Attached is a list of parts which make up the Lazair kit.

For inventory purposes please refer to this list.

Revised
26 July 1983

PACKING LIST

LAZAIR™ II "A" KIT

1. WING COMPONENTS AND MATERIALS

Part No.	Qty.	Description
-	1	D-cell L
-	1	D-cell R
R1	2	Rib
R2	2	Rib
R203	2	Rib
R204	2	Rib
R205	2	Rib
R206	2	Rib
R207	2	Rib
R208L	1	Root Rib L
R208R	1	Root Rib R
R9L	1	Tip Rib L
R9R	1	Tip Rib R
RA	8	Aileron Rib
RSTL	1	Rear Spar Top L
RSTR	1	Rear Spar Top R
RSBL	1	Rear Spar Bottom L
RSBR	1	Rear Spar Bottom R
RS200L	1	Rear Spar L
RS200R	1	Rear Spar R
C1A	2	Root Rib Top Cap
C1B	2	Root Rib Bottom Cap
C2	4	Capstrip, Tip Rib
C3	2	Capstrip
C4	2	Capstrip, Tip Spar, I
C5	2	Capstrip, Tip Spar, O
C6	2	Capstrip, Tip Spar, B
AS1	4	Aileron Spar
AS2	4	Aileron Spar Cap
B3	8	Bearing
B5	4	Bushing

Part No.	Qty.	Description
F2	2	Aileron Horn
F3	2	Aileron Hinge
F34	2	Angle, Spar Box
F36	2	Aileron Hinge O/B
F37L	1	Aileron Hinge L
F37R	1	Aileron Hinge R
F38	2	Bellcrank Mount
F39	4	Bellcrank
F41	2	Spacer
F42	2	Clip
F335	2	Bracket
G6	2	Gusset Angle
G12	2	Gusset
G14	2	Gusset
G15	4	Gusset
G20	2	Gusset
G22L	1	D-cell Tip Rib L
G22R	1	D-cell Tip Rib R
G23L	1	D-cell Root Rib L
G23R	1	D-cell Root Rib R
G25	4	Tip Gusset
G229	8	Rib Anchor
G301	2	Gusset, Bellcrank
GBR	24	Gusset
GC	60	Gusset
GC13	4	Gusset
P3	6	Plug, Rodend
P4	4	Plug, Aileron
S250	8	Spacer
S600	2	Spacer
S675	2	Spacer
S800	2	Spacer
S1.9	4	Spacer

2. FUSELAGE COMPONENTS

Part No.	Qty.	Description
T4	2	Pushrod, Aileron, Short
T5	2	Torque Tube, Aileron
T6	2	Trailing Edge
T24L	1	Tip Bow - Left
T24R	1	Tip Bow - Right
T25	2	Trailing Edge
T238	2	Pushrod, Aileron, Long
TSL	1	Tip Spar - L
TSR	1	Tip Spar - R
35DS	4	Bolt
36	2	Bolt
312	2	Bolt
321	2	Bolt
321DS	2	Bolt
323	4	Bolt
BE	6	Rodend
CN3	6	Nut, Castle
CP23	6	Cotter Pin
N3	16	Nut, Locking
W3H	12	Washer
-	1	Epoxy
-	1	Hole Saw
-	2000	Rivet, Aluminum, Short
-	100	Rivet, Aluminum, Long
-	300	Rivet, Stainless Steel
-	1	Tip Covering
-	1	Pliobond
-	1	Roll Tedlar
F241L	1	Strut Fitting Stabilizer L
F241R	1	Strut Fitting Stabilizer R
G93	4	Gusset, R7 Attach
G234	4	Doubler, Spar Box
G235	2	Gusset, Tape

Part No.	Qty.	Description
T213	2	Rear Fuselage Brace
T221	1	Crosstube
T226	2	Pushrod, Ruddervator
T239	1	Boom Tube
T240	2	Seat Tube
T241	2	Strut, Inner
T242	2	Strut, Outer
-	1	Fuel Tank

Revised 24 February 1984

PACKING LIST

LAZAIR™ II "B" KIT

Part No.	Qty. per A/C	Description
A200	1	Ass'y, Torque Tube
A201	2	Torque Tube, Aileron Control
A202L	1	Ass'y, Brake Caliper, L
A202R	1	Ass'y, Brake Caliper, R
A204	2	Cable J
A304L	2	Pedal, Brake, L
A304R	2	Pedal, Brake, R
A305	2	Retainer, Brake Cable
A311	2	Assembly, Tailwheel
A316	2	Assembly, Control Stick
A317	2	Assembly, Tailwheel Pant
`3L	1	Assembly, Brake Cable, L
203R	1	Assembly, Brake Cable, R
A205	2	Muffler, U342
A206L	1	Assembly, Throttle Cable, L
A206R	1	Assembly, Throttle Cable, R
A207	2	Assembly, Throttle Cable Clip
A208	2	Assembly, Lever, Throttle
A209	2	Assembly, Tab Bolt
B3	12	Bushing
B4	3	Bushing
B7	5	Bushing
B8	2	Bushing
B9	8	Bushing, Rudder Pedal
B10	6	Bushing
B13	4	Bushing
B15	2	Bushing
BE	28	Rodend (3/16)
1	4	Rodend (1/4)
BEP	2	Pinned Rodend
CJ	1	Cable Jacket
CN3	12	Castle nut (3/16")

Part No.	Qty. per A/C	Description
:4	1	Castle nut (1/4")
CP23	17	Cotter Pin (3/4")
F1	2	Horn, Ruddervator
F4	1	Y Bracket, Stabilizer
F5	2	Hinge, Ruddervator, I/B
F13	4	Nose Cluster Y
F35	2	Rear Spar Fitting
F51	4	Clip
F53	1	Clamp, Downtube
F6FL	2	Gusset, Strut/Axle
F6FR	2	Gusset, Strut/Axle
F6RL	2	Gusset, Strut/Axle
F6RR	2	Gusset, Strut/Axle
F54	2	Spreader, Seat Tube
F56	8	Clip, Crosstube
F60L	2	Angle, Nacelle
R	2	Angle, Nacelle
:4	2	Hinge, Ruddervator, O/B
F302	4	Fitting, Control Stick
F311	2	Disc, Backup
F321L	2	Horn, Rudder Pedal L
F321R	2	Horn, Rudder Pedal R
F322	2	Spring, Long Tailwheel
F323	2	Spring, Short Tailwheel
F324	2	Mount, Tailwheel Pant
F325	2	Mount, Tailwheel
F326	2	Disc, Brake
F327	2	Plate, Locking
F331	2	Bracket, Rodend Mount
F202	1	Gusset, Front Assembly
F203	1	Angle, Rear Spar
F207L	1	Angle, Side Support L
F207R	1	Angle, Side Support R
9	1	Angle, Front Fitting
210	1	Spreader, Cockpit Rear
F211	2	Clamp, Side Support
F212	1	Angle, Top, Fuel Tank

Part No.	Qty. per A/C	Description
F213	2	Angle, Side, Fuel Tank
F214	1	Angle, Bottom, Fuel Tank
F216	2	Shim, Rear Fitting
F218	2	Horn, Aileron Control, Outboard
F219	2	Horn, Elevator Control
F220	2	Bracket, T.T. Mount
F221	3	Bellcrank, Ruddervator
F222	1	Bellcrank, Aileron
F223	1	Mount, Aileron T.T. Bushing
F224	1	Horn, Aileron Control, Inboard
F225	1	Mount, Pushrod Bushing
F226	2	Holder, Torque Tube
F227	1	Tab, Locking
F228	2	Support, T.T.
F229	2	Actuator, Rudder Control
F230	4	Bellcrank, Elevator
231	2	Link, Control Stop
F236	2	Fitting, Stabilizer Attach
F240	4	Fitting, Wing Attach
F242	2	Shim, Front Fitting
F243	2	Mounting Bracket, Wheelpant
F244	4	Clamp, Jury Strut
F245	4	Bracket, Front Jury Strut
F246	2	Bracket, Rear Jury Strut
F247L	1	Fitting, Caliper Attach, Lower,Left
F247R	1	Fitting, Caliper Attach, Lower, Right
F248	2	Fitting, Caliper Attach, Upper
F249	1	Bracket, Tail Support
F252	2	Clamp, Leg Retainer
F253	2	Clamp, Pushrod Guide, Front
F254	2	Clamp, Pushrod Guide, Rear
F255	4	Clip, Inspection Cover
F257	2	Side Plate, Throttle Quad
258	8	Clamp Cable, Half
F259	1	Plate, Switch
F267	2	Bracket, Front Tube Mt.

Part No.	Qty. per A/C	Description
CS	4	Gusset
G8	1	Doubler, Fuselage
G26	2	Skin, Seat
G28	2	Top, Nacelle
G29	4	Gusset, Nacelle Side
G30	2	Bottom, Nacelle
G53	4	Doubler, Nacelle
G55	2	Gusset, Ruddervator
G61	1	Lock, Ruddervator Hinge
G76	4	Gusset, Front Axle
G304L	1	Gusset, Tailwheel
G304R	1	Gusset, Tailwheel
G305L	1	Gusset, Tailwheel
G305R	1	Gusset, Tailwheel
G308	4	Rudder Pedal
G309	2	Horn
12	2	Stop, Tailwheel Pant
201	1	Rear Spar, Mid-Section
G202	1	Main Spar, Mid-Section
G203	1	Doubler, Spar, Mid-Section
G204	2	Stiffener, Root Rib
G205	1	Sleeve, Rear Spar
G206	1	Skin, D-Cell, Mid-Section
G216	1	Skin, Upper Front
G217	1	Skin, Upper Rear
G218	2	Skin, Upper Middle
G219	1	Skin, Bottom
G220	1	Saddle, Fuel Tank
G221	2	Mount, Torque Tube
G222	4	Clamp, Seat
G307	1	Gusset
G223	1	Bracket, Side Tube, Bottom
G224	1	Bracket, Side Tube, Top
25	4	Gusset, Front Tail
226	4	Gusset, Rear Tail

Part No.	Qty. per A/C	Description
28	1	Bracket, Aileron Control
G6	2	Gusset, Angle
G236	2	Rib, Stiffening, Bottom
G237	2	Rib, Stiffening, Top
G238	2	Rib, Stiffening
G239	1	Rib, Stiffening
G240L	1	Riblet, Left
G240R	1	Ribelt, Right
G241L	1	Noserib, Left
G241R	1	Noserib, Right
G242	1	Cover, Tail Gap
G243L	1	Cover, Inspection, L
G243R	1	Cover, Inspection, R
HL20	1	Fuel Line
M312	2	Hub Half, Inboard
3	2	Hub Half, Outboard
201L	1	Wheelpant, Left
M201R	1	Wheelpant, Right
NB3	8	Nutplate
N3	310	Nut
N4	16	Nut
N5C	2	Nut
N5CNL	2	Nut
P1	3	Plug
P2	2	Plug
P3	18	Plug
P6	2	Plug
P8	2	Plug
P12	4	Plug
P16	2	Plug, Strut, Inboard
P19	2	Plug

Part No.	Qty. per A/C	Description
-21	4	Pushrod
P206	2	Plug
P208	2	Plug
P209	4	Plug, Rodend
P210	2	Plug, Strut, Outboard
P211	4	Plug
P302	5	Plug
P18	2	Plug, Axle
P11	2	Plug, Downtube
RS	2	Rib, Stabilizer
R208L	1	Rib, Root, L
R208R	1	Rib, Root, R
SCS250	2	Cap screw
S344	12	Spacer
90	4	Spacer
500	8	Spacer
S1000	5	Spacer
S1003	2	Spacer
S1205	2	Spacer
S1032	1	Spacer
S1410	1	Spacer
S550	2	Spacer
T2	2	Rib, Ruddervator
T9	1	Tube, Stabilizer Mount
T11S	1	Spreader
T14	1	Sidetube L
T15	1	Sidetube R
T52	4	Sleeve, Rudder Pedal
T47	4	Collar, Nosewheel Axle
T53	4	Axle, Rudder Pedal

Part No.	Qty. per A/C	Description
[illegible]	2	Collar, Main Axle
T55	2	Tube, Stabilizer Leading Edge
T43	2	Downtube
T56	2	Tube, Stabilizer Trailing Edge
T57	2	Tube, Stabilizer, Outboard
T58	2	Tube, Ruddervator
T59	2	Torque Tube, Ruddervator
T203	1	Torque Tube, Vertical
T212	2	Tube, Front
T214	1	Sidetube, Inboard, Left
T215	1	Sidetube, Inboard, Right
T216	1	Axle Tube, 1 3/8
T217	1	Axle Tube, 1 1/4
T218	1	Axle Tube, 1 1/8
T219	1	Downtube Splice, Outer
T220	1	Axle, Nosewheel, Outer
T[illegible]3	1	Downtube Splice, Inner
[illegible]4	1	Downtube, Vertical
T227	2	Pushrod, Rudder Control
T229	2	Pushrod, Aileron Control
T232	4	Sleeve
T233	2	Pushrod, stick, Vertical
T234	2	Torque Tube, Ruddervator
T235	2	Rib, Stabilizer, Inboard
T243	2	Jury Strut, Front
T244	2	Jury Strut, Rear
T245	1	Retainer, Leg
T246	1	Axle, Nosewheel, Inner
T247	2	Pushrod, Elevator, Primary
T248	1	Seat Support Tube
T313	2	Splice
T327	2	Tube, Locking

Part No.	Qty. per A/C	Description
[illegible]	175	Washer
W3T	41	Washer
W3S	6	Washer
W3L	7	Washer
W4H	3	Washer
W4T	6	Washer
W4VS	2	Washer
W5H	4	Washer
34	38	Bolt
35	62	Bolt
36	22	Bolt
35DS	8	Bolt
37	22	Bolt
310	2	Bolt
311	5	Bolt
312	7	Bolt
[illegible]	28	Bolt
314	29	Bolt
315	21	Bolt
316	14	Bolt
316DS	4	Bolt
317	6	Bolt
317DS	2	Bolt
320	12	Bolt
323	13	Bolt
324	2	Bolt
46DH	5	Bolt
46	4	Bolt
414	2	Bolt
417	2	Bolt
430	2	Bolt
432DS	1	Bolt
	1	Indicator, Airspeed
-	1	Bracket, ASI
-	2	Plug, Banana

Part No.	Qty. per A/C	Description
-	2	Spring, Brake Return
-	2	Adjuster, Brake Cable
-	4	Cable G
-	2	Decal, "Lazair™"
-	2	Assembly, Engine
-	2	Manual, Engine
-	2	Filter, Fuel
-	2	Inner Tube (400 X 8)
-	2	Nosewheel
-	1	Manual, Owner's
-	2	Propeller, 34-20
-	38	Snap, Male
-	2	Grip, Control Stick
-	2	Seatbelt
-	2	Switch, Magneto
-	1	Strap, Rubber
	2	Cover, Seat
	2	Cushion, Seat
-	2	Wire, Safety
-	1	Wire, Magneto
-	2	Tab, Spreader
-	8	Tie-Wrap
-	2	Tire (400 X 8)
-	1	Tube, Gap
-	1	Tape, Tedlar, 2 1/2", Roll
-	4	Tape, Double Face, 1/2", Roll
-	1	Tape, Double Face Foam, Roll
-	1	Weather Strip, Roll
-	4	Bearing, Main Wheel
-	4	Wire Stop
-	2	Bulb, Primer
-	1	Pliobond
-	1	Tape Paddle

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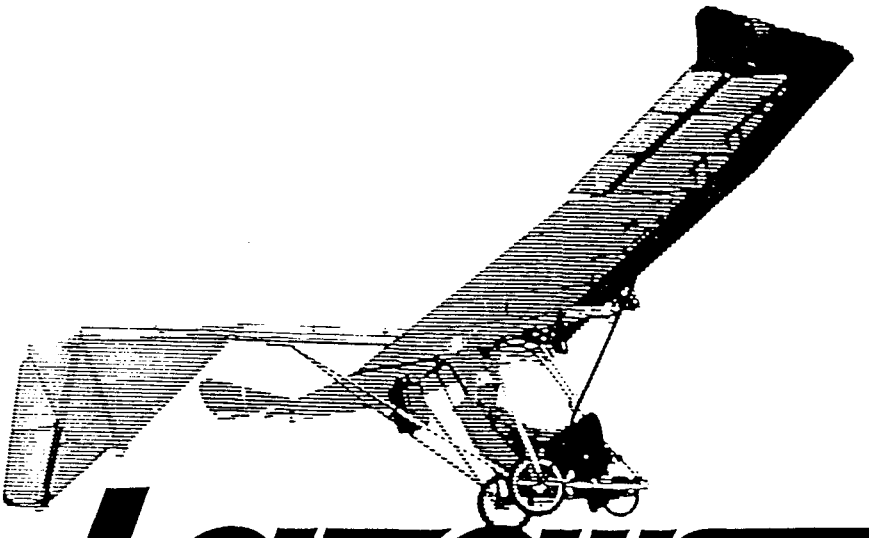
Revised 23 Feb. 1984



Lazair™ II

Two-place Microlight Trainer

ASSEMBLY MANUAL

ULTRAFLIGHT MANUFACTURING LIMITED

SECTION 1

INTRODUCTION AND GENERAL CONSTRUCTION TECHNIQUES

1.1 INTRODUCTION

This manual has been written to assist the Lazair dealer in the construction of his Lazair II two-place trainer. Some sections of the manual are almost identical with the manual for the single place Lazair, and therefore contain sufficient detail for the novice builder. However, other sections which have been written specifically for the Lazair II have been written under the assumption that the builder is familiar with the general methods and techniques of Lazair construction, and therefore less detail is included.

Although the Lazair II is very similar to the single place Lazair in concept and in flight characteristics, there are many structural and functional differences, a few of which are listed below:

(a) A twenty-inch mid section has been added between the wings. This provides an additional 9 square feet of wing area.

(b) The wing leading edge skin is doubled near the root.

(c) The main spar doubler at the root has been made larger.

(d) The D-cell capstrips have been augmented by additional fabricated U-channels and extruded angles.

(e) The outboard strut fitting has additional stabilization for forward loading.

(f) The lift strut has an additional outer sleeve.

(g) Jury struts have been added.

(h) Additional vertical stabilization of the wing ribs has been incorporated.

(i) Dual controls have been incorporated. Although the aileron control linkage is somewhat similar to earlier model Lazairs, an overlapping control horn has been incorporated to provide almost as much differential aileron travel as in the Series III Lazair.

(j) Ruddervator pushrods have been increased to 1/2 inch diameter with fewer pushrod guides.

(k) Stabilizers have been redesigned slightly to provide clearance for the pushrods and facilitate assembly.

1.2 USING THIS ASSEMBLY MANUAL

We do *not*, as you might have expected, suggest that you read the Assembly Manual from cover to cover before starting construction. To do so would probably leave you with the mistaken impression that building the Lazair is considerably more difficult and complicated than it actually is. As you progress through the assembly of the Lazair in a step-by-step sequence, with the individual components spread out in front of you, the written instructions and the accompanying drawings should be relatively easy to understand. If any particular instruction is not obvious the first time you read it, study the drawings and try to orient yourself so that you can see your partially completed assembly from the same vantage point as the drawings. In some cases, it may be helpful to read ahead one or two steps to better understand the instruction you are working on.

The illustrated parts catalogue (provided with the kit) contains complete exploded views of all the assemblies on the aircraft. Keeping it open at the appropriate page while you're working will facilitate identifying and orienting components properly.

1.3 TOOLS

Following is a list of the basic tools required to assemble the Lazair:

Electric Drill	Wrenches — 3/8", 7/16"(2 ea)
Drill Bits — 1/16, 7/32, 15/64, 3/16, 1/4 1/8, 9/32, 5/16, 1/2 (inches)	Nutdriver — 3/8"
	Screwdriver
	Centre Punch
Blind Rivet Gun	Hacksaw
Flat File	Tin Snips
Half Round File	Hammer
Felt Tip Marker	Soldering Iron
Measuring Tape	12 inch Ruler
Two C-Clamps or Locking Pliers	Allen Wrench — 5/32", 1/4"
Framing Square	Masking Tape
Plumb Bob	PVC Electrical Tape
String	Torque Wrench
Small Knife	Spirit Level

In addition to the tools listed, you will also need a saw to cut the plywood for the wing saddles and a heat source for shrinking the wing covering. A 20,000 BTU propane heater may be rented for this purpose and will do the job very quickly, but an ordinary dry iron can also be used.

For drilling several of the holes in the control system, the use of a drillpress is recommended. However, these holes may be drilled with a hand drill provided that you are extremely careful and the alignment is correct. Enlist the aid of a friend to sight the drill position when the alignment is critical.

You may find that some of the fittings with predrilled or prepunched holes have holes which appear too small. This has been done to ensure a good fit if the AN bolts are at the low end of their tolerance limit. If necessary, run a drill through the holes in the fittings to allow the bolts to fit in easily.

1.4 WORKING WITH ALUMINUM ALLOYS

1.4.1 Before each component is installed, all sharp corners, burrs and sharp edges should be removed by filing or sanding. This not only helps to prevent injuries and improve the appearance of the airplane, but it also reduces the possibility of fatigue failures.

1.4.2 For marking the aluminum, use a felt tip marker -- the one's marked "permanent" are best. These marks may be removed later with lacquer thinner. *Never* use a scriber on aluminum except for marking a cutting line.

1.4.3 When drilling holes, keep the drill bit perpendicular to the surfact to be drilled, and always use a sharp drill to prevent wandering. Remove all drill shavings from between mated parts before riveting. It is helpful to centre punch holes before starting to drill them.

1.4.4 Where a hole size or location is very critical (e.g. for wing strut bolts, control system components, etc.) it is best to drill an undersize hole first, then ream it with a drill of the required size.

1.5 RIVETS

1.5.1 Three types of rivets are supplied in the Lazair II kit: short aluminum, long aluminum, and stainless steel. *Always use short aluminum rivets unless there are specific instructions to use long aluminum or stainless steel.*

1.5.2 Use a 1/8 inch (or number 30) drill for all rivets.

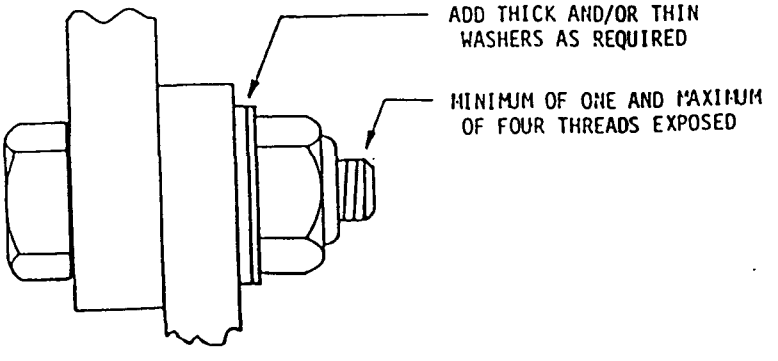
1.5.3 Wherever possible, rivet holes should be at least 1/4 inch away from the edge of the material to be riveted.

1.5.4 The Avex aluminum rivets supplied with the Lazair kit are superior to the more common type of blind rivets in many ways, but they are not easy to remove because the steel mandrel is harder than the surrounding aluminum. If a rivet must be removed, drill through the head only, then push the remainder of the rivet through the hole. This will avoid enlarging the hole.

1.6 BOLTS, NUTS, AND WASHERS

1.6.1 The bolts supplied in your Lazair kit are the Air Force - Navy Aeronautical Standard type, commonly known as AN bolts. To facilitate identification of bolts in the kit and in the manual, the extraneous prefixes and suffixes have been dropped so that a typical AN3-14A would be identified in the kit as a 314. Note that the first digit specifies the diameter in sixteenths of an inch, while the remaining digits specify the length in inches and/or eighths of an inch. For example our 314 would be 3/16 inches in diameter by 1 4/8 = 1 1/2 inches long, and a 45 would be 1/4 inch diameter by 5/8 inches long.

1.6.2 In many places in the text and in the exploded views you will notice a requirement for washers under the nut or under the head of the bolt. Occasionally a washer is required as a bearing surface, but in most cases washers are used as shims to compensate for the bolt length. Washers should be used as required so that when the nut is properly tightened, one to four threads are visible past the nut. Washers are provided in two thicknesses, 1/32 inch (W3T and W4T) and 1/16 inch (W3H and W4H) for this purpose. Use washers as recommended in the manual and in the parts catalogue initially, then add or delete *if necessary* to achieve the correct number of exposed threads as described above.



1.6.3 The nuts provided in the kit are AN type 365 elastic stopnuts. These nuts have a nylon insert which grips the threads on the bolt and eliminates the need for a lockwasher, lockwire or cotter pin *if they are used correctly*. They must not be used in applications where components move or rotate in such a way that they would tend to unscrew the nut. It is also essential that the bolt is clean and free from any grease or oil which could degrade the gripping ability of the nylon. Since the gripping ability of the nylon is progressively degraded every time a nut is put on and removed, *it is recommended that elastic stopnuts not be used more than three times*. Never clean out an elastic stopnut with a tap as this would render the nylon useless.

1.6.4 When tightening a nut, hold the bolt with a wrench and turn the nut with another wrench. Do *not* turn the bolt. Turning the bolt tends to enlarge the hole and removes the corrosion protection (cadmium plating) from the bolt.

1.6.5 In a few locations, where a nut and bolt may be subjected to rotation, bolts with a drilled shank and castle nuts are provided so that the nuts may be locked with a cotter pin. When using these nuts, they should be tightened as indicated in the manual, using washers as described in paragraph 1.6.2 to ensure that the hole for the cotter pin is properly aligned with one of the slots in the nut. Note that bolts with a drilled shank are designated with a DS suffix (e.g. 35DS) and the castle nuts have a C prefix (e.g. CN3).

1.6.6 Unless otherwise specified, all bolts should be inserted so that the head of the bolt is facing the direction of flight, or upwards, depending on the plane of the hole.

1.6.7 Although it should not be necessary to use a torque wrench to tighten all the nuts on the aircraft, it is recommended that you use one initially until you develop an adequate "feel" for the required torque. Unless otherwise noted in the manual, nuts should be tightened to the torque value indicated below.

Size	Torque
AN3 (3/16 inch)	20 to 25 inch pounds (1.7 to 2 Ft. lbs.)
AN4 (1/4 inch)	50 to 70 inch pounds (4 to 6 Ft. lbs.)

1.7 NYLON PLUGS

1.7.1 Although the nylon plugs which are used in the aluminum alloy tubes are machined after molding, they can sometimes be difficult to insert because of the tolerance on the inside diameter of the tubing. If a plug appears too large to fit into the tubing, sand or file it as required to achieve a good tight fit before trying to hammer it into the tube. If you get a plug half way in and it won't go any further, stick the end of the tubing into a bucket of ice until the nylon shrinks enough to be driven in.

SPECIAL NOTE REGARDING LONG ALUMINUM RIVETS

The long aluminum rivets are of a new closed-end design recently introduced by USM and share many of the advantages of the Avex rivet. However, they have a mandrel which is smaller than most standard 1/8 inch rivets. With some rivet tools (and especially those with an oversize hole in the nozzle) it may be necessary to use an adaptor over the end of the nozzle to prevent pulling rivet material into the nozzle. This can be made from a small piece of 1/16 inch steel with a 1/16 inch (#52 drill) hole in it. Or, if your rivet tool has a nozzle for 3/32 inch rivets, you can drill it out to the correct size.

SECTION 2

WING SADDLE CONSTRUCTION

2.1 GENERAL CONSTRUCTION AND USE

Before starting construction of the wing it is essential that a pair of wing saddles be available to hold the wing in working position. The type of saddle described below is recommended because it can be used either in the high position (as shown) or in the low position, with the extension (item 4) removed.

2.1.2 The materials for the saddles are not part of the Lazair kit and should be obtained locally. With the exception of item 2, all parts are cut from 3/4 inch plywood. Particle board may be used, but plywood is preferable because it is stronger. Item 2 can be made from spruce, pine or any other available softwood.

2.2 CONSTRUCTION DETAILS

2.2.1 Cut items 1, 3, 4, and 5 from 3/4 inch plywood to the dimensions shown in the table.

2.2.2 Cut item 2 from a piece of 2 x 2 inch (approximately) softwood.

2.2.3 Cut the D-cell contour in item 5 using the full-size template provided.

2.2.4 Fasten items 1, 2, and 3 together with 2 inch nails.

2.2.5 Bolt the remainder of the assembly together using 3/8 by 2 inch bolts, nuts and washers as shown.

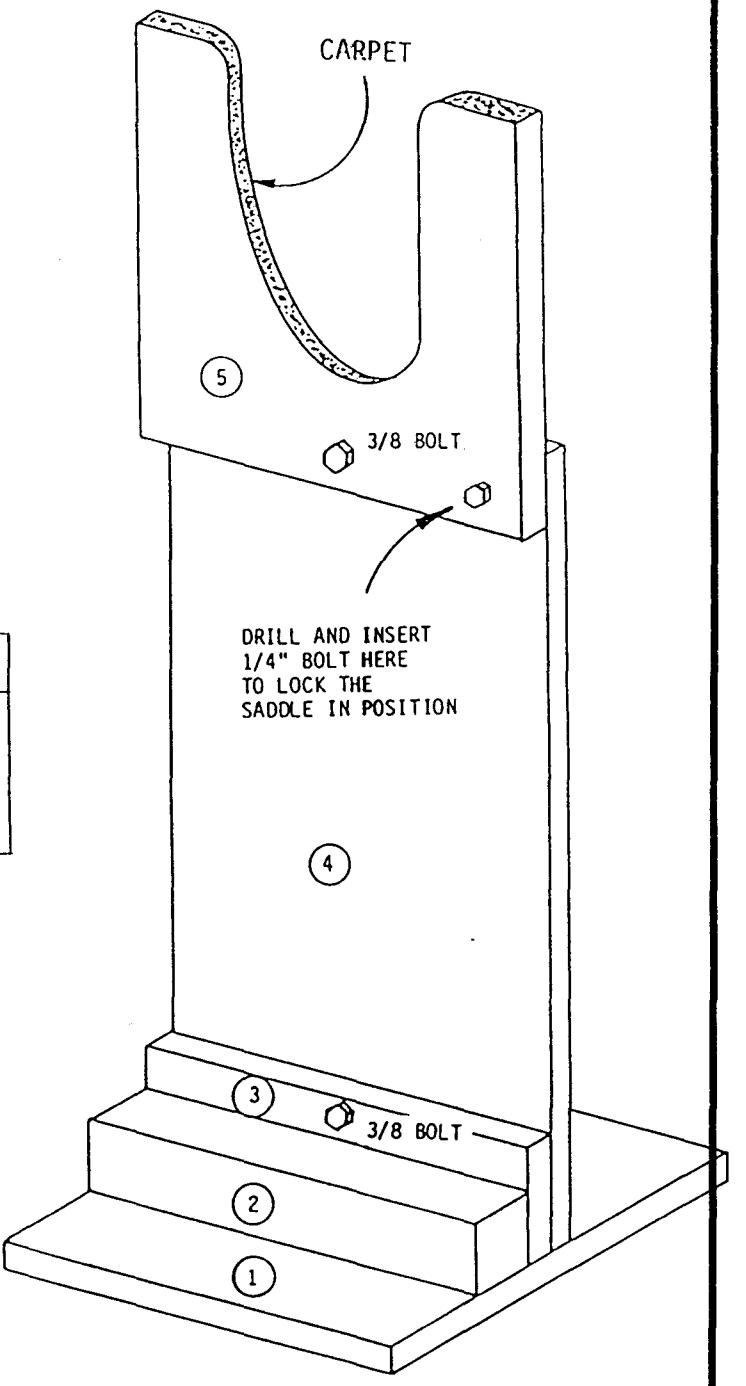
2.2.6 Line the contour of item 5 with a one inch wide strip of carpet material. If staples or nails are used to hold the carpet in place be sure thay are driven in far enough to avoid scratching the D-cell.

MATERIAL SIZES

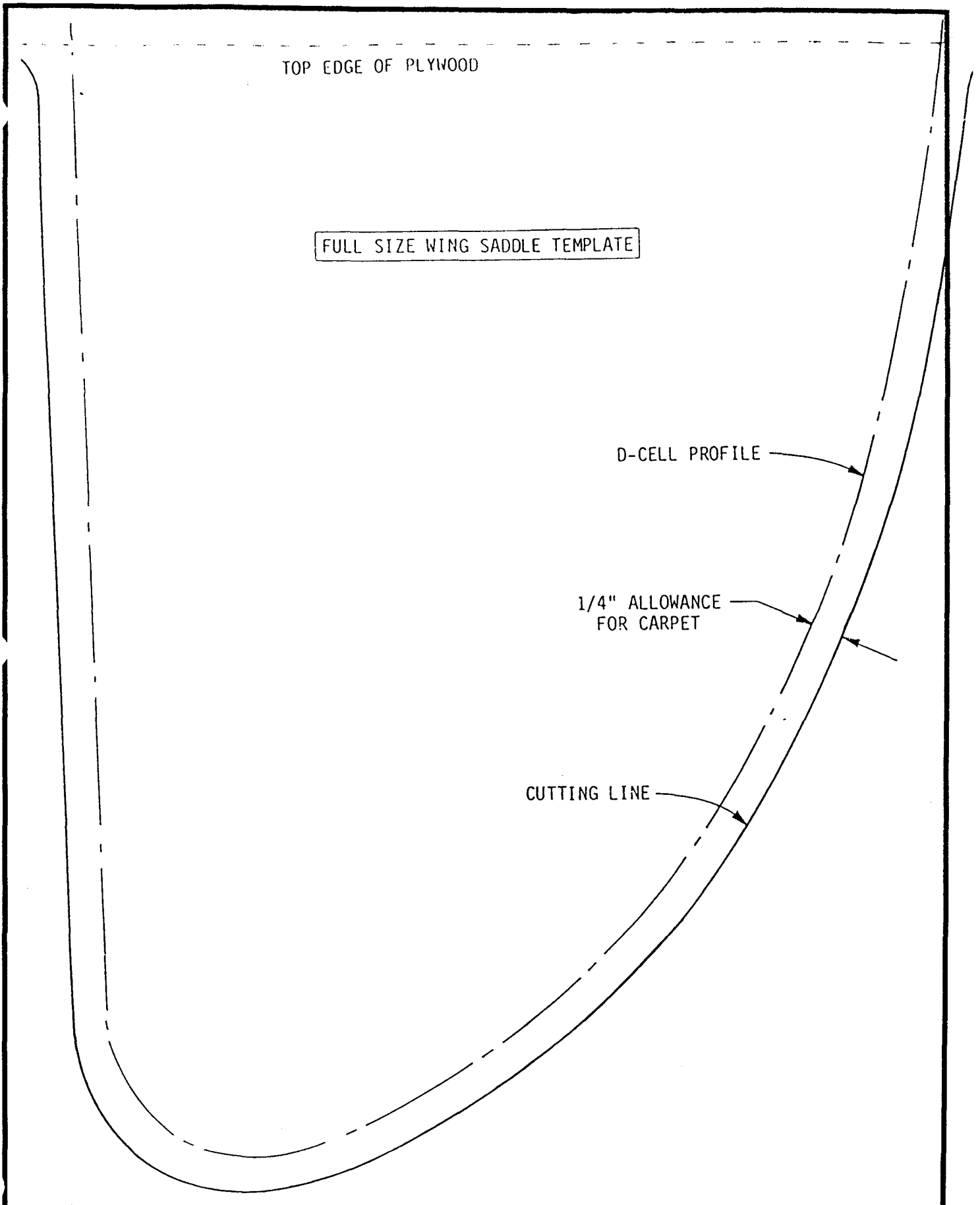
ITEM	SIZE (INCHES)
1	12 x 14
3	12 x 4 1/2
4	12 x 36
5	12 x 14

BOLT HOLE POSITION

ITEM	HOLE POSITION
3	3" from bottom
4	3" from bottom and 1" from top
5	1 1/2" from bottom



2.2.7 To convert the saddle to the low position, remove item 4 and bolt item 5 directly to item 3. Note that item 5 can pivot about the bolt if the nut is loosened and the locking pin is removed. This feature is required to set up the washout measurement as described in section 3.4.


TOP EDGE OF PLYWOOD
FULL SIZE WING SADDLE TEMPLATE
D-CELL PROFILE
1/4" ALLOWANCE
FOR CARPET
CUTTING LINE

SECTION 3

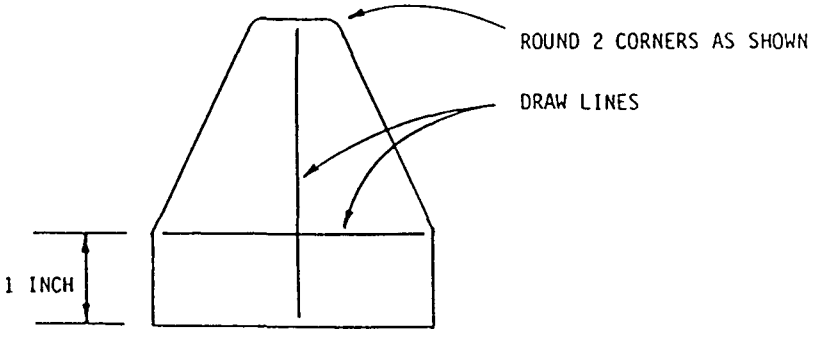
WING ASSEMBLY

NOTES:
1. *The instructions are written for the left wing. For the right wing, use parts with suffix R rather than L (except for gussets GBR which are the same for both left and right wing).*
2. *Terms such as front, rear, leading edge trailing edge, fore, aft, top, bottom, etc., refer to the wing in its normal flying orientation,* not *as positioned in the saddles.*

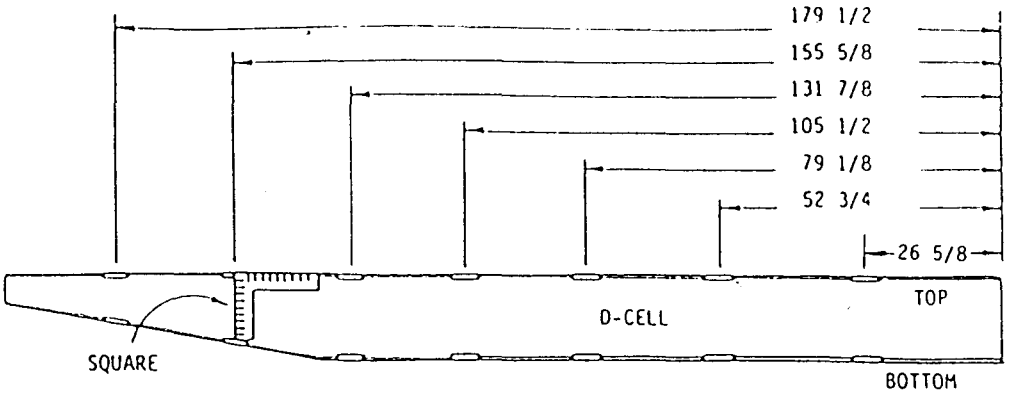
3.1 RIB GUSSET ATTACHMENT

3.1.1 Place the D-cell in the high saddles.

3.1.2 Round the two corners on all gussets marked GBR with a file as shown in the figure below. Mark the centreline on each GBR and draw a line 1 inch from the bottom edge as shown.



3.1.3 Mark the locations of the GBR's on the D-cell as shown. Measure the locations on the upper (straight) surface of the D-cell and use a square to project to the lower surface. Note that the 131 7/8 inch dimension is critical and should be held within ± 1/16 of an inch. A tolerance of ± 1/8 inch is acceptable for the others.



NOTE: All dimensions are from the root of the D-cell to the centreline of the GBR gussets.

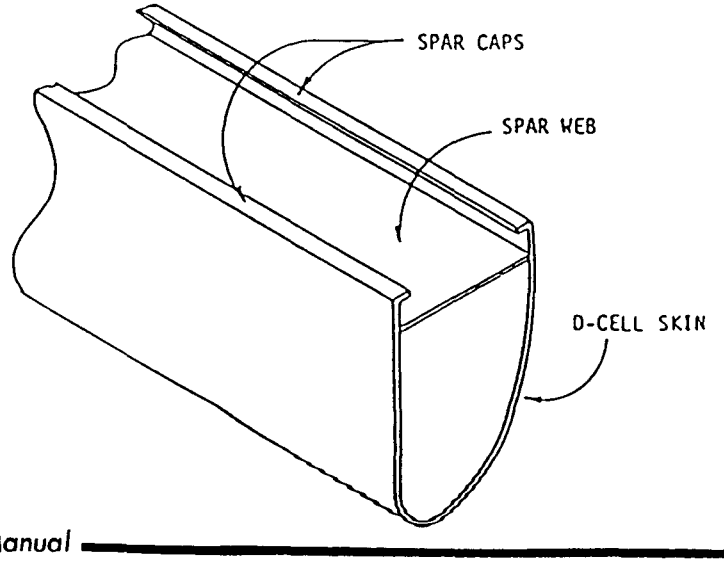
3.1.4 Insert the GBR's under the D-cell skin to a depth of 1 inch at the six outboard locations specified. Use a G93 at the inboard (26 5/8") location.

3.1.5 Drill and rivet gussets in place using 3 rivets in each. Position the rivets along the existing rivet line on the D-cell. Remember to clean out the drill shavings between mated surfaces before riveting. *Use long (Type 44) rivets in all locations where they pass through the extruded angle in the spar cap.*

3.2 D-CELL ROOT RIB INSTALLATION

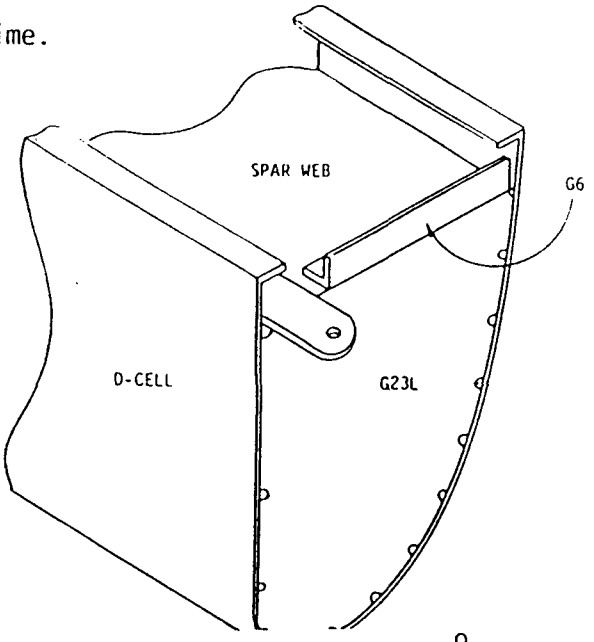
3.2.1 Make sure the tabs on the D-cell root rib G23L are bent at 90^{o}.

3.2.2 Insert G23L into the end of the D-cell (tabs first). Make sure all tabs are inside the skin of the D-cell and the outer surface of G23L is flush with the end of the D-cell.

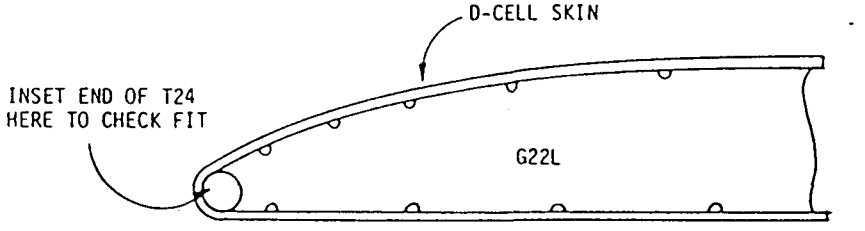


3.2.3 Drill and rivet G23L to the D-cell skin. Put one rivet in each short tab and three rivets in each long tab. Do *not* rivet to the spar web at this time.

3.2.4 Fit angle gusset G6 to the spar web as shown. G6 should be positioned so that it forms a smooth continuation of G23L. Rivet G6 to the spar web and G23L with six equally spaced rivets.



3.2.5 Make sure the tabs on the D-cell tip rib G22L are bent at 90^0 and fit G22L into the D-cell (tabs first). Cut or file the opening at the leading edge of G22L as necessary to provide a 1/2 inch diameter hole for T24 to be inserted later.

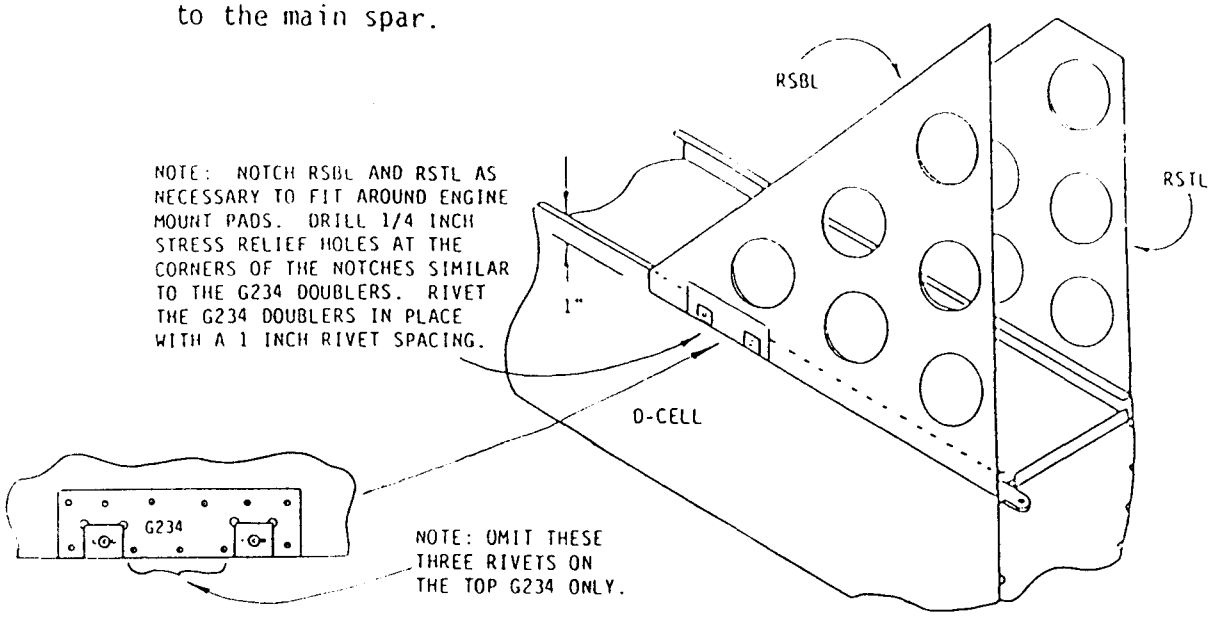


3.2.6 Drill and rivet G22L to the D-cell skin and spar web. Use two rivets in each short tab and one inch rivet spacing in the long tabs.

3.3 REAR SPAR BOX ASSEMBLY

3.3.1 Fit rear spar top RSTL to the D-cell (at the G23 end) so that the bottom of RSTL is one inch ahead of the edge of the D-cell skin. Note that RSTL goes on the outside of the D-cell skin. Clamp RSTL in place with C-clamps or vice-grips with cardboard pads

to avoid scratching the aluminum. Be sure that one edge of RSTL is flush with the end of the D-cell and the other edge is parallel to the main spar.



3.3.2 Drill and rivet RSTL to the D-cell. Put the first rivet 1/2 inch from the end of the D-cell and use one inch spacing for the remaining rivets. *Use long (Type 44) rivets in all locations where they pass through the extruded angle in the spar cap.*

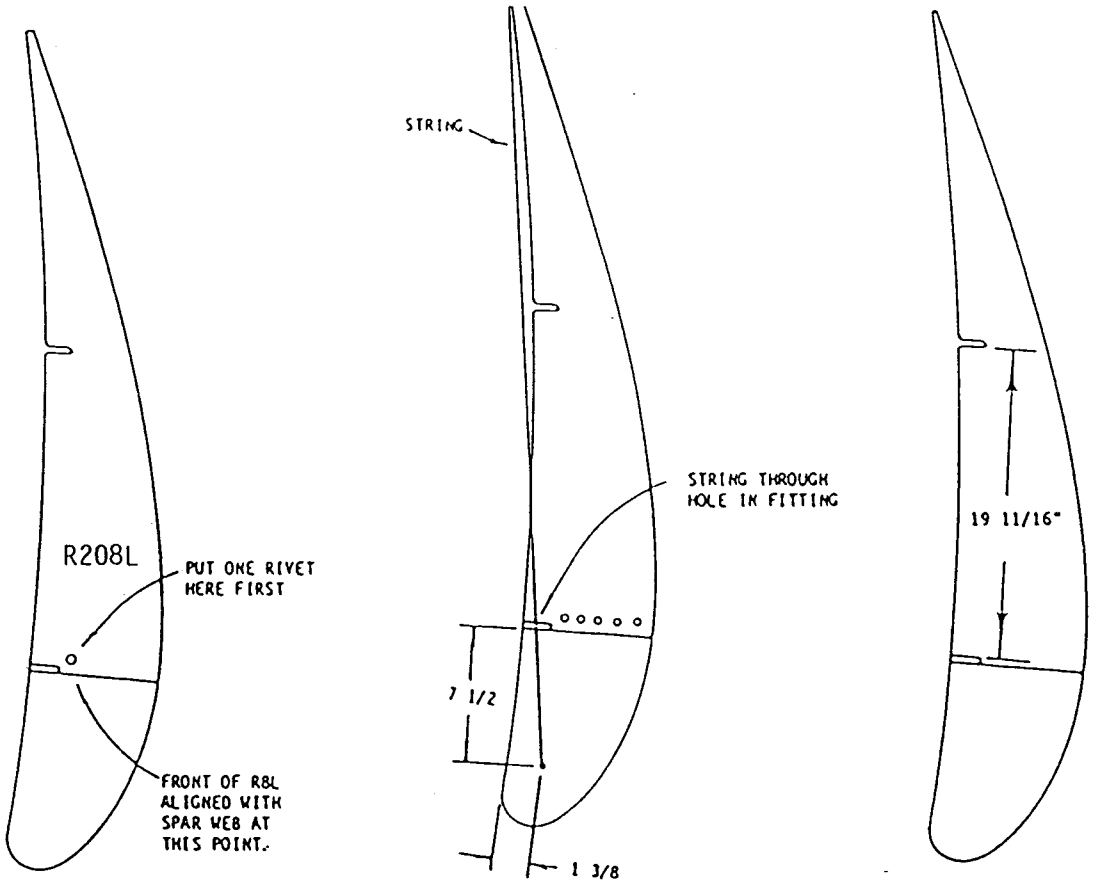
3.3.3 Similarly clamp, drill and rivet the rear spar bottom RSBL to the D-cell.

3.3.4 Remove all part numbers from the inner surfaces of RSBL and RSTL with lacquer thinner (these will become inaccessible when the spar box is complete).

3.3.5 Remove the D-cell from the saddles. Change the saddles from the high to the low position and replace the D-cell in the saddles.

Note: If your shop has sufficient ceiling height (in excess of 8 feet) you may prefer to leave the wing in the high saddles until all the ribs are installed (end of section 3.4). You might also find it convenient to revert to the high saddles for the installation of the aileron bellcrank assembly in section 3.7.

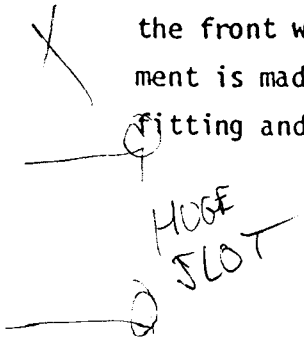
3.3.6 Position the root rib R208L as shown. Make sure the front edge of R208L is aligned with the spar web, and the bottom of R208L is in line with the bottom of the D-Cell. Rivet R208L to G6 with *one rivet only* in the bottom corner as shown.



3.3.7 Put a mark on G23L 7-1/2 inches ahead of the spar web and 1-3/8 inches above the bottom of the D-Cell. Tape a string to this mark, pass it through the hole in the wing attach fitting and tape it to the bottom of R208L at the trailing edge. Adjust the position of R208L so that the string is straight and passes through the centre of the hole in the wing attach fitting.

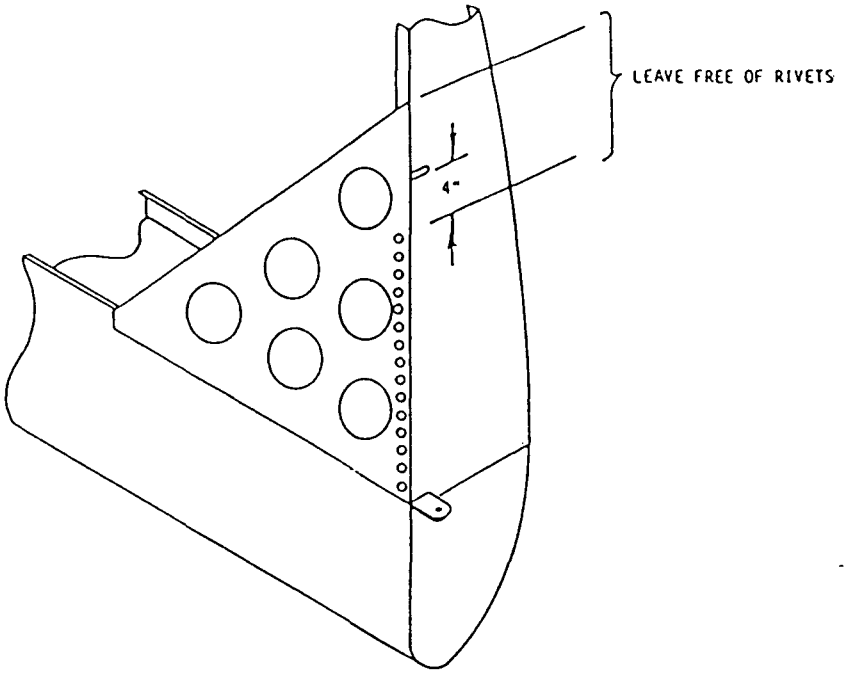
3.3.8 Rivet R208L to G6 with five more rivets with a one-inch rivet spacing.

3.3.9 File the slot in R208L to obtain a spacing of 19-11/16 inches between the front wing attach fitting and the slot. Note that this measurement is made between the *rear* surface of the front wing attach fitting and the *leading* edge of the slot.

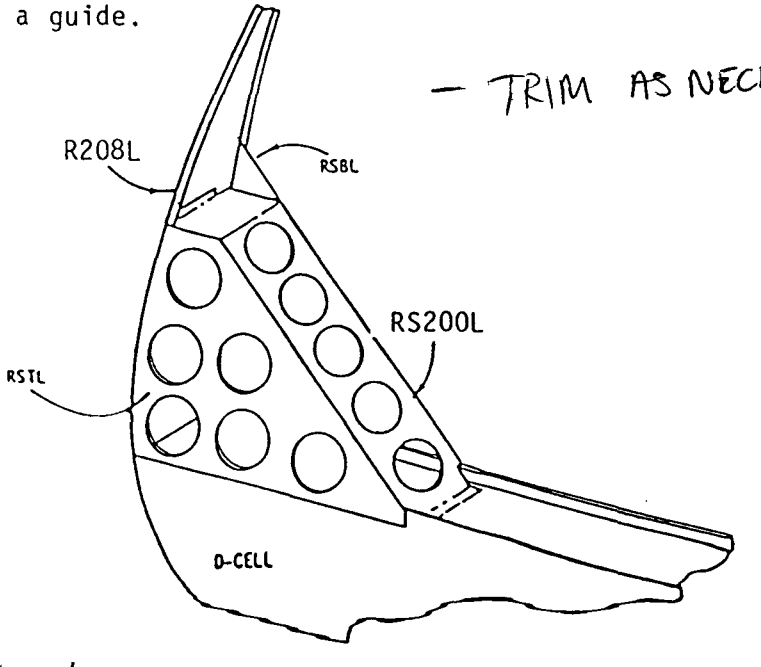


3.3.10 Rivet RSTL to R208L with a one-inch rivet spacing. Make sure that R208L is parallel to the edge of RSTL. Use clamps if necessary. Leave two inches at the trailing edge of RSTL free of rivets.

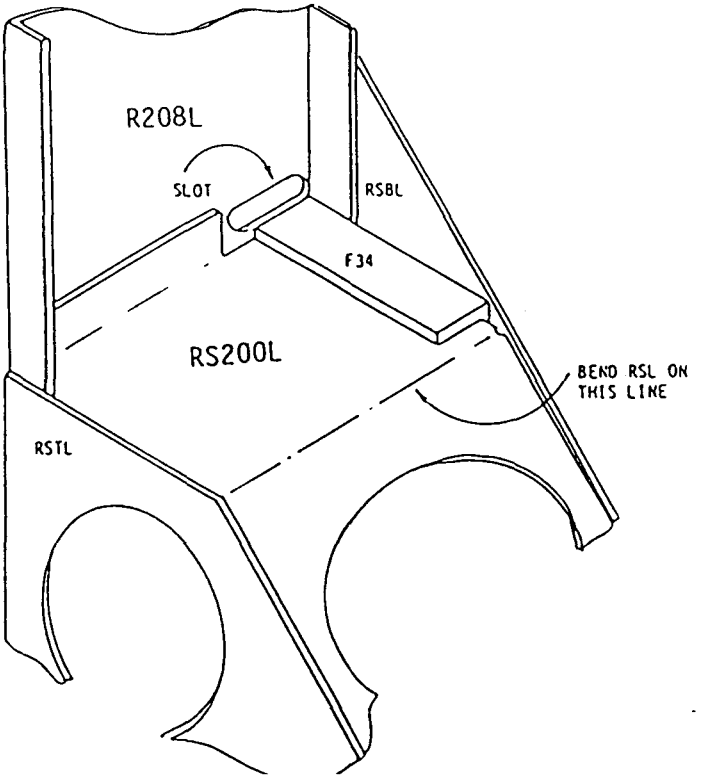
3.3.11 Rivet RSBL to R208L with one-inch rivet spacing. Leave the rear corner free of rivets as shown to allow for the insertion of G12 later.



3.3.12 Fit RS200L between RSTL and RSBL. Bend RS200L as necessary using RSTL as a guide.



3.3.13 Insert one flange of F34 between RS200L and RSBL as shown. Make sure that the exposed surface of F34 is flush with the forward edge of the slot in R208L and is 19 11/16 inches from the rear surface of the wing attach fitting (as established in step 3.3.9). *Make sure that the exposed surface of F34 is parallel to the spar web.*



3.3.14 Rivet RS200L to R208L with 4 equally spaced rivets through the rear tab of RSL.

3.3.15 Rivet RSTL to RS200L with one-inch rivet spacing. Rivet the short section of RS200L (the trailing edge) first, making sure that the surface of RS200L is parallel to the main spar web. *Before riveting along the hypotenuse of RSTL, make sure that the foreward tab of RS200L is positioned tightly against the spar web.* Note that the surface of RS200L might not be flush with the edge of RSTL and RSBL. This condition is normal.

3.3.16 Rivet RSBL to RS200L along the hypotenuse only. Do not put any rivets within 5 inches of F34.

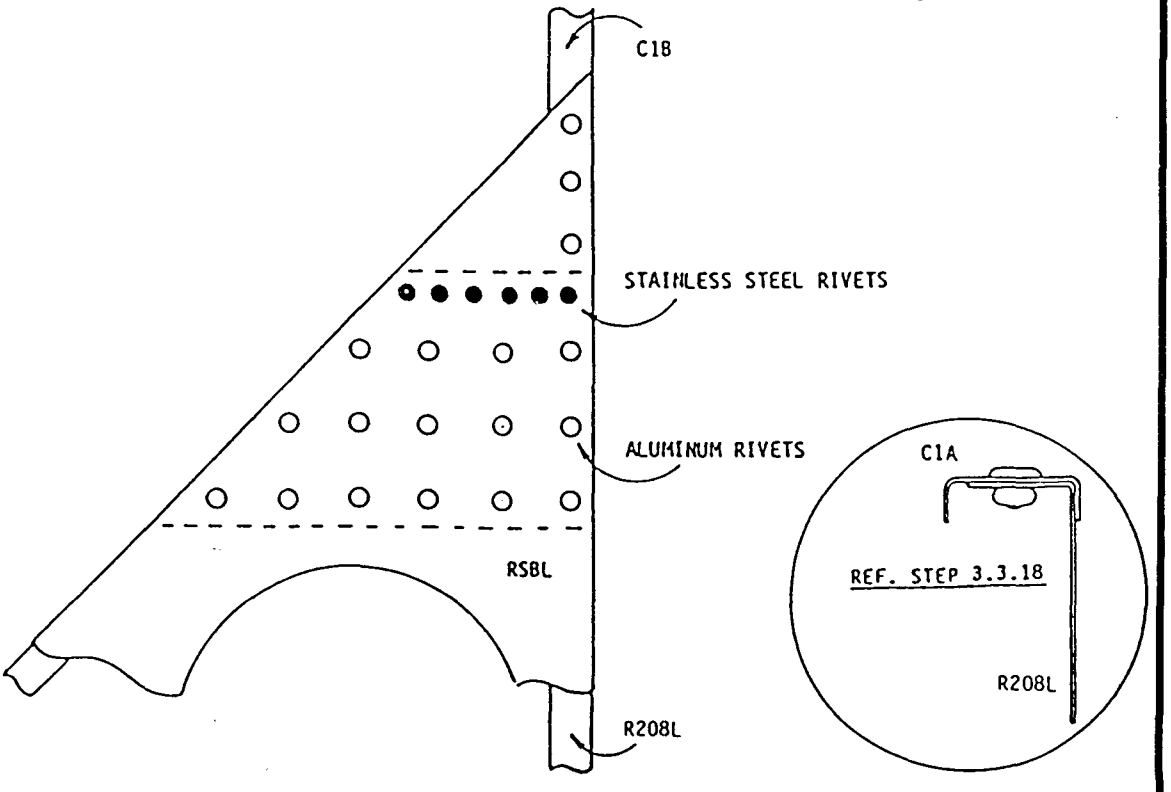
3.3.17 Rivet RS200L to the main spar web with 6 equally spaced rivets.

3.3.18 Position capstrip C1A on the top edge of R208L so that the trailing edge of C1A is 57 5/8 inches behind the leading edge of the D-cell.

3.3.19 Rivet C1A to R208L with a two-inch rivet spacing. Put the first rivet 1/2 inch from the leading edge of C1A and do not put any rivets within 2 1/4" of the trailing edge of C1A. Make sure that C1A and R208L are squeezed tightly together while riveting.

3.3.20 Similarly rivet C1B to the bottom of R208L so that the trailing edge of C1B is 57 5/8 inches from the leading edge of the D-cell. Do not rivet within 2-1/4 inches of the trailing edge nor within 3-1/4 inches of the leading edge of C1B.

3.3.21 Fit a G12 gusset under the free corner of RSBL. Recheck the position of F34 (as in step 3.3.13) and rivet as shown. Note that the rear row of six stainless steel rivets should go through RSBL, G12, and F34. The remaining 18 rivets are aluminum.



3.3.22 If the hypotenuse of RSBL and/or RSTL projects beyond the surface of RS200L , bend it inward slightly (using a block of wood and a hammer) so that the edge of the aluminum cannot contact the tedlar wing covering.

Note: You may have noticed that the corner of the spar box projects slightly above the plane of the wing covering. This is normal.

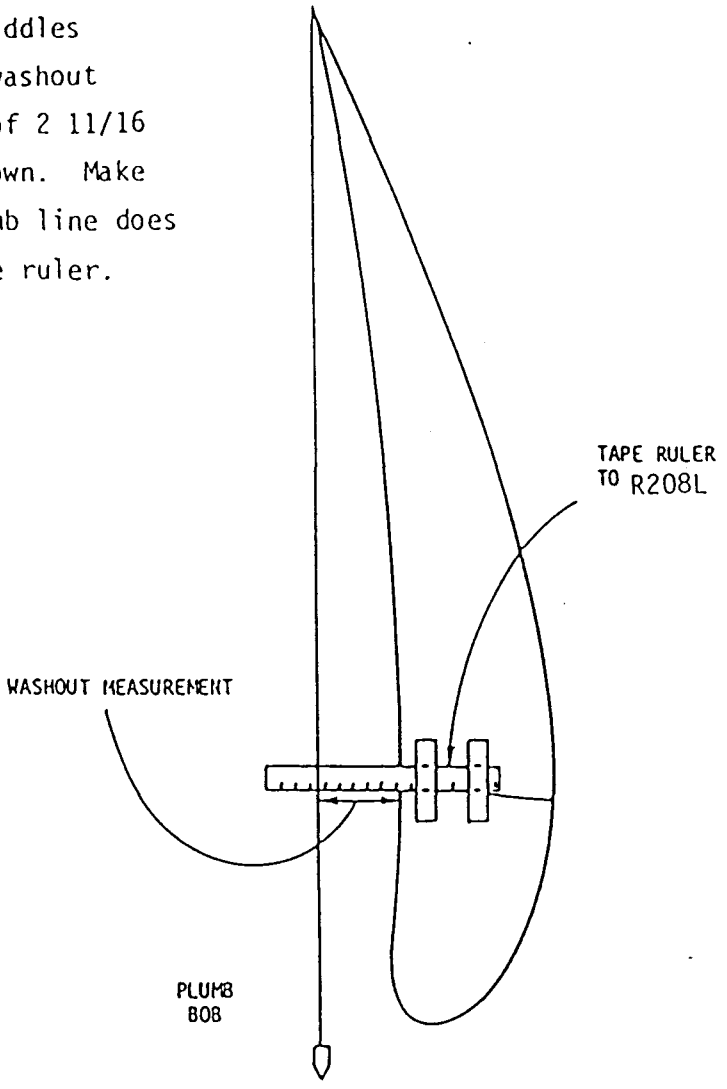
3.4 RIB ATTACHMENT

A WORD ABOUT WASHOUT

Washout (or twist) in a wing is a method used to improve the stability of an aircraft during a stall. By twisting the wing, the wing root has a higher angle of attack than the tips. Therefore, as the aircraft begins to stall, the wing root stalls first, and the tips keep flying. It should be obvious that it is important to build exactly the same amount of washout into both wings.

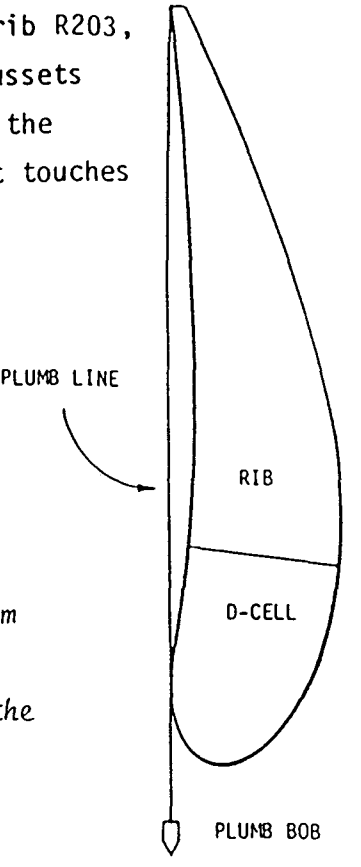
The amount of washout in the Lazair is controlled by measuring the distance between a plumb line (dropped from the trailing edge) and the bottom of the D-cell at the main spar. This distance will be referred to as the washout measurement.

3.4.1 Adjust the saddles to obtain a washout measurement of 2 11/16 inches as shown. Make sure the plumb line does not touch the ruler.

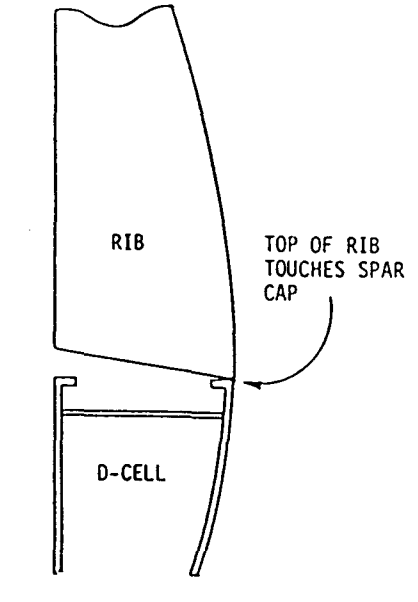


NOTE: *During the next three steps, make sure the wing does not move in the saddles, thereby changing the washout measurement. If the D-cell is not a tight fit in the saddles, it may be necessary to use some small wooden wedges or shims between the saddles and the D-cell. If there is any doubt,* recheck the washout measurement.

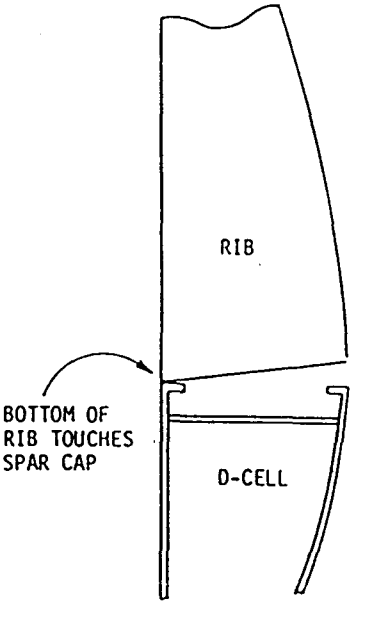
3.4.2 Tape the plumb line to the trailing edge of rib R203, and insert the rib between the appropriate gussets (131 7/8 inches from the wing root). Adjust the position of the rib until the plumb line just touches the bottom of the D-cell as shown.



NOTE: *You will notice that either condition A or condition B (as shown below) will exist. Either the top corner or the bottom corner of the rib will touch the spar cap The corner which touches the spar cap is the one which is riveted first.*

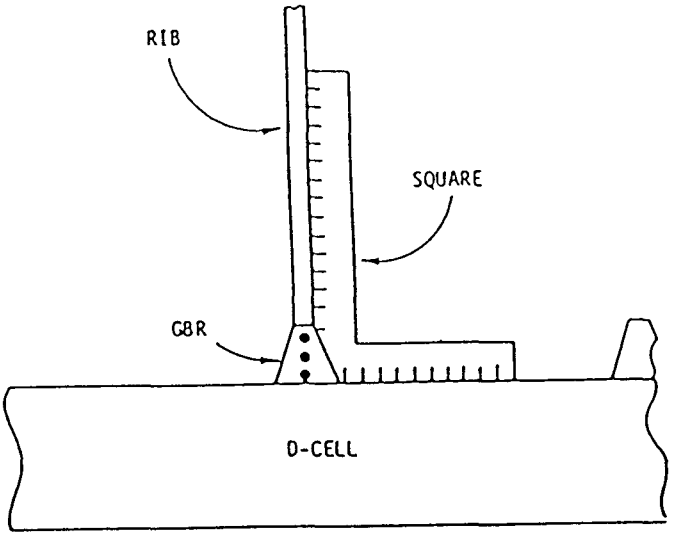


CONDITION A



CONDITION B

3.4.3 Rivet one corner of R203 to the GBR gusset with 3 rivets as shown. While drilling and riveting, hold a square against the side of the rib to ensure that it is perpendicular to the D-cell.



3.4.4 Again adjust the position of R203 so that the plumb line just touches the D-cell as in step 3.4.2. Temporarily use an aileron rib (RA) as a wedge under the unriveted corner of R203 to hold R203 in position. Rivet the remaining side of R203 through the GBR.

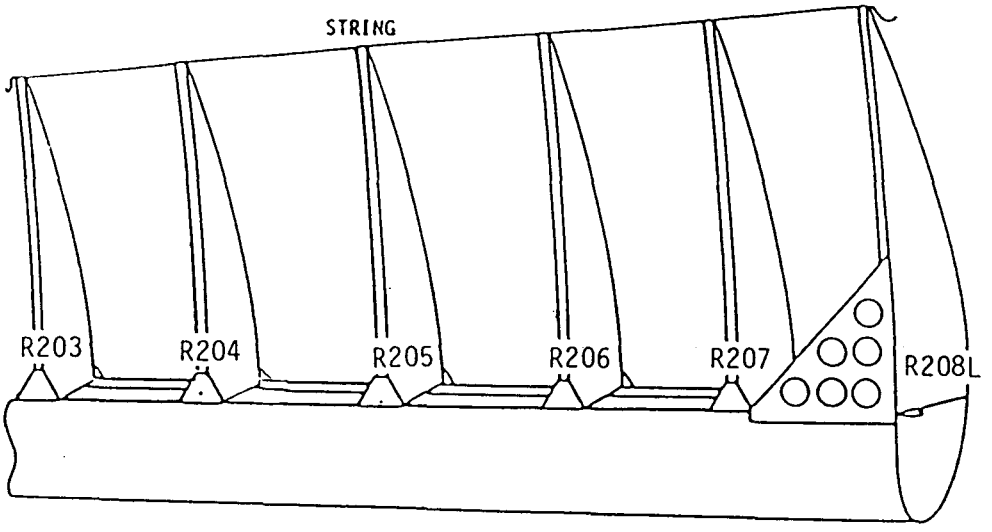
3.4.5 Trim the trailing edge of R203 so that it is 33-1/2 inches from the spar web. Use tin snips to cut the aluminum and a knife to cut the foam.

3.4.6 Trim the trailing edge of R208L, if necessary so that it is 48 inches from the spar web.

3.4.7 Tape or tie a string from the bottom of the trailing edge of R208L to the bottom of the trailing edge of R203.

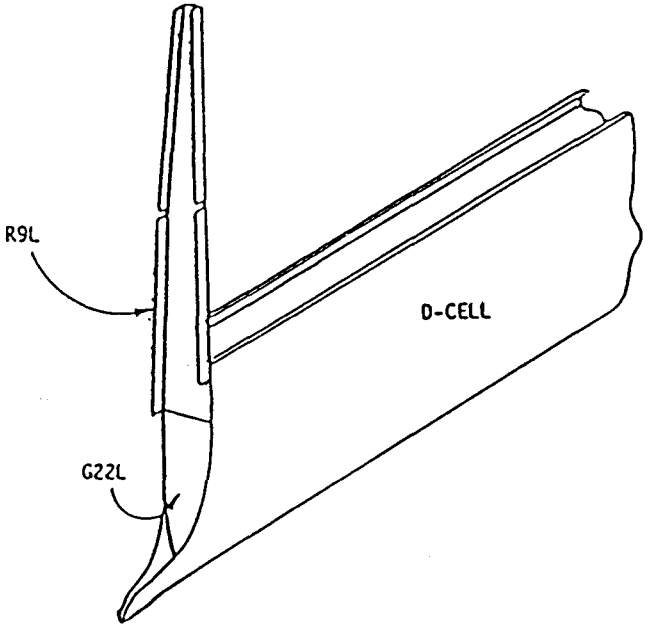
3.4.8 Insert rib R204 (105-1/2 inches from the root) so that the bottom of R204 just touches the string. Rivet R204 in place using the same riveting sequence as for R203.

3.4.9 Similarly rivet R205, R206 & R207 in place. Sight down the trailing edge to ensure that it is straight.

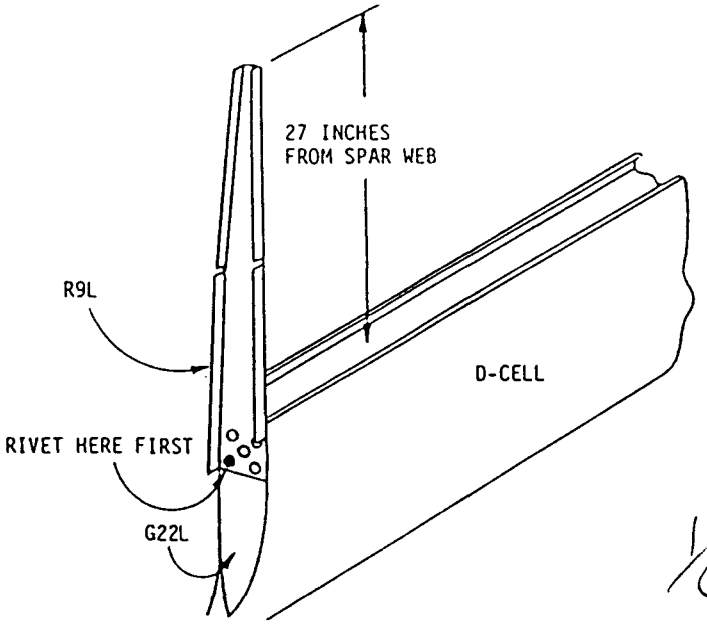


3.4.10 Trim the trailing edge of ribs R204 to R207 so that they just reach the string.

3.4.11 Position the tip rib R9L as shown. Note that the tabs are oriented toward the wing tip.



3.4.12 Adjust the position of R9L until the trailing edge of R9L is 27 inches from the spar web and the bottom edge of R9L is in line with the bottom edge of the D-cell. Rivet R9L to G22L with *one rivet only* in the bottom corner as shown.

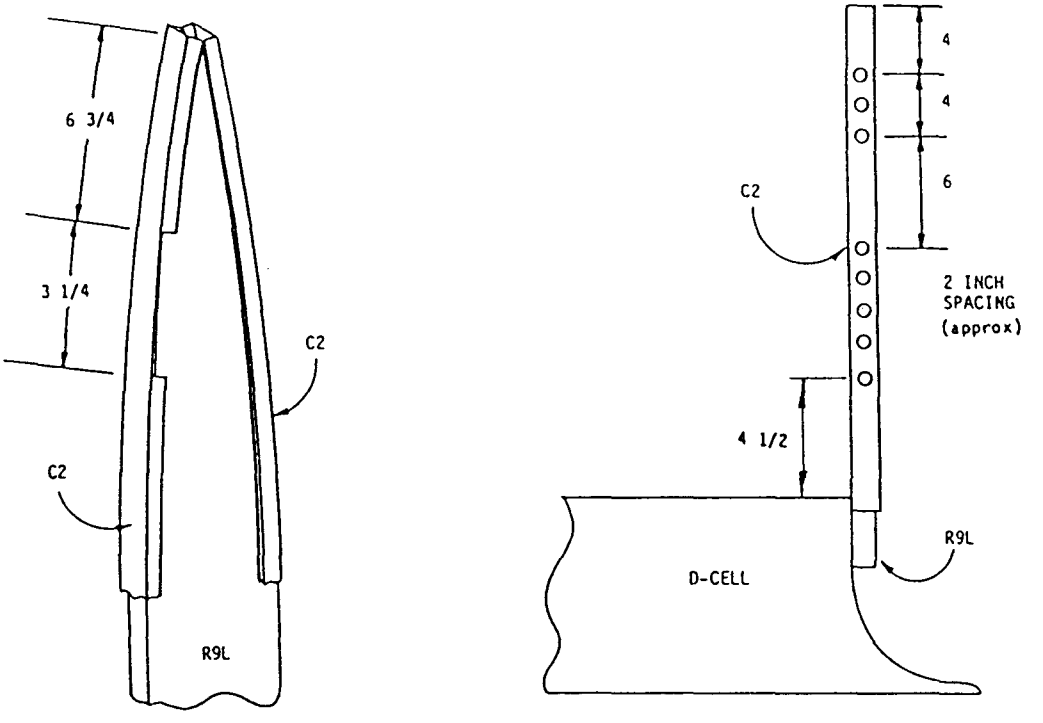


1/4" LESS

3.4.13 Adjust the wing saddles for a washout measurement of 5 5/8 inches (refer to figure for step 3.4.1).

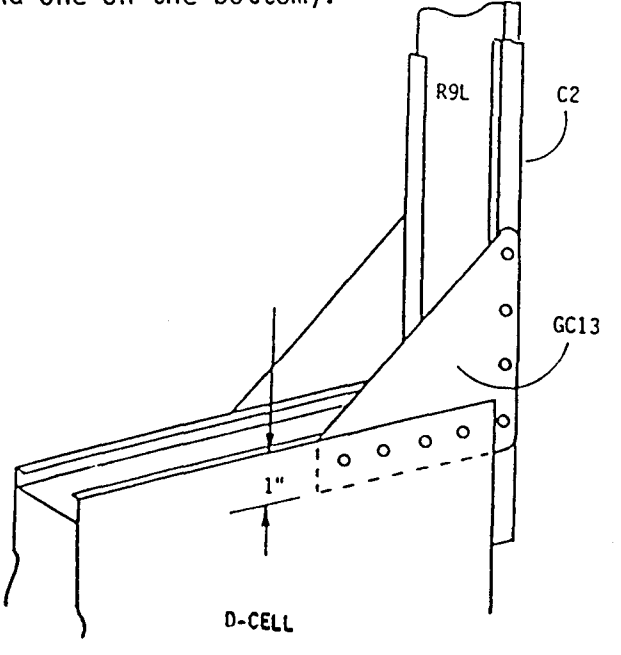
3.4.14 Move the plumb line to R9L and adjust the position of R9L so that the string just touches the bottom of the D-cell (refer to the figure in step 3.4.2). Rivet R9L to G22L with 4 more rivets as shown in the figure above.

3.4.15 Remove a 3 1/4 inch section of the lip from a capstrip C2 as shown. Note that this section is removed from the *bottom* capstrip only on the *aileron side* of R9.



3.4.16 Rivet capstrips C2 in place (top and bottom) using the rivet pattern shown above.

3.4.17 Round the two exposed corners of two GC13 gussets and insert one inch under the D-cell skin as shown (use one GC13 on the top of the wing and one on the bottom).



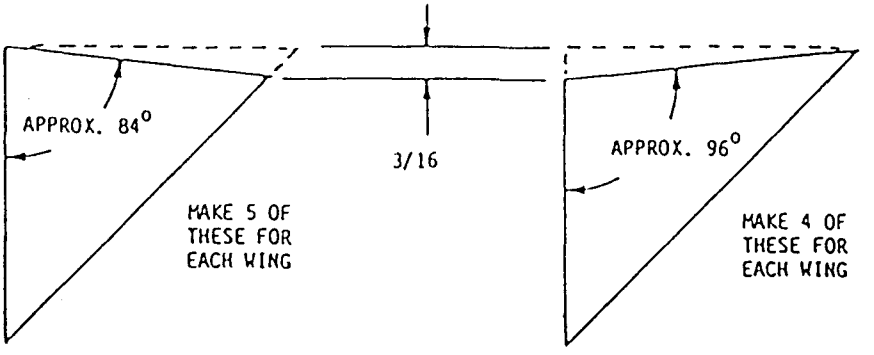
3.4.18 Rivet the GC13's to the D-cell with 4 rivets. Use a square to keep R9L perpendicular to the D-cell and rivet the GC13's to R9L with 4 rivets.

3.4.19 Tie or tape a string from the bottom of R9L to the bottom of R203, 10 inches ahead of the trailing edge.

3.4.20 Install and rivet the two short ribs R1 and R2 in place. Do not trim the length of R1 and R2 at this time.

3.5 TRAILING EDGE ATTACHMENT

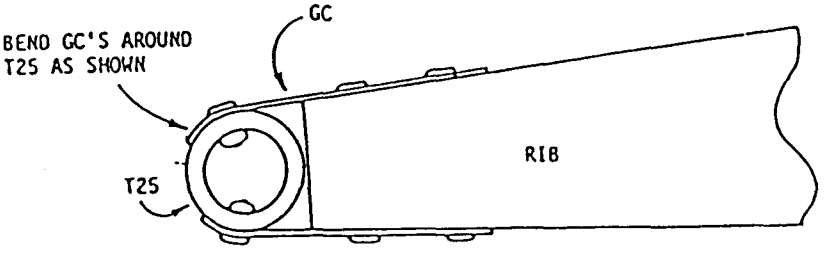
3.5.1 Trim GC gussets as shown. Round the corners of all GC gussets.



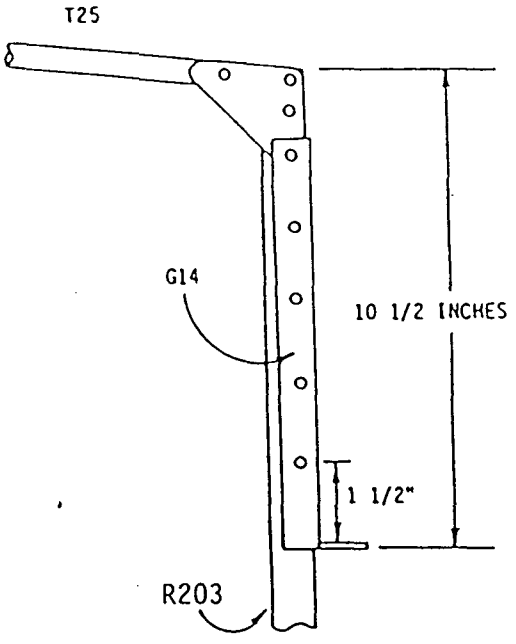
3.5.2 Put the trailing edge T25 in place and hold it temporarily with tape. Check that the distance from the spar web to the rear of the trailing edge (T25) is 48-1/2 inches at the root and 34 inches at R203. Sight along T25 to make sure that all the ribs have been properly trimmed and T25 is straight.

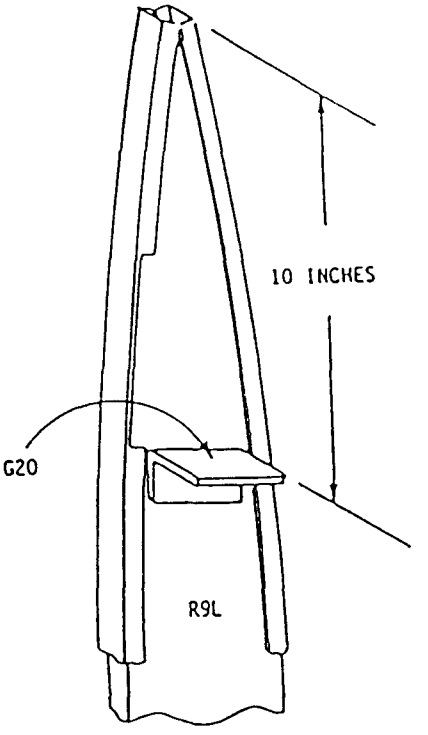
Rivet T25 in place using a GC top and bottom at each rib. For each GC use two rivets into T25 and two rivets into the rib capstrip. Use the 84° modified GC's at the root rib (R8L) and the 96° GC's at R203. Leave out the forwardmost rivet on R203 to allow G14 to be fitted later.

When all the GC's have been riveted in place, tap them with a hammer to form a smooth contour over T25.



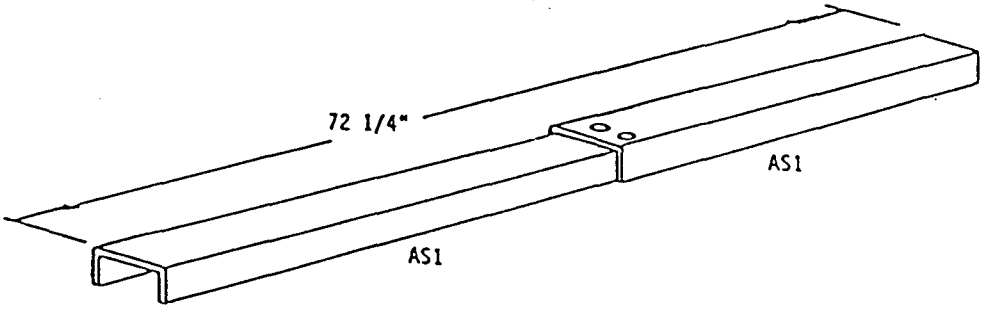
3.5.3 Round the corners on G14 and fit it over R203 as shown. Rivet G14 to R203 with 5 rivets top and bottom. Do not rivet within 1-1/2 inches of the tab on G14.





3.5.4 Rivet angle bracket G20 on the aileron side of R9L as shown with 2 rivets.

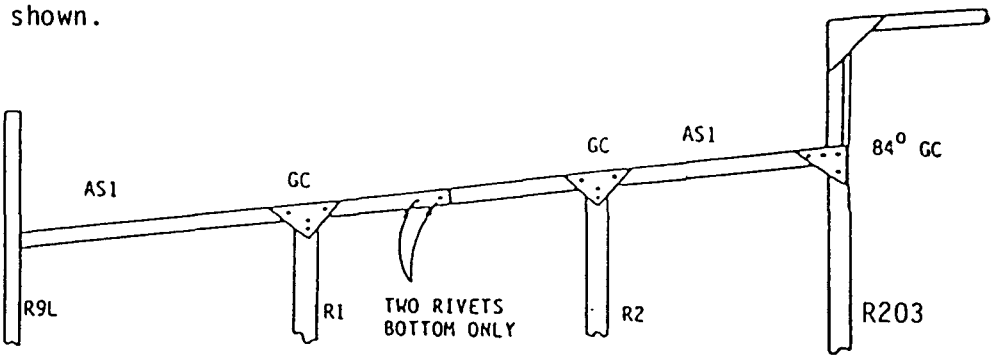
3.5.5 Splice two AS1's together to obtain a total length of 72 1/4 inches. Make sure the two pieces form a straight line. Use two rivets in the web. Do not put any rivets in the lip.



3.5.6 Using a string or a straightedge between the tabs of G14 and G20, trim R1 and R2 to length.

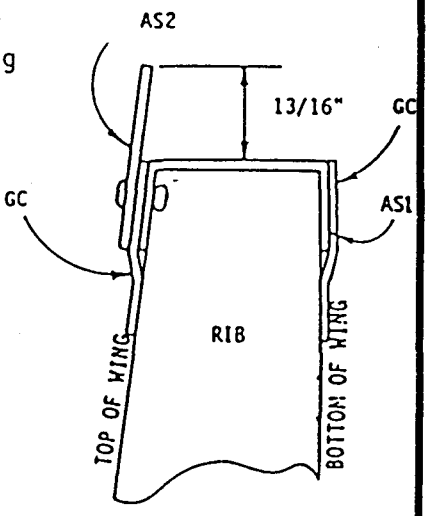
3.5.7 Fit the spliced AS1 assembly over G14, G20, R1, and R2. Make sure that the AS1 assembly is straight, is centred on R203 and R9L, and covers the tabs on G14 and G20 completely. R9L may be moved slightly if necessary to obtain the correct spacing between R9L and R203. Rivet the AS1 assembly in place with two rivets into G14 and two into G20.

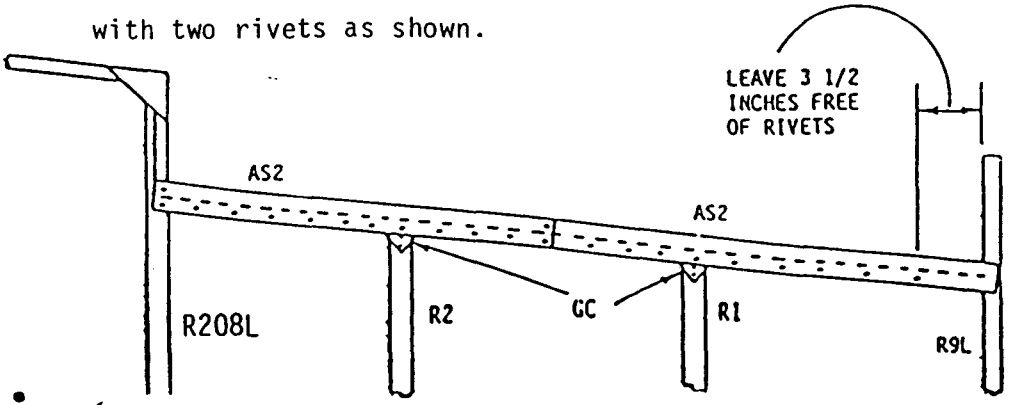
3.5.8 Rivet the AS1 assembly to R203 with a modified (84°) GC gusset *on the bottom of the wing only.* Do not rivet on the top of R203. Make sure AS1 is straight and install two rivets *in the bottom lip only* as shown.



3.5.9 Rivet the GC gussets to the ribs R1 and R2, top and bottom. The GC's should be positioned such that the rear edges of the GC and the AS1 are flush. The *lower* GC's can be riveted to the AS1's at this time.

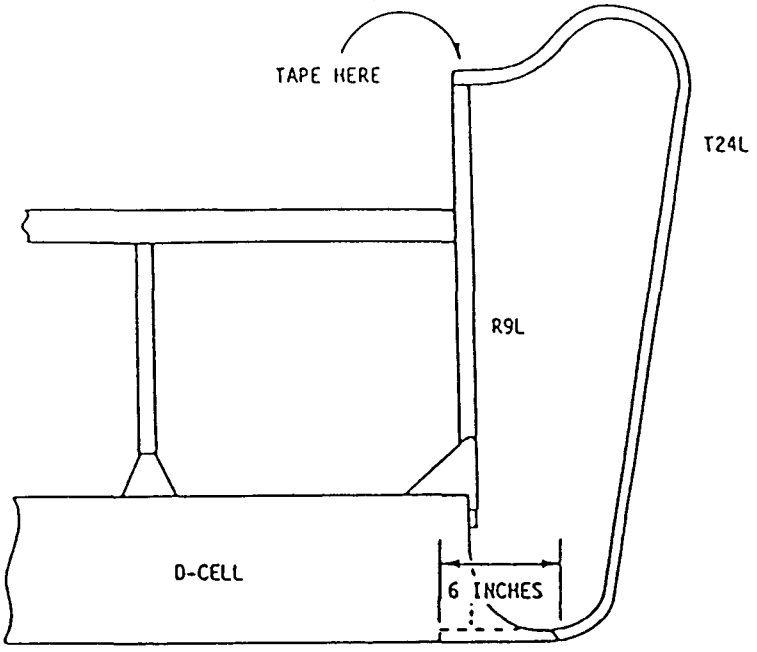
3.5.10 Round the corners on two AS2's and clamp them to the lip of the AS1's on the top of the wing only. The AS2's should extend 13/16 inches behind the web of the AS1's. Sight the trailing edge of the AS2's and make sure it is a straight line. Rivet the AS2's to the AS1's with a 3-inch rivet spacing. Start at the junctions of the R1 and R2 ribs with AS1 and AS2. Use three rivets holding each AS1, AS2 and GC together. Work outwards from the gussets, in both directions, to prevent wrinkles in the AS2's. Check frequently to ensure that the AS2's are straight. Do not rivet within 3 1/2 inches of R9L. Rivet the inboard end of AS2 to R203 with two rivets. Rivet the overlap of the AS2's with two rivets as shown.





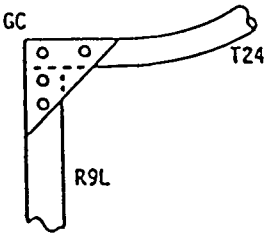
3.6 WING TIP ASSEMBLY

3.6.1 Insert the leading edge of the tip bow T24L through the hole in G22L to a depth of 6 inches from the end of the D-cell skin. Tape the trailing edge of T24L in place as shown.



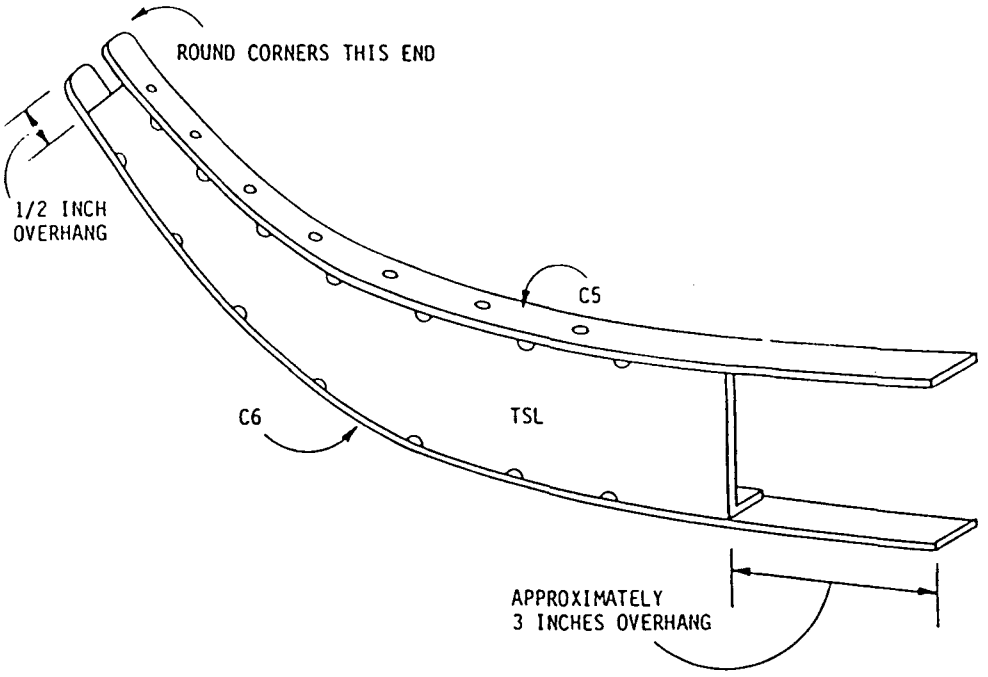
3.6.2 Rivet the leading edge of the tip bow in place with 4 equally spaced rivets through the leading edge of the D-cell skin.

3.6.3 Rivet the trailing edge of T24L in place with two GC gussets (one top, one bottom), and 4 rivets per gusset.



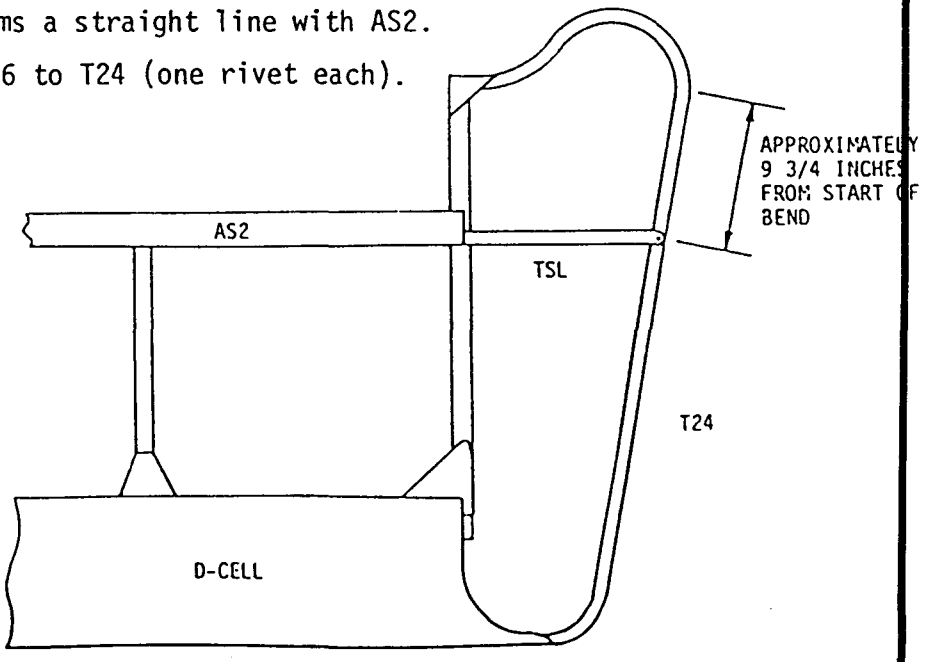
3.6.4 Round the corners on one end of capstrip C5 and rivet it to the inside curve of tip spar TSL as shown. The rounded end of C5 should extend 1/2 inch beyond the narrow end of TSL.

3.6.5 Use one rivet in each tab of TSL. Do not rivet the tab nearest the wide end of TSL.

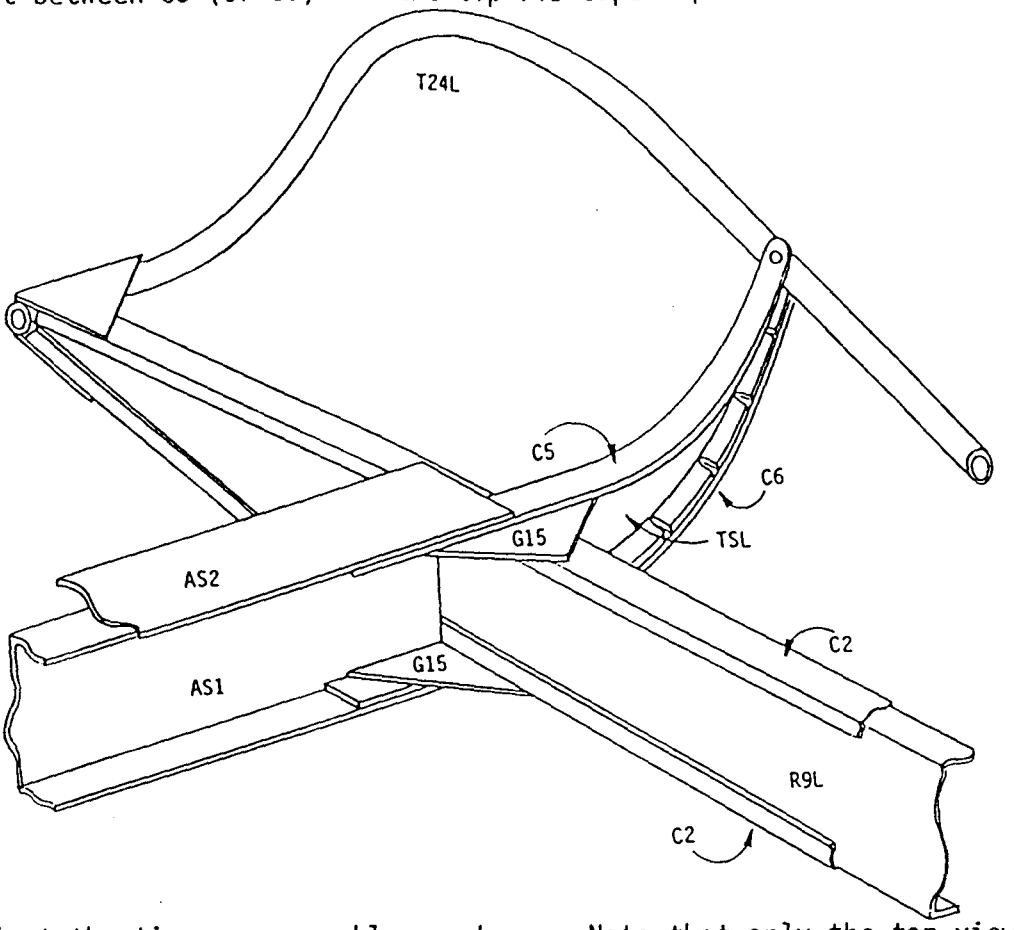


3.6.6 Round one end of capstrip C6 and rivet to the outside curve of TSL as shown. Rivet as in step 3.6.5 above.

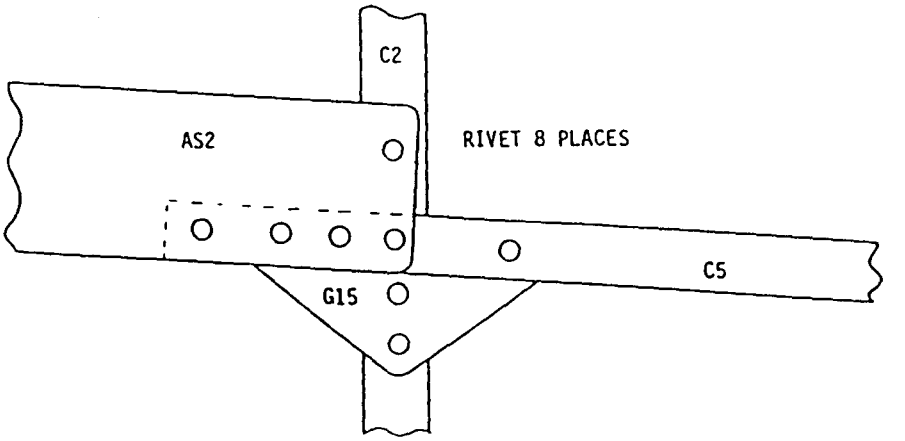
3.6.7 Fit TSL into position as shown. The leading edge of C5 should be in line with the leading edge of AS2 and the 3 inch extensions of C5 and C6 should be inside the flanges of AS1. Sight along the leading edge of AS2 and adjust the position of the TSL assembly so that it forms a straight line with AS2.
Rivet C5 and C6 to T24 (one rivet each).



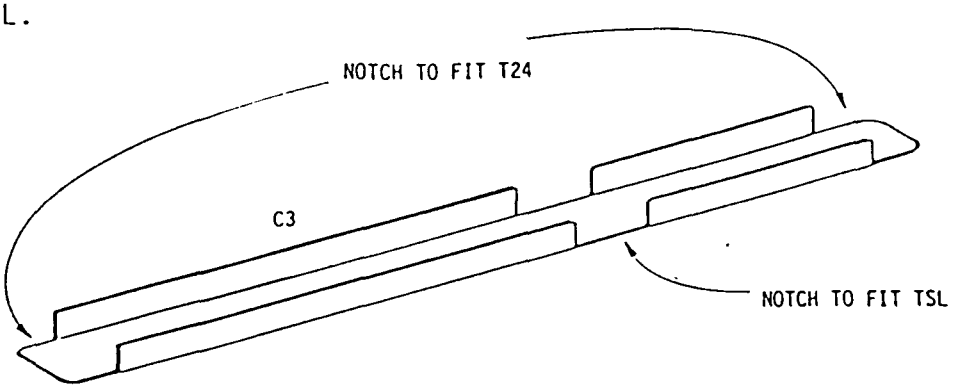
3.6.8 Insert two G15's (one top, one bottom) as shown. The G15's should fit between C5 (or C6) and the tip rib capstrip C2.



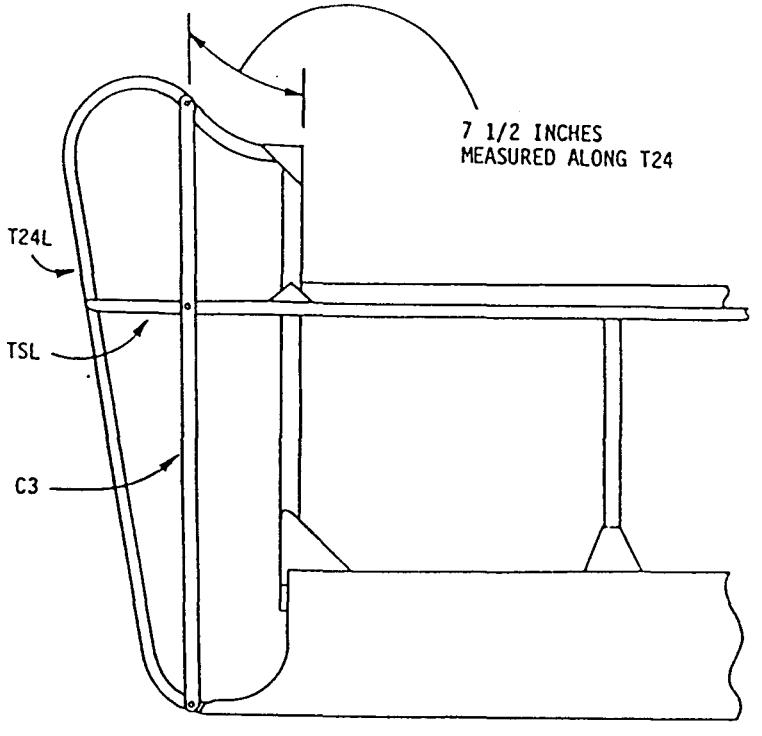
3.6.9 Rivet the tip spar assembly as shown. Note that only the top view is shown. The bottom should be riveted in the same way except that there is no AS2 on the bottom.



3.6.10 Cut and notch a tip capstrip C3 to fit on the bottom of the wingtip. Position C3 as in step 3.6.11 to locate the notch for TSL.



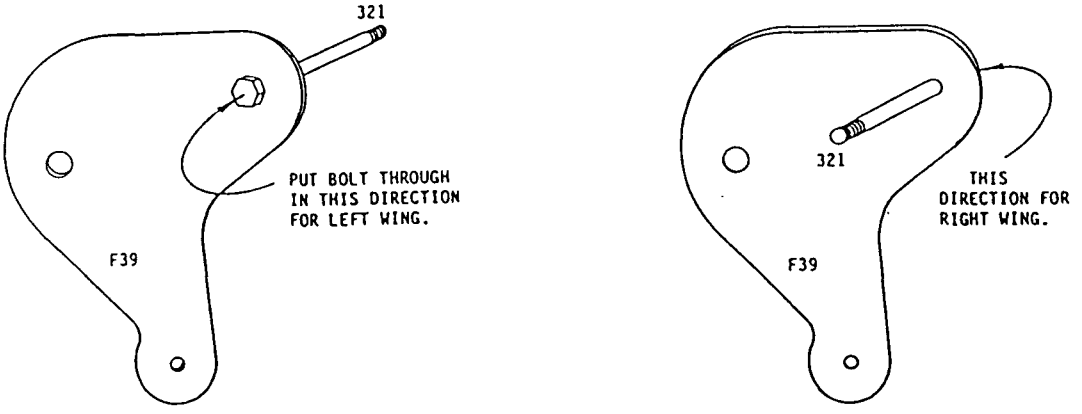
3.6.11 Rivet C3 as shown. Use one rivet each end into T24L and one into TSL.



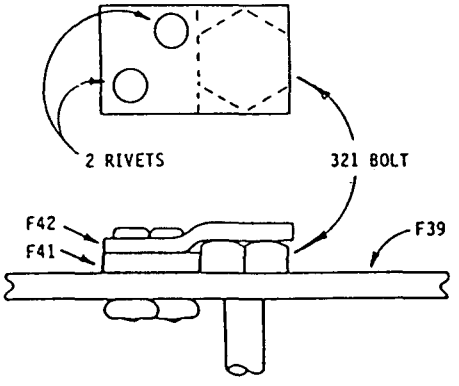
NOTE: *The tip gussets (G25) and capstrips C4 shown on drawing E will be installed after the wingtip is covered.*

3.7 AILERON BELLCRANK INSTALLATION

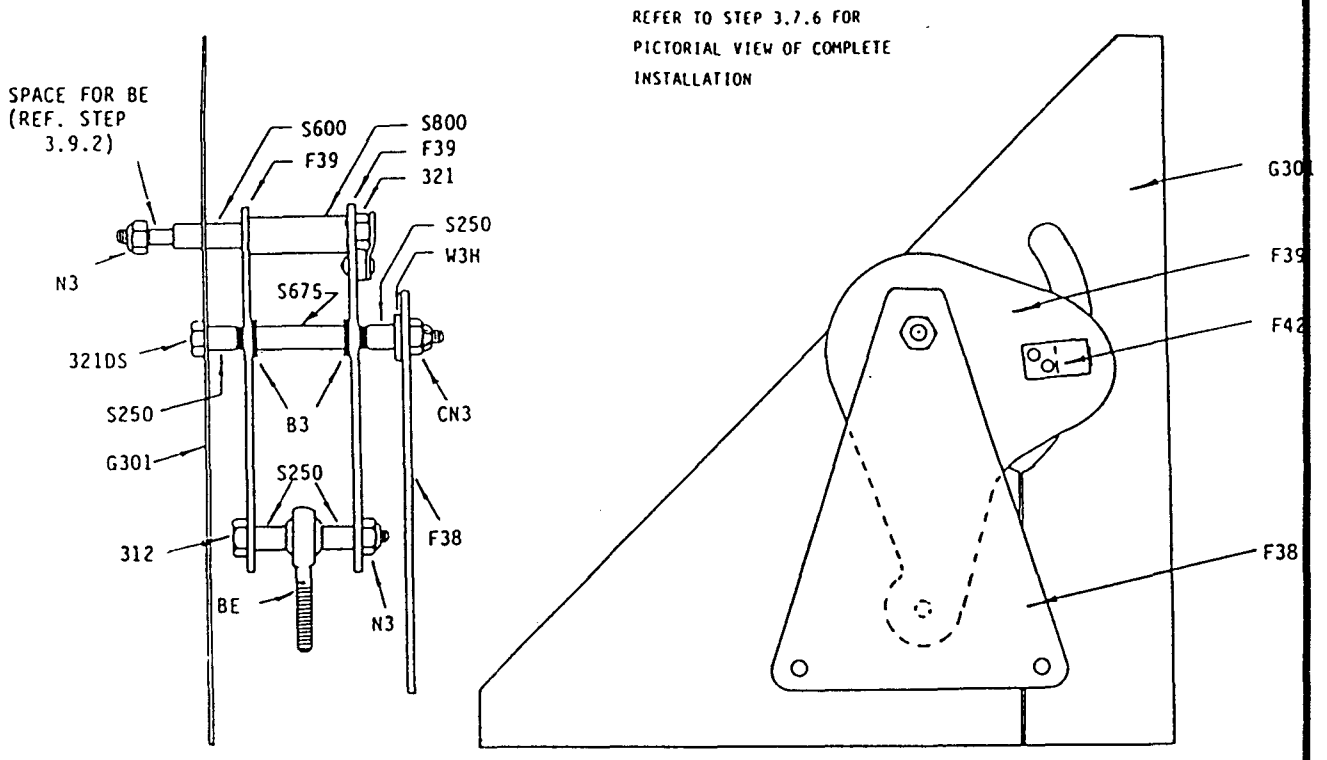
3.7.1 Push a 321 bolt through the hole in one bellcrank F39 as shown.



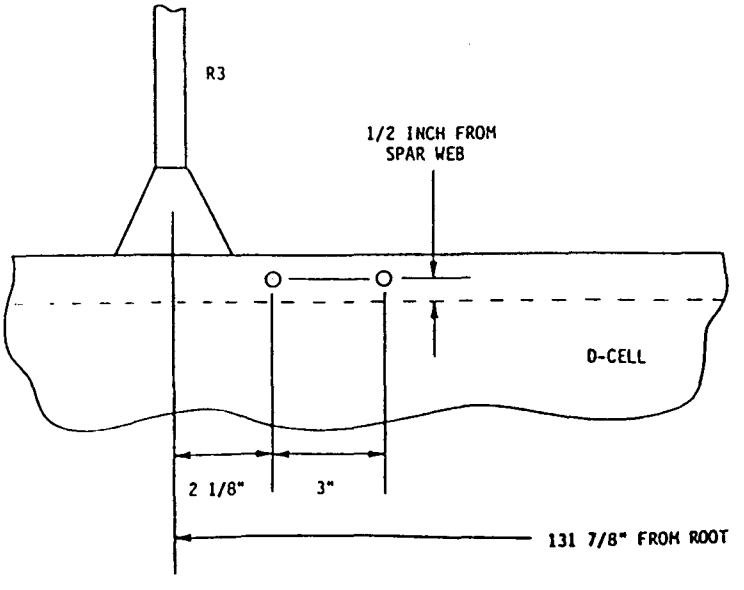
3.7.2 Rivet F41 and F42 to F39 to hold the 321 bolt in place and prevent it from turning. Use two rivets as shown. It may be necessary to bend F42 slightly to allow it to sit flat on F41.



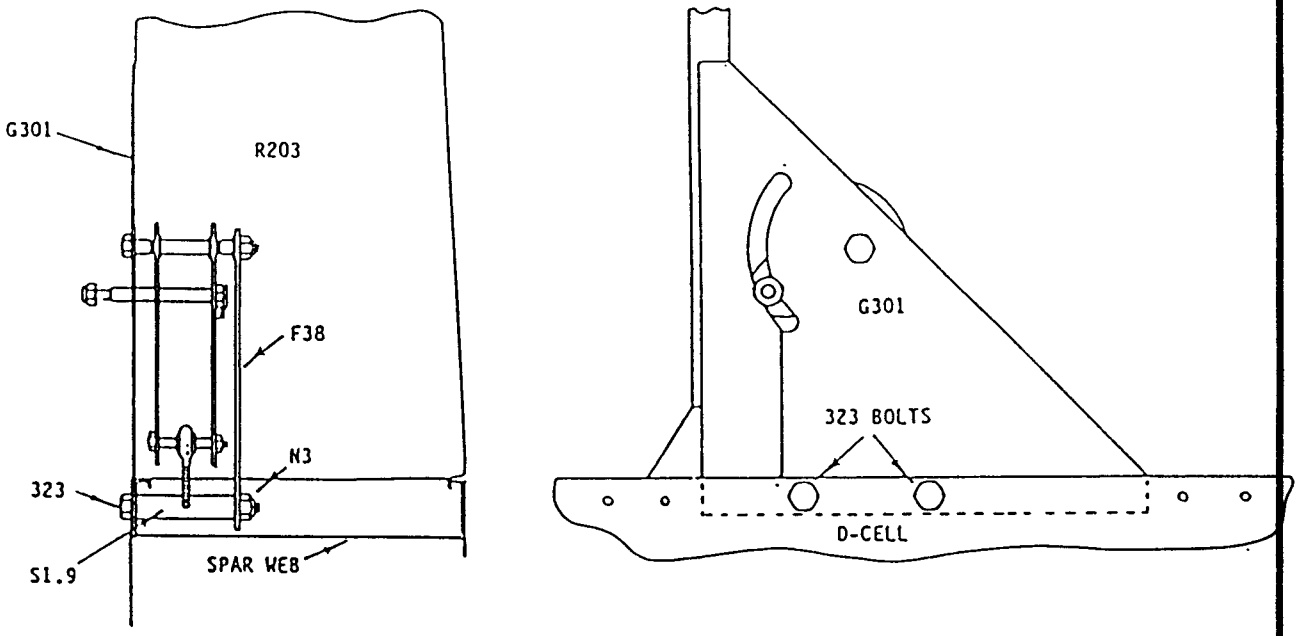
3.7.3 Complete the left aileron bellcrank assembly as shown below. Note that the B3 bushings are installed with the large diameter shoulder on the inside of the F39 bellcranks. Tighten the N3 nut on the 312 bolt securely. Do not tighten the CN3 nut on the 321DS bolt. Do not tighten the N3 nut on the captivated 321 bolt.
Note that the captivated 321 bolt and the S600 spacer fit through the semicircular slot in G301.



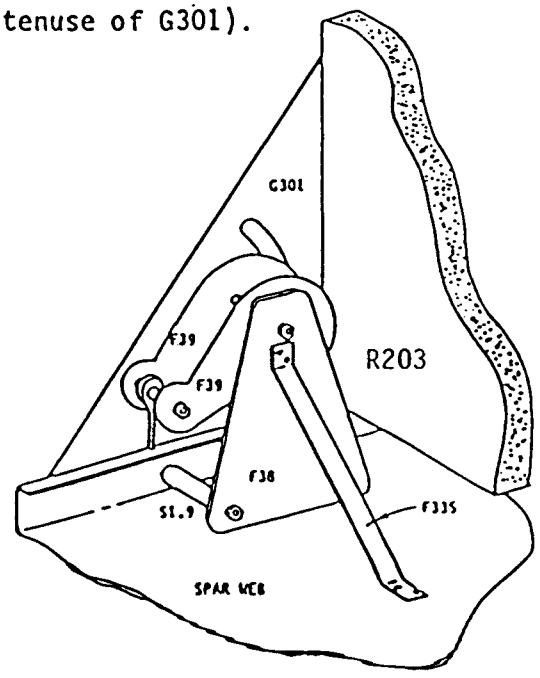
3.7.4 Drill two 3/16 inch holes through the spar cap on the *bottom* of the wing as shown. It may be necessary to drill out one or two rivets to locate these holes properly.



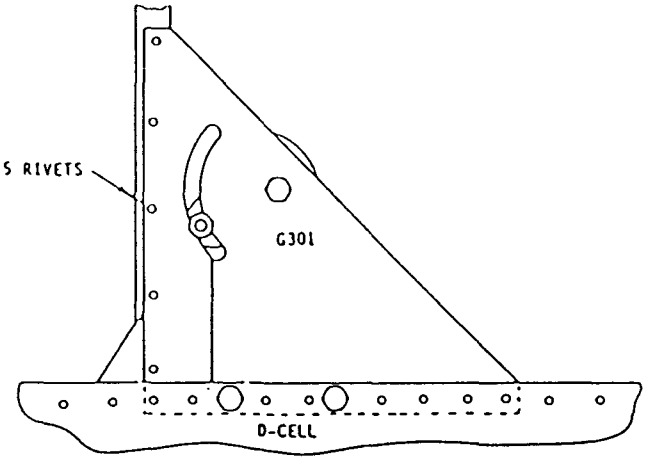
3.7.5 Position G301 and F38 as shown. Drill out any rivets in the spar cap which are under G301. Do not remove the rivets holding GBR to R3. Slip G301 under the D-cell skin until the holes are properly aligned. Bolt the bellcrank assembly to the spar cap using 323 bolts and S1.9 spacers as shown. Use washers under the nut as required.



3.7.6 Drill two 1/8 inch holes in each end of bellcrank bracket F335 and rivet it to F38 as shown. Adjust the position of the bellcrank assembly so that G301 is in plane with the bottom surface of the wing and rivet F335 to the spar web (the position can be checked by holding a straightedge between the bottom of R203 and the D-cell across the Hypotenuse of G301).

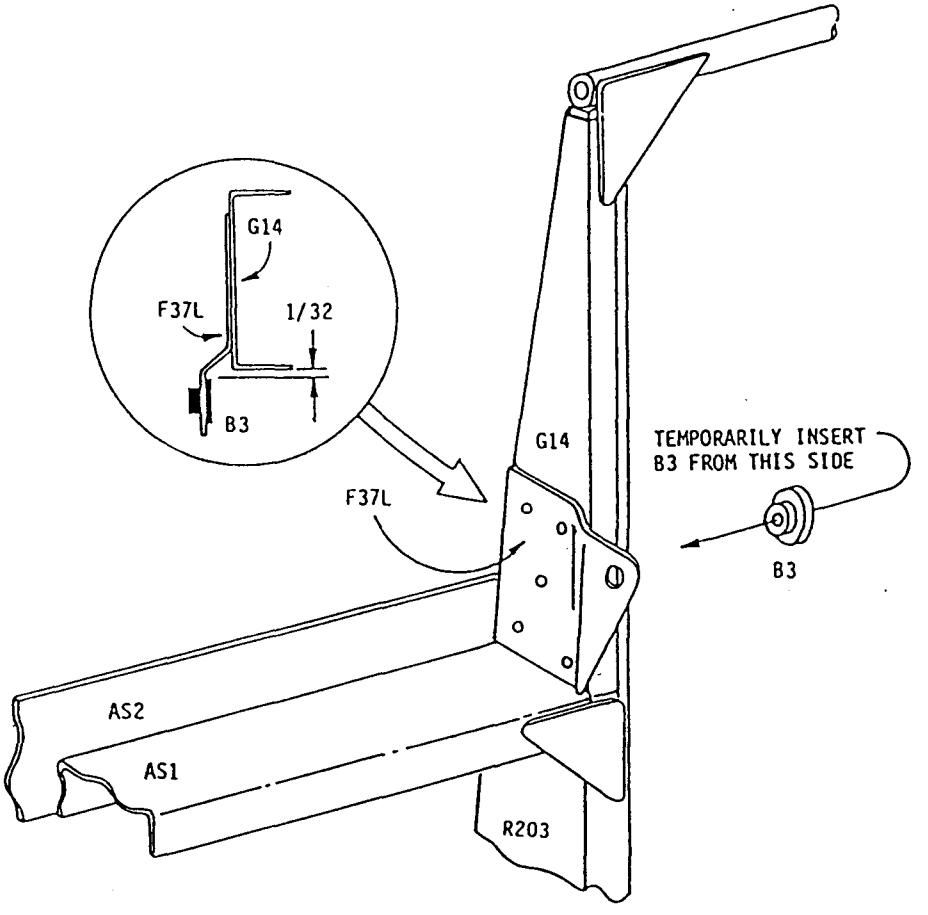


3.7.7 Rivet G301 to the bottom capstrip of R203 with 5 equally spaced rivets. Rivet G301 to the spar cap with a 1 inch rivet spacing.



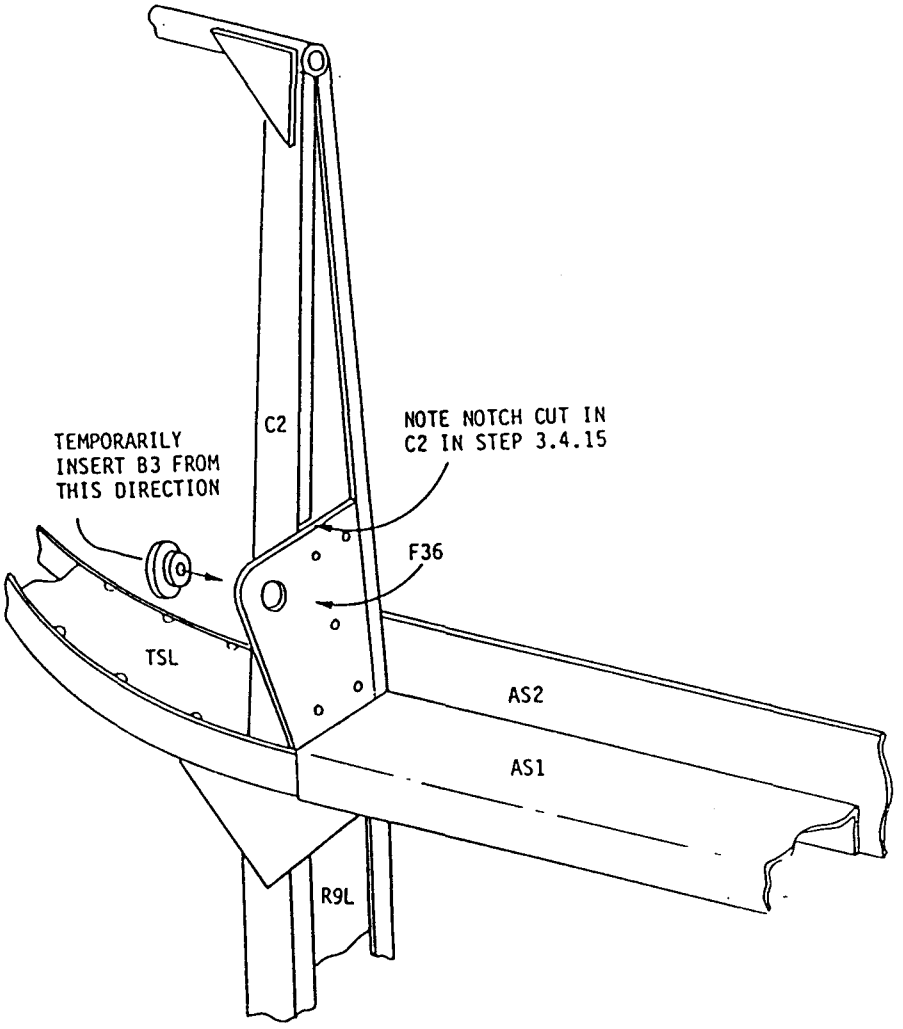
3.8 AILERON ASSEMBLY AND INSTALLATION

3.8.1 Position the inboard aileron hinge F37L as shown. Make sure the leading edge of F37L is tight against the AS1. Temporarily install a bearing B3 in the hole in F37L as indicated (in service, B3 is inserted on the aileron side of F37L, but is used here as an aid in positioning F37L). Position F37L so that the edge of the flange on the B3 is approximately 1/32 of an inch below the bottom of G14.

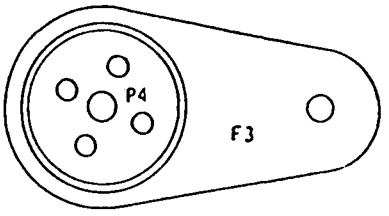


3.8.2 Position the outboard aileron hinge F36 as shown. Make sure the leading edge is tight against AS1. Temporarily install a B3 as in step 3.8.1 and position F36 for a 1/32 inch clearance between

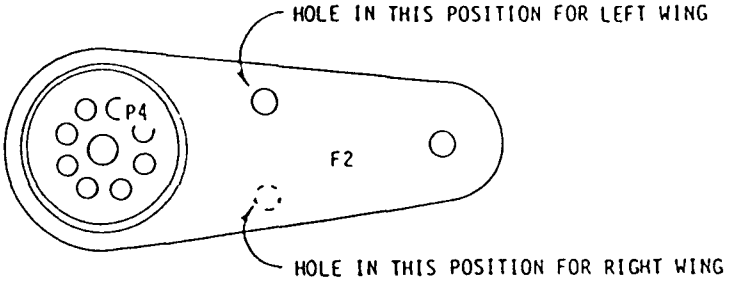
B3 and the C2 capstrip on R9L. Rivet F36 to R9 *with one rivet only.*



3.8.3 Temporarily bolt an aileron torque tube plug P4 to aileron hinge horn F3 with a 34 bolt and N3 nut as shown. Rivet P4 to F3 with 4 rivets, with the rivet head on the F3 side of the assembly. Remove the 34 bolt.

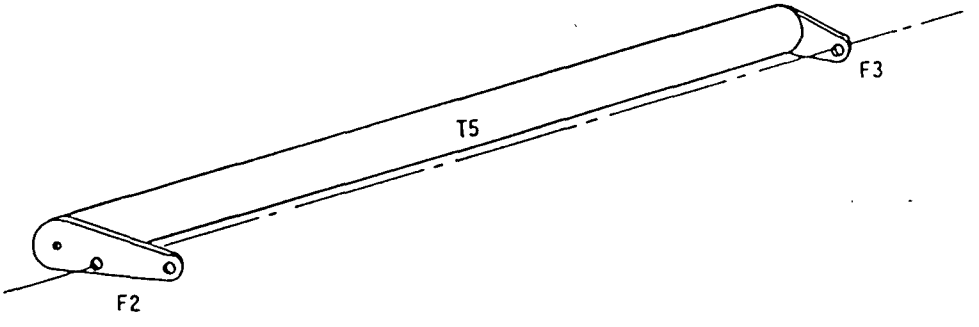


3.8.4 Similarly rivet a P4 to an F2 with *eight* rivets. Note the orientation of the hole in F2.



3.8.5 DELETED

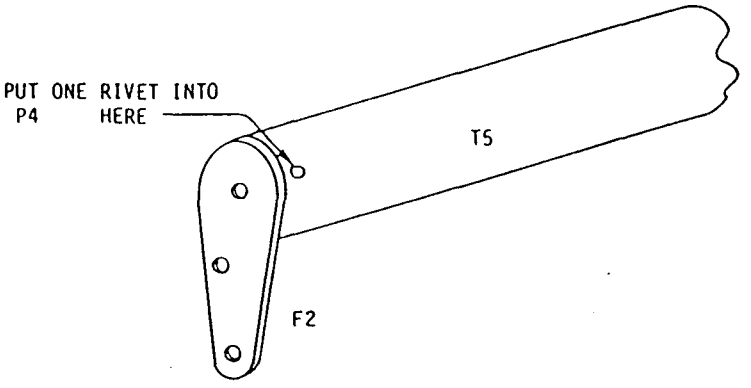
3.8.6 Insert the P4's attached to F2 and F3 into the ends of aileron torque tube T5, but do not rivet at this time. Orient F2 and F3 so that the two hinge holes are in line as shown.



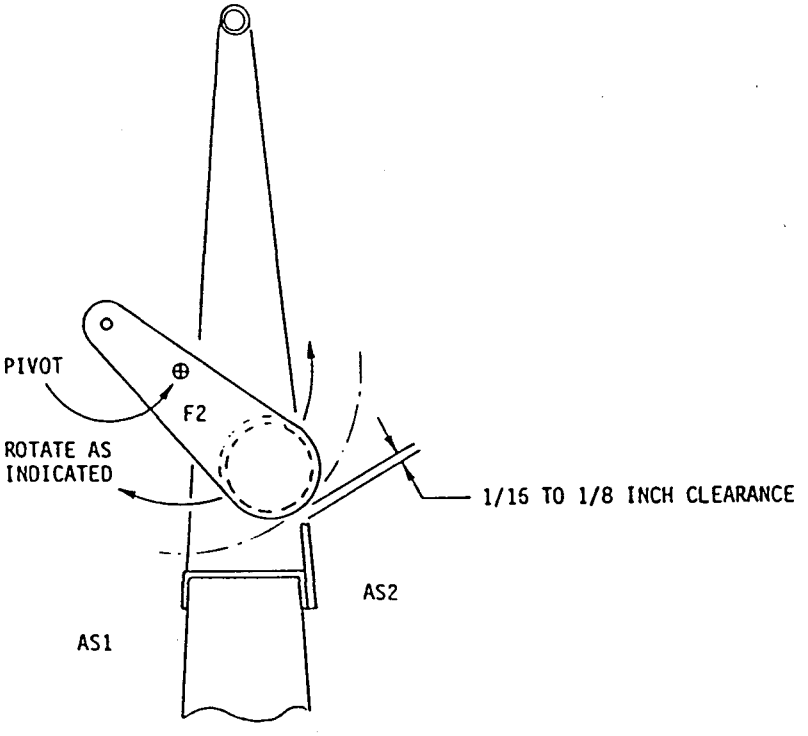
3.8.7 Insert B3 bearings into F36 and F37 *from the aileron side.* Position the aileron torque tube assembly (T5, F2 and F3) between F36 and F37 and temporarily insert two 35 bolts as hinge pins. Note that the F2 end of T5 goes inboard (next to F37). Note also that the hole in F2 nearest T5 is the one used for the hinge pin.

3.8.8 Trim the length of T5 as necessary so that the T5 assembly fits properly between F36 and F37 with at least 1/16 of an inch of clearance at both ends. When the end clearance is correct, rivet

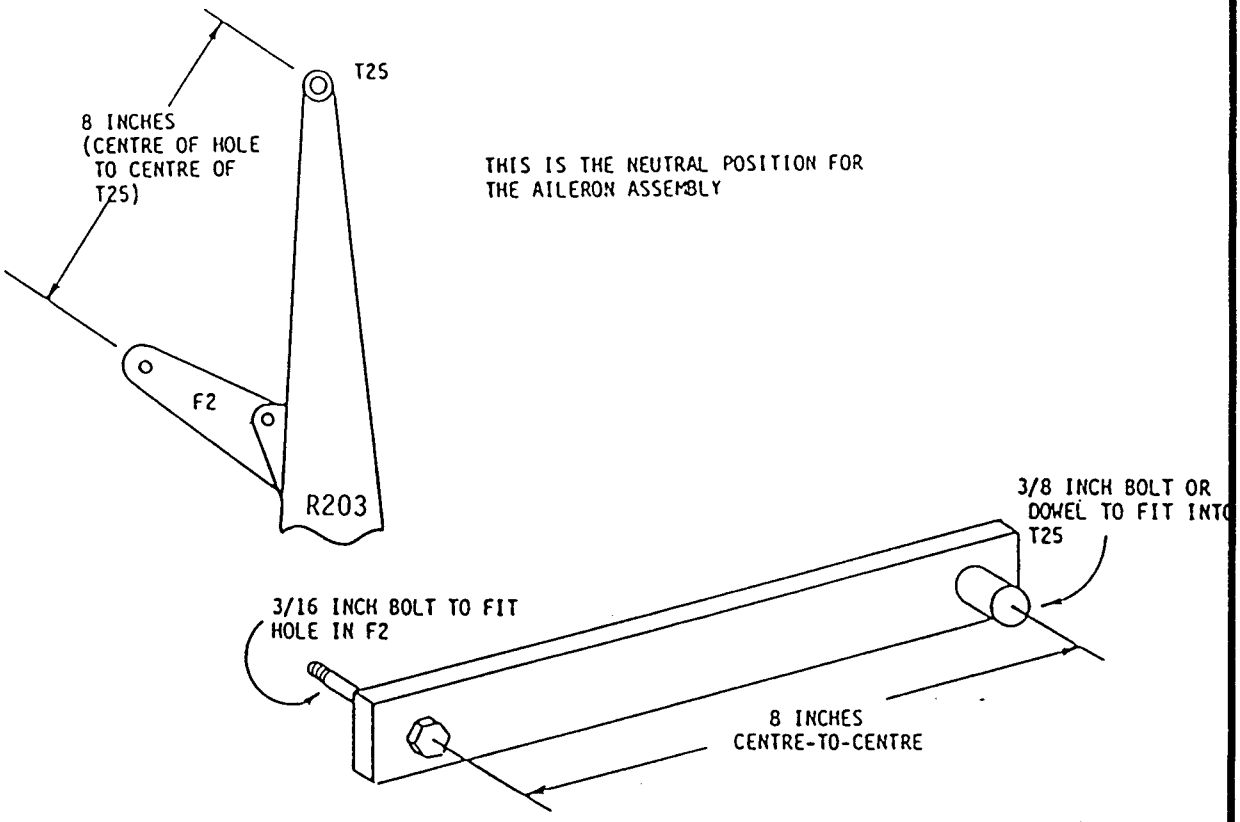
F2 in place *with one rivet only as shown.* Do not rivet F3 at this time.



3.8.9 Swing the T5 assembly on its hinges and make sure that T5 does not touch AS1, and the minimum clearance between T5 and AS2 is 1/16 to 1/8 of an inch. Move F36 or F37 slightly if necessary to obtain proper clearance. When clearance is correct, remove the T5 assembly and rivet F36 and F37 in place with four more rivets in each as shown in the figures for steps 3.8.1 and 3.8.2.

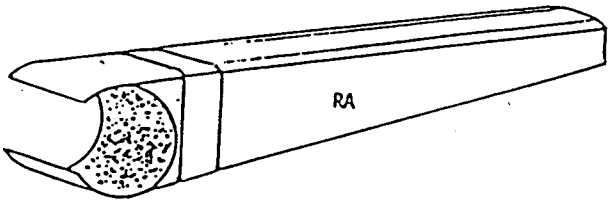


3.8.10 Re-install the T5 assembly and put in the hinge pins. Clamp the position of F2 as shown. A piece of wood and two C-clamps may be used, but it is recommended that a tool be made of wood, plastic or metal as shown in the diagram. Wrap tape around the 3/8 inch dowel pin to make it a tight fit in T25.

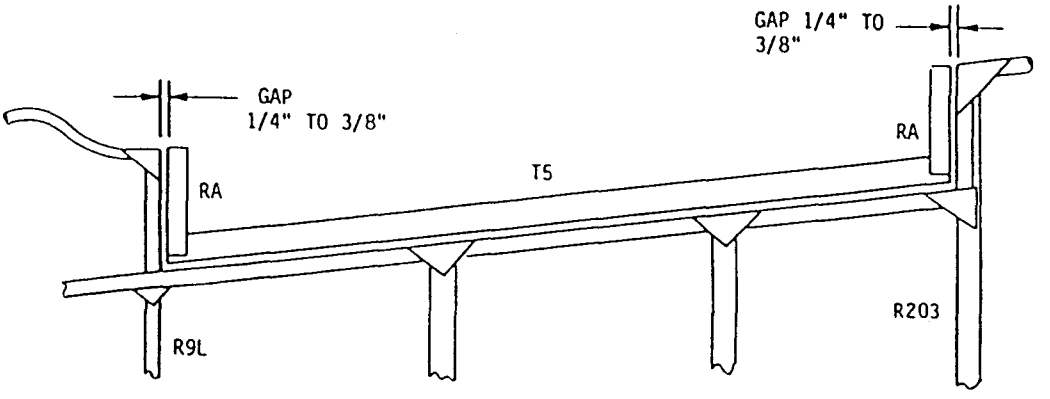


3.8.11 Sight T5 from behind the trailing edge and make sure that it is parallel to AS1/AS2. Rotate the F3 on the end of T5 if necessary. When T5 and AS1/AS2 are parallel, fix F3 in position with one rivet through T5 and the P4 tab (as was done for F2 in step 3.8.8).

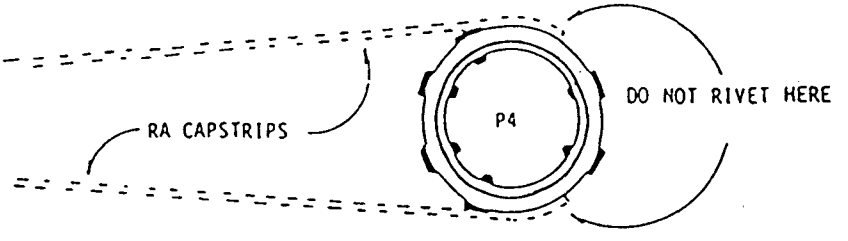
3.8.12 Flatten the capstrips on the aileron ribs RA and bend them to fit around T5. Round the corners of the capstrips with a file.



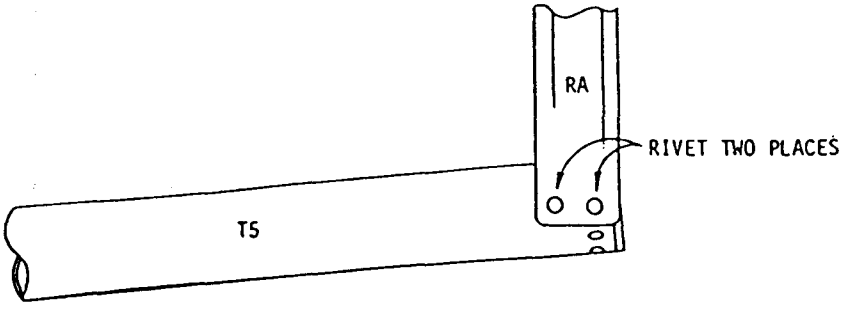
3.8.13 With the T5 assembly clamped in the neutral position, fit the two end ribs on the aileron as shown. Trace around the RA on T5 to mark the location of the capstrips.



3.8.14 Remove RA's. Remove the T5 assembly. Rivet both P4's to T5 with a 3/8" rivet spacing except where the rivet head would interfere with the RA capstrips.



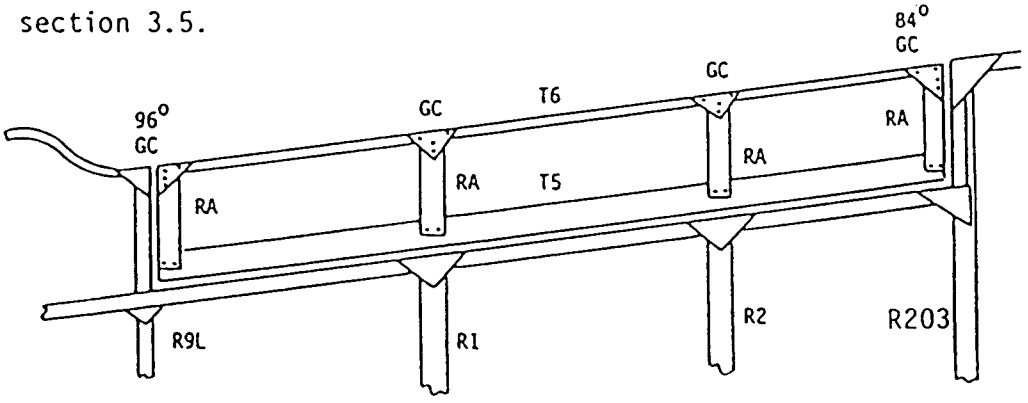
3.8.15 Re-install the T5 assembly. Clamp it in the neutral position and put the end aileron ribs into position again as in the figure for step 3.8.13. Make sure that the RA's are parallel to R9L and R3 with the gap as shown in the figure. Rivet the RA's to T5 with two rivets through each capstrip. Some of these rivets should also go through the P4's.



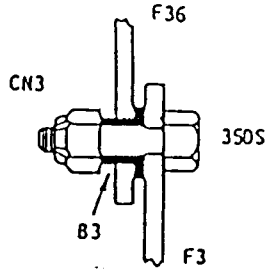
3.8.16 Run a string or a straightedge between the end RA's and fit the two intermediate RA's in place (similar to the installation of ribs R4 to R7 in section 3.4). Sight along ribs R1 and R2 to make sure the aileron ribs are directly in line with them. Rivet the RA's in place with 2 rivets in each capstrip.

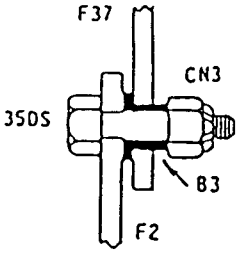
3.8.17 Fit the aileron trailing edge T6 in place. Trim the RA's as necessary so that T6 is in line with T24 and T25, and T6 is straight.

3.8.18 Attach T6 using GC gussets similar to the attachment of T25 in section 3.5.



3.8.19 Make sure the aileron hinges are assembled as shown. Tighten the nuts sufficiently to clamp the B3's to the F2 or F3. Check that rotation takes place between the F36 (or F37) and the B3. If not, ream the hole in F36 (or F37) slightly.
Use a CP23 Cotter pin to fix the CN3 nut in place. Bend the ends in opposite directions around the nut.





3.9 AILERON PUSHROD INSTALLATION

3.9.1 Pushrod Assembly, General Instructions

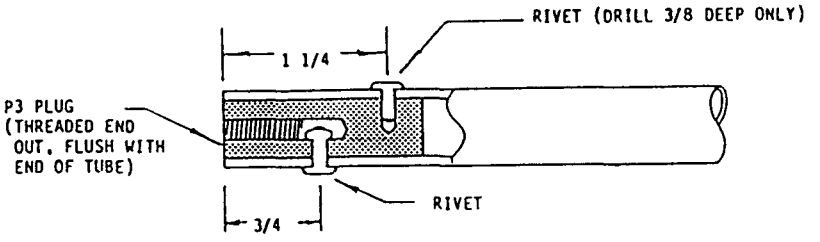
Several pushrods are used in the Aileron control linkage and for best operation, each should be custom fitted. Although the pushrod length is adjustable after assembly, final adjustment of the control system is much easier if the pushrods are assembled as outlined below.

(a) Set the bellcranks or horns to the exact position as indicated in the assembly manual. This will normally be the *neutral* position.

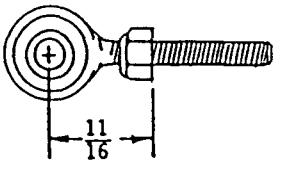
(b) Measure the effective length of the required pushrod (the exact distance between the centres of the bolt holes).

(c) Cut the pushrod tube 1 3/8 inches less than the effective length.

(d) Install P3 plugs in the ends of the pushrod tube as shown.



(e) Put N3 nuts on two BE rodends as shown. Note that the nut is put on "backwards". It will be necessary to screw the nut on and off a few times in the normal orientation to form threads in the nylon before attempting to put the nut on as shown.

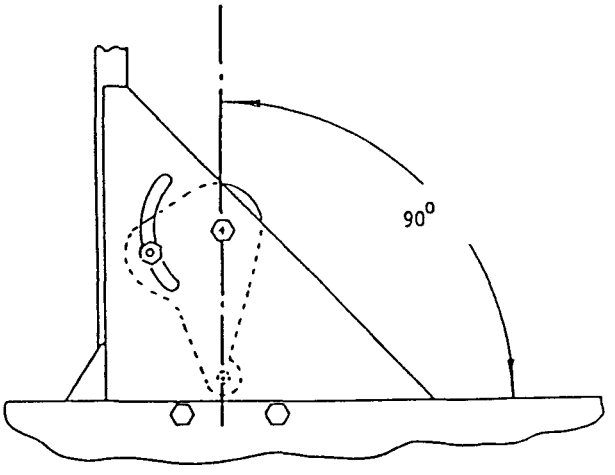


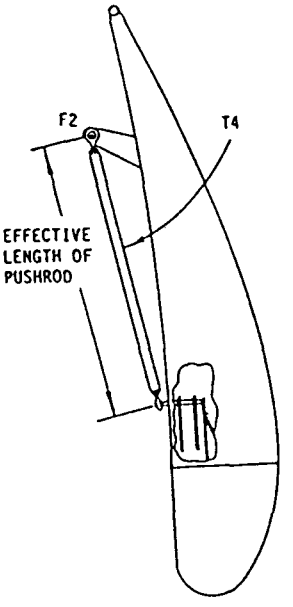
(f) Screw the rodends into the P3's and lock in place by tightening the N3 nut against the P3 plug.

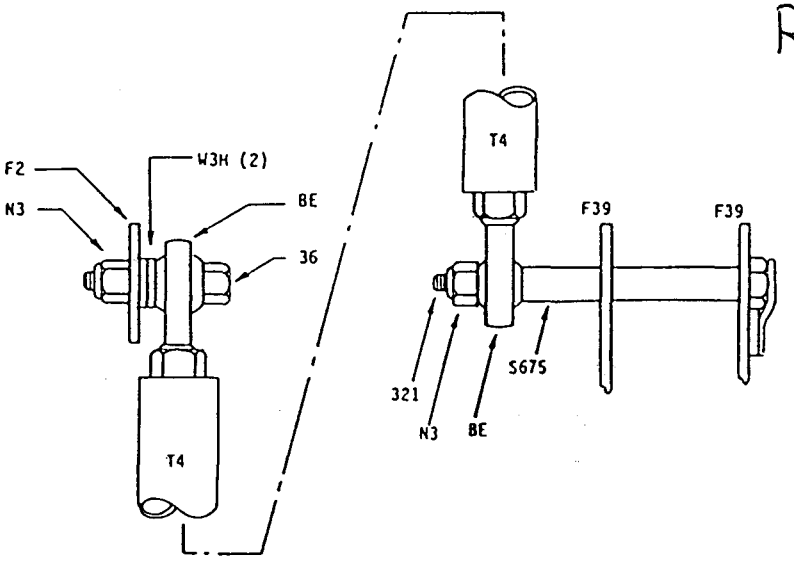
(g) Fit the pushrod into position and check that the bellcranks are positioned as required. If necessary, small adjustments to the pushrod length may be made by screwing the rodends in or out. Note that one full revolution of the rodend will change the pushrod length by 1/32 of an inch. Make sure that the locknuts are securely tightened after adjustment. **Ensure that at least 3/8 inch of thread is engaged in the plug.**

3.9.2 Install the T4 pushrod assembly between the aileron bellcrank assembly and the aileron horn F2 as follows: First position the aileron in its neutral position. Then set the bellcrank assembly in its neutral position as shown. Measure the *effective length* of the pushrod between the centre of the hole in F2 and the captivated 321 bolt on the bellcrank. Cut T4 1 3/8 inches shorter than this effective length and install the P3 plugs and BE rodends as in step 3.9.1. Instal the pushrod as shown and adjust the length if necessary to put the bellcrank into its neutral position.

WITH F39 BELLCRANK IN NEUTRAL POSITION, AN IMAGINARY LINE DRAWN THROUGH THE PIVOT AND THE RODEND HOLE WILL BE PERPENDICULAR TO THE D-CELL.







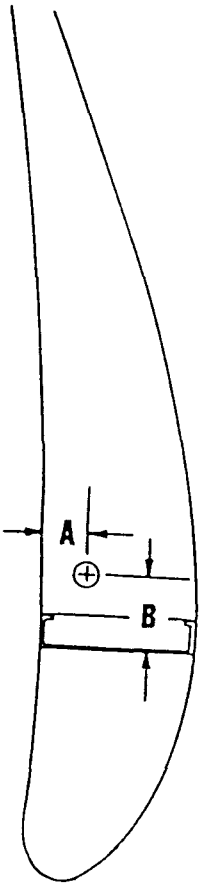
$R = 22\frac{1}{2} - 1\frac{3}{8} = 21\frac{1}{8}$

$L = 22\frac{3}{8} - 1\frac{3}{8} = 21$

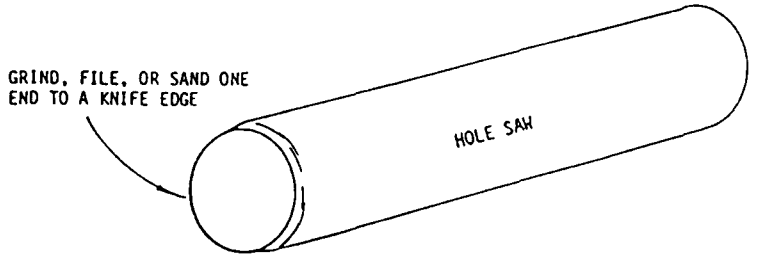
3.9.3 Check that the aileron and bellcrank assembly move freely with little friction and little or no play.

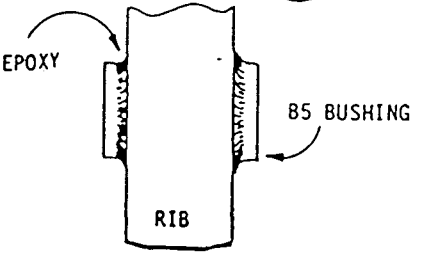
3.9.4 Mark the centres of the holes in ribs R204 to R207 using the dimensions in the table. Note that the "B" dimension is measured *from the spar web*. The "A" dimension is measured from the bottom capstrip of the rib.

	LEFT WING		RIGHT WING	
RIB	A	B	A	B
R204	7/8	1 7/8	7/8	1 7/8
R205	1 1/2	2 1/4	1 3/8	2 1/4
R206	2 1/8	2 5/8	1 7/8	2 5/8
R207	2 3/4	3	2 3/8	3



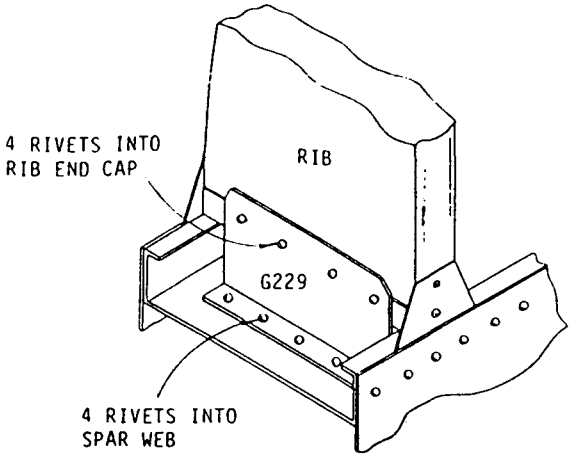
3.9.5 Cut out the 7/8 inch holes using a hole saw made from 7/8 inch tubing supplied with the kit.



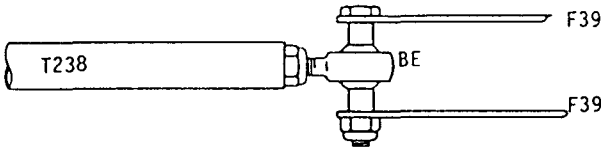


3.9.6 Glue pushrod bushings B5 in the holes in ribs R205 and R206 *only*. The holes in R204 and R207 are clearance holes only and bushings are not required. Use the 5 - minute epoxy supplied with the kit. Mix as directed and run a small bead around both ends of the B5's to prevent them from sliding out.

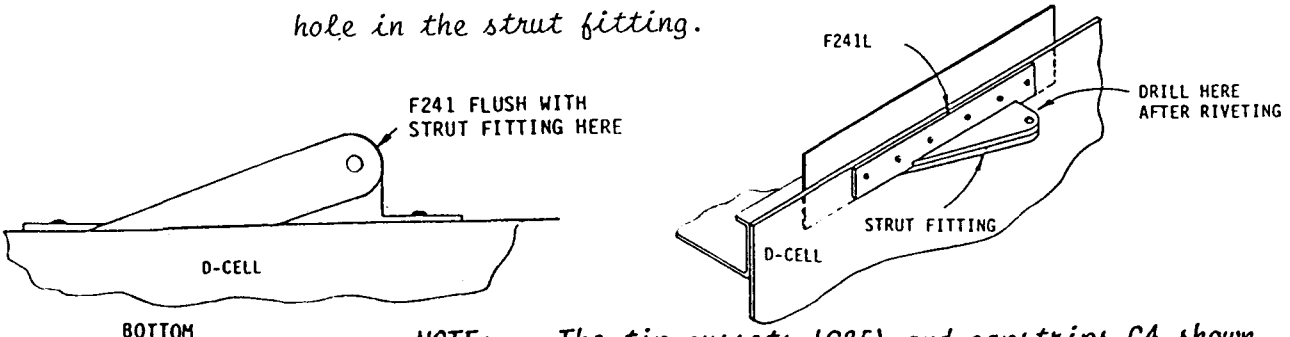
3.9.7 Rivet one G229 rib anchor in place on each rib R204 through R207 as shown. Note that G299 is normally installed on the inboard side of the rib but may be installed on the outboard side if necessary to avoid previously installed rivets in the spar web. Trim the G229's with tinsnips as necessary to clear the holes and bushings in the ribs. Allow 1/4 inch extra clearance so the holes may be enlarged later if necessary.



3.9.8 Rivet a P3 plug in one end only of a T238 aileron pushrod as in 3.9.1. Install the pushrod through the holes in the ribs and screw it onto the BE rodend in the F39 bellcrank assembly as shown. Tighten the N3 nut securely. Note that the inboard P3 plug and rodend will be installed later during calibration of the aileron control linkage.



3.9.10 Fit the strut fitting stabilizer F241L into position with the tape gusset G235 under it as shown. Rivet F241 to the spar cap with six stainless steel rivets. Clamp F241L to the strut fitting and *carefully* drill the 1/4 inch strut mounting hole through F241L using the strut fitting as a drill guide. *Do not enlarge the hole in the strut fitting.*



NOTE: *The tip gussets (G25) and capstrips C4 shown on drawing E will be installed after the wingtip is covered.*

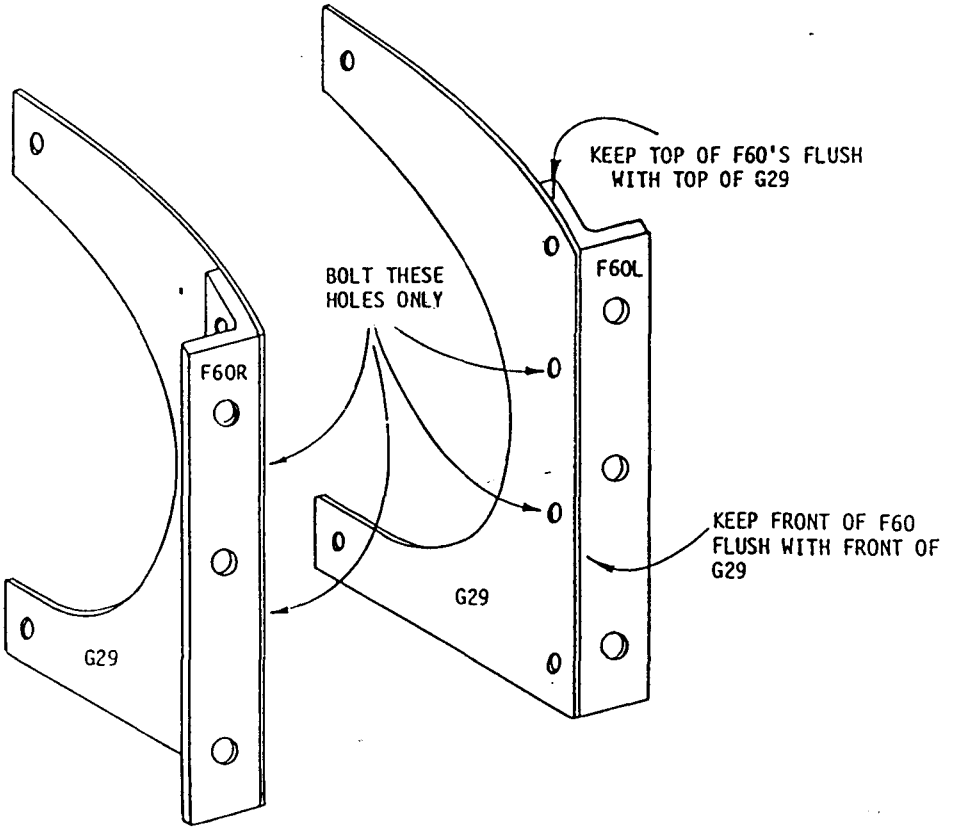
SECTION 4

NACELLE ASSEMBLY

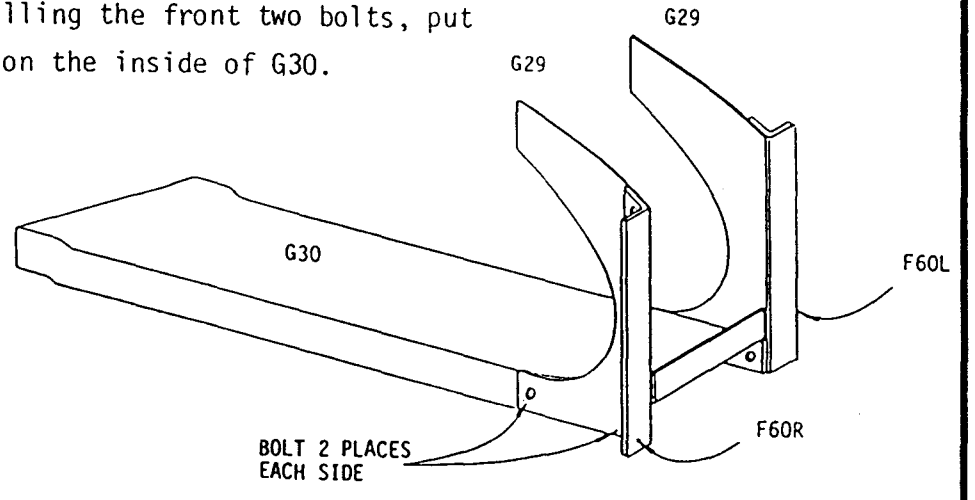
4.1 BASIC ASSEMBLY

NOTE: *Two nacelles are required (one for each engine). The two nacelles are identical except for the location of the cable clips (step 4.3.4). The nacelle front angles (F60L and F60R) are designated left and right with respect to their position on each nacelle (i.e. each nacelle uses one F60L and one F60R).*

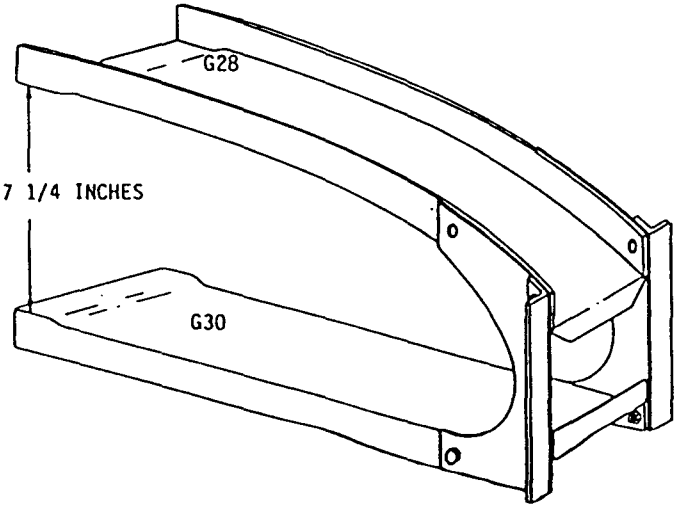
4.1.1 Clamp left and right nacelle front angles (F60L and F60R) to side gussets G29 as shown. Using the G29's as a template, drill the four mounting holes in each of the F60's. Bolt the F60's to the G29's with two 34 bolts in the middle two holes only. Make one left assembly and one right assembly for each nacelle as shown. Insert the bolts so that the head is on the F60 side of the assembly.



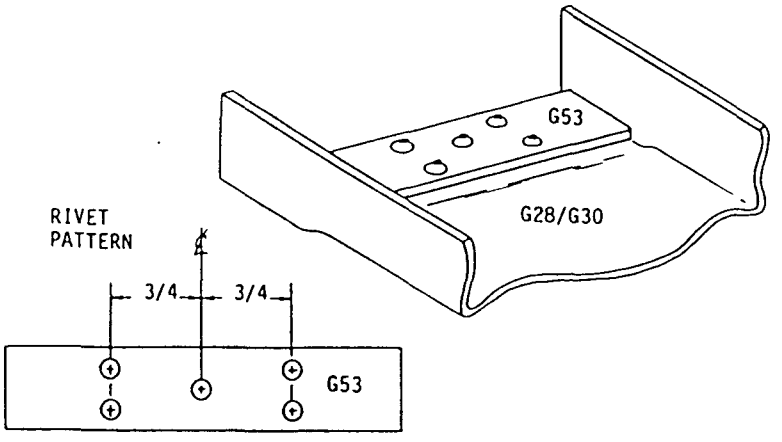
4.1.2 Clamp the nacelle gusset assemblies to the nacelle bottom (G30) as shown below. Make sure the bottom edges of the G29's are flush with the bottom edges of the G30. Make sure the front surface of the bent-up tab on G30 is flush with the front surface of the G29's and F60's. Using the G29's as templates, drill and bolt all four mounting holes. Use two 35 bolts with W3H washers in the front holes and two 34 bolts with W3H washers in the rear holes. When installing the front two bolts, put the heads on the inside of G30.



4.1.3 Clamp the nacelle top (G28) in place as shown below. Some force may be necessary to align both sides correctly. Make sure that the front surface of the bent-down tab on G28 is flush with the front edge of the G29's and F60's. Make sure that the top edge of the G28 is flush with the top edges of the G29's. Drill and bolt *the front holes only.* Adjust the spacing between the two rear mounting surfaces to 7 1/4 inches as shown and tighten the bolts.



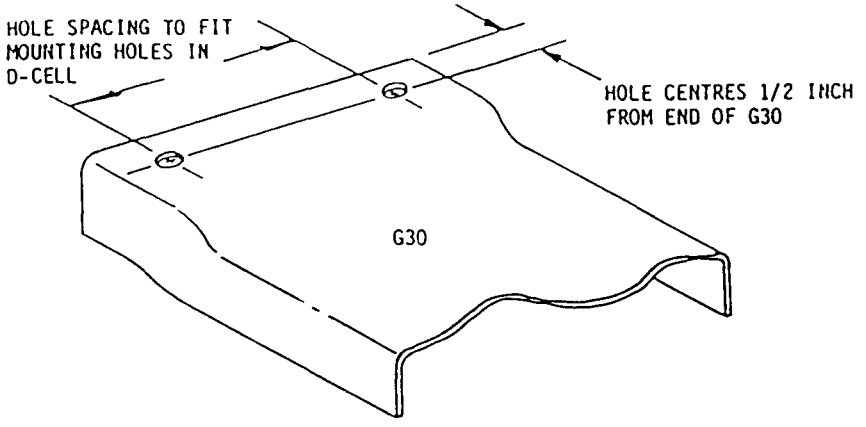
4.1.4 Fit the Nacelle Doublers G53 into G28 and G30 and rivet in place as shown. Make the edge of G53 flush with the trailing edge of G28/G30.



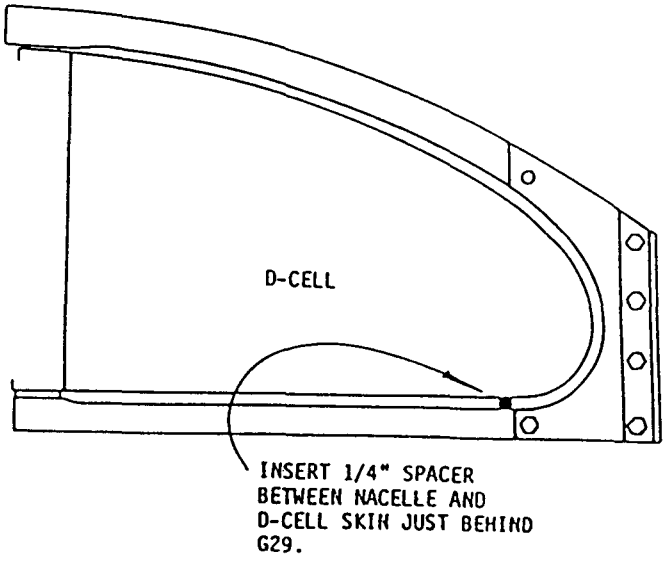
4.2 NACELLE - TO - WING FITTING

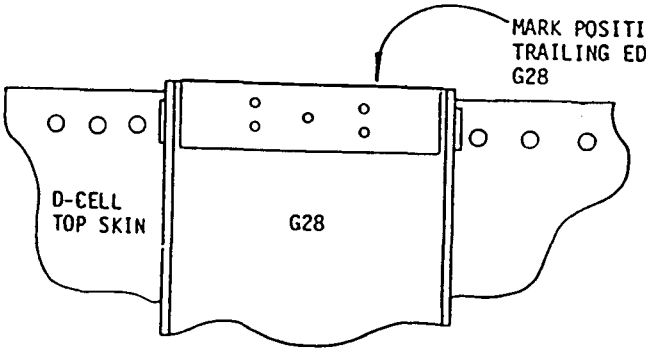
NOTE: *The hole spacing on the nacelle-to-wing mounting holes is nominally 3 inches. However, manufacturing tolerances can cause this measurement to vary as much as ± 1/32". Therefore, to ensure that the nacelle mounting bolts can be inserted and removed easily without resorting to oversize holes, it is recommended that each nacelle be custom fitted to the particular wing on which it will be used. After fitting, nacelles should be identified as left or right.*

4.2.1 Measure the hole spacing on the bottom nacelle mounting holes on the D-cell. Mark and drill corresponding holes 3/16" diameter in the nacelle bottom (G30) as shown.



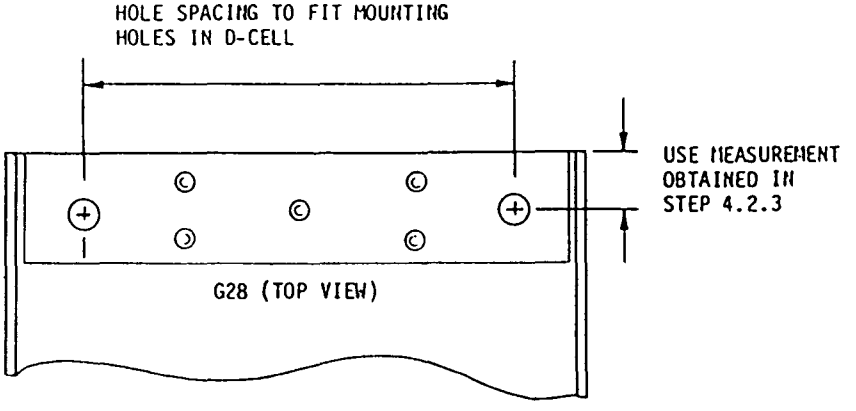
4.2.2 Bolt the nacelle onto the D-cell with two 35 bolts. Temporarily insert a 1/4 inch spacer (tube, dowel or a strip cut from 1/4 inch plywood) between the nacelle and the bottom of the D-cell at the location shown. Push the nacelle firmly against the spacer and mark the location of the trailing edge of the nacelle top on the gusset used to mount the R7 rib.



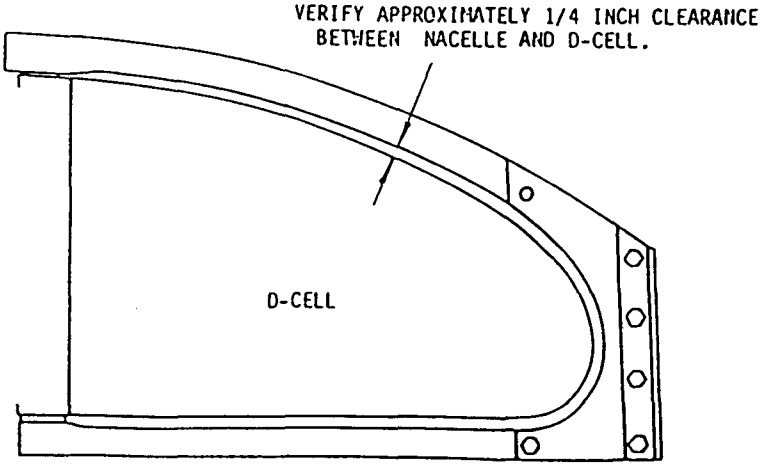


4.2.3 Measure the distance from the line drawn in step 4.2.2 to the centres of the nacelle mounting holes in the top of the D-cell. Note that this measurement might not be the same for both mounting holes. Transfer these measurements to G28.

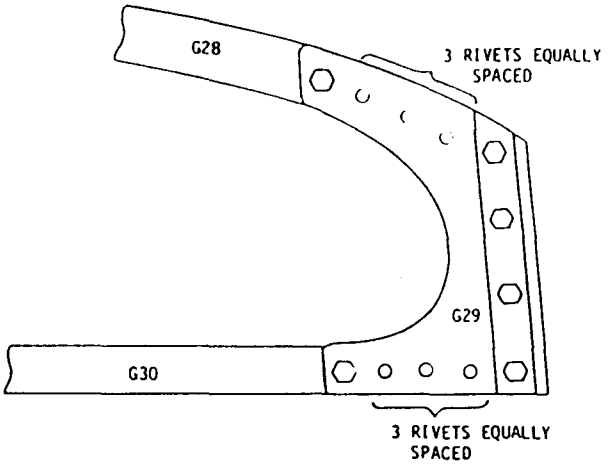
4.2.4 Measure the distance between mounting hole centres on the D-cell. Locate and drill corresponding mounting holes (3/16" diameter) in the G28.



4.2.5 Bolt the nacelle in place (use two 35 bolts with W3H washers in the top) and verify that there is approximately 1/4 inch clearance between the nacelle and the D-cell. Drill and bolt the top corners of the G29's to the G28, using two 34 bolts with W3H washers.



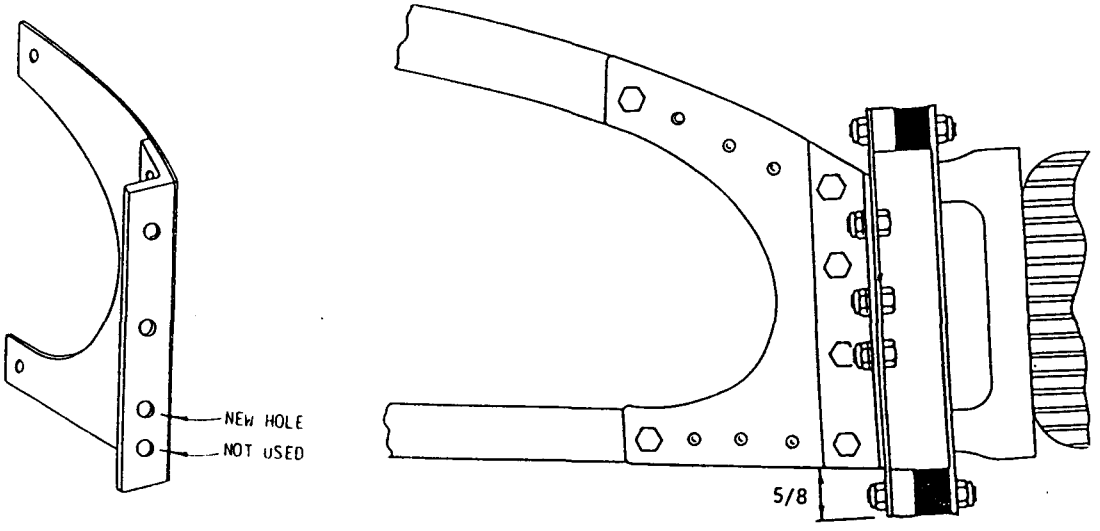
4.2.6 Remove the nacelle from the D-cell. Drill holes and install six rivets on each side of the nacelle as shown.



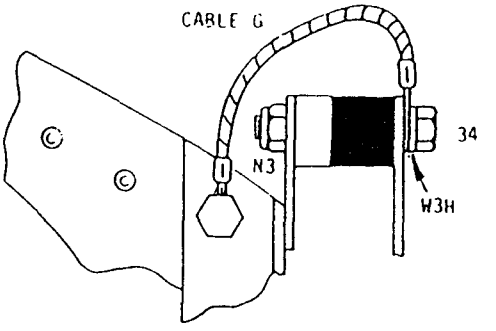
4.3 ENGINE MOUNTING

4.3.1 Before mounting the engine, drill one additional 3/16 inch mounting hole in the front face of each F60 angle. The new hole should be in line with the three existing holes and 5/8 of an inch above the bottom hole. Note that the bottom hole will not be used.

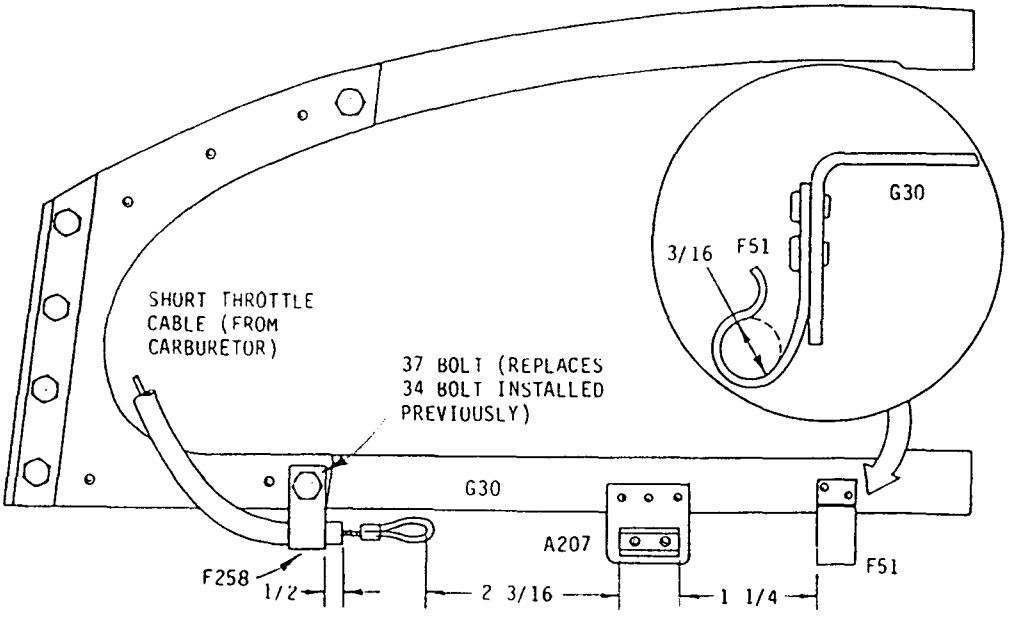
4.3.2 Clamp the nacelle to the engine mounting plate as shown. Centre the nacelle laterally on the mounting plate and position the bottom of the F60's 5/8 of an inch above the bottom edge of the mounting plate. Using the F60's as a template, mark the position of the six mounting holes on the mounting plate (do not mark the bottom hole) and drill the six 3/16 inch holes in the mounting plate. Bolt the nacelle to the mounting plate with six 35 bolts with W3H washers under the nuts. Drill and rivet the tabs on G28 and G30 to the mounting plate with three stainless steel rivets in each.



4.3.3 Install two ground cables (Cable G) on each engine as shown. Use the existing 35 bolts on the nacelle and install 34 bolts in the holes provided on the front mounting plate. Use W3H washers under the heads of the bolts. Make sure the cables are positioned so they cannot rub on the edges of the mounting plates.

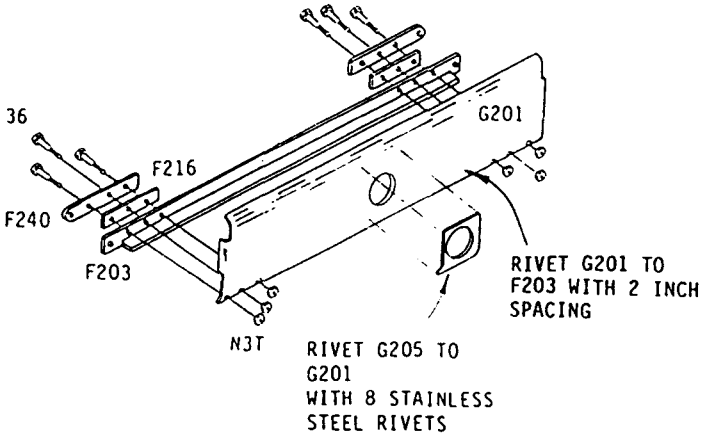


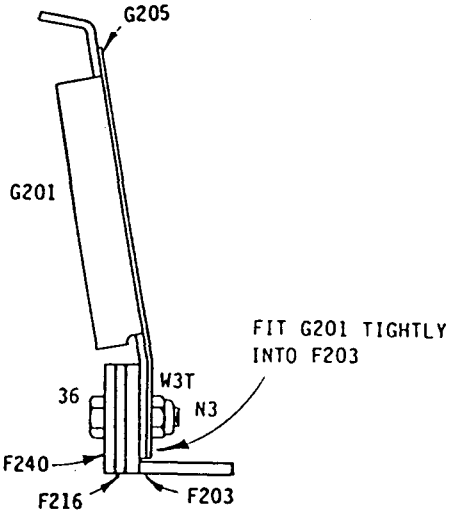
4.3.4 Remove the 34 bolt *on the inboard side* of G29/G30 and replace it with a 37 bolt to secure the F258's as shown. Position the short throttle cable so it is clear of the pull start assembly and make sure it is bent in a smooth curve. Position the A207 clip assembly so the forward edge of the clip is 2 3/16 inches aft of the inside of the loop in the cable as indicated in the figure, and rivet A207 in place with three rivets. Bend an F51 clip and rivet it in place with two rivets as shown. The loop in F51 should be in line with the clip on A207.



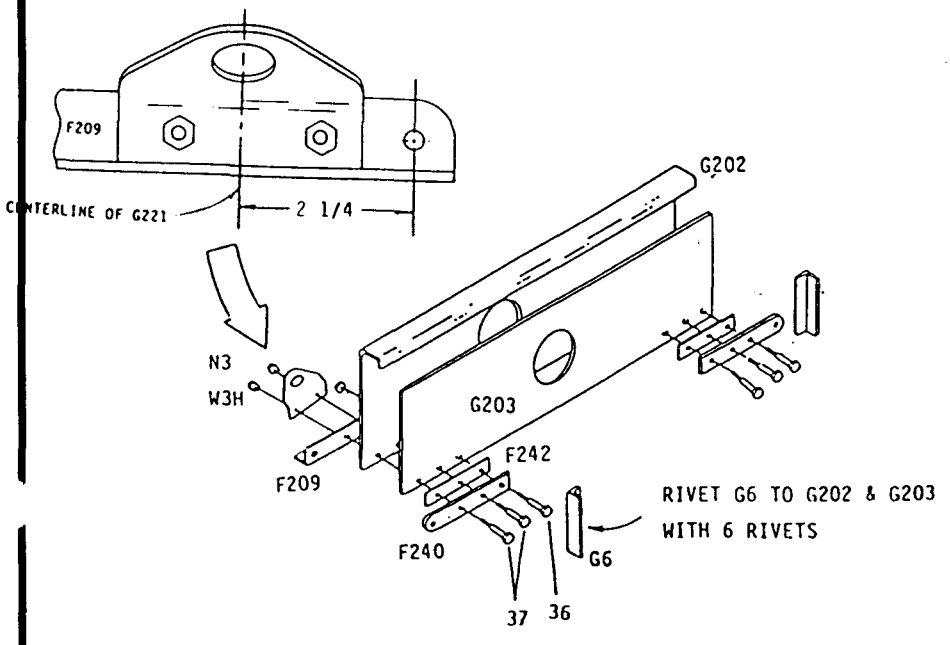
5.1 WING MID-SECTION ASSEMBLY

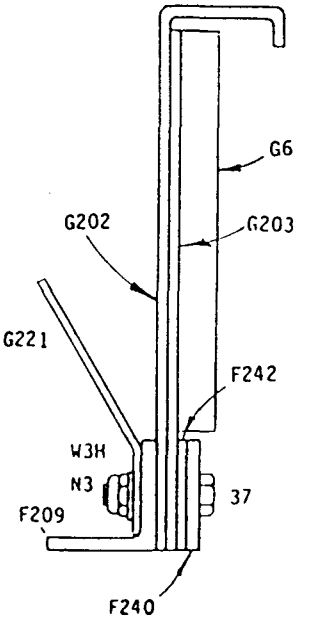
5.1.1 Assemble the rear spar as shown. Use 1/4 inch bolts through the outboard holes in the wing attach fittings to ensure proper alignment. Make sure G201 is centred on F203.



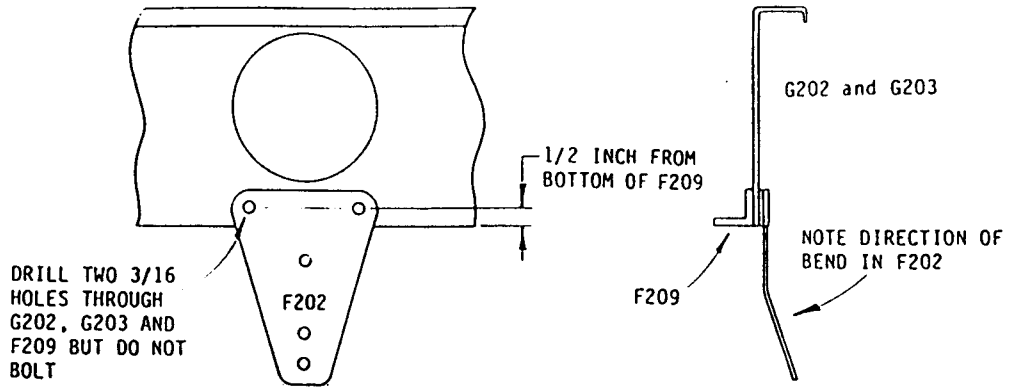


5.1.2 Similarly assemble the main spar as shown. Rivet the G6's flush with the end of G202/203. Make the bottom of F209 flush with the bottom of G202/203. Make the end of F242 flush with the end of G203.

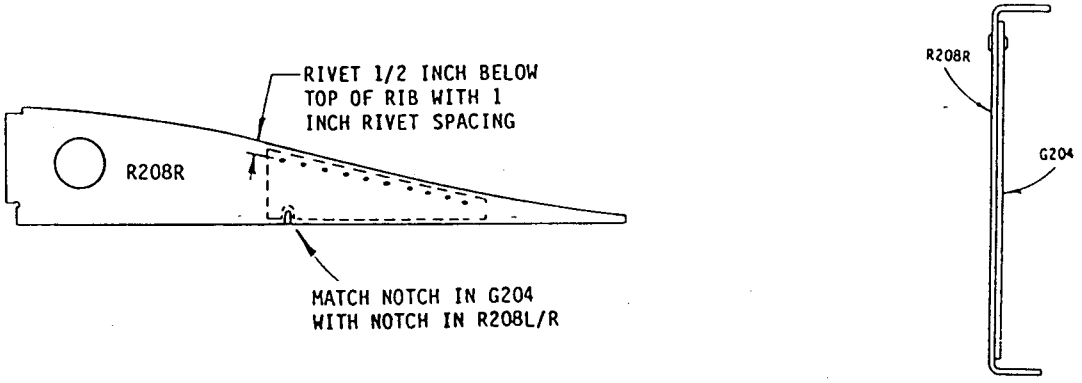




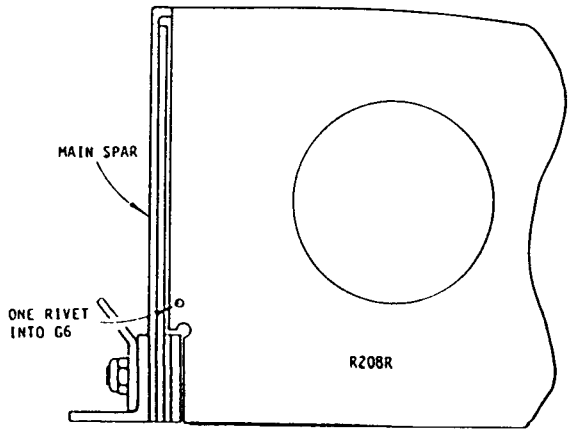
5.1.3 Temporarily clamp gusset F202 onto the main spar and drill the two 3/16 inch holes as shown. Make sure F202 is centred on the front spar.



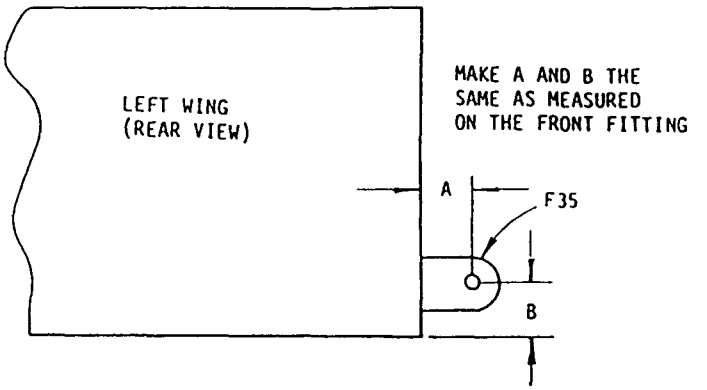
5.1.4 Fit G204 doublers into ribs R208L and R208R and rivet along the top edge as shown.



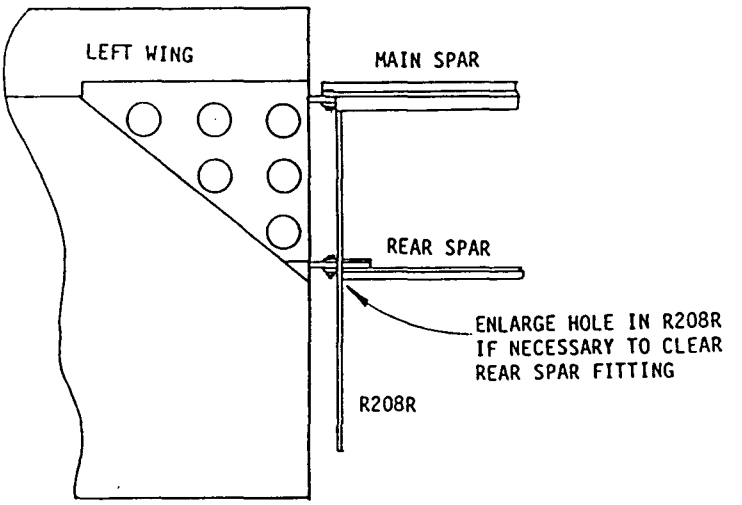
5.1.5 Rivet Rib R208R onto the main spar with one rivet only into the G6's as shown. Note that R208R is on the *left* side of the mid-section. Make the leading edge of R208R flush with the spar web.



5.1.6 Temporarily tape the F35 rear wing attach fittings onto the F34 angles in each wing.



5.1.7 With the left wing flat on the floor (or on a very large table) fit the mid section onto it as shown and pin with two 1/4 inch bolts.



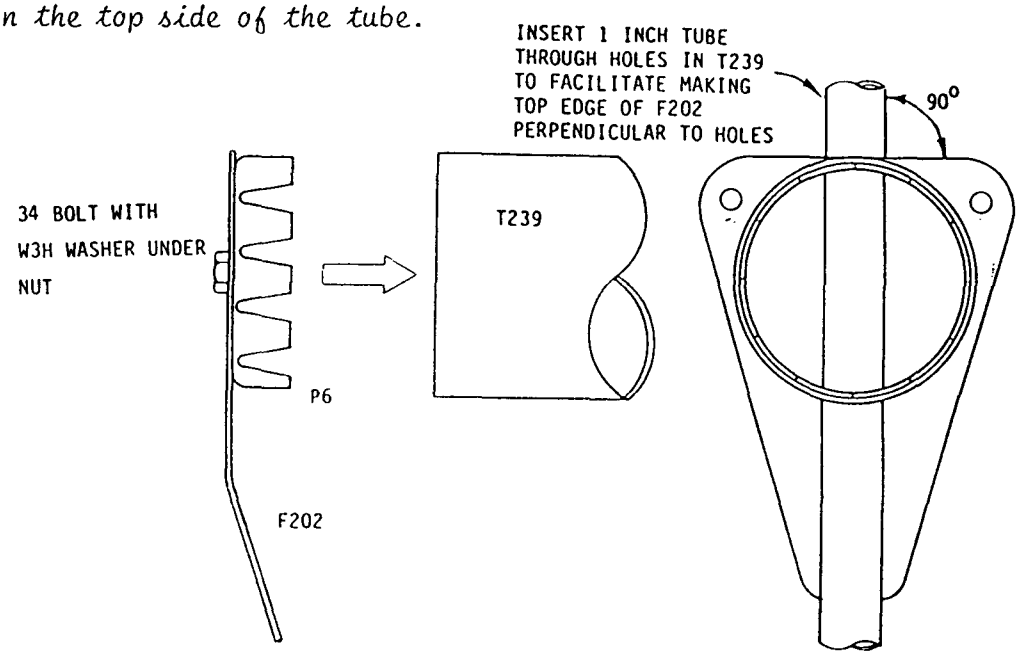
5.1.8 Align the R208R on the mid section with the root rib on the wing. Rivet or cleco the top corner of R208R to the G6 (from the inside) and put two rivets or cleco fasteners through the flange on G201 to secure it to R208R.

5.1.9 Repeat steps 5.1.5 to 5.1.8 for the right wing.

5.1.10 With the mid section removed from the wings, complete riveting R208L/R to the G6's for a total of 8 rivets each. Rivet R208L/R to G201 with a total of 5 rivets each side.

5.1.11 Remove all burrs from the inside of flange G205 and slide the boom tube T239 through it. Note that the end of T239 with the 1 inch hole drilled through it goes *forward*.

5.1.12 Bolt a P6 plug to the upper middle hole in F202. Fit the plug into the forward end of T239. Rotate the plug and F202 as shown and rivet the plug to T239 with one stainless steel rivet into each tab. Note that the 1 inch hole through T239 is not perpendicular to the axis of the tube. *The hole is closer to the end of the tube on the top side of the tube.*

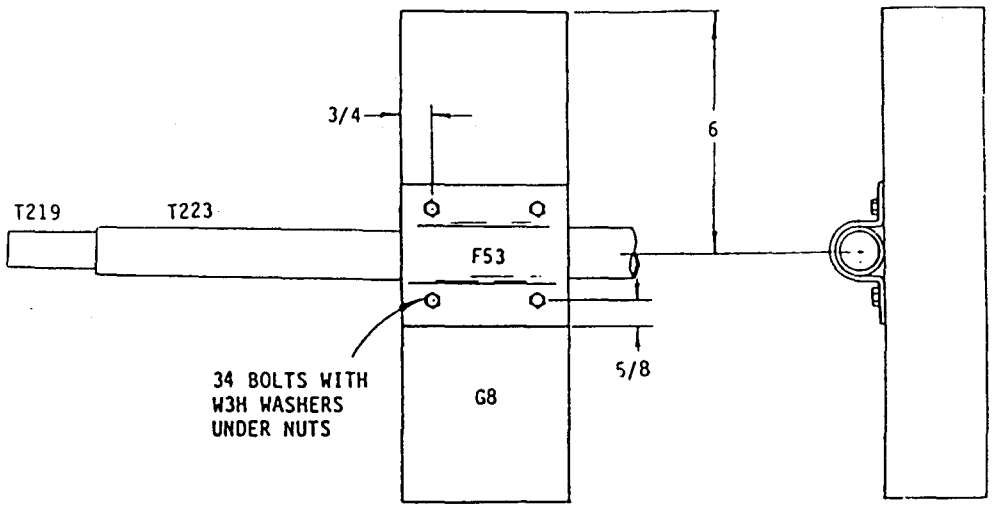


5.1.13 Rivet F202 to P6 with 8 stainless steel rivets equally spaced on a 2 inch diameter circle.

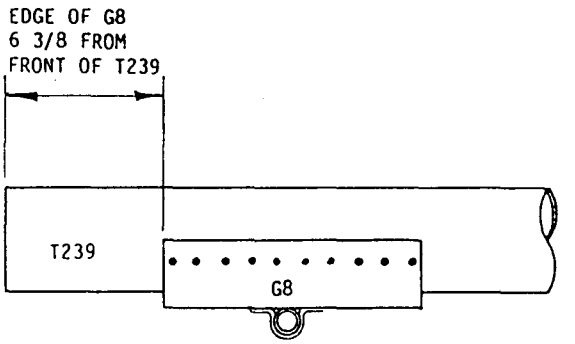
5.1.14 Bolt F202 to the main spar with two 35 bolts, and a W3H washer under the nut.

5.1.15 Rivet rear spar flange G205 to T239 with 6 equally spaced stainless steel rivets, making sure that *the main spar and rear spar are parallel.*

5.1.16 Assemble F53, T219 and T223 on G8 and bolt as shown. Make sure T219 and T223 are centered on G8 before tightening nuts.



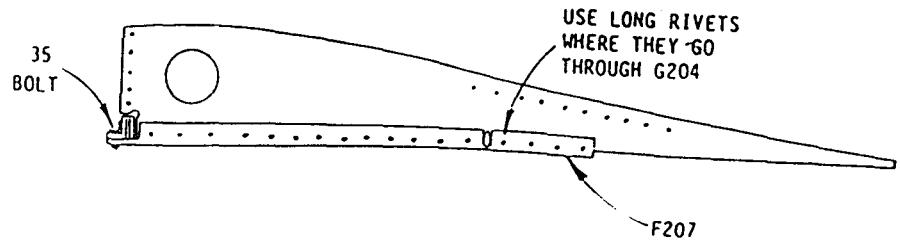
5.1.17 Position G8 on T239 as shown. Make sure T223 is parallel to the spars and rivet G8 in place with one row of rivets into each side of T239 and one row into the bottom of T239. Use aluminum rivets with a 1/2 inch spacing.



5.1.18 Rivet F53 to T223 with 8 stainless steel rivets. Do not rivet within 3/4 of an inch of the edge of F53.

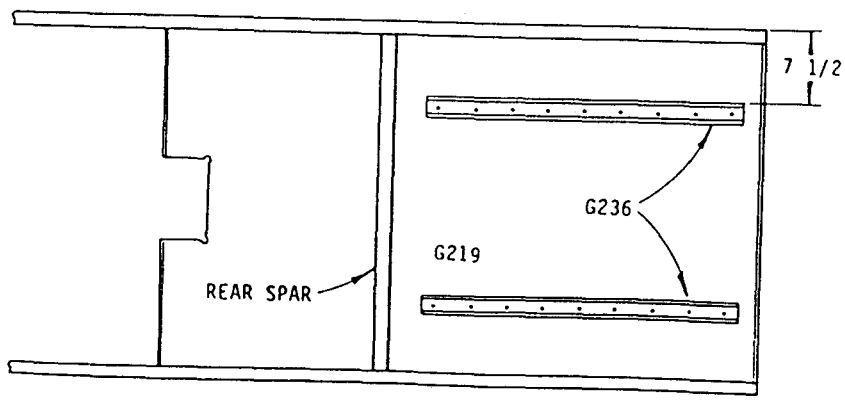
5.1.19 Rivet the bottom rear skin G219 in place using a 1 inch rivet spacing into the bottom flange on F203. Position G219 so that the trailing edge will be aligned with the trailing edge of the wings. Enlarge the cutout if necessary to clear G8. Rivet G219 to the rearmost 10 inches only of R208L/R with a 1 inch rivet spacing, keeping R208L/R straight.

5.1.20 Fit the F207L/R angles into position as shown and rivet to R208L/R. Bend F207L/R at the notch as required. Note that ahead of the notch, the F207's are straight and the bottom of the rib is curved, so there will not be continuous contact, but push the F207's up as tightly as possible. Use a 1 inch rivet spacing in the side of the rib and a 2 inch spacing in the bottom lip of the rib (where it is in contact with F207). Drill and bolt the F207's to F209 using a 35 bolt as shown. Position the bolt to allow sufficient room to tighten the nut and squeeze the F207's together to obtain sufficient clearance for the 1/4 inch wing fitting bolts.

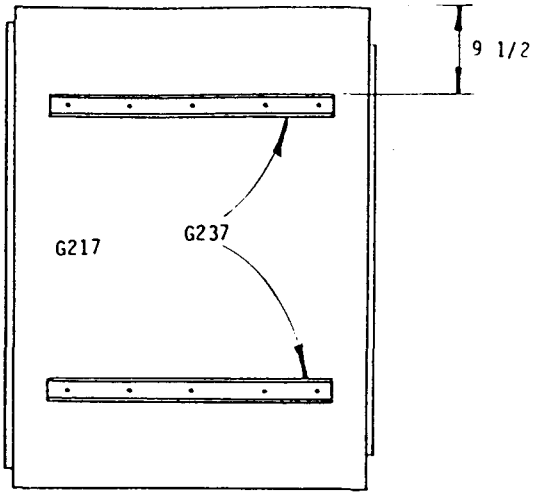


5.1.21 Complete the riveting of G204 to R208L/R with a 1 inch rivet spacing around the perimeter.

5.1.22 Rivet two G236 stiffening ribs in place on the inside of G219 as shown with a 2 inch rivet spacing (with the rivet heads on the outside).



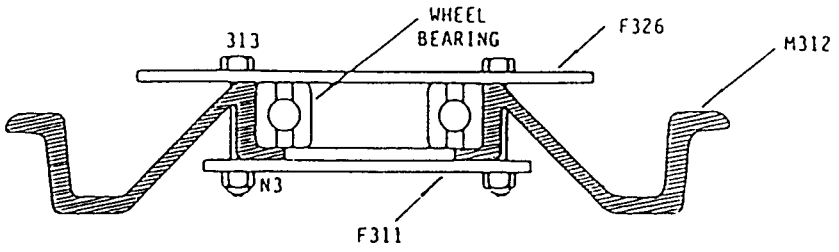
5.1.23 Rivet two G237 stiffening ribs onto the inside of the top rear skin G217 as shown. Use a 2 inch rivet spacing with the heads on the outside of G217.



5.1.24 Rivet G217 in place with a 1 inch rivet spacing into R208L/R and a 2 inch spacing into the lip on G219.

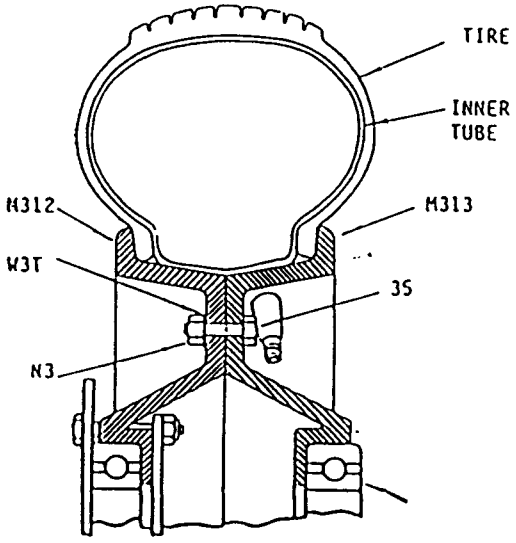
5.2 WHEEL, BRAKE AND AXLE ASSEMBLY

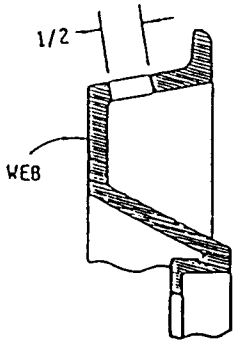
5.2.1 Assemble a wheel bearing, brake disc (F326) and backup disc (F311) on each inboard hub half (M312) as shown. Tighten nuts alternately and *evenly* to avoid distorting the brake disc.



5.2.2 Drill a 1/2 inch valve stem hole in each M313 outboard hub half as shown at right below. Drill the hole midway between two bolt holes as close to the vertical web as possible.

To assemble each wheel, fit the inner tube inside the tire and inflate it slightly to remove the wrinkles, then deflate it sufficiently to permit assembly of the wheel hubs. Fit the valve stem through the hole in M313 and fit the hub half inside the tire. Fit M312 into the tire making sure the bolt holes are aligned and *the inner tube is not pinched between the two webs*. Bolt the hub halves together with 35 bolts and a W3T washer under each nut. Install the bolt nearest the valve stem first, then the one opposite the valve stem, then the remaining bolts. Check frequently to make sure that the inner tube is not being pinched.





5.2.3 When the wheels and tires are assembled, inflate them to about 5 PSI and bounce them on the floor a few times to seat the inner tube, then inflate them to 16 PSI.

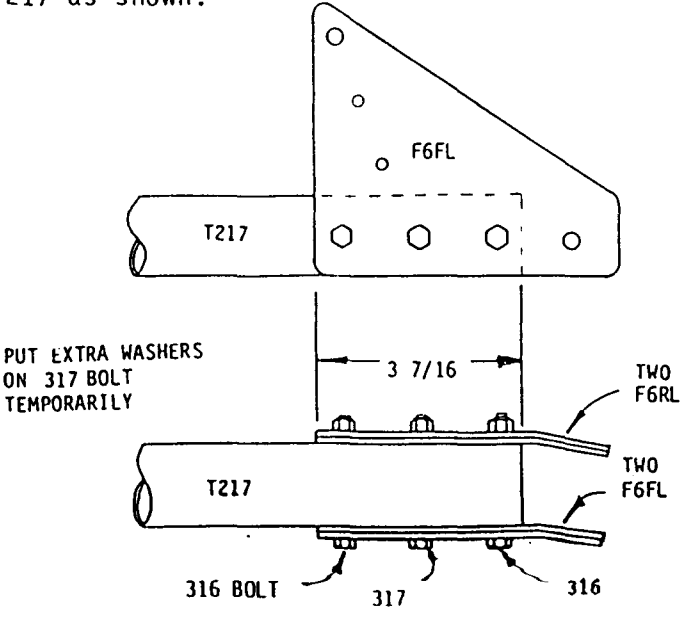
NOTE: The optimum tire pressure will depend on the pilot weight and the condition of the airfield. However, the wheel hubs are designed for low pressure tires.

TIRE PRESSURE SHOULD NOT, UNDER ANY CIRCUMSTANCES, EXCEED 18 PSI.

5.2.4 Check the fit of the wheel bearings over the T216 intermediate axle tube. If the bearings are a tight fit now, they will be much tighter two years from now when you have to remove a wheel to fix a flat tire. If necessary, file or sand the axle tube slightly so the wheels will slide on and off easily. Before the final installation of the wheels, coat the ends of the axle liberally with grease.

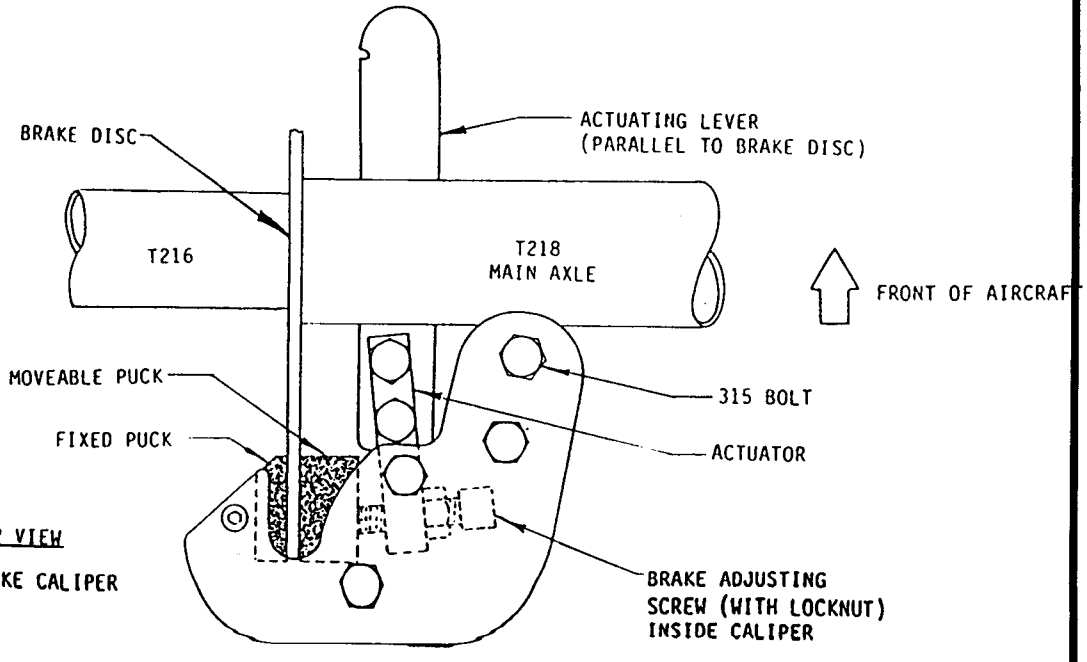
5.2.5 Insert a P18 plug into each end of inner axle tube T217. The P18's should be flush with the ends of T217.

5.2.6 Sand the edges of the strut/axle gussets F6FL, F6RL, F6RR and F6FL to a smooth finish for maximum resistance to fatigue cracking. Bolt *two* F6FL's (front left) and *two* F6RL's (rear left) to one end of T217 as shown.

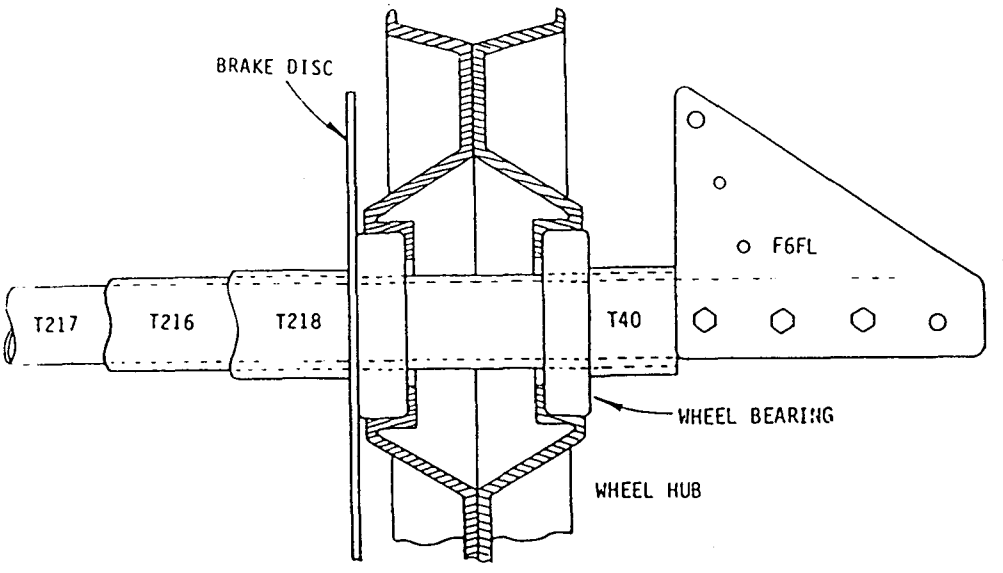


5.2.7 Slide the intermediate axle tube T216 over T217 and push it tightly against the F6's. Slide one T40 spacer over T216.

5.2.8 To avoid having to remove the wheels later, the brake calipers should be installed with the wheels (even though they will not be bolted in place until after the fuselage is assembled). Inspect each brake caliper, and make sure that the actuator lever moves freely and the moveable puck slides easily in the bore. Slide the puck back out of the way, hook the caliper over the brake disc on the wheel as shown. Note that the left wheel is installed first and it should have the left caliper (A202) on it. Verify that when the caliper is *behind* the axle, the acutating lever is *under* the axle. You may find it easier to back out the adjusting screw to install the caliper over the disc. After installation, the calipers should be adjusted as follows: the adjusting screw should be set so that when the brakes are applied, the *actuating lever* is parallel to the brake disc, then the screw should be locked by tightening the locknut. Note that this differs from the adjustment on the Series III Lazair where the actuator (not the actuating lever) is set parallel to the disc. The cable adjuster (to be installed later) should be used to calibrate the brake system during installation or to compensate for cable stretch, but should not be used to compensate for puck wear. As the pucks become worn, the brakes should be recalibrated by resetting the adjustment screw as described above.



5.2.9 Slide the left wheel (and brake assembly) onto the axle, then slide on the outer axle tube T218 and check that the assembly is as shown.



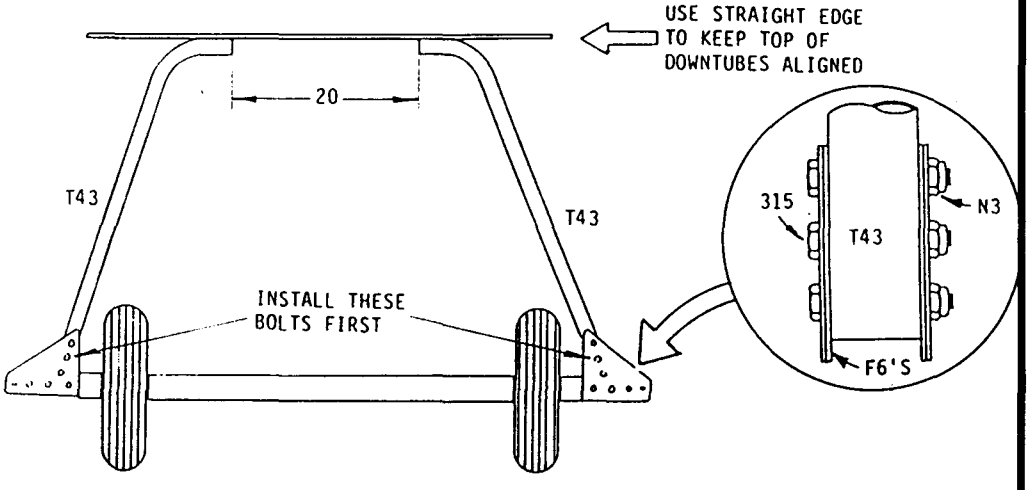
5.2.10 The inboard half of each seatbelt should be installed on the axle before the right wheel. Normally the belts are installed so that the buckle (with the adjustment) is on the pilot's right, but this may be reversed if you wish. The outboard half of each belt will be installed on the T14/T15 side tubes later. *Refer to drawing J. in the Parts Catalogue.*

5.2.11 Slide the right wheel (and brake) and T40 into place and push all the tubes tightly against F6FL and F6RL. The end of the second T40 should be flush with the end of T216. If necessary, trim the end of either T216 or T40 to make them flush.

5.2.12 Bolt the remaining strut/axle gussets (F6FR and F6RR) in place, making sure they are tight against the end of T216 and T40. Make sure they are parallel to the F6's on the other end of the axle, and make sure that all eight F6's face forward.

5.3 A-FRAME ASSEMBLY

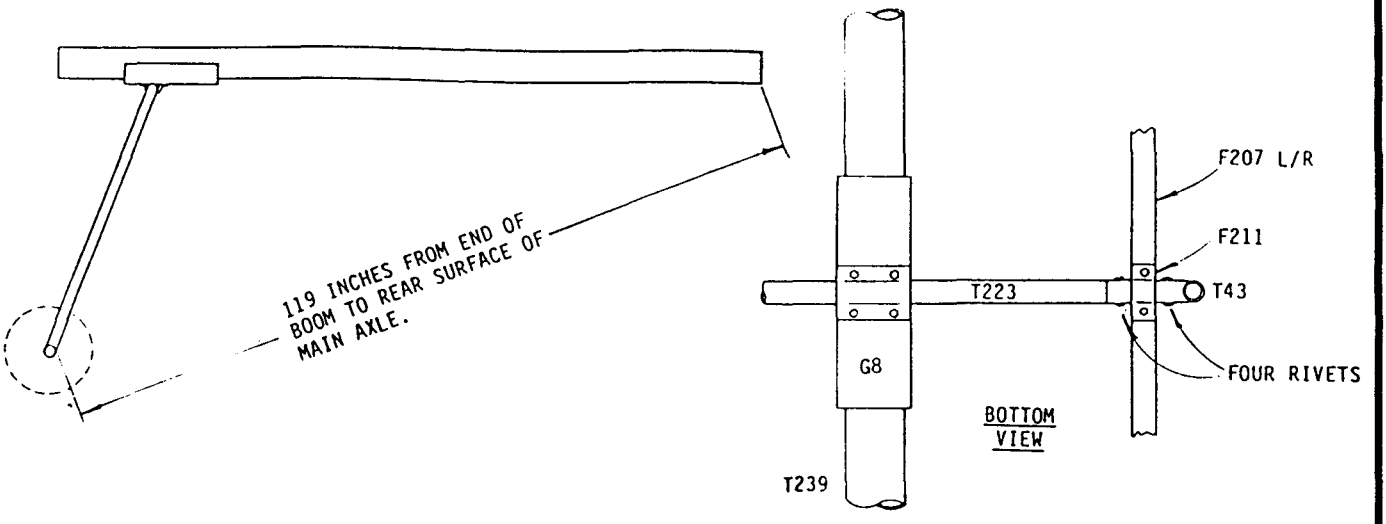
5.3.1 Install a P11 plug in the bottom end of each T43 downtube. To ensure that the A-frame is a flat plane it should be assembled on a *flat* bench or table. Assemble the T43 downtubes and axle as shown with the wheels over the edge of the bench so that the A-frame is flat. Use weights on the top end of the downtubes to hold them in place. The bottom of the downtubes should touch the axle. Drill and bolt the downtubes to the F6's as indicated. Drill and bolt the centre hole first and make sure it is on the centreline of T43. The other two holes may be slightly off the centreline of T43. Install nuts on the three bolts on one side only.



5.3.2 Remove one downtube (the one with the nuts left off), then re-assemble the A-frame on the fuselage (with the top of the downtubes over the ends of T219) and tighten all nuts.

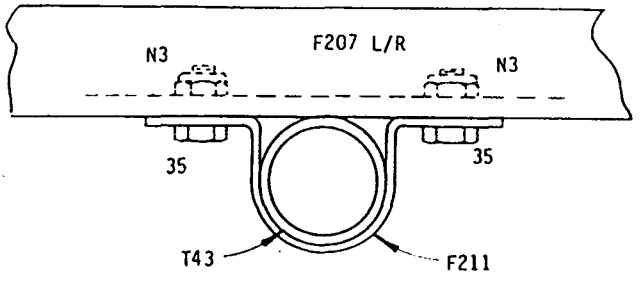
NOTE: *Many of the following steps will be easier with the fuselage inverted. However, to avoid confusion, figures in the instructions will show it in its normal upright position.*

5.3.3 Position the A-frame as shown and rivet the T43's to T219 with a total of 8 stainless steel rivets. Note that the downtube clamps (F211) shown in the figure will be installed in the next step, and position the rivets to avoid interference.



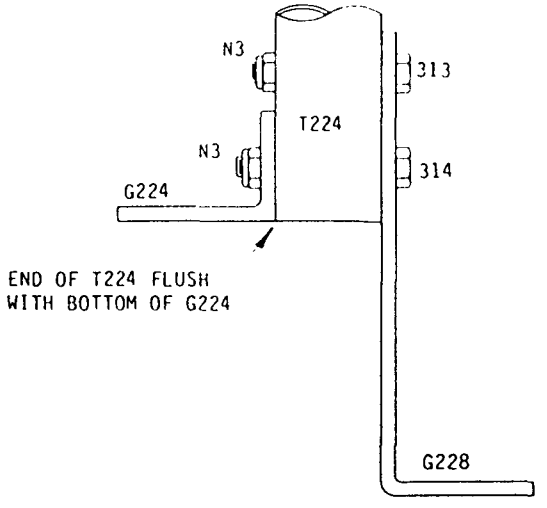
Note that at this stage of assembly, the A-frame is not triangulated. If you have to move or invert the fuselage, support the A-frame so it does not tend to rotate about T219 and shear the rivets. If necessary, tape a peice of tubing or wood between the axle and the boom to help hold the A-frame in position.

5.3.4 Make sure that T223 is perpendicular to the boom, then drill and bolt the two F211 downtube clamps to the bottom of the F207's.

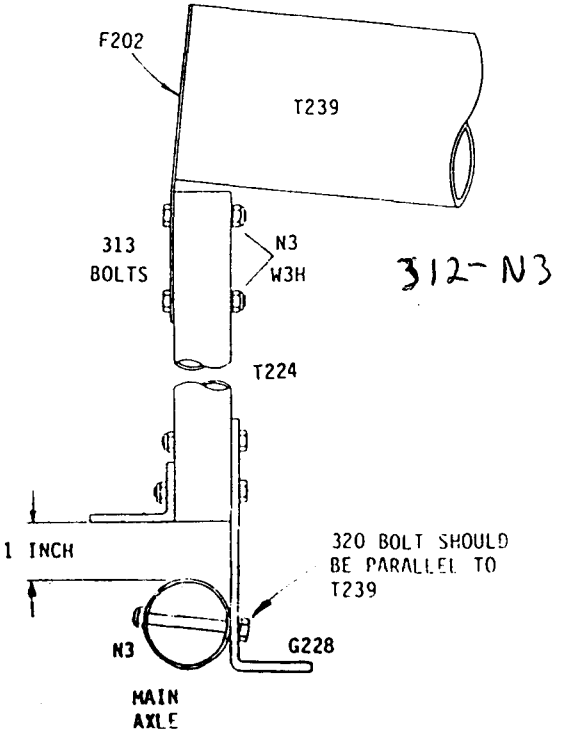


5.4 COCKPIT ASSEMBLY

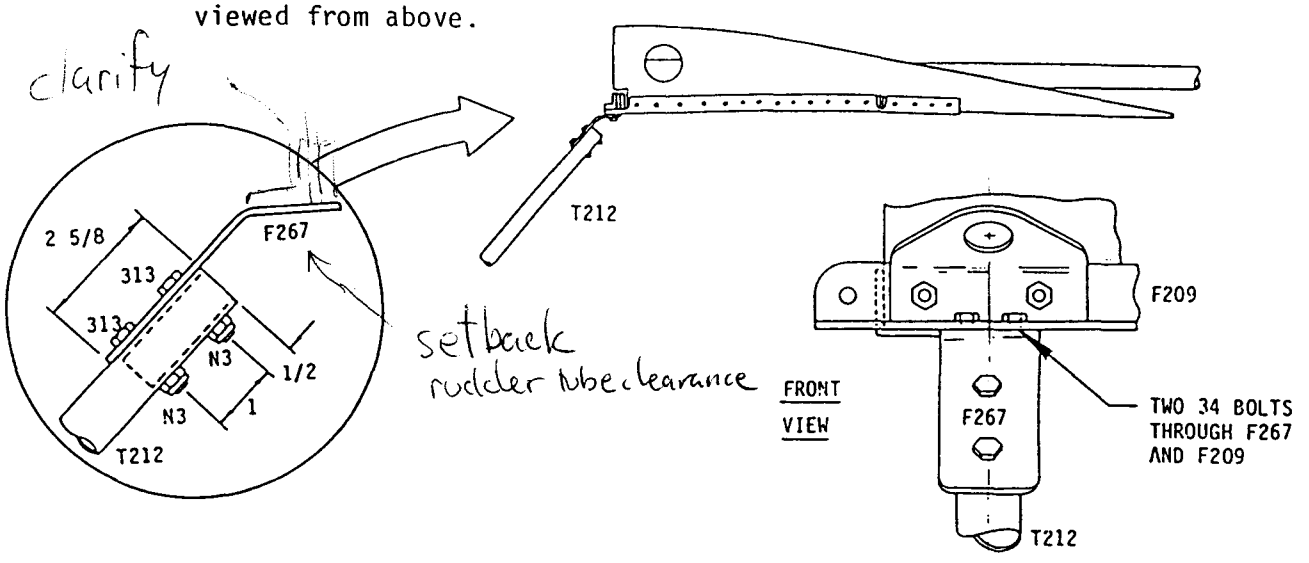
5.4.1 Insert a P12 plug into each end of vertical downtube T224 and assemble with Aileron Control Bracket G228 and top side tube bracket G224 as shown.



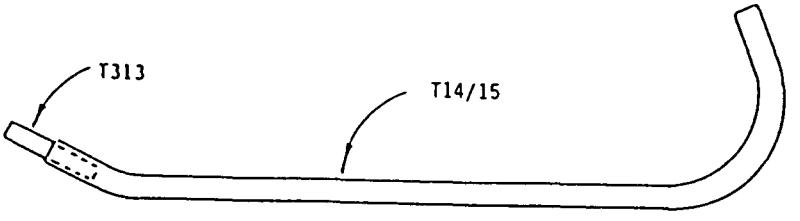
5.4.2 Install the T224 assembly between F202 and the main axle as shown. Use a 1 inch diameter tube as a spacer to locate the bottom of T224 one inch above the axle. Before drilling the holes in the top end of T224, recheck the measurement in step 5.3.3. Make sure the bottom end of T224 is centered laterally on the axle. Temporarily install extra washers on the 320 bolts as necessary.



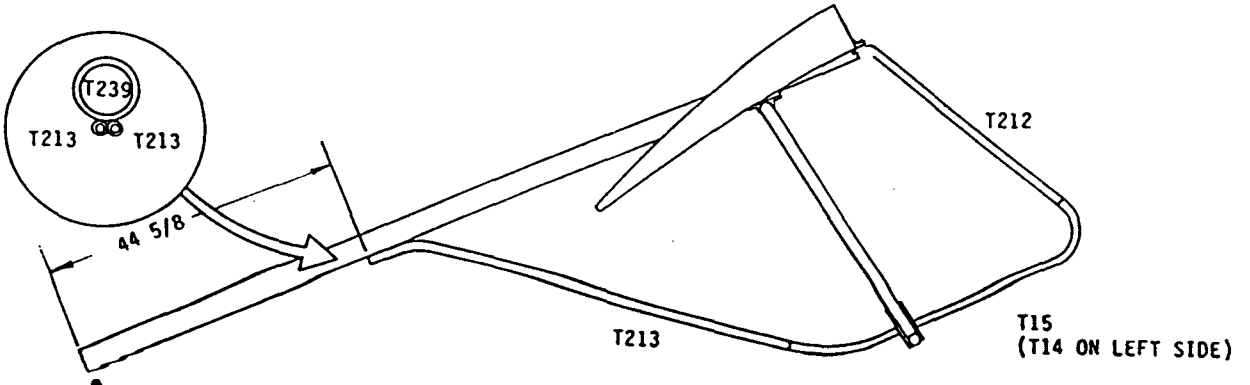
5.4.3 Install a P12 plug in one end only of both T212 front tubes, then drill and bolt the F267 mounting brackets in place as shown. Bolt each T212 assembly to the bottom of the main spar angle (F209). The top of T212 should be positioned so that the centerline of T212 is in line with the center of the large hole in G221. The T212's should be parallel to the boom when viewed from above.



5.4.4 Insert a T313 splice tube into the end of side tubes T14 and T15 as shown. Tap the T313's with a wooden block to seat them in the T14/15.



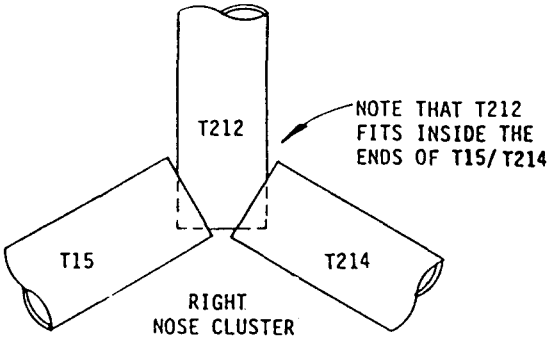
5.4.5 Slide a T213 rear fuselage brace over the T313's and position the tubes as shown. Tape the tails of the T213's temporarily but *tightly* to the bottom of T239 in the position indicated. Tape the junctions of T14/15 and T213 to hold the ends of the tubes tightly together.

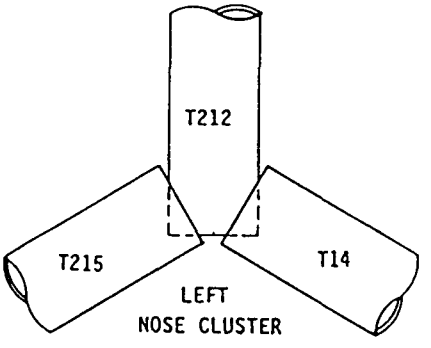


NOTE: *To avoid having to disassemble the fuselage later, now is a good time to install the remaining half of the seatbelts. Slide the loops in the ends of the seatbelt halves over the front of T14 and T15 and slide them back almost to the junction of T213.*

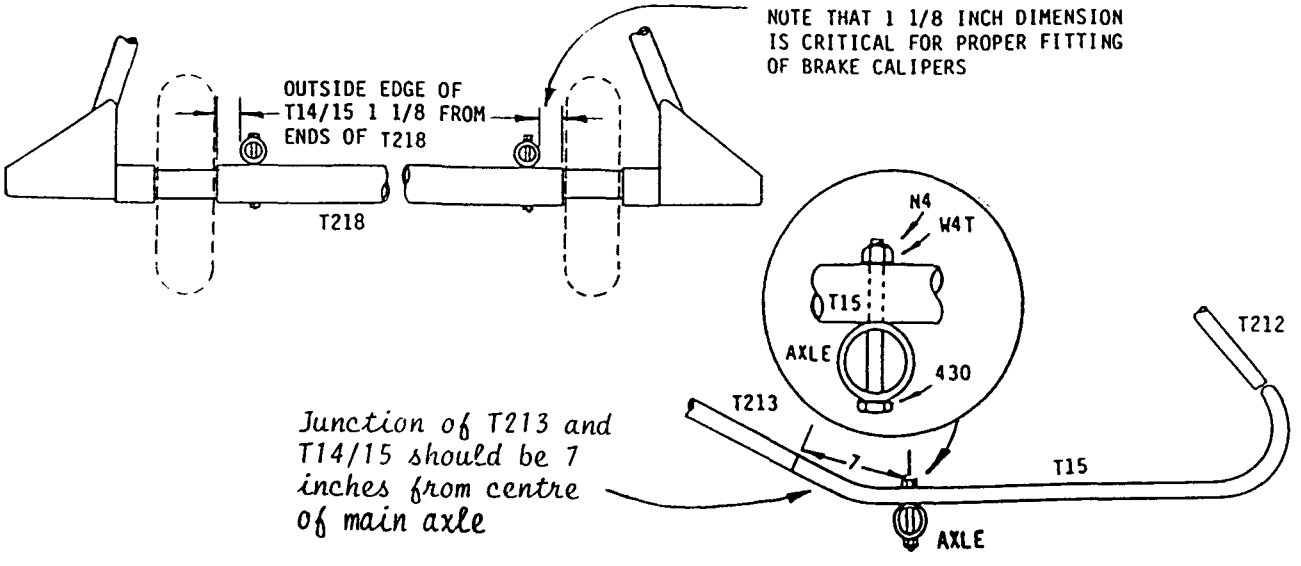
5.4.6 Fit the inboard side tubes T214 and T215 into position with the trailing end of each on top of the axle and under the G224 bracket installed in Step 5.4.1.

5.4.7 Temporarily tape the two nose clusters together as shown.

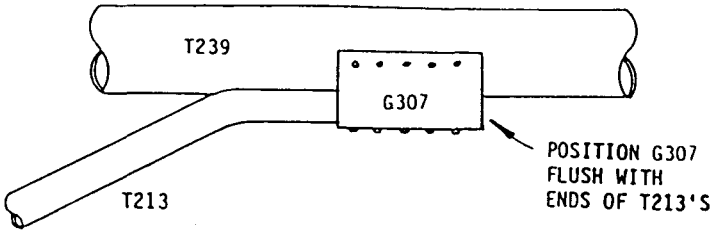


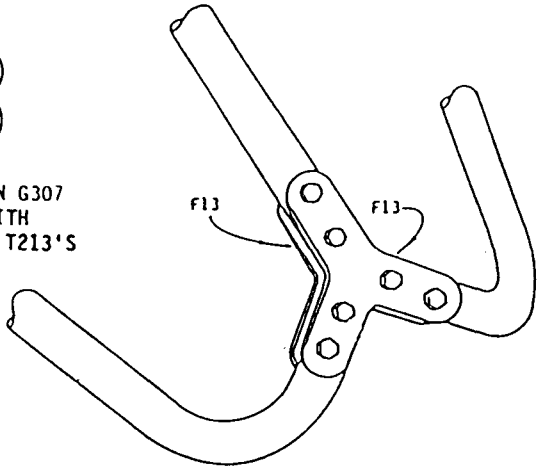


5.4.8 Drill 1/4 inch holes and bolt T14 and T15 to the axle as shown using 430 bolts and N4 nuts. If necessary the ends of the T213's may be moved along the boom to achieve the correct position of T14/15 on the axle.



5.4.9 Make sure the T213's are butted tightly against the ends of T14/T15 and rivet G307 in place as shown, using 5 stainless steel rivets into each side of the boom and 5 stainless steel rivets into the bottom of each T213.

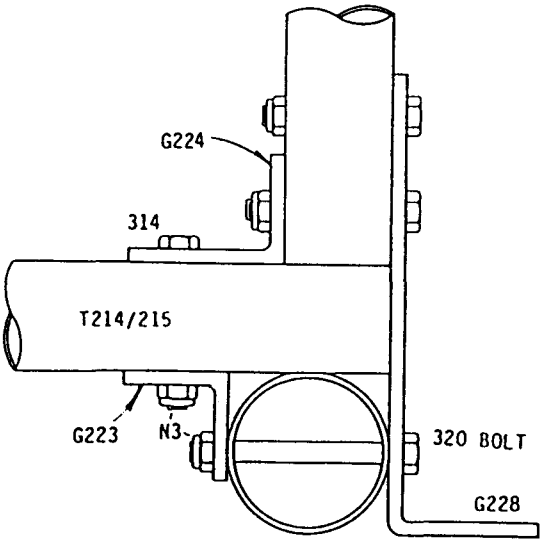




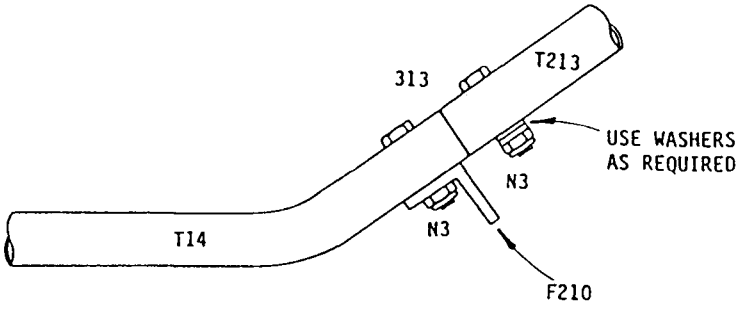
DO STEP 5.6.10 & 5.6.11

5.4.10 Bolt the nose clusters together using two F13 nose cluster Y's and six 314 bolts with W3T or W3H washers under the nuts as required.

5.4.11 Remove the 320 bolts installed in Step 5.4.2. Make sure the trailing ends of T214 and T215 are properly positioned and clamp the lower bracket G223 in place as shown. Using G224 and G228 as drill guides, drill the 4 holes in G223 (and the holes in T214 and T215) as required and install the bolts.

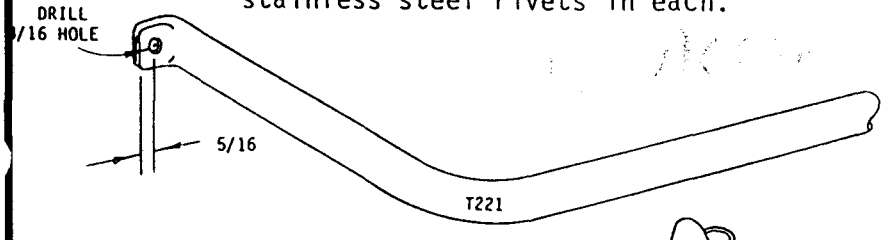


5.4.12 Install the rear cockpit spreader F210 between T14 and T15 as shown.

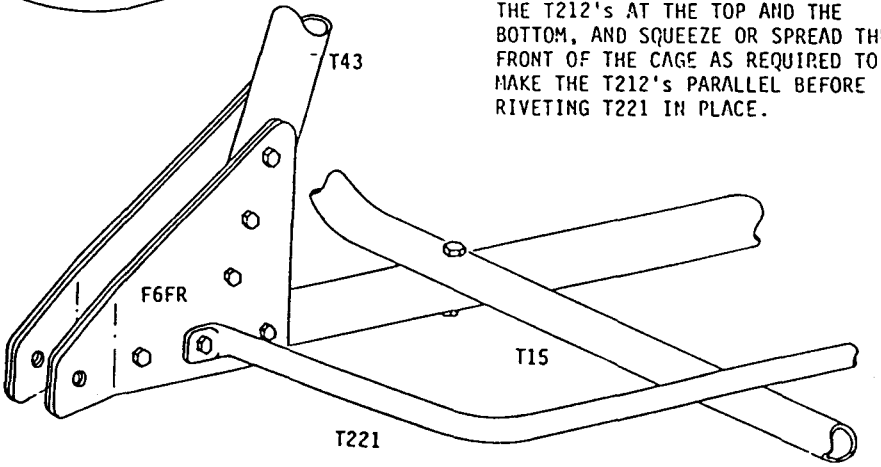


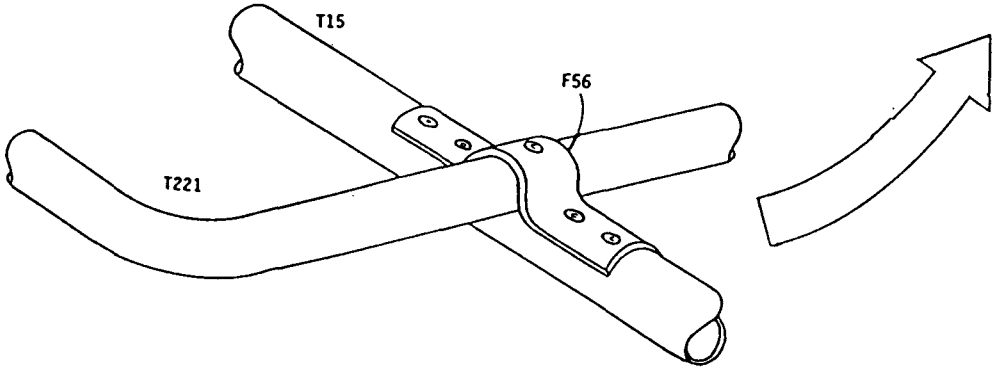
NOTE T214-T215 NEED

5.4.13 Drill a 3/16 inch hole in each end of front crosstube T221 and install as shown. Rivet the four F56 clamps in place with 5 stainless steel rivets in each.

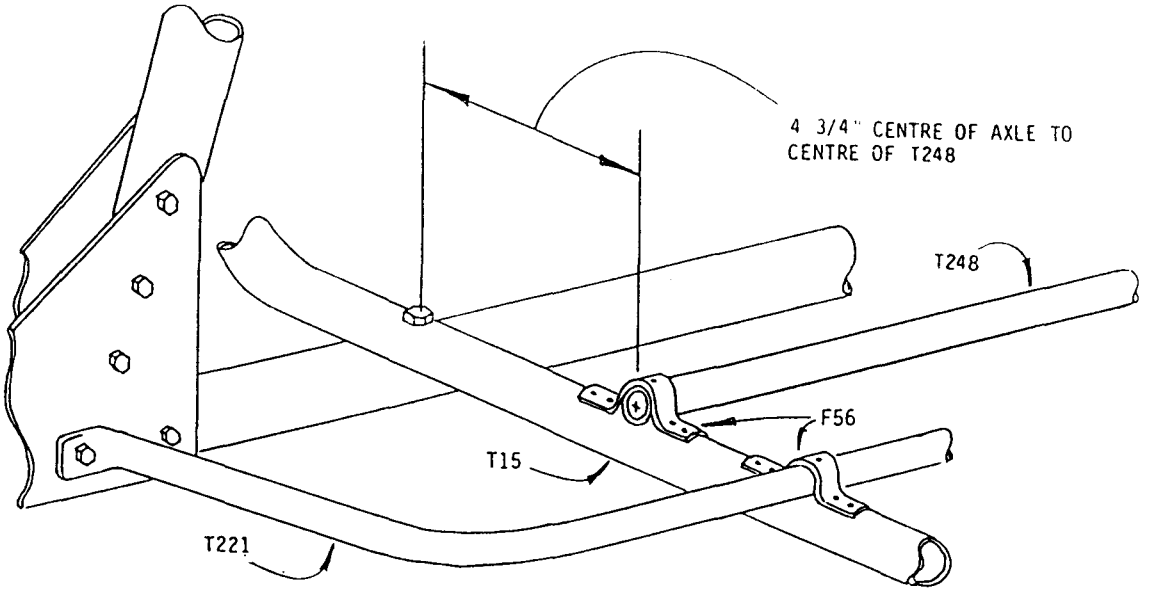


NOTE: MEASURE THE SPACING BETWEEN THE T212's AT THE TOP AND THE BOTTOM, AND SQUEEZE OR SPREAD THE FRONT OF THE CAGE AS REQUIRED TO MAKE THE T212's PARALLEL BEFORE RIVETING T221 IN PLACE.





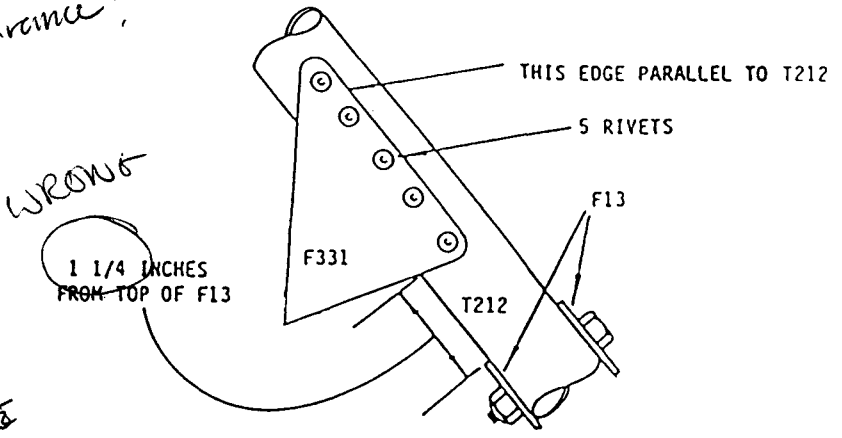
5.4.14 Install the two T248 Seat Support Tubes as shown below using the four F56 clamps provided and stainless steel rivets.



5.5. AILERON CONTROL LINKAGE INSTALLATION

5.5.1 Rivet an F331 Bracket to each T212 front tube as shown. Sight the position of F331 from above and in front of T212 to make sure it is properly aligned before riveting.

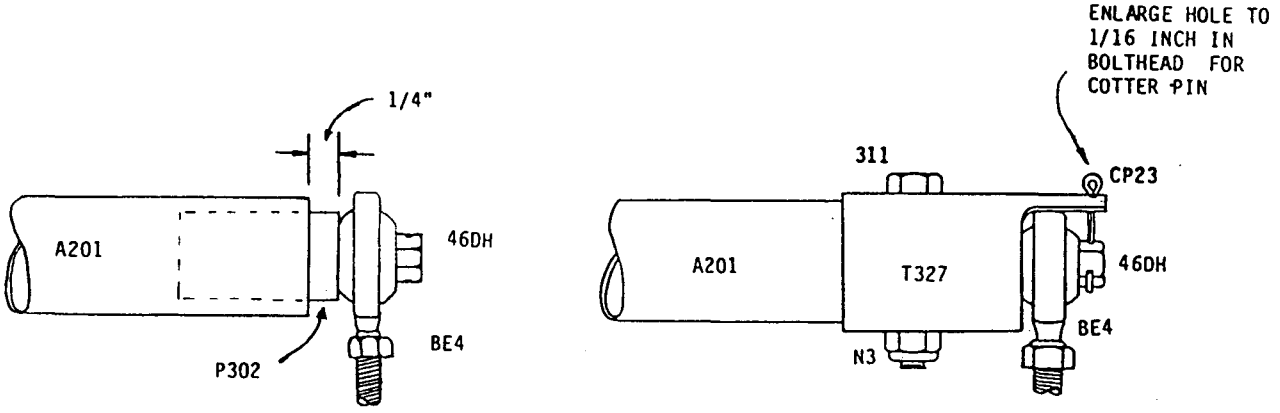
A201 clearance?



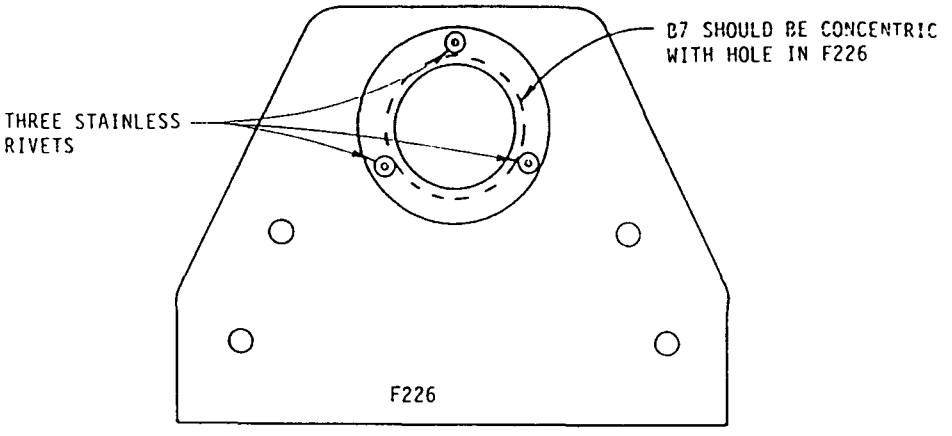
NEED MORE

INSTALL NOSEWHEELS / ASSEMBLE A201 / CK clearance OVER NOSEWHEEL

5.5.2 Make up two P302 assemblies and install in the A201 torque tube assemblies (with a T327 locking tube) and pin the bolt as shown. The hole for the 311 bolt should be in line with the tab on T327 and *perpendicular to the predrilled hole in A201.*

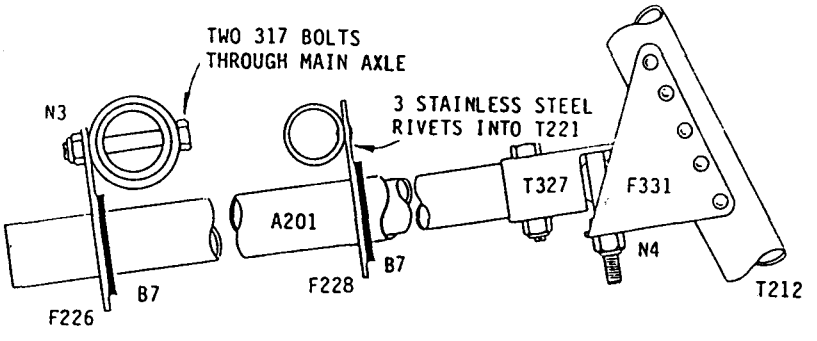


5.5.3 Rivet B7 bushings onto both F226 and F228 torque tube brackets with 3 stainless steel rivets in each. Make sure the holes are concentric. Check the fit of the B7 bushings by inserting an A201, and enlarge the hole if necessary. The tube should rotate with little or no friction, but should not be sloppy.

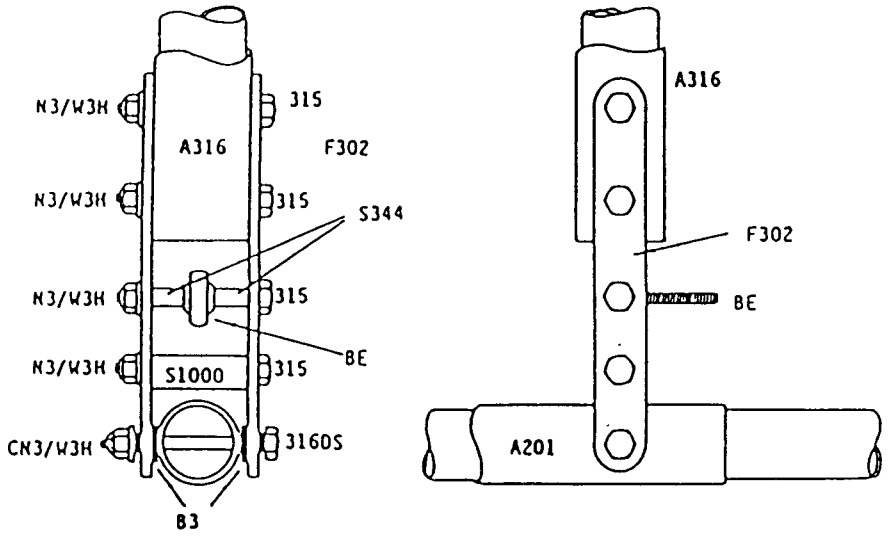


5.5.4 Install the A201 assembly in F331 and secure with an N4 nut as shown. Install the F226's and F228's as shown, making sure they are perpendicular to the A201 torque tube. Position the F226's laterally so that A201 is midway between the sidetubes (T14/215 and T15/214) and bolt with two 317 bolts as shown.

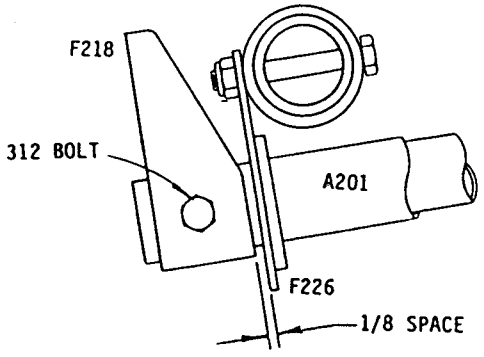
NOTE: Before riveting F228 in place, refer to the installation of the nosewheel axle in section 5.8. Temporarily fit the nosewheel axle in position to check the width of the cage. If it is necessary to squeeze or spread the cage in order to make the nosewheel axle fit, complete steps 5.8.1 to 5.8.4 before riveting F228 in place.



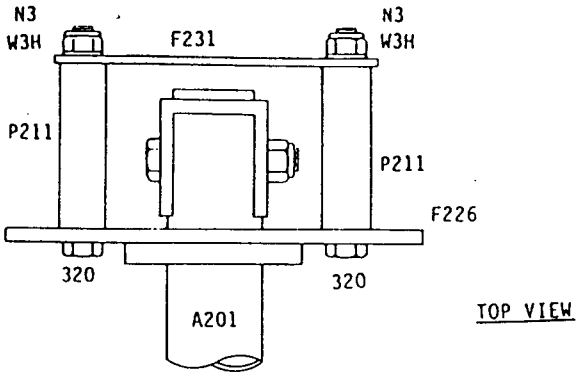
5.5.5 Install the A316 control sticks on the torque tubes as shown. Tighten the CN3 castle nut until the stick moves with just a bit of friction and install the CP23 cotter pin.



5.5.6 Install an F218 horn on each torque tube as shown. *Make sure F218 is parallel to the control stick.* The excess length on A201 may be cut off if you wish. *Do not overtighten the nut on the 312 bolt and deform the tube.*



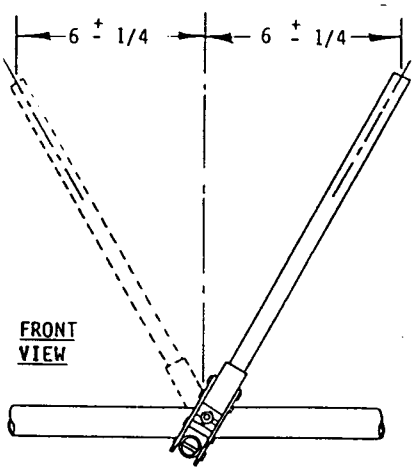
5.5.7 Install the P211 control stops and F231 strap on the F226's as shown.



5.5.8 Check and adjust the stick limit stops as follows:

(a) Stick Lateral Movement

Move the control stick from side to side and check the maximum deflection each side of neutral as indicated. To adjust the limit stops, loosen the 320 bolts installed in step 5.5.7 and rotate the P211's as necessary. When the stops have been adjusted tighten the nuts on the 320 bolts *securely*.

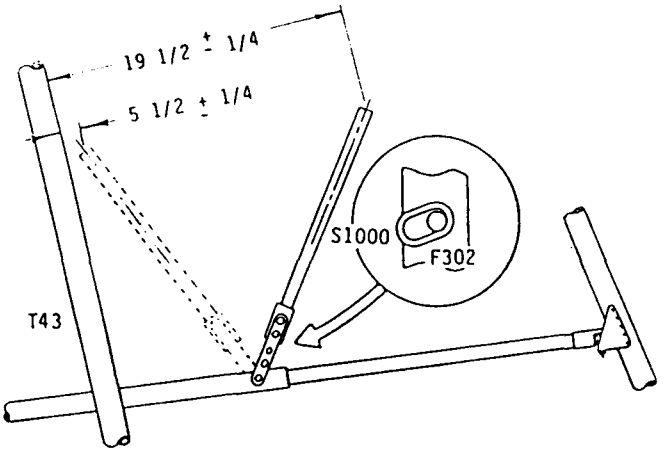


(b) Fore/Aft Movement

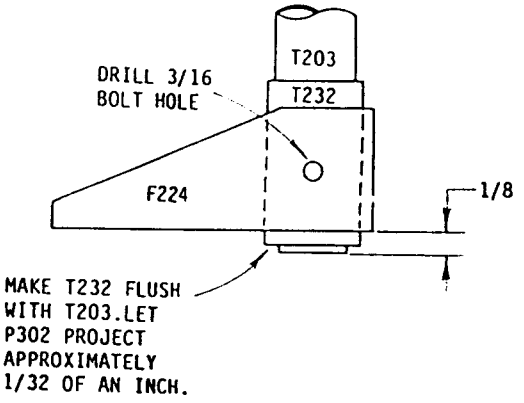
Fore/Aft limit stops are adjusted by the location of the S1000 stop on the stick assembly. Position S1000 as required to allow the stick movement as indicated

below, and tighten the bolt and nut securely to clamp S1000 in place. Note that it may be necessary to squeeze S1000 in a vise and install it as shown in the inset to achieve the correct limits.

Note that the stick position is measured from the front *plane* of the A-Frame (this is not a direct measurement from the T43 downtube)

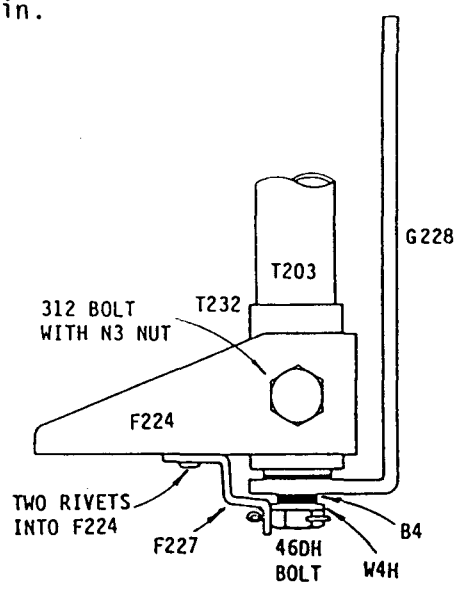


5.5.9 Install a P302 plug in one end of the T203 vertical torque tube. Assemble the F224 horn and T232 sleeve and drill a 3/16 inch bolt hole as shown.

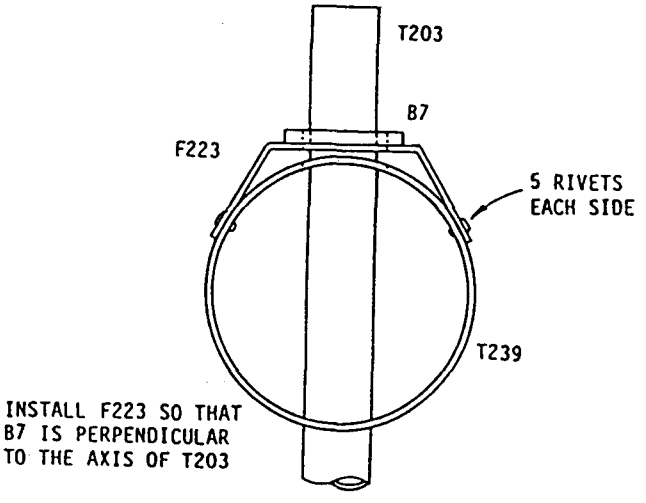


5.5.10 Fit T203 through the 1 inch hole in the boom and assemble the bottom as shown. *Proper adjustment of the 46 DH bolt is essential for proper control operation.* Tighten the 46DH bolt so that the B4 expands and eliminates any side play, but do not tighten it so much that rotational friction becomes excessive. Drill a 1/16 inch hole in the F227 locking plate and pin the bolt with a CP23 cotter pin. (Drill an additional hole in the bolt head if

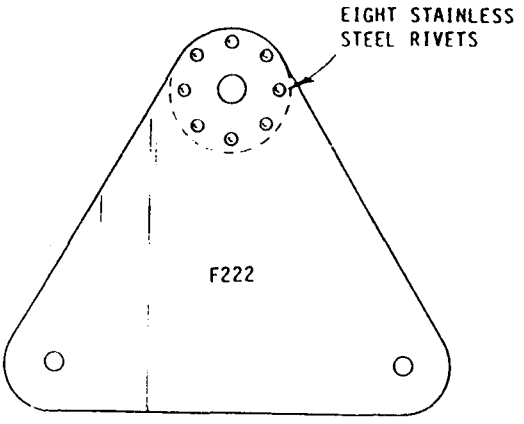
necessary). As this bolt is flight critical, it is strongly recommended that loctite® 242 or equivalent be used in addition to the cotter pin.

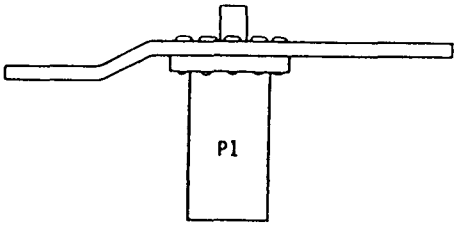


5.5.11 Rivet a B7 bushing to the F223 mount (as in Step 5.5.3) and install the mount on the boom with 5 rivets on each side. Make sure the mount is located to centre T203 in the 1 inch hole through the boom.

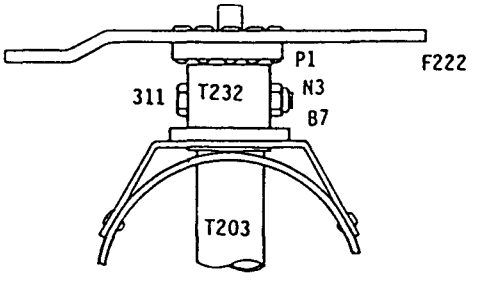


5.5.12 Rivet the F222 aileron bellcrank to a P1 plug with 8 stainless steel rivets as shown.

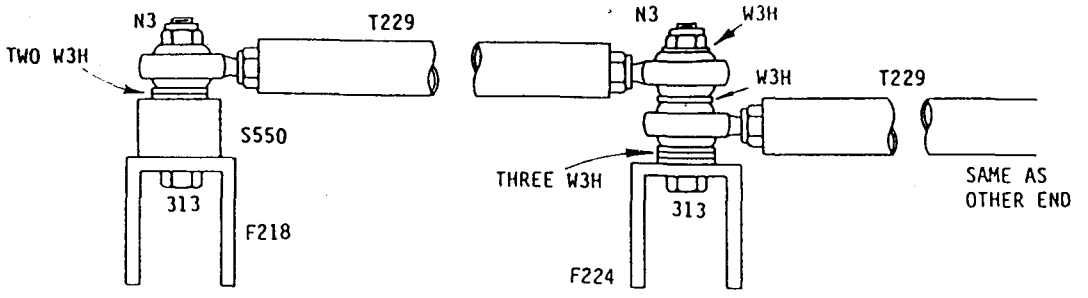




5.5.13 Install T232 and the bellcrank assembly on T203 and bolt as shown. *Make sure the centreline of F222 is parallel to the centreline of* F224, and they both face the rear of the aircraft. Note that T232 should fit through the B7 bushing but should *not* go into the hole in the boom. Trim the length of T232 if necessary.



5.5.14 Set both sticks and F222 to the neutral position, then cut, fit, and install the T229 aileron control pushrods as shown, using the general instructions in Step 3.9.1.



5.5.15 Check that the aileron control linkage works smoothly and with little or no play.

9 1/8

10 1/4 10 7/16

L 12

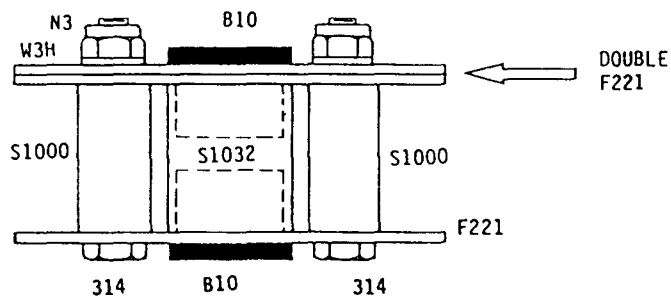
1 3/8 1 6/16

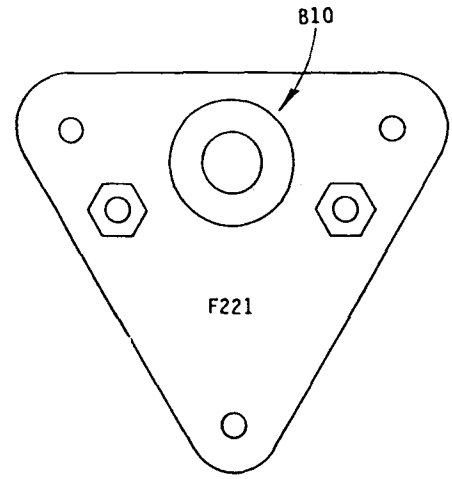
(8 7/8) 9 1/16

•

5.6. RUDDERVATOR CONTROL LINKAGE INSTALLATION

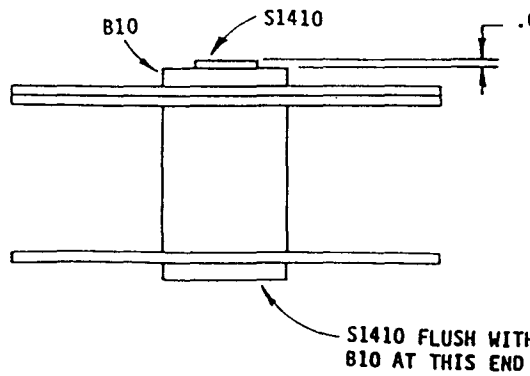
5.6.1 Assemble the mixer assembly as shown. Remove all burrs and sharp edges from the large holes in the F221 mixer plates before inserting the B10's.





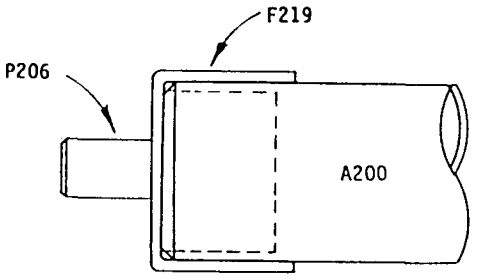
5.6.2 Fit the mixer bellcrank assembly into a vise with the B10's between the jaws (use smooth pads in the jaws to prevent deforming the B10's). Squeeze the assembly just enough to seat the B10's.

5.6.3 Insert the S1410 spacer through the B10's in the mixer bellcrank assembly. If it does not rotate freely, file or ream the holes in the B10's slightly as required. Check that S1410 is approximately .010 inches longer than the bellcrank assembly. File either the end of S1410 or one B10 if necessary.

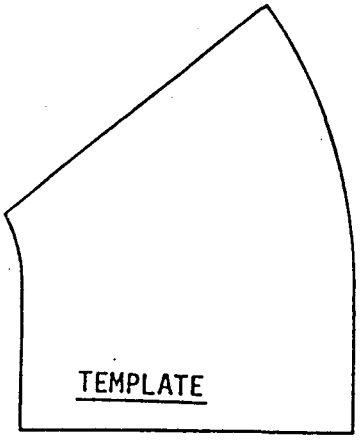


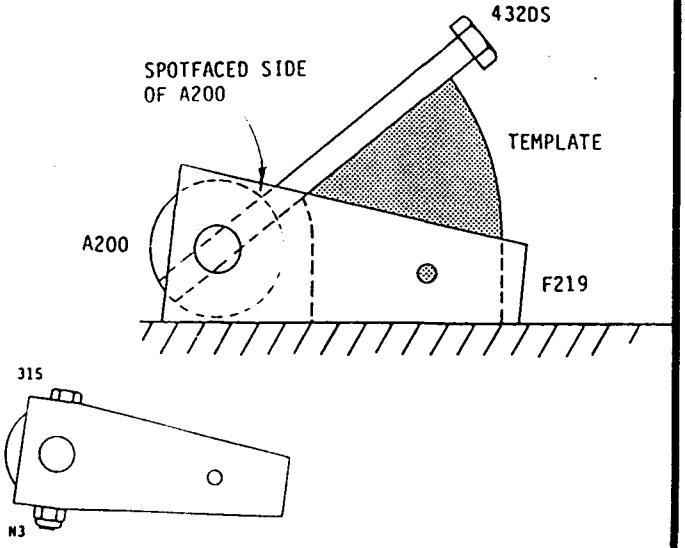
NOTE: IF S1410 IS MUCH TOO SHORT, USE W3H OR W3T WASHER (DRILL HOLE TO 1/4 INCH) TO INCREASE EFFECTIVE LENGTH OF S1410.

5.6.4 Fit a P206 plug into each end of torque tube A200, then fit an F219 elevator control horn over each as shown.

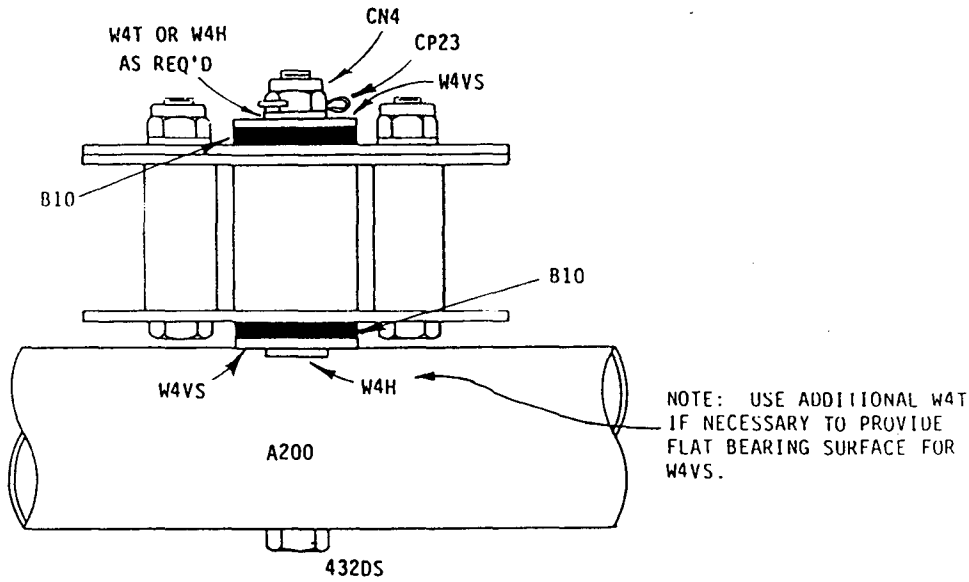


5.6.5 Lay the A200 assembly on a flat table as shown. Rotate A200 *so that the spotfaced end of the predrilled 1/4 inch hole is upward,* and temporarily put a 432DS bolt in the hole. Cut out the full size template below and use it to set the correct angle between the 1/4 inch hole and the horns as shown in the figure. Drill the 3/16 inch holes through the horns and A200, and bolt as shown. Make sure the face of each F219 is perpendicular to the axis of A200.

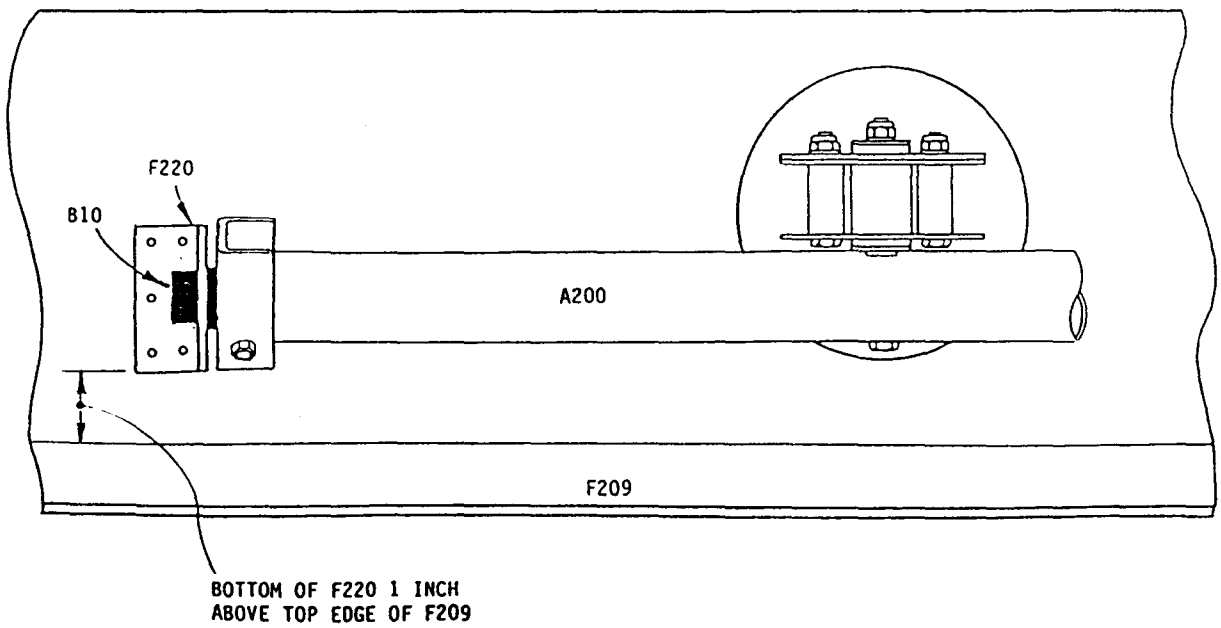




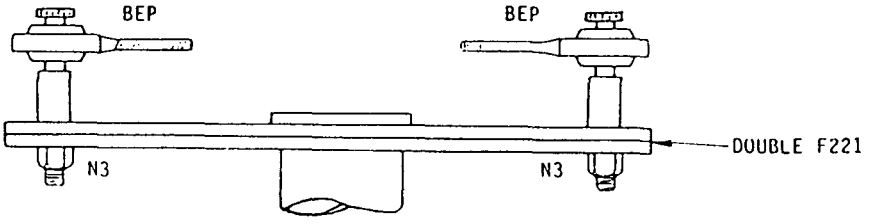
5.6.6 Install the mixer bellcrank on the torque tube as shown. Tighten the nut securely, then verify that the bellcrank rotates freely but with little or no end play, and pin the CN4 nut.



5.6.7 Press a B10 bushing into each F220 bracket and fit them over the ends of the A200 assembly. Check for ease of rotation and enlarge the holes in the B10's if necessary. Fit the entire assembly onto the front of the main spar and rivet in place as shown. Use six stainless steel rivets in each F220, with the heads on the rear side of G203.

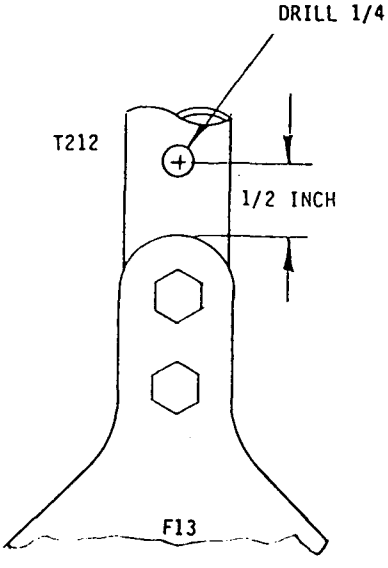


5.6.8 Install BEP pinned rodends in the two top rear holes in the F221 bellcrank assembly as shown. Be sure to hold the pin with an Allan key while tightening the nut to avoid deforming the shoulder standoff on the BEP.

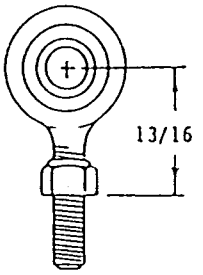


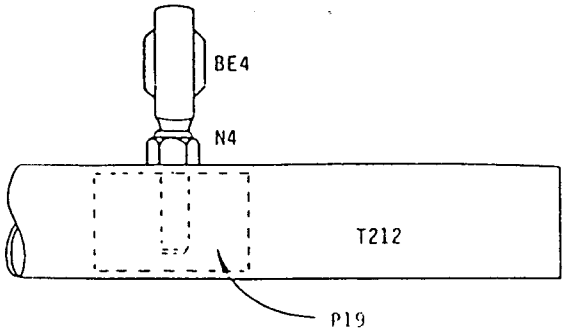
5.6.9 Rotate the A200 torque tube about its axis. Make sure it moves freely but without excessive play. Make sure there is at least 1/8 of an inch of clearance between the BEP rodends and the edge of the 4 inch diameter hole in the main spar. File the hole larger if necessary to obtain sufficient clearance.

5.6.10 Drill a 1/4 inch hole through the front of each T212, 1/2 an inch above the top edge of F13 as shown. Make sure the hole is exactly on the front of the tube.



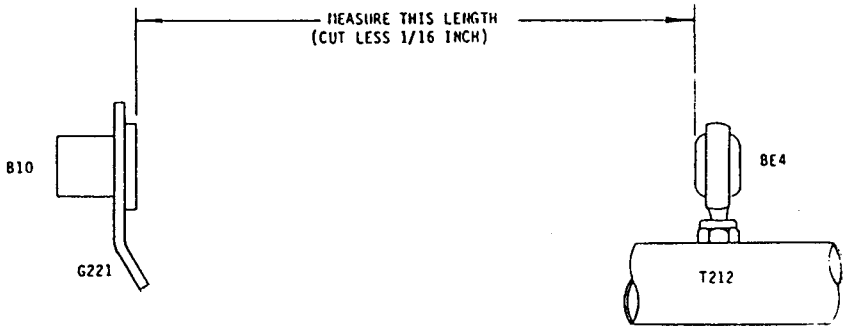
5.6.11 Remove each F13 and install a P19 plug. Align the tapped hole in the plug with the hole drilled in the previous step, and install a BE4 rodend with an N4 nut as shown. Reinstall the T212's on the airframe.



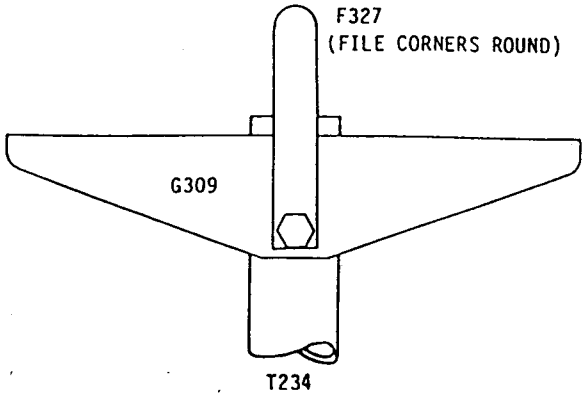


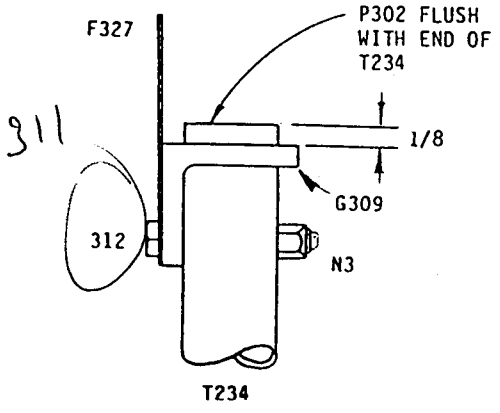
5.6.12 Remove any burrs or sharp edges from the hole in the G221 bracket (installed in Step 5.1.2) and press in a B10 bushing.

5.6.13 Install B10 bushings in the G221 brackets. Measure the distance from the surface of the B10 to the face of the BE4 rodend (step 5.6.11)and cut torque tube T234 1/16 of an inch shorter than the measured distance. (Note that due to tolerance buildup, the left and right torque tubes may be slightly different in length).

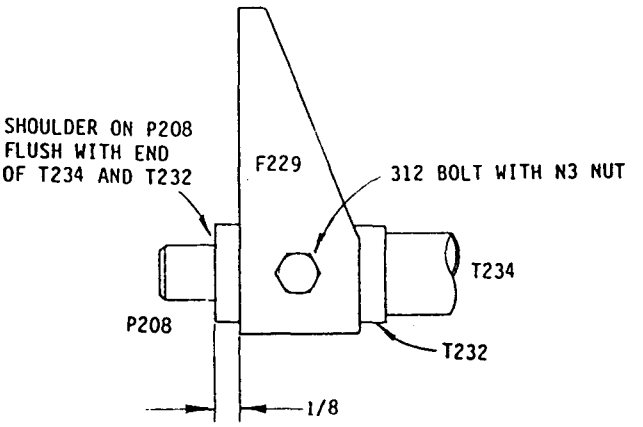


5.6.14 Install a P302 plug (tapped end out) and a G309 ruddervator control horn on one end of T234. Drill the tube and plug, install an F327 locking tab and bolt as shown.

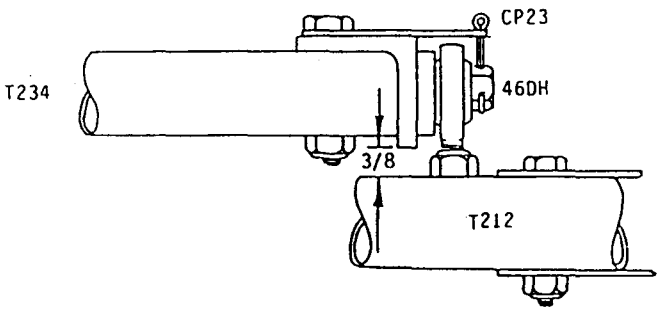




5.6.15 Install a P208, T232 and an F229 horn on the other end of T234, then drill and bolt as shown. *Make sure the G309 on the bottom of T234 and the F229 on the top are perpendicular to each other.*

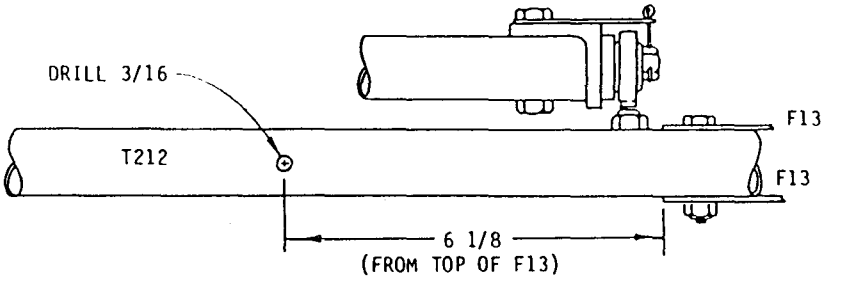


5.6.16 Install the T234 torque tube assembly on the aircraft as shown. The clearance between the bottom edge of G309 and T212 should be as close as possible to 3/8 of an inch as indicated. If necessary, screw the rodend in or out to achieve this clearance. An F324 may be used as a feeler gauge to check this clearance. Drill a 1/16 inch hole in the end of the lockplate as shown and pin the 46DH bolt with a CP23 cotter pin. If the hole in the bolt head cannot be aligned with the axis of the cotter pin, you can drill a new hole through the bolt head or use lockwire in lieu of the cotter pin.

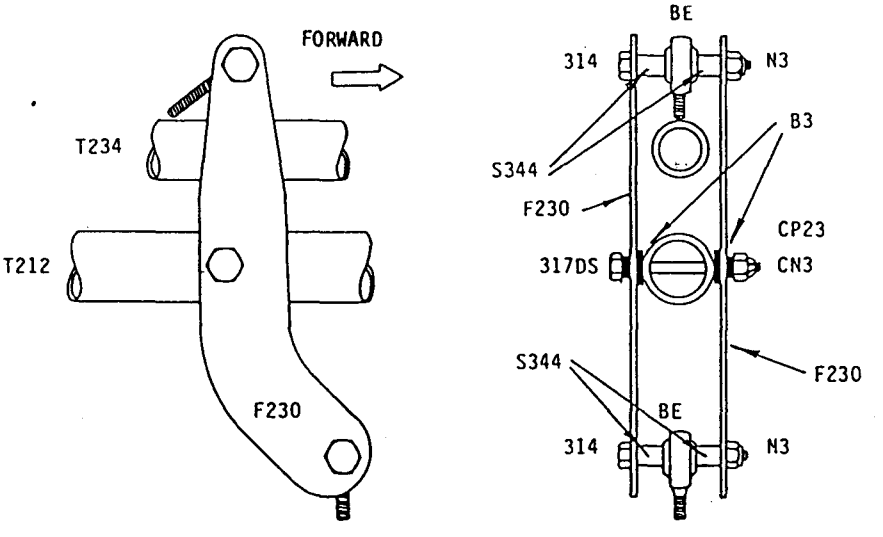


5.6.17 Drill a 3/16 inch hole through T212 as shown. Make sure the hole is horizontal (parallel to the axle) and goes through the centreline of T212. Drill carefully to avoid making an oversize hole.

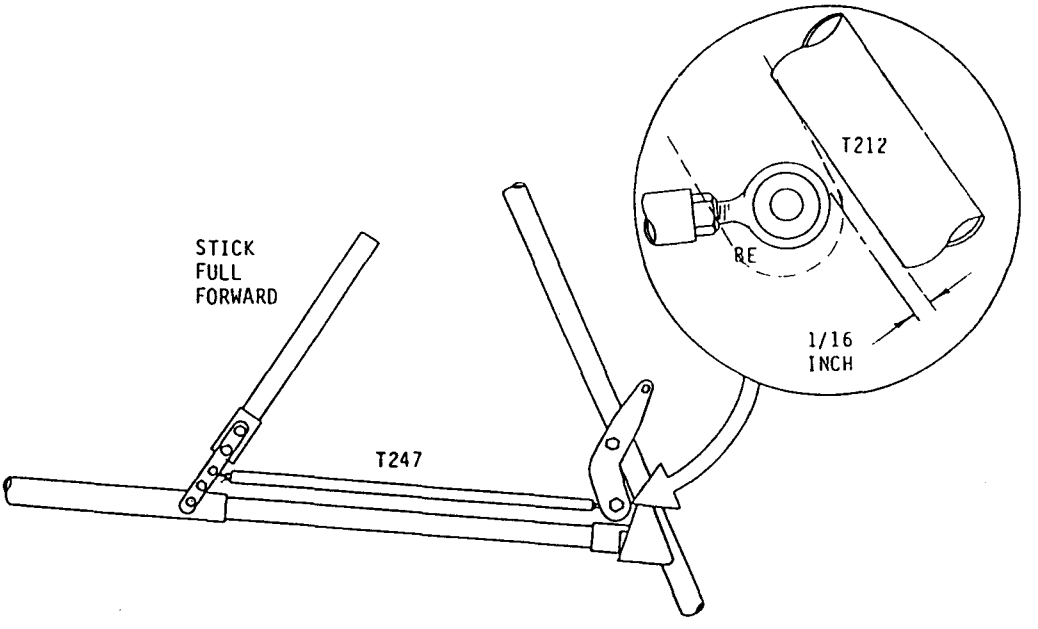
NOTE *



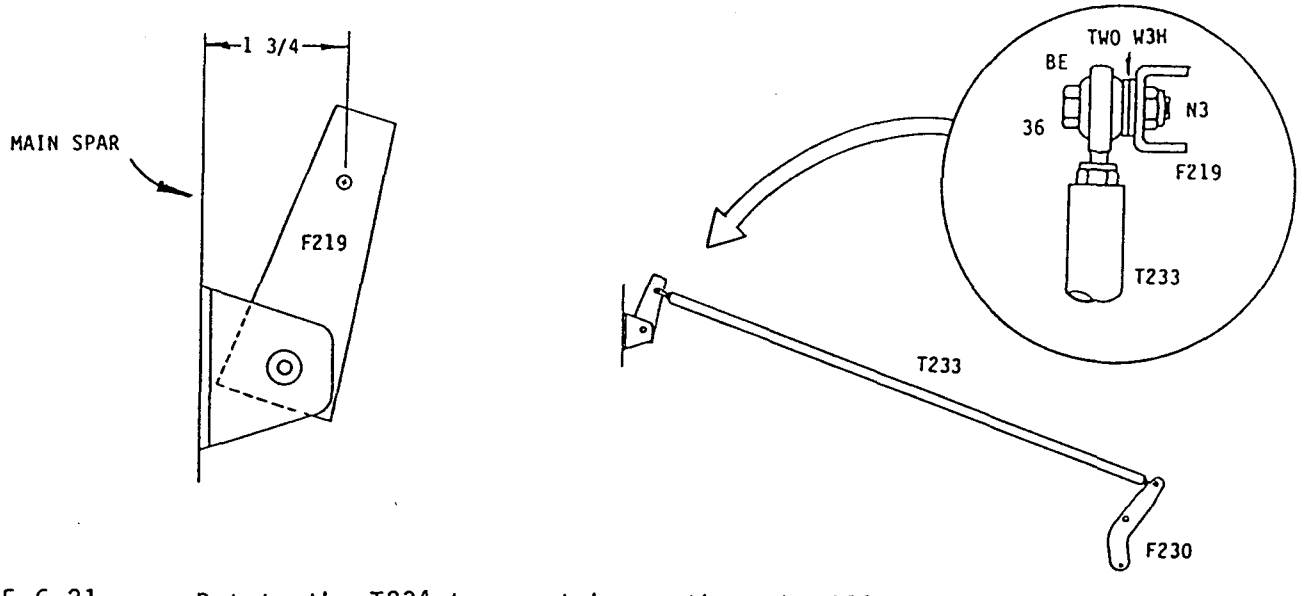
5.6.18 Assemble the ruddervator control bellcrank on T212 as shown. Adjust the CN3 nut until the bellcrank moves with just a bit of friction and no play, then lock the nut with a CP23 cotter pin.



5.6.19 Cut, fit and install the T247 primary elevator control pushrod as shown using the general instructions in Step 3.9.1. To obtain the effective length, set the stick to the *full forward* position (as defined in Step 5.5.8) and set the F230 bellcrank assembly so there is 1/16 of an inch clearance between the bottom rodend and T212 as shown in the inset. After installation, adjust the length of the pushrod as required to obtain the 1/16 inch clearance in the full forward position.

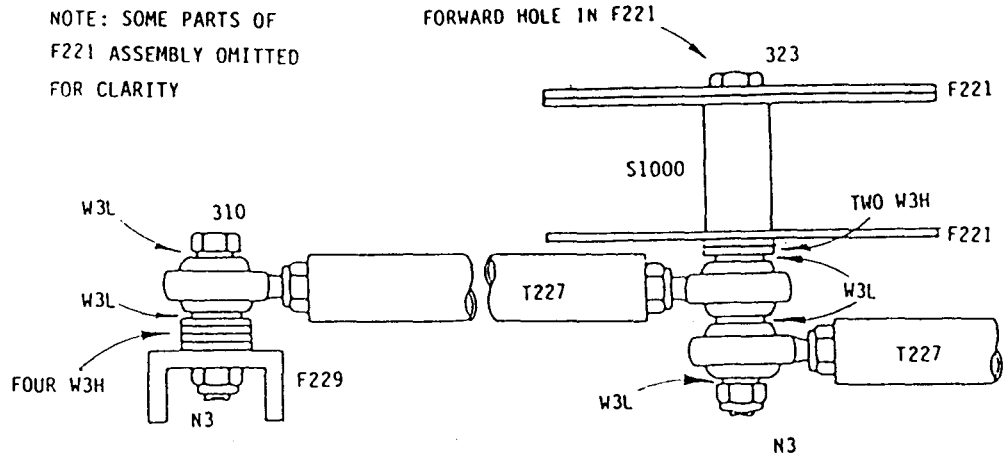


5.6.20 Set both sticks to the full forward position as before. Rotate the A200 torque tube assembly to position the F219 horns as shown, and measure the effective length of the T233 pushrods. Cut, assemble, install and adjust the T233 pushrods following the general instructions in Step 3.9.1, but use P209 plugs in place of P3's.



5.6.21 Rotate the T234 torque tube so that the G309 horn is horizontal (parallel to the main spar). Rotate the F221 mixer assembly so its rear edge is parallel to the main spar. Cut, assemble, install and adjust the two T227 pushrods.

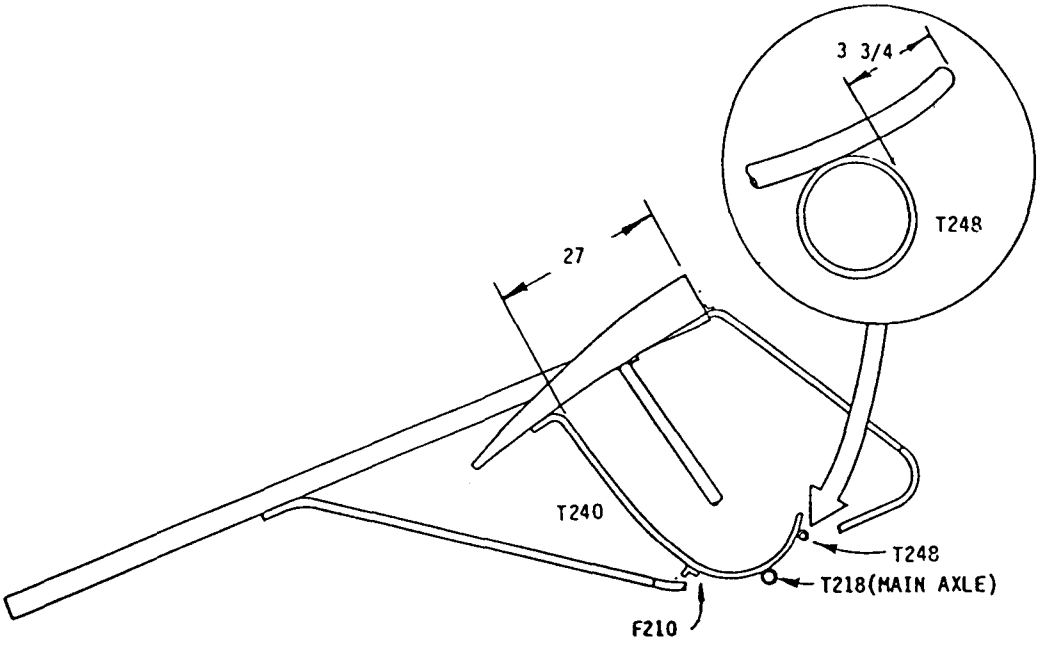
NOTE: SOME PARTS OF F221 ASSEMBLY OMITTED FOR CLARITY



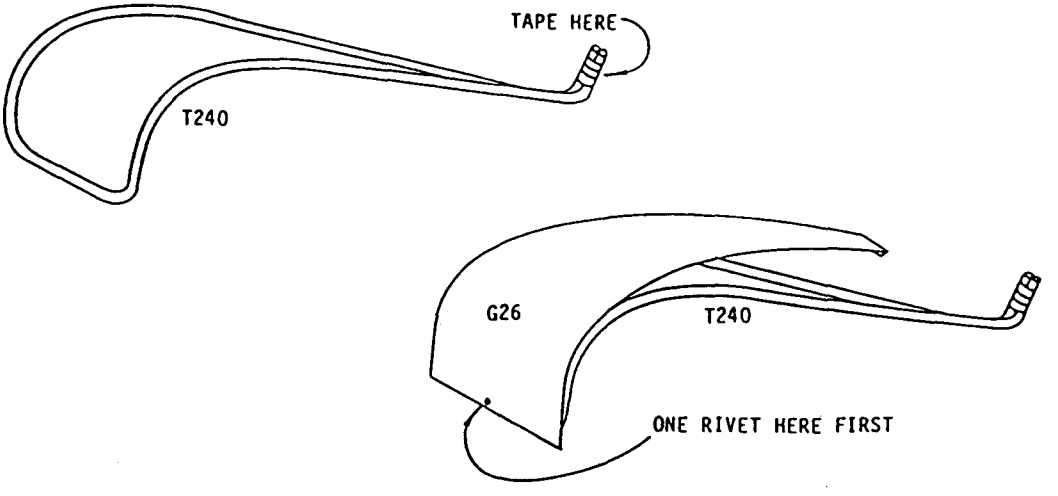
NOTE: THAT THE W3L LOCKWASHERS ARE REQUIRED TO ALLOW SUFFICIENT ROTATION OF THE RODENDS. AFTER ADJUSTMENT, MAKE SURE THAT T227 CAN ROTATE SLIGHTLY WITH THE STICK FULL FORWARD AND FULL BACKWARD.

5.7 SEAT INSTALLATION

5.7.1 Set the two T240 seat tubes into position as shown. T240 may be rebent slightly if necessary to make it touch T248, T218 and F210. When bending T240, bend it very gradually, and check the fit frequently. Be sure both sides are bent equally.

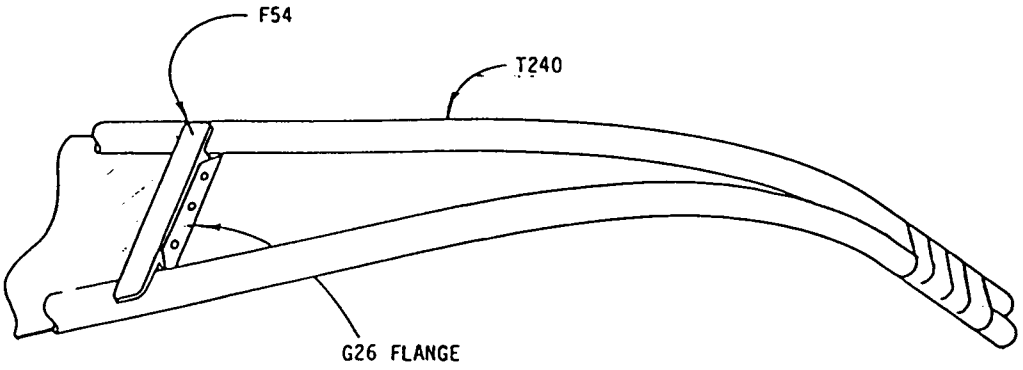


5.7.2 Remove each T240 from the fuselage and position it on your work table as shown at left below. Tape the tails together as indicated to keep them aligned properly.

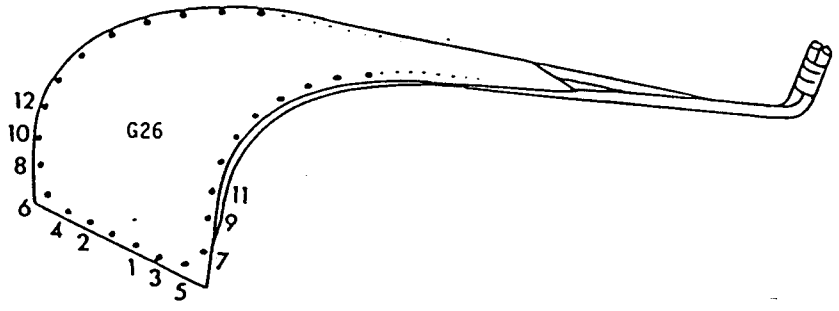


5.7.3 Put the seat skin (G26) in position as shown at right above. Note that the flange on the top edge of G26 should face forward (or downward with the seat positioned as shown). Make sure that G26 is even with the front edge of T240 and is centered properly, then put in one rivet as indicated.

5.7.4 Round the corners of seat spreader F54. Turn the seat over and install F54 as shown. Use three equally spaced rivets to attach F54 to G26. *Do not rivet F54 to the seat tube at this time.*



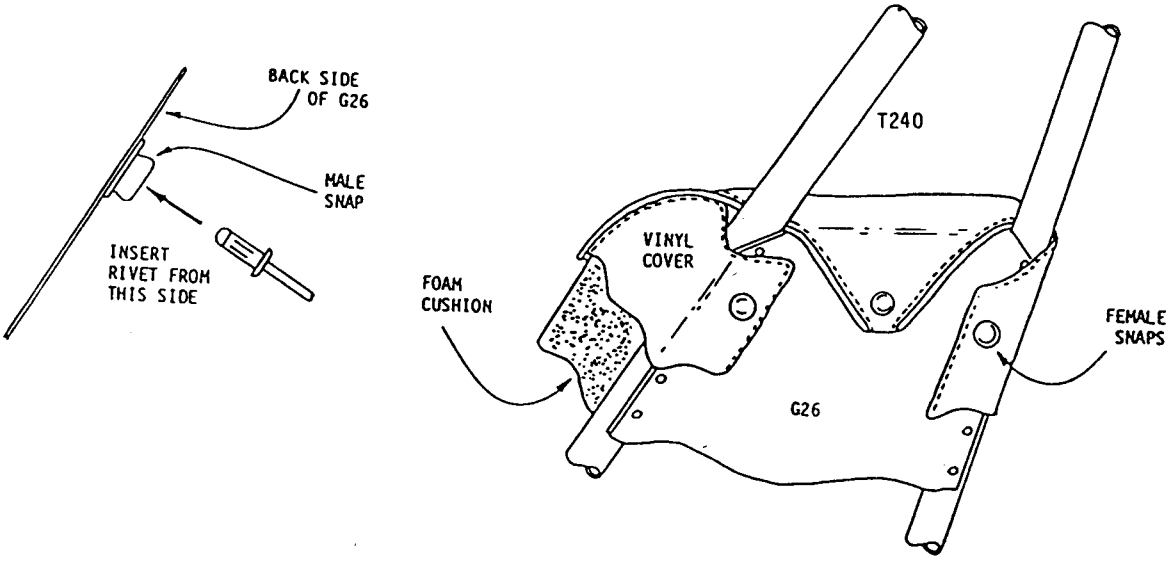
5.7.5 Rivet the seat skin to T240 with a rivet spacing of 2 inches. Install the rivets in the sequence shown below. You may find it helpful to tape the skin in position before riveting. After about 16 rivets have been put in, the tape on the tails of T240 may be loosened to let the tails spread about an inch apart while the rest of the rivets are put in.



5.7.6 Rivet seat spreader F54 to T240 with one stainless steel rivet in each end. Trim the front corners of G26 to conform to T240. Cut the ends of the T240 so that the tails are flush.

5.7.7 Position each seat on the fuselage according to step 5.7.1 and mark the location of the main axle, F210 cockpit spreader and T248 seat support tube for use in 5.7.9.

5.7.8 Fit the foam seat cushion into the seat. Fit the vinyl seat cover over the cushion and pull it tight. Mark the location of the three top female snaps on G26 as shown. Remove the cover and cushion and rivet the three male snaps in place.

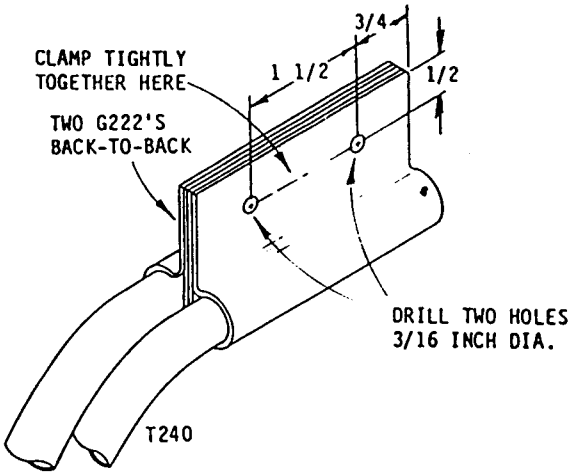


5.7.9 Refit the cushion and cover and snap the top in place. Pull the rest of the cover tight and locate and rivet the balance of the male snaps. *Do not rivet male snaps where the position of the main axle, F210 and T248 are indicated.*

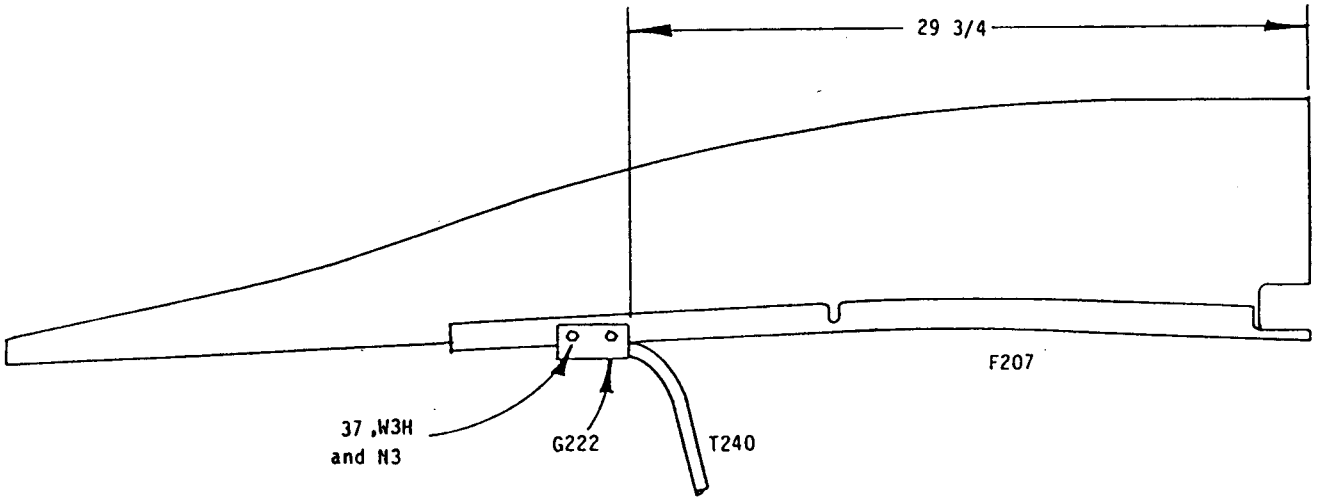
5.7.10 If there are any large bulges or wrinkles in the seat cover, they should be eliminated by relocating one or two of the snaps. However, small wrinkles will disappear quickly with use and exposure to the heat from the sun.

5.7.11 When the cover has been properly fitted, remove the cover and cushion to protect them from damage during the balance of the assembly.

5.7.12 Slide two G222 seat clamps over the ends of each seat tube as shown. Clamp the two G222's together with vise-grips and drill the two mounting holes as indicated.



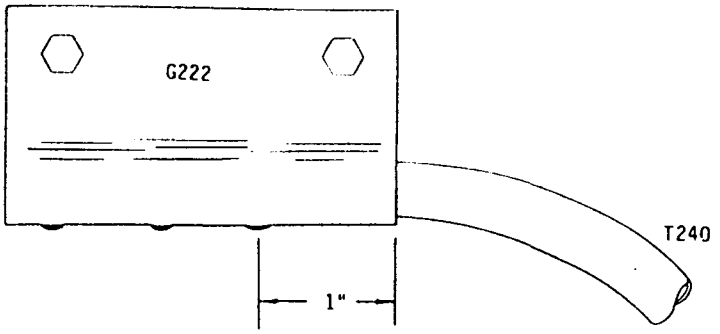
5.7.13 Reinstall the seats in the fuselage (as in Step 5.7.1). Hold the G222 clamps against the side of the F207 angle and drill the mounting holes through F207 and the rib. Bolt the G222's in place as shown.



5.7.14 Apply weatherstrip on the axle where the seats rest on it.

5.7.15 Centre the front of the seats between the sidetubes (T14/T215 & T15/T214) and rivet the G26 seat skins to T248 with 6 stainless steel rivets each. *Do not rivet the seat to the main axle.*

5.7.16 Rivet each G222 to T240 with 3 rivets.

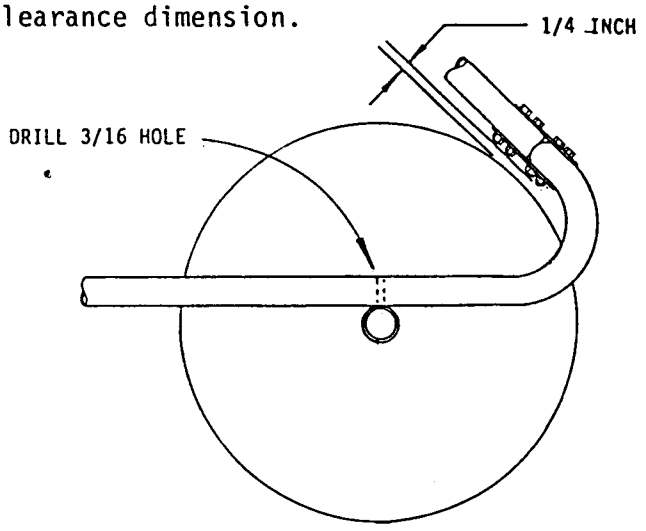


5.8. NOSEWHEEL AND RUDDER PEDAL INSTALLATION

NOTE: Unlike the Series III Lazair, the nosewheels may not be omitted from the LazairII. (The main gear on the Series III has been moved forward several inches to make it possible to operate without the nosewheel).

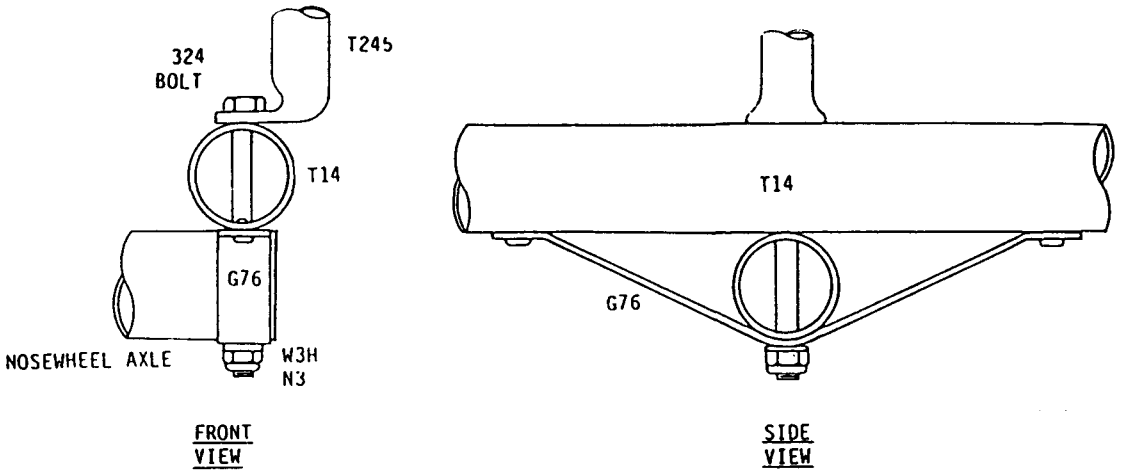
5.8.1 Fit a T246 inner sleeve into the T220 nosewheel axle, and install the two nosewheels with a T47 collar on each side of each wheel.

5.8.2 Fit the nosewheel axle into position on the fuselage and drill the 3/16 inch mounting holes through T220/T246 and T14/T15. Note the 1/4 inch clearance dimension.



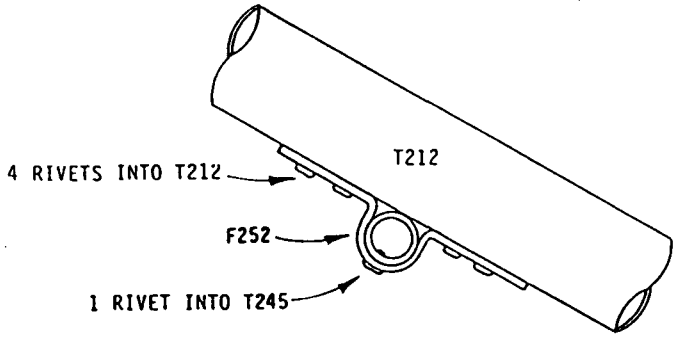
NOTE: The engines on the LazairII are 10 inches closer to the pilot(s) than on the single place Lazair. To reduce the possibility of a pilot's leg contacting the prop (in the event of extreme turbulence, a very bumpy field, or mishap), a "Leg Retainer", T245, has been incorporated into the design of the LazairII.

5.8.3 Drill a 3/16 inch hole in the middle of each tab on the T245 Leg Retainer. Assemble T245 and the nosewheel axle on T14/15 as shown. Before putting nuts on the 324 bolts, drill a 3/16 inch hole in the centre of the G76 gussets, and bend them to fit around the nosewheel axle as shown. Install the G76's, tighten the nuts, and rivet the G76's to T14/T15 with one stainless rivet in each end.



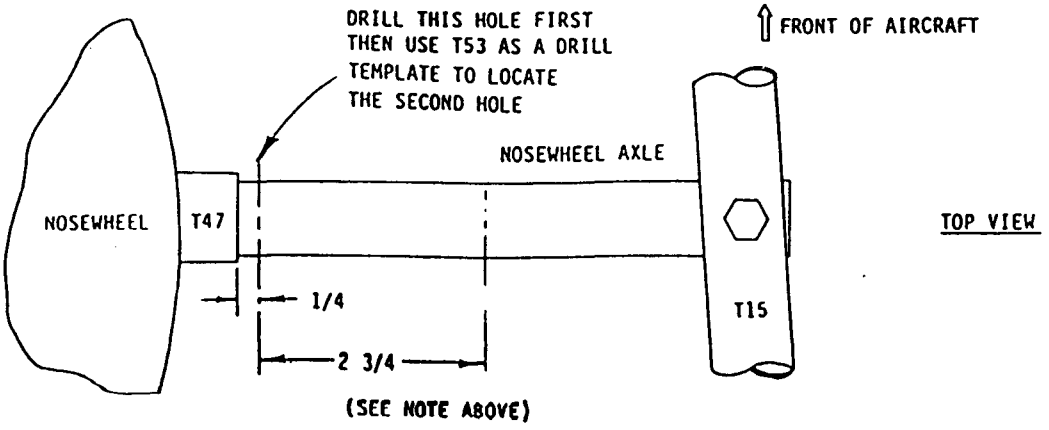
5.8.4 Drill and bolt the nosewheel axle to T214 and T215 using 323 bolts and rivet two G76 gussets in place as in Step 5.8.3.

5.8.5 Secure T245 to the T212's front tubes using F252 clamps as shown.



5.8.6 Centre each nosewheel on its respective side. Rivet the T47's in place on each side of the wheels, with two rivets in each. Allow about 1/32 inch sideplay in the nosewheels.

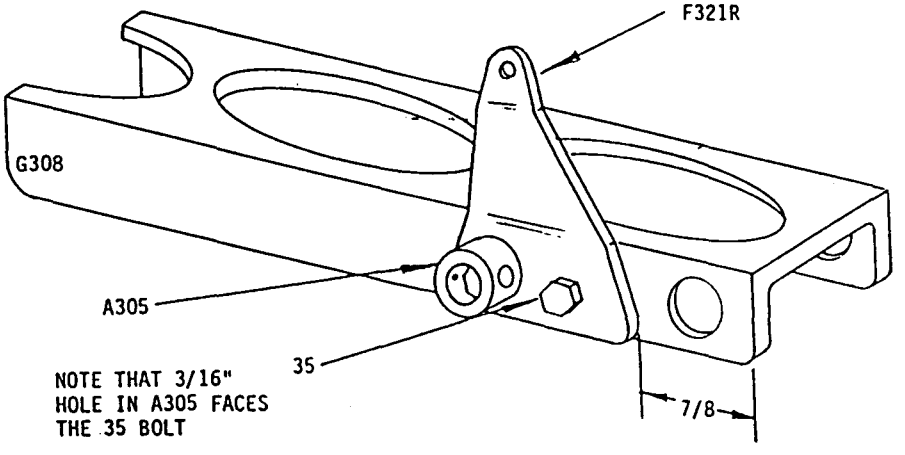
5.8.7 Drill eight 3/16 inch holes in the nosewheel axle as shown (two on each side of each nosewheel). Make sure the holes are horizontal (parallel to T14/T15)



NOTE: *As the LazairII has been designed to be soloed from the right hand seat, the brakes will be connected to the brake pedals mounted on the right side pair of rudder pedals. Although brake pedals are included for the left set of rudder pedals, they are not functional.*

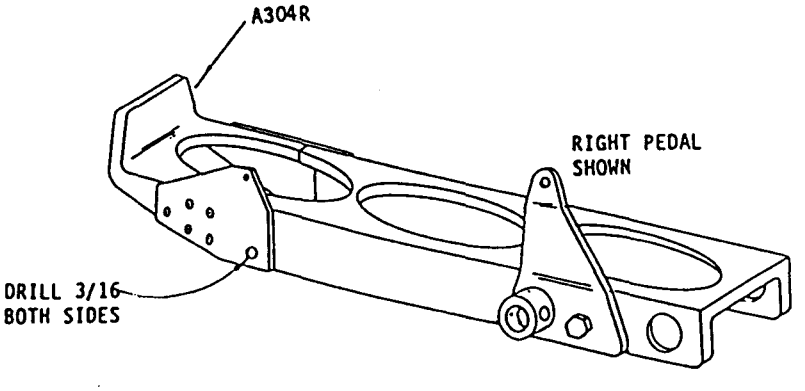
5.8.8 Assemble one pair of rudder pedals for the right side as shown. *Be sure to make one left and one right pedal.* Note that the F321L/R horn is mounted on the nosewheel side of the pedal. Note also that the upper bolt is part of the A305 assembly.

RIGHT PEDAL SHOWN

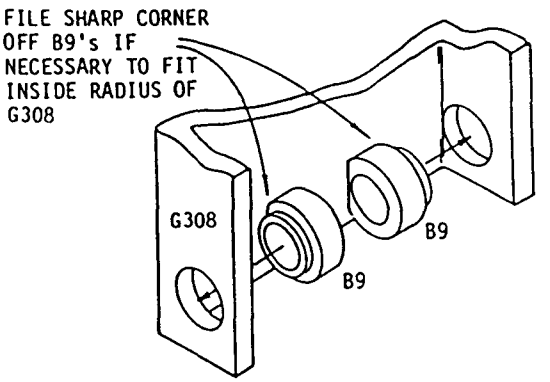


5.8.9 Assemble one pair of pedals for the left side. These are similar to the pedals for the right side except that a 34 bolt is used in place of the A305 shown above.

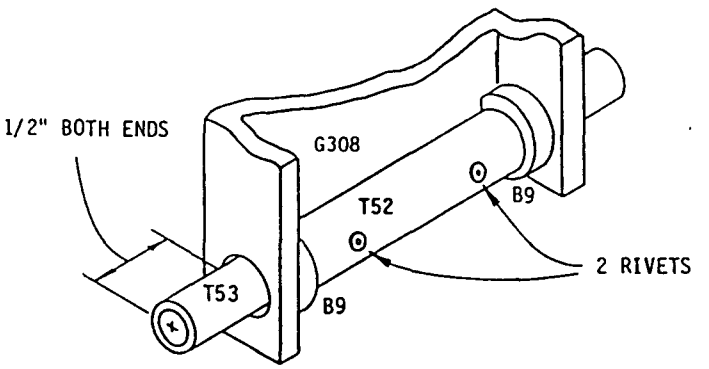
5.8.10 Before installing the rudder pedals, drill the 3/16 inch holes for attaching the brake pedals (A304L/R) as shown, but do not install the brake pedals at this time.



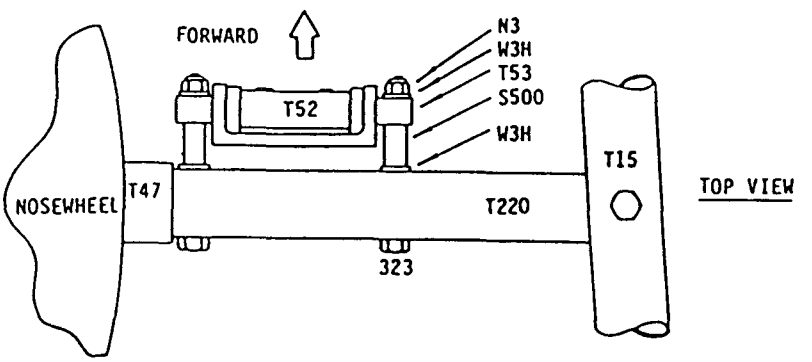
5.8.11 Fit the B9 rudder pedal bushings into the holes in the rudder pedals (from the inside) as shown. Check that the B9's fit flush against the sides of G308 and file the B9's as indicated in the figure if necessary.



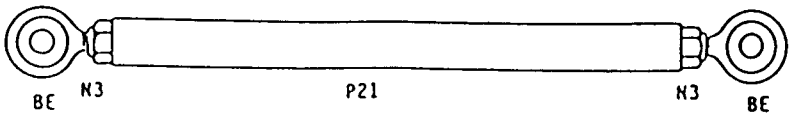
5.8.12 Install the T53 rudder pedal axles and T52 sleeves and rivet as shown. Before riveting make sure that the pedals rotate freely on the axles and trim the T52's to length if required. Locate the rivets so that they are approximately in line with the predrilled holes in T53.



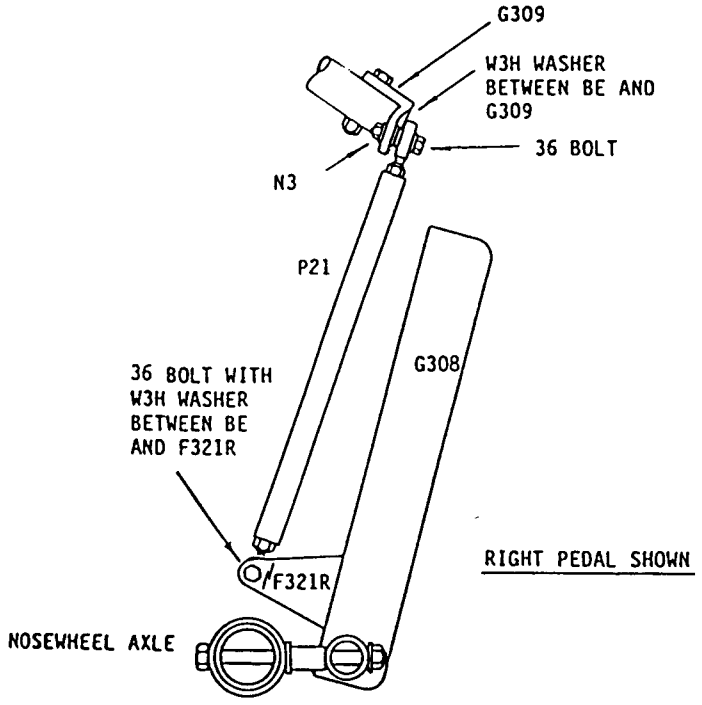
5.8.13 Mount the rudder pedals on the nosewheel axle as shown. Note that for clarity the F321R horn and A305 are not shown in the figure, but should be on the nosewheel side of the pedal.



5.8.14 Make up four pushrod assemblies as shown. Leave approximately 3 threads exposed on each rodend and do not tighten the locknuts at this time.



5.8.15 Install the pushrods as shown. Note that the lower rodends are on the nosewheel side of the F321 horns. Do not tighten the nuts on G309 at this time.



5.8.16 Note that there are two possible rudder pedal control stops provided by (a) the interference between G309 and T212 and (b) interference between the rudder pedals and T14/15. When properly adjusted the initial control stop should be provided by G309/T212 with the pedal on T14/15 used as a secondary stop to prevent overstressing the control linkage.

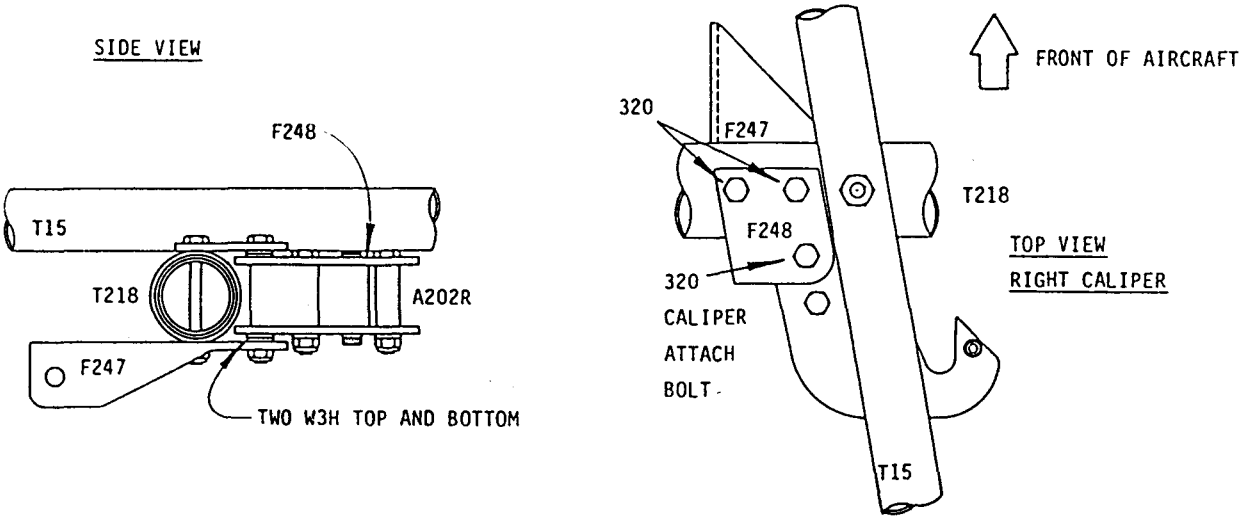
Adjust the length of the P21 pushrod assemblies so that when G309 just makes contact with T212, there is about 3/16 of an inch clearance between the rudder pedal and T14/15. If necessary, the P21 pushrods may be shortened by trimming up to 1/8 of an inch off each end.

5.8.17 When the rudder pedal linkage is adjusted, check that all bolts have been properly installed and tighten all nuts securely.

5.9 BRAKES INSTALLATION AND ADJUSTMENT

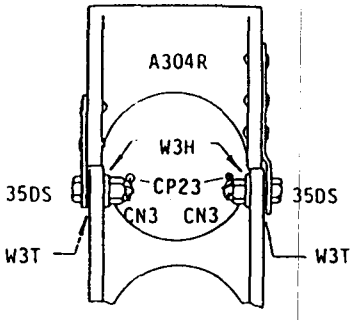
5.9.1 Check the calibration of the brake calipers. Make sure they are adjusted so that the actuating lever is parallel to the brake disc as in Step 5.2.8.

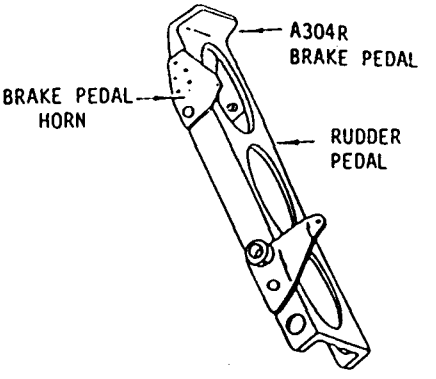
5.9.2 Assemble the caliper attach fittings F247 and F248 and the caliper using a 320 bolt. Do not tighten the nut completely at this time. Position the caliper and fittings on the axle as shown. Squeeze the actuating lever to apply the brakes and locate the caliper. Make sure there is clearance between the caliper sideplates and the wheel hub. Clamp or hold the caliper attach fittings in place and drill the two mounting holes through the axle.



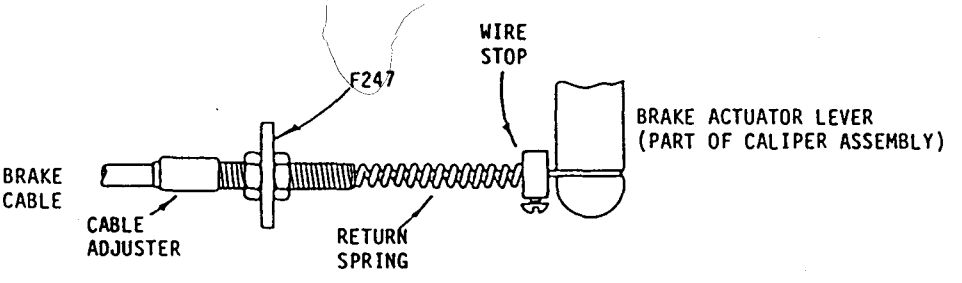
5.9.3 Bolt the caliper assembly in place. Squeeze the actuator lever to apply the brakes and tighten the nut on the 320 caliper attach bolt. Spin the wheel and check for brake drag. Tap the caliper sideways as required so that the drag is *almost* nil.

5.9.4 Install all four A304 brake pedals on the rudder pedals as shown. For the A304L and A304R on the right side of the aircraft, tighten the CN3 nuts until the pedals will just fall under their own weight, and install the cotter pin. For the two pedals on the left side, substitute N3 nuts for the CN3's and tighten the nuts securely so the brake pedals will not move (they are extensions to the pedals only).

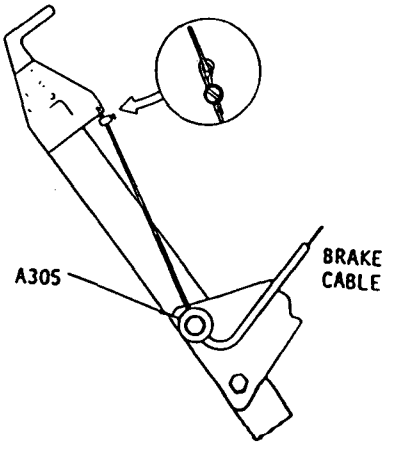




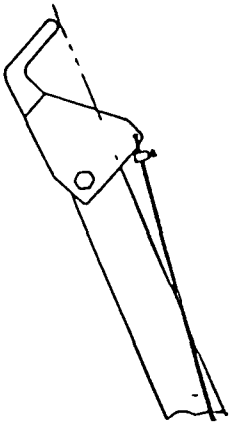
5.9.5 Install the brake cable, return spring, and adjuster as shown. Note that the left brake cable is longer than the right.



5.9.6 Feed each brake cable through its respective hole in the F228 on the right side of the aircraft (Ref. Steps 5.5.3 and 5.5.4). Feed the free end of each cable through an A305 cable retainer on the rudder pedal, then fit a wire stop over the inner cable, and feed the cable through the small hole in the brake pedal horn. To obtain the correct cable length, squeeze the lever on the caliper to apply the brakes. With the pedal in the fully retracted position, pull the inner cable tightly through the horn and bend it as shown. Slide the wire stop into position and tighten it securely.



5.9.7 To perform the final calibration of the brake system, pull back on the pedals to release the brakes completely. If necessary adjust the cable adjusters to make sure the *moveable* puck does not contact the disc. Spin the wheel and gently tap the caliper sideways until the fixed puck *almost* touches the disc. Adjust the cable adjuster so that the brakes are fully released when the brake pedal is released, and fully applied when the toe pad is approximately in line with the surface of the rudder pedal as shown.



PEDAL POSITION
WITH BRAKES FULLY APPLIED

Note that as with virtually all disc brake systems there will probably be some residual drag when the brakes are released. If the wheel will coast for several revolutions after being spun by hand, the brake drag can be considered acceptable.

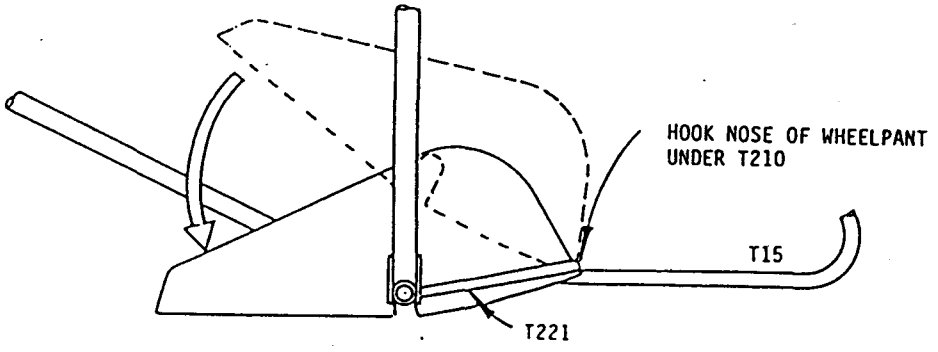
5.9.8 Dress the cables as required to prevent sharp bends. Make sure all nuts are securely tightened, and cut off any excess inner cable at the brake pedal.

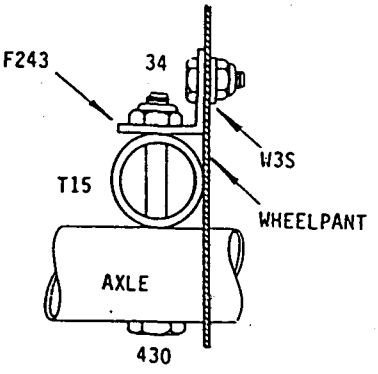
5.10 WHEELPANTS INSTALLATION

NOTE: Before the wheelpants are permanently installed, they should be painted as required to match the colour scheme on your LazairII. Before painting, they should be degreased and sanded lightly with No. 400 wet or dry sandpaper. Any good quality automotive paint may be used for the final finish.

Because of the possibility of scratching the paint during installation, it is recommended that the wheelpants be fitted and installed (with the exception of the rivets into T221) before painting. They can then be removed and painted, then reinstalled and riveted in place.

5.10.1 Slide each wheelpant into place as shown. Hold the forward lip tightly against the bottom of T221 and check for adequate clearance around the tire and brakes. If necessary, the axle tube slots in the wheelpants may be enlarged with a saw or file to allow the wheelpant to be properly positioned.



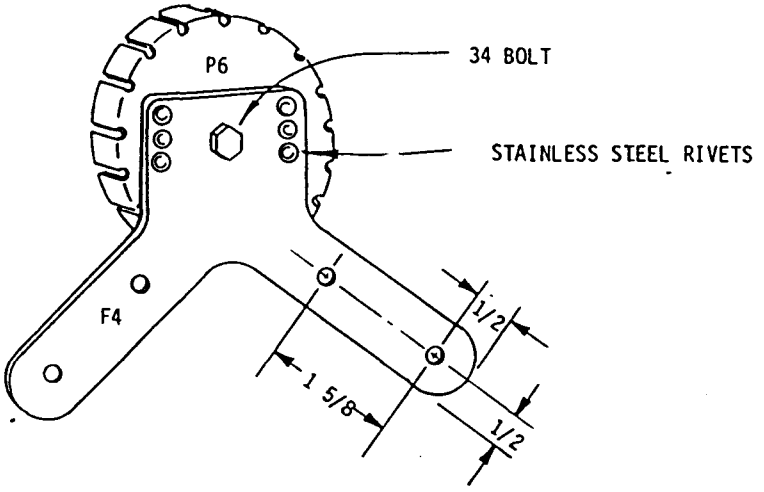


5.10.2 Remove the nuts and washers from the two 430 bolts and install the F243 mounting brackets. Hold, clamp or tape the front of the wheelpants to T221. Mark the location of the mounting holes on the wheelpants (using the F243's as templates). Remove the wheelpants, drill the 3/16 inch mounting holes, then bolt the wheelpants in place as shown. Rivet the nose of the wheelpant to T221 with two stainless steel rivets.

SECTION 6

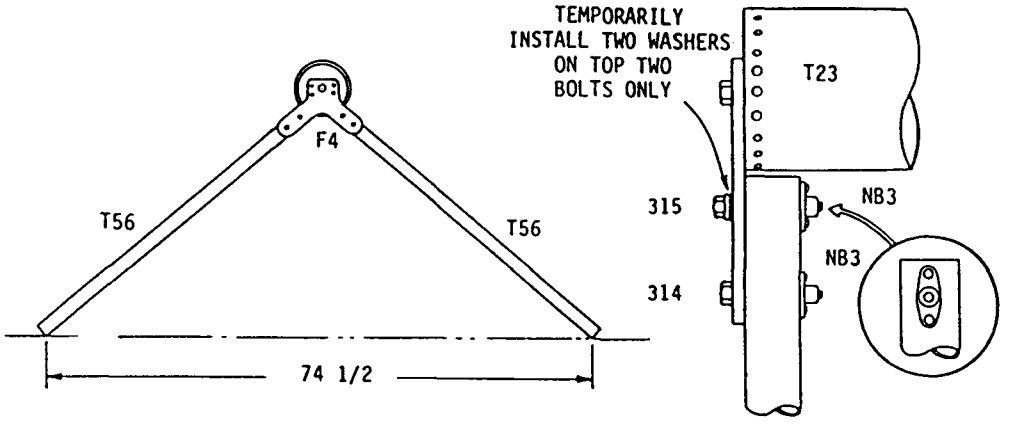
TAIL ASSEMBLY

6.1.1 File and/or sand the edges of the stabilizer Y bracket F4 to remove all tooling marks. Drill four 3/16 inch holes as shown below. Bolt the F4 to rear fuselage plug P6 as shown using a 34 bolt, N3 nut and W3T washer. Install 6 stainless steel rivets as shown.



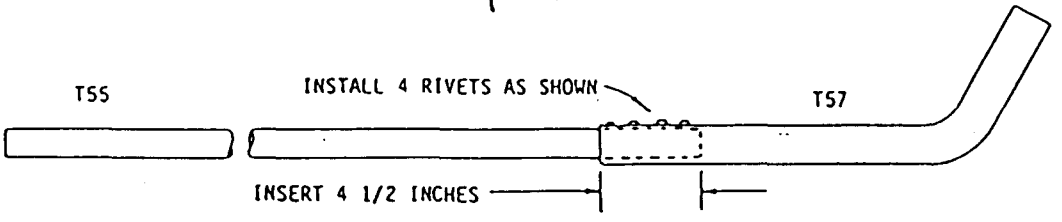
6.1.2 Rivet the P6 plug into the end of the boom so that the bottom of the lugs is parallel to the axle. Use one stainless rivet in each tab on the P6.

6.1.3 Insert P8 plugs into one end of each of the two rear stabilizer tubes, T56. Clamp the plugged end of the T56's to F4 as shown below. Make sure there is a gap of 3/16 of an inch between the end of each T56 and the boom T239. Using F4 as a template, drill 3/16 inch holes in the T56's (and P8's) and bolt the T56's in place using the hardware shown. Note that NB3 nutplates are used as nuts. After tightening the bolts, drill and rivet the nutplates to the T56's as indicated. Note that two bolt sizes are used.

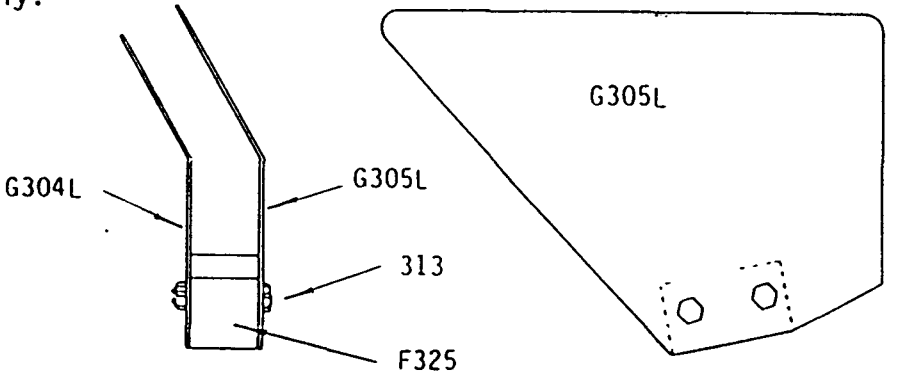


6.1.4 Rivet a T57 Stabilizer Outboard Tube to one end of each T55 Stabilizer Front Tube as shown.

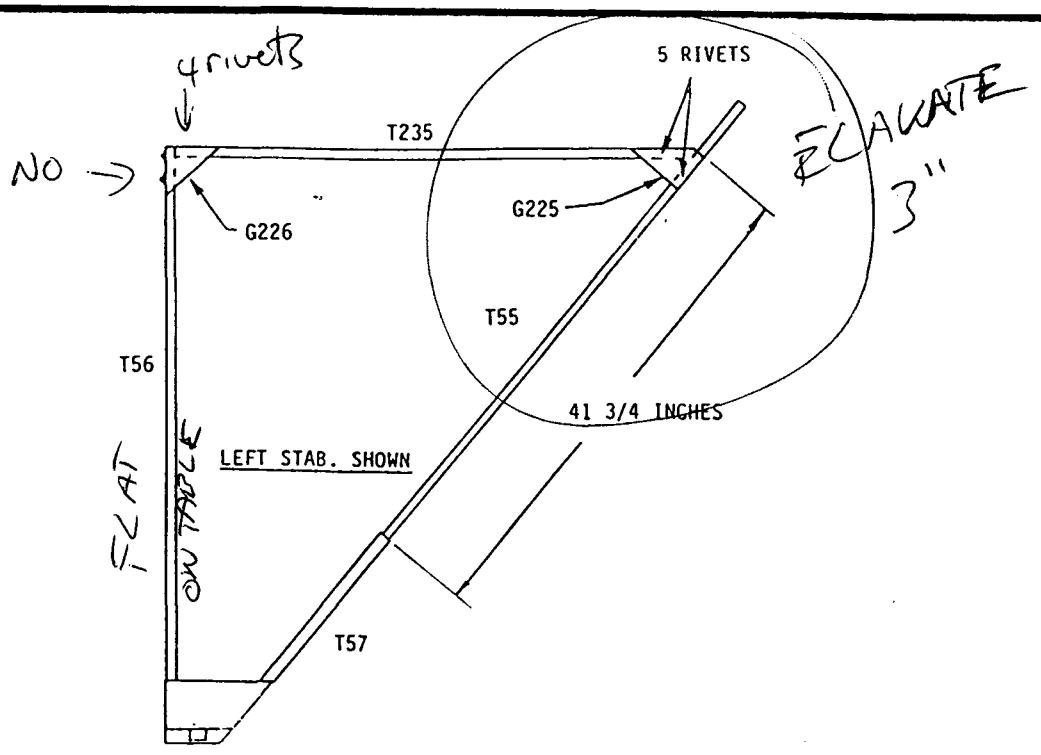
1 rivet



6.1.5 Make up two tailwheel gusset assemblies by temporarily bolting the gussets to the F325 tailwheel mount block. Note that the figure shows the left assembly. Use G304R and G305R for the right assembly.



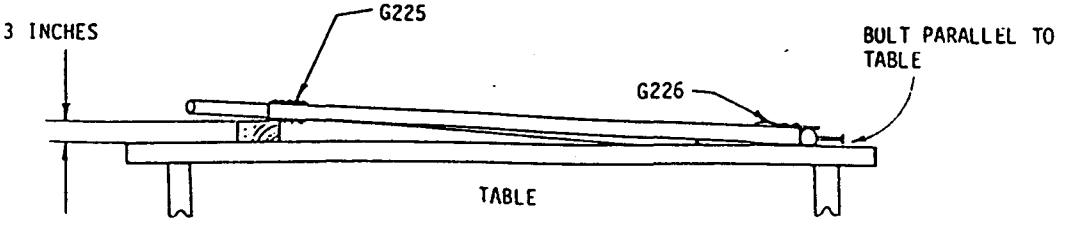
6.1.6 Fit the gusset assembly over T57 as shown and rivet in place with 6 rivets in each G304 and G305 gusset.



6.1.6 Rivet the G225 gusset in place with 5 rivets into T235 and 5 rivets into T55. Rivet G226 in place with 4 rivets into T235. *Do not rivet into T56 at this time.*

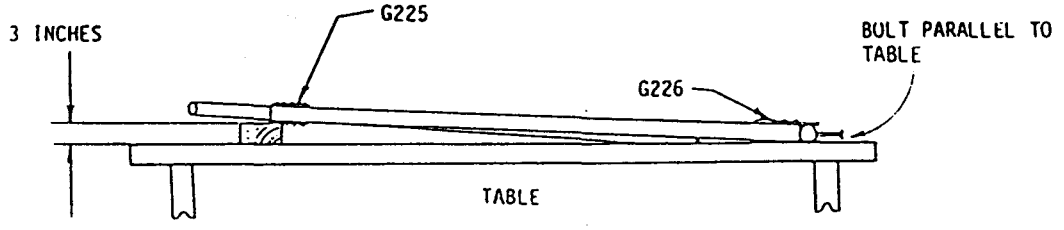
6.1.7 Turn the stabilizer over and rivet the other two G225 and G226 gussets to T55 and T235, making sure the stabilizer forms a flat plane (let the tailwheel gusset assembly hang over the edge of the table).

6.1.8 Elevate the junction of T235 and T55 with a block as shown. *T56 should be flat on the table.* Temporarily screw a long 3/16 bolt (323) into one of the holes in T56. Rotate T56 so that the bolt is parallel to the table top. Rivet the G226's to T56 with 5 rivets in each.



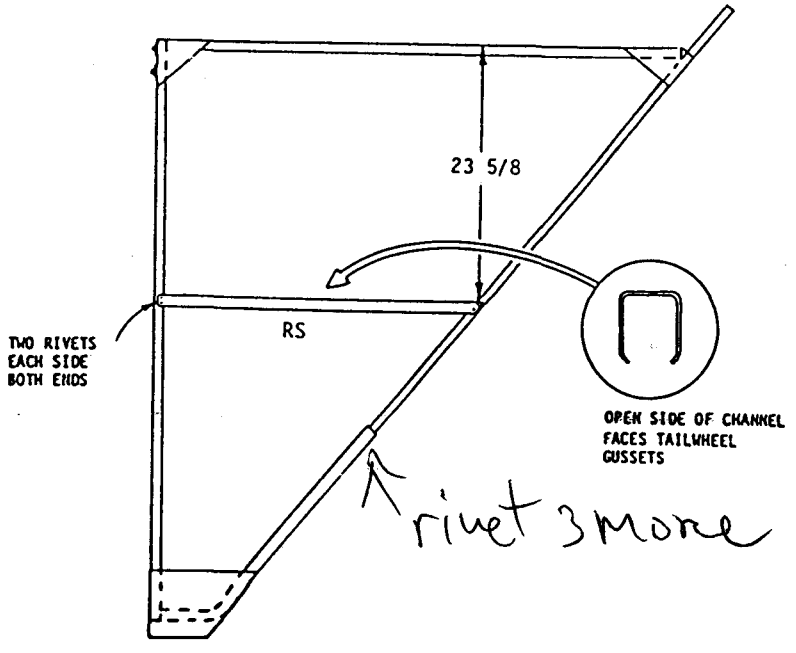
6.1.9 Turn the stabilizer over and rivet the other two G225 and G226 gussets to T55 and T235, making sure the stabilizer forms a flat plane (let the tailwheel gusset assembly hang over the edge of the table).

6.1.10 Elevate the junction of T235 and T55 with a block as shown. *T56 should be flat on the table.* Temporarily screw a long 3/16 bolt (323) into one of the holes in T56. Rotate T56 so that the bolt is parallel to the table top. Rivet the G226's to T56 with 5 rivets in each.



6.1.11 Rivet T56 to the G305 and G304 gussets with 6 rivets in each.

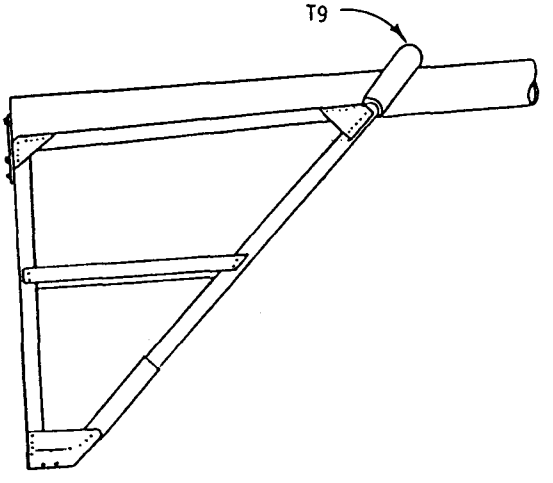
6.1.12 Bend the sides of stabilizer rib RS by hand if necessary so that the sides are parallel. Cut and file the ends of stabilizer rib RS to fit T56 and T55. Rivet in place as shown. Make RS parallel to T235.



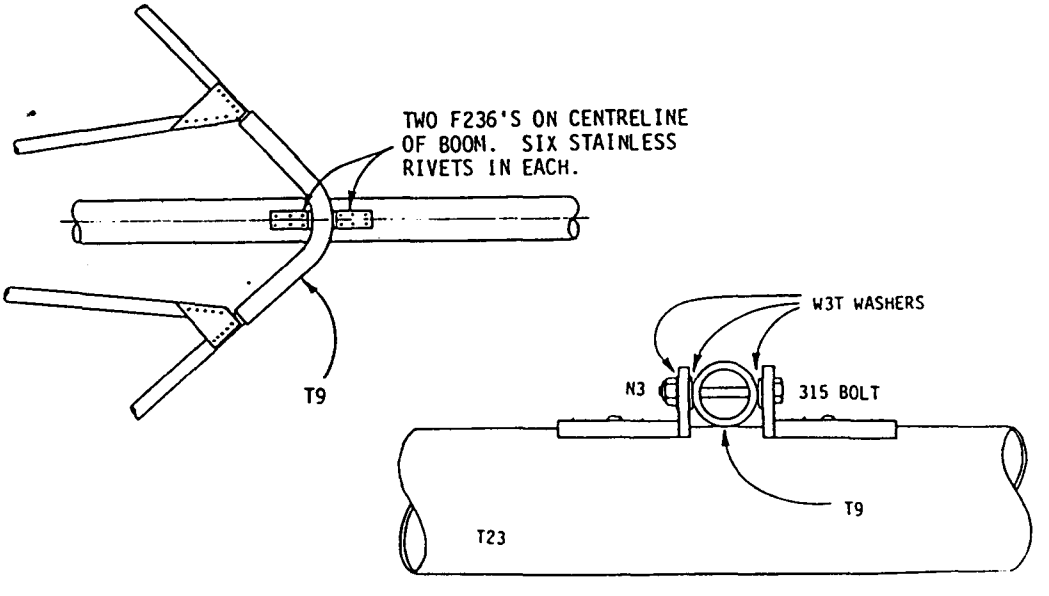
6.1:13 Repeat steps 6.1.6 through 6.1.12 for the right stabilizer.

6.1.14 Support the boom so that the tail surfaces will be clear of the floor when attached. Using the same hardware as in step 6.1.1, attach the stabilizers to the F4. Support the leading edge of the stabilizers to avoid twisting the F4.

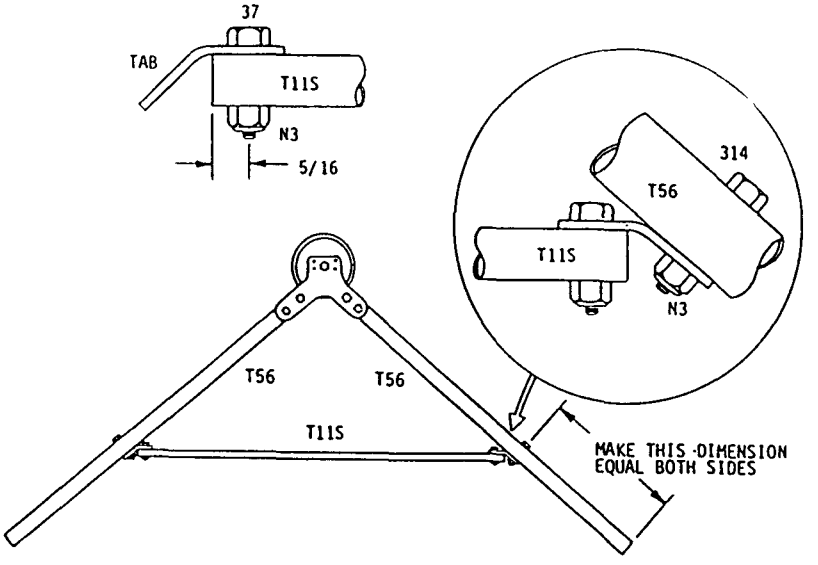
6.1.15 Fit a T9 over the top of the boom and slide it over the ends of the T55's as far as possible as shown below.



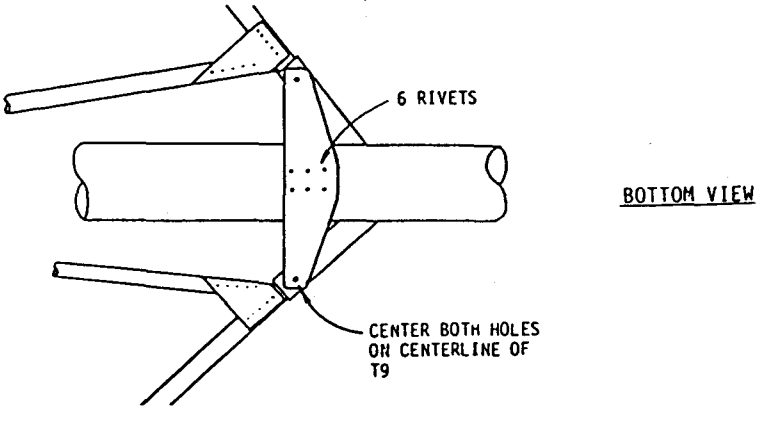
6.1.16 Rivet two F236's to the boom as shown. Drill and bolt T9 to the F236's making sure T9 is centered.



6.1.17 Bolt a TAB to each end of the spreader T11S as indicated. *Make sure that the two bolt holes are parallel to each other.* Bolt the spreader to the T56's as shown.



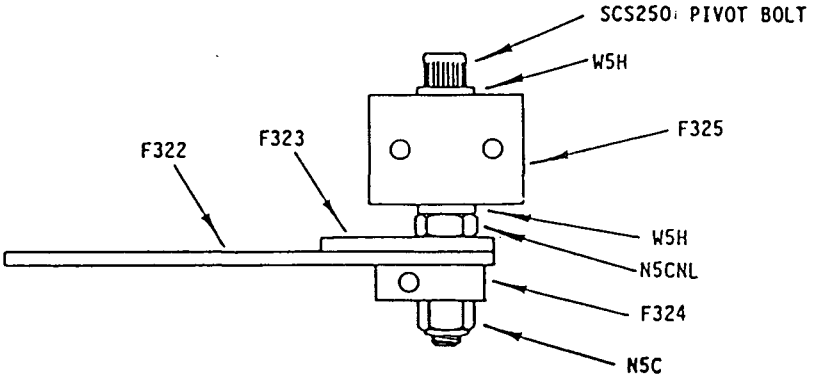
6.1.18 Set the tail on the ground. Block up one side of the tail if necessary so that the spreader is parallel to the main axle. Bend F249 so that it will straddle the bottom of the boom and touch T9 on each side as shown. Make sure the holes in F249 are on the centreline of T9. Rivet F249 to the boom with one stainless rivet.



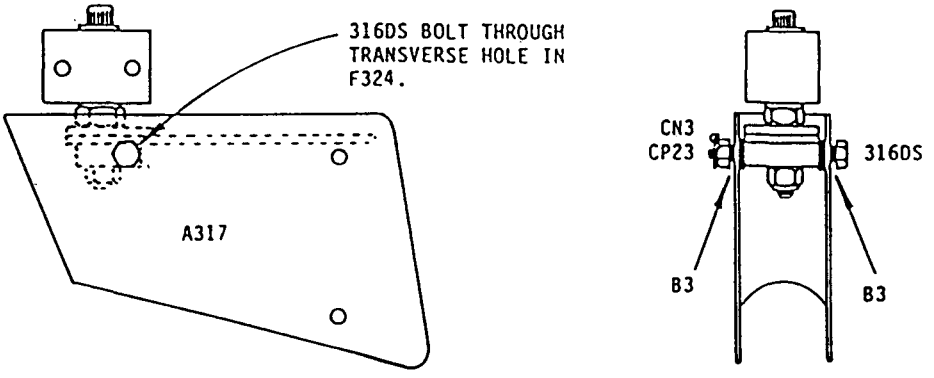
6.1.19 Check the alignment of F249 and clamp one end to T9. Install the remaining 5 rivets in F249.

6.1.20 Using the two 3/16 inch holes as guides, drill through T9 and T55 with a 3/16 inch drill. Temporarily bolt with 314 bolts. *Make sure the T55's are pushed into T9 as far as possible before drilling.*

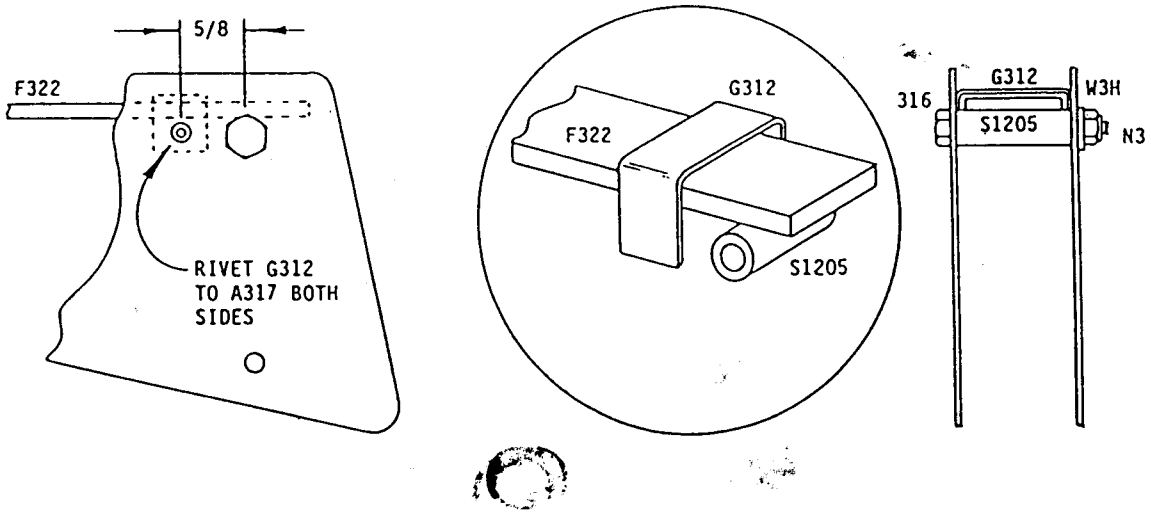
6.1.21 Remove the F325 tailwheel mount blocks from the aircraft. Grease the SCS250 pivot bolt and assemble the two tailwheel spring and pivot assemblies as shown. The nut between F325 and F323 should be adjusted so that F325 will rotate freely on the bolt but there is little or no end play. Then, while holding this nut with an open end wrench, the other nut (on the end of the bolt) should be tightened to clamp F322, F323 and F324 securely. It may require several attempts to adjust both of these nuts to achieve the required freedom of rotation for F325.



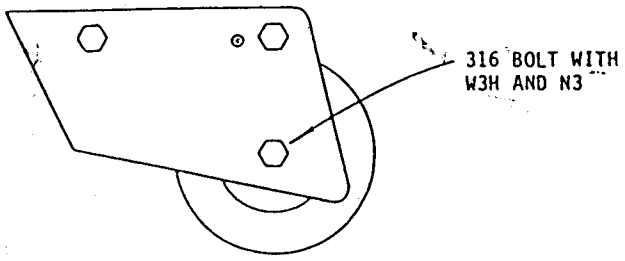
6.1.22 Fit each spring and pivot assembly into a tailwheel pant (A317) as shown. Adjust the CN3 so that A317 will move freely, and pin the nut with a CP23 cotter pin. Make a left and right assembly by inserting the two 316DS bolts in opposite directions. (The left assembly is shown in the figure).



6.1.23 Install the S1205 spacer with a 316 bolt (below the F322 leaf spring). Install the G312 stop and rivet in place as shown to retain the spring. Note that the spring should not be *clamped* by G312 (about 1/16 of an inch play is acceptable).



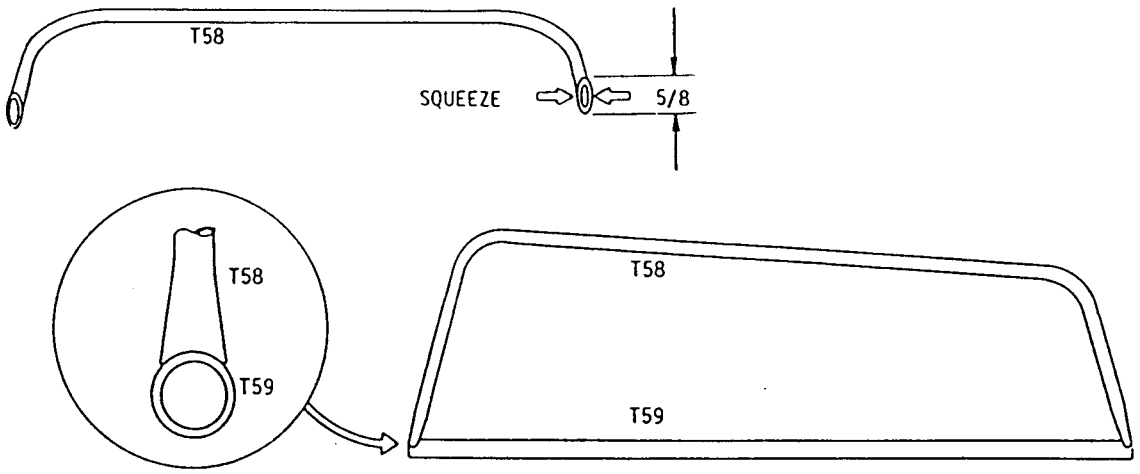
6.1.24 Install the tailwheel and axle assembly with a 316 bolt as shown.



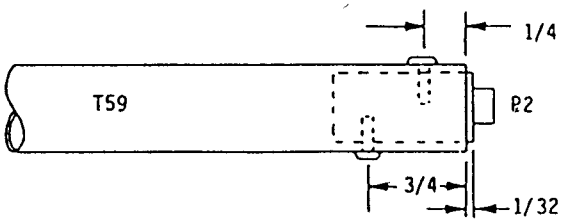
6.1.25 Reinstall the F325 mount blocks on the aircraft. Check that the tailwheel assembly rotates freely on its pivot bolt. Press down on the top of the tail and check that the tailwheel springs deflect.

6.2 RUDDERVATOR ASSEMBLY

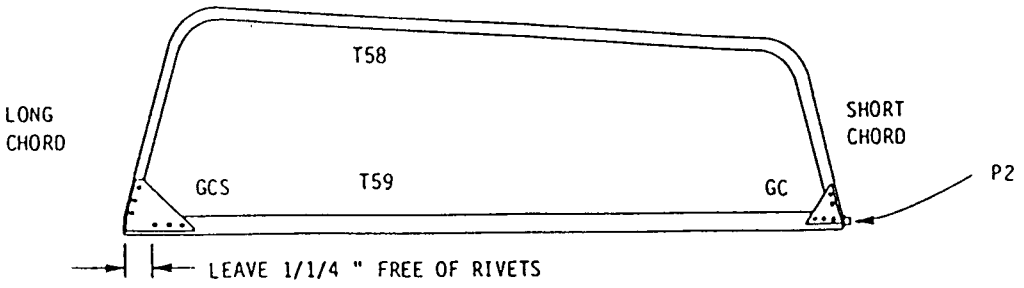
6.2.1 Squeeze the ends of the bent ruddervator tube T58 as shown, then file the ends to fit the torque tube T59.



6.2.2 Insert a P2 ruddervator hinge plug into one end of each torque tube T59 and rivet as shown.

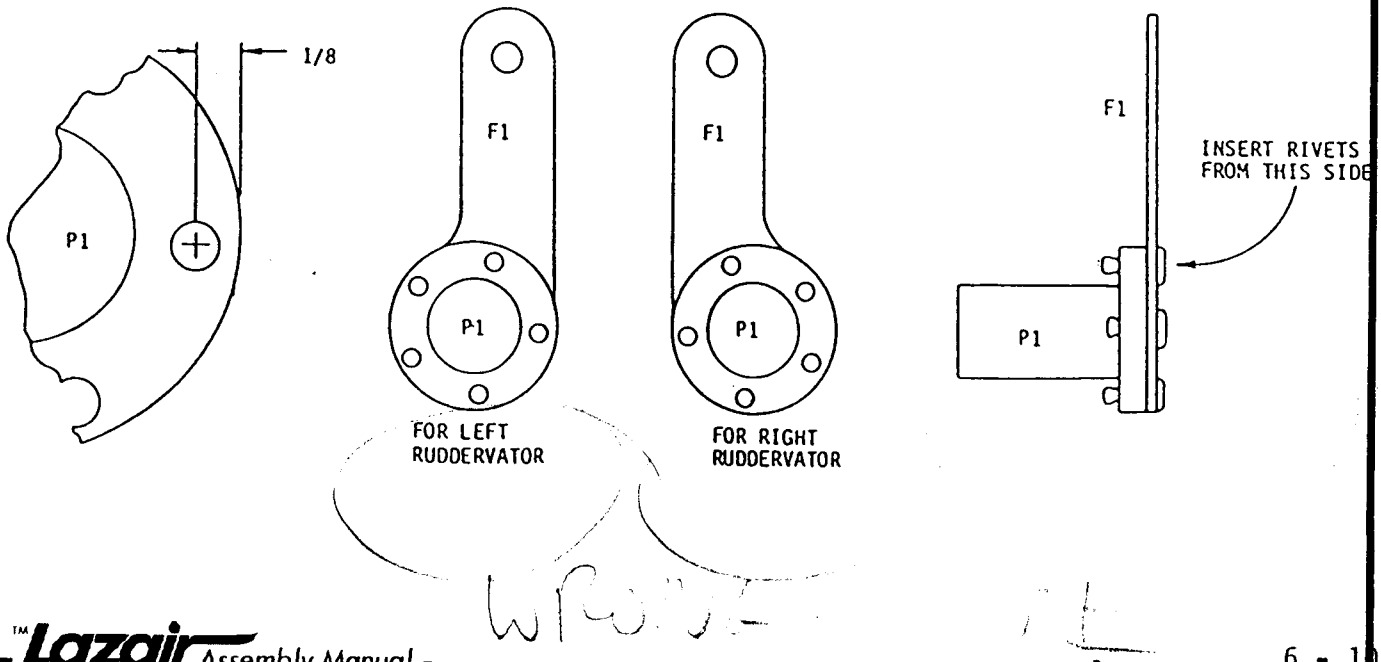


6.2.3 Fit T58 to T59 as in step 6.2.1. Trim GC gussets as required to fit as shown, and round the corners of the GC and GCS gussets. Rivet the gussets in place as shown (both top and bottom). Use five rivets in each GC and six in each GCS. Build the ruddervator on a flat surface and make sure that T59 is rotated such that the rivets installed in step 6.2.2 do not interfere with the GC gussets. Note that the end of the ruddervator with the shorter chord is joined to the end of T59 containing P2.

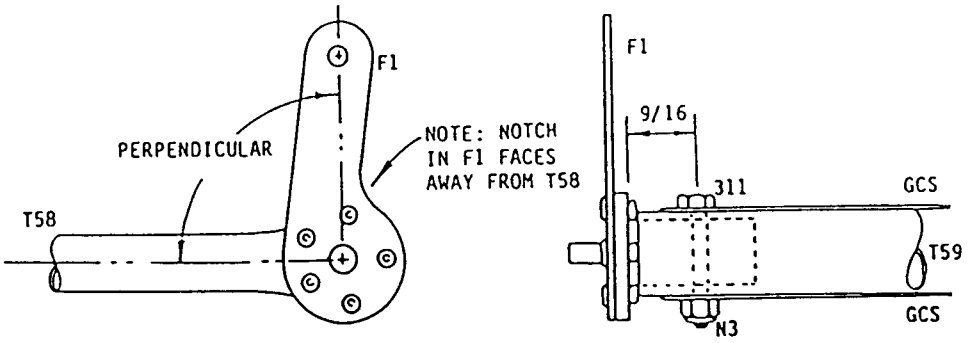


6.2.4 Sand or file the edges of Ruddervator Horn F1 to remove tooling marks, and drill out the hole in the large end to 1/4 inch diameter. Fit F1 over the stud on the end of the Ruddervator Plug P1 and Rivet in place with 5 Stainless Steel Rivets as shown.

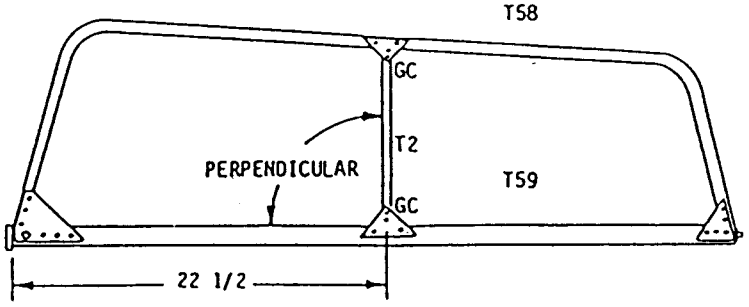
NOTE: *It is possible to install the rivets very close to the edge of P1 and leave enough space for the end of T59 to fit inside the rivet pattern. However, it is easier to install the rivets as shown below and allow the end of T59 to butt against the end of the rivets as shown in the figure for Step 6.2.5.*



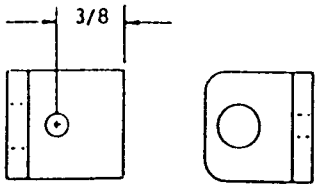
6.2.5 Insert P1 into the open end of T59 and bolt in place as shown. Note that the head of the bolt is on the top surface of the Ruddervator (the side from which F1 projects).



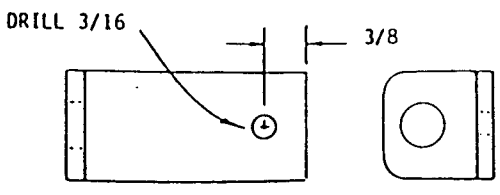
6.2.6 Rivet ruddervator rib T2 into position as shown, using four GC gussets. Trim T2 to length if necessary to keep T58 and T59 straight. Use four rivets in each GC.



6.2.7 Round the corners on Ruddervator Hinges F5 and F64 as shown and remove all burrs and sharp edges from the predrilled 3/8 inch holes. Drill 3/16 inch mounting holes as indicated.

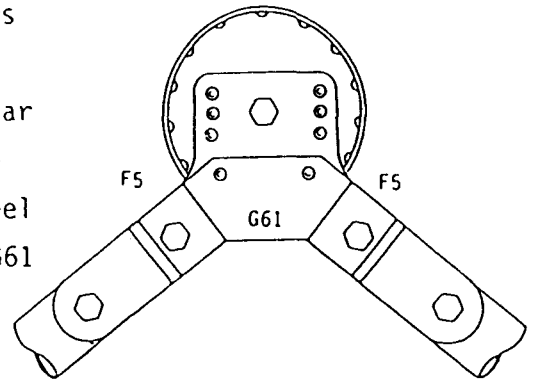


F5

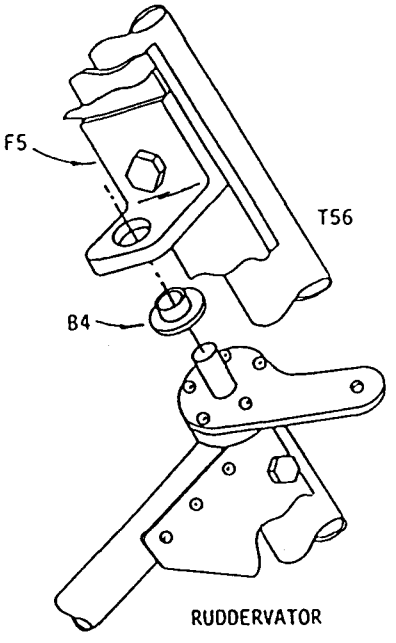


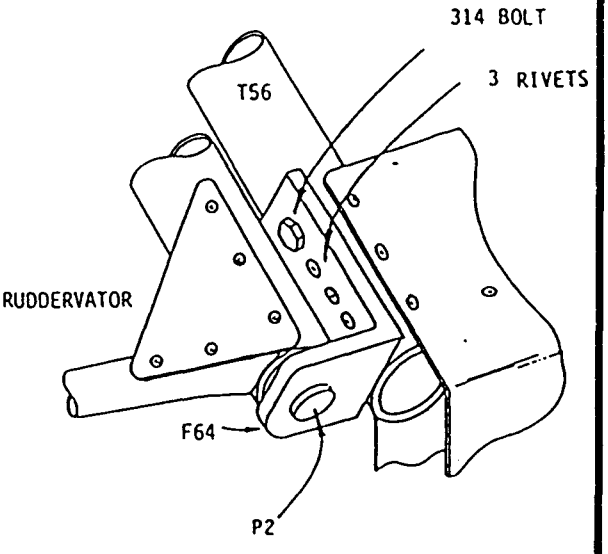
F64

6.2.8 Bolt the F5's in place using the two top bolts on F4 (remove the two washers installed in step 6.1.1). Make sure the surface of the F5's is perpendicular to the axis of T56 and rivet the hinge lock G61 in place with 2 stainless steel rivets as shown. Make sure that the G61 is tight against the F5's to prevent them from rotating.



6.2.9 Fit the top of the ruddervator into F5 with a B4 Bearing as shown at left below. Make sure the B4 is properly seated, then fit the F64 over the end of P2 and locate it as shown at right below. Make sure the ruddervator fits properly (T59 is parallel to T56 and there is no end play), then mark the location of F64. Remove the ruddervator and bolt and rivet F64 to T56 as shown.

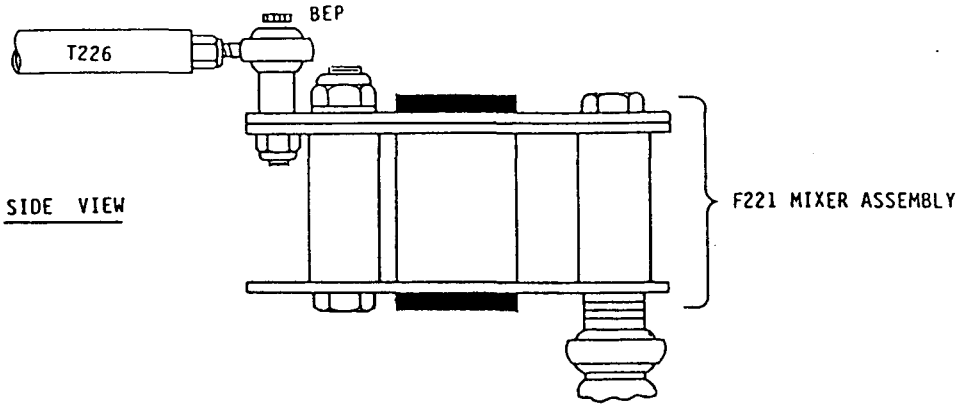




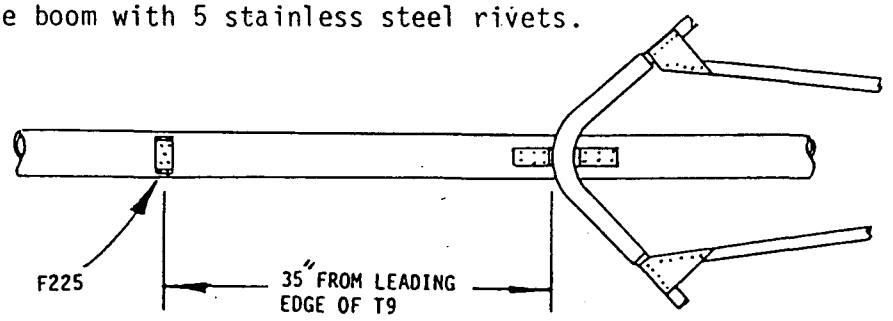
6.2.10 Reinstall the ruddervators (it will be necessary to remove the bolts in the F5's) and check that they move freely but without excessive end play.

6.3. RUDDERVATOR PUSHROD INSTALLATION

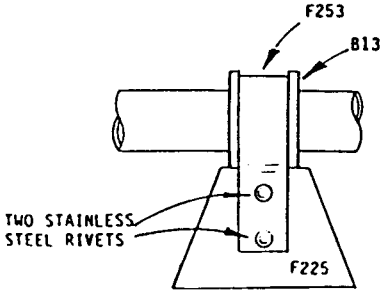
6.3.1 Rivet a P3 plug into *one end only* of both T226 long ruddervator pushrods. Put an N3 nut on each of the BEP pinned rodends on the F221 mixer assembly and install the pushrods as shown. Note that the T226 pushrods should pass between F249 and the boom.

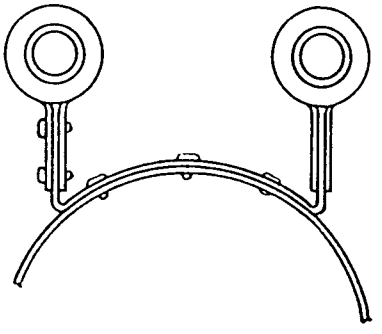


6.3.2 Position the forward pushrod guide bracket F225 as shown and rivet it to the boom with 5 stainless steel rivets.

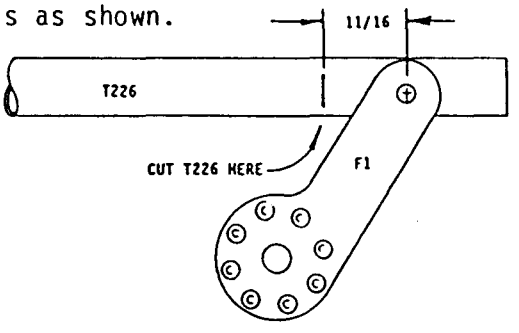


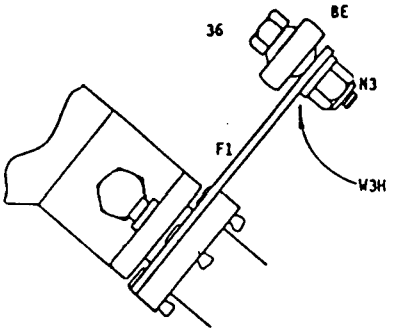
6.3.3 Slide a B13 bushing over each T226 and secure to the F225 bracket using F253 clamps. Before riveting, clamp the F253 in place and check that the axis of the B13's is in line with the T226's.



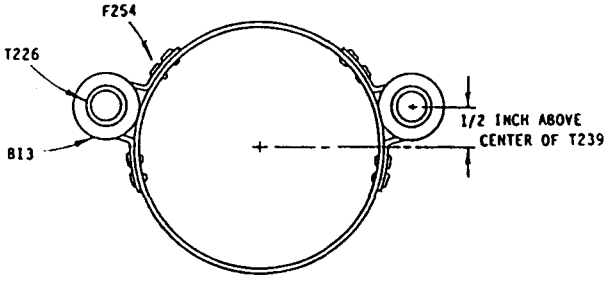


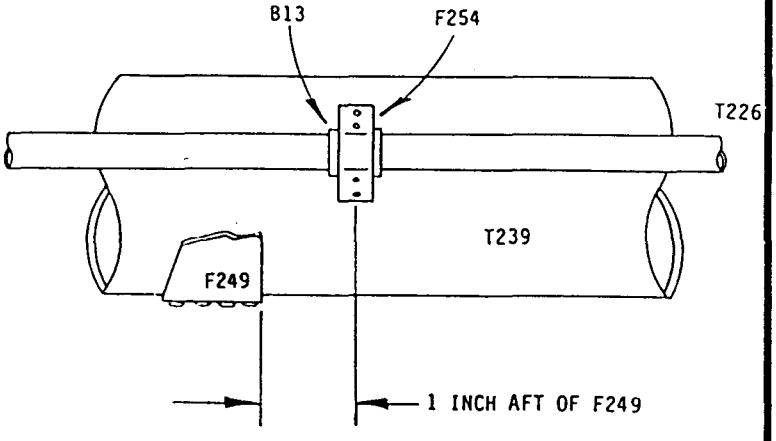
6.3.4 Set the stick in the full forward position (as shown in the figure for Step 5.5.8). Set both ruddervators in the full down position (so they almost touch -- a separation of 1/2 an inch is acceptable). Make sure both ruddervators are deflected equally, and make sure the rear edge of the F221 mixer assembly is parallel to the main spar. Hold each T226 beside its respective F1 ruddervator horn and mark the T226 at the centre of the hole in F1. Cut each T226 11/16 of an inch shorter than the mark. Fit another B13 bushing over each T226, then install and rivet a P3 plug flush with the end of each T226. Install BE rodends with locknuts and bolt them to the F1's as shown.





6.3.5 Install the two rear pushrod guides as shown, and rivet in place with 4 stainless steel rivets in each F254 clamp.

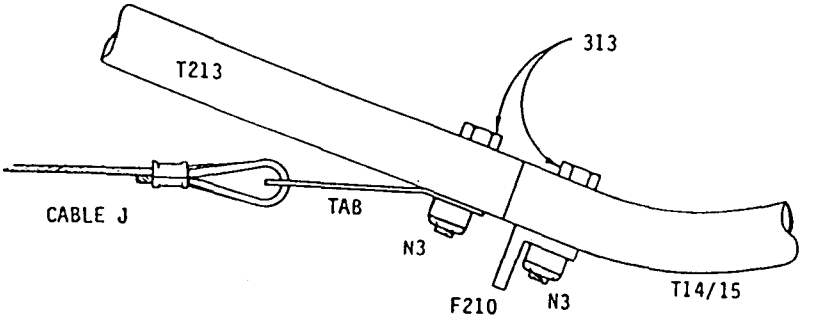




6.3.6 Check that the elevator control system works properly with little friction and little or no play. Twist or bend the pushrod guide brackets if necessary so that the B13 bushings are aligned with the T226 pushrods.

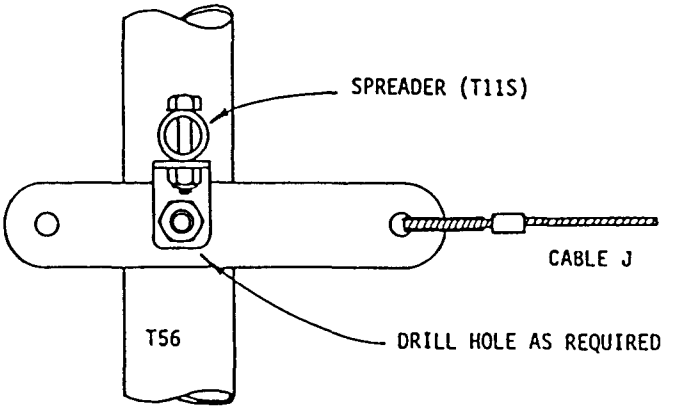
6.4 DRAG CABLE INSTALLATION

6.4.1 Install the Cable J Assemblies on the bolts at the junction of the T213 and T14/15 as shown. Do not tighten the nuts at this time.



6.4.2 Pull the cables tight and make sure there are no kinks or tangles. Note that the cables are crossed (so that one runs from the right front to the left rear, and one from the left front to the right rear).

6.4.3 Pull the cables into position and mark the location for the holes in the rear cable tabs. Drill the tabs and bolt to the T56's as shown using the 314 bolts which hold the spreader in place. Note that the cables should be tight enough to be free of bends but there should not be any appreciable tension in the cables at this time. Do not cut the ends off the tabs until after final adjustment of cable tension in Section 7.

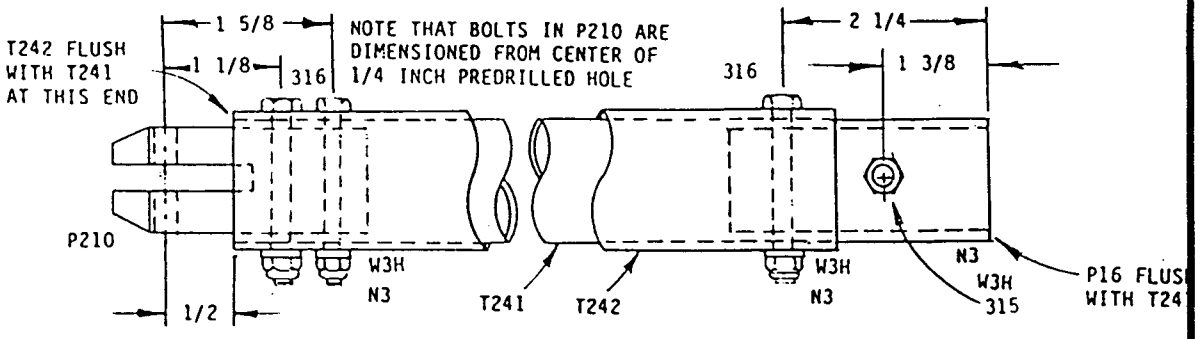


SECTION 7

WING TO FUSELAGE MATING

7.1 WING AND STRUT INSTALLATION

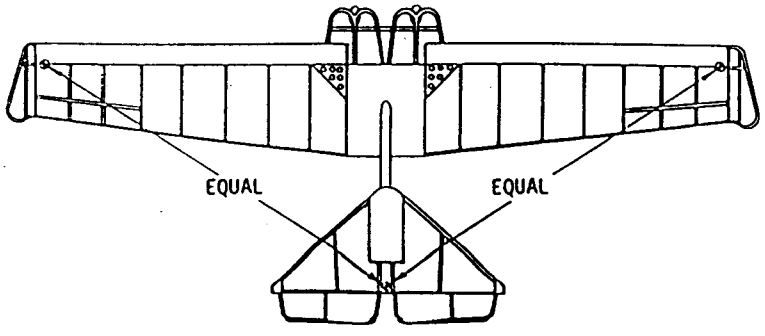
7.1.1 Assemble the two lift struts as shown below. Note that each strut is made from an outer tube T242 and an inner tube T241.



7.1.2 With the aid of at least one assistant, fit the wings onto the fuselage. Secure the wing roots with a 46 bolt through each forward wing attach fitting. Support the wing tips so that both wings are approximately level. Sight along the leading edge and adjust the fore/aft position of the wingtips until the leading edge is straight.

7.1.3 Install the F35 rear wing attach fittings on the rear spar and pin each with a 46 bolt. The outboard end of each F35 should go through the slot in the root rib and fit flat against the F34 in the wing.

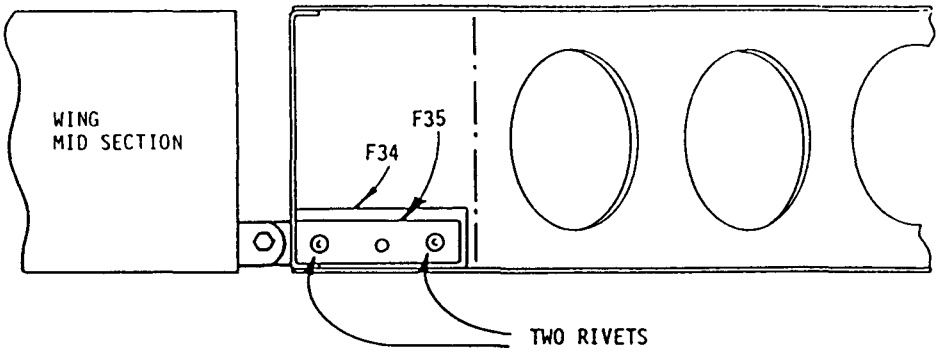
7.1.4 Put a mark on the top of each D-cell (equidistant from the centreline as shown). Put another mark on the top of the boom near the tail. Measure the distance from each mark on the wing to the mark on the tail. Adjust the position of the wings so that this distance is the same for the left and right wing, while making sure the leading edge is kept straight as in Step 7.1.2.



7.1.5 Raise or lower the trailing edge of each wing as required so they are aligned with the mid section.

7.1.6 When all the conditions of Steps 7.1.2, 7.1.4 and 7.1.5 have been met, temporarily rivet the F35's in place with two rivets in each as shown.

RIGHT WING SHOWN (REAR VIEW)



7.1.7 Recheck the position of the wings as in steps 7.1.2, 7.1.4 and 7.1.5. Drill out the centre hole in each F35 to 3/16 inches and bolt with a 35 bolt. Drill out the rivets installed in step 7.1.5 *one at a time* and replace with 35 bolts.

NOTE: DO NOT FORGET STEP 7.1.7

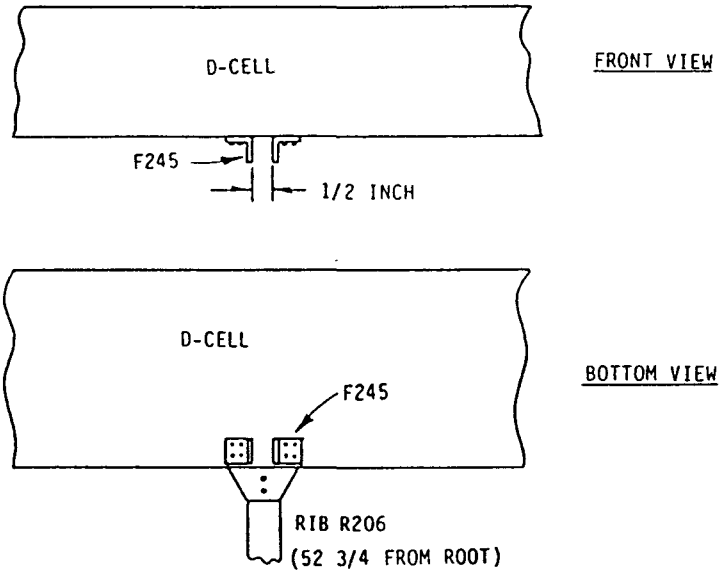
7.1.8 Slide both struts onto the wing strut fittings and put a 414 bolt through the holes in the P210's. Block the wings up so that the bottom ends of the struts just touch the F6's. Bend each wing strut fitting slightly by pulling forward on the strut fitting and pushing back on the strut, so that when you let go, the bottom end of the strut points to the end of the axle. Bend the ends of the F6's if necessary to make them parallel to the struts.

7.1.9 Fit the inboard ends of the struts between the F6 gussets and lower the wingtips slightly. Clamp the F6's together to hold the strut, then drill the lower bolt hole in the strut and gussets. Note that a pilot hole is prepunched in the front gussets only. Make sure the hole goes through the centreline of the strut and is perpendicular to it. The centre of the hole should be 5/8 of an inch from the end of the strut. Drill the hole with a 3/16 inch

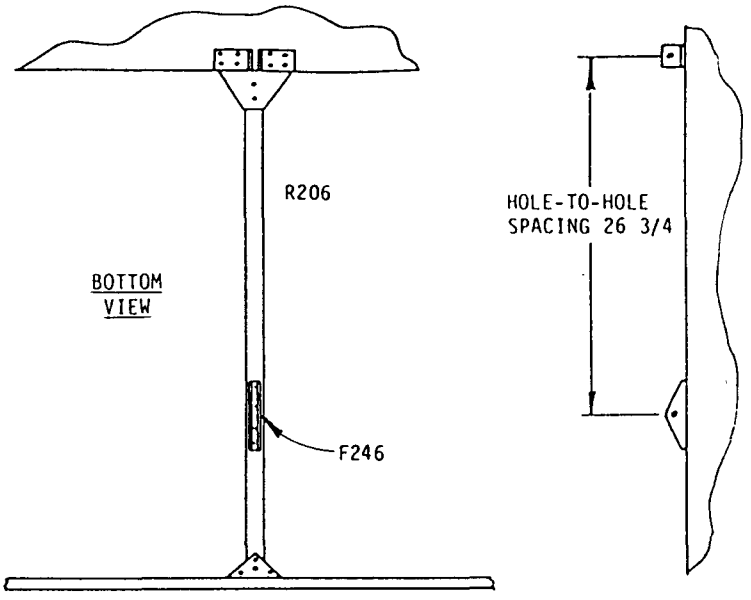
drill first, then carefully enlarge it with a 1/4 inch drill. Temporarily pin the lower end of the strut in place with a 417 bolt.

NOTE: *The following instructions for the installation of Jury struts are included in this section because the jury struts are considered part of the strut assembly. However, the installation of the jury struts (and brackets) should be done after the wing covering has been applied as in Section 9.*

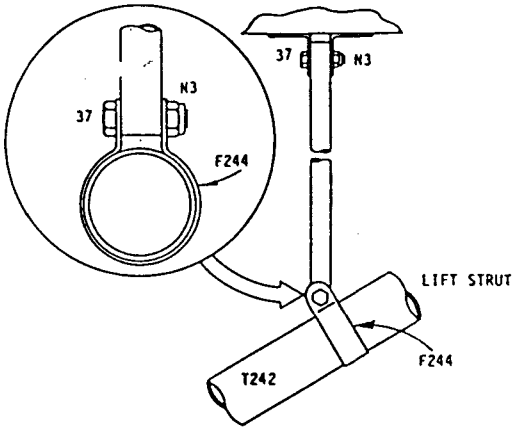
7.1.10 Rivet the F245 forward jury strut brackets to the under side of the spar cap on each wing as shown, using four stainless steel rivets in each bracket. Drill out and remove any previously installed rivets which would prevent the F245's from fitting tightly against the spar cap.



7.1.11 Apply a 4 inch long piece of Tedlar tape to act as a skin doubler, then rivet the F246 rear jury strut brackets in place with four rivets in each as shown.



7.1.12 Cut the T243 forward jury strut to fit between the F245's and the lift strut as shown. Drill a 3/16 inch hole in each end of T243 as required and bolt it in place. *Make sure T243 is the proper length to keep the lift strut straight.* Note that T243 should be vertical (perpendicular to the axle) not perpendicular to the wing.



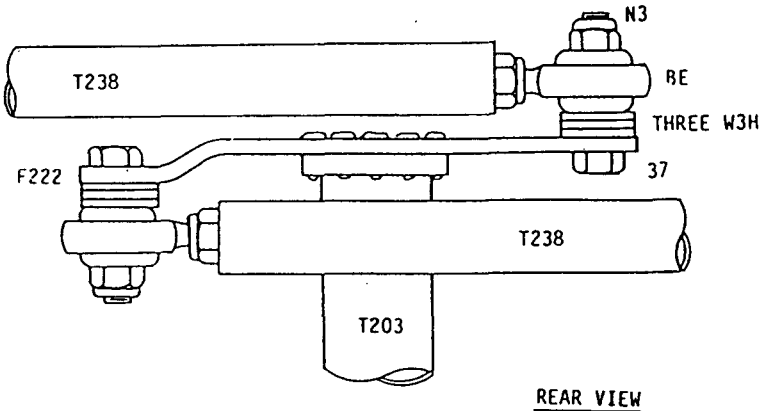
7.1.13 Similarly cut, fit and bolt the rear jury strut T244 in place between F246 and the lift strut. Note that the F244 clamp which secures T244 to the lift struts fits on the inboard side of the previously installed F244.

7.1.14 Check again to *make sure the lift strut is straight*, and refit the jury struts if necessary.

7.2 AILERON CONTROL LINKAGE CONNECTION

7.2.1 Block the ailerons in the neutral position. Set the stick in the neutral position (laterally). Position the T238 aileron pushrods (the long ones in the wings) so they overlap the F222 bellcrank. Mark each pushrod opposite its respective bolt hole in F222, then cut the pushrods 11/16 of an inch shorter than the mark (similar to Step 6.3.4). *Make sure the pushrods are cut so they overlap the F222 bellcrank as shown in the figure for Step 7.2.2.*

7.2.2 Rivet P3 plugs into the T238 pushrods, and install as shown. Adjust the pushrod length as required then make sure all locknuts are tight.



REAR VIEW

1/2" SHORT

7.2.3 Check that the aileron controls work smoothly with little friction and little or no play. Adjust pushrod lengths as necessary to make the stick and ailerons neutral.

7.3 DRAG CABLE ADJUSTMENT

7.3.1 Push down on the nose of the aircraft to lift the tail off the ground. Stand several feet behind the aircraft and sight the spreader (T11S) and the main axle for parallelism. Remove the cable from the *higher* end of the spreader. While holding the outboard corner of the stabilizer, pull the cable to produce a tension of approximately 10 pounds in the cable, then drill and bolt the cable tab to T56 as in step

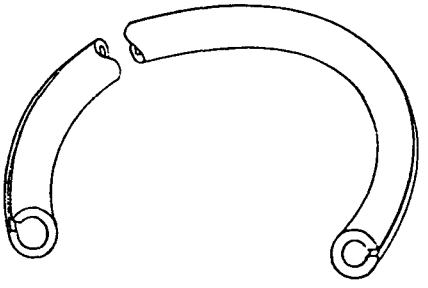
7.3.2 Remove the other cable from T56 and again raise the tail off the ground and sight the spreader. Adjust the tension in the cable as required to make the spreader parallel to the main axle. Clamp the cable tab to T56 until the tension is correct, then drill and bolt as before. Cut the excess length off the cable tabs and file the ends smooth.

Note that if you cannot get sufficient tension in the cables, the front cable tab may be shortened.

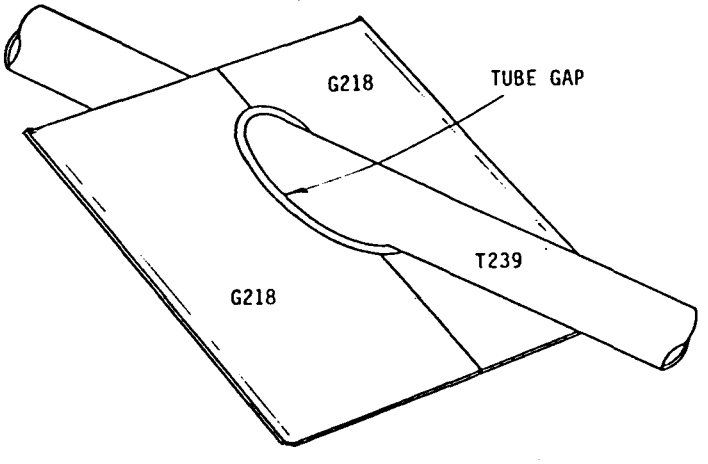
7.4 WING MID-SECTION SKIN INSTALLATION

7.4.1 Cut the semi-elipses in the two G218 mid skin sections with tin snips and fit them in place. Check that there is a clearance of at least 1/8 of an inch all around the T239 boom. Enlarge the cutouts in the G218's if necessary. Note that the edges of the G218's should be aligned with the rear skin (G217). Do not rivet at this time.

7.4.2 Using a razor knife or other sharp instrument, slit the Tube Gap as shown. If the tube gap has a natural curve, put the slit on the outside of the curve.

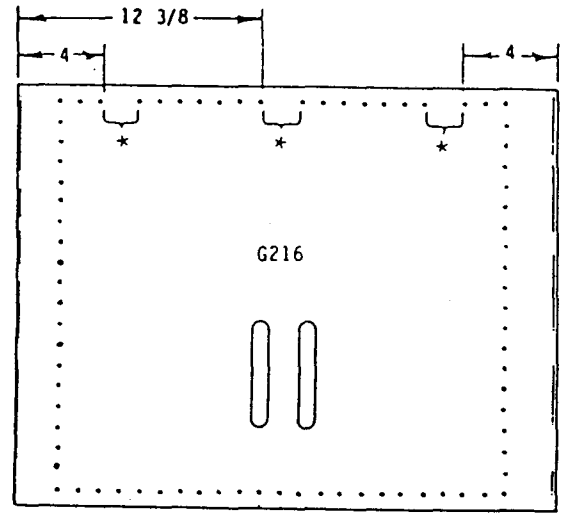


7.4.3 Press the tube gap onto the edges of the cutout in the G218's. Position the tube gap so the ends are under the boom. Rivet the G218's in place with a 1 inch rivet spacing along both sides and the trailing edge. Rivet the two G218's together where they overlap. Do not rivet the leading edge of the G218's at this time.



7.4.4 Disconnect the T226 ruddervator pushrods and slide them back out of the way.

7.4.5 Fit the top front skin G216 in place. Make sure it is properly aligned and rivet as shown. The leading edge of G216 should be flush with the main spar. Use a 1 inch rivet spacing on all 4 sides, but leave three places two inches wide along the leading edge (as shown by the asterisks) free of rivets.



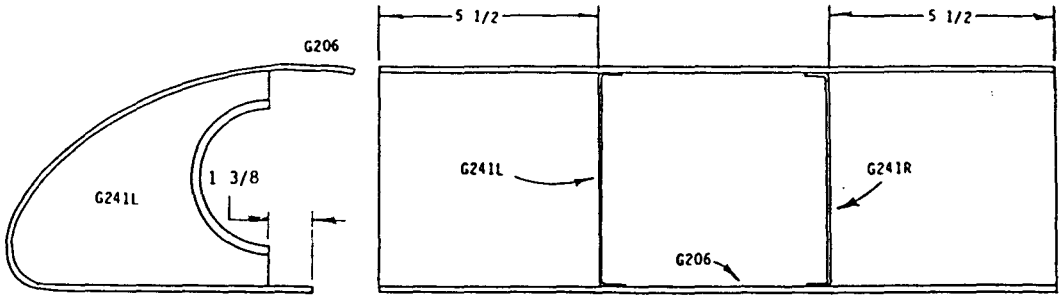
* 2 INCH WIDE SPACE, FREE OF RIVETS

7.4.6 Rivet the two G238 stiffeners in place inside the G216 front skin with a 2 inch rivet spacing. Use the same lateral position as on the G237's (step 5.1.23).

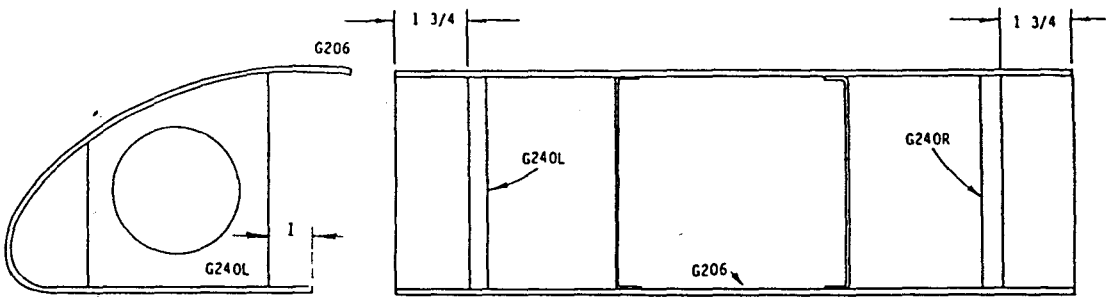
7.4.7 Replace the T226 pushrods and check that the clearance between the T226's and the edge of the cutouts in G216 is at least 1/4 of an inch for any position of the stick and rudder pedals. Enlarge the cutouts if necessary.

7.5 MID-SECTION NOSE ASSEMBLY

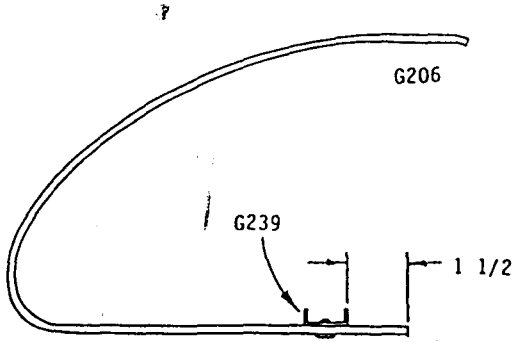
7.5.1 Fit the two G241 noseribs inside the G206 skin and rivet in place as shown. Use a 2 inch rivet spacing on the bottom and 1 rivet into each tab on the top. Installing these ribs is not difficult, but it can be tricky if you attempt to do it too quickly. An extra pair of hands may be helpful.



7.5.2 Similarly, rivet the two G240 riblets in place as shown.



7.5.3 Rivet the G239 stiffener inside G206 with a 2 inch rivet spacing. Centre G239 between the two G241's.



7.5.4 With the wings on the fuselage, fit the mid section nose assembly onto the main spar and push it into position. Check the fit and notch or trim G206 if necessary so it fits tightly around the D-cells on the wings. Drill four 3/16 inch mounting holes through G206 and the spar caps (3 on top in the middle of the spaces left in Step 7.4.5 and one in the middle of the bottom spar cap).

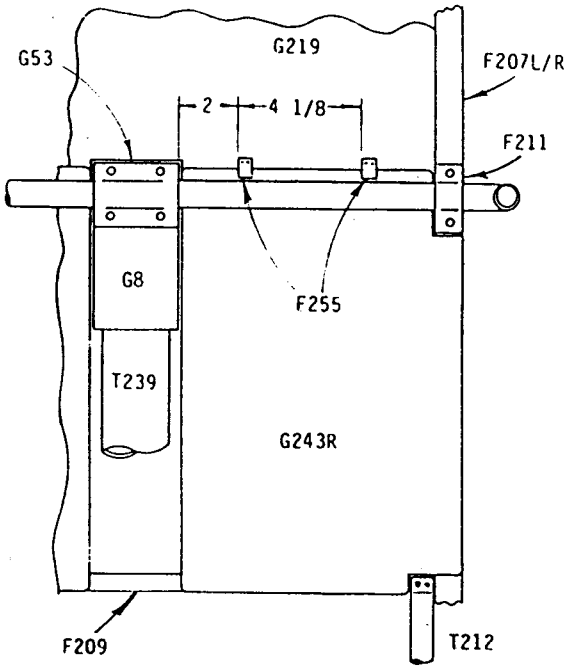
7.5.5 Install an NB3 nutplate in each of the four holes as follows: secure the nutplate to the outside of the sparcap with a 34 bolt (use W3H washers to prevent bottoming the threads). With a 1/8 inch drill, drill the two rivet holes in the nutplate and the sparcap but do not install the rivets. Remove the nutplate and drill out the bolt hole in the sparcap to 7/32 of an inch. Fit the nutplate inside the spar cap and rivet it in place (with the rivet heads on the outside of the spar cap).

NOTE: When bolting the nose assembly in place, use 34 bolts with W3H washers under the heads.

7.5.6 Install foam weatherstrip around the inside edges of G206 (where it contacts the wings and the main spar) and along the bottom edges of G216, G217 and G218 where they contact the wing.

7.6 INSPECTION COVER INSTALLATION

7.6.1 With the nose assembly (G206) removed, check the fit of the G243 inspection covers, and trim them if necessary. With the inspection covers held or taped in place, rivet the F255 clips to the G219 bottom skin as shown.



BOTTOM VIEW

FRONT OF AIRCRAFT

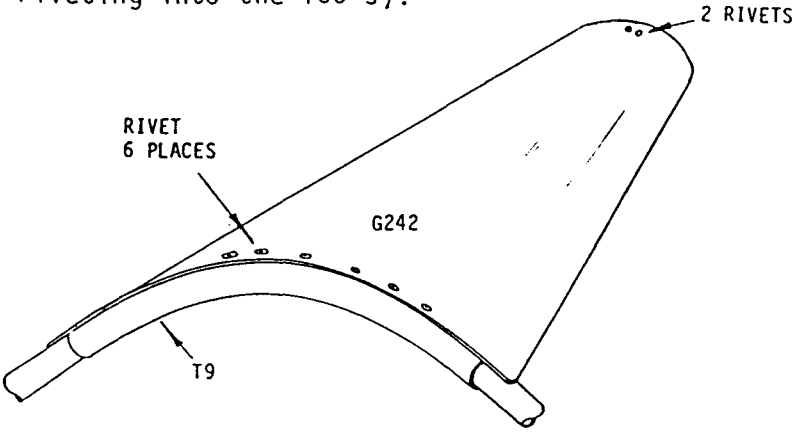
7.6.2 Apply weatherstrip to the inside of the inspection covers along the leading edge.

7.6.3 When the aircraft is assembled for flight, the inspection covers should be installed so that the trailing edge is held in place by the F255 clips, and the leading edge by the G206 nose assembly.

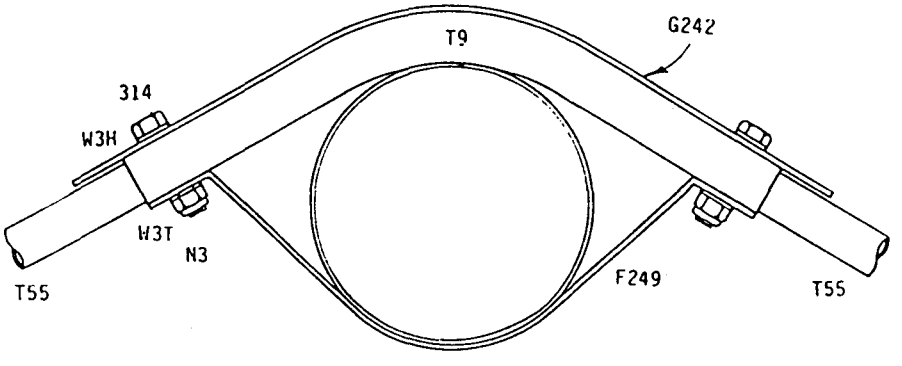
NOTE: The G206 nose assembly and the inspection covers should be removed every 25 flight hours to permit a thorough inspection of the ruddervator and aileron control linkage.

7.7 TAIL GAP COVER INSTALLATION

7.7.1 Cut out the tail gap cover G242 with tin snips and file the edges smooth. Bend it to form a smooth curve so that when installed it will conform to T9 and touch the stabilizers along T235. Apply weather strip along the edges where it contacts the stabilizer and rivet it in place as shown below. Note that the rivets along the leading edge should not be within 1 5/8 inches of the ends of T9 (to avoid riveting into the T55's).



7.7.2 Drill the bolt holes through the gap cover (in line with those drilled in Step 6.1.20) and re-install the 314 bolts.



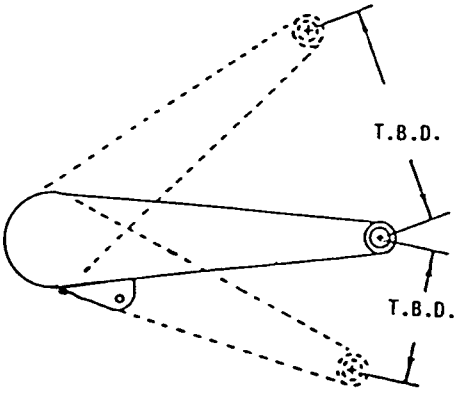
7.8 FINAL CHECKS AND ADJUSTMENTS

7.8.1 Aileron Balance

Set the sticks in the neutral position (both fore/aft and laterally). Check that the ailerons are both in the neutral position (aligned with the adjacent ribs). Adjust the length of the T238 pushrods if necessary.

7.8.2 Aileron Travel

Move the sticks as far as possible to the left and check that the aileron deflection is within the limits shown in the figure. Move the sticks as far as possible to the right and check that the aileron deflection is within the limits. Aileron deflection may be adjusted as described in Step 5.5.8(a).



7.8.3 Ruddervator Balance

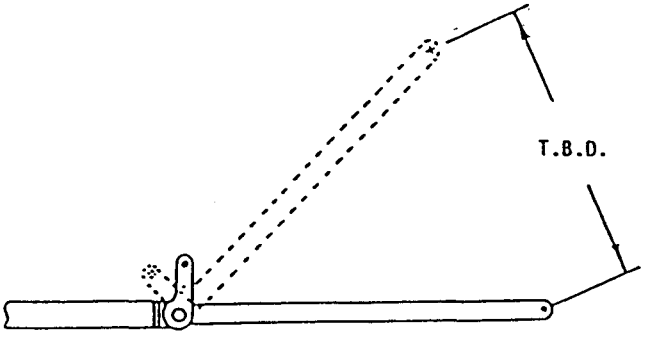
With the sticks in the neutral position adjust the position of the rudder pedals so they are parallel to each other. Move the sticks slightly if necessary so that one ruddervator is in its neutral position (aligned with its stabilizer). The other ruddervator should be at or very near its neutral position. If necessary, adjust the length of one T226 pushrod or one T227 pushrod to balance the ruddervator system. (Checking the positions of the F221 mixer bellcrank with the ruddervators in neutral should indicate which pushrod requires adjustment).

7.8.4 Ruddervator Downward Travel

Push the stick as far forward as possible while maintaining the rudder pedals in neutral. The downward deflection of the ruddervators should be such that they *almost* touch each other. Adjust the length of pushrod T233 as required to achieve the correct downward deflection.

7.8.5 Ruddervator Upward Travel

Pull the stick back as far as possible while maintaining the rudder pedals in neutral. The upward deflection of the ruddervator (measured from the neutral position and measured at the location of the maximum chord) should be within the limits shown in the figure. If necessary, adjust the position of the stick stops (Ref. Step 5.5.8(b)) to achieve the required upward deflection. Note that if the stick stops are moved, it will be necessary to recheck (and readjust) the ruddervator downward deflection as in step 7.5.4 above.



7.8.6 Balance (Centre-of-Gravity) Check

NOTE: THIS CHECK SHOULD BE CARRIED OUT AFTER THE WING AND TAIL HAVE BEEN COVERED AS IN SECTION 9.

Flight testing has shown that the Lazair II is very tolerant of changes to the position of the centre of gravity. However, for comfortable hands-off flying at a reasonable air speed, and for assurance that there is no gross error effecting the C of G, the check outlined below is recommended. With the C of G positioned as defined, the Lazair should trim out hands-off at approximately to mph indicated airspeed. With the seat positioned as indicated in the Assembly Instructions, the pilot sits very near the centre-of-gravity, so reasonable differences in pilot weight do not have an appreciable effect on the position of the C of G. However, there will be some slight effect from such trivial things as the position of the pilot's feet or even the type of shoes he is wearing. Minor in-flight trim adjustments can be made by just moving the position of your feet. Also, there will be an effect from the weight of the fuel, so it is recommended that the following check be made with the fuel tank approximately half full.

With the aircraft on the ground and two "average weight" pilots sitting in the seat in the "normal" (or most comfortable) seating position, raise the tail until the boom is level (use a spirit level on top of the boom). Hold the aircraft in this position with a bathroom scale under the tail(at F4). The reading on the scale should be between and pounds. If the aircraft meets this requirement it is adequately balanced for the first test flight (if possible, the first flight should be made by an experienced Lazair pilot who is capable of recognizing any unusual flight characteristics). Fine tuning of the balance is best done by test flying the aircraft and adjusting the C of G for hands-off trim at the power setting and airspeed preferred by the pilot.

Note that for weight and balance calculations, the C of G limits are 12 to 15 inches aft of the wing leading edge.

7.8.7 Final Inspection

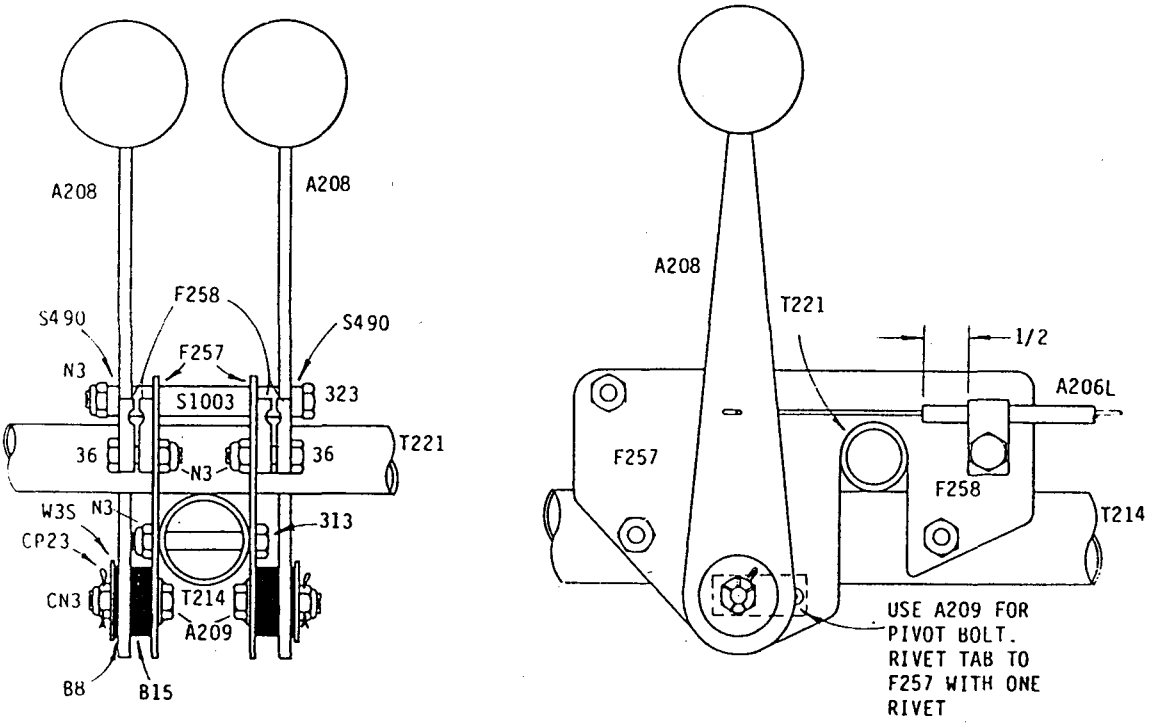
Before being covered, the aircraft should be inspected for overall workmanship and to make sure it is complete. Be sure all nuts are tightened securely (especially those on the pushrods if control adjustments were necessary). Check for free and proper movement of control surfaces and make sure that bearings and hinges operate properly as defined in steps 3.8.19. Anytime the aircraft is assembled for flight, make sure the proper hardware is used as tabulated below. Note that any nuts which must be removed to disassemble the aircraft should have washers under them to prevent damage to the aluminum alloy tubes and fittings. Note also that the bolts holding the nacelles onto the wing should be the drilled head type and should be lockwired.

LOCATION	BOLT TYPE	QTY.	WASHER
Inboard wing attachment, Front	46	2	W4T
Inboard wing attachment, Rear	46	2	W4H
Inboard strut attachment		2	W4H
Outboard strut attachment	414	2	W4T
Aileron pushrods (inboard end)	37	2	W3H(3)
Nacelles to wing, Top	DH35	4	N/R*
Nacelles to wing, Bottom	DH36	4	N/R*

*G53 used as washer

8.1 THROTTLE SYSTEM INSTALLATION

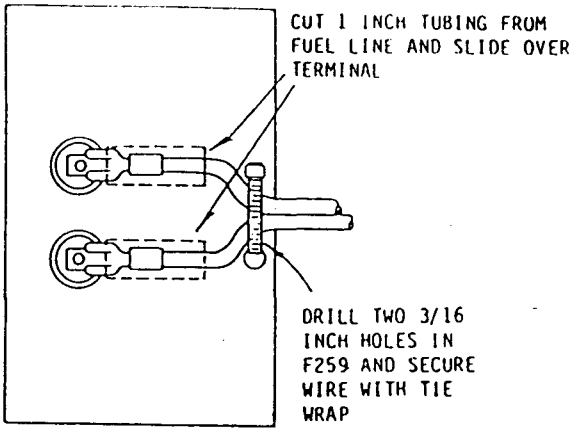
8.1.1 Assemble the throttle quadrant as shown below. Rivet the A209 tabs to the F257 side plates with one rivet 1/8 of an inch from the end of each tab (the A209 tabs should be parallel to T214/215, and the rivet heads should be against the F257's). Tighten the castle nuts to provide enough friction to hold the throttle levers in position. Insert the cotter pins and bend them only slightly so they may be easily removed later for final adjustment.



8.1.2 Loosen the nuts on the 323 bolts as necessary and fit the throttle quadrant over T214 and T221. Drill two 3/16 inch holes through T214 and bolt the throttle quadrant in place.

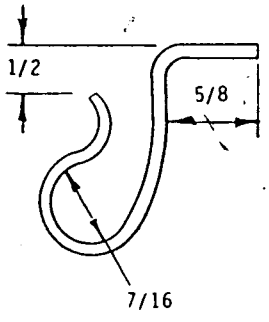
8.1.3 Assemble and install the two magneto switches and wires on F259 as shown. Strip about 1/4 inch of insulation from the wires and crimp the terminals on with a crimping tool or vise-grips. Pull on the terminal to check that it is securely attached to the wire. If you have difficulty, the wire may be soldered directly to the switch terminal. Make sure the hex nuts on the switches are tight. Position the back edge of the F259 Switch Plate 6 inches

in front of the throttle quadrant and rivet to T214/215 with four rivets.



BOTTOM VIEW

8.1.4 Route the throttle cables and magneto wires to their respective engines (separate the two magneto wires as necessary). The wires and cables should be routed under the axle, then up T224. Bend two F51 clips as shown and rivet to the bottom of the mid-section with two rivets in each. Locate the clips approximately 1 1/2 inches aft of the rear spar and 3 inches inboard of the R208L/R ribs.

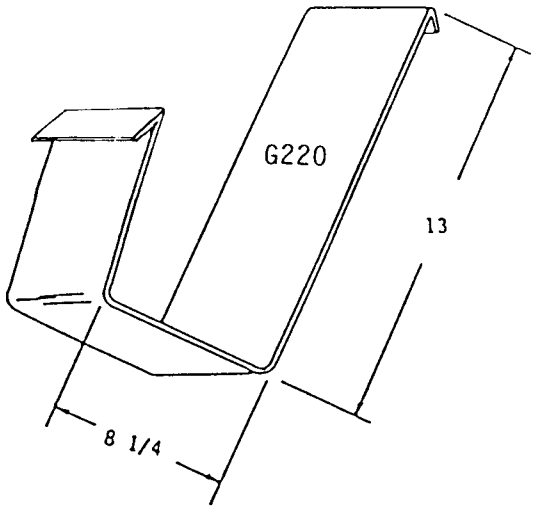


8.1.5 With the engines installed on the wing, hook the end of the throttle cable into the loop on the end of the cable on the nacelle. Hook the throttle cable into the F51 on the nacelle and snap the ferrule into the A207 clip. Adjust the bend in the F51's if necessary so that if you pull on the cable it does not tend to pull out of the A207 clip.

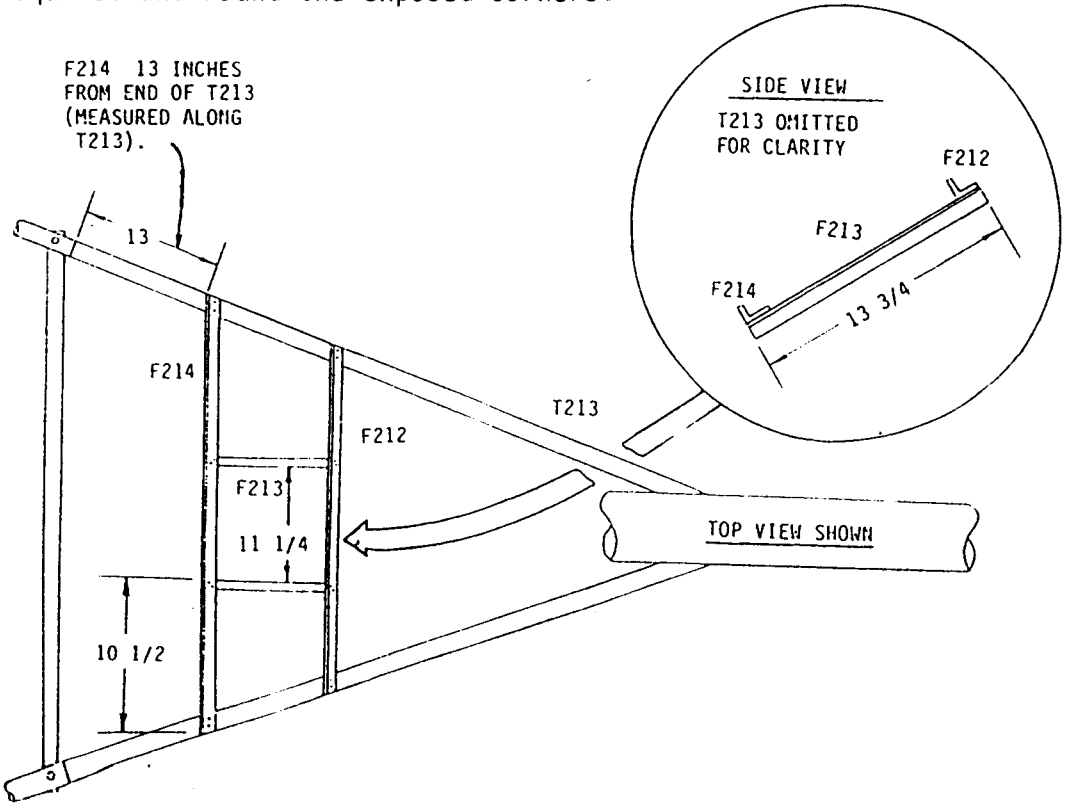
8.1.6 If all cables and clamps have all been installed as specified, the throttle should be close to proper adjustment. Check the position of the throttle slide in the carburetor and verify that it is fully open with the throttle lever in the full forward position. With the lever in the full back position, the throttle slide should be fully closed but there should be enough tension in the cable to ensure that it does not unhook at the junction on the nacelle. Adjust the position of the cable in the F258 clamps as necessary. Adjust the castle nuts on the throttle quadrant so that the levers will not return to idle from the force of the return spring in the carburetor when subjected to vibration, and lock the nuts with the cotter pin.

8.2 FUEL TANK INSTALLATION

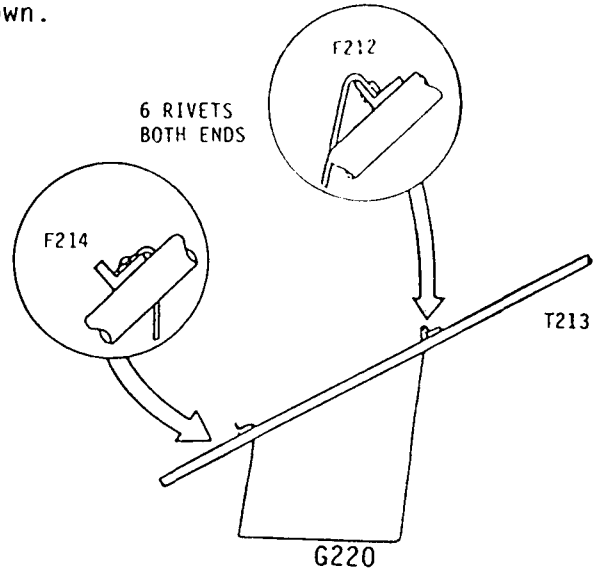
8.2.1 Bend the fuel tank saddle G220 as shown, using a 1/2 inch or 3/4 inch tube as a mandrel to obtain a large bend radius.



8.2.2 Rivet the fuel tank support angles F212, F214 and two F213's in place as shown. Note that the vertical web on F214 and F212 faces upward and forward. On the F213's it is downward and inboard. Use two stainless steel rivets in the end of each angle. Cut F212, F213's, and F214 as required and round the exposed corners.



8.2.3 Rivet the fuel tank saddle G220 in place midway between the F213's as shown.



8.2.4 To install the rubber strap to hold the fuel tank in place, first drill a 3/16 inch hole at the midpoint of each F213 (in the horizontal web). Bend the S-hooks closed (on the strap end only) to avoid scratching the fuel tank. Install the tank and secure it with the strap. The strap should hook into one F213, go through the handle on the fuel tank, then hook into the other F213.

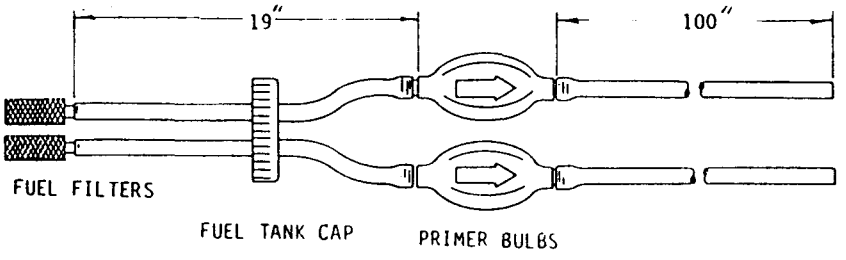
8.2.5 Slide the ends of the fuel lines onto the nipples on the fuel filters and secure with two turns of lockwire. The fuel line will fit on easier if it is first heated slightly with a match or cigarette lighter, but *do not attempt this if the line has had gasoline in it.*

8.2.6 Replace the cap and make sure there are no sharp bends in the line which could impede fuel flow.

8.2.7 Drill a 1/8 inch diameter vent hole in the small cap (remove the cap before drilling to avoid drill shavings in the fuel tank). Note that some kits may be provided with a small cap having a flip-up vent. With this cap, it is not necessary to drill a hole, but *be certain the vent is in the open position prior to every takeoff. This should be added to your preflight checklist.*

8.3 FUEL LINE & MAGNETO WIRE INSTALLATION

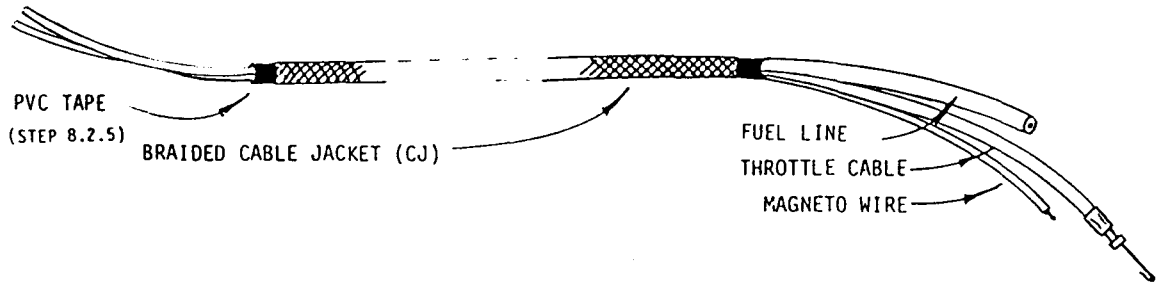
8.3.1 Drill two holes 3/8 of an inch in diameter in the large fuel tank cap. Make up two fuel lines as shown and safety-wire all junctions.



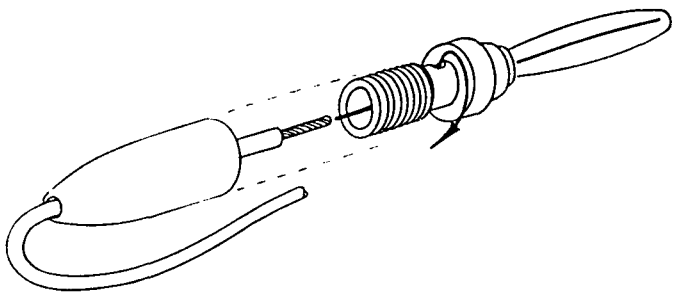
8.3.2 Install the fuel lines, route them along the throttle cable and connect them to the input of the fuel pump. The primer bulbs must be installed vertically (with the fuel exit at the top) to prevent the entrapment of air bubbles. Note that the primer bulbs provided with the LazairII kit are much superior to those mentioned in Technical Update Items 1.6 and 2.3, and should not be susceptible to the same problems. Make sure there are no sharp bends or kinks which could impede fuel flow. Make sure the fuel lines are pushed into the tank far enough to reach the bottom with a few inches extra. Note that when exposed to gasoline for a prolonged period, the fuel line will shrink slightly, so if you trim the length, leave it about four inches longer than what would appear to be the correct length.

Before flying the aircraft, make sure all fuel line connections including those on the fuel pump and carburetor are safety wired.

8.3.3 Dress the fuel line and magneto wire along each throttle cable. Compress the CJ Cable Jacket to expand it and feed it over the end of the cable, fuel line and wire.



8.3.4 Cut the magneto wires as required and install the banana plugs to mate with the banana jack on the engine mounting plate. Be sure to leave enough slack in the wire to allow for engine movement and dress the wires so they will not be in contact with any sharp edges.



8.2.5 Position all cables and lines as required and tape the ends of the cable jacket with PVC electrical tape (not supplied). Install tie wraps to hold the cable bundle in place.

SPECIAL NOTICE REGARDING

APPLICATION OF TEDLAR® COVERING

Tedlar® PVF film has been used as a covering material on the Lazair™ ultralight aircraft for over a year, and, when properly applied, its performance has been excellent. However, there have been a few reports of the Tedlar tending to slip slightly under the tape. In most cases this slippage is considerably less than 1/16 of an inch and does not represent a serious problem. However, it is an indication that the covering has not been applied properly, and if slippage persists, it could become a serious problem. After a lengthy investigation, it has been determined that this tape slippage has been caused by two factors:

1. The tape was not pressed down sufficiently when it was applied. Because the tapes use an acrylic adhesive, a significant dwell time is required to develop maximum bonding strength after the tape is applied. If the tape is not properly pressed down prior to this dwell time, a proper bond cannot be formed.

2. The Tedlar was overheated during the shrinking process. The Tedlar tends to shrink considerably after the heat source is removed. It also tends to shrink proportionally more along its length than along its width. Therefore, if the heat source is maintained after there is sufficient shrinkage in width, there may be excessive shrinkage in length, which will aggravate any problem with tape adhesion.

Although it is certainly possible to obtain a satisfactory covering job by following the procedure in the Assembly Manual, (most builders have done so) we now recommend some additional steps which should make it much easier to ensure a good tape bond.

1. To make sure the tape is properly pressed down, we now supply a "tape paddle" with each Lazair™ kit. After you have pressed the tape down with your thumb or finger, go over it carefully but firmly with the end of the paddle. This will ensure good contact and will push out any air bubbles and "fisheyes". Although this may seem tedious (it can take up to an hour to do a wing) it is well worth the time it takes.

The tape paddle should also be used to press down the double face tape before the backing paper is removed. This will ensure that the adhesive will adhere to the aluminum rather than try to lift off with the backing paper.

2. When heat shrinking the Tedlar, be sure to follow the procedure in the manual and apply the heat for a few seconds, then remove the heat and watch the Tedlar to see if it shrinks. If the heat is maintained after the Tedlar begins to shrink, there is a possibility that excessive shrinkage could occur.

3. You will find that it is often unnecessary to shrink the middle part of the wing or tail panels. If you shrink only about 4 to 5 inches around the perimeter of each panel, all the wrinkles will pull out of the middle of it and there will be much less stress on the tape than if you attempt to shrink the whole panel.

4. This fourth recommendation is a diversion from the procedure in the Assembly Manual. While it may not be necessary to use this new procedure if all the other recommendations are followed, the new procedure may be a bit easier and is probably more tolerant if you should happen to overshrink the covering. The change to the procedure is quite simple -- just do the heatshrinking before the single face Tedlar tape is applied rather than after.

Old Procedure	New Procedure
1. Apply double face tape	1. Apply double face tape
2. Apply Tedlar	2. Apply Tedlar
3. Trim Tedlar	3. Trim Tedlar
4. Apply single face tape	4. Heatshrink
5. Heatshrink	5. Apply single face tape

In addition a further change has been made that is now standard procedure. Formerly, the root ribs and G25's used double-sided tape. The change is to foam tape on both the root ribs and the G25's. This change has been incorporated in the latest edition of the Assembly Manual.

SECTION 9

WING AND TAIL COVERING

9.1 GENERAL INSTRUCTIONS AND INFORMATION

9.1.1 Materials

Two types of covering materials are used on the Lazair. The wingtips are covered with urethane impregnated (zero porosity) Dacron, and the remainder of the wings and the tail surfaces are covered with .002 inch (2 mil) Tedlar PVF film. The Dacron is applied with Pliobond contact adhesive while the Tedlar is attached with a series of three pressure-sensitive tapes. Both covering materials require heat shrinking to remove wrinkles after application.

9.1.2 Painting

If the wing ribs are to be painted, they should obviously be painted before the wing covering is applied. Any good quality Latex based paint may be used (most oil based paints or lacquers will dissolve the styrofoam ribs and should therefore be avoided). Be sure to keep the paint off the rib capstrips as it will prevent proper adhesion of the Tedlar.

The Dacron for the wingtips is supplied in whatever colour is available at the time, so the tips must be painted if a particular colour is desired. Excellent results can be obtained with urethane paint (available in spray cans) but the following precautions should be observed. Unlike most other types of paint, the overspray produced from spraying urethane does not dry in mid air and form a fine dust which can be easily brushed away. *Urethane overspray sticks like glue.* When spraying the wingtips, the entire wing and everything else within fifteen feet should be completely masked or covered. Since the urethane overspray can also do a fine job of coating your nostrils (and presumably your lungs as well) the use of a breathing mask is highly recommended.

Unlike the Mylar polyester film used on earlier Lazairs, the Tedlar film is inherently paintable. Although long term test data is not available, we have demonstrated good initial adhesion using enamels, lacquers and urethane paints. The demonstrator which you may have seen at Oshkosh '82 was painted with DuPont Centari acrylic enamel. As more information becomes available, it will be distributed via the Lazair Technical Updates. Since a transparent wing is an obvious asset when making inspections as well as when flying, most Lazair owners prefer to leave the inboard wing panels and the bottom surface of the wing unpainted. Use light colours to reduce the heating of the Tedlar and tape by the sun.

9.1.3 Heat Shrinking

A hair dryer will *not* produce enough heat to shrink the covering materials. Some of the larger industrial heat guns (3000 to 4000 watts with adjustable airflow) can be used but they will heat only a small area and are relatively slow. The best heat source is a propane fueled radiant heater. We use a 39,000 BTU heater at the factory, but a 20,000 BTU unit is quite adequate for home use, and may be rented from many tool rental shops. If a propane heater is not available, excellent results may be obtained by using an ordinary dry iron —— it just takes a bit more time.

Shrinking the Tedlar is not difficult, but you should develop your shrinking technique before you attack your airplane. Tape a scrap piece of Tedlar to a wire coathanger and try shrinking it. Hold the radiant heater about 8 to 10 inches from the Tedlar and move it from side to side. Unlike Mylar and most other heat shrinkable covering materials, Tedlar will continue to shrink after the heat source is removed. Therefore, to avoid overheating the Tedlar, apply the heat for a few seconds, then remove it and check for signs of shrinkage. If there is no indication, heat it a bit longer , then remove the heat and check again for shrinkage. As the heating period is increased, you will find the correct exposure so most of the shrinkage will occur *after* the heat source is removed. If the heat is maintained on the Tedlar for a significant period of time after it begins to shrink, it is possible to overheat the material and reduce the adhesion of the tape.

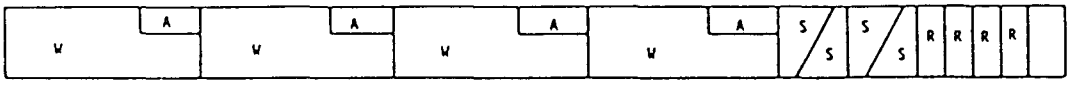
Unlike the Mylar used on earlier Lazairs, Tedlar will not give you any visible indication if it is overheated. Where Mylar will turn white, then become brittle and melt, the Tedlar will just continue to shrink. Be careful also to avoid overheating the tape. Excessive heat on the tape will cause it to shrink noticeably (sometimes as much as half its original width) and develop undulating edges. With a bit of practice you should be able to develop the technique for applying just the right amount of heat to get the wrinkles out without overshrinking the Tedlar.

When you heatshrink the various parts of the airplane, start with the stabilizers, then do the ruddervators and ailerons so that by the time you get to the wings you will be an expert. Position the pieces so that the surface you are shrinking is vertical, and position yourself so you can see light reflecting from the surface of the Tedlar. This will allow you to see any wrinkles more easily.

Do not shrink the Tedlar more than necessary to get it tight and wrinkle free. Excessive shrinking may cause the Tedlar to pull away from the tape.

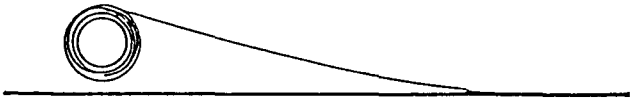
If you are using an iron to shrink the Tedlar, the technique will be somewhat different. The correct temperature should be established by testing since the markings on most irons are not very reliable and the temperature will vary with voltage. To obtain the correct temperature, set the dial at "wool" and let the iron warm up until it is stablized. Touch the bottom of the iron with a small piece of Tedlar. If the Tedlar turns brown, bubbles, smokes, or melts, the iron is too hot. If nothing happens to the Tedlar, the iron is too cold. If the iron temperature is correct, the Tedlar will shrink noticeably, but will remain clear. Adjust the temperature setting gradually until the correct temperature is reached, and make sure it is stabilized before using it on the aircraft. Small adjustments to the temperature may be made if necessary as the shrinking progresses. To avoid scratching the surface of the Tedlar with the iron, *use a sheet of newspaper between the Tedlar and the iron.* Keep the iron moving at all times and go back and forth over the Tedlar until all the wrinkles are removed, and the Tedlar is tight like a drumhead. The technique used for shrinking the Dacron is essentially the same as for the Tedlar except that the required heat is slightly less. Reshrink the Dacron at least once before painting it.

The Dacron is supplied in six pre-cut pieces —— two pieces for the bottom and one for the top of each wingtip. The Tedlar is supplied in a 100 foot roll. This is sufficient to cover the entire aircraft with a little bit left over *if it is cut properly*, but there is not enough Tedlar to permit any gross errors in cutting, so be sure you cut it right the first time. When cutting the Tedlar allow an extra two inches on all sides for handling. The diagram below shows how the pieces may be cut from the roll.



W-WING A-AILERON S-STABILIZER R-RUDDERVATOR

When the Tedlar is unrolled it will become electrostatically charged and will attract any dust particles which come within a few inches of it so it is essential that the covering be done in a relatively clean area —— definitely not in a woodworking shop. To avoid fingerprints on the *inside* of the covering, the Tedlar should be unrolled as shown.



LIKE THIS

NOT LIKE THIS

The three types of tape used for the application of the Tedlar covering are as follows:

- single face Tedlar tape, 1-1/2 inches wide, used to cover all seams and edges
- double face foam tape, 3/4 inch wide, used on the top and bottom of the wing ribs, and stabilizer ribs
- double face clear tape, 1/2 inch wide, used under all edges

Sufficient tape is supplied in the kit to apply the covering as described in the instructions, but it must be used carefully to avoid waste.

As with most acrylic adhesives, the initial tack with this tape is only moderate, but the adhesion improves as it ages. For this reason, it is essential that the tape be firmly pressed down to make sure there is 100 percent initial contact. Then as the adhesive cures, a proper bond will develop.

9.1.6 Surface Preparation

Before covering, all parts of the airframe where tape or adhesive will be applied should be clean and free of grease and oil. Use lacquer thinners or naptha to clean the aluminum and wipe it dry with a clean cloth or paper towel. *Do not get any solvent on the ribs as it will dissolve the styrofoam.*

MAKE SURE ALL SHARP CORNERS AND EDGES ARE FILED OR SANDED SMOOTH WHERE THEY WILL CONTACT THE COVERING MATERIAL.

9.2 DETAILED COVERING INSTRUCTIONS

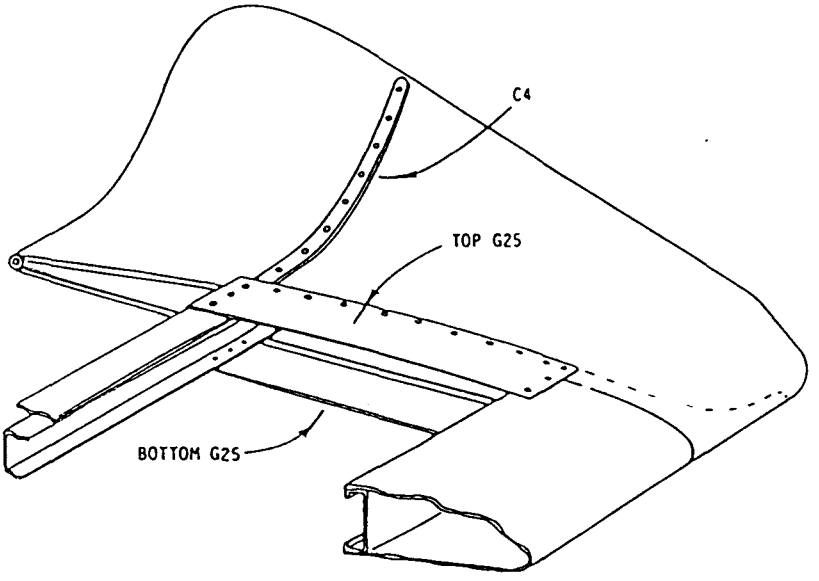
9.2.1 Wing Tips

The Dacron has a shiny side and a dull side. Apply the Dacron with the *shiny side out*. Do not use pliobond adhesive in temperatures below 60° F (16° C).

Start with the bottom aft section first. Check that the pieces fit properly and lay them on your workbench right side up. Apply the pliobond adhesive generously to the R9 tip rib. Put the Dacron into position and press it into the adhesive. After a few seconds, remove the Dacron and allow the adhesive to dry for about three minutes or until it is tacky. Then put the Dacron into position again and press it down tightly. Repeat the process to attach the Dacron to the tip spar and the tip bow T24. Pull the Dacron tight enough to remove all the major wrinkles but it is not necessary to stretch the fabric. Install the other bottom piece the same way, overlapping on the Dacron on the tip spar and covering the tip of the D-cell. When the bottom is covered, trim the edges so that they wrap about 3/4 of the way around T24. Apply a little more adhesive if necessary to secure the edges.

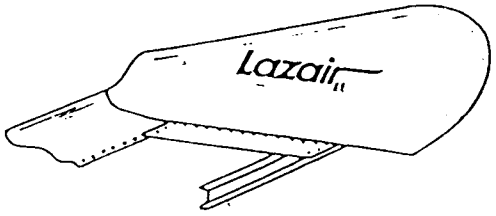
Cover the top of the wingtip using the same technique. Trim the outside edge carefully (since it will be visible). Apply a small amount of adhesive to the outside of the Dacron on T24 and smooth it with your finger.

File the outer tip spar capstrip C4 so that the edges are smooth and rivet it in place on top of C5. Make sure the rivets go between the rivets holding C5 to the tip spar. File the edges and corners of tip gussets G25 and rivet in place as shown. Rivet the G25's on three sides using 1 inch rivet spacing on AS1 and the D-cell and 1-1/2 inch spacing on the tip rib R9.



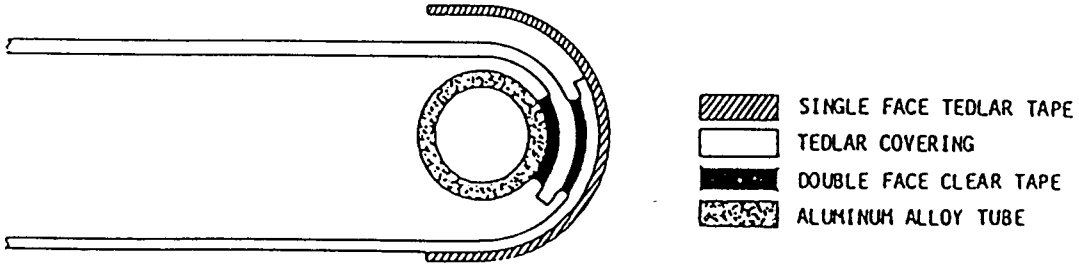
Allow the adhesive to dry overnight before heat shrinking the Dacron. If you use an iron to shrink the Dacron, be sure to test it on a piece of scrap as described in section 9.1.3 to avoid melting the Dacron.

Allow the Dacron to age for a few days and then re-shrink it before painting. Allow the paint at least two days to dry before applying the Lazair wing tip decals. To apply the decals remove the backing paper then press the carrier film with the Lazair logo on it onto the wingtip and remove the carrier film. Note that the backing paper is heavier than the carrier film. If, when you begin to pull the two apart you see the back (white side) of the logo, the film is separating properly. If the front of the logo (black side) is exposed, the film is separating incorrectly. Press it back together and try again.



9.2.2 STABILIZERS

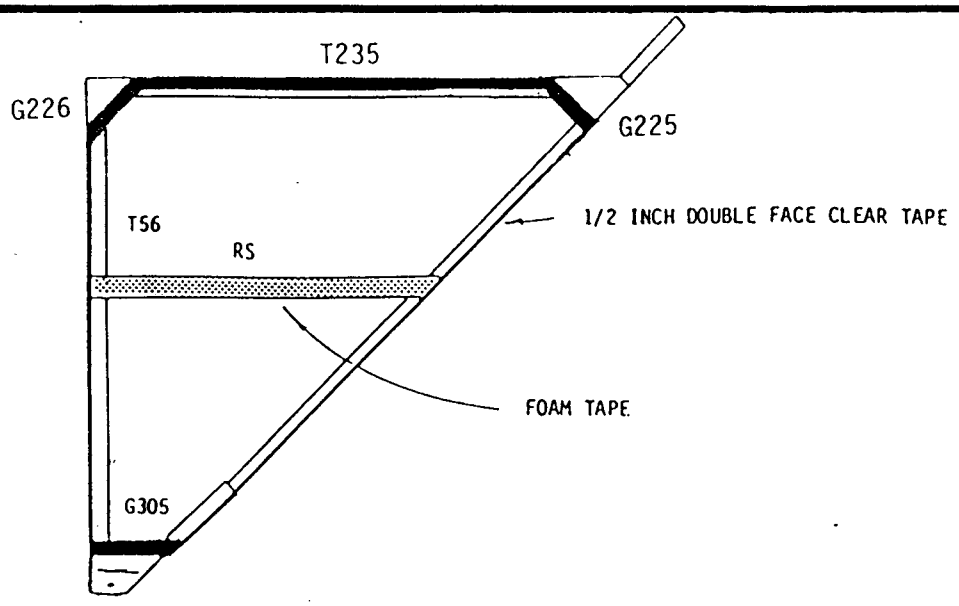
The stabilizers are the easiest surfaces to cover in Tedlar and should, therefore, be done first. Tape and covering should be applied so that when the covering is completed the materials will be overlapped as shown. The illustration is shown for T56 but is typical of the application of Tedlar to airframe tubing. (Note that the thickness of the materials and the spacing between materials have been exaggerated for clarity.)



First, apply one strip of 1/2 inch double face clear tape in the following locations:

leading edge of T55
trailing edge of T56
top edge of T235
top edge of G304/305
top edge of G225/226

Apply double face foam tape to the face of RS.



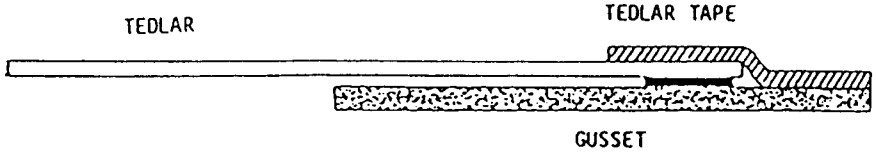
Cut the Tedlar to fit (with about 2" extra for gripping). Remove the backing paper from the foam tape of RS *only* and position the Tedlar. Once the Tedlar touches the tape it doesn't want to let go, so make sure you get it in the right place on the first try. *Tap* the Tedlar on top of the tape before sliding your finger along it to avoid wrinkles. Fold back the Tedlar and remove the backing paper from all the tape below RS. Carefully lower the Tedlar into position and again tap it on top of the tape. Note that the Tedlar should be put on as wrinkle-free as possible but it is not necessary to stretch it. Similarly, remove the backing paper from the tape above RS and attach the Tedlar. Trim the Tedlar with a razor knife on all sides along the edge of the tape.

Turn the stabilizer over and cover the other side. Note that when you do the second side, the double face tape on T55 and T56 is applied over the Tedlar from the first side rather than directly on the tubing. This reduces the amount of tape which must be removed from the tubing should you ever recover the aircraft. Trim the Tedlar using scissors or be very careful with the knife to avoid cutting the Tedlar from the previous side.

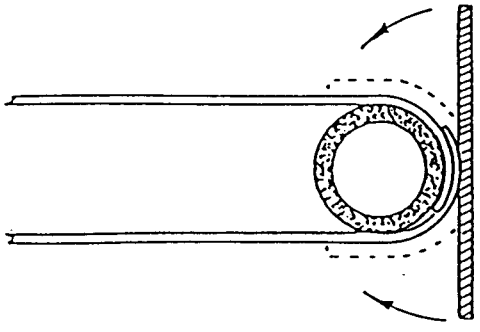
Although an experienced Lazair builder might prefer to cover all the surfaces before starting to do the heat shrinking, it is probably better (if this is your first time) to shrink the

stabilizer before covering any other components. This will give you a chance to see how good your covering workmanship is and will probably convince you that a good covering job is not as difficult as you might have imagined. Just follow the instructions in section 9.1.3 and chase the wrinkles around with the radiant heater or iron until they disappear. By the time you finish the second side of the stabilizer, you should have the technique mastered quite well.

Apply the 1-1/2 inch wide single face Tedlar tape on G225 and G226 as shown. Cut the tape about an inch longer than the gusset on both ends so it may be wrapped around T55 and T56.

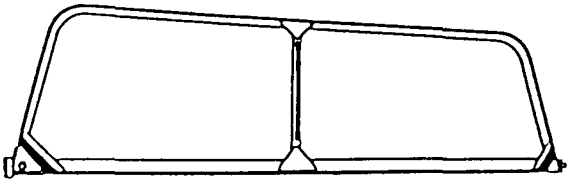


Apply Tedlar tape to the Tedlar on T55, T56, T235. Put the tape onto the tube tangentially as shown below, then fold the edges down very gradually, working from the centre towards both ends to avoid wrinkles in the tape. Some wrinkles will inevitably occur in areas around the gussets or RS, but these can usually be smoothed with a hot iron afterwards. Check to make sure all edges are completely taped down with Tedlar tape. Make sure that the Tedlar tape extends at least 3/4 of an inch past the edge of the Tedlar.

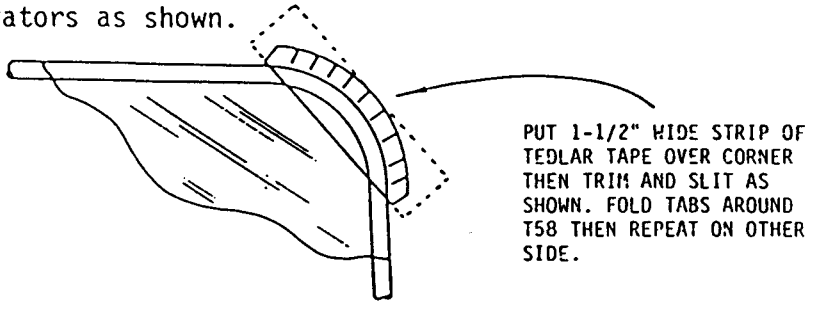


9.2.3 Ruddervators

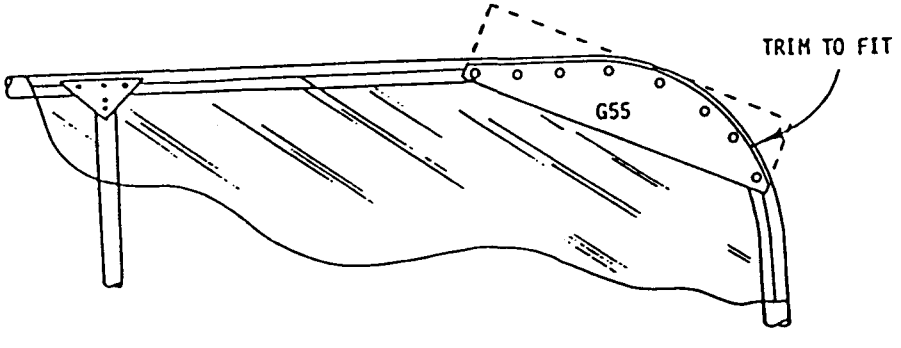
Now that you're an experienced aircraft covering technician, covering the ruddervators should be no problem. Although it is possible to cover a ruddervator using one piece of Tedlar wrapped around the leading edge to cover both sides, it is much easier to cover one side at a time as was done for the stabilizer. The tape should be applied to all edges as was done for the stabilizers. Use ½ inch clear tape rather than the foam tape for the ruddervator rib. Leave the corners of the GC and GCS gussets free of Tedlar as indicated by the taping diagram below to allow a surface to receive the Tedlar tape.



After covering, apply the Tedlar tape to all the edges as was done for the stabilizer. Finish the rounded corners of the ruddervators as shown.



Trim the Ruddervator wear Gussets G55 to fit the outboard corners of the Ruddervators and rivet in place on the *bottom* side of the Ruddervators as shown. This will prevent damage to the Tedlar in the event that the Ruddervators inadvertently scrape along the ground.



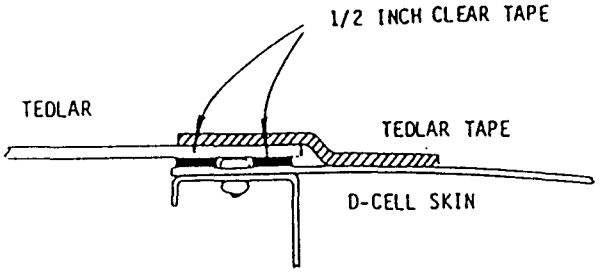
9.2.4 Wings

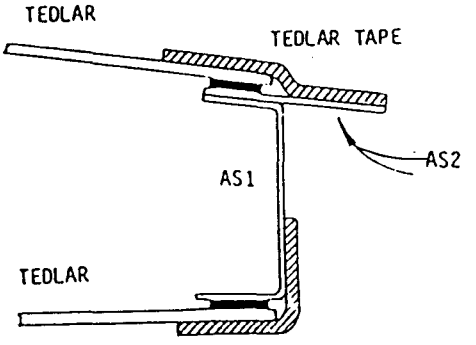
Cover the bottom of the wing first. Use clear tape on the trailing edge (the same as for the stabilizers and ruddervators). Use the foam tape on the ribs (on the section between the gussets only - do not put foam tape on the gussets). Use foam tape on the root rib and on the G25's. Put weatherstrip on the hypotenuse of the spar box (top and bottom).

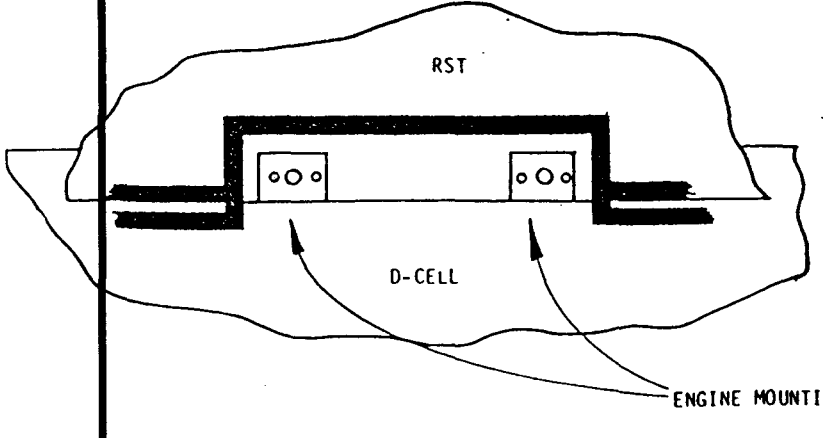
Use a double band of clear tape on the trailing edge of the D-cell (just ahead of the rivets as shown in the illustrations). Apply clear tape to AS1 and around engine mount pads and strut fitting area as shown. Where possible, position the tape such that the Tedlar can be trimmed on the edge of the tape and allow a space for the overlaying Tedlar tape to cover the edge of the Tedlar *and also adhere to the aluminum alloy skin or fittings.*

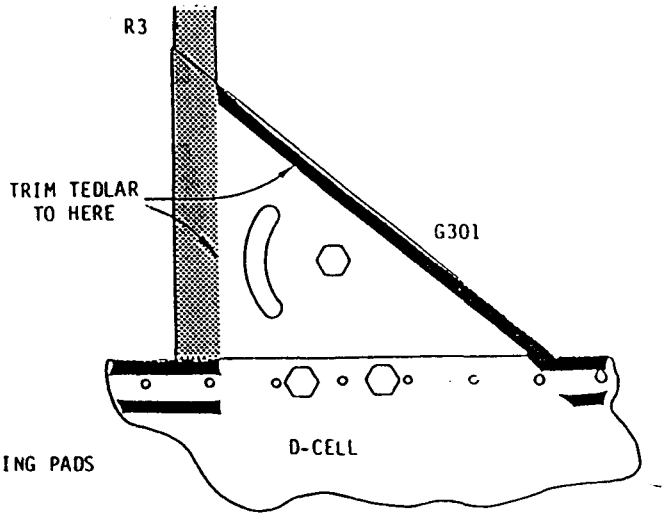
When all the double face tape is in place, unroll the Tedlar and position it so that it extends about one inch ahead of the tape on the D-cell at the tip, and just reaches the trailing edge at the root. When you cover the top of the wing, you will notice that the Tedlar is not quite wide enough to cover both bands of tape on the D-cell and reach the trailing edge *at the root.* Move it back slightly to ensure that it can be securely taped to the trailing edge and let it cover just one band of double face tape on the D-cell (for a short section near the root). Use extra Tedlar tape if necessary to increase the width of the covering at the trailing edge.

Using masking tape, temporarily tape the leading edge of the Tedlar to the D-cell outboard of R3. Carefully remove the backing paper from the foam tape on R3 and tap the Tedlar in place. Then, working from R3 toward the wing root, remove the backing paper from the tape on the ribs and attach the Tedlar *one panel at a time.* When the inboard panels are complete, remove the backing paper and attach the outboard panels one at a time, working outward from R3. Make sure the Tedlar and double face tape are well pressed down before trimming the Tedlar.


1/2 INCH CLEAR TAPE
TEDLAR
TEDLAR TAPE
D-CELL SKIN


TEDLAR
TEDLAR TAPE
AS2
AS1
TEDLAR


RST
D-CELL
ENGINE MOUNTING PADS


R3
TRIM TEDLAR
TO HERE
G301
D-CELL

When the bottom of the wing is complete, turn it over and cover the top using the same technique. Heatshrink the tedlar and then finish the edges with Tedlar Tape (including the wrap-around on the trailing edge). Make sure all the edges are securely cover-covered and taped to the structure. On the root rib, fold the Tedlar Tape over the edge so it will adhere to R8, notching the tape as necessary.

9.2.5 AILERONS

The ailerons should be covered using the same techniques as for the other surfaces. Use clear tape on the leading and trailing edges and foam tape on the ribs. Make sure all edges are securely taped down with Tedlar tape and fold the tape around the ends of the inboard and outboard ribs.

9.3 MAINTENANCE OF COVERING MATERIALS

9.3.1 Painted Dacron

The wingtips, when covered in Dacron and painted with urethane, should need little or no maintenance (with the exception of an occasional wash) for many years. When necessary, the urethane may be degreased, sanded lightly with fine sandpaper and re-painted.

9.3.2 Tedlar Life

In July 1982, the covering material for the Lazair was changed from Mylar to Tedlar. The major reason for the change was the superior life expectancy of Tedlar when exposed to ultraviolet radiation from the sun. Depending upon usage and storage location, the Mylar had a useable life of one to three years. Based on tests conducted on Tedlar for other applications, the Tedlar covering is expected to last five to ten years.

Although the longevity of the Tedlar is much superior to Mylar under any conditions, the life can be extended by minimizing the exposure to ultraviolet. In Technical Update Number 3 (September 1981) there are some guidelines for extending the life of Mylar. For maximum life, these suggestions should also be followed for Tedlar (with the exception of the necessity for recovering). The life of the Tedlar may also be extended by painting it to provide UV protection.

> NOTE: SINCE THE COVERING CAN ONLY BE AS GOOD AS THE TAPE WHICH HOLDS IT ON, TO OBTAIN MAXIMUM COVERING LIFE IT IS IMPERATIVE THAT THE TEDLAR TAPE BE COVERED TO PROTECT THE ADHESIVE FROM ULTRAVIOLET RADIATION.

The Tedlar tape may be covered by a metal (aluminum) or metalized Mylar tape, but it is considerably cheaper to simply brush on some aluminum paint over the Tedlar tape. Use masking tape on the Tedlar to obtain a clean straight edge (unless you plan to paint the Tedlar).

9.3.3 Patching Tedlar

One of the most attractive features of Tedlar is the ease with which it can be repaired. Although damaging the Tedlar in flight is very unlikely (except possibly by a bird strike, and even then it is very unlikely that any serious damage would result), damage on the ground due to mishandling, sharp objects in hangars or trailers, falling tree branches, etc., is not uncommon. A simple puncture in the Tedlar will usually not propagate and may be easily patched with a small piece of Tedlar tape. Cut the tape in a circular shape (or at least trim the corners) to prevent the patch from working loose. A rip or tear in the Tedlar may also be repaired with Tedlar tape provided the Tedlar is tight enough to stay in position while the tape is being applied. Reshrink the Tedlar after patching if necessary. If the damage is too extensive to be repaired with tape alone, a panel may be replaced without recovering a complete wing or tail. Just cut out the damaged section with a razor knife (leaving all the tape intact), apply more double face tape, a new piece of Tedlar, trim to size and tape the seams with Tedlar tape. After heat shrinking, the new panel will be indistinguishable from the rest.

9.3.4 Recovering

Recovering a Lazair is even easier than covering it because of all the experience you gained the first time around. But .... (*and this is a very big but*) before you can *recover*, you have to *uncover*. While uncovering is not particularly difficult, it does take time and is rather uninteresting. After going through this a few times, we have learned a few tricks which you may find helpful:

To do the job properly, all the Tedlar and tape should be removed before the new covering is applied. The Tedlar tape holds the Tedlar onto the airframe very well, but fortunately it can be peeled off without too much difficulty when you want to remove it. The clear double face tape is a bit more difficult to remove, but it will come off with a bit of effort. The double face foam tape is another story. It usually holds on until you get fighting mad, then just separates so you are left with a pile of messy foam all over your capstrips. Most of the foam can be removed fairly readily with a wire brush in an electric drill. The remaining adhesive must be scraped away or removed with solvents. We have tried virtually every solvent we could find, and most proved to be unsuccessful. Acrylic solvent/cement (the type used for cementing Plexiglass) removes the tape residue quite readily, but should not be used on the ribs because one drip spilled on a foam rib can make a hole an inch in diameter. Other solvents such as Lacquer Thinner or M.E.K. work reasonably well and are much safer, but they must also be used very carefully when working around the ribs. Once you get all the tape off, the rest is easy. Just go back to section 9.2 (or rely on your own experience) and put on the new covering.

REPORT No. 83014

Lazair II™

Two-place Microlight Trainer

PARTS CATALOGUE

This catalogue is intended as an aid to construction. It is not intended as a packing list. Do not take an inventory of parts received from this catalogue.

TO USE...

1. Look up part number.

2. Beside each part number is a part description and an index of the quantity to be found per drawing. The Total indicates the quantity of that part per aircraft.

3. Suffixes H, T or S on the end of a bolt or a nut part number signify:

   H - heavy washer
   T - thin washer
   S - special washer

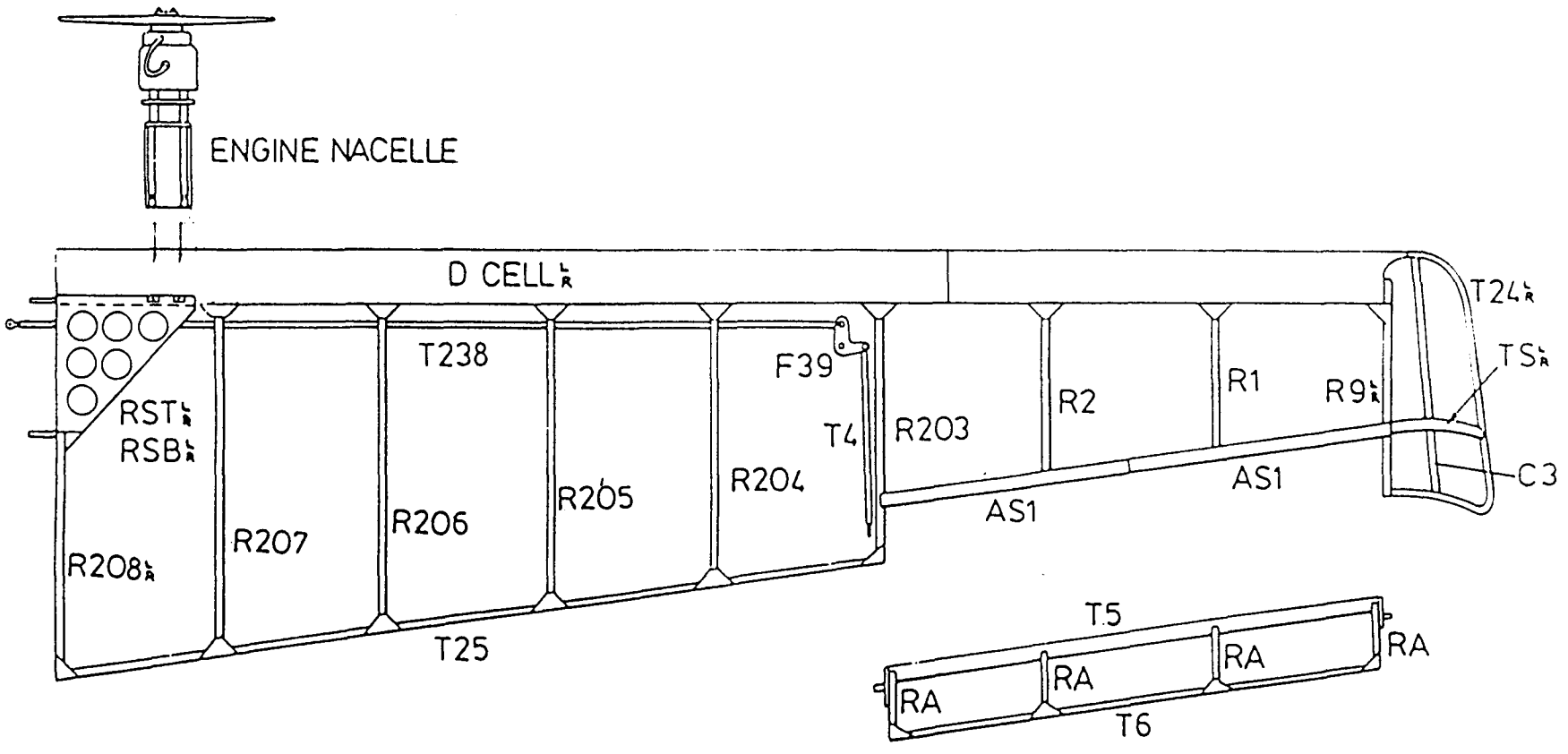
   These washers go under bolt heads if they follow a bolt part number and under nuts if they follow a nut part number.

4. Idents shown in parentheses (x) are for reference only.

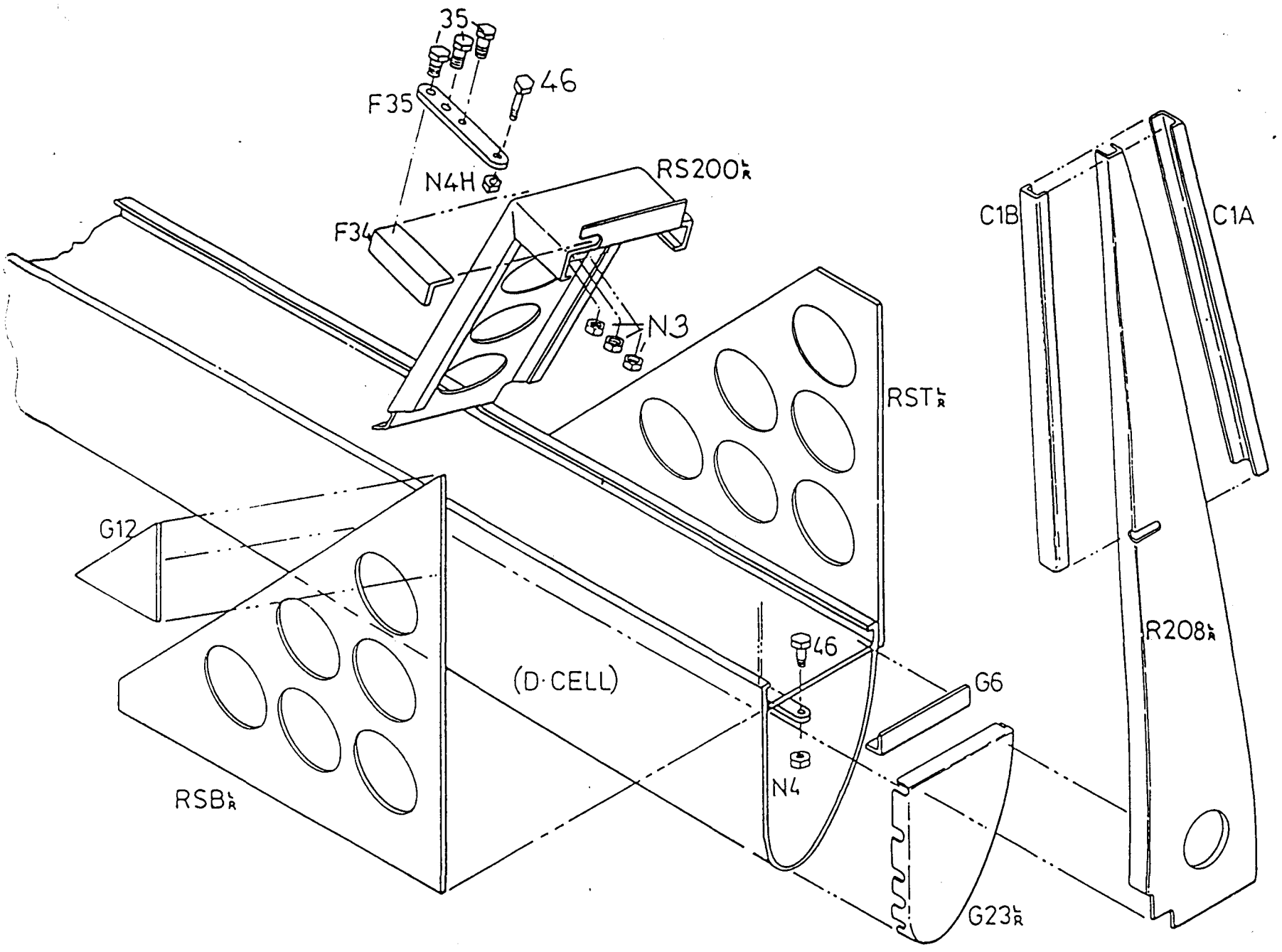
5. Abbreviations used in the Parts Catalogue are:

Assembly	- Ass'y	Bottom	- Bot.
Torque Tube	- T.T.	Inboard	- IB
Left	- L	Outboard	- OB
Right	- R	Stabilizer	- Stab.
Upper	- Up.	Attachment	- Attach.
Front	- Fr.	Section	- Sect.
Rear	- Re.	Vertical	- Vert.

Revised 23 Feb. 1984



NOTE: L R NOTATION REPRESENTS LEFT AND RIGHT OF THE PART.



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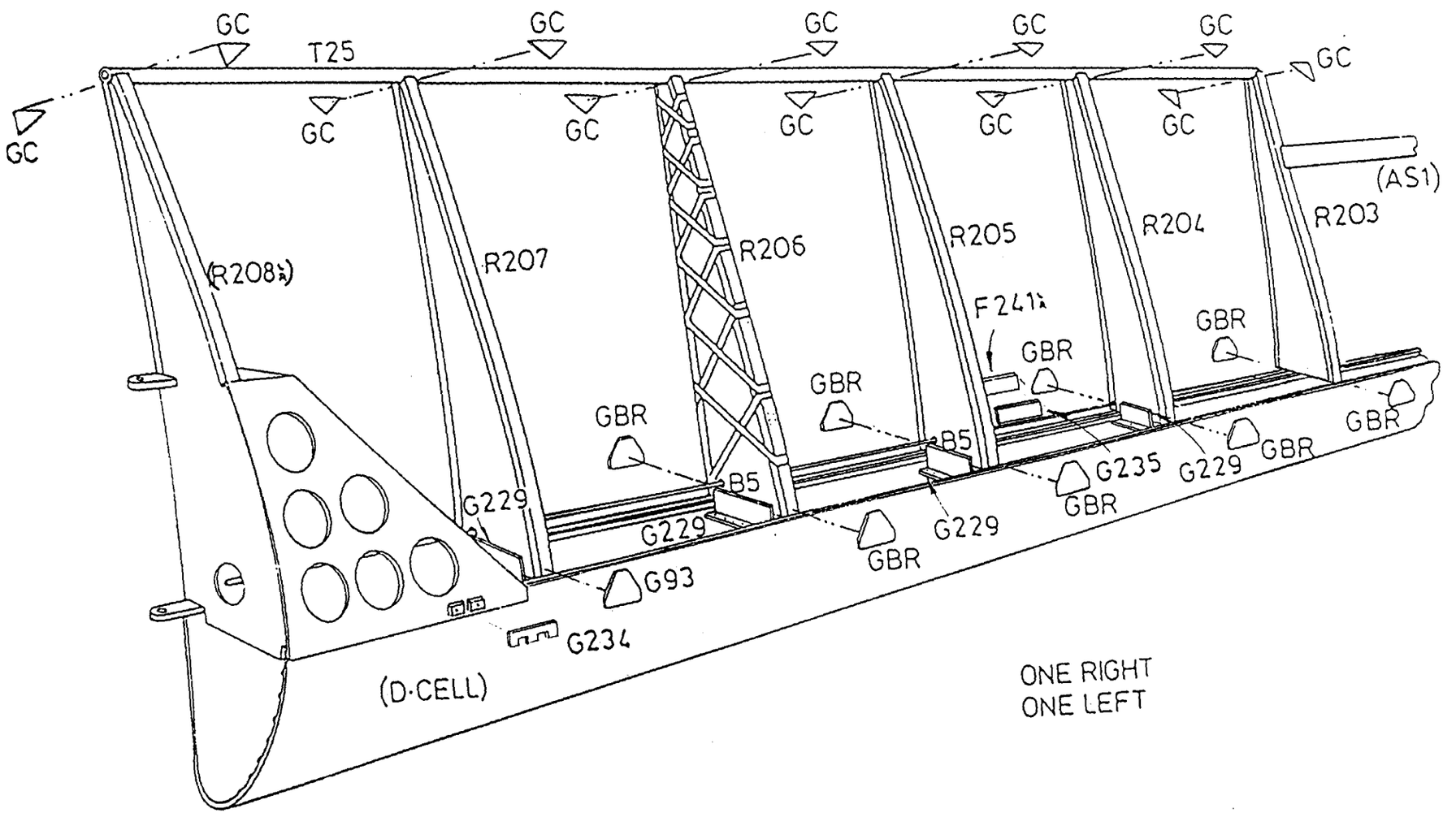
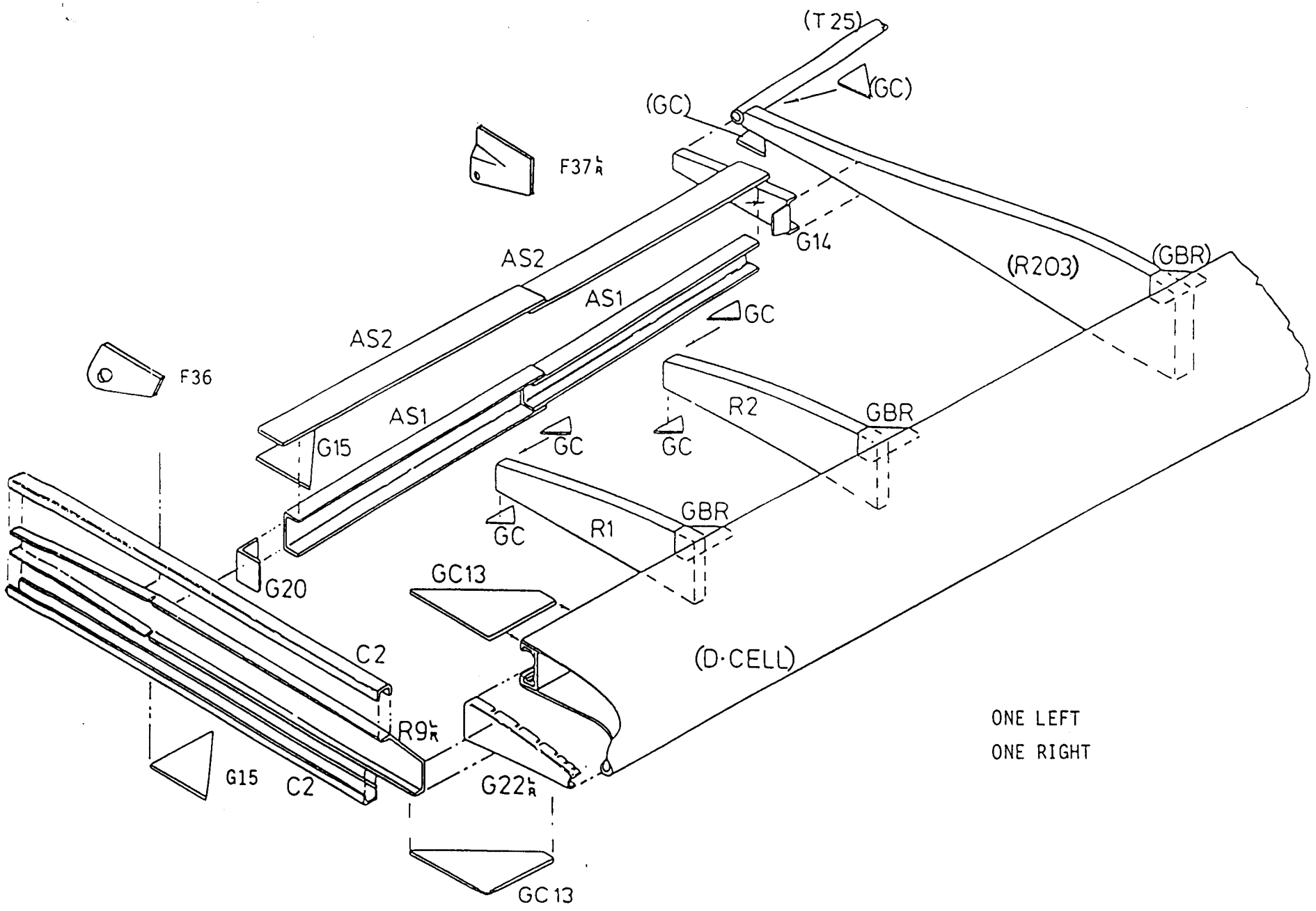
ONE LEFT

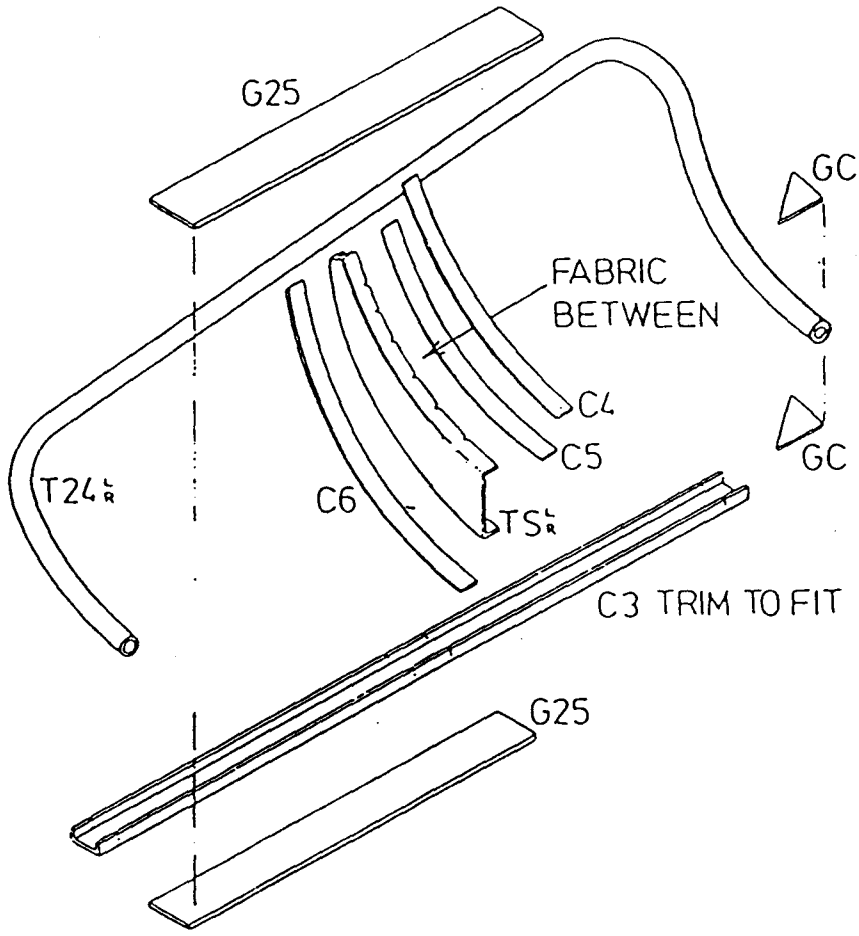
B


GC
T25
GC
GC
GC
GC
GC
GC
GC
GC
GC
GC
(AS1)
R203
R204
R205
R206
R207
(R208)
F241
GBR
GBR
GBR
GBR
GBR
GBR
GBR
B5
B5
G235
G229
G229
G229
G229
G93
G234
(D·CELL)
ONE RIGHT
ONE LEFT



ONE LEFT
ONE RIGHT

E



ONE RIGHT
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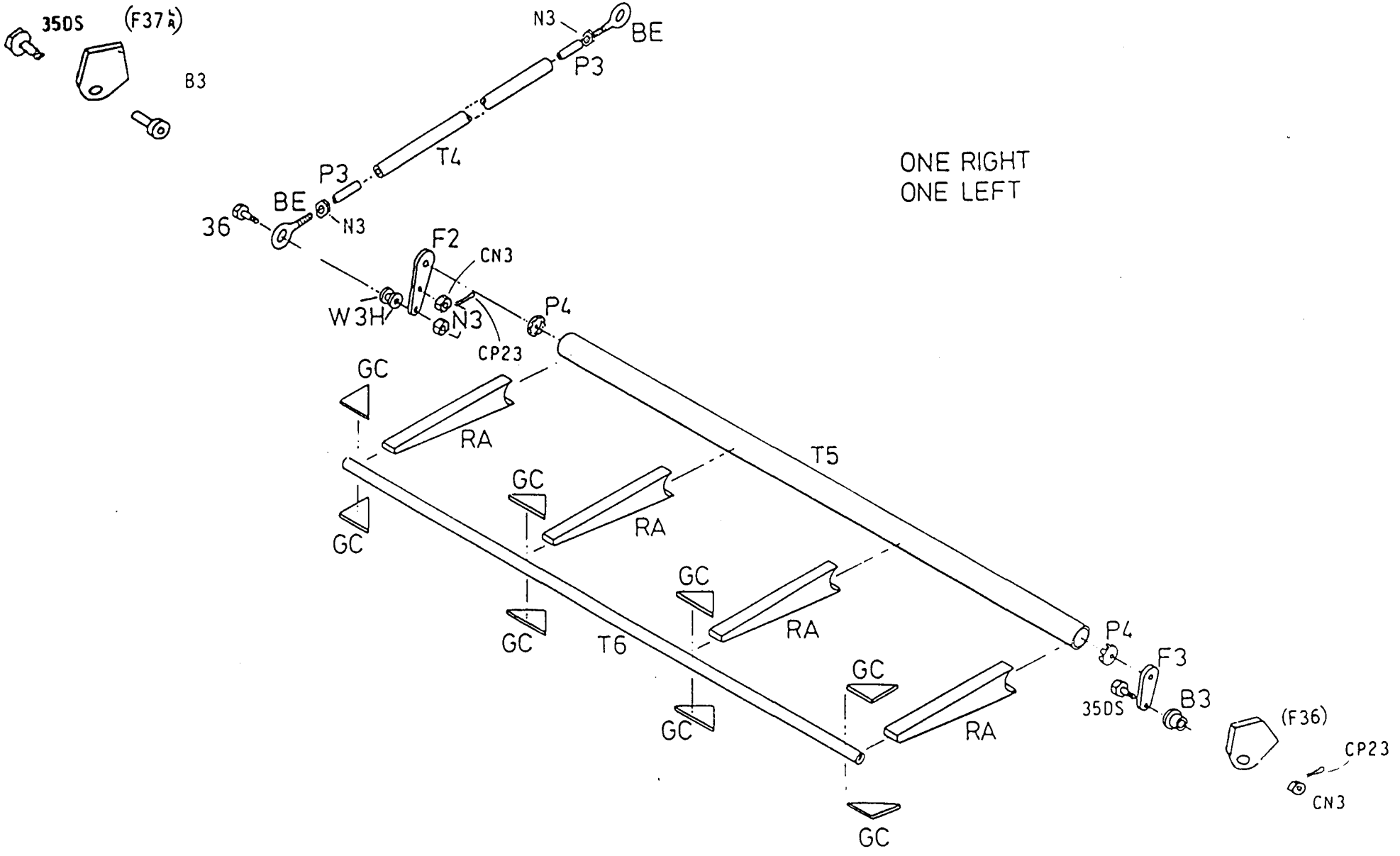
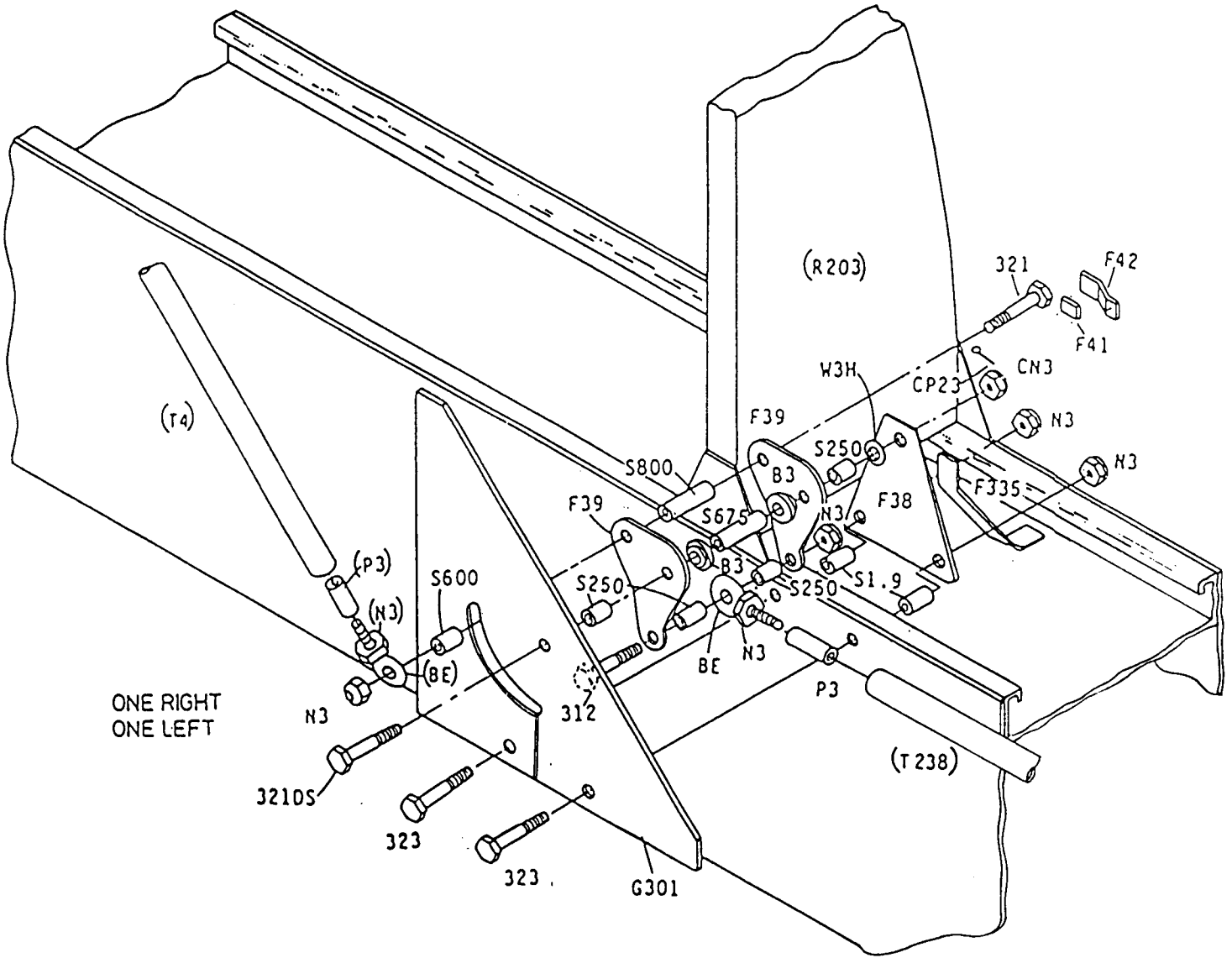
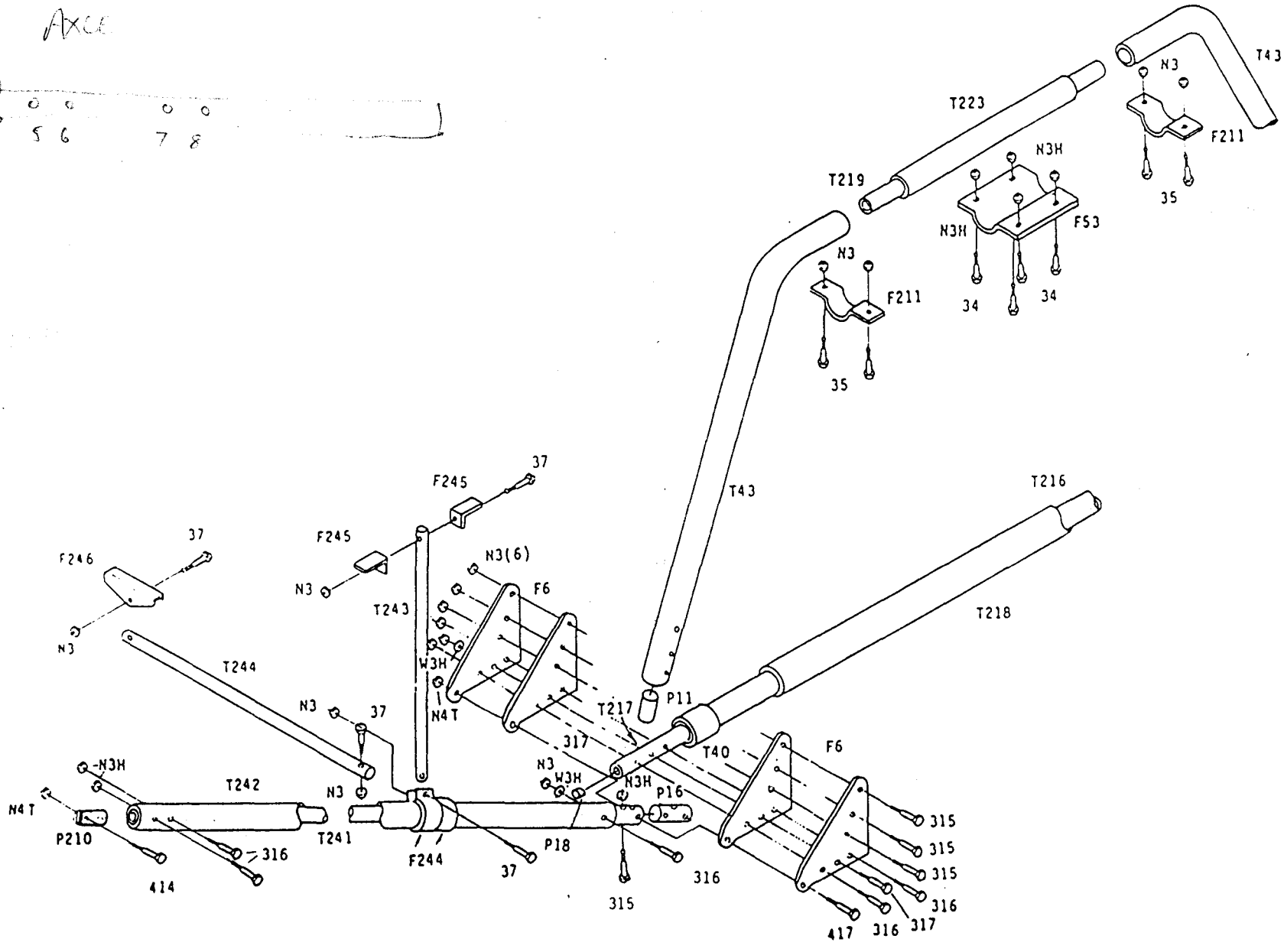

35DS
(F37)
B3
N3
BE
P3
T4
P3
BE
N3
36
F2
CN3
W3H
N3
P4
CP23
GC
RA
T5
GC
RA
GC
GC
T6
GC
RA
GC
RA
P4
F3
35DS
B3
(F36)
CP23
CN3
ONE RIGHT
ONE LEFT


(R203)
321
F42
F41
W3H
CP23
CN3
N3
N3
F39
S250
B3
S800
F335
F39
S675
N3
F38
B3
S250
S250
S1.9
BE
N3
P3
312
(T238)
(T4)
(P3)
(N3)
(BE)
S600
N3
ONE RIGHT
ONE LEFT
321DS
323
323
G301


T43
N3
F211
35
T223
N3H
T219
N3H
F53
34
34
N3
F211
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T43
T216
T218
F245
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F245
F246
37
N3(6)
F6
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T243
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T244
W3H
N4T
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T217
P11
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T40
F6
N3
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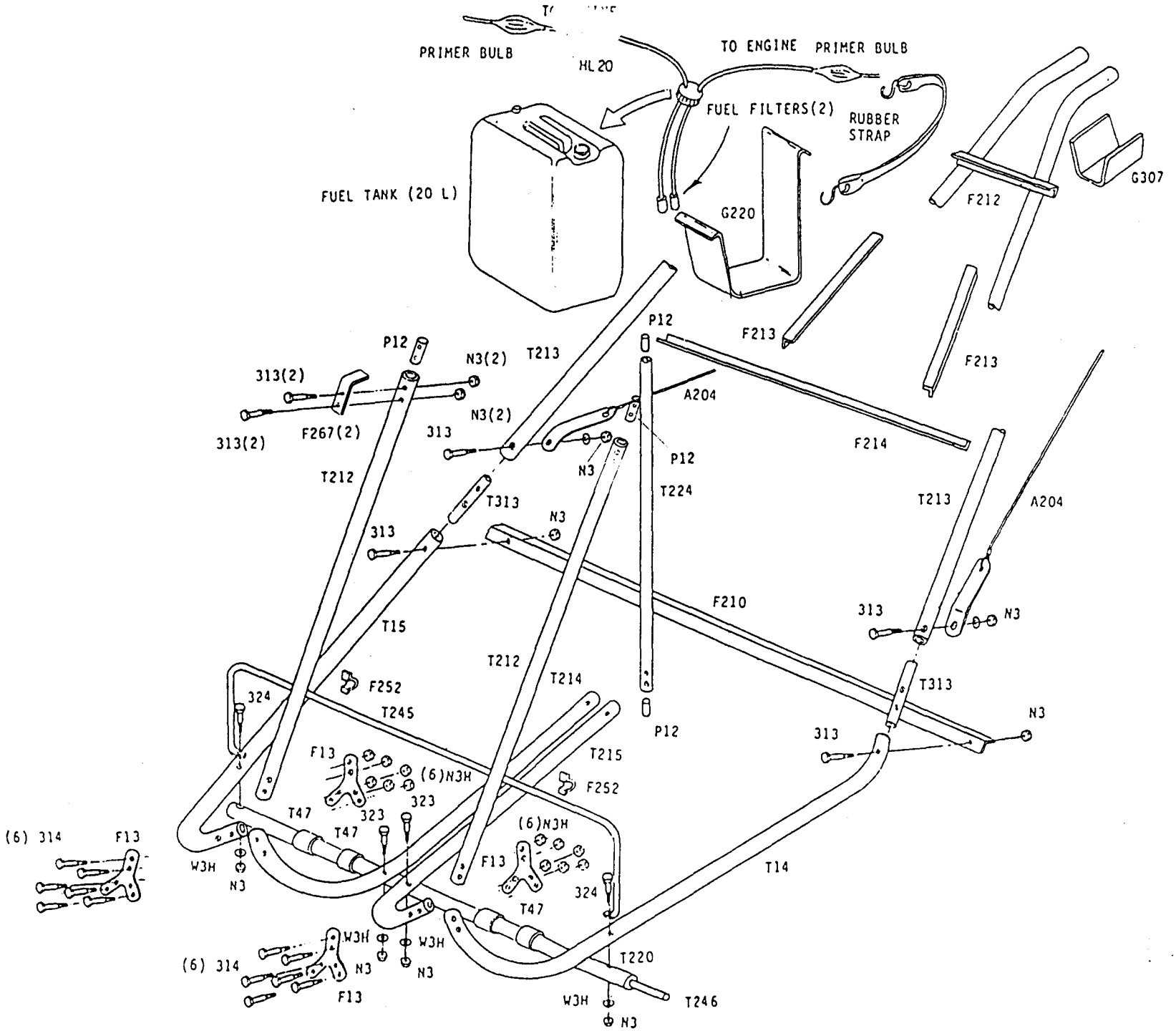
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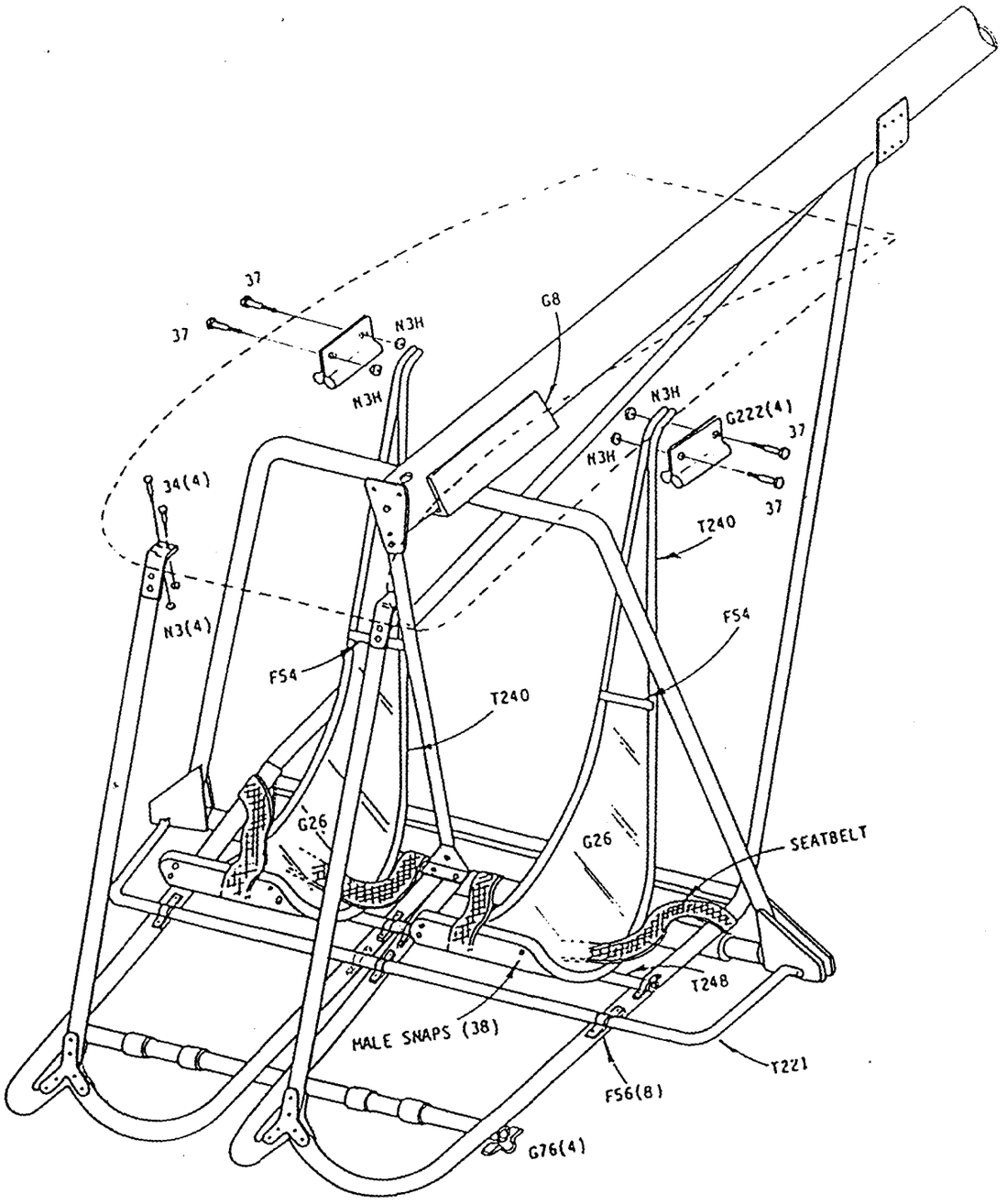
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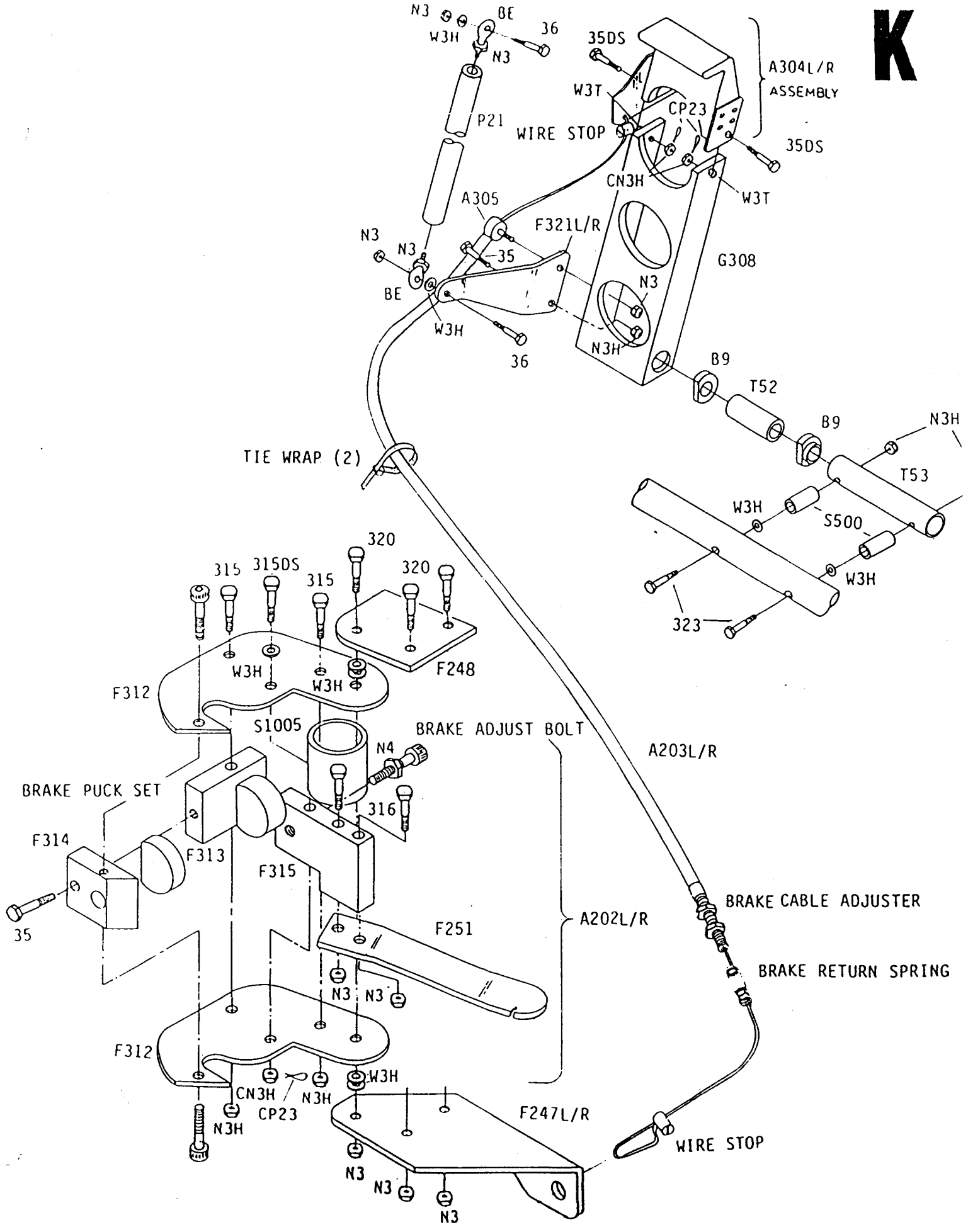
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G308
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N3H
B9
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N3H
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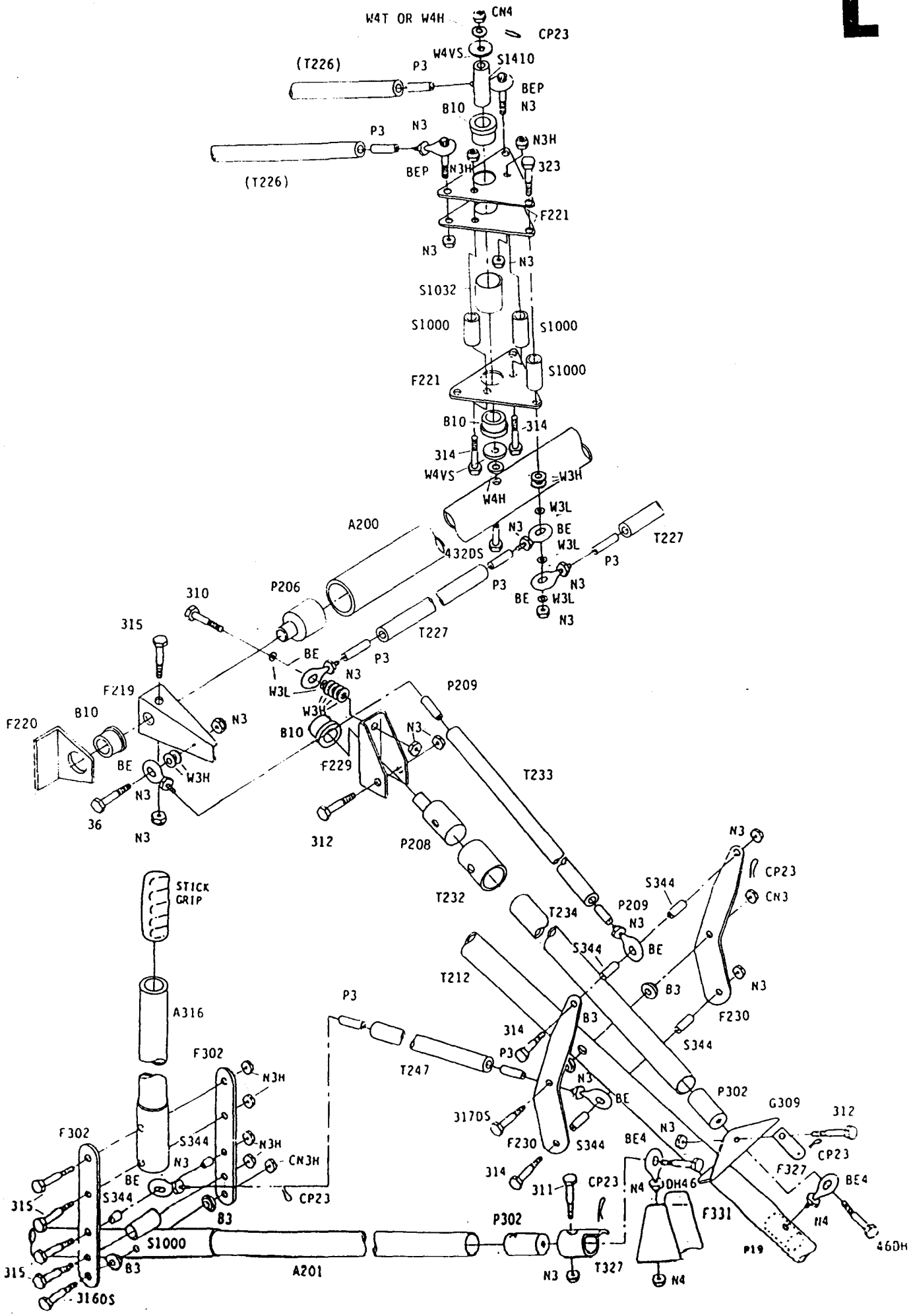
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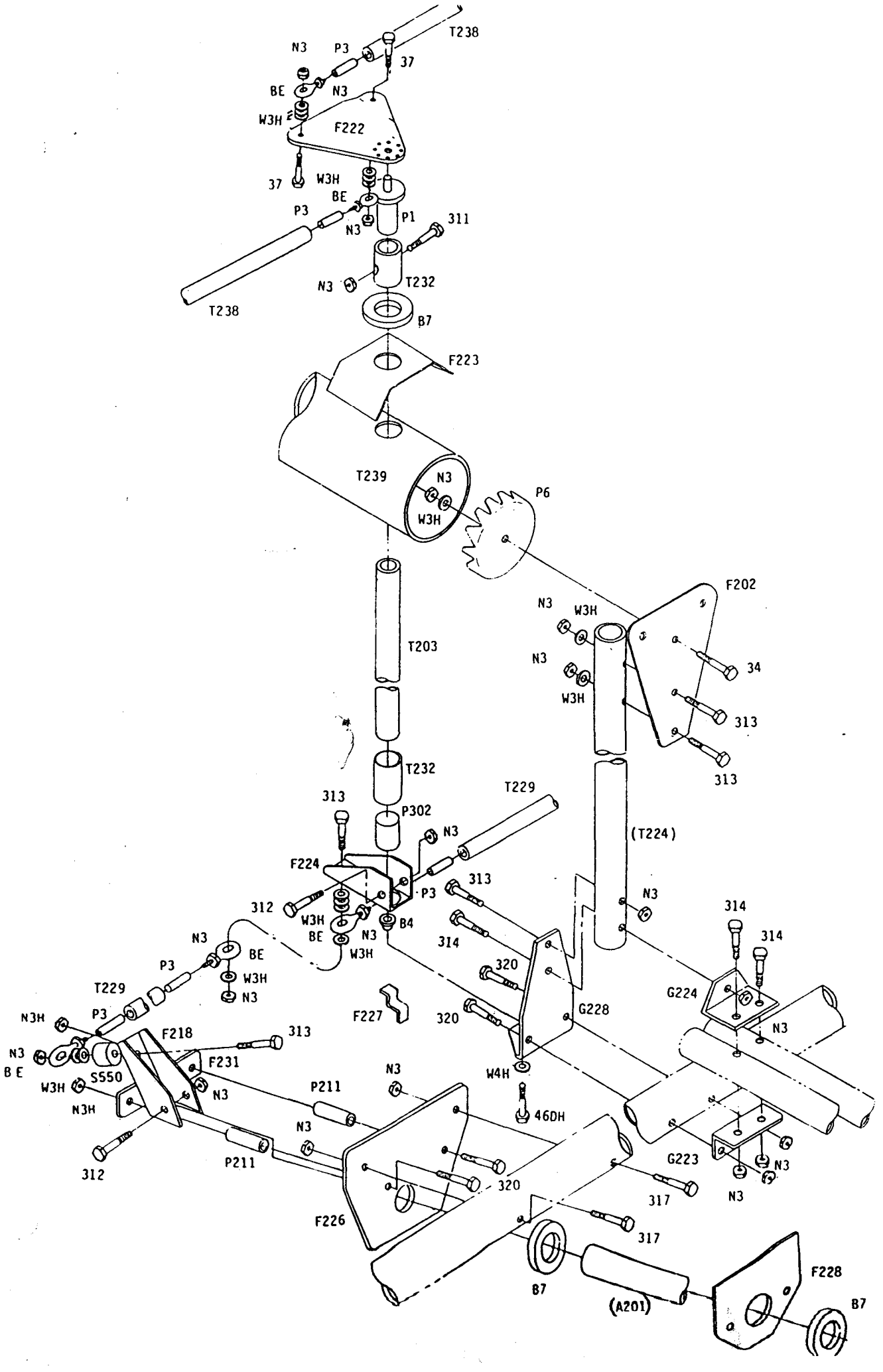
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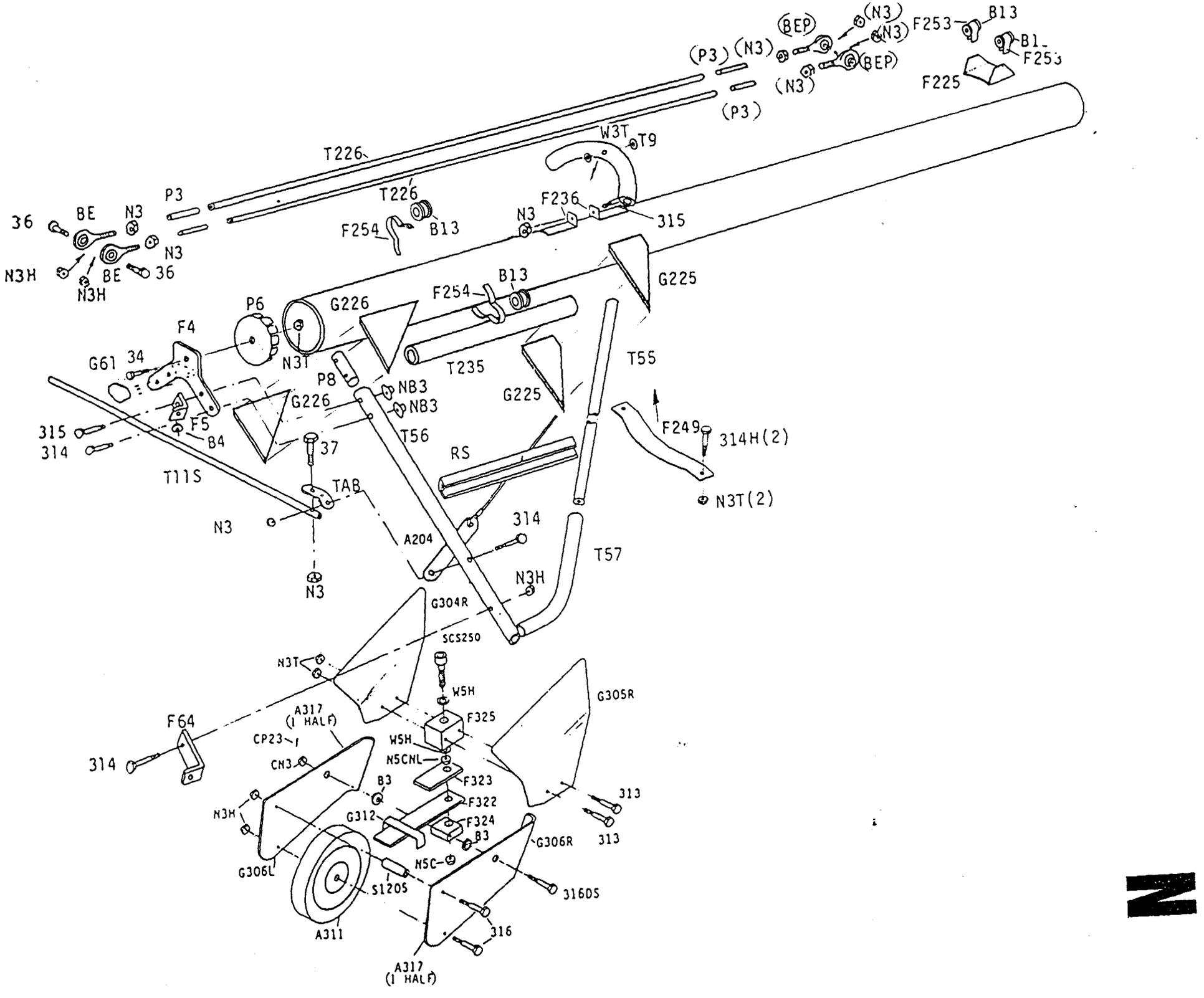
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G226
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T56
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RS
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TAB
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T57
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G304R
SCS250
N3T
W5H
G305R
F64
A317
(1 HALF)
F325
CP23
W5H
314
CN3
N5CNL
F323
B3
313
N3H
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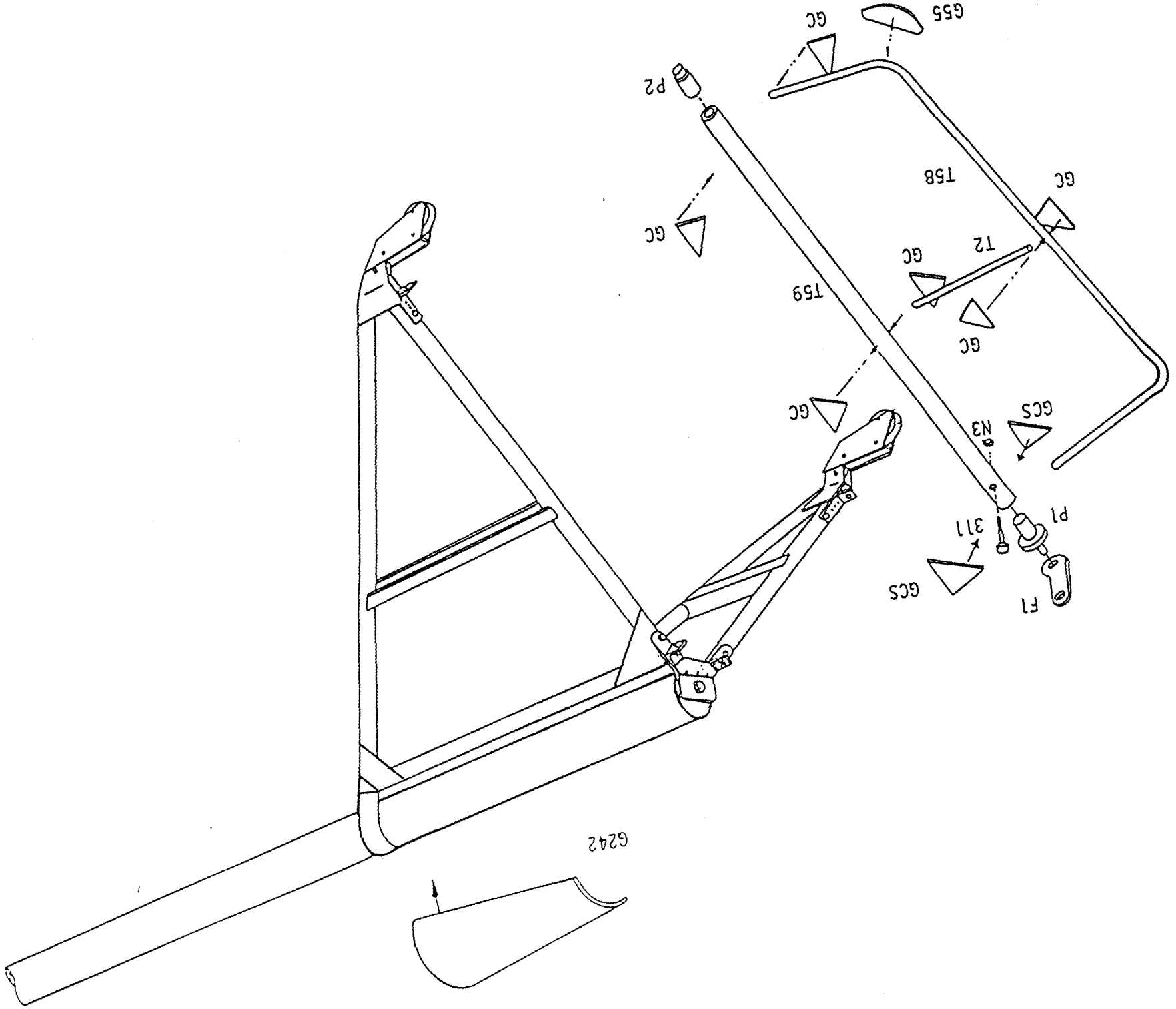
(1 HALF)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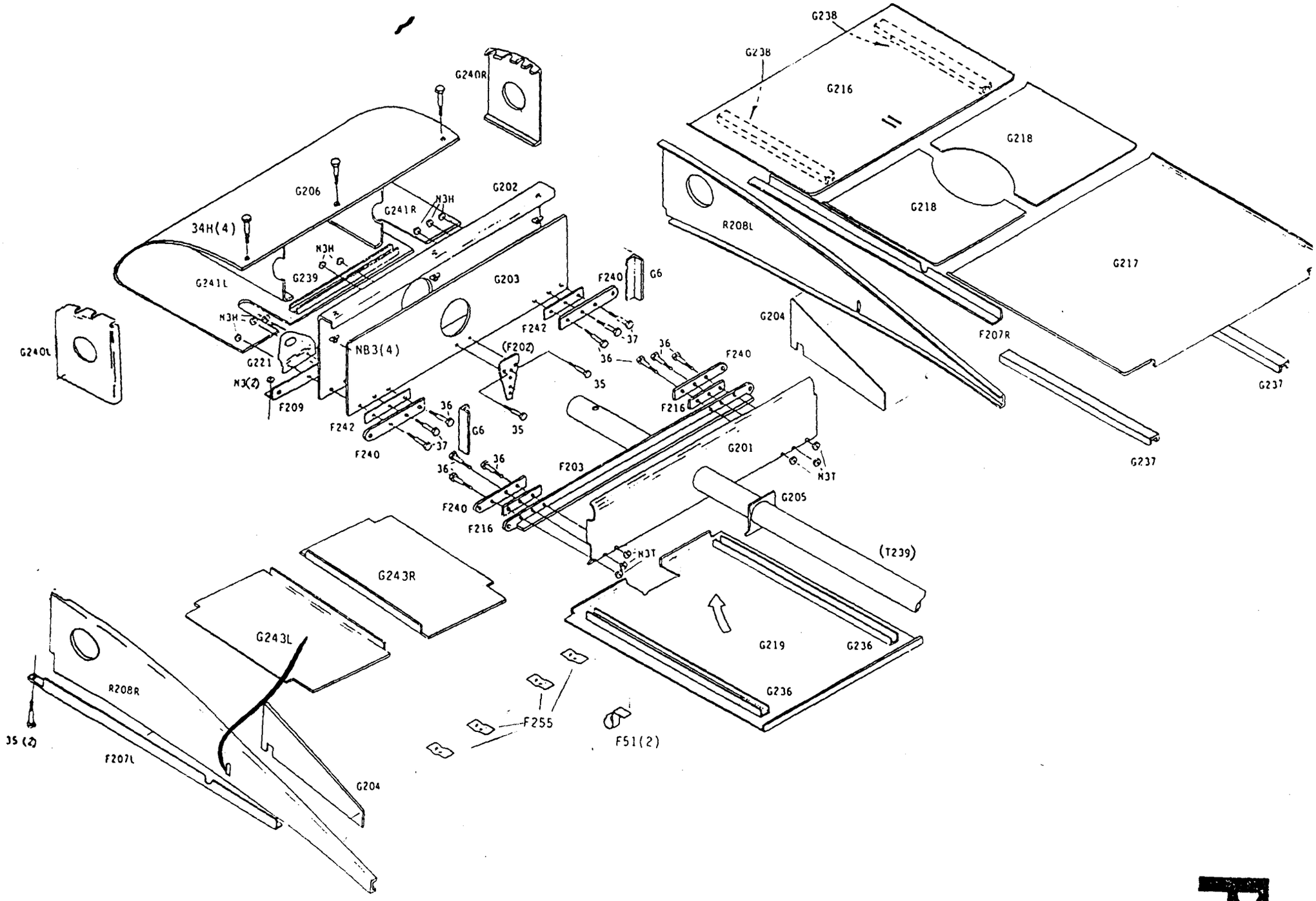
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F216
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G219
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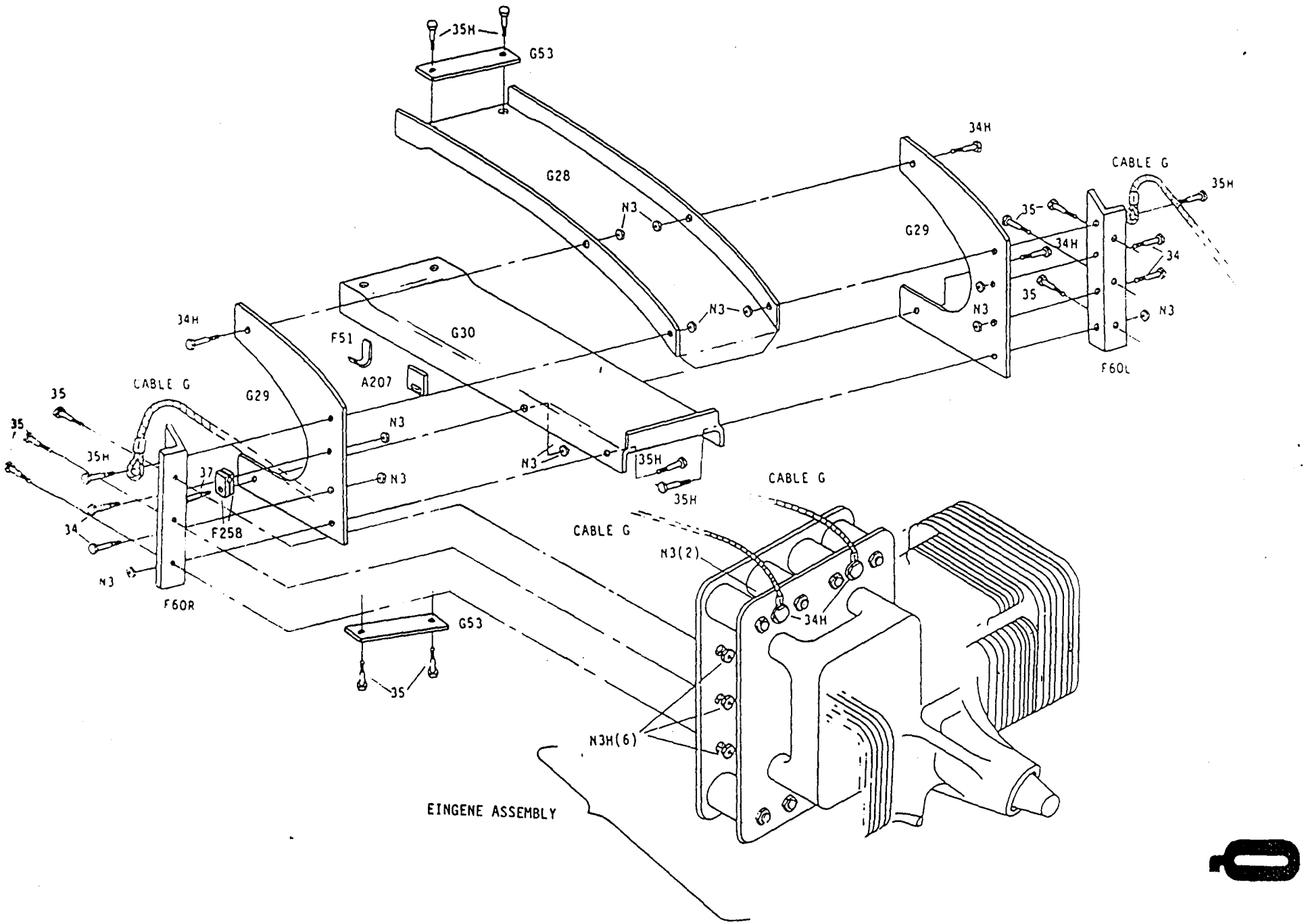
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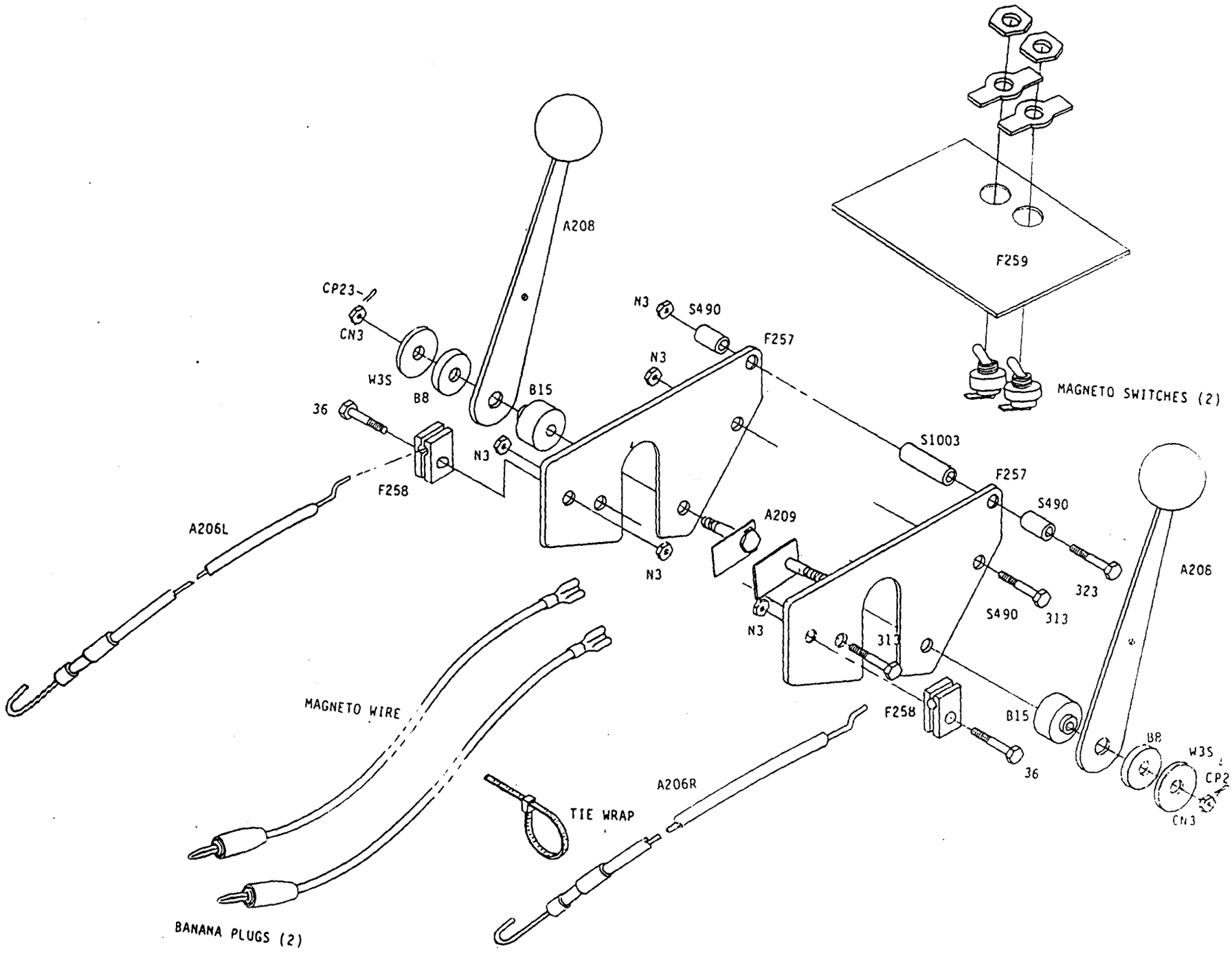
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TIE WRAP
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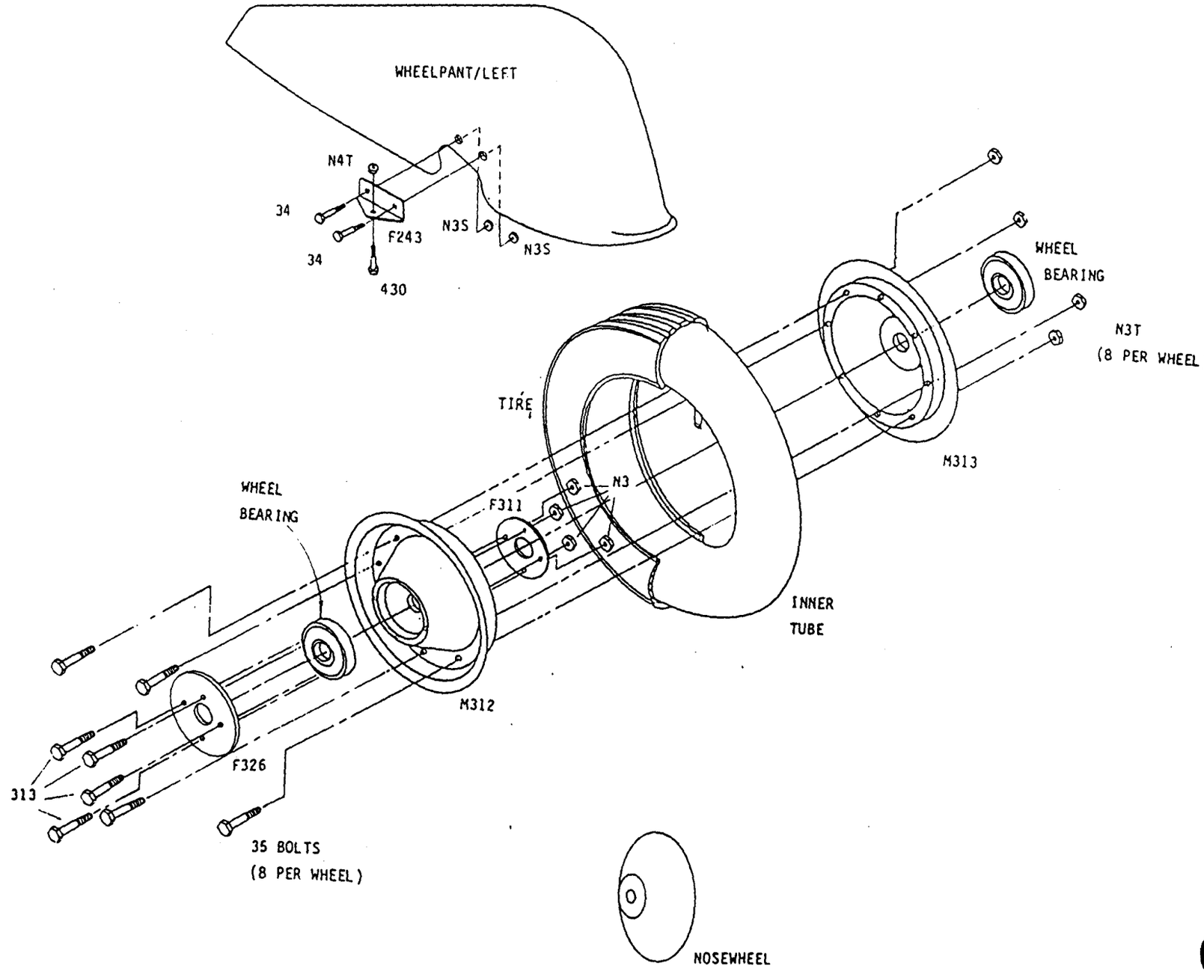
BANANA PLUGS (2)


WHEELPANT/LEFT
N4T
34
34
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N3S
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BEARING
N3T
(8 PER WHEEL)
TIRE
M313
N3
F311
WHEEL
BEARING
INNER
TUBE
M312
F326
313
35 BOLTS
(8 PER WHEEL)
NOSEWHEEL

Policy Notice

Policy No: FOT-01 **Subject:** ENGINE BREAK-IN AND FLIGHT TEST, LAZAIR II

Issued: 21 DEC. '83 **Effective:** 21 DEC. '83 **Revised:**

As you are no doubt aware, the responsibilities involved in operating a two-place aircraft are (both legally and morally) considerably higher than in flying a single place ultralight. When you carry a passenger, his well being is in your hands. He has to rely on not only your flying skill, but your judgement, your workmanship, your maintenance procedures and your preflight inspections. Obviously, it is imperative that before carrying a passenger, the pilot of a Lazair II must be completely familiar with the aircraft, its flight characteristics and the characteristics of its powerplant.

The pilot who makes the first flight in a new Lazair II could be faced with several unknown and potentially dangerous factors:

(a) He will be flying an aircraft with which he is not familiar, and presumably he has not had a checkout. As compared to a single place Lazair™, take-off, landing, and stall speeds will be higher, and the "feel" of the aircraft will obviously be different.

(b) He will be flying an aircraft which has never flown before. Regardless of how carefully an assembly manual is prepared and how careful a builder is in following that manual, mistakes can occur.

(c) He will be flying an aircraft of a relatively new design. Although three prototypes have been built and extensively flight tested, this cannot provide the same level of confidence which can be generated by hundreds of production aircraft.

(d) He will be flying with engines which are relatively new to the Lazair and totally unfamiliar to the pilot. The engines are bigger, heavier, much more powerful, more complex, more difficult to tune properly, and more susceptible to the effects of improper tuning than the Rotax engines used on the single place Lazair. In addition to this, the relative positions of the engines and pilot virtually precludes restarting both engines in flight.

If the factors listed above can be faced one-at-a-time rather than simultaneously, the potential danger can be reduced considerably.

Policy Notice

Policy No. FOT-01 **Subject:** ENGINE BREAK-IN AND FLIGHT TEST, LAZAIR II
Issued: 21 DEC. '83 **Effective:** 21 DEC. '83 **Revised:**

For this reason, a formal procedure for engine break-in and aircraft flight test sequence has been established. This procedure is detailed in report No. 83019 (copy attached). Following completion of the test program, fill in the Certificate of Compliance, keep a copy for your files, and mail the original to Ultraflight Sales Ltd.

As more field experience is acquired, the recommended procedure will be revised as required.

PROPS 34-20

CARBURETOR TUNING INSTRUCTIONS

For Dellorto type PHBH-30
used on JPX PUL425 Engine

1.0 INTRODUCTION

1.1 RESPONSIBILITY

Although the engines are test run and the carburetors are adjusted to some extent before being shipped, *fine tuning of the carburetor before flying the aircraft is essential.* It is recommended that the carburetors be tuned several times during the break-in period to ensure proper engine operation, and also to allow the aircraft operator/pilot to become familiar with the tuning procedure, and learn how to recognize the difference between a properly tuned carburetor and one which is not properly tuned. Remember that neither the carburetor manufacturer, the engine manufacturer nor Ultraflight has any control over carburetor settings after the engine is shipped.

IT IS THE RESPONSIBILITY OF THE PILOT TO ENSURE THAT THE CARBURETORS ARE PROPERLY ADJUSTED BEFORE THE AIRCRAFT IS FLOWN.

1.2 OBJECTIVES

Although there are several adjustments on the carburetor, there are essentially only two main objectives:

1. To ensure that the proper mixture of fuel and air is delivered to the engine at all operating speeds.
2. To ensure that the engine idles at the proper speed.

A proper fuel mixture at all operating speeds is essential for safe reliable engine performance. A fuel/air mixture which is too lean can cause severe engine overheating, resulting in

burned pistons and engine siezure. A mixture which is too rich will cause four-stroking (a situation where the engine fires only once for every two revolutions of the crankshaft) resulting in high vibration levels, very low power output and a tendancy to misfire and stall when the throttle is advanced.

It is this four-stroking which provides the best indication of carburetor performance. Therefore it is imperative that before attempting to finalize the adjustment of the carburetor, the pilot must be able to recognize when an engine is four-stroking. At very low speeds and at very high speeds when four-stroking is severe, it is quite easy to recognize, but at some mid-range power settings with mixture set just slightly too rich, the resulting four-stroking can be more subtle and considerably more difficult to detect. Only by intentionally making an engine four-stroke and listening to it can you learn to recognize this phenomenon. Once you have mastered this, you can proceed to properly tune the carburetor.

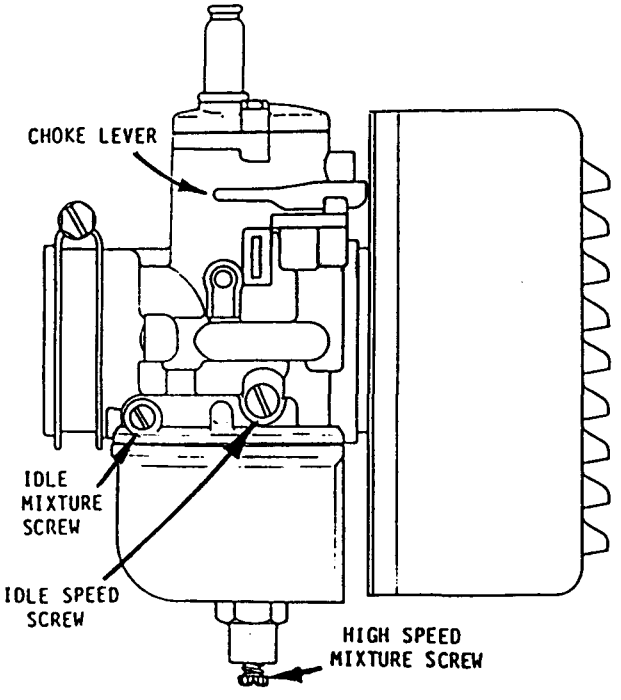
The basic criteria for proper mixture adjustment is quite simple—*the carburetor should be adjusted so the mixture is as rich as possible without causing four-stroking*. The procedure to follow to achieve this goal is covered in Section 2.

1.3 AVAILABLE ADJUSTMENTS

As shipped from the manufacturer, the carburetor has adjusting screws for idle speed (throttle stop) and idle mixture control. The mid range mixture is set by the position of the slide needle, and high speed mixture is controlled by a fixed high speed jet. Changing the position of the slide needle and changing main jets both require partial disassembly of the carburetor and are therefore, not ideally suited to field adjustment. Since the correct high speed mixture is very critical for any two-stroke engine (and especially so in an aircraft application), Ultraflight

has incorporated an *adjustable* main jet for use on the Lazair II. Although the location of this jet (nestled between the two mufflers) does not make it easy to adjust while the engine is running, it is certainly far easier than removing and replacing jets to achieve the optimum mixture. Using the three screw adjustments, it should be possible to properly tune the carburetor for most normal environments. It should be noted that each of the three mixture adjustments is designed to control the mixture over a particular range of throttle position only and has little effect on engine performance outside that range. The effective range of each adjustment is as indicated below:

THROTTLE OPENING	ADJUSTMENT	EFFECT
0 to 20%	Idle mixture screw	Turning screw in (clockwise) will make mixture leaner.
20% to 80%	Slide needle position	Lowering needle will make mixture leaner (requires partial disassembly of carburetor)
80% to 100%	High speed mixture screw	Turning screw in (clockwise) will make mixture leaner.



1.4 CHOKE OPERATION

The choke is engaged by lifting up on the choke lever or by pulling on the choke cable (if attached). Unlike the butterfly type of carburetor used on other Lazairs, the Dellorto carburetor uses an "independent" or "bypass" type of choke. When this type of choke is engaged, it tends to increase the fuel flow to the engine (as opposed to the more conventional type of choke which increases the mixture ratio by restricting the airflow). One of the most significant features of this type of choke is that *it is effective only if the throttle is closed or very nearly closed.*

Experience has shown that this engine requires choking to start it at all times when it is cold. Even when it is fairly warm, it will usually start more readily if the choke is used.

2.0 TUNING PROCEDURE

CAUTION: *Always be extremely careful around the propellers as you would with any aircraft. The Lazair propellers may be small but they are quite capable of inflicting serious injury.*

2.1 **INITIAL SETUP AND ADJUSTMENT**

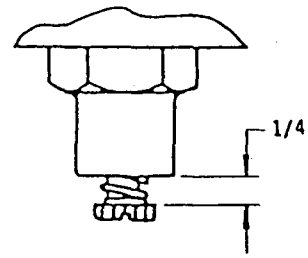
(a) Remove the air cleaner and cover so you can see into the carburetor intake. Check the operation of the throttle levers and cables and make sure they are adjusted so they can move the throttle slide from fully closed to fully open.

(b) Adjust the *idle speed* screw so that the slide is **about 1/16 of an inch from the bottom** of the carburetor throat. Replace the air cleaner and cover.

(c) Turn the idle mixture screw in (clockwise) until it just bottoms, then back it out 3/4 of a turn.

NOTE: To avoid damage to the jet and/or needle do not force the screw after it has bottomed.

(d) Set the high speed mixture screw so that there is about 1/4 of an inch between the screw head and the housing as shown.



2.2 STARTING PROCEDURE

(a) Squeeze the primer bulbs to fill the fuel lines and carburetors with fuel.
(b) Set throttles at idle.
(c) Engage the choke.
(d) Push in the compression release valves.
(e) Pull-start engine.

2.3 CARBURETOR ADJUSTMENT

2.3.1 General

Allow the engine to warm up for about half a minute, then disengage the choke. With the carburetor adjusted as in 2.1 above, the engine should continue to run at a fast rich idle.
Advance the throttle slowly and note the speeds at which the engine tends to four-stroke.

2.3.2 High Speed Mixture

With the high speed mixture set as in 2.1, the engine will probably four-stroke at full power. If so, shut it off and screw the high speed mixture screw in 1/2 a turn. Restart the engine (with the throttle set to idle) then open the throttle fully and check again for four-stroking. Continue this procedure until you have the high speed mixture adjusted *as rich as possible without four-stroking*.

2.3.3 Idle Mixture

Let the engine idle for at least one minute, then advance the throttle abruptly. With the mixture screw adjusted as in 2.1, the engine will probably four-stroke and smoke excessively. If so, stop the engine and turn the idle mixture screw in 1/4 turn. Restart the engine, let it idle, then open the throttle abruptly. Repeat this procedure until you find the richest setting which will allow the engine to accelerate smoothly from idle to full power without four-stroking.

2.3.4 Mid-Range Mixture

It is unlikely that the mid-range fuel mixture will require adjustment. However if it does, remove the top cover from the carburetor, pull the needle out of the slide and reposition the circlip on the needle by one notch. Note that raising the needle (moving the circlip down a notch) will make the mixture richer.

Winter toward rich
Sommer toward lean (June-Sept.)

2.3.5 Idle Speed

As with any aircraft engine, the optimum idle speed is a compromise. It must be low so that the thrust at idle is kept to a minimum, yet it must be high enough to ensure that the engine will continue to run reliably. An idle speed of 1200 rpm appears to be best for the JPX engine. However, this should be verified by allowing the engine to run at idle for several minutes, then advancing the throttle quickly to ensure that the engine will not stall.

3.0 OTHER ADJUSTMENTS

The Dellorto carburetor allows adjustment of several other parameters in addition to those discussed above. Although it is unlikely that you will have to use these, there may be some extremes of altitude or temperature which will require adjustments beyond the range of the adjusting screws. The following information is provided for use in such cases or should a carburetor be damaged and require repair.

3.1 IDLE JET

The carburetor is supplied with a No. 55 or No. 60 idle jet. This may be changed to a larger or smaller size if necessary to achieve the proper fuel mixture at idle.

3.2 MAIN JET

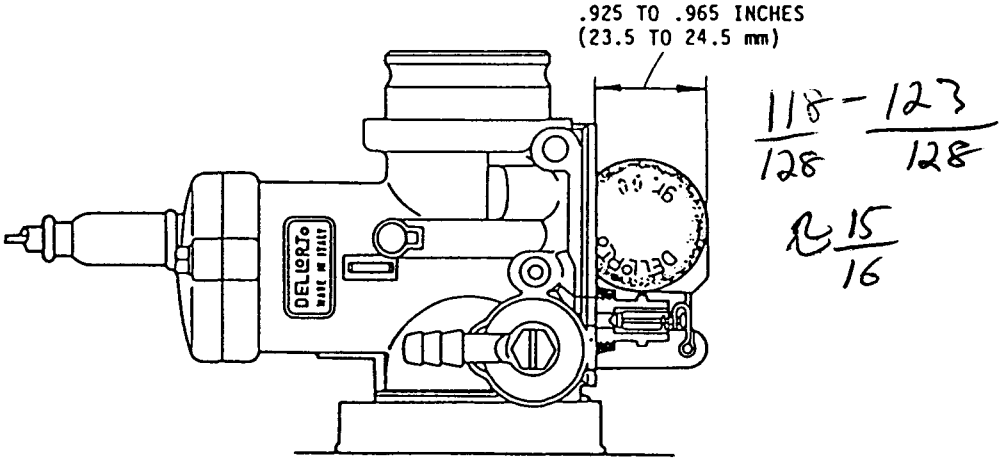
The carburetor is supplied with a No. 160 main jet. This may be changed to a larger or smaller size if necessary to achieve the proper high speed fuel mixture within the range of adjustment of the screw.

3.3 SLIDE NEEDLE

The carburetor is supplied with a type X15 tapered needle. This may be changed as required to achieve the correct mid-range fuel mixture, and a proper transition from low to high speed.

3.4 FLOAT ADJUSTMENT

If the carburetor is abused, adjustment of the float level may be necessary. To check the float position, lay the carburetor body on a flat surface as shown and check the distance from the float to the carburetor body as indicated. If necessary, bend the float arm carefully to achieve the correct position.



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≈ 15/16

3.5 FLOAT BOWL VENT

As shipped, the float bowl is vented to ambient pressure via two vent holes on the side of the carburetor body. For proper operation of the carburetor, the pressure at these ports should remain constant (or at least predictable) for all possible combinations of engine RPM and airspeed. Although some installations

require the use of additional elbows or tubes to relocate the vent, a very small change in position of these devices can have a significant effect on carburation. Therefore, *it is strongly recommended that the configuration of the float vents not be changed in any way.*

3.6 ADDITIONAL MODIFICATIONS

Many other items such as different floats, atomizers, starter jets, and throttle slides are available for this carburetor. However their use and possible effects are beyond the scope of this manual, and such changes are not recommended.

4.0 FUEL MIXTURE

The fuel mixture suggested by the engine manufacturer is 2.5% (40:1) synthetic. Due to problems encountered when using synthetic oils in other engines and because there are so many different types of "synthetic" oils, each with its own characteristics, we do *not* recommend the use of synthetic oils. The North American Distributor recommends mineral oil at 30:1 or AMS/OIL at 70:1. All of our factory testing has been done using **mineral oil at 30:1.** Test results have been excellent and this is the only fuel mixture we recommend at this time. As more experience is obtained, any additional recommendations will be published in the Lazair™ Technical Updates.

ENGINE BREAK-IN AND FLIGHT TEST PROCEDURE

for the Lazair II Two-Place
Microlight Trainer

PHASE	GENERAL PROCEDURE AND PURPOSE

1 Run engines on test stand or on aircraft in stationary or taxi mode only for a period of not less than 2 hours, using various power settings, with both fast and slow transitions from low to high power. During this phase, carburetors should be tuned several times following the procedure in Ultraflight Report No. 83018.

This phase should allow the pilot to become familiar with engine starting and carburetor adjustments, to gain the ability to recognize an improperly tuned engine, and to become familiar with any idiosyncrasies of the engines.

2 Flight test engines on a single place Series III Lazair for a minimum of 5 flight hours and a minimum of 25 flights. A flight is defined as one takeoff and one landing. The pilot for this phase should be the same pilot who will make the first flight in the Lazair II (Phases 4 and 5), and should have a minimum of 25 hours previous flight experience in a Lazair. This phase should allow the pilot to identify and rectify any engine problems which may be airspeed related (and therefore undetected during Phase 1) while in a relatively familiar environment.

3 Install engines on Lazair II and operate in taxi mode only for a period of not less than 1 hour. The purpose of this phase is to allow the pilot to become familiar with the ground handling characteristics of the aircraft and to develop some feel for the aerodynamic controls at low airspeeds. The duration of this phase should be extended until the pilot feels comfortable with the aircraft and his control of it.

4 Test fly the Lazair II without a passenger for a minimum of 5 flight hours and a minimum of 10 flights. With a pilot weight of 190 pounds or over, the use of ballast during this phase is optional. If ballast is used, it should be properly located and securely fastened to the airframe. The duration of this phase should be extended as required until the pilot is confident with the aircraft, the powerplant, and his flying proficiency. The flying sequences and environment should include, to the extent possible, all situations which are likely to be encountered in a normal flight training situation. This would include (but would not be limited to) fast and slow flight, stalls, turns up to and including 45 degrees of bank, single engine flight, power on, and power off landings, and wind and weather conditions considered normal and anticipated. It is the responsibility of the pilot to ensure that all flight maneuvers are performed in a location and at an altitude appropriate to the maneuver, and that suitable primary and emergency landing sites are available for use in the event of engine failure or other recoverable problem.

5 Test fly the Lazair II with a second pilot for a minimum of 1 hour and a minimum of 5 flights. Where possible, the two occupants of the aircraft should be the owner/operator of the aircraft and his CFI. During this phase, the pilot should become familiar with the flight characteristics of the aircraft with the added weight and drag of a passenger.

CERTIFICATE OF COMPLIANCE

LAZAIR II ENGINE BREAK-IN AND FLIGHT TEST

I _____ certify that the recommended Lazair II Engine Break-in and Flight Test Procedure (21 Dec 1983 revision) was followed to the extent indicated below, for Lazair II, Serial No. B034 with JPX PUL 425 cc engines, Serial No's. 3200384 and 3150384.

Phase	Description	No. of hours	No. of flights	Pilot(s)	Date completed
1	Engine static break-in		N/A		
2	Test flights on single place Lazair Series III				
3	Taxi tests on Lazair II		N/A		
4	Pilot only test flights of Lazair II				
5	Two-pilot test flights of Lazair II				

SIGNED _____ DATE _____

FLYING MANUAL

for the

LAZAIR™ II TWO-PLACE MICROLIGHT TRAINER

1. GENERAL

This is not intended to be a complete learn-to-fly manual. It has been prepared for the experienced Lazair pilot who is making the transition from a single-place Lazair to a Lazair II two-place trainer. It is written with the assumption that the pilot has acquired sufficient flight time in a Series III Lazair to be familiar with its flight characteristics and the operation of the lower pivoted control stick.

It is strongly recommended that any pilot transitioning to the Lazair II (without first having dual instruction in the Lazair II) read the Engine Break-in and Flight Test Procedure, Ultraflight Report No. 83019 and follow the recommended procedures as applicable.

This manual has been prepared based on observations from very experienced test pilots only. As more observations and comments become available from less experienced pilots, the manual will be amended accordingly.

2. ENGINE STARTING

The recommended starting sequence, the use of the choke, and other items are covered in the carburetor tuning manual, Ultraflight Report No. 83018. However, one additional safety precaution should be observed to avoid sore fingers and arms: when pulling on the starter rope, pull it slowly until you can feel the compression, then give it one short sharp pull through one compression stroke only, and relax your grip immediately. The JPX engine has displayed a nasty tendency to occasionally backfire when starting. This can pull the starter rope quite violently and if you are not prepared to let go, you may get a very unpleasant surprise.

3. FLIGHT CHARACTERISTICS AND PROCEDURES

One of the design goals for the Lazair II was the creation of a two-place training aircraft with flight characteristics as similar as possible to those of the single place Lazair. Although this goal has been met, there are some differences of which a pilot should be aware before flying the Lazair II.

3.1 Airspeed

Since both wing loading and drag are higher, the Lazair II must be flown at higher airspeeds to remain in the air. An increase of 5 to 7 mph above the airspeed of a single-place Lazair is a good general rule for most situations. A minimum landing approach speed of 40 mph is recommended.

3.2 Stalls

In most situations, a single-place Lazair will give the pilot adequate warning before it stalls. While the stall characteristics of the Lazair II are somewhat similar, the warning signs are not always as obvious. With power off, it is possible to hold the stick all the way back, with the only indication of a stall being a very high sink rate. This condition can be dangerous, especially at low altitude, and should definitely be avoided since there will not be sufficient airspeed to permit a landing flare.

3.3 Takeoff and Landing

The takeoff distance and especially the landing distance will be considerably longer than with a single-place Lazair. An airfield of 2,000 feet minimum length is recommended for safe flight training. Although this may seem excessive to the average ultralight pilot, it provides an additional measure of safety not available to pilots of conventional light aircraft trainers.

Should a problem (such as an engine failure) develop during takeoff, there are normally two possible procedures to follow, depending on the altitude at which the problem occurs. At low altitudes, it should be possible to land straight ahead on the remaining runway. At higher altitudes, it should be possible to initiate the necessary turn(s) and return to the runway for a normal approach. With most conventional light aircraft taking off from most normal runways, there will be some intermediate range of altitude at which neither of these options is available and a more drastic emergency procedure will be required. However, this is one area in which the pilot of an ultralight has a definite advantage. Because of the low airspeed and high angle of climb of ultralights, a 2,000 foot runway should provide sufficient overlap of the two options to allow a safe landing from any altitude, if the pilot has sufficient judgement to select the correct option. A 2,000 foot runway with a Lazair II is approximately equivalent to a 5,000 foot runway with a Cessna 150. One other procedure which is both possible and practical in an ultralight is the practice of turning left or right well before reaching the end of the runway, then flying parallel to (but to one side of) the runway. If there is a crosswind component on takeoff, you should be on the downwind side of the runway. The turn and the altitude at which it is initiated should obviously be chosen to permit a power off return to the runway at any time. The advantage of this technique is that in an emergency situation, it will allow the aircraft to return to the runway for a downwind landing by turning only 180 degrees rather than requiring a 360 degree turn (with the associated loss of altitude). Although downwind landings may be frowned upon in many aviation circles, the low airspeed of an ultralight will permit a downwind landing with a relatively low groundspeed. This, in most situations, is preferable to an emergency landing in a tree. These procedures are obviously intended for uncontrolled, low traffic density airfields and may not be possible at busy airports where standard patterns must be observed.

3.4 Weight and Balance

All solo test flying of the Lazair II to date has been done with a pilot weight of 190 pounds or more. Unless notified otherwise, any pilot weighing less than 190 pounds should ballast the aircraft (or himself) as required to achieve this minimum pilot weight for solo flight. Test flights on prototype aircraft have indicated that if constructed according to the assembly manual, the aircraft should be properly trimmed. However, if flight testing indicates that trim correction is necessary, ruddervator trim tabs should be added as described in Lazair Technical Update No. 9, Item 9.11.

3.5 Use of Brakes

As is the practice in many light aircraft trainers, the Lazair II has brake pedals only for the pilot flying the right hand seat. This is the seat which would normally be used for solo flight, since it puts the throttles at the pilot's left hand as in a single-place Lazair. For training, the instructor will normally fly from the right hand seat for the introductory and/or first instructional flight. After sufficient ground handling skill has been acquired, the student will occupy the right hand seat for all subsequent training flights and the student will therefore have control of the brakes.

3.6 Power Changes

It is a proven fact that with almost any aircraft (not just ultralights) an engine failure is more likely to occur while the power levels (throttles) are being changed than when they are left constant. For this reason, changes in power level during takeoff, climbout, and landing should be held to a minimum. Abrupt changes in power level should be avoided at all times, and before making power level changes in flight, check for a suitable landing site. Remember, an aircraft without a place to land is a potential accident looking for a place to happen.

Lazair II TECHNICAL UPDATE 1

27 June 1984

1.1 GENERAL

Although the Lazair II has only been in service for a few months, most of the ones which are now flying are being used on a regular basis for flight training. As a result, many of them have accumulated a surprisingly high number of flight hours. As with any new aircraft, a few problems and potential problems have been discovered. To keep these problems and their effects to a minimum, we will periodically be issuing Lazair II Technical Updates similar to those for the single place Lazair®. In addition to technical information, with this update, we are also distributing, at no charge, several modification kits to incorporate recent design improvements. These kits should be installed on your aircraft immediately. Additional information is provided in the installation manuals. If your aircraft kit was shipped after the date on this Technical Update, you can assume the required components were included with your kit.

1.2 IGNITION COIL MOUNTING BOLT MODIFICATION KIT Kit No. YU0074 (JPX engine)

We have had reports of three ignition coil mounting screws breaking in service. To reduce the possibility of this happening, we are providing type AN-3 aircraft bolts to replace the mounting screws originally supplied.

1.3 EXTERNAL CAPSTRIP RETROFIT KIT Kit No. YU0076

We have had one report of a partial separation of the Tedlar covering from the upper surface of some of the ribs, following a steep pull-up at high gross weight. Although the pilot reported that the aircraft flew "not too badly" in this condition, additional capstrips are now provided to be installed on the ribs on the outside of the wing covering to provide a greater margin of safety.

1.4 REAR SPAR BOX STIFFENING KIT
Kit No. YU0078

While doing some tests and investigations into the effects of hanging very heavy engines on the D-cell, it was noted that if the g forces on the engine are increased until something begins to deform, the first component to show signs of deformation is the RSL/RSR rear spar. Although the original configuration will withstand static loads on the engine in excess of 10 g's, repeated hard landings on a rough field might eventually effect RSL/RSR. The kit includes short stiffening ribs to be installed between the lightening holes, and a doubler for the area surrounding the hole in the root rib.

NGK B8EV

1.5 SPARKPLUGS AND OIL MIXTURE

Throughout the initial phase-in period of the JPX engines, we have received numerous claims from operators regarding the attributes of various types of sparkplugs and oil. Although many of the claims are mutually contradictory, and therefore of questionable value, there are a few common elements which may be helpful. First, you cannot make a bold statement to the effect that plug "A" is good and plug "B" is no good. Other factors, most notably carburetor tuning, type of oil, and oil ratio, can influence the operation of (and therefore the proper selection of) sparkplugs. If any one of these factors is changed, it is possible that a different sparkplug may be required. A plug which performs poorly with one oil type and ratio may be quite satisfactory with another oil. Other factors, such as exhaust system, and propeller size and type, which effect engine performance, can also influence the choice of sparkplugs. However, for use on the Lazair II, these factors can be considered non-variable. The effects of environmental conditions such as temperature and altitude can, in most cases, be considered negligible. Therefore, in an attempt to standardize on one specific recommendation, we have selected one combination of oil type, oil ratio and sparkplug which our testing has shown gives the best results.

During the past few months we have run many hundreds of test hours with many brands of oil and several different engines. Generally, we found relatively little difference between the various types of oil -- with one very notable exception. When we used Valvoline BIA Certified 2-cycle Outboard Oil (manufacturers part no. 469) we found a dramatic decrease in carbon and ash deposits on the sparkplugs and in the cylinder heads, and a much lower tendency for wet plug fouling. On one test, we accumulated over 230 hours on an engine without changing or even cleaning the sparkplugs. On another test, the buildup on the plug after an hour at idle using Valvoline was much less than after only five minutes with one of the other brands.

We have discussed the use of various oil ratios with the engineering department at JPX in France, and have received approval to use oil ratios as lean a[redacted] based on the fact that we use the engine in a tractor configuration (which provides much better cooling than a pusher) and because we use a relatively benign muffler rather than a tuned exhaust system. Using a lean oil ratio will generally make carburetor tuning more critical (because of the increased possibility of overheating due to a fuel/air mixture which is too lean), but carburetor tuning may actually be easier, and the possibility of an engine stoppage after a prolonged idle (due to oil fouled or carbon fouled plugs) can be significantly less.

After several months in service, there is some agreement in favour of a sparkplug slightly hotter than the B9EV supplied by the engine manufacturer, although, as stated previously, the required heat range can be influenced by the type and ratio of oil being used. The engine manufacturer suggested that we may need a hotter plug because of our tractor configuration and exhaust system, and recommended a [redacted] This plug has worked well in other similar installations on European Ultralights using a similar oil ratio. Our testing to date, while not extensive enough to be conclusive, indicates that this combination works extremely well. Unfortunately, the N3G (like the B9EV supplied with the engine) is a gold/palladium type with a retail price in excess of $10.00 each. However, if your engine operation indicates that a hotter sparkplug is required, the N3G is recommended. If

ongoing testing with this plug continues to show good performance, we will, in time, make this the standard plug and ship it with all new engines.

1.6 FLYWHEEL MOUNTING

As originally designed, the JPX engine had the flywheel (magneto ring) keyed to the ignition cam (hub) by two dimples in the flywheel protruding into holes in the cam. Although this appeared to work well for quite a while, the engine manufacturer had a few reports of flywheels working loose. In an attempt to cure this problem, they added two dowel pins to improve the keying. However, it has recently been discovered that the major cause of the original problem was not lack of keying but a reduction in clamping pressure because the mating surfaces of the steel flywheel and the aluminum starter cup are not machined and do not provide 100 percent contact area. As a result, the soft aluminum can be gradually worked into the depressions in the steel and reduce the clamping force. In future, all flywheels will be machined before assembly to provide the necessary contact area. With engines already in service, it is recommended that they be reassembled as specified in Modification Instructions XM0080, included with this update.

1.7 FUEL PUMP MODIFICATION

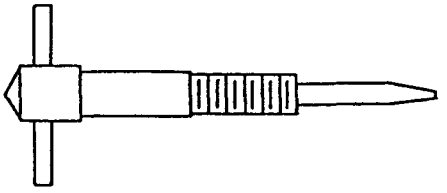
Although the fuel pumps on the JPX engine appear to work acceptably, the internal check valves on some of them do not seal very well. The resulting leakage through the check valves can be annoying because it allows the fuel to drain back into the tank when the engine is shut off. Another problem can result from leaking check valves if the amount of reverse leakage becomes equal to (or close to) the pumping rate of the pump. Although this is unlikely at normal engine speeds where the pumping rate is quite high, at a very slow idle the pumping rate is diminished and it might be possible under some conditions for the net pumping rate to fall low enough to starve the engine. To alleviate a potential problem, we are supplying Mikuni fuel pumps to replace the original pumps. The cost of the new pumps will be borne jointly by JPX and Ultraflight. Owners are asked to please return the original fuel pumps (by prepaid mail) when the new ones have been installed. These new pumps have a higher pumping rate because of the larger diaphragm and the check valves are much superior. Installation instructions are included in Manual XM0084.

1.8 CARBURETOR TUNING

Although the majority of owners appear to have mastered the art of tuning the Dellorto carburetor on the JPX engine, it is obviously much more difficult than tuning the Tillotson carburetor on the smaller Rotax engine used on the single place Lazair. Based on feedback received to date, the most consistent problem is the inability to recognize four-stroking. Unfortunately, this is something which cannot be learned from reading a manual. You have to make the engine four-stroke by

setting the mixture too rich, then stop it from four-stroking by leaning in the mixture screw until the four-stroking stops. Only by noticing the difference in noise and vibration can you recognize four-stroking. This problem was compounded on at least four engines by high speed needles which could not be screwed in far enough to make the mixture too lean. It should be possible, once the engine has stopped four-stroking, to turn the needle in even farther until you reach a setting at which the engine just begins to slow down. At this setting, the mixture is definitely too lean and the engine should not be run continously in this mode. If you cannot turn the needle in far enough to cause the engine to slow down (at wide open throttle), it may be that the adjustment range is limited because the spring on the needle is too long. To check this, screw the needle in until it bottoms (do not force it as this can damage the jet), and check to see if the spring is fully compressed. If it is, remove the needle and grind about 1/16 of an inch off the end of the spring. Note that there will be a small washer and a rubber O-ring on the needle. Be sure to reinstall these correctly. Some of the later engines have a needle with a coarser taper to prevent this problem. The coarser needle can be recognized by the "T" handle. Modification of the spring should not be necessary if you have the needle with the "T" handle.

FINE TAPER NEEDLE



COARSE TAPER NEEDLE

Although the tuning procedure outlined in XM0040 supplied with your kit is still considered correct you may find it easier to use the procedure below to set the high speed needle.

Back off the high speed needle until you are sure the engine is four-stroking (at full power). With the engine running, slowly turn the high speed needle in until the four-stroking just stops and the engine runs smoothly. Note the position of the needle. Then, slowly turn the needle in until the engine just begins to slow down, and note the position of the needle. Set the final adjustment mid way between these two points, but in no case should the needle be opened more than one turn from the point at which the engine begins to slow down. Tests at the factory indicate that the difference in needle setting between the "four-stroke point" and the "slow-down point" can vary between one and two turns. It should be noted that as the engine is broken in, internal friction will be reduced and the required fuel mixture for optimum engine performance will gradually become leaner. An engine which runs perfectly after five hours of operation may begin to four-stroke after ten hours unless the carburetor is readjusted. Check the carburetor adjustment frequently, especially during the first twenty hours of operation. To facilitate tuning the carburetor with the engine running, we have provided a small square knob part no. UT0403. This knob should be tightened onto the end of the high speed needle and

used to adjust the mixture and then removed before the aircraft is flown or taxied.

1.9 PROPELLER HUBS

We have had one report of a crack in a propeller hub. While this may be an isolated case, a visual inspection of both propeller hubs should be included in every preflight.

1.10 RECOIL STARTERS

Recoil starters on small engines have always been (and will probably continue to be) a source of aggravation. Although the starter on the JPX engine is probably as good as any we have seen, it will occasionally need repair and/or replacement. Because many Lazair II's are used for flight training, the recoil starters will be used much more than those on a purely recreational ultralight and will, therefore, need more frequent maintenance. Any operator who is doing flight training on a regular basis would be wise to keep an extra starter or at least a couple of extra starter ropes in stock to keep downtime to a minimum. We are presently testing a recoil starter cable (made of steel and nylon) to replace the rope, and will report on the test results in the next Technical Update. If you replace a rope on a starter, make sure the new rope is not so long that it reduces the pull from the rewind spring. When the handle is released, the rewind spring should hold it firmly against the fairlead. If the spring does not hold it tightly, the sheave can oscillate at low engine speeds. This can cause the pawl to engage and result in premature failure of the starter. Put an extra 1 or 2 turns on the spring if necessary. This starter assembly is manufactured by (or for) Honda and after going through the Honda distribution network to JPX, then through the JPX distributor to Ultraflight, then through Ultraflight distributors and dealers, it retails for about $120.00. However, if you want to save some money, you can go directly to your local Honda dealer and buy the same part for about one quarter of that amount. The Honda part number is 28400-883-030H and it is used on their type FR500 roto-tiller.

1.11 INSPECTING ENGINE MOUNTS

Although the rubber engine mounts can withstand static loads much higher than they would ever encounter in normal service, engine mounts (even rubber ones) can occasionally fail in fatigue. This is not necessarily a serious problem if one mount fails because of the designed-in redundancy if the initial failure is detected and the failed mount is replaced. Because of the nature of fatigue failures, the probability of two or more mounts failing simultaneously is virtually zero. However, if a failed mount is undetected (or detected but ignored), the load on the other mounts will be increased and the probability of a secondary failure is increased. As with the single place Lazair, rubber mounts should be visually inspected during every preflight. Because there are so many mounts and they are mounted so close together, a cursory visual is not sufficient. When inspecting mounts, the engine should be pushed up, down, left and right far enough to stretch each mount at least 1/8 of an inch and every mount should be individually inspected for any sign of separation, fracture, or external damage while it is in this stretched state.

1.12 JPX PUL425 ENGINE DATA

Flywheel Bolt Torque	65 Ft. Pounds
Propeller Hub Bolt Torque	87 Ft. Pounds
Cylinder Head Nuts Torque	16 Ft. Pounds
Propeller Bolts Torque	14 Ft. Pounds (see Note 1)
Ignition Timing	.088 inches BTDC (see Note 2)
Breaker Point Gap	.012 to .020 inches (see Note 2)
Sparkplug Gap	.025 inches
Replace Breaker Points	200 hours
Inspect Sparkplug	20 hours
Replace Sparkplug	50 hours
Cylinder Head Temperature	220 C (428 F) maximum continuous 250 C (482 F) never exceed
Carburetor Float Adjustment	See Note 3
Inspect Carburetor Screen	20 hours
Inspect Air Filter	20 hours

Note 1. The final tightening of the propeller bolts should be performed by holding the bolt and rotating the nut. The recommended torque value is specified accordingly. Measuring the torque while rotating the bolt would be irrelevant and potentially misleading. As with any wooden propeller, the applied torque should be rechecked frequently (at least once every two weeks) and especially following any significant decrease in atmospheric relative humidity.

Note 2. Measured on the piston (through the sparkplug hole). Ignition timing is set by removing and rotating the ignition cam (flywheel hub). A slight change in timing may be made by altering the point gap (within the specified range).

Note 3. The carburetor manufacturer recommends that the float be set as in XM0040 supplied with your kit. However, it may also be adjusted by setting the float lever parallel to the gasket.

1.13 CONDENSER FAILURES

We have had three reports of condensers failing short circuit on JPX engines. Unfortuantely, when a condenser fails in this mode, it is instantaneous, and gives no warning. We are attempting to obtain a more reliable condenser and will provide further information when it is available. In the meantime, all operators should be aware that a short circuited condenser resulting in an engine stoppage is a possibility. Flying sites and flight paths should be selected to permit a safe single-engine landing if necessary.

1.14 NACELLE MOUNTING BOLTS

Although most operators don't bother to lockwire the bolts which hold the nacelles onto the D-cells, this is recommended. The nylon locking feature in the elastic stopnuts works well when it is new and clean, but if the nacelles are removed frequently, the gripping action can be degraded. The presence of any grease or oil on the threads can also have a significant effect. To make it possible to lockwire the bolts, you can replace them with the drilled head type (35DH or AN3H5A) or drill a small hole through the head for lockwire.

MEMO

To All Owners of Lazair II Kits and Lazair Elite Kits shipped prior to 22 August 1984, Lazair Series III A905, Lazair SS A838

Date 22 August 1984

From ULTRAFLIGHT SALES LTD.

Copies File

Subject EXTERNAL CAPSTRIP INSPECTION

The G251 capstrips which are installed on the foam ribs (over the Tedlar) have the edges bent up to prevent the edge of the capstrip from rubbing on the Tedlar. At the ends of the capstrips, the corners require a compound bend, and the clearance between the edge of the capstrip and the Tedlar may not be as much as it is along the sides. If the capstrips are installed slightly off the centerline of the rib, or too close to a rib attach gusset, there is a possibility that the edge of the capstrip could rub on the Tedlar and eventually wear through it.

After installation, both ends of every capstrip should be inspected carefully. If there is any indication that the edge of the capstrip could contact the Tedlar, the capstrip should be reworked as required. If necessary, remove the last rivet (or the last few rivets), then lift the end of the capstrip away from the rib. Carefully bend the corners of the capstrip with pliers and/or file the corner to obtain the necessary clearance. If the aircraft has been flown with the capstrips installed and there is any indication of chafing on the Tedlar, the affected area should be reinforced with a small piece of Tedlar tape before the capstrip is reriveted in place.

PJL:br

TYPE 3 BRAKE PUCKS, PART NO. A411

1.0 GENERAL

The brake pucks used originally on the Lazair® Series III worked quite well for their intended purposed of occasionally slowing a very light aircraft or augmenting the rudders for ground steering. However, with the advent of the two-place Lazair II with its much higher mass (especially with two heavyweights on board) and the more frequent use of paved rather than grass runways, there developed a need for an improved brake puck. As the demands placed on the original pucks increased, two problem areas were noted. First, the wear rate on the puck material was quite high, resulting in the requirement for frequent adjustment and replacement. The second problem was that if the brakes were used to stop the aircraft from very high speed with a high gross weight, the heat buildup could be sufficient to soften the bonding agent in the puck material, causing the pucks to crack. When the brakes were first introduced on the Lazair, they were not intended to be used in this manner, and the instructions in the Lazair Operating Manual specifically suggest keeping the use of brakes to a minimum. However, it has been recognized that if brakes are available, they will be used, and will probably be used more often and with more force when the aircraft is being flown by students. With this in mind, the search was begun for an improved brake puck.

After several weeks of lab and field testing, a new puck material made of sintered copper/iron was chosen. This material has much better wear resistance than the material used previously, and a higher temperature rating. To make the pucks, the material is machined to the correct diameter with a step on one end, then bonded into a machined aluminum alloy cap to provide better guidance, stress distribution, and heat sinking.

2.0 INSTALLATION

If the new pucks are installed in the calipers before the aircraft is assembled, installation is straightforward. However, if they are being used as replacements for the original pucks, the operation is a bit more difficult. Because both pucks (inboard and outboard) are thicker than the ones used previously, it will be necessary to disassemble and/or remove the caliper from the aircraft to install the new pucks. On a Series III Lazair, this is not too difficult because the wheels are easily removed from the axle. But on the Lazair II, the caliper must be disassembled while it is on the aircraft. While this is not a bad job when you have the aircraft up on a stand and all your tools available, don't attempt to do it on the flight line a few minutes before your scheduled takeoff. This is <u>not</u> a 15 minute job.

2.1 Since the outboard puck is about 1/16 of an inch thicker than the old one, the relative position of the disc and caliper may have to change by this amount to get good alignment. On the Series III, this can be done by removing the inner wheel collar (T335) and removing about 1/16 of an inch off the end of it (or you could slot the mounting holes in T335 with a 3/16 inch round file so it can be moved 1/16 of an inch).

On the Lazair II, the caliper can be moved by filing the mounting holes and moving the F248 caliper attach fittings. In either case, check the alignment of the puck faces on the disc before making any changes. If you're lucky, you may not have to move anything.

To install the outboard puck, knock the old one out of the socket by using a punch or screwdriver through the hole in the end of the caliper. Clean the socket and cement the new puck in place with contact cement. Then sand off the top corner to provide the necessary clearance in the wheel hub (similar to the original puck).

ADJUSTMENT

To adjust the brakes, follow the procedure in your Assembly Manual. Note that as the inboard puck is thicker, the 1/4-20 adjusting screw will have to be backed out several turns to achieve proper adjustment.

MAINTENANCE AND LONGEVITY

The new pucks were used on our Lazair II at Oshkosh '84, and during the entire week of flying, no adjustment to the brake system was required. The officer who has been flying the Lazair SS for the Monterey Park California Police Department has been testing the new pucks, and he has estimated their wear resistance as at least ten times better than the original ones. However, to make the brakes last as long as possible, they should, as stated previously, be used only as necessary. The condition of the puck should be checked frequently, and the brakes should be adjusted when necessary. As the disc does not cover the entire surface of the puck, a small section at the bottom of the puck will not be worn. The thickness of this projection can be used as an indication of puck wear. When the wear is sufficient that the projections from the inboard and outboard pucks are almost touching, the projections should be removed by using a hacksaw blade or pointed tool. The second time this occurs, the pucks should be replaced.

ORDER INFORMATION

Brake pucks are sold as sets only. One set (Part No. A411) contains one inboard puck and one outboard puck — this will do <u>one wheel only</u>. For one complete shipset, order two A411 Puck sets.

MODIFICATION INSTRUCTIONS

FLYWHEEL MOUNTING, JPX PUL425

Manual Part No. XM0080R001

1.0 GENERAL

This manual provides rework instructions for remounting the flywheel (magneto ring) on the JPX PUL425 engine to improve the surface contact area between the flywheel and the starter cup.

2.0 APPLICATION

This modification should be performed on engines shipped from Ultraflight prior to 27 June 84.

3.0 REQUIRED TOOLS AND EQUIPMENT

Socket, 1 1/4 inches, with long drive handle torque wrench
Flat file and/or No. 180 wet-or-dry sandpaper
Locktite® 242 (blue) or equivalent
Large screwdriver
Hammer

4.0 METHOD

4.1 Remove the mounting plate and recoil starter from the engine. Do not remove the propeller.

4.2 Examine the mating of your socket on the flywheel mounting bolt. Note that the bolt head has a very large chamfer on it. If your socket also has a large chamfer, there may not be enough engagement on the bolt head to prevent slipping. If necessary, grind the face of the socket to remove most of the chamfer before attempting to remove the bolt.

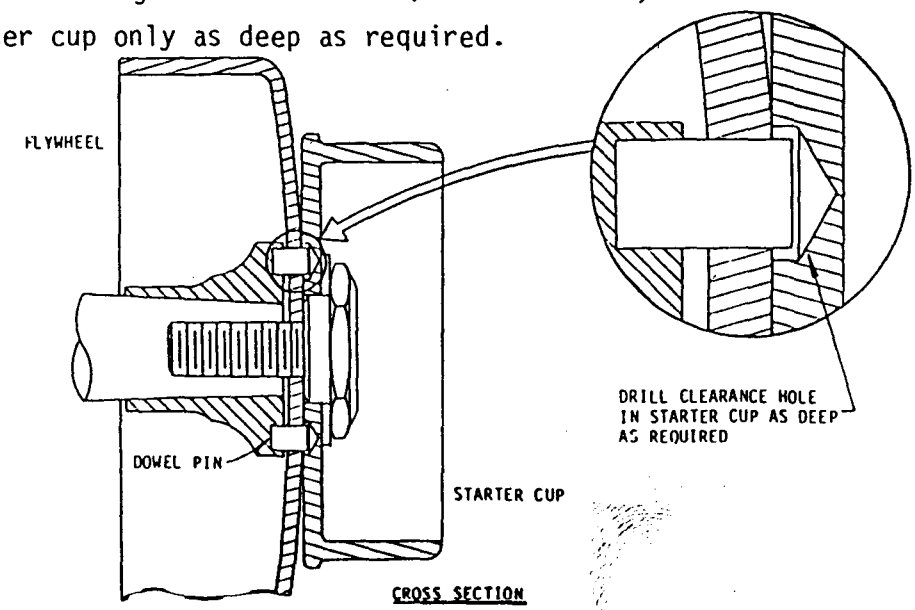
4.3 Bend the locking washer down flat and unscrew the flywheel mounting bolt. With the locking compound used on this bolt, the torque required to unscrew the bolt is usually so high that you will probably think the threads are stripped, so don't be alarmed.

4.4 Lift off the starter cup and locking washer.

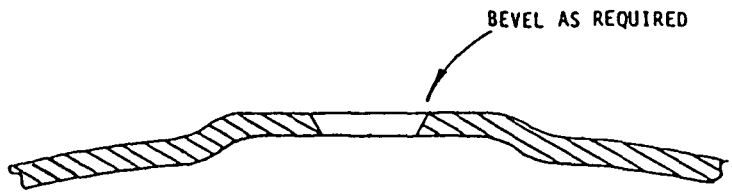
4.5 Insert Allan keys or small screwdrivers (or anything else which is handy) about 1/4 of an inch into two of the holes in the flywheel and lift it out. Note that the flywheel can fit on in two orientations. Either one is acceptable so it is not necessary to put an index mark on it.

4.6 Place a sheet of 180 grit wet-or-dry sandpaper on a piece of glass or other flat surface. Place the flywheel on it and carefully sand the contact surface to obtain an area of at least 1 1/2 inches in diameter which is flat and smooth. Make sure the flywheel does not rock while you are doing this. Normally only a very small amount of material will need to be removed. If necessary, you can use a flat file, but make sure the file is in good condition (and clean), and file slowly and carefully.

4.7 Before reassembling the engine, check the method by which the flywheel is keyed to the hub. Early engines have two dimples on the inside of the flywheel which mate with holes in the hub. Later engines have, in addition to this, two dowel pins in the hub which mate with holes in the flywheel. If your engine is of the latter type, check the surface of the aluminum starter cup where it has been in contact with the flywheel. If there is any indication that the dowel pins may be too long, the starter cup should be counterbored as required to provide clearance for the dowel pins. If your starter cup must be counterbored, use the flywheel to mark the position of the holes but do not use the flywheel as a drill guide. Use a 1/4 inch drill, and drill the holes in the starter cup only as deep as required.



4.8 Before reassembling, put the bolt, locking washer, starting cup and flywheel together to check the length of the shoulder on the bolt. If this shoulder is too long, it will bottom in the hole in the flywheel and prevent the bolt from squeezing the starter cup onto the flywheel. If necessary, file a slight bevel around the circumference of the hole in the flywheel.



FLYWHEEL, CROSS SECTION

4.9 Make sure all mating surfaces are clean and free of any grease or oil (this includes the hub surface, both surfaces on the flywheel and the mating surface on the starter cup). Apply Locktite 242 to all 3 surfaces. Reassemble the components on the engine. Make sure the tab on the locking washer fits properly into the keyway in the starter cup. Apply loctite to the bolt threads and tighten to 65 foot pounds torque. Bend the side of the locking washer as required to prevent the bolt from rotating.

MODIFICATION INSTRUCTIONS

FUEL PUMP, JPX PUL425

Manual No. XM0082R001

1.0 GENERAL

These instructions describe the recommended procedure for removing the diaphragm spring from the fuel pump on the JPX PUL425 engine. Removal of the spring increases the pumping rate and reduces the possibility of fuel starvation at a low idle speed due to leaky check valves.

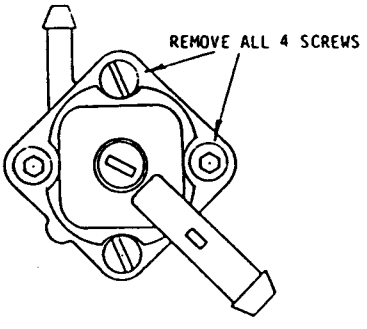
2.0 DISASSEMBLY

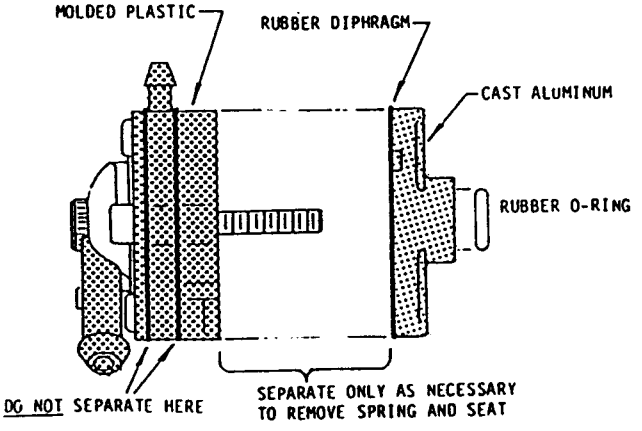
2.1 This modification can be performed without removal of the fuel lines.

2.2 Remove the two slot head screws from the fuel pump. Carefully remove the two alan head screws which secure the fuel pump to the crankcase. Hold the fuel pump onto the crankcase while removing these screws.

2.3 Carefully withdraw the fuel pump from the crankcase. There is a small rubber O-ring between the fuel pump and the crankcase. Don't lose it.

2.4 Separate the fuel pump laminations exactly at the interface shown in the figure. If the pump is separated anywhere else, it can be very difficult to reassemble.





2.5 Pull the two parts of the pump apart just enough to allow the spring and plastic seat to be removed. The spring is a light compression spring about 1/4 inch in diameter and 5/8 of an inch long. The seat is a molded plastic disc about 7/16 of an inch in diameter.

3.0 REASSEMBLY

Reassemble the pump on the crankcase. Make sure the rubber O-ring is properly installed between the pump and the crankcase. Tighten all four screws securely.

4.0 CARBURETOR TUNING

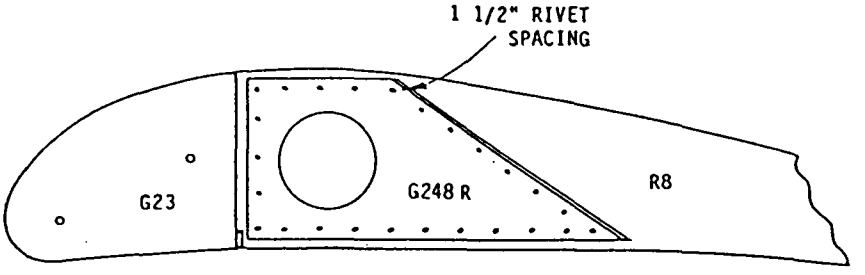
With the increased pumping rate, the fuel pressure and float level will increase slightly and this may require retuning the carburetor. In most cases, a slightly leaner setting of the main jet will be required. Follow the recommended procedure for adjusting the carburetor.

INSTALLATION INSTRUCTIONS

REAR SPAR BOX STIFFENING KIT

Manual Part No.	XM0078R001
Use with Kit Part No.	YU0078-001

2.2 Rivet a G248 L/R doubler onto each root rib as shown.



PARTS LIST

REAR SPAR BOX STIFFENING KIT

Part No.	Quantity	Description
G153-5.5	8	Ribholder
G248L	1	Doubler, Root Rib
G248R	1	Doubler, Root Rib
RV1043	100	Rivet, Aluminum

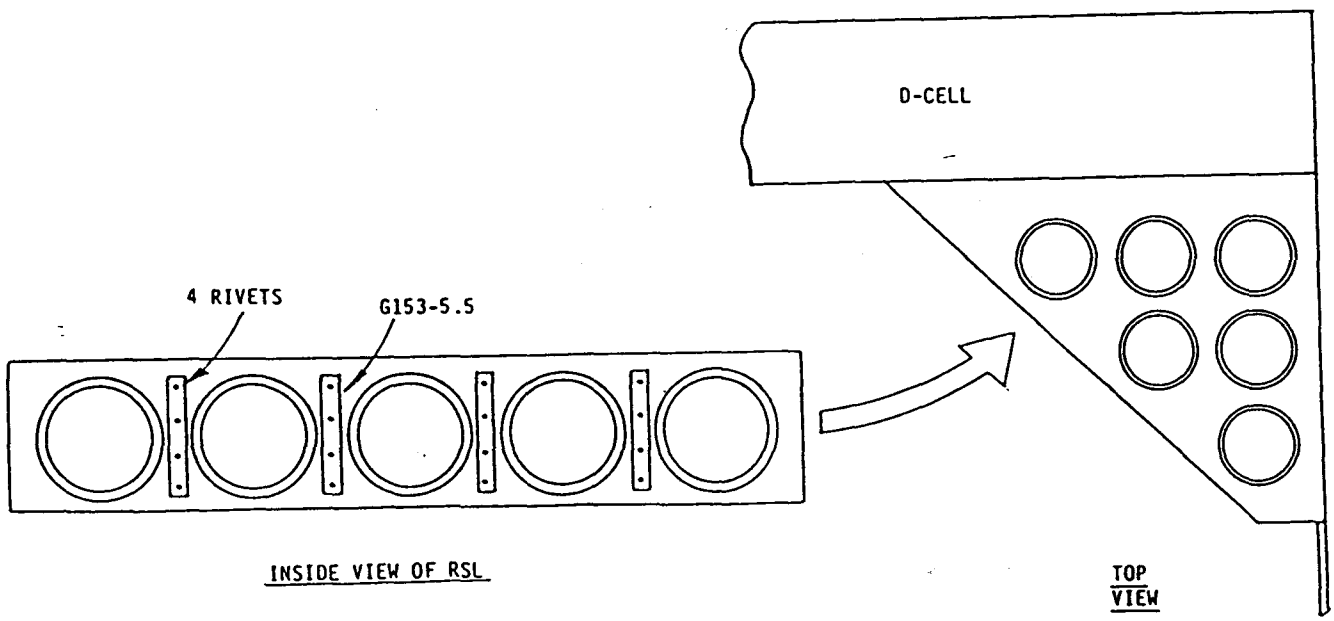
1.0 GENERAL

1.1 This kit is provided ot improve the torsional strength of the wing and improve its resistance to damage resulting from very high g forces applied to the engines.

1.2 The kit may be installed very easily during construction of the wing. However, if the wing has been completed and covered, this kit may also be installed by working through the access hole in the root rib.

2.0 INSTALLATION

2.1 Rivet a G153-5.5 channel between each pair of holes on the vertical web of the rear spar box (RSL/RSR) using 4 rivets in each as shown. If you are working through the access hole in the root rib, you may find it easier to install the channels with double face tape first, to hold them in place while drilling.



INSTALLATION INSTRUCTIONS

EXTERNAL CAPSTRIP RETROFIT KIT, LAZAIR II

Manual Part No.	XM0076R001
Use with Kit No.	YU0076-001

1.0 GENERAL

This kit is intended for retrofit purposes and the instructions have been written with the assumption that construction of the aircraft has been completed and the Tedlar covering has been applied.

2.0 INSTALLATION OF CAPSTRIPS ON FOAM RIBS

2.1 Use capstrips, Part Numbers G0251-1 through G0251-7 where the dash number designates the rib on which the capstrip should be installed. Capstrips on the foam ribs are installed on the top of the wing only. Note that the capstrips should be installed with the bend up to protect the Tedlar covering from the edge of the capstrip.

2.2 Lightly file or sand the edges, ends and corners of each capstrip to remove all burrs and sharp edges. Apply type TP2405 double face tape to the under side of each capstrip. Remove the backing paper and fit the capstrip in place on the top of the rib (equidistant between the gussets). Rivet each capstrip to the rib using a 3 inch rivet spacing.

3.0 INSTALLATION OF CAPSTRIPS ON G25 GUSSETS

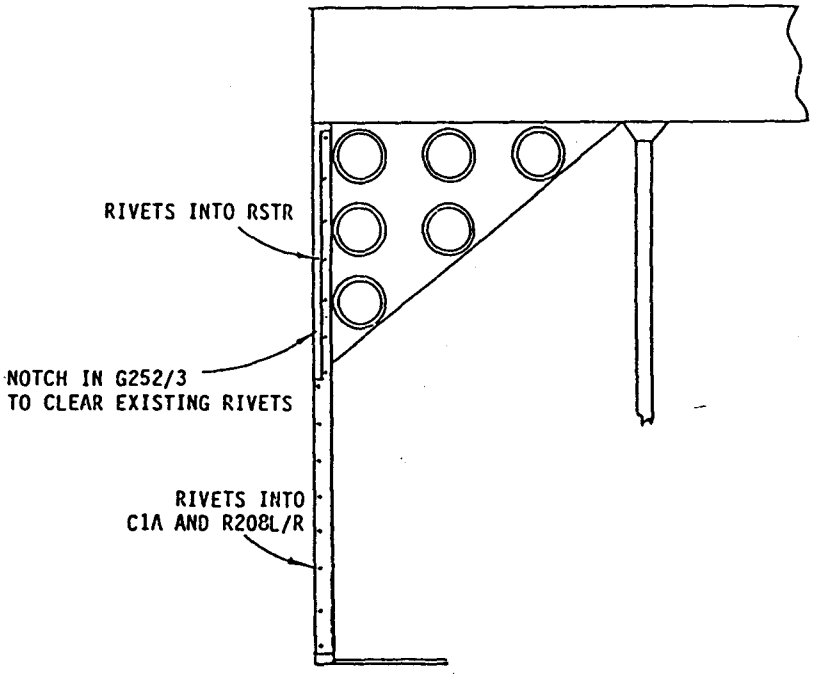
3.1 Similarly tape and rivet capstrips G0251-9 over the G25 tip gussets using a 1 1/2 inch rivet spacing. Locate the capstrips directly over the foam tape. Install these capstrips on both the top and the bottom of the wing.

4.0 INSTALLATION OF CAPSTRIPS ON ROOT RIBS

4.1 External capstrips should be installed on both the top and the bottom of the root ribs. Part number G0252 is used on the top of the right wing and the bottom of the left wing. G0253 is used on the top left and bottom right.

4.2 To ensure good contact, the rivets holding the C1A and C1B capstrips to the root rib should be removed before the external capstrip is installed. The best way to remove the rivets is to first cut a small disk out of the Tedlar (and tape) over the rivet head. This makes it possible to drill out the rivet and remove the head cleanly. A plug cutting tool, UT0401, has been provided in this kit for cutting the Tedlar. Fit the tool over the rivet head, press down and rotate the tool. Note that the tool is made from aluminum tubing and will probably require resharpening several times.

4.3 Tape and rivet the capstrips in place as shown. Use a 1 1/2 inch rivet spacing. Apply the tape to the capstrips along the rivet rows.



PARTS LIST

EXTERNAL CAPSTRIP KIT

Part No.	Quantity	Description
G0251-1	2	Capstrip, 15 1/2 inches
G0251-2	2	Capstrip, 17 3/4 inches
G0251-3	2	Capstrip, 20 1/2 inches
G0251-4	2	Capstrip, 33 inches
G0251-5	2	Capstrip, 36 inches
G0251-6	2	Capstrip, 39 inches
G0251-7	2	Capstrip, 41 inches
G0251-9	4	Capstrip, 15 inches
G0252	2	Capstrip, Root Rib
G0253	2	Capstrip, Root Rib
TP2105/60	1	Tape, Double Face
RV1043	300	Rivet, Aluminum
UT0401	1	Tool, Plug Cutting

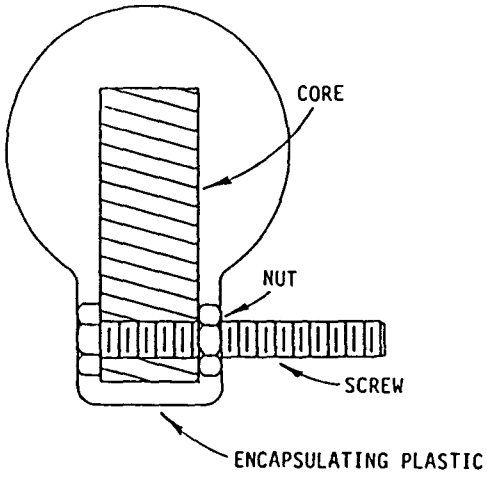
INSTALLATION INSTRUCTION

IGNITION COIL MOUNTING BOLT MODIFICATION KIT
for JPX PUL425 engines

Manual Part No. XM0074R001
Use with Kit Part No. YU0074-001

1.0 GENERAL

1.1 As supplied by the manufacturer, the ignition coils are mounted by two 10-32 machine screws with the head and nut encapsulated in plastic as shown. As these screws have full length threads, the part of the screw which is most highly stressed has also a reduction in cross section and a stress concentration due to the threads. To eliminate this problem, the machine screws should be removed and replaced by the type AN-3 aircraft bolts.



CROSS SECTION OF ORIGINAL COIL MOUNTING

1.2 Note that the two ignition coils are connected with their primary circuits in series. Only one of the coils is grounded directly to the crankcase and the other one is insulated from the crankcase by insulating washers. For this reason it is recommended that you remove only one coil at a time, modify it, then reinstall it on the engine before removing the other coil. Make sure that all the insulating washers and electrical connectors are reinstalled exactly as removed.

2.0 COIL REMOVAL

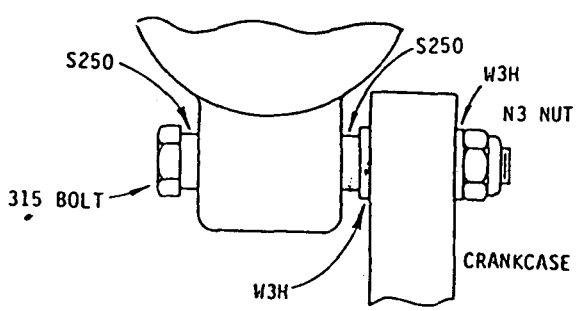
Unscrew the retaining cap and disconnect the high voltage lead from the coil. Unplug the primary lead. Loosen the nuts and remove the coil from the engine.

3.0 COIL MODIFICATION

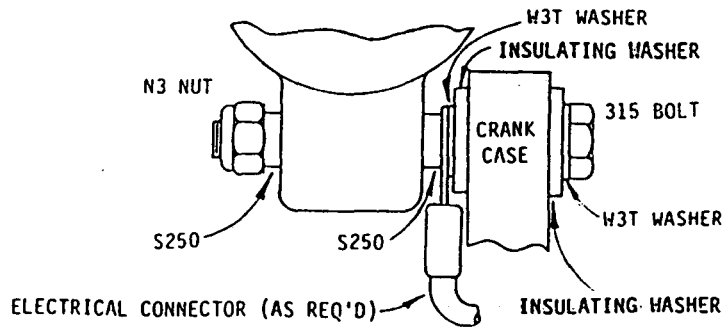
Grip the threaded end of each mounting screw in a vise or with vise-grip pliers and screw it out of the coil. Note that the head of the screw is encapsulated in the plastic and it may require some effort to break it free. Be sure to turn the screw in the right direction. As viewed form the threaded end, it should be turned clockwise. On some coils, you may find that the nut will break free first rather than the screw. If this happens, just unscrew the nut then tap the screw out with a hammer. If the screw comes out first, screw it back in a few turns and tap it with a hammer to remove the nut. When the screw and nut have been removed, use a sharp knife to cut away the deformed plastic around the holes.

4.0 REINSTALLATION

Install the coils on the engine as shown. The S250 spacers are used to ensure good electrical contact and to make it easier to fit a wrench onto the bolthead.



MOUNTING OF UNINSULATED COIL



MOUNTING OF INSULATED COIL

PARTS LIST

PARTS TO MODIFY 4 COILS (2 ENGINES)

Part No.	Quantity	Description
S250	16	Spacer, 1/4 x 1/4
N3	8	Nut, 10-32 Nylock
W3T	12	Washer, 3/16 x 1/32
W3H	8	Washer, 3/16 x 1/16
315	8	Bolt, 10-32 x 1 5/8

INSTALLATION INSTRUCTIONS

FUEL PUMP RETROFIT KIT FOR JPX PUL425 ENGINES

Manual No. XM0084R001
Use with Kit No. YU0084-001

1.0 GENERAL

1.1 This fuel pump retrofit kit is provided to replace the fuel pumps on JPX PUL 425 engines shipped from Ultraflight prior to 28 June 1984.

1.2 The Mikuni fuel pumps in this kit provide increased fuel pressure, increased flow rate and superior check valves.

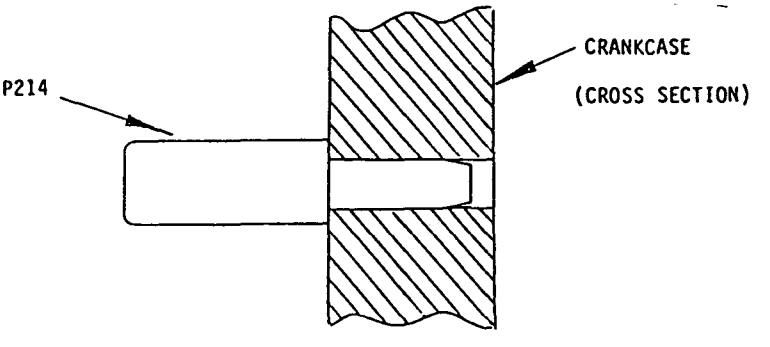
2.0 FUEL PUMP REMOVAL

2.1 Disconnect both fuel lines from the fuel pump.

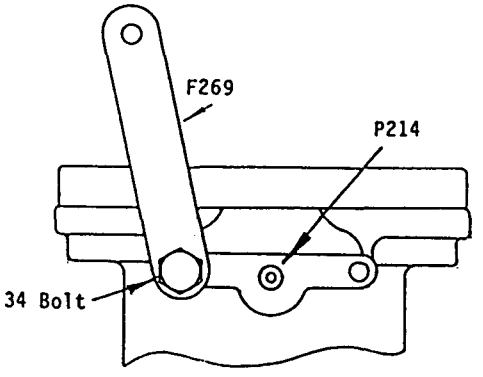
2.2 Remove the two Allen head screws and withdraw the fuel pump. Remove the rubber O-ring from the face of the crankcase.

3.0 NEW FUEL PUMP INSTALLATION

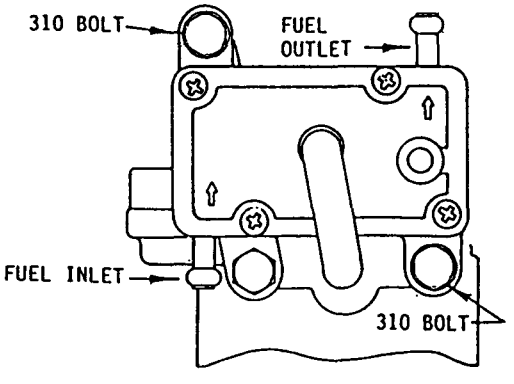
3.1 Insert the P214 pulse nipple into the pulse hole in the crankcase (the hole where the O-ring was removed) and gently tap it in until the shoulder is seated.

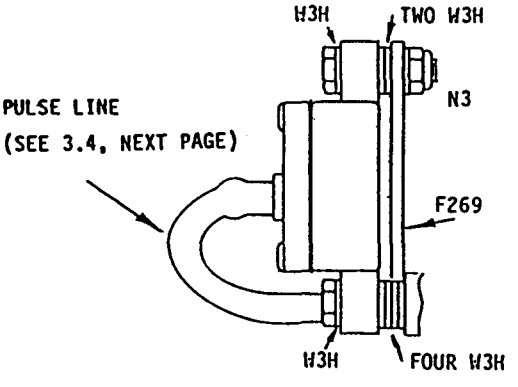


3.2 Bolt the F269 mounting bracket in place as shown. Use Loctite® on the threads. Do not use washers. Set the position of F269 approximately as shown and tighten the bolt (it is difficult to tighten it after the pump is installed).



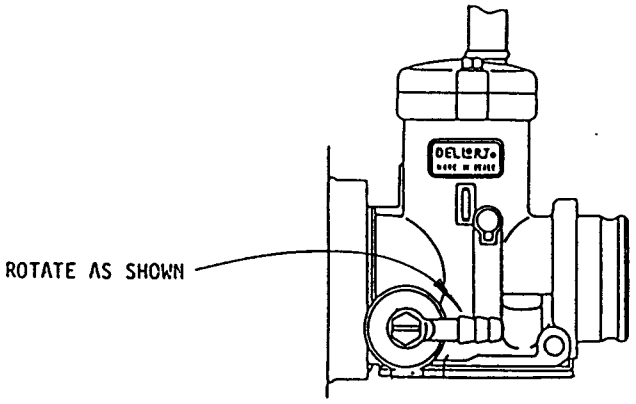
3.3 Install the fuel pump as shown with the fuel outlet (indicated by the arrow) pointing upward. Install bottom 310 bolt with 1 W3H washer between the bolt head and the pump, and 4 washers between the pump and the crankcase. Use Loctite on the bolt. Tap the F269 bracket sideways as necessary to align the top holes, and install the top bolt with 1 washer under the head, 2 washers between the pump and the F269, and 1 washer under the nut.





3.4 Install the pulse line TF0002-3.8 between the P214 nipple and the pulse port in the middle of the fuel pump. Safety wire both ends.

3.5 Loosen the bolt securing the inlet fitting on the carburetor. Rotate the fitting to the horizontal position as shown and retighten the bolt.



3.6 Reconnect the fuel lines to the fuel pump and secure with safety wire. Cut the fuel lines to length if required and make sure they have no sharp bends. Make sure the fuel lines are routed away from the mufflers.

4.0 CARBURETOR ADJUSTMENTS

4.1 Start the engine and verify that the fuel pump is operating. Shut the engine off and verify that the check valves prevent the fuel from draining back into the tank.

4.2 Adjust the carburetor as described in tuning manual XM0040 and/or the applicable Technical Updates. As the new fuel pump will produce a higher fuel pressure, the float level will be raised slightly. This will probably require slightly leaner adjustment of the mixture settings.

PARTS LIST YU0084-001

(for two engines)

Part No.	Quantity	Description
34	2	Bolt, 10-32 x 1/2
310	4	Bolt, 10-32 x 1
F269	2	Bracket, Fuel Pump Mt.
N3	2	Nut, 10-32 nylock
P214	2	Nipple, Pulse
PC21	2	Fuel Pump
TF2-3.8	2	Tubing, Pulse
W3H	18	Washer, 3/16 x 1/16
WR25-24	1	Safety wire, 2 feet