. CUT TWO PIECES OF 20 GAUGE IGNITION WIRE TO LENGTHS SHOWN. STRIP ENDS AND CRIMP ON WIRE CONNECTORS.

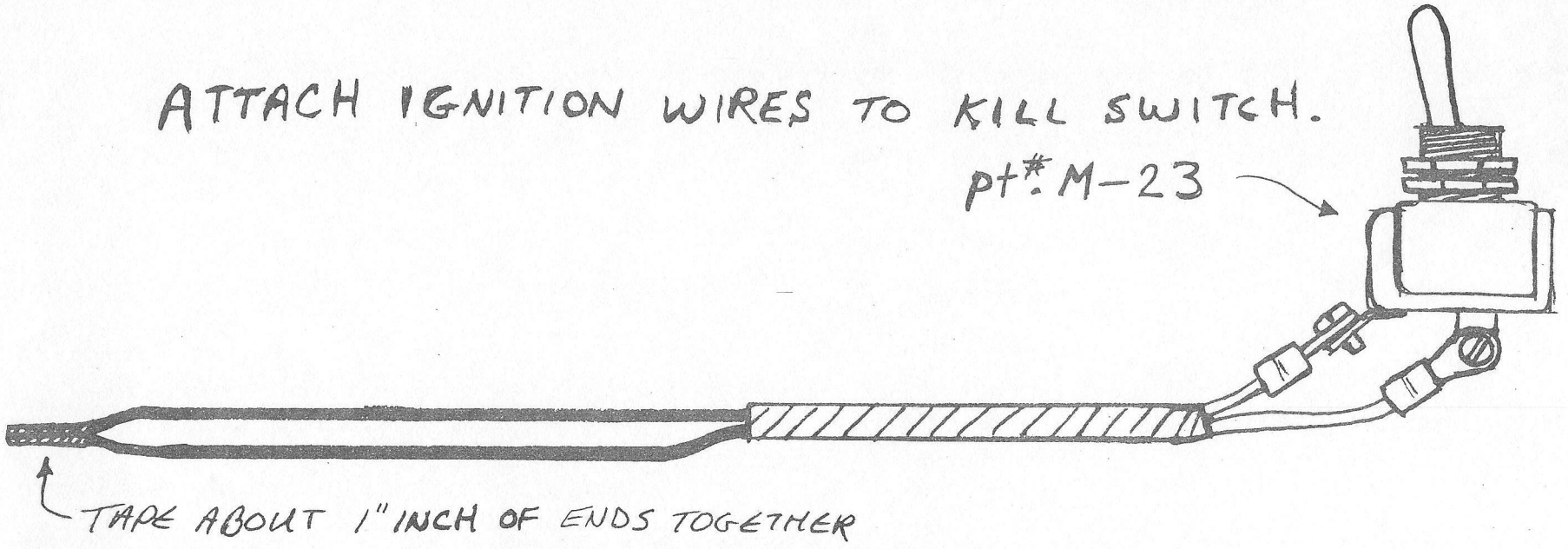


NOTE: USE A PROPER ELECTRICIANS CRIMPING TOOL FOR CRIMPING ENDS.
— DO NOT USE PLIERS! —



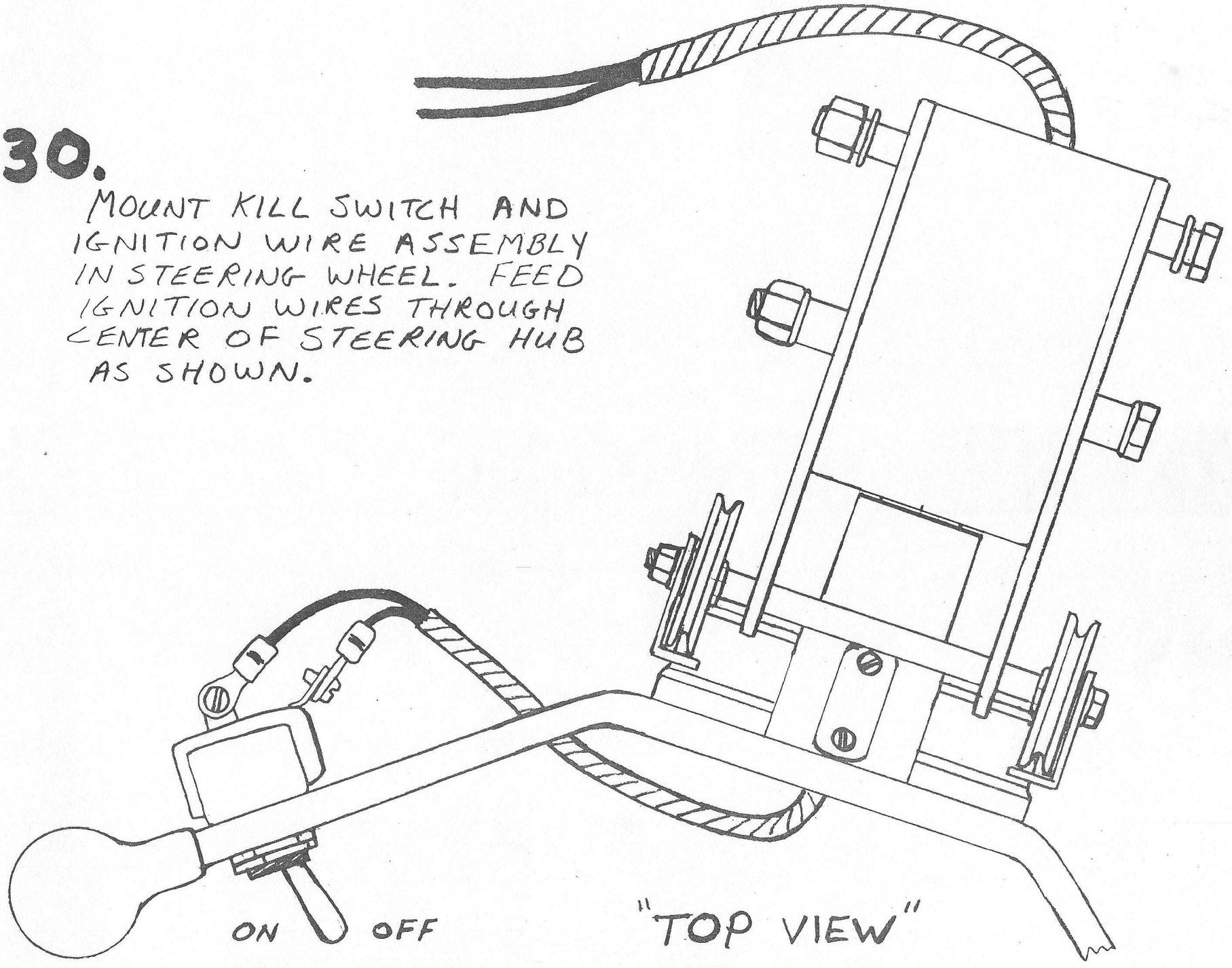
USE ELECTRICAL TAPE AND WRAP WIRES TOGETHER FOR ABOUT 12" INCHES AS SHOWN.

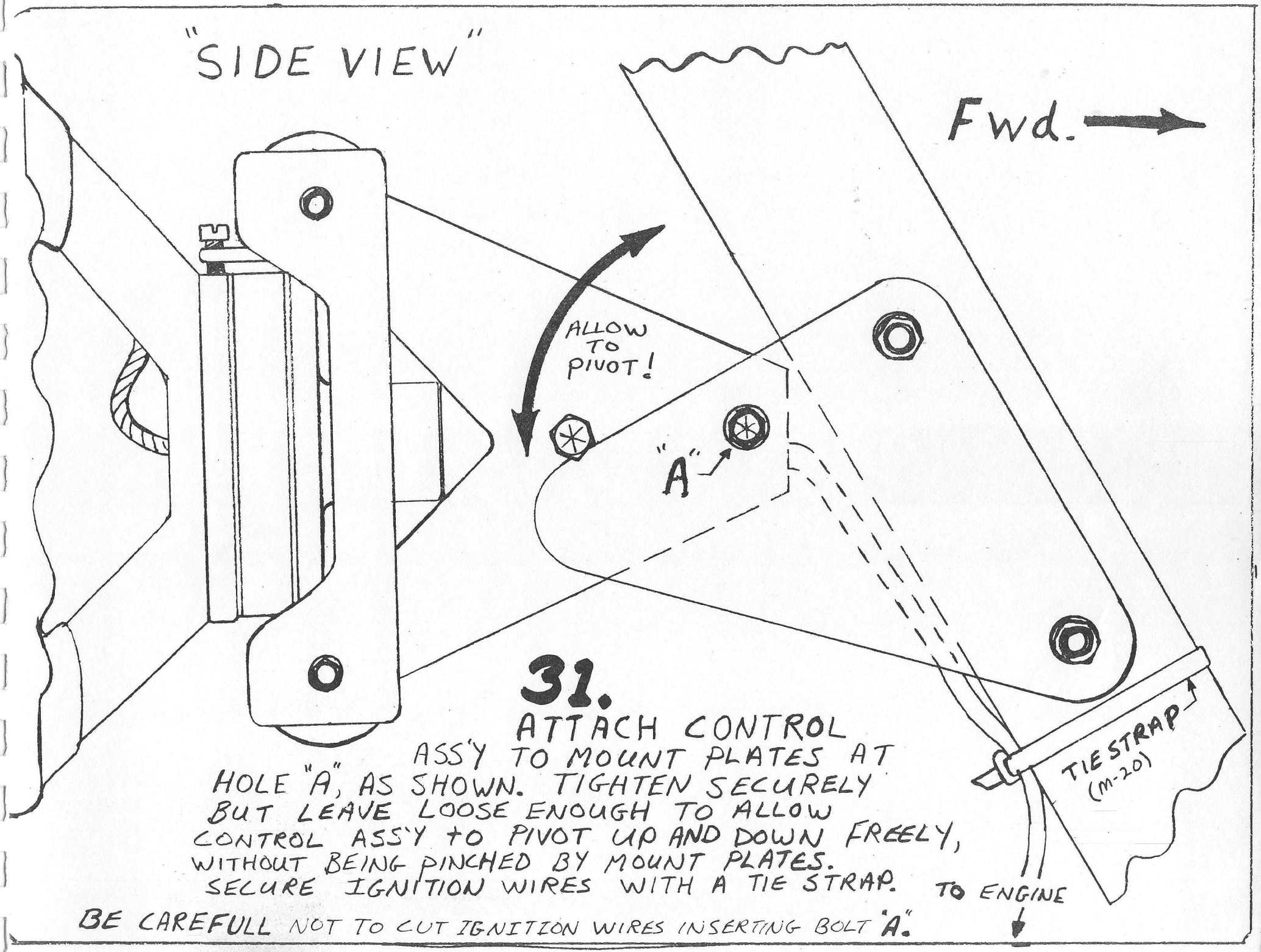
ATTACH IGNITION WIRES TO KILL SWITCH.



30.

MOUNT KILL SWITCH AND IGNITION WIRE ASSEMBLY IN STEERING WHEEL. FEED IGNITION WIRES THROUGH CENTER OF STEERING HUB AS SHOWN.



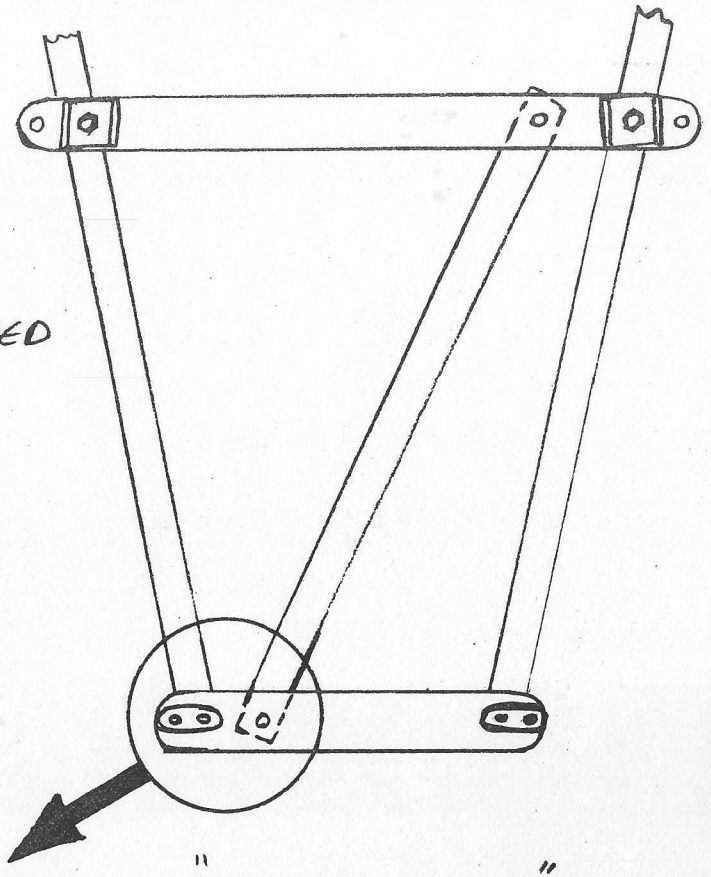


31.

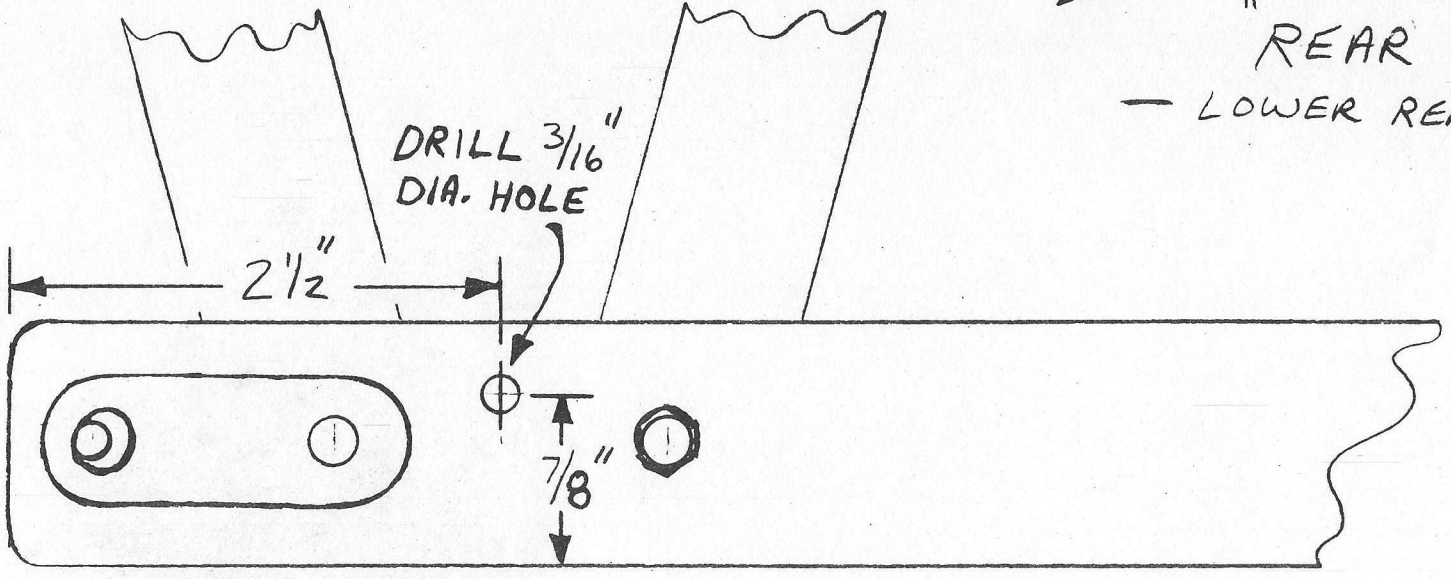
ATTACH CONTROL ASS'Y TO MOUNT PLATES AT HOLE "A", AS SHOWN. TIGHTEN SECURELY BUT LEAVE LOOSE ENOUGH TO ALLOW CONTROL ASS'Y TO PIVOT UP AND DOWN FREELY, WITHOUT BEING PINCHED BY MOUNT PLATES. SECURE IGNITION WIRES WITH A TIE STRAP.

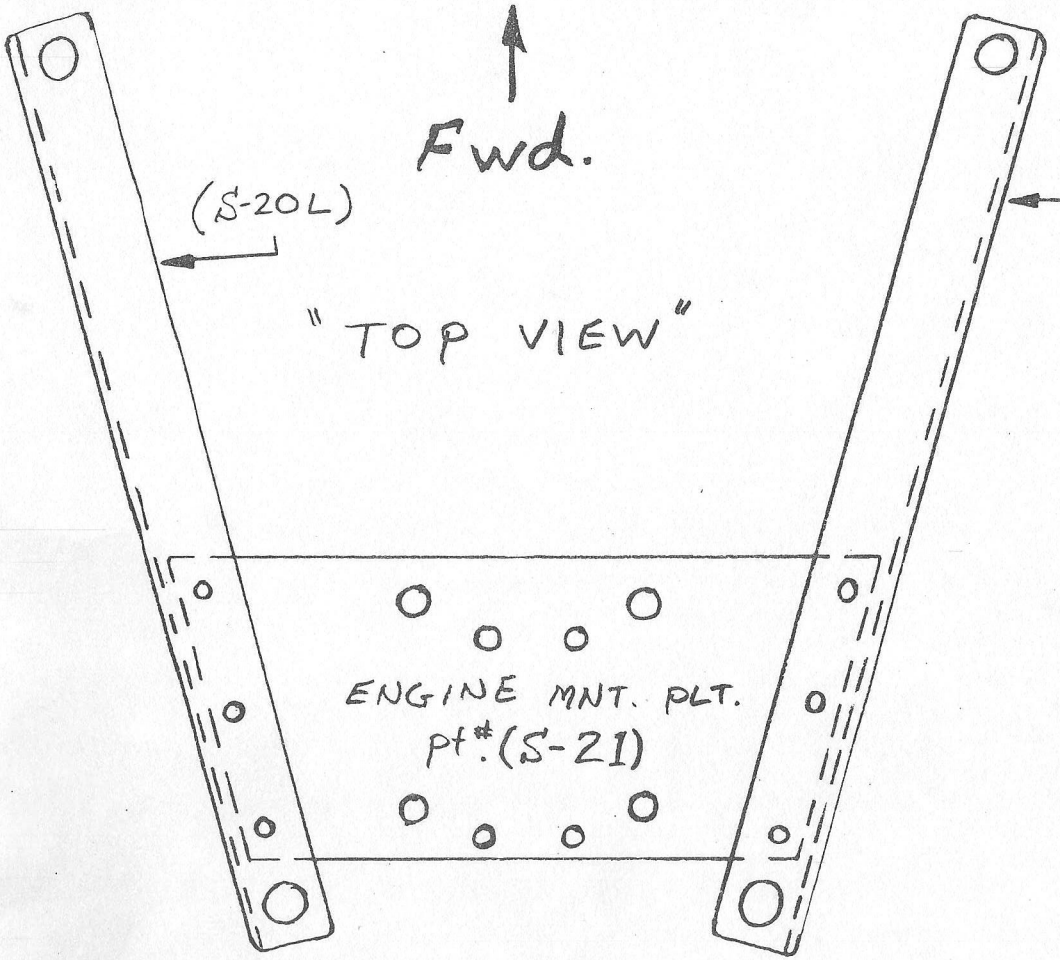
BE CAREFULL NOT TO CUT IGNITION WIRES INSERTING BOLT "A".

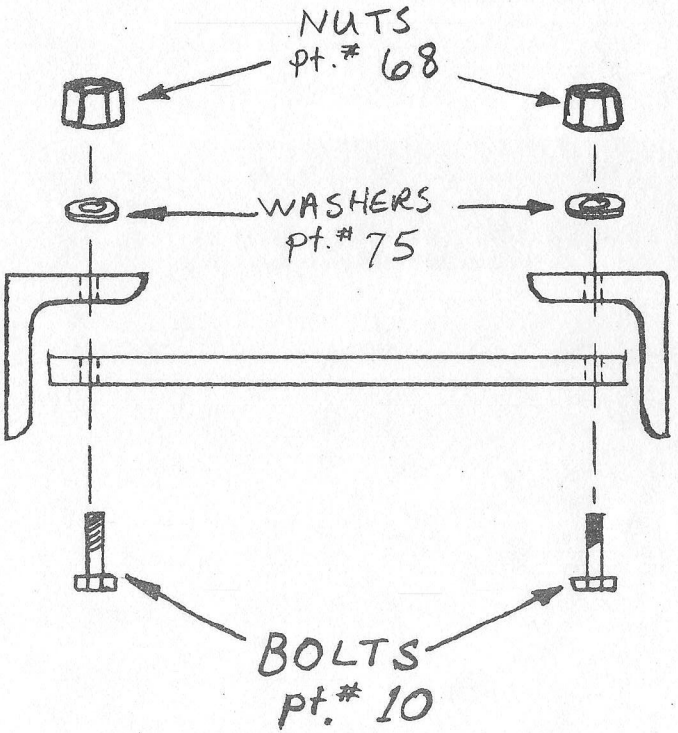
32. CHECK LOWER LEFT CORNER OF REAR FRAME ASSEMBLY FOR POSITION OF LOWER PULL STARTER PULLEY MOUNT HOLE. IF NO HOLE IS PRESENT, MARK REAR SIDE OF BRACKET AND CENTER PUNCH FOR DRILLING AS SHOWN. DRILL 3/16" DIA. HOLE IN REAR SIDE OF BRACKET ONLY. REMOVE ANY BURRS WHICH MAY HAVE FORMED AROUND HOLE.



"REAR VIEW"
— LOWER REAR FRAME —

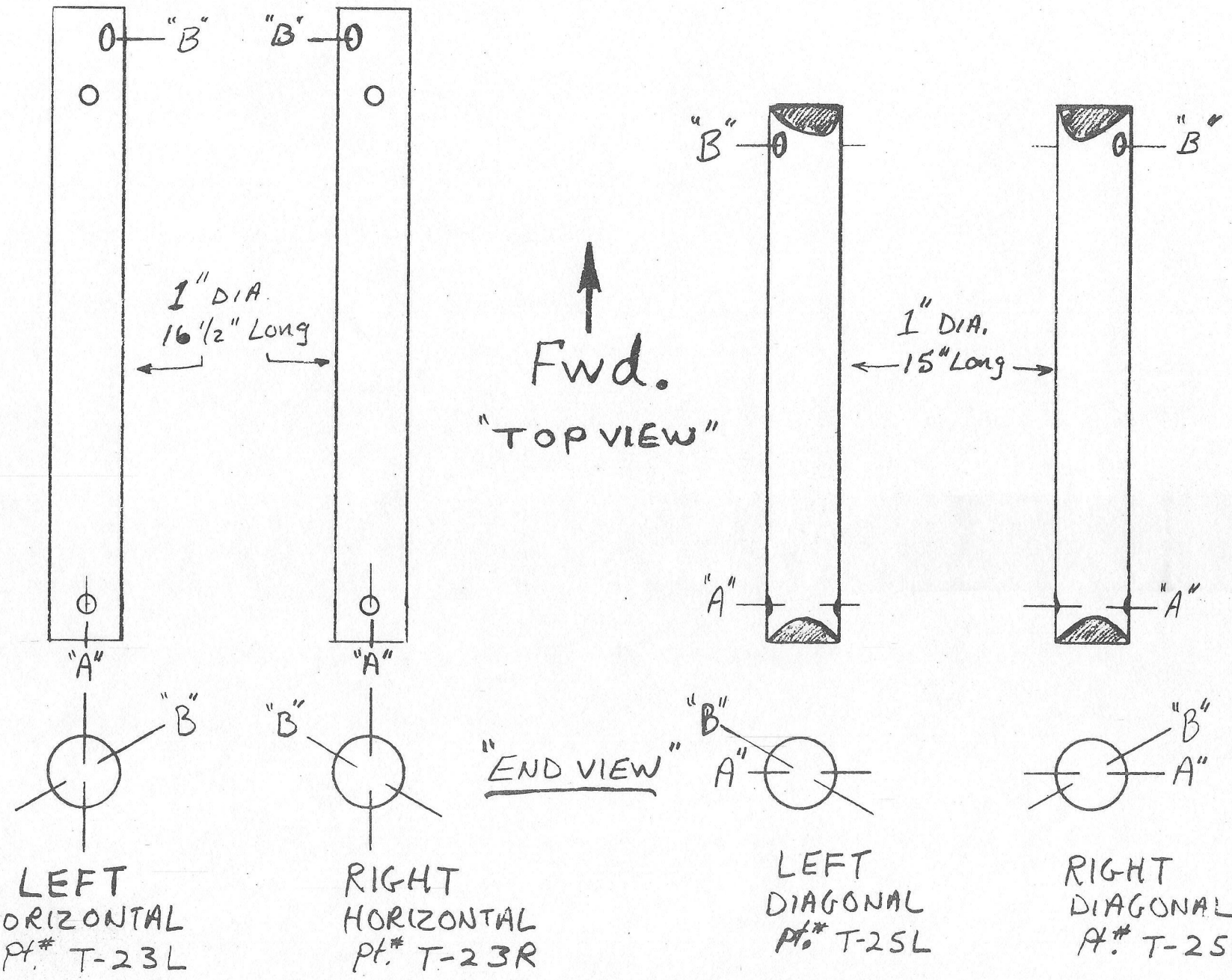




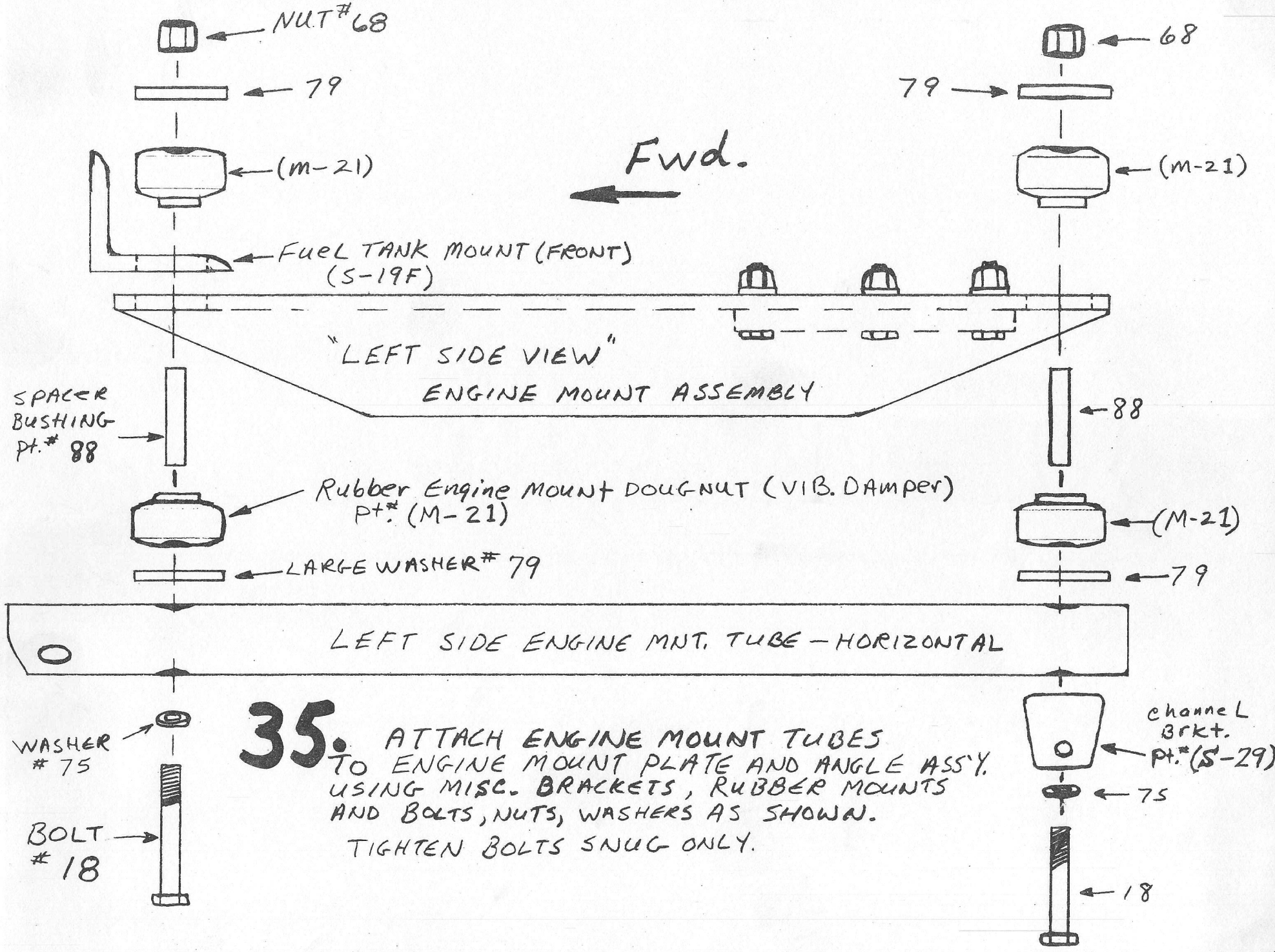


"REAR VIEW"

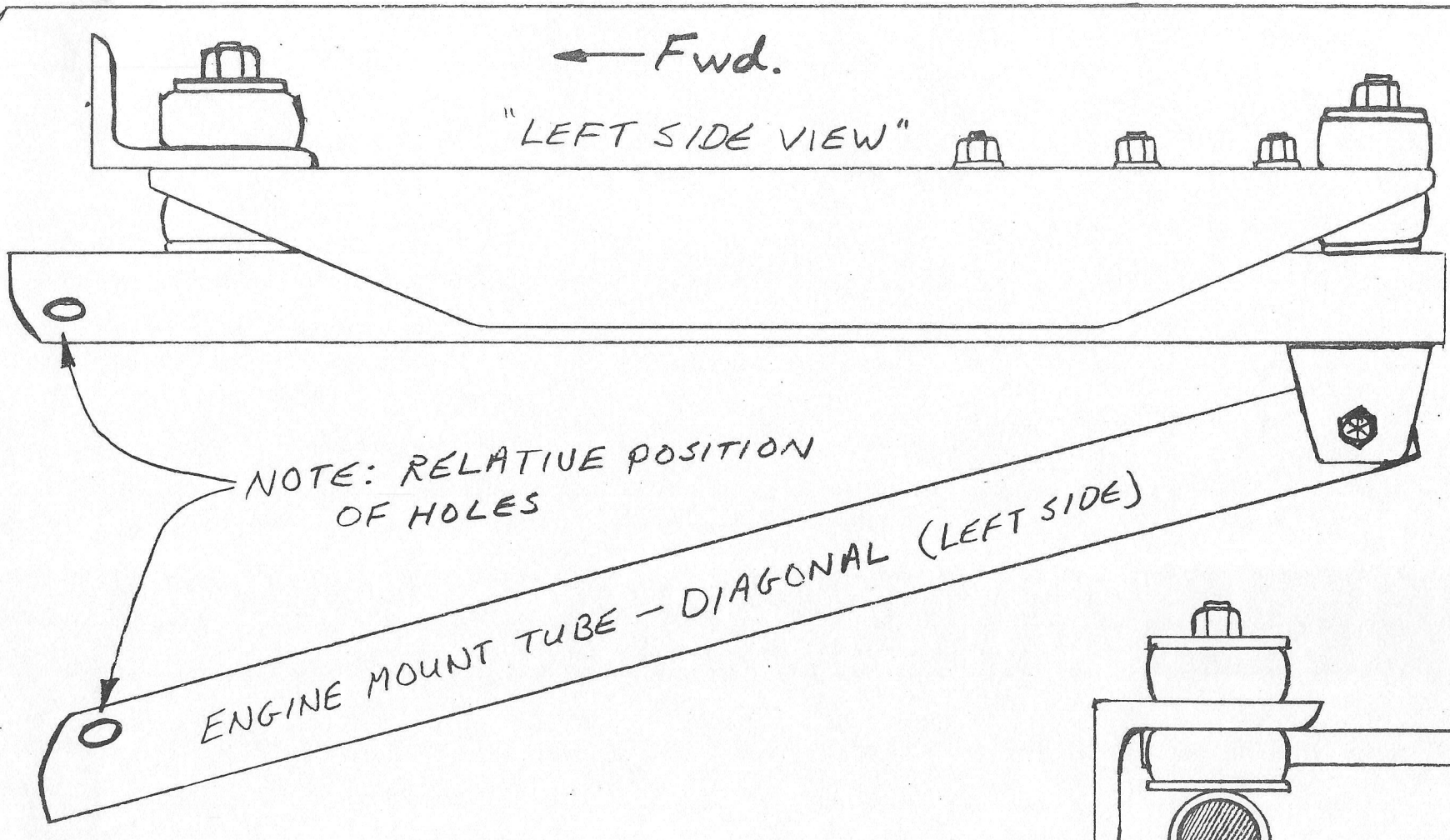
33. ATTACH ENGINE MOUNT PLATE AND LEFT AND RIGHT ENGINE MOUNT ANGLES TOGETHER USING 6 BOLTS, NUTS AND WASHERS AS SHOWN. TIGHTEN SECURELY!

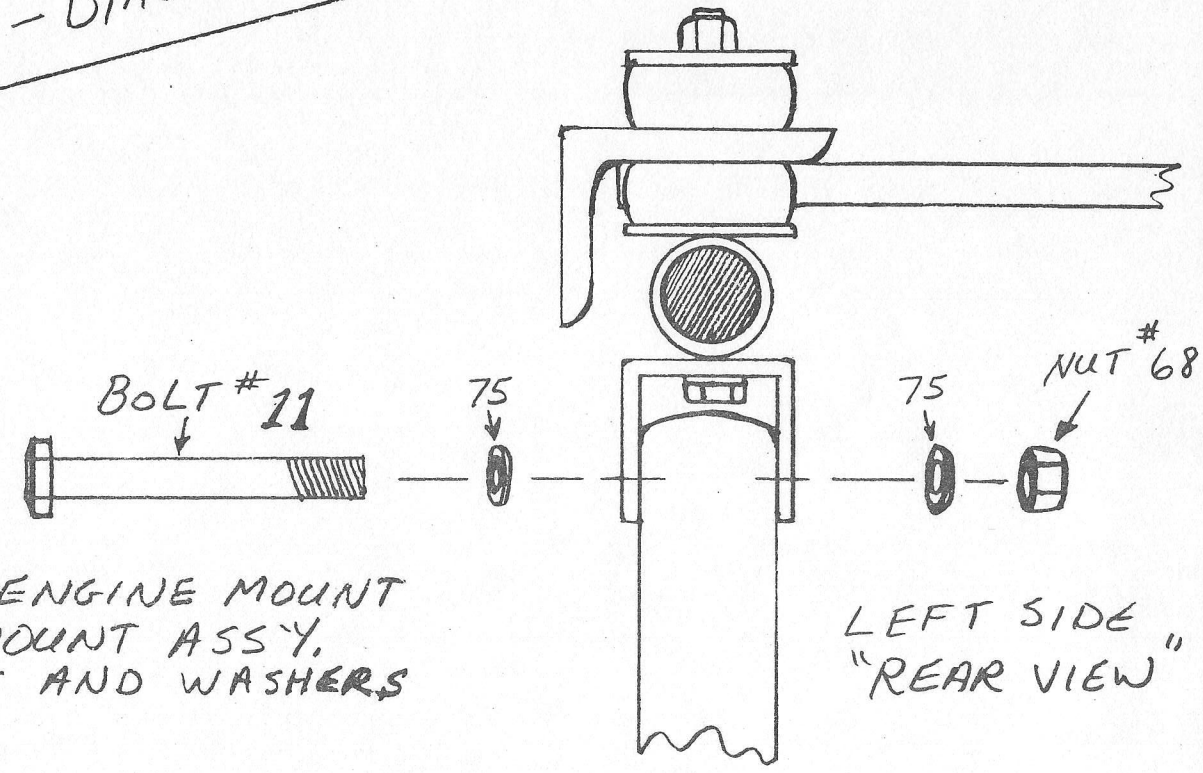


34. LAYOUT ENGINE MOUNT TUBES AS SHOWN. NOTE IN PARTICULAR THE DIFFERENT ANGLES BETWEEN HOLES **"A" AND "B"** IN ENDS OF EACH TUBE. THIS IS TO DISTINGUISH RIGHT SIDE TUBES FROM LEFT SIDE PRIOR TO NEXT STEP OF ASSEMBLY.

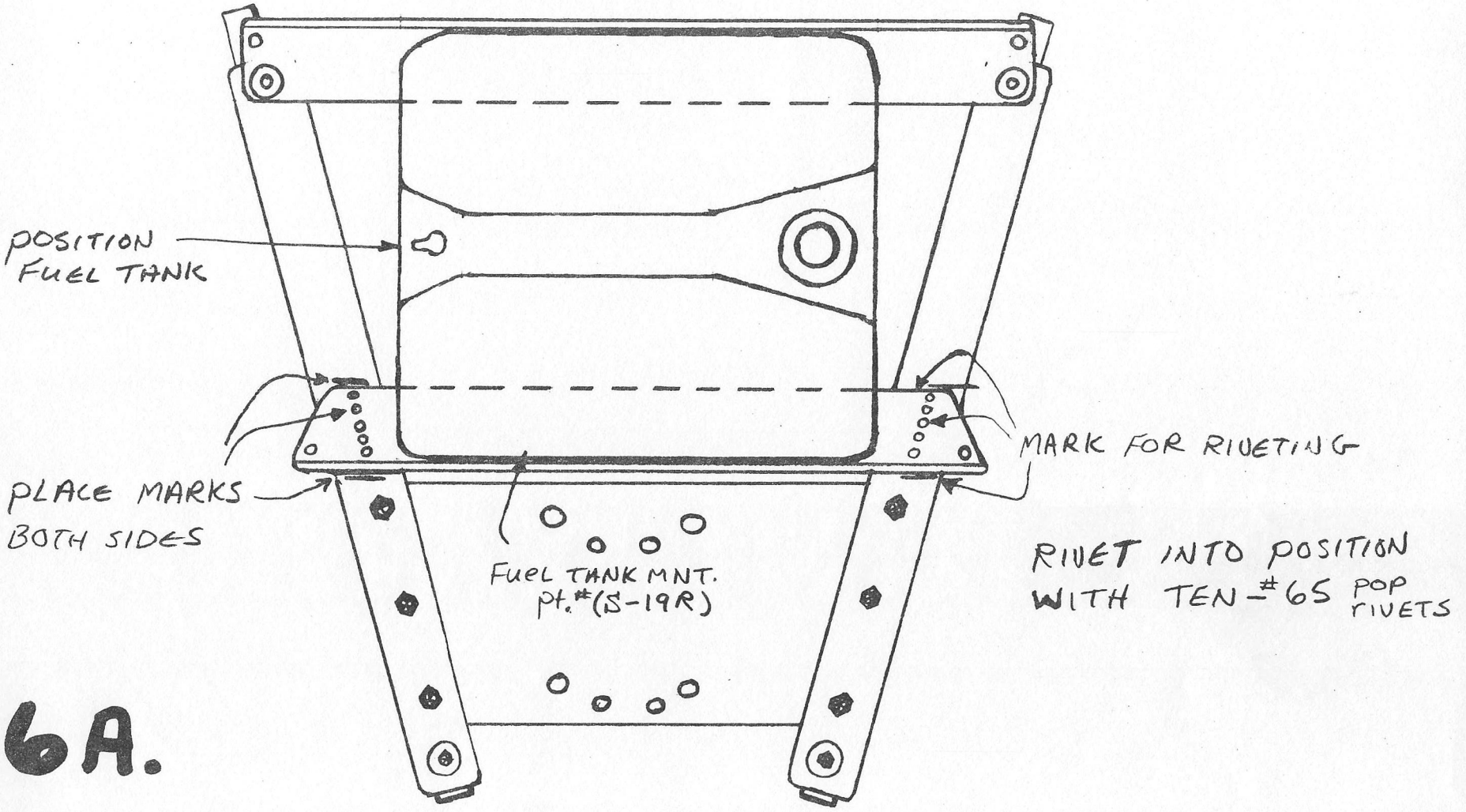


35. ATTACH ENGINE MOUNT TUBES TO ENGINE MOUNT PLATE AND ANGLE ASS'Y. USING MISC. BRACKETS, RUBBER MOUNTS AND BOLTS, NUTS, WASHERS AS SHOWN.
TIGHTEN BOLTS SNUG ONLY.





36. ATTACH DIAGONAL ENGINE MOUNT TUBE TO ENGINE MOUNT ASS'Y. WITH BOLTS, NUTS AND WASHERS AS SHOWN.



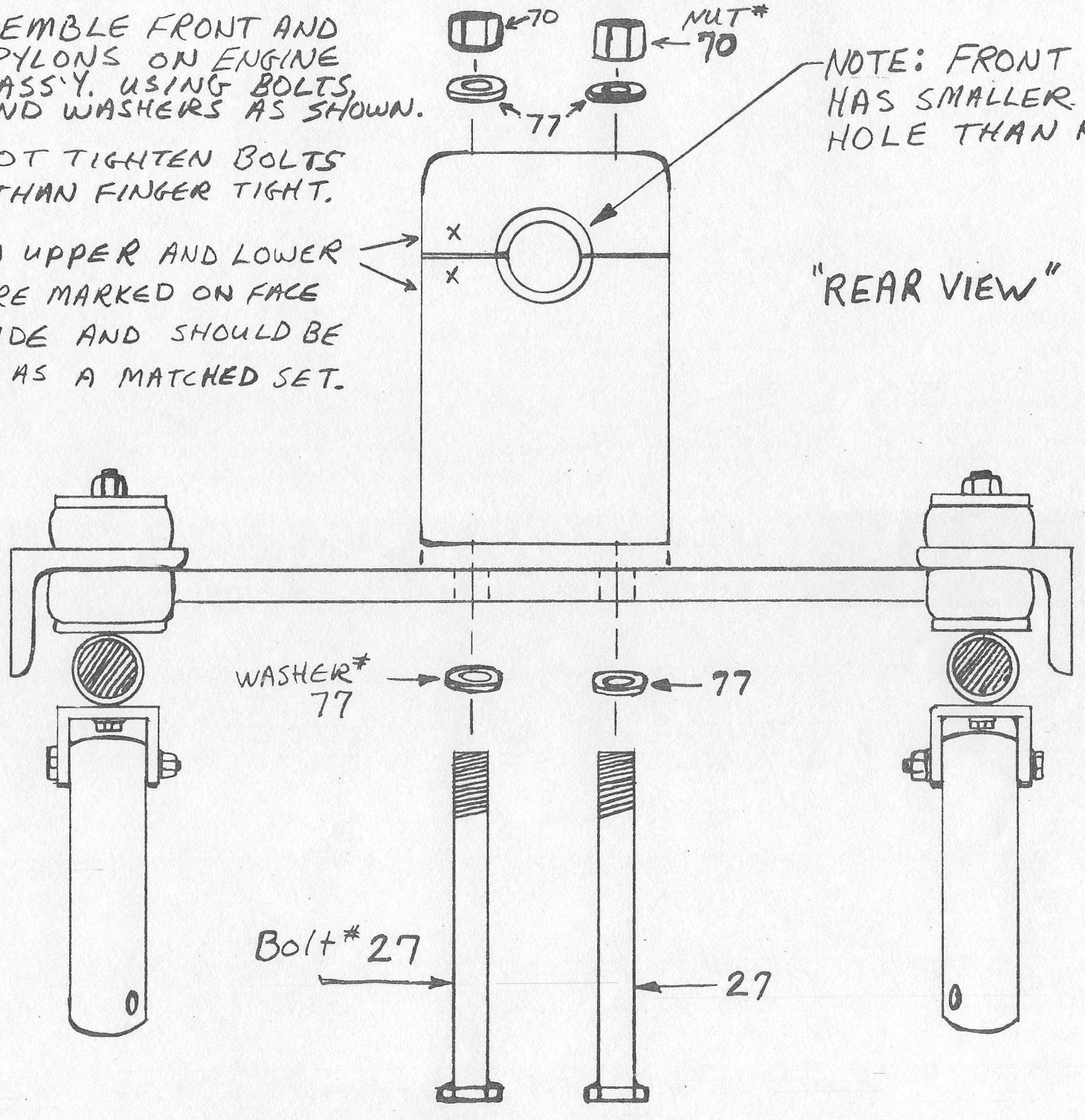
36A.

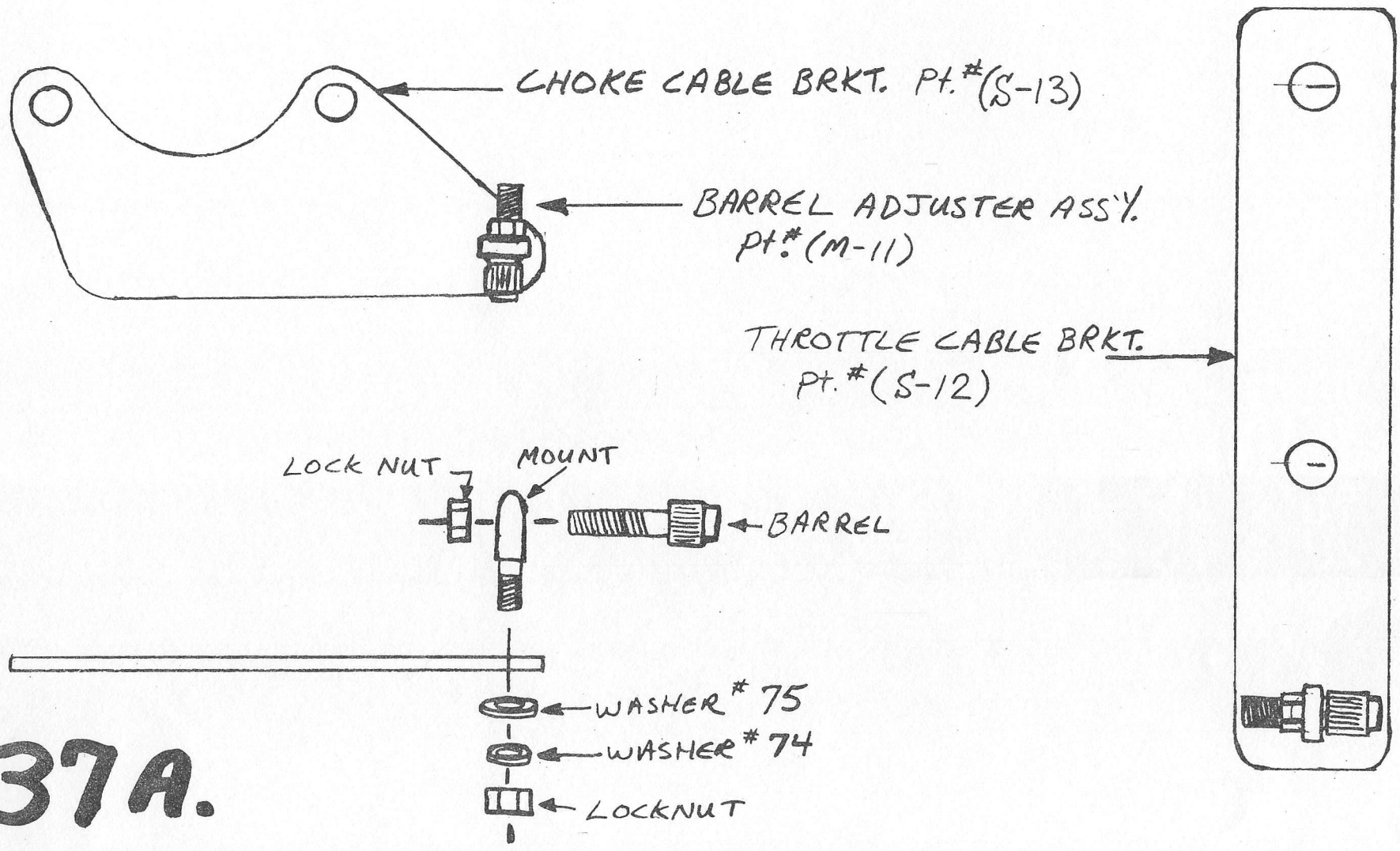
POSITION FUEL TANK AND FUEL TANK MNT. (REAR), ON ENGINE MNT. ASS'Y. AS SHOWN. MARK ENGINE MNT. ANGLES FOR POSITION OF REAR TANK MNT. BRACKET. REMOVE FUEL TANK AND DRILL 1/8" POP RIVET HOLES AS SHOWN. RIVET REAR TANK MNT. INTO POSITION WITH LONG 1/8" POP RIVETS.

37. ASSEMBLE FRONT AND REAR PYLONS ON ENGINE MOUNT ASS'Y. USING BOLTS, NUTS AND WASHERS AS SHOWN.

DO NOT TIGHTEN BOLTS MORE THAN FINGER TIGHT.

PYLON UPPER AND LOWER HALVES ARE MARKED ON FACE OR ON SIDE AND SHOULD BE MOUNTED AS A MATCHED SET.

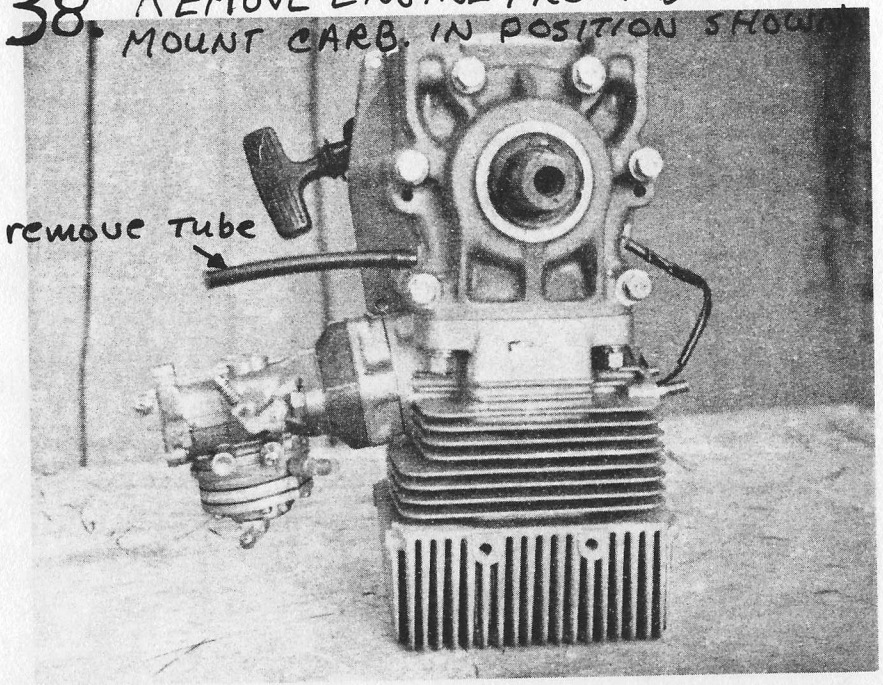




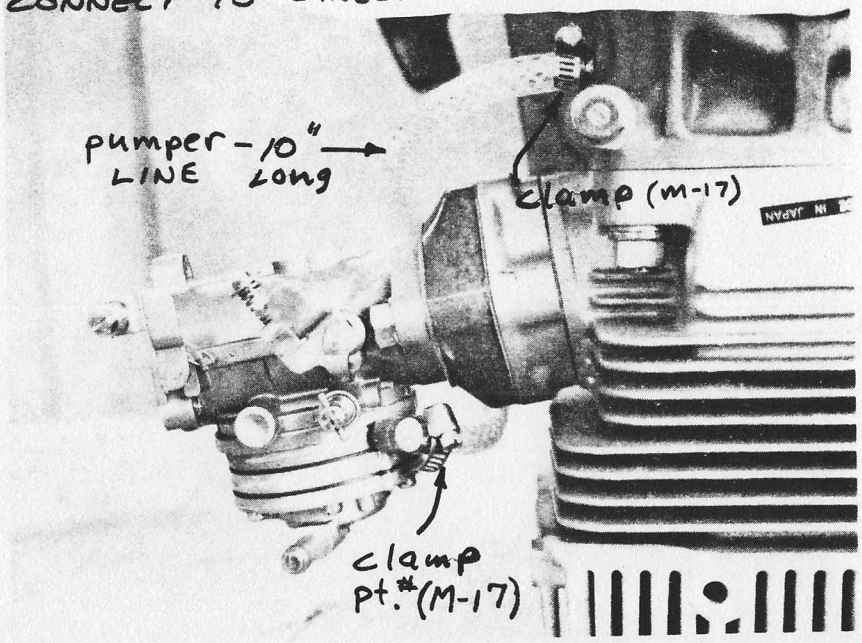
37A.

MOUNT BARREL ADJUSTER ASSEMBLIES IN CHOKE AND THROTTLE CABLE BRKTS. AS SHOWN. PUT A LITTLE LOCTITE - THREAD LOCKING COMPOUND (AVAILABLE FROM MOST AUTO PARTS STORES) ON THREADS PRIOR TO FINAL ASSEMBLY.

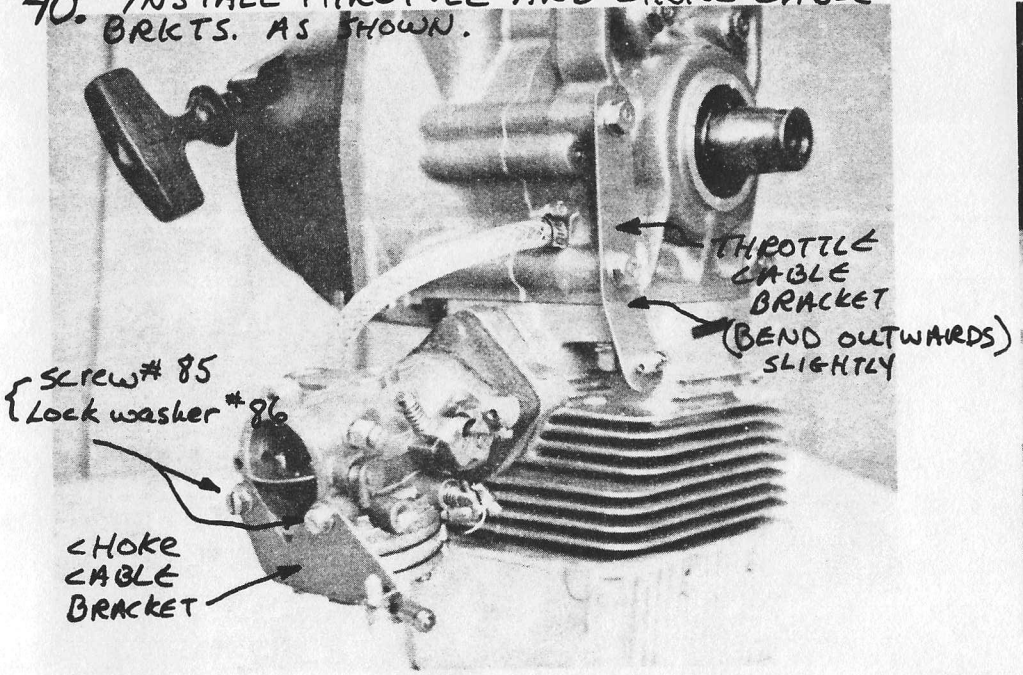
38. REMOVE ENGINE FROM BOX
MOUNT CARB. IN POSITION SHOWN



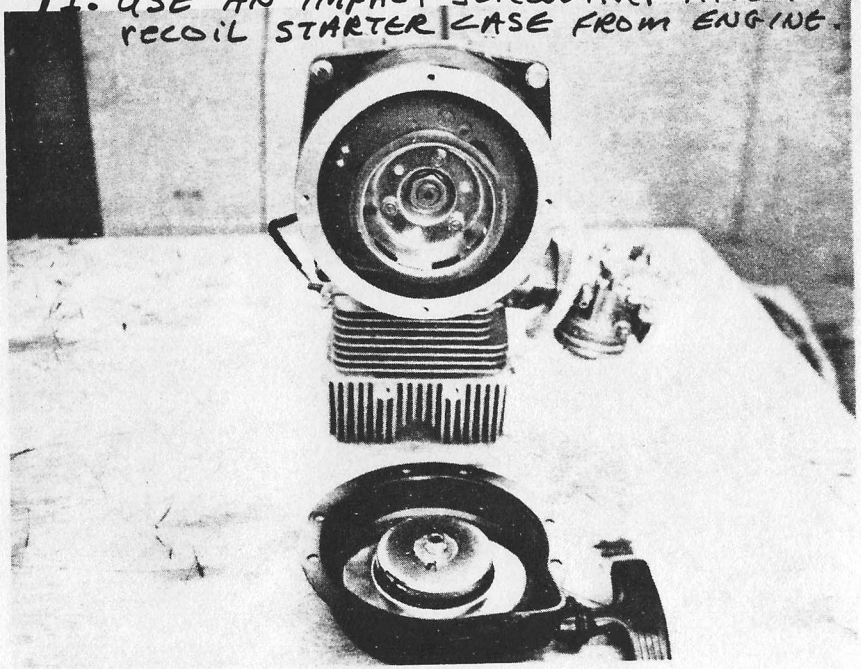
39. CUT A 10" LONG PUMPER LINE AND
CONNECT TO CARBURATOR WITH HOSE CLAMPS



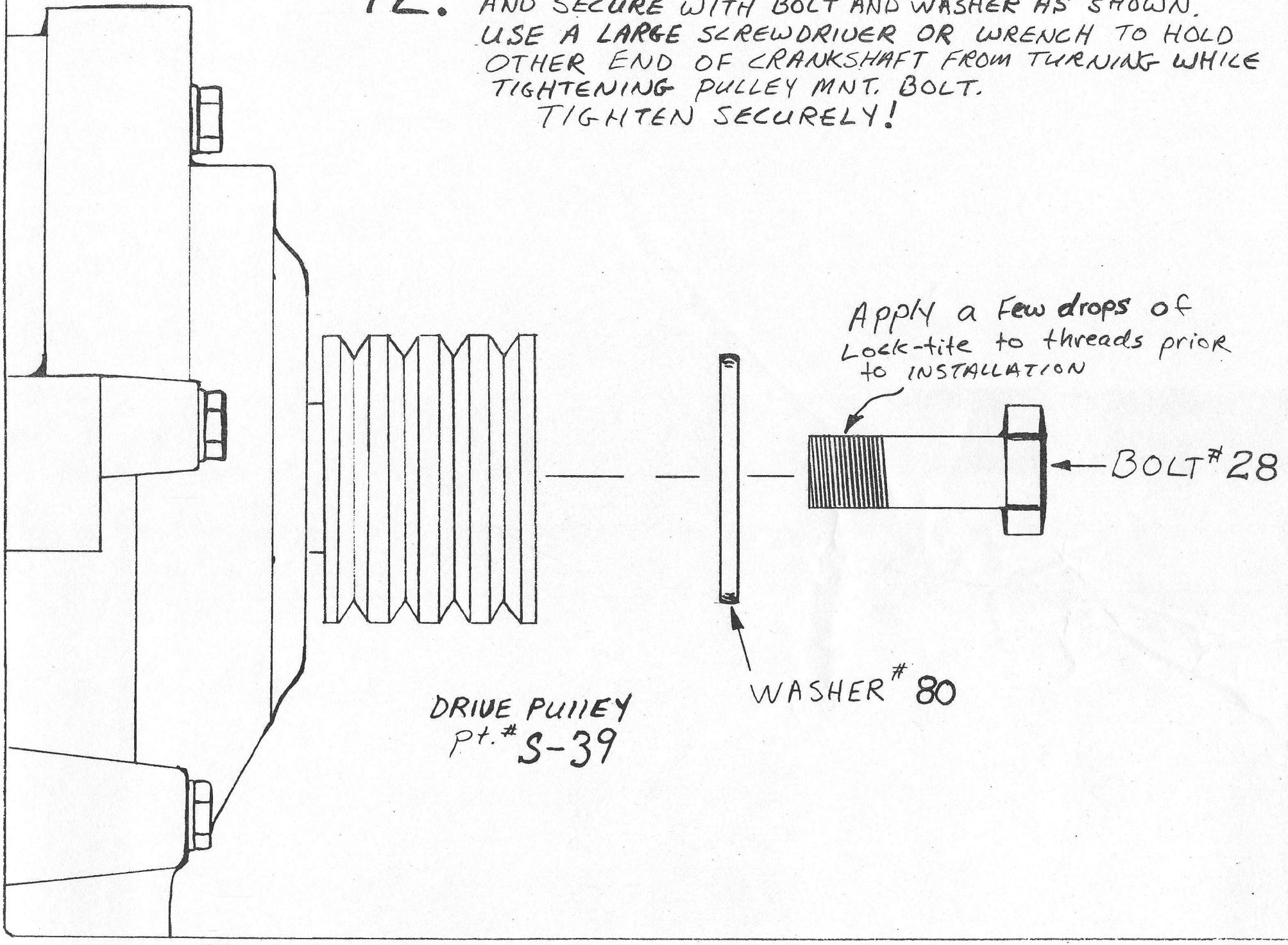
40. INSTALL THROTTLE AND CHOKE CABLE
BRKTS. AS SHOWN.



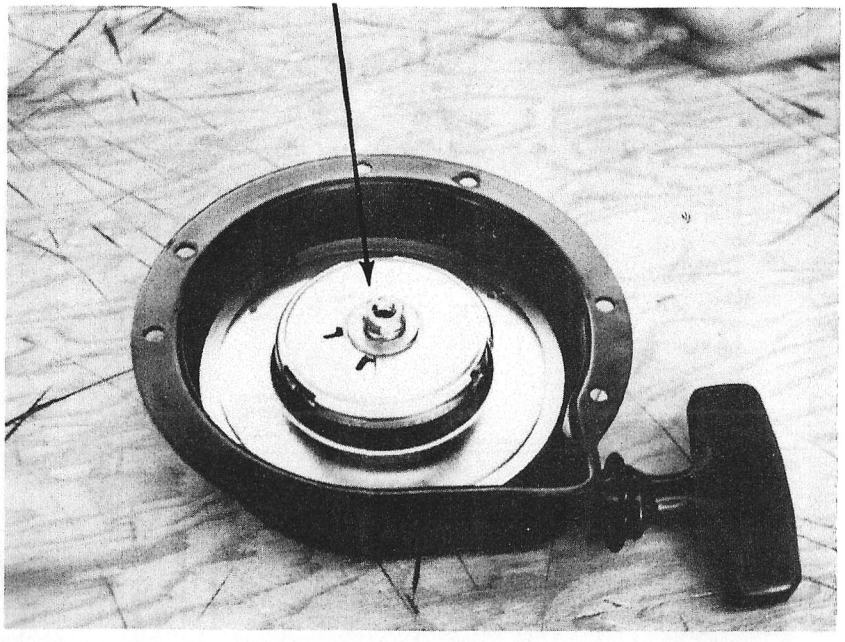
41. USE AN IMPACT screwdriver AND remove
recoil STARTER CASE FROM ENGINE.



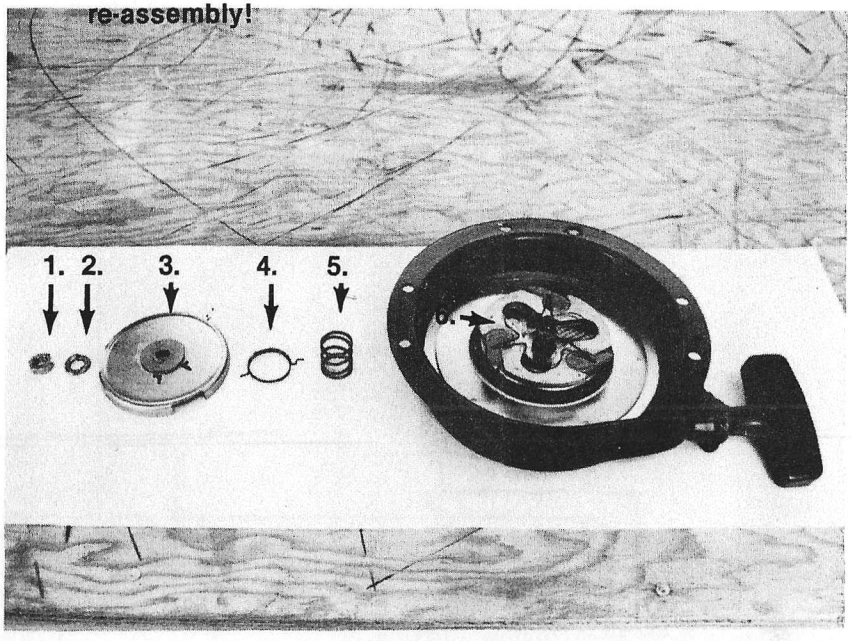
42. MOUNT DRIVE PULLEY ON ENGINE CRANKSHAFT AND SECURE WITH BOLT AND WASHER AS SHOWN. USE A LARGE SCREWDRIVER OR WRENCH TO HOLD OTHER END OF CRANKSHAFT FROM TURNING WHILE TIGHTENING PULLEY MNT. BOLT.
TIGHTEN SECURELY!



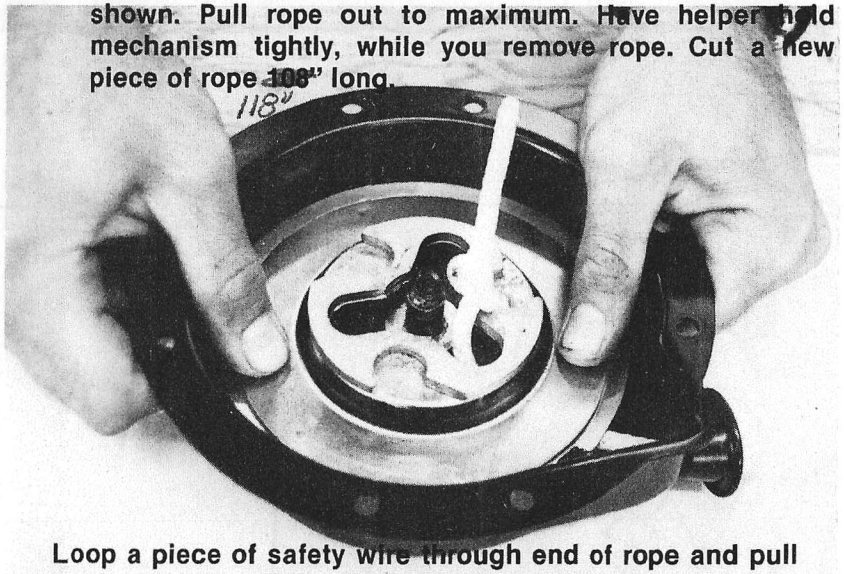
43. Carefully loosen nut.



44. Remove parts carefully in sequence, note position for re-assembly!

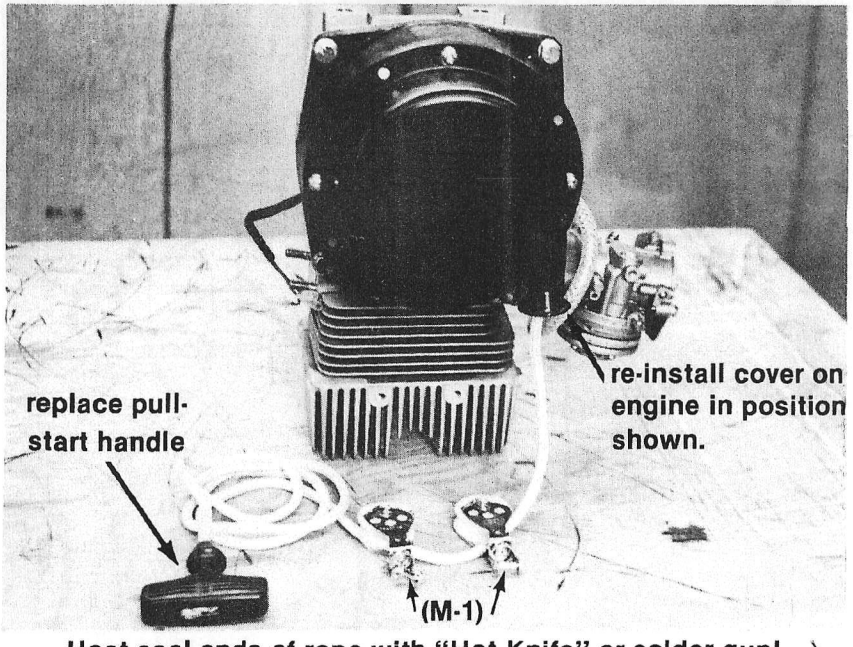


45. Have a helper position thumbs on recoil mechanism as shown. Pull rope out to maximum. Have helper hold mechanism tightly, while you remove rope. Cut a new piece of rope ~~108~~ 118" long.



Loop a piece of safety wire through end of rope and pull back through recoil assembly. Re-tie knot in end and re-wind rope slowly. Re-assemble cover by reversing sequence.

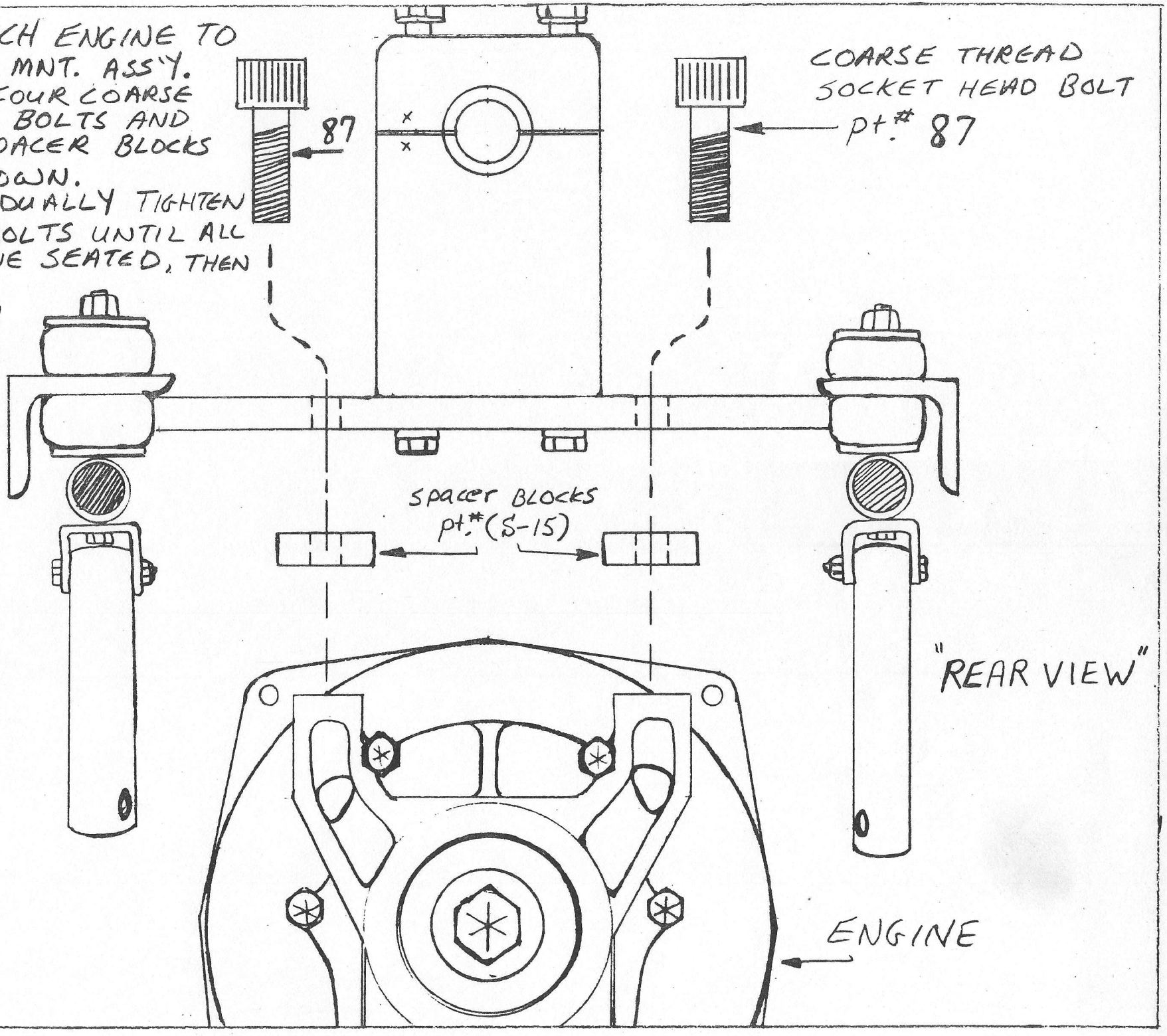
46. Slip rope through 2 pulleys part #(M-1)



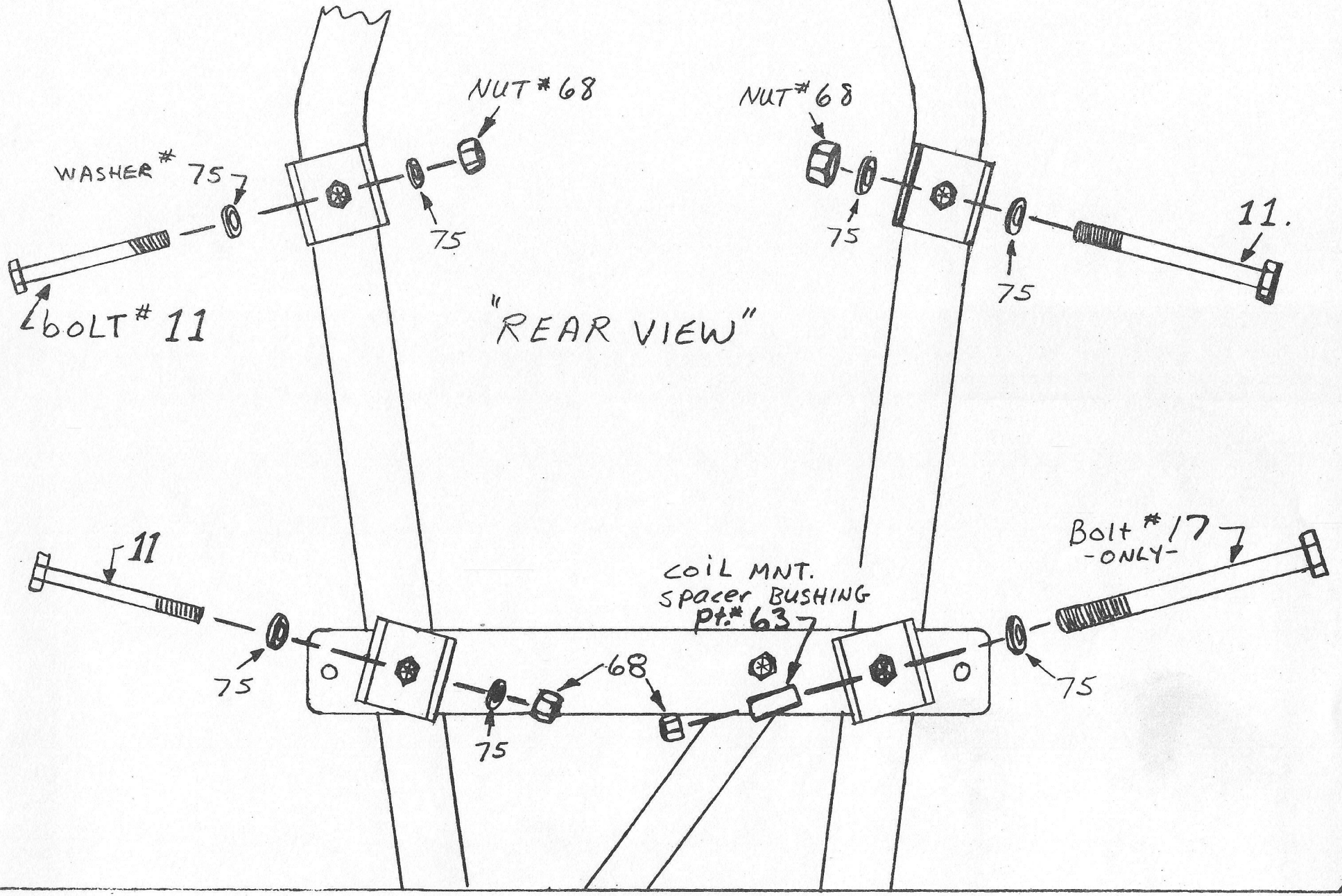
Heat seal ends of rope with "Hot Knife" or solder gun!

47. ATTACH ENGINE TO ENGINE MNT. ASS'Y. USING FOUR COARSE THREAD BOLTS AND TWO SPACER BLOCKS AS SHOWN.

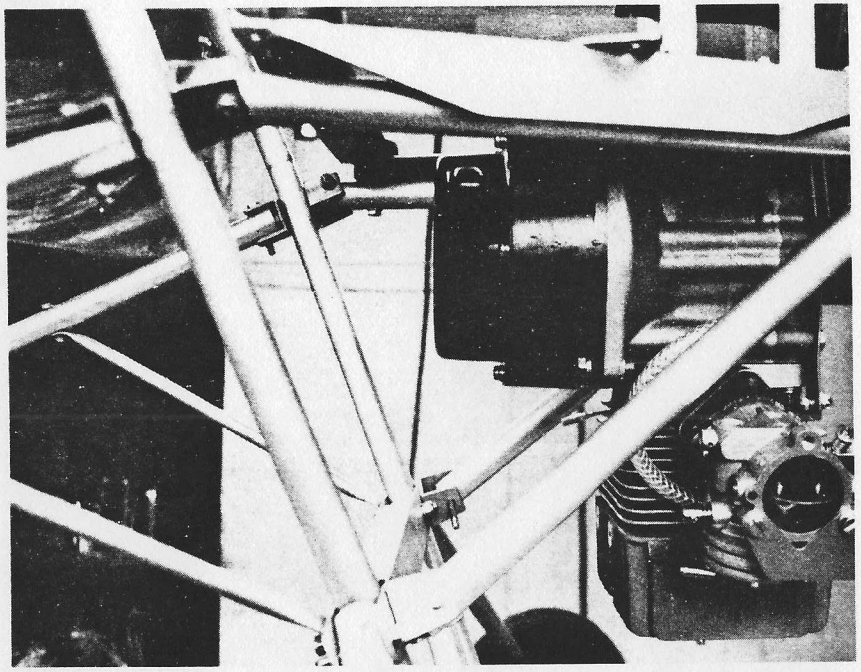
GRADUALLY TIGHTEN MOUNT BOLTS UNTIL ALL FOUR HAVE SEATED, THEN TIGHTEN SECURELY!



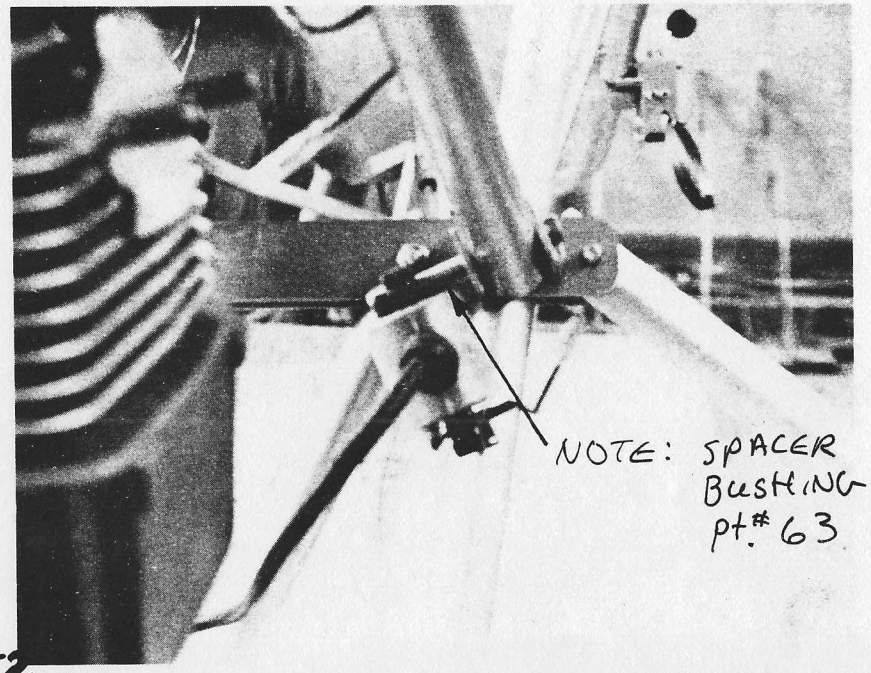
48. ALIGN ENGINE MNT. BRKTS. AT APPROXIMATE ANGLES SHOWN FOR ENGINE INSTALLATION. TEMPORARILY INSTALL BOLTS AND HARDWARE. DO NOT TIGHTEN. AFTER ENGINE INSTALLATION TIGHTEN ALL BRACKETS AND MOUNTS SECURELY.



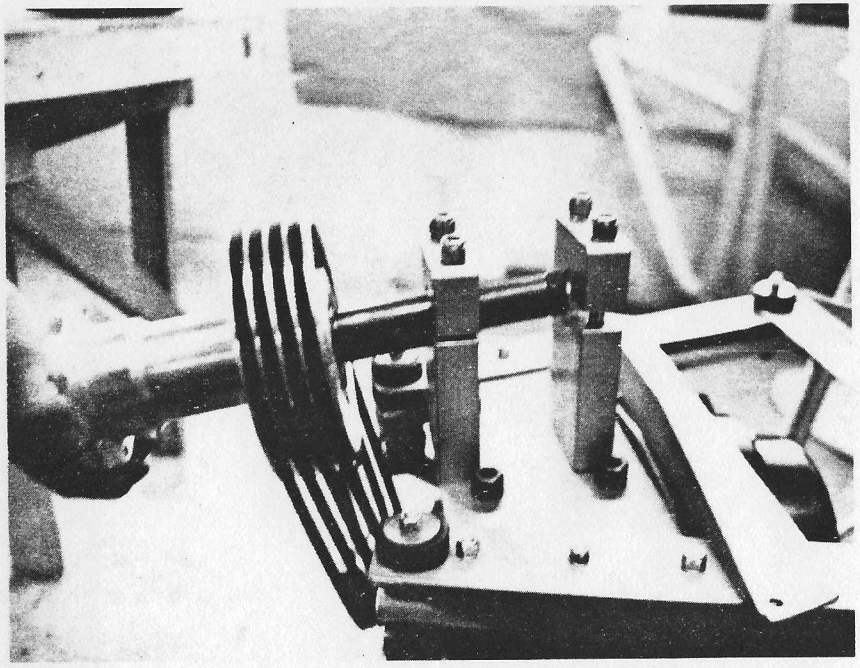
49. ATTACH ENGINE TO REAR OF FRAME



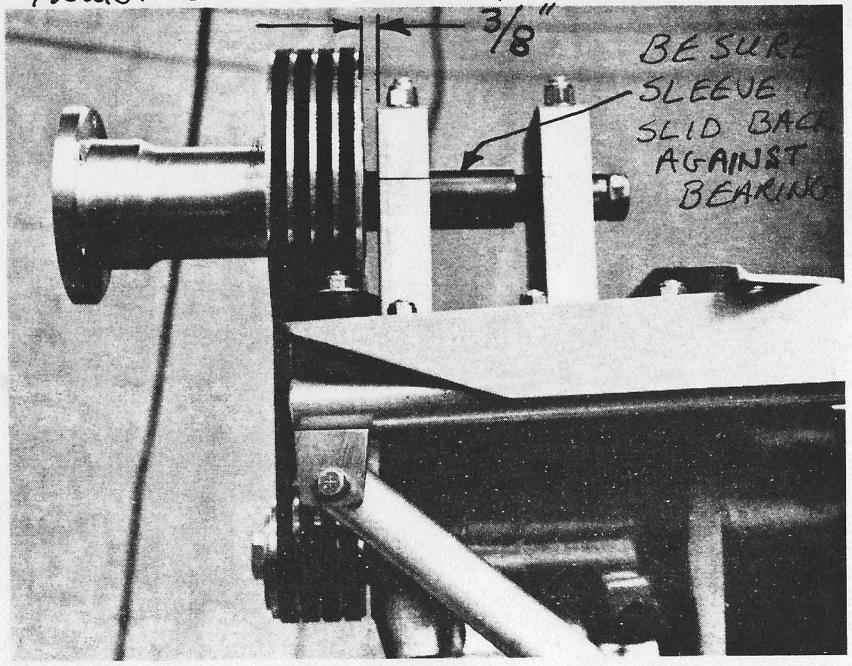
50. ATTACH COIL AS SHOWN.



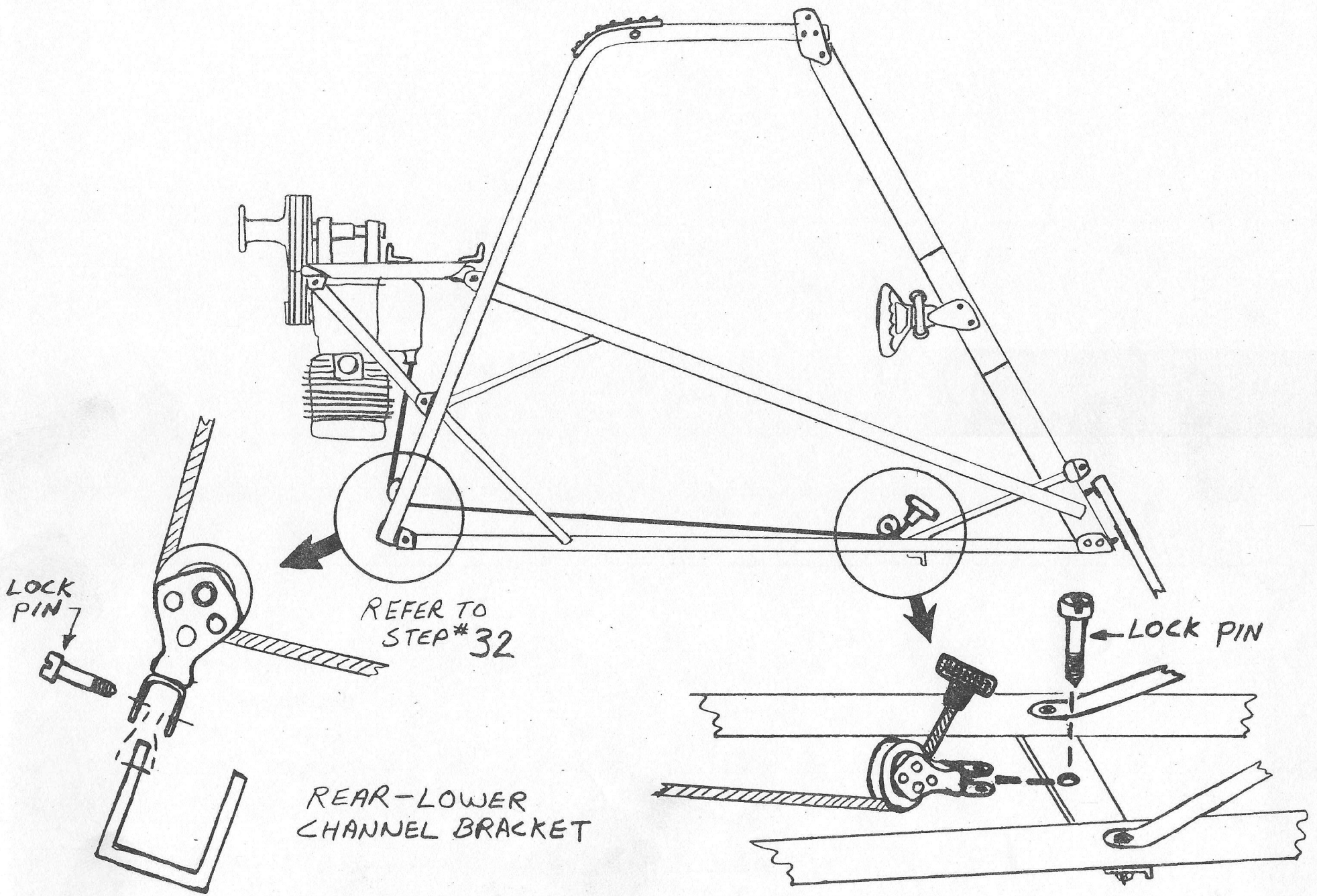
51. POSITION REDUCTION UNIT AND BELTS.



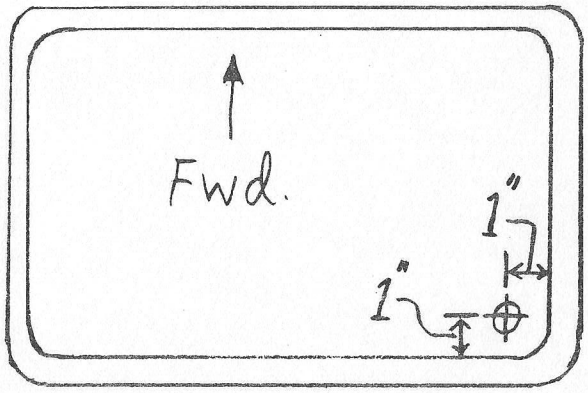
52. ALIGN. REDUCTION UNIT AND TIGHTEN PYLON MOUNT BOLTS EVENLY.



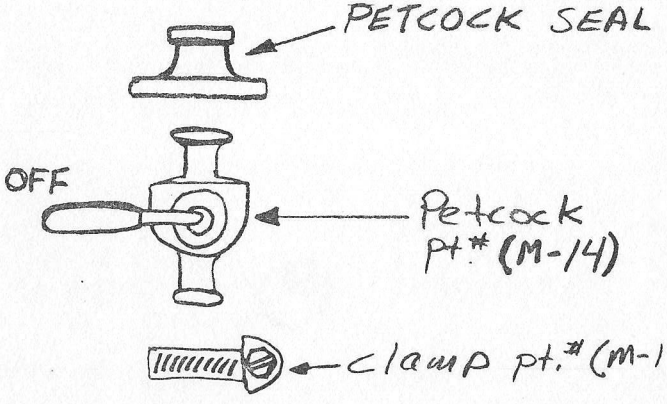
52A. ATTACH FRONT AND REAR PULL STARTER PULLEYS TO LOWER FRAME TUBE BRACKETS AS SHOWN. TIGHTEN LOCK PINS SECURELY!



"BOTTOM VIEW"

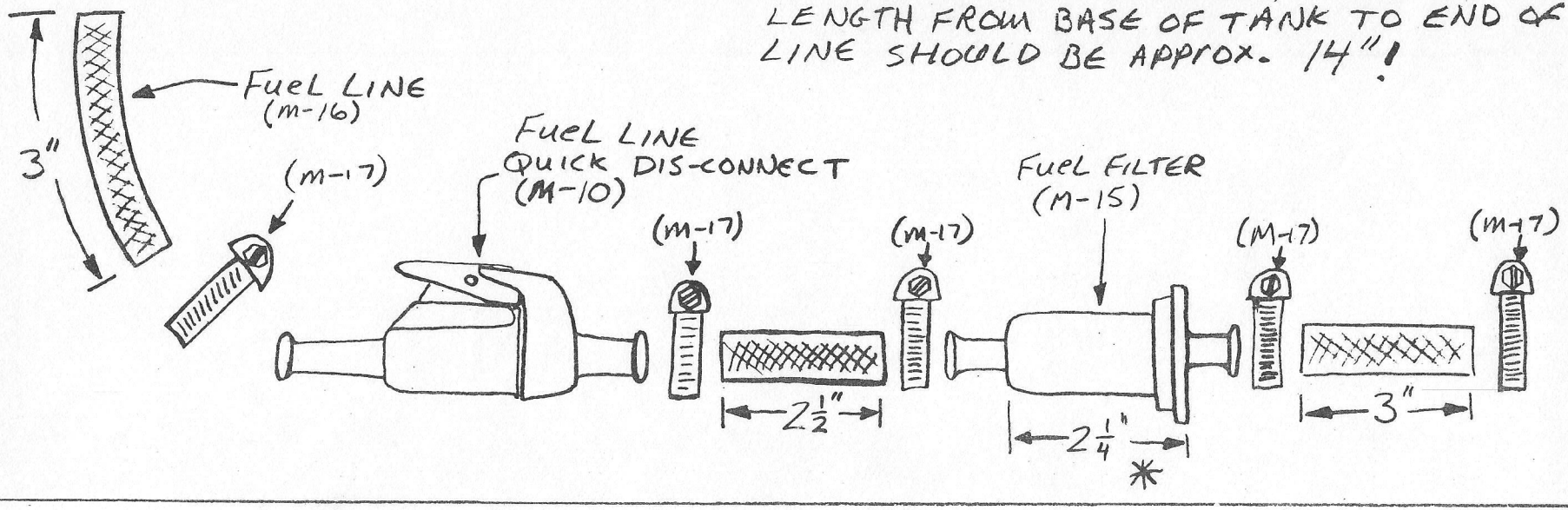


53. DRILL A 1/2" DIA. HOLE IN BOTTOM (LEFT REAR) CORNER OF FUEL TANK AS SHOWN. REMOVE ANY BURRS OR DRILL PARTICLES FROM AROUND EDGES OF HOLE. RINSE INSIDE OF FUEL TANK WITH GAS OR BLOW OUT WITH COMPRESSED AIR TO REMOVE ANY OTHER FOREIGN PARTICLES FROM INSIDE OF TANK. SOFTEN FUEL PETCOCK SEAL WITH HOT WATER. APPLY A LITTLE DISHWASHING LIQUID OR LIGHT OIL TO RIM OF SEAL AND PRESS INTO POSITION IN BOTTOM OF FUEL TANK

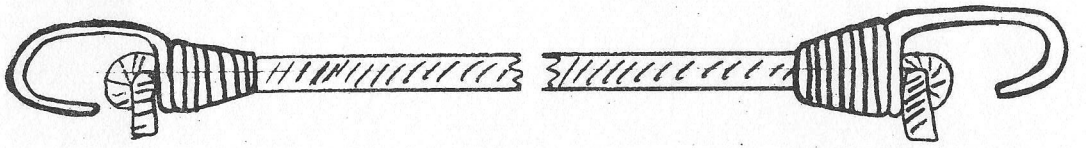


MAKE UP FUEL LINE ASS'Y. FROM COMPONENTS AS SHOWN. TIGHTEN HOSE CLAMPS SECURELY! press petcock AND FUEL LINE ASS'Y INTO BOTTOM OF FUEL TANK.

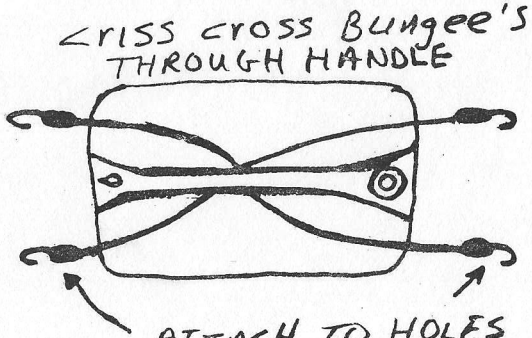
* IF OTHER FUEL FILTERS OR FUEL LINE COMPONENTS ARE USED, OVERALL LENGTH FROM BASE OF TANK TO END OF LINE SHOULD BE APPROX. 14"!

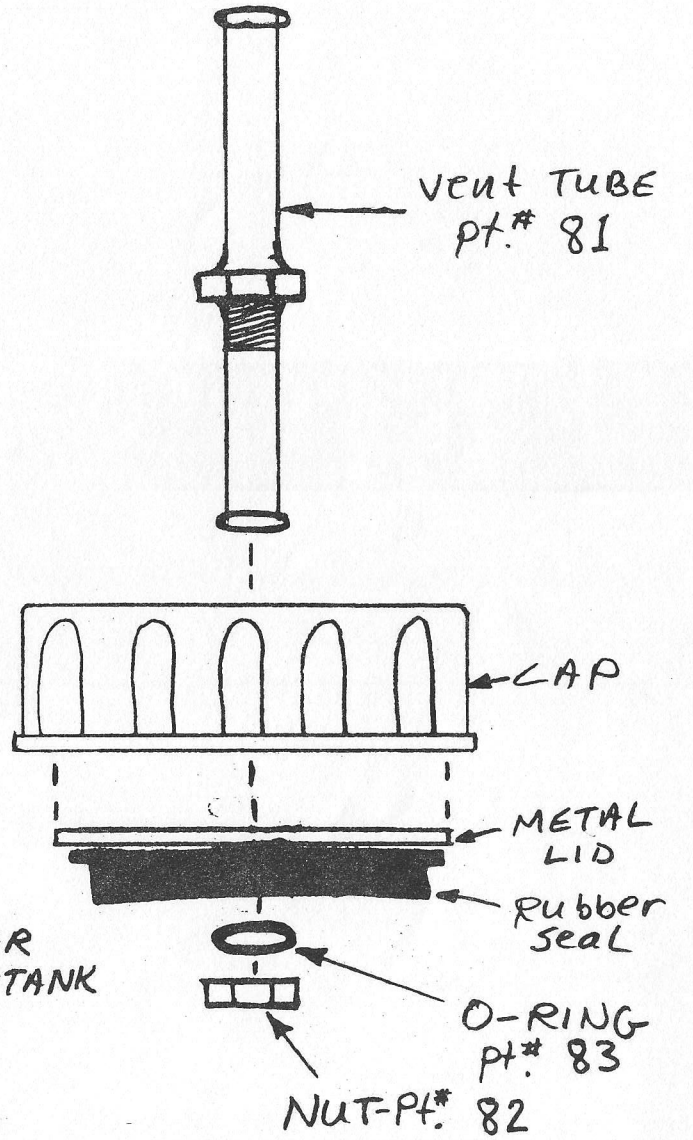


54.



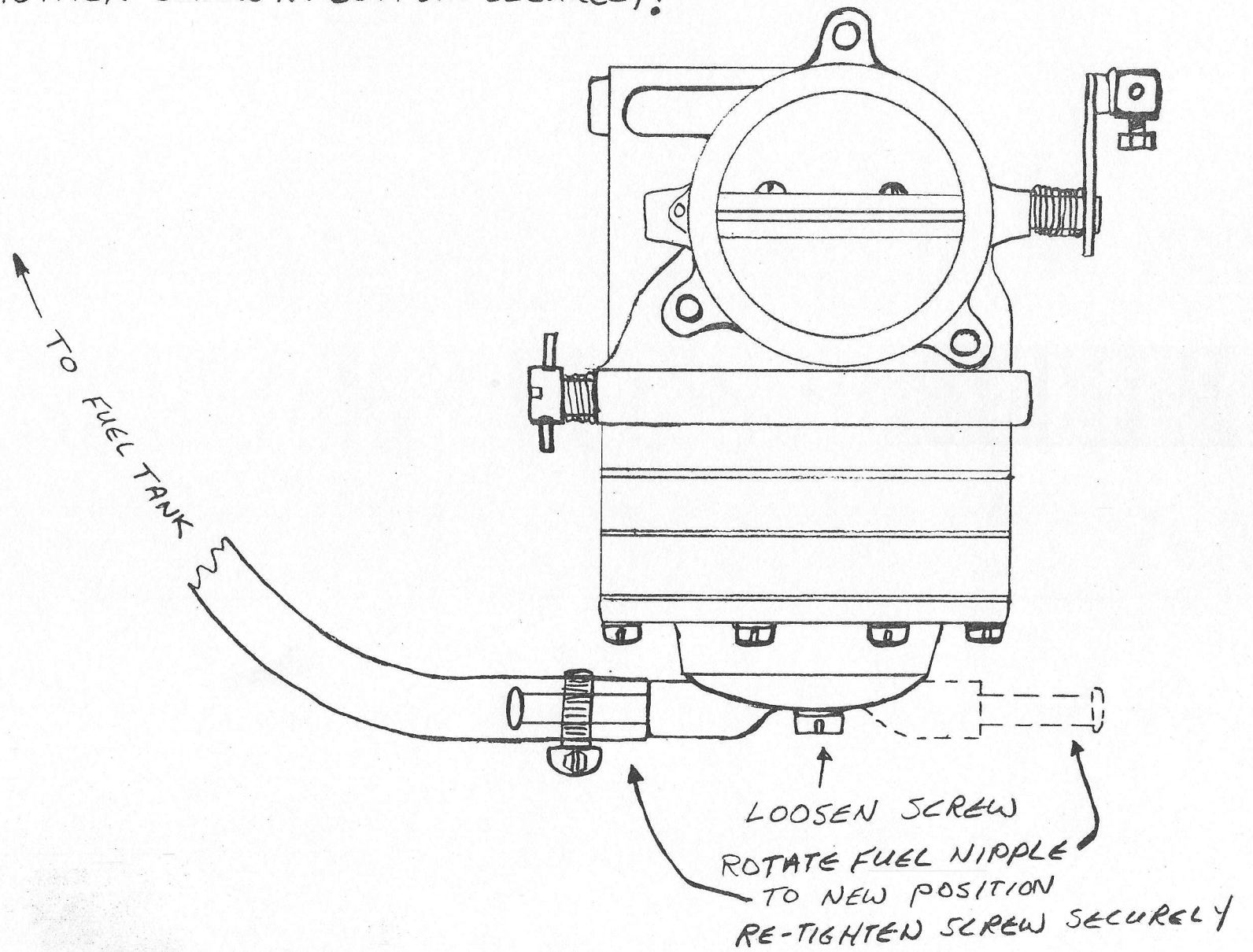
USE A HOT KNIFE OR CUT AND HEAT SEAL TWO PIECES OF 5/16" BUNGEE CHORD (M-6), 24" LONG FROM 48" PIECE PROVIDED IN KIT. MAKE UP TWO FUEL TANK ANCHOR CHORDS USING HOOKS AS SHOWN. SLIDE BUNGEE THROUGH HOOKS AND TIE KNOTS IN ENDS. SECURE FUEL TANK IN PLACE AS SHOWN

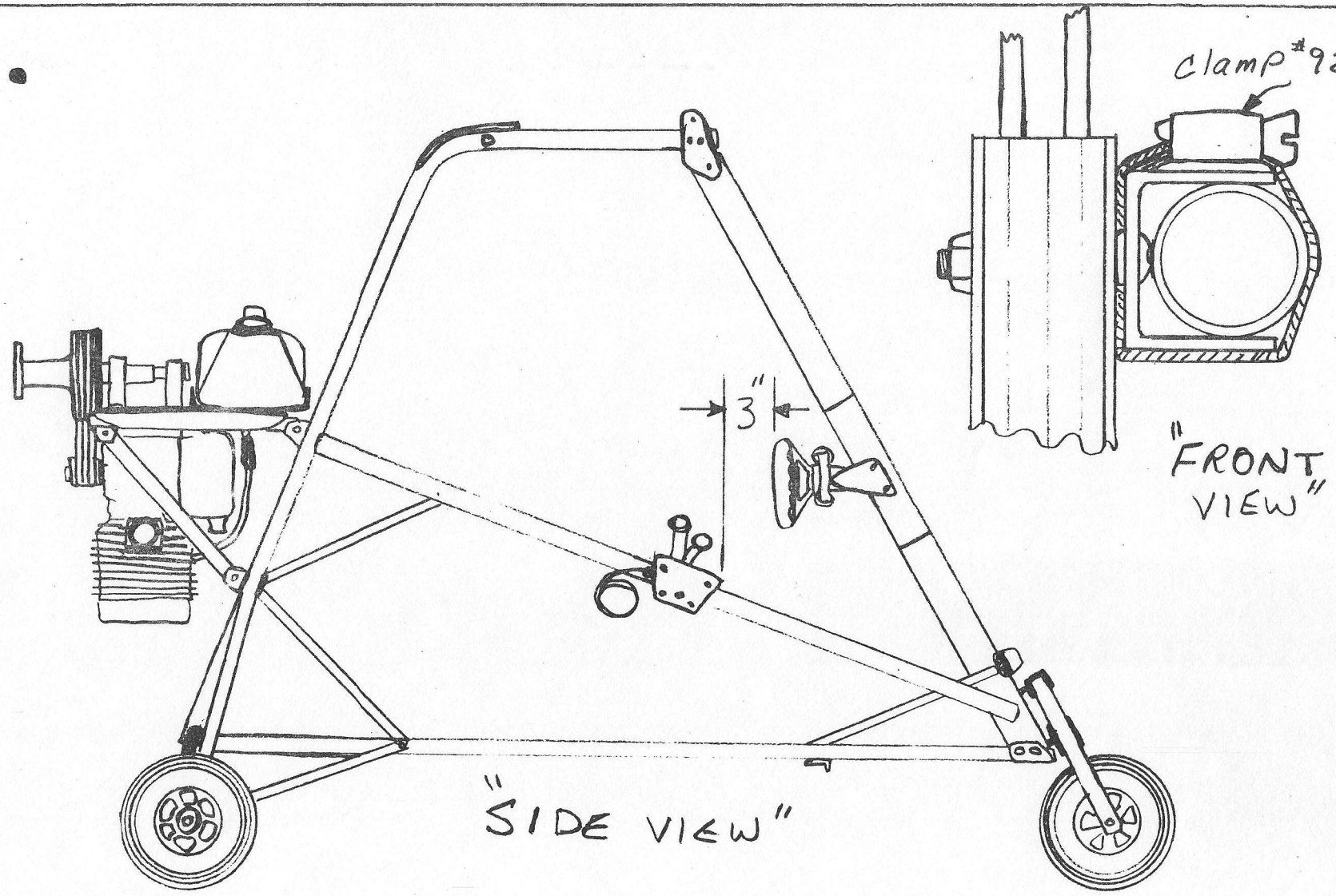




REMOVE CAP FROM FUEL TANK. DRILL A 7/16" DIA. HOLE IN CENTER OF METAL LID. INSTALL FUEL TANK VENT IN CAP AS SHOWN.

55. MOUNT FUEL TANK ON REAR OF FRAME AND SECURE IN POSITION WITH BUNGEE HOOKS. LOOSEN SCREW IN BOTTOM OF CARBURETOR. ROTATE FUEL INLET NIPPLE TO POSITION SHOWN. CONNECT FUEL LINE FROM FUEL TANK TO NIPPLE WITH HOSE CLAMP. POSITION FUEL LINE SO IT DOESN'T RUB ON ANY FRAME TUBES OR COMPONENTS. TIGHTEN SCREW IN BOTTOM SECURELY!





ATTACH THROTTLE QUADRANT ASSEMBLY TO RIGHT SIDE FRAME TUBE IN POSITION SHOWN. SECURE WITH STAINLESS STEEL CLAMP (pt.# 92).

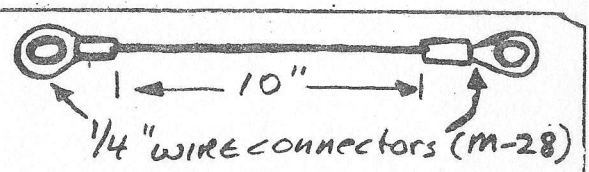
CHOKE 66" →

THROTTLE 57" →

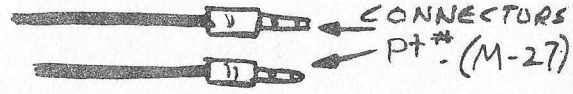
CUT TWO PIECES OF CABLE CASING FROM 12 Ft PIECE PROVIDED (M-12) LEFT OVER PIECE WILL BE USED FOR RUDDER CONTROLS.

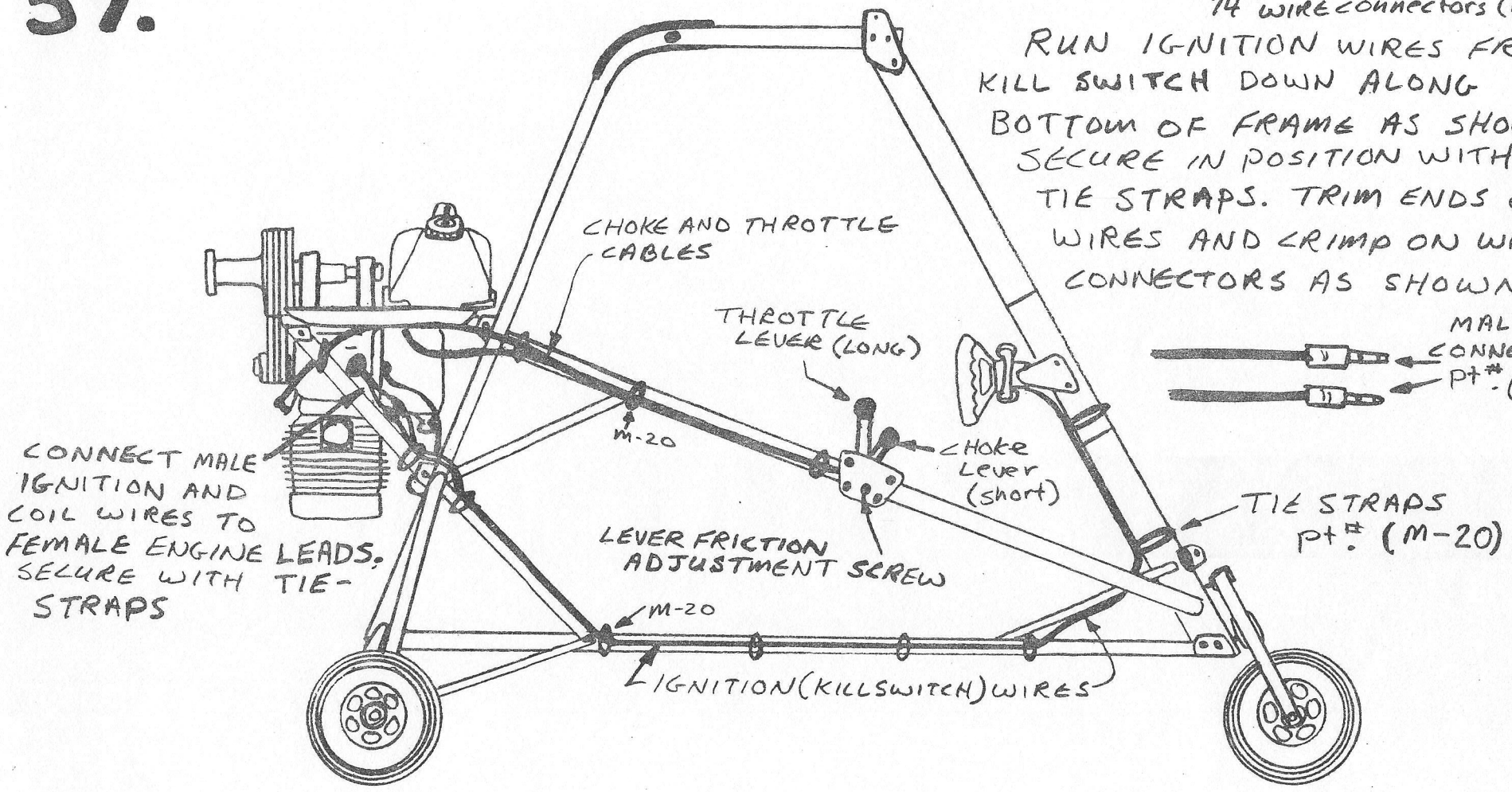
MAKE UP A GROUND WIRE AND CONNECT COIL MNT. BOLT TO PULL STARTER HSING. USE A proper crimping TOOL!

57.



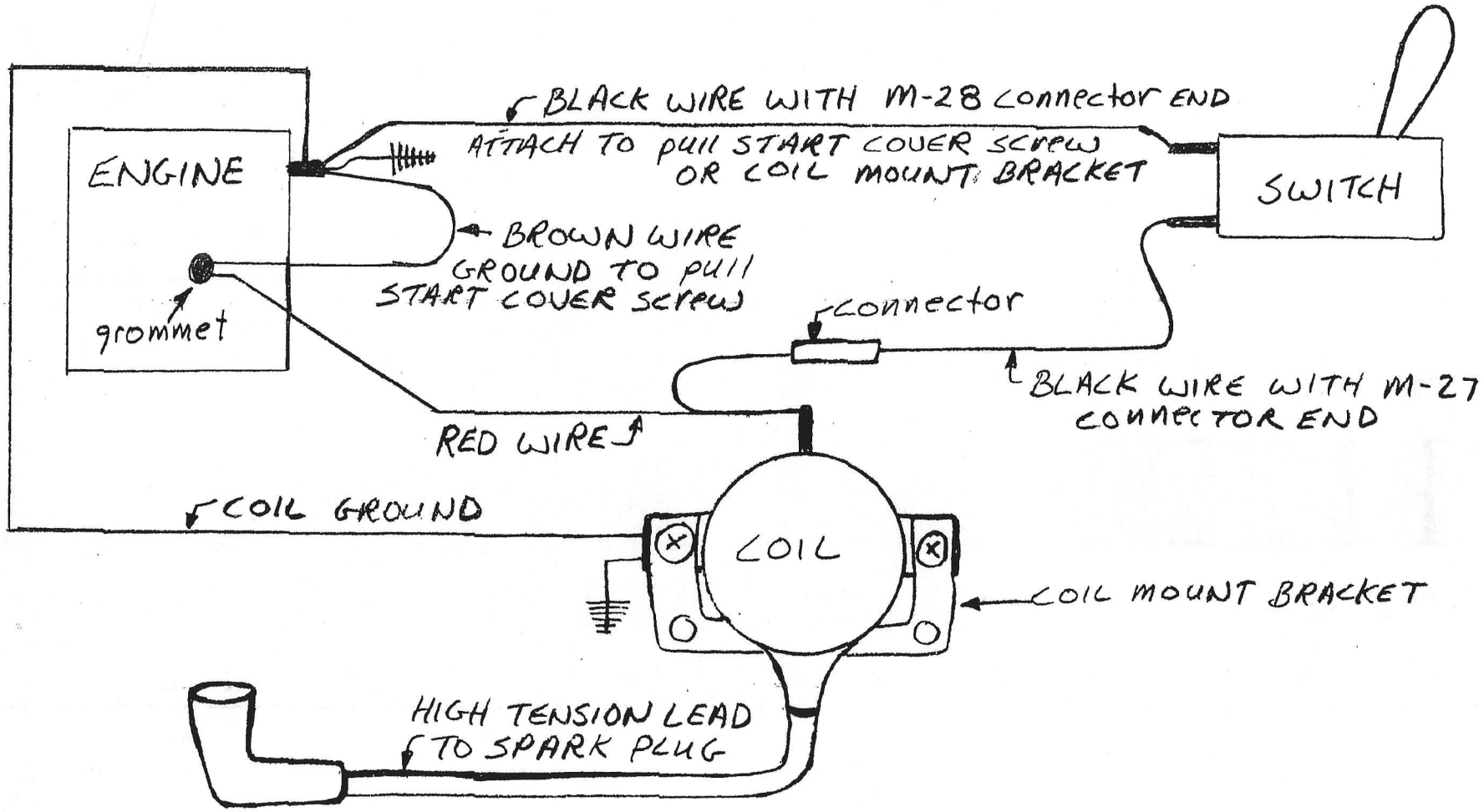
RUN IGNITION WIRES FROM KILL SWITCH DOWN ALONG BOTTOM OF FRAME AS SHOWN. SECURE IN POSITION WITH TIE STRAPS. TRIM ENDS OF WIRES AND CRIMP ON WIRE CONNECTORS AS SHOWN.





SQUIRT W.D.-40 OR OTHER LIGHT LUBRICANT INSIDE 57" LONG THROTTLE CABLE HOUSING AND 66" LONG CHOKE CABLE HOUSING UNTIL HOUSING IS SATURATED AND LIQUID comes out other END. SLIDE CHOKE AND THROTTLE CABLES INSIDE HOUSINGS AND CONNECT TO proper LEVERS ON CARBURETOR. USE TIE STRAPS AS INDICATED TO HOLD HOUSING IN POSITION ON FRAME. ADJUST CARBURETOR THROTTLE STOPS SO THAT ENGINE WILL QUIT RUNNING WHEN THROTTLE LEVER IS pulled TO THE FULL AFT (closed) POSITION. ADJUST FRICTION ADJUSTER SCREW ON THROTTLE QUADRANT SO THAT LEVERS STAY IN DESIRED POSITION WHEN NOT HELD.

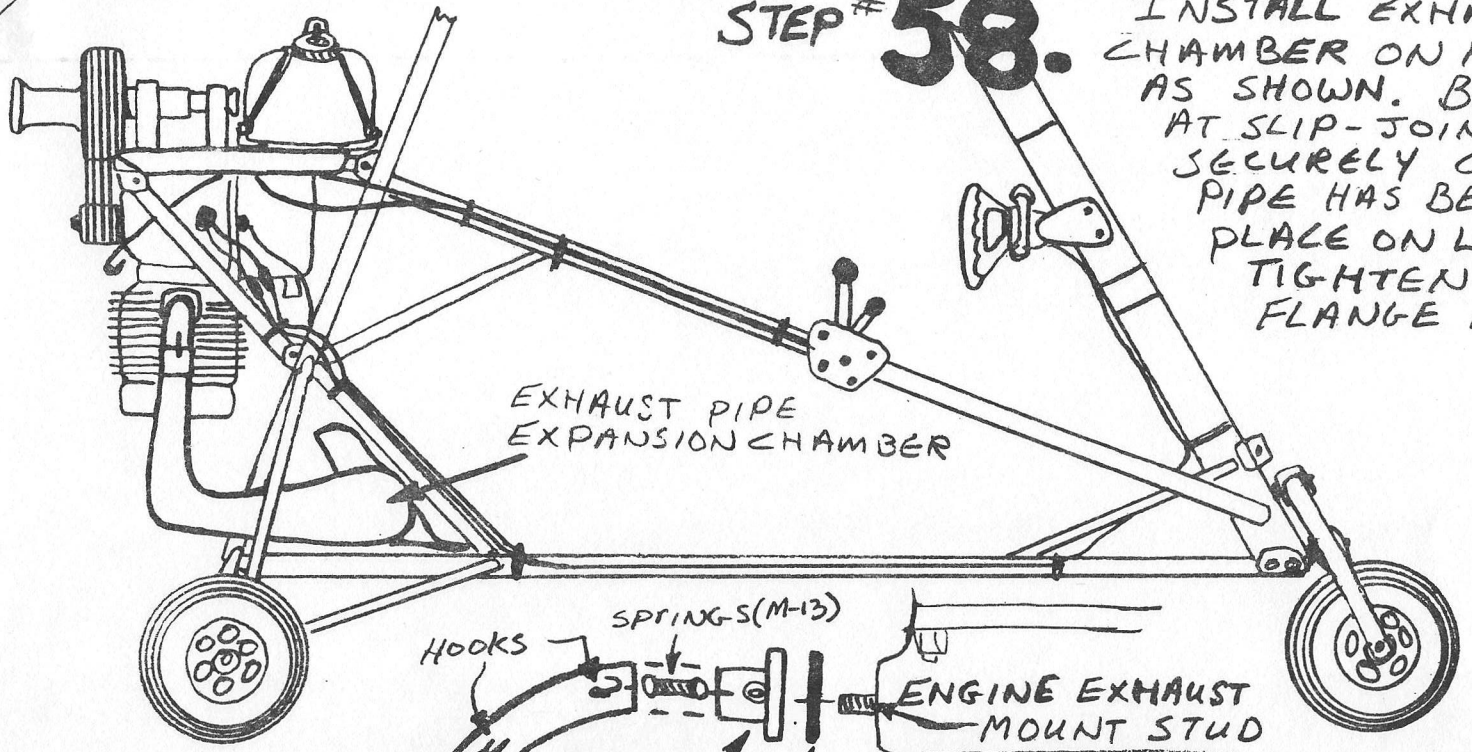
STEP # 57.1 IGNITION WIRING DIAGRAM

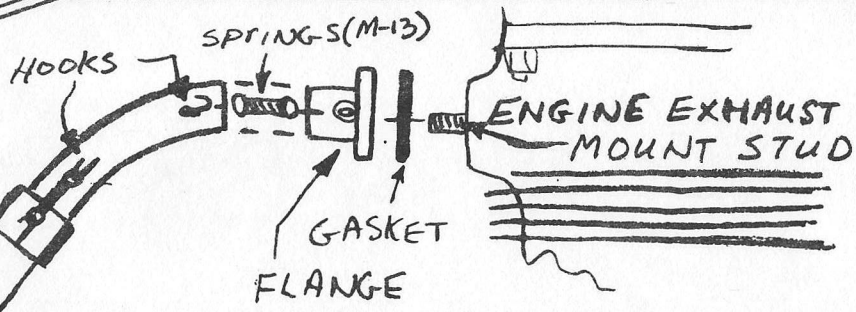


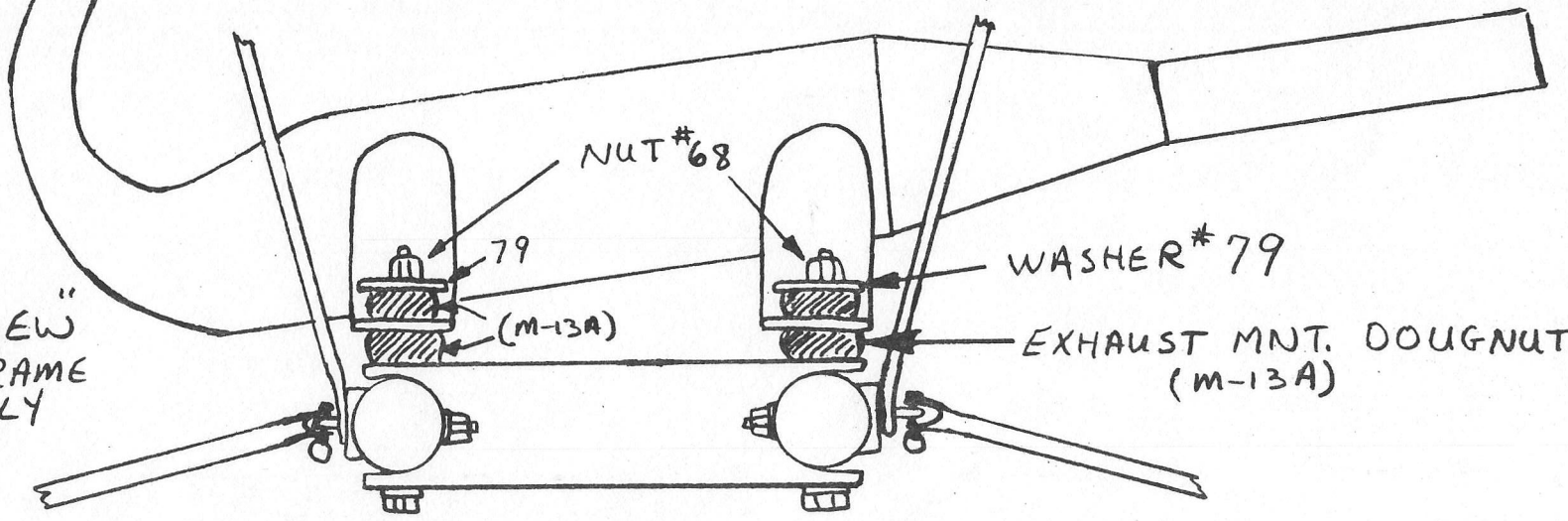
ATTACH BROWN ENGINE WIRE, SWITCH WIRE AND COIL GROUND WIRE TO MOST CONVENIENT PULL START COVER SCREW. TIGHTEN SECURELY!
CONNECT OTHER WIRES TO COIL AND SWITCH AS SHOWN.
MAKE SURE ALL CONNECTORS ARE SECURELY ATTACHED!

STEP # 58.

INSTALL EXHAUST EXPANSION CHAMBER ON FRAME IN POSITION AS SHOWN. BE SURE ALL SPRINGS AT SLIP-JOINT COUPLINGS ARE SECURELY CONNECTED. AFTER PIPE HAS BEEN BOLTED INTO PLACE ON LOWER FRAME ASS'Y, TIGHTEN NUTS ON EXHAUST FLANGE MOUNTING STUDS.



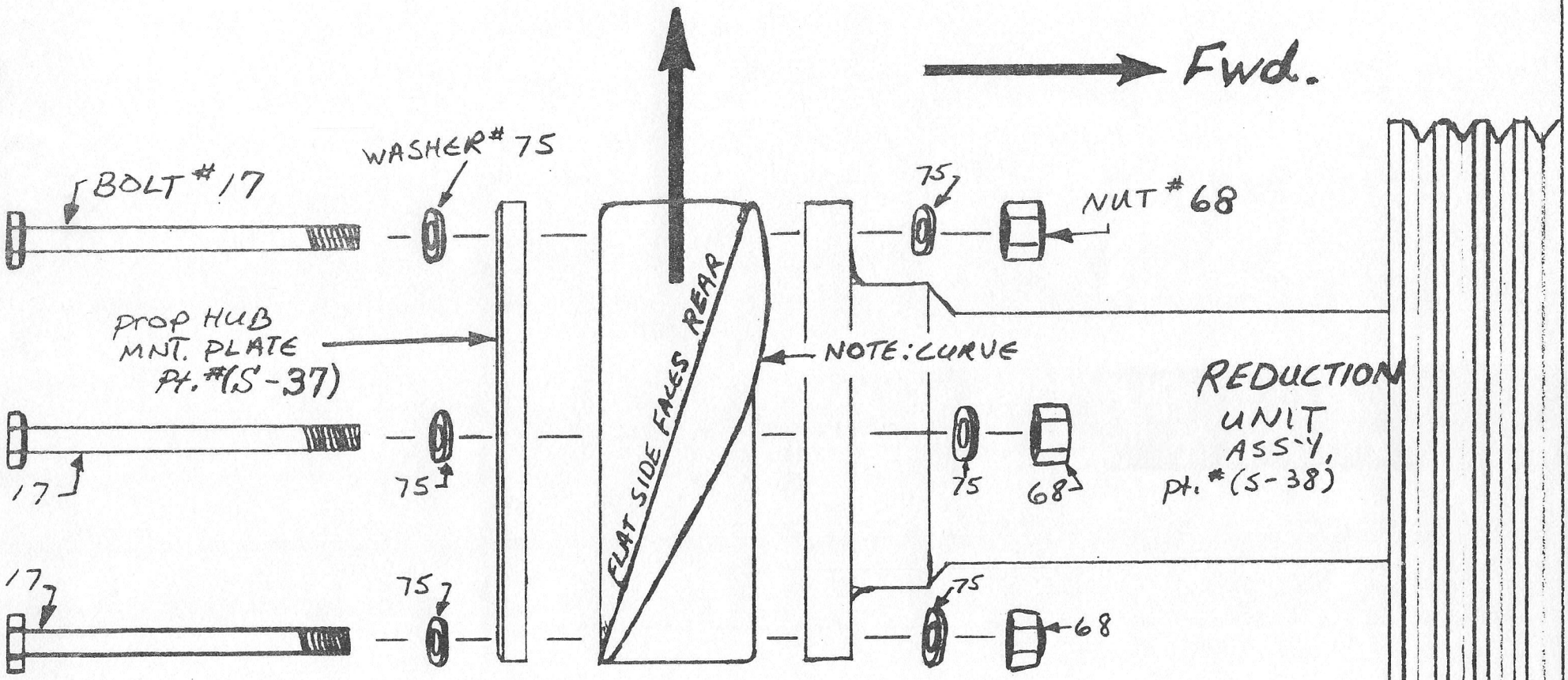




" FRONT VIEW "
LOWER FRAME
ASSEMBLY

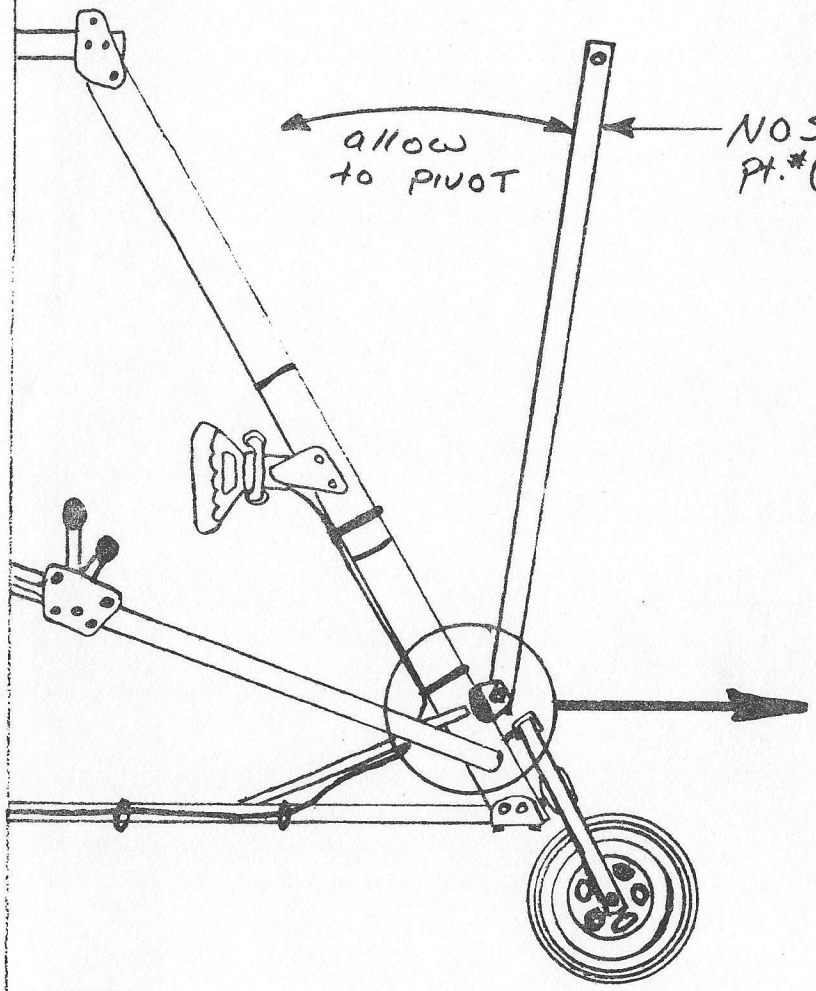
59.

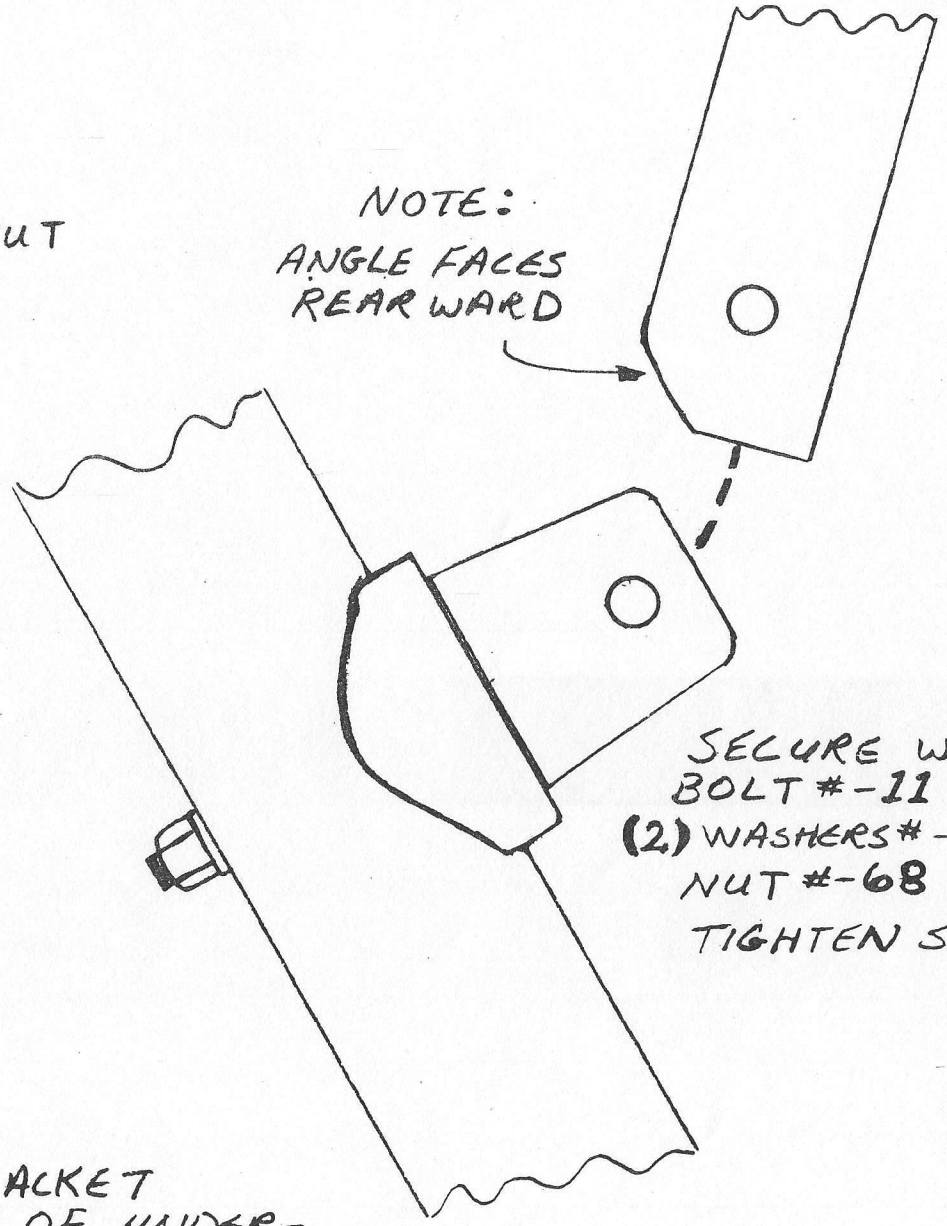
DIRECTION OF ROTATION.



ATTACH PROPELLER, PROP HUB MOUNT PLATE, AND REDUCTION UNIT TOGETHER WITH PROPER BOLTS, NUTS, AND WASHERS AS SHOWN. NOTE: DIRECTION OF PROPELLER ROTATION WHEN VIEWED FROM REAR LOOKING FORWARD IS COUNTER CLOCK-WISE. (LEFT HAND!) CURVE OF PROPELLER AIRFOIL GOES FORWARD. TIGHTEN ALL SIX BOLTS SECURELY AND <u>EVENLY</u>. DO NOT OVERTIGHTEN!

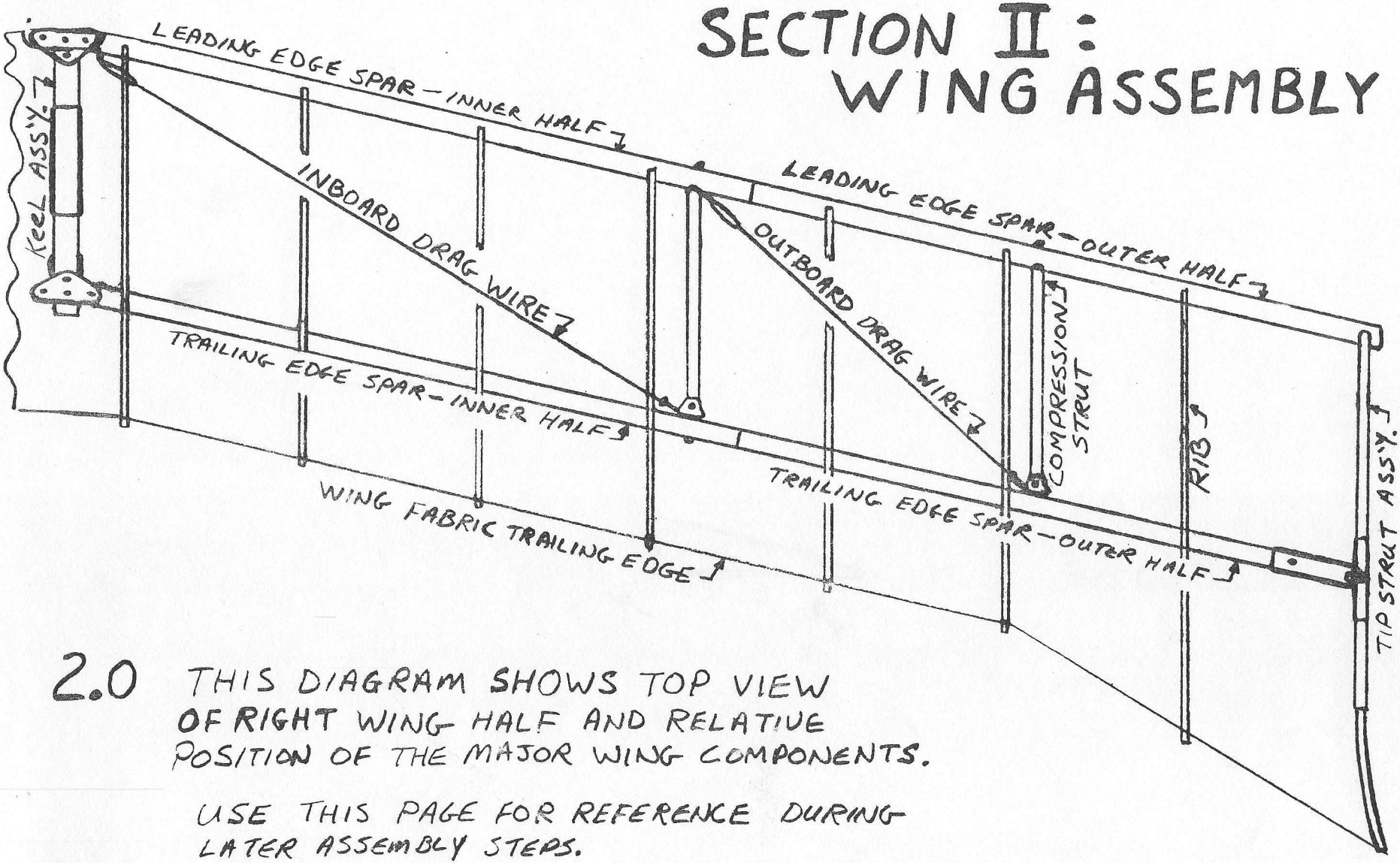
STEP.# 60





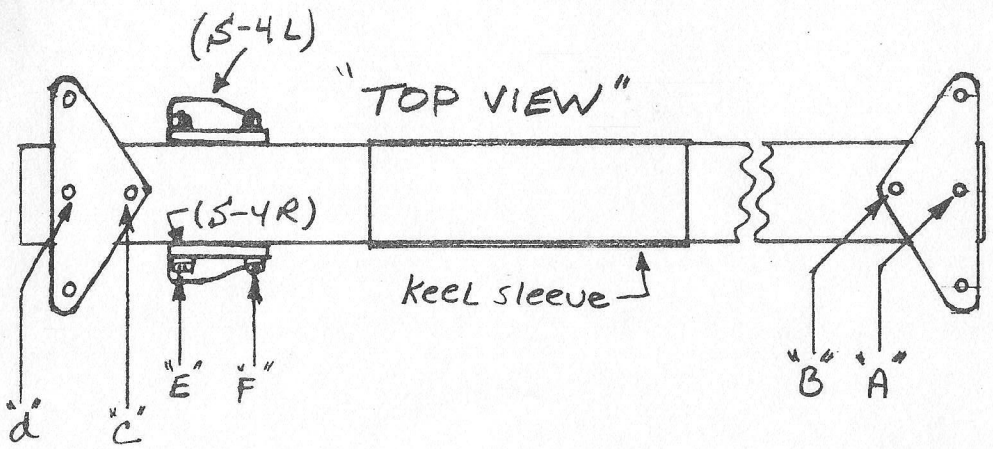
ATTACH NOSE STRUT TO BRACKET LOCATED AT BOTTOM-FRONT OF UNDER-CARRIAGE AS SHOWN. SECURE WITH BOLT, NUT AND WASHERS AS INDICATED. LEAVE LOOSE ENOUGH TO ALLOW STRUT TO PIVOT IN AND OUT FOR WING ATTACHMENT.

SECTION II: WING ASSEMBLY

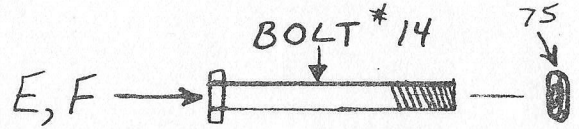


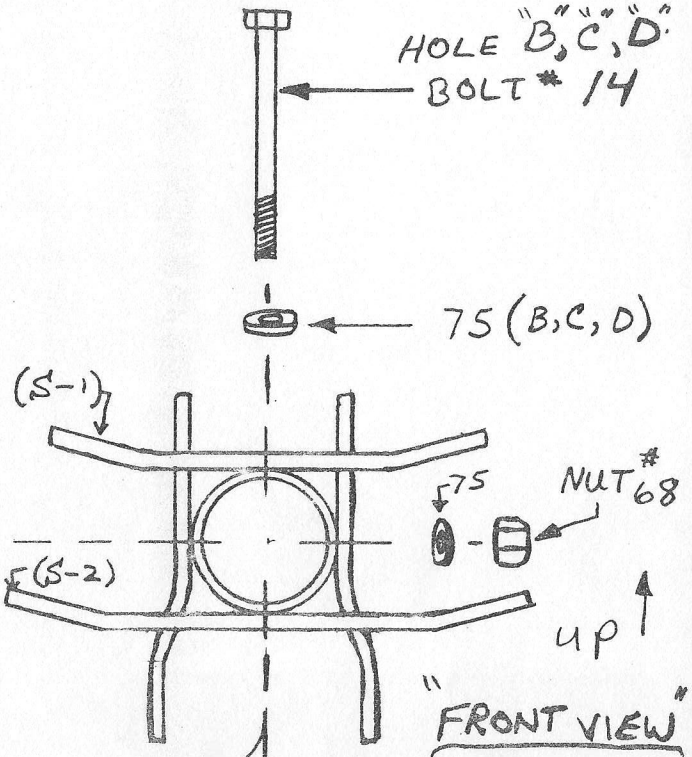
2.0 THIS DIAGRAM SHOWS TOP VIEW OF RIGHT WING HALF AND RELATIVE POSITION OF THE MAJOR WING COMPONENTS.

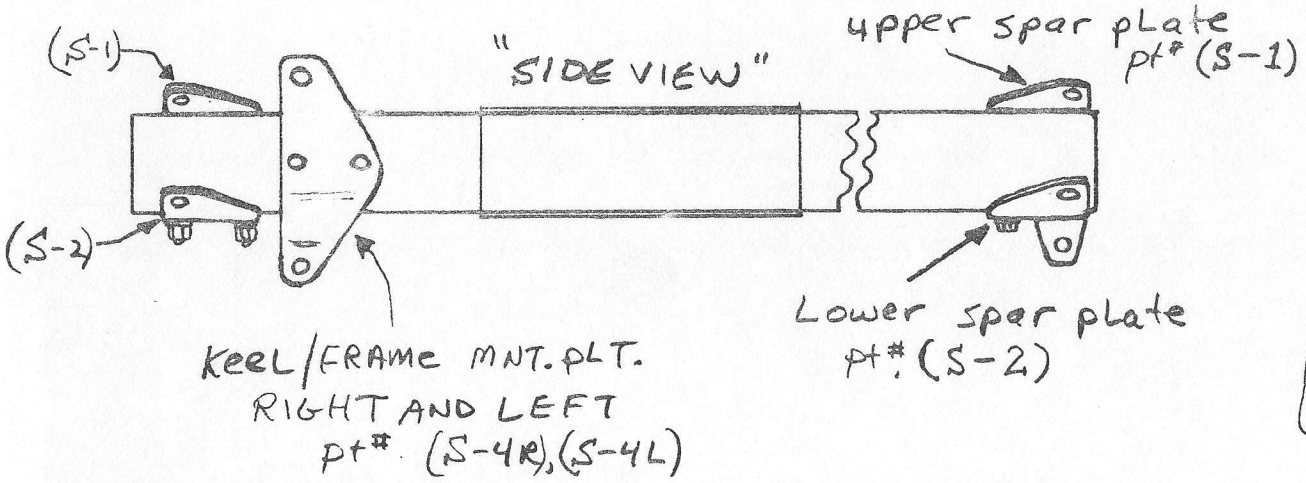
USE THIS PAGE FOR REFERENCE DURING LATER ASSEMBLY STEPS.

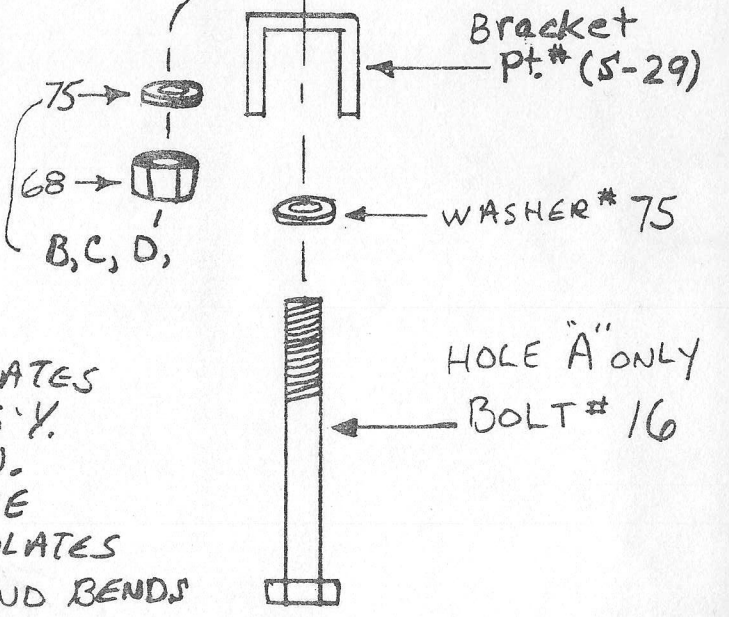


Fwd. →



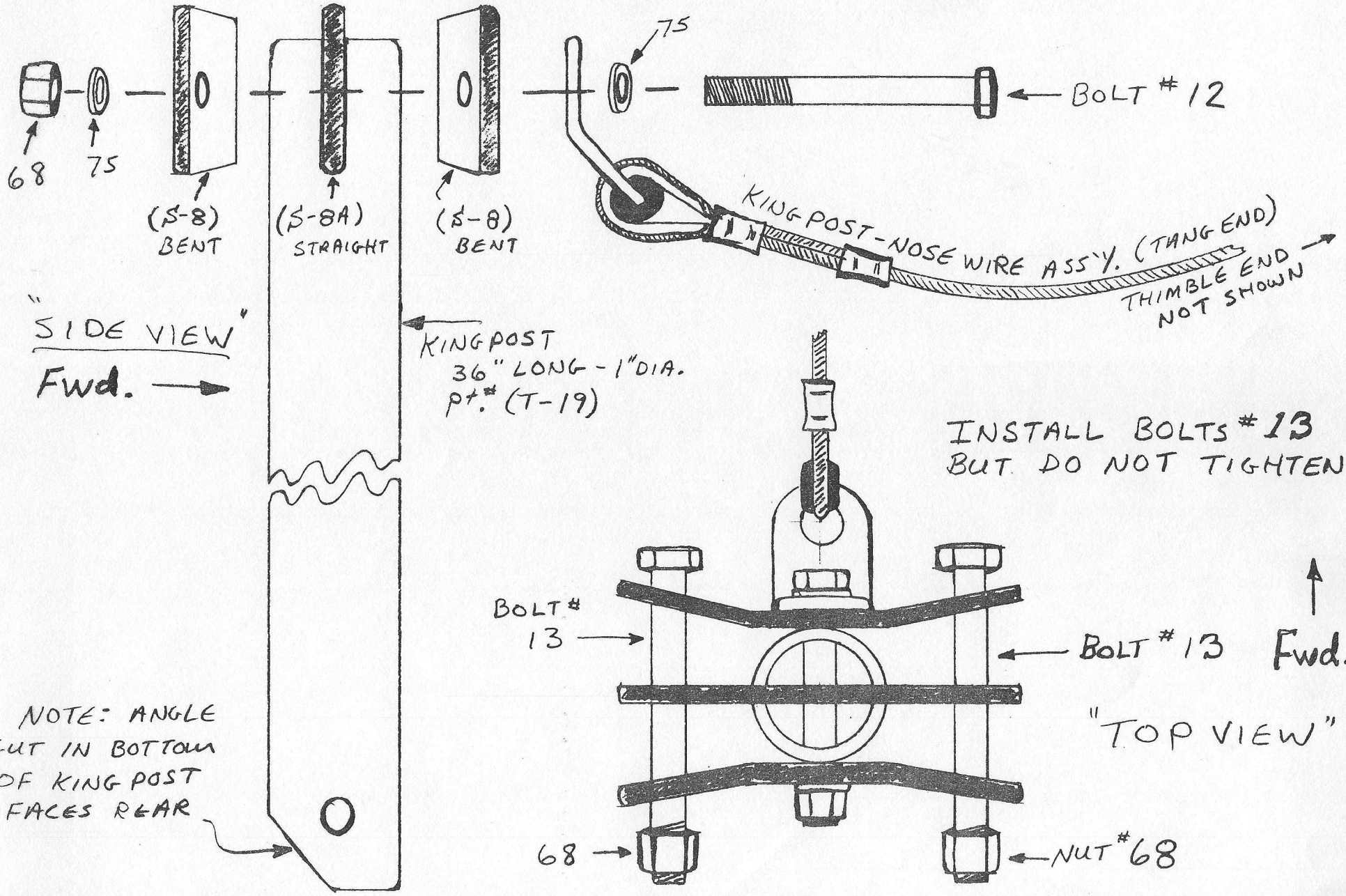


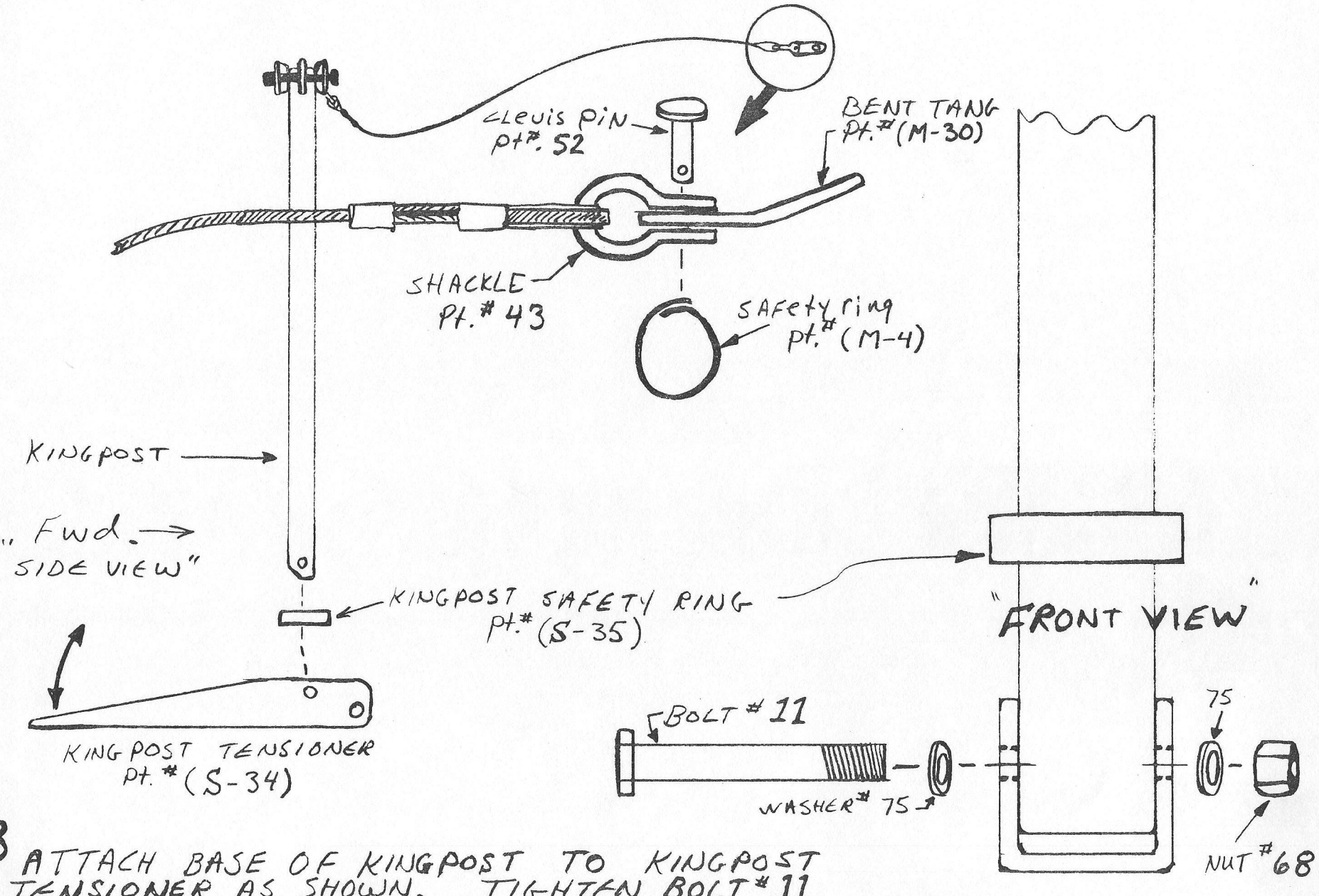




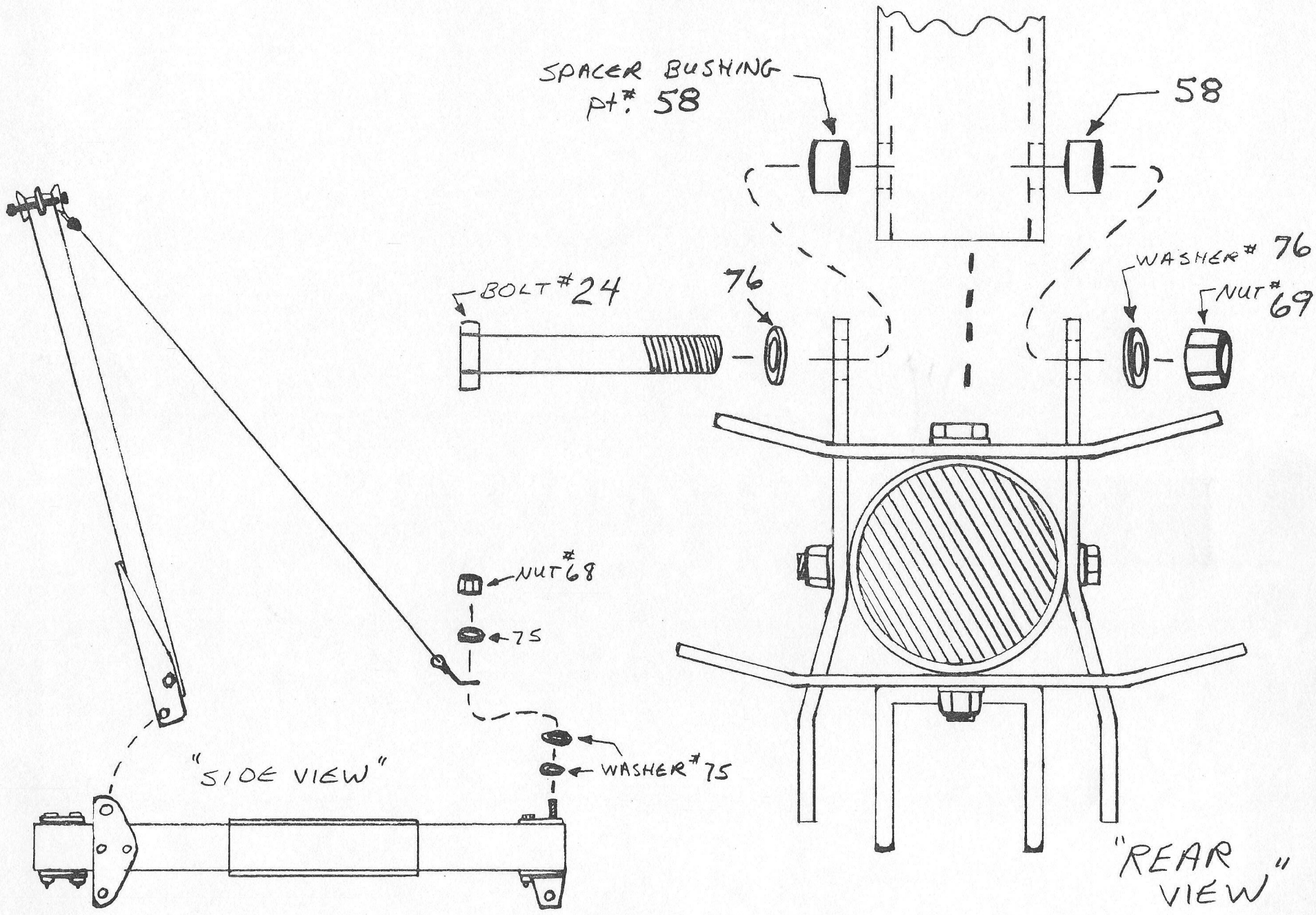
2.1 ATTACH SPAR PLATES, KEEL/FRAME MNT. PLATES AND CHANNEL BRACKET TO KEEL TUBE ASS'Y. USING NUTS, BOLTS AND WASHERS AS SHOWN. MAKE SURE KEEL SLEEVE IS IN POSITION BEFORE FINAL ASSEMBLY BEGINS. NOTE: LOWER SPAR PLATES ARE SLIGHTLY LARGER THAN UPPER SPAR PLATES AND BENDS IN BOTH UPPER AND LOWER PLATES ANGLE UPWARD.

2.2 ATTACH LANDING WIRE TANGS AND NOSE WIRE ASS'Y. TO TOP OF KINGPOST AS SHOWN. TIGHTEN BOLT #12 SECURELY. PASS A 1/4" DRILL THROUGH REMAINING TWO HOLES IN ALL THREE TANGS TO INSURE ALIGNMENT.

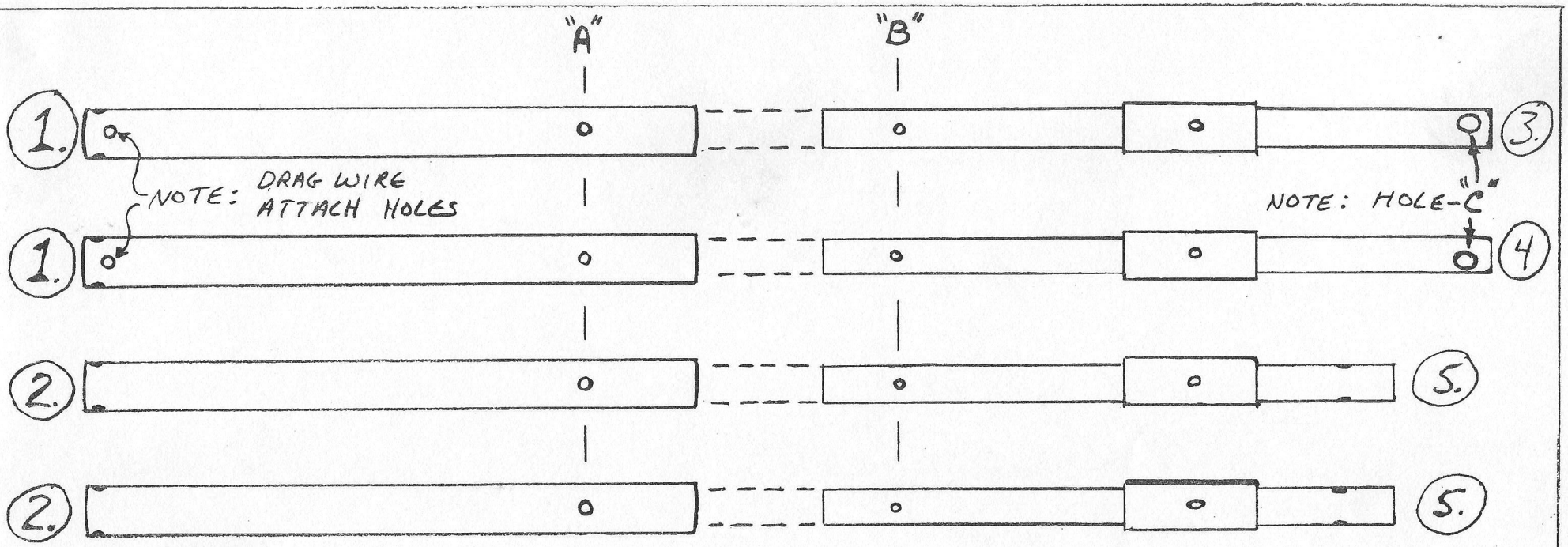




2.3 ATTACH BASE OF KINGPOST TO KINGPOST TENSIONER AS SHOWN. TIGHTEN BOLT # 11 SECURELY BUT LEAVE LOOSE ENOUGH TO ALLOW KINGPOST AND TENSIONER TO MOVE FREELY ONCE ASSEMBLED. ATTACH SHACKLE, TANG, CLEVIS PIN AND SAFETY RING TO END OF NOSE WIRE ASS'Y AS SHOWN.

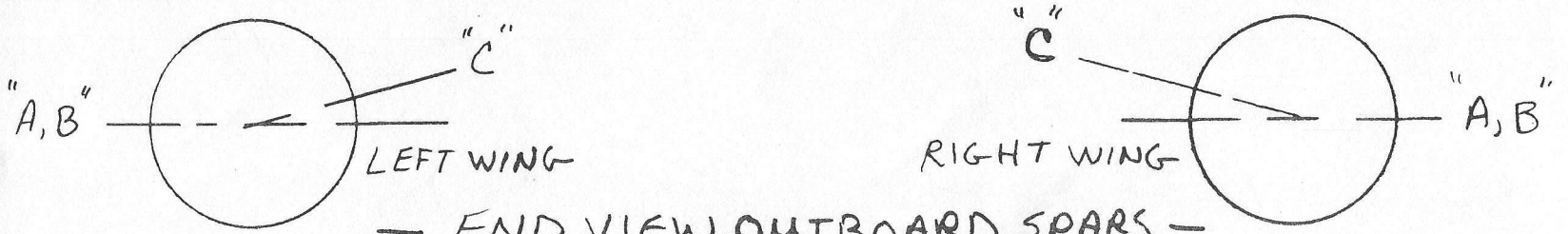


2.4 ATTACH KINGPOST AND NOSEWIRE TO KEEL TUBE ASSEMBLY USING BOLTS, NUTS, SPACER BUSHINGS AND WASHERS AS SHOWN. TIGHTEN BOLT #24 SECURELY BUT ALLOW KINGPOST TENSIONER TO PIVOT FREELY ON BOLT # 24.



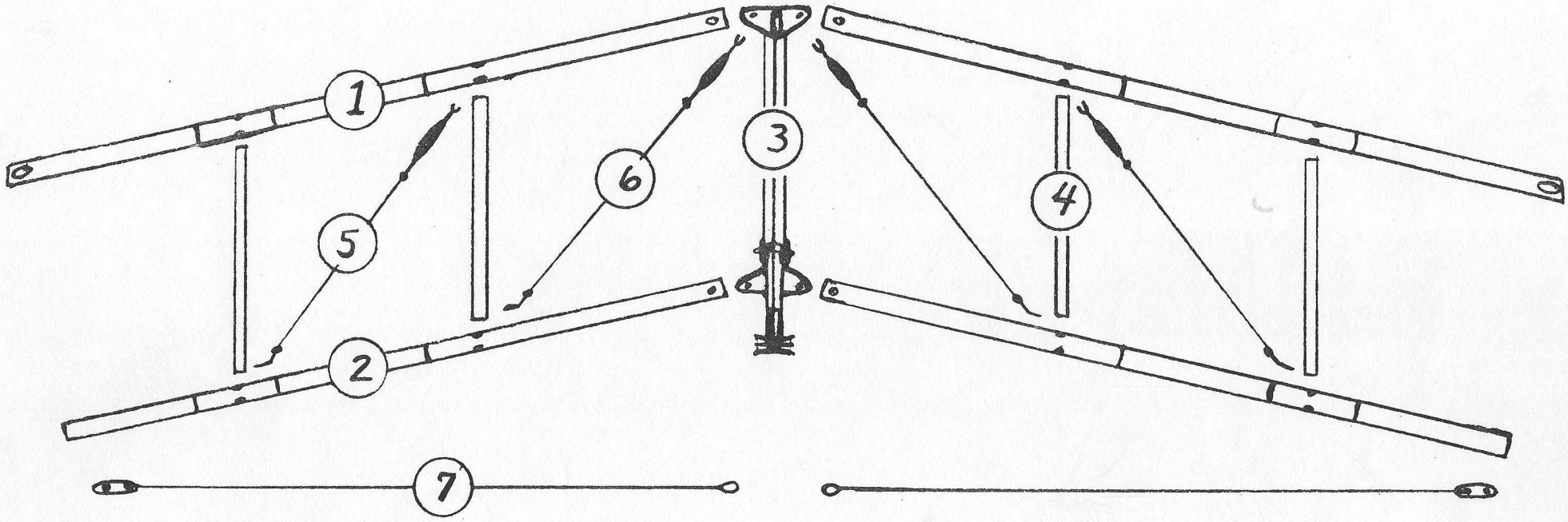
1. LEADING EDGE SPAR - INNER HALF (RIGHT OR LEFT WING)
2. TRAILING EDGE SPAR - INNER HALF (RIGHT OR LEFT WING)
3. LEADING EDGE SPAR - OUTER HALF (RIGHT WING)
4. LEADING EDGE SPAR - OUTER HALF (LEFT WING)
5. TRAILING EDGE SPAR - OUTER HALF (RIGHT OR LEFT WING)

2.5 ASSEMBLE SPAR TUBES BY SLIDING TOGETHER INNER AND OUTER HALVES UNTIL HOLES "A" AND "B" ALIGN. NOTE ANGLES OF 1" DIA. HOLE "C" IN **END** OF OUTER, LEADING EDGE SPARS.



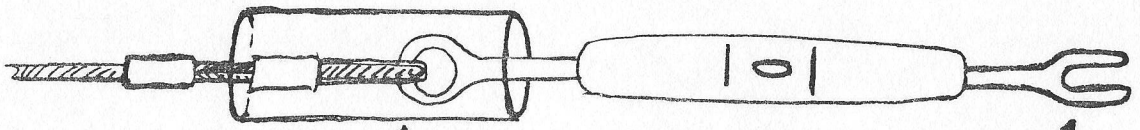
— END VIEW, OUTBOARD SPARS —

2.6 TO BEGIN WING ASSEMBLY, LAY OUT VARIOUS WING COMPONENTS AS SHOWN. IT WILL HELP TO FIND A LARGE OPEN SPACE (PREFERABLY INDOORS) APPROXIMATELY 20ft. x 40ft. TO FINISH THE REMAINDER OF THE ASSEMBLY AND RIGGING PROCESS.

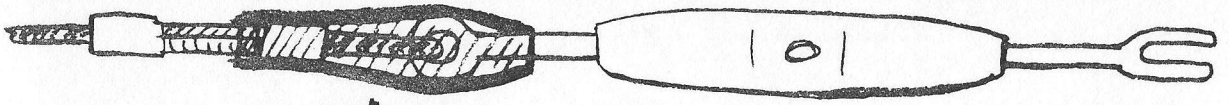


1. LEADING EDGE SPAR ASSEMBLY
2. TRAILING EDGE SPAR ASSEMBLY
3. KEEL TUBE ASSEMBLY
4. COMPRESSION STRUT
5. OUTBOARD DRAG WIRE ASSEMBLY – APPROXIMATELY 92 3/8" LONG
6. INBOARD DRAG WIRE ASSEMBLY – APPROXIMATELY 105 1/2" LONG
7. DIHEDRAL WIRE ASSEMBLY – 165" LONG

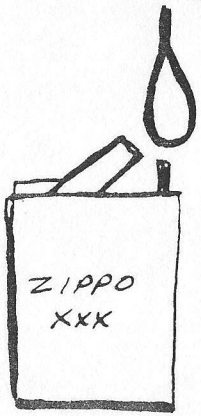
2.6A CUT 12" LONG PIECE OF HEAT SHRINK TUBE (PART NO. M-24) INTO EIGHT, 1½" LONG PIECES. SLIP A PIECE OF HEAT SHRINK ONTO END OF DRAG WIRE TURNBUCKLE AND POSITION OVER THIMBLE AS SHOWN. USE A HEAT GUN OR OPEN FLAME SUCH AS A BUTANE LIGHTER OR MATCHES TO SHRINK HEAT SHRINK TUBE INTO PLACE OVER THIMBLE AND TURN-BUCKLE EYE. BE CAREFUL NOT TO OVERHEAT AND MELT OR CATCH HEAT SHRINK ON FIRE. WHEN FIRST PIECE OF HEAT SHRINK HAS BEEN SHRUNK TOTALLY, PLACE ANOTHER PIECE OVER TOP OF FIRST ONE AND SHRINK IT IN PLACE TOO! USE OF HEAT SHRINK WILL PREVENT THIMBLES FROM TWISTING AND KINKING.



POSITION HEAT SHRINK

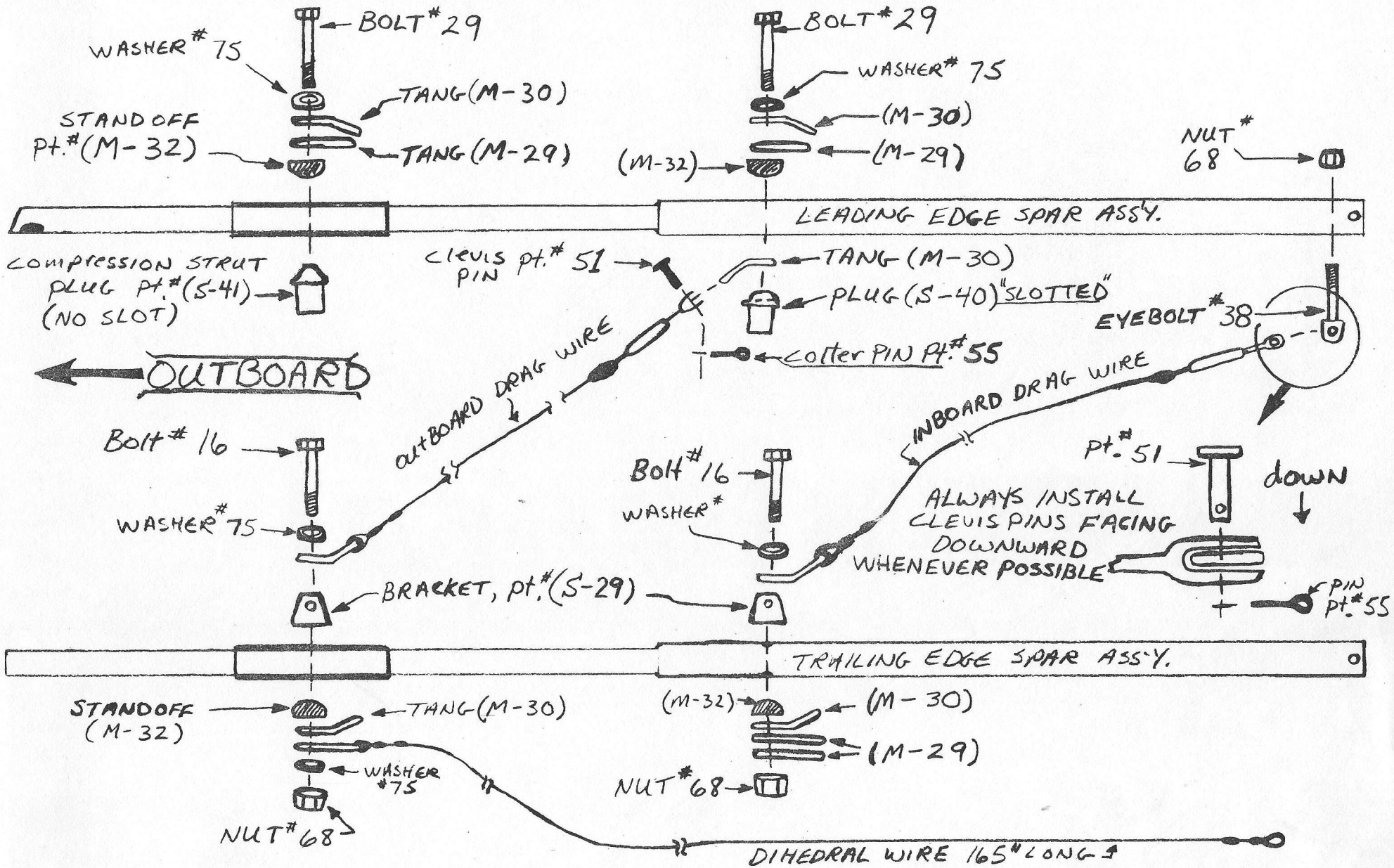


SHRINK IN PLACE

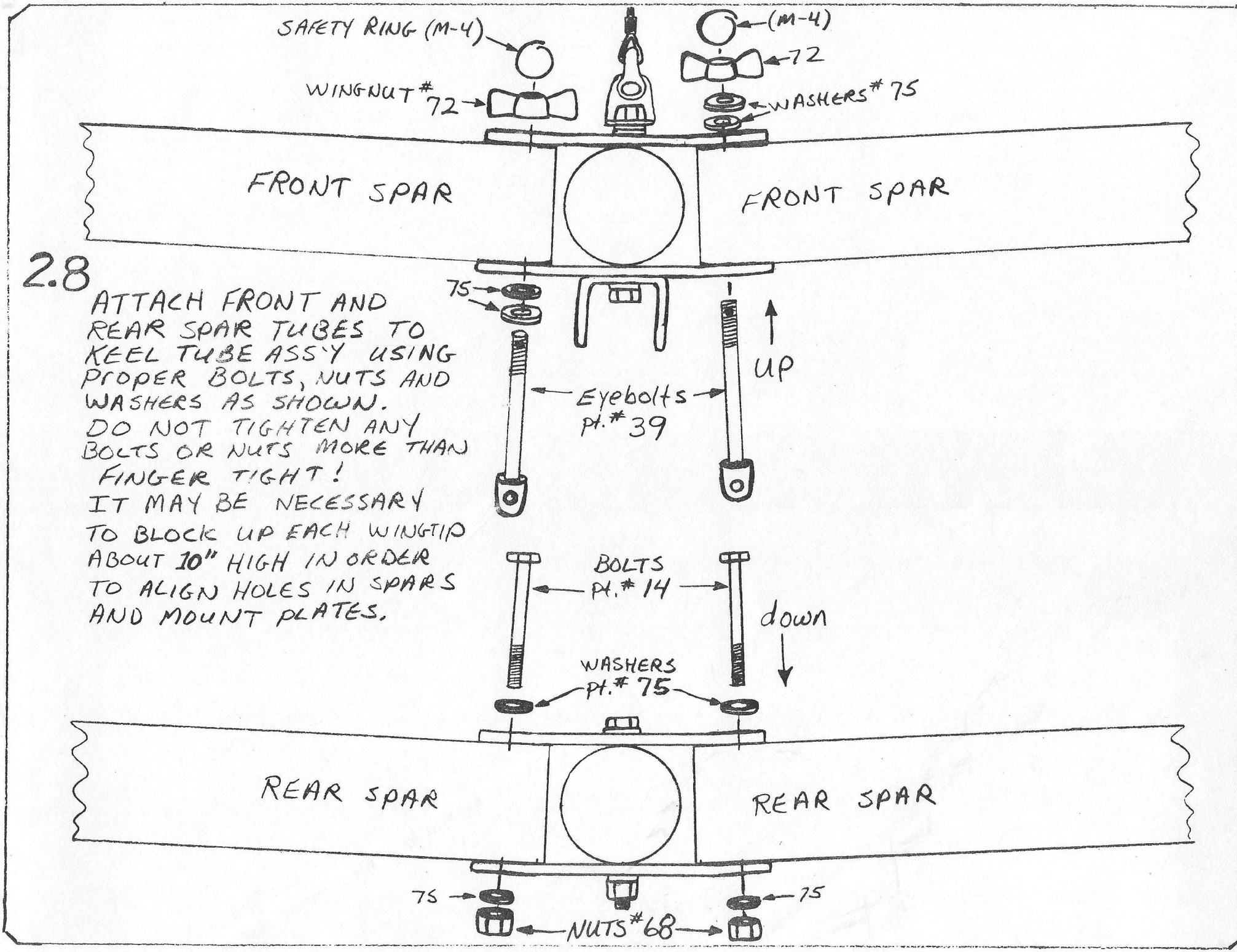


STOP HEATING WHEN HEAT SHRINK **STOPS** SHRINKING

REPEAT TO OTHER THREE TURNBUCKLES

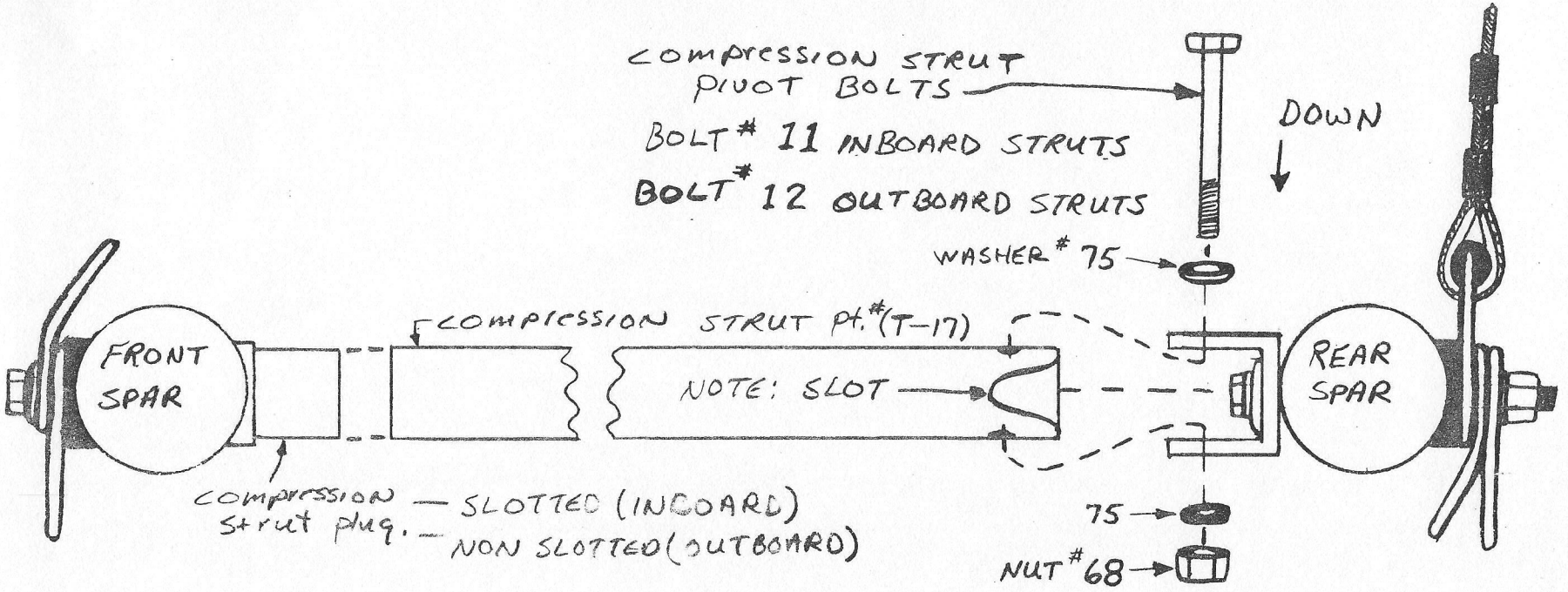


2.7 ATTACH ALL STRUCTURAL AND MISCELLANEOUS PARTS TO FRONT AND REAR SPAR ASSEMBLIES AS SHOWN. USE PROPER NUTS, BOLTS, AND WASHERS WHERE INDICATED. BE SURE TO SECURE DRAG WIRES TO proper TANGS OR EYEBOLTS WITH CLEVIS PINS AND COTTER PINS AS INDICATED. BEND OVER COTTER PINS ONCE INSTALLATION IS COMPLETE. DO NOT TIGHTEN ANY BOLTS OR NUTS MORE THAN FINGER TIGHT AT THIS POINT.



2.8

ATTACH FRONT AND REAR SPAR TUBES TO KEEL TUBE ASS'Y USING PROPER BOLTS, NUTS AND WASHERS AS SHOWN. DO NOT TIGHTEN ANY BOLTS OR NUTS MORE THAN FINGER TIGHT! IT MAY BE NECESSARY TO BLOCK UP EACH WINGTIP ABOUT 10" HIGH IN ORDER TO ALIGN HOLES IN SPARS AND MOUNT PLATES.



2.9 ATTACH COMPRESSION STRUTS TO BRACKETS LOCATED ON REAR SPAR AS SHOWN. SLOT IN END OF COMPRESSION STRUT ALWAYS FACES OUTWARD TOWARD WINGTIP. THIS WILL ALLOW FRONT END OF COMPRESSION STRUT TO PIVOT OUTWARD AND LIE AGAINST REAR SPAR WHEN FOLDING WING FOR TRANSPORT BY CAR TOP OR VAN. NOTE ALSO COMPRESSION STRUT PIVOT BOLTS. THE LONGER BOLTS, pt.# 12, ATTACH THE <u>OUTER</u> COMPRESSION STRUTS TO THEIR BRACKETS AND THE SHORTER BOLTS, pt.# 11, ATTACH THE INNER COMPRESSION STRUTS. THE LONGER BOLTS WILL LATER PROVIDE A MOUNTING POINT FOR CONTROL CABLE GUIDE CLAMPS. DO NOT TIGHTEN ANY BOLTS MORE THAN FINGER TIGHT AT THIS POINT. CONNECT FRONT SPARS TO COMPRESSION STRUTS BY INSERTING PLUG INTO END OF STRUT.

2.10 RIGGING INTRODUCTION:

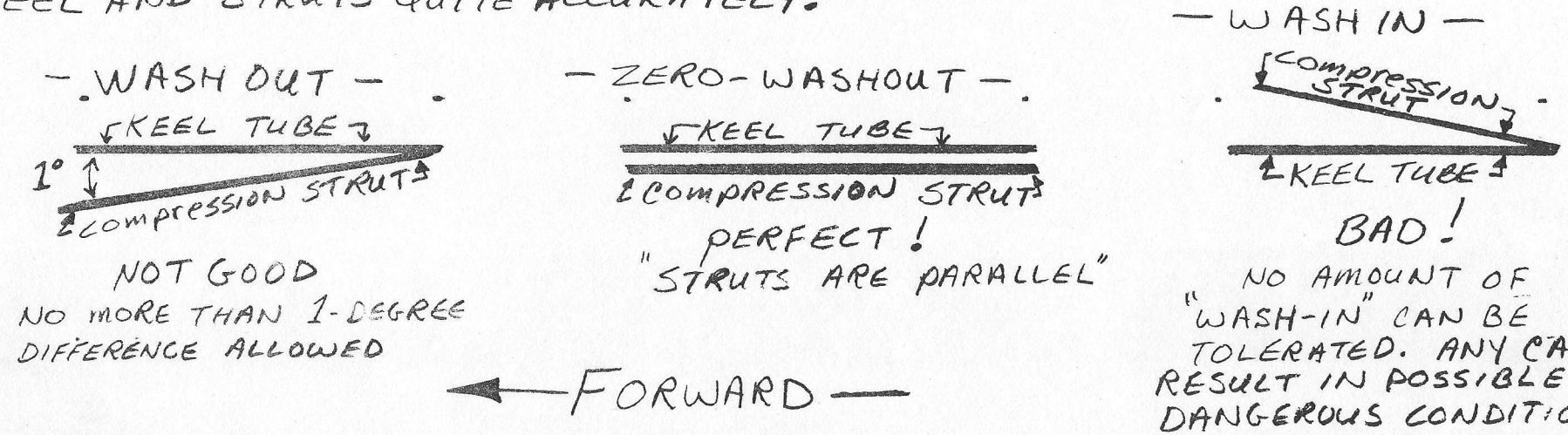
BEFORE GIVING YOU THE STEP BY STEP PROCESS IN WHICH TO COMPLETE THE RIGGING OF YOUR WING, I WOULD FIRST LIKE TO FURNISH YOU WITH A LITTLE GENERAL BACKGROUND. ALL OF THE UPPER RIGGING CABLES WHICH SUPPORT THE WING WHEN IT IS NOT BEING FLOWN ARE CALLED "LANDING WIRES". ALL OF THE LOWER RIGGING CABLES WHICH SUPPORT THE WING IN FLIGHT ARE CALLED "FLYING WIRES". THE LANDING AND FLYING WIRE CABLES WILL BE REFERRED TO IN THE ASSEMBLY SEQUENCE BY THE NUMBERS #1, #2, #3, ... #9, ETC. AND ARE USUALLY MADE UP AND INSTALLED IN PAIRS, ONE FOR THE LEFT WING AND ONE FOR THE RIGHT WING. SINCE MOST PEOPLE DON'T HAVE ACCESS TO, NOR COULD THEY AFFORD AN AIRCRAFT GRADE CABLE TENSIOMETER TO CHECK FOR PROPER CABLE TENSION, IT WILL BE NECESSARY TO LITERALLY "PLAY IT BY EAR". ONCE YOU HAVE ESTABLISHED THE LENGTH AND TENSION OF A PARTICULAR CABLE ON ONE SIDE OF THE WING, IT IS EASY TO CHECK THE TENSION IN A CORRESPONDING CABLE OF EQUAL LENGTH ON THE OTHER SIDE OF THE WING BY SIMPLY PLUCKING THE CABLE AND LISTENING TO ITS SOUND AS IF YOU WERE TUNING A MUSICAL INSTRUMENT. WHEN TWO CABLES OF EQUAL LENGTH SOUND THE SAME, THEY WILL HAVE EQUAL TENSION. THIS IS VERY HELPFUL WHEN TUNING THE INBOARD DRAG WIRES, AS THEY ARE USUALLY VERY "TAUGHT" AND ARE DIFFICULT TO FINE ADJUST SIMPLY BY MEASURING.

PHYSICALLY, OUR WING IS RIGGED WITH BOTH SPARS STRAIGHT AND ALL THE COMPRESSION STRUTS ARE "PARALLEL". IN CONVENTIONAL AIRCRAFT THE WINGS TWIST GRADUALLY AS THEY EXTEND AWAY FROM THE FUSELAGE OR CENTER SECTION. THE WINGTIPS OF THE MACHINE FLY AT A LOWER ANGLE OF ATTACK THAN THE CENTER OF THE WING SO THAT THE CENTER SECTION ALWAYS BEGINS TO STALL FIRST KEEPING THE MACHINE FROM SPINNING.

THIS EFFECT IS USUALLY REFERRED TO AS "WASHOUT" OR "GEOMETRIC TWIST". IN THE KASPERWING, "WASHOUT" IS ACCOMPLISHED BY THE UPSWEPT HORIZONTAL STABILIZER INTERACTING WITH THE WINGTIP ASSEMBLY WHICH HELPS PREVENT OUR WINGTIP FROM STALLING.

—CONTINUED—

2.11 RIGGING INTRODUCTION, CONT. — WHEN RIGGING, ONE SHOULD TAKE PARTICULAR CARE TO SEE THAT THE SPARS COME OUT "STRAIGHT", NOT BOWING IN ANY DIRECTION. TOO MUCH TENSION IN THE CABLES CAN CAUSE SPARS TO "BOW" SLIGHTLY. THE WING SHOULD BE RIGGED WITH "ZERO-WASHOUT." BELOW ARE THREE DIAGRAMS ILLUSTRATING SOME OF THE POSSIBLE RIGGING CONFIGURATIONS YOU MAY ENCOUNTER. BY SIGHTING DOWN ALONG THE COMPRESSION STRUTS AND COMPARING THEM TO THE KEEL TUBE, YOU SHOULD BE ABLE TO ADJUST CABLE LENGTHS OR TENSION, AND ALIGN KEEL AND STRUTS QUITE ACCURATELY.

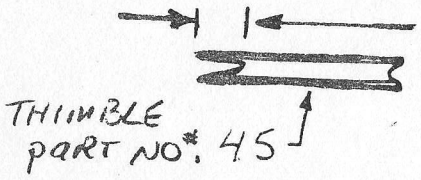


THE ABOVE LINES SERVE TO ILLUSTRATE THE LIMITS OF RIGGING TOLERANCE ALLOWED, AS VIEWED LOOKING DOWN LEFT WING FROM TIP TOWARDS CENTER. IT SHOULD BE OBVIOUS FROM THE ABOVE DIAGRAMS THAT UP TO ONE-DEGREE OF "WASHOUT" CAN BE TOLERATED, BUT NO AMOUNT OF "WASH IN" SHOULD BE PERMITTED. THIS IS THE SINGLE MOST IMPORTANT THING TO KEEP IN MIND WHEN COMPLETING THE RIGGING. IF AFTER YOU'VE COMPLETELY RIGGED YOUR WING AND YOU FIND ANY AMOUNT OF "WASHIN" PRESENT, REPLACE THOSE CABLES WHICH WERE IMPROPERLY ADJUSTED AND SWAGED WITH NEW CABLES OF THE PROPER LENGTH OR TENSION! TAKE YOUR TIME AND WORK SLOWLY. STRIVE FOR ACCURACY AND PERFECTION, AS THIS STAGE OF ASSEMBLY CAN PROFOUNDLY AFFECT HOW YOUR WING PERFORMS.

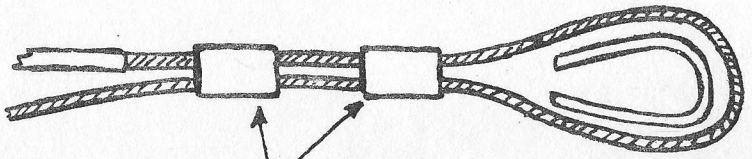
2.12 TO MAKE UP UPPER RIGGING (LANDING-WIRES), BEGIN BY CUTTING 6-pieces of coated 3/32" CABLE FROM 190 ft. ROLL PROVIDED.

1. _____ 112" LONG - 2 EA.
2. _____ 178" LONG - 2 EA.
3. _____ 105" LONG - 2 EA.

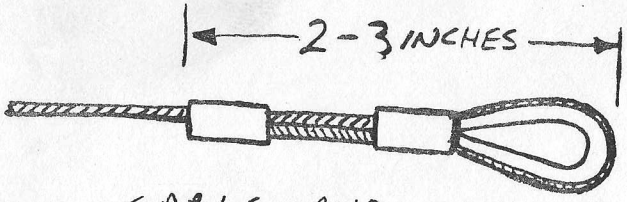
USE A POCKET KNIFE OR OTHER SUITABLE TOOL TO (STRIP) REMOVE ABOUT 8" OF COATING FROM ONE END OF EACH CABLE.



CLIP OFF FORKED END OF THIMBLES USING CABLE CUTTER OR DIKES AS SHOWN.

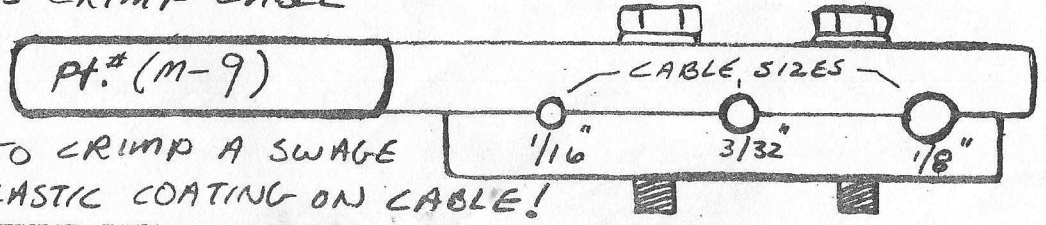


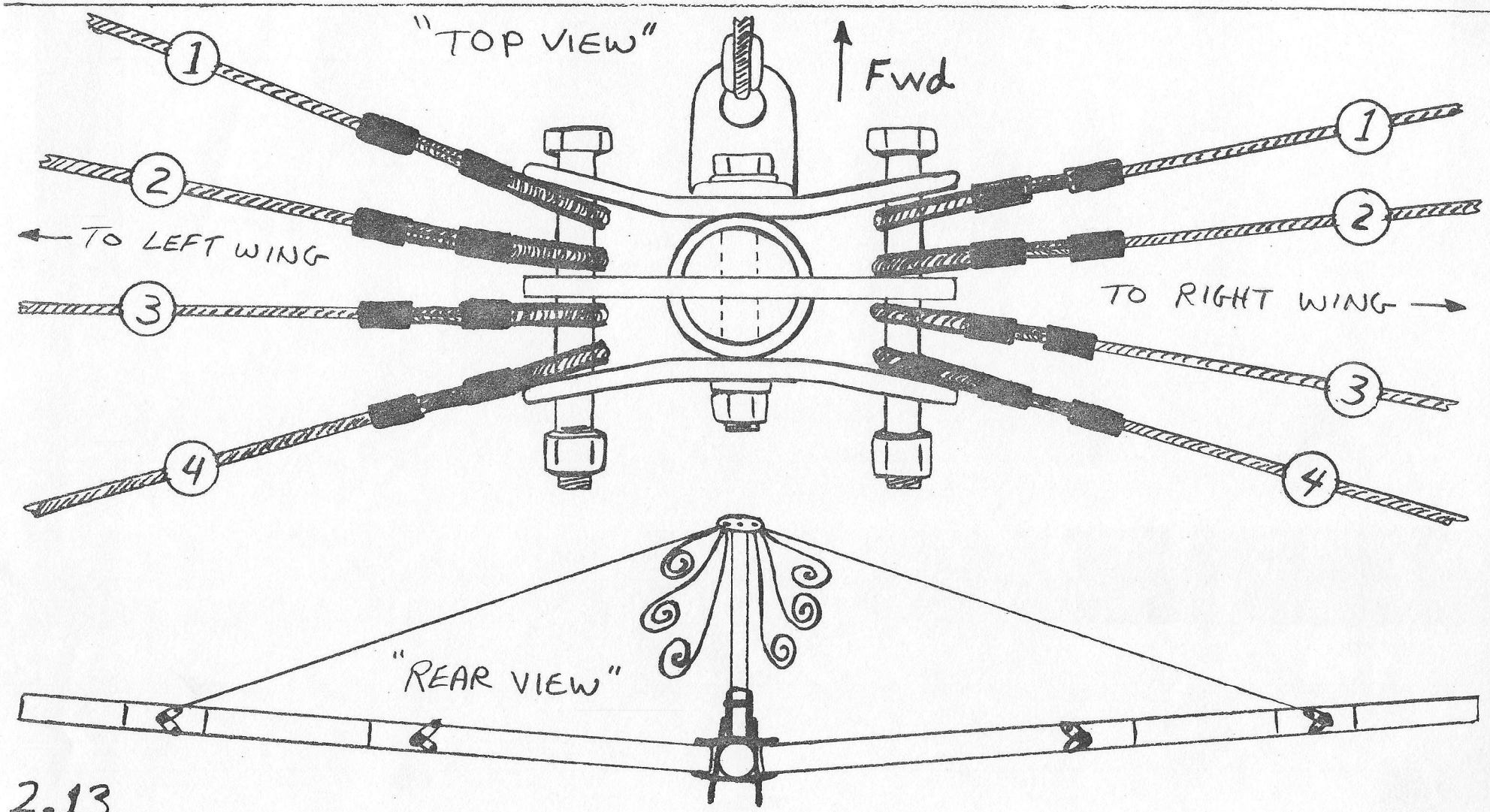
SLIP TWO SWAGES, PART NO.# 46 OVER STRIPPED END OF CABLE, PASS CABLE AROUND THIMBLE AND BACK THROUGH SWAGES AS SHOWN.



PULL SWAGE UP "TIGHT" AGAINST BACK OF THIMBLE AND CRIMP SWAGE PERMANENTLY INTO POSITION AS SHOWN USING PROPER CRIMPING TOOL. TRIM EXCESS CABLE AND CRIMP A SECOND SWAGE INTO POSITION OVER CUT END OF CABLE AS SHOWN.

CAUTION: BE SURE TO USE PROPER HOLE IN SWAGING TOOL WHEN CRIMPING CABLE. ALWAYS CRIMP CABLE EVENLY AND COMPLETELY BY TIGHTENING BOLTS TIGHT SO THAT SWAGES ARE THOROUGHLY CRIMPED. NEVER ATTEMPT TO CRIMP A SWAGE OVER THE OUTSIDE OF CLEAR PLASTIC COATING ON CABLE!



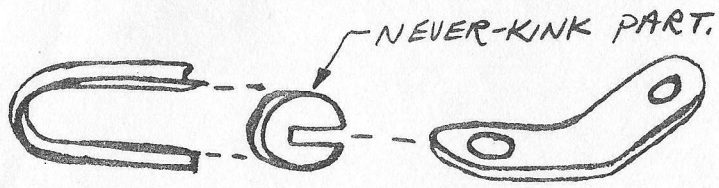


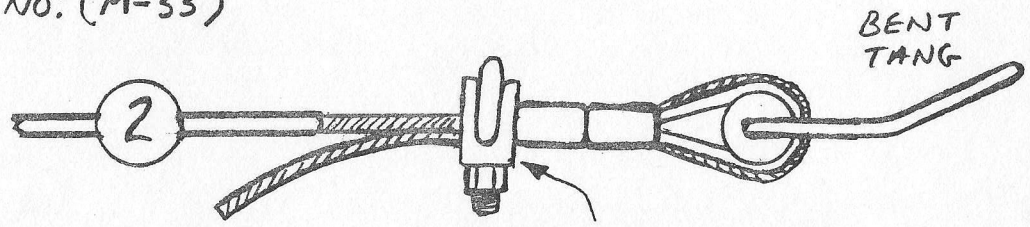
2.13

CONNECT ALL UPPER RIGGING TO KINGPOST AS SHOWN. REAR VIEW SHOWS POSITION OF CABLES READY TO BE CLAMPED INTO POSITION PRIOR TO SWAGING. TOP VIEW SHOWS PLACEMENT OF ALL UPPER RIGGING CABLES RELATIVE TO EACH OTHER AFTER THEY HAVE BEEN SWAGED INTO POSITION TO WING SPAR TANGS.

1. TO LEADING EDGE SPAR - INBOARD
2. TO LEADING EDGE SPAR - OUTBOARD
3. TO TRAILING EDGE SPAR - INBOARD
4. TO TRAILING EDGE SPAR - OUTBOARD

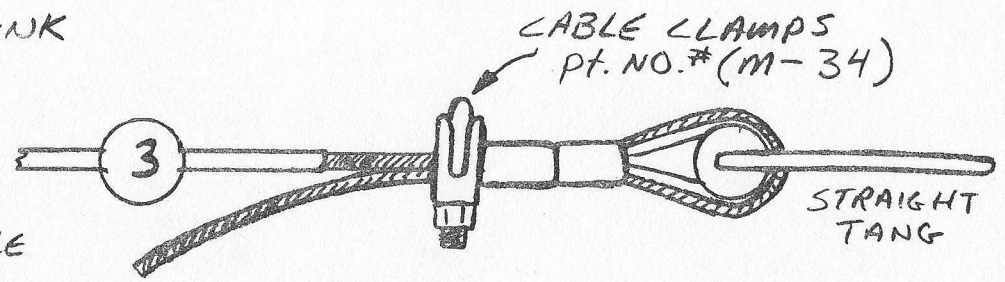
2.14 CLAMP CABLES #2 AND #3 TO WING SPAR TANGS USING PROPER THIMBLES, SWAGES, NEVER-KINKS AND CLAMPS AS SHOWN.

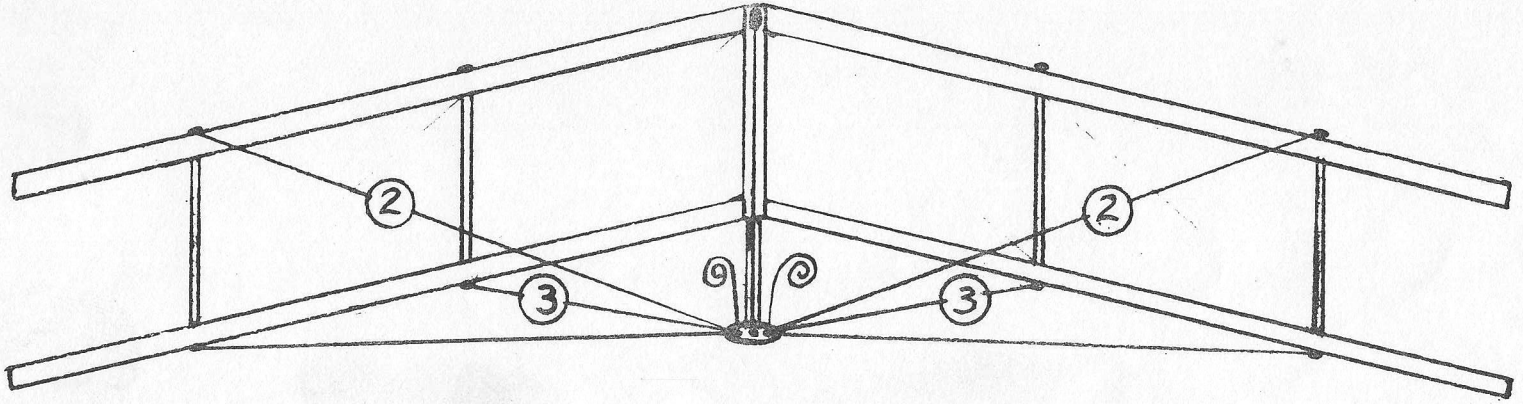




TRIM ENDS OF THIMBLE AND SPREAD OPEN AS SHOWN. INSTALL NEVER-KINK ON TANG END WITH LARGE HOLE. PLACE THIMBLE IN POSITION AROUND NEVER-KINK AND SQUEEZE THIMBLE CLOSED USING PLIERS. CLAMP CABLE AND TWO SWAGES TO TANG AND THIMBLE AS SHOWN. TIGHTEN CLAMP ONLY ENOUGH TO KEEP CABLE FROM SLIPPING.

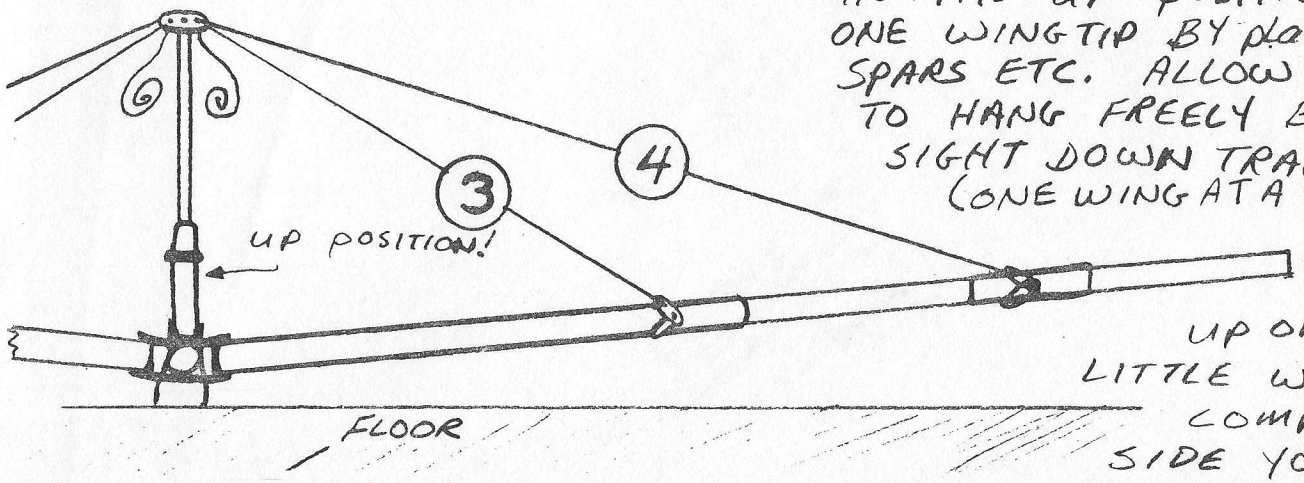
NOTE: BE SURE TO PEEL BACK CABLE COATING BEFORE CLAMPING OR SWAGING. NEVER CRIMP A SWAGE OVER THE CABLE COATING!



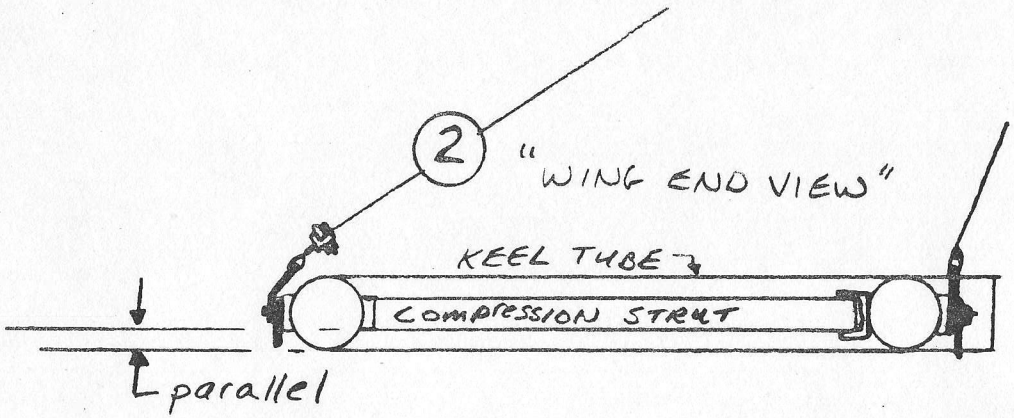


CLAMP CABLES INTO POSITION, DO NOT SWAGE YET!

2.15 MAKE SURE THAT KING-POST TENSIONER IS IN THE "UP" POSITION! ANCHOR THE END OF ONE WINGTIP BY placing WEIGHT ON TOP OF SPARS ETC. ALLOW THE OTHER SIDE OF WING TO HANG FREELY BY CABLES *3 AND *4. SIGHT DOWN TRAILING EDGE SPAR TUBE (ONE WING AT A TIME) AND ADJUST LENGTH OF CABLE #3 UNTIL SPAR IS STRAIGHT (NOT BOWING UP OR DOWN). YOU CAN ADD A LITTLE WEIGHT TO THE INBOARD COMPRESSION STRUT ON THE SIDE YOU ARE RIGGING IN ORDER TO TAKE ANY SLACK OUT OF CABLE #3, OR SIMPLY HAVE A HELPER APPLY A LITTLE DOWN PRESSURE TO STRUT WHILE YOU SIGHT DOWN SPAR. WHEN YOU ARE CONFIDENT REAR SPAR IS AS STRAIGHT AS POSSIBLE, PERMANENTLY SWAGE CABLE #3 INTO POSITION. REPEAT PROCESS TO OTHER SIDE OF WING.

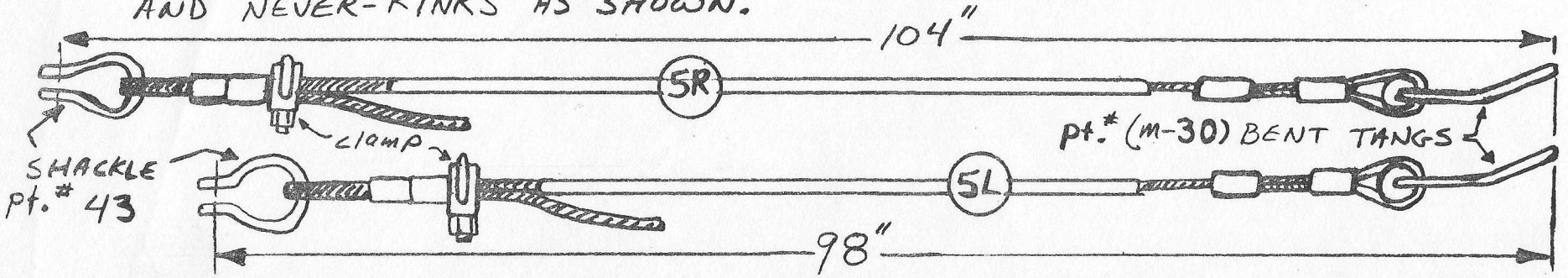


ADJUST CABLE #2 UNTIL OUTBOARD COMPRESSION STRUT IS ALIGNED "PARALLEL" TO KEEL TUBE. DO NOT SWAGE CABLE *2 AT THIS TIME!



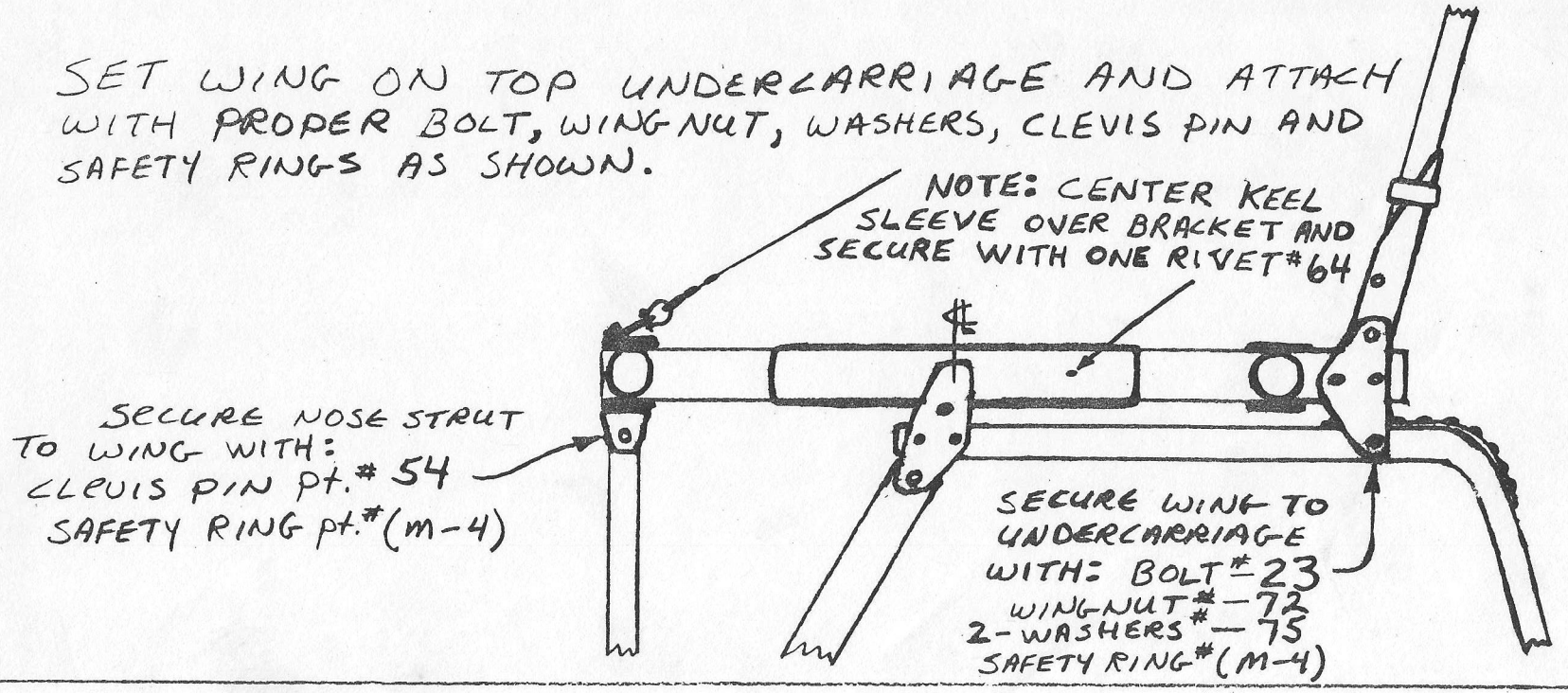
NOW THAT YOU KNOW HOW THE UPPER RIGGING ATTACHES TO THE WING, UNBOLT SPARS, STRUTS, KEEL TUBE, KINGPOST AND ALL UPPER RIGGING AND DRAG WIRES. CAREFULLY NOTE WHAT POSITION ALL THE COMPONENTS WERE IN PRIOR TO DIS-ASSEMBLY! LAY WING COVERING (SAIL), BOTTOM SIDE UP ON A FLAT "CLEAN" SURFACE. SLIP SPAR TUBES INTO SPAR POCKETS. ATTACH KEEL TUBE, COMPRESSION STRUTS AND DRAG WIRES AS BEFORE BUT DO NOT TIGHTEN BOLTS. FLIP WING OVER AND ATTACH KING POST AND UPPER RIGGING.

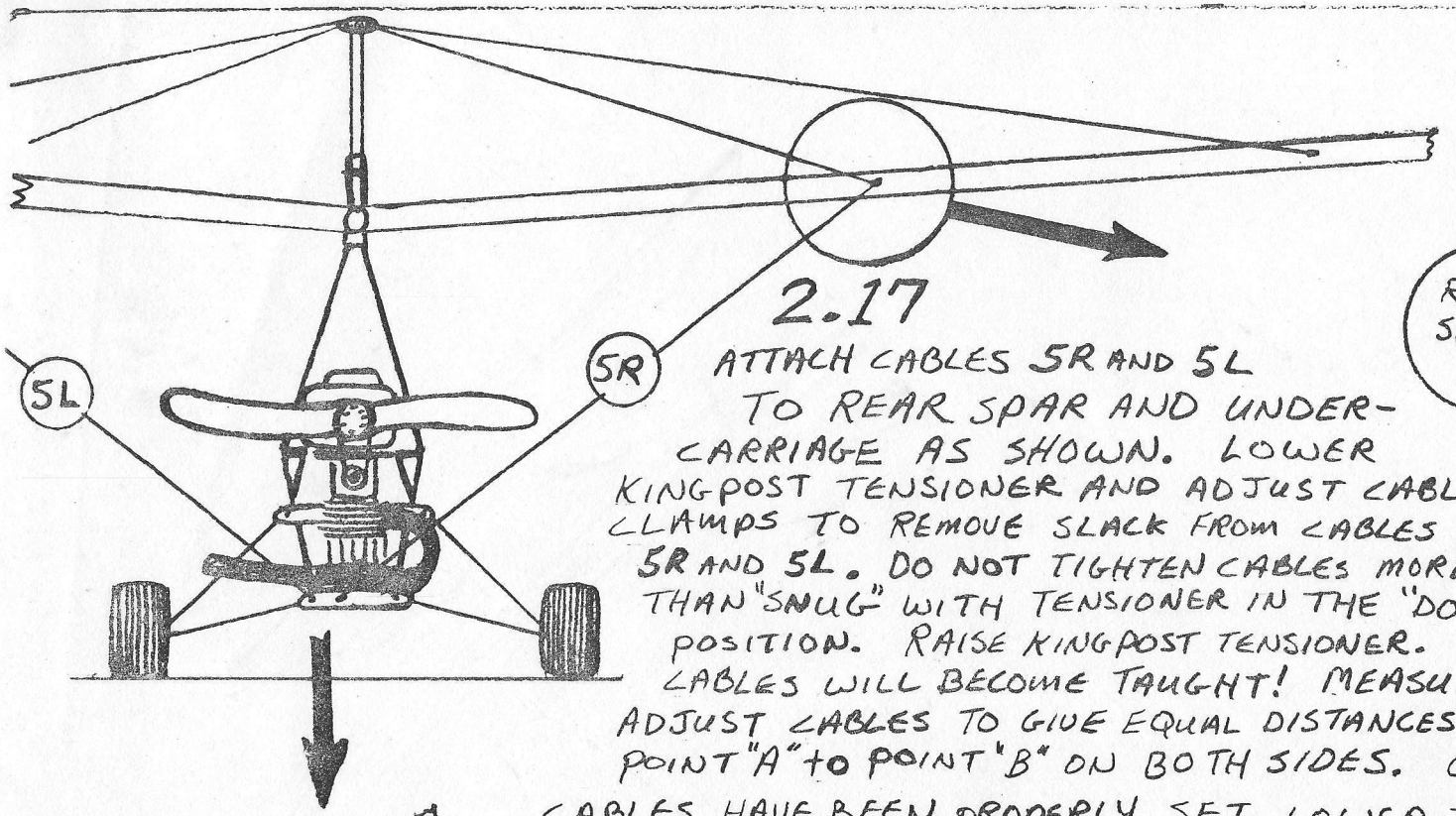
2.16 CUT ONE PIECE OF 3/32" CABLE 114" LONG AND ONE PIECE 108" LONG. STRIP ABOUT 8" OF COATING FROM ONE END OF EACH CABLE AND SWAGE ENDS TO TANGS USING PROPER SWAGES, THIMBLES AND NEVER-KINKS AS SHOWN.



STRIP ABOUT 12" OF COATING FROM UN-SWAGED END OF CABLES AND ATTACH SHACKLES TO CABLE ENDS USING PROPER THIMBLES, SWAGES AND CABLE CLAMPS AS SHOWN. ADJUST ASSEMBLED CABLES TO LENGTHS SHOWN AND TIGHTEN CLAMP ONLY TIGHT ENOUGH TO KEEP CABLE FROM SLIPPING.

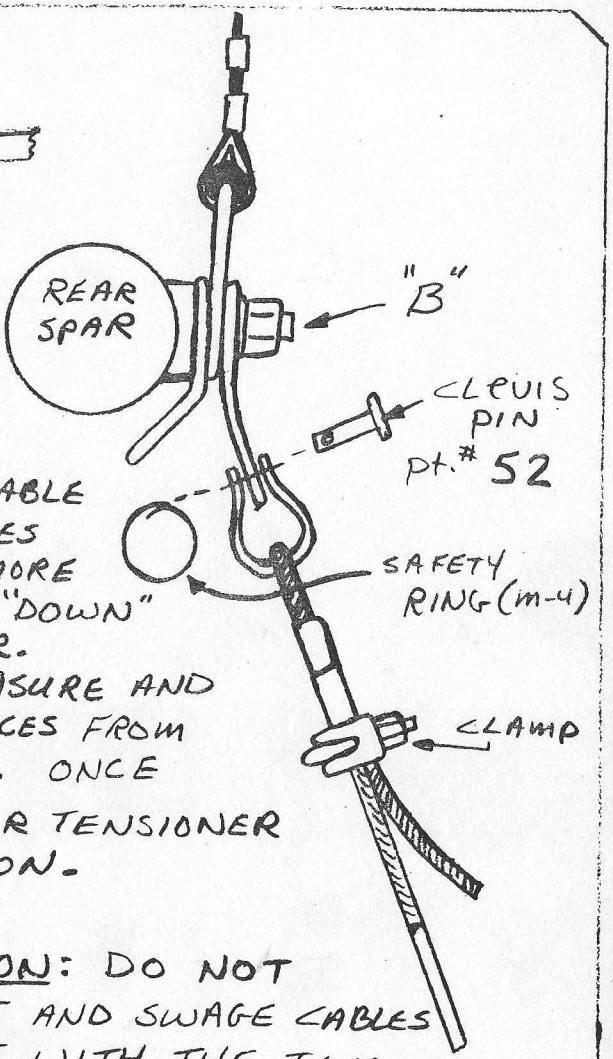
SET WING ON TOP UNDERCARRIAGE AND ATTACH WITH PROPER BOLT, WING NUT, WASHERS, CLEVIS PIN AND SAFETY RINGS AS SHOWN.

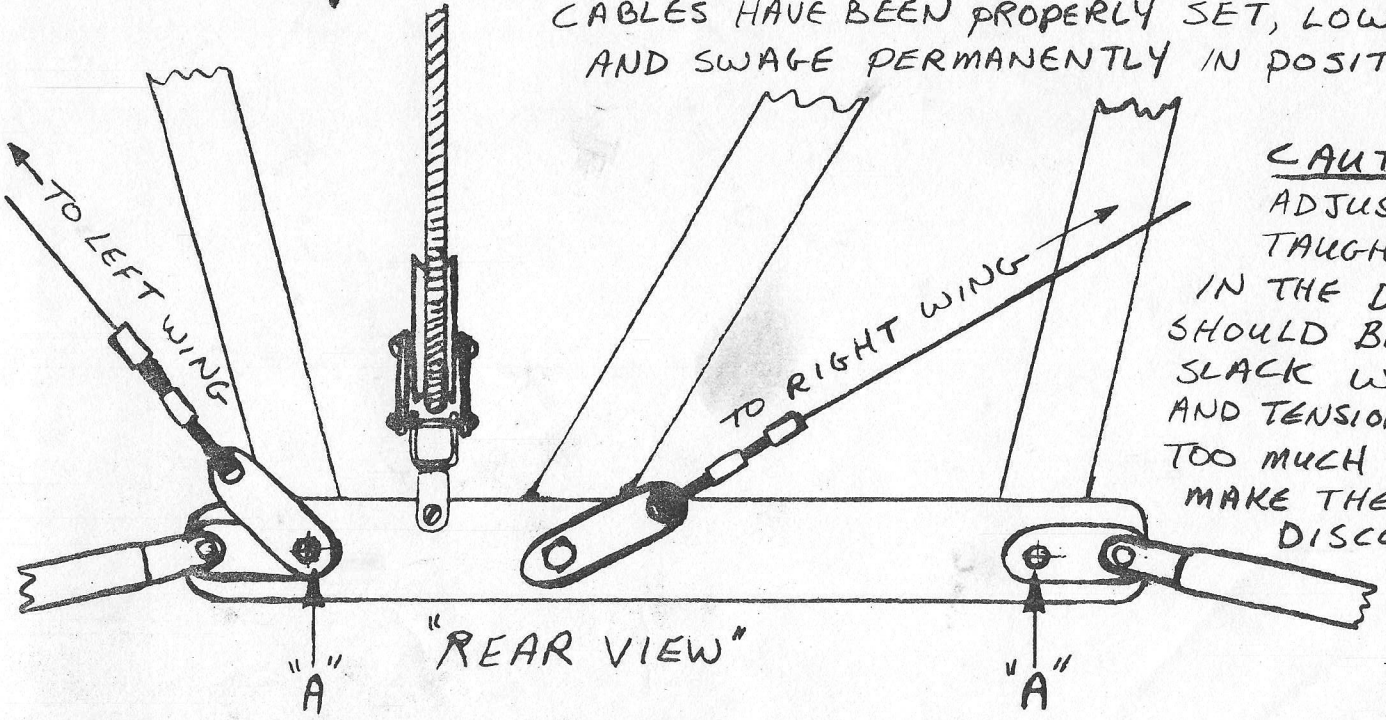




2.17

ATTACH CABLES 5R AND 5L TO REAR SPAR AND UNDER-CARRIAGE AS SHOWN. LOWER KINGPOST TENSIONER AND ADJUST CABLE CLAMPS TO REMOVE SLACK FROM CABLES 5R AND 5L. DO NOT TIGHTEN CABLES MORE THAN "SNUG" WITH TENSIONER IN THE "DOWN" POSITION. RAISE KINGPOST TENSIONER. CABLES WILL BECOME TAUGHT! MEASURE AND ADJUST CABLES TO GIVE EQUAL DISTANCES FROM POINT "A" TO POINT "B" ON BOTH SIDES. ONCE CABLES HAVE BEEN PROPERLY SET, LOWER TENSIONER AND SWAGE PERMANENTLY IN POSITION.

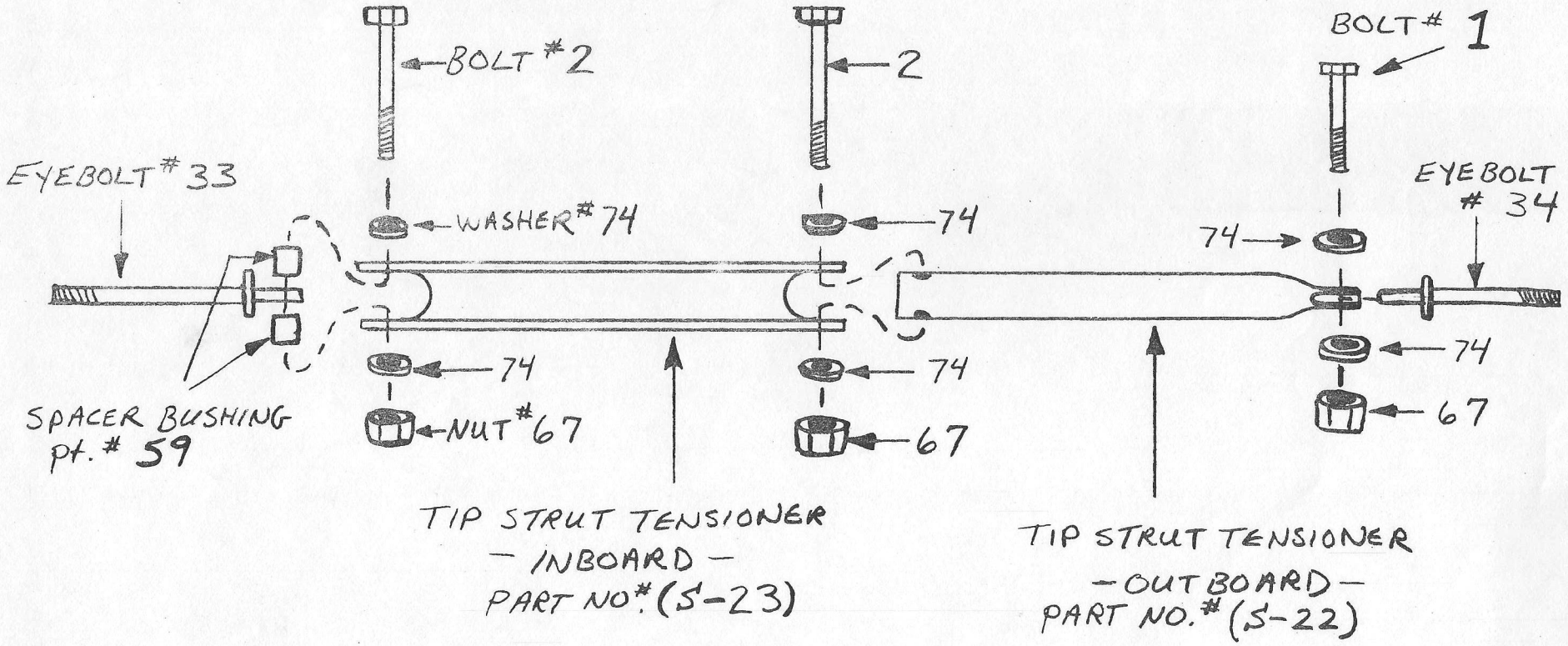


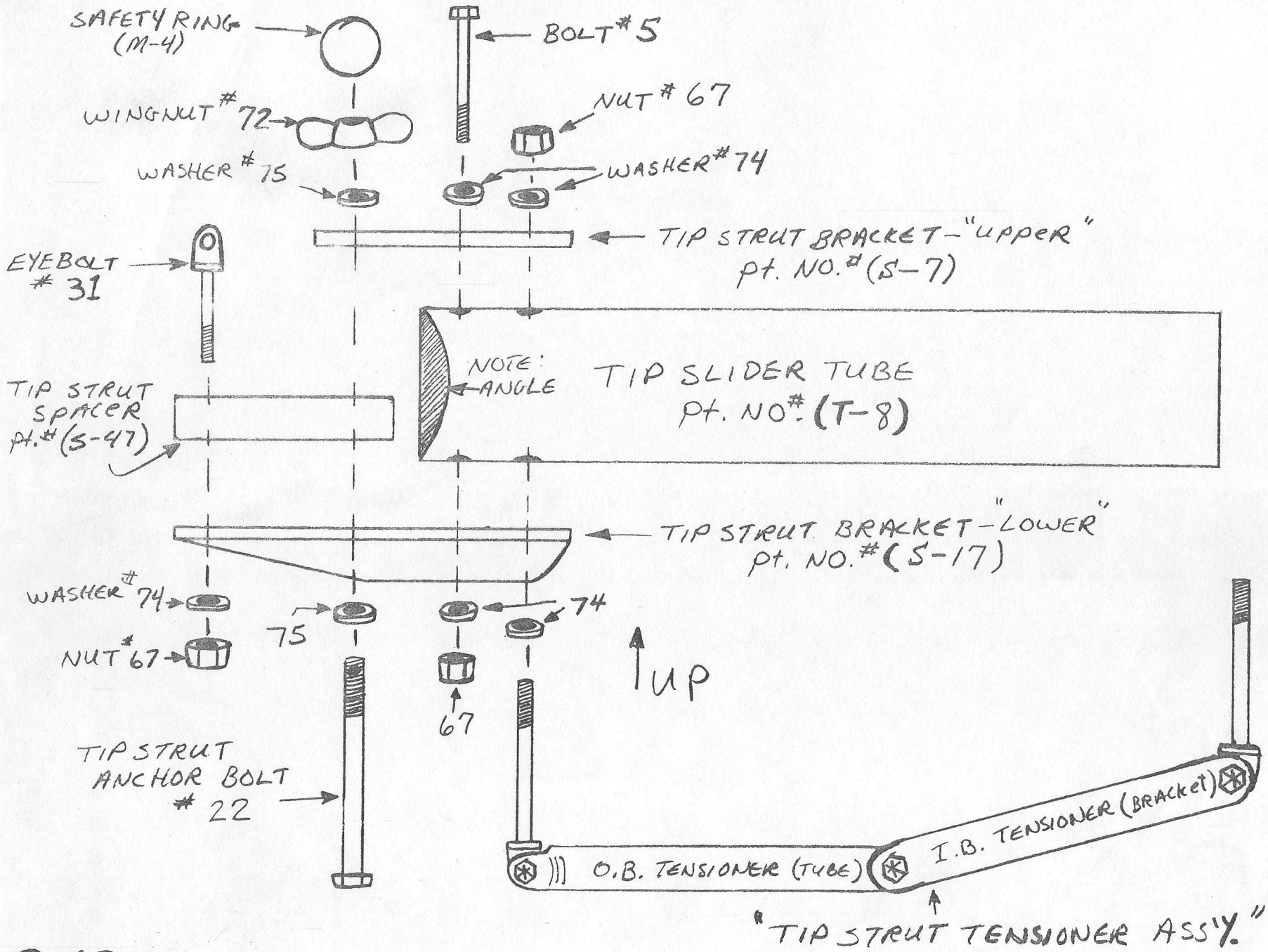


CAUTION: DO NOT ADJUST AND SWAGE CABLES TAUGHT WITH THE TENSIONER IN THE DOWN POSITION! CABLES SHOULD BE SNUG ONLY, OR A LITTLE SLACK WHEN PERMANENTLY SET AND TENSIONER IS IN "DOWN" POSITION. TOO MUCH TENSION IN THE CABLES WILL MAKE THEM DIFFICULT TO CONNECT OR DISCONNECT AND WILL ALSO CAUSE THE REAR SPARS TO BOW DOWNWARD MORE THAN A REASONABLE AMOUNT.

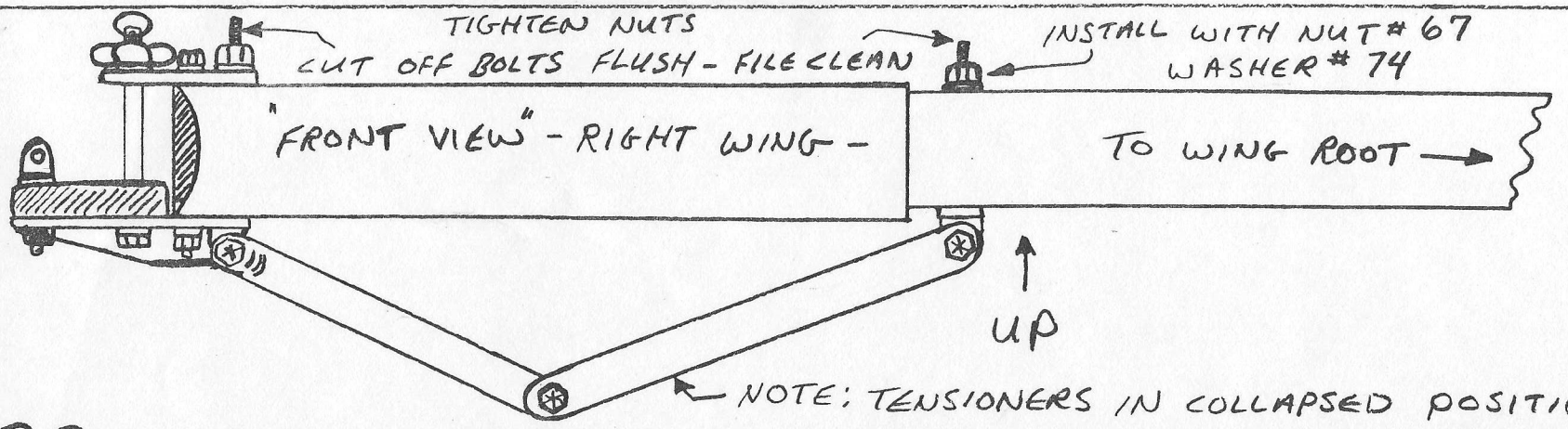
2.18 CONSTRUCT TWO-EACH, TIP STRUT TENSIONER ASSEMBLIES (ONE PAIR FOR EACH WING) USING PROPER NUTS, BOLTS AND WASHERS AS SHOWN. TIGHTEN NUTS AND BOLTS SNUG, BUT LEAVE LOOSE ENOUGH TO ALLOW ALL PARTS TO WORK FREELY.

TIP STRUT TENSIONER ASSEMBLY
"TOP VIEW"

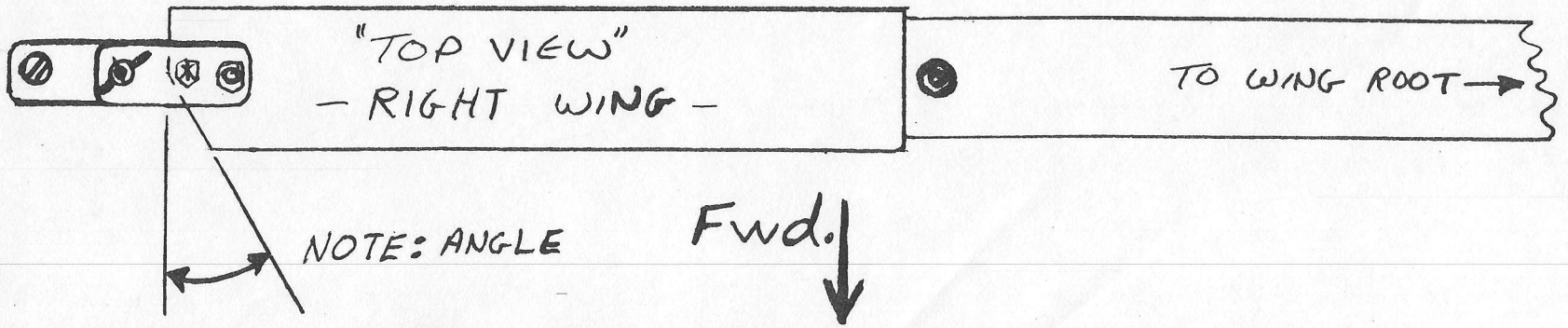




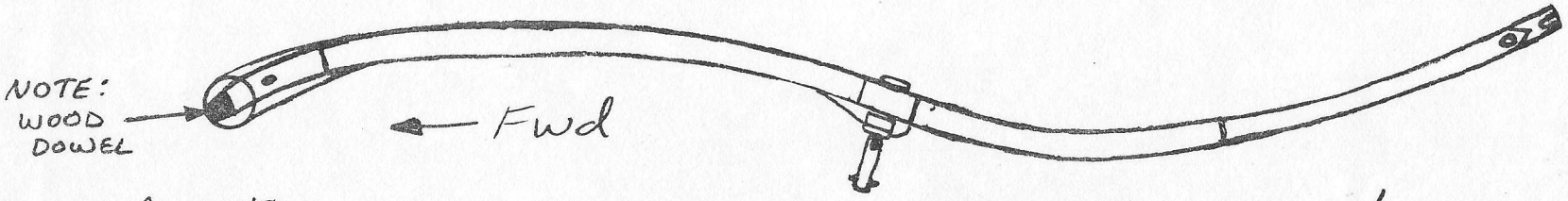
2.19 ASSEMBLE TWO-EACH, TIPSLIDER/TENSIONER ASSEMBLIES (ONE FOR EACH WING) USING PROPER NUTS, BOLTS, WASHERS AND BRACKETS AS SHOWN. NOTE: ANGLE IN END OF TIP SLIDER TUBE FACES FORWARD!



2.20 INSTALL TIP SLIDER/TENSIONER ASSEMBLIES ON TIP OF REAR SPARS AS SHOWN. MAKE SURE THERE ARE NO "BURRS" OR FOREIGN MATTER INSIDE TIP SLIDER TUBE PRIOR TO INSTALLATION. TO MAINTAIN SMOOTH OPERATION IT WILL HELP TO SQUIRT A LITTLE W.D.40 OR OTHER SUITABLE LIGHTWEIGHT LUBRICANT INSIDE TIP SLIDER TUBE BEFORE MOUNTING ON REAR SPAR. BE SURE TO WIPE OFF ANY EXCESS. CUT OFF PROTRUDING ENDS OF EYEBOLTS AND SMOOTH WITH A FILE. THIS WILL PREVENT ABRASION OF WING COVER (SAIL). BEFORE PERMANENT MOUNTING, BE SURE THAT LEFT TIP SLIDER ASSEMBLY AND RIGHT TIP SLIDER ASSEMBLY ARE MOUNTED ON THEIR PROPER RESPECTIVE WING TIPS AS INDICATED BY ANGLE CUT IN END OF TIP SLIDER TUBE! ANGLE ALWAYS FACES FORWARD.

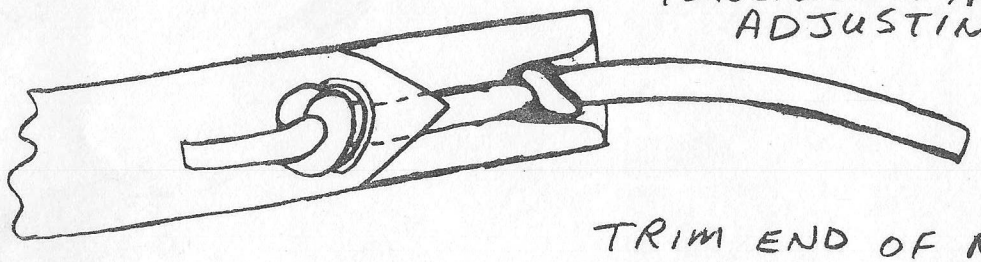


2.21 LOCATE LEFT AND RIGHT SIDE TIP STRUT ASSEMBLIES. NOTCH AT REAR OF TIP STRUT ALWAYS FACES OUTWARD AWAY FROM CENTER OF WING. THIS DISTINGUISHES LEFT FROM RIGHT TIP STRUTS. CHECK THAT TIP STRUT TENSIONERS ARE IN THE COLLAPSED POSITION. REMOVE TIP STRUT ANCHOR BOLTS FROM TIP STRUT BRACKETS. INSERT REAR END OF TIP STRUT INTO FRONT OF TIP STRUT POCKET. SLIDE END OF TIP STRUT BACK THROUGH TIP STRUT BRACKETS AND CONTINUE TO SLIDE REARWARD UNTIL END PROTRUDES FROM BACK OF TIP STRUT POCKET. INSERT FRONT END OF TIP STRUT THROUGH HOLE LOCATED ON REAR SIDE OF FRONT SPAR TIP AS SHOWN.



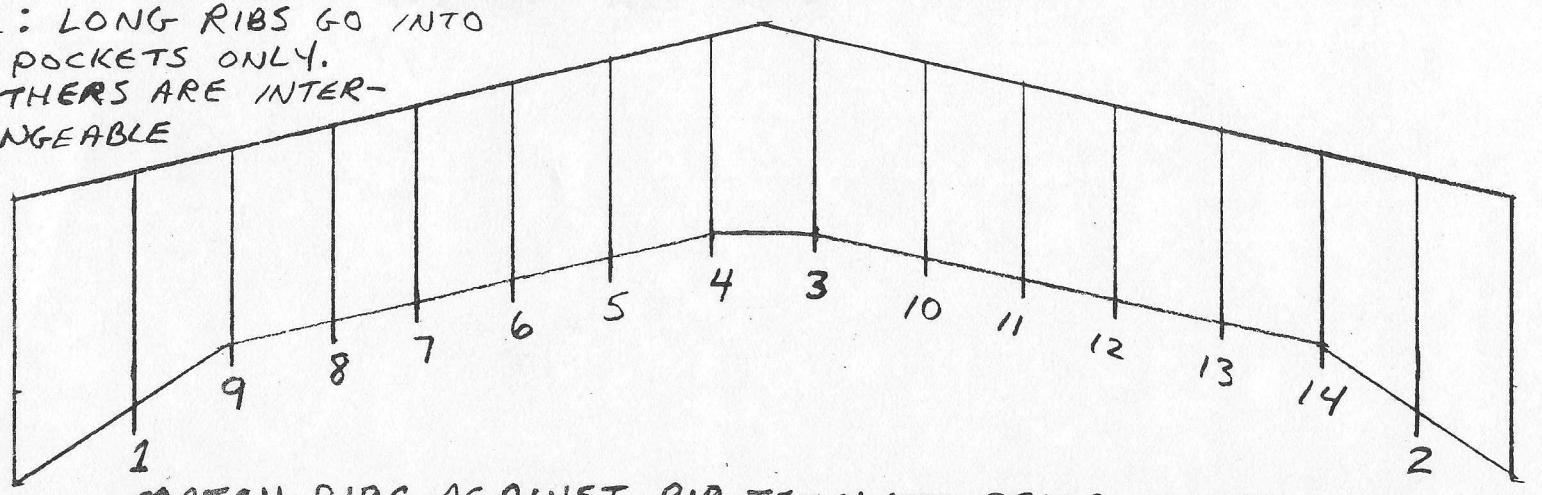
— ALWAYS SLIDE STRUT INTO POCKET FROM FRONT TO REAR ! —

USE A "HOT KNIFE" OR SOLDER GUN WITH CUTTING TIP TO CUT AND HEAT SEAL TWO PIECES OF 1/4" NYLON ROPE, EACH 12" LONG. TIE A SQUARE KNOT ABOUT ONE INCH FROM END OF EACH ROPE. SLIP FREE END OF ROPE THROUGH SAIL GROMMET LOCATED AT EACH WINGTIP. TIE ANOTHER KNOT ABOUT 1 1/4" FROM THE FIRST ONE. PULL ROPE REARWARD STRETCHING SAIL "TAUGHT" AND HOOK KNOT IN NOTCH IN END OF TIP STRUT. IF IT BECOMES TOO DIFFICULT TO HOOK KNOT IN NOTCH, LOOSEN KNOT A LITTLE TO GIVE ROPE A LITTLE MORE SLACK. BE SURE FRONT END OF TIP STRUT IS "SEATED" IN FRONT SPAR AND TIP STRUT TENSIONERS ARE COLLAPSED WHEN HOOKING OR ADJUSTING ROPE. RE-INSTALL TIP STRUT ANCHOR BOLT AND SECURE WITH A WING NUT AND SAFETY RING.



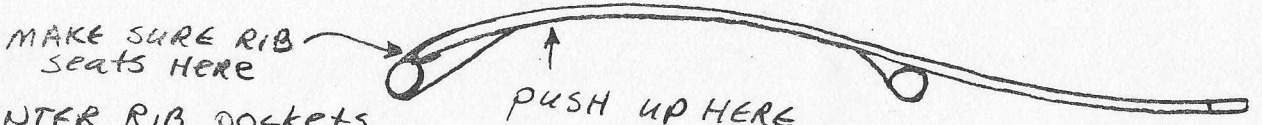
TRIM END OF ROPE TO LEAVE ABOUT 3 INCHES PROJECTING REARWARD FROM NOTCH AS SHOWN.

NOTE: LONG RIBS GO INTO END POCKETS ONLY. ALL OTHERS ARE INTER-CHANGEABLE



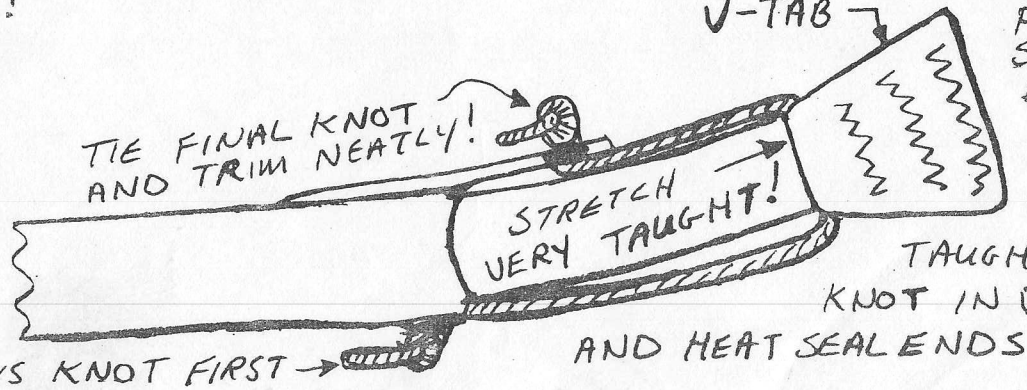
2.22 MATCH RIBS AGAINST RIB TEMPLATE PRIOR TO INSTALLING IN SAIL.

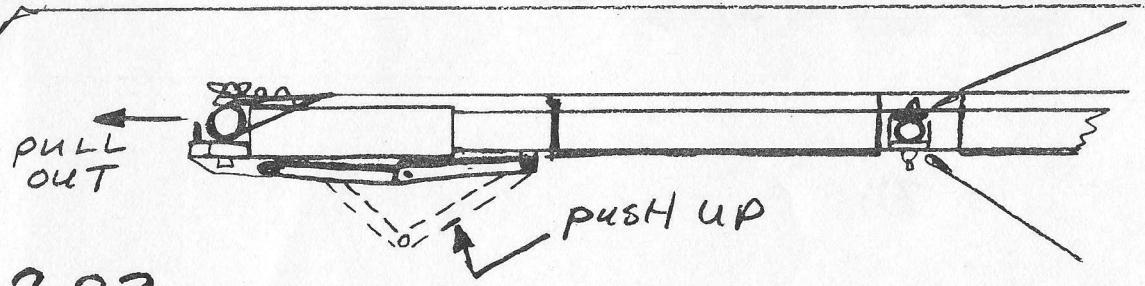
SLIDE RIBS INTO RIB POCKETS USING SEQUENCE SHOWN. BE SURE NOSE OF RIB SEATS AGAINST STOP IN FRONT END OF POCKET. WHILE SAIL IS STILL VERY NEW IT MAY BE NECESSARY TO PUSH UP RIB POCKET NEAR LEADING EDGE IN ORDER TO ALLOW RIB TO SLIDE FULLY FORWARD SMOOTHLY.



NOTE: CENTER RIB POCKETS DO NOT HAVE A STOP SEWN INTO SAIL. BE CAREFUL NOT TO PUSH THOSE TWO RIBS THROUGH FRONT OF SAIL!

TIE A SQUARE KNOT IN END OF 8 FOOT LONG, 3/16" DIA. BUNGEE CHORD. PASS BUNGEE THROUGH LOWER SAIL GROMMET. STRETCH BUNGEE THROUGH LEATHER V-TAB AND BACK OUT THROUGH UPPER GROMMET. STRETCH BUNGEE VERY TAUGHT BEFORE TYING SECOND KNOT IN BUNGEE AS SHOWN. CUT AND HEAT SEAL ENDS. REPEAT ON OTHER RIBS.



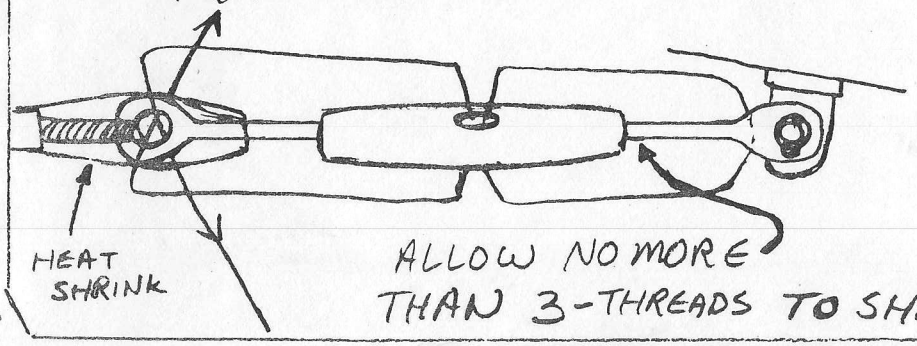


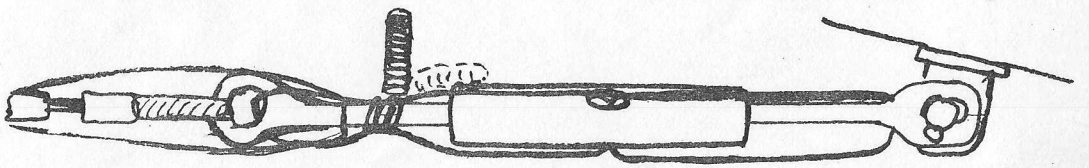
NOTE: LEAVE LEADING EDGE SPAR BOLTS A LITTLE LOOSE TO ALLOW SAIL MATERIAL TO MOVE.

2.23 CHECK TO BE SURE SAIL MATERIAL IS NOT PINCHED BEHIND COMPRESSION STRUT BRACKETS OR OTHERWISE CAUGHT ANYWHERE ON FRAME, BOLTS, ETC. PUT ONE HAND UNDER INBOARD TIP STRUT TENSIONER WHILE PULLING OUTWARD ON TIP STRUT AND SNAP TENSIONERS INTO THE EXTENDED POSITION. REPEAT ON OTHER WING.

ADJUST AND TIGHTEN TURNBUCKLES LOCATED ON DRAG WIRE ASSEMBLIES UNTIL ALL WRINKLES IN SAIL HAVE DISAPPEARED. GENERALLY, INBOARD DRAG WIRES WILL HAVE TO BE ADJUSTED VERY "TAUGHT" AND OUTBOARD ONES WILL HAVE A LITTLE LESS THAN HALF THE TENSION OF THE INBOARD ONES.

MAKE SURE THAT NONE OF THE THIMBLES HAVE BEEN TWISTED DURING ASSEMBLY AND ARE NOW PULLING OUT OF SHAPE. YOU CAN TUG ON THE DRAG WIRES WITH YOUR HAND WHILE ADJUSTING TO SEE WHEN TO STOP TIGHTENING TURNBUCKLES BECAUSE MAKING THEM TOO TIGHT WILL CAUSE NEW WRINKLES TO RE-APPEAR. WHEN DRAG WIRES HAVE BEEN PROPERLY ADJUSTED, CHECK SPARS TO SEE THAT THEY ARE REASONABLY STRAIGHT WITHIN THE DRAGWIRE PLAIN, AND LOCKWIRE TURNBUCKLES WITH .032" SAFETY WIRE AS SHOWN.





WRAP WIRE AROUND EYESTOCK SEVERAL TIMES AND THEN TWIST TIGHTLY 8-10 TURNS. SNIP END AND BEND OVER.

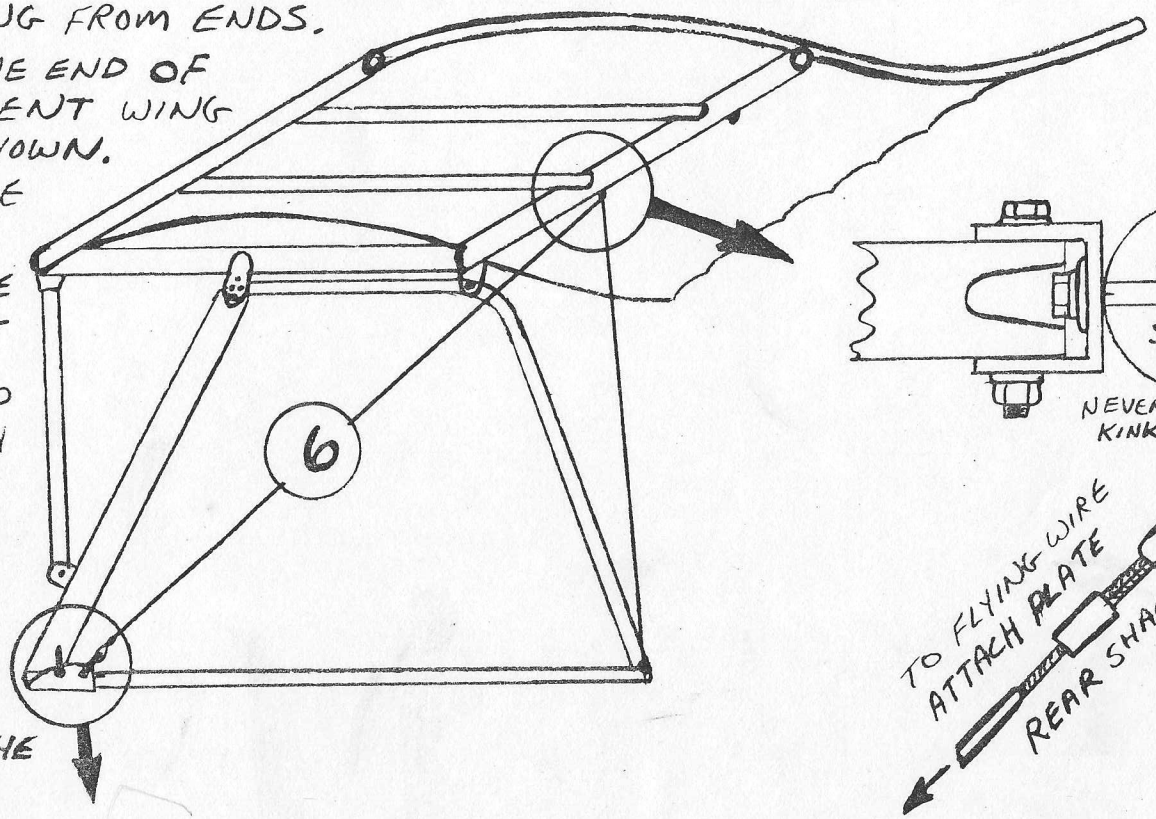
2.24 CUT TWO PIECES OF 3/32" CABLE - 130" LONG EACH. STRIP COATING FROM ENDS.

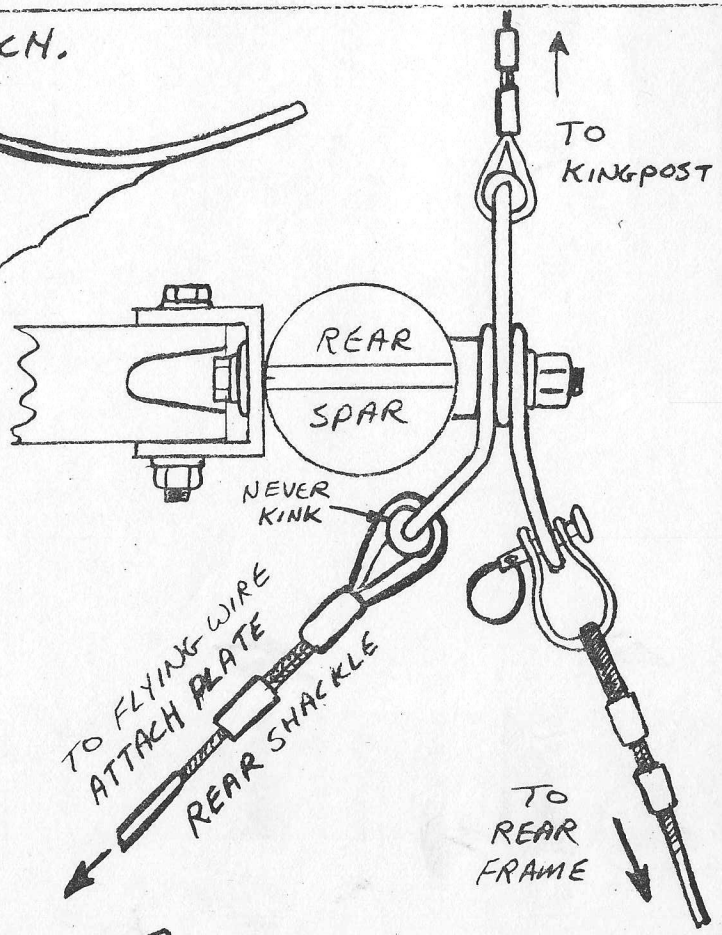
DOUBLE SWAGE ONE END OF EACH CABLE TO BENT WING SPAR TANGS AS SHOWN.

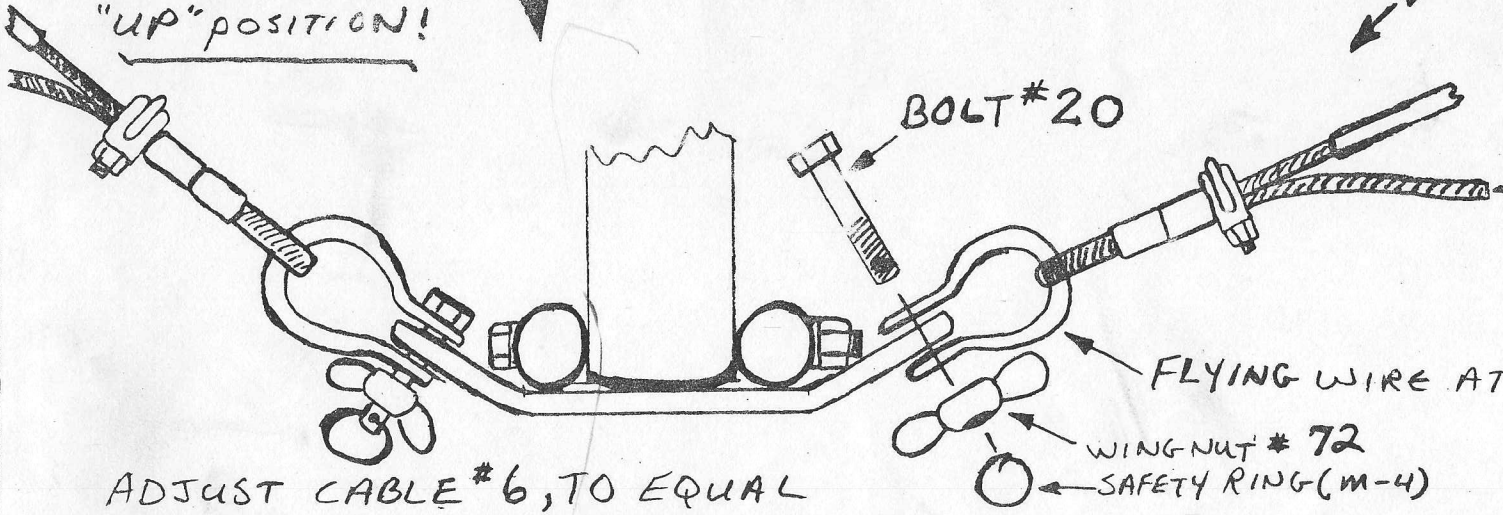
ATTACH FLYING WIRE SHACKLES TO REAR HOLE OF FLYING WIRE MOUNT PLATE USING PROPER BOLTS ETC. AS SHOWN. CLAMP CABLE #6 FROM BOTH WINGS TO FLYING WIRE SHACKLES.

USE A VISE-GRIP PLIER, ETC. TO PULL SLACK FROM CABLE.

BE SURE KINGPOST TENSIONER IS IN THE "UP" POSITION!







ADJUST CABLE #6, TO EQUAL LENGTHS ON BOTH SIDES.

TIGHTEN ONLY UNTIL SNUG, DO NOT MAKE "SUPER TAUGHT". WHEN SATISFIED BOTH CABLES ARE EQUAL LENGTH AND EQUAL TENSION, LOWER KINGPOST TENSIONER.

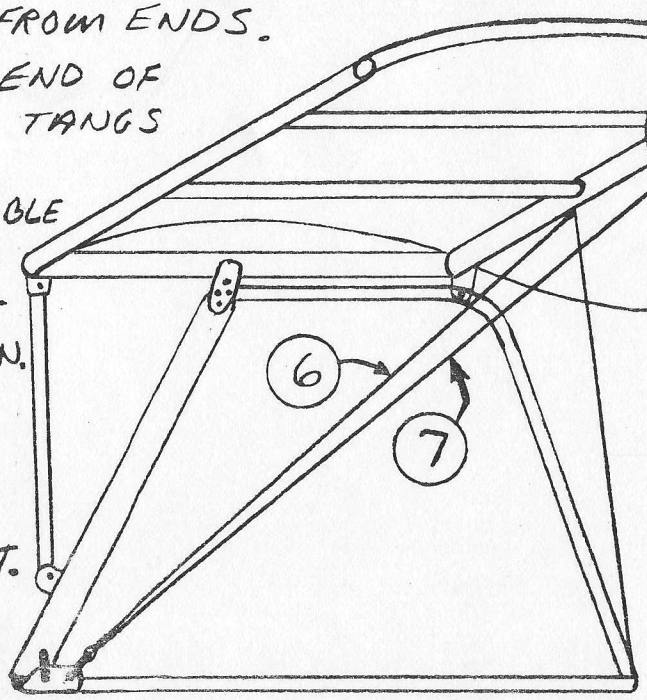
DIS-CONNECT SHACKLES AND PERMANENTLY SWAGE BOTH CABLES. RE-CONNECT SHACKLES.

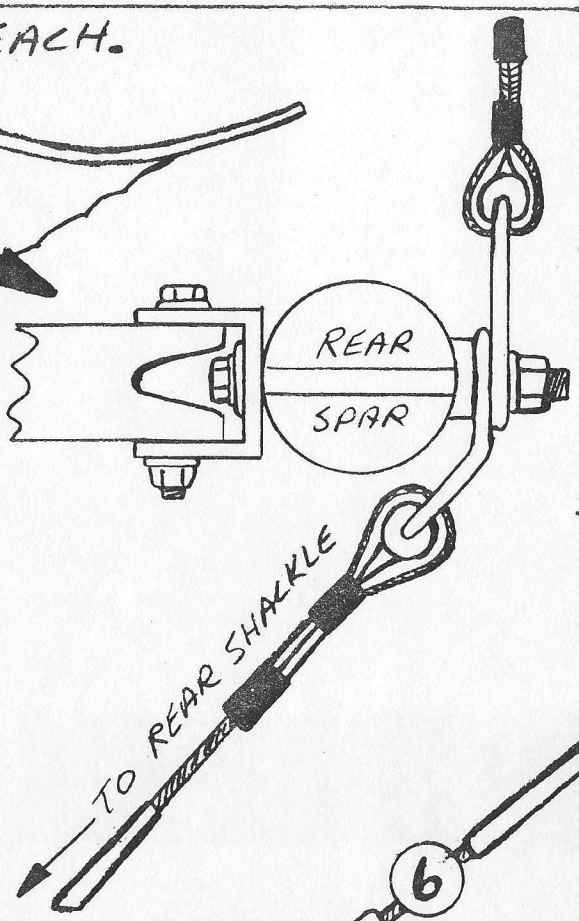
2.25 CUT TWO PIECES OF 3/32" CABLE – 200" LONG EACH. STRIP COATING FROM ENDS.

DOUBLE SWAGE ONE END OF EACH CABLE TO BENT TANGS AS IN STEP* **2.24**.

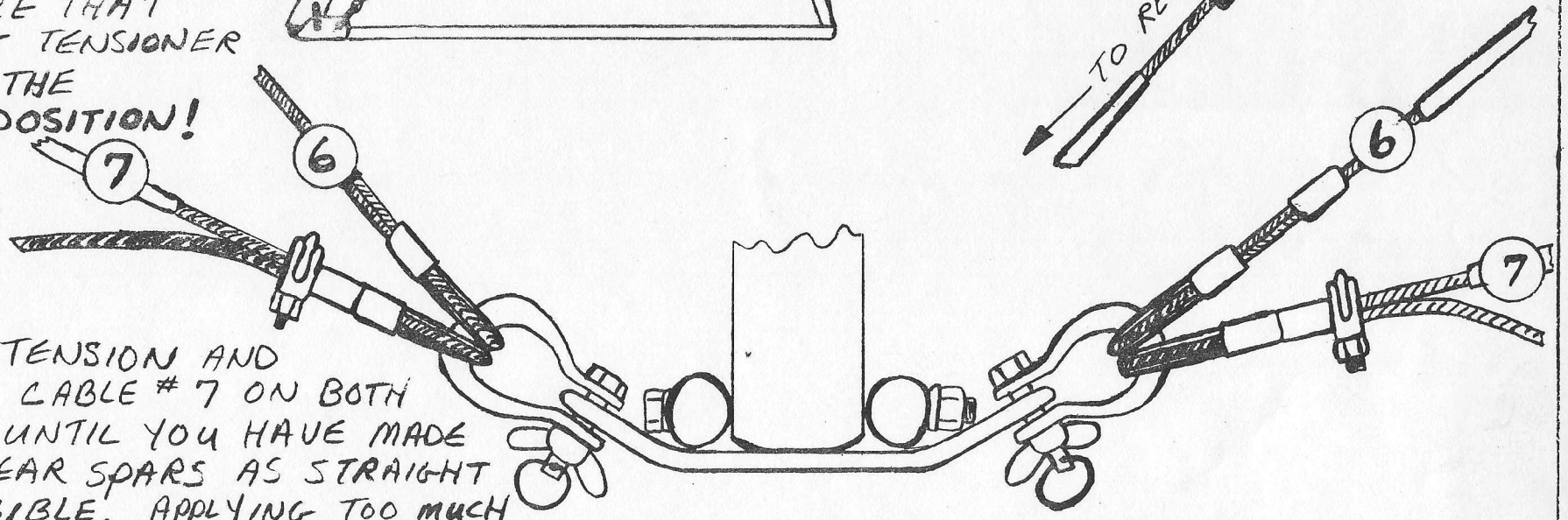
STRIP OTHER END OF CABLE NO*. 7 AND CLAMP TO REAR FLYING WIRE SHACKLES IN POSITION SHOWN.

PULL CABLE TAUGHT UNTIL YOU CAN SIGHT DOWN REAR SPAR AND SEE THAT IT IS STRAIGHT.



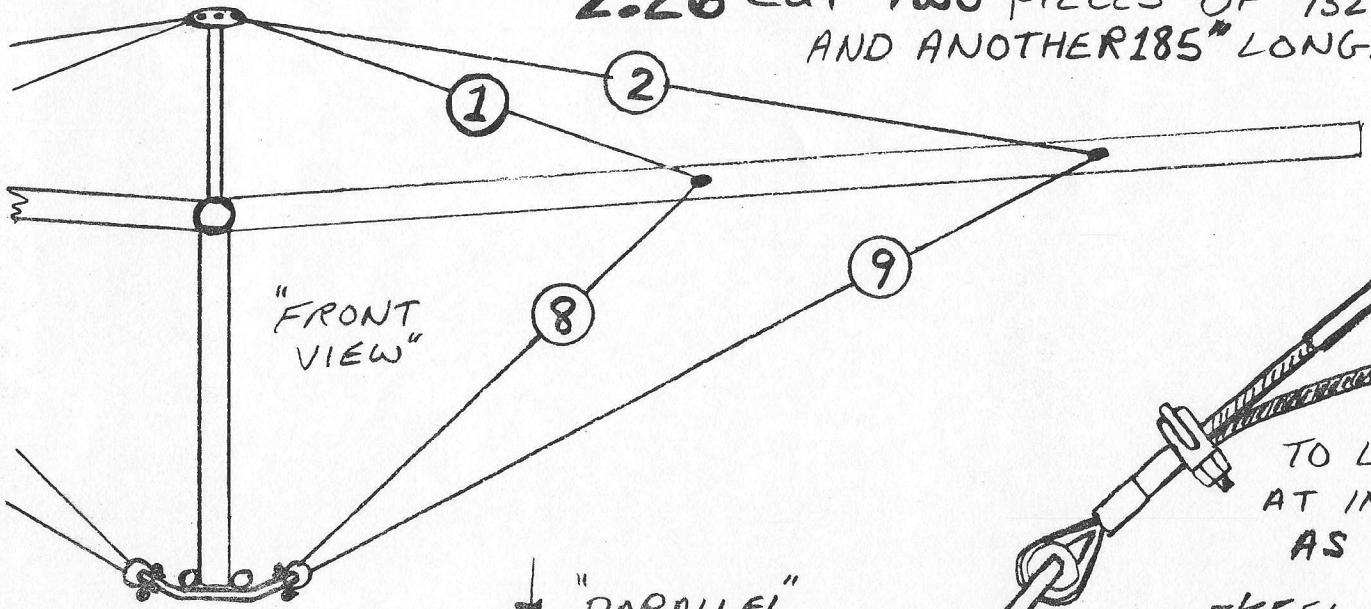


BE SURE THAT KINGPOST TENSIONER **IS IN THE "UP" POSITION!**

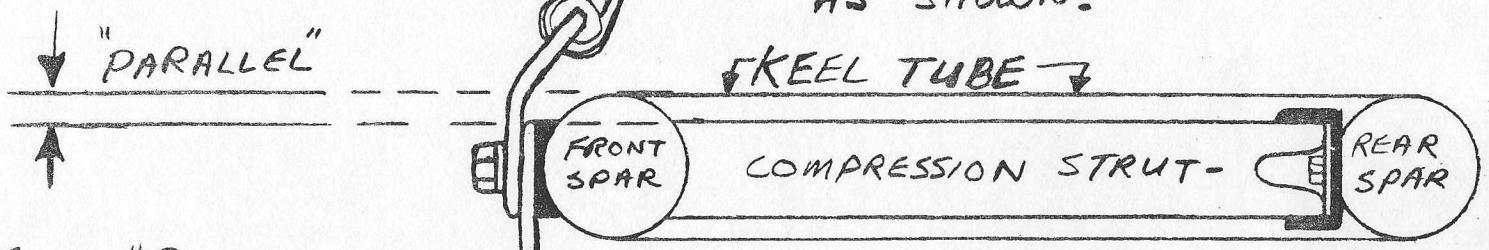


APPLY TENSION AND ADJUST CABLE # 7 ON BOTH WINGS UNTIL YOU HAVE MADE BOTH REAR SPARS AS STRAIGHT AS POSSIBLE. APPLYING TOO MUCH TENSION WILL CAUSE SPARS TO "BOW DOWN". WHEN YOU ARE SATISFIED THAT BOTH REAR SPARS ARE EQUALLY STRAIGHT AND BOTH CABLES #7 HAVE ABOUT EQUAL TENSION, LOWER KINGPOST TENSIONER, DIS-CONNECT SHACKLES AND PERMANENTLY SWAGE BOTH CABLES. RE-CONNECT SHACKLES AND RAISE KINGPOST TENSIONER.

2.26 CUT TWO PIECES OF 3/32" CABLE, ONE 115" LONG AND ANOTHER 185" LONG. STRIP ENDS OF CABLE AND DOUBLE SWAGE ONE END OF EACH CABLE TO FLYING WIRE SHACKLE (pt.# 44). BOLT SHACKLE TO FRONT HOLE OF FLYING WIRE ATTACH PLATE.



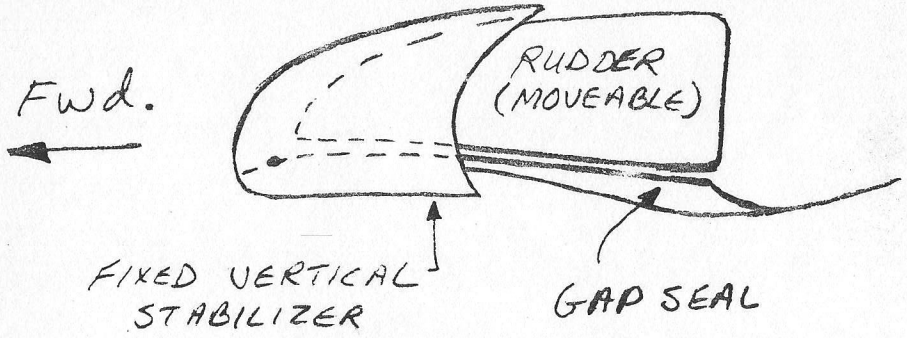
CLAMP CABLES #1 AND #8 TO LEADING EDGE SPAR TANGS AT INBOARD COMPRESSION STRUT AS SHOWN.



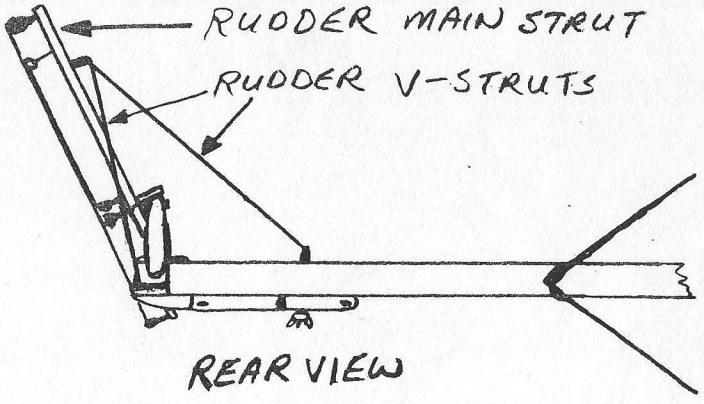
ADJUST CABLES #1 AND #8 UNTIL THEY ARE SNUG AND INBOARD COMPRESSION STRUT AND KEEL TUBE ARE ALIGNED "PARALLEL" TO EACH OTHER AS SHOWN. BE SURE KINGPOST TENSIONER IS IN THE "UP" POSITION WHEN ADJUSTING CABLES. ADJUST CABLES #2 AND #9 IN THE SAME MANNER AS #1 AND #8. WHEN BOTH INBOARD AND OUTBOARD COMPRESSION STRUTS ARE PROPERLY ALIGNED AND CLAMPED PARALLEL TO KEEL TUBE, LOWER KINGPOST TENSIONER AND PERMANENTLY SWAGE CABLES #1, #8, #2 AND #9. KEEP IN MIND THAT ALL THE COMPRESSION STRUTS AND KEEL TUBE SHOULD BE ALIGNED PARALLEL, UPPER AND LOWER CABLES SHOULD BE AT LEAST SNUG OR A LITTLE TAUGHT AND BOTH LEADING AND TRAILING EDGE SPARS SHOULD BE AS STRAIGHT AS IS POSSIBLE FOR WING GEOMETRY TO BE CORRECT! REPEAT PROCESS TO OTHER WING. AFTER ALL FLYING AND LANDING WIRES HAVE BEEN PROPERLY SWAGED ON BOTH WINGS, GO AROUND AND TIGHTEN UP EVERY NUT, BOLT AND COTTER PIN IN WING SECURELY UNTIL 3 OR MORE THREADS ON ALL BOLTS ARE SHOWING OR UNTIL NUTS ARE SECURELY TIGHTENED IN PLACE.

2.27 CONTROL INSTALLATION

THE WINGTIP CONTROL SURFACES CONSIST OF A STATIONARY END PLATE OR VERTICAL STABILIZER, AND A MOVEABLE RUDDER ASSEMBLY WHICH CONTROLS THE YAW AND ROLL OF THE MACHINE. EACH WINGTIP CONTROL ASSEMBLY IS SUPPORTED BY A TUBULAR MAIN STRUT WHICH THE RUDDER HINGES ON, AND LONG (INNER) AND SHORT (outer) V-STRUTS WHICH TRIANGULATE AND MAKE THE ASSEMBLY VERY RIGID. THE RUDDER MAIN STRUT AND STABILIZER FRAMES ATTACH TO THE WINGTIP STRUT ASS'Y AND THE V-STRUTS ATTACH TO THE REAR SPAR. EACH RUDDER IS INDEPENDENTLY OPERATED BY A CONTINUOS LOOP CABLE (1/16" DIA.) WHICH WRAPS AROUND THE STEERING HUB, PASSES THROUGH A PULLEY SYSTEM LOCATED ON THE WING AND UNDERCARRIAGE, AND TRAVELS OUT AND ATTACHES TO THE RUDDER AT TWO POINTS AFTER PASSING THROUGH A COUPLE OF GUIDES. SOUNDS COMPLICATED, HUH! AFTER CLOSER EXAMINATION AND STUDY, I THINK YOU'LL FIND THAT THE WHOLE SYSTEM IS REALLY FAIRLY SIMPLE.



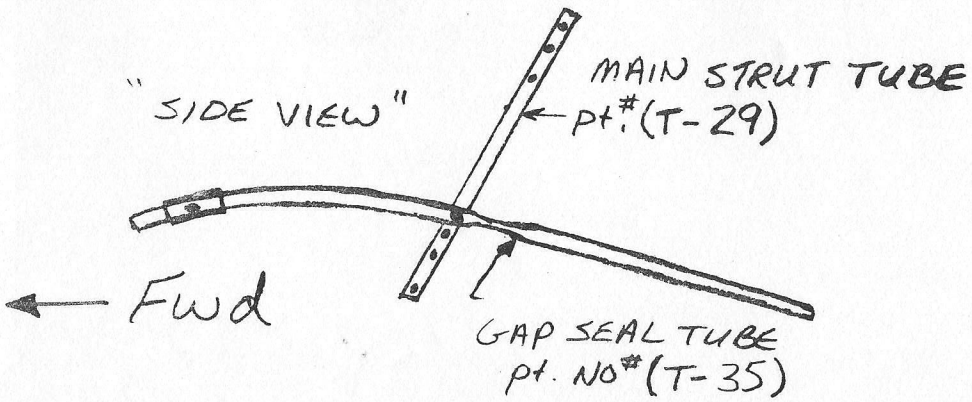
"SIDE VIEW"

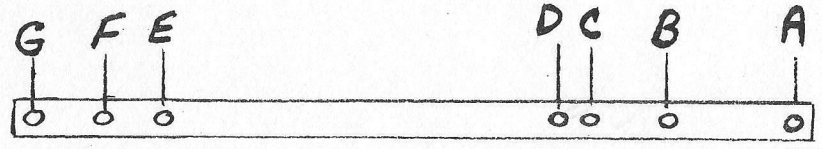


REAR VIEW

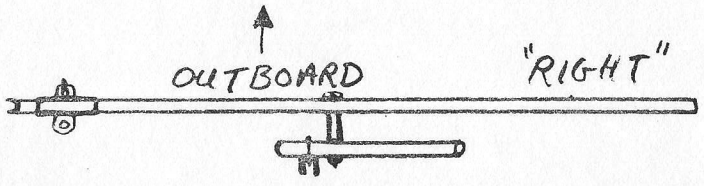
← OUTBOARD

2.28 BEGIN RUDDER ASSEMBLY BY MOUNTING HARDWARE IN MAIN STRUTS AND ATTACHING TO GAP SEAL TUBES AS SHOWN. ATTACH GAP SEAL TUBE TO HOLE "C" IN MAIN STRUT

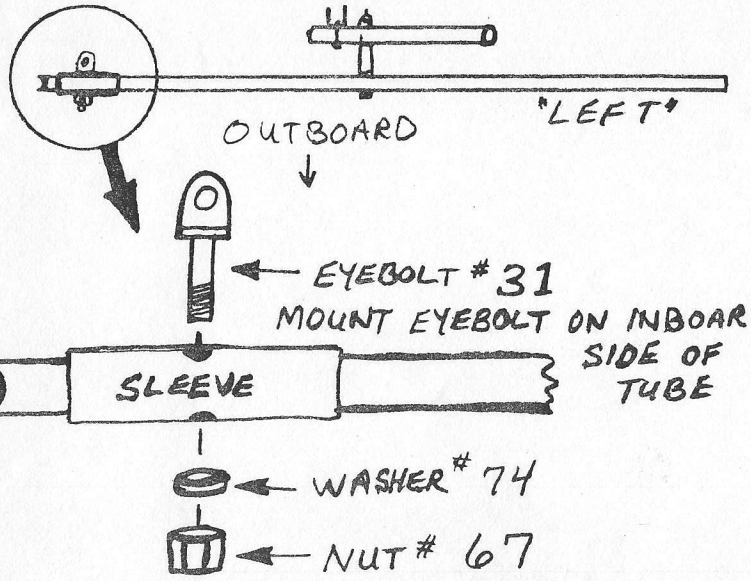


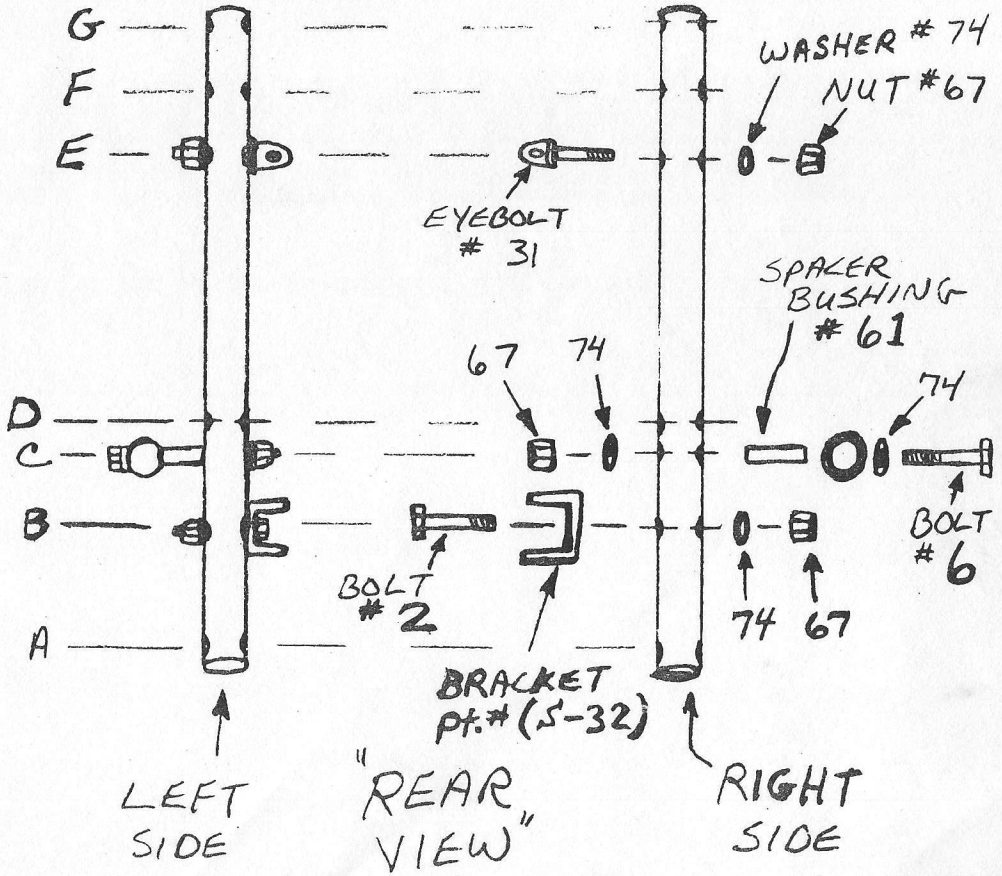


RUDDER MAIN STRUT TUBE HAS HOLES LOCATED AS SHOWN.



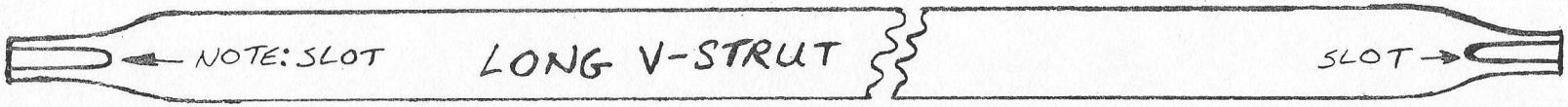
Fwd "TOP VIEW"



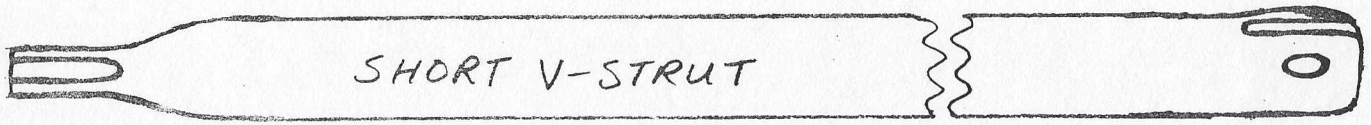


2.29 LOCATE V-STRUT TUBES. LONG V-STRUTS CAN BE USED ON EITHER THE LEFT OR RIGHT RUDDER ASSEMBLY AND ARE INTERCHANGEABLE. THE SHORT V-STRUTS ARE MADE TO FIT ON THE LEFT OR RIGHT RUDDER ASSEMBLY ONLY AND CANNOT BE INTERCHANGED.

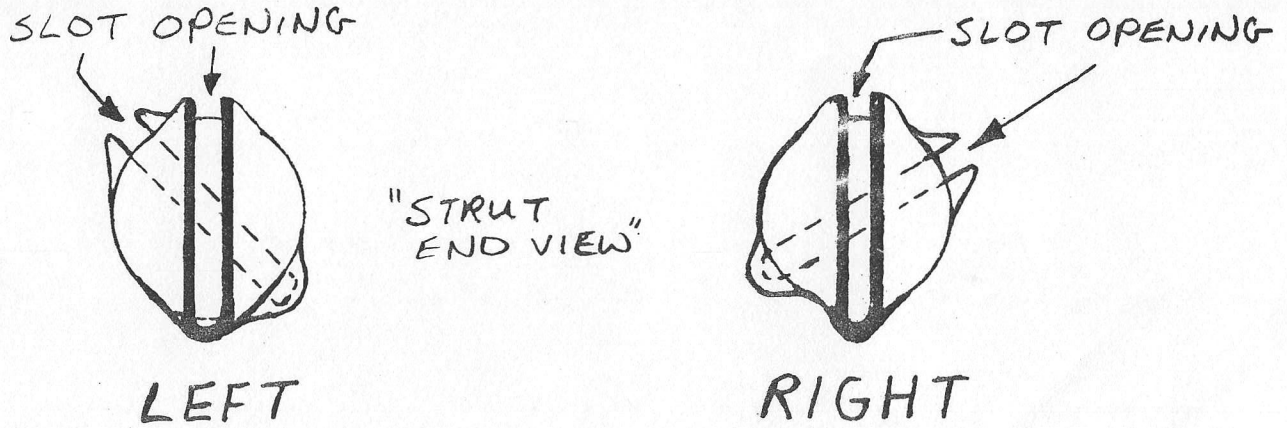
YOU WILL NOTICE THAT ON THE LONG V-STRUTS THE SLOTTED ENDS ARE FACING THE SAME DIRECTION.



ON THE SHORT V-STRUTS, THE ENDS ARE ALIGNED AT APPROXIMATELY A 45° ANGLE TO EACH OTHER

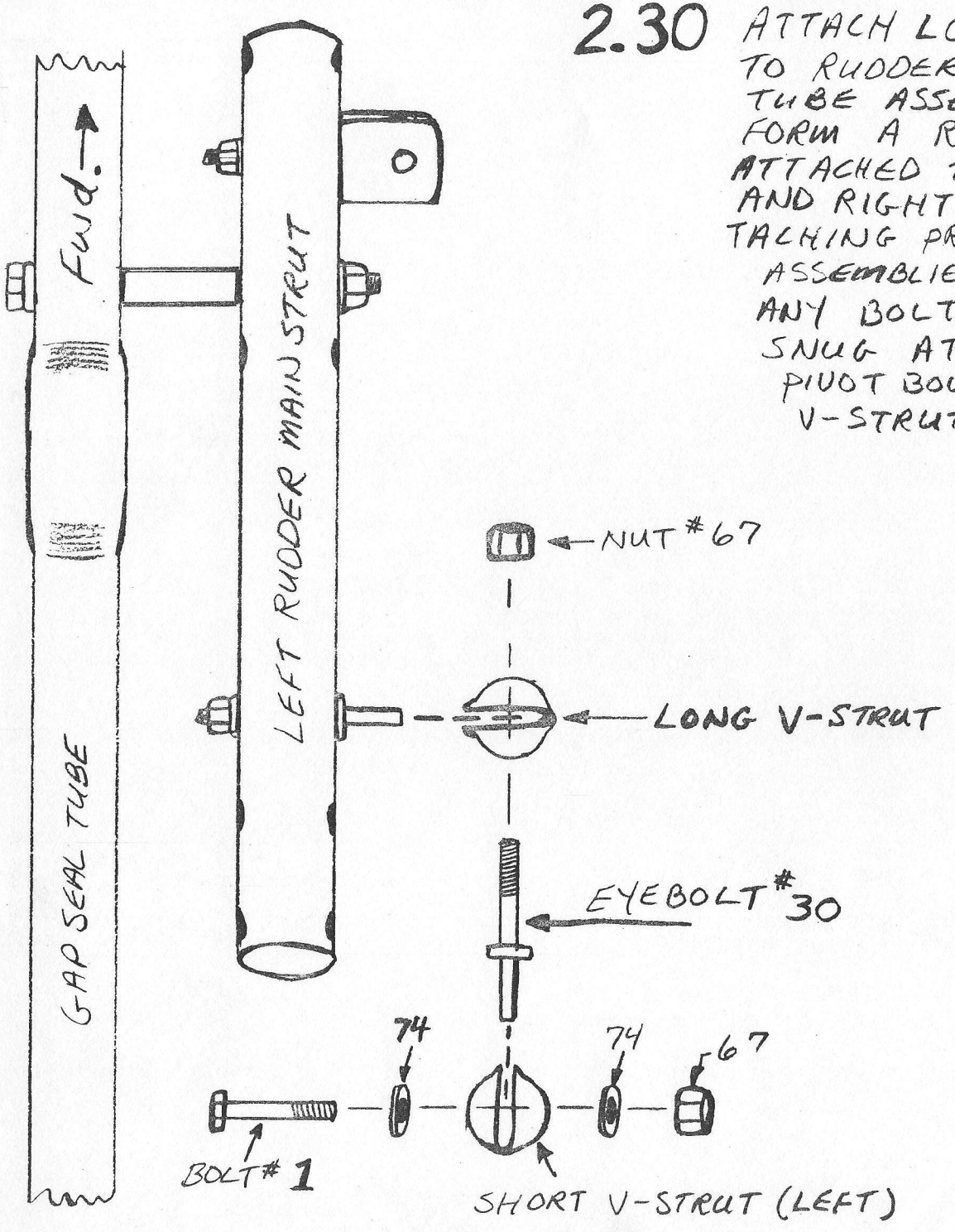


THE END VIEW BELOW WILL INDICATE WHETHER A SHORT STRUT MOUNTS TO THE LEFT OR RIGHT RUDDER ASSEMBLY.



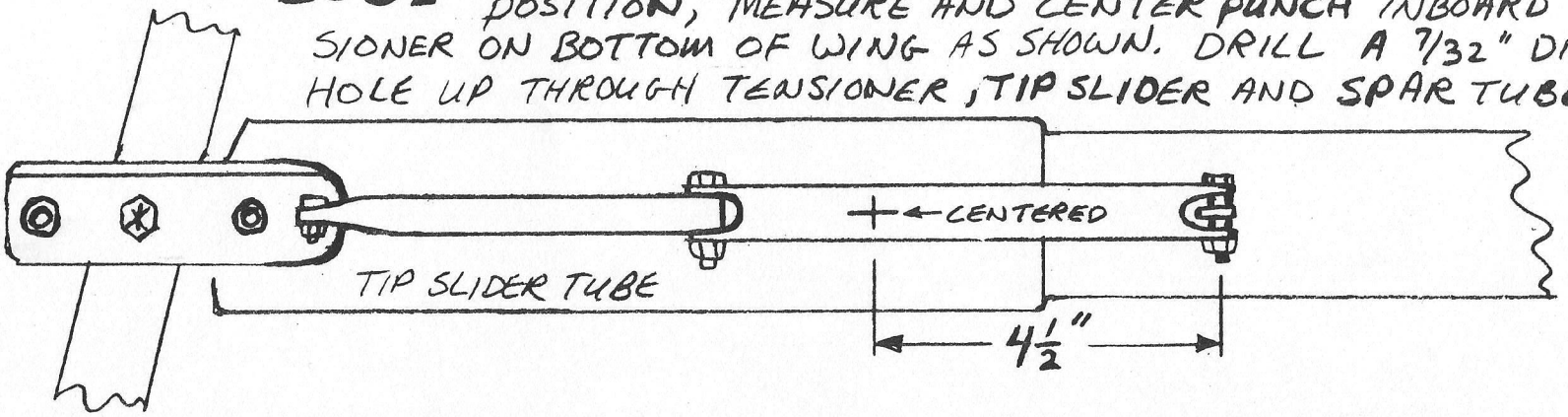
2.30

ATTACH LONG AND SHORT V-STRUTS TO RUDDER MAIN STRUT AND GAP SEAL TUBE ASSEMBLY AS SHOWN. THIS WILL FORM A RUDDER MOUNT PYLON WHEN ATTACHED TO THE WING. MAKE UP LEFT AND RIGHT PYLON ASSEMBLIES BY ATTACHING PROPER V-STRUTS TO MAIN STRUT ASSEMBLIES. DO NOT TIGHTEN DOWN ANY BOLTS OR NUTS MORE THAN SNUG AT THIS POINT. LEAVE V-STRUT PIVOT BOLTS LOOSE ENOUGH TO ALLOW V-STRUTS TO ROTATE FOR ALIGNMENT.

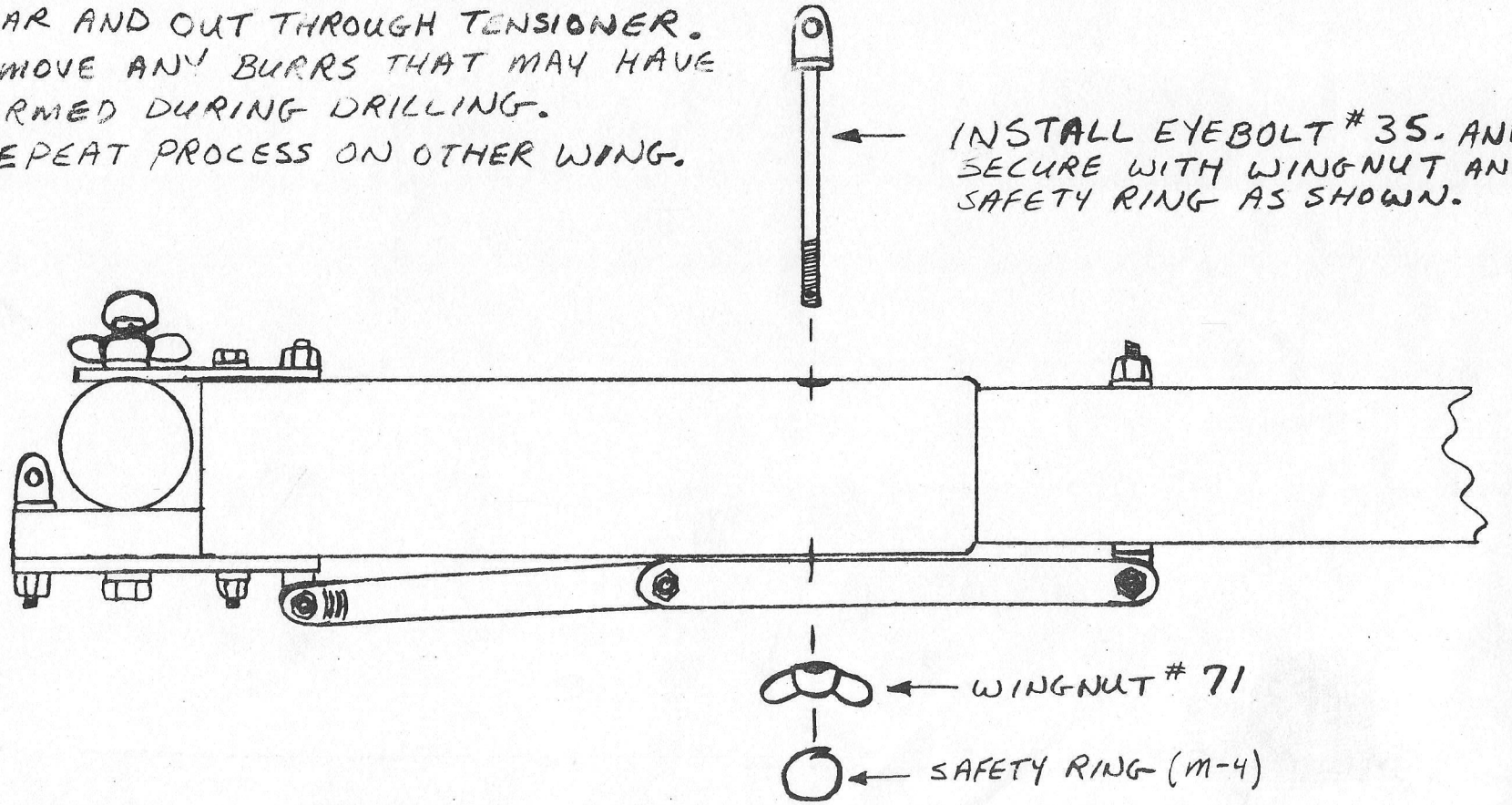


"TOP VIEW"
LEFT SIDE
MAIN STRUT/PYLON
ASSEMBLY

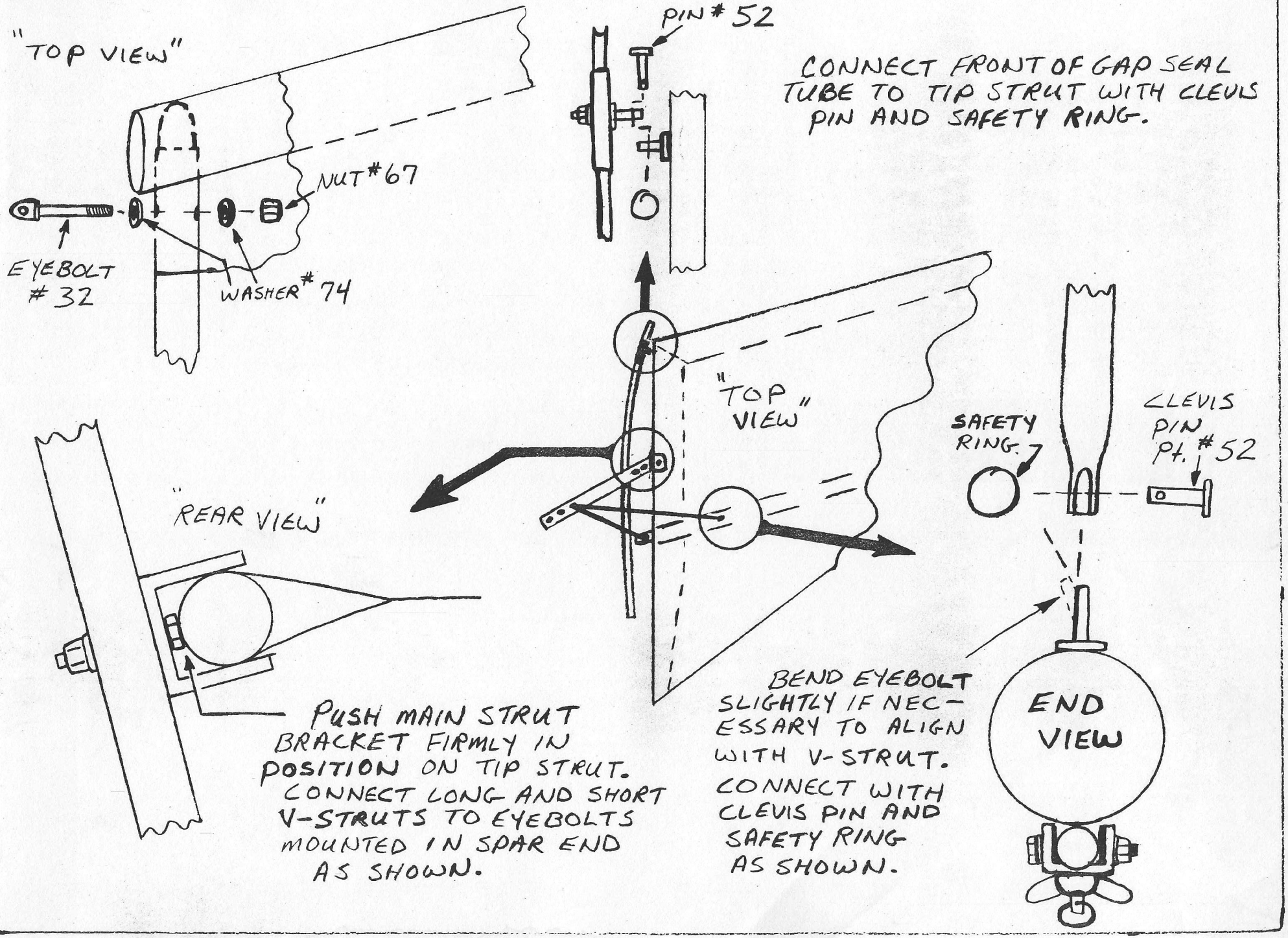
2.31 WITH TIP STRUT TENSIONERS IN THE EXTENDED POSITION, MEASURE AND CENTER PUNCH INBOARD TENSIONER ON BOTTOM OF WING AS SHOWN. DRILL A 7/32" DIA. HOLE UP THROUGH TENSIONER, TIP SLIDER AND SPAR TUBE.



PRESS DOWN ON TOP OF SAIL AND LOCATE POSITION OF PRE-DRILLED HOLE IN TOP OF TIP SLIDER TUBE. DRILL A 7/32" HOLE DOWN THROUGH SPAR AND OUT THROUGH TENSIONER. REMOVE ANY BURRS THAT MAY HAVE FORMED DURING DRILLING. REPEAT PROCESS ON OTHER WING.

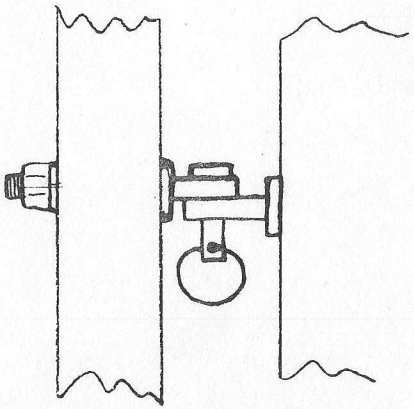


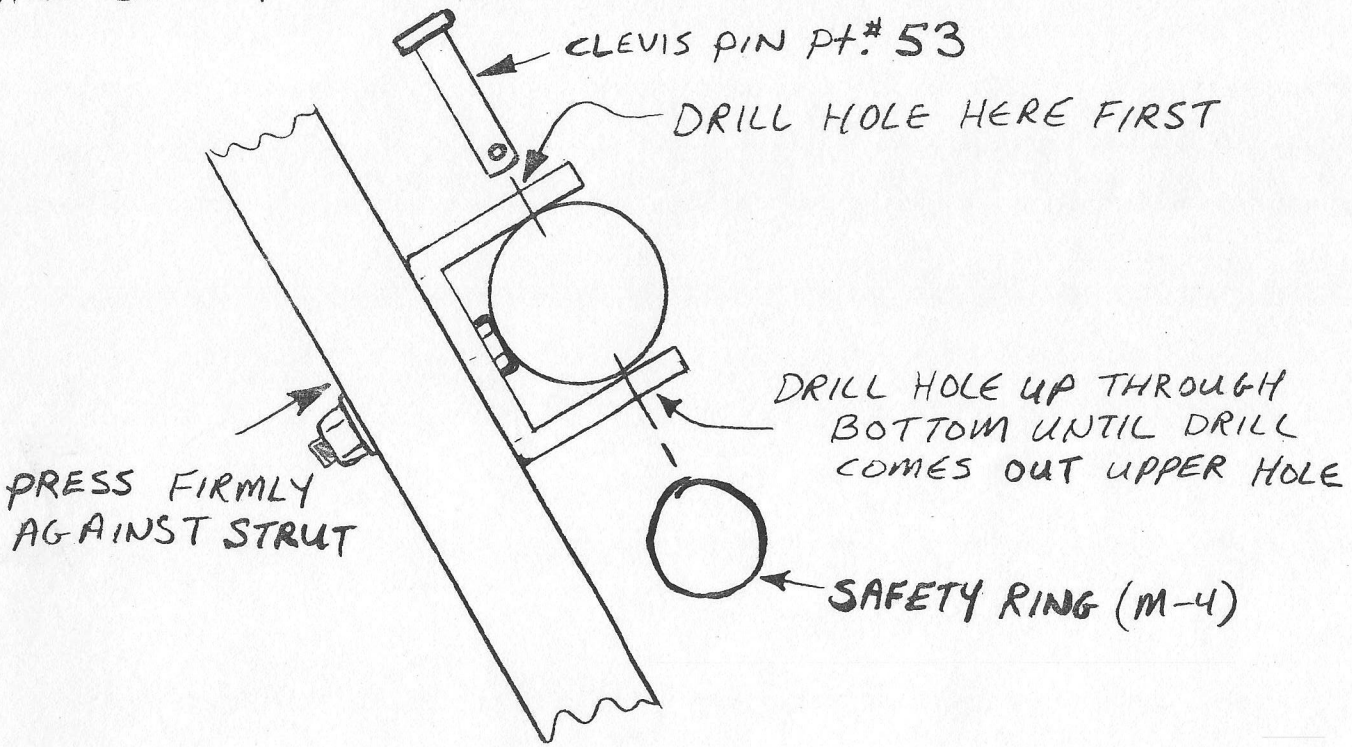
2.32 MOUNT EYEBOLT IN FRONT END OF EACH TIP STRUT AS SHOWN.



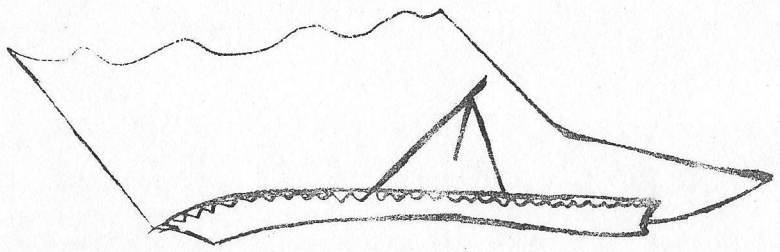
2.33 _ MAKE SURE THAT EYEBOLTS WHICH MOUNT FRONT END OF GAP SEAL TUBE TO TIP STRUT ARE POSITIONED SO THAT THERE IS NO SLACK BETWEEN THEM AS SHOWN.

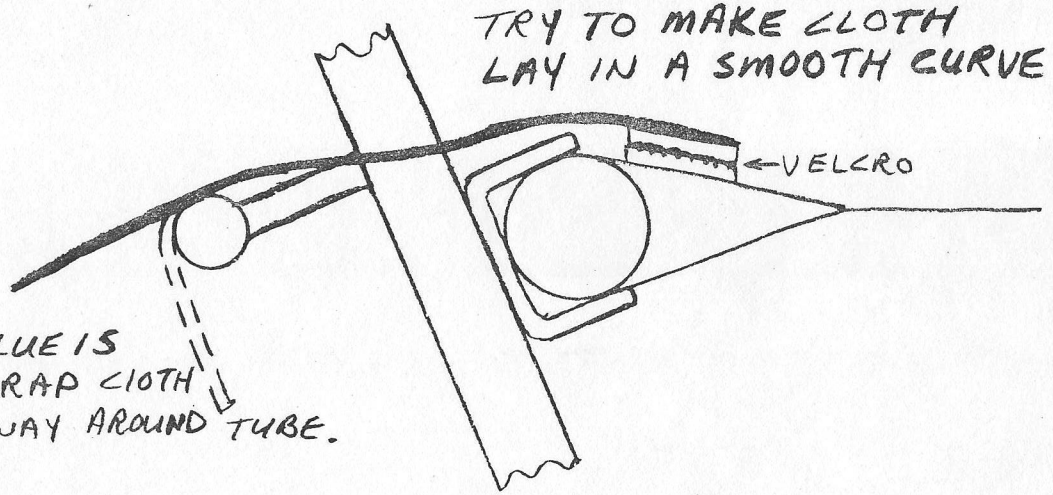
CHECK TO BE SURE RUDDER MAIN STRUT BRACKET IS FIRMLY POSITIONED ON TIP STRUT AND BOTH V-STRUTS ARE PROPERLY CONNECTED. DRILL A 3/16" DIA. HOLE DOWN THROUGH MAIN STRUT BRACKET AND TOP OF TIP STRUT TUBE. PLACE A 3/16" DIA. PIN OR BOLT IN HOLE TO HOLD BRACKET IN POSITION. DRILL 3/16" DIA. HOLE UPWARD THROUGH BRACKET AND TIP STRUT TUBE. REMOVE PIN OR BOLT AND PASS DRILL OUT THROUGH TOP OF BRACKET. SECURE BRACKET IN POSITION WITH CLEVIS PIN AND SAFETY RING AS SHOWN.



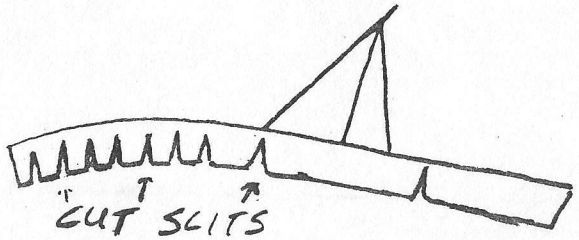


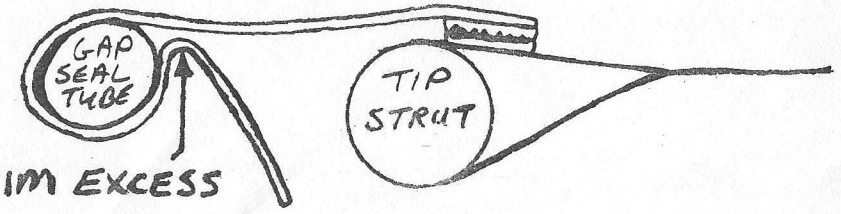
2.34 USE A CHEAP THROW-AWAY BRUSH TO APPLY A THOROUGH COATING OF WELDWOOD CONTACT CEMENT (OR OTHER NON-WATERBASE BRAND) TO GAP SEAL TUBE. APPLY GLUE COMPLETELY (360°) AROUND TUBE. WHILE GLUE IS STILL WET, CAREFULLY PLACE IN POSITION FABRIC GAP SEAL PIECE BY CONNECTING VELCRO STRIPS. GLUE WILL LEAVE A LINE ON FABRIC WHERE IT CONTACTED GAP SEAL TUBE. REMOVE GAP SEAL AND APPLY A THOROUGH COATING OF CONTACT CEMENT ONE INCH INBOARD FROM GLUE LINE AND ALL THE WAY OUT TO THE EDGE OF THE FABRIC OPPOSITE THE VELCRO PIECE. WHEN GLUE HAS BECOME "TACKY" CAREFULLY PLACE GAP SEAL IN POSITION AS BEFORE. SUPPORT FREE END OF GAP SEAL TUBE WITH ONE HAND AS YOU PRESS DOWN AND WRAP GAP SEAL ABOUT A QUARTER OF THE WAY AROUND OUTSIDE OF TUBE WITH YOUR OTHER HAND.



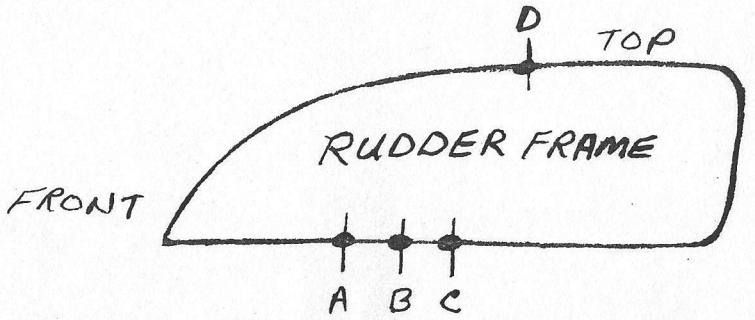


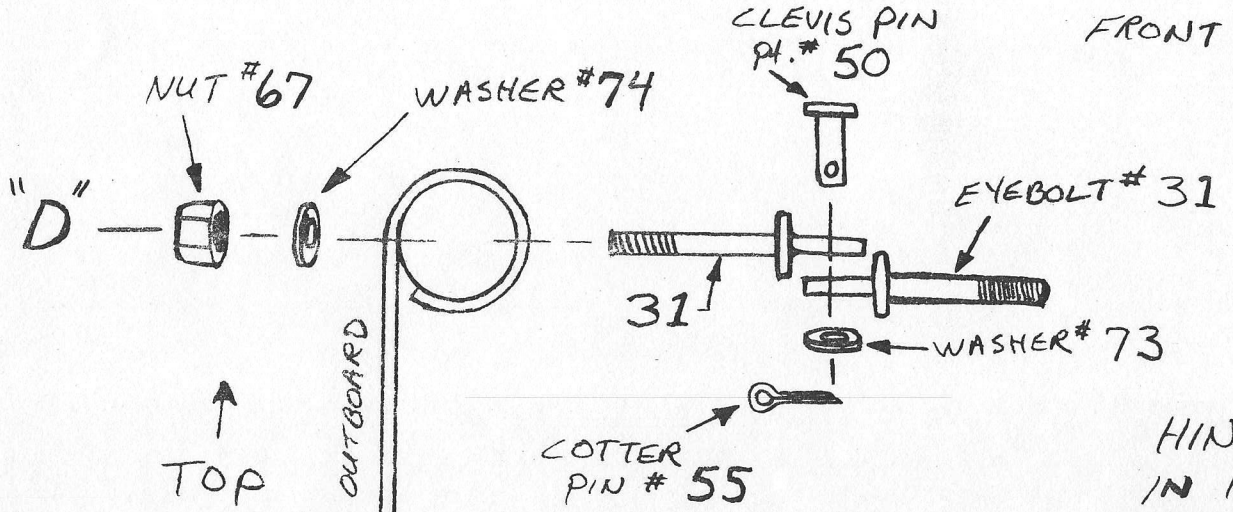
USE SCISSORS OR A HOT KNIFE TO CUT SLITS IN FABRIC ABOUT EVERY TWO INCHES WHERE TUBE CURVES OR WHERE CLOTH MUST WRAP AROUND A BOLT ETC. APPLY A SECOND COATING OF GLUE TO CLOTH AND TUBE. WHEN GLUE DRIES FINISH WRAPPING FABRIC AROUND TUBE AND TRIM EXCESS.



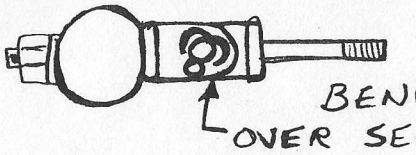


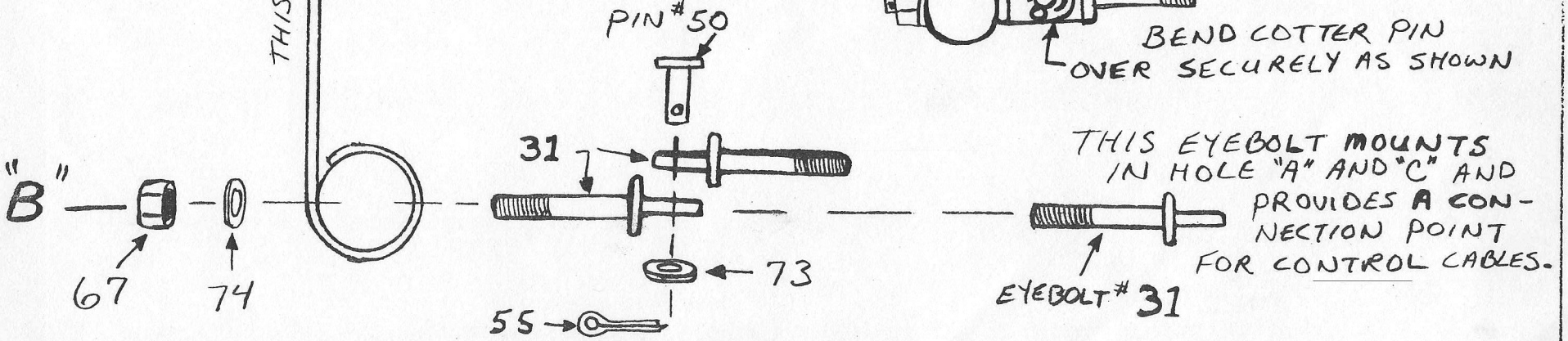
2.35 MOUNT EYEBOLTS IN RUDDER FRAME FORMING RUDDER HINGES AND CONTROL CABLE CONNECTION POINTS AS SHOWN.



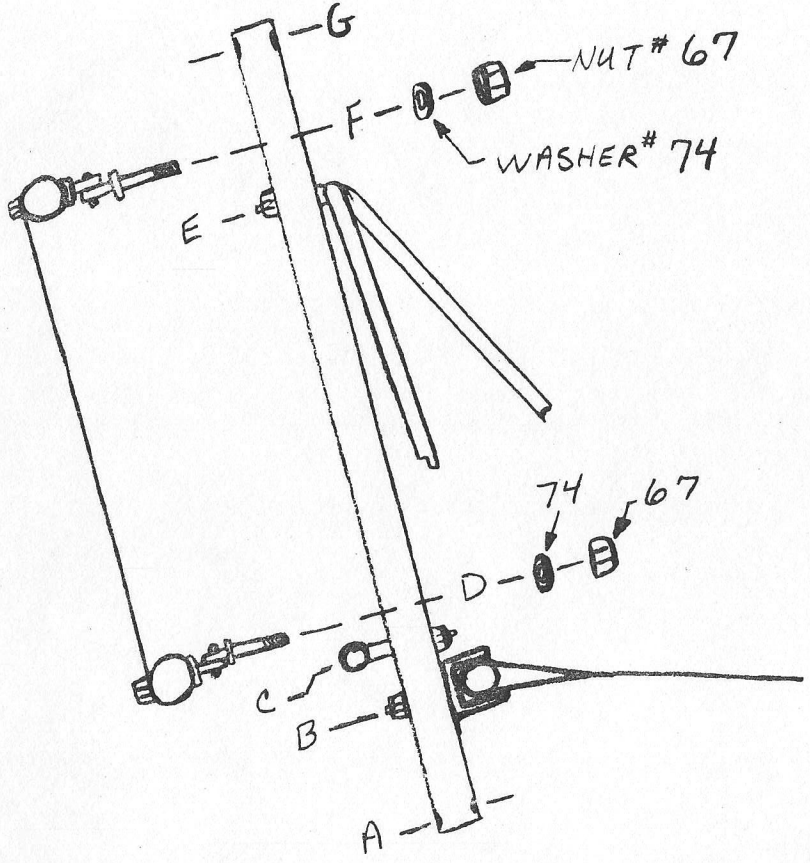


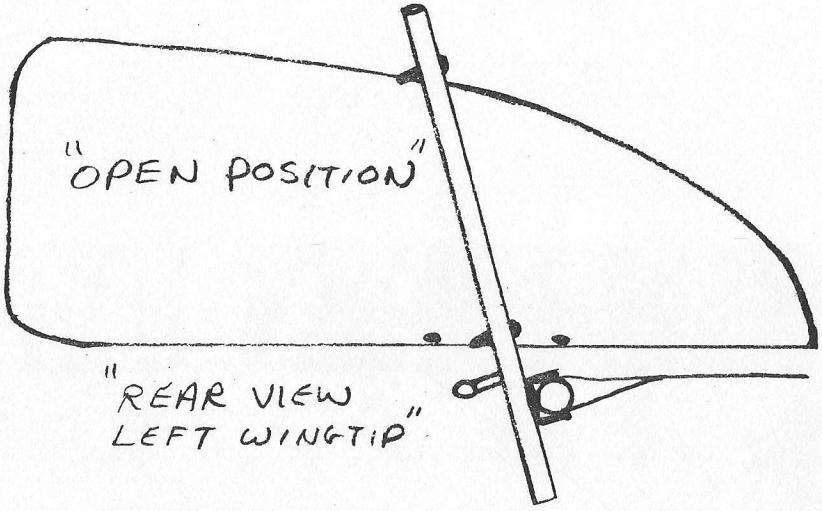
HINGE POINT EYEBOLTS MOUNT IN HOLES "B" AND "D" ONLY. NOTE: STAGGERED ARRANGEMENT. HINGE PINS ALWAYS GO IN FROM TOP TO BOTTOM (FACE DOWNWARD).





2.36 ATTACH RUDDER TO MAIN SUPPORT PYLON AS SHOWN. IT MAY BE EASIER TO ATTACH IF YOU ROTATE EYEBOLT HINGES 180°, MOUNT RUDDER AND THEN ROTATE BOLTS BACK TO ORIGINAL POSITION IN ORDER TO TIGHTEN SKIN.

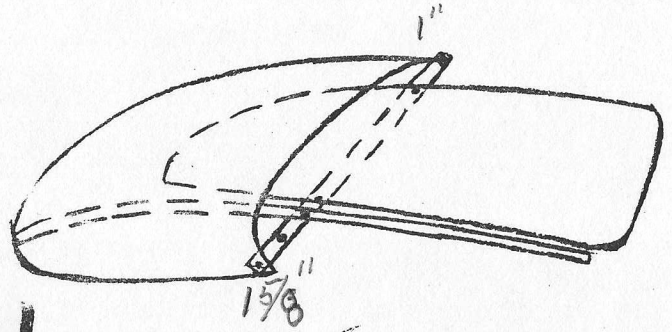


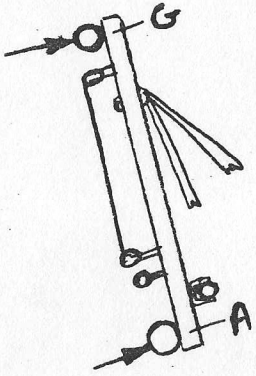


SWING RUDDER INTO THE FULL OPEN POSITION. BE SURE EYEBOLTS ARE IN THE STAGGERED POSITION AS SHOWN IN ASSEMBLY STEP # **2.35**. ALSO MAKE SURE THAT HINGE PINS ARE FACING DOWNWARD AND COTTER PINS HAVE BEEN BENT OVER SECURELY. TIGHTEN ALL RUDDER MOUNT NUTS (67) ON ALL EYEBOLTS SECURELY! SWING RUDDER OPEN AND CLOSED A FEW TIMES TO CHECK FOR PROPER (NON-BINDING) OPERATION. A LITTLE W.D. 40 ON HINGES WILL KEEP RUDDER OPERATION SMOOTH.

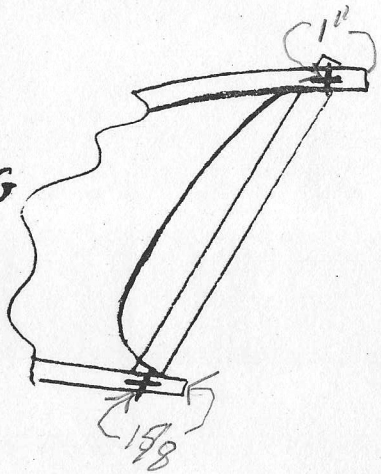
2.37

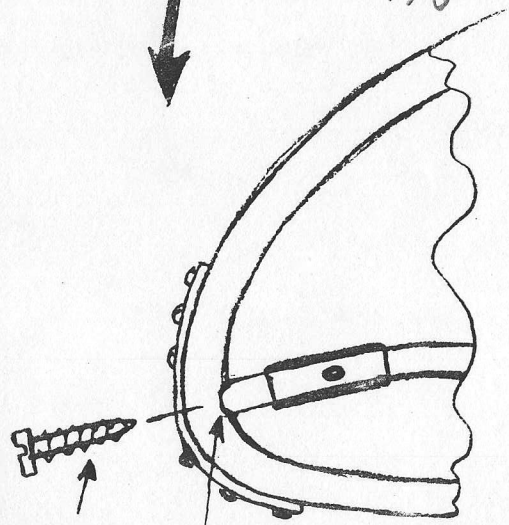
PLACE VERTICAL STABILIZER (END PLATE) IN POSITION AS SHOWN. ATTACH FRONT OF FRAME TO GAP SEAL TUBE WITH SCREW #91 TIGHTEN SCREW JUST ENOUGH TO HOLD FRAME IN POSITION TO BE MARKED FOR **DRILLING.** HOLD FRAME AGAINST MAIN STRUT TUBE AND ALIGN WITH HOLES "A" AND "G". MARK STABILIZER FRAME FOR DRILLING AT THOSE POINTS USING A PENCIL. REMOVE FRAME AND LAY ON A FLAT SURFACE. CENTER PUNCH AND DRILL 3/16" DIA. HOLES IN STABILIZER FRAME. BOLT STABILIZER TO MAIN STRUT.





MARK FOR **DRILLING**

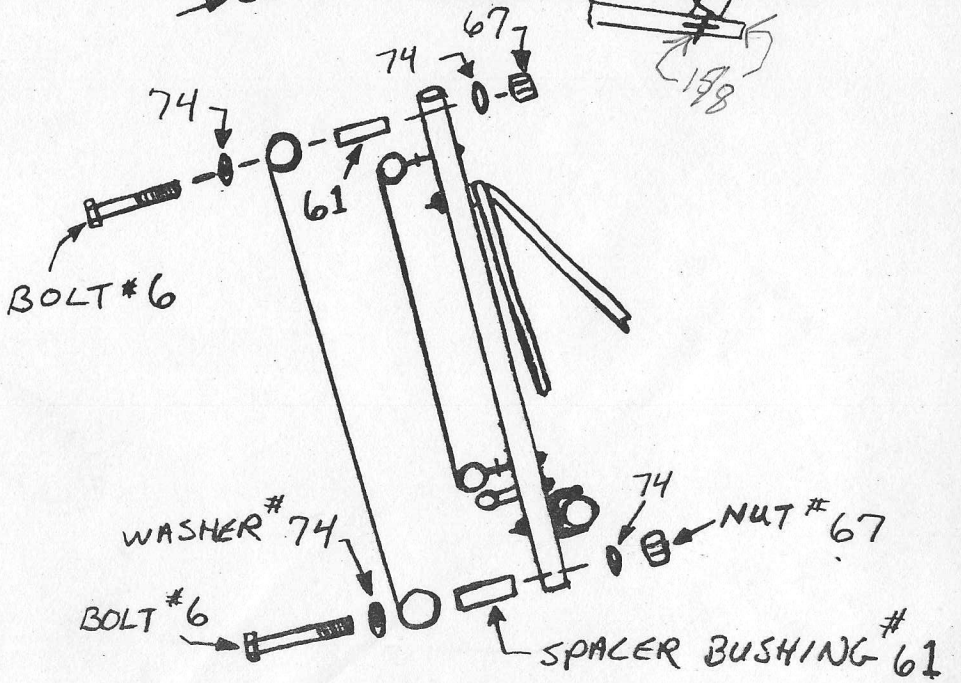




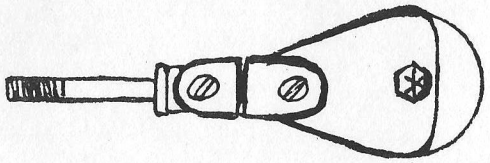
TEMPORARILY SECURE FRONT END OF FRAME

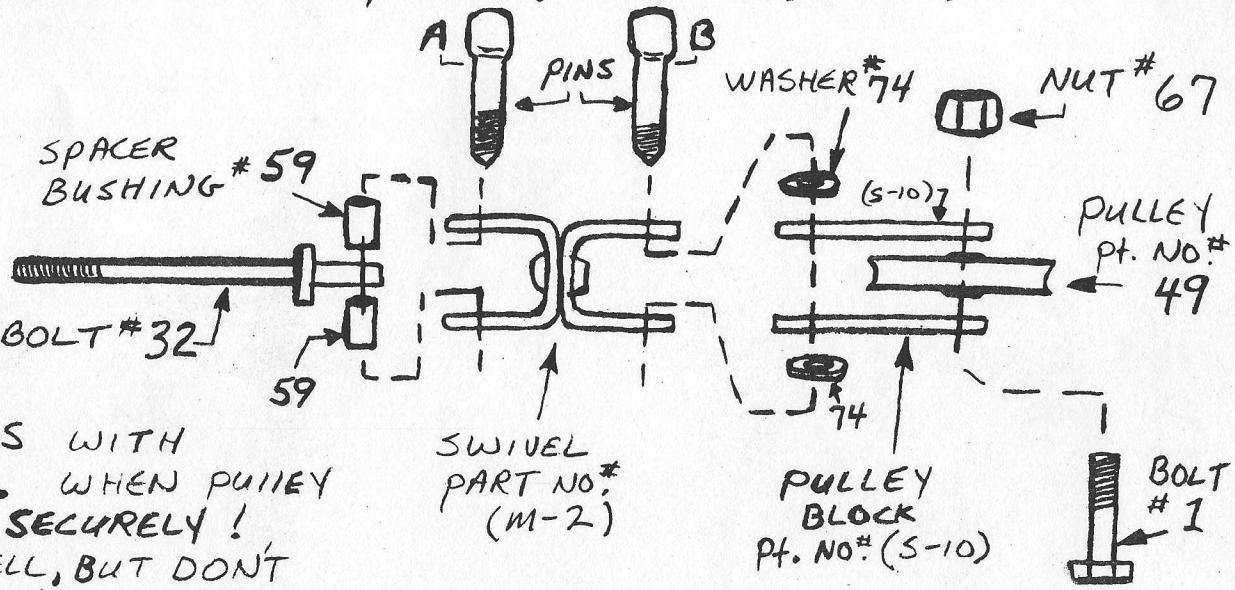
SCREW Pt. # 91

BE SURE FRAME is pulled UP SNUG AGAINST GAP SEAL TUBE END.



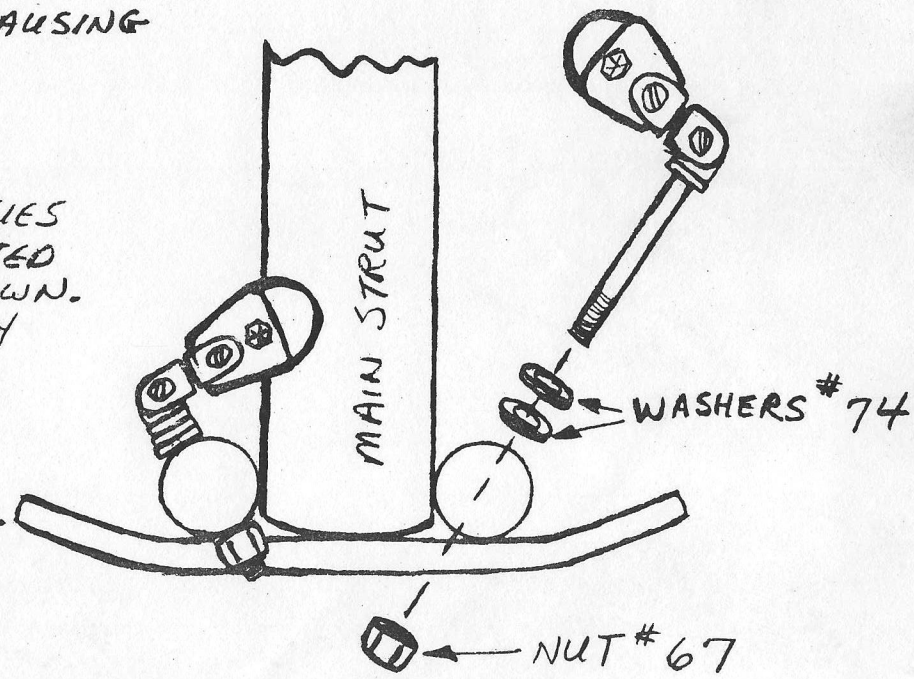
2.38 ASSEMBLE FOUR CONTROL CABLE PULLEYS AS SHOWN.





MAKE TWO PULLEY ASSEMBLIES WITH EYEBOLT #32, TWO WITHOUT. WHEN PULLEY IS ASSEMBLED TIGHTEN BOLT #1 SECURELY! TIGHTEN PINS SECURELY AS WELL, BUT DON'T TIGHTEN PIN "B" SO MUCH THAT IT PINCHES SIDES OF SWIVEL AND PULLEY BLOCKS AGAINST PULLEY WHEEL, KEEPING IT FROM TURNING OR CAUSING IT TO RUB. LEAVE ABOUT .001" CLEARANCE BETWEEN PULLEY WHEEL AND PULLEY BLOCKS.

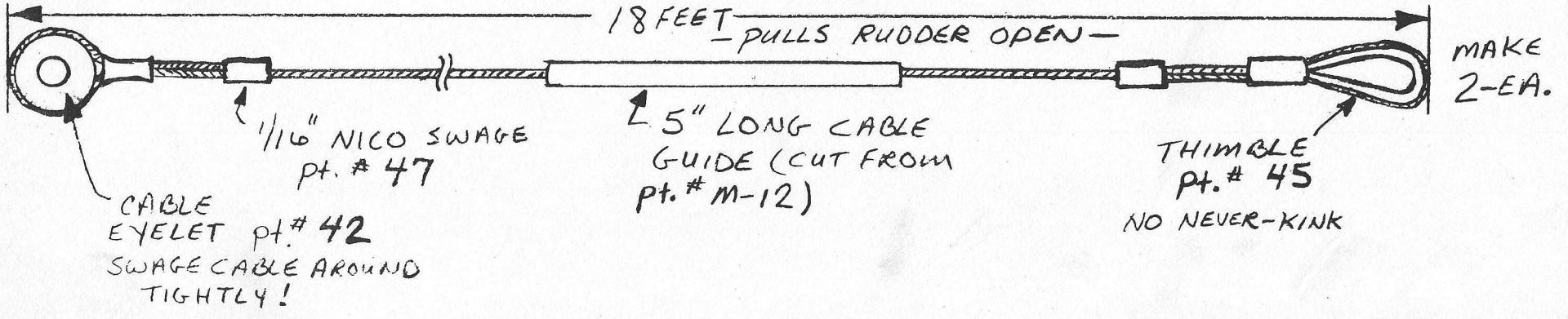
MOUNT TWO OF THE FOUR PULLEY ASSEMBLIES (THE ONES WITH THE EYEBOLTS) IN HOLES LOCATED AT FRONT OF LOWER FRAME TUBES AS SHOWN. LEAVE NUT #67 LOOSE ENOUGH TO ALLOW PULLEY ASSEMBLIES TO BE ROTATED FOR LATER ALIGNMENT.

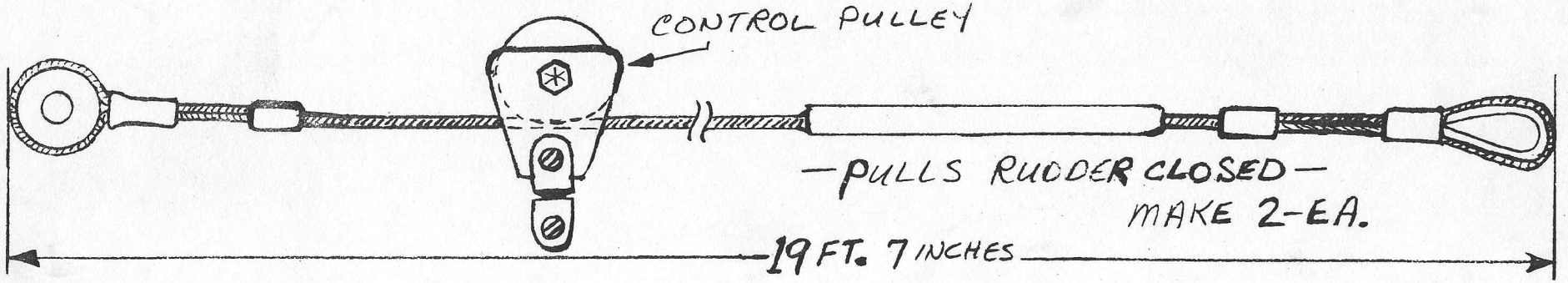


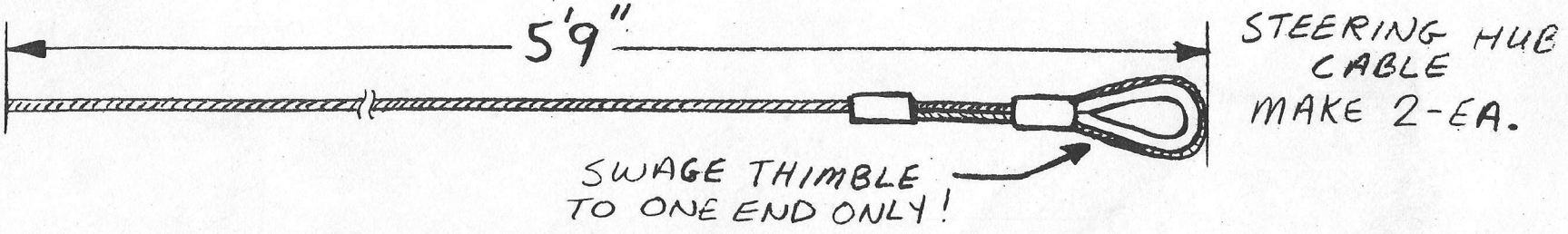
- FLYING WIRES OMITTED FOR CLARITY -

"REAR VIEW"

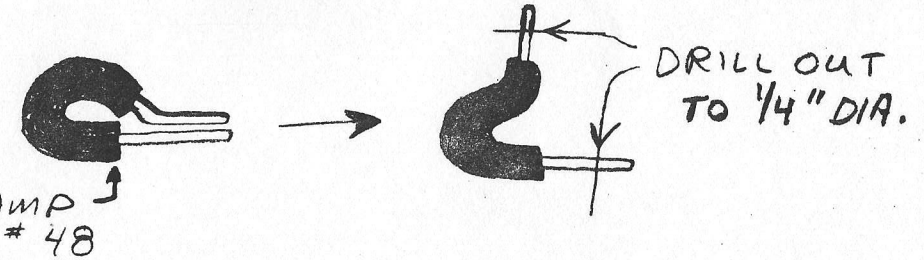
2.39 MAKE UP 1/16" RUDDER CONTROL CABLES AS SHOWN. SQUIRT A LITTLE W.D. 40 INSIDE CABLE GUIDES BEFORE SLIDING THEM OVER CABLE AND SWAGING CABLE ENDS. BE SURE TO USE PROPER SWAGING TOOL FOR CONTROL CABLES (1/16" ONLY). UNDER NO CIRCUMSTANCES TRY TO USE ANYTHING BUT A TOOL DESIGNED FOR CRIMPING 1/16" SWAGES. USE OF ANYTHING ELSE (SUCH AS A 3/32" SWAGING TOOL) WILL RESULT IN CONTROL CABLE FAILURE.

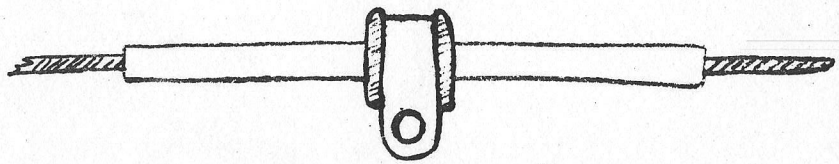




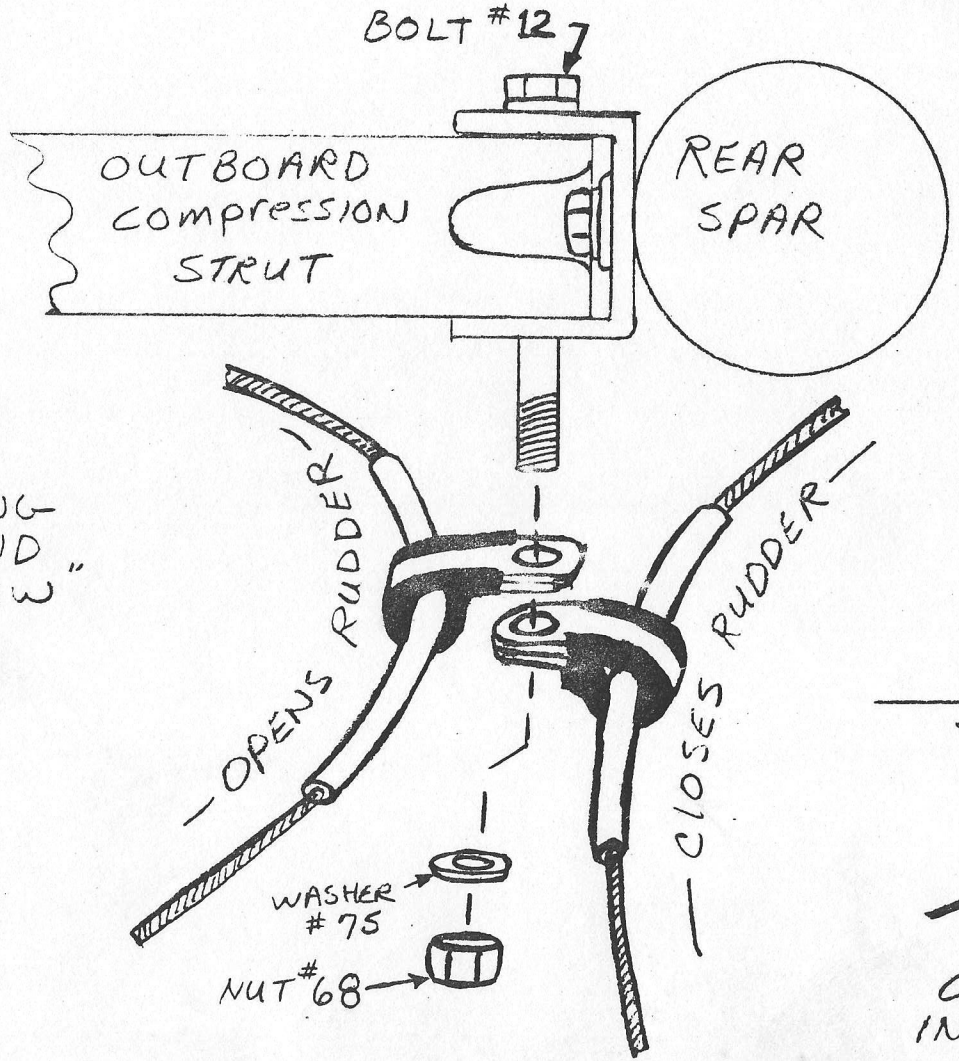


2.40 SPREAD CLAMP #48 OPEN AND PLACE IN VISE OR HOLD SECURELY WITH PLIERS. DRILL OUT 3/16" DIA. HOLES TO 1/4" DIA. AS SHOWN.

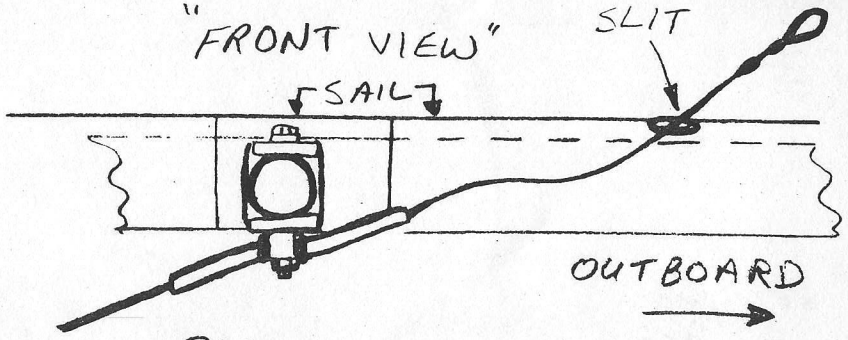




MOUNT CLAMP "CENTERED" ON CABLE GUIDE.



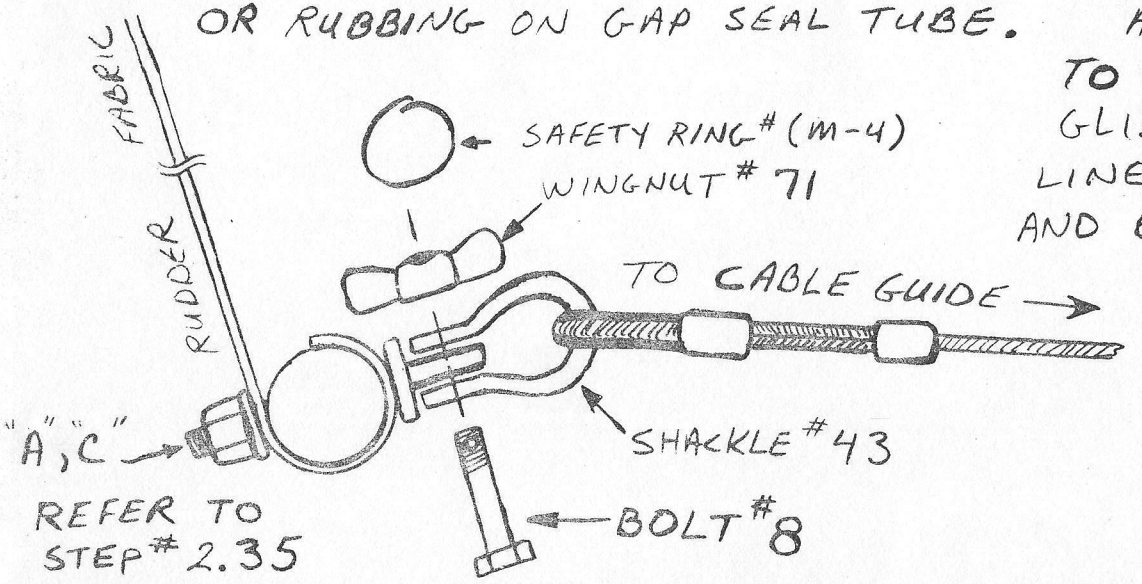
ATTACH CONTROL CABLE GUIDES AND CLAMP TO BOLT #12 ON BOTTOM OF OUTBOARD COMPRESSION STRUT BRACKET AS SHOWN.

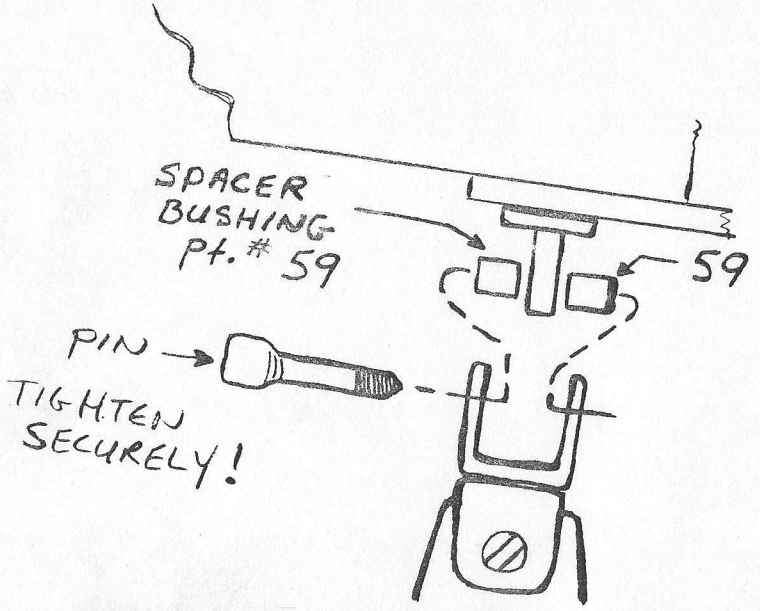


PASS THIMBLE END OF CABLES OUT THROUGH SLIT IN SAIL AS SHOWN.

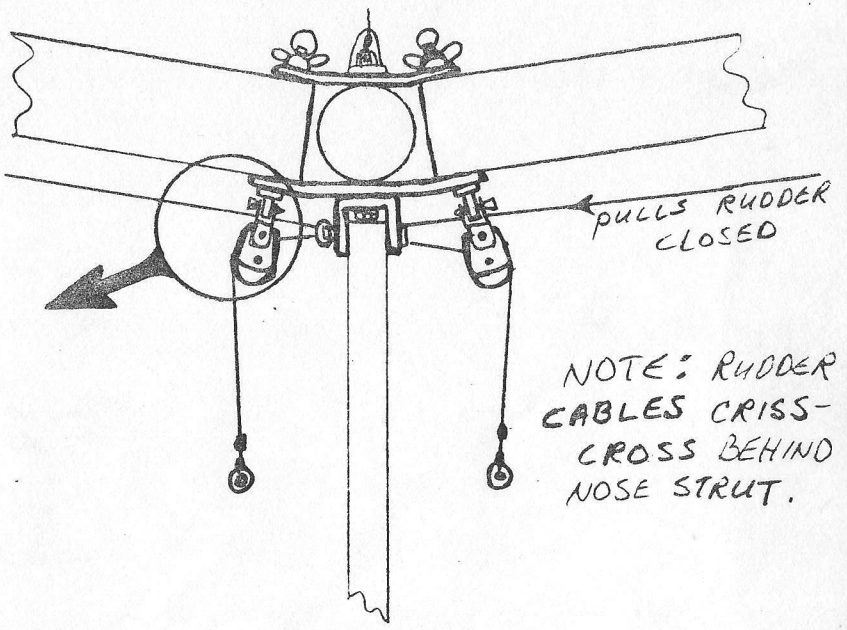
2.41

ATTACH RUDDER CONTROL CABLES TO EYEBOLTS "A" AND "C" USING PROPER SHACKLES, BOLTS, WINGNUTS AND SAFETY RINGS AS SHOWN. ALWAYS INSERT BOLT #8 FROM BOTTOM UP. THIS WILL PREVENT IT FROM CATCHING OR RUBBING ON GAP SEAL TUBE. ATTACH RUDDER CONTROL LINE PULLEYS TO EYEBOLTS LOCATED ON NOSE OF GLIDER AS SHOWN. NOTE THAT CONTROL LINES CRISS CROSS BEHIND NOSE STRUT AND ONE EYEBOLT HAS SEVERAL WASHERS MOUNTING IT LOWER THAN THE OTHER EYEBOLT. THIS IS TO KEEP CABLES FROM RUBBING ON EACH OTHER DURING OPERATION.

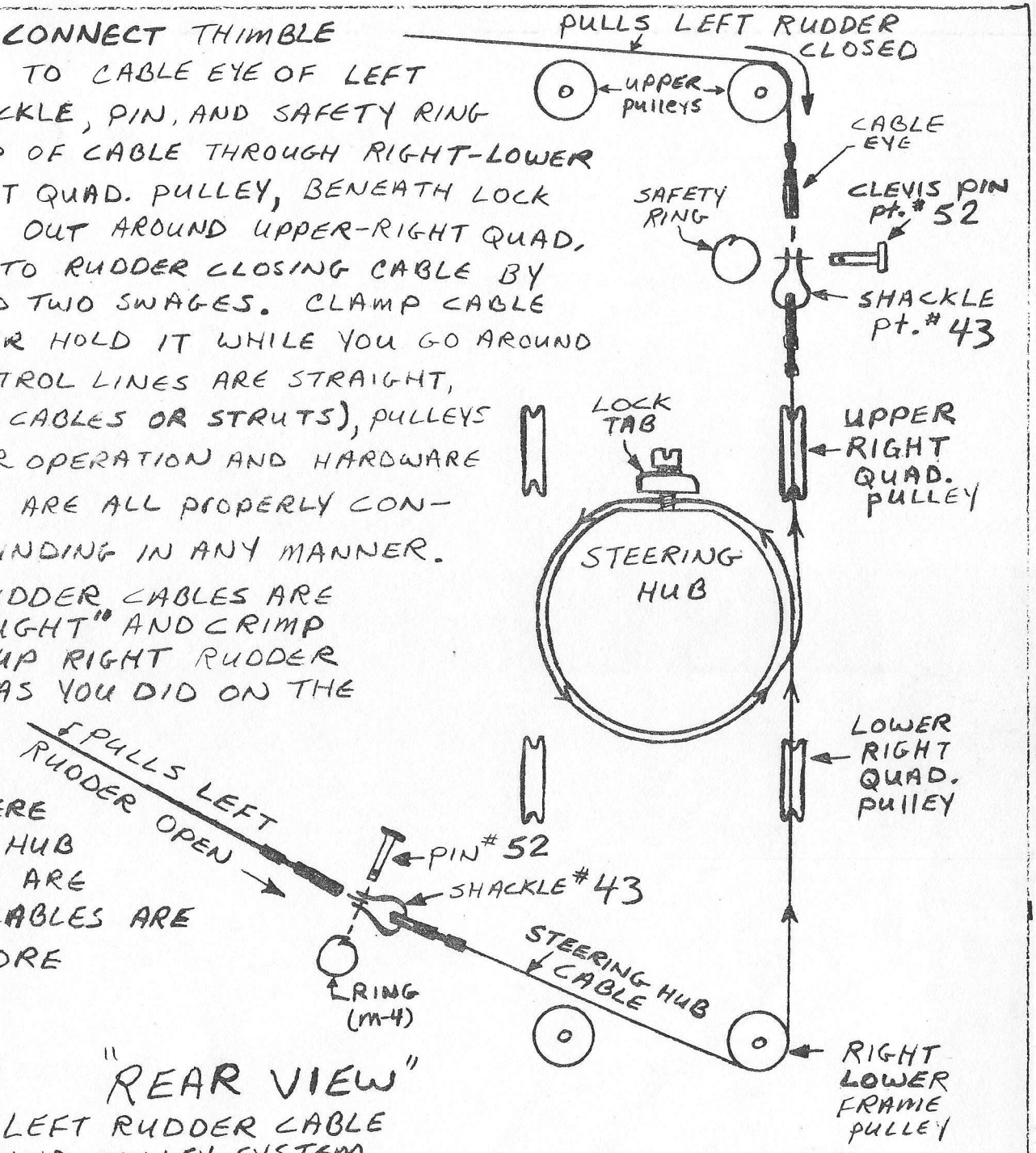




"FRONT VIEW"



2.42 REFER TO STEP # 2.39. CONNECT THIMBLE END OF STEERING HUB CABLE TO CABLE EYE OF LEFT RUDDER OPENING CABLE USING SHACKLE, PIN, AND SAFETY RING AS SHOWN. PASS UNSWAGED END OF CABLE THROUGH RIGHT-LOWER FRAME PULLEY, UP TO LOWER-RIGHT QUAD. PULLEY, BENEATH LOCK TAB AND AROUND STEERING HUB, OUT AROUND UPPER-RIGHT QUAD. PULLEY, AND FINALLY CONNECTING TO RUDDER CLOSING CABLE BY MEANS OF A SHACKLE, THIMBLE AND TWO SWAGES. CLAMP CABLE IN THIS POSITION OR HAVE A HELPER HOLD IT WHILE YOU GO AROUND AND CHECK TO BE SURE ALL CONTROL LINES ARE STRAIGHT, (NOT WRAPPED OR ANGLING AROUND CABLES OR STRUTS), PULLEYS ARE ALIGNED AT BEST ANGLE FOR OPERATION AND HARDWARE SUCH AS THIMBLES AND SHACKLES ARE ALL PROPERLY CONNECTED AND NOT TWISTED OR BINDING IN ANY MANNER. WHEN SATISFIED THAT LEFT RUDDER CABLES ARE CONNECTED, PULL CABLE "TAUGHT" AND CRIMP SWAGES IN POSITION. SET UP RIGHT RUDDER CABLES IN THE SAME MANNER AS YOU DID ON THE LEFT RUDDER, CHECKING TO BE SURE CABLES ARE NOT RIDING OVER EACH OTHER WHERE THEY PASS AROUND STEERING HUB AND UPPER AND LOWER PULLEYS ARE PROPERLY ALIGNED. MAKE SURE CABLES ARE STRAIGHT AND "TAUGHT" BEFORE SWAGING IN POSITION.

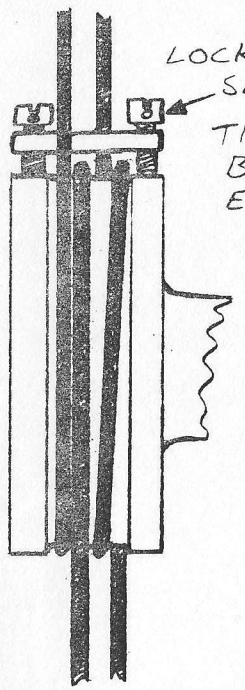


"REAR VIEW"
— LEFT RUDDER CABLE AND PULLEY SYSTEM —

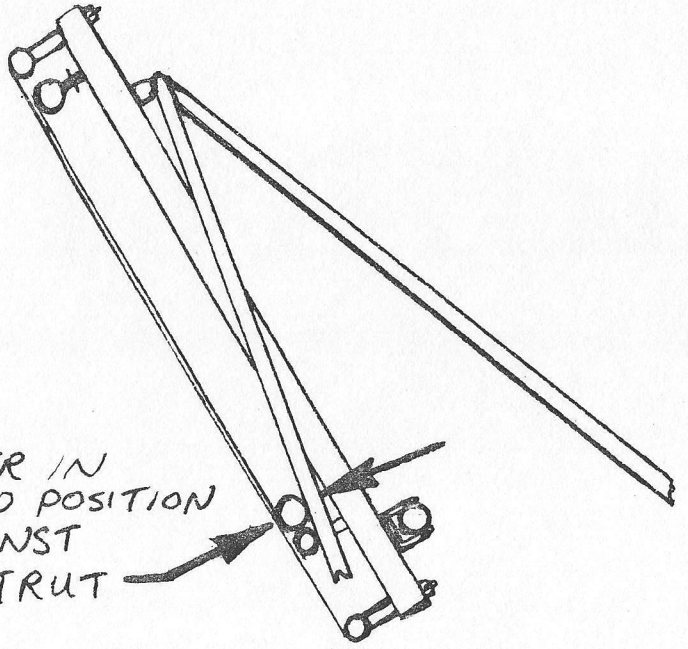
CABLE GUIDES AND PULLEY SWIVELS ETC. OMITTED FOR CLARITY

2.43 CONTROL ADJUSTMENT – EXAMINE STEERING HUB. MAKE SURE CABLES ARE WRAPPED EVENLY AROUND HUB, NOT RIDING OVER THE TOP OF ONE ANOTHER. CABLES ARE PERMITTED TO RUB AGAINST EACH OTHER A LITTLE DURING OPERATION AND A FEW SQUIRTS OF W.D.40 IN THIS AREA WILL HELP KEEP ACTION SMOOTH BUT CABLES SHOULD NOT OVERRIDE EACH OTHER OR BIND IN ANY MANNER.

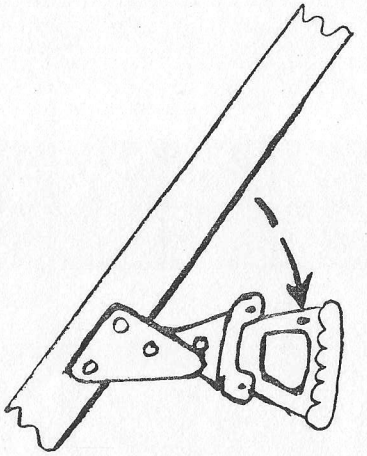
HAVE SOMEONE HOLD RUDDERS CLOSED AGAINST V-STRUTS. SHORT V-STRUTS SERVE AS A RUDDER STOP. ADJUST CONTROL YOKE SO THAT IT IS IN THE DOWN AND LEVEL POSITION. WHEN BOTH RUDDERS ARE CLOSED AND YOKE IS DOWN AND LEVEL, TIGHTEN LOCK TAB SCREWS EVENLY AND SECURELY TO PREVENT CABLES FROM SLIPPING AROUND HUB WHEN RUDDERS ARE APPLIED. LOCK-WIRE LOCKTAB SCREWS WITH .032" SAFETY WIRE.



CABLES WRAPPED PROPERLY!



"REAR VIEW"



STEERING YOKE DOWN AND AGAINST STOP

ADJUST LEVEL

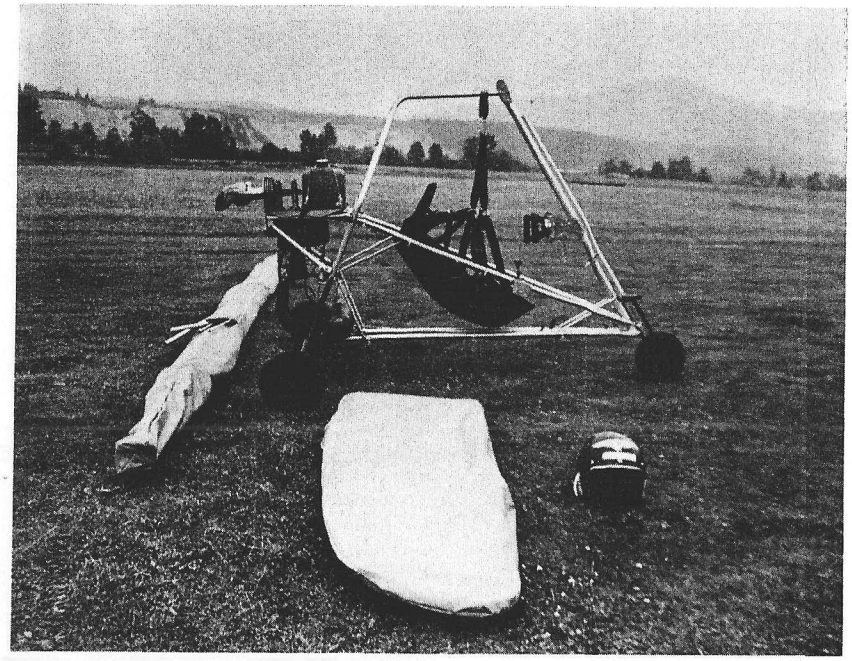
2.44 NOW THAT YOU HAVE THE ENTIRE GLIDER TOGETHER, GO BACK OVER IT AND CHECK EVERY NUT AND BOLT IN THE MACHINE TO BE SURE THEY ARE PROPERLY AND SECURELY FASTENED. ALSO CHECK ALL THE COTTER PINS TO SEE THAT THEY ARE BENT OVER AND PROPERLY SECURE. CHECK TO BE SURE THAT ALL SAFETY RINGS ARE PROPERLY INSTALLED AND SECURED. USE THE LIST BELOW AS A GUIDE WHEN GIVING YOUR WING A FINAL THOROUGH INSPECTION.

=FINAL ASSEMBLY CHECKLIST=

1. ALL BOLTS, NUTS, CLEVIS PINS, COTTER PINS AND SAFETY RINGS PROPERLY SECURED.
2. ALL FLYING WIRES PROPERLY AND SECURELY FASTENED.
3. DRAG WIRE THIMBLES STRAIGHT AND TURNBUCKLES SAFETY WIRED.
4. KING POST TENSIONER UP AND LOCK RING IN PLACE.
5. RUDDERS AND STRUTS SECURELY MOUNTED AND SAFETY RINGS INSTALLED.
6. RUDDER HINGE PINS PROPERLY MOUNTED AND COTTER PINS PROPERLY INSTALLED.
7. RUDDERS HINGE OPEN AND CLOSED WITHOUT BINDING.
8. CONTROL CABLES PROPERLY AND SECURELY FASTENED, NOT BINDING ON TUBES OR CABLES.
9. STEERING YOKE AND PULLEY SYSTEM FUNCTIONING PROPERLY.
10. ALL CONTROL SYSTEM PULLEYS AND GUIDES PROPERLY ANCHORED TO AIRFRAME.
11. ENGINE, PROPELLOR AND DRIVE BELTS PROPERLY AND SECURELY MOUNTED.
12. EXHAUST SYSTEM COMPONENTS PROPERLY AND SECURELY MOUNTED.
13. FUEL TANK PROPERLY MOUNTED AND BUNGEE CHORDS PROPERLY SECURED.
14. QUICK DIS-CONNECT FITTINGS, FUEL FILTER AND FUEL LINES CLAMPED AND NO LEAKS.
15. ALL IGNITION WIRES PROPERLY ROUTED AND SECURED.
16. THROTTLE AND CHOKE CABLES PROPERLY ROUTED AND SECURE.
17. ALL ENGINE CONTROLS FUNCTIONING PROPERLY.
18. KILL SWITCH FUNCTIONING PROPERLY.
19. PULL STARTER ROPE PROPERLY AND SECURELY MOUNTED AND FUNCTIONING.
20. ALL WHEELS AND TIRES PROPERLY INFLATED AND COTTER PINS INSTALLED.

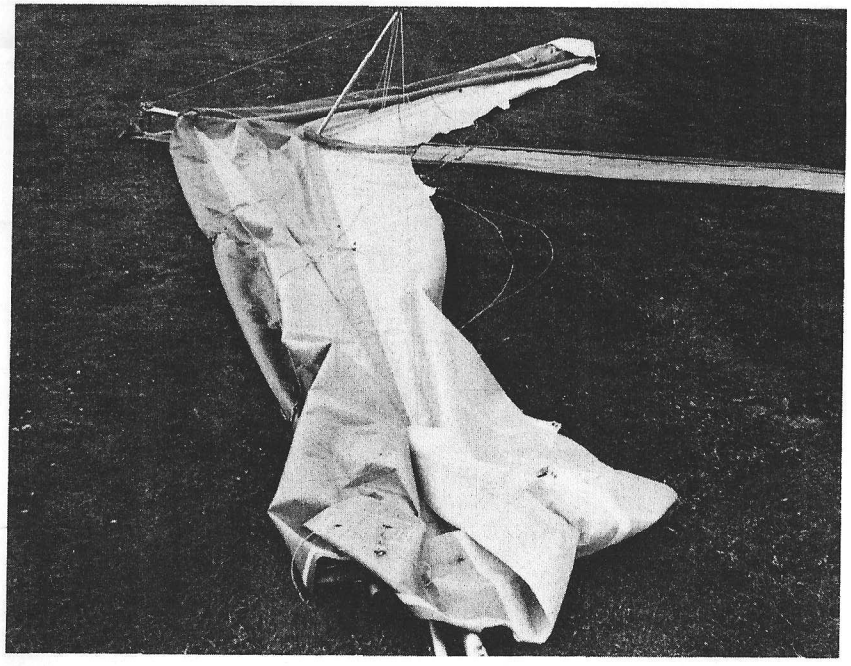
KASPER WING IS NOW READY FOR PRE-FLIGHT!

KASPERWING READY FOR PRE-FLIGHT ASSEMBLY

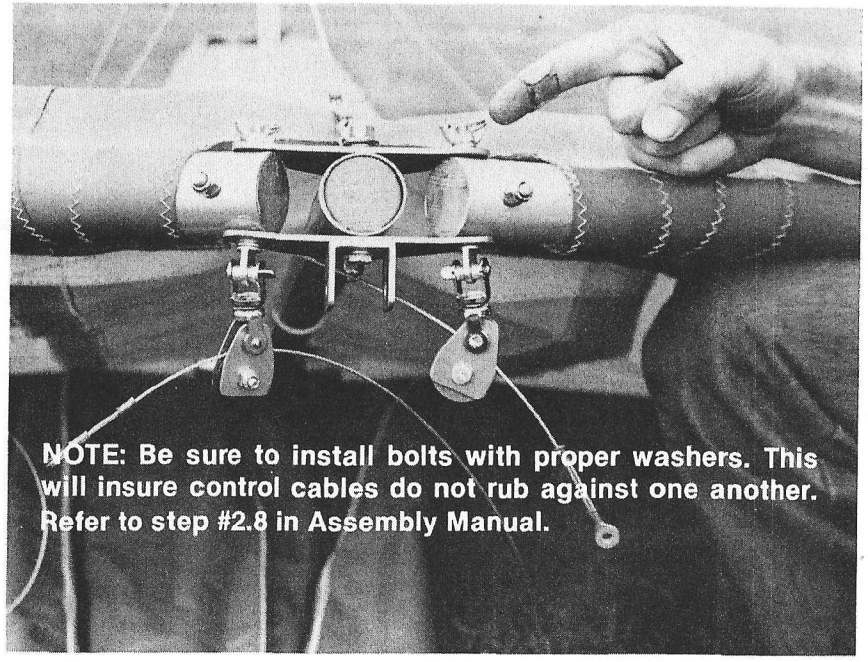


1. Remove ribs and struts from bag pocket

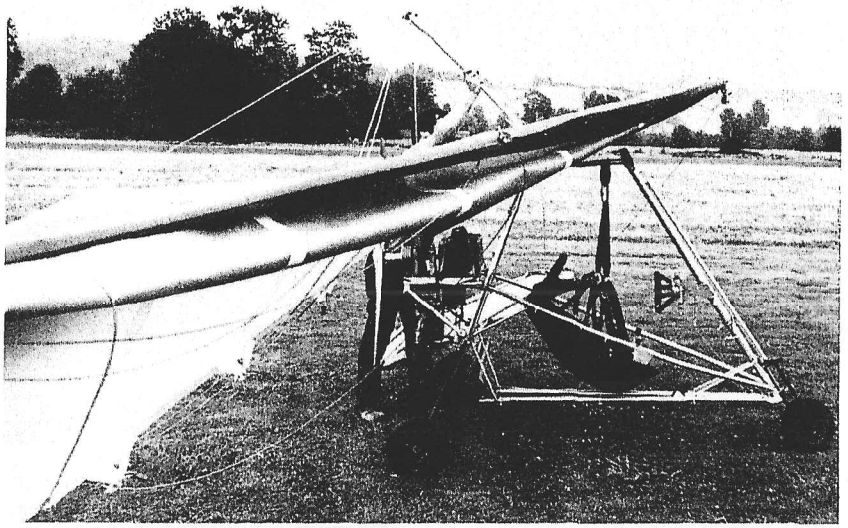
2. Flip Glider over and spread wings



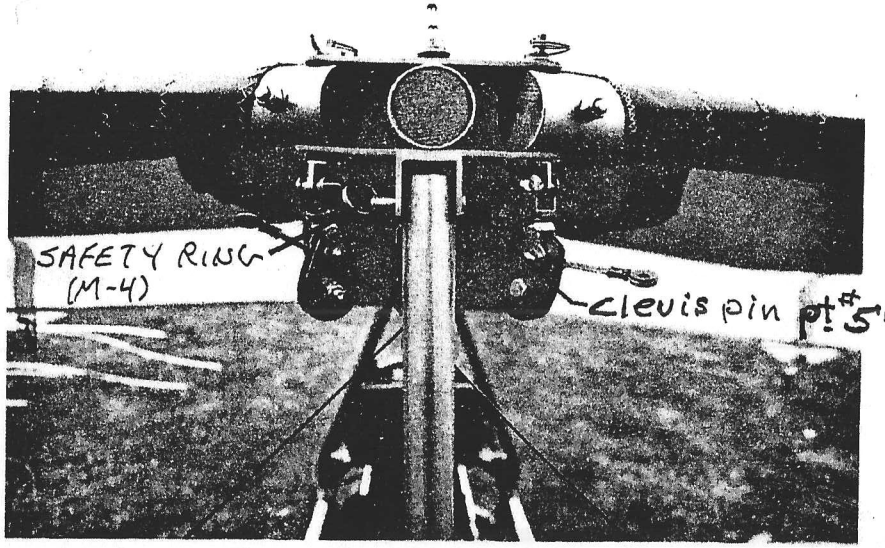
3. Install spar anchor bolts, wing nuts, and safety rings.



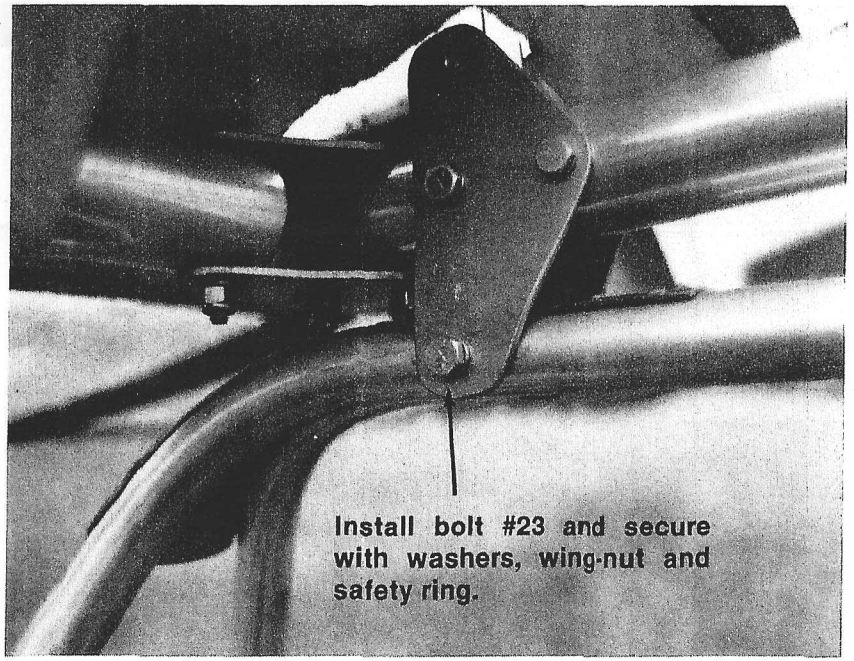
4. Grab kingpost, lift wing into position on top of frame.



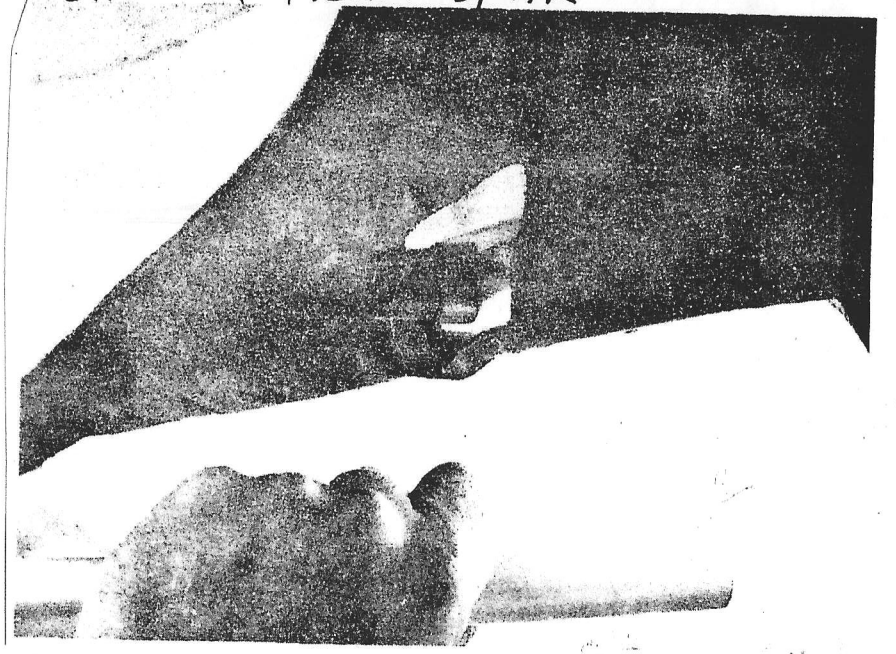
5. INSTALL CLEVIS PIN AND SAFETY RING THROUGH NOSE STRUT AND BRACKET TO SECURE WING.



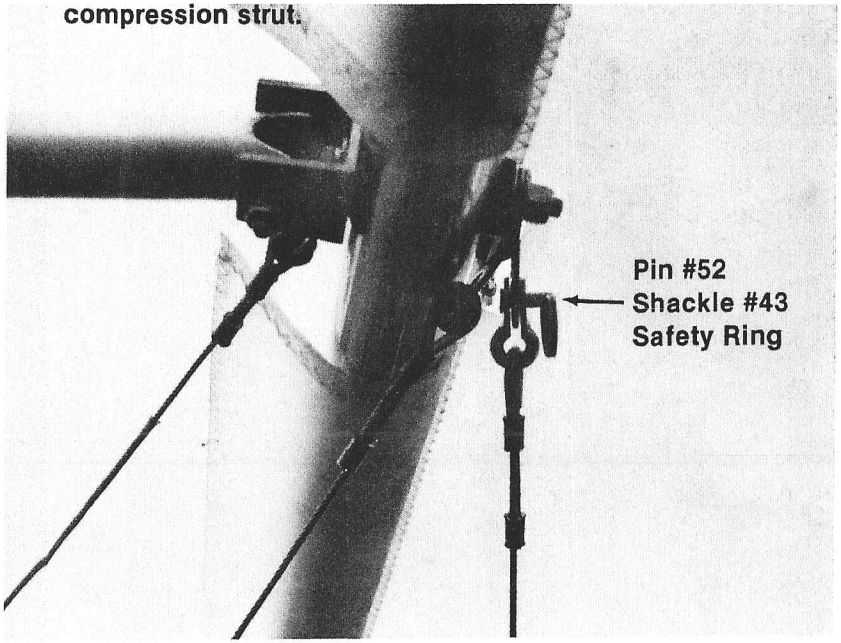
6.



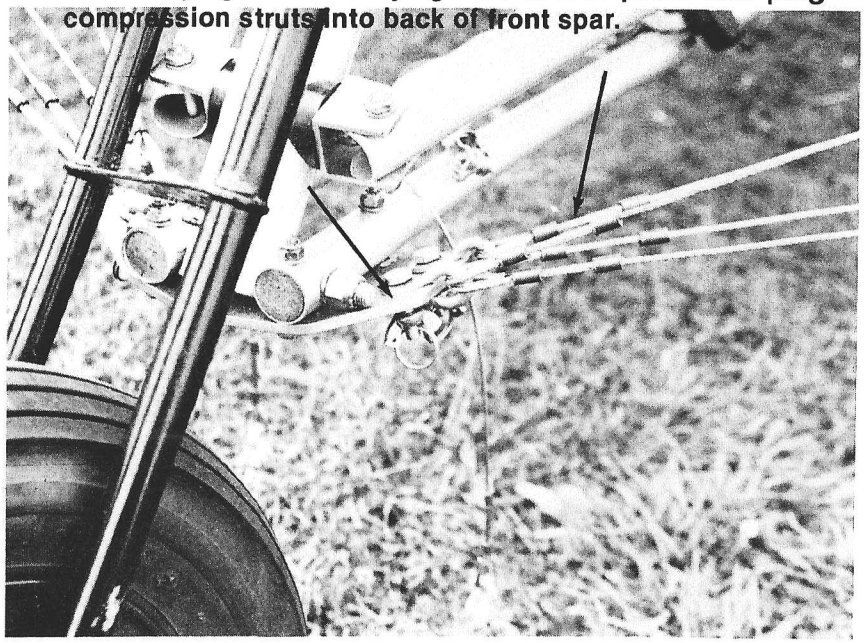
7 PLUG COMPRESSION STRUTS INTO BACK OF FRONT SPAR



8. Attach rear frame landing wires to each wing at inner compression strut.

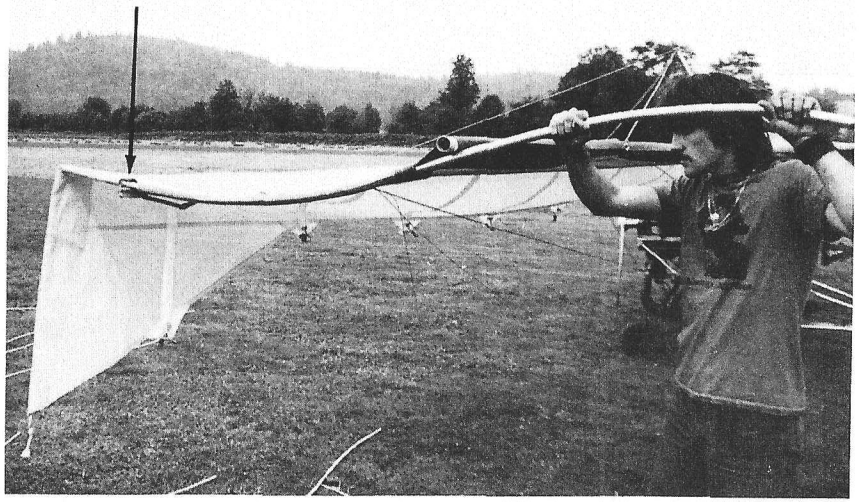


9. Attach flying wires to flying wire attach plate and plug compression struts into back of front spar.

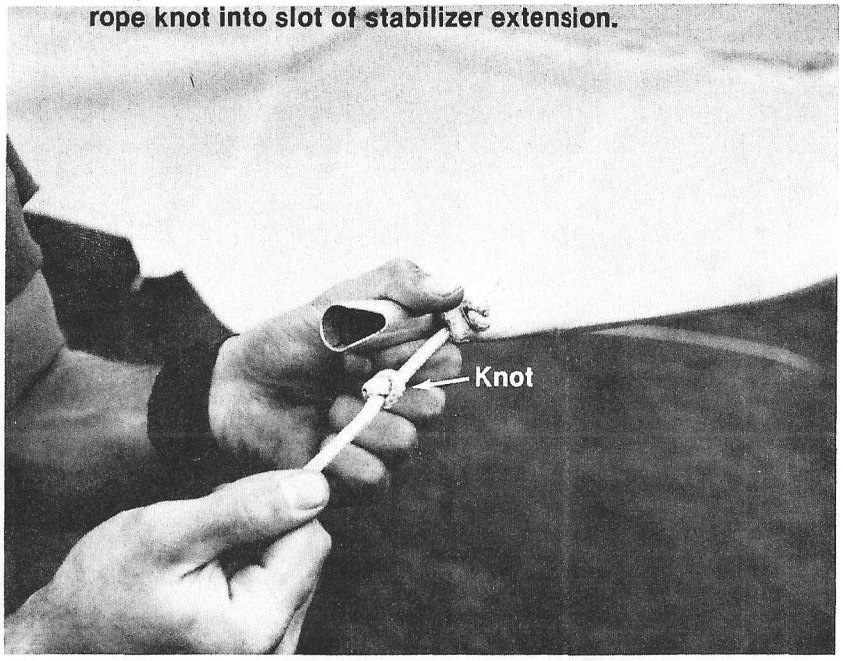


10. Double check to be sure no thimbles are twisted and raise kingpost tensioner. Slide safety ring into position.

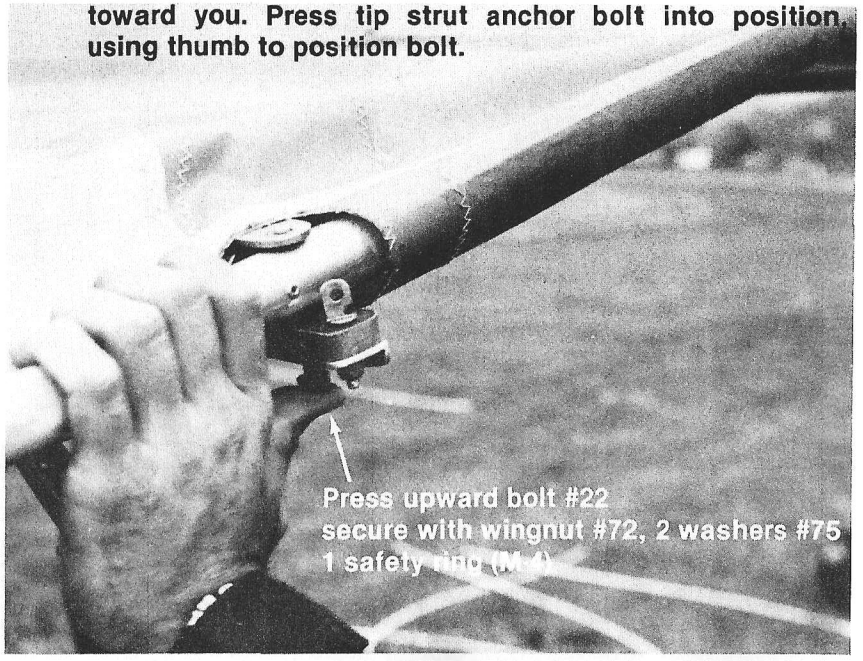
11. Slip tipstrut into tipstrut pocket starting at leading edge. Make sure strut goes through brackets.



12. Plug front end of tip strut into hole in front spar. Anchor rope knot into slot of stabilizer extension.



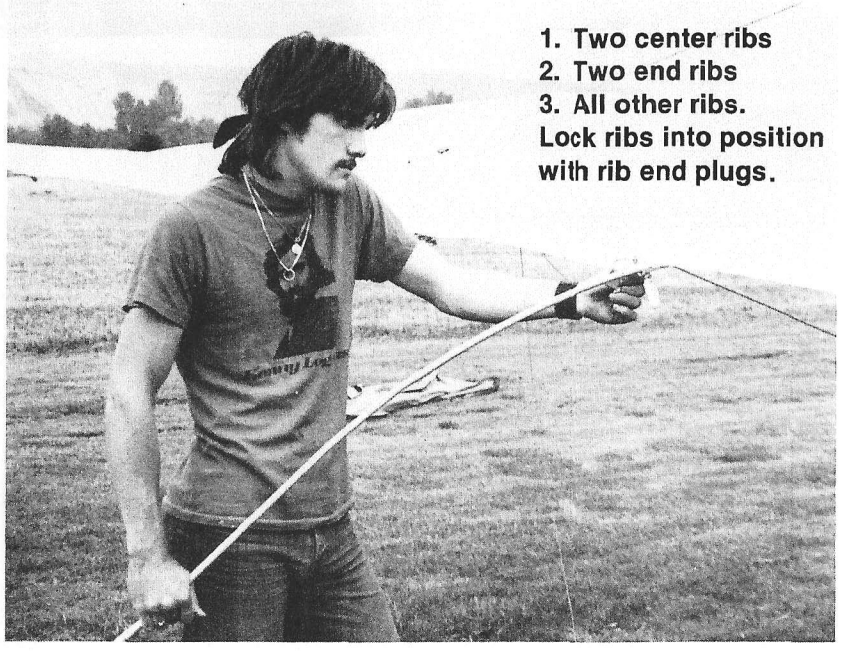
13. Put one hand on cambered portion of tip strut and pull toward you. Press tip strut anchor bolt into position, using thumb to position bolt.



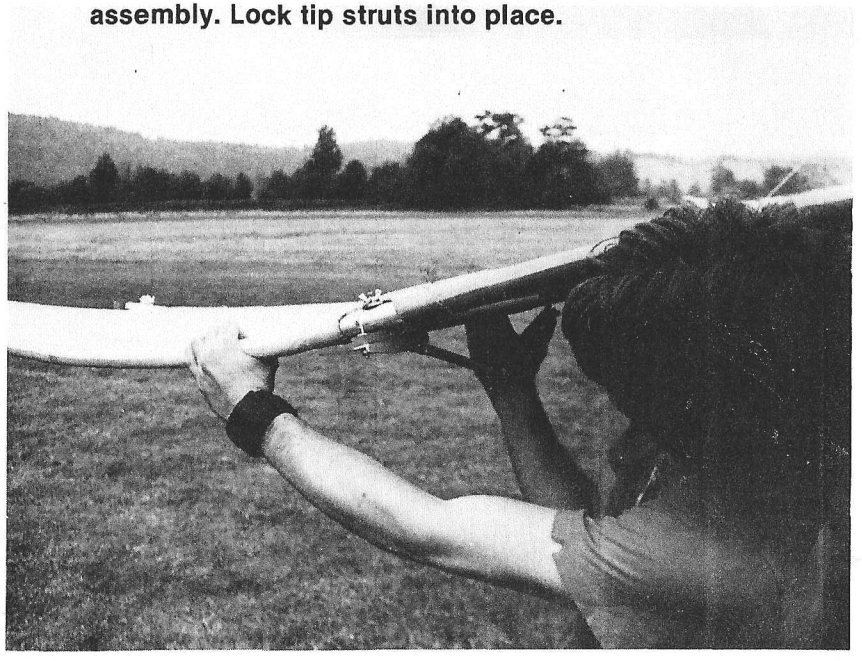
14. Slide ribs into rib pockets in back of sail starting with:

1. Two center ribs
2. Two end ribs
3. All other ribs.

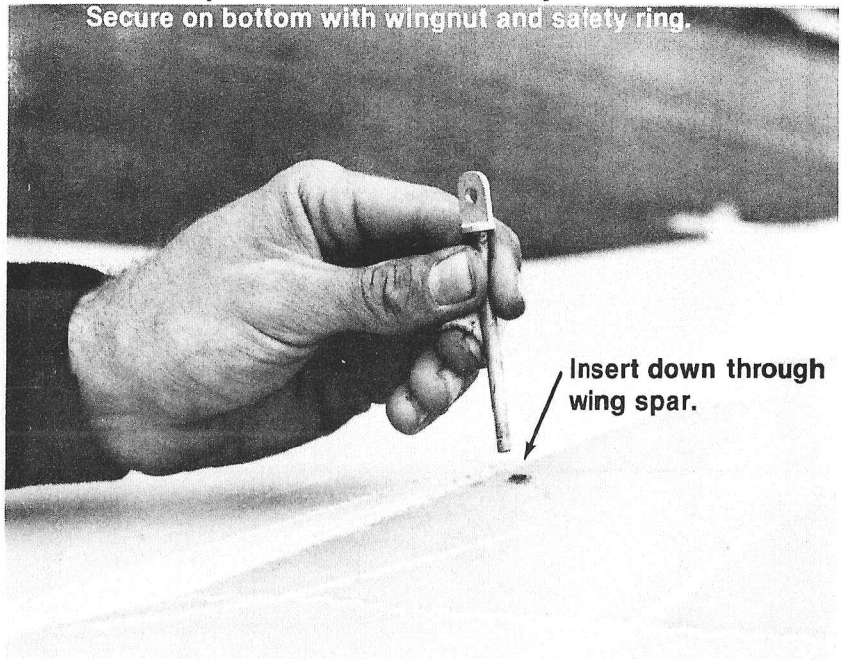
Lock ribs into position with rib end plugs.



15. Pull tip strut outward while pushing upward on tensioner assembly. Lock tip struts into place.

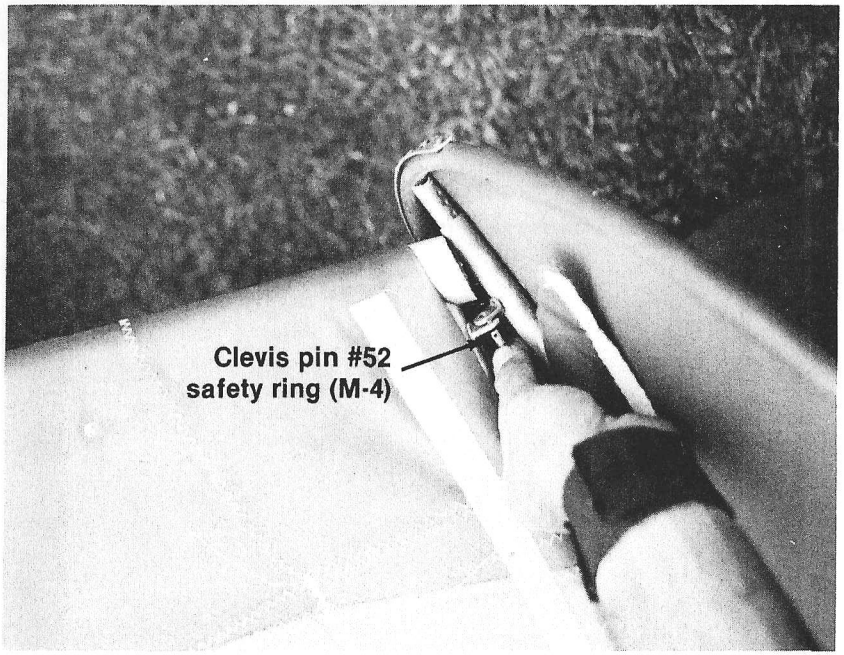


16. Secure tip strut tensioners with eyebolt #35 as shown. Secure on bottom with wingnut and safety ring.

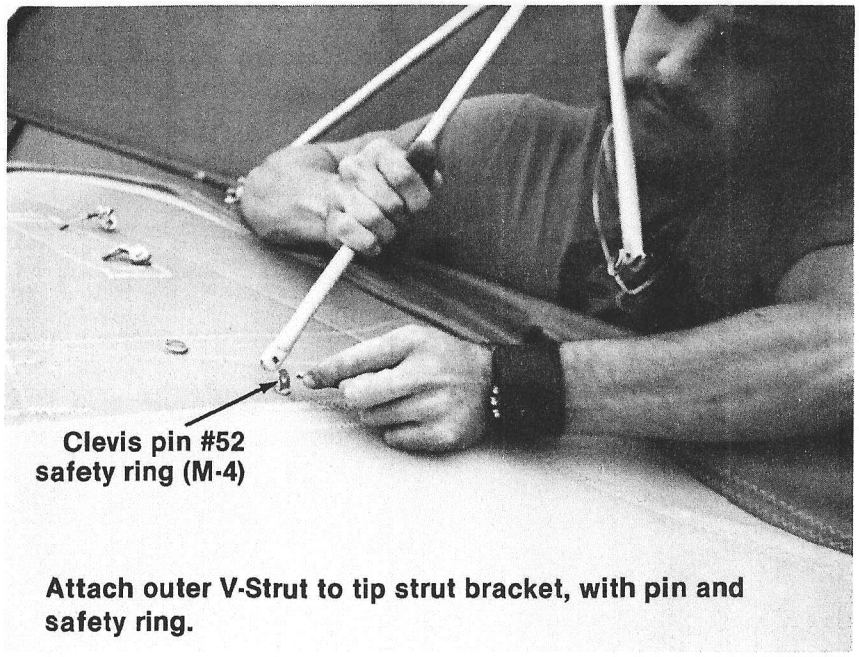


17. Attach rudder to tip strut, using clevis pin and safety ring. NOTE: have someone hold wing down if available.

18. Secure vertical stabilizer with clevis pin and safety ring.

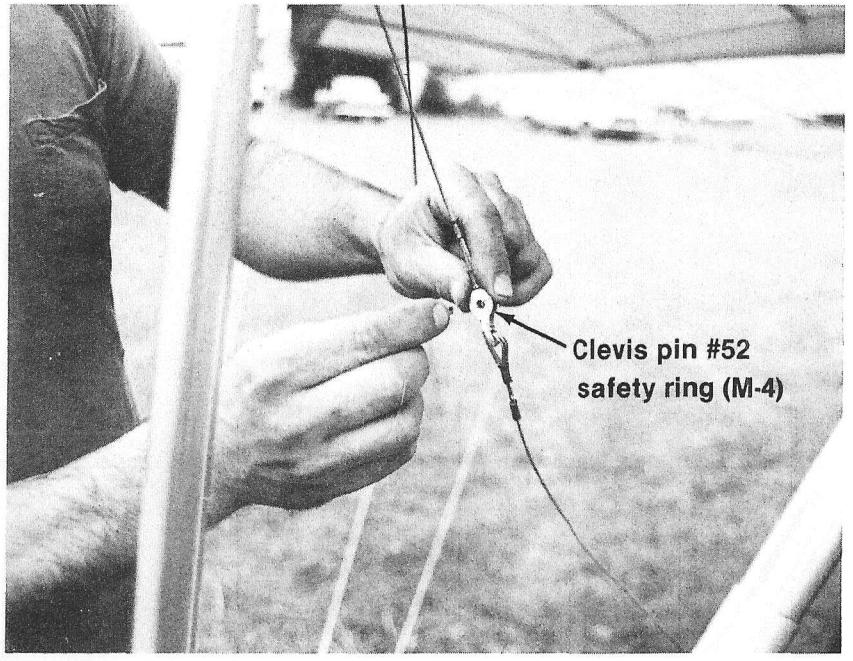


19. Attach inner V-Strut to eyebolt with pin and safety ring.

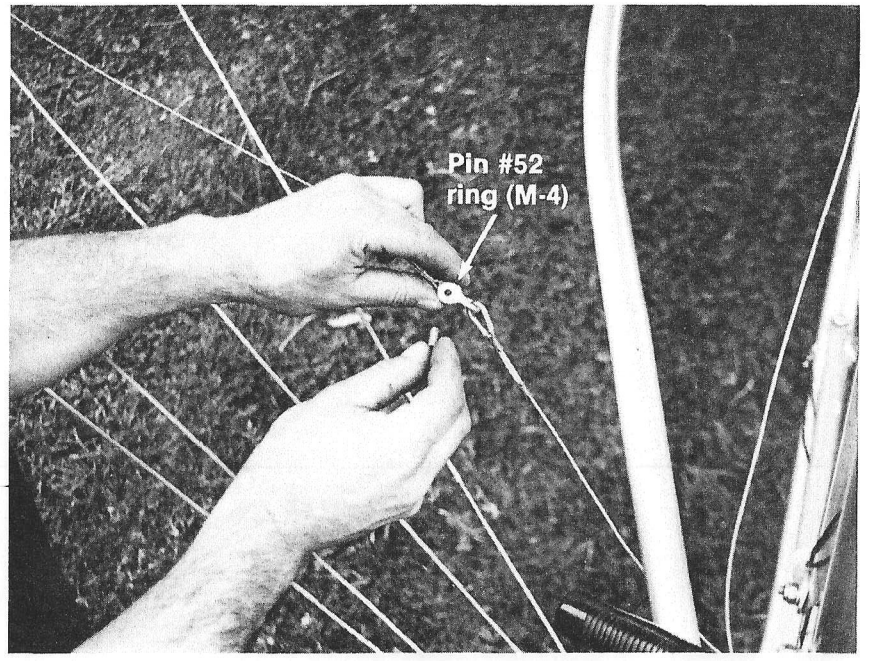


Attach outer V-Strut to tip strut bracket, with pin and safety ring.

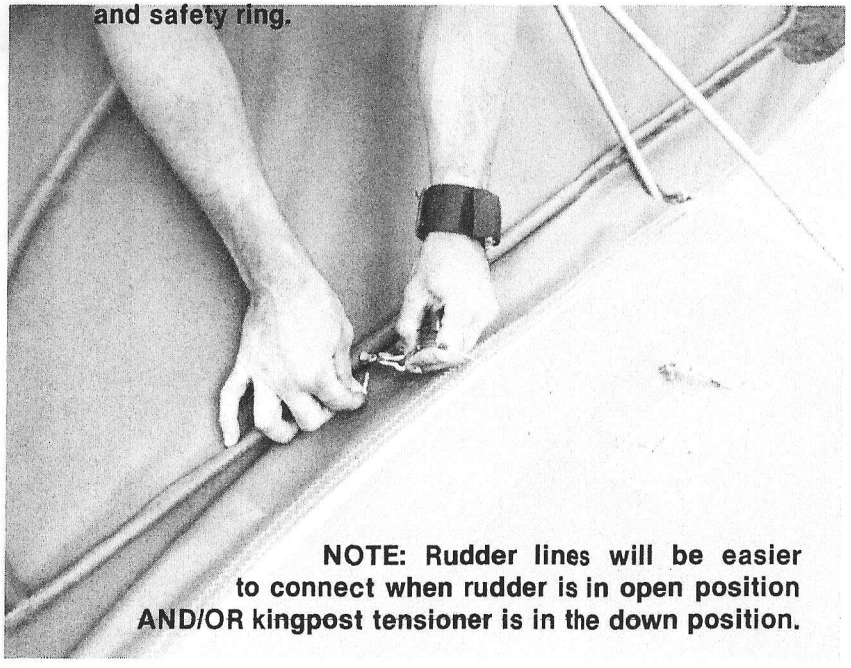
20. Connect Rudder return lines with pin and safety ring



21. Connect rudder opening lines with pin and safety ring.



22. Attach both control lines to rudders using bolt, wingnut and safety ring.



NOTE: Rudder lines will be easier to connect when rudder is in open position AND/OR kingpost tensioner is in the down position.

Be sure to attach rudder lines to rudders with shackle bolt facing UPWARD. This will prevent it's catching on Rudder-Gapseal tube or wing, when opened or closed.