

# CHAPTER 13

## ✓ WING ASSEMBLY

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Section 1  
Wing Parts List  
Figures W-1 through W-12

INDEX#	PART #	QTY	DESCRIPTION
1.	W-318	2	FRONT WING SPAR
2.	W-271	2	REAR WING SPAR
3.	AN43-23A	8	1/4" EYEBOLT
4.	MS21047-4	8	1/4" PLATE NUT
5.	SS32	16	3/32" X 1/8" POP-RIVETS
6.	TI-1	14	THREADED INSERT
7.	W-310	12	NYLON COMPRESSION STRUT PLUG
8.	W-303	6	COMPRESSION STRUT
9.	AN3-15A	8	3/16" BOLT
10.	AN960-10	32	3/16" WASHER
11.	AN365-1032	14	3/16" LOCKNUT
12.	AN42B-15A	4	3/16" EYEBOLT
13.	W-309	4	INNER DRAG RIGGING
14.	W-309-1	4	OUTER DRAG RIGGING
15.	AN4-32A	8	1/4" BOLT
16.	AN960-416L	36	1/4" THIN WASHER
17.	AN-26A	6	1/4" BOLT
18.	W-44A (TC-2)	2	TIP PLUG
19.	AN4-26A	2	1/4" BOLT
20.	W-270	2	CURVED TIP TUBE
21.	SS64	12	3/16" STAINLESS POP RIVET
22.	AN4-27A	2	1/4" BOLT

7.

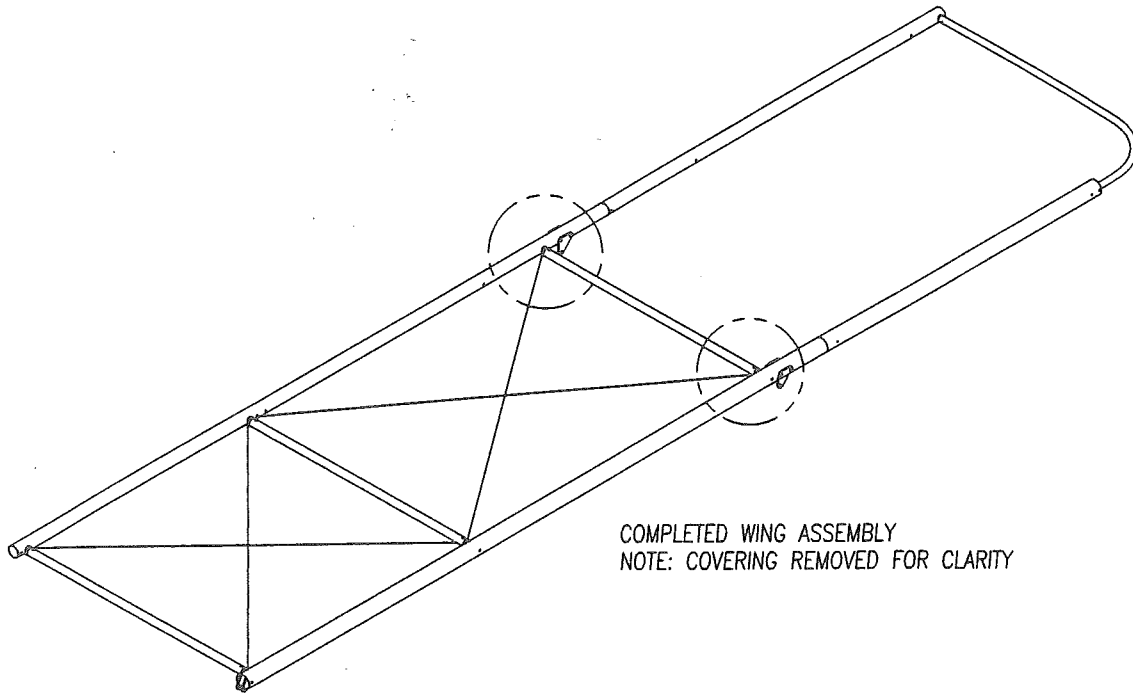
*(Wing Parts List Continued On Following Page)*

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Section 1  
Wing Parts List Continued  
Figures W-1 through W-12

*(Wing Parts List Continued From Previous Page)*

23.	AN365-428	24	1/4" LOCKNUT
24.	AN4-33A	2	1/4" BOLT
25.	AN43B-26A	2	1/4" EYEBOLT
26.	CS-152	2	SAFETY RING
27.	AN960-416	34	1/4" WASHER
28.	AN4-16A	2	1/4" BOLT
29.	W-9	4	STRUT ATTACH PLATES REAR
30.	W-265 (OUTER)	2	STRUT ATTACH PLATE FRONT
31.	W-265-1 (INNER)	2	STRUT ATTACH PLATE FRONT
32.	W-314	2	FOLDING BLOCK
33.	AN4-17A	2	1/4" BOLT
34.	L33-5	4	.015 TEFLON SHIM - 1" (O.D.) X 1/4" (I.D.)
35.	AN3-13A	2	3/16" BOLT
36.	AN350-4	8	1/4" WING NUT
37.	W-317	2	SPACER WASHER
38.	AN4-26	2	1/4" BOLT
39.	AN350-4	2	WING NUT
40.	SC-357-1	2	WING COVERING
41.	W118	10	BATTEN RIB, LOWER
42.	W285	18	BATTEN RIB, UPPER
43.	SC-357-1	2	WING COVERING
44.	PT-1	44	BATTEN TIP
45.	WP-264	44	BATTEN END
46.	TRP 12"	11	12" LONG PLASTIC TIE WRAP
47.	SC-368	1	VELCRO GAP SEAL
48.	AN970-4	4	1/4" FENDER WASHER
49.	SO1-04	4	SADDLE
50.	SB6-8	4	STEEL POP RIVET
51.	W-396	2	TIP COMPRESSION STRUT



COMPLETED WING ASSEMBLY  
NOTE: COVERING REMOVED FOR CLARITY

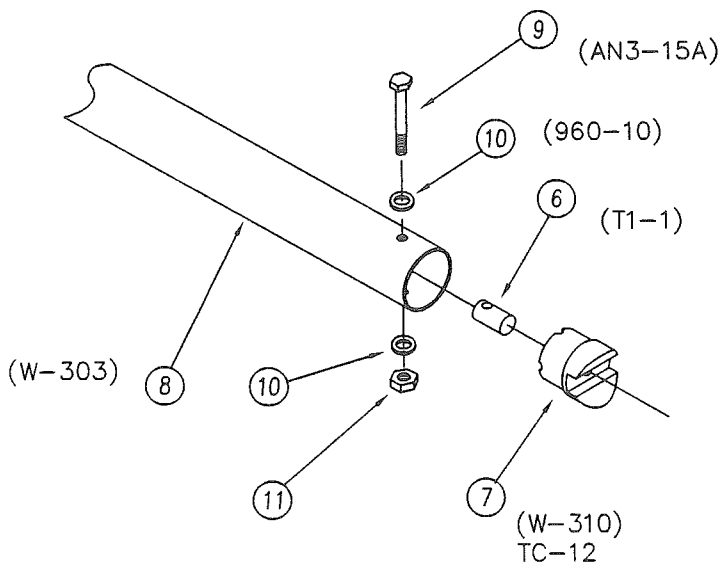
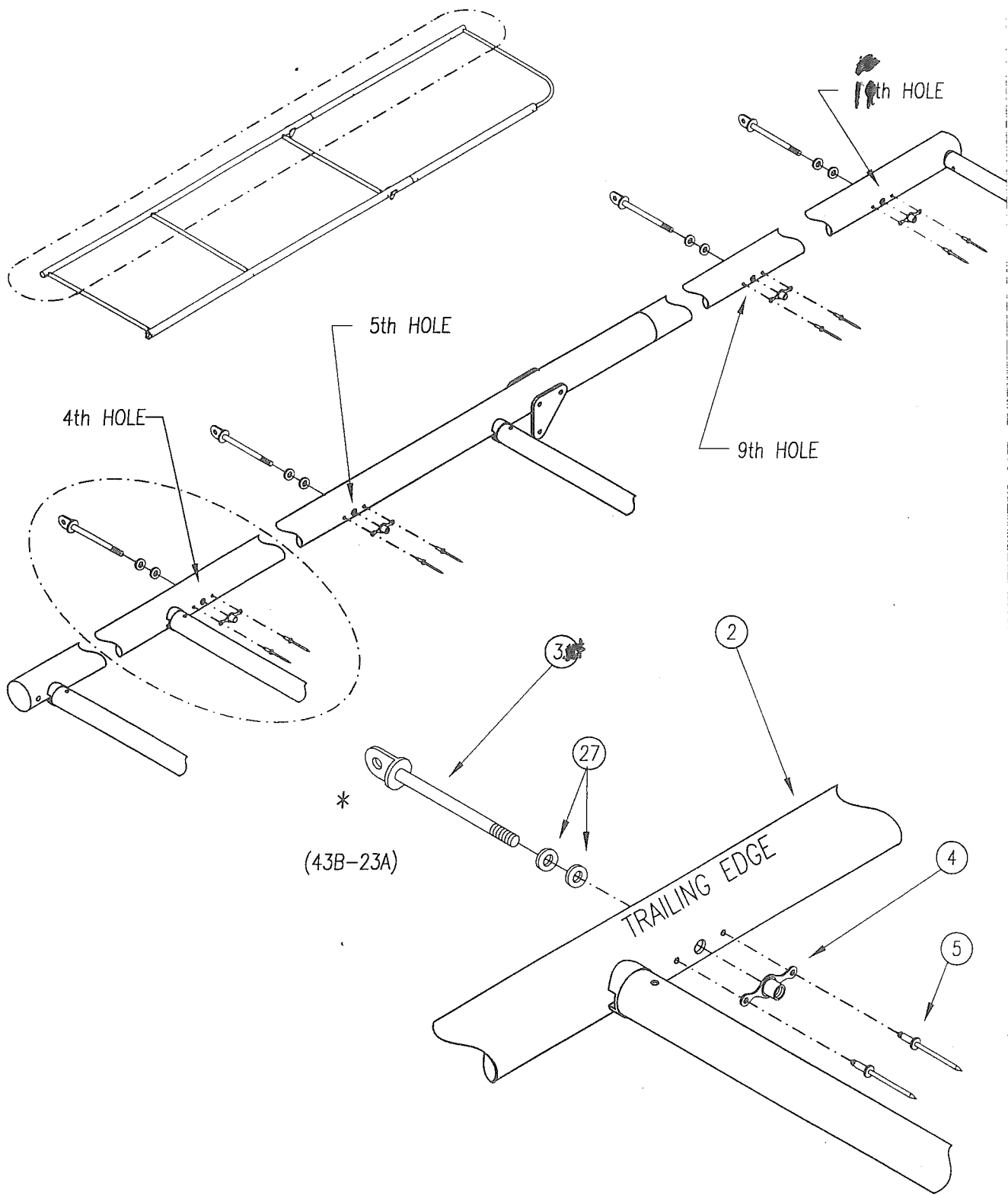


FIGURE W-1  
TYPICAL COMPRESSION STRUT ASSEMBLY

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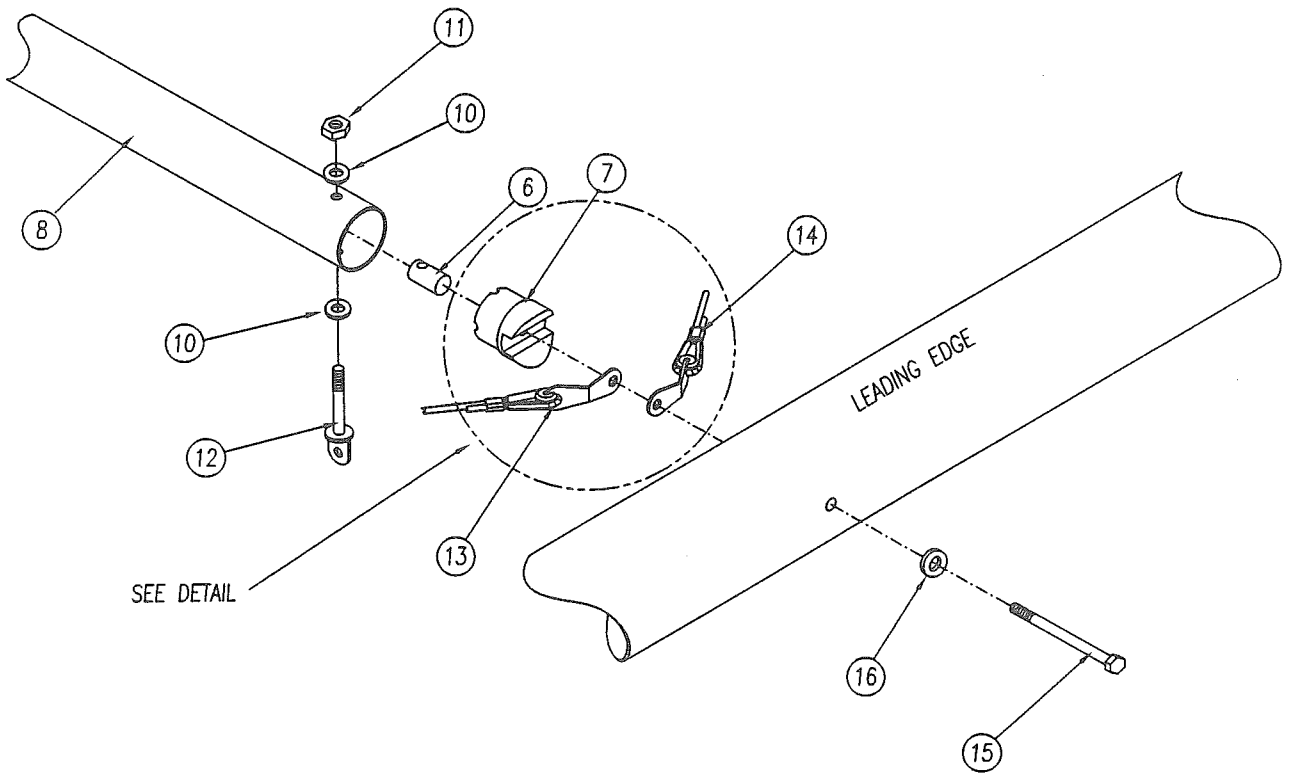
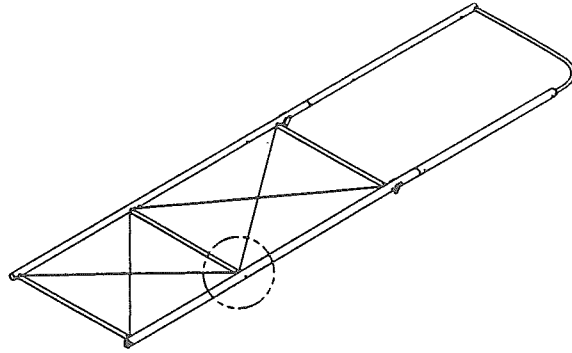
\* INSTALLATION OF EYE BOLTS IS COMPLETED AFTER COVERING IS ATTACHED. SEE THE TEXT.

FIGURE W-2  
 INSTALLATION OF EYE BOLTS  
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NOTE: THE INBOARD DRAG RIGGING IS 1/8" CABLE AND HAS THICK TANGS AT THE CABLE ENDS.



TYPICAL ASSEMBLED VIEW OF  
DRAG RIGGING AND STRUT PLUG

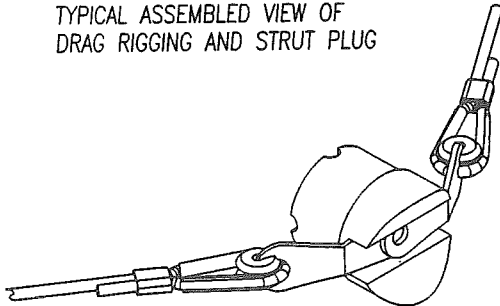


FIGURE W-3

MIDDLE-FORWARD COMPRESSION STRUT ASSEMBLY

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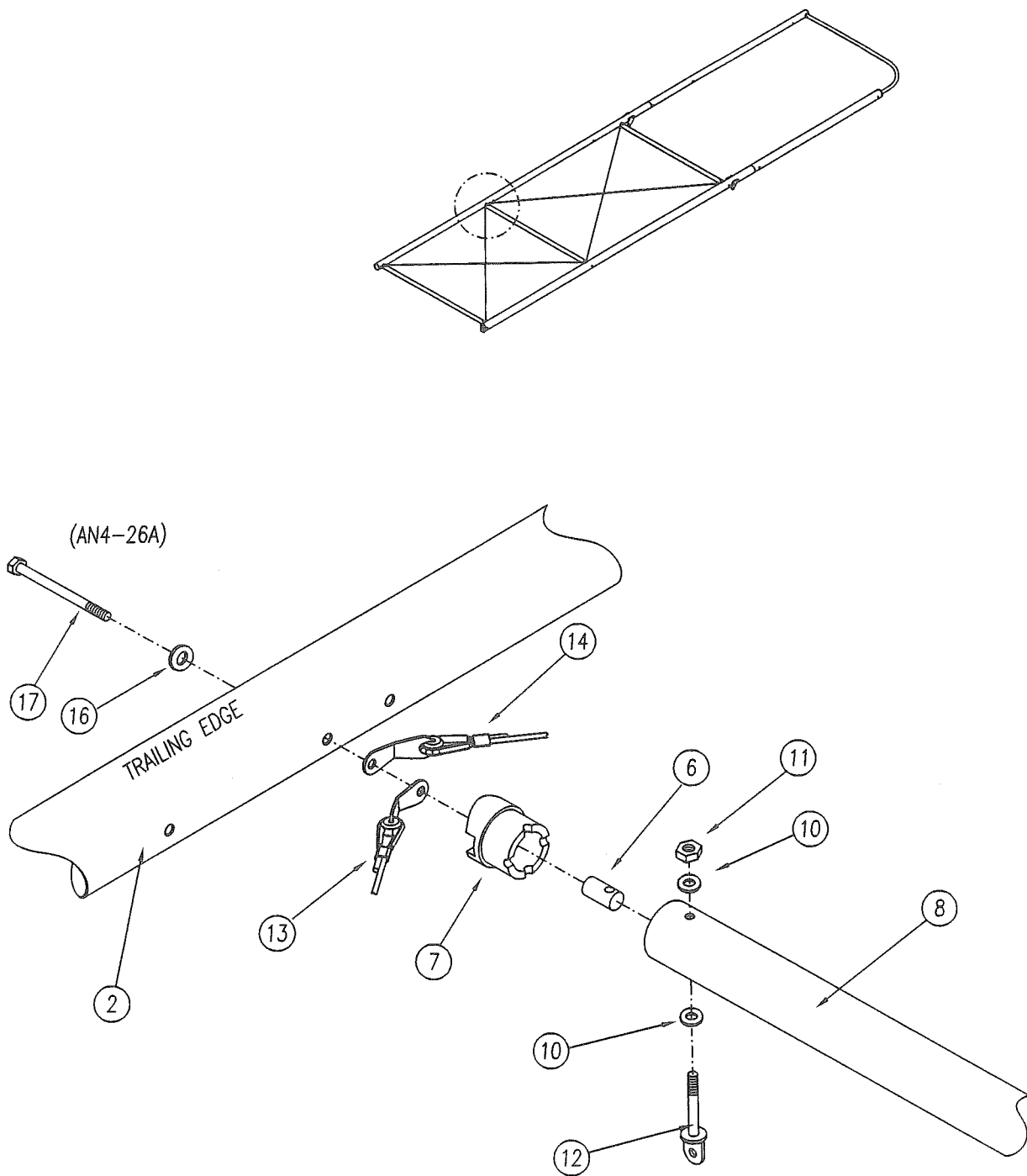


FIGURE W-4  
MIDDLE-AFT COMPRESSION STRUT ASSEMBLY

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\*NOTE: DO NOT TIGHTEN LOCKNUTS ON STRUT ATTACH PLATES UNTIL WING COVERING IS ATTACHED.

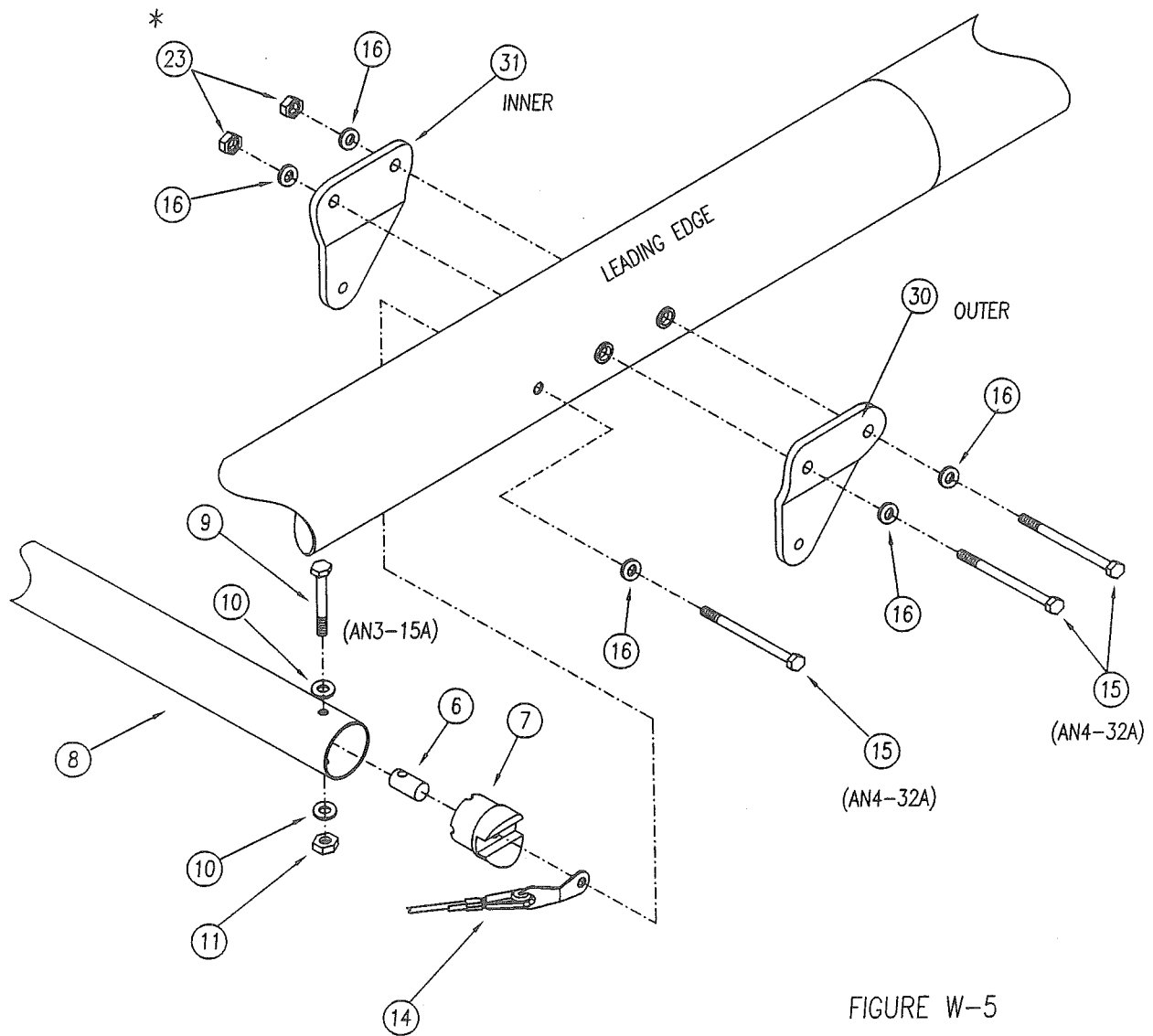
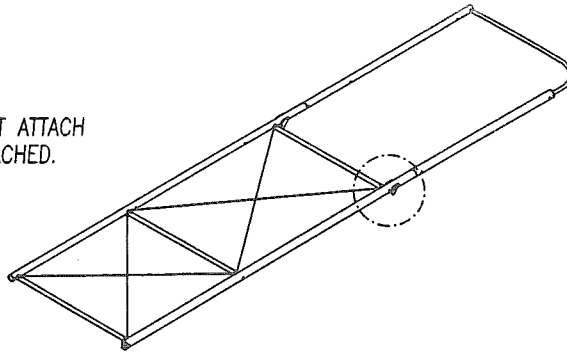


FIGURE W-5  
 OUTER-FORWARD COMPRESSION STRUT  
 AND STRUT ATTACH PLATES

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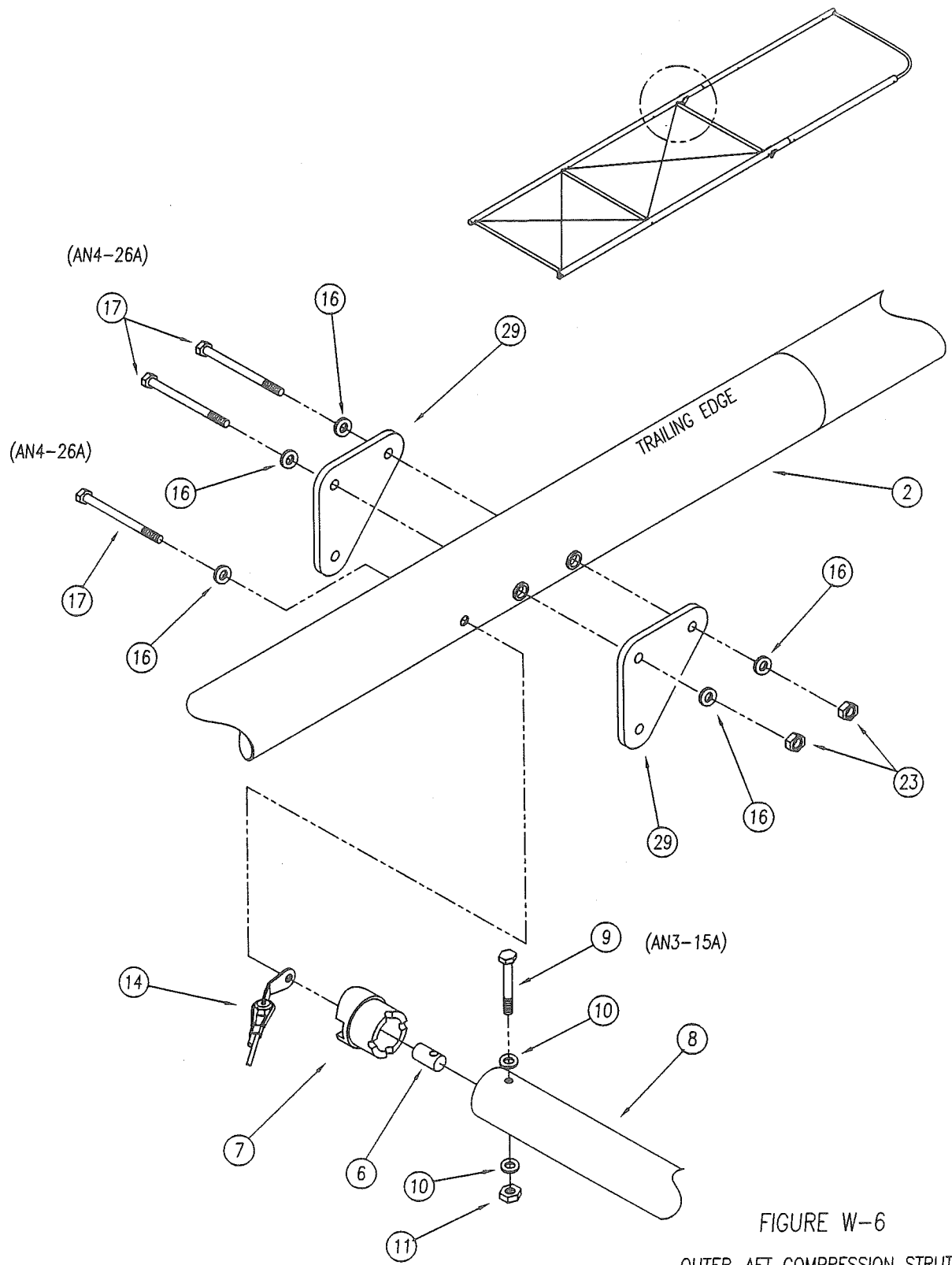


FIGURE W-6

OUTER-AFT COMPRESSION STRUT  
AND STRUT ATTACH PLATES

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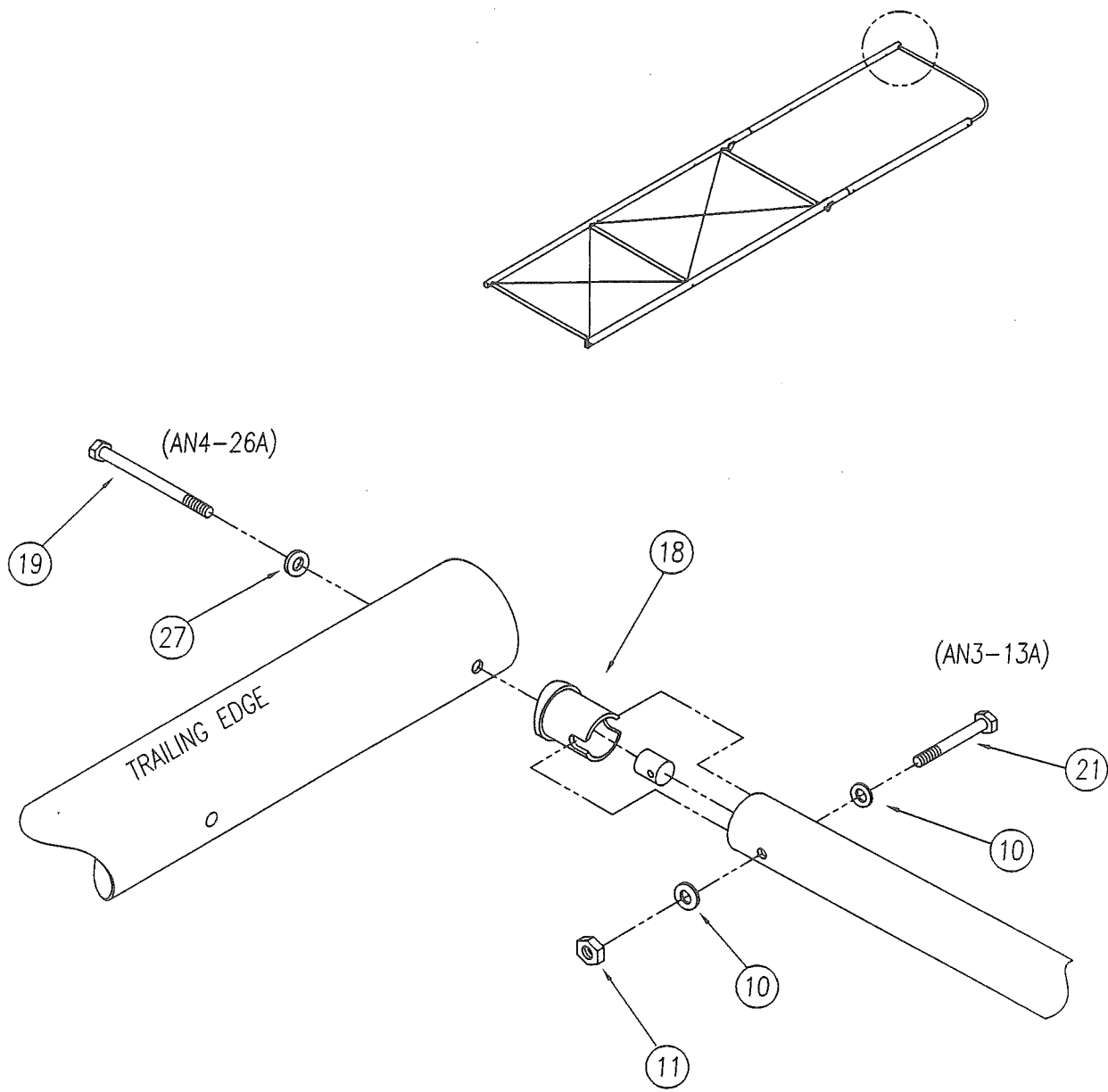


FIGURE W-7

AFT TIP TUBE ASSEMBLY

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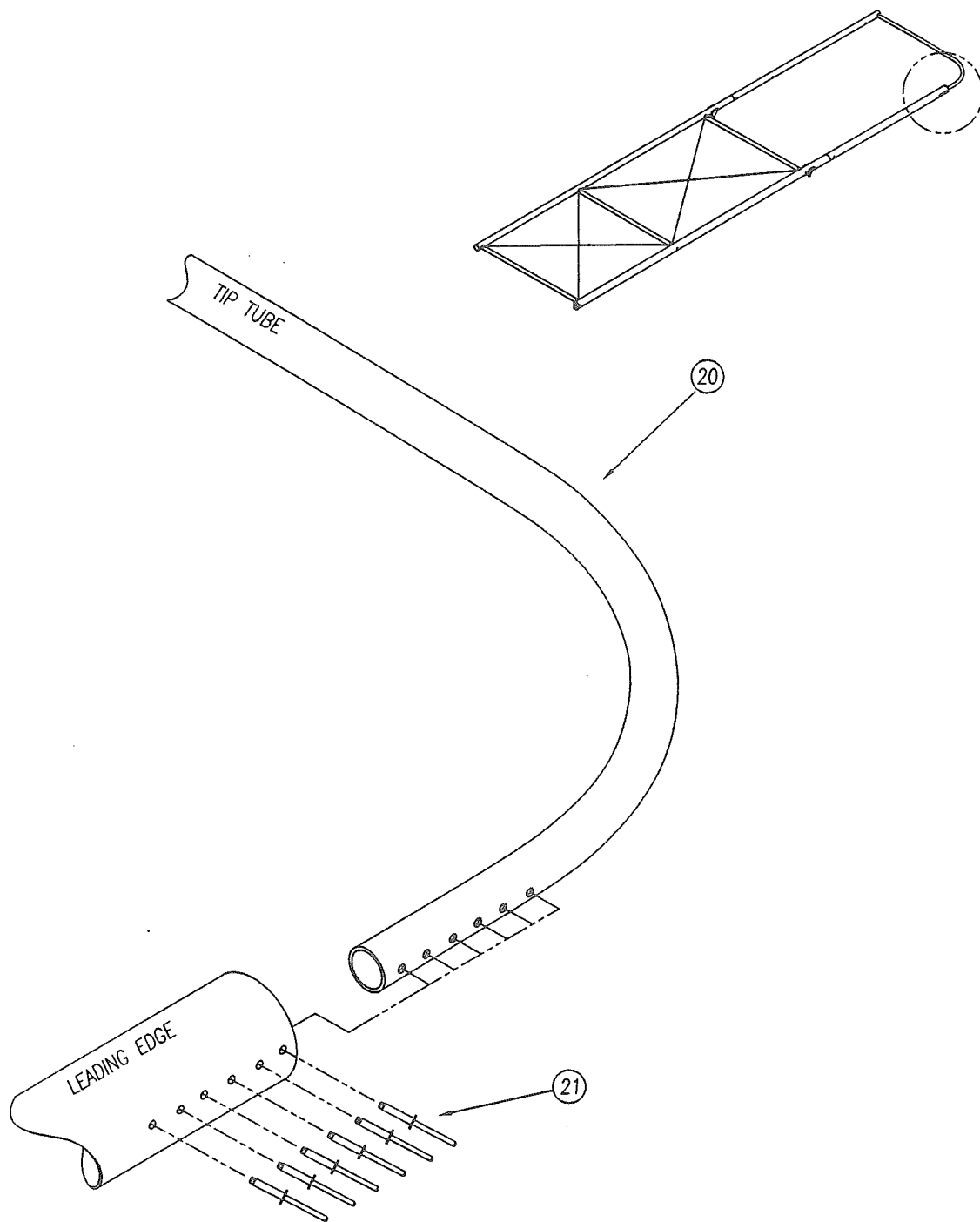


FIGURE W-8

FORWARD WING TIP ASSEMBLY

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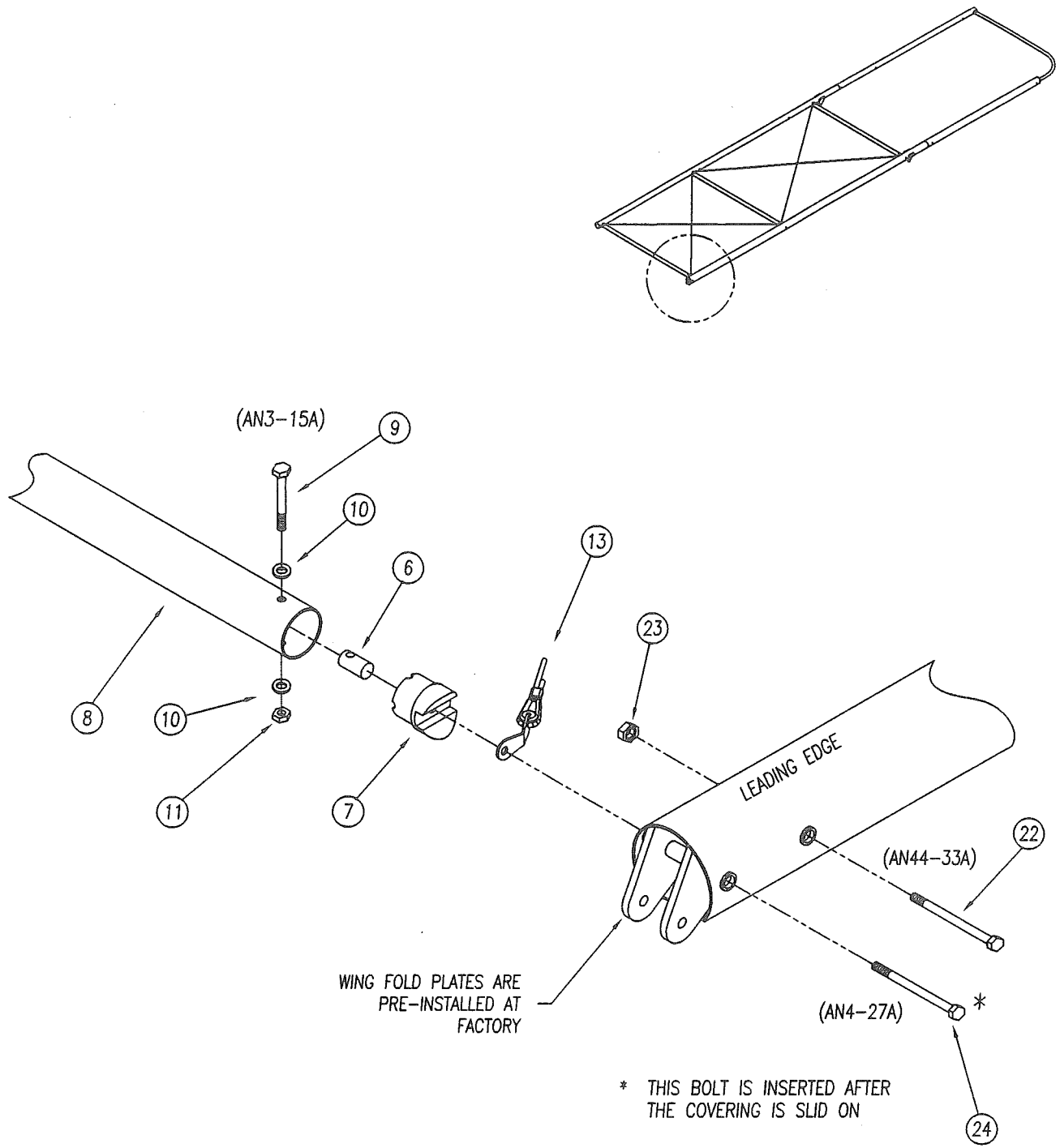
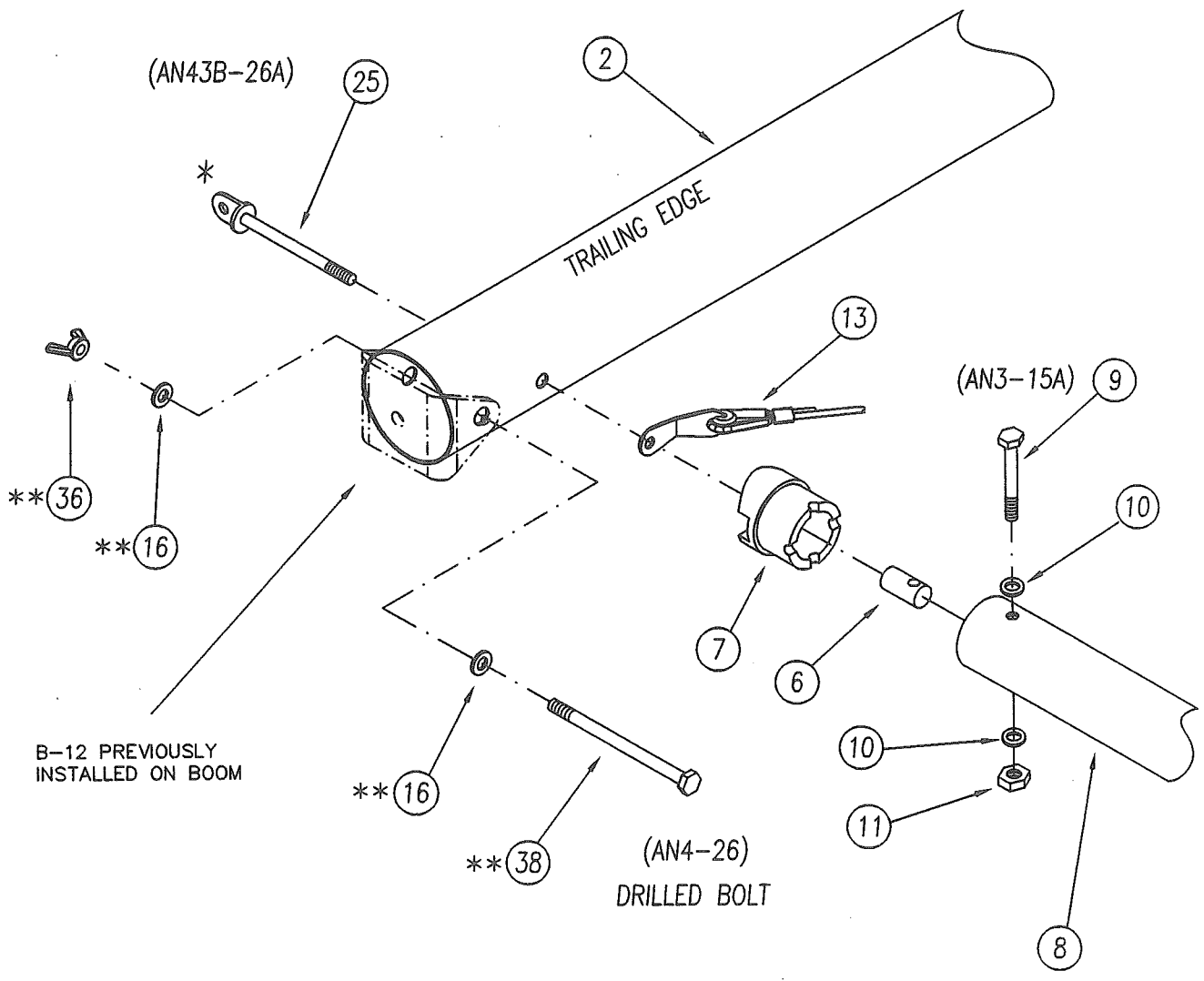
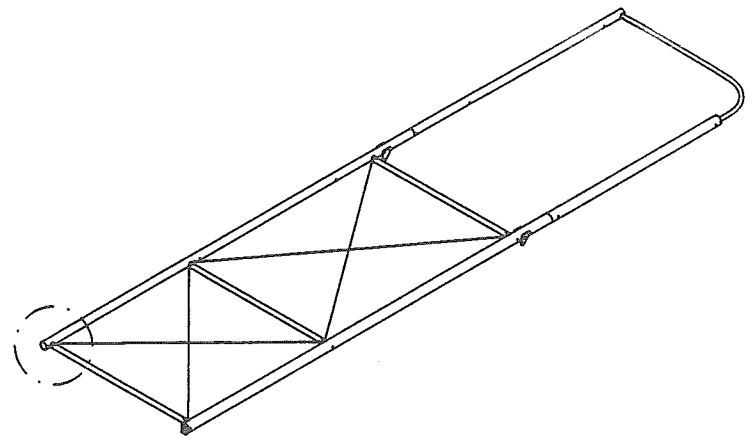


FIGURE W-9  
FORWARD ROOT COMPRESSION STRUT ASSEMBLY

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\* THIS EYEBOLT IS INSERTED AFTER THE COVERING IS SLID ON



B-12 PREVIOUSLY INSTALLED ON BOOM

(AN4-26)  
DRILLED BOLT

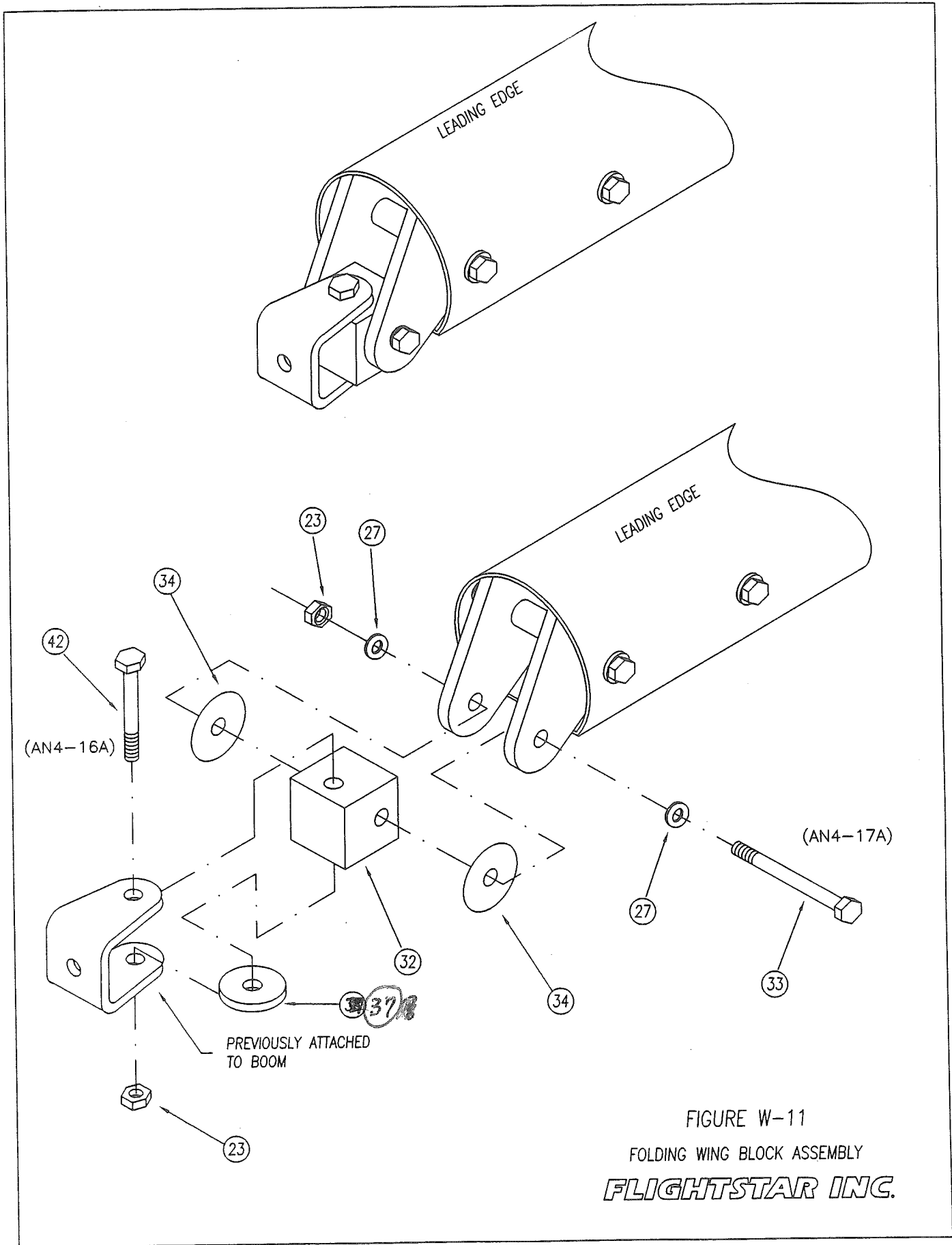
\*\*NOTE THAT THESE FASTENERS ARE USED TO ATTACH THE WING TO THE WING CHANNEL LATER DURING FINAL ASSEMBLY

FIGURE W-10  
AFT-ROOT COMPRESSION STRUT ASSEMBLY

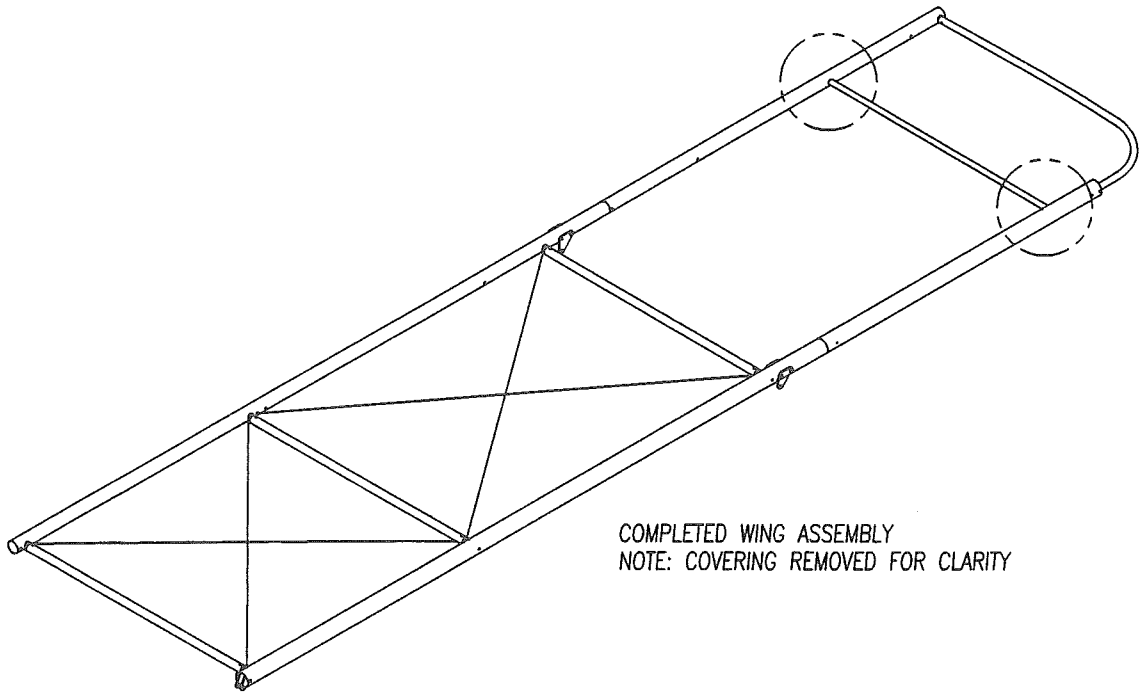
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COMPLETED WING ASSEMBLY  
NOTE: COVERING REMOVED FOR CLARITY

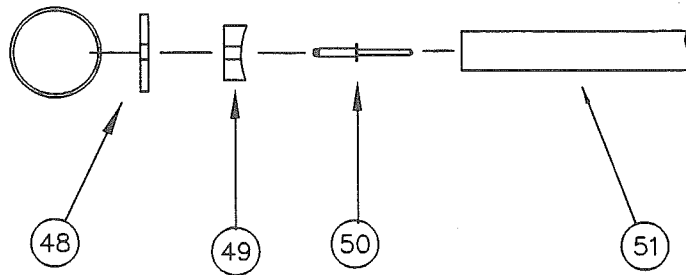


FIGURE W-12

TYPICAL COMPRESSION STRUT ASSEMBLY

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## ✓ CHAPTER 13

### WING ASSEMBLY

#### Section 1 Wing Assembly

#### Figures W-1 through W-11

1. Figure W-1    PREPARING COMPRESSION STRUTS FOR BOTH WINGS
  - a) Prepare nylon compression strut plugs (7) for use in compression struts (8). Place threaded insert (6) into nylon compression strut plug (7). Align holes in the threaded insert with the saddle shaped cut in the nylon compression strut plug, as shown in figure W-1. (*This Assembly Will be Referred To As 'Nylon Compression Strut Plug / Insert'*) Repeat this procedure on all twelve nylon compression strut plugs (7).
  - b) Prepare compression struts, to be used in both wing assemblies, by inserting nylon compression strut plug / insert into each end of the six compression struts, carefully aligning holes. Four of the six compression struts (8), will utilize bolts (9) to attach the nylon compression strut plugs / inserts to compression struts. Place washer (10) on bolt (9). Insert through aligned holes of compression strut (8), and into nylon compression strut plug / insert. Add a second washer (10) and secure with locknut (11). Repeat this procedure on both ends of four compression struts. These compression struts will be referred to as the inner and outer compression struts.
  
2. Figure W-3    MIDDLE COMPRESSION STRUT ASSEMBLY

The middle two compression struts (8) will utilize eyebolts (12) to attach the nylon compression strut plugs / inserts to the compression struts. Place washer (10) on eyebolt (12). Insert through aligned holes on the bottom of compression strut (8) and in through nylon compression strut plug / insert. Add washer (10) and secure with locknut (11). Repeat this procedure on both ends of the last two compression struts. These compression struts will be used, one each, at the middle location of each wing and will receive the inner (13) and outer (14) outer drag riggings, and will be referred to as the middle compression struts.

NOTE: This prepares all compression struts for use in both wings. Two compression struts from 'Step b)' and one compression strut from 'Step 2.' will be used in each wing as noted in assembly instructions below.
  
3. Figure W-2    INSTALLING PLATE NUTS TO REAR WING SPAR FOR HINGES
  - a) To install plate nuts (4) to rear wing spars (2), position spars on a flat non-abrasive surface. Position plate nut (4) over fourth hole as shown in inset in rear wing spar (2).
  - b) TEMPORARILY thread eyebolt (3) into plate nut to hold it securely in place, for riveting. Drill two 3/32" holes through plate nut holes, into rear wing spar. Rivet plate nut into position with pop-rivets (5). Repeat on fifth, ninth, and eleventh holes as indicated in figure W-2. Compare the 1/4" holes in the aileron spar for reference. The eyebolts must be removed before installing the wing covering.

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c) Attach the hardware for the tip compression struts by measuring 163" out from the root of the trailing edge spar and 161-1/2" out on the Leading edge spar. Find the predrilled 3/16" holes. Use Pop rivets (50) fender washers (48) and saddles (49) as shown in Fig. W1 for the later attachment of the compression struts. **DON'T FORGET TO ATTACH THEM PRIOR TO SLIDING ON THE COVERING.**

4. Figure W-3      POSITIONING FOR LEFT WING ASSEMBLY  
Place front (1) and rear (2) wing spars on a clean, flat surface. Be certain that the pre-inserted folding plates, located in the front wing spar (1), as detailed in Figure W-9, are facing downward. This ensures that the front wing spar is in correct position for assembly. Also note that the 6 pre-drilled holes at the tip of the front wing spar (1) face forward for attachment of the curved tip tube (20).
5. Figure W-3      COMPRESSION STRUT DRAG RIGGING ASSEMBLY  
Begin assembly of the compression strut drag rigging system with the middle compression strut (8) that has an eyebolt. Snap the end of inner drag rigging (13) into previously inserted nylon compression strut plug (7). Snap end of outer drag rigging (14) onto that, aligning all holes. **IT IS IMPORTANT TO PLACE THE INNER (13) DRAG RIGGING END IN FIRST, AND THEN THE OUTER (14) DRAG RIGGING IN SECOND, TO AVOID A BUILT IN TURN IN THE WING. IF THE DRAG RIGGING CABLES ARE TOO SLACK, THEY CAN BE TWISTED 1 OR 2 TURNS TO MAKE THEM TIGHTEN UP.**
6. Figure W-3      ATTACHING MIDDLE COMPRESSION STRUT  
Attach the middle compression strut (8) to front wing spar (1) by first placing compression strut (8) with drag rigging into position as shown in figure. Put a drop of service removable loctite on the threads of bolt (15) and insert it through indicated hole on front of front wing spar (1) and into drag riggings and nylon compression strut plug / insert on compression strut. Tighten securely, being careful not to oval (crush)the spar.
7. Figure W-4      INSERTING INNER AND OUTER DRAG RIGGING TO MIDDLE STRUT  
Insert inner (13) and outer (14) drag rigging into other end of middle compression strut (8) as in step 4. Attach middle compression strut (8) to rear wing spar (2) by first placing compression strut (8) with drag rigging into position as shown in figure. Put a drop of service removable loctite on bolt (17) and insert through the indicated hole on back of rear wing spar (2) and into the drag rigging and nylon compression strut plug / insert on compression strut. Tighten securely, being careful not to oval (crush) the spar.
8. Figure W-5      TEMPORARY ATTACHMENT OF OUTER / INNER STRUT ATTACH PLATES TO FRONT WING SPAR  
TEMPORARILY attach outer (30) and inner (31) strut attach plates front, to front wing spar (1) at location indicated in figure, to verify positioning. Place washers (16) on bolts (15) and insert through top holes of outer strut attach plate (30), and through front wing spar (1). Place inner strut attach plate (31) over bolts. Add a second set of washers (16) and finger tightened locknuts (23). **THESE MUST BE REMOVED AND REINSTALLED AFTER COVERING IS PUT ON.**

## ✓ Chapter 13 SECTION 1 WING ASSEMBLY

9. **Figure W-5 OUTER COMPRESSION STRUT ATTACHMENT**  
Insert outer (14) drag rigging into end of outer compression strut (8). Attach outer compression strut (8) to front wing spar (1) by first placing compression strut (8) with drag rigging, into position as shown in figure. Put a drop of service removable loctite on bolt (15) and insert through indicated hole on front of front wing spar (1); adjacent to outer strut attach plate (30), and into drag rigging and nylon compression strut plug / insert on compression strut. Tighten securely, being careful not to oval (crush) the spar.
10. **Figure W-6 TEMPORARY ATTACHMENT OF OUTER / INNER STRUT ATTACH PLATES TO REAR WING SPAR**  
TEMPORARILY attach strut attach plates rear (29), to rear wing spar (2) at location indicated in figure. Place washers (16) on bolts (17) and insert through top holes on back of strut attach plate (29), and through rear wing spar (2). Place second strut attach plate (29) over bolts. Add a second set of washers (16) and fingered tightened locknuts (23). **THESE MUST BE REMOVED PRIOR TO AND REINSTALLED AFTER THE COVERING IS PUT ON.**
11. **Figure W-6 ATTACHING OUTER COMPRESSION STRUT TO REAR WING SPAR**  
Insert outer (14) drag rigging into other end of outer compression strut (8). Attach outer compression strut (8) to rear wing spar (2) by first placing compression strut (8) with drag rigging into position as shown in figure. Put a drop of service removable loctite on bolt (17) and insert it through indicated hole on back of rear wing spar (2) and into drag rigging and nylon compression strut plug / insert on compression strut. Tighten securely, being careful not to oval (crush) the spar.
12. **Figure W-7 ATTACHING CURVED TIP TUBE TO REAR WING SPAR**  
a) Attach the curved tip tube (20) to rear wing spar (2) by first placing threaded insert (6) into the tip plug (18), carefully aligning the holes. Place tip plug (18) into curved tip tube (20), again aligning holes.  
  
Drill out the existing hole for bolt (21) with a 3/16" drill. Place washer (10) on bolt (35) and insert through the curved tip tube (20). Add a second washer and secure with locknut (11).  
  
b) Position curved tip tube to rear wing spar as shown in figure. Place washer (27) on bolt (19). Insert through back of rear wing spar (2) and into tip plug on curved tip tube. Do not tighten the bolt completely.
13. **Figure W-8 ATTACHING CURVED TIP TUBE TO THE FRONT WING SPAR**  
Attach the curved tip tube (20) to the front wing spar (1) by inserting the end of the curved tip tube into the front wing spar as shown, carefully aligning holes. Insert rivets (21), as indicated, through the front of the front wing spar, and in through the curved tip tube. Pop rivet into place as shown.

**✓ Chapter 13 SECTION 1 WING ASSEMBLY**

**14. Figure W-7 ATTACHING TIP COMPRESSION STRUTS TO BOTH SPARS**

a) Attach the tip compression struts (51) to the previously attached hardware at the wing tip by placing them between the spars. **DON'T FORGET TO ATTACH THE COMPRESSION STRUTS BEFORE SLIDING ON THE COVERING.**

a) Figure W-9 ATTACHING FOLDING PLATES

Insert bolt (22) through the indicated hole to secure the rear hole of the folding plates. Secure with locknut (23).

**PRIOR TO ATTACHMENT OF THE WING COVERING, SECURE THE DRAG RIGGING FROM ABRASION. FIND THE SHORT PLASTIC FUEL LINE SECTIONS FOUND ON THE DRAG RIGGING. SECURE THEM IN THE MIDDLE OF THE X CREATED BY THE RIGGING, USING A SMALL TIE WRAP OR SAFETY WIRE.**

**15. Not Pictured ATTACHING THE COVERING TO THE LEFT WING**

a) Be certain that **TEMPORARILY** installed hardware has been removed prior to applying wing covering. Refer back to Steps 2, 7 and 9.

b) Carefully check wing frame for any surfaces that might snag the covering. Tape over all rough spots with clear mylar or other box-packing type tape, particularly at the junction of the curved tip tube (20) and the front wing spar (1). Use several strips of mylar tape, spanwise (down the spar onto the tip), in this area, to prevent snagging or ripping the sail covering as it slides over the frame.

c) Lay out the wing covering, (40) bottom side up, on a clean, flat surface, such as carpet, grass, or the best, padded saw horses.

d) Slip the covering on to the wing frame, taking care not to use excessive force on the tubes. Any part that hangs up on the covering might rip the fabric. Make certain that the eyebolts (12) on the bottom of the middle compression strut, as pictured in Figures W-3 and W-4, are on the same side as the pre-cut holes in the covering for the jury strut / eyebolt connection. Remove bolt (19) that attaches the rear end of the tip tube. Pivot the rear of the tip tube in towards the root of the wing several inches, this allows the cloth to loosen at the tip and makes the attachment of the covering at the root much easier.

e) Snap the end of the inner drag rigging (13) into the end of the final (inner) compression strut (8), aligning holes. Attach inner compression strut (8) to front wing spar (1) by aligning it with hole on front wing spar as shown. Insert bolt (24) through corresponding grommet, at an angle, and use as a lever to aid in pulling the wing covering tight. This will help to pull the cover in place. Finally, tighten bolt securely into compression strut.

f) figure W-10 COMPLETING DRAG RIGGING & CONTINUING WITH COVERING

Snap the end of the inner drag rigging (13) into end of inner compression strut (8), aligning holes. Position end of inner compression strut (8), as shown, against rear wing spar (2). Insert eyebolt (25) through grommet in



## ✓ Chapter 13 SECTION 1 WING ASSEMBLY

the covering and into the second hole of the rear wing spar, and into the compression strut. Note that there are no washers used on this eyebolt, as the covering grommet is quite thick at this location. Re-insert bolt (19) into the trailing edge and the rear of the tip tube.

- g) Place washer (16) on bolt (38) and insert TEMPORARILY through end hole of rear wing spar (2), as shown. Add a second washer (16) and finger tightened wing nut (36). This will be removed when the wings are attached to the plane later.

### 16. a) Figure W-5 REATTACHING FRONT STRUT ATTACH PLATES

Reattach outer (30) and inner (31) strut attach plates front, to front wing spar (1) at location indicated in figure. NOTE: BECAUSE OF THE SADDLED SHAPE, THERE IS AN INNER AND OUTER PLATE. POSITION AS SHOWN. Place washers (16) on bolts (15) and insert through top holes of outer strut attach plate (30), and through front wing spar (1). Place inner strut attach plate (31) over bolts. Add a second set of washers (16) and securely tighten with locknuts (23).

### b) Figure W-6 REATTACHING REAR STRUT ATTACH PLATES

Reattach strut attach plates rear (29), to rear wing spar (2) at location indicated in figure. Place washers (16) on bolts (17) and insert through top holes on back of strut attach plate (29), and through rear wing spar (2). Place second strut attach plate (29) over bolts. Add a second set of washers (16) and securely tighten with locknuts (23).

### c) Figure W-2 REATTACHING EYEBOLTS

To reattach eyebolts (3) into previously installed plate nuts (4), locate the PRECUT holes through the covering. Add two washers per eyebolt and insert through forth, fifth, ninth, and tenth holes in rear wing spar (2) and into plate nuts, tightening securely. *Note that the washers are added to space the hinge point even with the eyebolt that fits through the covering grommet.*

### 17. Figure W-11 ATTACHING FOLDING BLOCKS TO FOLDING PLATES

- a) Attach the folding block (32) to the pre-installed folding plates by positioning the folding block, with Teflon shims (34) on each side, into the folding plates. Carefully align holes. Place washer (27) on bolt (33) and insert through holes. Add a second washer (27) and tighten locknut (23), allowing the block to swivel.

- b) TEMPORARILY insert bolt (28) through top hole of folding block. Add plastic washer (37) and a finger tightened locknut (23).

**THIS BOLT WILL BE USED TO ATTACH THE WING TO THE FUSELAGE IN CHAPTER 13 / SECTION 3 / STEP 1. THESE HARDWARE PARTS WILL NOT APPEAR ON THE PARTS LIST IN THAT SECTION.**

✓ **Chapter 13** SECTION 1 WING ASSEMBLY

18. Figure W-12 INSERT RIBS INTO COVERING

a) Assemble the 24 bent upper (42) and 20 straight lower wing ribs (41) using front batten end (44) and rear batten end (45) as shown in figure. Trim the rear of 2 of the upper ribs 3/8". Use these at the root of the wing. **TRIM ONLY TWO OF THESE FOR THE UPPER ROOT.**

b) Insert the 10 lower batten wing ribs (41) into the slots on the lower surface of the wing covering. Slide the front of the rib into the rib pocket. Push the wing rib until the rear plastic plug snaps into place on the rear wing spar. This can be quite difficult and can be made easier by the use of a hammer handle to push with. Take a ball peen or similar hammer and place the head in the inside of your elbow, push up and in with the handle using your hip to push your elbow. It's best to have a helper hold the wing in place. It's also easier with the wing on the plane with the ailerons not attached yet as well.

c) Repeat procedure with the 12 upper batten ribs (42) into slots of the upper surface of the wing covering.

19. Not Pictured ADJUSTING TENSION OF WING COVERING

a) Most wing coverings come with a grommet root tensioning system. After assembly of the wings, tension the root top of the wings with tie wraps (46). If the system has the "QUICK RELEASE" adjustable buckle option, please refer to STEP b) below.

b) Locate the adjustable nylon buckles found on the upper center of the wing covering. Insert the webbing under the bottom of the buckle and then thread the webbing up through the buckle. It is important the buckle really grabs the webbing. If it does not, repeat threading, as the webbing was inserted incorrectly.

c) Tightly pull the webbing until the top of the wing covering is smooth between the ribs, but not so tight as to make wrinkles on the leading edge of the wing.

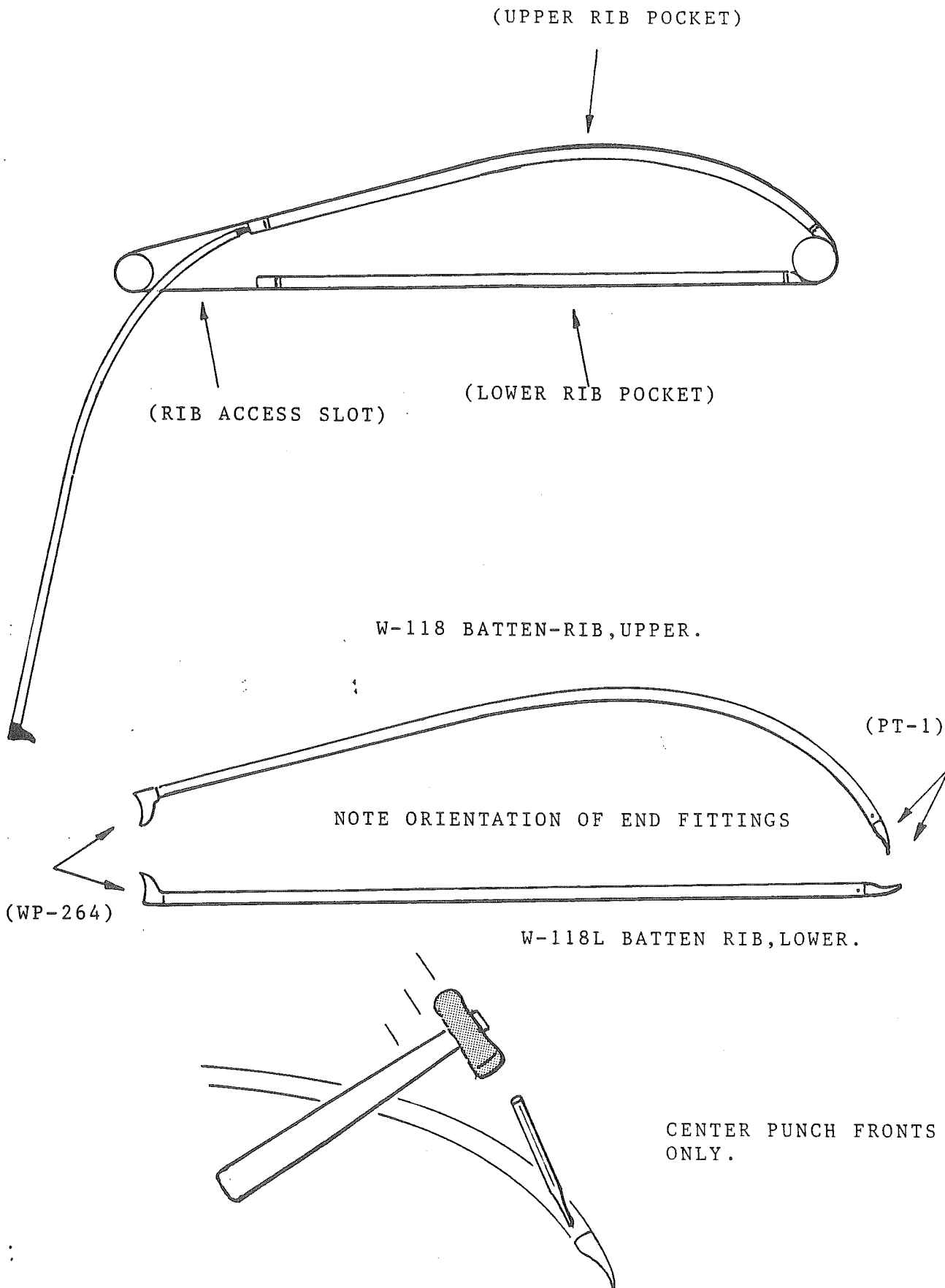
d) Attach gap seal (47) to the tensioned wing covering using the velcro sewn on the gap cover and wing covering. Cut a slot on both sides of the gap seal at the front and secure it to the wing covering with a small ty-wrap. If the plane is equipped with the optional flap system, trim and seal the covering and the gap seal in that area.

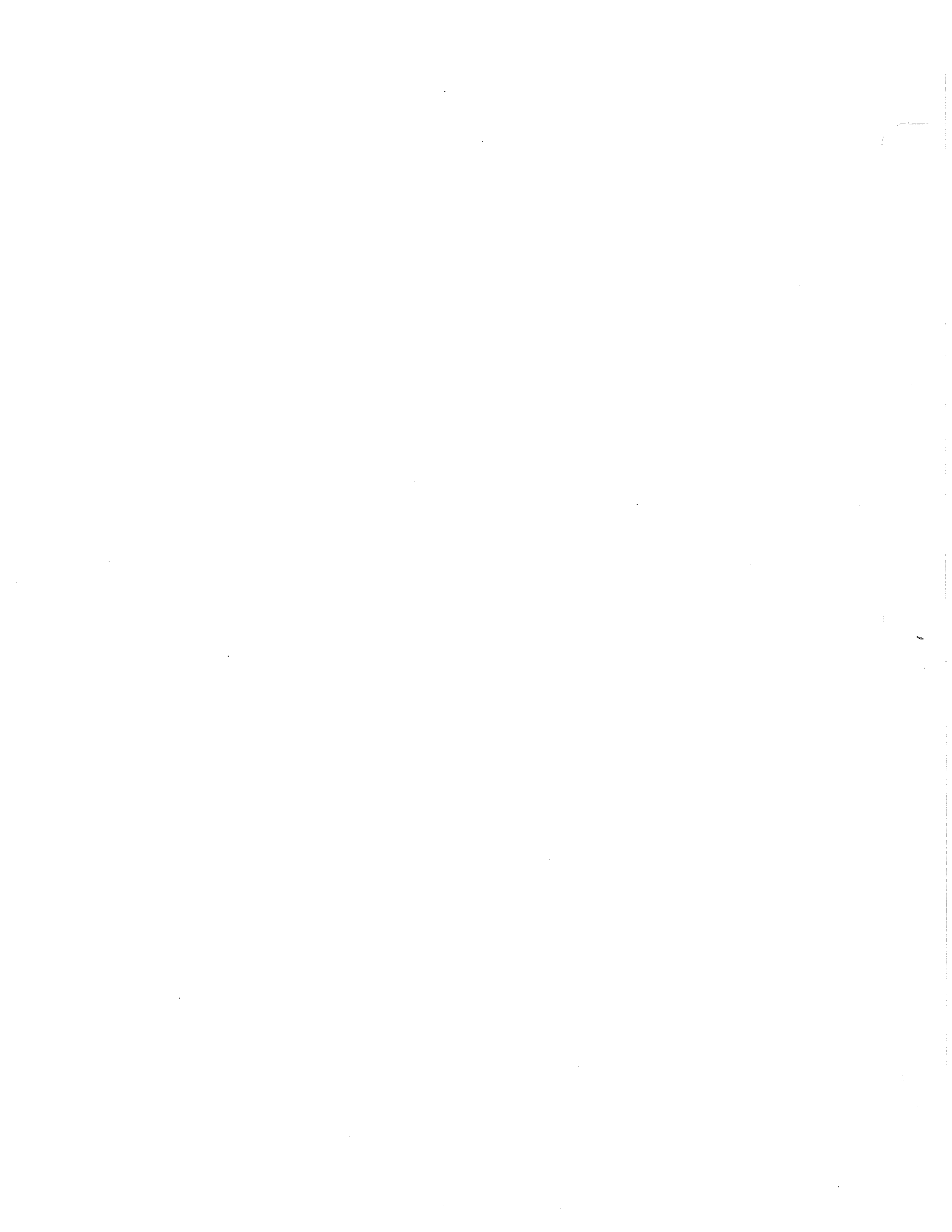
Attach the lower Velcro seal on the bottom of the covering. Trim the access area for the lower part of the flap handle cut. Trim the access for the primer pump line.

20. Not Pictured ASSEMBLY OF RIGHT WING

Follow steps 3-19 to assemble the right wing.

**AN IMPORTANT NOTE: AVOID THE ACCIDENTAL MAKING OF A SECOND LEFT WING INSTEAD OF A RIGHT WING, BE CERTAIN THAT THE PRE-INSTALLED FOLDING PLATES ATTACHED TO THE RIGHT SIDE FRONT WING SPAR (1) POINT DOWNWARD!!**





✓ Chapter 13

SECTION 2 STRUT ASSEMBLY & ATTACHMENT

Section 2

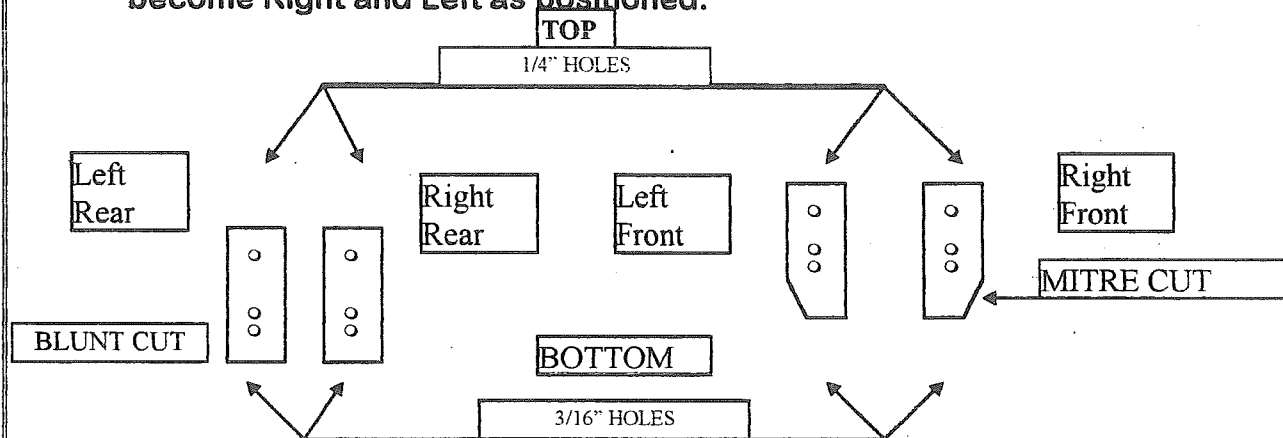
Strut Assembly & Attachment

Figure WS-1

**NOTE: IMPORTANT INFORMATION:**

For identification purposes: The front wing struts are longer than the rear wing struts. The tubes are *similar*, but different. Note the difference in Part number on the part.

- a) The Right and Left Front (1), and the Right and Left Rear (2) wing struts are identical in appearance. To determine which are right and which are left, place the wing struts side by side, with blunt edges together. These become Right and Left as positioned.



- b) It is IMPORTANT that ALL BOLTS, IN BOTH RIGHT AND LEFT; FRONT AND REAR STRUTS ARE INSERTED POINTING DOWN. Verify That Struts Are In Correct Right And Left Positioning Before Inserting Bolts.
- c) All blunt edges of the 4 struts must point forward when attached to the wing.

**PLEASE NOTE THAT THESE INSTRUCTIONS WILL NOT BE REPEATED**

1. Figure WS-1 Right Front Strut Assembly

- a) Begin strut assembly by placing strut spacer washers (5), on top and bottom of strut pivot (6), aligning holes. Slide into the end of the right front wing strut (1), with the single 1/4" holes, aligning holes. Place washer (4) on bolt (3). Insert through aligned holes. Add a second washer (4) and locknut (7), tightened to remove all slop, but allowing for freedom of movement until strut is attached to the wing. At that time, the locknut (7) will be securely tightened.
- b) Position strut attach block (10) into the end of right front wing strut (1) with the two 3/16" holes, aligning holes. Place washers (9) on two bolts (8) and insert

## ✓ Chapter 13 SECTION 2 STRUT ASSEMBLY & ATTACHMENT

through aligned holes. Add washers (9) and securely tightened locknuts (11).

- c) Refer to bottom left of figure, indicating later attachment of wing strut to wing. Prepare strut pivot (6), at this time, by placing washer (14) on bolt (13) and TEMPORARILY inserting through holes on extended portion of strut pivot (6). Add a second washer (14) and a finger tightened wingnut.

### 2. Figure WS-1      RIGHT REAR WING STRUT ASSEMBLY

Position right rear wing strut (2) as was done for right front wing strut (1) above, NOTE: THE REAR WING STRUTS DO NOT HAVE THE MITRE CUT AT THE BOTTOM THAT THE FRONT WING STRUTS DO.

Repeat Steps a), b), and c) for installation and preparation of the strut pivot (6) and strut attach block (10).

### 3. Not Pictured      LEFT FRONT WING STRUT ASSEMBLY

a) Position left front wing strut (1) as noted above in IMPORTANT INFORMATION block. Begin strut assembly by placing strut spacer washers (5), on top and bottom of strut pivot (6), aligning holes. Slide into non-mitre end of right front wing strut (1), again aligning holes. Place washer (4) on bolt (3). Insert through the aligned holes. Add a second washer (4) and locknut (7), tightened to remove all slop, but allowing for freedom of movement until strut is attached to the wing. At that time, the locknut (7) will be securely tightened.

b) Position strut attach block (10) into mitred end of right front wing spar (1), aligning holes. Place washers (9) on two bolts (8) and insert through aligned holes. Add washers (9) and securely tightened locknuts (11).

c) Refer to bottom left of figure, indicating later attachment of wing strut to wing. Prepare strut pivot (6), at this time, by.

### 4. Not pictured      LEFT REAR WING STRUT ASSEMBLY

Position left rear wing strut (2) as was done for left front wing strut (1) above. HOWEVER IT SHOULD BE NOTED THAT THE REAR WING STRUTS DO NOT HAVE THE MITRE CUT THAT THE FRONT WING STRUTS DO.. Repeat Steps a), b), and c) for installation and preparation of the strut pivot (6) and strut attach block (10).

### 5. Figure WS-1      ATTACHING STRUTS TO WINGS

a) Position right front strut, as shown in bottom left figure, with the strut pivot (6) between the strut attach plate (*previously attached to front wing spar in Chapter 13 / Section 1 / Figure W-5.*) Place washer (14) on bolt (13) and insert through strut plate hole and add a second washer (14), the strut pivot, a third washer (14), strut plate, and a fourth washer (14) and locknut. Tighten locknut to allow for freedom of movement.

**✓ Chapter 13 SECTION 2 STRUT ASSEMBLY & ATTACHMENT**

- b) Repeat entire procedure for left front strut.
  - c) Repeat entire procedure for right and left rear struts. (Inner and Outer Strut Attach Plates were attached to Rear Wing Spar in Chapter 13 / Section 1 / Figure W-6)
6. Figure WS-1      INSERTING EYEBOLTS TEMPORARILY THROUGH STRUTS  
 Insert eyebolt (12) through indicated hole on right front strut. Add washer (9) and a finger tightened locknut (11).

THE WASHER AND LOCKNUT WILL BE REMOVED AND REATTACHED WHEN ATTACHING LOWER JURY STRUTS IN SECTION 3.

**✓ Chapter 13 SECTION 2 STRUT ASSEMBLY & ATTACHMENT**

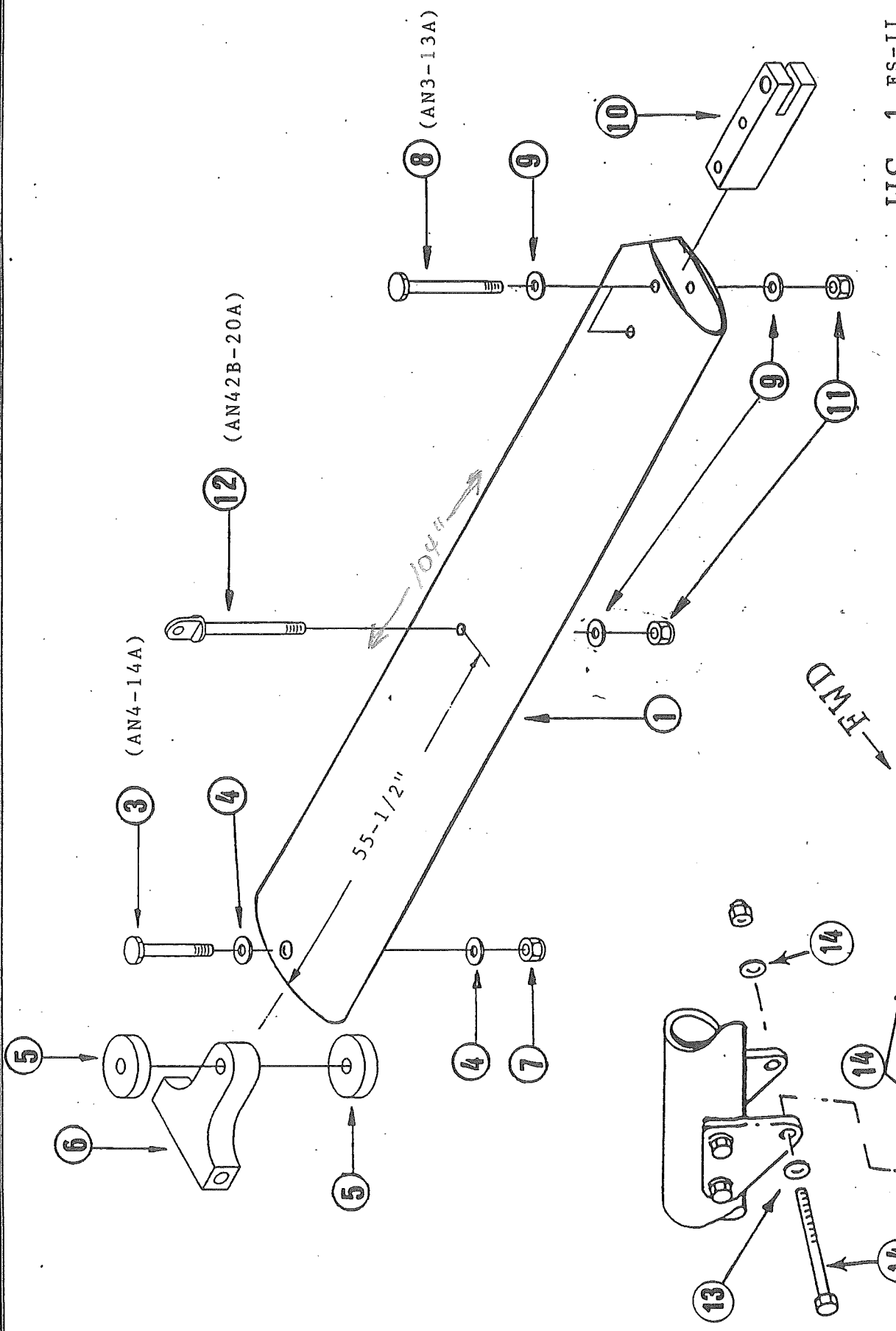
**Section 2  
Strut Parts List  
Figure WS-1**

INDEX#	PART #	QTY	DESCRIPTION
1.	W-332	2	FRONT WING STRUT
2.	W-332-1	2	REAR WING STRUT
3.	AN4-14A	4	1/4" BOLT
4.	AN960-416	8	1/4" WASHER
5.	W-317	8	STRUT SPACER WASHER
6.	W-306	4	STRUT PIVOT
7.	AN365-428	8	1/4" LOCKNUT
8.	AN3-13A	8	3/16" BOLT
9.	AN960-10	20	3/16" WASHER
10.	W-307	4	STRUT ATTACH BLOCK
11.	AN365-1032	10	3/16" LOCKNUT
12.	AN42B-20A	4	3/16 EYEBOLT
13.	AN4-26A	4	1/4" BOLT
14.	AN960-416L	16	1/4" WASHERS





DRAFT



WS-1 FS-II

RIGHT FRONT STRUT SHOWN

FLIGHTSTAR



✓ **Chapter 13** SECTION 3 WING & JURY STRUT ATTACHMENT  
Section 3  
Wing & Jury Strut Attachment To Plane  
Figures W-10, W-11 & WS-2

NOTE THAT THE STRUT ATTACH PLATE IS MOUNTED ON THE BOTTOM OF THE CAGE RAIL ON **FLIGHTSTAR II & IISL**. THIS STRUT ATTACH PLATE WAS PREVIOUSLY ATTACHED IN CHAPTER 2 / SECTION 2 / FIGURE CA-2.

1. **Figure W-11 ATTACHING THE WINGS TO FOLDING WING CHANNEL ON THE BOOM**
  - a) Remove the TEMPORARILY INSERTED BOLT, WASHER AND LOCKNUT from the folding block (previously attached in Chapter 13 / Section 1 / Step 17a / Figure W-11).
  - b) With the aid of an assistant to hold the wing tip, align the folding block on the root end of the wing, with the forward steel folding wing channel (previously attached to the boom in Chapter 8 / Section 1 / Step b / Figure BA-2).
  - c) Reinsert bolt (from step a, above) through folding wing channel and folding block, making sure that the plastic spacer washer is inserted between bottom of folding block and folding wing channel. Secure with the locknut.
2. **Figure W-10 ATTACHING THE WINGS TO THE REAR WING CHANNEL**
  - a) Remove the TEMPORARILY INSERTED BOLT, WASHERS, AND WING NUT from the end hole of the rear wing spar (inserted during Chapter 13 / Section 1 / Step g / Figure W-10).
  - b) With the aid of an assistant to hold the wing tip, align the trailing edge of the root end of the wing, with the rear wing channel on the boom (previously attached to the boom in Chapter 8 / Section 1 / Step c / Figure BA-2).
  - c) Reinsert bolt and washer through trailing edge and rear wing channel. Add second washer and secure with wing nut and safety ring (9).
  - d) Repeat entire procedure for other side.
3. **Figure WS-2 left side inset ATTACHING FRONT AND REAR STRUTS TO THE CAGE**
  - a) Locate the right strut attach plate on the bottom of the cage (previously installed in Chapter 2 / Section 2 / Figure CA-2).
  - b) Align the holes of the front strut / strut attach block with the strut attach plate. Insert bolt (10) through holes. The strut may need to be twisted slightly to aid alignment. Add washer (11) and securely tightened wing nut (12). Finish with safety ring (9).
  - c) Repeat entire procedure for rear strut.
  - d) Repeat entire procedure on the left side.

## ✓ Chapter 13 SECTION 3 WING & JURY STRUT ATTACHMENT

4. Figure WS-2 right side inset **INSERTING JURY STRUT PLUGS INTO JURY STRUTS**  
Insert the jury plug (12) into one end of a jury strut with a predrilled 3/16" hole, aligning the holes. Insert aluminum brad (5) through the aligned holes. Lightly peen the end of the aluminum brad. Repeat the entire procedure on all jury struts, at the location of the predrilled 3/16" holes.

THE LOWER JURY STRUTS (3) WILL HAVE PREDRILLED HOLES IN BOTH ENDS. THE FORWARD (1) AND REAR (2) JURY STRUTS HAVE ONLY ONE PREDRILLED HOLE.

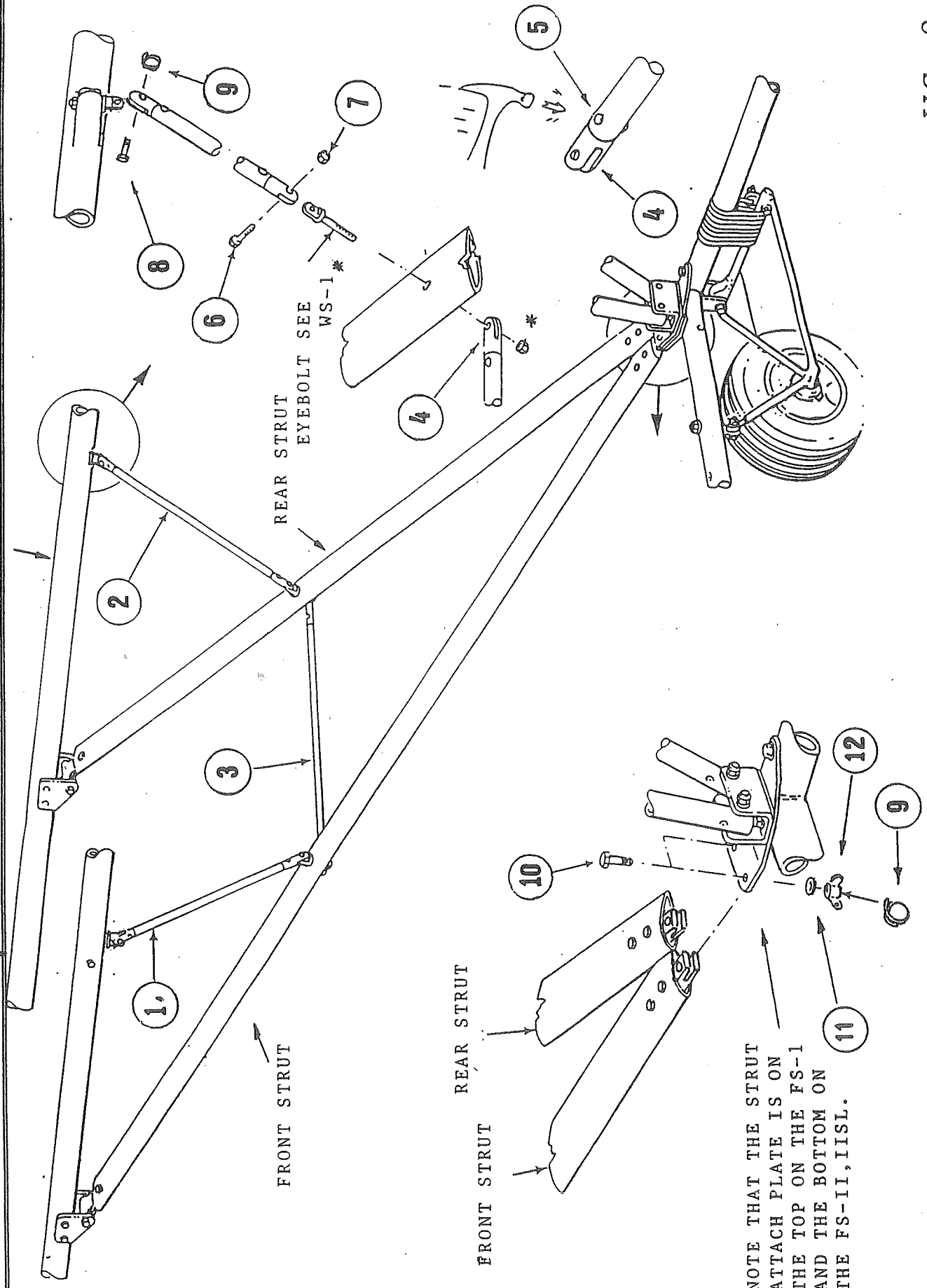
5. Figure WS-2(right side view) **ATTACHING LOWER JURY STRUT TO FRONT AND REAR STRUT**
- Locate previously installed eyebolts (see Chapter 13 / Section 2 / Step 6 / Figure WS-1) on the front and rear struts. Remove washers and locknuts. Position the lower jury strut (3) on the bottom of the eyebolts. Reinstall washers and locknuts, securely tightened.
  - Repeat entire procedure for left side.
6. Figure WS-2 **ATTACHING FORWARD AND REAR JURY STRUTS TO FRONT AND REAR WING SPARS**
- As above, locate previously installed eyebolts (see Chapter 13 / Section 2 / Step 6 / Figure WS-1) on the front and rear struts. Align forward jury strut (1) with eyebolt located on the front strut. Attach with bolt (6) and secure with locknut (7).
  - Repeat entire procedure for rear jury strut (2) to rear strut.
7. Figure WS-2 **ATTACHING FORWARD AND REAR JURY STRUTS TO MIDDLE COMPRESSION STRUT**
- Locate eyebolts that are on the middle compression struts on the wings, the eyebolts poke out of the pre-cut holes in the covering (see Figure W-3 and W-4 for location).
  - Insert jury strut plugs into the unattached ends of the forward and rear jury struts. Swing the forward jury strut up to align with the eyebolt located on the middle compression strut. Mark the position of the lower hole on the jury strut plug and then mark the position on the strut. Drill the jury strut for a 3/16" upper attachment hole. [DRILL THESE PLUGS IN PLACE AS THE FOUR DRILLED PLUGS / STRUTS WILL RESULT IN 4 DIFFERENT ANGLES.]
  - Insert aluminum brad (5) through the just drilled holes of jury strut / plug. Lightly peen the end of the aluminum brad.
  - Attach jury strut to upside down eyebolt using a clevis pin (8) and a safety ring (9).
  - Repeat entire procedure for rear jury strut to middle compression strut eyebolt.
  - Repeat step 6a through f for the left side assembly.

**✓ Chapter 13    SECTION 3    WING & JURY STRUT ATTACHMENT**

**Section 3  
Wing & Jury Strut Attachment To Plane Parts List  
Figure WS-2**

<b>INDEX#</b>	<b>PART #</b>	<b>QTY</b>	<b>DESCRIPTION</b>
1.	W-329-1	2	FORWARD JURY STRUT
2.	W-329-5	2	REAR JURY STRUT
3.	W-329-3	2	LOWER JURY STRUT
4.	W-25	12	JURY STRUT PLUG
5.	187R0750A	12	ALUMINUM BRAD
6.	AN3-7A	4	3/16" BOLT
7.	AN365-1032	4	3/16" LOCKNUT
8.	AN393-21	4	3/16" CLEVIS PIN
9.	CS-152	8	SAFETY RING
10.	AN4-11A	4	1/4" BOLT
11.	AN960-416	4	1/4" WASHER
12.	AN350-4	4	WING NUT





NOTE THAT THE STRUT ATTACH PLATE IS ON THE TOP ON THE FS-1 AND THE BOTTOM ON THE FS-II, IISL.



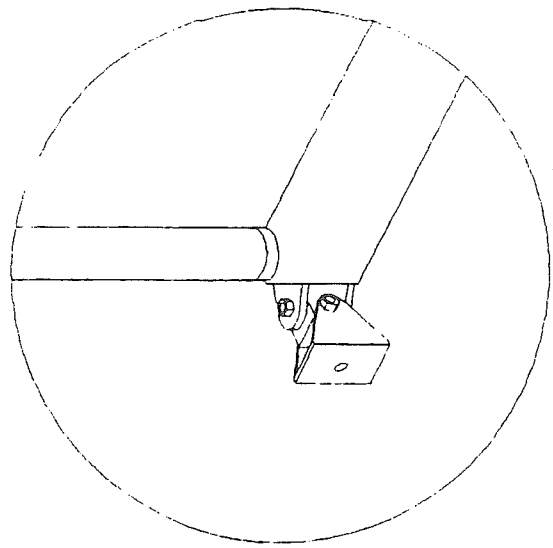


## WING FINAL ASSEMBLY NOTES

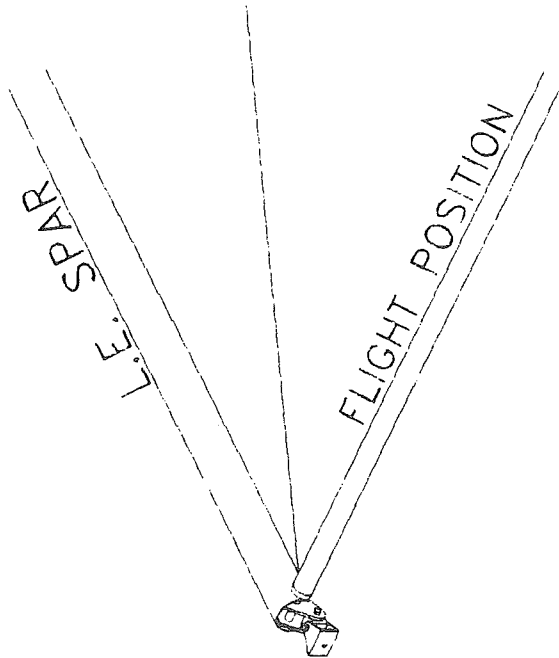
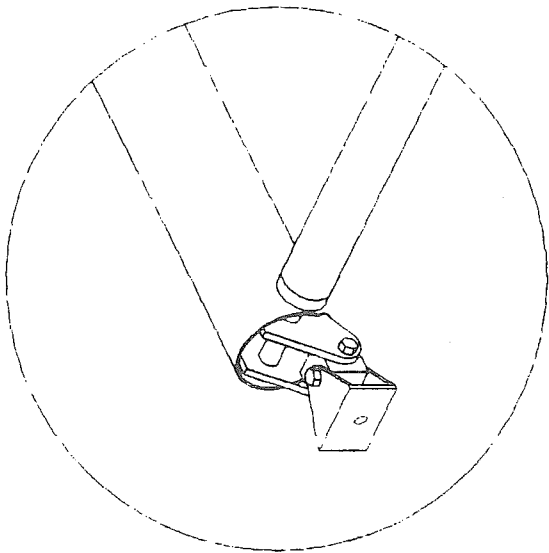
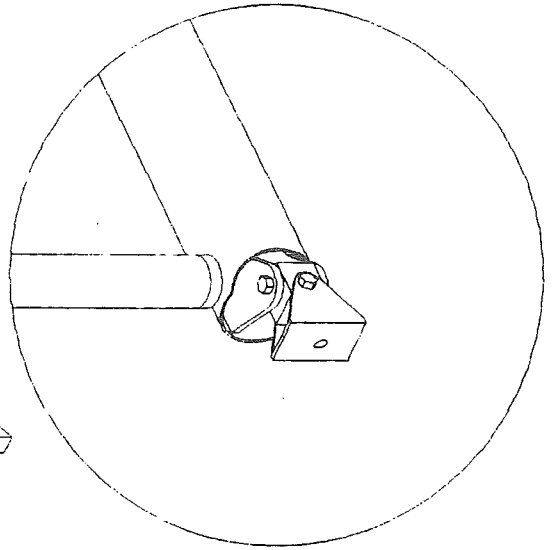
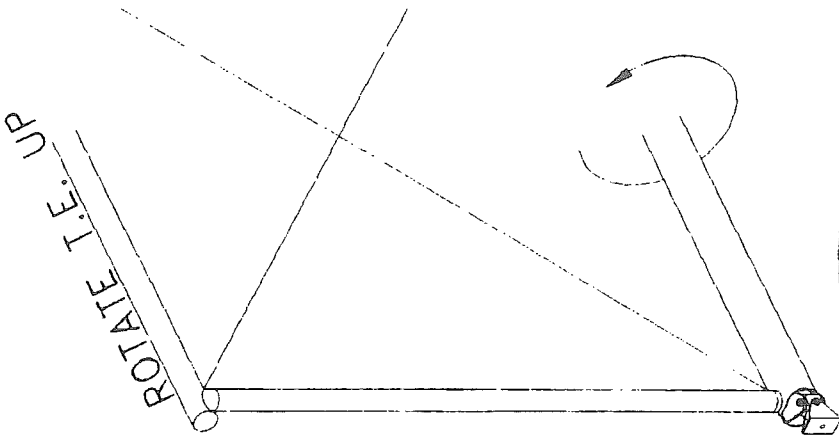
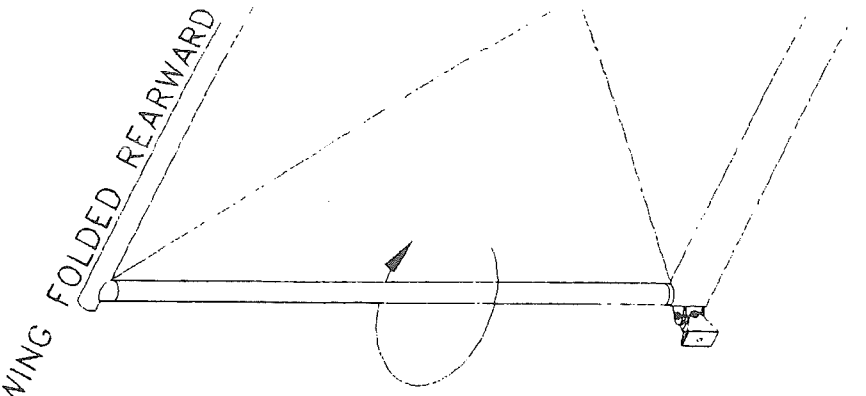
Much of the information regarding the final assembly of the wings is presented previously in Chapter 13. There are however several things that need to be remembered.

1. Have a helper ready when you attach the wings. The first time, three people total is preferable. If you and a friend are doing this alone, you can use a 5' step ladder at the rear wing channel location. Attach the folding wing swivel block first.
2. Make certain that you trimmed 3/8" off of the upper root ribs, prior to installing them.
3. Secure the gap cover to the root of the wing by cutting a small slot in either side with a hot knife. Attach the cover with two small ty-wraps.
4. Make certain that the hinges are free to pivot, you should be able to rotate the hinge bolts with your fingers.
5. When folding the wings, pivot them up and back. You can rest the wings on the tail. The plane will sit tail low in this configuration. Secure the root of the wing by using a bungee between the aileron tubes. The ailerons fold down flat to the outside.
6. Cut the slot for the flap lever (if your plane is so equipped) and the handle at the bottom using a hot knife. Draw out the cut out with a pencil and trim with scissors then clean up the edge with the hot knife.
7. The final assembly process is made a lot easier with a custom made "Flightstar assembly tool" this made from a hardware store cheapo screwdriver. This tool is great for lining up the folding blocks, the rear wing channel and struts. Choose a size with a 1/4" shank (#2 phillips). Grind the shank into a point. If you spend more than \$ 4.00 on this you're cheating!





WING FOLDED REARWARD



FS II

3DFOLD

PN-

SCALE:

**FLIGHTSTAR, INC.**

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## ✓ Chapter XX SECTION 1 SPRAYING ACRYLIC URETHANE "MONTANA PRODUCTS CRYSTAL CLEAR PAINT."

***WARNING! This is very a dangerous product and procedure.*** Please follow all safety precautions and use the correct equipment.      **PREPARING YOUR WING COVERING FOR PAINT.**

1. Do not use any Silicone spray while assembling the aircraft. This will cause the paint to "Fish eye". Water works the best to help slip on the coverings while assembling the Flaps and Ailerons.
2. If possible it is easiest to to paint on the flat, rather than vertical. 2 X 4 fixtures or angle iron sawhorses can be built to support the wings and tails . This is best done with the Ailerons, flaps and tails assembled. This keeps the paint from getting in the Velcro at the gap seals.
3. Tape off any exposed tubing and hardware (hinge bolts etc...).
4. Wipe down the covering with reducer or Lacquer thinner. Clean any stained areas.
5. Follow the instructions on the Montana can for instructions on reducing and application pressures etc.
6. Three coats are required for a glossy finish and adequate UV protection.
7. First coat: Apply a "medium" tack coat. Don't try to fill the pores of the fabric. Allow 4-8 hours for this to dry. This seals the fabric so the second and third coat stay on top of the fabric. This gives the best finish and prevents the fabric from being glued to the airframe.
8. Second coat: Apply a "wet" coat. Again, don't try to fill the pores or spray it on so thick that you get sags and runs. Allow approximately 16 hours drying time before wet sanding with 600 grit wet/dry sand paper. Avoid sanding over the stitched areas. Wet sanding removes any fibers that might be sticking up out of the material and dust that may be stuck to the paint. Only use enough water to keep the paper from filling up. When done wet sanding wipe down the covering with a clean, dry, lint free cloth.
9. Third and final coat: After the second coat you will see some areas start to gloss. The third and final coat will fill the rest of the areas and give glossy finish. Let this coat dry overnight. Remove the tape being careful not to peel the paint off with the tape. Mount the wings and tails on the aircraft and readjust the hinge bolts. Use the adjustment procedure used in the assembly manual.



✓ Chapter 13 SECTION 4 AILERON W/FLAPS ASSEMBLY

Section 4  
 Aileron Assembly  
*(Used with optional Wing flap system)*  
 Figure AF-1

**IMPORTANT NOTE: THE ASSEMBLY PROCEDURES FOR THE RIGHT AND LEFT AILERONS ARE IDENTICAL UNTIL THE APPLICATION OF THE AILERON COVERS AND THE ATTACHMENT OF THE AILERON HORNS (14). IT IS THE POSITION OF THE AILERON HORNS AND THE ORIENTATION OF THE VELCRO GAP SEAL THAT WILL DETERMINE IF IT IS A RIGHT OR LEFT AILERON.**

1. Figure AF-1 VIEW OF RIGHT SIDE AILERON

Position the front aileron spar (1) and the rear aileron tube (2) on a clean flat surface as shown in the figure. The rear aileron tube (2) should be positioned so that the 3/8" holes align correctly with the 3/8" holes in the front aileron spar (1). *(one simple way to verify this is to turn the tube in both directions. If the rear aileron tube is incorrectly positioned when the holes are opposite the holes of the front aileron spar, one edge of the rear aileron tube will extend beyond the front aileron spar. Note that the 70" measurement from the tube end to the 3/4" hole will be positioned at the inside end of the front aileron spar that will accept the control horn (14).)*

2. Figure AF-1 ATTACHING THE PLATE NUTS

- a) Verify that the 3/8" rib holes on the front aileron spar (1) are pointing rearward as shown in the figure. TEMPORARILY insert two eye bolts (10) in through the 1/4" holes shown. Thread plate nuts (3) over both eye bolts (10) and position the plate nuts horizontally.
- b) Using a 3/32" drill, drill holes through the plate nuts into the front surface of the front aileron spar. Attach both plate nuts with two pop-rivets (4) each. Eyebolts may be removed at this time for later insertion after the covering has been applied.

3. Figure AF-1 ATTACHING THE AILERON RIBS

- a) Insert aileron ribs (5), (6), (7) & (8) into the 3/8" holes, as shown, on the front aileron spar (1) and rear aileron tube (2). Wrap mylar tape, in a half loop, around the front aileron spar and rear aileron tube, in order to help hold the ribs in place.

Place aluminum pop-rivet (11) through outside hole of the front aileron spar (1) and into the aileron ribs (5) & (8). The rivets do not grip into the rib.

**✓ Chapter 13** SECTION 4 AILERON W/FLAPS ASSEMBLY  
VERIFY THAT THE POP-RIVETS HAVE BEEN POSITIONED INSIDE THE RIB  
BEFORE POP-RIVETING.

4. Figure AF-1 ATTACHING AILERON TORQUE TUBE
- a) Slide the anchor plug (16) into the end with the predrilled 3/16" hole of the aileron torque tube (17), carefully aligning the holes.
  - b) Drill out the holes with a 3/16" drill to clean out the holes and to remove the threads on the anchor plug. **DO NOT DO THIS ON THE FLAPS!**
  - c) Insert aluminum brad rivet (18) through holes. Cut the rivet head off and file down so that the rivet is roughly flush to the torque tube.
  - d) Using a set punch or nail, punch the rivet on both ends. File or grind the rivet so that it is blended in with the torque tube. The surface should be smooth, so that it can be easily inserted into the front aileron spar (1).
  - e) Insert the end of the aileron torque tube (17) with the anchor plug, into the large 3/4" hole of the front aileron spar (1). The torque tube must be positioned so that the cut out on the bottom side faces outward as shown.
  - f) Place a drop of serviceable Loctite on bolt (15). Slide on washer (11) and insert through the 1/4" hole that is in front of the large 3/4" hole of front aileron spar (1) and into the anchor plug (16) / aileron torque tube (17). Tighten the bolt securely, but be careful not to strip the anchor plug, as it is aluminum.
5. Figure AF-1 ATTACHING THE AILERON TIP PLATE
- a) Carefully bend the edges of the aileron tip plate (19) to conform to the curves of both the front aileron spar and the rear aileron tube.
  - b) Position the aileron tip plate (19) over the front aileron spar and rear aileron tube as shown in the figure.
  - c) Measure the outside distance from the outermost edge of the front aileron spar (1) to the outermost edge of the rear aileron tube (2), at the aileron tip plate (19). **ADJUST SPARS AS NECESSARY TO OBTAIN A DISTANCE OF 7 11/16" THIS IS A CRITICAL MEASUREMENT. MARK THE POSITION WITH A PENCIL FOR REFERENCE.** Before attaching the aileron tip plate (19) to the ends of the front aileron spar (1) and the rear aileron tube (2), sight down the frame from tip toward root to confirm that the rear aileron tube (2) has no twists in the surface. **DO NOT SIMPLY PRESS THE TIP PLATE FLAT TO THE GROUND; SINCE THE AILERON IS TAPERED, THIS WILL GUARANTEE A TWIST!**
  - d) Using the inside hole of the aileron tip plate on the front aileron spar as a guide, drill a 1/8" hole and insert (*but do not pop-rivet at this time*) a pop-rivet (20).



**✓ Chapter 13 SECTION 4 AILERON W/FLAPS ASSEMBLY**

- e) Use a carpenter's square, or similar, to verify that the aileron tip plate (19) and the front aileron spar (1) are at 90 Deg. Make any necessary adjustments.
- f) Again, verify that the outside distance measured from the outermost edge of the front aileron spar to the outermost edge of the rear aileron tube at the aileron tip plate is 7 11/16". (IT IS IMPERATIVE THAT THIS MEASUREMENT IS NOT "WIDE").
- g) Pop-ribose the inserted pop-ribose (20). Drill and pop-ribose the hole next to that one. Flip the frame over to drill and pop-ribose the two holes of the aileron tip plate (19) on the front aileron spar as described above. CONFIRM THAT THERE IS NO TWIST IN THE SURFACE. When completed, flip the frame back to its original position.
- h) Drill a hole for the pop-ribose on the outside hole of the aileron tip plate on the rear aileron tube (2). Place the pop-ribose in the hole (20), but do not complete pop-ribose until verifying the 7-11/16" dimension.
- i) Drill the final hole on this side of the aileron plate tip, as described previously. Insert, but do not pop-ribose the pop-ribose. Make any necessary adjustments and then complete pop-ribose.
- j) Flip the frame over and complete procedure for final two holes on the aileron plate tip over the rear aileron tube.
- k) Carefully contour or bend over the edges of the tip plate. File all sharp edges, smooth. Cover the aileron tip plate with a mylar tape, or equivalent, to prevent snagging of the aileron cover. Check the entire frame for any rough edges and smooth and tape them. Repeat this procedure for the second aileron.

**Note:** The pile of the Velcro gap seal on the rear of wing is up. The hook on the ailerons and flaps are down and the control horn on the ailerons point down and forward.

**6. NOTE: A REMINDER THAT AT THIS POINT, THE ASSEMBLY FOR THE RIGHT AND LEFT SIDES IS IDENTICAL. THE ATTACHMENT POSITION OF THE AILERON CONTROL HORN (16), DETERMINES RIGHT AND LEFT SIDE DIFFERENTIATION.**

**7. Figure AF-1 COVERING THE RIGHT SIDE AILERON**

- a) Make certain that the TEMPORARILY inserted eyebolts from Step 2 have been removed before sliding on the aileron cover.
- b) Position the frame as shown in the figure. Use a talc or warm water to lubricate the frame, so that the aileron cover will slide on more easily. DO NOT USE OILS OR ANY OIL BASE LUBRICANT. IT WILL DAMAGE THE COVERING!

**✓ Chapter 13 SECTION 4 AILERON W/FLAPS ASSEMBLY**

- c) Position the aileron cover (20) over the narrow end of the frame with the GROMMETS FACING DOWN and the velcro edge facing forward.
- d) Pull the aileron cover over the frame CAREFULLY. Back the frame up against a padded wall and pull the covering down the frame. The cover fits very tightly and will require patience to apply. Do not pound the frame, as damage may occur. Remember that the tighter the cover, the better the aerodynamic shape in flight. The pouring of warm water into the cover, when nearly on, will loosen the cloth and will aid in getting the last few inches on. Rubber gloves can help get more grip to pull with and a helper is very useful.

**8. Figure AF-1 TIE WRAPPING THE GROMMETS TO FINISH APPLYING THE COVER**

- a) Pull the cover tightly enough so that the two ends that have the grommets are over the torque tube and are approximately no more than 1" apart.
- b) Insert tie wraps (22) through the grommets as shown in figure, smaller end first. Pull through and tighten snugly, helping to narrow the gap. Use the tie wraps to help pull the last few inches. Work the cover down more.
- c) Continue in this manner, working the cover down, and tightening all tie wraps, until the gap is fully closed and the two edges of the cover are able to touch each other.
- f) Snip off the 'tail' of the tie wraps.

**NOTE:** The cover should be "drum tight" along the whole length. If not, remove the tie wraps and the cover. Lightly bend the trailing edge tube outward in any loose areas of the trailing edge.

**9. Figure AF-1 REINSERTING THE EYEBOLTS**

- a) Using the figure as a guide, locate the two eyebolt holes through the covering. Use a scratch awl or a pin to help. Hot knife or carefully cut the velcro, over the holes, and sear the edges with a soldering iron. Be careful not to cut too much of the stitching, except over the eyebolt hole.
- b) Place washer (9) on eyebolt and insert into the hole and the threaded plate nut. Repeat with the second eyebolt.

**10. Figure AF-1 ATTACHING RIGHT SIDE AILERON HORN**

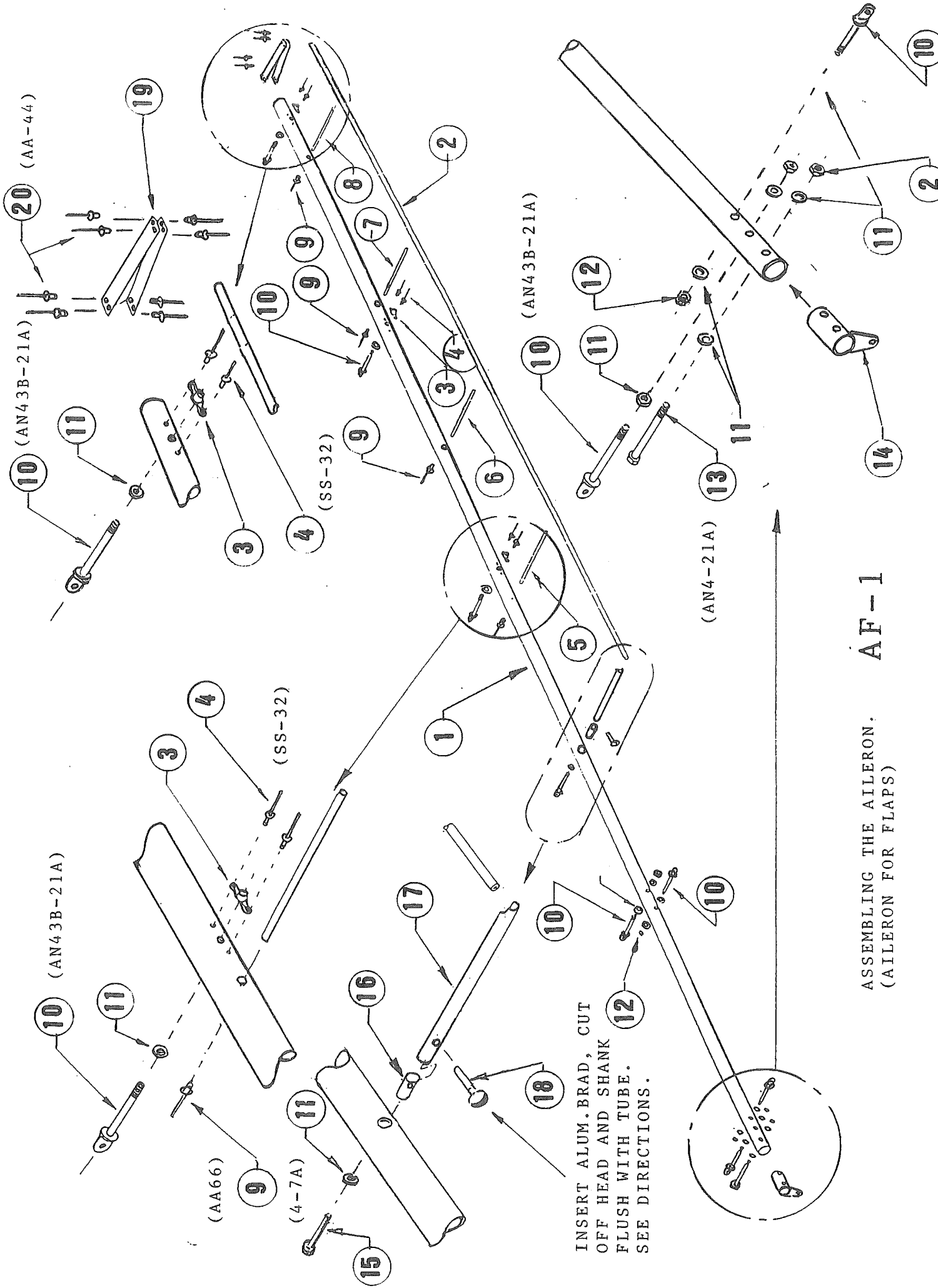
**THE AILERON HORNS ARE NOT ATTACHED UNTIL AFTER THE FLAP GAP SEAL HAS BEEN PUT ON. PROCEED WITH THE NEXT SECTION. AILERON HORN ATTACHMENT INSTRUCTIONS WILL BE FOUND IN CHAPTER 13 / SECTION 5 / STEP 14.**

✓ Chapter 13 SECTION 4 AILERON W/FLAPS ASSEMBLY

Section 4  
 Aileron Parts List  
 (Used with optional Wing flaps system)  
 Figure AF-1

INDEX#	PART #	QTY	DESCRIPTION
1.	W-279-5	2	FRONT AILERON SPAR
2.	W-279-3	2	REAR AILERON TUBE
3.	MS21047-4	6	1/4" PLATE NUT
4.	SS32	12	3/32" POP-RIVET
5.	W-279-7	2	AILERON RIB - 9 7/8"
6.	W-279-9	2	AILERON RIB - 9 5/16"
7.	W-279-11	2	AILERON RIB - 8 3/4"
8.	W-279-13	2	AILERON RIB - 8 3/16"
9.	AA66	8	3/16" ALUMINUM POP-RIVET
10.	AN43B-21A	10	1/4" EYEBOLT
11.	AN960-416	28	1/4" WASHER
12.	AN365-428	10	1/4" LOCKNUT
13.	AN4-21A	2	1/4" BOLT
14.	CS-114	2	AILERON HORN FOR FLAP OPTION
15.	AN4-7A	4	1/4" BOLT
16.	W-40	2	ANCHOR PLUG
17.	W-125	2	AILERON TORQUE TUBE
18.	A187R1250A	2	ALUMINUM BRAD RIVET
19.	W-42A	2	AILERON TIP PLATE
20.	AA44	16	1/8" ALUMINUM POP-RIVET
21.	SC-363-1	2	AILERON COVER
22.	TRP-12	12	TIE WRAP 12"





INSERT ALUM. BRAD, CUT  
 OFF HEAD AND SHANK  
 FLUSH WITH TUBE.  
 SEE DIRECTIONS.

ASSEMBLING THE AILERON.  
 (AILERON FOR FLAPS)

# AF-1



**✓ Chapter 13**      SECTION 5  
OPTIONAL FLAP ASSEMBLY & ATTACHMENT

**Section 5**  
**Optional Flap Assembly & Attachment**  
**Figures AF-2 & AF-3**

**IMPORTANT NOTE: THE ASSEMBLY PROCEDURE FOR THE OPTIONAL FLAP IS VERY SIMILAR TO THAT OF THE AILERON. THERE ARE DIFFERENCES, HOWEVER, SO PLEASE READ INSTRUCTIONS CAREFULLY. THE BEGINNING ASSEMBLY PROCEDURES FOR THE RIGHT AND LEFT FLAPS ARE IDENTICAL UNTIL THE APPLICATION OF THE FLAP COVER AND THE ATTACHMENT OF THE FLAP CONTROL HORN (16). DO NOT DRILL OUT THE THREADS ON THE TORQUE TUBE ANCHOR PLUG (11).**

1. **Figure AF-2**                      **VIEW OF RIGHT SIDE FLAP**  
Position the front flap spar (1) and the flap trailing edge (2) on a clean flat surface as shown in the figure. The flap trailing edge (2) should be positioned so that the holes align correctly with the 3/8" holes in the front flap spar (1). *(one simple way to verify this is to turn the tube in both directions. If the flap trailing edge is incorrectly positioned when the holes are opposite the holes of the front flap spar, one edge of the flap trailing edge will extend beyond the front flap spar.*
  
2. **Figure AF-2**                      **ATTACHING THE PLATE NUTS**
  - a) Verify that the 3/8" hole on the front flap spar (1) is pointing inward as shown in the figure. TEMPORARILY insert two eye bolts (8) in through 1/4" holes shown. Thread plate nuts (3) on to both eye bolts (8).
  
  - b) Using a 3/32" drill, drill holes through the plate nuts into the front surface of the front flap spar. Attach both plate nuts with two pop-rivets each (4). Eyebolts may be removed at this time for later insertion after the covering has been applied.
  
3. **Figure AF-2**                      **ATTACHING THE RIBS**
  - a) Insert flap rib (5) and flap rib (6) into 3/8" holes on front flap spar (1) and flap trailing edge (2) as shown. Wrap mylar tape, in half a loop, around the front flap spar and flap trailing edge, in order to help hold the ribs in place.  
  
Place aluminum pop-rivet (7) through the 3/16" hole of the front flap spar (1) and into the flap rib (5). VERIFY THAT THE POP-RIVET HAS BEEN POSITIONED INSIDE THE RIB BEFORE POP-RIVETING.
  
  - b) Repeat this entire procedure with second flap rib (6).
  
4. **Figure AF-2**                      **ATTACHING FLAP TORQUE TUBE**
  - a) Slide the anchor plug (11) into the end of the flap torque tube (12) with the

## ✓ Chapter 13

### SECTION 5 OPTIONAL FLAP ASSEMBLY & ATTACHMENT

predrilled 3/16" hole, carefully aligning the holes. **DO NOT DRILL OUT THE THREADS.**

- b) **TEMPORARILY** insert a bolt (13) through the aligned holes, to hold the anchor plug in place.
- c) Insert the end of the flap torque tube (12) with the anchor plug into the 5/8" hole of the front flap spar (1). The flap torque tube must be positioned so that the cut out side faces as shown to fit on the flap trailing edge (2).
- d) Place a drop of serviceable loctite on bolt (10). Slide on washer (8) and insert through end hole of front flap spar (1) and into the anchor plug (11) / flap torque tube (12). Tighten the bolt securely, but be careful not to strip the anchor plug, as it is aluminum. Once this is completed the **TEMPORARILY** inserted bolt may be removed.

#### 5. Figure AF-2 ATTACHING THE FLAP TIP PLATE

- a) Carefully bend the edges of the aileron tip plate (17) to conform to the curves of both the front flap spar and the flap trailing edge.
- b) Position the flap tip plate (17) over the front flap spar and flap trailing edge as shown in the figure.
- c) Measure the outside distance from the outermost edge of the front flap spar (1) to the outermost edge of the flap trailing edge (2), at the aileron tip plate (17). **ADJUST SPARS AS NECESSARY TO OBTAIN A DISTANCE OF 7 11/16" THIS IS A CRITICAL MEASUREMENT. MARK THE POSITION WITH A PENCIL FOR REFERENCE.**
- d) Before attaching the aileron tip plate (17) to the ends of the front flap spar (1) and the flap trailing edge (2), sight down the frame from tip toward root to confirm that the flap trailing edge (2) has no twists in the surface.
- e) Using the inside hole of the flap tip plate on the front flap spar as a guide, drill a 1/8" hole and insert *(but do not pop-rievet at this time)* a pop-rievet (18).
- f) Use a carpenter's square, or similar, to verify that the flap tip plate (17) and the front flap spar (1) are at 90°. Make any necessary adjustments.

Again, verify that the outside distance measured from the outermost edge of the front flap spar to the outermost edge of the flap trailing edge at the aileron tip plate is 7 11/16". (IT IS IMPERATIVE THAT THIS MEASUREMENT IS NOT "WIDE").

- g) Pop-rievet the inserted pop-rievet (18). Drill the 1/8" hole for the second pop-rievet on the flap tip plate, and pop-rievet. Flip the frame over to drill and pop-rievet the two bottom holes of the flap tip plate (17) on the front flap spar as described above. Confirm that there is no twist in the surface. When completed, flip the



**✓ Chapter 13** SECTION 5 OPTIONAL FLAP ASSEMBLY & ATTACHMENT

frame back to its original position.

- g) Drill a hole for the pop-rivet on the outside hole of the aileron tip plate over the flap trailing edge (2). Place the pop-rivet in the hole (18), but do not complete pop-riveting until verifying the 7-11/16" dimension
- h) Drill the final hole on this side of the aileron tip plate, as described previously. Insert, but do not pop-rivet the pop-rivet. Verify that the tip is square. Make any necessary adjustments and then complete pop-riveting.
- i) Flip the frame over and complete procedure for final two bottom holes on the flap plate tip on the flap trailing edge.
- j) Carefully contour or bend over the edges of the tip plate. File all sharp edges, smooth. Cover the flap tip plate with a mylar tape, or equivalent, to prevent snagging of the aileron cover. Check the entire frame for any rough edges and smooth and tape them. Repeat this procedure for the second (left side) flap.

Note: The pile of the Velcro gap seal on the rear of wing is up. The hook on the flaps are down and the control horns on the flaps point up and forward.

6. **NOTE: A REMINDER THAT AT THIS POINT, THE ASSEMBLY FOR THE RIGHT AND LEFT SIDES HAS BEEN IDENTICAL. THE ATTACHMENT POSITION OF THE FLAP CONTROL HORN (16), DETERMINES RIGHT AND LEFT SIDE DIFFERENTIATION.**

7. **Figure AF-2                      COVERING THE RIGHT SIDE FLAP**

*(same procedure used for covering ailerons)*

- a) Be certain that the TEMPORARILY inserted eyebolts from Step 2 have been removed before sliding on the flap cover.
- b) Position the frame as shown in the figure. Use a talc or warm water to lubricate the frame, so that the flap cover will slide on more easily. **DO NOT USE OILS OR ANY OIL BASE LUBRICANT. IT WILL DAMAGE THE COVERING!**
- c) Position the flap cover (20) over the narrow end of the frame with the GROMMETS FACING DOWN and the velcro edge facing forward.
- d) Pull the flap cover over the frame CAREFULLY. Back the frame up against a padded wall and pull the covering down the frame. The cover fits very tightly and will require patience to apply. Do not pound the frame, as damage may occur. Remember that the tighter the cover, the better the aerodynamic shape in flight. The pouring of warm water into the cover, when nearly on, will loosen the cloth and will aid in getting the last few inches on.

8. **Figure AF-2 TIE WRAPPING THE GROMMETS TO FINISH APPLYING THE COVER**

- a) Pull the cover tightly enough so that the two ends that have the grommets are

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over the torque tube and are approximately no more than 1" apart.

- b) Insert tie wraps (21) through the grommets as shown in figure, smaller end first. Pull through and tighten snugly, helping to narrow the gap. Use the tie wraps to help pull the last few inches. Work the cover down more.
- c) Continue in this manner, working the cover down, and tightening all tie wraps, until the gap is fully closed and the two edges of the cover are able to touch each other.
- f) Snip off 'tail' of the tie wraps.

**NOTE:** The cover should be "drum tight", as should all covers. If not, remove any inserted tie wraps and the cover. Lightly bend the trailing edge tube outward in any loose areas.

- 9. Figure AF-2 REINSERTING THE EYEBOLTS
  - a) Using the figure as a guide, locate the two eyebolt holes through the covering. Use a scratch awl or a pin to help. Hot knife or carefully cut the velcro, over the holes, and sear the edges with a soldering iron. Be careful not to cut too much of the stitching, except any stitching over the eyebolt hole.
  - b) Place washer (9) on eyebolt and insert into hole and into threaded plate nut. Repeat with second eyebolt.
- 10. REPEAT THE ENTIRE PROCEDURES FOR THE LEFT SIDE FLAP. BE CAREFUL TO POSITION THE FRAME CORRECTLY BEFORE APPLYING THE COVER.
- 11. Figure AF-2 ATTACHING THE FLAP CONTROL HORN TO THE RIGHT FLAP
  - a) Position the covered right side flap as shown. IT IS IMPORTANT TO POSITION THE FLAP CONTROL HORN (16) WITH THE LONGEST SIDE POINTING UPWARD. Place washer (15) on bolt (14). Insert through end hole on bottom of flap control horn (16). Add three more washers (15) and insert through the flap torque tube (12). Secure with locknut (20).
  - b) Place washer (15) on bolt (13). Insert through center hole of flap control horn and in through anchor plug (11) in flap torque tube (12). Tighten securely.
- 12. Not Pictured ATTACHING THE FLAP CONTROL HORN TO THE LEFT FLAP

Carefully position the covered flap for the left side. REMEMBER THAT IT IS IMPORTANT TO POSITION THE FLAP CONTROL HORN (16) WITH THE LONGEST SIDE POINTING UPWARD. Repeat Step 11 attachment procedure for left side control horn. BE CAREFUL TO ATTACH THE CONTROL HORN AS TO MAKE A RIGHT AND A LEFT SIDE, NOT TWO OF THE SAME SIDE.

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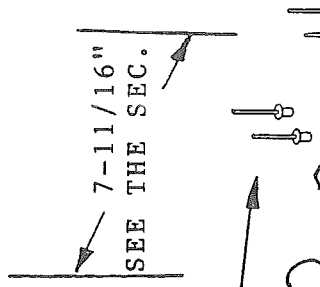
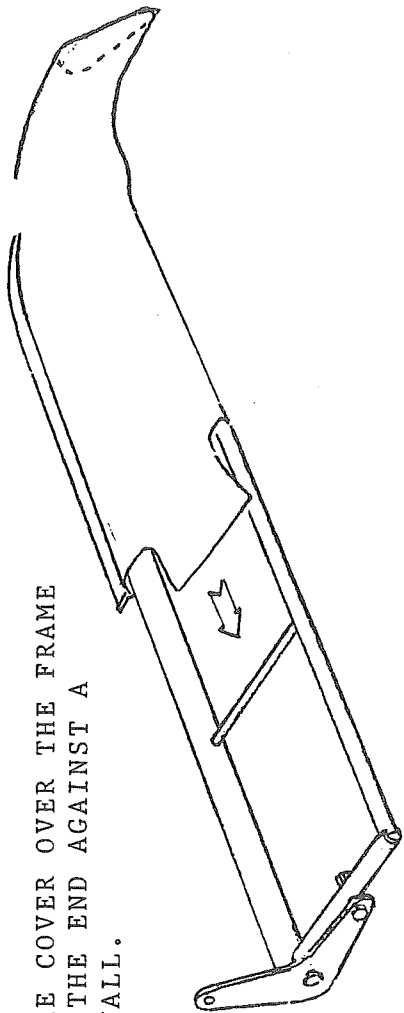
13. **Figure AF-3** APPLYING THE FLAP GAP SEAL
- a) Slide the flap gap seal (22) over the aileron spar. Take care to be certain that the velcro positioning is correct. FIGURE SHOWS APPLICATION OF FLAP GAP SEAL TO THE RIGHT WING. Repeat for left side
14. **Figure AF-1** ATTACHING RIGHT SIDE AILERON HORN
- a) Slide aileron horn (14) on to end of front aileron spar (1), with point of horn facing downward and forward, carefully aligning holes.
  - b) Place washer (11) on bolt (13) and insert through hole closest to aileron horn. Add a second washer (11). Secure with locknut (2),
  - c) Slide washer (11) on eyebolt (10). Insert through the middle hole, carefully noting bolt direction in figure. Add a second washer (11) and secure with locknut (12).
  - d) Place washer (11) on eyebolt (10). Insert through the third hole. Add a second washer (11), and secure with locknut (12).
  - e) Repeat entire procedure for left side aileron horn
15. **Not shown** ATTACHING THE AILERONS AND FLAPS
- After the ailerons and flaps are assembled and the wings are on, attach the ailerons to the main wing using hinge bolts (23) washers (15), thin washers (24) castle nuts (25) and after final adjustment cotter pins (26). The ailerons mount on the outside of the eyebolts on the trailing edge.
- a) Begin at the root hinge point. Do not put a washer between the eyebolts at this location. Tighten bolt securely (23) using castle nut (25) (after final adjustment, go back and loosen this first bolt and insert cotter pin).
  - b) At the other locations, Place a washer (15) between the two eyebolts (one on the trailing edge, one on the aileron), insert hinge bolt (23) facing inwards towards the root of the wing. Place thin washer (24) then castle nut (25).
  - c) If the space between the eyebolts is too tight or too loose, use a combination of thick or thin washers to space the surface. Tighten the castle nuts only to the point of taking up any clearance. **DO NOT OVER TIGHTEN THE HINGE BOLTS.** The hinge bolts should be free enough to finger turn.
  - d) After finishing the adjustment, insert cotter pins (26). Repeat this procedure for the flaps. A drop of light oil helps reduce friction and limits corrosion and wear.

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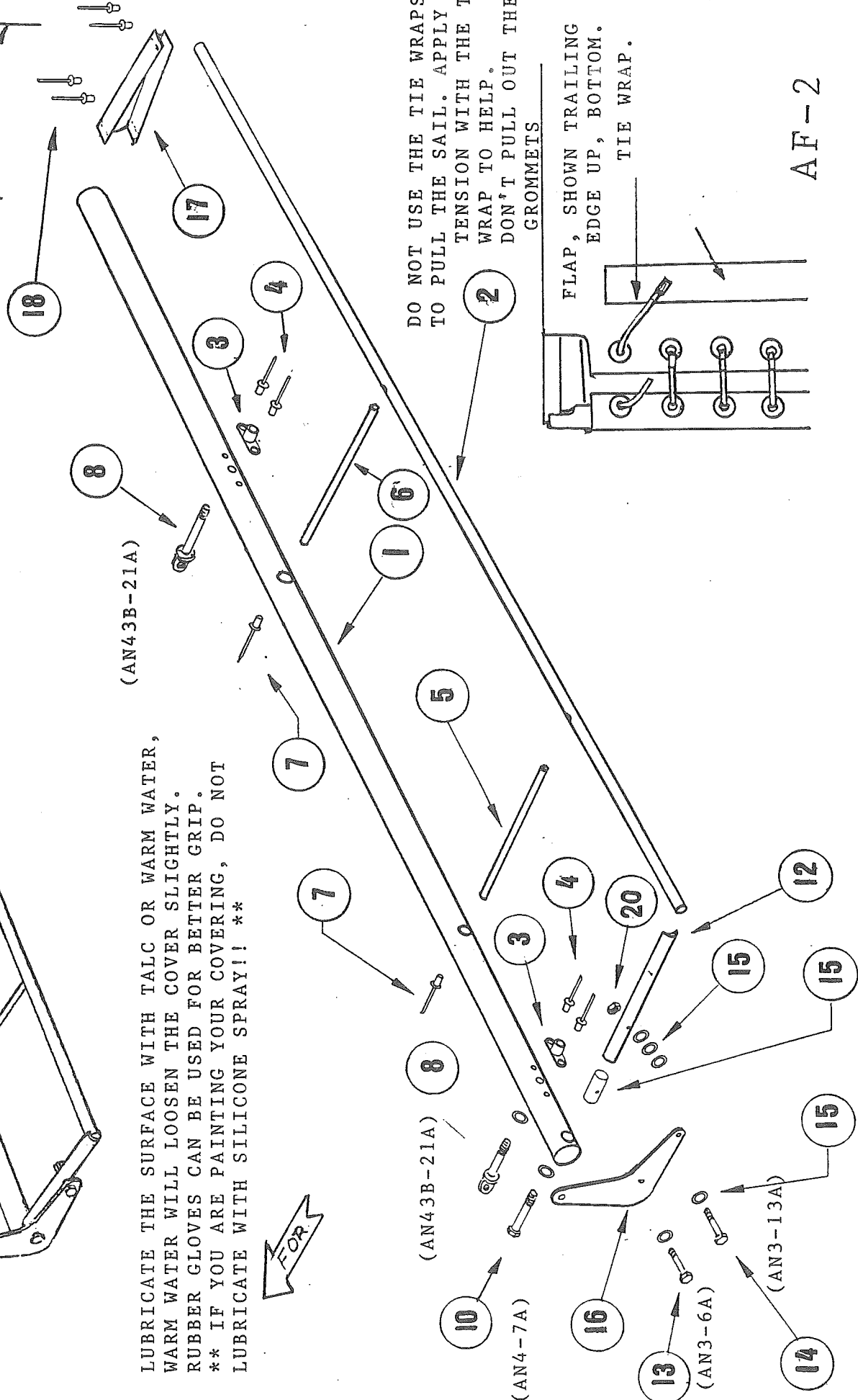
**Section 5  
Wing Flap Parts List  
Figures AF-2 & AF-3**

<b>INDEX#</b>	<b>PART #</b>	<b>QTY</b>	<b>DESCRIPTION</b>
1.	W-196-5	2	FRONT FLAP SPAR
2.	W-196-3	2	FLAP TRAILING EDGE
3.	MS21047-4	4	1/4" PLATE NUT
4.	SS32	8	3/32" POP-RIVET
5.	W-196-7	2	FLAP RIB 8 7/16"
6.	W-196-9	2	FLAP RIB 8"
7.	AA66	4	3/16" ALUMINUM POP-RIVET
8.	AN43B-21A	4	1/4" EYEBOLT
9.	AN960-416	6	1/4" WASHER
10.	AN4-7A	2	1/4" BOLT
11.	W-40	2	ANCHOR PLUG
12.	W-197	2	FLAP TORQUE TUBE
13.	AN3-6A	2	3/16" BOLT
14.	AN3-13A	2	3/16" BOLT
15.	AN960-10	24	3/16" WASHER
16.	CS-194	2	FLAP CONTROL HORN
17.	W-42A	2	FLAP TIP PLATE
18.	AA44	8	1/8" ALUMINUM POP-RIVET
19.	SC-364-1	2	FLAP COVER
20.	AN365-1032	2	3/16" LOCKNUT
21.	TRP-12	10	TIE WRAP 12"
22.	SC-367	2	AILERON FLAP GAP SEAL
23.	AN3-5	14	3/16" BOLT, DRILLED
24.	AN960-10L	14	3/16" WASHER, THIN
25.	AN310-3	14	3/16" CASTLE NUT
26.	MS24665	14	1/2" COTTER PIN

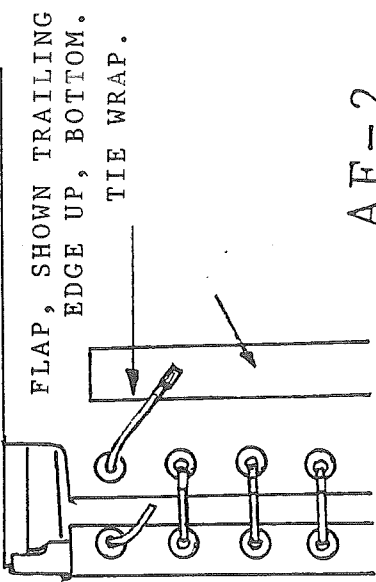
SLIDE THE COVER OVER THE FRAME BRACING THE END AGAINST A PADDED WALL.



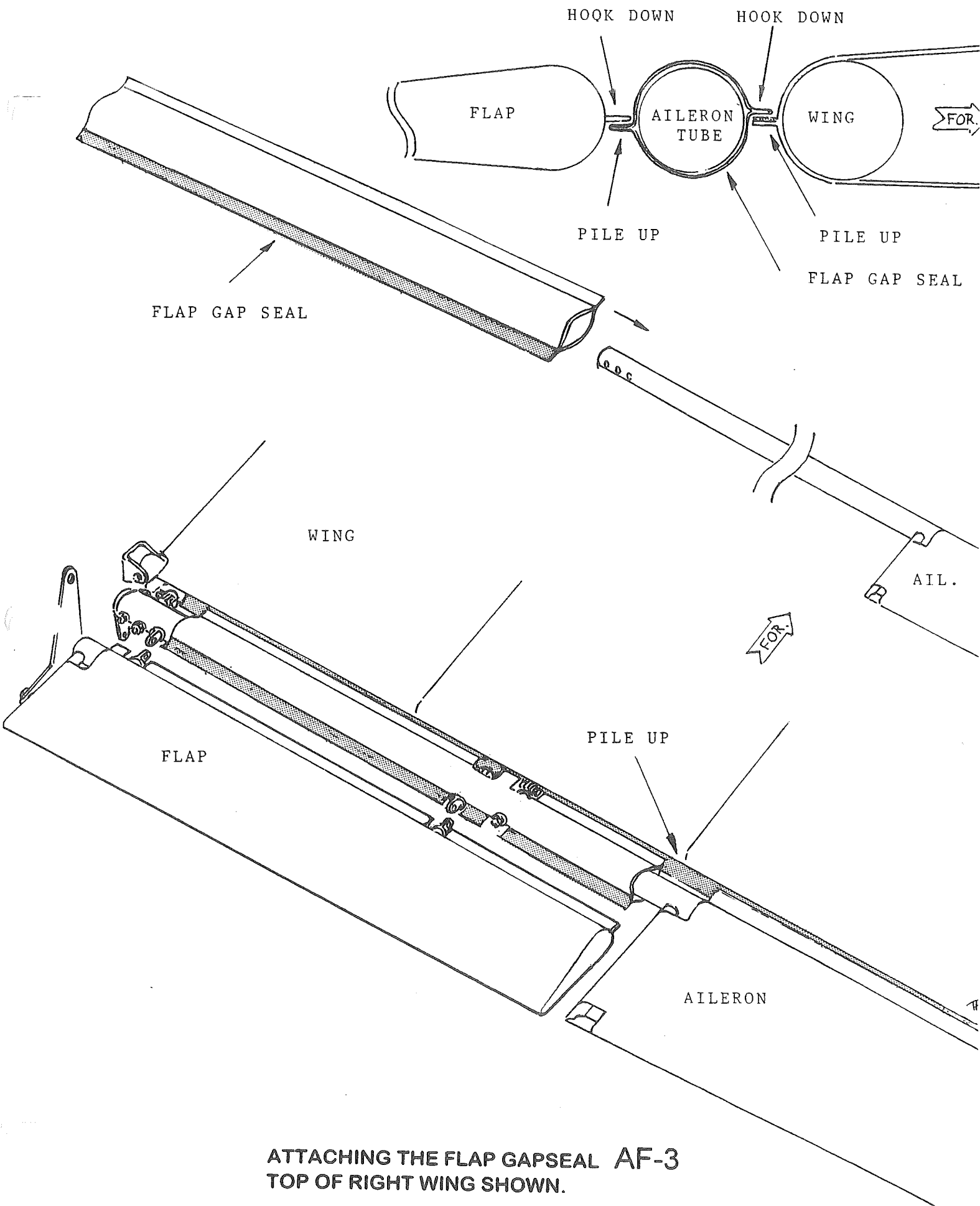
LUBRICATE THE SURFACE WITH TALC OR WARM WATER, WARM WATER WILL LOOSEN THE COVER SLIGHTLY. RUBBER GLOVES CAN BE USED FOR BETTER GRIP. \*\* IF YOU ARE PAINTING YOUR COVERING, DO NOT LUBRICATE WITH SILICONE SPRAY!! \*\*



DO NOT USE THE TIE WRAPS TO PULL THE SAIL. APPLY TENSION WITH THE TIE WRAP TO HELP. DON'T PULL OUT THE GROMMETS







ATTACHING THE FLAP GAPSEAL AF-3  
TOP OF RIGHT WING SHOWN.





✓ Chapter 13 SECTION 6 2K FULL SPAN AILERON ASSEMBLY

Section 6  
2K Full Span Aileron Assembly  
Figure A-1

**IMPORTANT NOTE: THE ASSEMBLY PROCEDURES FOR THE RIGHT AND LEFT AILERONS ARE IDENTICAL UNTIL THE APPLICATION OF THE AILERON COVERS AND THE ATTACHMENT OF THE AILERON HORNS (14). IT IS THE POSITION OF THE AILERON HORNS AND THE ORIENTATION OF THE VELCRO GAP SEAL THAT WILL DETERMINE IF IT IS A RIGHT OR LEFT AILERON.**

1. Figure AF-1 VIEW OF RIGHT SIDE AILERON

Position the front aileron spar (1) and the rear aileron tube (2) on a clean flat surface as shown in the figure. The rear aileron tube (2) should be positioned so that the 3/8" holes align correctly with the 3/8" holes in the front aileron spar (1). *(one simple way to verify this is to turn the tube in both directions. If the rear aileron tube is incorrectly positioned when the holes are opposite the holes of the front aileron spar, one edge of the rear aileron tube will extend beyond the front aileron spar. Note that the 14" measurement from the tube end to the 3/4" hole will be positioned at the inside end of the front aileron spar that will accept the control horn (17).)*

2. Figure AF-1 ATTACHING THE PLATE NUTS

a) Verify that the 3/8" rib holes on the front aileron spar (1) are pointing rearward as shown in the figure. TEMPORARILY insert eyebolts (13) in through the 1/4" holes shown. Thread plate nuts (3) over the eyebolts (13) and position the plate nuts horizontally.

b) Using a 3/32" drill, drill holes through the plate nuts into the rear surface of the front aileron spar. Attach both plate nuts with two pop-rivets (4) each. Eyebolts may be removed at this time for later insertion after the covering has been applied.

3. Figure AF-1 ATTACHING THE AILERON RIBS

a) Insert aileron ribs (5), (6), (7), (8), (9), (10) & (11) into the 3/8" holes, as shown, on the front aileron spar (1) and rear aileron tube (2). Wrap mylar tape, in a half loop, around the front aileron spar and rear aileron tube, in order to help hold the ribs in place.

Place aluminum pop-rivet (12) through outside hole of the front aileron spar (1) and into the aileron ribs (5)-(11). The rivets do not grip into the rib.

**✓ Chapter 13 SECTION 6 2K FULL SPAN AILERON ASSEMBLY**  
**VERIFY THAT THE POP-RIVETS HAVE BEEN POSITIONED INSIDE THE RIB BEFORE POP-RIVETING.**

4. **Figure AF-1 ATTACHING AILERON TORQUE TUBE**
- a) Slide the anchor plug (19) into the end with the predrilled 3/16" hole of the aileron torque tube (20), carefully aligning the holes. Drill out the holes with a 3/16" drill to remove the threads on the anchor plug. Should you build a flap equipped plane in the future, **DO NOT DO THIS ON THE FLAPS.**
  - b) Insert aluminum brad rivet (21) through holes. Cut the rivet head off and file down so that the rivet is roughly flush to the torque tube.
  - c) Using a set punch or nail, punch the rivet on both ends. File or grind the rivet so that it is blended in with the torque tube. The surface should be smooth, so that it can be easily inserted into the front aileron spar(1).
  - d) Insert the end of the aileron torque tube (20) with the anchor plug, into the large 3/4" hole of the front aileron spar (1). The torque tube must be positioned so that the cut out side face as shown.
  - e) Place a drop of serviceable Loctite on bolt (18). Slide on washer (14) and insert through the 1/4" hole that is in front of the large 3/4" hole of front aileron spar (1) and into the anchor plug (19) / aileron torque tube (20). Tighten the bolt securely, but be careful not to strip the anchor plug, as it is aluminum.
5. **Figure AF-1 ATTACHING THE AILERON TIP PLATE**
- a) Carefully bend the edges of the aileron tip plate (22) to conform to the curves of both the front aileron spar and the rear aileron tube.
  - b) Position the aileron tip plate (22) over the front aileron spar and rear aileron tube as shown in the figure.
  - c) Measure the outside distance from the outermost edge of the front aileron spar (1) to the outermost edge of the rear aileron tube (2), at the aileron tip plate (22). **ADJUST SPARS AS NECESSARY TO OBTAIN A DISTANCE OF 7 11/16" THIS IS A CRITICAL MEASUREMENT. MARK THE POSITION WITH A PENCIL FOR REFERENCE.** Before attaching the aileron tip plate (22) to the ends of the front aileron spar (1) and the rear aileron tube (2), sight down the frame from tip toward root to confirm that the rear aileron tube (2) has no twists in the surface. **DO NOT SIMPLY PRESS THE TIP PLATE FLAT TO THE GROUND; SINCE THE AILERON IS TAPERED, THIS WILL GUARANTEE A TWIST!**
  - d) Using the inside hole of the aileron tip plate on the front aileron spar as a guide, drill a 1/8" hole and insert *(but do not pop-rivet at this time)* a pop-rivet (23).

**✓ Chapter 13 SECTION 6 2K FULL SPAN AILERON ASSEMBLY**

- e) Use a carpenter's square, or similar, to verify that the aileron tip plate (22) and the front aileron spar (1) are at 90 deg. Make any necessary adjustments.
- f) Again, verify that the outside distance measured from the outermost edge of the front aileron spar to the outermost edge of the rear aileron tube at the aileron tip plate is 7 11/16". (IT IS IMPERATIVE THAT THIS MEASUREMENT IS NOT "WIDE").
- g) Pop-rievet the inserted pop-rievet (23). Drill and pop-rievet the hole next to that one. Flip the frame over to drill and pop-rievet the two holes of the aileron tip plate (22) on the front aileron spar as described above. CONFIRM THAT THERE IS NO TWIST IN THE SURFACE. When completed, flip the frame back to its original position.
- h) Drill a hole for the pop-rievet on the outside hole of the aileron tip plate on the rear aileron tube (2). Place the pop-rievet (23) in the hole, but do not complete pop-rieveting until verifying the 7-11/16" dimension.
- i) Drill the final hole on this side of the aileron plate tip, as described previously. Insert, but do not pop-rievet the pop-rievet. Make any necessary adjustments and then complete pop-rieveting.
- j) Flip the frame over and complete procedure for final two holes on the aileron plate tip over the rear aileron tube.
- k) Carefully contour or bend over the edges of the tip plate. File all sharp edges, smooth. Cover the aileron tip plate with a mylar tape, or equivalent, to prevent snagging of the aileron cover. Check the entire frame for any rough edges and smooth and tape them.

Repeat this entire procedure for the second aileron surface.

- 6. **NOTE: A REMINDER THAT AT THIS POINT, THE ASSEMBLY FOR THE RIGHT AND LEFT SIDES IS IDENTICAL. THE ATTACHMENT POSITION OF THE CONTROL HORN (17), DETERMINES RIGHT AND LEFT SIDE DIFFERENTIATION.**
- 7. **Figure AF-1 COVERING THE RIGHT SIDE AILERON**
  - a) Make certain that the TEMPORARILY inserted eyebolts from Step 2 have been removed before sliding on the aileron cover.
  - b) Position the frame as shown in the figure. Use a talc or warm water to lubricate the frame, so that the aileron cover will slide on more easily. DO NOT USE OILS OR ANY OIL BASE LUBRICANT. IT WILL DAMAGE THE COVERING!

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- e) Position the aileron cover (24) over the narrow end of the frame with the GROMMETS FACING DOWN and the velcro edge facing forward.
- f) Pull the aileron cover over the frame CAREFULLY. Back the frame up against a padded wall and pull the covering down the frame. The cover fits very tightly and will require patience to apply. Do not pound the frame, as damage may occur. Remember that the tighter the cover, the better the aerodynamic shape in flight. The pouring of warm water into the cover, when nearly on, will loosen the cloth and will aid in getting the last few inches on. Rubber gloves can help get more grip to pull with and a helper is very useful.

8. **Figure AF-1 TIE WRAPPING THE GROMMETS TO FINISH APPLYING THE COVER**

- a) Pull the cover tightly enough so that the two ends that have the grommets are over the torque tube and are approximately no more than 1" apart.
- d) Insert tie wraps (25) through the grommets as shown in figure, smaller end first. Pull through and tighten snugly, helping to narrow the gap. Use the tie wraps to help pull the last few inches. Work the cover down more.
- e) Continue in this manner, working the cover down, and tightening all tie wraps, until the gap is fully closed and the two edges of the cover are able to touch each other.
- f) Snip off the 'tail' of the tie wraps.

NOTE: The cover should be "drum tight" along the whole length. If not, remove the tie wraps and the cover. Lightly bend the trailing edge tube outward in any loose areas of the trailing edge.

9. **Figure AF-1 REINSERTING THE EYEBOLTS**

- a) Using the figure as a guide, locate the eyebolt holes through the covering. Use a scratch awl or a pin to mark the holes. Hot knife or carefully cut the velcro, over the holes, and sear the edges with a soldering iron. Be careful not to cut too much of the stitching, except over the eyebolt hole.
- c) Place washer (14) on eyebolt (13) and insert into the hole and the threaded plate nut. Repeat with the other eyebolts.

10 **Figure AF-1 ATTACHING RIGHT SIDE AILERON HORN**

- a) Slide aileron horn (17) on to end of front aileron spar (1), with point of horn facing downward and forward, carefully aligning holes.
- f) Place washer (14) on bolt (16) and insert through hole closest to aileron horn. Add a second washer (14). Secure with locknut (15).
- g) Slide washer (14) on eyebolt (13). Insert through the second hole. Note bolt direction in figure. Add a second washer (11) and secure with locknut (12).

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Section 6

2K Full-span Aileron Parts List

Please refer to drawing AF-1 the assembly details are the same

INDEX#	PART #	QTY	DESCRIPTION
1.	W-397-5	2	FRONT AILERON SPAR
2.	W-397-3	2	AILERON TRAILING EDGE
3.	MS21047-4	6	1/4" PLATE NUT
4.	SS32	12	3/32" POP-RIVET
5.	W-397-7	2	AILERON RIB - 10-1/8"
6.	W-397-9	2	AILERON RIB - 9-3/4"
7.	W-397-11	2	AILERON RIB - 9-3/8"
8.	W-397-13	2	AILERON RIB - 9"
9.	W-397-15	2	AILERON RIB - 8-5/8"
10.	W-397-17	2	AILERON RIB - 8-1/4"
11.	W-397-19	2	AILERON RIB - 7-7/8"
12.	AA66	8	3/16" ALUMINUM POP-RIVET
13.	AN43B-21A	10	1/4" EYEBOLT
14.	AN960-416	28	1/4" WASHER
15.	AN365-428	10	1/4" LOCKNUT
16.	AN4-21A	2	1/4" BOLT
17.	CS-114	2	AILERON HORN FOR FLAP OPTION
18.	AN4-7A	4	1/4" BOLT
19.	W-40	2	ANCHOR PLUG
20.	W-125	2	AILERON TORQUE TUBE
21.	A187R1250A	2	ALUMINUM BRAD RIVET
22.	W-42A	2	AILERON TIP PLATE
23.	AA44	16	1/8" ALUMINUM POP-RIVET
24.	SC-363-1	2	AILERON COVER
25.	TRP-12	12	TIE WRAP 12"
26.	AN3-5	10	3/16" BOLT, DRILLED
27.	AN960-10	10	3/16" WASHER
28.	AN960-10L	10	3/16" WASHER, THIN
29.	AN310-3	10	3/16" CASTLE NUT
30.	MS24665	10	1/2" COTTER PIN

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**11 Not shown ATTACHING THE AILERONS**

After the ailerons are assembled and the wings are on, attach the ailerons to the main wing using hinge bolts (26) washers (27), thin washers (28) castle nuts (29) and after final adjustment cotter pins (30). The ailerons mount on the outside of the eyebolts on the trailing edge.

- a) Begin at the root hinge point. Do not put a washer between the eyebolts at this location. Tighten bolt securely (26) using castle nut (29) (after final adjustment, go back and loosen this first bolt and insert cotter pin).
- b) At the other locations, Place a washer (27) between the two eyebolts (one on the trailing edge, one on the aileron), insert hinge bolt (26) facing inwards towards the root of the wing. Place thin washer (28) then castle nut (29). If the space between the eyebolts is too tight or too loose, use a combination of thick or thin washers to space the surface.
- c) Tighten the castle nuts only to the point of taking up any clearance. **DO NOT OVER TIGHTEN THE HINGE BOLTS.** The hinge bolts should be free enough to finger turn. After finishing the adjustment, insert cotter pins (30). Repeat this procedure for the flaps. A drop of light oil helps reduce friction and limits corrosion and wear.



