T.O. 1T-6G-3
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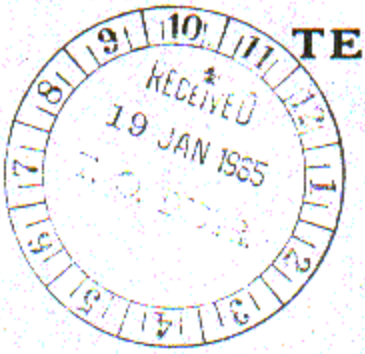

TECHNICAL MANUAL

STRUCTURAL REPAIR

USAF MODEL	NAVY MODELS
T-6	**SNJ-3** **SNJ-4** **SNJ-5** **SNJ-6**

AIRCRAFT

Contract AF04(606)-8533

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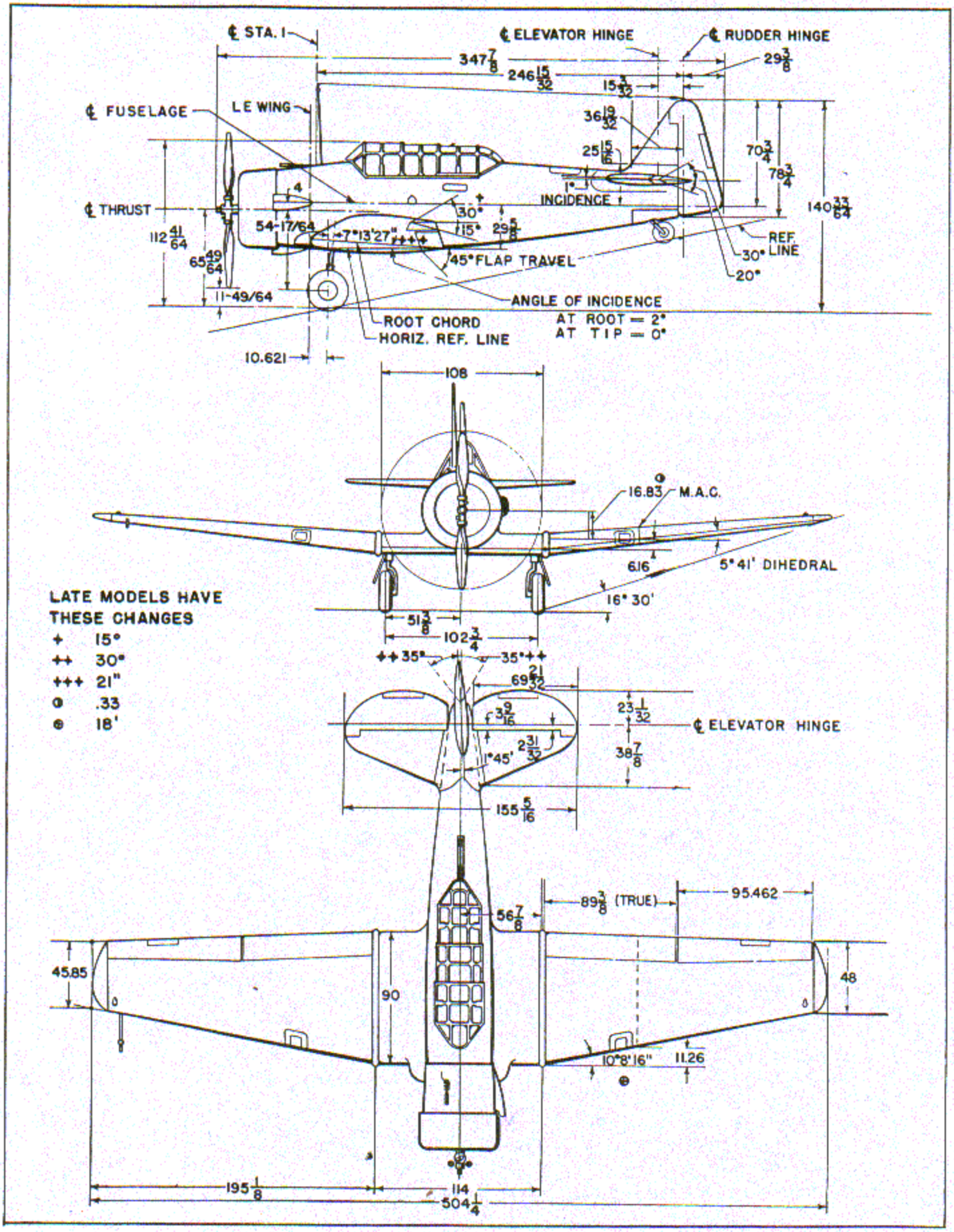


Figure 1 — Airplane Three View Dimensions

SECTION I
GENERAL INSTRUCTIONS

1. TYPE OF CONSTRUCTION.

a. GENERAL. *(See figure 1.)*—AT-6 and SNJ (Navy) series airplanes are single-engine, two-place, dual-control, low-wing advanced trainers designed and manufactured by North American Aviation, Inc. Structural members of the airplane are constructed primarily of 2024-T4 aluminum-alloy extruded sections and 2024-T3 Alclad sheet. The front fuselage truss and the engine mounts are chrome-molybdenum steel tubing. Construction of the front and rear fuselage sections, outer wing panels, and empennage facilities removal and repair or replacement in the event of damage.

b. STATIONS. *(See figure 2.)*—The term "station" used throughout this publication and on NAA production drawings specifies the location of frames, ribs, and other parts of the airplane measured in inches or by bulkhead number from a specific point. For fuselage stations this point is at the engine fire wall; for wing center section stations, the airplane center line; for wing outer panel, the bolting angle. Elevator stations are numbered at each bulkhead from the inboard edge and rudder stations are numbered at each bulkhead from the top.

c. STANDARD PARTS.—Certain standard items such as rivets and extrusions are North American standards and are numbered so that the first letter corresponds with the title of the part. For example, 2R1 is a rivet part number and 1E7 is an extrusion part number.

2. INVESTIGATING DAMAGE.

When estimating the extent of damage, carefully examine the surrounding structure for resultant secondary damage remote from the primary damaged area. If the secondary damage is not repaired, loads applied in the normal course of operation may cause failure of this part. Make a careful investigation of all structures across which the load must travel. Particularly examine joints for security of fastening.

3. SUPPORT OF STRUCTURE DURING REPAIR.

During repair or replacement of any member or part of a member, the structure being repaired must be supported to prevent distortion. For example, it is very important to support the wing properly when removing a skin panel or repairing spars or spar caps. In such repair, use the wing center jacking point or special trestles. If special trestles or jigs are not available for other structural components of the airplane, make a temporary support.

4. AIRPLANE ALIGNMENT.

a. GENERAL.—Certain types of damage may result in secondary distortions, not visible externally, which can be discovered only by checking the alignment of the airplane. Hard landings or faulty repairs of a major nature may cause such distortion. If this type of damage is suspected, make an alignment check.

b. LOCATION OF LEVELING POINTS. *(See figure 3.)*—It is necessary to level the airplane before making an alignment check. The longitudinal leveling lugs are on the fuselage diagonal tubes at the left side of the rear cockpit. Lateral lugs are on the upper fuselage cross tube aft of the front cockpit seat. Any straight bar and a spirit level can be used to level the airplane.

c. HORIZONTAL AND ELEVATION ALIGNMENT CHECK OF AIRPLANE.—The location of arbitrary alignment check points and the correct horizontal and vertical distances between them are shown in *figure 4*. Proceed as follows to make the check of measurements on a horizontal plane.

(1) Move the airplane to a smooth level area and level it.

(2) Select the first two points to be checked, then drop a plumb line from each point on the airplane and carefully mark the point at which the plumb bob touches the ground plane.

(3) Measure the distance between these two points on the ground with a steel tape.

(4) Repeat the foregoing steps for each measurement to be taken.

(5) Check the vertical measurements between the reference points with a surveyor's level or transit and a steel scale. The scale is held perpendicularly against each of the check points. Locate the transit or level below the plane of the datum point. For each check point read the elevation of the point and the corresponding datum point elevation. Compute the relative vertical distance between the datum point and the reference points. For the greatest accuracy, move the transit to the shortest sighting distance and take a new reading of the datum point each time the transit position is changed, to establish the zero point of the assumed horizontal plane.

(6) Correct dimensions and allowable tolerances are listed on the diagrams. Deviations in excess of the tolerance given necessitate a structural check of the airplane.

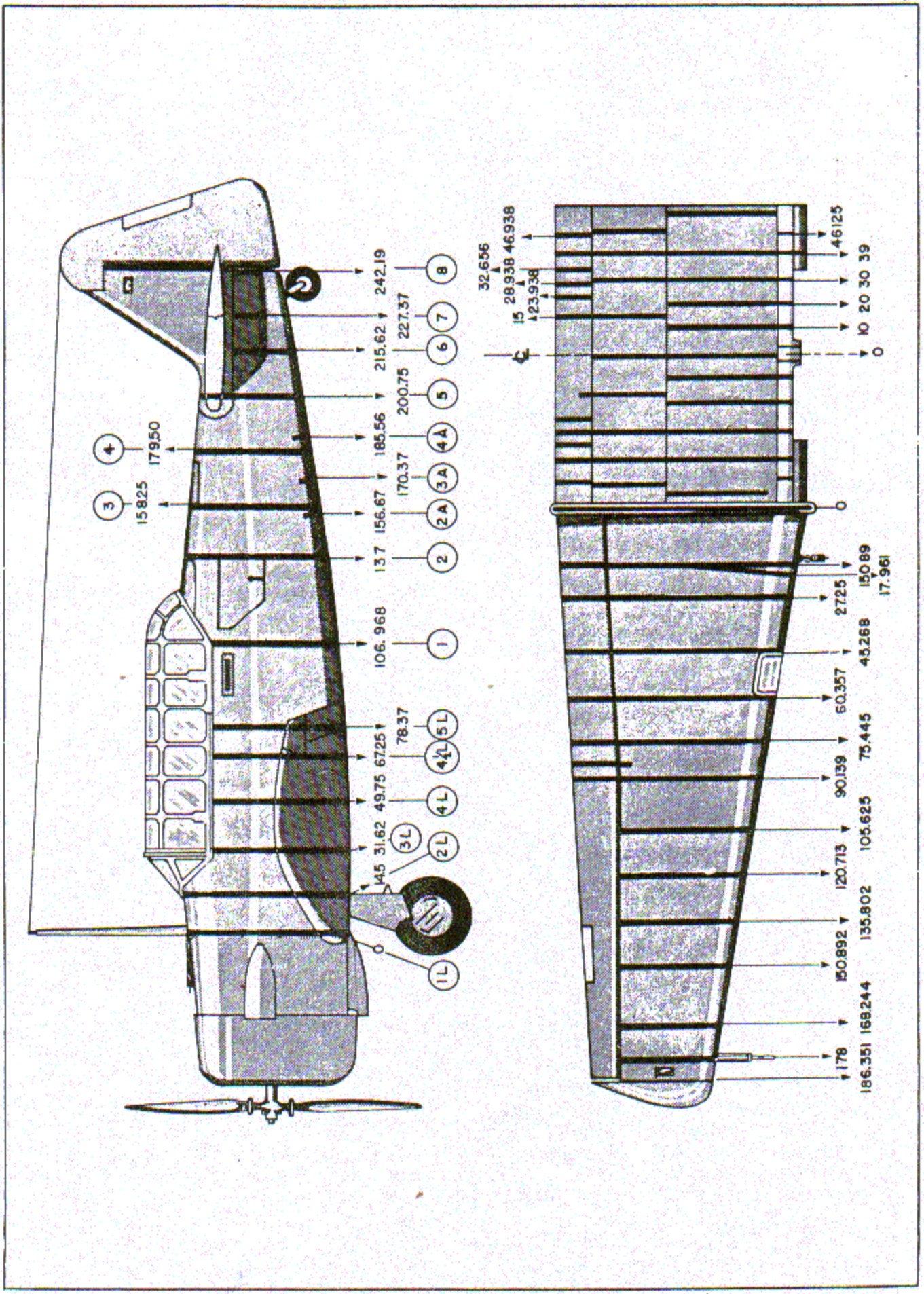


Figure 2 — Stations Diagram

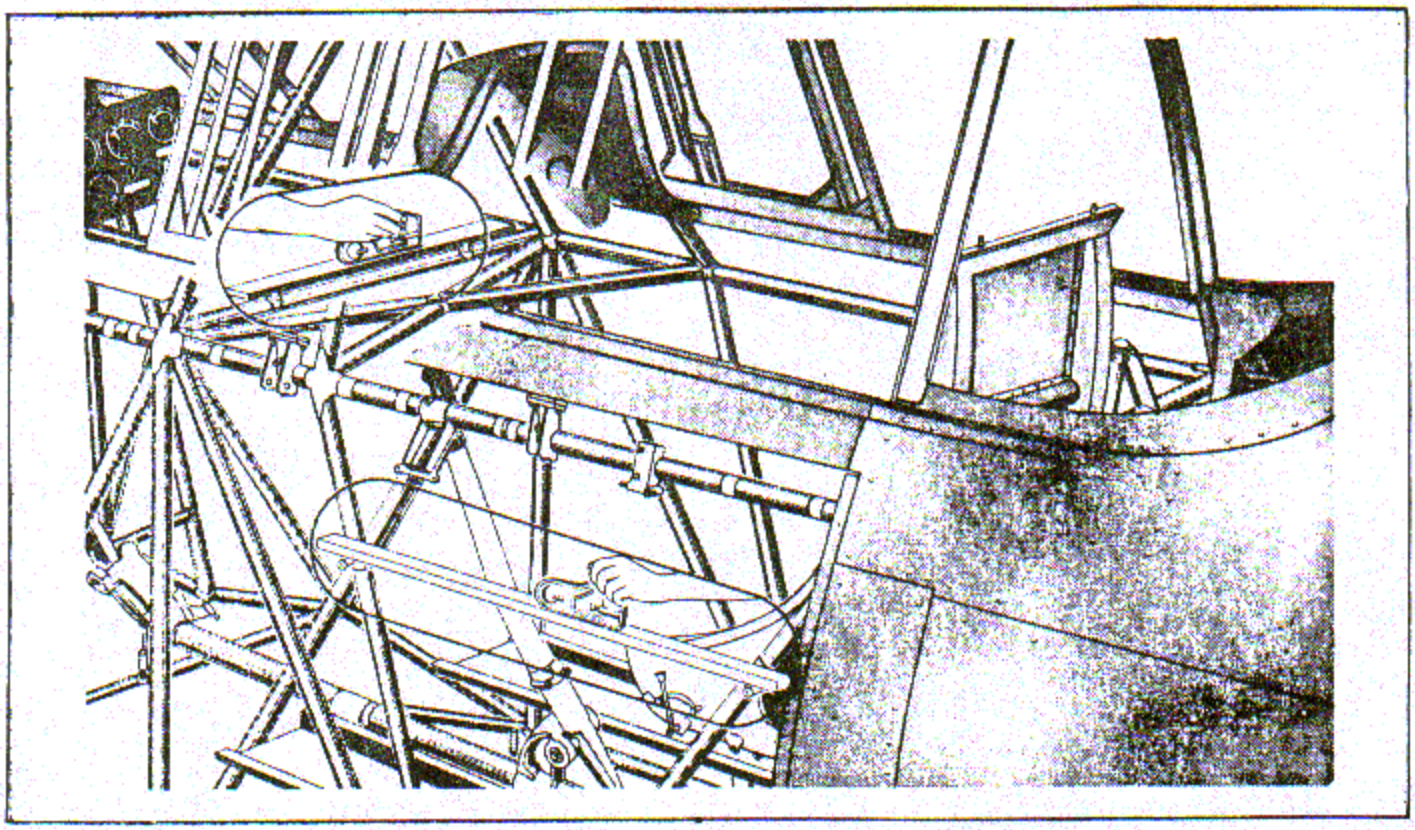


Figure 3 — Leveling Brackets Diagram

(7) Repeat the alignment check after damage has been located and repaired.

d. EMERGENCY ELEVATION CHECK OF AIRPLANE.—If a surveyor's level or transit is not available, use the following emergency method of elevation check.

(1) Level the airplane.

(2) Position a small box or table below the plane of the datum point with relation to the airplane points to be checked (similar to placing a transit). Place the box under the rear fuselage and sight to all points from this position.

(3) Cover the table top with a sheet of heavy gage aluminum sheet or other metal. Blacken the edge of the box sighting plane to give a sharper line. Level the box with a spirit level.

(4) With a man suspending a steel tape or scale from the datum point, sight along the top of the box or table onto the scale. The man holding the scale should move a finger or piece of wood along the scale until it lines up with the sighting plane formed by the box or table. Then take the reading. Repeat the same procedure for all other points.

(5) Complete the check.

Note

Although this method is classified as an emergency elevation check, the readings taken from sighting distance up to 12 feet may be considered accurate.

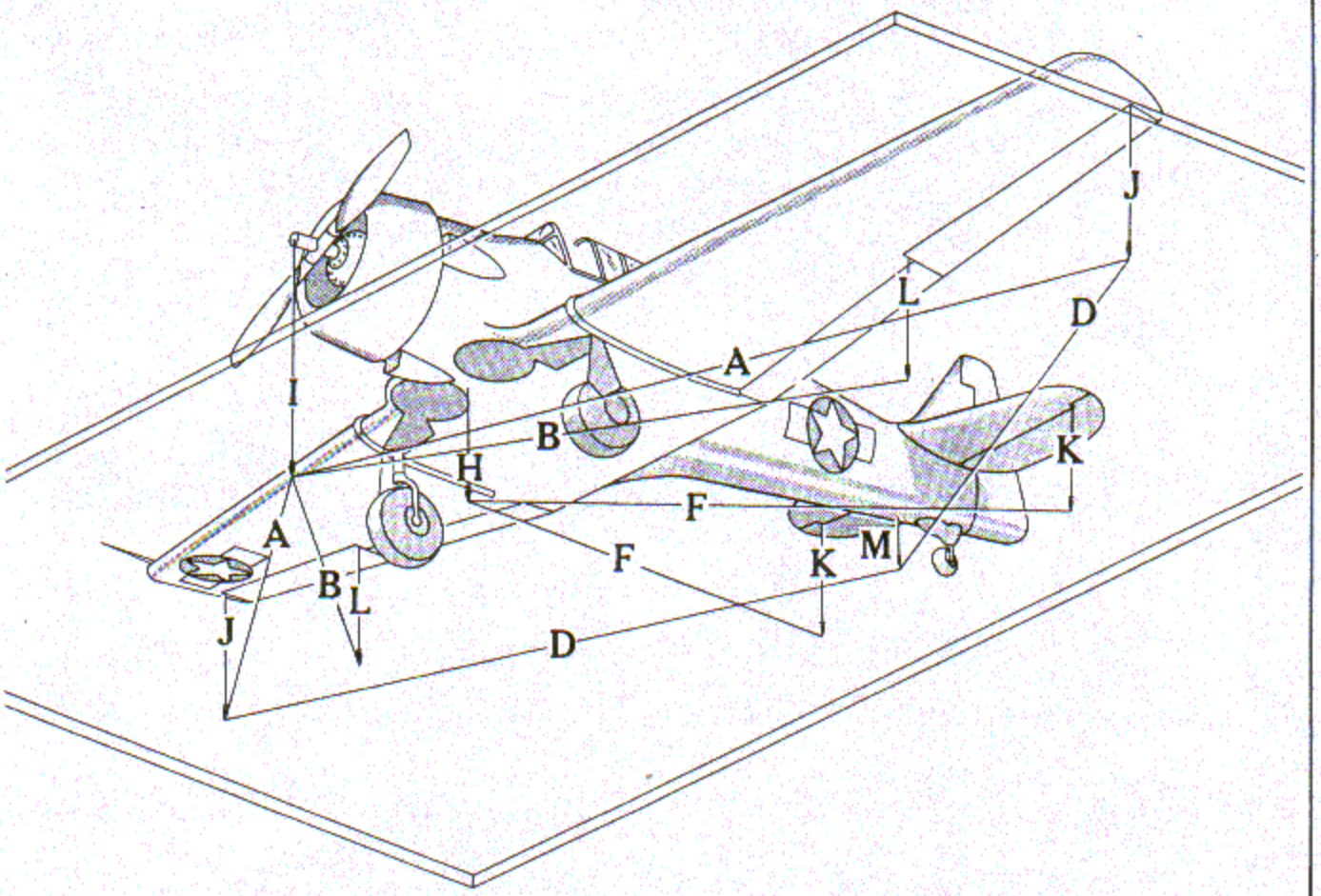
5. TYPES OF REPAIR.

a. TREATMENT OF MINOR SCRATCHES, DENTS, AND CRACKS.—Many parts become scratched and dented in the course of service, thus producing stress concentration which may cause failure of the part. Sharp nicks in smooth surfaces are especially dangerous and should be smoothed out to eliminate high concentration of stress. Ensure that no cracks remain undetected. Cracks in the skin generally occur at points of attachment where the skin is drilled or dimpled for flush-type rivets or bolts.

b. PATCHING.—A repair completely encompassing a damaged area, such as a skin patch, corrugation patch, web patch, etc.

c. SPLICING.

(1) PARTIAL.—A repair which involves a portion of the member but does not require a complete splice.



ELEVATOR CHECK

DROP SCALE OR STEEL TAPE FROM CHECK POINTS AND SIGHT THROUGH SURVEYOR'S TRANSIT OR SIGHT ALONG FIXED LEVEL SURFACE. SUBTRACT ACTUAL "H" READING FROM OTHER VALUES FOR PROPER CHECK DIMENSIONS.

H = 0 (ZERO POINT ON AIRPLANE THROUGH WHICH LEVEL GEOMETRIC PLANE IS ASSUMED TO PASS)

I = 27"±1/2" J = 21-13/16"±2"

K = 46"±3/4" L = 10-19/32"±1"

M = 18-1/16"±1/2"

HORIZONTAL CHECK

DROP PLUMB BOBS FROM CHECK POINTS AND MEASURE HORIZONTAL DISTANCE ON GROUND PLANE.

A = 279-3/32" (23'3-3/32")±1" B = 202-1/32" (16'10-1/32")±1"

D = 284-15/32" (23'8-15/32")±1" F = 238-5/8" (19'10-5/8")±1"

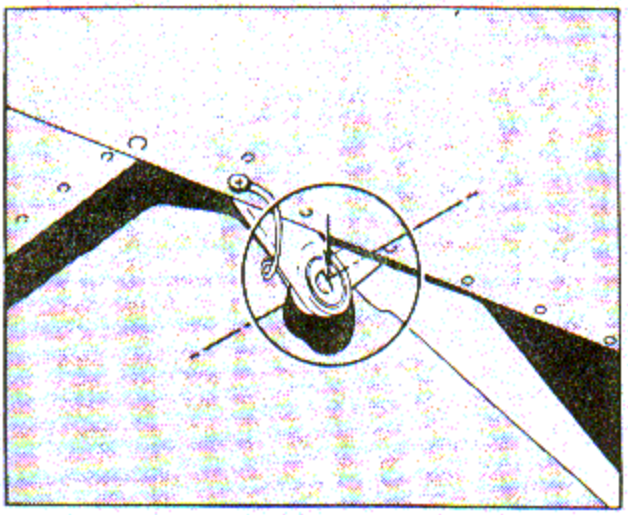
NOTE:

LEVEL AIRPLANE LONGITUDINALLY AND LATERALLY BEFORE MAKING ALIGNMENT CHECK. SEE FIGURE 3.

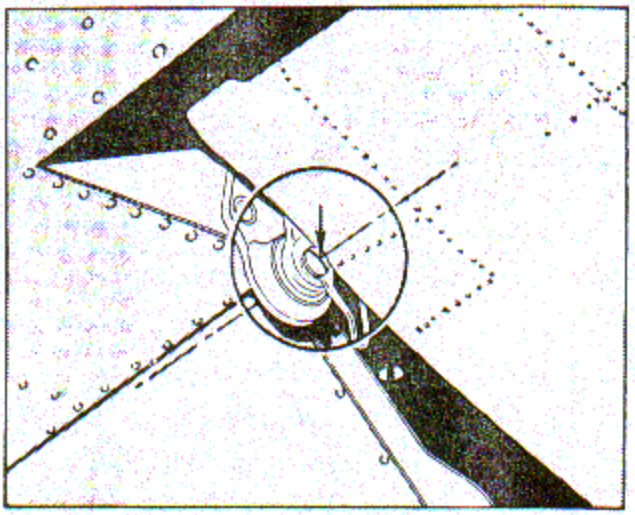
IF THERE IS A VARIATION IN ANY DIMENSION, IT IS DESIRABLE THAT IT BE LESS THAN 50 PERCENT OF THE GIVEN TOLERANCE. IF THIS VALUE IS EXCEEDED, CHECK THE STRUCTURE FOR DEFLECTIONS OR DAMAGE.

168-91-98LB

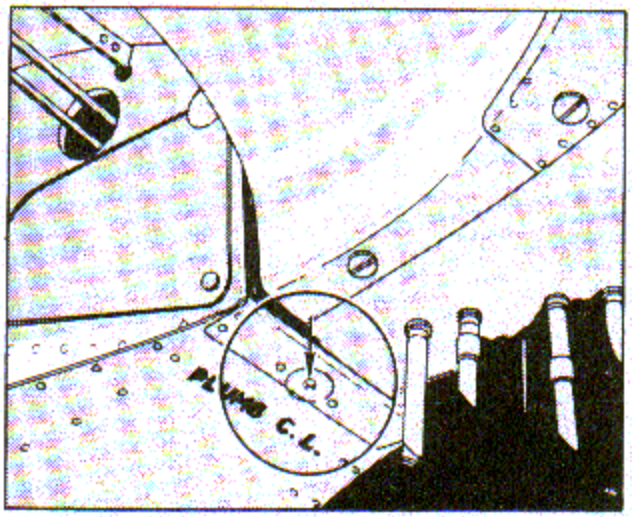
Figure 4 (Sheet 1 of 2)—Alignment Check Dimensions



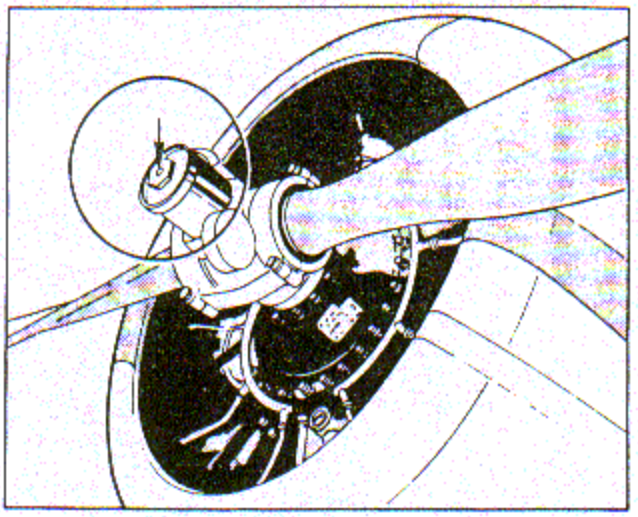
Aileron Outboard Check Point



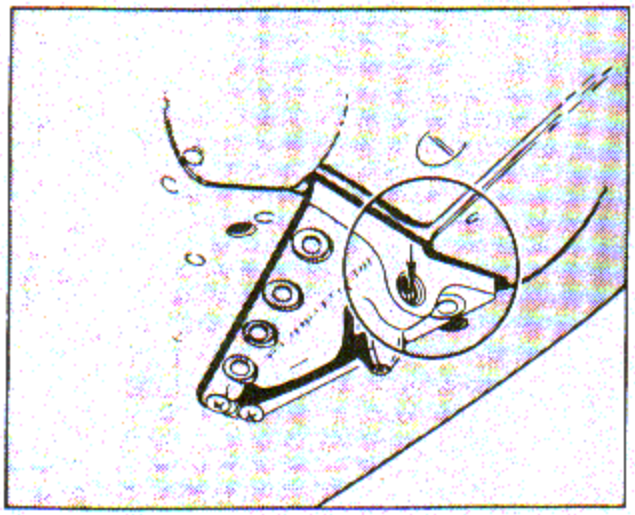
Aileron Inboard Check Point



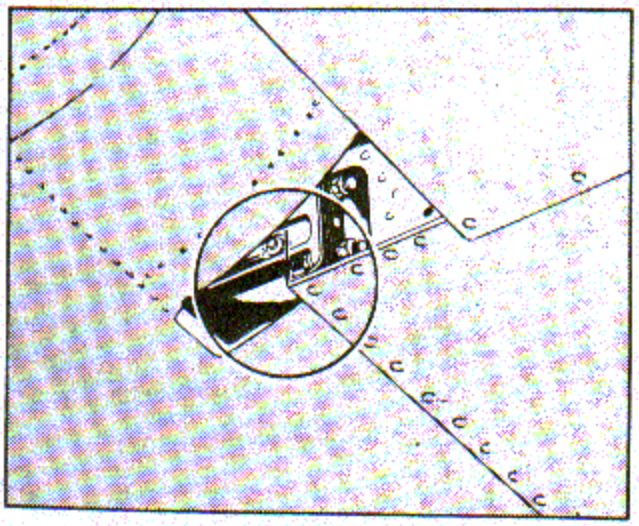
Fuselage Datum Point



Propeller Hub Point



Fuselage Jack Pad Point



Elevator Check Point

168-91-982

Figure 4 (Sheet 2 of 2)—Alignment Check Dimensions

(2) COMPLETE.—Damage causing a complete cut through the member but reparable by a splice that completely spans the damaged area.

d. INSERTION.—Damage of such length that an insertion member must be spliced in to replace the removed material.

e. CLEANING OUT DAMAGE.

(1) Smooth out all dents.

(2) Smooth out all shallow abrasions.

(3) Round out all deep abrasions.

(4) Clean out all holes, preferably to a round shape. The cleaned out area should include all minute cracks.

(5) Round out all jagged tears to form a smooth outline.

(6) Drill a No. 40 (.098) hole at the end of all isolated cracks.

f. BENDING REPAIR MATERIALS.—When bending sheet stock for the various repairs outlined, do not exceed the minimum bend radii given in Table 2 unless specifically shown otherwise on the repair drawings. Where material must be flanged, a power or hand brake will be particularly useful. Alclad sheet may be formed and bent as required, but the allowable bend radius for the thickness of sheet must not be exceeded.

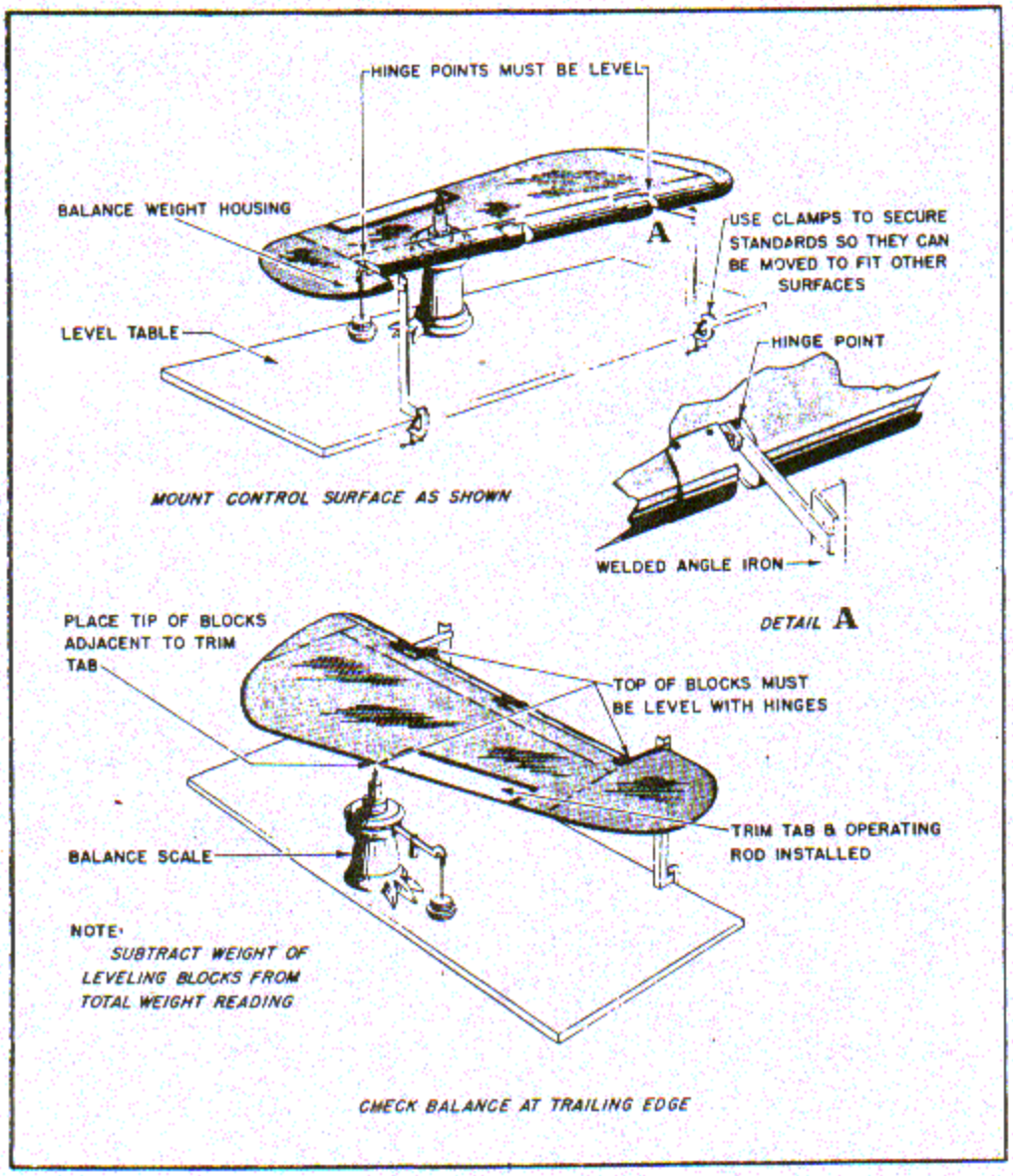


Figure 5 — Determining Control Surface Unbalance

LEGEND

1. Spinner
2. Hub-Hamilton
3. Blade
4. Control—Constant Speed
5. Engine
6. Cowling—Engine Ring Lower
7. Cowling—Removable Bottom
8. Cowling—LH Engine Ring
9. Cowling—RH Engine Ring
10. Ring—Engine Fixed Cowling
11. Heating and Ventilating System
12. Cowling—Removable Lower Right
13. Mount—Engine
14. Installation—Main Landing Gear
15. Starting System
16. Cowling—Carburetor Air Scoop
17. Cowling—Lower Left
18. Fairing—Landing Gear LH
19. Fairing—Landing Gear RH
20. Fire Wall—Fuselage
21. Cowling—Removable Top
22. Gun
23. Cover—Right Nose
24. Door—Landing Light
25. Door—Ammunition Access
26. Cover—Wing Gun Access
27. Tube—Pitot
28. Tip—Wing
29. Tip—Wing
30. Aileron
31. Aileron
32. Tab—Aileron
33. Tab—Aileron
34. Wing Outer Panel
35. Wing Leading Edge
36. Wing Trailing Edge
37. Cover—Bolting Angle Top and Bottom—RH
38. Cover—Bolting Angle Top and Bottom—LH
39. Angle—Outer Wing Bolting
40. Angle—Outer Wing Bolting
41. Angle—Wing Center Section—RH
42. Angle—Wing Center Section—LH
43. Wing Center Section
44. Installation—Fuel System
45. Installation—Engine Controls
46. Manifold
47. Installation—Electrical
48. Doors—Fuel Tank
49. Installation—Oil System
50. Fairing—Fuselage Fire Wall Upper LH
51. Fairing—Fuselage Fire Wall Lower LH
52. Cover—Fuselage Main Fuse Box
53. Strip—Fuselage Fairing Lower Attaching Channel
54. Panel—Fuselage LH Fairing
55. Flap—Wing Center Section
56. Fillet—Wing to Fuselage Front LH
57. Fillet—Wing to Fuselage Intermediate Rear LH
58. Fillet—Wing to Fuselage Intermediate Front LH
59. Fillet—Front Bulkhead LH
60. Step—Cockpit
61. Fairing—Wing to Fuselage Station 6 Lower
62. Fillet—Wing to Fuselage Rear LH
63. Flap—Outer Wing LH
64. Door—Fire Extinguisher
65. Cover—Hydraulic Tank Filler Access
66. Flap
67. Door—Fuselage Fire Wall to Windshield LH
68. Door—Fuselage Fire Wall to Windshield RH
69. Fairing—Fuselage Fire Wall Lower Right
70. Door—Fuselage Fire Wall Lower Right Fairing
71. Fairing—Fuselage Fire Wall Upper Right
72. Panel—Fuselage RH Fairing
73. Mast—Radio Antenna Complete
74. Fillet—Front Bulkhead RH
75. Fillet—Wing to Fuselage Front RH
76. Fillet—Wing to Fuselage Intermediate Front RH
77. Fillet—Wing to Fuselage Intermediate Rear RH
78. Fillet—Wing to Fuselage Rear RH
79. Fixed Gun Camera
80. Windshield—Cockpit Enclosure
81. Panel—Front Cockpit
82. Track—Cockpit Enclosure Front Outboard LH and RH
83. Panel Fixed
84. Track—Cockpit Enclosure Rear Inboard LH and RH
85. Panel—Cockpit Enclosure (Rear)
86. Enclosure—Rear Cockpit (Rear)
87. Pilot's Seat—Schick Johnson (Ref. 121-53001) Warren-McArthur (Ref. 121-53001)
88. Panel—Rear Instrument Complete
89. Panel—Front Instrument Complete
90. Installation—Surface Controls
91. Installation—Brake Controls
92. Floor—Front Cockpit RH and LH
93. Floor—Rear Cockpit Complete Front LH and RH
94. Frame—Complete
95. Installation—Radio Equipment
96. Installation—Furnishings
97. Installation—Oxygen Equipment
98. Door—Baggage Compartment
99. Rear Fuselage Assembly
100. Installation—Tail Wheel
101. Shelf-Hydraulic Control
102. Installation—Hydraulic
103. Fairing—Tail wheel
104. Fairing—Fuselage Tail Wheel LH
105. Fairing—Fuselage Tail Wheel RH
106. Cover—Fuselage Rear Section 7 to 8 Access
107. Cover—Fuselage Rear Station 215-⅝ to 227-⅜
108. Cover—Fuselage Rear Section Body Access
109. Fillet—Horizontal Stabilizer Intermediate LH
110. Fillet—Horizontal Stabilizer Intermediate RH
111. Fairing—Fuselage Horizontal Stabilizer RH
112. Fairing—Fuselage to Horizontal Stabilizer LH
113. Stabilizer—Horizontal
114. Horn—Complete
115. Elevator
116. Tab—Elevator Trim
117. Fairing—Horizontal Stabilizer Rear LH

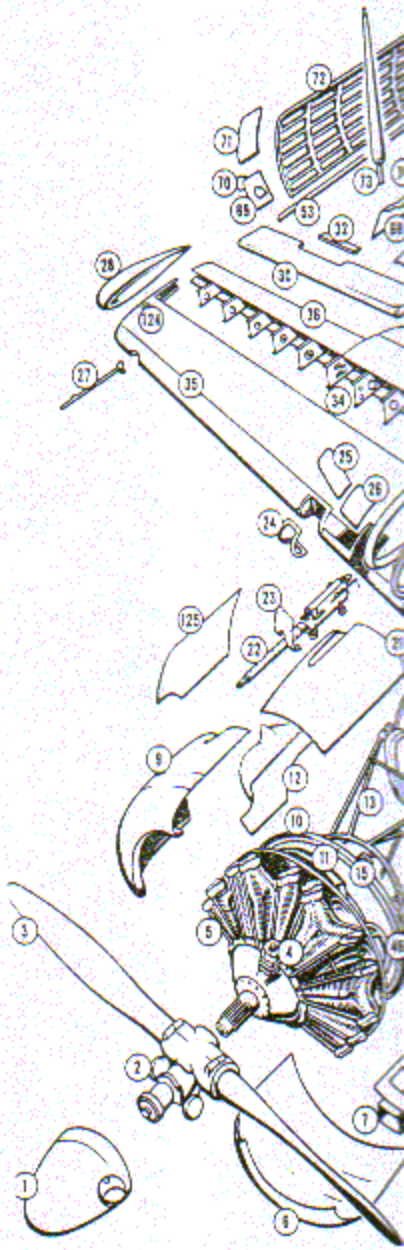


Figure 9 — General Airplane

zontal Stabilizer
LH
zontal Stabilizer
RH
elage Horizontal
H
elage to Horizontal
H
lorizontal
plete

r Trim
rizontal Stabilizer

118. Fairing—Horizontal Stabilizer RH
119. Fairing—Fuselage to Vertical Stabilizer
120. Stabilizer—Vertical
121. Rudder Assembly
122. Tab—Rudder Trim
123. Instrument Flying Hood
124. Outer Wing Electrical Installation
125. Cowling—Engine Removable Upper Right

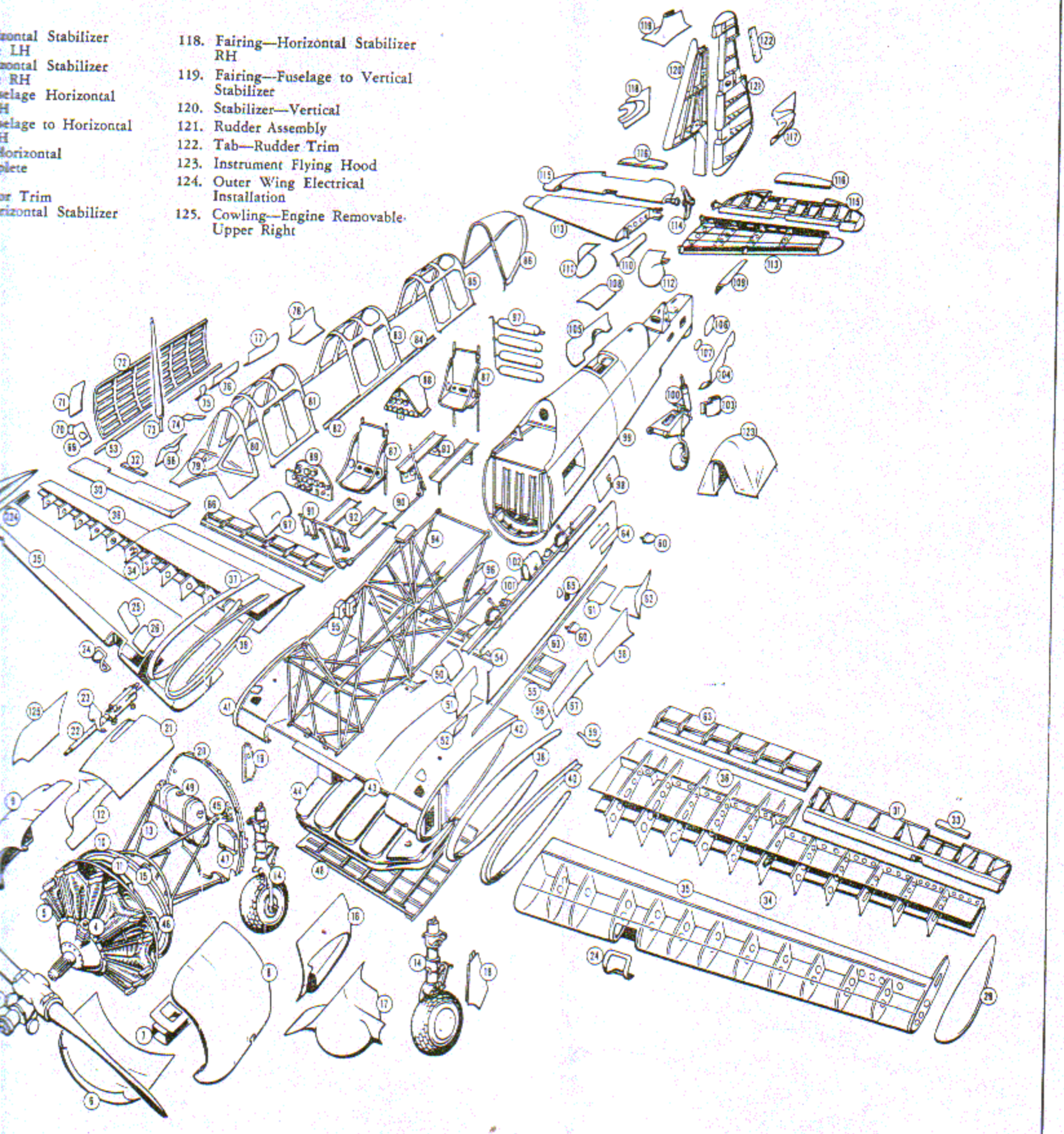


TABLE I

DIMENSIONS AND LEADING PARTICULARS

GENERAL

Over-all wing span ..... 42 ft, 1/4 in.

Over-all length ..... 28 ft, 11-7/8 in.

Over-all height, antenna mast, thrust line level ..... 12 ft, 9-1/4 in.

Over-all height, antenna mast, three point position ..... 12 ft, 6 in.

WINGS

Airfoil section at root ..... NACA 2215

Airfoil section at tip ..... NACA 4412

Chord at root ..... 90 in.

Chord at tip ..... 48 in.

Dihedral leading edge ..... 5°, 41 min

Incidence at root ..... 2°

Incidence at tip ..... 0°

Washout at tip ..... 2°

Sweepback ..... 10°, 18 min, 16 sec

FLAPS

Chord, each flap ..... 14-11/32 in.

Length of center section flap ..... 113-1/4 in.

Length of each outer wing flap ..... 89-3/8 in.

EMPENNAGE

Horizontal Stabilizer

- Over-all span ..... 12 ft, 11-5/16 in.
- Maximum chord (leading edge to hinge line ..... 38-7/8 in.
- Incidence (fixed setting) ..... 1°

Vertical Stabilizer

- Maximum chord (leading edge to hinge line) ..... 36-19/32 in.
- Setting, fixed ..... 1°, 45 min left

Elevators (each)

- Span ..... 12 ft, 11-5/16 in.

AREAS

Wings (total area including ailerons) ..... 253.73 sq ft

Ailerons (each)

- Area aft of hinge line, including tab ..... 8.98 sq ft
- Area of balance ..... 2.42 sq ft
- Total area of each aileron ..... 11.40 sq ft
- Area of tab ..... .44 sq ft

Flaps

- Area of center section flap ..... 11.40 sq ft
- Area of each outer wing flap ..... 8.73 sq ft
- Total area (3 flaps) ..... 28.86 sq ft

Empennage

- Total area horizontal tail surface, including 5.33 sq ft fuselage ..... 50.11 sq ft
- Total area vertical surfaces ..... 18.54 sq ft

Horizontal Stabilizer

- Total area, including 5.33 sq ft fuselage ..... 28.34 sq ft

Elevators (each)

- Area aft of hinge line, including tab ..... 9.13 sq ft
- Area trim tab ..... .73 sq ft
- Area of balance ..... 1.75 sq ft
- Total area, including tab and balance ..... 10.88 sq ft

Vertical Stabilizer ..... 5.33 sq ft

Rudder

- Area aft of hinge center line ..... 10.95 sq ft
- Area of balance ..... 2.26 sq ft
- Area trim tab ..... .60 sq ft
- Total area including balance and tab ..... 13.21 sq ft

SETTING AND RANGE OF MOVEMENT OF CONTROL SURFACES

(Movements measured from neutral or streamline position in degrees or inches)

Ailerons—up	15°	4-19/64 in.
Ailerons—down	15°	4-19/64 in.
Flaps—down	45°	11-3/8 in.
Elevators—up	30°	12-11/32 in.
Elevators—down	20°	8-25/32 in.
Elevator Tabs—up	8°	5/8 in.
Elevator Tabs—down	16°	1-9/32 in.

Rudder—right	30°	16-61/64 in.
Rudder—left	30°	16-61/64 in.
Rudder Tab—right	4°	15/64 in.
Rudder Tab—left	10°	39/64 in.

THESE SETTINGS USED ON AT-6, A, B, AND MOST C MODELS

Ailerons—up	30°	9-1/4 in.
Ailerons—down	15°	4-19/64 in.
Aileron Tabs—up	15°	27-32 in.
Aileron Tabs—down	30°	1-13/16 in.
Rudder—right	35°	20-9/16 in.
Rudder—left	35°	20-9/16 in.

WHEEL TYPE LANDING GEAR

Type	Hydraulically retractable
Tread (width from center of tire to center of tire)	102-3/4 in.

MAIN SHOCK STRUTS

Type	Combination air and oil
Make (Bendix)	NAA 77-33102 AC Spec. No. 40228

WHEELS (MAIN)

Type 11-drop center—27 in.	AC Spec. No. AN-W-6
Tire	27 in. 8-ply

BRAKES

Type	Hayes—Hydraulic "Servo"

TAIL WHEEL

Type	Steerable and non-retractable
Tire	12.5 in.
Tire, AT-6, A, B, SNJ-3	10 in.

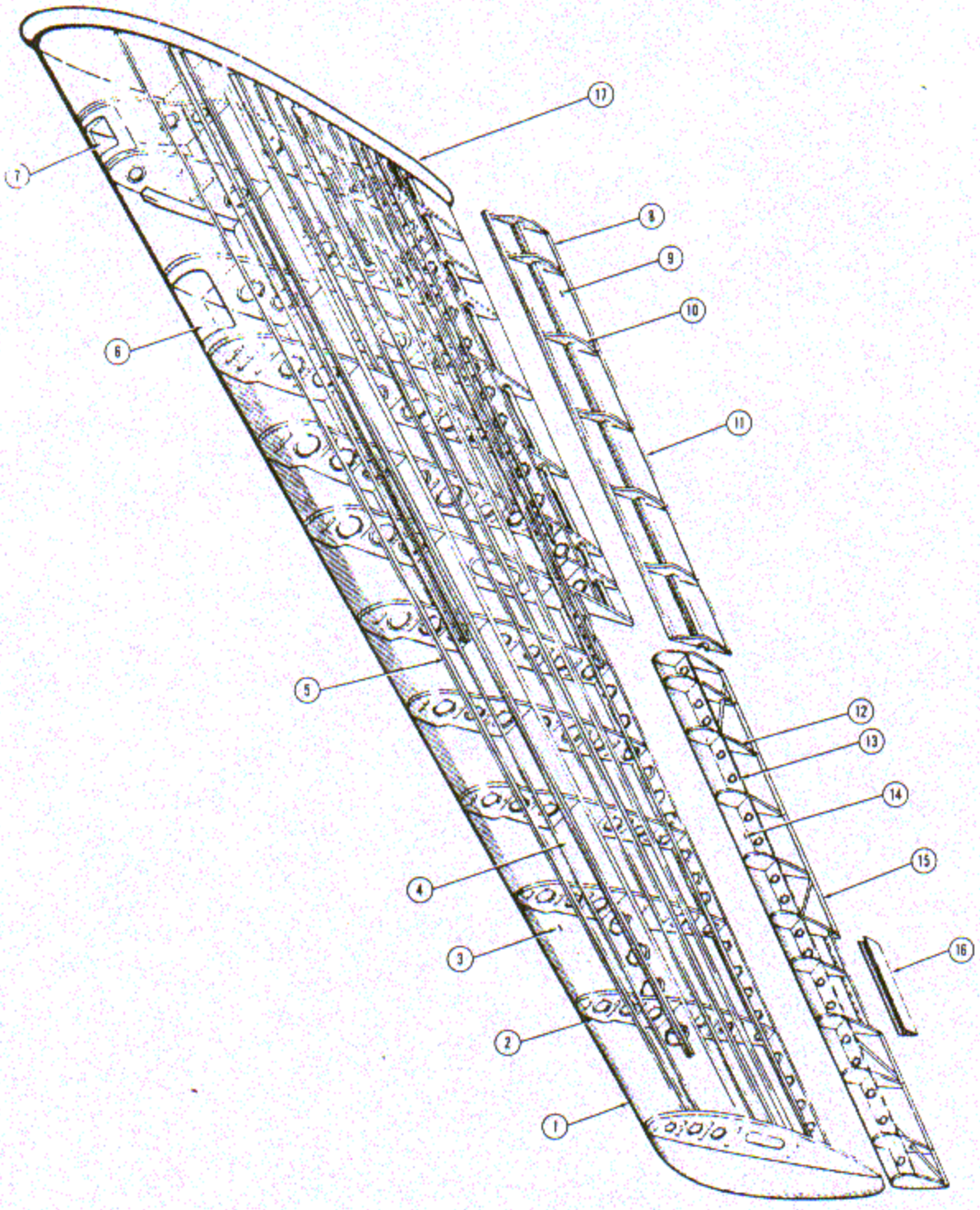
TAIL SHOCK STRUT

Type	Combination air and oil
Make (Bendix or Gladden)	AC Spec. No. 25272

TABLE II

STANDARD BEND RADII FOR ALUMINUM SHEET

GAGE	2024-O	2024-T3 or T4	2024-T36
.012	1/32	1/16	1/16
.016	1/32	1/16	1/16
.020	1/32	1/16	1/16
.025	1/16	1/16	1/16
.032	1/16	3/32	3/32
.040	1/16	3/32	1/8
.050	1/16	1/8	5/32
.063	3/32	5/32	7/32



1. Wing, Outer Panel
2. Rib, Wing
3. Skin, Wing
4. Spar, Nose
5. Stringer
6. Landing Light Compartment
7. Camera Compartment
8. Flap
9. Skin, Flap
10. Rib, Flap
11. Flap, Trailing Edge
12. Rib, Aileron
13. Spar, Aileron
14. Skin, Aileron
15. Aileron
16. Trim Tab, Aileron
17. Cover, Bolting Angle

Figure 10—Wing Repair Index

SECTION II

WING GROUP

1. GENERAL.

(See figure 10.)

The wing is of full-cantilever, stressed skin design and consists of a center section and two detachable outer wing panel sections. Two sections of .040 inch thick pressed 2024-O Alclad sheet heat-treated, lap-riveted along the periphery, form the wing tip and are secured to the rib at station 186.351 by screws and nut plates. A channel extends from this rib and is fastened to it by rivets, 37-5/16 inches aft of the leading edge of the wing panel. The structure is built from 2024-T3 Alclad sheet formed into spars and power-pressed ribs, and the skin is stiffened in a span-wise direction by 2024-T4 aluminum-alloy and Alclad stringers. The outer wing sections and the center section are joined by external bolting angles along the upper and lower skin surfaces. A plate rib, also known as the end plate, distributes shear from the single outer panel main spar to the two center section spars. On the T-6G, the inboard bay of each outer panel, aft of the front spar, is modified structurally to accommodate a new fuel cell. The notation "wing station" indicates the distance in inches measured from the center line of the airplane to any position outboard of the center line. This is not to be confused with the term "station" which when used in reference to each outer wing may signify either the distance in inches outboard of the wing joint, or outboard of the center line of the airplane as noted. *(See figure 11.)*

2. STRINGERS.

a. DESCRIPTION.

(1) Stringers used in the construction of the fixed surfaces are extruded shapes of 2024-T4 aluminum alloy except in a few instances where the material used is Alclad sheet in rolled shapes. On the AT-6A the stringer types and locations in the right wing are symmetrical with those of the left wing. *(See figure 11.)* In the AT-6B and C the stringer types and locations in the left wing *(figure 12)* are symmetrical with those of the right wing except for a small portion of the upper and lower surfaces of the outer wing leading edge at the joint. *(See figures 13 through 28.)*

(2) Refer to Section VIII for a summary of the types of stringers used in the original construction of the fixed surfaces and a list of acceptable substitutes.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Negligible damage to stringers includes a damage not more than 1/32 inch deep; abrasions and nicks, not through the Alclad, which can be burnished out to prevent stress concentrations; bends or kinks having radii equal to or more than twice the thickness of the member which can be straightened or corrected by cold working without cracking the metal.

(2) DAMAGE REPARABLE BY PATCHING.—A damage not more than ¼ inch deep and 6 inches long or a hole not more than ¼ inch in diameter can be repaired by patching. Inspect thoroughly for small cracks which must be filed or ground out or arrested by a drilled hole No. 40 (.098) at the end of the crack.

(3) DAMAGE REPARABLE BY INSERTION.—A stringer damage more than ¼ inch deep and 6 inches long or a hole more than ¼ inch in diameter may be repaired by replacing a portion of the damaged stringer with a new piece and adding suitable reinforcements or splice members and rivets. All splice members must be fully heat-treated before installation in the wing.

CAUTION

Do not make any splice in the bay at the outboard or inboard end of the stringer. Replace the damaged stringer with a new portion and locate the splice outboard of the first bay. Make no more than two splices in any one bay and no two splices in adjacent bays. It is permissible to splice a stringer in the bay of the outer panel between stations 0 and 15 provided that splice members are used the full length of the bay.

(4) DAMAGE NECESSITATING REPLACEMENT OF PARTS.—In case of short stringers particularly, and where damage occurs in adjacent bays, extensive repair can in some instances be more satisfactorily accomplished by the total replacement of a stringer, resulting in structural strength equal to the original installation without weight increase.

Note

Estimation of damage to the bulb portion of an extrusion (or the loop of a rolled section) requires particular attention. Where some stringers such as 1S40LT (C123LT), 1E2T (C180T), 1E4 (C366T), 4E6T (C274T), combination 1E87T - 1E4T (C250T - C366T), and doubled 1S4T (C366T) have damaged webs in the flanges but no damage in the bulbs or loops, they may be repaired as described in the following applicable paragraphs. See appropriate figures illustrating repairs.

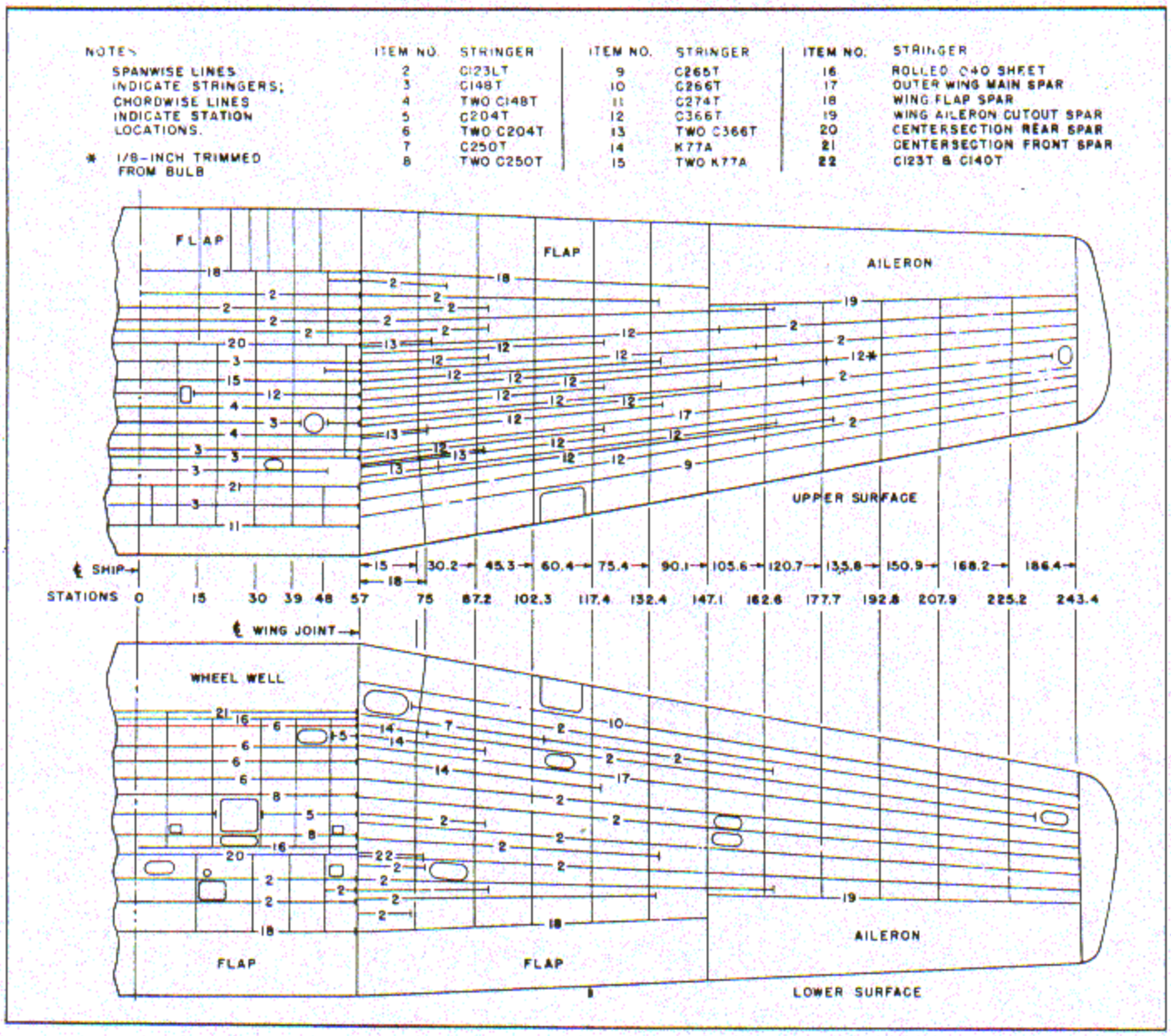


Figure 11 — Wing Stringer Arrangement and Stations—AT-6A

c. REPAIR METHODS.—From the reference drawings *(figures 11 and 12)* determine the type of the damaged stringer and refer to applicable paragraph and illustration. Typical major repair of the specific stringer involved is outlined on the figure. The reinforcing member used for minor repair, where no cut-out or filler is inserted, is of the same length, material thickness, and with the same rivet spacing unless otherwise noted in the text.

CAUTION

Support the wing in a proper manner to relieve tension and compression loads in the wing surfaces before making any repairs.

(1) GENERAL NOTES.

(a) Where skin rivets are located on 1-1/4 inch centers, or more, through the stringer, additional rivets not to exceed double the number of existing skin rivets should be used in the stringer and splice member at the splice. Skin rivets and splice rivets at the end of the splice must have at least 3/8-inch edge distance.

(b) Where ribs interfere with the installation of a stringer splice, modify the rib cut-out as required. Limit cut-outs to dimensions not to exceed 1/16 inch clearance between the cut-out and the stringer.

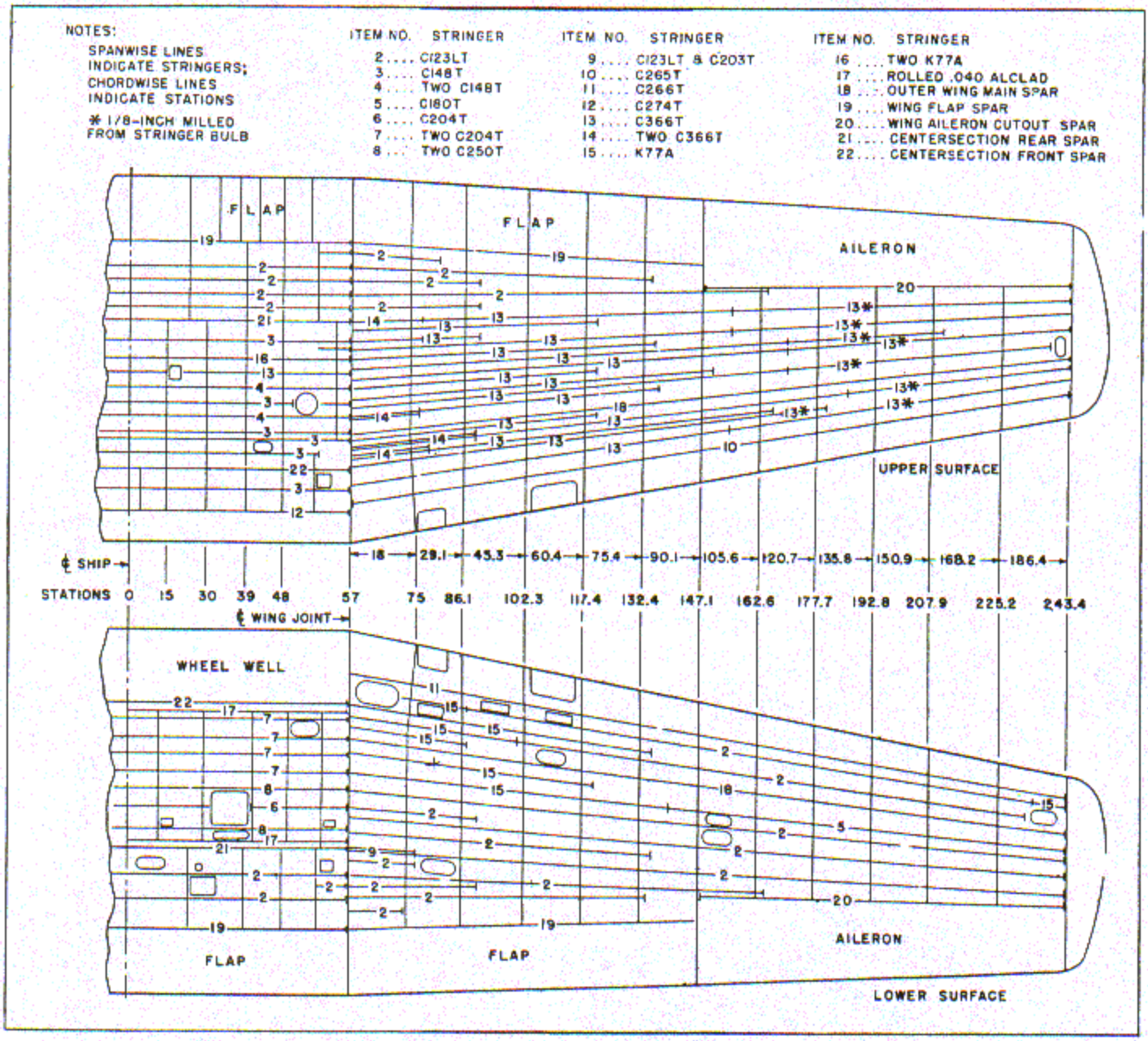


Figure 12—Wing Stringer Arrangement and Stations—AT-6B, C, D, and G

CAUTION

The ends of stringers that are replaced at the wing joint should be well aligned to a straightedge held across both the upper and lower bolting flanges at the same time; skill must be used in making this fit because the stringers must bear on the end plate. Limits of tolerance between the end plate and the end of the stringer are .000 minimum at the heel and .006 at the toe.

(c) All bolt holes must be drilled and reamed to make a light drive fit with the bolts. No bolt threads shall be in bearing.

(d) File radii in all the inside corners, and break all the outside corners.

(e) Chamfer the outside corners of all splice members to entirely clear the inside corner radii.

(f) Both ends of the cut stringer and of the filler should be filed off square, and the filler should be fitted closely at both ends of the cut to minimize loss of rigidity.

(2) TYPE 1S40LT (C123LT). *(See figure 13.)*—This stringer is used extensively in the costruction of both upper and lower surfaces of the wing. It is formed by rolling 2024-T3 Alclad sheet .040-inch thick and has no equivalent Alcoa die number. Minor damage to type 1S40LT stringers in both upper and lower surfaces of the wing may be repaired with an extrusion of 2024-T4 aluminum alloy, type 1E101T (C203T) as a reinforcement. If the extrusion is not available, a satisfactory

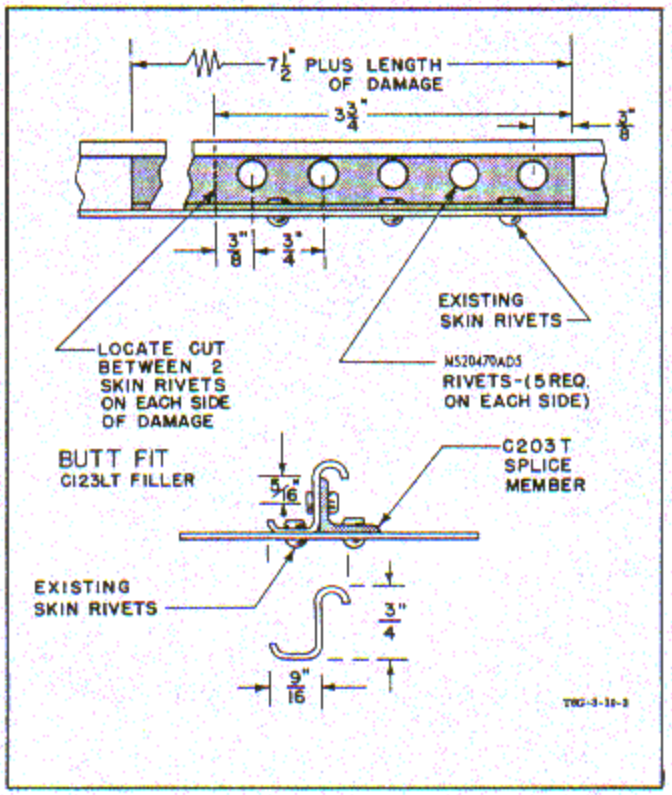


Figure 13 — Splice for Stringer Type 1S40LT (C123LT)

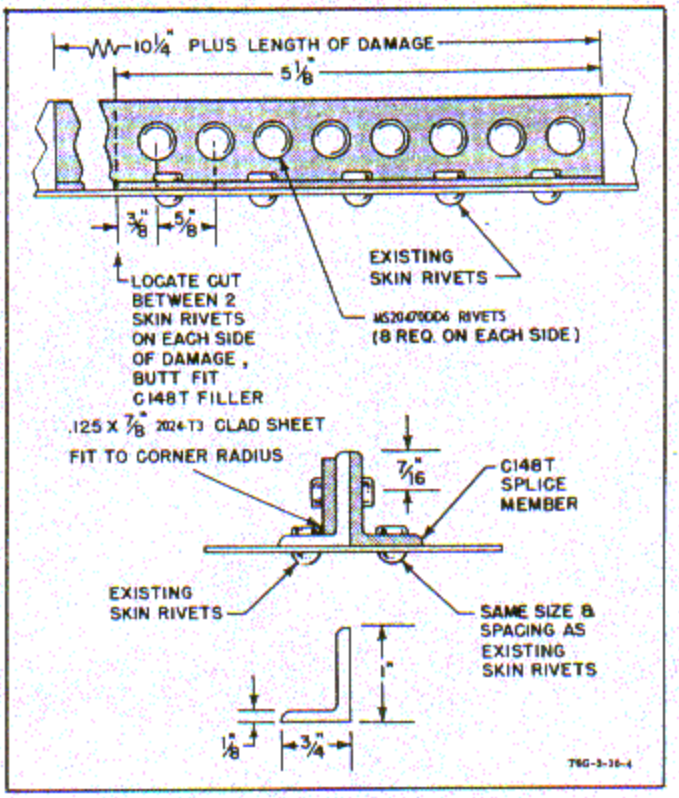


Figure 14 — Splice for Stringer Type 1E110T (C148T)

repair may be made with a piece of .081-inch 2024-T3 Alclad sheet bent to a similar shape.

(3) TYPE 1E110T (C148T). *(See figure 14.)*—A stringer of this type is used in the upper surface of the wing center section. It is an extrusion of 2024-T4 aluminum alloy, Alcoa No. K734-JJ. Minor damage may be repaired with a length of 1E110 extrusion not to exceed 10¼ inches plus the damage.

(4) DOUBLED TYPE 1E110T (C148T). *(See figure 15.)*—Two right-angle stringers are placed together so that they form a T-shaped member in the upper surface of the center section.

(a) Minor damage to one stringer may be repaired by reinforcing the stringer with one piece of 1E110T extrusion in a manner similar to the repair of the single 1E110T stringer *(figure 14)*, but the square corner of the extrusion must be chamfered to clear the inside corner radius of the stringer.

(b) Minor damage to two stringers (sections) may be repaired in the same manner except that two reinforcing pieces are used, the MS20470DD6 rivets being of sufficient length to pass through the four upright flanges.

(5) TYPE 1E2T (C180T). *(See figure 16.)*—Located in the lower surface of the outer wing of AT-6B and C airplanes are bulb angle stringers made from extruded 2024-T4 aluminum alloy, Alcoa No. K14280. When estimating damage to a bulb angle stringer remember that any injury whatever to the bulb portion requires a major repair. However, if damage had occurred which affects only the web of the upright flange or the straight flange, a minor repair is permissible and may be made by riveting a reinforcing piece of 1E2T extrusion to the stringer and to the skin as instructed in *figure 16*.

(6) TYPE 1E100T (C204T). *(See figure 17.)*—This type stringer, located only in the lower surface of the center section, is an extrusion of 2024-T4 aluminum alloy, Alcoa No. K14654. Minor damage may be repaired with a reinforcement affixed as illustrated.

(7) DOUBLED TYPE 1E100T (C204T). *(See figure 18.)*—Two right-angle stringers are placed together so that they form a T-shaped member in the lower surface of the center section.

(a) Minor damage to one stringer may be repaired by reinforcing the stringer with one piece of 1E100T extrusion in a manner similar to the repair of the single 1E100T stringer *(figure 17)*, but the square corner of the extrusion must be chamfered to clear the inside corner radius of the stringer.

(b) Minor damage to two stringers (sections) may be repaired in the same manner except that two reinforcing pieces are used, the MS20470AD5 rivets be-

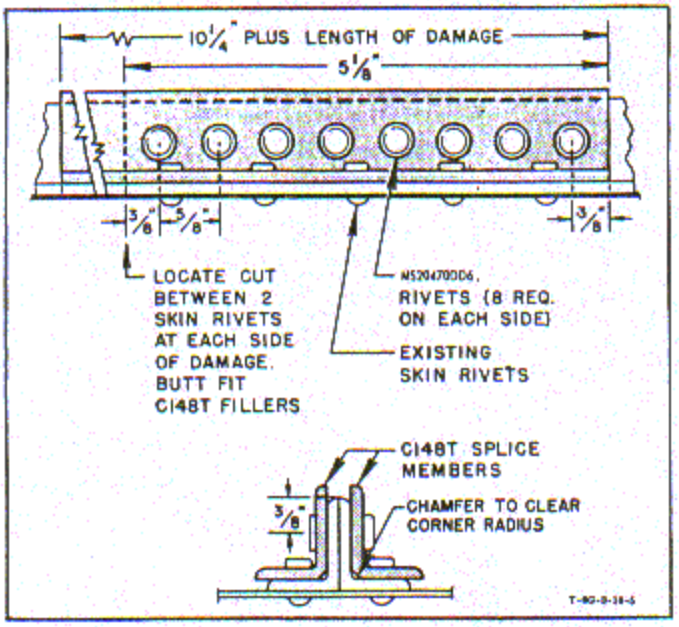


Figure 15 — Splice for Doubled Type Stringers 1E110T (C148T)

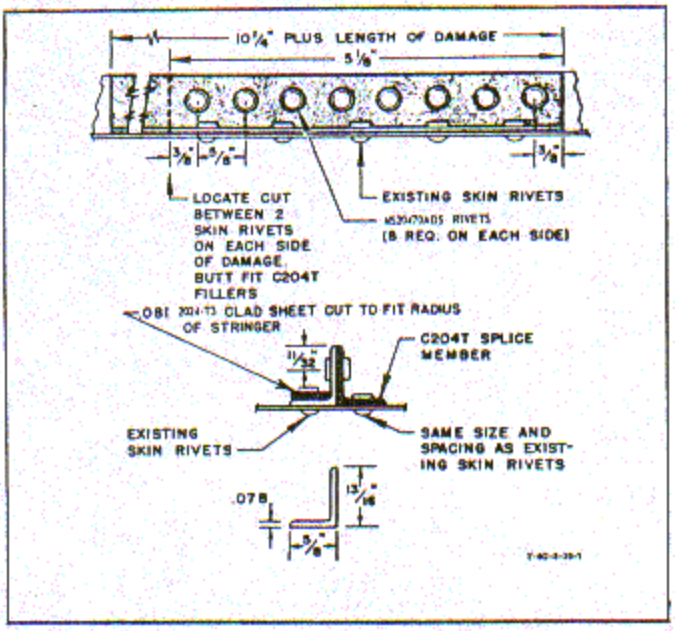


Figure 17 — Splice for Stringer Type 1E100T (C204T)

ing of sufficient length to pass through the four upright flanges.

(8) TYPE 1E87T (C250T). *(See figure 19.)*—This stringer, used only in one location in the lower surface of the outer wing on AT-6A airplanes, is an extruded form of 2024-T4 aluminum alloy, Alcoa No. K16869. Minor damage may be repaired with a length of 1E87T extrusion not to exceed 10-¼ inches plus the length of damage.

(9) DOUBLED TYPE 1E87T (C250T). *(See figure 20.)*—These stringers are located in several positions in the lower surface of the center section on AT-6 series airplanes. Doubled stringers are used in the center section and also in the upper surface of the right outer wing just aft of the wing gun bay on AT-6B and C airplanes. *(See figure 12.)*

(a) Minor damage to one stringer may be repaired by reinforcing the stringer with one piece of 1E87T extrusion in a manner similar to the repair of the single 1E87T stringer *(figure 19)* but the square

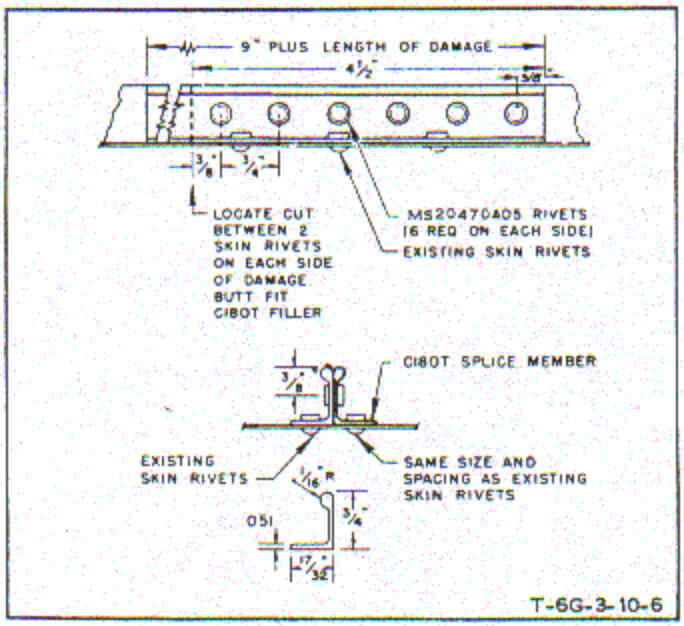


Figure 16 — Splice for Stringer Type 1E2T (C180T)

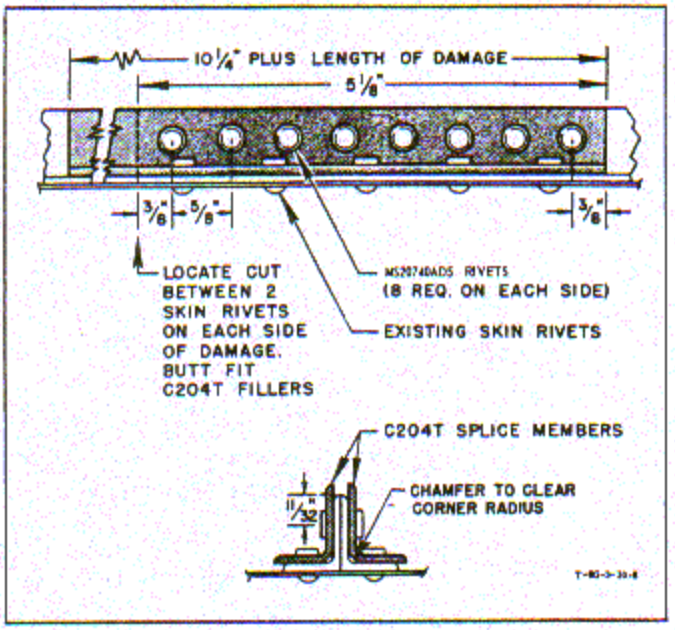


Figure 18 — Splice for Doubled Type Stringers 1E100T (C204T)

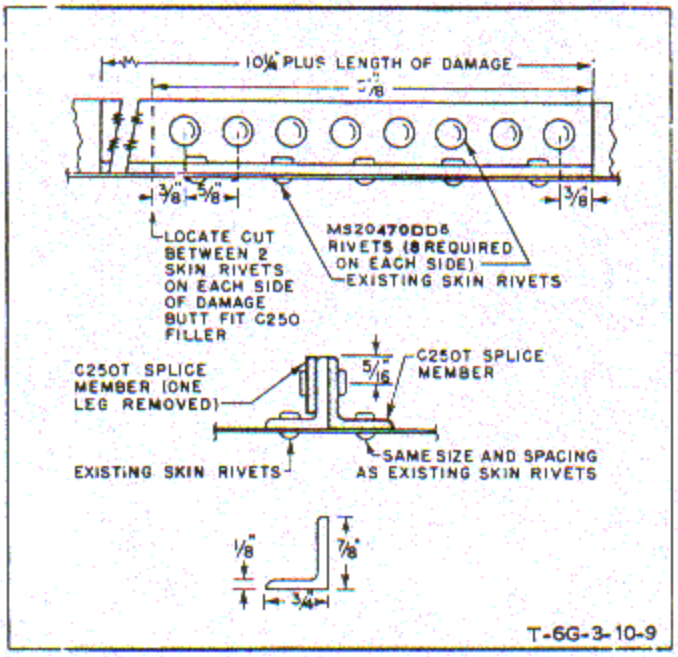


Figure 19 — Splice for Stringer Type 1E87T (C250T)

corner of the extrusion must be chamfered to clear the inside corner radius of the stringer.

(b) Minor damage to double stringers (sections) may be repaired in the same manner except that two reinforcing pieces are used, the MS20470DD6 rivets being of sufficient length to pass through the four upright flanges.

(10) COMBINATION TYPES 1E87T AND 1E4T (C250T AND C366T). *(See figure 21.)*—A 1E87T and a 1E4T stringer combination is used on AT-6B and C airplanes in one location in the upper surface of the right outer wing, just aft of the wing gun compartment.

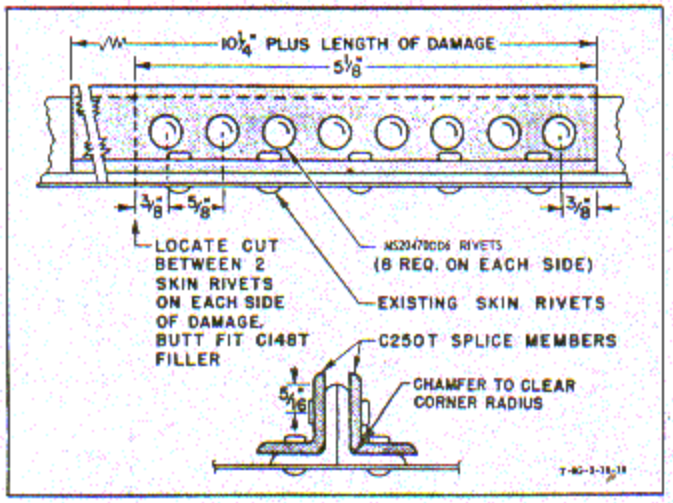


Figure 20 — Splice for Doubled Type Stringers 1E87T (C250T)

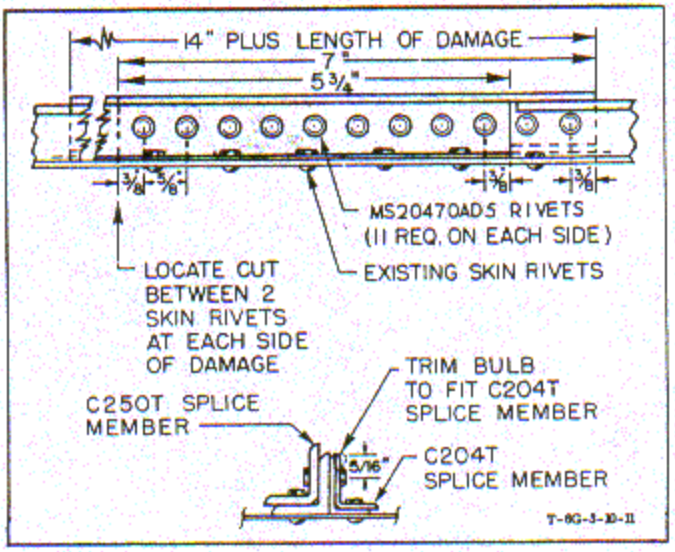


Figure 21 — Splice for Combination Stringers 1E87T — 1E4T (C250T — C366T)

(a) Minor damage to the 1E87T section may be repaired by reinforcing with a piece of the same type of extrusion, similar to the repair of the single 1E87T stringer.

(b) Minor damage to the 1E4T section, except the bulb portion, should be reinforced with a piece of 1E100T (C204T) extrusion 10-1/4 inches long plus the length of damage. File the upright flange of the 1E100T piece to fit the radius at the bulb of the 1E4T stringer, and chamfer the square corner to clear the inside corner radius of the stringer.

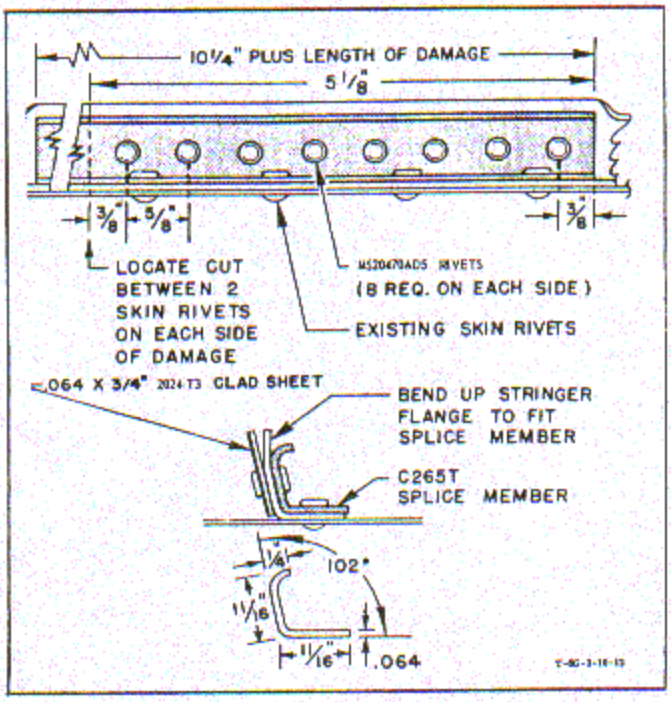


Figure 22 — Splice for Stringer Type 1561T (C265T)

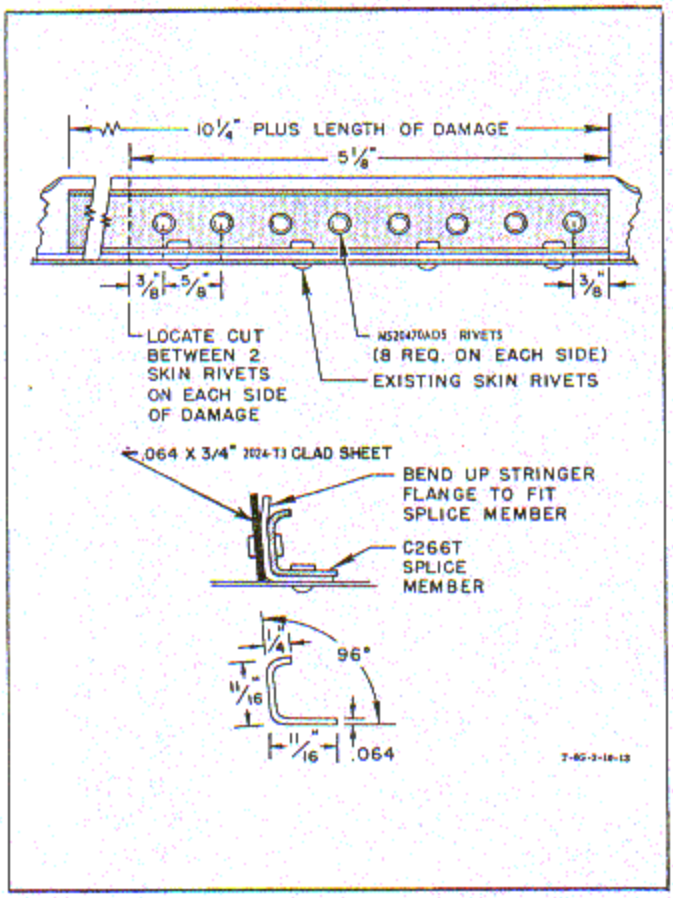


Figure 23 — Splice for Stringer Type 1S62T (C266T)

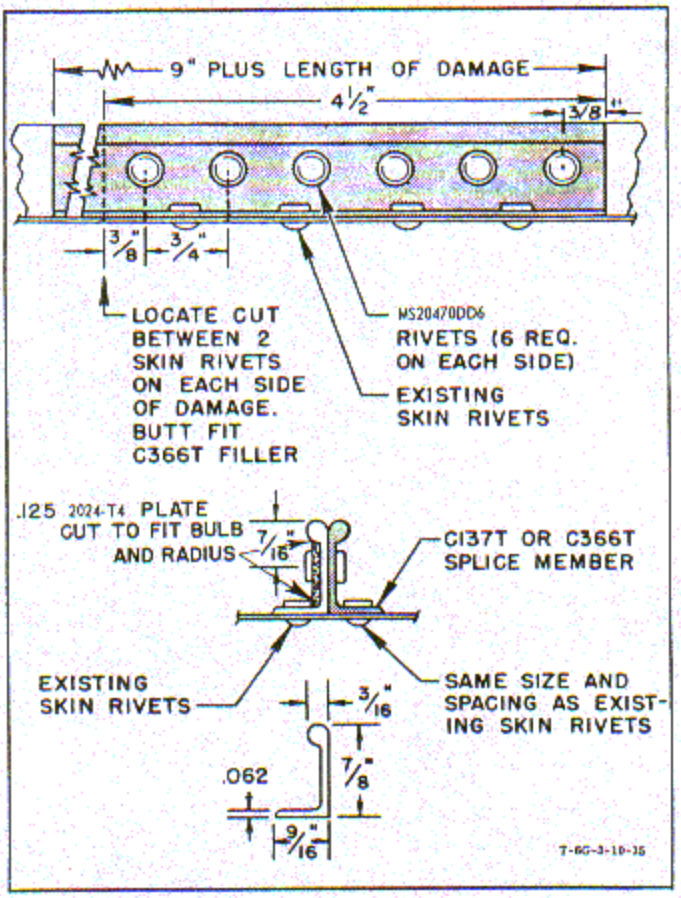


Figure 25 — Splice for Stringer Type 1E4T (C366T)

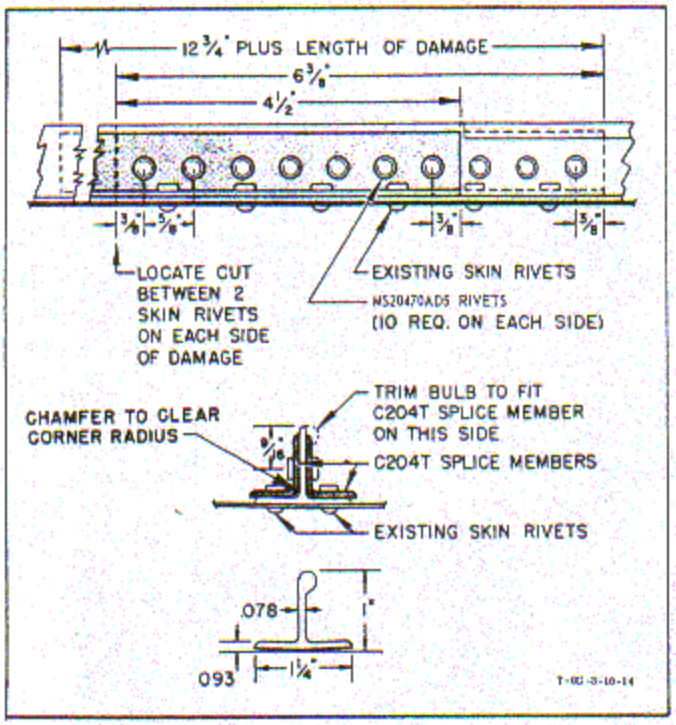


Figure 24 — Splice for Stringer Type 4E6T (C274T)

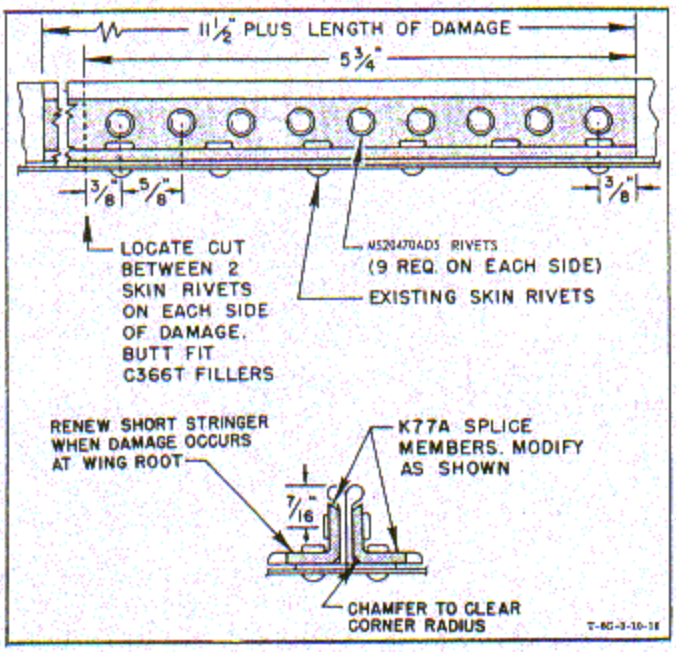


Figure 26 — Splice for Doubled Type Stringer 1E4T (C366T)

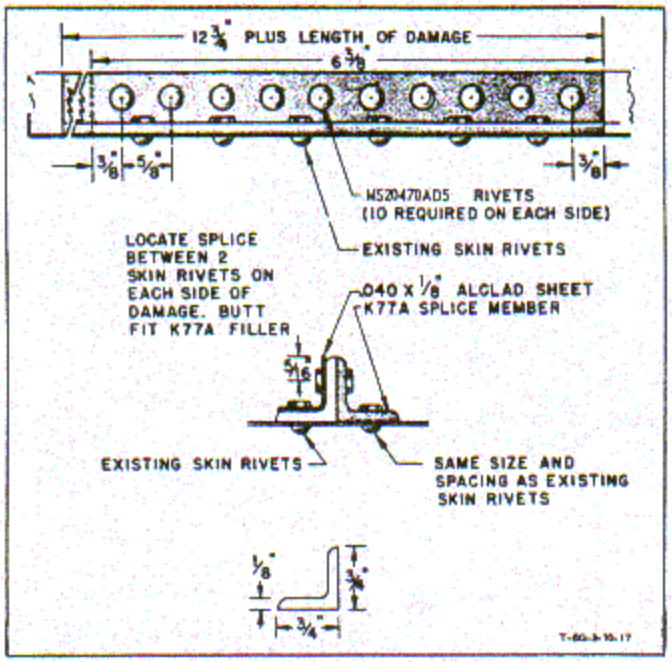


Figure 27 — Splice for Stringer Type K77A

(11) TYPE 1S61T (C265T). *(See figure 22.)*—This type of stringer is used at the leading edge on the upper surface of the outer wing. It is formed of 2024-T3 Alclad sheet and has no equivalent Alcoa die number. Minor damage may be repaired by reinforcing as illustrated.

(12) TYPE 1S62T (C266T). *(See figure 23.)*—A stringer of this type is used at the leading edge on the lower surface of the outer wing. It is formed of 2024-T3 Alclad sheet and has no equivalent Alcoa die number. Repair minor damage by reinforcing as illustrated.

(13) TYPE 4E6T (C274T). *(See figure 24.)*—This T-angle bulb extrusion, Alcoa No. L23966, is used at the leading edge on the upper surface of the center section. Repair minor damage by riveting a reinforcement to the flat side of the upright flange. Any damage to the bulb portion must be treated as a major repair.

(14) TYPE 1E4T (C366T). *(See figure 25.)*—These stringers, Alcoa No. L24910, are bulb angle extrusions of 2024-T4 aluminum alloy used extensively in the upper surface of the outer wing and in several locations in the upper surface of the center sections.

(15) DOUBLED TYPE 1E4T (C366T). *(See figure 26.)*—A combination of two 1E4T stringers is employed in the upper surface of the outer wing. Usually only a short length of the stringer is used to reinforce another of the same type near the root of the wing. When damage occurs here the entire length of the doubled stringers, never longer than one or two bays, should be renewed and the remaining stringer spliced

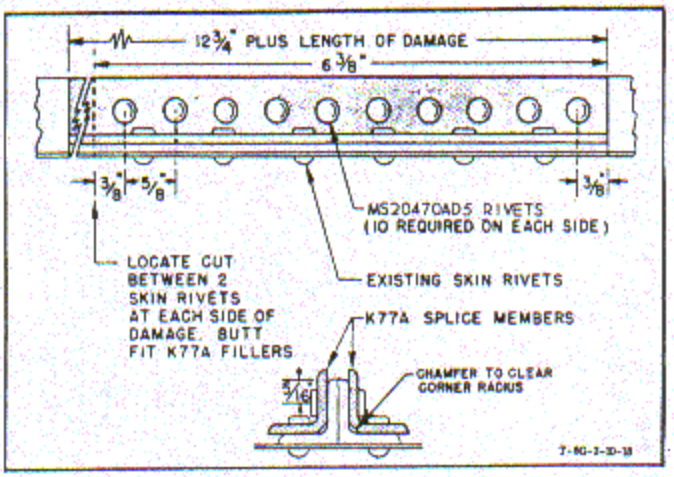


Figure 28 — Splice for Doubled K77A Type Stringers

as shown in *figure 25*. Replacement of this combination is recommended, but the splice shown in *figure 26* may be utilized when immediate repair is necessary and the damage does not extend beyond two bays. This condition occurs only in the upper surface of the right outer wing of the AT-6B and AT-6C airplanes, just aft of the gun compartment.

(16) TYPE K77A. *(See figure 27.)*—This Alcoa extrusion of 2024-T4 aluminum alloy is used in several locations in the lower surface of the outer wing. Repair minor damage by riveting reinforcement to the upright flange.

(17) DOUBLED TYPE K77A. *(See figure 28.)*—A combination of two K77A stringers is located only in the upper surface of the center section. Minor damage to one stringer may be repaired by reinforcing with a piece of the same extrusion in a manner similar to the repair of the single K77A stringer, *figure 27*. Make major repairs as illustrated in *figure 28*.

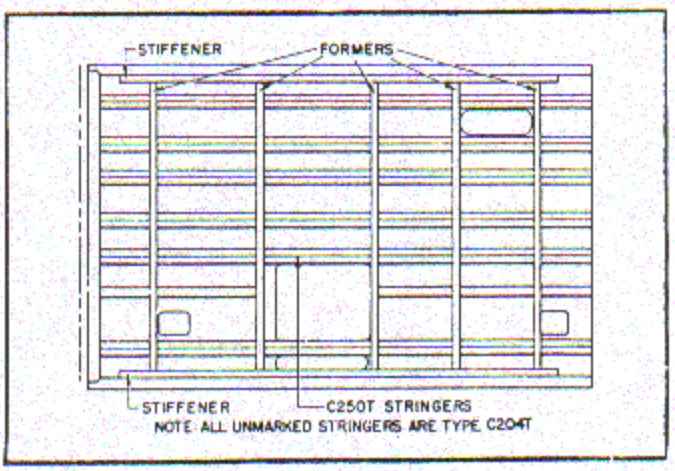


Figure 29 — Center-Section Fuel Tank Compartment Door

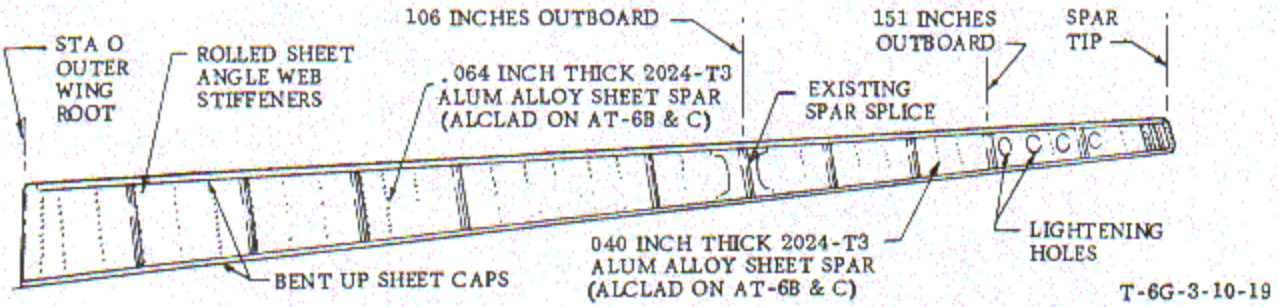


Figure 30 — Outer Wing Main Spar

(18) CENTER SECTION FUEL TANK COMPARTMENT DOOR STRINGERS.—*(See figure 29.)*

3. SPARS.

a. DESCRIPTION.—The spars in the earlier airplanes were made from 2024-T3 aluminum-alloy sheet, but in the newer models Alclad sheet is used. These are formed with bent up caps, except on the front spar of the center section where both upper and lower caps are angle extrusions type 1E117T (C245T) riveted to the web. The material thicknesses of these sheets vary from .032 in the aileron spar to .064 in the outer wing main spar and the center section front spar. Rolled sheet angle web stiffeners are riveted to the spars. *(See figure 30.)* Spars and ribs are joined with gussets riveted to both members. The skin is riveted to the spar, rib, and stringer.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE. — Abrasions and nicks not more than 1/32 inch deep which are not through the Alclad can be burnished out. Bends or kinks having radii equal to or more than twice the thickness of the member which can be straightened or corrected by cold working without cracking the metal are considered negligible.

(2) DAMAGE REPARABLE BY PATCHING.—Small cracks which must be filed or ground out or arrested by a drilled hole No. 40 (.098) can be repaired by riveting a patch over the affected area provided that no interference results. Where a spar cap only is damaged it may be repaired by adding a reinforcing plate riveted to the cap and the web. Damage not greater than 50 percent of the depth of the spar web may be repaired in a like manner, but angle stiffeners must be added on the side of the spar opposite the reinforcement. If large dents or holes occur in the spar web, patches may be used. *(See figure 42.)*

(3) DAMAGE REPARABLE BY INSERTION. *(See figures 31 through 42.)*—Major damage to a spar is usually repaired by inserting fillers of the same material, to which splice plates are added and, in some cases, made to lap by joggling.

(4) DAMAGE NECESSITATING REPLACEMENT OF PARTS.—Spar caps may be repaired in an emergency as illustrated in *figures 40 and 41,* but where severely damaged or entirely severed, complete replacement is recommended.

c. REPAIR METHODS. — The procedures for the typical repairs shown in the accompanying figures will be modified to suit the character and location of the particular injury under consideration.

(1) OUTER WING MAIN SPAR.

(a) ROOT TO 106 INCHES OUTBOARD. *(See figure 31.)*—Modify the rib attaching angles as required to permit replacement. When the cap and web are badly damaged, the entire depth of the spar should be cut through and completely spliced with overlapping plates.

(b) 106 to 151 INCHES OUTBOARD OF ROOT. *(See figure 32.)*—Make repairs in a manner similar to those for the preceding paragraph.

(c) 151 INCHES OUTBOARD TO TIP. *(See figure 33.)*—This splice is applicable only to areas between flanged web cut-outs. Where these cut-outs are present in the affected area, the doublers around cut-outs should be trimmed as required and the necessary number of rivets picked up at each side of the damage.

(2) OUTER WING FLAP SPAR. *(See figure 34.)*

(3) OUTER WING AILERON SPAR. *(See figure 35.)*

(4) CENTER SECTION FLAP SPAR. *(See figure 36.)*—The repair shown in this case does not involve the lightening hole. When the damage is in the area of the lightening hole a repair can be made similar to that shown in *figure 34.*

(5) CENTER SECTION REAR SPAR. *(See figure 37.)*—All or part of the repair shown may be made, dependent upon the severity of the injury.

(6) CENTER SECTION FRONT SPAR WEB. *(See figure 42.)*—Two repairs are illustrated, a patch and a splice, to be selected according to the nature of the damage and the accessibility of the area.

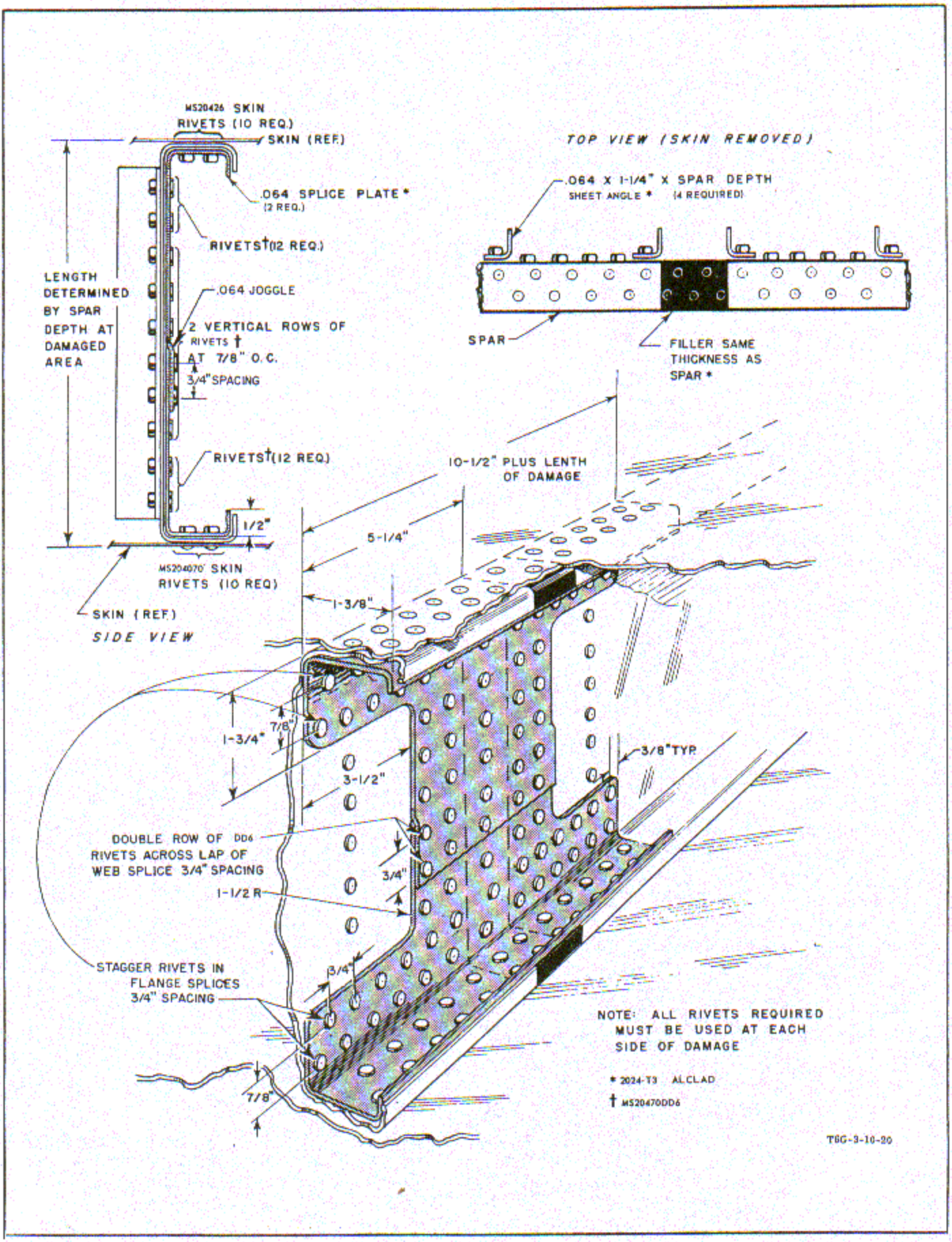


Figure 31 — Outer Wing Panel Main Spar Splice — Root to 106 Inches Outboard

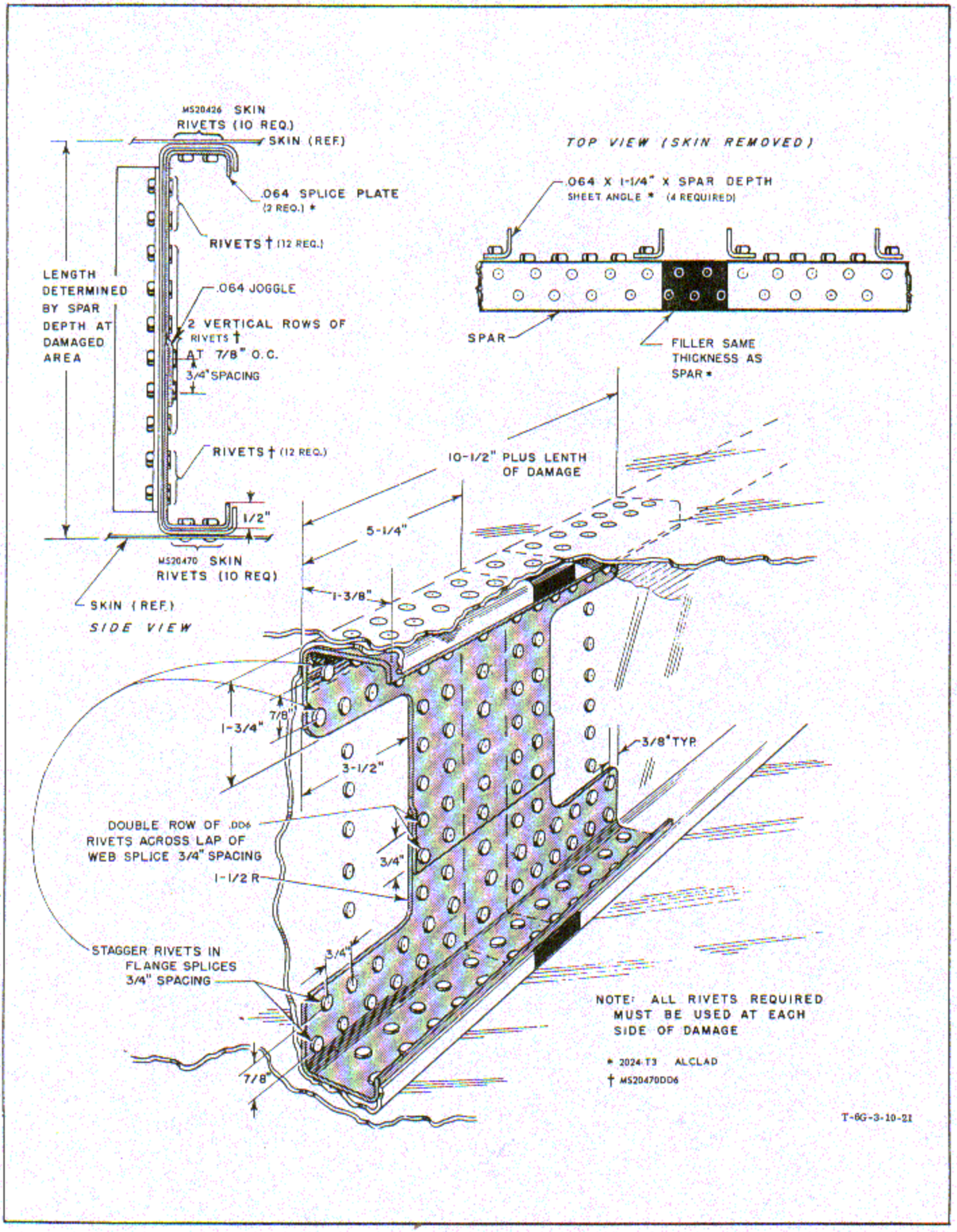


Figure 32 — Outer Wing Main Spar Splice — 106 to 151 Inches Outboard of Root

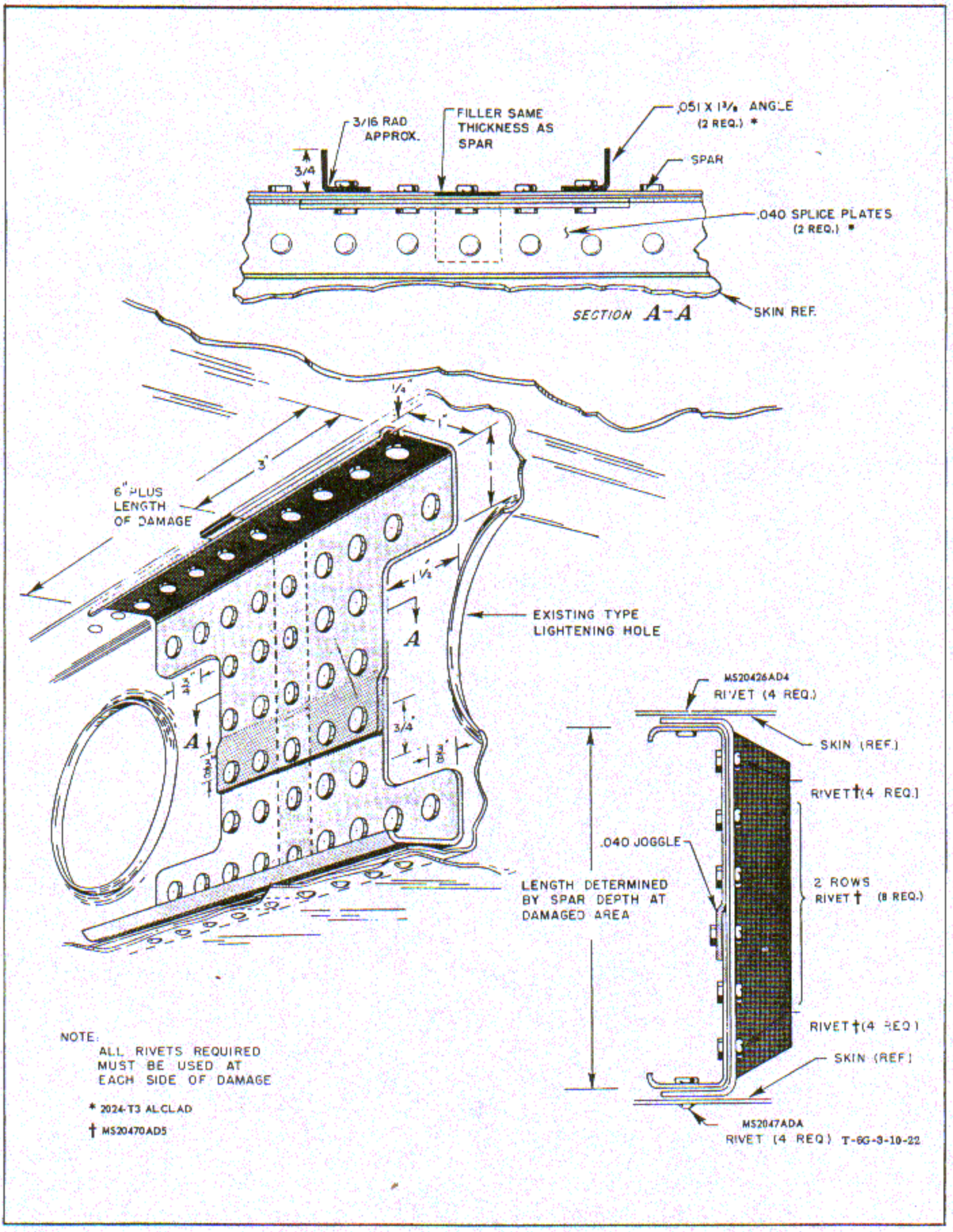


Figure 33 — Outer Wing Main Spar Splices — 115 Inches Outboard to Tip

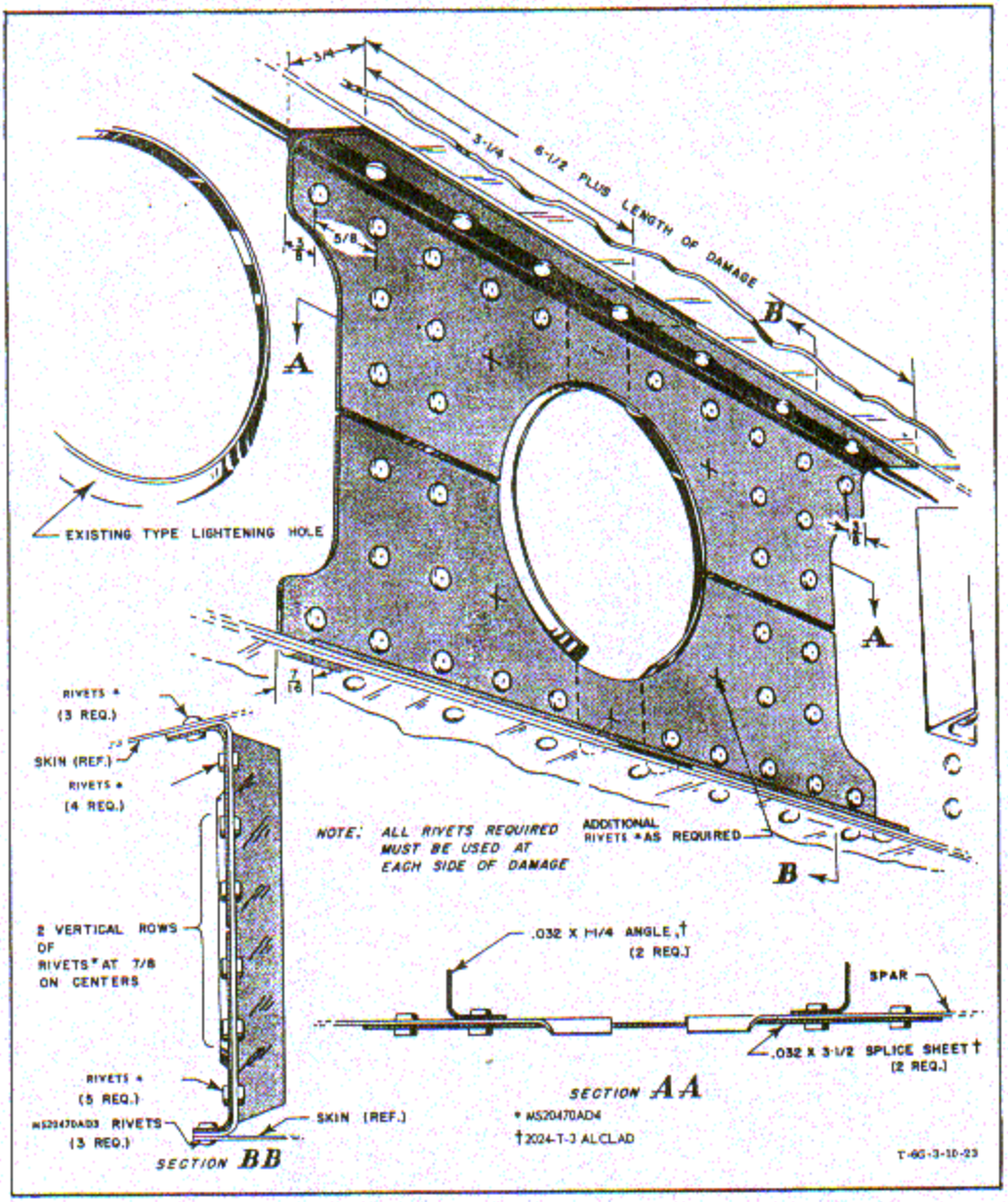


Figure 34—Outer Wing Flap Spar Splice

4. RIBS.

a. DESCRIPTION. *(See figures 38 and 39.)*—The ribs are chordwise members which form and hold the contour of the wing. Two plates called end ribs form, with the bolting angles, a means of joining the outer panels to the center section, at wing station 57. A heavy rib, known as the center rib, is located at station 0. There are also right and left center ribs, one each, in the center section, and five right and left nose ribs, intermediate ribs, front trailing ribs, and rear trailing ribs. These with the exception of the end ribs are provided with cut-outs for stringers, most of them with circular or elliptical lightening holes. Material used is 2024-T3 Alclad sheet formed on power presses. The sheet stock varies in thickness from .032 to .051 inch. Stiffening angles are riveted to the end plates and to the intermediate center rib. Generally the ribs in the outer wing panels have flanged lightening holes and beads pressed into the sheet stock which serve the purpose of stiffeners. Outer panel spars and ribs are shown in *figure 39*. The material used is the same as the center section ribs, varying from .020 to .064 inch in thickness. Give special attention to estimating damage which involves lightening holes. *(See figures 46 and 50.)*

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Any injury not through the Alclad or not more than 1/32 inch deep which can be burnished out, and all kinks and bends, not having a greater radius than twice the thickness

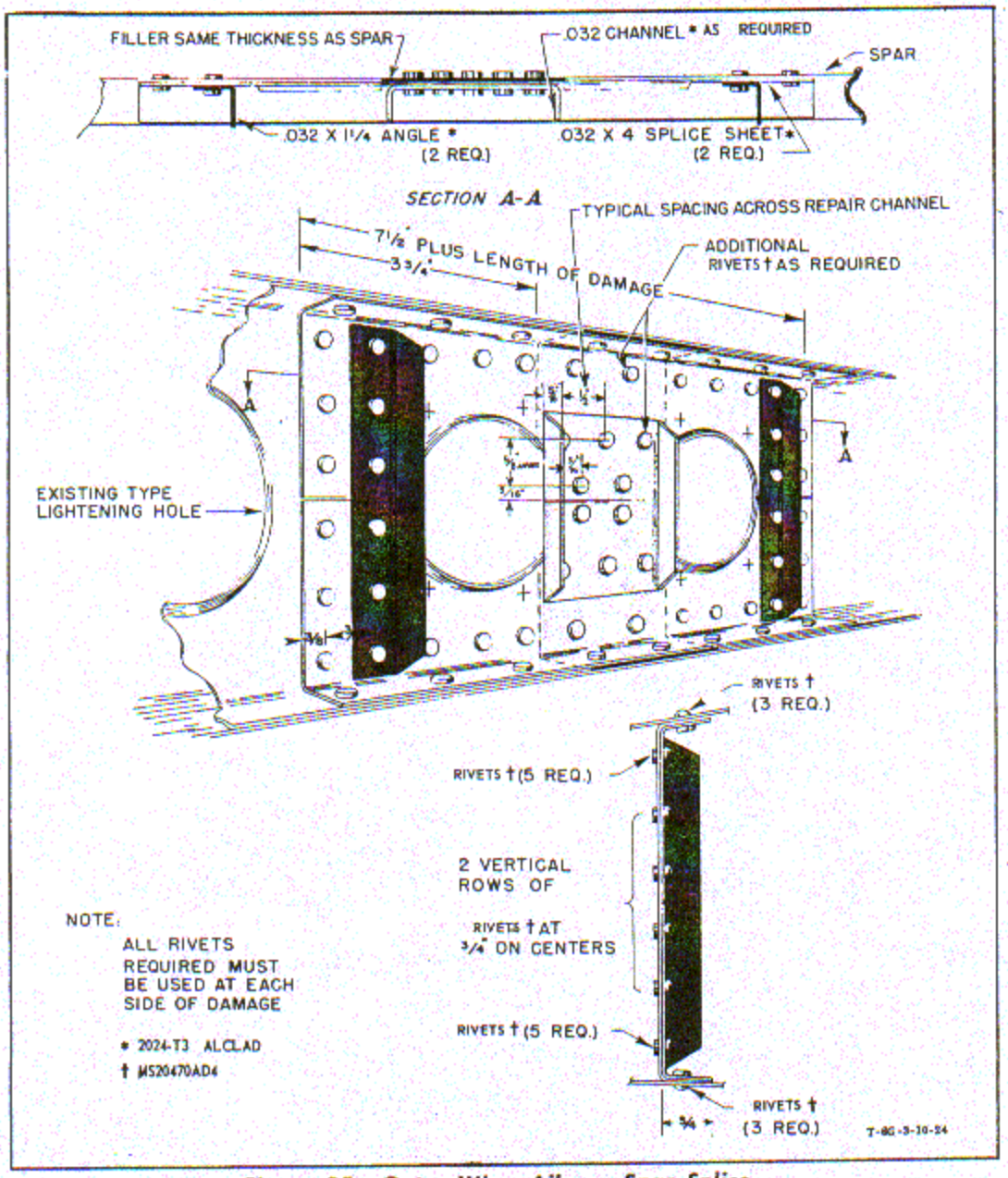


Figure 35—Outer Wing Aileron Spar Splice

of the material, which can be bumped out or straightened without cracking the metal are included in negligible damage.

(2) DAMAGE REPARABLE BY PATCHING.—Small cracks which can be arrested by drilling No. 40 (.098) holes at their ends may be covered with a suitable patch as a reinforcement. Patches in the form of bent up sheets may be used to repair broken rib beads. Holes not greater in diameter, after rounding out with a file, than 1-½ inches are repaired with patches, sometimes in conjunction with reinforcing angles riveted through the ribs. The patches should be of ample dimensions to permit a proper rivet pattern.

(3) DAMAGE REPARABLE BY INSERTION. *(See figure 44.)*—When it is necessary to make a complete splice, use a filler in addition to one or two splice plates. Properly butt-fitted, the filler is capable of taking up compression loads, while the rivets through the filler secure it to the splice member or members.

(4) DAMAGE NECESSITATING REPLACEMENT.—The wing trailing edge ribs inboard of the aileron cut-out and the center section leading edge ribs are easily replaced; however, if spare parts are not available a satisfactory repair can be made. It is a matter of choice which is the better, but it should be remembered that splices add weight, and several such repairs will affect the balance. Where damage involves two or more lightening holes in the same rib, it is desirable to replace the rib.

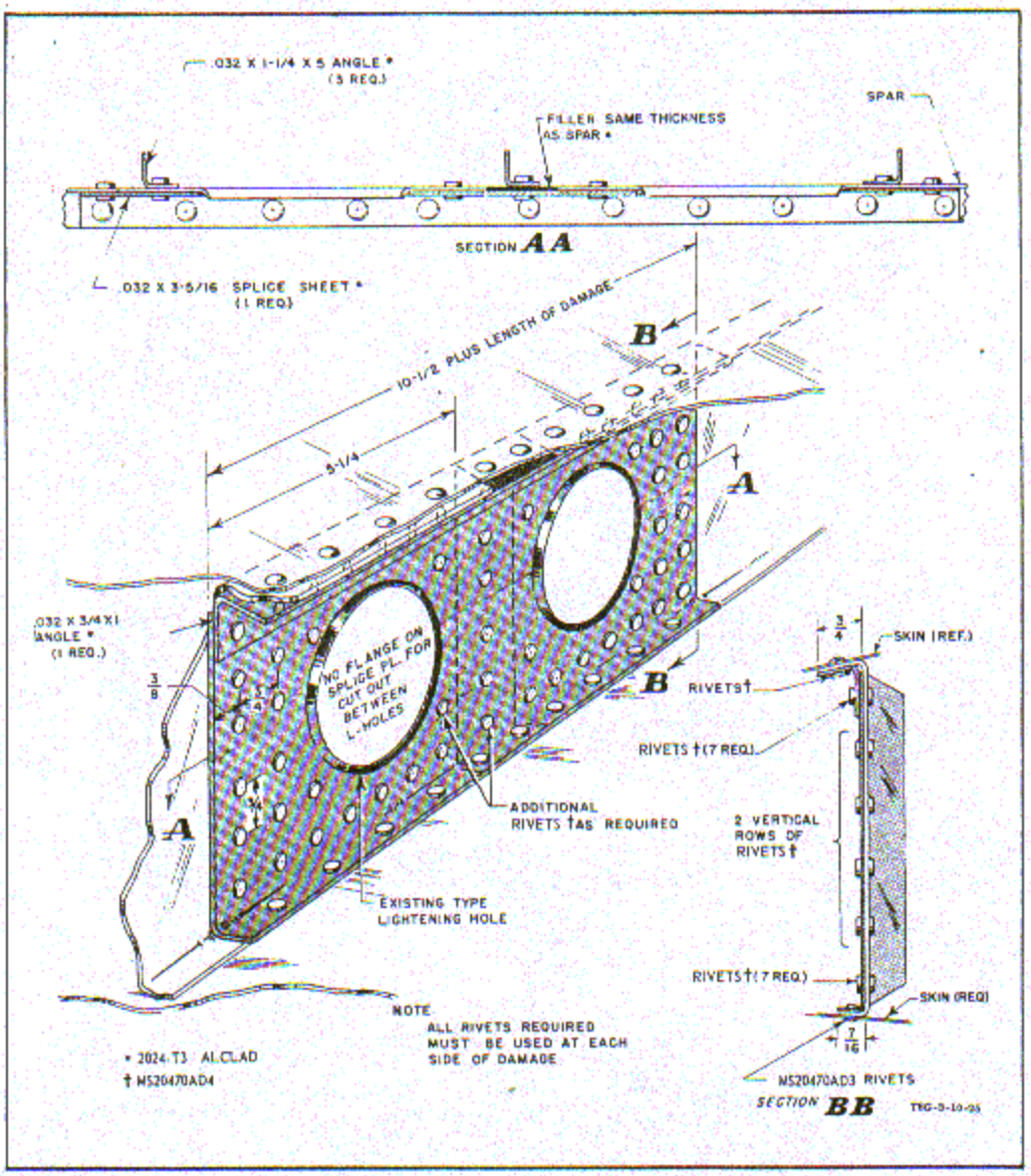


Figure 36 – Center-Section Flap Spar Splice

c. REPAIR METHODS.—Damage to flanges and lightening holes, which also have integral flanges, is most serious, and no repair should be undertaken until the details of the following illustrations have been studied.

(1) CENTER SECTION INTERMEDIATE RIBS. *(See figure 43.)*—These ribs may be spliced by using all or part of the complete repair shown, as required.

(2) WING TRAILING EDGE RIBS AND CENTER SECTION LEADING EDGE RIBS.—*(See figure 44.)*—Entire replacement of these ribs is easily accomplished but they may be repaired by splicing as shown.

(3) DAMAGED RIB BEADS.—*Figure 45* illustrates a typical repair of damage located on or about the beads in the web.

(4) DAMAGED RIB CUT-OUTS.—Any damage here requires a major repair as shown in *figure 46*.

(5) BUCKLED RIB WEBS.—Those that are not cracked or distorted beyond restoration can be straightened and reinforced as shown in *figure 47*.

(6) RIB FLANGES.—Two types of rib flanges are repaired as illustrated. In *figure 48* the flange is riveted to the skin and cut around the stringers. The other type, having the unbroken flange located approximately 3/4 inch within the skin mold line, is shown in *figure 49*.

(7) TYPICAL RIB SPLICE.—The center section rib between the rear spar and the flap spar and all the outer wing nose ribs and intermediate ribs may be spliced as shown in *figure 50*.

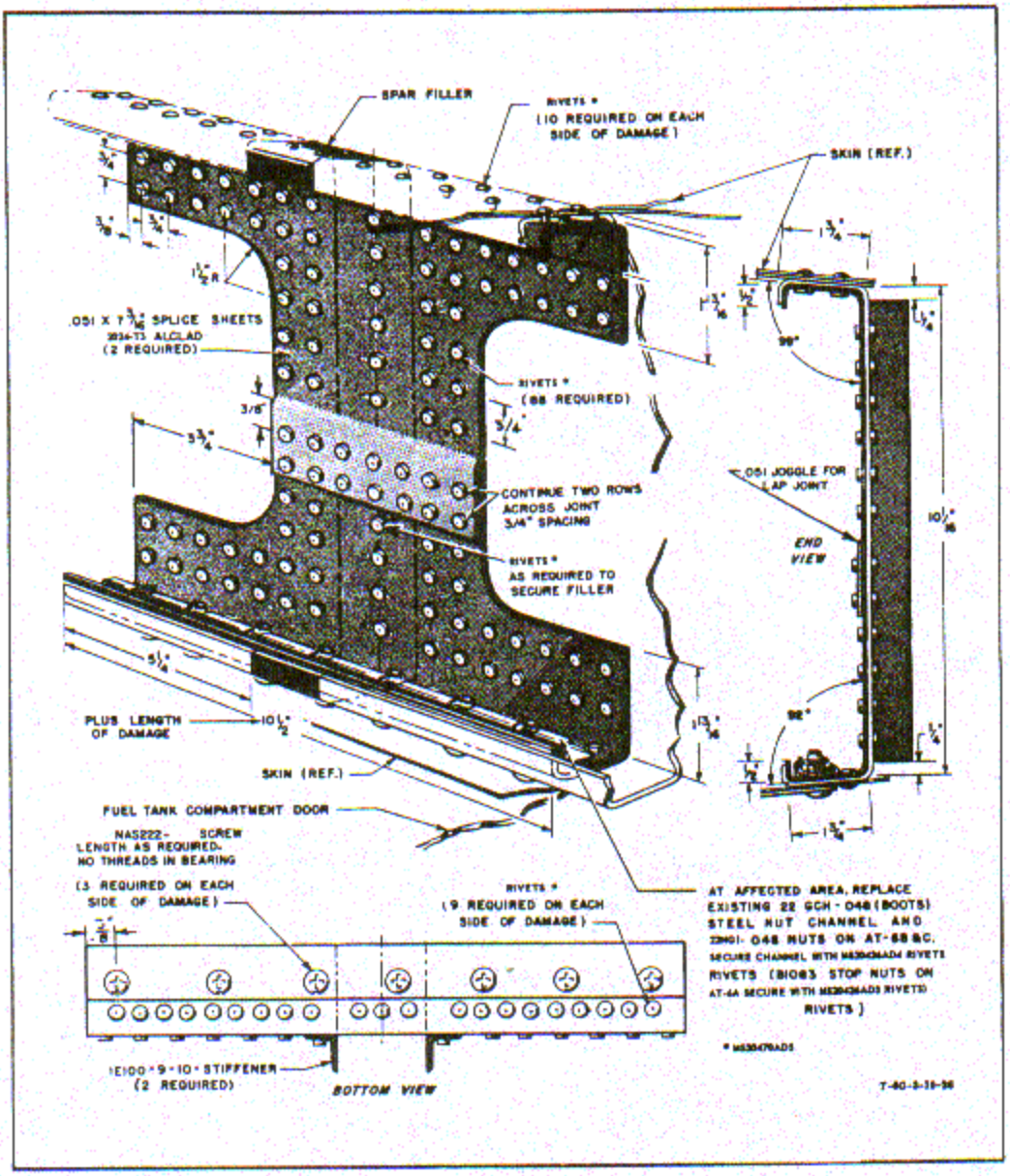


Figure 37 — Center-Section Rear Spar

(8) FUEL TANK COMPARTMENT COVER FORMER SPLICE.—Although not strictly a spar or a rib, the former can be repaired in a similar manner. *(See figure 51.)*

(9) WING TRAILING EDGE SPLICE.—Repair the trailing edge as shown in *figure 60.*

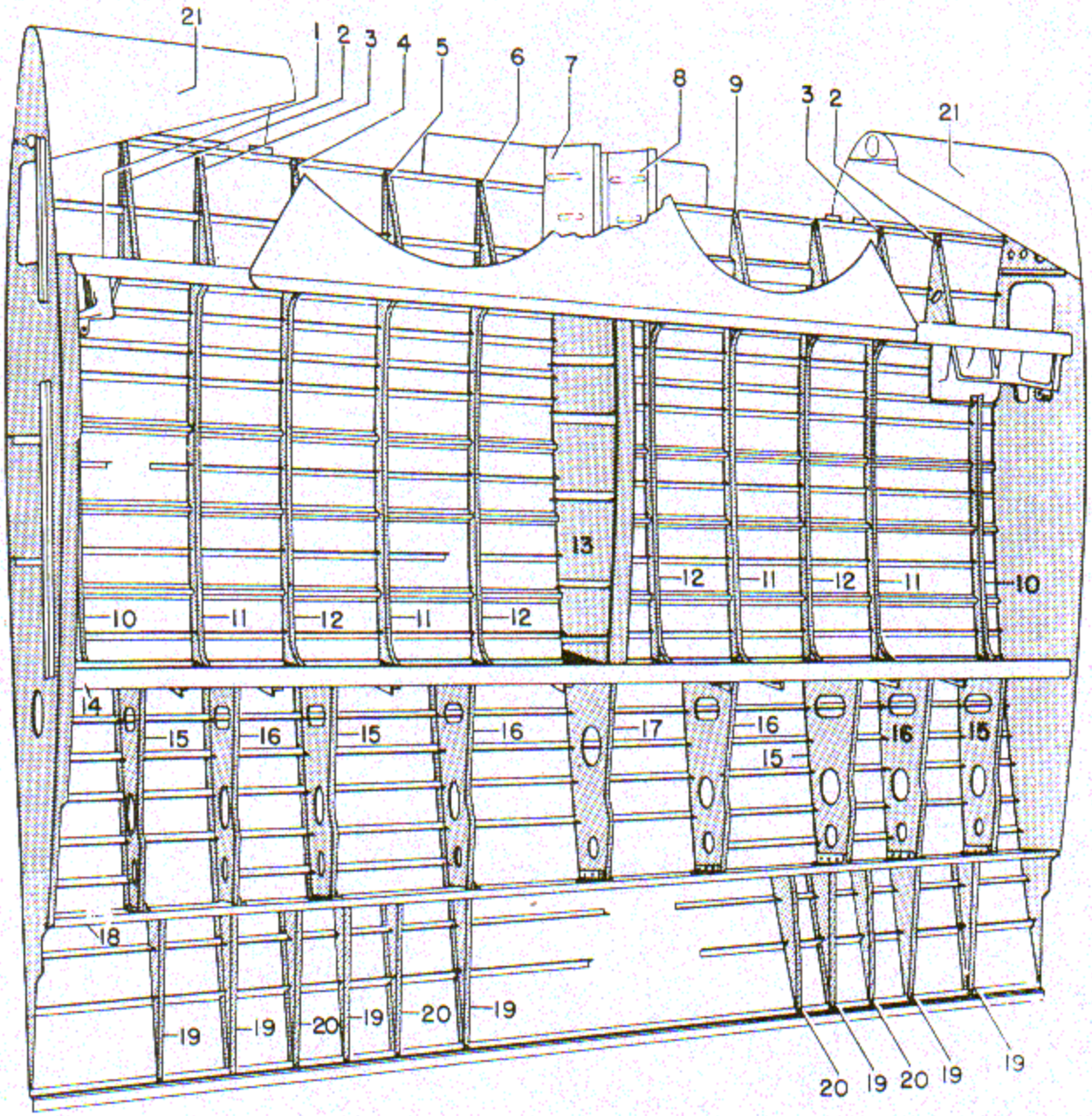
5. WING JOINT.

a. BOLTING ANGLES.

(1) DESCRIPTION.—The center-section bolting angle consists of four sections; also four sections comprise the angle of the outer wing.

(2) CLASSIFICATION OF DAMAGE. — Damaged angles must be removed and new ones installed. No repair is permissible.

(3) REPLACEMENT PROCEDURE.—Dismount the wing after providing proper support to preserve alignment. Remove bolts and drill out the rivets which are through the angles and the skin, using extreme care not to elongate the holes. When the rivets have been drilled and pushed out, remove the remaining attaching screws. The fuel tank cover bolting angle and the lower rear bolting angle of the center section are furnished as spare parts with pilot holes drilled at proper locations. The top bolting angle of the center section and all of the bolting angles of the outer wing are supplied as spare parts without pilot holes. New bolting angles must be lined up flush with the skin edge. Drill pilot holes No. 40 (.098) where necessary, picking up existing rivet holes as centers. Use replacement rivets of the same size and kind, except in



1. Front Spar
2. LH and RH Rib, Station 46-1/8
3. LH and RH Rib, Station 39
4. Right Rib, Stations 30 and 10
5. Right Rib, Station 20
6. Right Center Rib
7. Left Center Rib
8. Left Rib, Stations 30 and 10
9. Left Rib, Station 20
10. LH and RH Rib, Station 53-1/2
11. LH and RH Rib, Stations 39 and 20
12. LH and RH Rib, Stations 30 and 10
13. Center Rib, Station 0
14. Rear Spar
15. LH and RH Rib, Stations 48 and 30
16. LH and RH Rib, Stations 39 and 15
17. Center Rib, Station 0
18. Wing Flap Spar
19. Left Rib, Stations 46-15/16, 39 and 28-15/16
    Right Rib Stations 46-15/16, 39, 28-15/16 and 15
20. LH and RH Rib, Stations 33-21/22 and 23-15/16
21. Skin, Nose

Figure 38 — Center-Section Rib and Spar Parts

1. LH and RH Outer Wing Spar Assembly
2. LH and RH Nose Rib, Station 15.087
3. LH and RH Nose Rib, Stations 30 and 27.25
4. LH and RH Nose Rib, Station 45
5. LH and RH Nose Rib, Station 60
6. LH and RH Nose Rib, Station 75
7. LH and RH Nose Rib, Station 89.606
8. LH and RH Nose Rib, Station 105
9. LH and RH Nose Rib, Station 120
10. LH and RH Nose Rib, Station 135
11. LH and RH Nose Rib, Station 150
12. LH and RH Nose Rib, Station 167.25
13. LH and RH Rib, Station 186.351
14. LH and RH Outer Wing Flap Spar
15. LH and RH Intermediate Rib, Station 15.089
16. LH and RH Trailing Edge Rib, Station 15.089
17. LH and RH Reinforcement, Station 23.75
18. LH and RH Trailing Edge Rib, Station 23.75
19. LH and RH Trailing Edge Rib, Station 30.178
20. LH and RH Intermediate Rib, Station 30.178
21. LH and RH Intermediate Rib, Station 45.268
22. LH and RH Trailing Edge Rib, Station 30.178
23. LH and RH Intermediate Rib, Station 60.357
24. LH and RH Trailing Edge Rib, Station 60.357
25. LH and RH Intermediate Rib, Station 75.445
26. LH and RH Trailing Edge Rib, Station 75.445
27. LH and RH Reinforcement, Station 84
28. LH and RH Trailing Edge Rib, Station 84
29. LH and RH Trailing Edge Strip
30. LH and RH Trailing Edge Rib, Station 90.139
31. LH and RH Wing Aileron Cut-out Channel Spar
32. LH and RH Trailing Edge Rib, Station 105
33. LH and RH Trailing Edge Rib, Station 120
34. LH and RH Trailing Edge Rib, Station 135.802
35. LH and RH Trailing Edge Rib, Station 150
36. LH and RH Trailing Edge Rib, Station 167.25
37. LH and RH Trailing Edge Rib, Station 167.25
37. LH and RH Aileron Slot Fairing

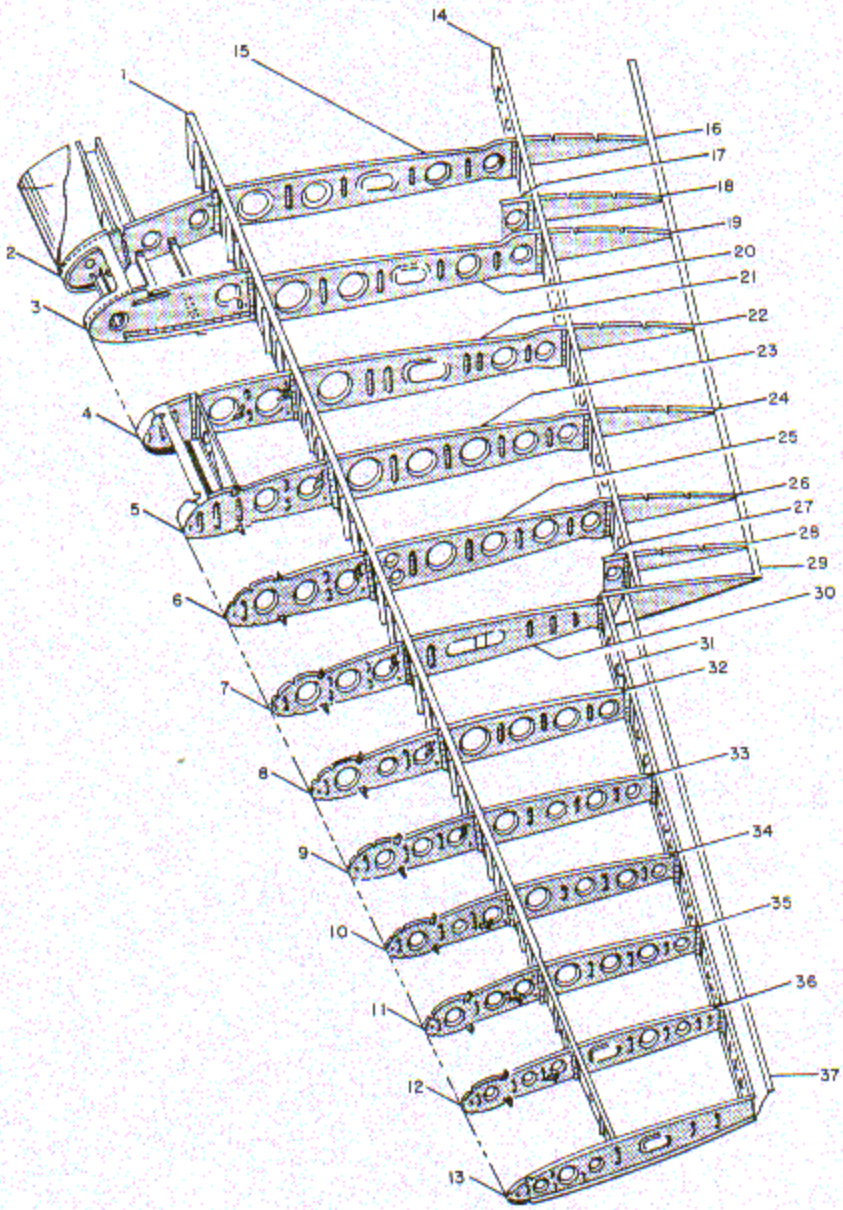


Figure 39 — Outer Wing Rib and Spar Parts

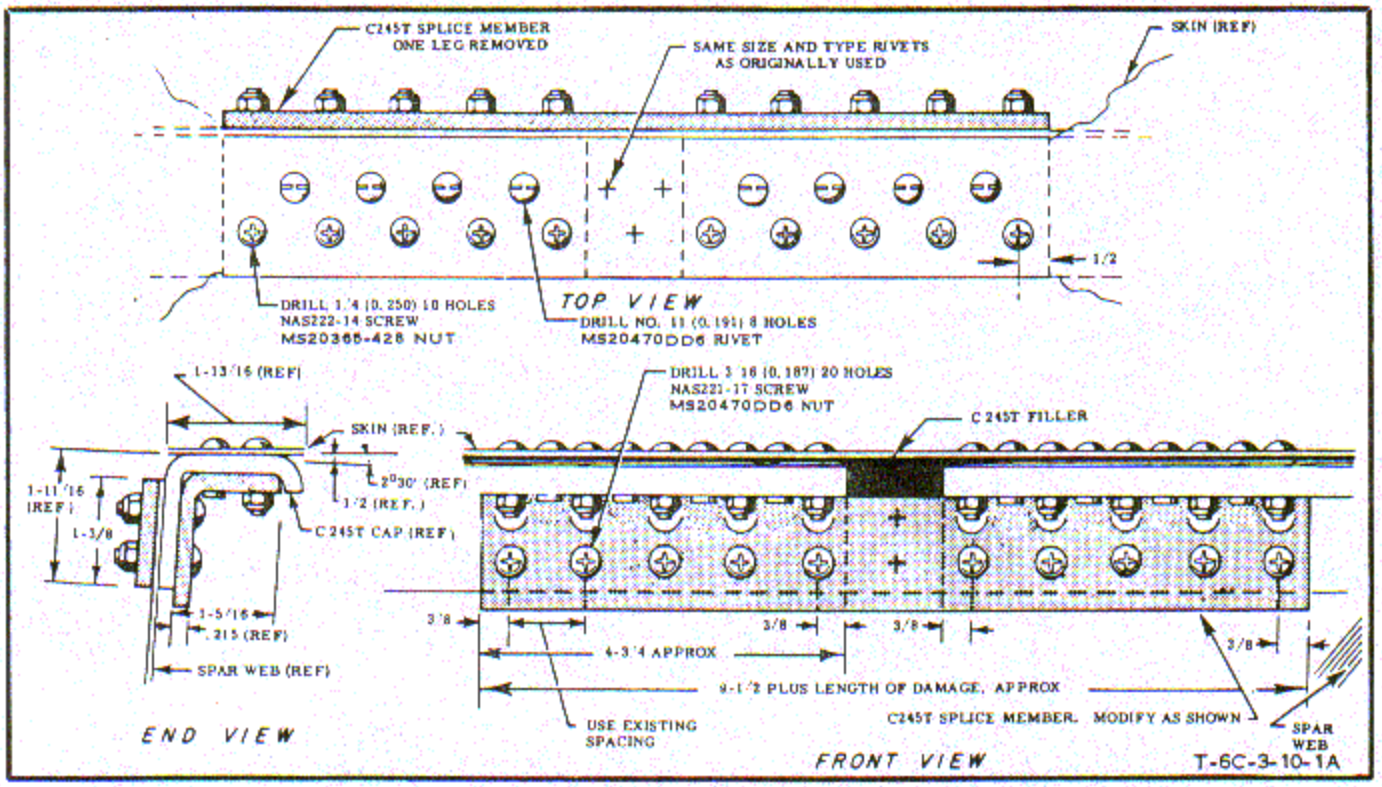


Figure 40—Center Section Front Spar—Upper Cap Splice

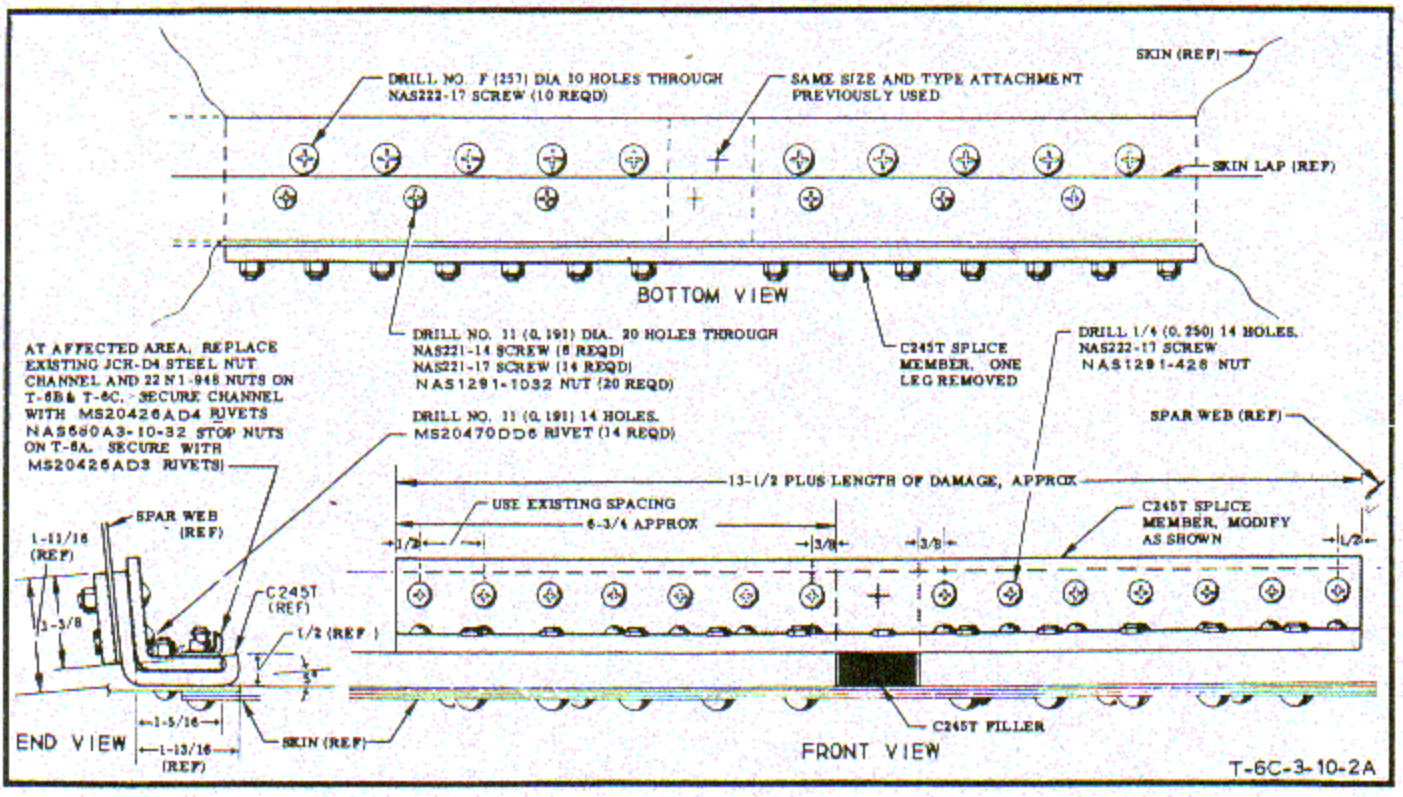


Figure 41—Center Section Front Spar—Lower Cap Splice

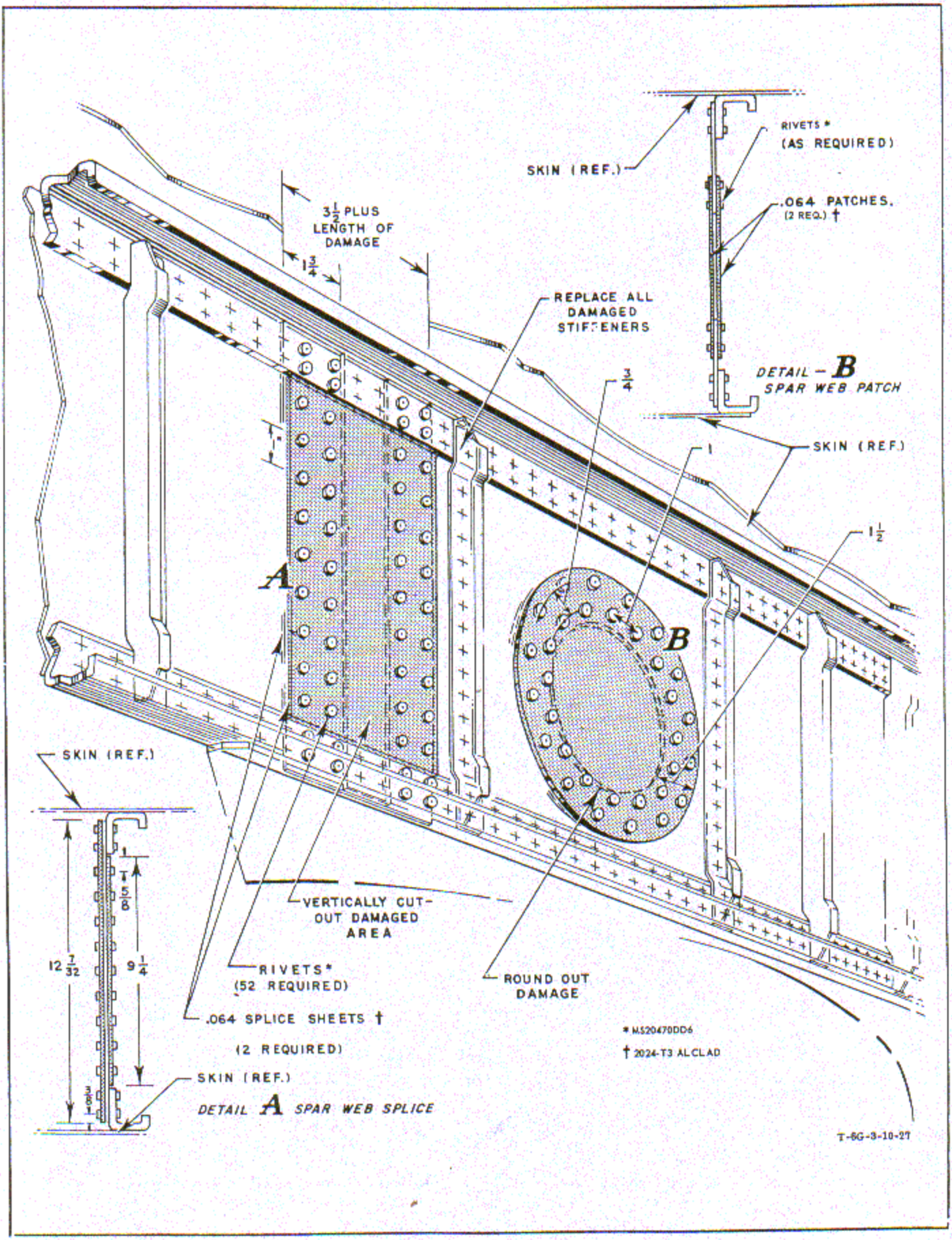


Figure 42 – Center-Section Front Spar Web Repair

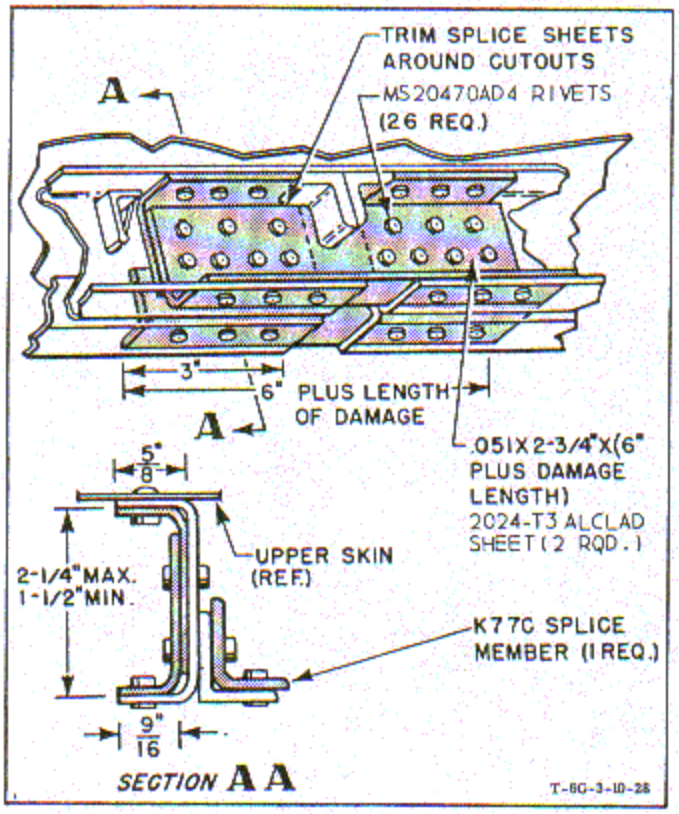


Figure 43 — Center-Section Intermediate Rib Splice

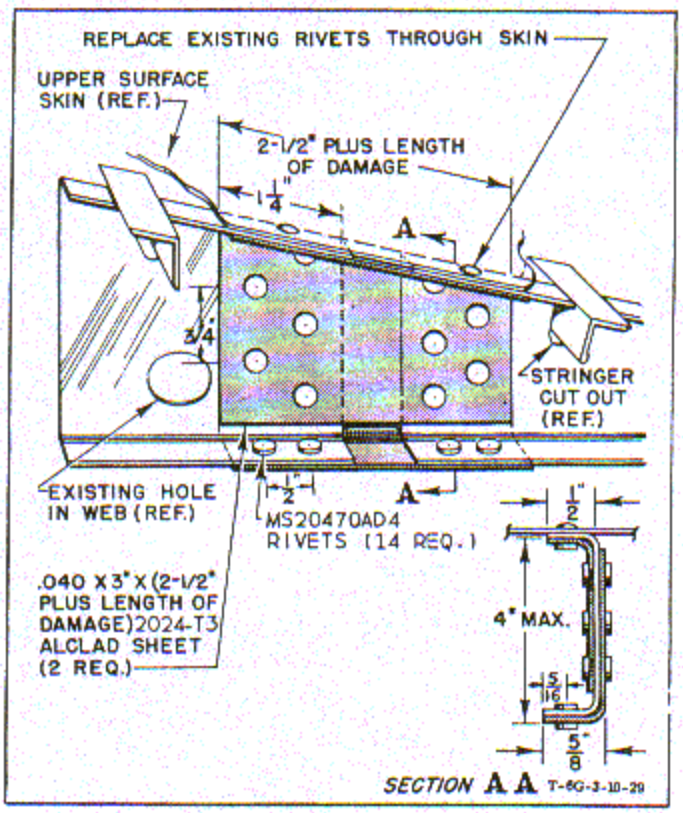


Figure 44 — Trailing Edge Rib Splice

case of an elongated hole where a larger rivet diameter is necessary to prevent buckling the rivet stem. Use an undamaged wing as a guide in laying out the rivet pattern and assembling the bolting angles to the center section as well as to the wings.

b. WING JOINT COVERS.

(1) DESCRIPTION.—The wing joint cover consists of an upper and lower section fabricated from 2024-T3 Alclad sheet.

(2) CLASSIFICATION OF DAMAGE. — Any injury to the bolting angle cover is critical. A splice would prevent proper alignment of joint covers, therefore replacement is necessary.

(3) REPLACEMENT PROCEDURE. — On the lower outboard surface skin, make a grease pencil mark at the center line of the screw hole in the wing cover attaching bracket. Cut off the head of an AN526-832R-7 screw, file the end down to a point, and thread the screw into the wing cover attaching bracket hole, leaving the sharp point protruding about 1/8 inch. This serves as a back center punch to locate the hole through the cover. Slip the cover assembly over the leading edge of the wing joint. Grasp the lower portion of the cover, and hook it over the small bracket at the lower trailing edge of the wing bolting angles. Continue holding the lower trailing edge of the cover to keep the cover hooked; then grasp the upper trailing edge of the cover and lift up the handle. Pull aft on the upper cover; when the cover is in position, push the handle down over the hook to complete the installation. Along the lower surface skin where the center of the screw hole in the cover attaching bracket is marked, measure 7/8 inch down on the contour of the cover from the edge of the cover, and tap the cover lightly with a mallet. The previously installed sharp screw protruding from the bracket screw hole will center punch the hole location on the inside of the cover. Remove the cover; and in the cover, drill the center-punched rivet location with a 3/8-inch diameter drill. Remove sharp screw. Two 7E6-172-0 Neoprene strips are required at each wing joint to provide a water-tight seal between the bolting angles and the cover assembly. These are attached to the metal with rubber cement. Again install the cover as outlined above. Through the bracket hole that was drilled in the cover, install a AN526-832R-7 screw through a 2W1-11-20-32 washer. This completes the installation.

6. WING TIP.

a. DESCRIPTION.—A cap, known as a wing tip, is attached to the extreme outer wing structure and serves as a fairing only. The tip comprises two sections of .040-inch 2040-O Alclad, heat-treated, lap-jointed along their peripheries, and riveted together to form a seam at the ends of the chord lines.

b. CLASSIFICATION OF DAMAGE.—Repairs are limited to minor damage only.

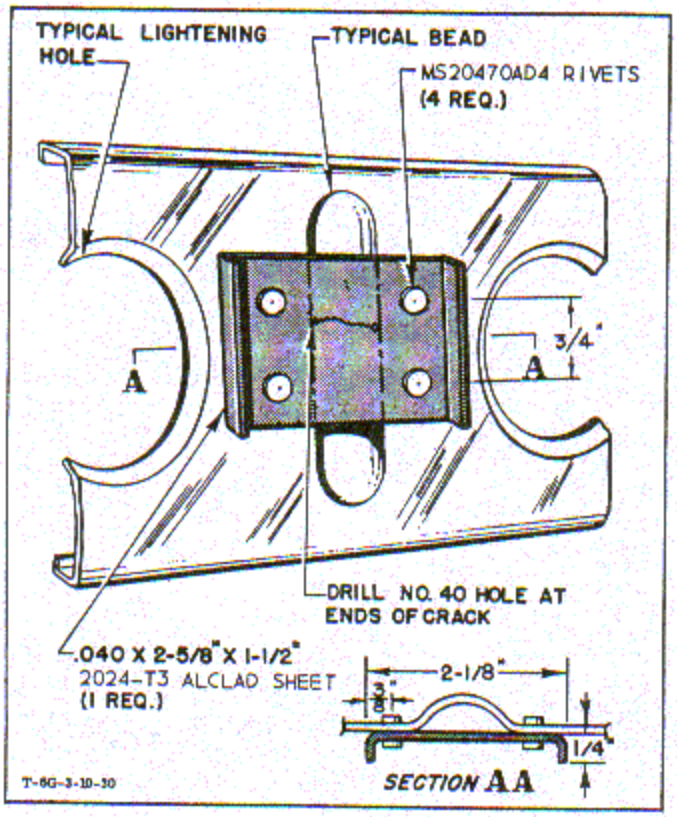


Figure 45 — Typical Repair of Broken Rib Beads

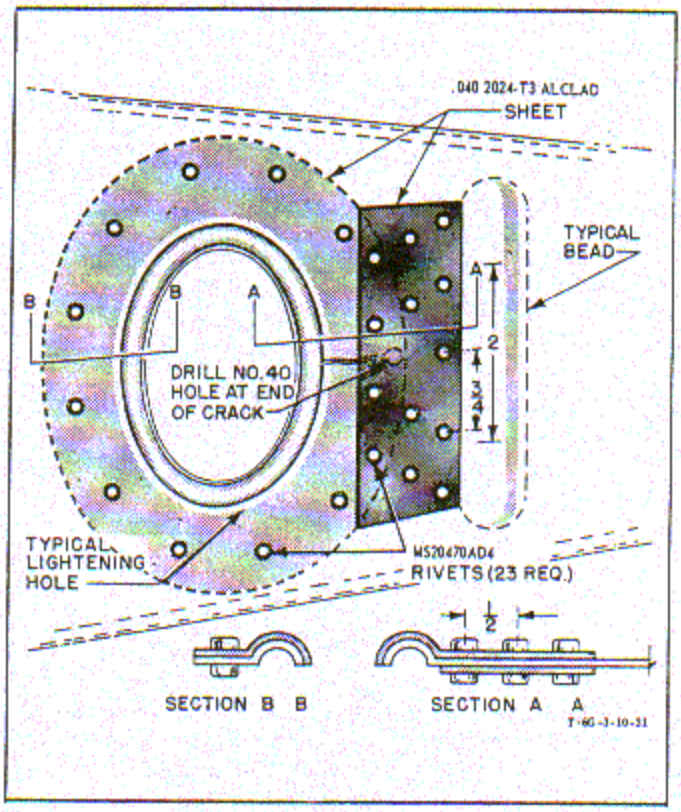


Figure 46 — Typical Repair of Broken Rib Cut-Outs

(1) NEGLIGIBLE DAMAGE. — Dents may be bumped out in many cases without cracking the metal; however, care must be exercised in working the metal to avoid conditions which would necessitate patching or renewal of the tip.

(2) DAMAGE REPARABLE BY PATCHING.— Small cracks not exceeding ½-inch in length may be patched with material of the same gage, after arresting the crack by drilling a No. 40 (.098) hole at the end of each crack. The reinforcement should be riveted to the inside surface of the tip, using MS20470AD4 rivets. Cracks exposed on the outer surface should be filled with zinc chromate compound to prevent entrance of water.

(3) DAMAGE REPARABLE BY INSERTION.— Large patches or double patches with insertions are not permissible; they increase weight and air flow resistance.

(4) DAMAGE NECESSITATING REPLACEMENT.—When extensive damage occurs, replace one or both sections of the tip, as required. Loft lines may be obtained for the purpose of laying out special tools and blocks for reworking the tips.

7. FLAPS.

a. DESCRIPTION. — The center section and outer wing landing flaps extending from left to right aileron pass beneath the fuselage and form the lower half of the trailing edge of the wing. The three flap sections are constructed entirely from 2024-T3 Alclad sheet and each section consists of a .040-inch thick hat section channel spar, .032-inch thick Z-section leading edge, .025-inch thick closed V-section trailing edge, and .020-inch thick ribs and skin. Where the hat-section

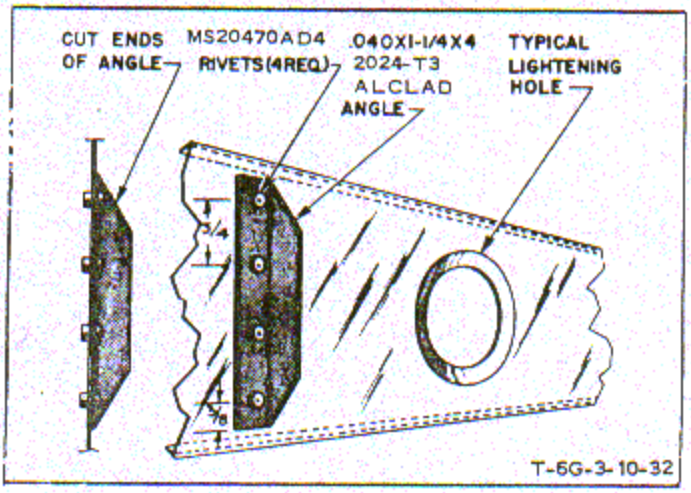


Figure 47 — Typical Repair of Buckled Rib Webs

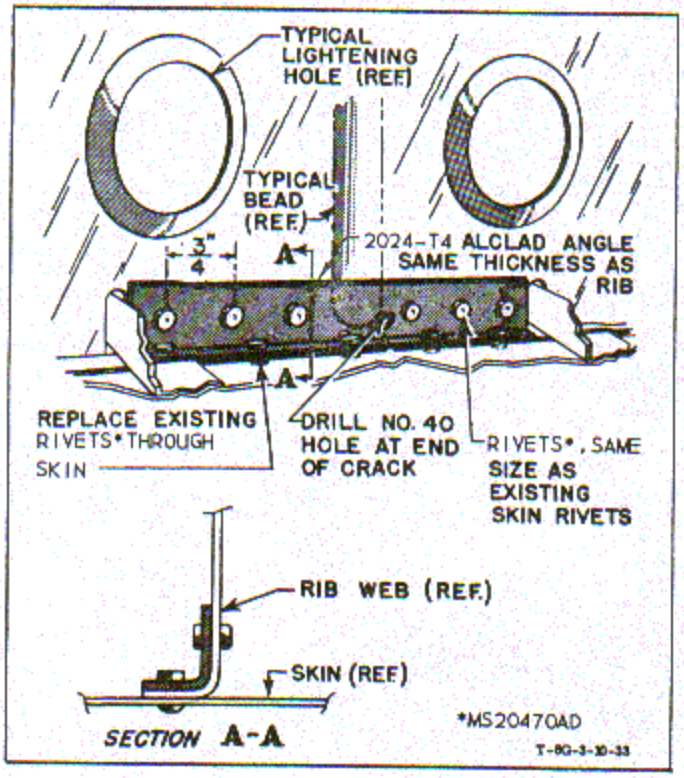


Figure 48 — Typical Rib Flange Repair Where Flange Is Riveted to Skin

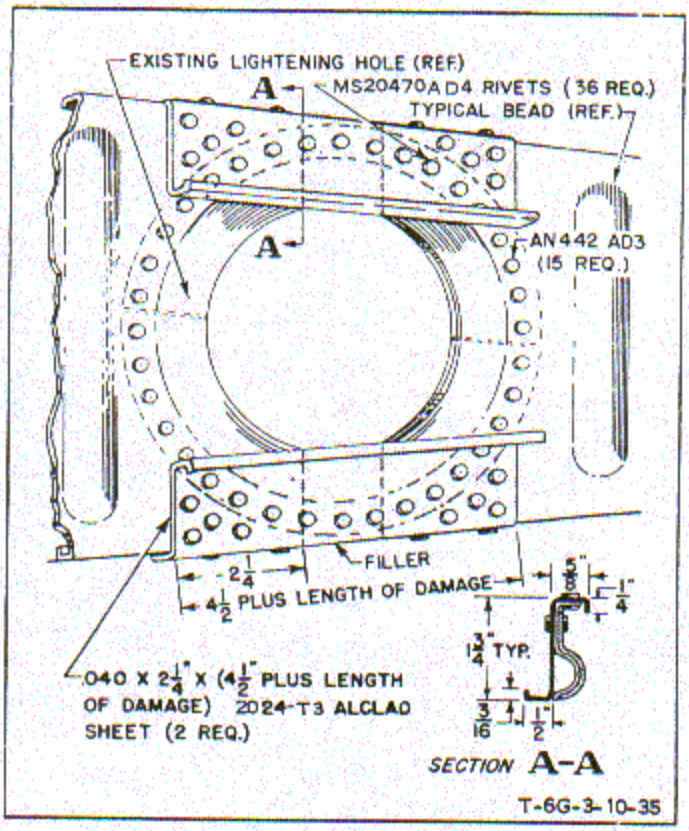


Figure 50 — Typical Rib Splice

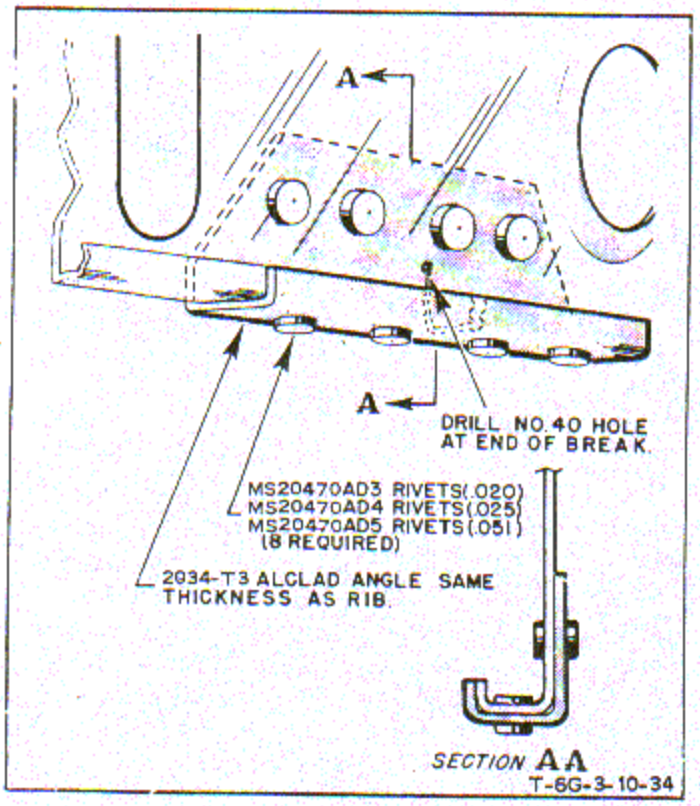


Figure 49 — Typical Rib Flange Repair Where Flange Is Not Riveted to Skin

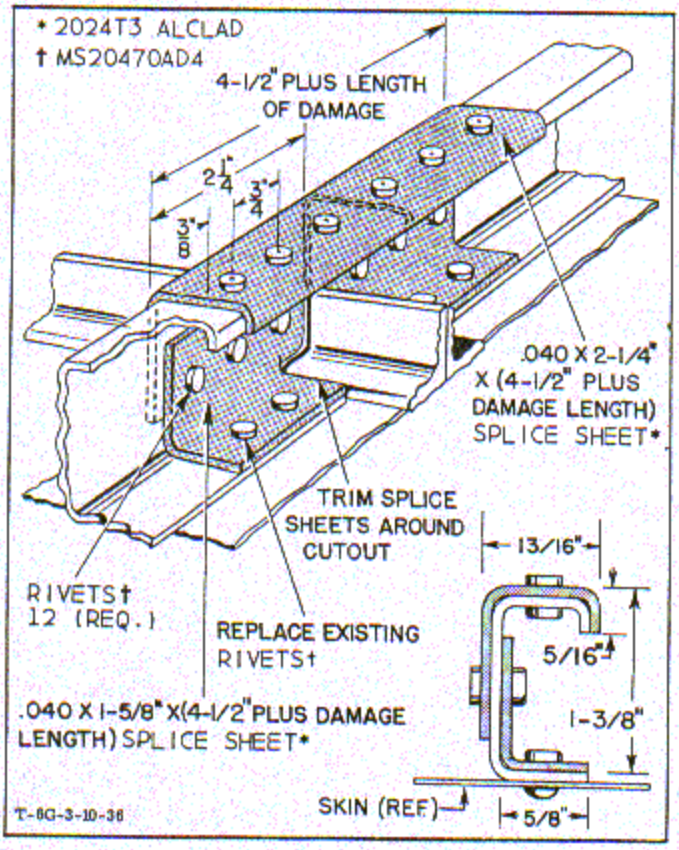


Figure 51 — Fuel Tank Compartment Cover Former Splice

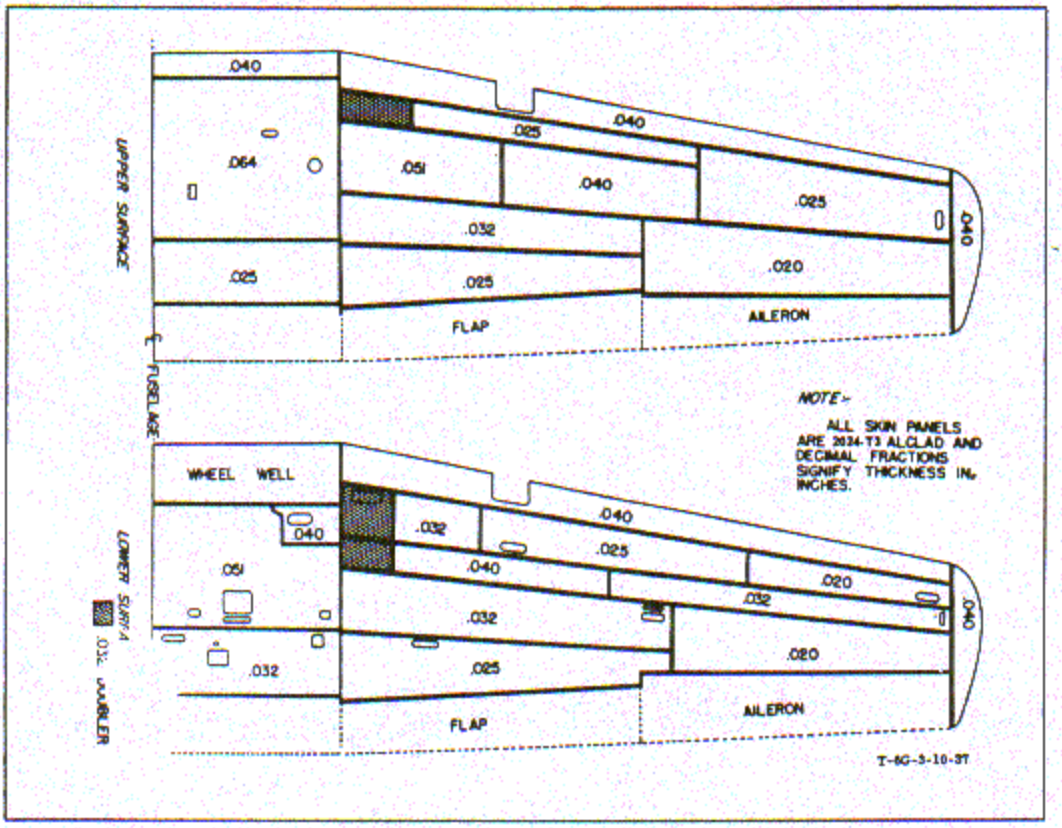


Figure 52 — Wing Skin Arrangement

spar is riveted to the flap skin a torsion box is formed which reacts the main bending loads. The maximum loads on the flaps occur when the flaps are in the fully extended position. The structural parts of center section and outer wing flaps are illustrated. *(See figure 61.)*

b. CLASSIFICATION OF DAMAGE.—Replacement of damaged flaps is recommended, as there is no practical repair except for skin damage. If repair is warranted, see procedures outlined in *c.* following.

c. REPAIR METHODS.

(1) GENERAL.—Replacement of damaged ribs is recommended but if repair is necessary, follow the splice procedure outlined for trailing edge ribs of the wing in this section. The landing flaps are not statically balanced in original construction and no balance check is necessary after repair. All parts of flap are easily accessible for repair.

(2) SKIN.—If the skin directly under the flap channel spar is damaged and the damage is less than 1 inch in diameter, repair as illustrated in *figure 62.*

(3) FLAP CHANNEL SPAR. *(See figure 63.)*

(4) FLAP LEADING EDGE. *(See figure 64.)*—Damage to the leading edge of both the center section and the outer wing flap may be repaired as shown.

(5) FLAP TRAILING EDGE. *(See figure 65.)*—The trailing edge of the outer wing and center section flap may be spliced as illustrated. If the damage is in the form of a crack, drill a No. 40 (.098) hole at the ends of the crack.

8. AILERONS.

a. DESCRIPTION. *(See figure 66.)*—The ailerons are located at the trailing edge of each wing outboard of the flaps and extend from station 147.1 to 243.4. The aileron frame structure is made entirely from 2024-T3 Alclad and is covered with doped fabric. The 2024-T3 Alclad spar and leading edge skin form a torsionally rigid box. Balancing counterweights secured inside the leading edge skin provide adequate static balance. A metal tab is located on the trailing edge. A total of three hinges supports each aileron. The flanged leading edge ribs are riveted to the leading edge skin and to the trailing edge ribs. The trailing edge ribs are formed from 2024-T3 Alclad and are provided with integral flanged cap strips in which dimpled holes are spaced to provide for the insertion of the countersunk fabric-attaching screws and washers. Fabric covering is attached to the ribs and at the trim tab and hinge cut-outs.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Small cracks that may be arrested with a No. 40 (.098) drilled hole at

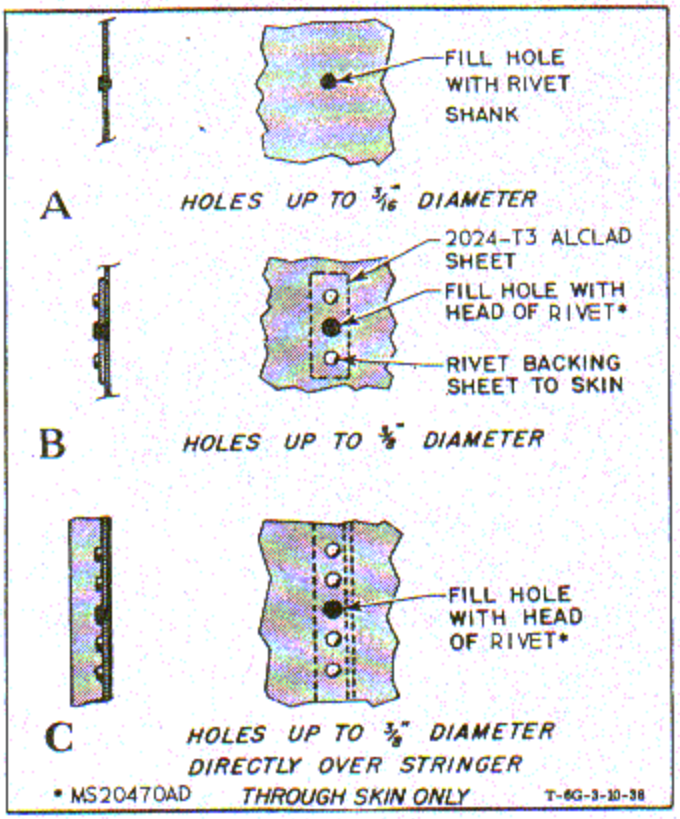


Figure 53 — Skin Repairs for Holes Less Than ½-Inch Diameter

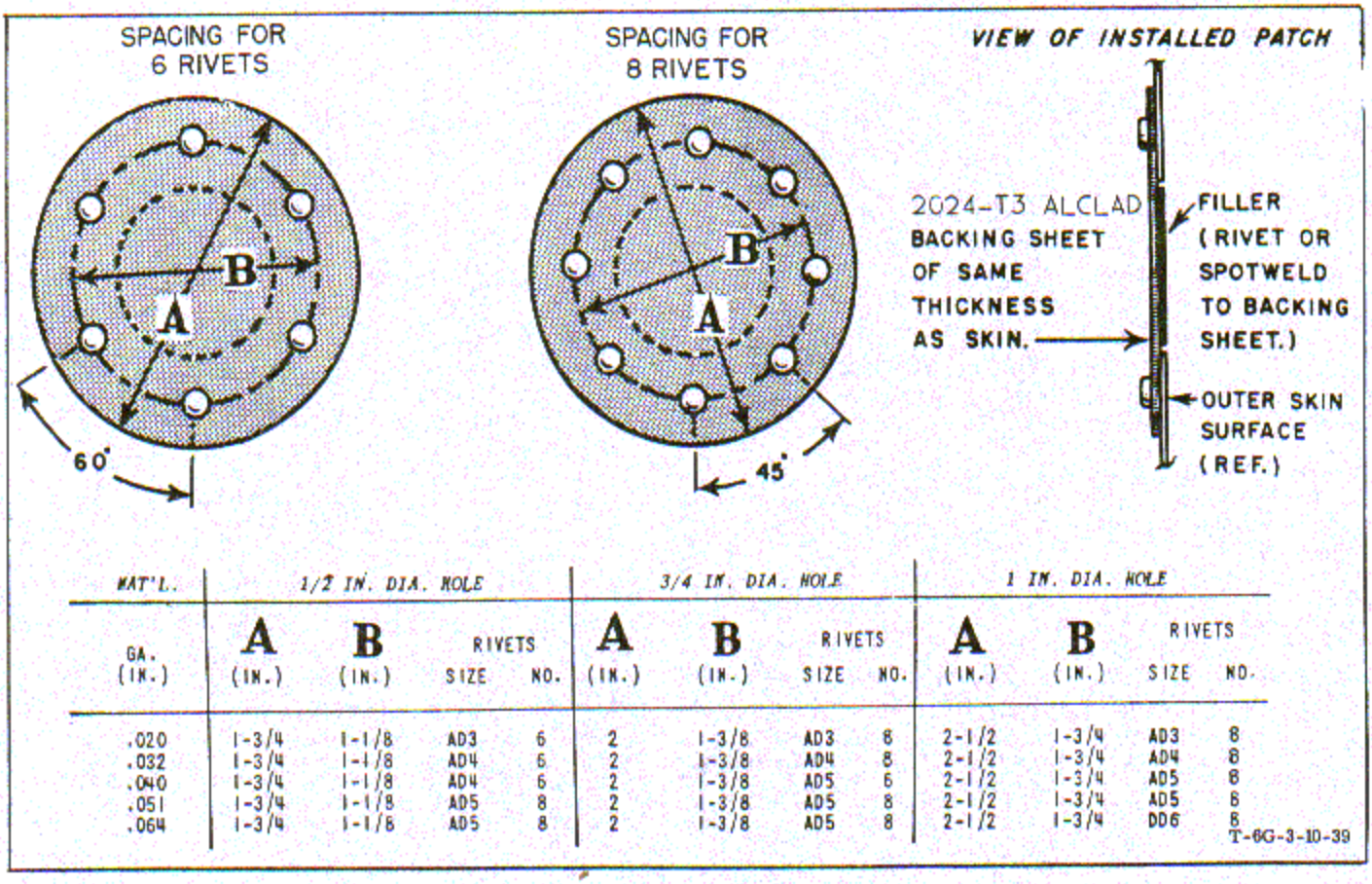
each end, dents that can be bumped out without cracking the metal, scratches not through the Alclad which can be burnished out, and nicks not more than 1/32 inch deep may be regarded as negligible damage.

(2) DAMAGE REPARABLE BY PATCHING.—The spar may be reinforced by the addition of a splice; however added weight is undesirable; therefore, the size and number of patches must be limited. Small holes and cracks in the web can usually be repaired by patching. There is no practical repair of the nose rib by patching or insertion.

(3) DAMAGE REPARABLE BY INSERTION.—When the spar is spliced a filler of the same material and thickness is used in addition to splice sheets and stiffeners.

(4) DAMAGE NECESSITATING REPLACEMENT.—Extensive damage should be repaired by total replacement with a new aileron frame.

c. REPAIR METHODS.—Because of the static unbalance created by any weight added to these surfaces, replacement rather than repair of damaged structural parts is recommended. However, where the repair material is added near the hinge line of the surface, the static balance of the surface is not seriously affected. Structural repairs to the ailerons vary from those of the elevators and rudder, as each aileron has a channel



MAT'L. GA. (IN.)	1/2 IN. DIA. HOLE A (IN.)	B (IN.)	RIVETS SIZE	NO.	3/4 IN. DIA. HOLE A (IN.)	B (IN.)	RIVETS SIZE	NO.	1 IN. DIA. HOLE A (IN.)	B (IN.)	RIVETS SIZE	NO.
.020	1-3/4	1-1/8	AD3	6	2	1-3/8	AD3	8	2-1/2	1-3/4	AD3	8
.032	1-3/4	1-1/8	AD4	6	2	1-3/8	AD4	8	2-1/2	1-3/4	AD4	8
.040	1-3/4	1-1/8	AD4	6	2	1-3/8	AD5	6	2-1/2	1-3/4	AD5	8
.051	1-3/4	1-1/8	AD5	8	2	1-3/8	AD5	8	2-1/2	1-3/4	AD5	8
.064	1-3/4	1-1/8	AD5	8	2	1-3/8	AD5	8	2-1/2	1-3/4	DD6	8

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Figure 54 — Patch for Skin Holes ½- to 1-Inch Diameter

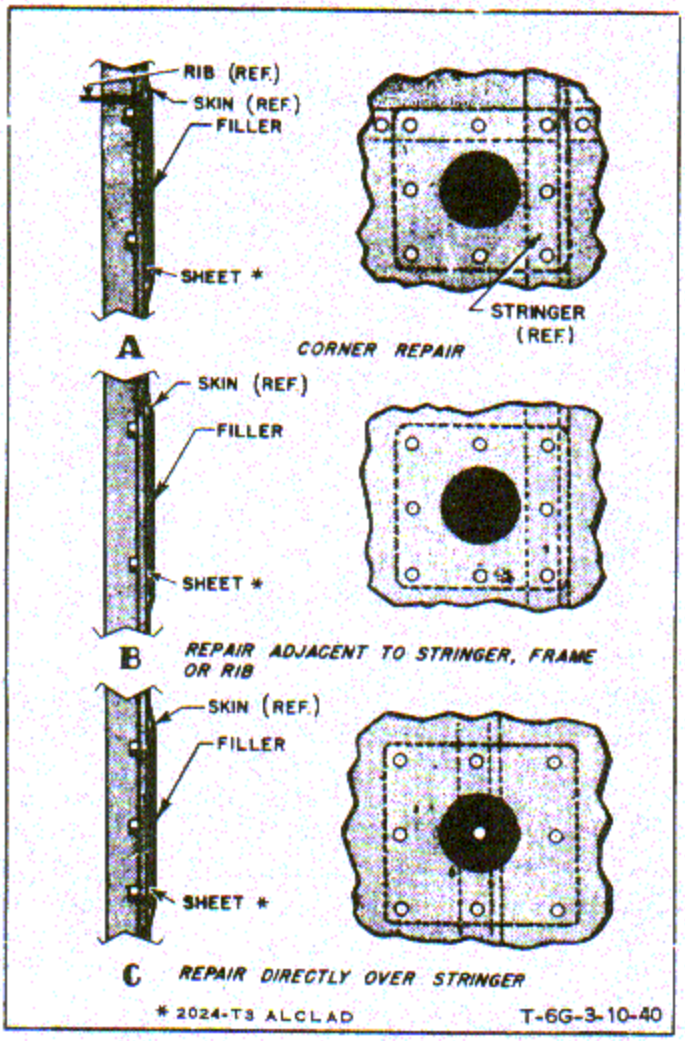


Figure 55 — Patch for 1-Inch Diameter Skin Holes Near Adjacent Structure

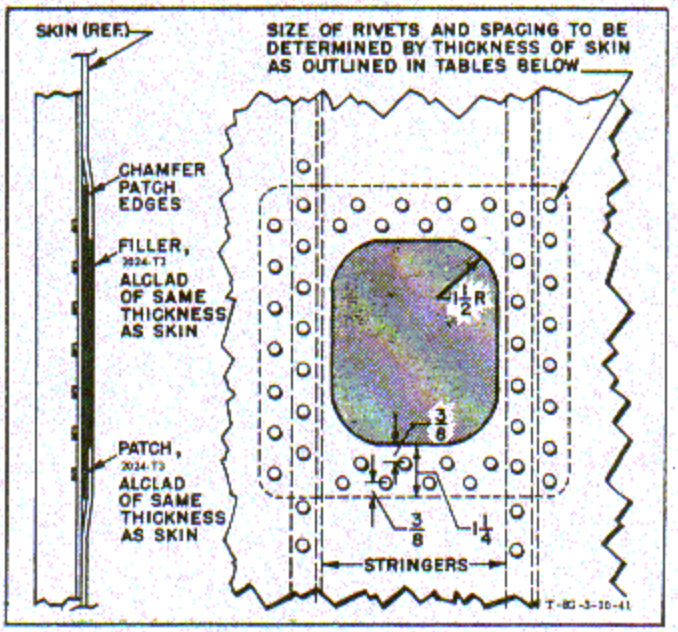


Figure 56 — Typical Flush Patch for Large Skin Holes

LEGEND — Figure 56

Thickness of Skin	*Rivet Type and Size*	*Rivet Pattern on Centers*
		Chordwise
.020	AD3	4 rows at 5/8 inch centers
.025	AD4	4 rows at 3/4 inch centers
.032	AD4	4 rows at 3/4 inch centers
.040	AD5	4 rows at 7/8 inch centers
		Spanwise
.020	AD3	2 rows at 5/8 inch centers
.025	AD4	2 rows at 5/8 inch centers
.032	AD4	2 rows at 5/8 inch centers
.040	AD5	2 rows at 3/4 inch centers

Stringer Rivets Not Included

Space Between Rivet Rows	*Drill No.*
.020 AD3 ½ inch	41
.025 AD4 ½ inch	30
.032 AD4 ½ inch	30
.040 AD5 5/8 inch	21

spar in place of the torque tube. Obviously, access for any structural repair must be gained by cutting away the damaged fabric adjacent to the proposed repair. After a major repair, check the static balance of these surfaces as outlined in Section I.

(1) TRAILING EDGE STRIP REPLACEMENT.

(a) As additional weight in the form of repairs should be avoided at the trailing edge of a structure, replacement rather than repair of trailing edge is recommended. After the doped fabric covering has been removed, drill out all rivets that secure the trailing edge strip to the ribs and to any longitudinal stiffening tubes. If no spare part is available, fabricate a replacement strip of 2024-O Alclad and heat-treat.

(b) Bend up a V-formed section to match the length, thickness, weight, and cross section of the removed strip. To observe the minimum bend radius allowable, use 2024-O Alclad and subsequently heat-treat to required hardness. Place the strip in position, and with a blind hole locating tool mark the locations of the holes for the rib attaching rivets. Remove the strip, drill and burr the holes, and apply a coat of zinc chromate primer to all faying surfaces. After replacing the strip in position, insert two or more skin fasteners to hold it rigidly in place. Insert and upset all attaching rivets. Re-cover the partially exposed structure as instructed in Section VII.

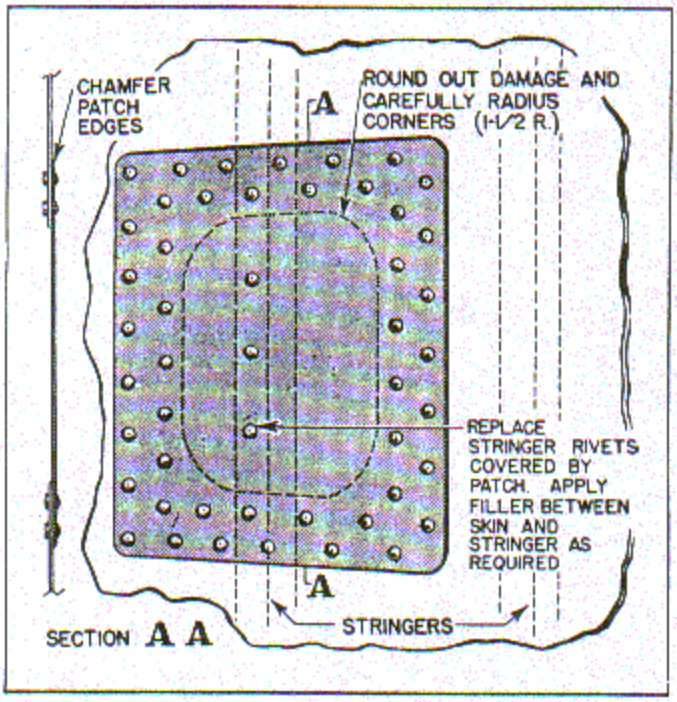


Figure 57 — Typical External Patch for Large Skin Holes

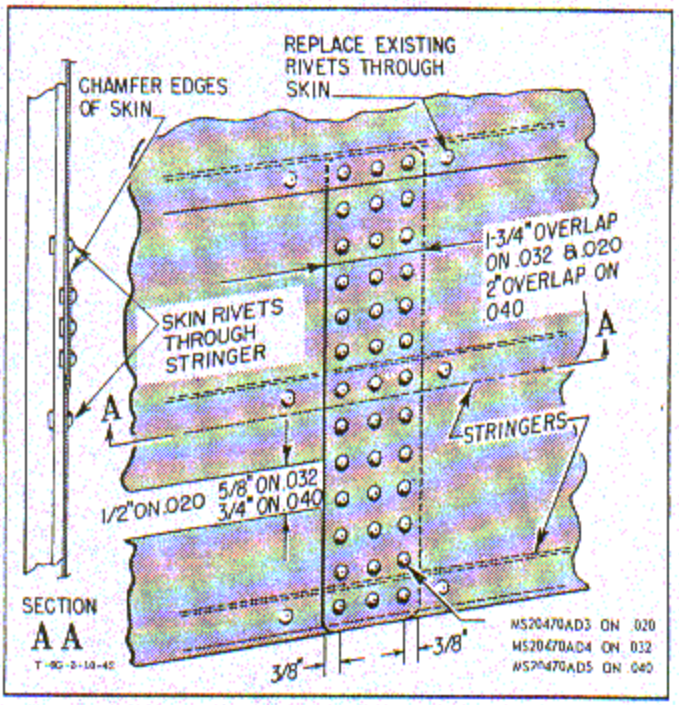


Figure 58 — Typical Skin Splice

(2) SPAR SPLICE. *(See figure 67.)*—Remove the fabric covering and examine the damage to the aileron spar. The spar cannot be replaced satisfactorily but it can be repaired without seriously affecting the mass balance of the aileron as a whole.

(3) TRAILING EDGE RIB REPLACEMENT.—Simplicity of construction and ease of attachment to the aileron spar warrants replacement rather than repair of damaged ribs. Replacement maintains the static balance of the aileron as no weight from repair members is added. Most of the aileron trailing edge ribs are secured to the aileron trailing edge by two MS20470AD3 rivets, to the aileron spar web and to the extending flange on the leading edge ribs by four MS20470AD3 rivets, and to the spar flange and overlapping leading edge skin by two MS20426AD3 rivets. Remove and repair fabric covering as instructed in Section VII.

(4) NOSE RIB REPLACEMENT.—Remove the leading edge fabric and skin from the damaged rib area. To gain access to the interior of the leading edge skin through the lightening holes in the aileron spar, remove enough fabric from the adjacent trailing edge bay to permit proper tool manipulation. With a hacksaw or a tapered reamer, cut away the damaged skin. Drill out the attaching rivets of the nose rib and remove the rib from the structure. *(See figure 66.)* If a spare part is not available, fabricate a replacement rib from 2024-O Alclad sheet of the required thickness and heat-treat to required hardness after forming. Observe a minimum bend radius of 1/16 inch and round all corners to 1/4-inch minimum radius.

9. SKIN.

a. DESCRIPTION. *(See figure 52.)*—Fixed surfaces of the wings are covered with 2024-T3 Alclad sheet which varies in thickness from .020 to .064 inch.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE. — Scratches not through the Alclad that can be burnished out, nicks not more than 1/32-inch deep, and bends and kinks not exceeding a radius twice the thickness of the skin which can be bumped out without cracking the metal are regarded as negligible damage.

(2) DAMAGE REPARABLE BY PATCHING.—Small cracks may be patched after arresting by a No. 40 (.098) drilled hole at each end of the crack. Long and irregular cracks require filing or grinding out after which the skin may be repaired with patches of suitable material and rivets.

(3) DAMAGE REPARABLE BY INSERTION.—Areas affected by serious damage require an insertion of sheet material, to further strengthen the skin, in addition to suitable patches and rivets. Flush patches are insertions.

(4) DAMAGE NECESSITATING REPLACEMENT.—Where the damage is extensive (more than 8 inches wide and one third the width of the panel) or the skin sheet covers a relatively small area, total

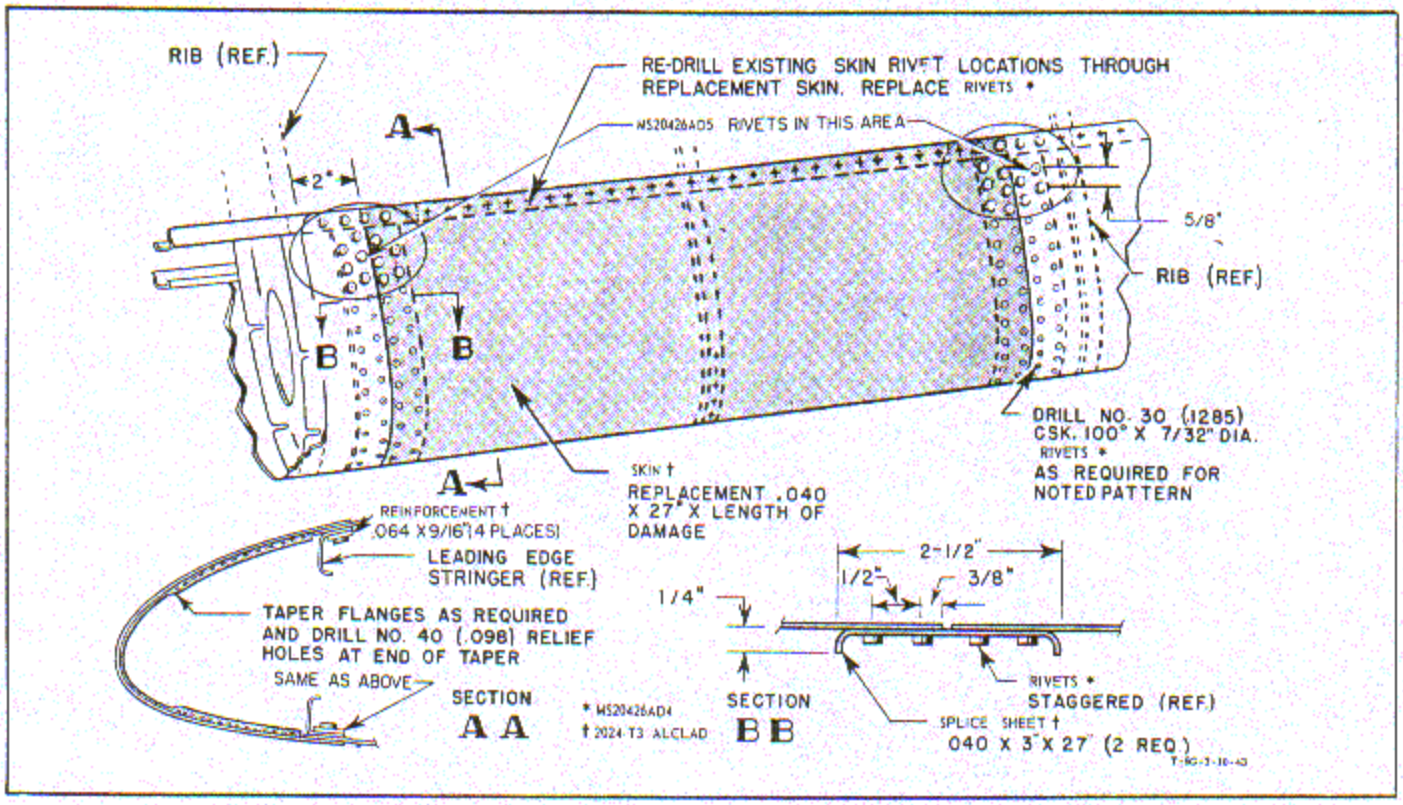


Figure 59 — Wing Leading Edge Skin Splice

renewal is desirable to restore the skin to its original strength and weight.

c. REPAIR METHODS.

(1) HOLES LESS THAN ½-INCH DIAMETER. *(See figure 53.)*

(2) HOLES LESS THAN ½- to 1-INCH DIAMETER. *(See figure 54.)*

(3) ISOLATED CRACKS.—Drill a No. 40 (.098) hole at each end of an isolated crack. Use a patch of 2024-T3 Alclad sheet to overlap the edges by at least 1-¼ inches all around the marginal area of the crack, using a staggered two row rivet pattern adapted from *figure 56.*

(4) LARGE HOLES.—On all flush surfaces, damage which is confined within the limits of less than one third the width of the skin panel and not more than 8 inches long should be repaired according to *figure 56 or 57.* Holes which exceed these dimensions should be entirely eliminated by installing all or part of a new skin panel. Extensive damage which has occurred at or directly over a doubler requires a new skin panel. Study contemplated repairs for unfavorable characteristics and stalling tendencies. All minor repairs to leading edge skin should include flush patching; however, at all other locations, external patches may be used in the field to facilitate repair, which can be accomplished readily and with less skill than is required to install flush patches.

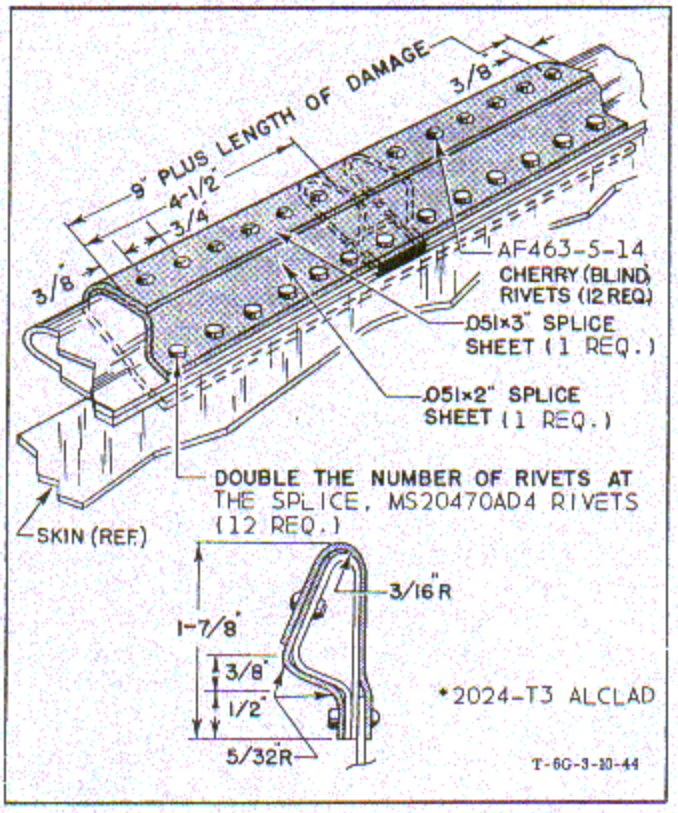
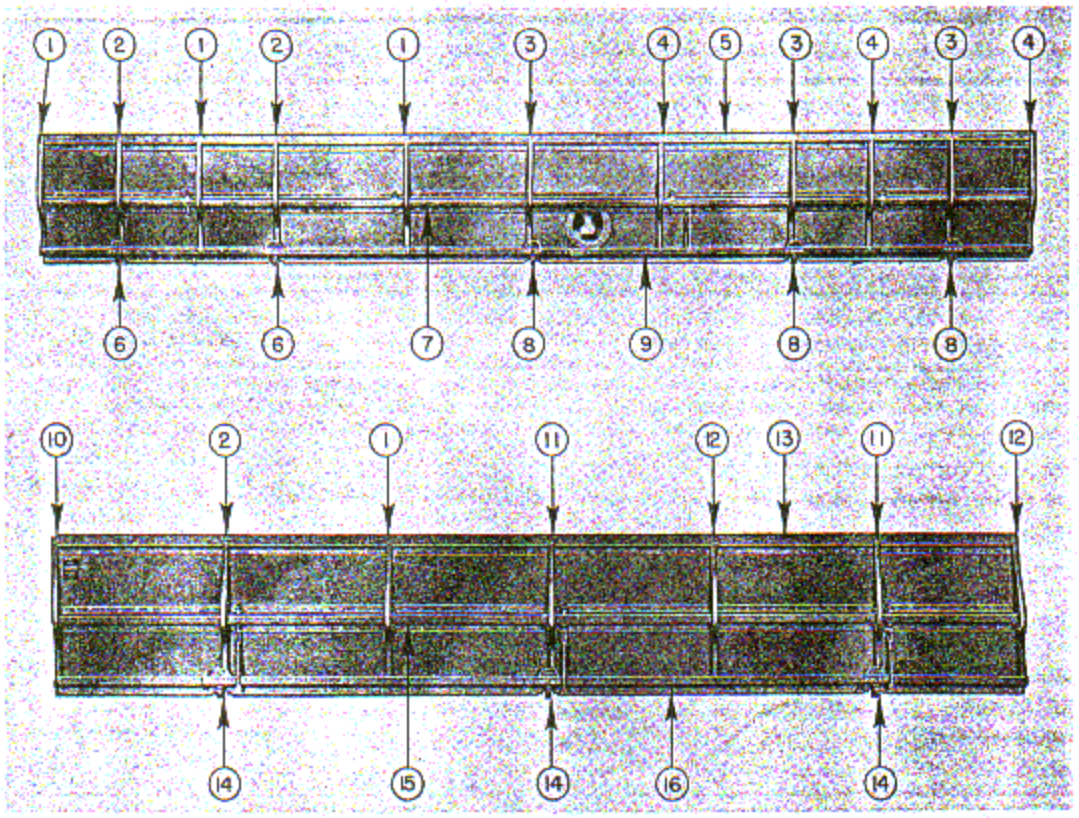


Figure 60 — Splice for Wing Trailing Edge



1. Rib, RH
2. Rib, RH
3. Rib, LH
4. Rib, LH
5. Edge, Trailing
6. Hinge, RH
7. Channel, Center Section Flap
8. Hinge, LH
9. Edge, Leading
10. Rib, RH and LH
11. Rib, RH
12. Rib, RH
13. Edge, Trailing
14. Hinge, RH and LH
15. Channel, Outer Wing Flap
16. Edge, Leading

Figure 61 — Landing Flap Parts

(5) SPLICES.—Skin splices applicable to various repairs are shown in accompanying illustrations.

(a) TYPICAL SPLICES. *(See figure 58.)*—Sheet thickness, overlaps, rivet sizes, kinds, and spacing are shown in relation to one another. A rivet pattern which is satisfactory in most cases is outlined.

(b) WING LEADING EDGE. *(See figure 59.)*—A splice of this nature is recommended where the skin forward of the leading edge stringer is severely damaged. Here the repair is made by splicing in an entire new leading edge skin sheet of the required dimensions.

(c) AILERON LEADING EDGE. *(See figures 55 and 56.)*—If damage to the aileron leading edge is extensive, repair by removing the entire damaged skin between the two adjacent ribs and splice in a new section of skin cut and formed from 2024-T3 Alclad sheet.

1. Remove the doped fabric covering from the leading edge and adjacent trailing edge bay or bays. With a hacksaw, metal snips, or tapered reamer,

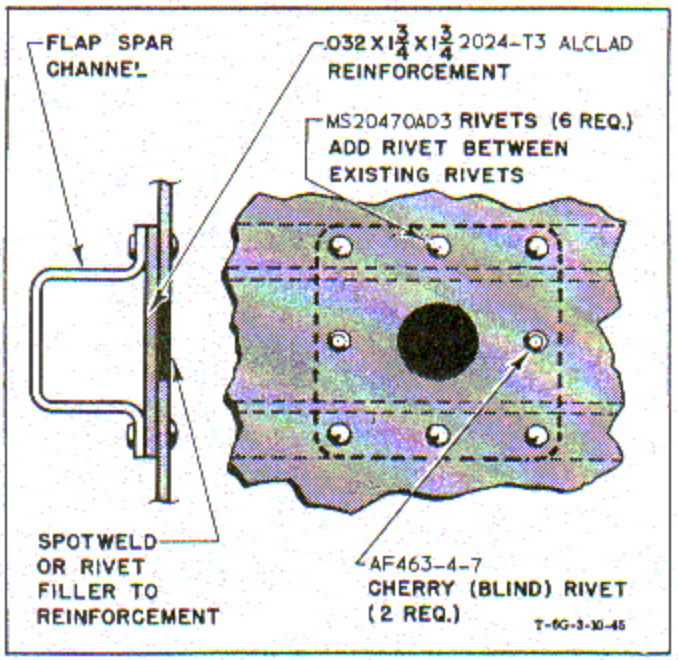


Figure 62 — Repair of 1-Inch Diameter Hole in Skin Under Flap Channel Spar

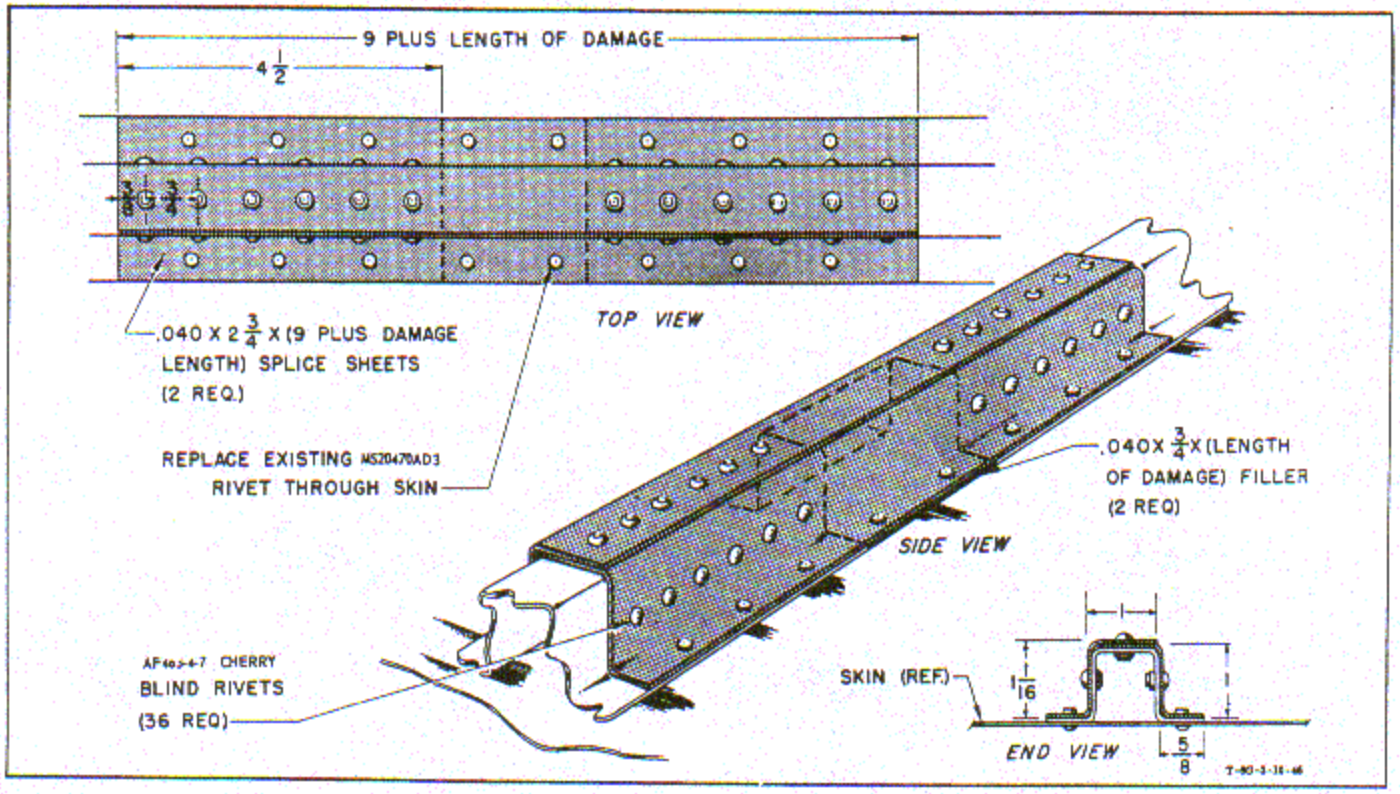


Figure 63 — Flap Channel Spar Splice

cut away the damaged skin within 7/8 inch of an adjacent rib flange rivet line. Drill out the affected skin rivets around the circumference and also the rivets that attach the skin to the spar flanges. To serve as a splice section for the leading edge skin, cut and form a sheet of .025-inch thick 2024-T3 Alclad to match the width of the removed damaged portion. The length of the splice section should be 2-1/2 inches longer than the removed portion to permit the ends to overlap the rib flanges at least 1-1/4 inches, permitting the new skin to be lap riveted to the rib flanges.

2. After the splice member has been cut and formed to fit the contour of the leading edge, lay it in position over the nose ribs, and with a scribe, mark all rivet hole locations through the existing holes in the ribs and skin. At each side of the damage, mark

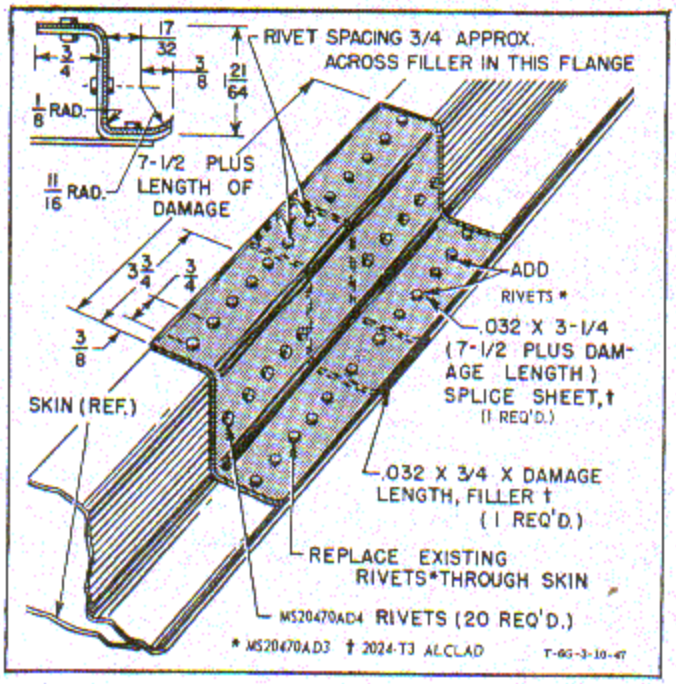


Figure 64 — Flap Leading Edge Splice

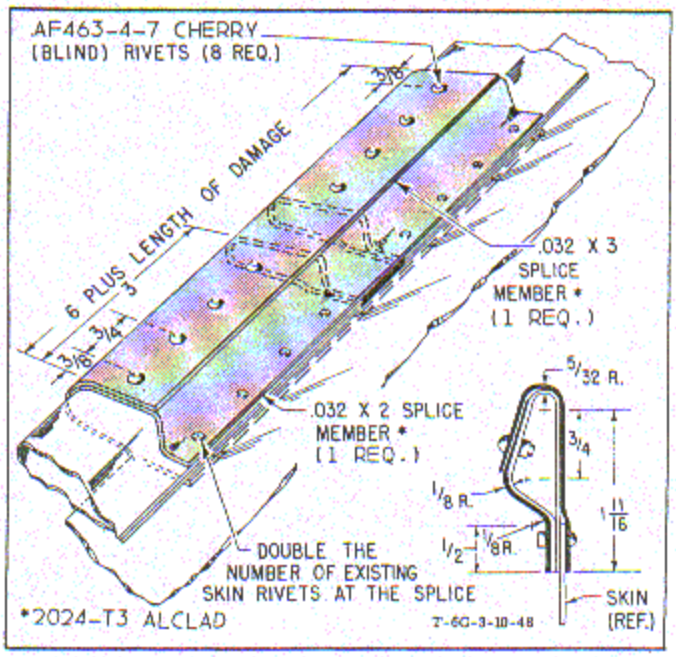
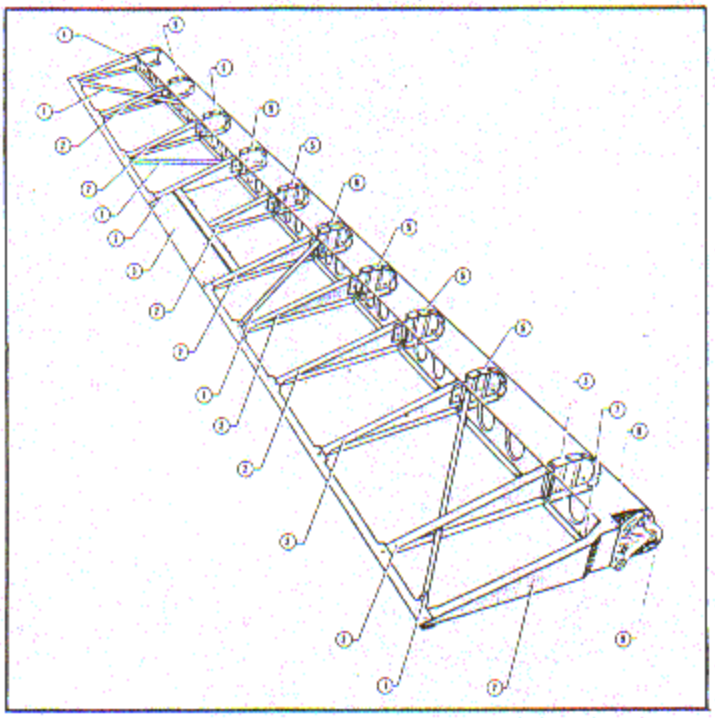


Figure 65 — Flap Trailing Edge Splice



1. Brace
2. Rib, Trailing
3. Tab
4. Rib
5. Rib, Nose
6. Rib, Nose — Center Hinge Assembly
7. Spar
8. Skin, Leading Edge
9. Bracket

Figure 66 — Aileron Frame Parts

an additional rivet line on the lap area adjacent to the rib flange. Along this rivet line, center punch rivet locations at 1 inch on centers. After the holes are thus marked, remove the skin splice member and drill all existing rivet holes. Burr the rivet holes and apply one coat of zinc chromate primer to all overlapping surfaces. Reapply the splice member and secure it in place by the use of skin fasteners in alternate rivet holes. Insert and drive all attaching rivets, starting at the tip of the leading edge to prevent the skin from buckling as it is riveted around the contour of the leading edge. After riveting is accomplished, re-cover the exposed structure with fabric as directed in Section VII.

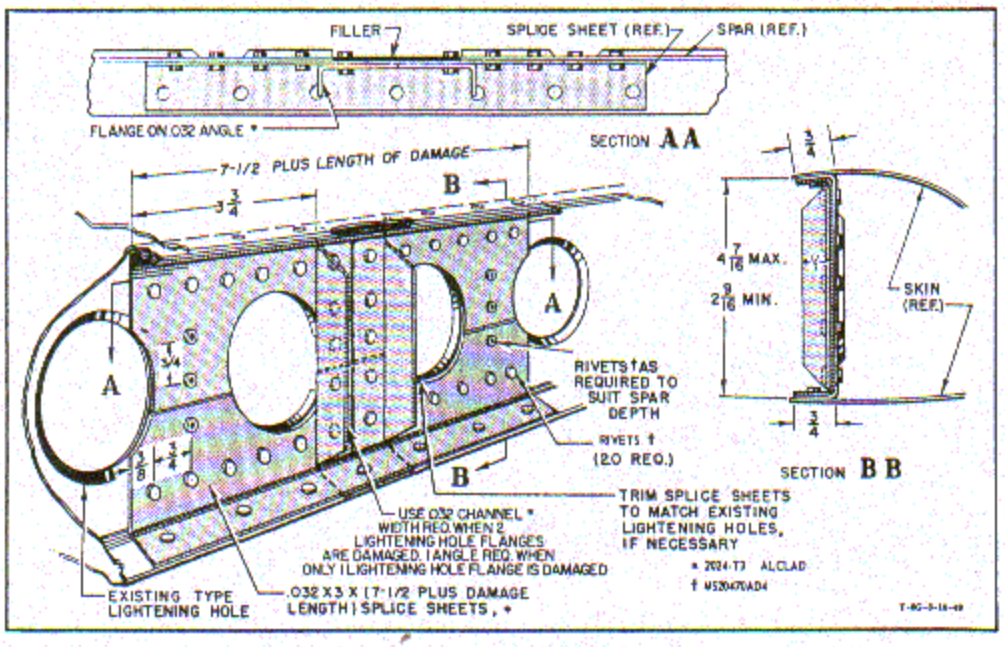


Figure 67 — Aileron Spar Splice

TABLE I

AILERON METAL STRUCTURE REPAIR MATERIALS

Materials	*Remarks*
Sheet, 2024-T3 Alclad	.020 to .040 inch thick
Rivets, MS20470AD4	Universal
Rivets, MS20426AD4	Countersunk
Rivets, MS20426AD3	Countersunk
Rivets, AF463-4-7	Cherry blind
Ribs, Replacement	*(See figure 66)*

TABLE II

ALCLAD SHEET REPAIR MATERIAL

(Specification QQ-A-362)

Thickness of 2024-T3 Alclad (Inches)	*Remarks*
.020	Ribs, Skin, Stringers 1S14LT (C107LT)
.025	Ribs, Skin, Stringers 1S3LT (C373LT)
.032	Ribs, Skin, Spars, Stringers
.040	Ribs, Skin, Spars, 1S40LT (C123LT)
.051	Ribs, Skin, Spars
.064	Ribs, Skin, Spars

TABLE III

RIVETS, BOLTS, SCREWS, AND NUTS REQUIRED FOR REPAIR

Part No.	*Description*	*Diameter*
MS20470AD3	Rivet, universal head	3/32
MS20470AD4	Rivet, universal head	1/8
MS20470AD5	Rivet, universal head	5/32
MS20470DD6	Rivet, universal head	3/16
MS20426AD3	Rivet, 100 deg countersunk	3/32
MS20426AD4	Rivet, 100 deg countersunk	1/8
MS20426AD5	Rivet, 100 deg countersunk	5/32
MS20426DD6	Rivet, 100 deg countersunk	3/16
AF463-4-1	Rivet, brazier head, pull	1/8
AF463-4-7	Rivet, brazier head, pull	1/8
AF463-4-14	Rivet, brazier head, pull	1/8
AF463-4-20	Rivet, brazier head, pull	1/8
AF463-5-1	Rivet, brazier head, pull	5/32
AF463-5-7	Rivet, brazier head, pull	5/32
AF463-5-14	Rivet, brazier head, pull	5/32
AF463-5-20	Rivet, brazier head, pull	5/32
AF463-6-7	Rivet, brazier head, pull	3/16
AF463-6-14	Rivet, brazier head, pull	3/16
AF463-6-20	Rivet, brazier head, pull	3/16
AF462-4-7	Rivet, 100 deg countersunk, pull	1/8
7S16-10-14	Screw, 100 deg countersunk	3/16
7S16-10-17	Screw, 100 deg countersunk	3/16
7S16-416-14	Screw, 100 deg countersunk	1/4
7S16-416-17	Screw, 100 deg countersunk	1/4
NAS221-14	Screw, brazier head	3/16
NAS221-17	Screw, brazier head	3/16
NAS222-14	Screw, brazier head	1/4
NAS222-17	Screw, brazier head	1/4
NAS680A-1032	Nut, elastic, plate	3/16
NAS1291-3	Nut, elastic stop	3/16
NAS1291-4	Nut, elastic stop	1/4
JCH-04*	Channel, steel	
22G1-048*	Nut	

*Elastic Stop Nut Corp of America, Union, New Jersey

TABLE IV

REPAIR TOOLS

Tool	*Remarks*
Bars, Rivet bucking	TJ600-1 TJ600-2 TJ600-5 TJ600-6 TJ600-10 TJ-600-28 TJ600-32 TJ600-42 TJ600-60 TJ600-64 TJ600-65 TJ600-86 TJ600-90 TJ600-99 TJ600-106
Brake, Hand	Used for bending Alclad sheet.
Burnishing Tool	Used to smooth minor scratches in metal.
Burring Tool	Used to smooth trimmed edges of metal.
Calipers, Slide	Inside or outside diameter measurement.
Chisel	Used for metal cutting and removal of rivet heads where drilling is impractical.
Clamp, "C"	Used for holding two or more pieces of metal until drilling and/or riveting is accomplished.
Clamp, Skin	Used to secure metal when riveting, drilling, etc.
Countersink	Countersinks holes in heavy stock for insertion of countersunk rivets and screws.
Countersink, Back	Used for countersinking in locations where direct pressure cannot be applied readily on side desired.
Dividers	Used for sheet-metal layout.
Drill, Hand	Used for restricted or slow drilling and also in the presence of gas fumes, if an air motor is not available.
Drills, Twist	These drills used with hand or power tools are standard.
Extractor	Used for removing the remaining portions of broken screws, bolts and pins. Drill hole in object approximately one-half the diameter, insert EZY-Out, and withdraw object by counterclockwise rotation.
Files, Hand	Used for finishing work on all types of metal, plastic, and fiber, and enlarging holes, burring edges, smoothing curves, removing metal, and sharpening tools.
File Holder	Used to hold files in curved position.
Forceps (pliers), Cleco	Used to insert or remove sheet holders when riveting, drilling, etc. Regular and right-angle types.
Gun, Cherry rivet	Models G10 hand gun, or G15 pneumatic gun.
Gun, Cleco safety	Used to insert skin fasteners.
Gun, Pneumatic	Used to drive standard rivets.
Hack Saw, Keyhole	Used for cutting holes in restricted places.
Hack Saw, Large, adjustable	Used for metal, fiber, and plastic cutting. Blades vary in length and in number of teeth per inch.

TABLE IV (Continued)

REPAIR TOOLS

Tool	*Remarks*
Hack Saw, Small	Used for light cutting of metal, fiber, or plastic.
Hammers, Finishing; ball peen, straight and cross peen, square tip and offset peen of pyroxylin plastic.	Used to form and finish metal.
Mallet, Lead	Used for sheet-metal forming.
Mallet, rawhide, pyroxylin plastic, fiber, hard wood	Used to form and bend metal.
Mallet, Rubber	Used to bump dents in sheet-metal.
Pilot, Hole saw	Used to pilot hole saws.
Pliers, Clamping	Used for holding two or more pieces of metal until drilling and/or riveting is accomplished.
Protractor, Flat	Used for sheet-metal layout.
Punches, Center	Used for centering holes and as a punch before drilling to ensure an accurate drill start.
Punches, Drive pin "drifts"	Used for driving out pins, rivets, and bolts. Use next size smaller than hole.
Reamers, hand, square shank, spiral fluted	Used for enlarging drilled holes to desired size. Various sizes available.
Reamers, square shank, taper pin, spiral fluted	Used for enlarging drilled holes in sheet stock and for reaming shaft holes for taper pins. In electric and air motor-chucks reamers are excellent for making cut-outs in aluminum material.
Rule, 6-foot, flexible	Used for sheet-metal layout.
Rule, 6-inch, rigid	Used for sheet-metal layout.
Rule, square, center and protractor combination	Used for sheet-metal layout.
Saw, Band	Used for cutting fuselage frame form blocks.
Saw, Hole	Used with pilot in hand and power drills, this tool is excellent for cutting circular holes in damaged sheet metal prior to application of standard button patch. Sizes range from ⅝ to 2 inches.
Scribe	Used for sheet-metal layout.
Sets, rivet	Used for brazier, flat, and countersunk rivet heads.
Sheet Holders, Cleco	Inserted in drilled holes to hold two or more pieces of metal until riveting is accomplished.
Snips, Combination circle "Duck Bill"	Used for straight line and curved cutting.
Snips, Left-hand, double-action "Dutchmans"	Used for cutting to left and/or cutting ends of tubing.
Snips, Tinners	Used for straight line cutting of sheet metal up to .064 inch thick.
Spot-Facer, Back	Used with various sizes of pilots where accuracy of hole location is desired. Also used for flushing bolt heads in castings.

TABLE IV (Continued)

REPAIR TOOLS

Tool	*Remarks*
Tap	Used for threading various sizes of holes for all standard threads. Available in nominal diameters, number of threads per inch, and pitch diameters.
Vise, Drill press, speed	Used to hold objects while drilling.
Wheels, Emery	Used to smooth metal surfaces and enlarge and shape holes.
Wrench, Tap	Used in conjunction with taps, Ezy-Outs, and reamers.

TABLE V

RIVETING SPLICE OVERLAP

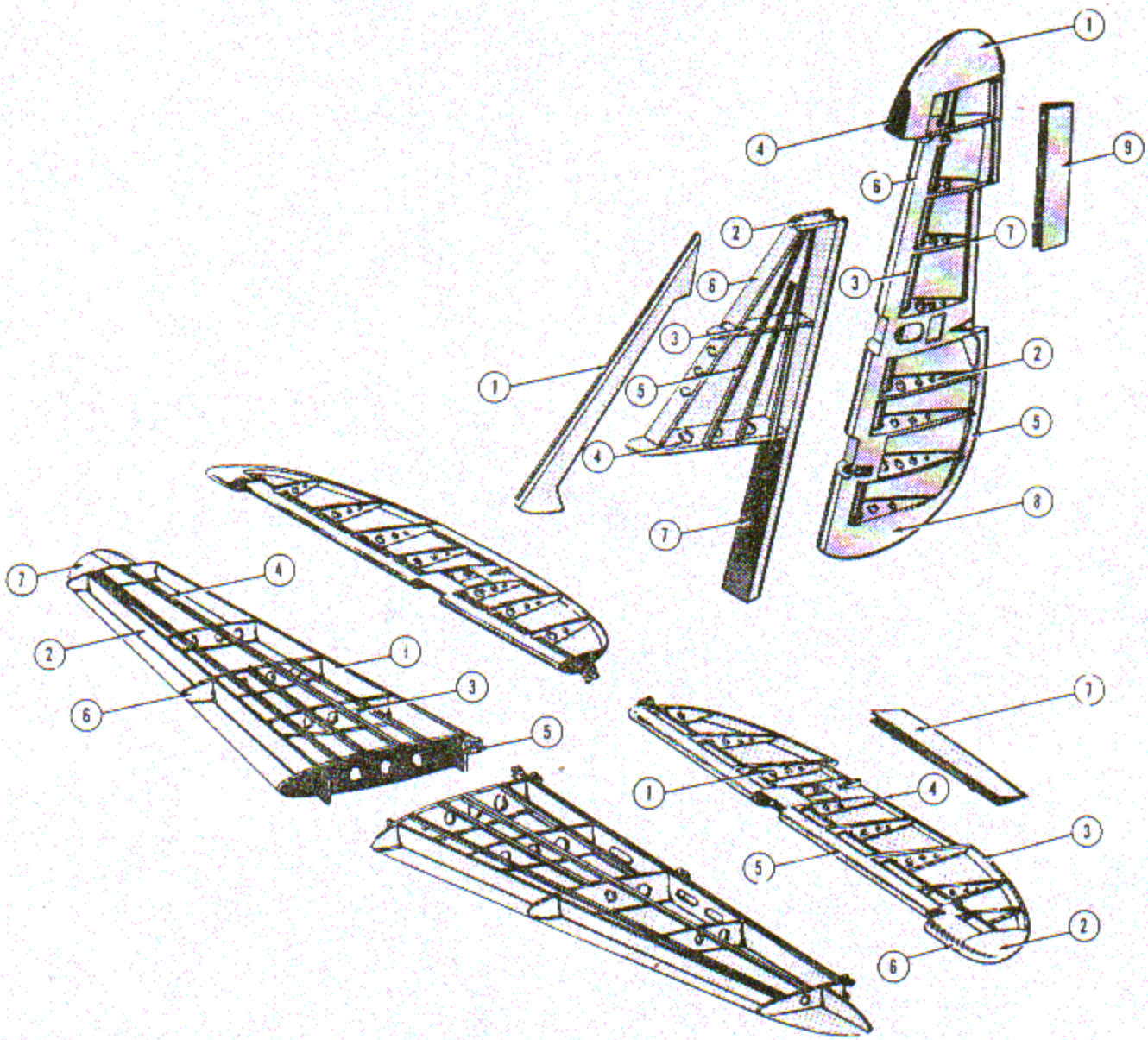
Thickness of Skin in Inches	*Rivet Type and Size*	*Rivet Pattern (On Centers)*	*Space Between Rows*	*Drill*
.020	AD-3	4 rows at 5/8 inch	1/2 in.	No. 41
.025	AD4	4 rows at 3/4 inch	1/2 in.	No. 30
.032	AD4	4 rows at 3/4 inch	1/2 in.	No. 30
.040	AD5	4 rows at 7/8 inch	5/8 in.	No. 21
.051*				
.064*				

*Because of the shape and location of these panels on the wing center section, complete replacement is recommended.

TABLE VI

SUMMATION OF STRINGER TYPES USED IN FIXED SURFACES

Stringer Type	*Used on Aircraft*	*Location*
1S40LT (C123LT)	AT-6A, B, C, D, and F	Wing Center Section and Outer Panel
1E110T (C148T)	All	Wing Center Section Upper Surface
1E110T (C148T) (Doubled)	All	Wing Center Section Upper Surface
1E2T (C180T)	AT-6B, D, and F AT-6C	Wing Outer Panel Lower Surface
1E100T (C204T)	All	Wing Center Section Lower Surface
1E100T (C204T) (Doubled)	All	Wing Center Section Lower Surface
1E87T (C250T)	AT-6A	Outer Wing Lower Surface
1E87T (C250T) (Doubled)	All	Wing Center Section Lower Surface (Wing Outer Panel Lower Surface AT-6C Only)
1E4T-1E87T (C250T-C366T) (Combination)	AT-6B AT-6C	Right Outer Wing Upper Surface
1E61T (265T)	All	Outer Wing Upper Surface
1S62T (C266T)	All	Outer Wing Lower Surface
4E6T (C274T)	All	Wing Center Section Upper Surface
1E4T (C366T)	All	Wing Upper Surface
1E4T (C366T) (Doubled	AT-6B AT-6C	Right Outer Wing Upper Surface (Only Reparable Location)
K77A	All	Outer Wing Lower Surface
K77A (Doubled)	All	Wing Center Section Upper Surface
1E101T (C203T)	AT-6D and F	Outer Wing Lower Surface



HORIZONTAL STABILIZER

1. Rear Spar
2. Front Spar
3. Rib
4. Stringers
5. Hinge
6. Nose Rib
7. Tip

RUDDER

1. Upper Cap Assembly
2. Rib
3. Torque Tube
4. Weight Balance
5. Trailing Edge
6. Skin
7. Channel
8. Lower Cap Assembly
9. Trim Tab

VERTICAL STABILIZER

1. Nose Skin
2. Upper End Rib
3. Center Rib
4. Lower End Rib
5. Stringers
6. Front Spar
7. Rear Spar

ELEVATOR

1. Rib
2. End Cap
3. Trailing Edge
4. Channel Assembly
5. Skin
6. Weight Balance
7. Trim Tab

Figure 68 — Empennage Repair Index

SECTION III
TAIL GROUP

1. GENERAL.

(See figure 68.)

The tail group or empennage is composed of right and left elevators and stabilizers, a vertical stabilizer, and a rudder. The elevators and rudder are movable while the stabilizers are fixed. Rudders and elevators are of similar construction in that they are built around a torque tube with ribs, trailing edges, and nose skins and are enveloped in a fabric cover. Stabilizers are built with ribs attached to front and rear spars, the frame structure being covered with an aluminum skin.

2. SPARS.

a. DESCRIPTION.—Six spars distributed as follows are used in constructing the empennage:

Horizontal stabilizers, right hand and left hand, front and rear.

Vertical stabilizer, front and rear.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Holes and nicks which can be drilled out to ⅜-inch diameter may be regarded as negligible if located at least 1 inch from bends, holes, edges, and existing rivets, and if not more than five holes occur in a 12-inch span of the spar.

(2) DAMAGE REPARABLE BY PATCHING.—If the damage exceeds the negligible limits but does not exceed half the cross-sectional area of the spar, a reinforcement may be applied with a short splice or repair member. Trim out all the damaged area, leaving no sharp corners to cause stress concentration. In most instances it is necessary to remove the skin on either side of the stabilizers mounted on stringers.

(3) DAMAGE REPARABLE BY INSERTION. *(See figures 69 through 73.)*—Damage that exceeds half the cross-sectional area requires a filler or insertion backed up with a splice of the same material. Removal of rib attaching angles on the spar in the affected area may also be necessary. Modify these angles as required when replacing them after making repairs. Bend splice members to match the inside shape of the spar to be repaired with a minimum radius of ⅛ inch. Detailed instructions appear on illustrations applying to the particular spar to be repaired.

Note

When repairing the rear spar in the vertical stabilizer, remember that the section below the lowest or root rib includes an additional stiffening angle in the flanges. Repair of the lower section of the rear spar on the vertical stabilizer may necessitate replacement of the two *inner* strengthening angles. Using the damaged length for a template, cut out two pieces of .040 x 3-⅝ x 20-¼ sheets of 2024-T3 Alclad material. Drill necessary riveting holes, bend to proper shape to fit, and fasten with rivets as directed in *figure 71*. If damage to this lower section includes the inner reinforcement angles which are only 20-¼ inches in length, it is more economical to replace with spare angles. If, however, a spare part is not available, use the damaged member as a template and form a new angle. Bend to proper shape and drill necessary riveting holes. The filler for repairing the spar is made of .040 2024-T3 Alclad sheet and is to fit the space covered by the web of the splice. The filler should butt-fit between the two inner reinforcement angles. *Figure 71* shows a typical repair. The width of the splice and filler is determined by the location of the damage as the spar tapers outward toward the bottom.

(4) DAMAGE NECESSITATING REPLACEMENT.—Replace the spar if two thirds or more of the area is damaged, particularly if the damage occurs on the inboard section of the horizontal stabilizer or below the root of the vertical stabilizer.

3. RIBS.

a. DESCRIPTION. *(See figures 74 and 75.)*—There are eleven ribs in each elevator and in the rudder. They are, with three exceptions, made of subsequently heat-treated .020-inch 2024-O Alclad. The exceptions are two center ribs in the elevator which are .025-inch thick and the top rib in the rudder which is .032-inch thick.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Dents up to ⅛ inch (nose ribs ¼ inch) deep and 1 inch wide may be considered negligible. No more than three (nose ribs two) dents in any one rib is permissible. A maximum

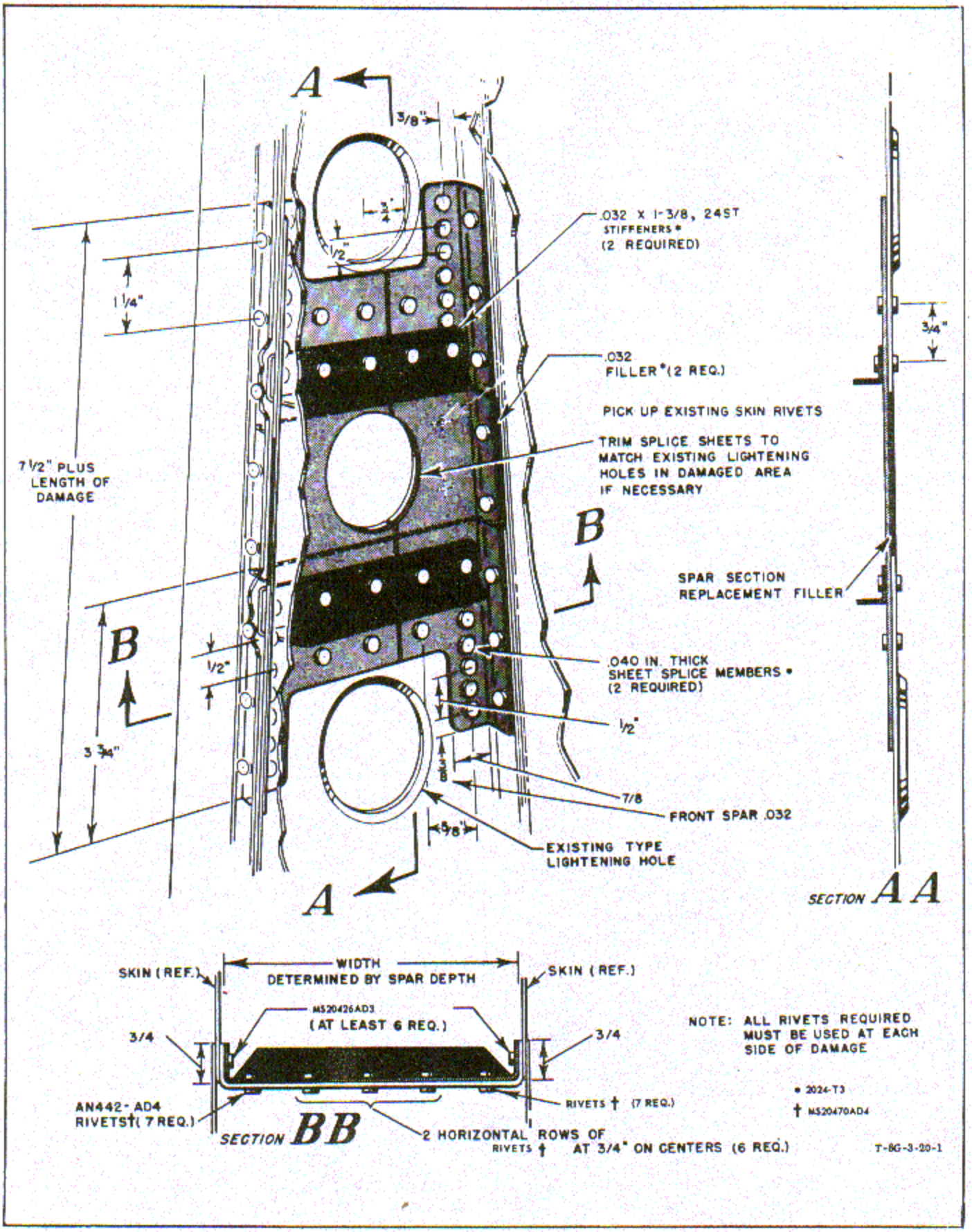


Figure 69 — Vertical Stabilizer Front Spar Splice

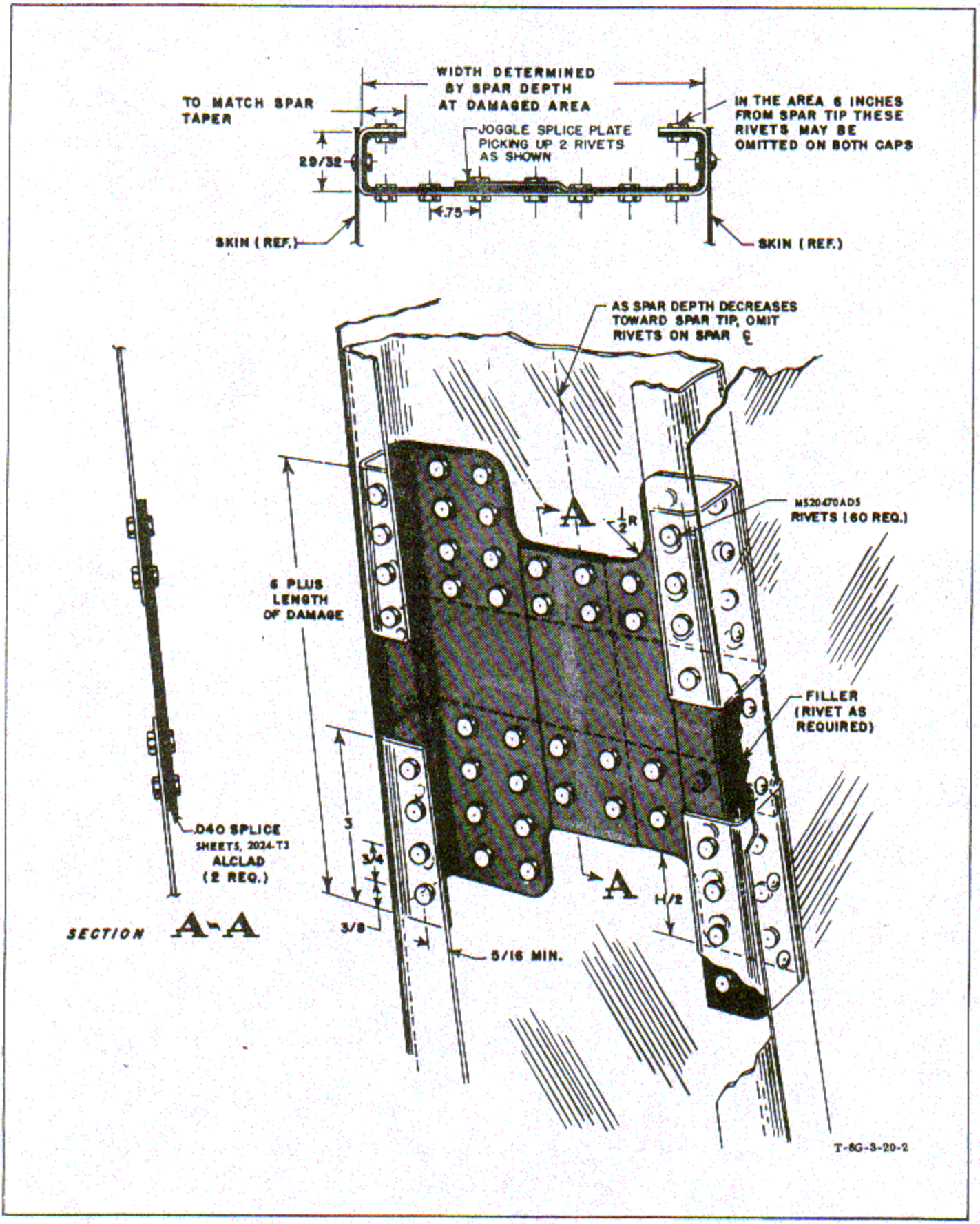


Figure 70 — Vertical Stabilizer Rear Spar Splice for Area Above Root Rib

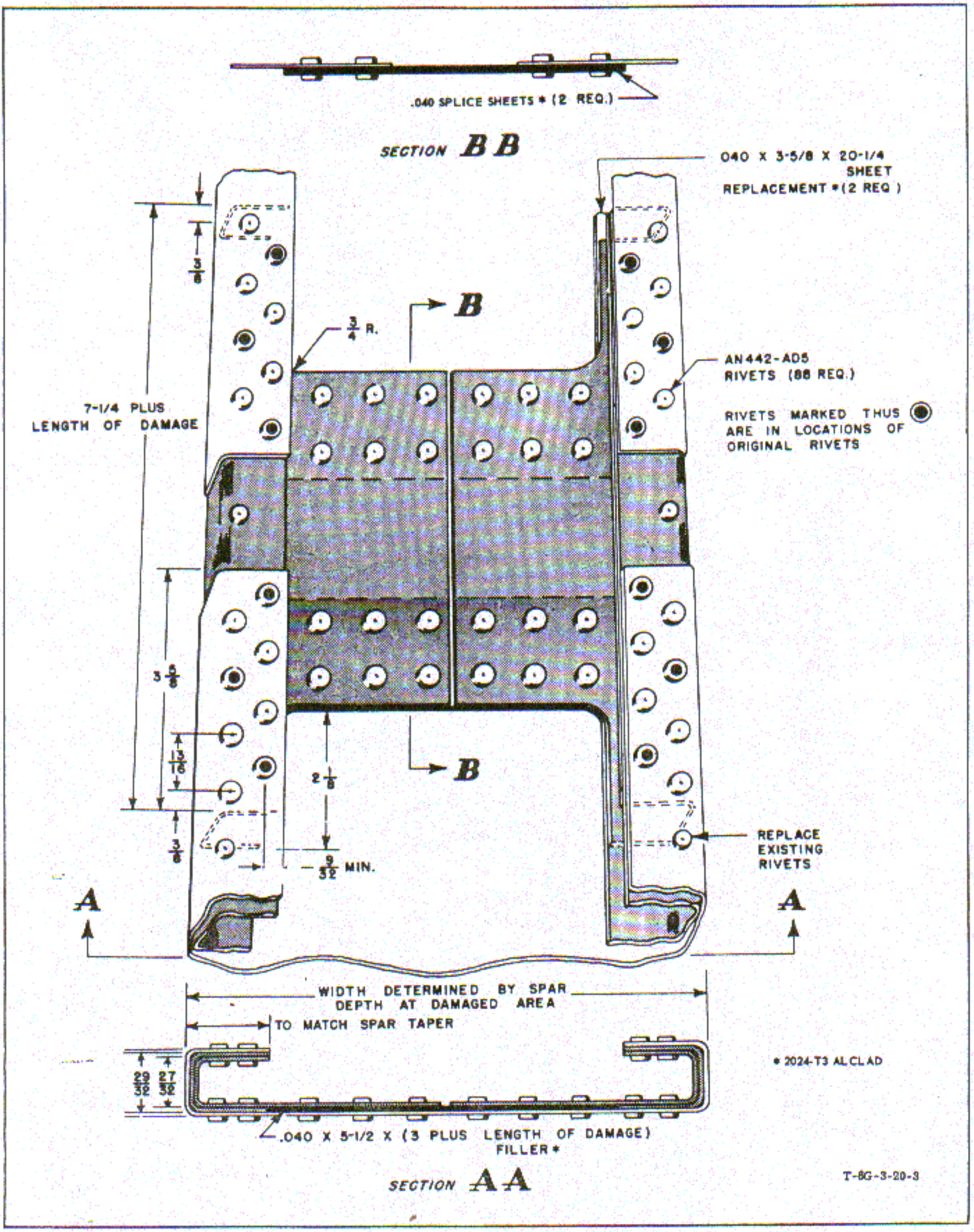


Figure 71 — Vertical Stabilizer Rear Spar Splice for Area Below Root Rib

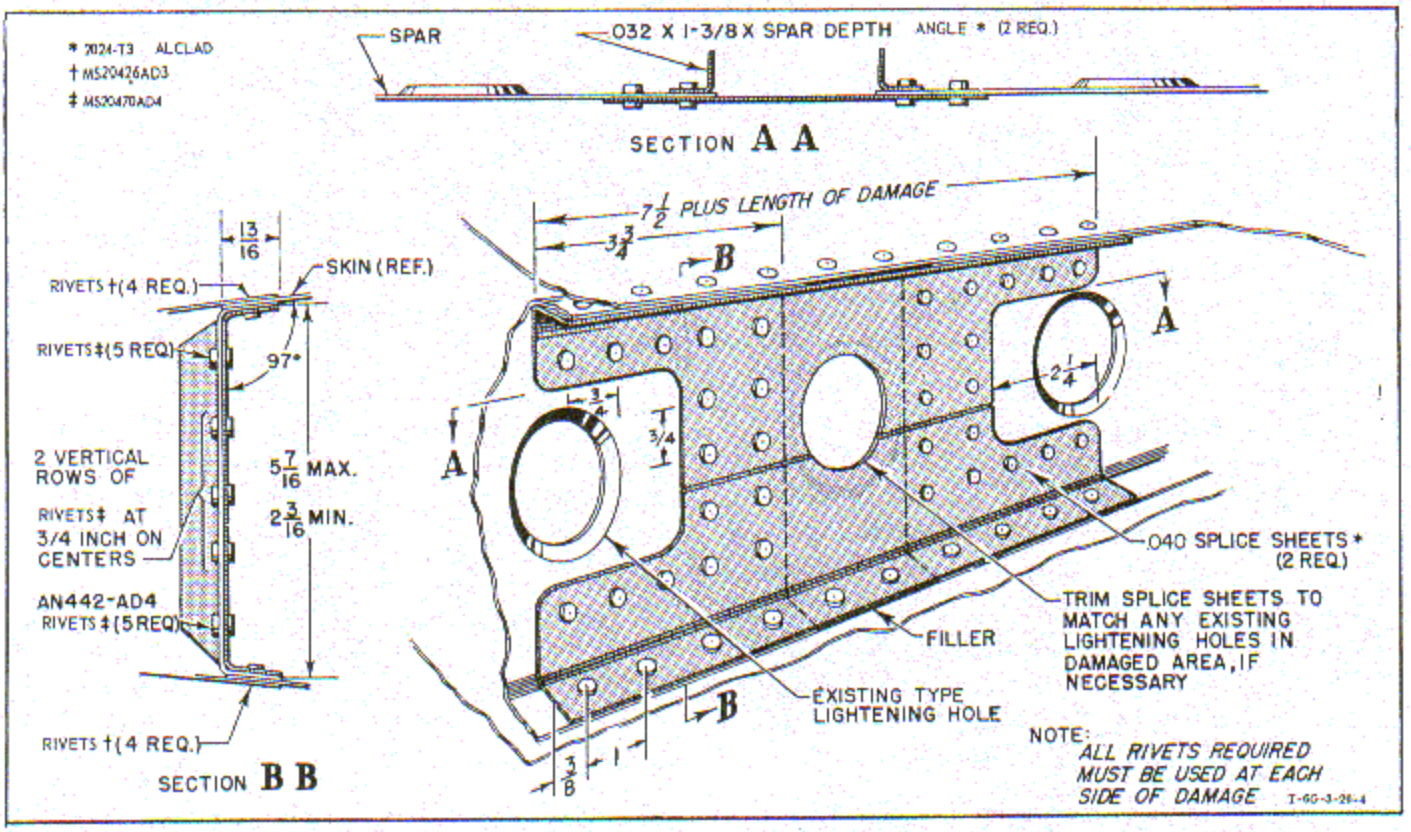


Figure 72—Horizontal Stabilizer Front Spar Splice

of five smooth, round holes may be regarded as negligible if the holes do not exceed ½ inch in width and are located at least 1 inch from all bends, holes, edges, and existing rivet holes. Bent ribs that can be bumped back to original shape without evidence of creasing or cracking are entirely usable; however, if cracking appears, the affected rib must be reinforced, spliced, or replaced.

(2) DAMAGE REPARABLE BY INSERTION.—*(See figure 76.)*

(a) It may be necessary to cut a damaged rib to facilitate its removal. If a spare part is not available and immediate repair is necessary, fabricate a duplicate of the damaged rib section, using the old one as a template.

(b) It is essential that the weight of the new rib match the weight of the original rib to prevent static unbalance; however, when repair material is added near the hinge line of the surface, the static balance of the surface is not seriously affected.

(c) After the rib replacement section is prepared to match the damaged section, place it in position and drill No. 40 (.098) holes through the trailing edge strip or the leading edge skin, depending upon the location of the damage. Use existing holes in the structure as a guide and secure with MS20470AD3 rivets.

(d) When the damage to the rib is in the torque tube area, prepare two splice members of 2024-T3 Alclad .032-inch thick and 3-½ inches square to place on the opposite side of the rib collar. On one side of each splice member, bend up an angle to match the existing rib caps. Trim around the torque tube and lightening holes when they come within the repair zone.

(e) After center punching the rivet locations in the splice members, drill No. 30 (.1285) holes through the existing holes, including those in the rib collar. Remove the splice members and burr the rivet holes. Apply one coat of zinc chromate primer to overlapping surfaces; fasten the splice pieces to the rib; insert and drive MS20470AD4 rivets.

(f) Further suggestions for rib repair appear in Section II.

(3) DAMAGE NECESSITATING REPLACEMENT.—When it is more economical to install a new rib than to attempt repair, replace with a spare; however, most damages to ribs are reparable.

4. STRINGERS.

a. DESCRIPTION. *(See figures 77 and 78.)*—The six stringers in the vertical stabilizer and eight in each of the horizontal stabilizers are rolled Alclad, type 1S3LT (C373LT). Type 1S14LT (C107LT) stringers were used on early airplanes.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Negligible damage includes dents no greater than ⅛ inch in depth or ¼ inch in width with no sharp corners; nicks or cracks that do not exceed ¼ inch and can be burnished or smoothed out; a maximum of two round holes (not more than ⅛ inch in diameter and ¼ inch from rivet holes) between ribs.

(2) DAMAGE REPARABLE BY PATCHING.—Damage which affects less than half the cross-sectional area of the stringer after being smoothed out requires minor repair. A maximum of one reinforcement is permissible in a length of stringer between two ribs.

(3) DAMAGE REPARABLE BY INSERTION.—*(See figures 70 and 80.)*—If the damage exceeds half of the cross-sectional area, repair by insertion and splicing. Either duplicate the original member, using like stock and bending to required shape, or use two pieces of stock, bending one L-shaped and the other J-shaped as illustrated.

(4) DAMAGE NECESSITATING REPLACEMENT.—If damage extends into the second bay, replace stringer.

5. RUDDER AND ELEVATOR TRAILING EDGES.

a. DESCRIPTION.—Trailing edge strips of the elevators and rudder are made of subsequently heat-treated 2024-O Alclad sheet formed into type 1S32LT (C144LT) sections which are V-shaped with the ends turned inward. A section of the trailing edge is omitted to permit installation of controllable trim tabs. On the T-6G, two navigation lights are fitted to the lower trailing edge of the rudder.

b. CLASSIFICATION OF DAMAGE.—As all additional weight in the form of repairs should be avoided, replacement rather than repair of the trailing edge is recommended.

(1) NEGLIGIBLE DAMAGE.—Smooth dents in the trailing edge strip located at least ¼ inch from bends may be regarded as negligible if the dents do not exceed a depth of 1/16 inch and width of ½ inch. A maximum of one dent in the trailing edge section between ribs is permissible. A maximum of three smooth, round holes or nicks in a bay, located at least ¼ inch away from all edges, bends, and existing holes and not exceeding ¼-inch diameter, may be considered negligible. Slightly bent trailing edges may be bumped back into proper shape. If the trailing edge strip cannot be bent back into shape or if cracks appear in the strip, repair or replace.

(2) DAMAGE NECESSITATING REPLACEMENT.—If there are cracks in the short trailing edge section at the top of the rudder or in the short trailing edge section at the inboard end of the elevator, replace the unit. If replacement parts are not available, they can be fabricated.

(a) Remove the doped fabric in the damaged area and drill out all rivets which secure the trailing edge strip to the ribs.

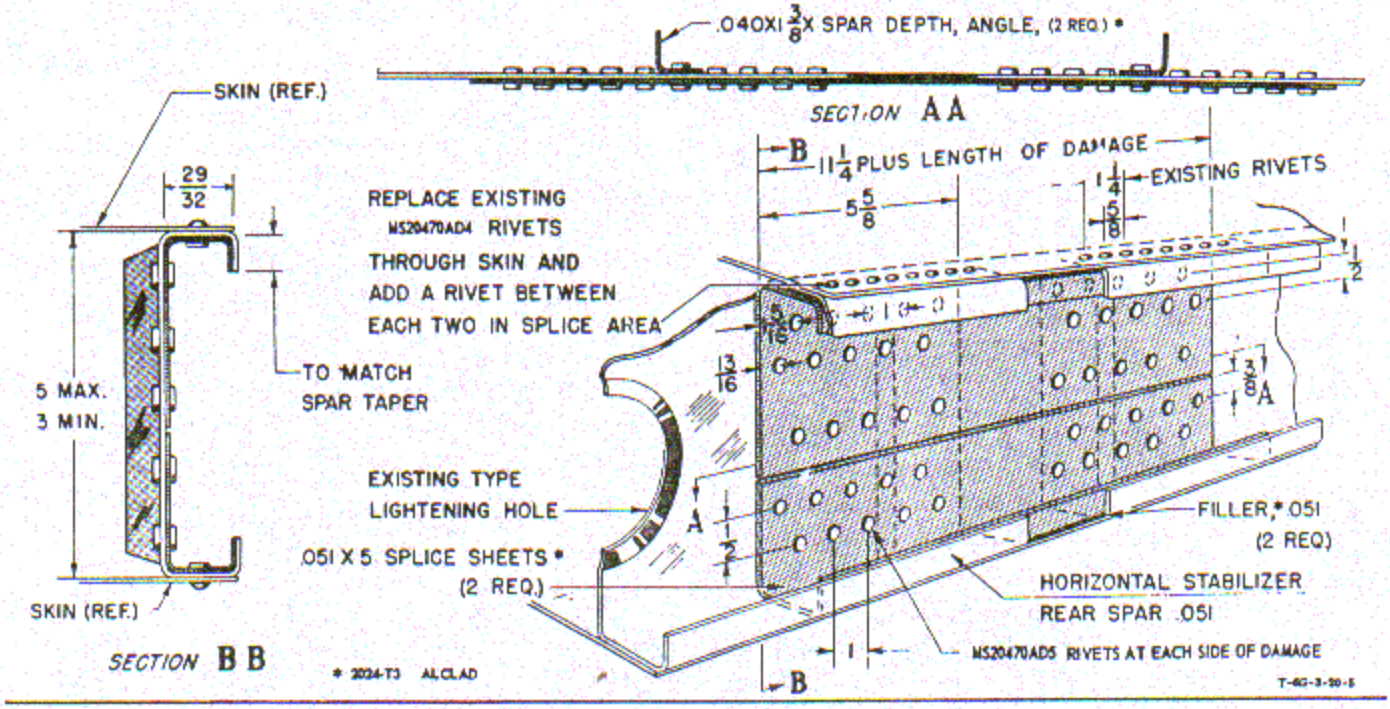
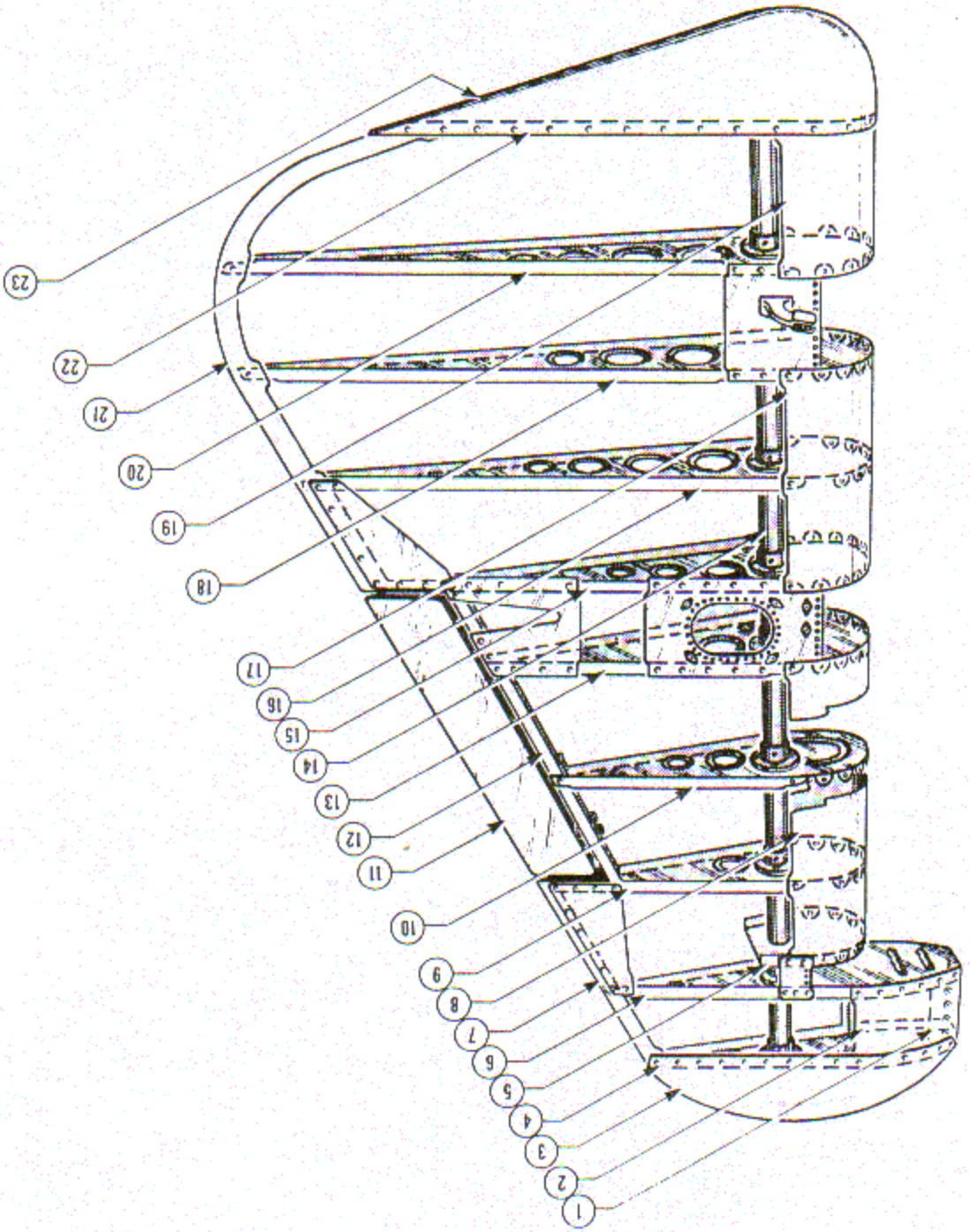
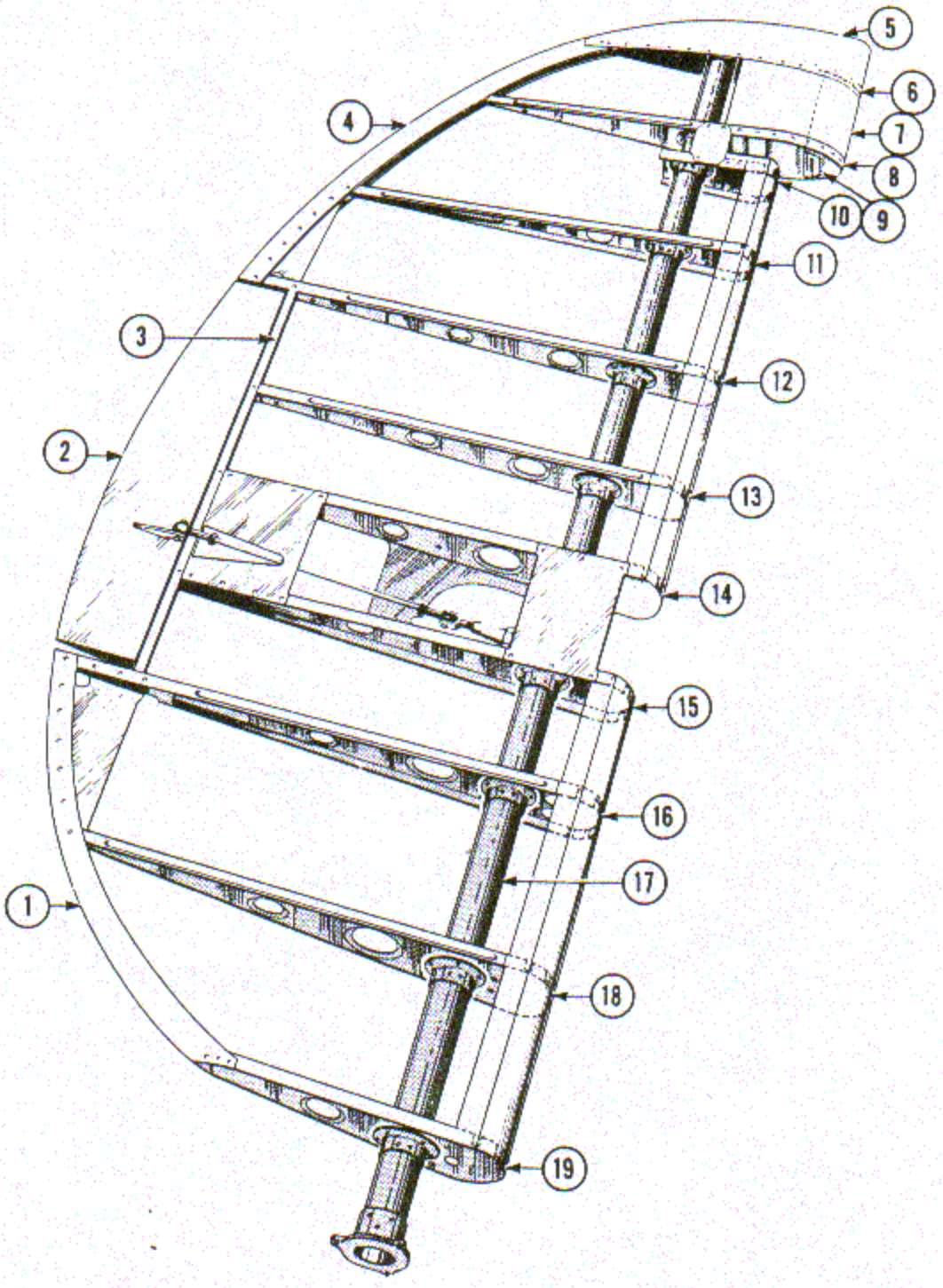


Figure 73—Horizontal Stabilizer Rear Spar Splice for Area Outboard of Center Hinge Fitting



1. Balance Weight
2. Skin
3. Cap
4. No. 1 Rib
5. No. 3 Nose Rib
6. No. 2 Rib
7. Trailing Edge
8. Skin
9. No. 4 Rib
10. No. 5 Rib
11. Trim Tab
12. Channel
13. No. 6 Rib
14. Torque Tube
15. No. 7 Rib
16. No. 8 Rib
17. Skin
18. No. 9 Rib
19. Nose Skin
20. No. 10 Rib
21. Trailing Edge
22. No. 11 Rib
23. Cap

Figure 74 — Rudder Frame Parts



1. Trailing Edge
2. Trim Tab
3. Channel
4. Trailing Edge
5. Cap
6. No. 11 Rib
7. Skin
8. No. 10 Rib
9. Weight
10. No. 9 Rib
11. No. 8 Rib
12. No. 7 Rib
13. No. 6 Rib
14. No. 5 Rib
15. No. 4 Rib
16. No. 3 Rib
17. Torque Tube
18. No. 2 Rib
19. No. 1 Rib

Figure 75—Elevator Frame Parts

(b) Fabricate a new part of 2024-O Alclad. Bend up a V-formed section to match the length, thickness, weight, and cross section of the removed damaged strip. To observe the minimum bend radius, use 2024-O Alclad and then heat-treat to required hardness.

(c) Place the strip in position and with a blind-hole locating tool mark the locations of the holes for the rib attaching rivets.

(d) Remove the strip, drill and burr the holes, and apply a coat of zinc chromate primer to all faying surfaces.

(e) After replacing the strip in position, insert two or more skin fasteners to hold rigidly in place. Insert and upset all attaching rivets.

(f) With Grade A mercerized cotton fabric, re-cover the partially exposed structure as outlined for partial fabric re-covering.

Note

If either of the elevator sections is interchanged, be sure to provide drainage for the moisture caused by condensation inside the elevator. Drain washers are located at the trailing edge in each bay on both sides of the elevator fabric covering. When the elevator sections

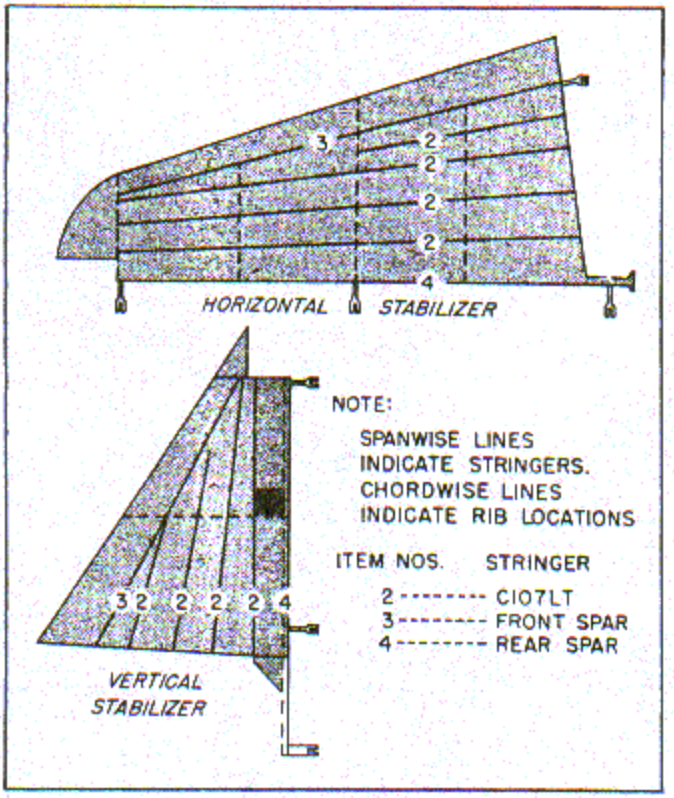


Figure 77—Stabilizer Stringer Arrangement—AT-6A

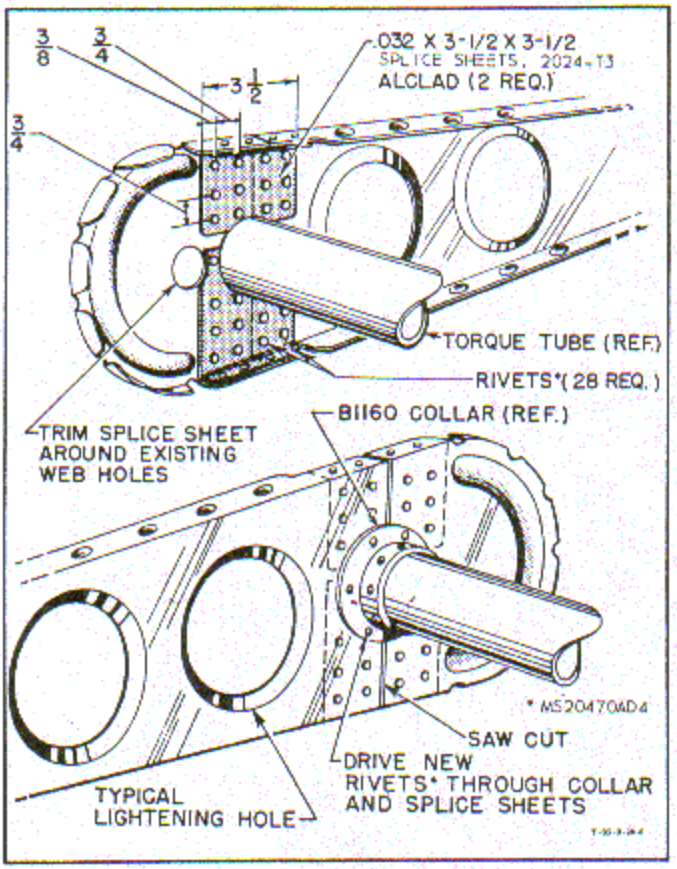


Figure 76—Rudder and Elevator Rib Replacement

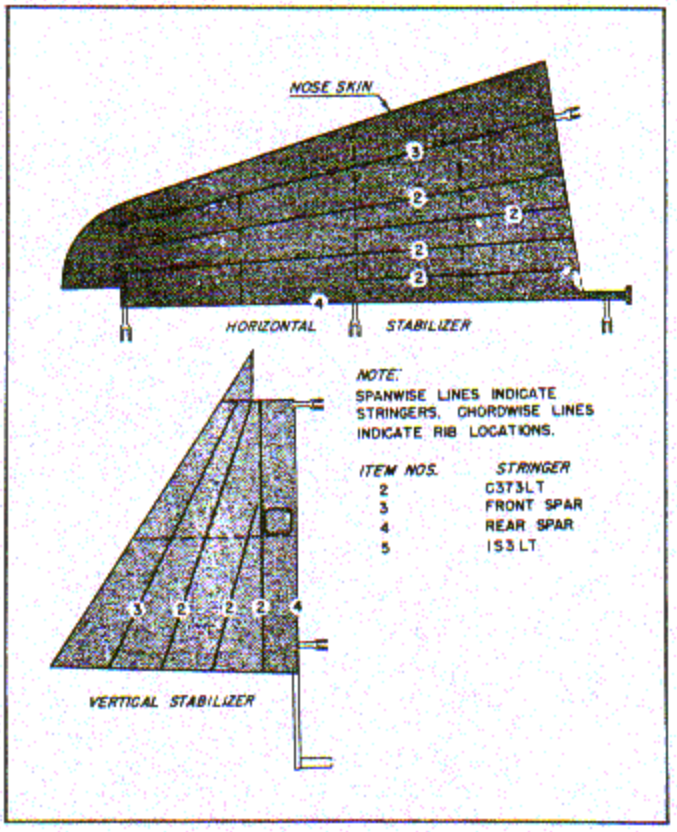


Figure 78—Stabilizer Stringer Arrangement—AT-6B, C, D, F, and G

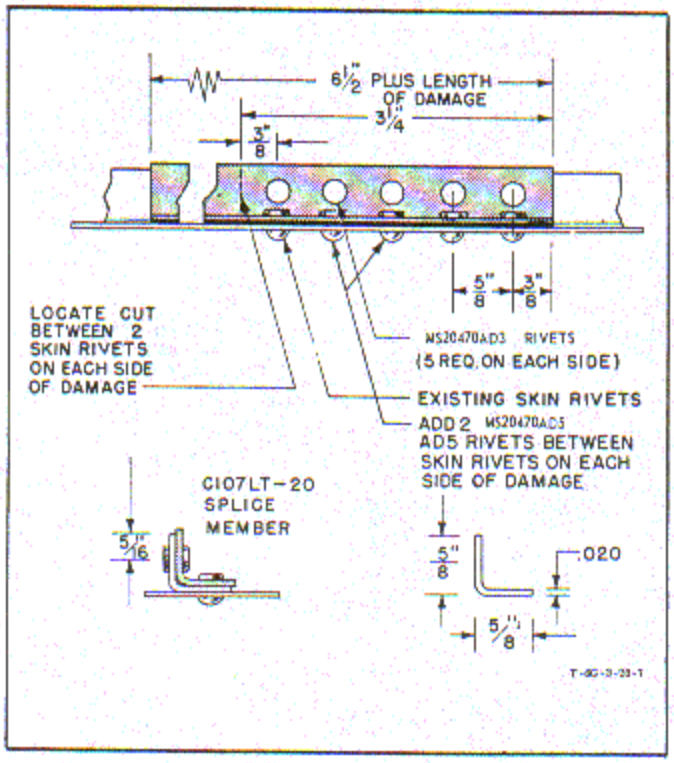


Figure 79 — Splice for Stringer Type 1S14LT(C107LT)

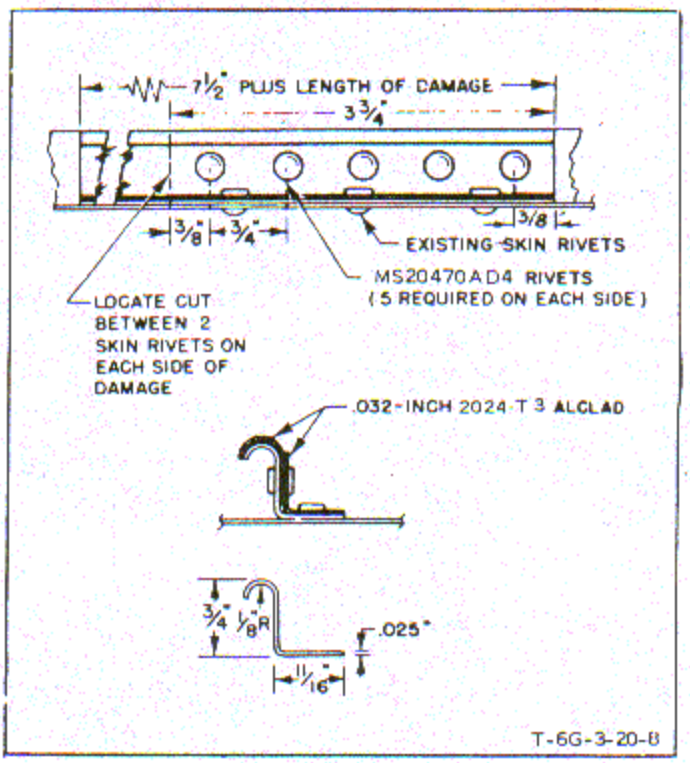


Figure 80 — Splice for Stringer Type 1S3LT(C373LT)

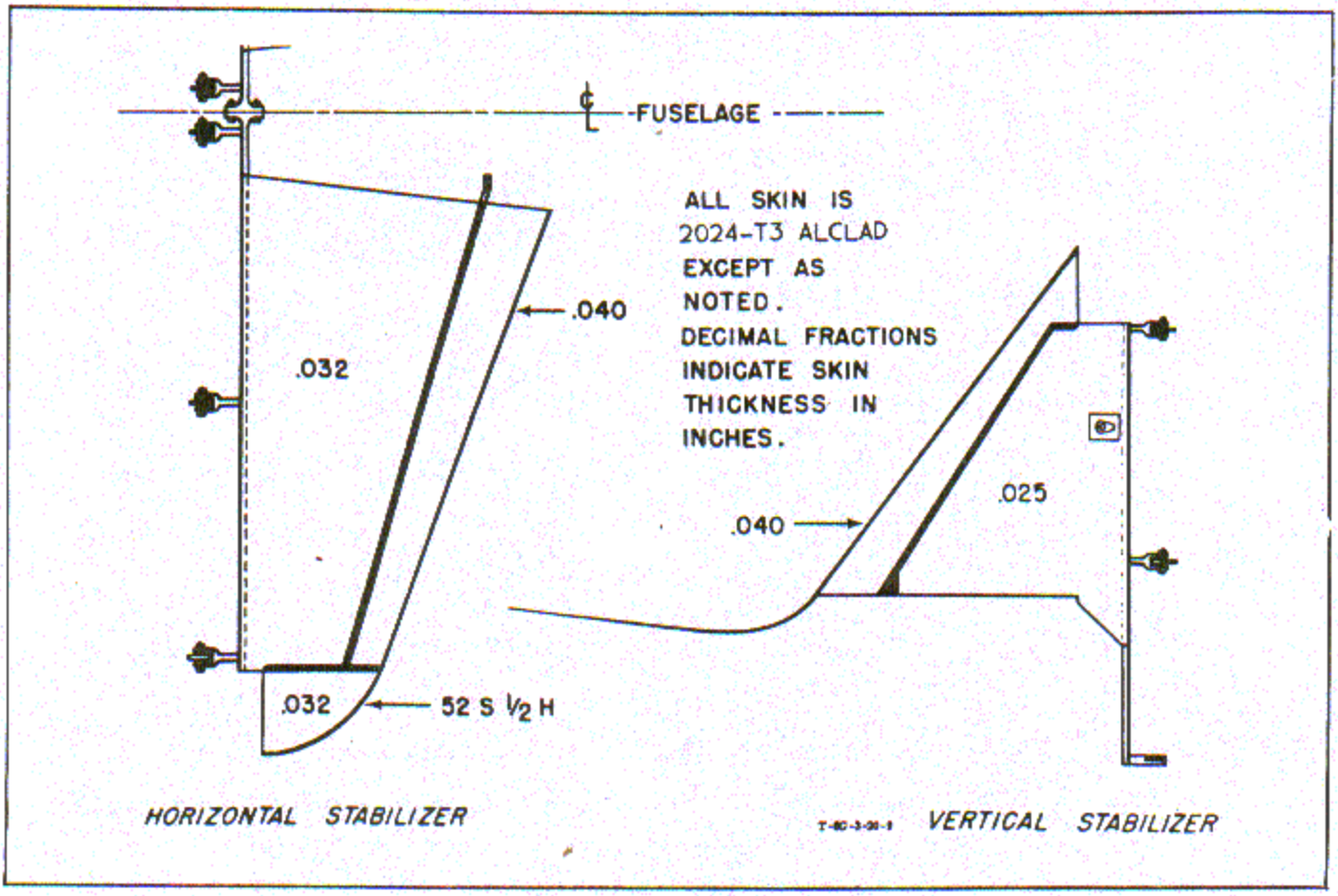


Figure 81 — Stabilizer Skin Arrangement

are reversed, the centers of these drainage holes must be cut out on the lower side and the holes on the upper side resealed by the application of doped fabric patch.

6. TORQUE TUBES.

Do not attempt repair of torque tubes in elevators or rudders; if damaged, install a new torque tube. A torque tube must not be removed or installed without the aid of a jig. Completely dismantle an elevator or rudder before removing or installing a torque tube.

7. TRIM TABS.

(See figures 74 and 75.)

The rudder and both elevators are provided with 2024-T3 aluminum trim tabs, made of skin .016-inch thick for elevators and .020-inch thick on the rudder. When a tab is damaged and a spare is not available, shape a new one, using the original as a template. Occasionally an airplane is found with wood trim tabs which, when damaged, should be replaced with a spare made of metal.

8. COVERING MATERIALS.

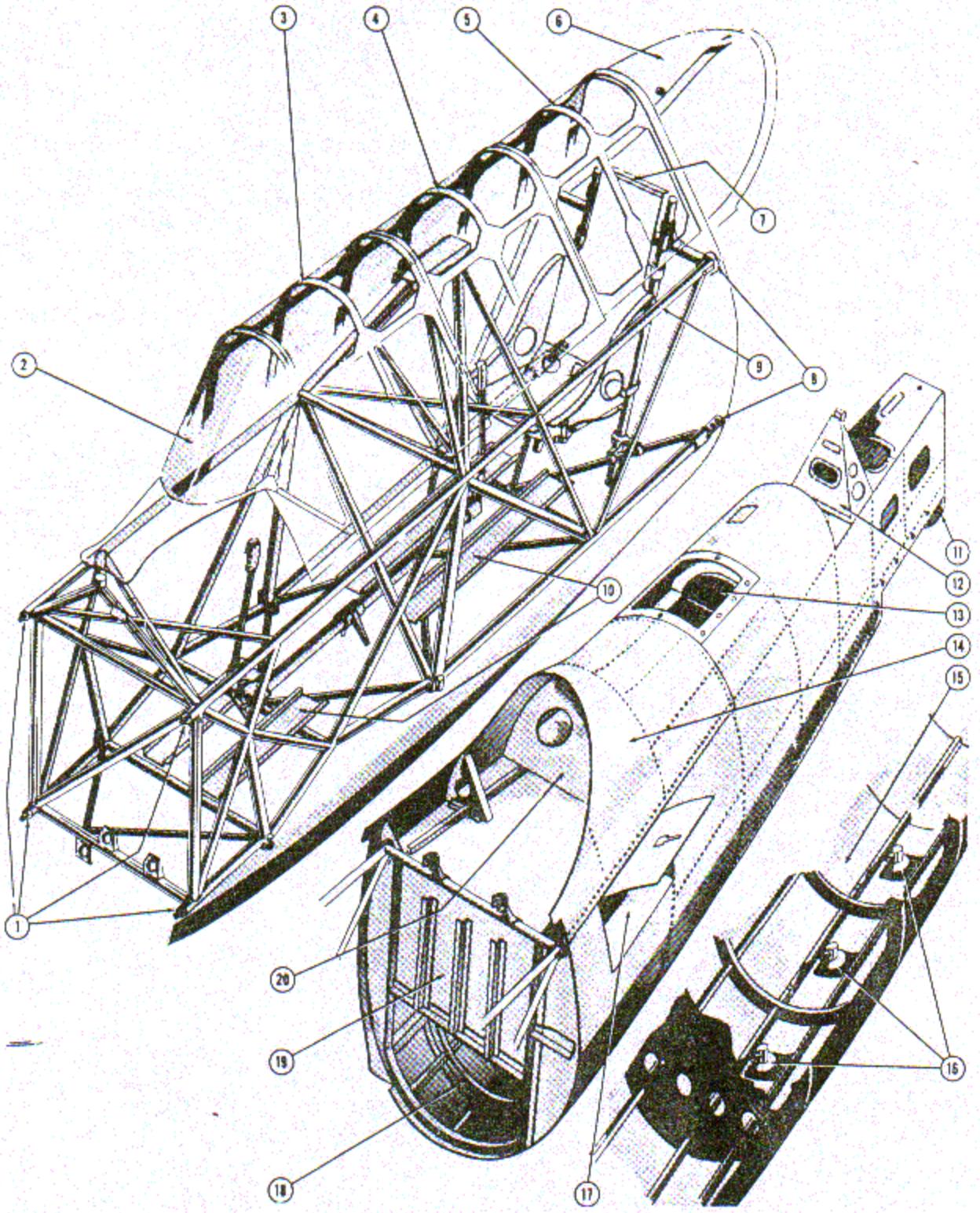
a. METAL. *(See figure 81.)*—The skin is riveted to stringers and the complete sides of the stabilizer are riveted to the ribs. The sides and nose can be removed intact. All stabilizer skin except the tip is 2024-T3 Alclad while the tip skin on the horizontal stabilizer is 52S½H aluminum alloy, .032 inch thick. This is the same thickness as the top and bottom panels. The nose skin is .040 inch thick. See Section II for methods and repair procedures.

b. FABRIC.—Fabric covering repairs are outlined in Section VII and in T.O. AN 01-1A-1, General Manual of Structural Repair, Section XIII.

TABLE I

REPAIR MATERIALS

Type	*Thickness*	*Specification*
Sheet, Alclad, 2024-O heat-treated and 2024-T3	.016, .024, .025, .032, .040, .051	QQ-A-362
Sheet, 3003-O Alum Alloy	.032	QQ-A-359
5052 ½ Alum Alloy	.032, .040	QQ-A-318
Rod, Welding 1100		QQ-A-411
Rivets, MS20470AD4 Universal		
Rivets, MS20470AD3 Universal		
Rivets, MS20426AD3, Countersunk		
Stringer, 1S14LT(C107LT) (AT-6A)		QQ-A-362
Stringer, 1S3LT(C373LT) (AT-6B, C, D, F)		QQ-A-362



1. Connection, Engine Mount
2. Windshield Assembly
3. Enclosure, Front Movable
4. Enclosure, Fixed Center
5. Enclosure, Rear Movable
6. Enclosure, Fixed Rear
7. Seat, Fixed Rear
8. Connection, Rear Fuselage
9. Frame, Tubular
10. Floor
11. No. 8 Bulkhead
12. Pylon, Stabilizer
13. Shelf, Remote Compass
14. Deck, Upper Assembly
15. Deck, Lower Assembly
16. Lights, Recognition
17. Compartment, Baggage
18. Tank Provisions, Auxiliary Fuel
19. No. 1 Bulkhead
20. No. 2 Bulkhead

Figure 82 — Fuselage Repair Index

SECTION IV
BODY GROUP

1. GENERAL.

(See figures 82 through 85.)

The complete fuselage is comprised of a front tubular section and rear monocoque. The front tubular section from the fire wall to a position aft of the rear cockpit is made of chrome-molybdenum steel tubing with welded steel joints and fittings. Removable side panels on the front fuselage are made of 2024-T3 Alclad formers, stringers, and skin riveted and spot-welded together. The rear fuselage section is a semi-monocoque structure of 2024-T3 Alclad. The frame consists of longerons, formers, stringers, and bulkheads. See *figure 86* for the outside diameter and wall thickness of all tubing used in AT-6 series airplanes. Repairs that may be necessary to the tubular section are covered in Section X of AN 01-A1-1, General Manual for Structural Repair.

2. LONGERONS.

a. DESCRIPTION. — Two upper and two lower longerons are located in the rear fuselage. The upper longerons, 120 inches long and fabricated from .064-inch 2024-T3 Alclad, are U-shaped. The lower longerons are hat sections 111 inches long, and fabricated from .051 2024-T3 Alclad.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—If dents are not deeper than 1/16 inch or wider than ½-inch radius with a depth not exceeding 3/16 inch, they may be considered negligible.

(2) DAMAGE REPARABLE BY PATCHING.—Round out the damaged area with a file or emery wheel and if the depth of the damage to either the upper or lower longeron flange exceeds 3/16 inch, round out to a radius of at least 1 inch. If the rounded-out area on the flange does not exceed 1-¼ inch, the damage is minor and can be patched.

(3) DAMAGE REPARABLE BY INSERTION. *(See figures 87 and 88.)*—If more than half of the cross-sectional area has been destroyed, the repair will require an insertion and a splice. If the length of the damage exceeds 7-½ inches, insert a longeron section; if less than 7-½ inches, insert a filler between the two repair members.

(4) DAMAGE NECESSITATING REPLACEMENT.—Replace a longeron if more than one insertion splice is necessary unless the second damage is located near either end.

3. STRINGERS.

a. DESCRIPTION,

(1) FRONT FUSELAGE STRINGERS. *(See figure 89.)*—The stringers in the front fuselage are type IS13LT (C364LT) and are used in the construction of the left and right side panels. Each panel has six stringers made of rolled stock with the exception of the two lowest in the right panel which are heavier due to provisions for the British heating unit.

(2) REAR FUSELAGE STRINGERS.

(a) TYPE 1S14LT (C107LT). *(See figure 90.)*—This type stringer is used in AT-6C airplanes only and is located in the lower covered frame assembly.

(b) TYPES 1E116T AND 1E4T (C108T AND C366T.)—Types 1E116T and 1E4T are in the upper and lower rear sections respectively. Replacement rather than repair of these stringers is recommended, since the longest length used of either type is 23 inches.

(c) TYPE 1S23LT (C234LT). *(See figure 91.)*—Type 1S32LT is used extensively throughout the rear fuselage. Repair procedures are outlined in the illustration.

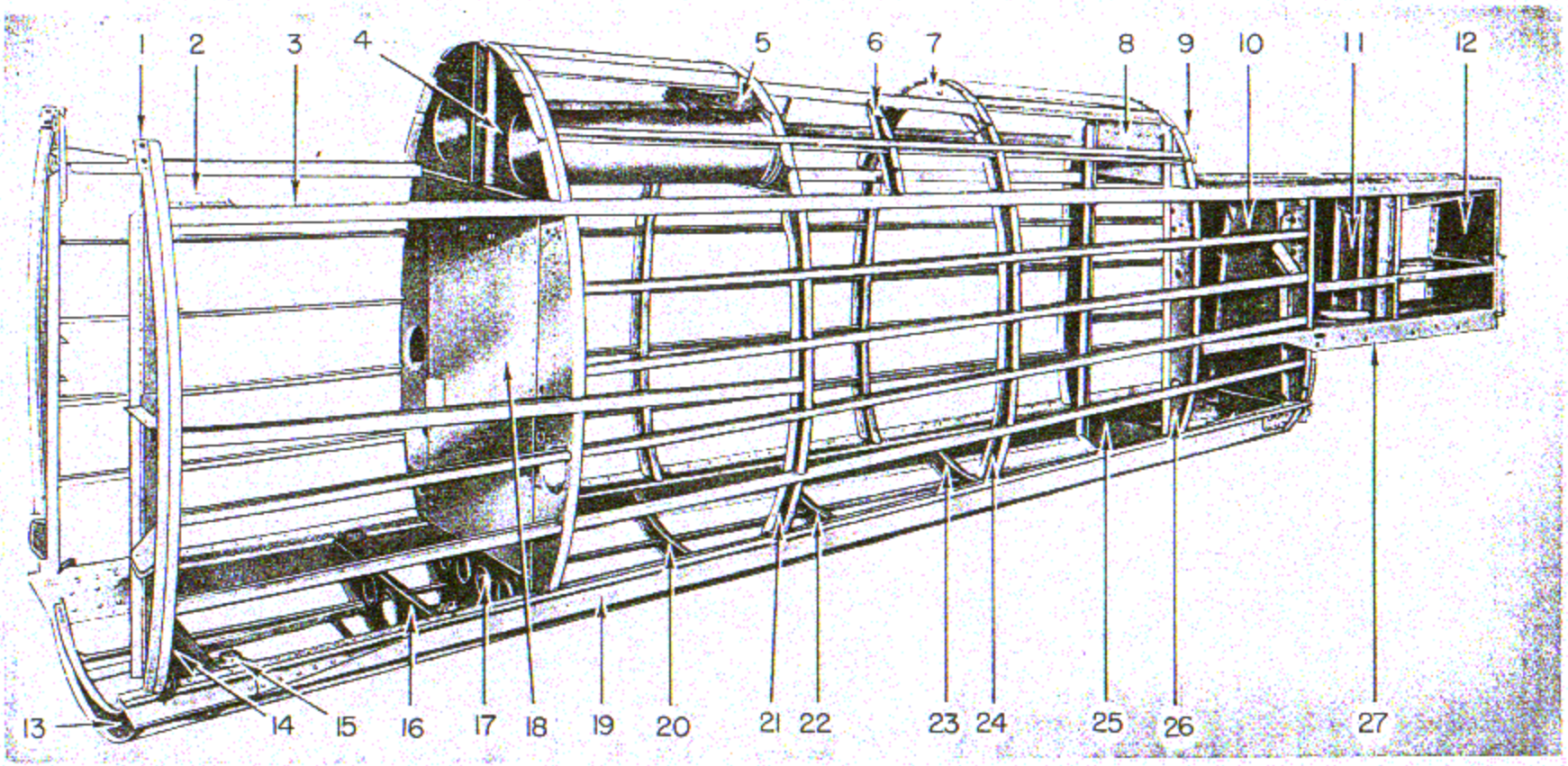
b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Dents no deeper than ⅛ inch are negligible. A maximum of four nicks not more than ⅛ inch deep in a length of a stringer between two formers is permissible; however, they must not be nearer than 5/16 inch to existing holes and edge of stock to be repaired. No damage to the stringer bulb may be classified as negligible; the damaged section must be replaced.

(2) DAMAGE REPARABLE BY PATCHING.—If less than half of the cross-sectional area is damaged, a reinforcement angle may be used without the addition of a filler.

(3) DAMAGE REPARABLE BY INSERTION.—When more than half of the cross-sectional area is damaged it is necessary to insert a filler or a section exactly like the original stringer.

(4) DAMAGE NECESSITATING REPLACEMENT.—Replace the entire stringer if damage exceeds the length of three bays.



1. Bulkhead, Station 106.5 RH
2. Fitting, Fuselage Attaching LH
3. Longeron, Upper LH
4. Bulkhead, Station 137 Upper
5. Bulkhead (Former) Station 158-1/4 Upper
6. Former, Station 168-1/2 Upper Left
7. Bulkhead (Former) Station 179-1/2 Upper
8. Bulkhead (Former), Station 200-3/4 Upper
9. Fitting, Horizontal Stabilizer Attaching
10. Bulkhead, Station 215-5/8 Rear
11. Bulkhead, Station 227-3/8 Rear
12. Bulkhead, Station 242-3/16 Upper
13. Former, Station 106-1/2 Lower
14. Former, Fuselage Rear Section 1B Lower
15. Mount, Camera LH
16. Former, Fuselage Rear Section 1B Lower
17. Bulkhead, Station 137 Lower
18. Bulkhead, Station 137
19. Longeron, Lower LH
20. Former, Station 156-11/16 Lower
21. Former, Station 158-1/4 Left Side
22. Former, Station 170-3/8 Lower
23. Former, Station 185-9/16 Lower
24. Former, Station 179-1/2 Left Side
25. Former, Station 200-3/4 Lower
26. Former, Station 200-3/4 Left Side
27. Channel, Assembly

4. INTERCOSTAL ANGLE — BAGGAGE COMPARTMENT.

a. DESCRIPTION. *(See figure 92.)* — Used only in the left side beneath the baggage compartment between stations 106 and 150, the intercostal is 51 inches long and is made of 2024-O .081 Alclad sheet, heat treated after forming.

b. REPAIR.—Classification of damage and repair procedures for this angle are the same as for stringers.

5. FORMERS.

a. DESCRIPTION.—There are 20 formers in the body section, equally divided between the front and rear fuselage. Those in the front are all on the side panels while in the rear fuselage they are distributed from station 106.5 to station 242.

(1) FRONT FUSELAGE FORMERS.

(a) FORWARD FORMERS OF FRONT FUSELAGE SIDE PANEL.—The single forward former on both the left and right fairing side panels of the front fuselage, station 10-5/8, is repaired as illustrated in *figure 93.*

(b) REAR FORMERS OF FRONT FUSELAGE SIDE PANELS. *(See figure 94.)*—The four formers in the left panel and the one at station 84-3/8 in the right panel are repaired as illustrated.

(c) FORMERS FOR BRITISH HEAT UNIT PROVISIONS.—The three formers made for the British heat unit provisions in the right panel at stations 26-7/8, 45-3/8, and 68-1/8 are identical to the former at station 84-3/8 with the exception of a 7-inch section designed for a heating duct. Repairs to damage outside this area are as outlined in *figure 94*. The right front panel incorporates provisions for the installation of the British heating unit, which is used only in those airplanes sold to Great Britain. The several deviations in the construction of the right-hand panel as compared with the left are as follows: two stringers 66-31454 and 66-31454-1 made of heavier stock; three formers 66-31201 made with provisions for the heating duct; one cover 88-310172 to cover holes made for the unit ventilation; doubler 88-31051-9 to reinforce cut-outs; cut-outs, one circular 3-1/4 inch diameter, the other 2-3/4 x 2-7/8. The three formers above may be replaced with standard formers such as 66-31200 at station 84-3/8. If either of the two special stringers incorporated for the British heating unit are damaged, they too can be replaced with

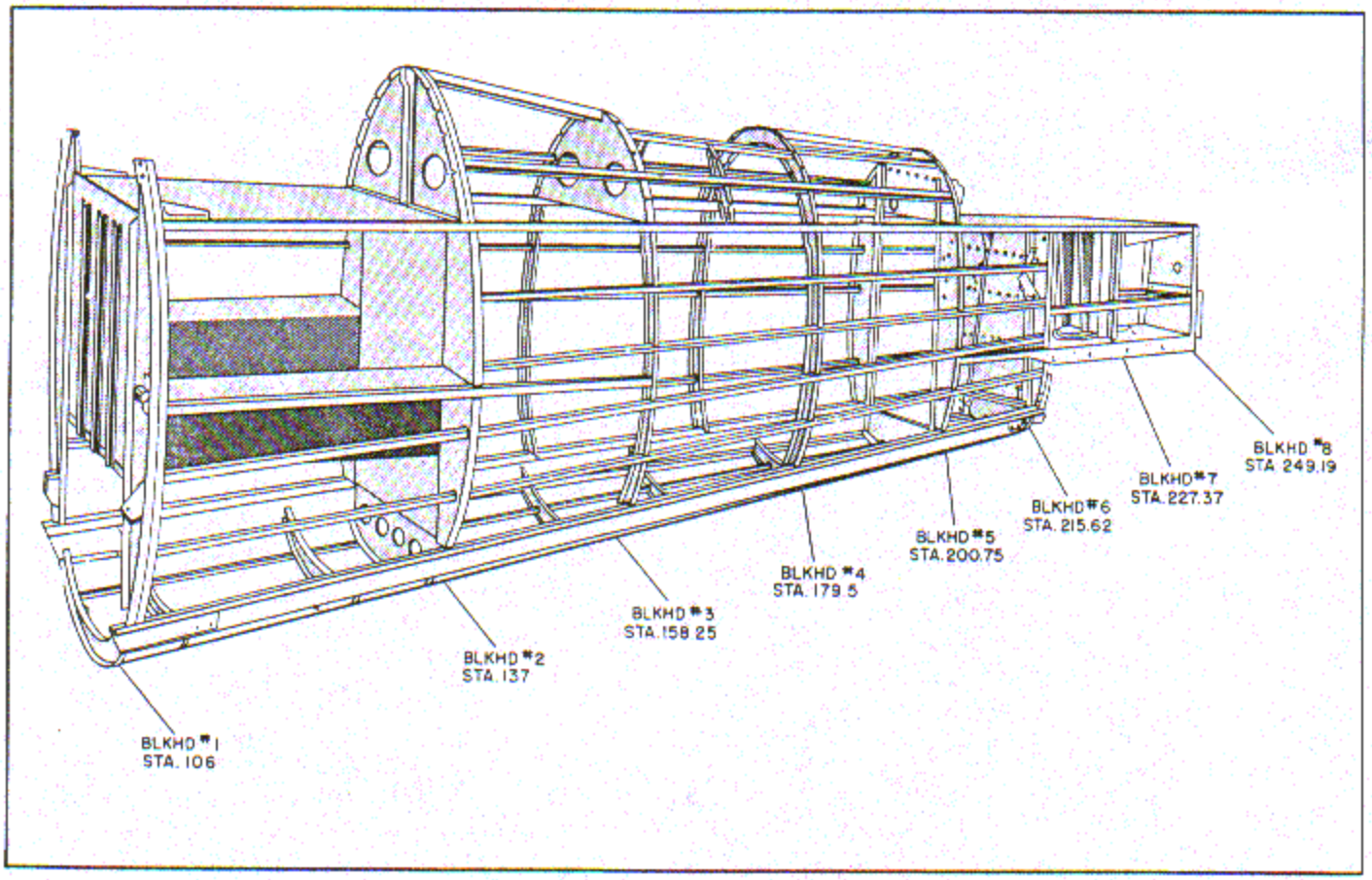
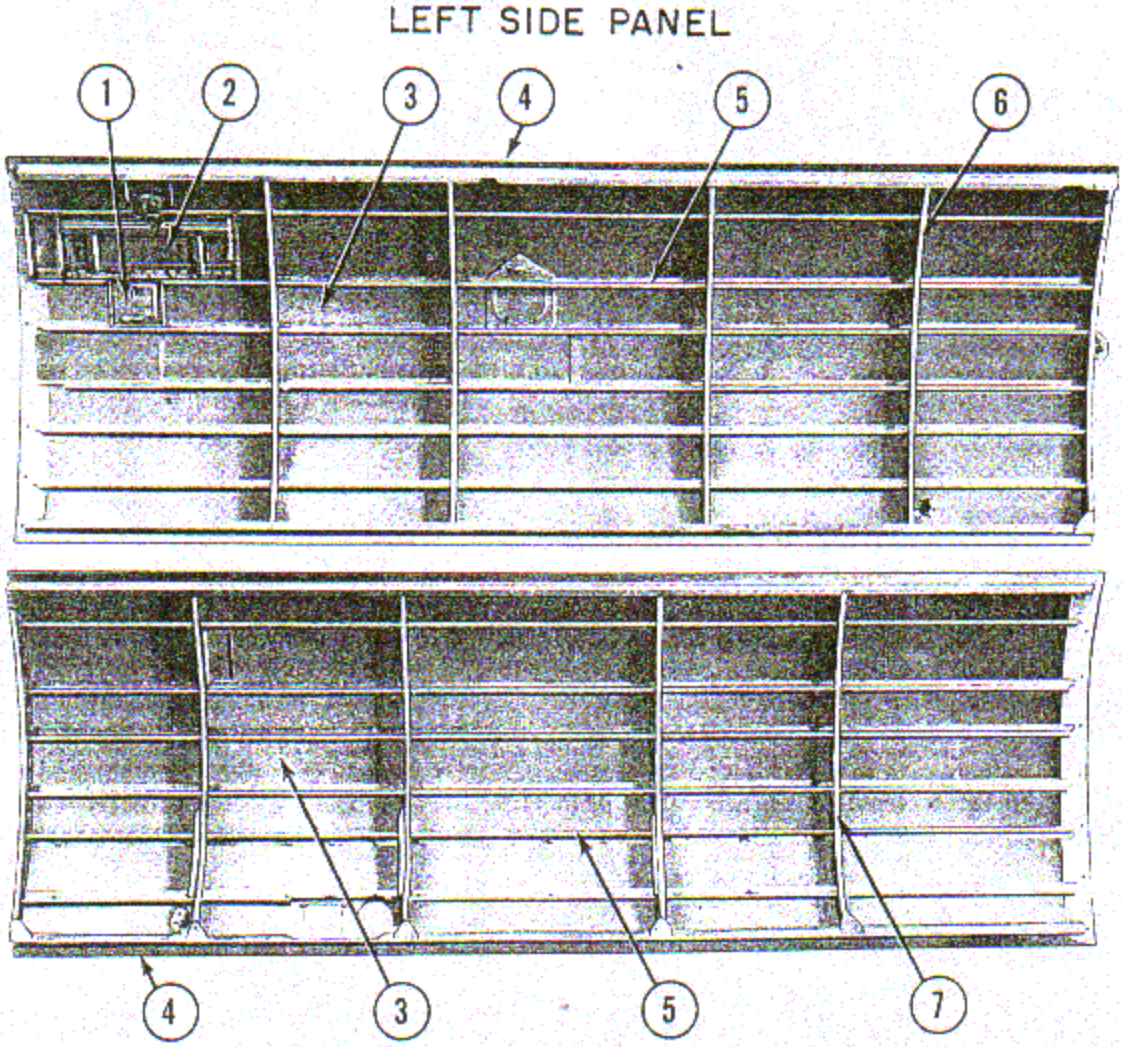


Figure 84 — Aluminum Rear Fuselage Parts — AT-6F



1. Ventilator Assembly
2. Door
3. Skin
4. Zee Section Stiffener—2024-T3
5. Stringer 1S13LT (C364LT)
6. Former
7. Former

Figure 85 — Front Fuselage Side Panels

two standard stringers such as installed throughout the left panel or the top four in the right panel.

(2) REAR FUSELAGE FORMERS. *(See figures 95 and 96.)*

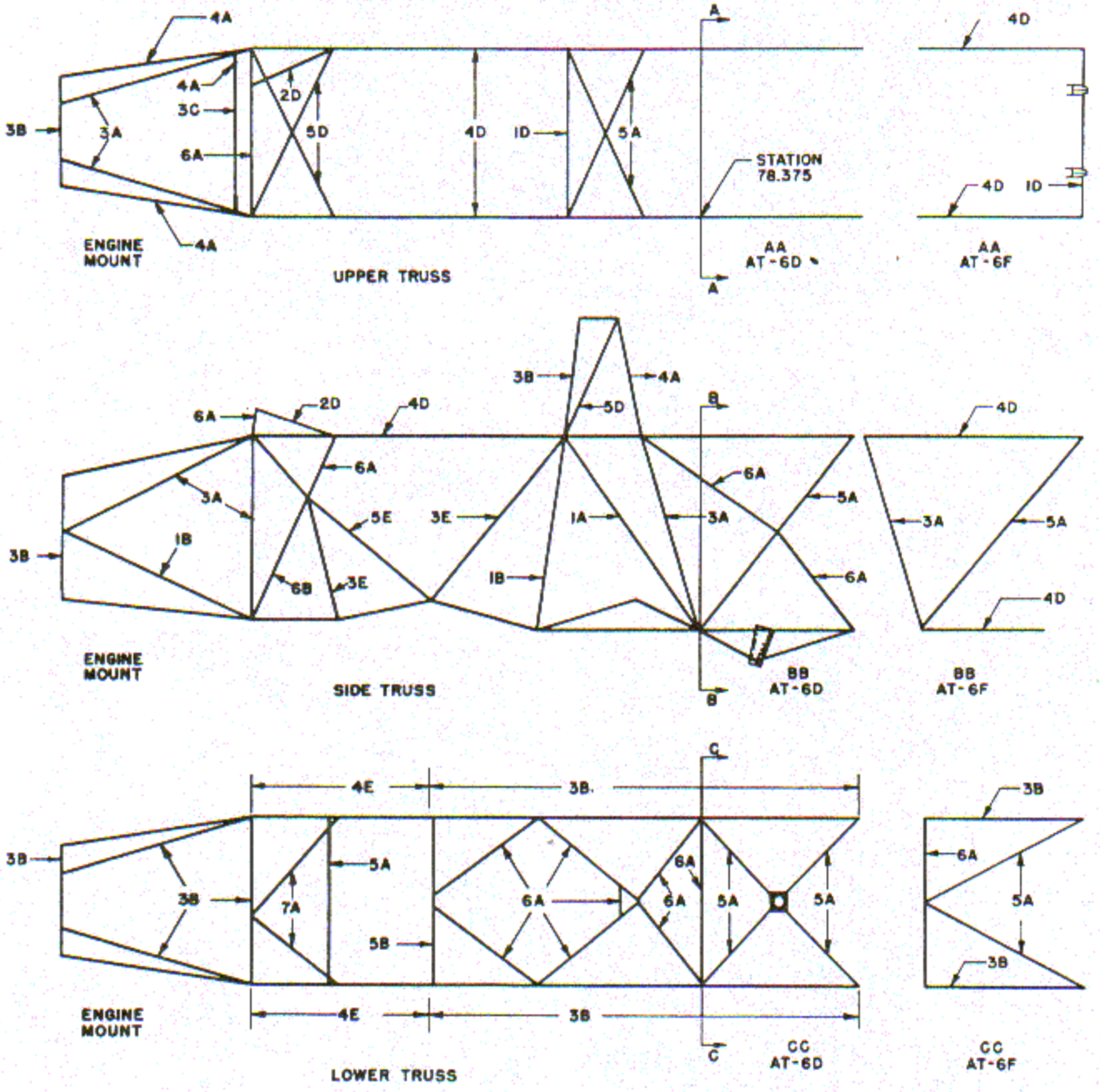
(a) The ten formers used in the rear fuselage are made of 2024-O Alclad heat-treated after forming and .032-inch thick with three exceptions. These exceptions are lower formers as follows:

1. Station 106.5—.064
2. Station 127—.025
3. Station 137—.040

(b) Figure 95 illustrates repairs for a typical damage. Stock is to be .040 inch thick with one exception, that being the former at station 106.5, the first aft of the tubular frame. This is repaired with a splice of the same thickness as the original which is .064. Add additional rivets between existing skin rivets when a splice member is added.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Negligible damage to formers includes dents less than twice the thickness of the former; breaks or holes in the web which after being smoothed or drilled out do not exceed $\frac{3}{8}$ inch in diameter, are $\frac{1}{2}$ inch away from the flange, and are 12 inches apart; damage extending less than $\frac{1}{4}$ of the way through the flange which is not longer than 1 inch and does not recur within 12 inches.



ENGINE MOUNT AND FRONT FUSELAGE TUBE SIZES

	TUBE DIAMETER		WALL THICKNESS
1	1 1/2	A	.049
2	1 3/8	B	.058
3	1 1/4	C	.058 2024-T4
4	1 1/8	D	.065
5	1	E	.083
6	7/8		
7	3/4		

CHANGES MADE IN THE AT-6F AIRPLANES INCLUDED THE RE-DESIGNING OF THAT SECTION OF THE TRUSS ASSEMBLY AFT OF STATION 78.375.

NOTE: ALL TUBES ARE C.M. STEEL EXCEPT AS NOTED.

T-6G-3-31-1

Figure 86 — Engine Mount and Front Fuselage Tube Sizes

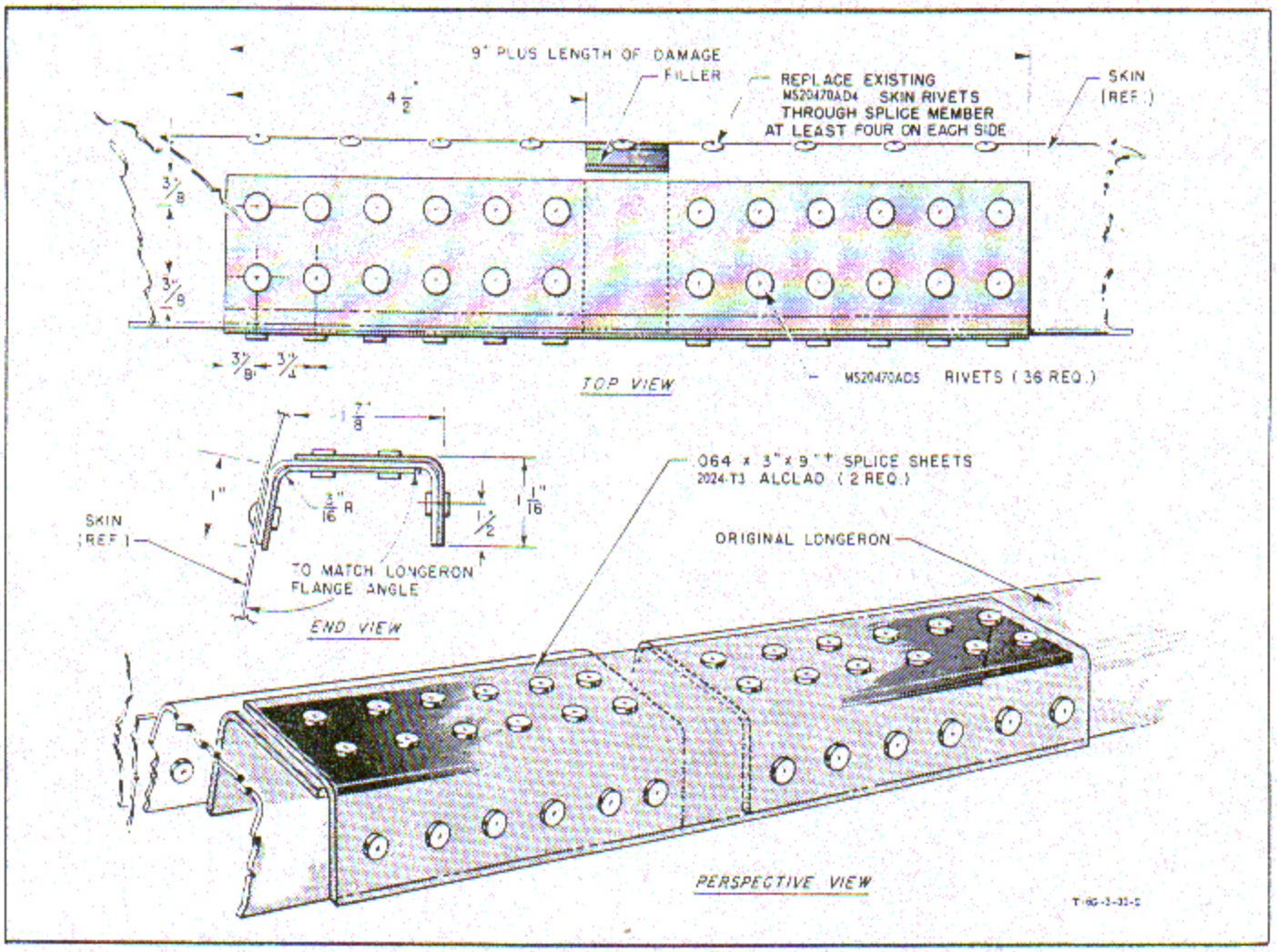


Figure 87 — Aluminum Rear Fuselage Upper Longeron Splice

(2) DAMAGE REPARABLE BY PATCHING.—Repair by patching if the damage is less than 50 percent of the cross-sectional area of the former.

(3) DAMAGE REPARABLE BY INSERTION.—If more than 50 percent of the cross-sectional area of the former is damaged it is necessary to place a splice member on both sides and insert a filler shim.

(4) DAMAGE NECESSITATING REPLACEMENT. *(See figure 96.)*—Replace formers injured to the extent that repair is impractical. *Figure 97* illustrates procedure for fabricating a former if spares are not available. Lay out the shape of the former to be replaced before flattening the flanges on a ½-inch panel of wood. Temporarily nail this panel to a second ½-inch wood panel. With a band or key saw, cut around the marked contour. Pull out the nails and separate the two equivalent panels cut to the contour of the affected former. Cut a sheet of 2024-T3 Alclad the same thickness as the damaged former, shaped as the former when hammered flat. Clamp this flat piece between two shaped pieces of wood in a vise. Pound the edges with a rawhide mallet until the flange is formed over the edge of the wooden form.

6. BULKHEADS.

a. DESCRIPTION.—Bulkheads are made of webs of thin Alclad sheet which support the stiffeners, angles, doublers, etc. All bulkheads in the body section are located in the rear monocoque. Repairs to bulkheads at stations 106, 137, 215, 227, and 242 will be made in the same manner as skin repairs except that countersinking of rivets is unnecessary as patches can be applied without the necessity of flush finishing. Angles, doublers, strengtheners, etc., can be used as outlined for rib repairs in Section II. Repair bulkheads at stations 158, 179, and 200 as shown in *figure 95.*

b. REAR DECK REPAIR AND BULKHEAD REINFORCEMENT.

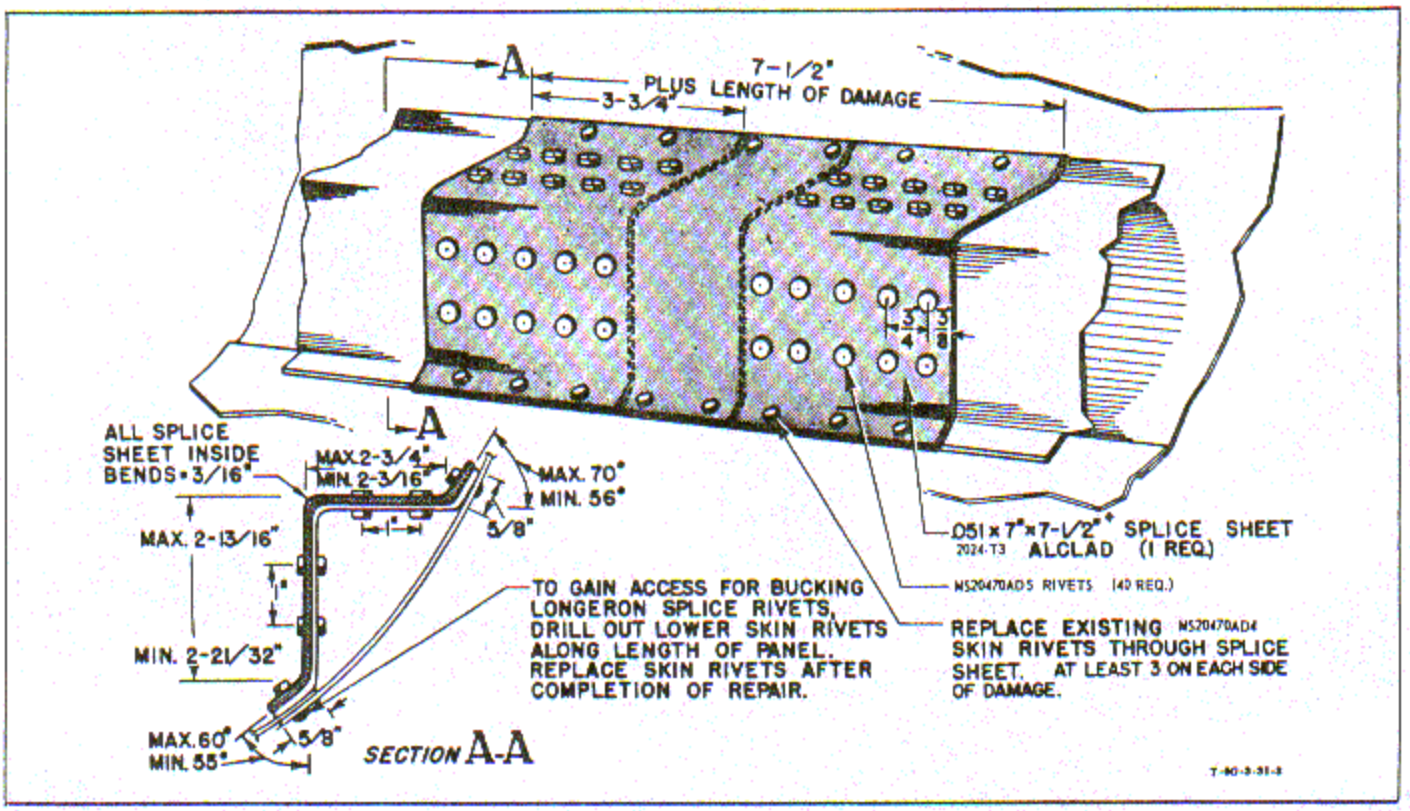


Figure 88 — Aluminum Rear Fuselage Lower Longeron Splice

(1) BULKHEAD REINFORCEMENT. *(See figure 97.)*—If repair is necessary aft of station 200.75 and the forward side of bulkhead 7 is not fabricated with a vertical reinforcement as shown in *figure 97*, prepare a reinforcement.

(a) The vertical reinforcement channel is made of .064 Alclad sheet and is attached to the upper deck with nine rivets, three of them countersunk, the other six MS20470AD5 rivets being on opposite sides of the top flange.

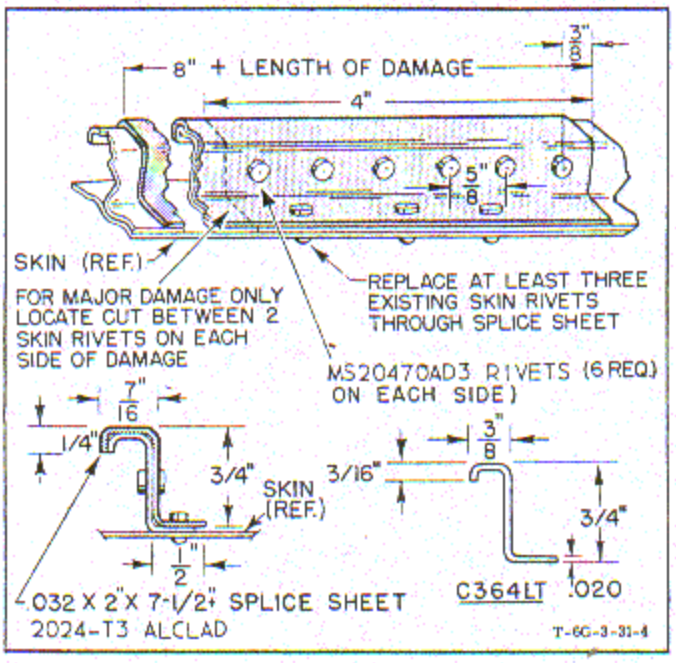


Figure 89 — Splice for Stringer Type 1513LT (C364LT)

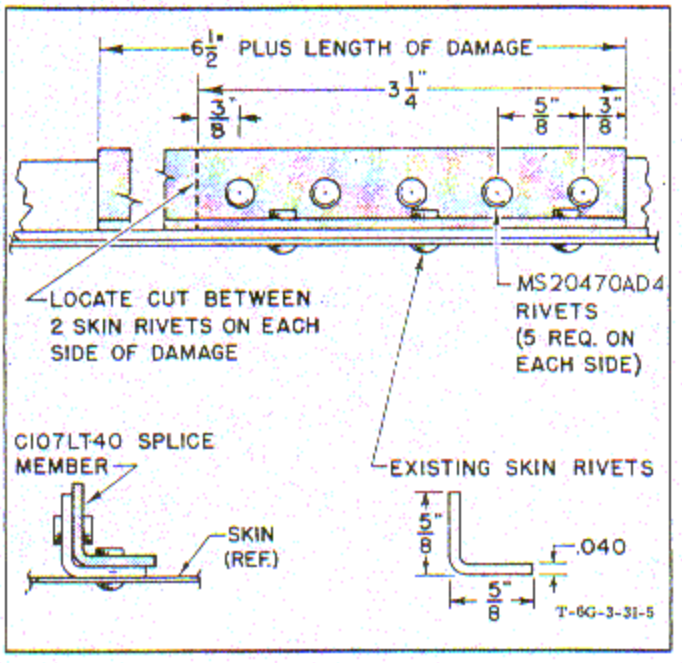


Figure 90 — Splice for Stringer Type 1514LT (C107LT)

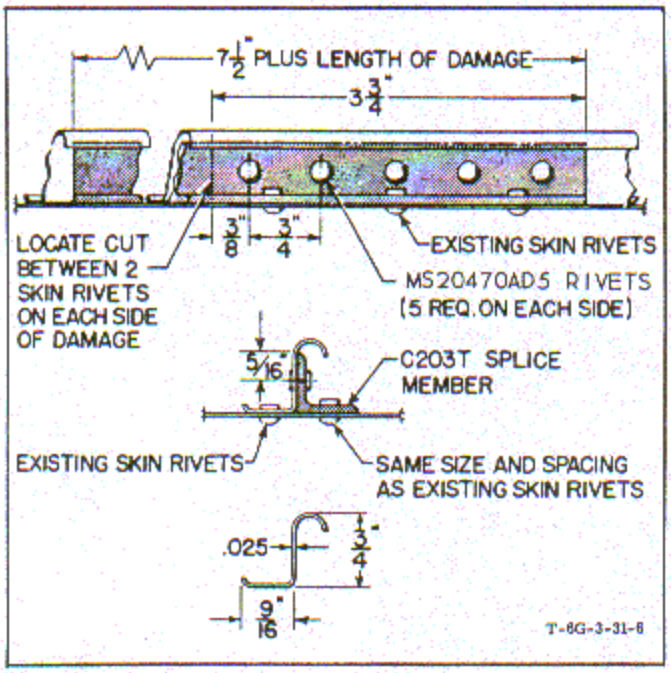


Figure 91 — Splice for Stringer Type 1523LT (C234LT)

(b) Use eight NAS501-3 bolts to replace the screw bolts temporarily removed from near the top center of the bulkhead web. These are used to fasten the forward end of the horizontal reinforcement channel that is placed between bulkheads 7 and 8.

(c) Remove the ten AD5 rivets below these bolts and replace through holes drilled in the center of the channel web which is being added.

(d) Remove the seven AD4 rivets in the angle at the bottom of the bulkhead and replace with AD5 rivets.

(2) UPPER DECK REPAIR. *(See figure 98.)*—Before repair of the rear upper deck, check the forward side of bulkhead 7 and if it has not been fabricated with a vertical reinforcement, prepare one as illustrated in *figure 97*. If the deck between stations 227 and 242 is severely damaged, repair as illustrated in *figure 98*.

c. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—Negligible damage includes dents that do not exceed ⅛ inch in depth and 1 inch in width and any damage that can be drilled out to a diameter not exceeding ⅜inch, provided there are no more than two holes in a 12-inch square area, and holes are at least ½ inch from edges and bends.

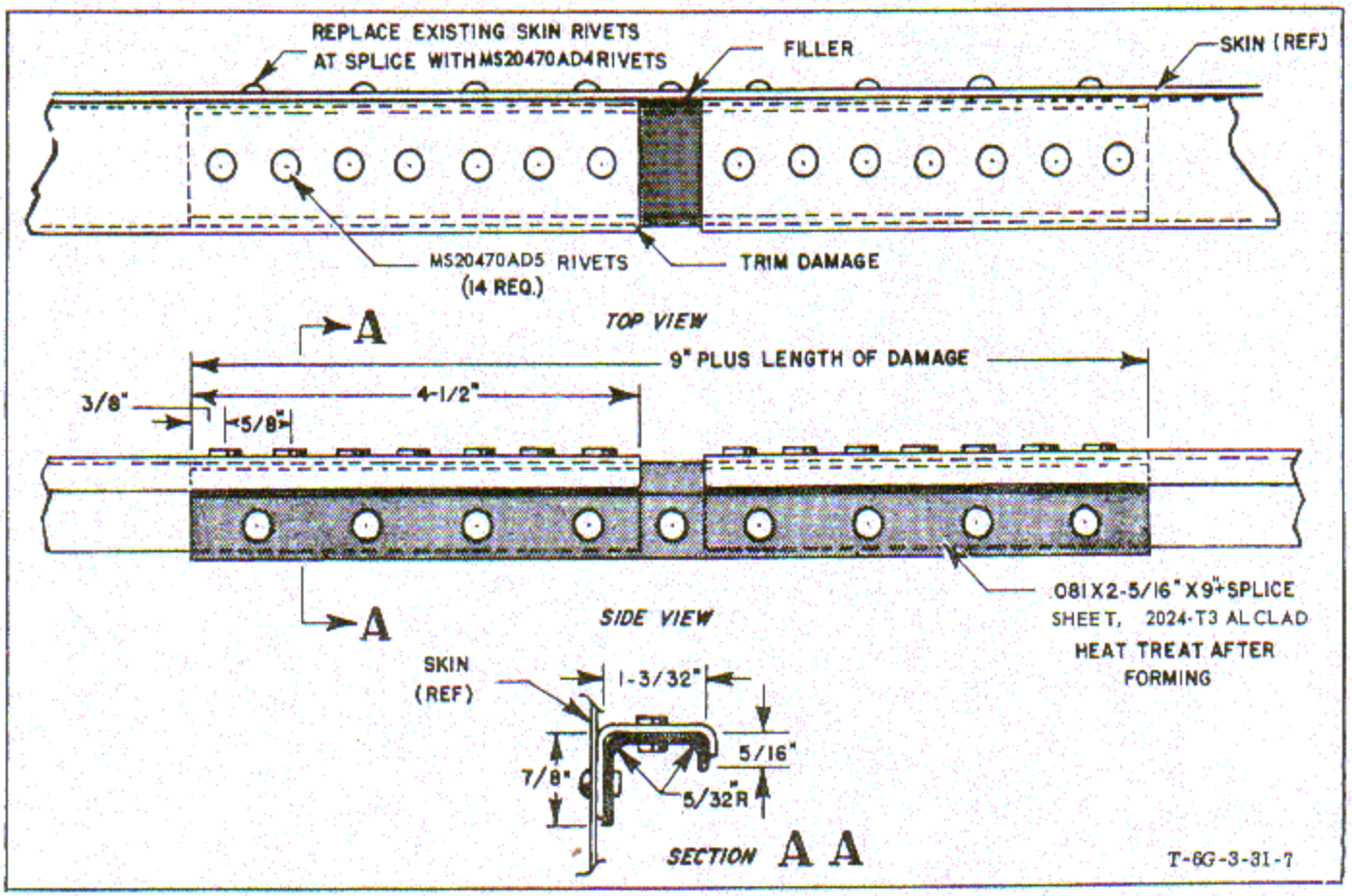


Figure 92 — Aluminum Rear Fuselage Baggage Compartment Intercostal Angle Splice

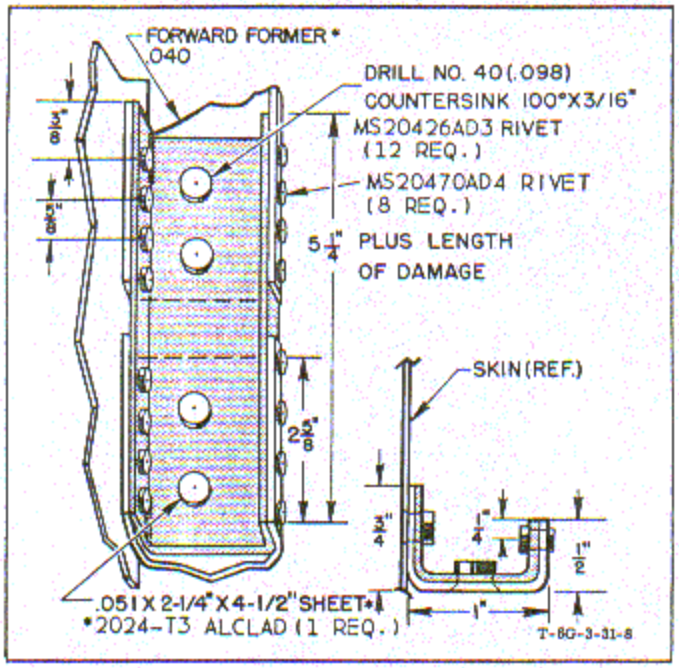


Figure 93 — Front Fuselage Side Panel Forward Former Splice

(2) DAMAGE REPARABLE BY PATCHING.—Holes less than 1 inch in diameter in a bulkhead not being exposed to the wind stream may be repaired by patching.

(3) DAMAGE REPARABLE BY INSERTION.—When a bulkhead is damaged to the extent that a complete new section should be inserted, the repair instructions outlined for skin repair in Section II apply.

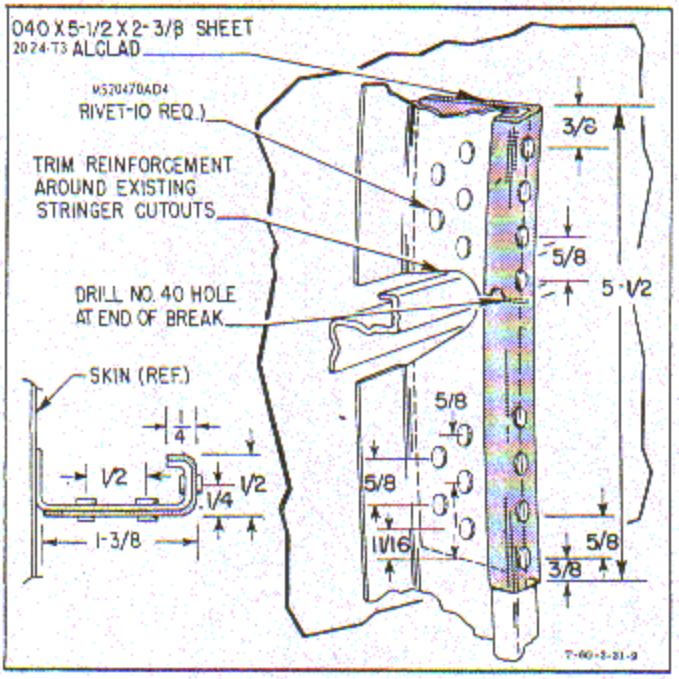


Figure 94 — Splice of Rear Four Formers of Front Fuselage Side Panels

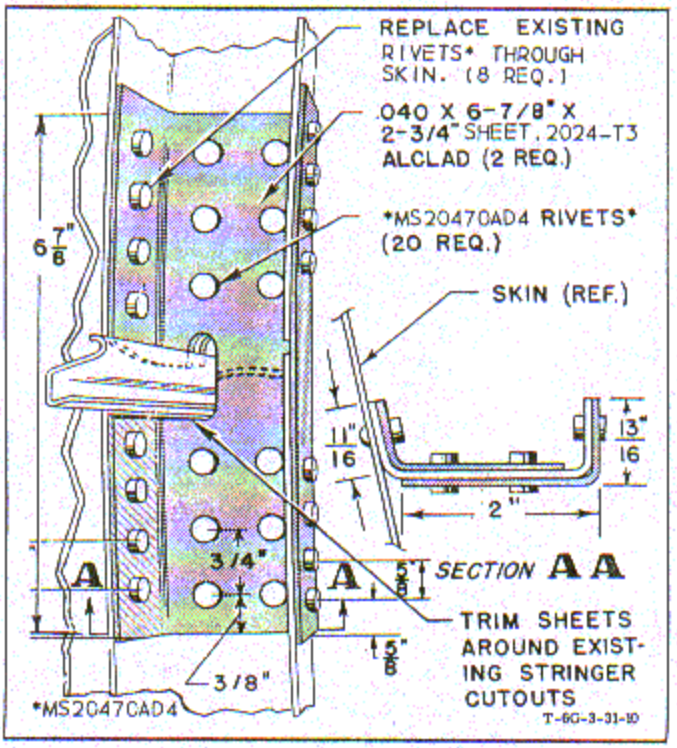


Figure 95 — Aluminum Rear Fuselage Former Splice

(4) DAMAGE NECESSITATING REPLACEMENT.—Replace bulkheads damaged so severely that repair is impractical.

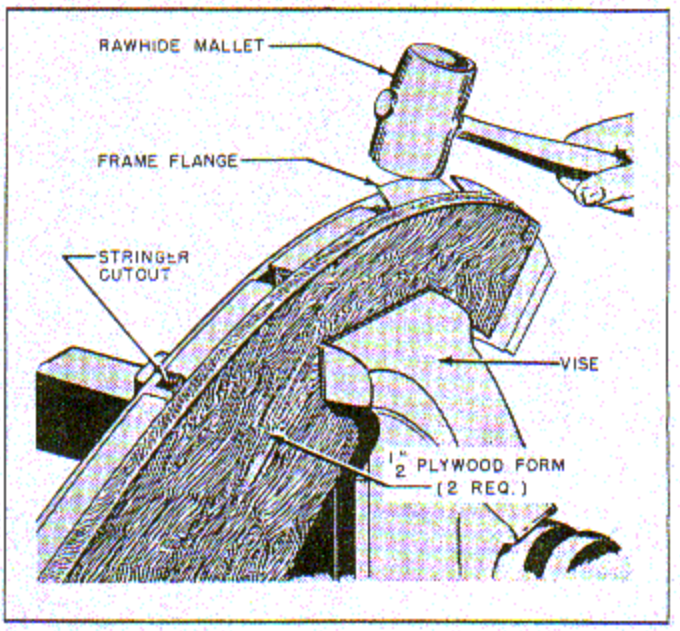


Figure 96 — Fabricating Replacement Formers

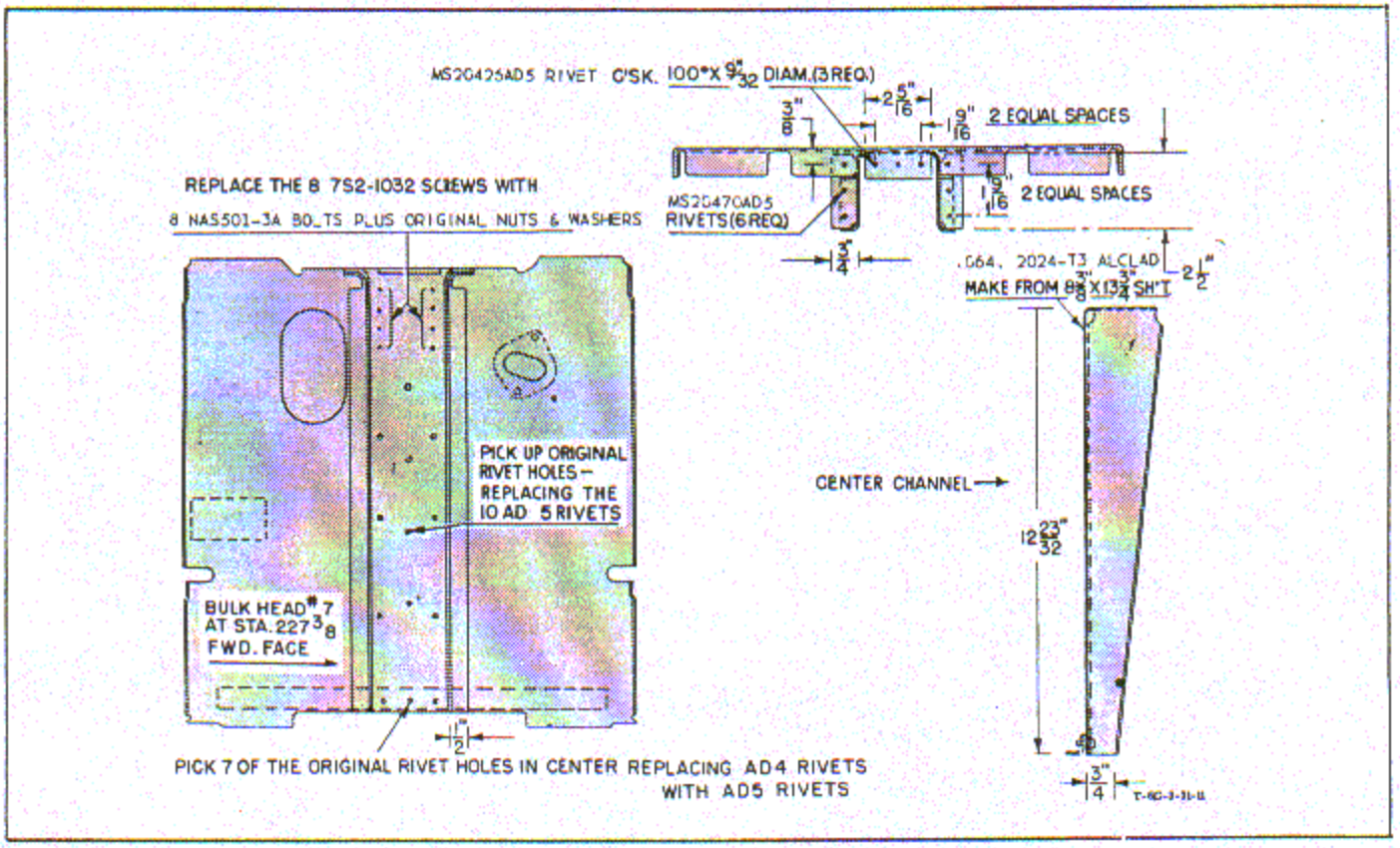


Figure 97 — No. 7 Bulkhead Channel Installation

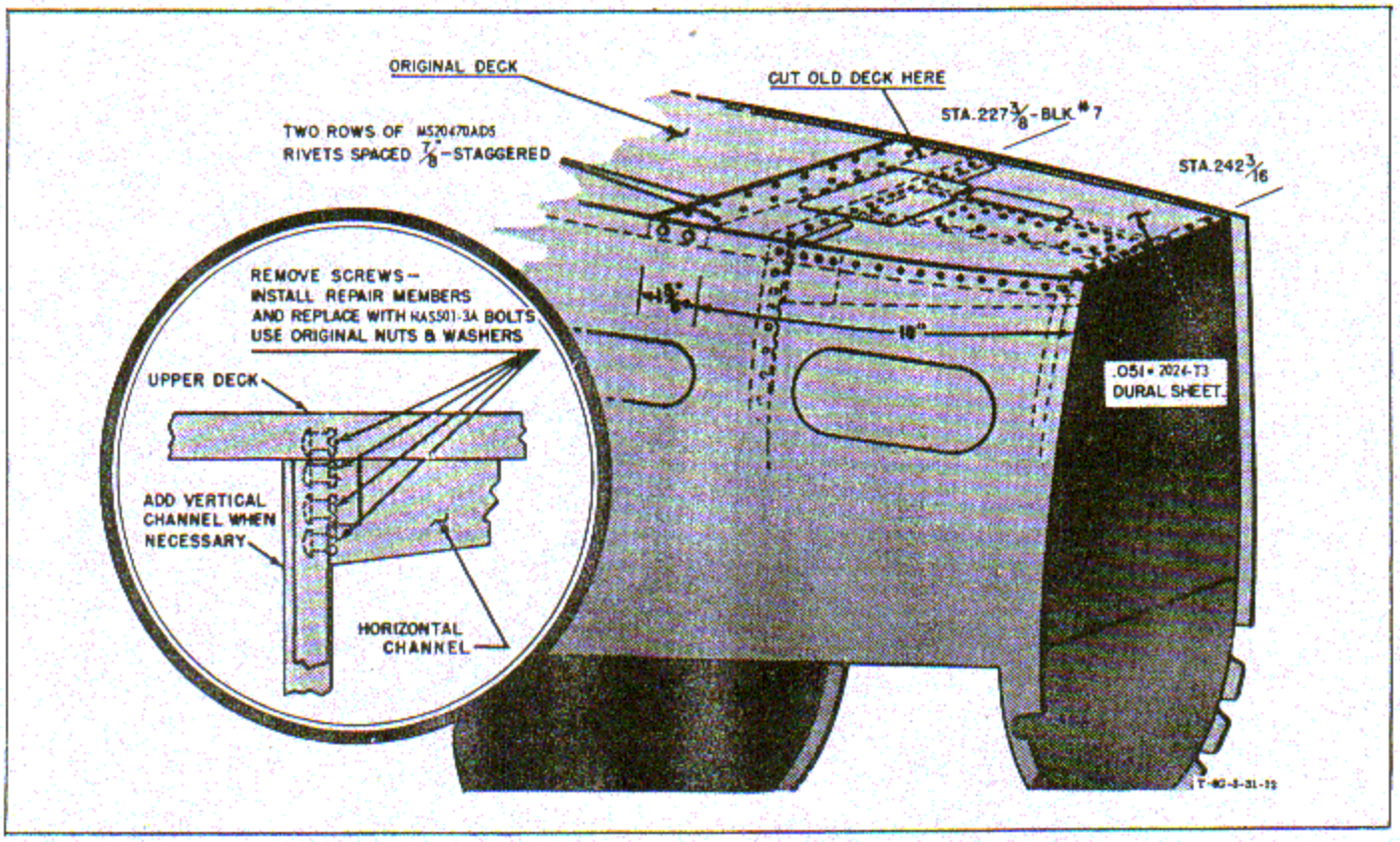


Figure 98 — Deck Repairs Between Bulkheads 7 and 8

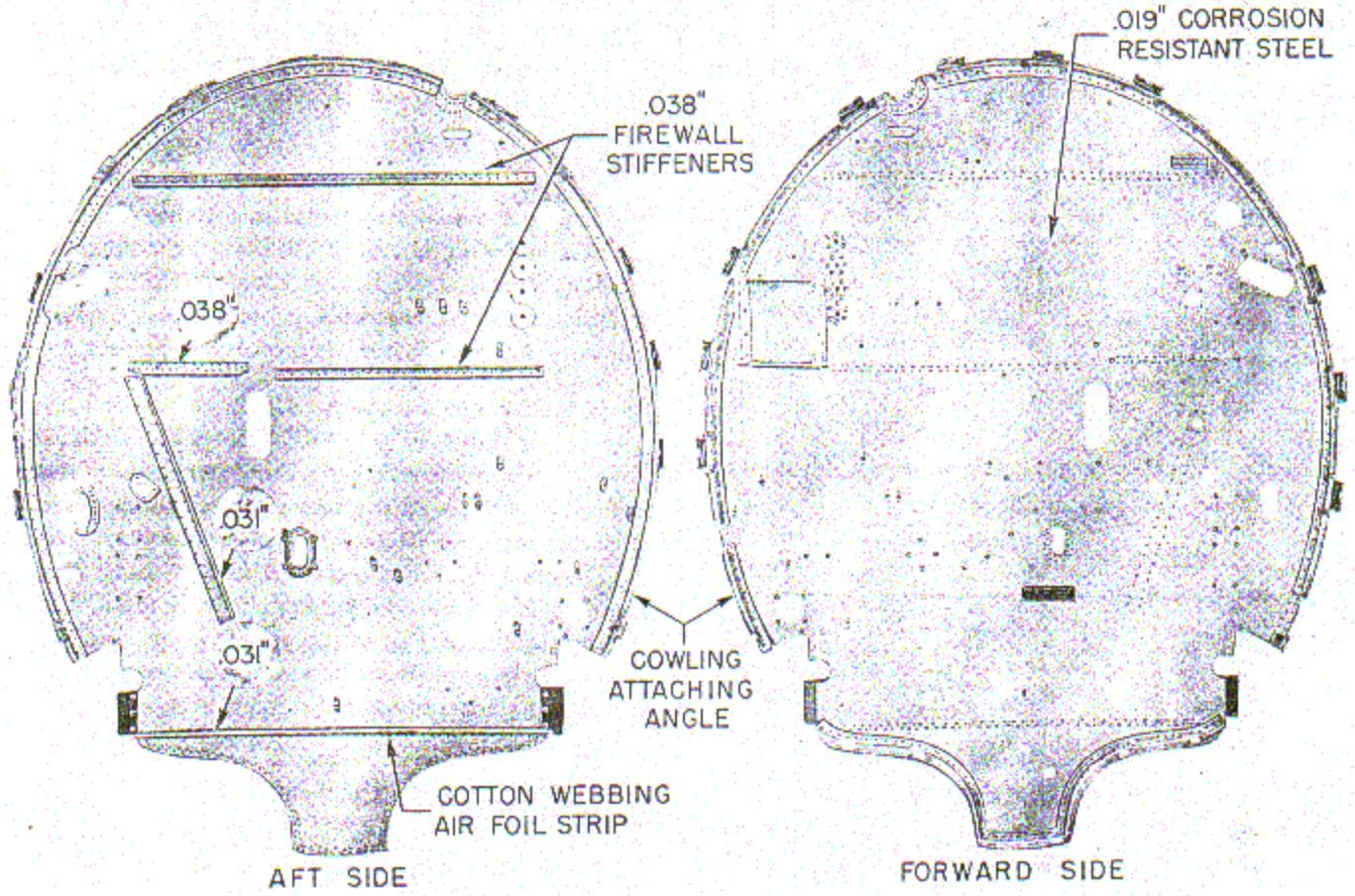


Figure 99 — Engine Fire Wall Assembly

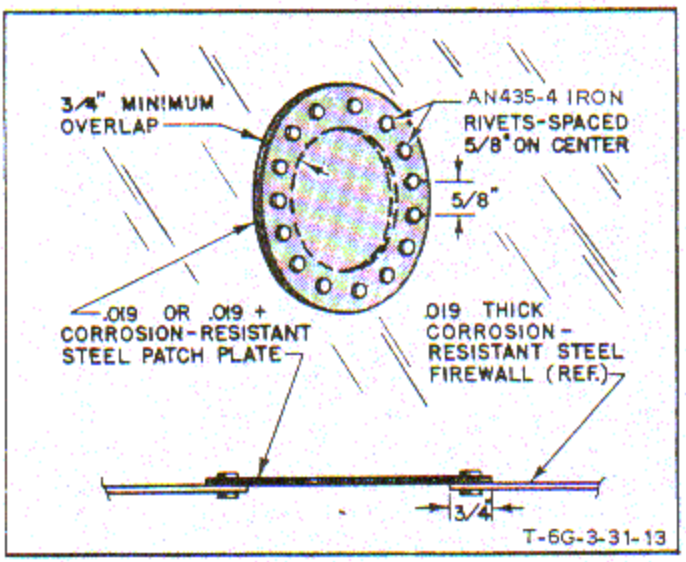


Figure 100 — Fire Wall Web Repair

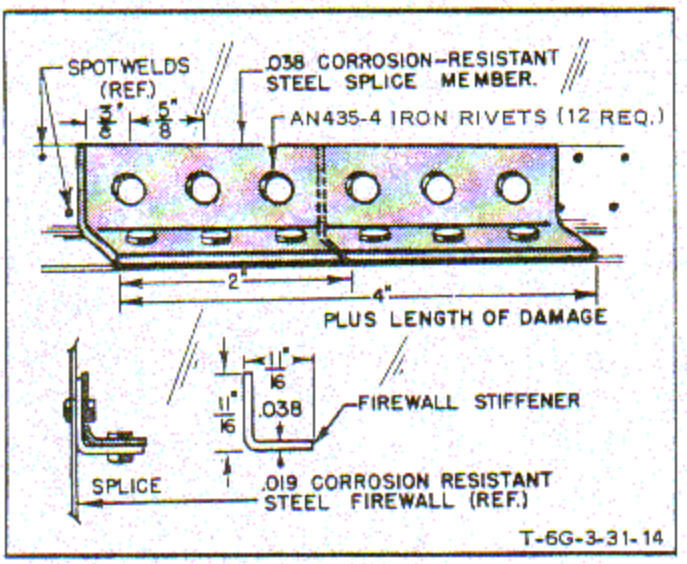


Figure 101 — Fire Wall Wide-Flanged Stiffener Splice

7. FIRE WALL.

a. DESCRIPTION. *(See figure 99.)*—A corrosion-resistant, .019-inch sheet steel fire wall is located at the forward end of the main fuselage steel-tubing truss. Five stiffeners are placed on the aft side. Four circular holes drilled in the fire wall permit it to be slipped over the four engine mount attachment bolt fittings. Dzus fastener attachment springs, located at intervals on the attaching angle spot-welded around the periphery of the fire wall, provide for attachment of the engine cowling and fairings.

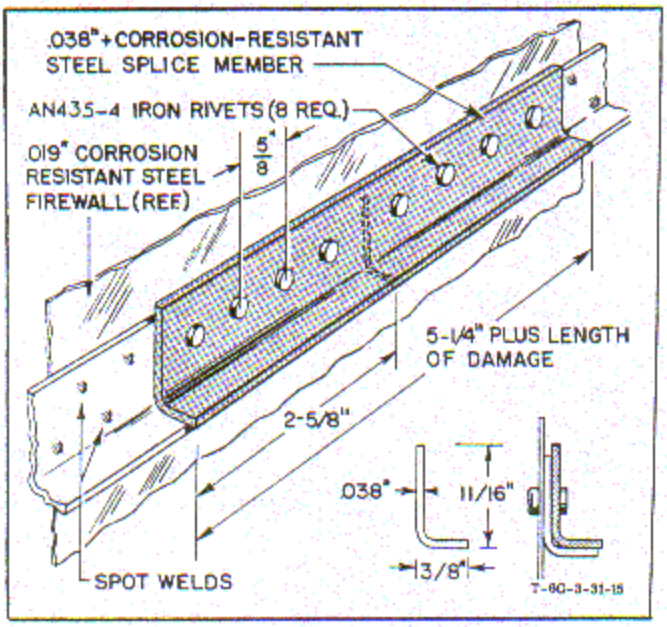


Figure 102 — Fire Wall Narrow-Flanged Stiffener Splice

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—As the fire wall is constructed of light weight sheet steel, any damage to the sheet steel itself that does not interfere with the angle strengtheners, or the angle around the outside edge to which the skin fairing is fastened, or the various items of equipment mounted on either or both sides of the fire wall can be considered negligible.

(2) DAMAGE REPARABLE BY PATCHING. *(See figure 100.)*—Minor bends and broken parts of the fire wall can be hammered into shape and patched without removing the fire wall from the tubular frame. Before drilling any holes in the fire wall, check the opposite side for clearance of all engine accessories, electrical junction boxes, and other equipment.

(3) DAMAGE REPARABLE BY INSERTION. *(See figures 101 and 102.)*—Damaged angle stiffeners, being spot-welded, are not easily removed. Fabricate a similar stiffener of the same gage and cross-sectional area and repair as illustrated. Make cowling attaching angle repair similar to stiffener repair, using a metal shrinker to insure splice member fitting the contour of the periphery. When the attaching angle has been damaged to the extent that it interferes with attaching the fairings, replace the damaged section.

(4) DAMAGE NECESSITATING REPLACEMENT.—If damage to the fire wall necessitates its removal, replace with a new assembly.

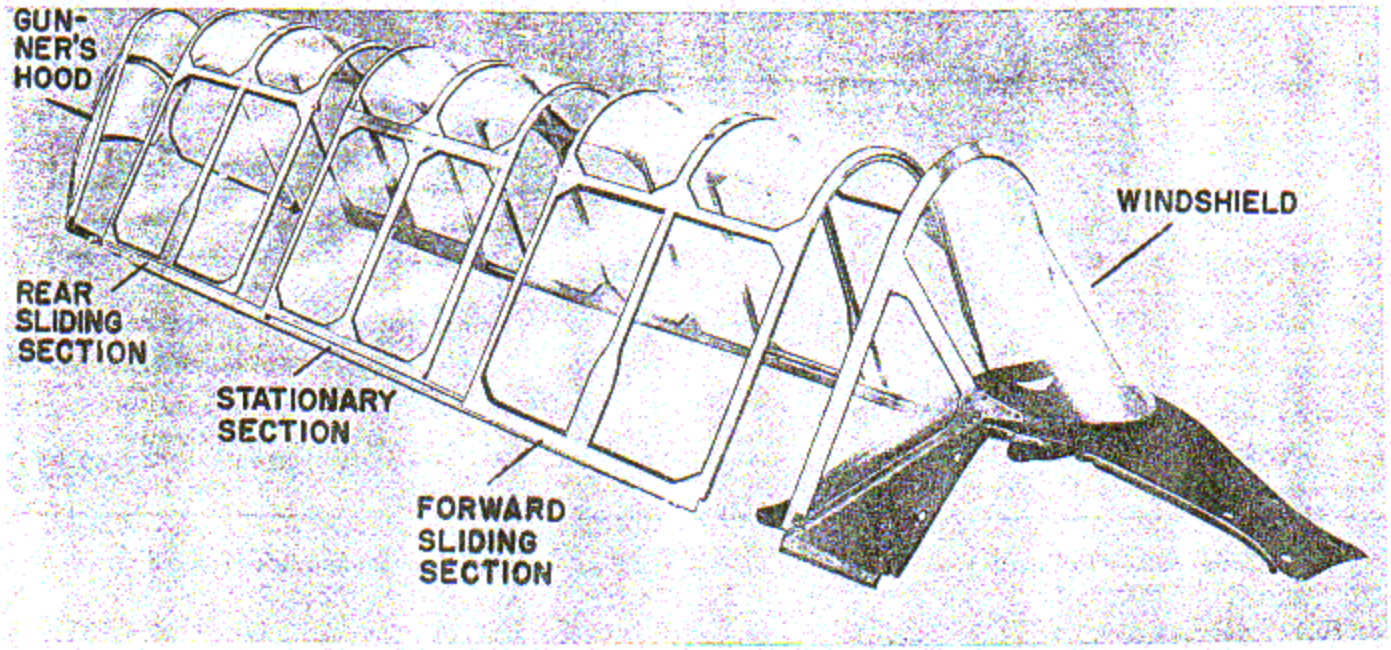


Figure 103 — Cockpit Enclosure Assembly

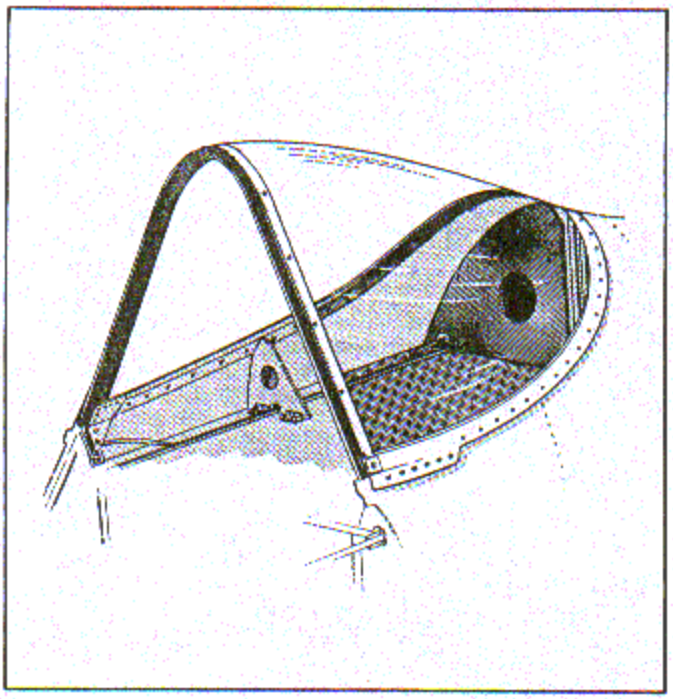


Figure 104—Fixed Rear Enclosure—AT-6F

8. COCKPIT ENCLOSURE.

a. DESCRIPTION. *(See figure 103.)*—The enclosure consists of five sections: windshield, front sliding, stationary center, rear sliding, and rear canopy or gunner's hood. On late airplanes the gunner's hood is replaced by a single-piece Plexiglas enclosure. On the T-6G, the side windows are replaced by new single-pane safety-glass panels. The windshield section includes three fuselage cowling panels and an instrument panel shield made of .062 stock. The tracks are fabricated from .078 x 2⅛ corrosion-resistant steel sheet. *(See figure 104.)*

b. CLASSIFICATION OF DAMAGE.—Since unobstructed operation of sliding sections is absolutely essential at all times, repair of damaged sections is not recommended; however, repair to the gunner's hood which does not come in contact with sliding sections is permissible.

c. REPAIR PROCEDURE. *(See figure 105.)*

(1) For repair on early AT-6 and SNJ-3 airplanes, fabricate 10 spacers of .028 aluminum-alloy tubing, 3/16 inch outside diameter, to go beneath the cut out section that must be removed from the Plexiglas panel. Use 10 rivets. Two repair members of the same size but different thickness are required; the lighter .051 inch is placed on the outside while the .081 thickness goes inside.

(2) The repair of AT-6C, D, and SNJ-4 and -5 airplanes requires two members of different thickness.

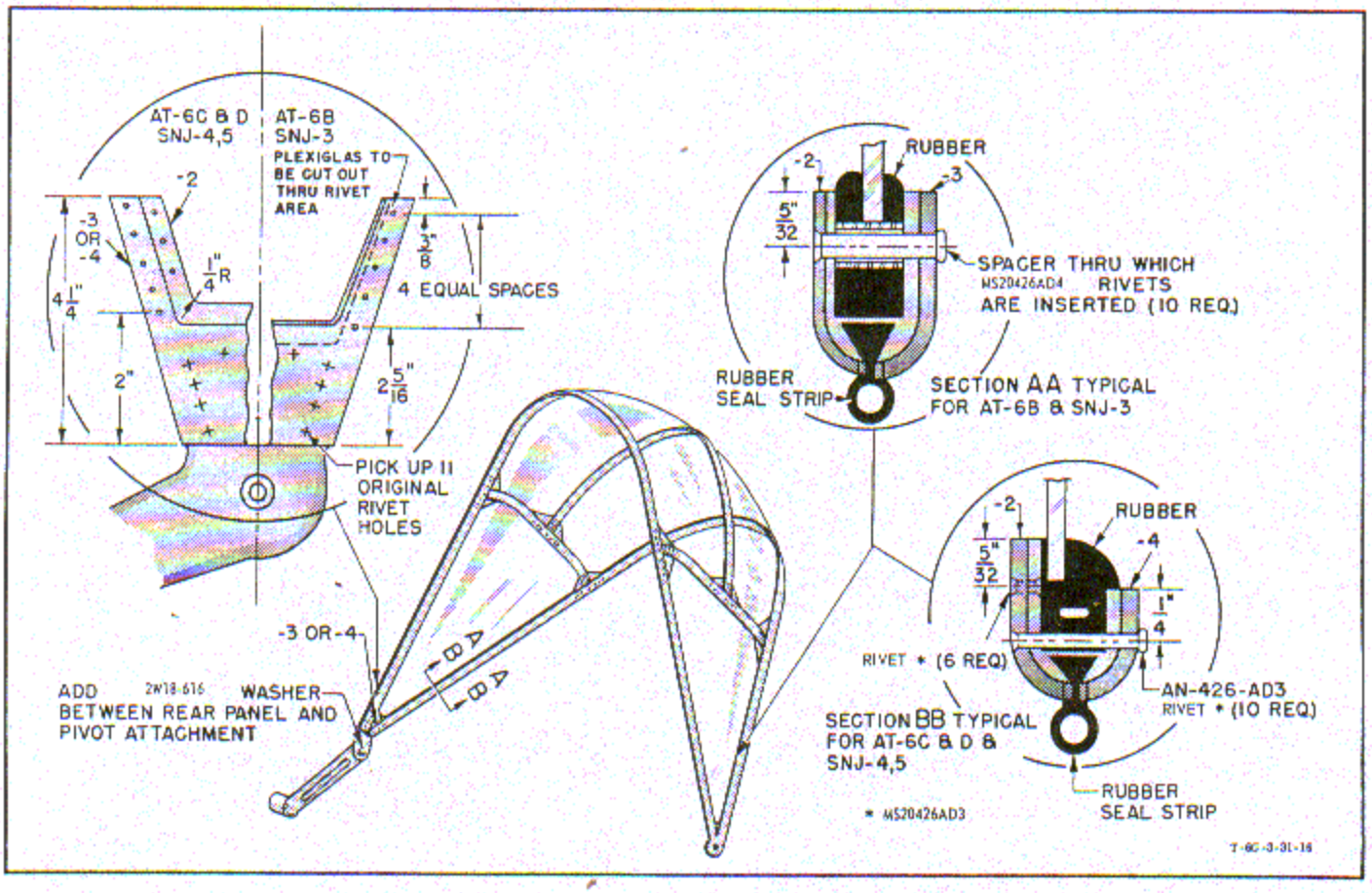


Figure 105—Movable Rear Enclosure Repair—AT-6A, B, C, and D

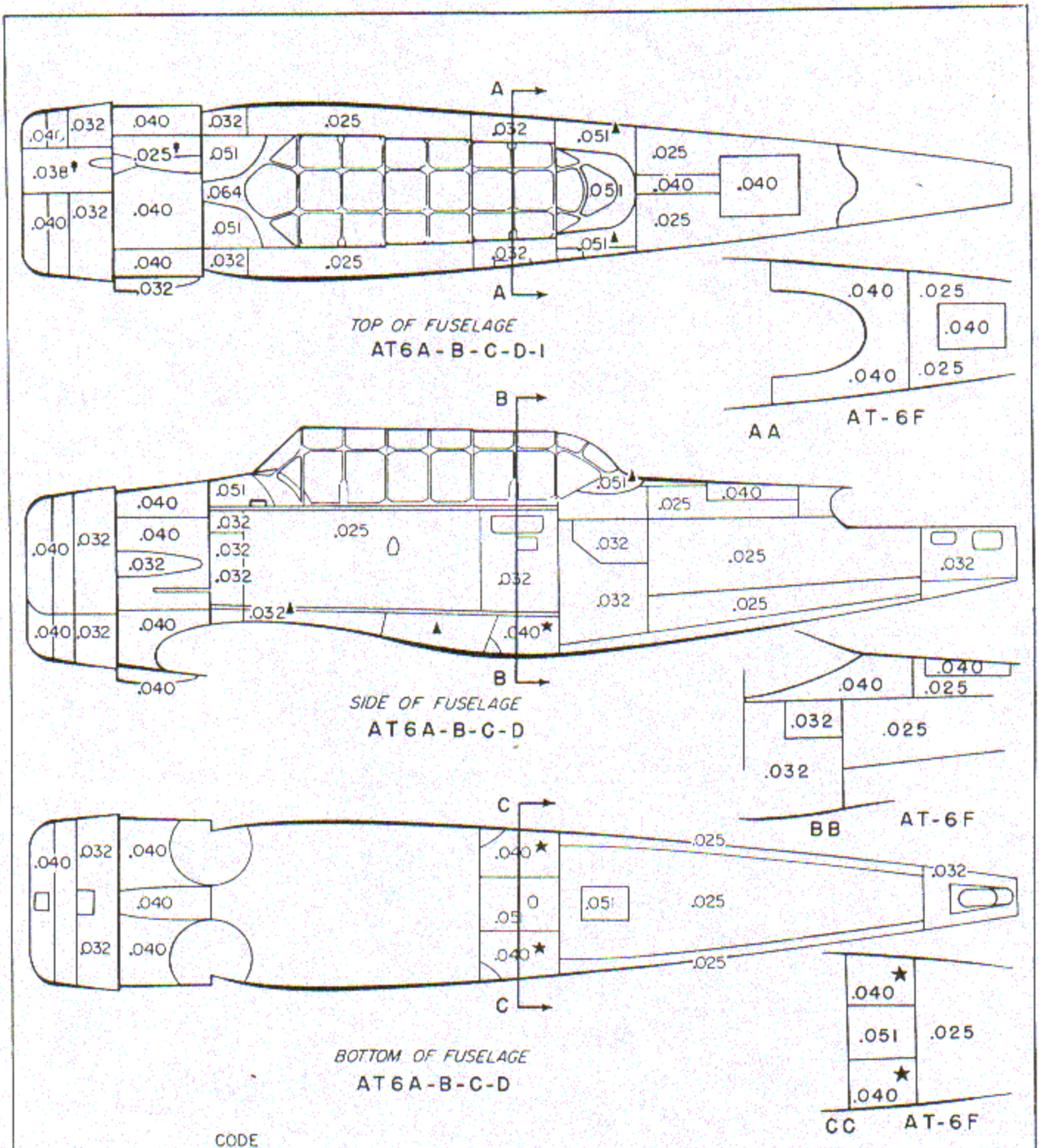


Figure 106 — Fuselage Skin Arrangement

That to be placed outside is larger and is .051 inch thick. The inside .081 member is smaller to provide for the rubber strip that is visible on the inside.

9. MISCELLANEOUS.

a. DOORS.—The double skin construction of baggage compartment, camera, and fire extinguisher doors provide no interior access for rivet bucking; when damaged they will be repaired with Cherry blind rivets.

b. FAIRINGS AND FILLETS.—These are made from 3003 and 5052 aluminum alloy and subsequently heat-treated 2024-O Alclad. Repair 3003 and 5052 aluminum alloy by welding a patch of the same material over the hole, using a torch and 1100 aluminum-alloy welding wire.

c. SKIN.—*See figure 106* for types of skin used in the fuselage and Section II, Wing Group, for repair instructions.

TABLE I

REPAIR MATERIALS

TYPE	THICKNESS	SPECIFICATION
Sheet, Alclad 2024-O heat-treated and 2024-T3	.020, .025, .032, .040, .051, .064, .081	QQ-A-362
Sheet, Alum Alloy 3003 ½H	.040, .051	QQ-A-359
Sheet, Alum Alloy 3003-O	.040	QQ-A-359
Sheet, Alum Alloy 5052 ½H	.040, .051	QQ-A-318
Sheet, Alum Alloy 5052-O	.040	QQ-A-318
Sheet, Stainless Steel-Type 302	.019, .025, .031, .038	MIL-S-5059
Sheet, Chrome-Molybdenum Steel X4130	.062, .078, .093	MIL-S-6758
Tube, Chrome-Molybdenum Steel X4130	*(See figure 86.)*	MIL-T-6731
Rivets, MS20426AD3 Countersunk		
Rivets, MS20426AD4 Countersunk		
Rivets, MS20470AD3, Universal		
Rivets, MS20470AD4, Universal		
Rivets, MS20470AD5, Universal		
Rivets, AN435-5, mild steel		
Rivets, AF463-4-1, Cherry blind		
Rod, Welding—1100		QQ-A-411
Primer, Zinc Chromate		MIL-P-8585, FSN 8010-582-5318
Flux, Chromaloy (Linde Air Products Co., New York)		
Oil, Linseed		TT-L-190, FSN 8010-152-3245
Lacquer, Clear		TT-L-58, FSN 8010-165-6111
Lacquer, Yellow-Green		TT-L-58
Lacquer, Aluminum		MIL-L-8641, FSN 8010-526-1478

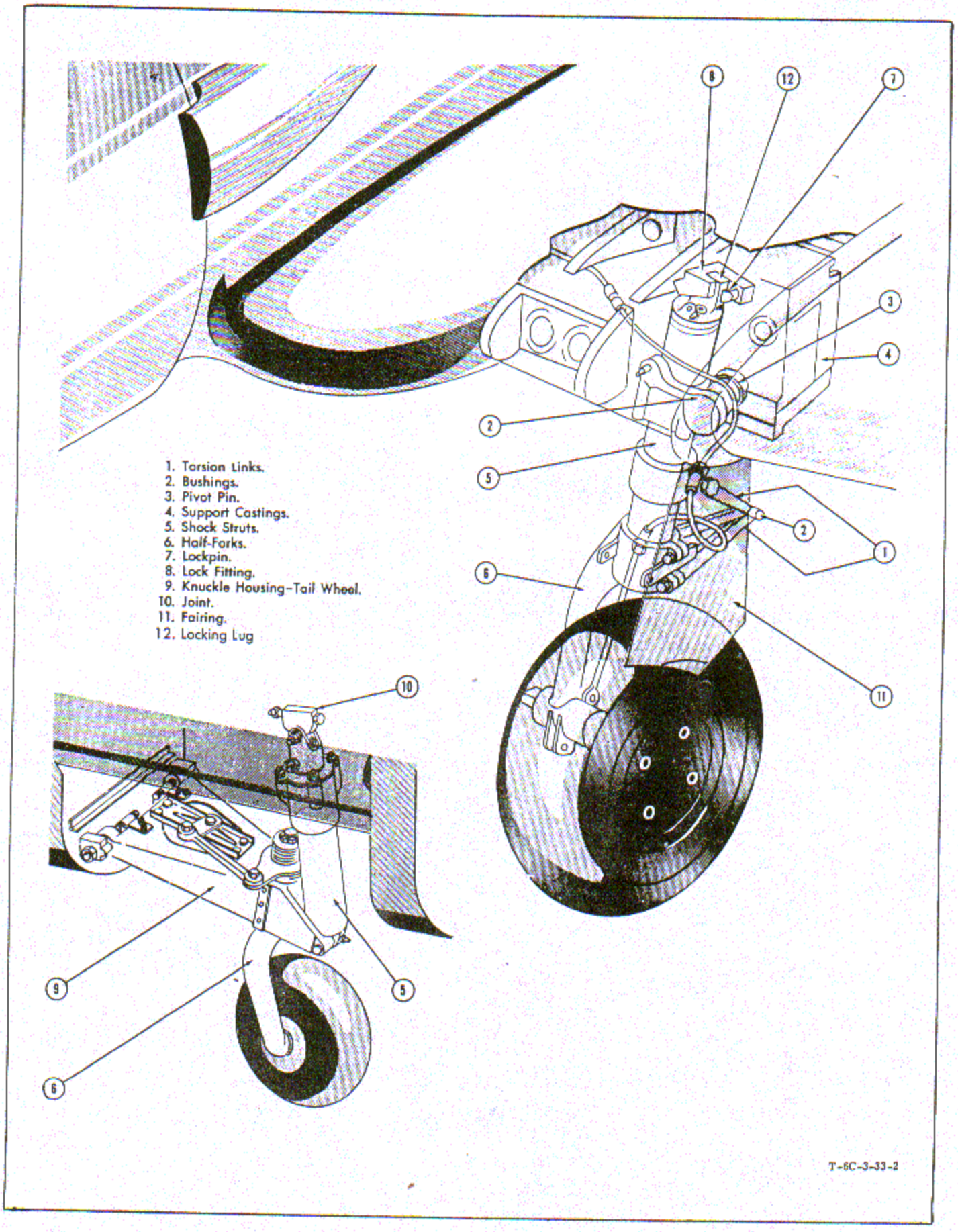


Figure 107 — Landing Gear Repair Index

SECTION V
LANDING GEAR

1. GENERAL.

a. DESCRIPTION. *(See figure 107.)*

(1) MAIN LANDING GEAR.—The main landing gear consists of two single-leg, half-fork, fully retractable, air-oil type shock struts, supported on the front spar of the wing center section.

(2) TAIL WHEEL.—The tail wheel assembly is a single-leg, half-fork, full cantilever structure, nonretractable and supported by an aluminum-alloy casting. The forward end of the casting is attached to the fuselage aft section by means of two trunnions; the aft end is supported by a pneudraulic-type shock strut.

b. GENERAL REPAIR INSTRUCTIONS.

(1) FORGINGS. — After straightening operation has been completed, if there is doubt concerning condition of forging, determine if deformation exists. Set up forging on surface plate and check against manufacturer's original specification. Reject if forging exceeds standard tolerance allowed during manufacture. Original contour or shape must be retained and no evidence of bending or rework be visible on completion. Magnaflux inspection will reveal all surface and some subsurface cracks. Prior to cadmium plating be sure to remove the old plating completely, otherwise new plating will flake off.

(2) CASTINGS.—Castings cannot be straightened successfully. Cracks usually appear at or near abrupt changes in sections. If small surface cracks appear in holes where bushings are usually installed, reboring holes will remove cracks. Castings may be used and restored to service after an oversize bushing is pressed in place. Aluminum-alloy castings must be inspected by Zyglo (black light). However, only cracks or ruptures (surface and internal) will be revealed. Internal stress cannot be detected except by X-ray.

2. SUPPORT CASTING.

a. DESCRIPTION.—The support casting, made from aluminum alloy, is machined to close dimensions. It has two large chrome-molybdenum steel bushings pressed in the bored pivot pin bushing holes, one at each end of casting.

b. CLASSIFICATION OF DAMAGE.—The body of the casting is subject to damage, resulting from hard or crash landings, by cracking at any point where excessive stress is present due to distortion in the front pivot pin bushing hole.

(1) NEGLIGIBLE DAMAGE.—Nicks, burrs, and scratches up to 1/32 inch in depth or width may be considered negligible and can be polished out with fine emery cloth, fine hone, or crocus cloth.

(2) DAMAGE REPARABLE BY MACHINING. —When the pivot pin bushing hole is elongated more than .003 inch, mount the casting on a special locating fixture and rebore. *(See figures 108, 109 and 110.)*

(3) DAMAGE NECESSITATING REPLACEMENT.—Any visible damage in the form of cracks or breaks in the casting is cause for rejection. If undue stress is suspected, subject the casting to X-ray inspection if available.

3. PIVOT PIN.

a. DESCRIPTION.—The pivot pin is made of seamlessless chrome-molybdenum steel tubing, ground to very close tolerance, heat-treated, and slots and threads are milled on each end.

b. CLASSIFICATION OF DAMAGE. — The pivot pin is subject to natural wear at bearing points and cracking or bending resulting from crash or abnormally hard landings.

(1) NEGLIGIBLE DAMAGE.—Pivot pins bent less than .003 inch may be restored to service by polishing with crocus cloth to remove small nicks, burrs, and scratches.

(2) DAMAGE REPARABLE BY MACHINING. Pivot pins bent or kinked in excess of .003 and not over .3125 inch may be restored to service as illustrated in *figure 111.*

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace pivot pins bent or kinked in excess of .3125 inch, cracked, worn more than .020 inch, or with worn or damaged threads.

4. SHOCK STRUT PISTON TUBE.

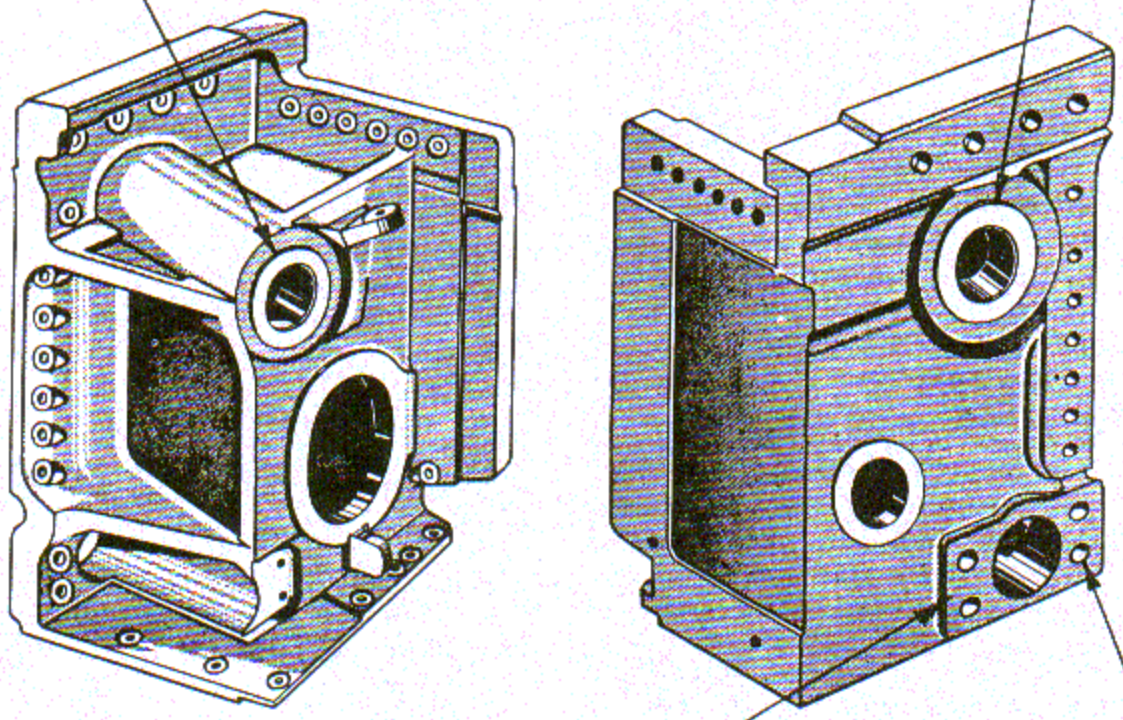
a. DESCRIPTION.—Made from chrome-molybdenum seamless steel tubing, the piston tube is heat-treated, the outside diameter is ground to close tolerance, and the inside diameter is honed.

b. CLASSIFICATION OF DAMAGE.—The piston tube is subject to damage by bending, cracking, and natural wear to bearing area.

(1) NEGLIGIBLE DAMAGE. — Remove nicks, burrs, scratches, and corrosion with a fine, smooth oil

1. Use rear pivot pin bushing hole as pilot for special boring jig.

2. Bore oversize to clean up. After new oversize bushing, heat-treated to 160,000 to 180,000 psi, is pressed into place, bore hole for a press fit on pivot pin.



3. Mount support casting on jig for resurfacing latch pad on support casting (figure 503). With end milling cutter, clean up latch pad face. Limit depth of cut to .072 in. Prepare 4130 steel shim of thickness corresponding to depth of milling cut. Shape and drill to match latch pad.

4. If bearing area of bolt holes is less than 95 percent, bore holes oversize to accommodate 1/32 to 1/16 in. wall bushing. Make bushing from 4130 steel heat-treated to 125,000 psi. Install bushing .0015 to .002 in. tight.

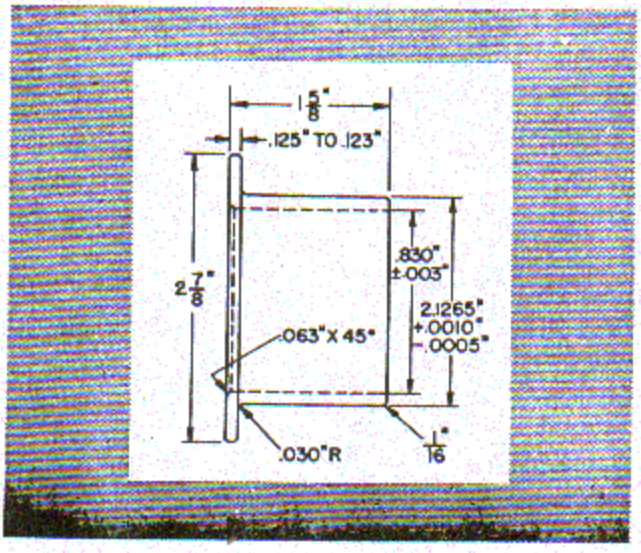


Figure 108 — Support Casting

stone or polish with crocus cloth and oil. Tubes bent less than .003 inch may be restored to service by polishing.

(2) DAMAGE REPARABLE BY MACHINING.

(a) Subject tube to magnaflux inspection prior to rework.

(b) Piston tubes bent more than .003 inch must be straightened and checked on a special jig with rollers at each end set 16 inches between centers. *(See figure 111.)*

(c) Attach special grinding centers. *(See figure 112.)*

(d) Polish bore of piston tube if 2.9365 inch plug gage will not pass kink or other irregularity; reject if 2.9332 inch gage will not pass freely through full length of bore.

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace piston tubes cracked, bent more than .3125 inch, worn at bearing area more than .015 inch, or with damaged threads.

5. OLEO ATTACHING FITTING.

a. DESCRIPTION.—The oleo attaching fitting is an aluminum-alloy forging (14ST) accurately machined with two chrome-molybdenum bushings pressed in place and reamed to a close running fit for the pivot pin. The bored hole in center of body locates over the main landing gear shock strut. *(See figure 113.)*

b. CLASSIFICATION OF DAMAGE.—This fitting is subject to the following damage resulting from hard or crash landings: holes for bushing in fitting elongated; old bushings loose in fitting; retracting arm attaching pin bent; fitting cracked.

(1) NEGLIGIBLE DAMAGE.—Burrs and scratches up to 1/32 inch must be rubbed out with a small file, fine emery paper, or crocus cloth.

(2) DAMAGE REPARABLE BY MACHINING.—If holes for pivot pin bushing are elongated or out-of-round .003 inch or more, mount the fitting on a special jig, rebore, and install special oversize bushing. *(See figure 114.)*

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace all attaching fittings cracked, broken, or out of shape 1/32 inch or more.

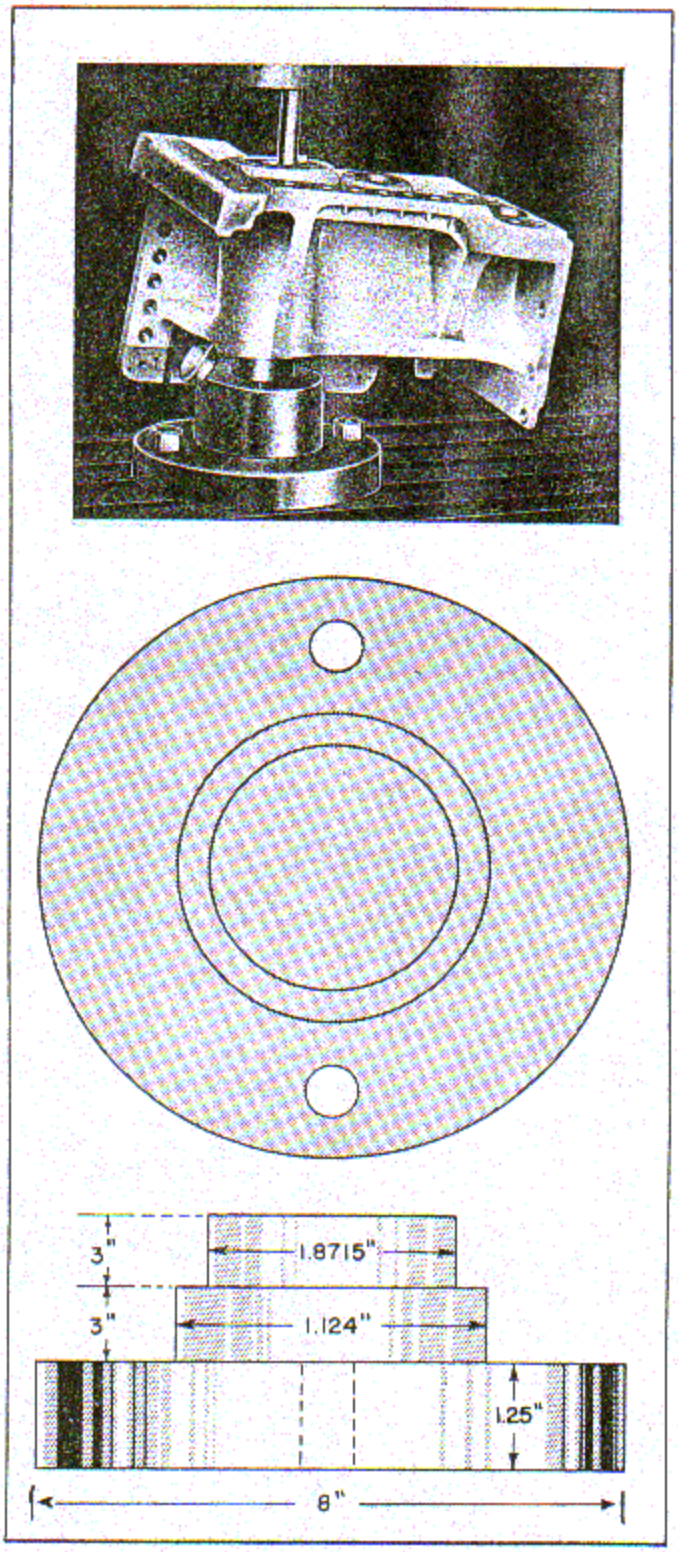
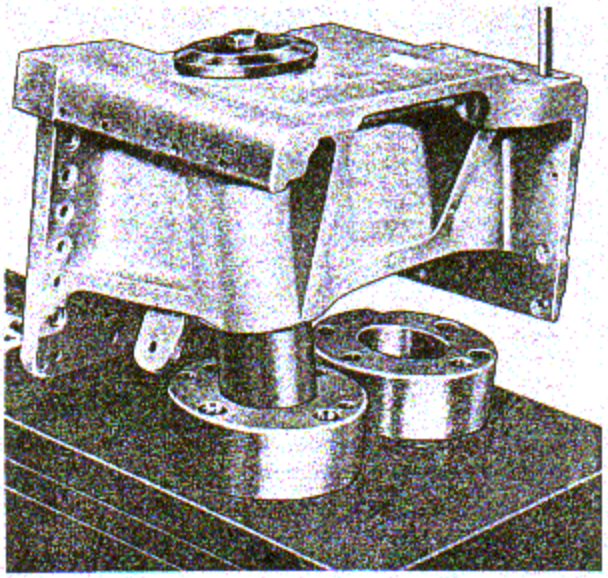
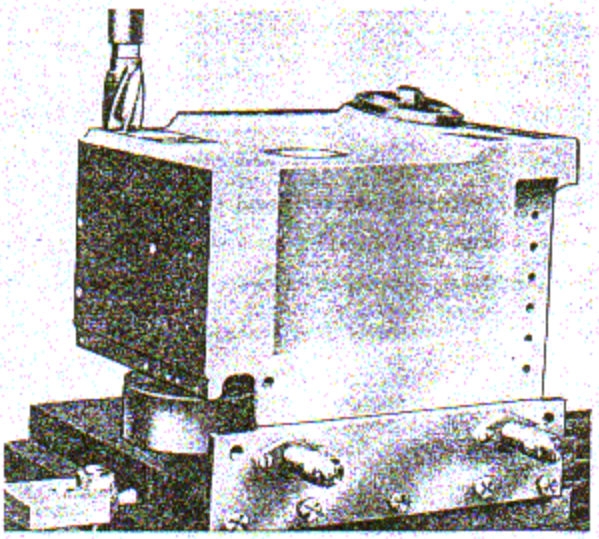


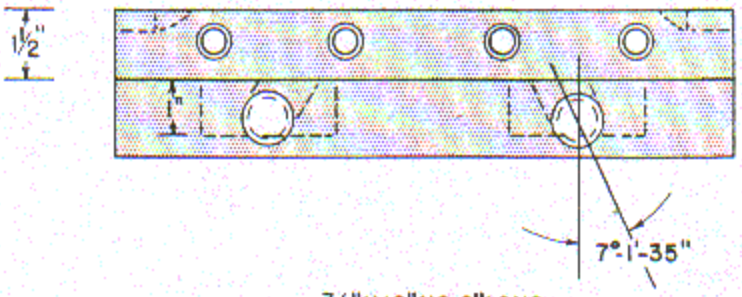
Figure 109—Rebore Jig, Support Casting

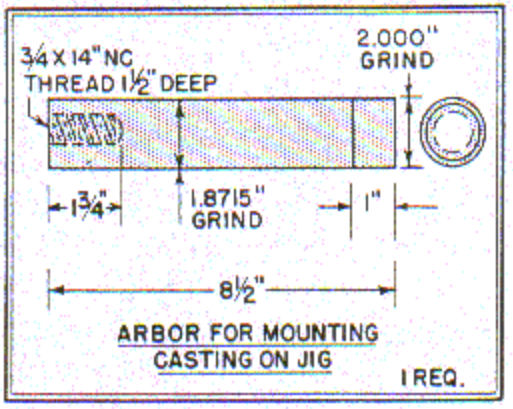
6. TORSION LINK.

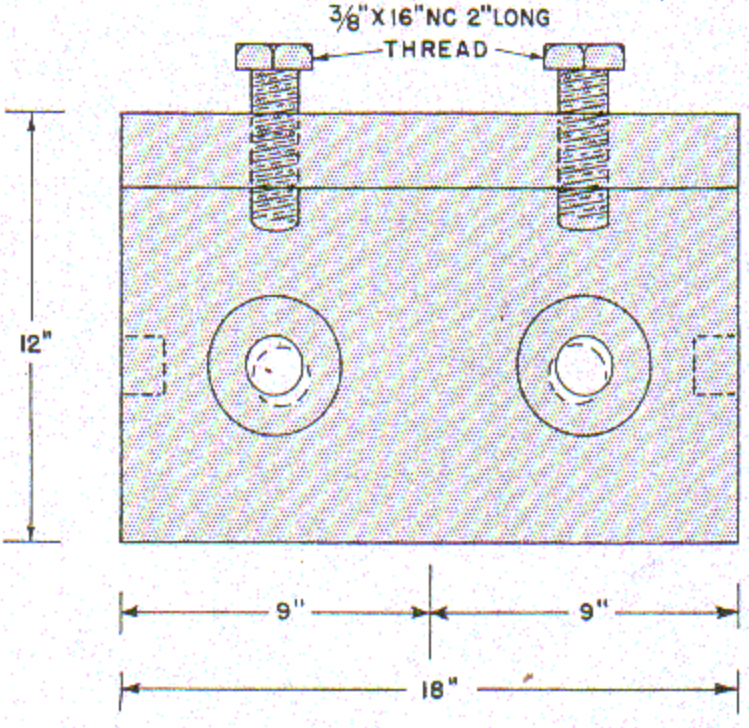
a. DESCRIPTION.—The torsion link is a chrome-molybdenum forging, stress-relieved and machined to close tolerance.











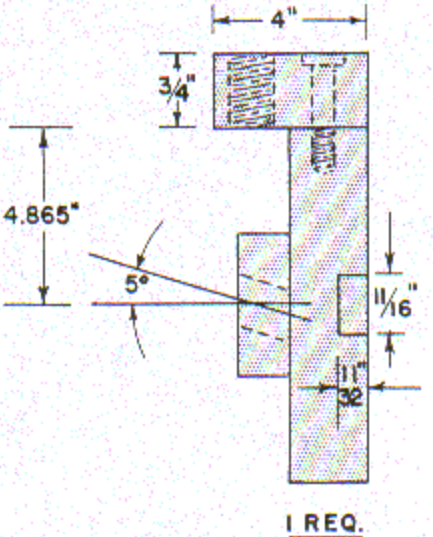
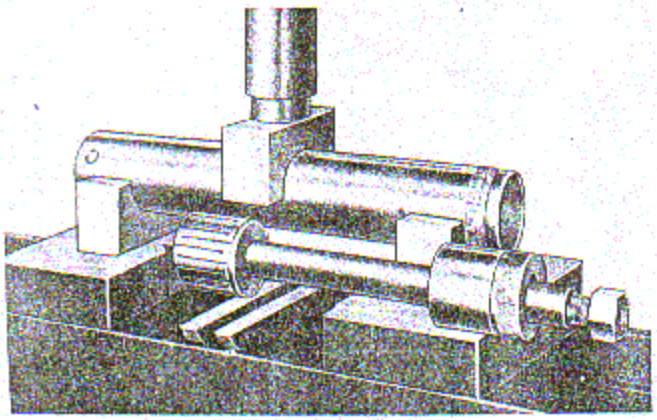
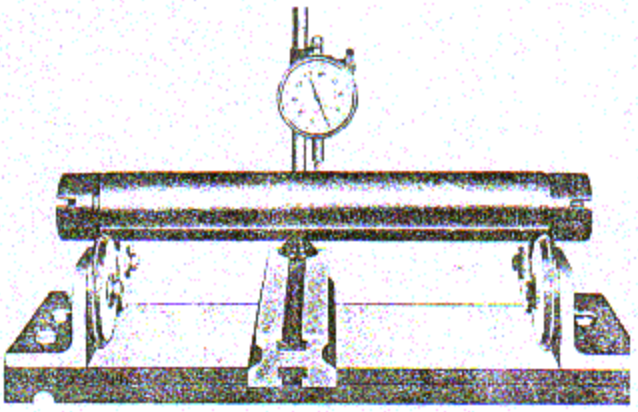


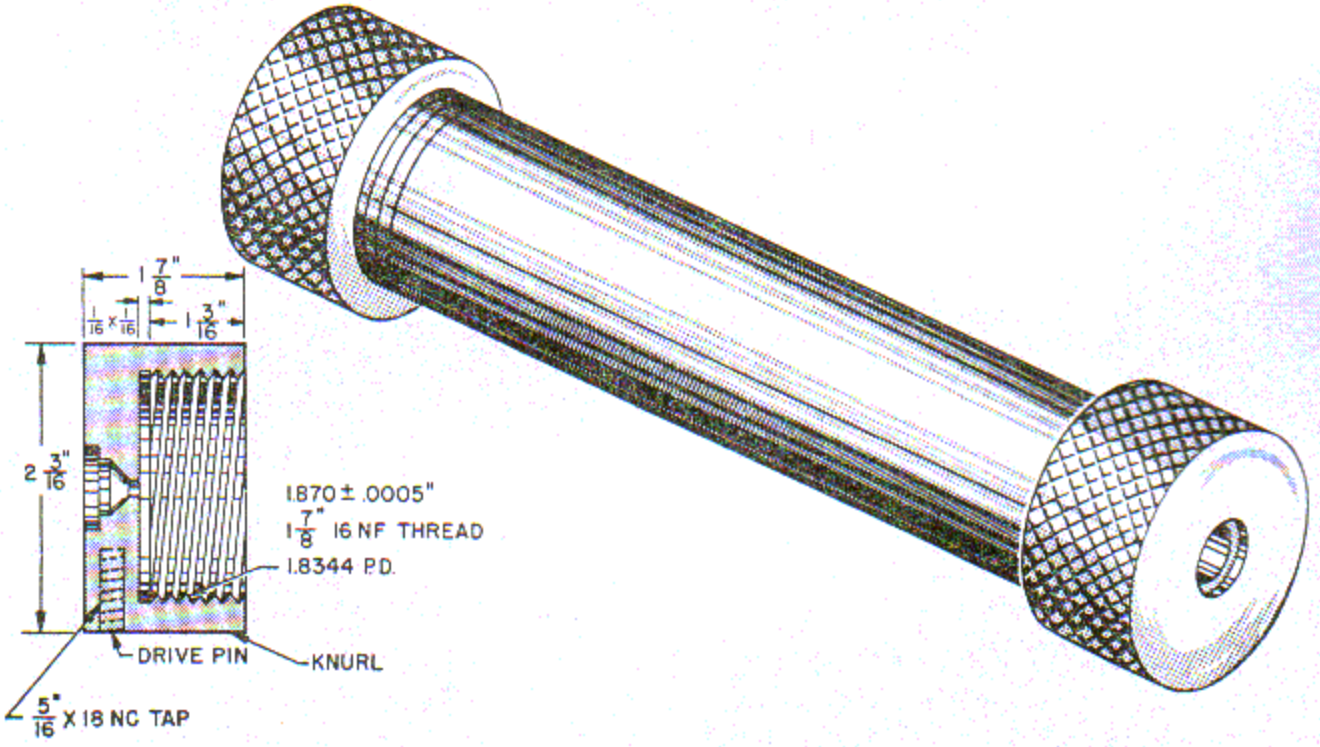
Figure 110 — Latch Pad Refacing Jig





Place expanding mandrel inside piston tube and tighten against side wall to avoid crushing during straightening operation.

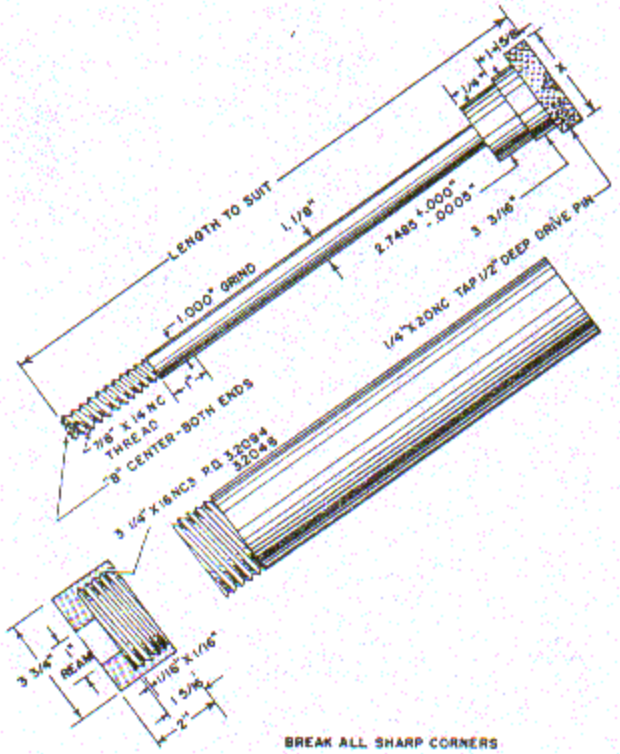
Use form blocks for support at each end of tube when straightening on Arbor press.



1. Attach grinding centers to pivot pin (after straightening).
2. Rough grind OD to clean up (max material remove .020 in.)
3. Hard chrome plate.
4. Bake four hours at 400°F.
5. Magnaflux.
6. Finish grind to original specification.

(Break all sharp corners.)

Figure 111 — Pivot Pin Grinding Centers



1. Attach special grinding centers.
2. Rough grind to clean up (max material removed .020).
3. Hard chrome plate.
4. Bake 4 hours at 400°F.
5. Finish grind to Bendix Dwg. No. 53864.

Figure 112—Shock Strut Piston Tube Grinding Centers

b. CLASSIFICATION OF DAMAGE. — Magnaflux inspect if the link has been subjected to crash or hard landing, and reject if cracks or damage are visible.

(1) NEGLIGIBLE DAMAGE.—Nicks and burrs less than 1/32 inch in width or depth must be rubbed out with fine emery cloth or a fine file.

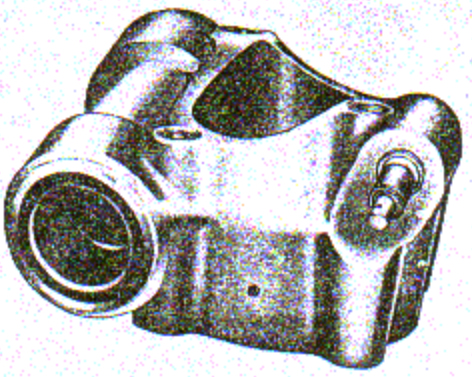
(2) DAMAGE REPARABLE BY MACHINING. —Torsion links worn or galled under specified tolerance of 1/32 inch must be processed as illustrated in *figures 115 and 116.*

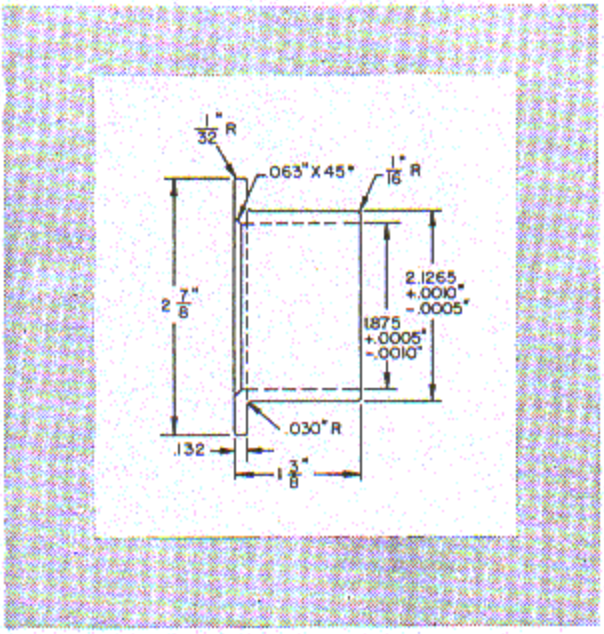
(3) DAMAGE NECESSITATING REPLACEMENT.—Reject torsion links with visible cracks and those twisted out of shape more than ½ inch.

7. LANDING GEAR FAIRING.

a. DESCRIPTION.—Fabricated from 2024-T3 aluminum-alloy sheet, the fairing is reinforced around outer edges with 2024-T4 aluminum-alloy extrusions.

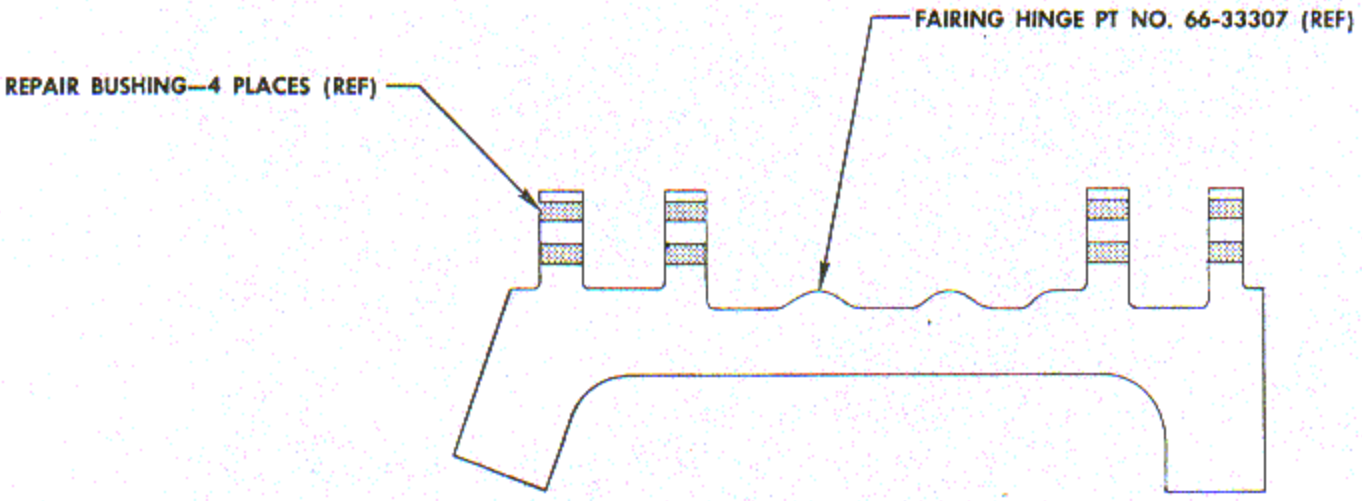
b. CLASSIFICATION OF DAMAGE.—The fairing is subject to damage from crash landings and flying objects such as stones and gravel that inflict small skin damage necessitating repair.

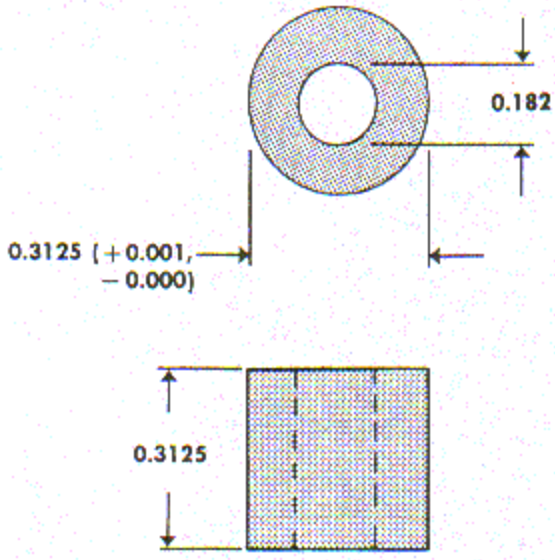




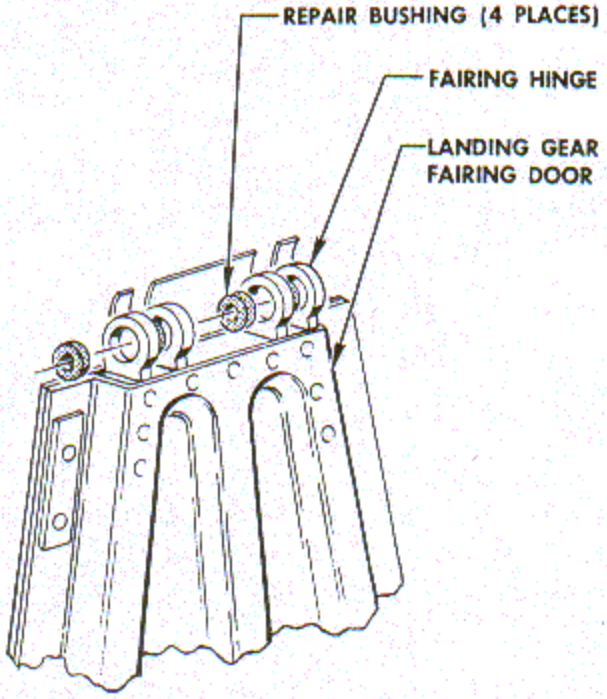
1. To rebore pivot pin bushing holes, locate from this shock strut outer cylinder hole and four 7/16-ream holes in mounting flange on boring jig for oleo attaching fitting *(figure 115).*
2. Measure maximum and minimum diameter of front pivot pin bushing hole to determine amount of elongation; if more than .003 inch, rebore oversize to clean up. Install new oversize bushings made from 4130 bar stock heat-treated to 125,000 to 140,000 psi.

Figure 113—Oleo Fitting Bushing





REPAIR BUSHING DIMENSIONS



NOTE

1. Drill and line-ream fairing hinge holes to 0.3125 (+0.000, −0.001) inch.
2. Make repair bushings to dimensions shown from Oilite bronze bar stock (preferred) or SAE4130 molybdenum steel (Specification MIL-S-6758).
3. Install repair bushings by press fit. Line-ream bushings to 0.1875 (+0.0005, −0.0010) inch.

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Figure 113A — Repair of Landing Gear Fairing Hinges — Oversize Holes

(1) NEGLIGIBLE DAMAGE.—Small shallow scratches with sharp edges must be rubbed out with fine emery cloth or file and polished with crocus cloth and oil.

(2) DAMAGE REPARABLE BY PATCHING OR INSERTION.—For all reparable damage to skin area, see Section II, Wing Group.

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace fairing when damage exceeds 50 percent.

8. LOCK AND HOIST FITTING.

a. DESCRIPTION.—The lock and hoist fitting is a chrome-molybdenum steel forging, heat-treated, and machined to close tolerance. *(See figure 117.)*

b. CLASSIFICATION OF DAMAGE.—Damage to the lock and hoist fitting includes inboard and rear faces of latch fitting worn or damaged by landing gear locking lug, locking pin hole worn oversize, and inboard surface of latch throat worn.

(1) NEGLIGIBLE DAMAGE.—When magnaflux reveals forging to be free of cracks, and wear is within the plus .003 tolerance permitted, forgings are serviceable.

(2) DAMAGE REPARABLE BY MACHINING.—When the inboard and rear faces of the latch fitting have worn oversize in excess of above tolerance, set the fitting up on the special locating jig for machining. *(See figures 118 through 122.)*

(3) DAMAGE NECESSITATING REPLACEMENT.—Reject as unserviceable all forgings cracked, broken, or worn in excess of permissible tolerance.

9. LOCKING LUG.

a. DESCRIPTION.—The locking lug or upper end fitting is made from chrome-molybdenum steel forging, welded to the outer cylinder, which is also made of chrome-molybdenum steel, and then machined as a one-piece unit.

b. CLASSIFICATION OF DAMAGE.—The locking lug is subject to damage from hard or crash landings and excessive clearance between the locking lug and component parts due to wear.

(1) NEGLIGIBLE DAMAGE.—Scratches up to 1/32 inch may be removed with a fine file, fine emery cloth, or polished out with crocus cloth. Minor scratches and pits are negligible provided 85 percent of the bearing surface is maintained.

(2) DAMAGE REPARABLE BY MACHINING.—When wear to one or more of the locking lug faces occurs, the disassembled shock strut outer cylinder must

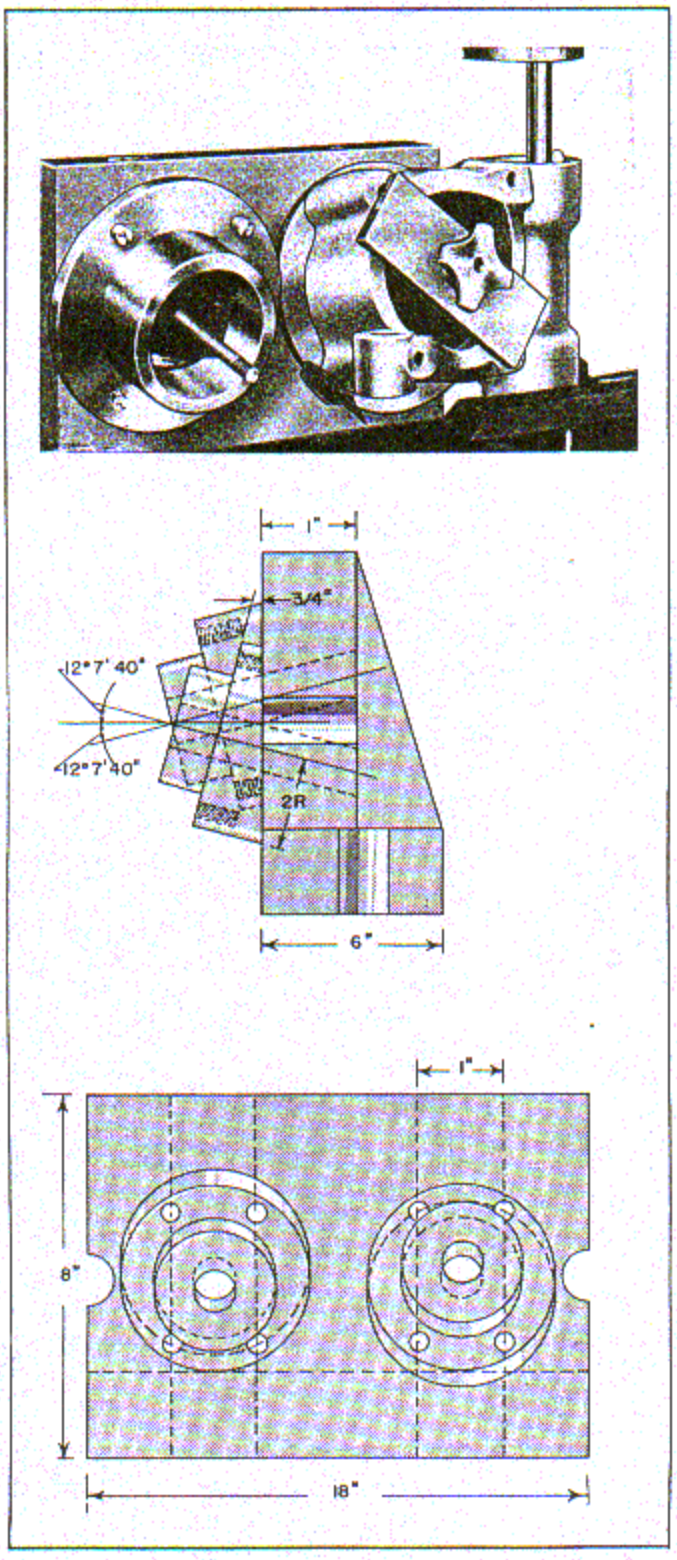
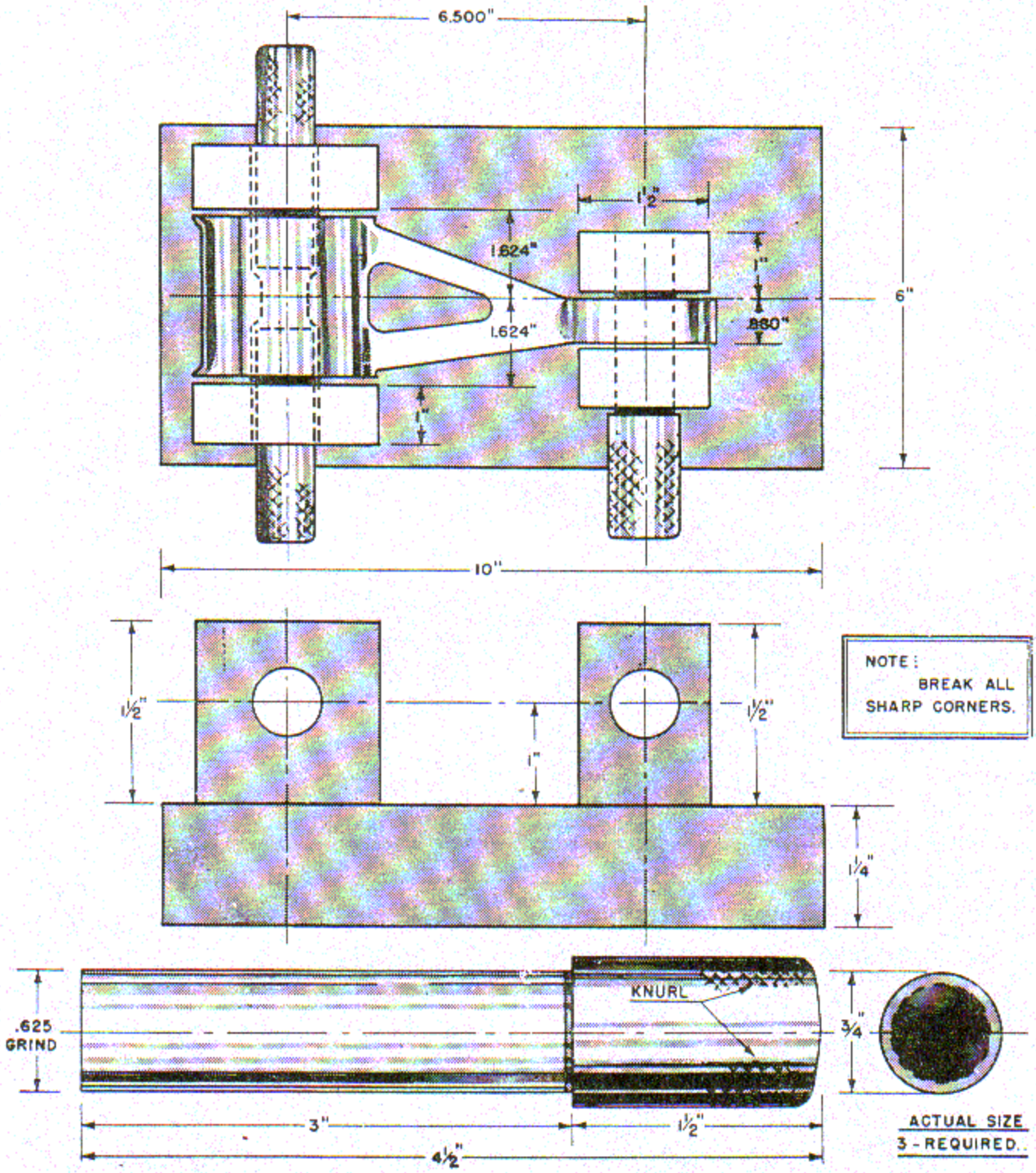


Figure 114—Oleo Fitting Jig



1. Check torsion links for straightness with bushings removed.
2. Magnaflux before and after straightening.
3. Anneal before straightening.
4. Straighten by heating each side of bend with acetylene torch. Use bar or pipe as lever. *DO NOT* strike with hammer or other object.
5. Heat-treat for 125,000 to 140,000 psi.
6. Cadmium plate AN-QQ-P-421
7. Use check jig for final inspection.

Figure 115 — Torsion Link Jig

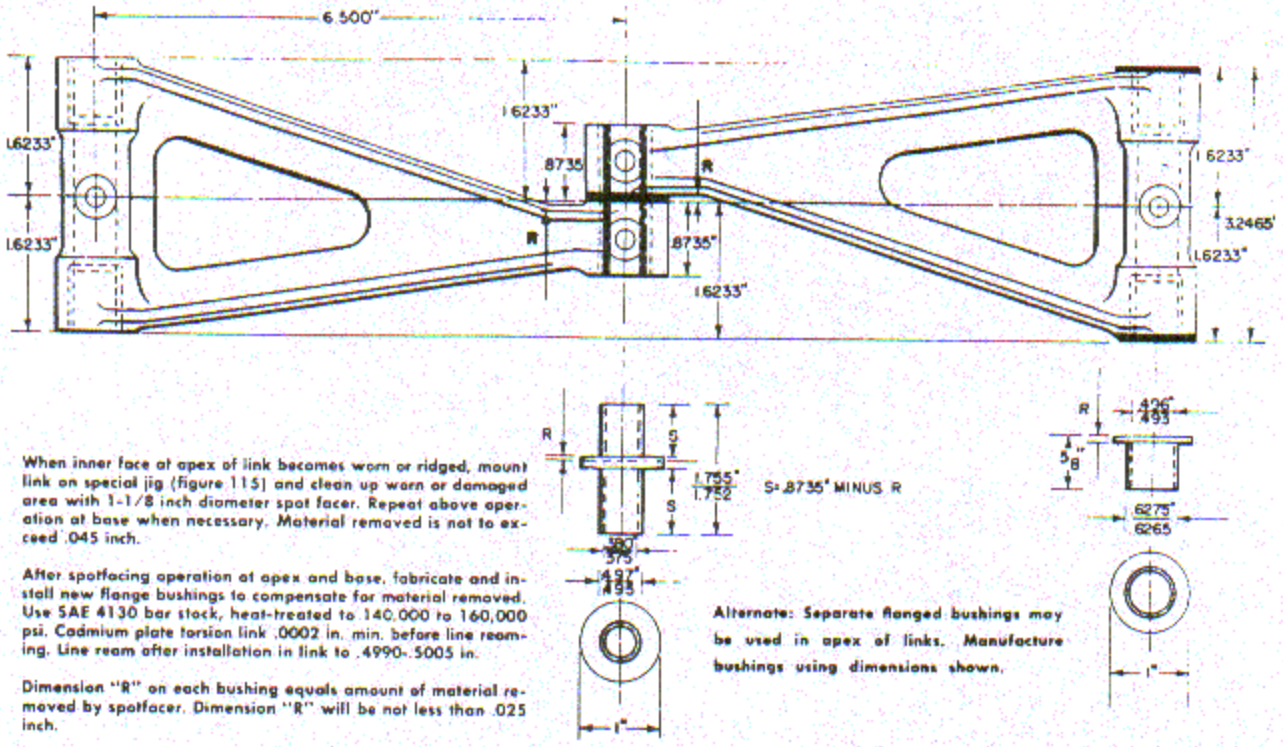


Figure 116—Machining Procedure, Torsion Link

be mounted on a special fixture for grinding. *(See figures 123 and 124.)* Locking lugs worn undersize may be restored to service by hard chrome plating and finishing to original drawing specification. *(See figure 123A.)*

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace struts when all four locking lug faces show over-all wear in excess of 0.010 inch and cannot be restored by chrome plating, or when outer cylinder or locking lug fitting is cracked.

10. LOCKPIN.

a. DESCRIPTION.—The lockpin is machined from chrome-molybdenum steel bar stock to close dimensions and is heat-treated.

b. CLASSIFICATION OF DAMAGE.—If landing gear is known to have been subjected to a severe or crash landing, magnaflux the lockpin and reject if cracked at any point. *(See figure 125.)* Lockpins worn undersize may be restored to service by reworking.

(1) NEGLIGIBLE DAMAGE.—Lockpins worn less than .003 inch may be returned to service without reworking.

(2) DAMAGE REPARABLE BY MACHINING.—When lockpins are worn more than .003 inch, false centers must be prepared. *(See figure 125.)*

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace all cracked or faulty lockpins and those worn on latching face or outside diameter in excess of .020 inch.

Figure 117—Lock and Hoist Fitting

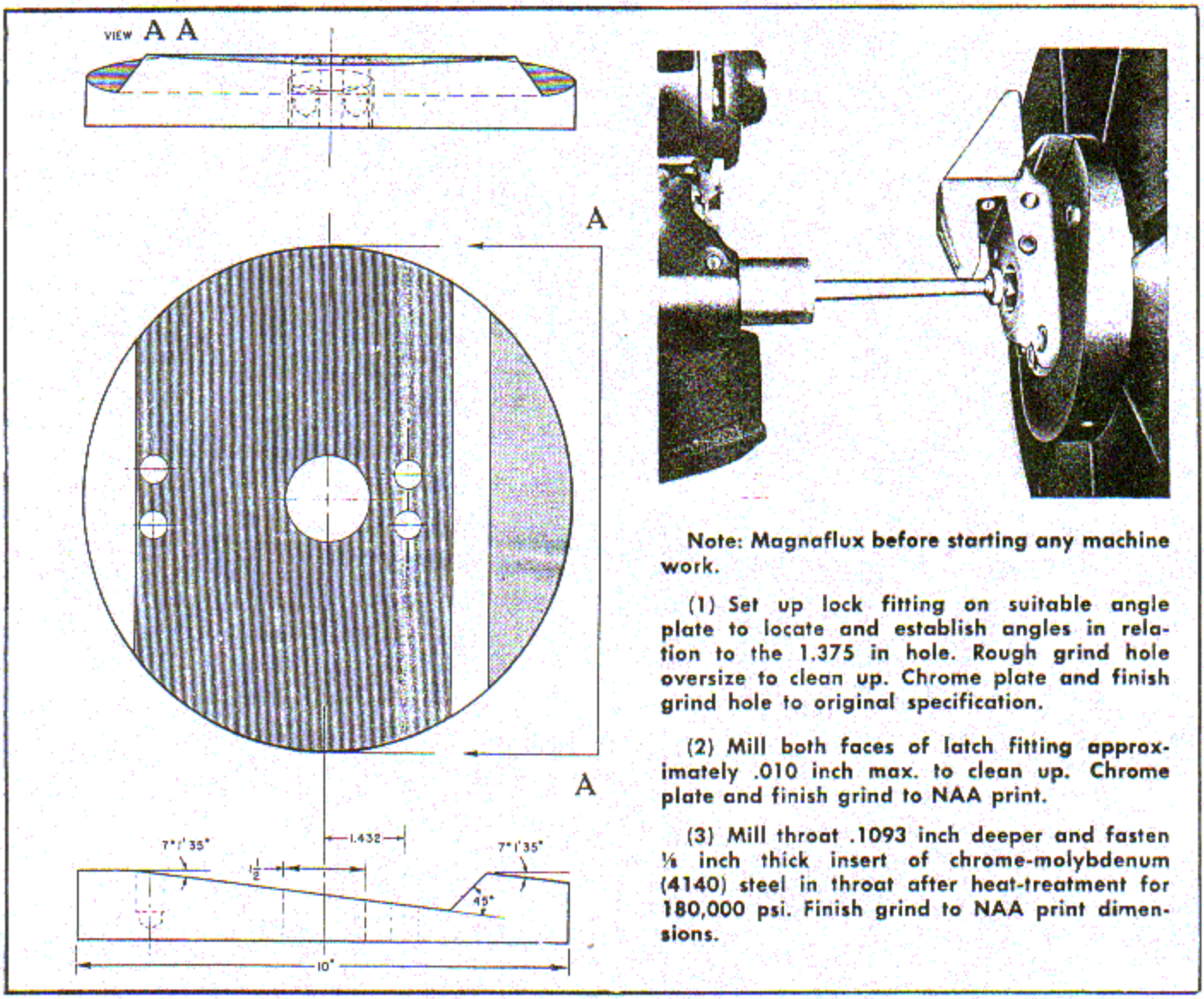


Figure 118 — Lock and Hoist Fitting Jig

11. KNUCKLE OR HALF-FORK.

a. DESCRIPTION.—The knuckle or half-fork is machined from a chrome-molybdenum steel forging, heat-treated after machining.

b. CLASSIFICATION OF DAMAGE.—When landing gear is known to have been subjected to a severe or crash landing, magnaflux the knuckle; if cracked or broken, reject as unservicable.

(1) NEGLIGIBLE DAMAGE.—If magnaflux inspection shows knuckle or half-fork free from flaws or cracks, restore it to service. Remove scratches and nicks to 1/32 inch with a fine file or fine emery cloth.

(2) DAMAGE REPARABLE BY STRAIGHTENING.—Knuckle or half-fork bent or twisted 1/32 inch or more must be normalized at 1600°F, heated with acetylene torch at each side where bent, and straightened to original shape and position. Heat repeatedly if necessary.

CAUTION

Use bar or pipe as lever. Do not strike with hammer or other object to straighten.

Magnaflux after straightening procedure.

(3) DAMAGE NECESSITATING REPLACEMENT—Reject as unserviceable all knuckles or half-forks cracked or bent beyond 1/2-inch.

(4) DAMAGE REPARABLE BY WELDING.—Landing gear half-forks cracked between the axle flange and the elbow can be repaired by welding a 1-inch thick gusset of steel, Specification MIL-S-6758, between the flange and the elbow. (See figure

118A.) Carefully file out the crack and weld it with an electric arc. File the new weld smooth and arc weld the gusset in place. Care should be taken not to overheat the fork when welding the gusset in place. Make welds in runs not to exceed 1 inch in length with a machine setting of 150 amps and 65 volts. Use Wilson 1/8-inch welding rod No. 520 or equivalent. The tendency of the weld to crack can be reduced by preheating the part 300 to 440°F prior to welding. After each run, allow the weld to cool to preheat temperature before making the next run. Magnetically inspect the weld.

12. KNUCKLE HOUSING—TAIL WHEEL.

a. DESCRIPTION.—The knuckle housing, a precision machined aluminum-alloy casting, has two 5/8-inch outside diameter bronze bushings pressed in place at

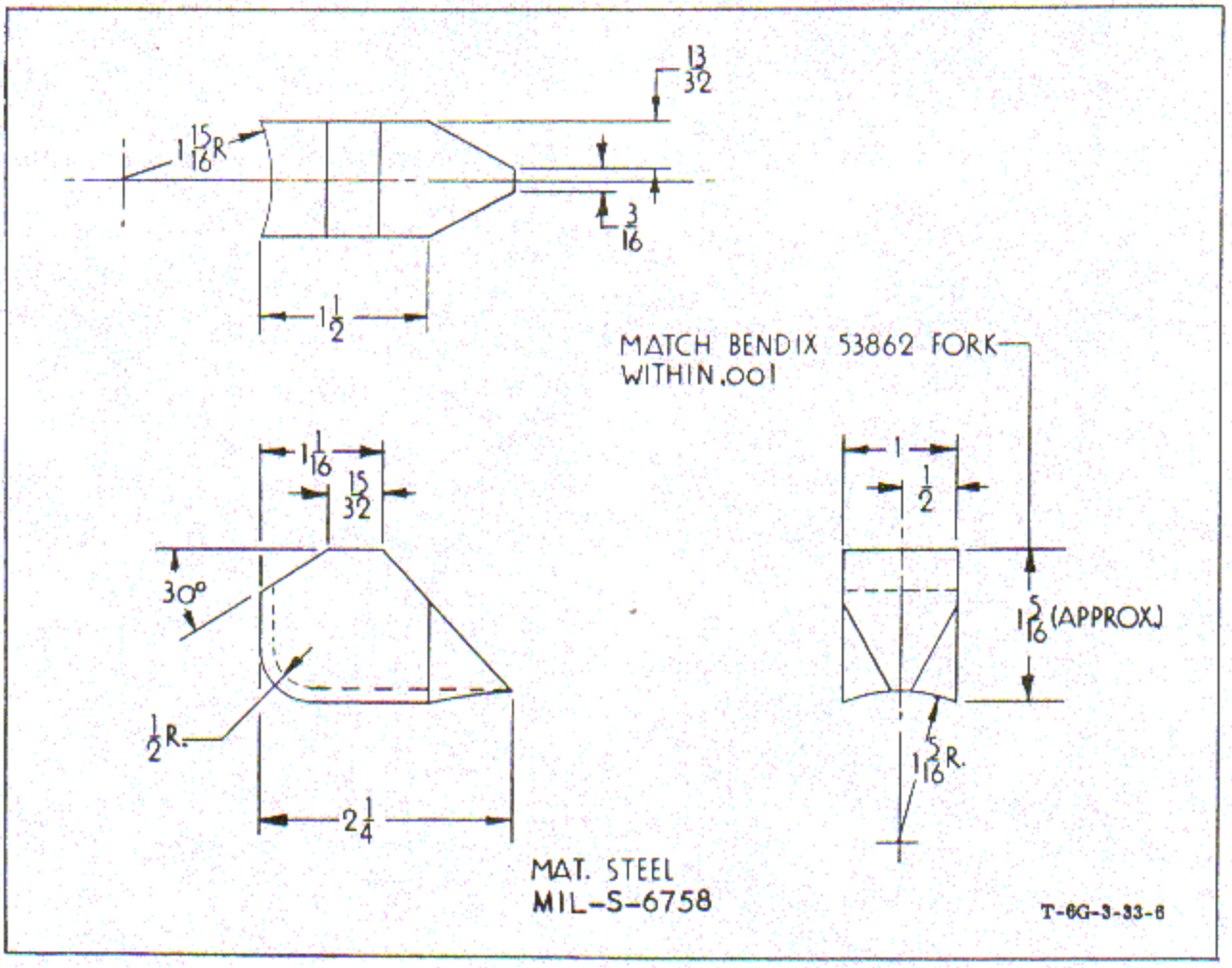
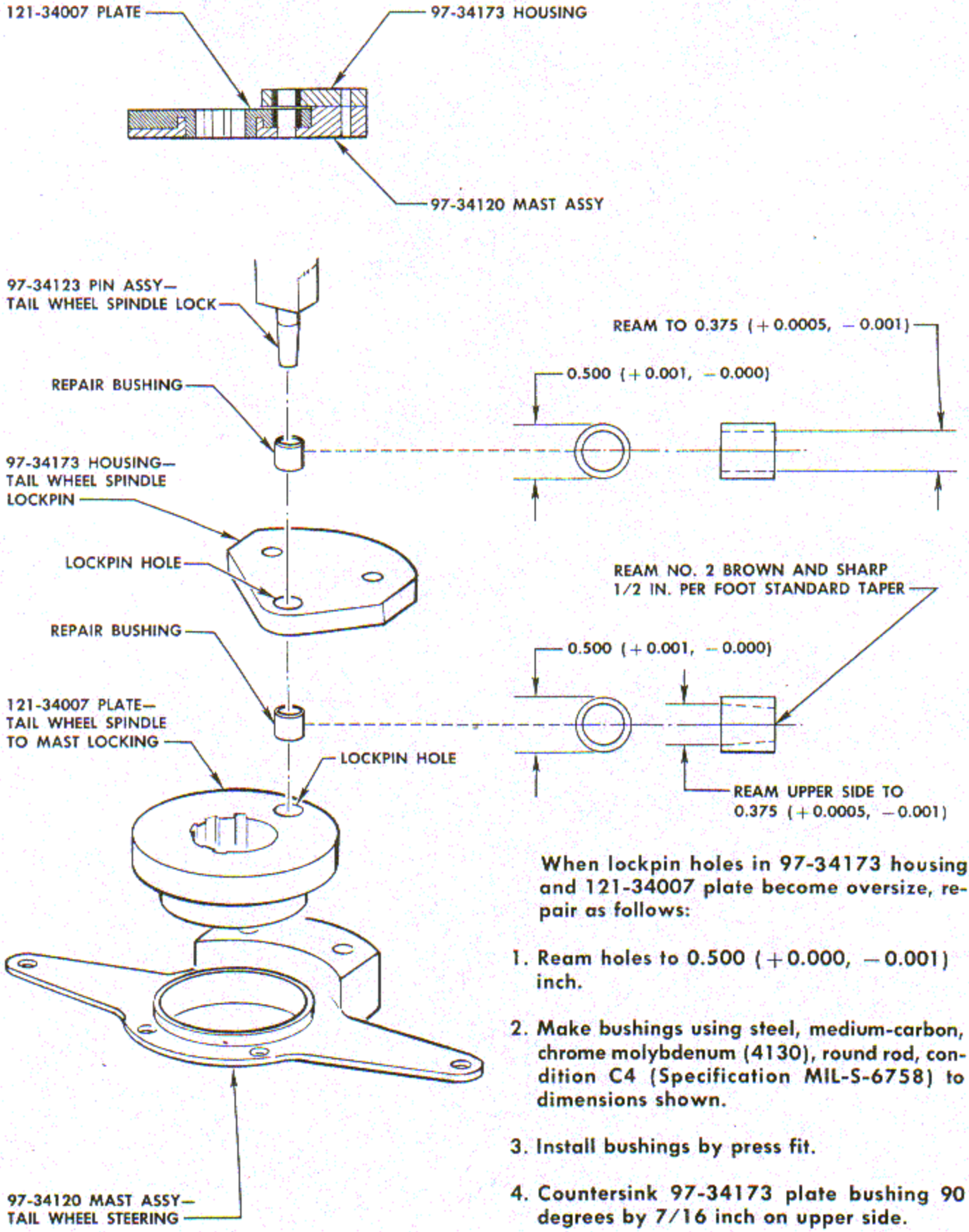


Figure 118A—Gusset—Landing Gear Reinforcement



When lockpin holes in 97-34173 housing and 121-34007 plate become oversize, repair as follows:

1. **Ream holes to 0.500 (+0.000, —0.001) inch.**
2. **Make bushings using steel, medium-carbon, chrome molybdenum (4130), round rod, condition C4 (Specification MIL-S-6758) to dimensions shown.**
3. **Install bushings by press fit.**
4. **Countersink 97-34173 plate bushing 90 degrees by 7/16 inch on upper side.**

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Figure 118B — Repair of Tail Wheel Lock Assembly — Oversize Holes

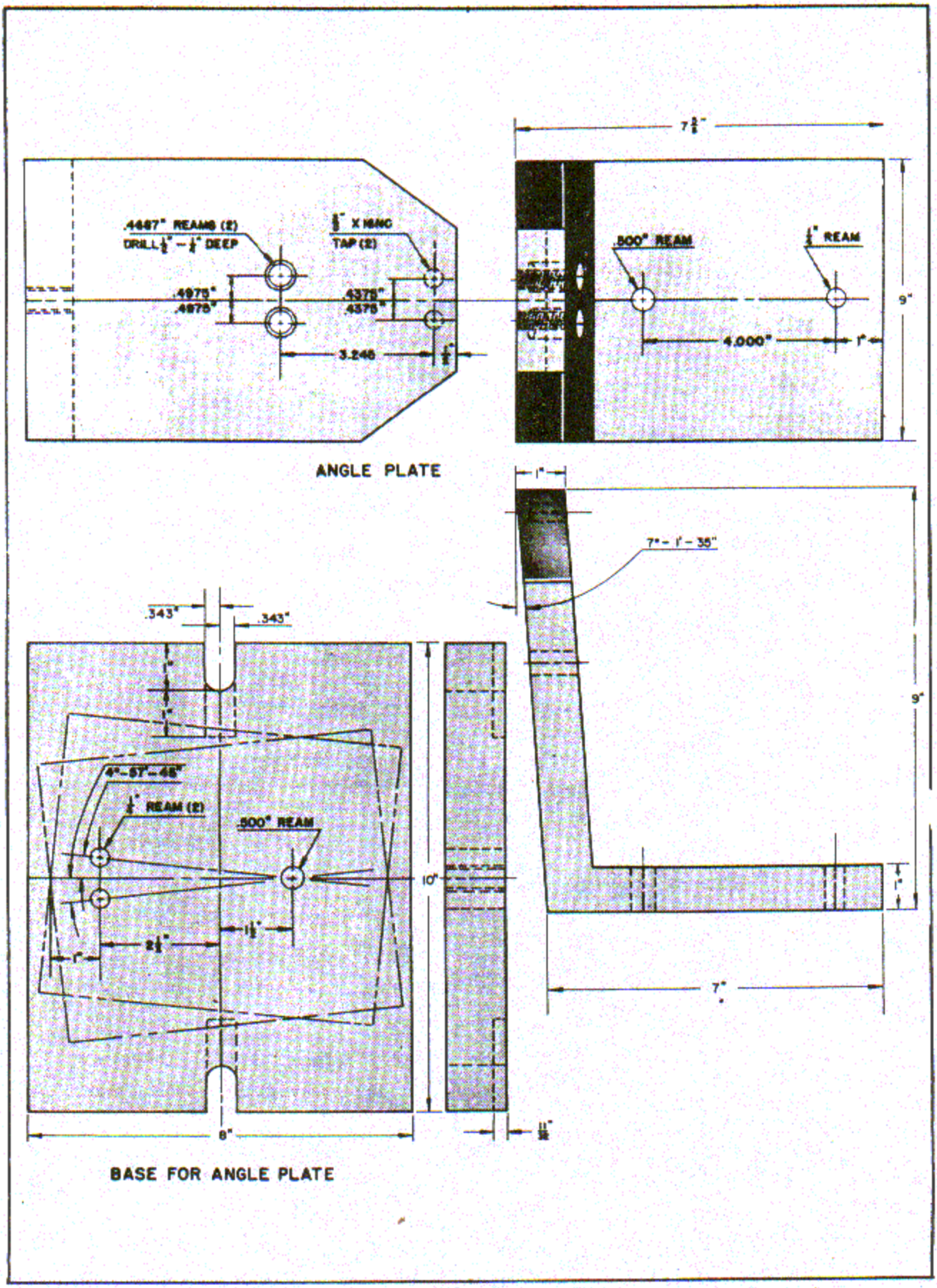


Figure 119 – Compound Angle Jig and Base Plate

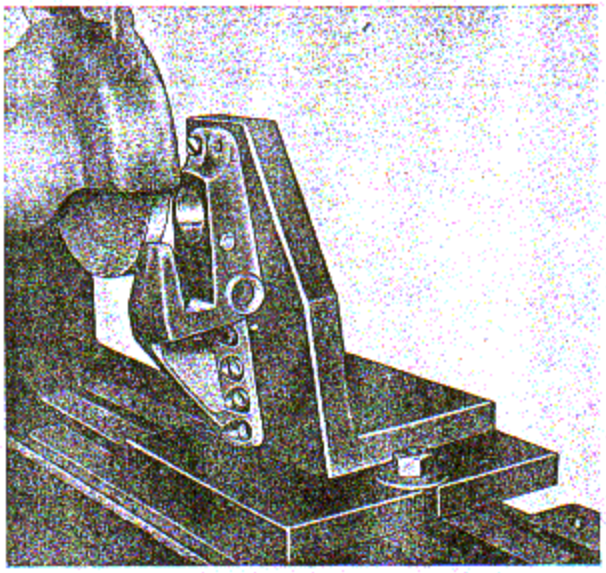


Figure 120 — Grinding the Lock Fitting

the front end of the casting and two ½-inch bronze bushings at the aft end.

b. CLASSIFICATION OF DAMAGE.—If the landing gear was subjected to severe or crash landing, X-ray inspection is necessary to determine if stress is present in the knuckle casting.

(1) NEGLIGIBLE DAMAGE. — Deep scratches and nicks not more than 1/32-inch deep may be removed with a fine file or emery cloth.

(2) DAMAGE NECESSITATING REPLACEMENT.—The knuckle housing will be rejected when cracks or flaws are present at any point in the casting.

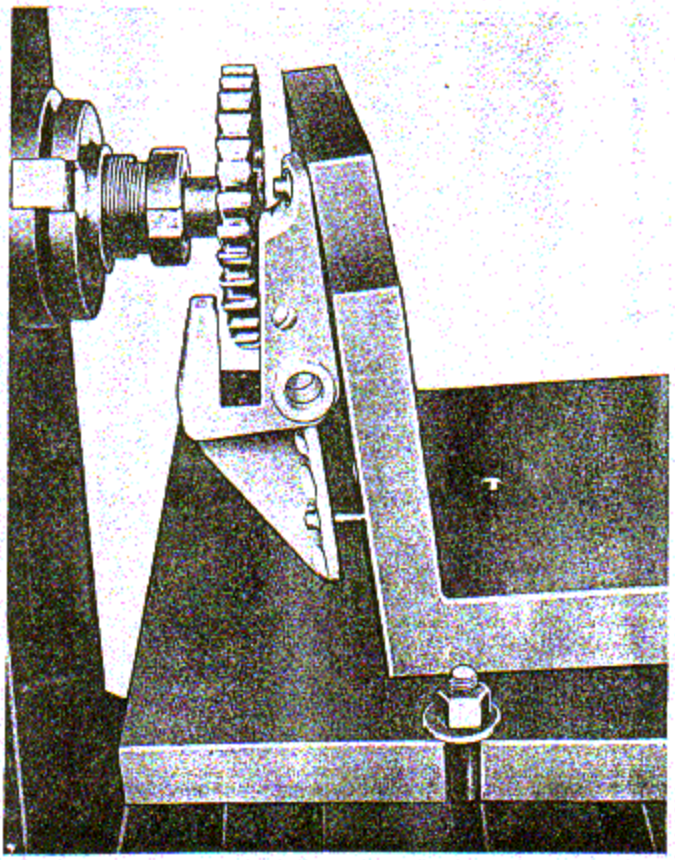


Figure 121 — Lock and Hoist Fitting on Milling Jig

13. KNUCKLE POST.

a. DESCRIPTION.—A knuckle post is made from a chrome-molybdenum steel forging, stress-relieved.

b. CLASSIFICATION OF DAMAGE.—The knuckle

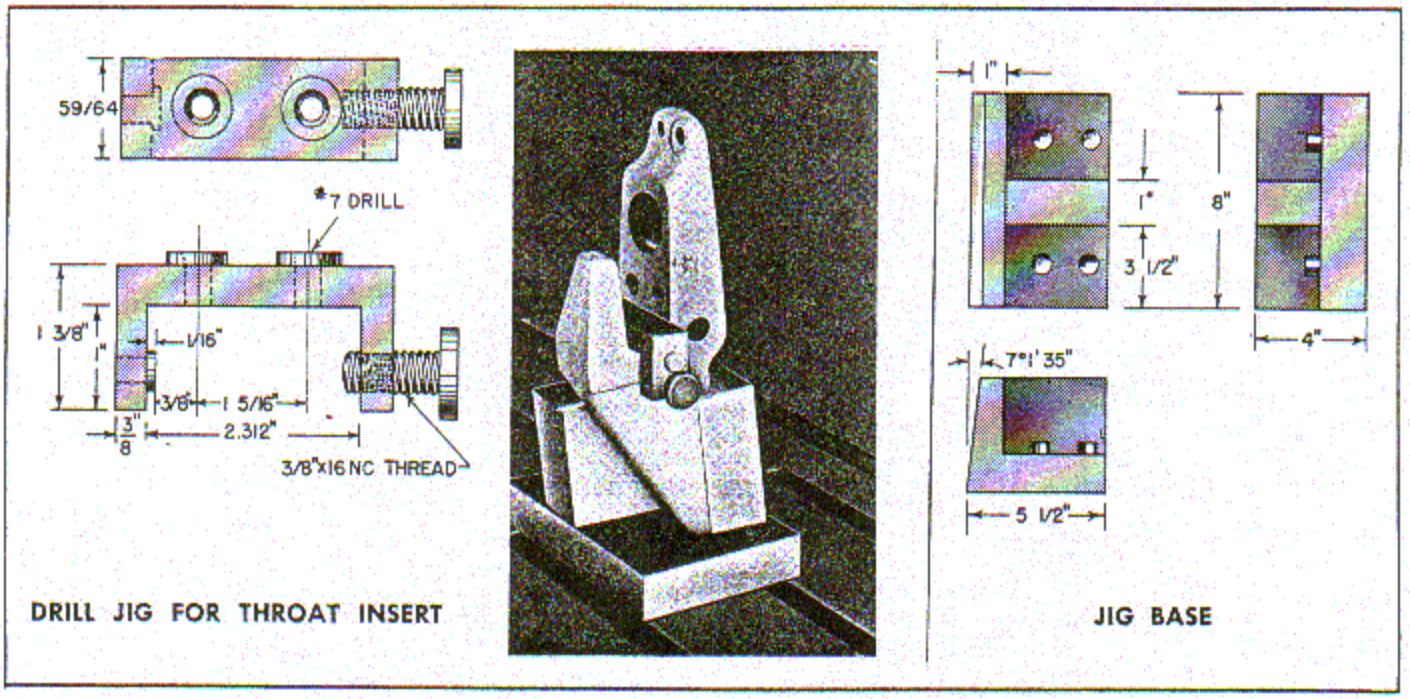


Figure 122 — Lock and Hoist Fitting Throat Jig

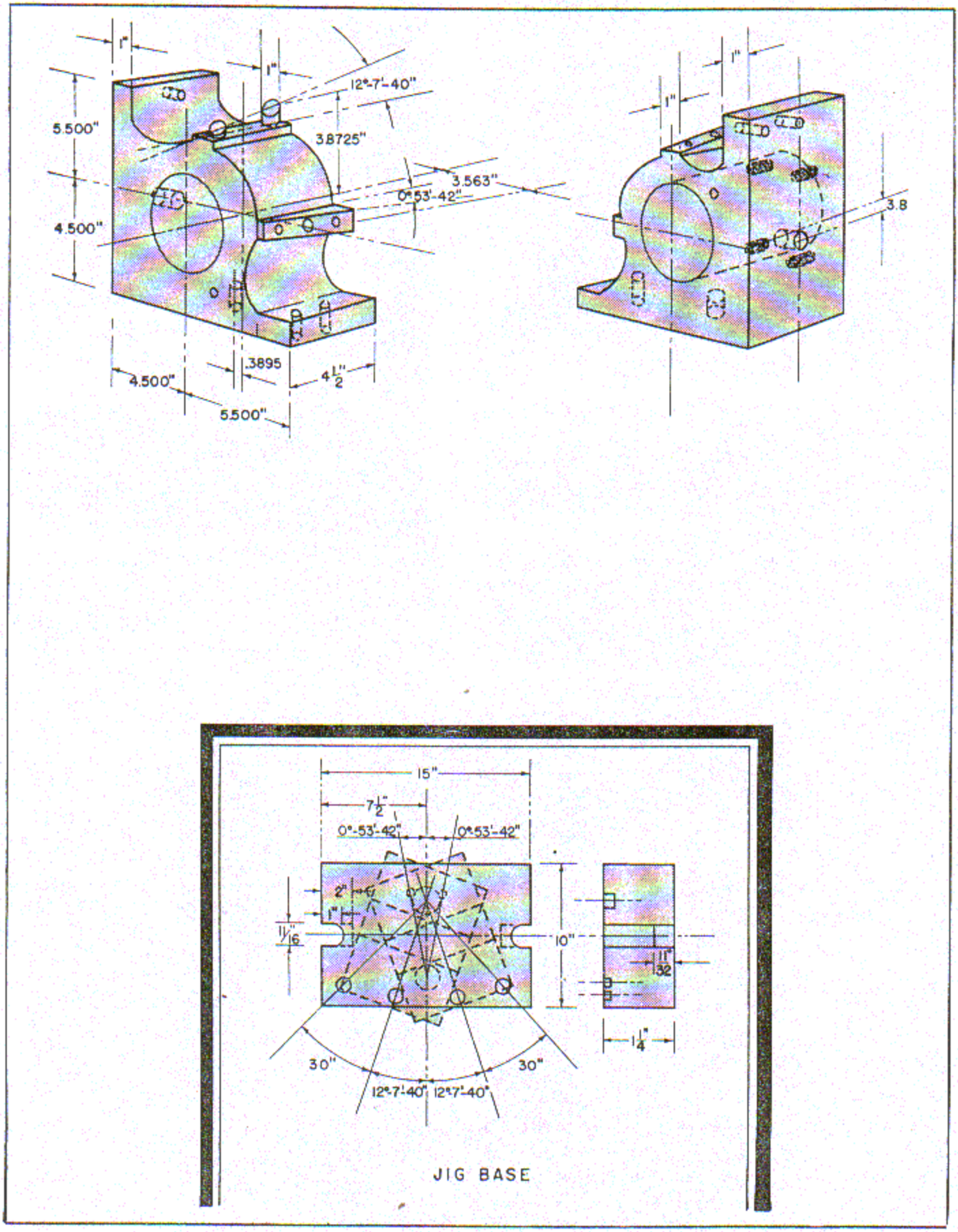
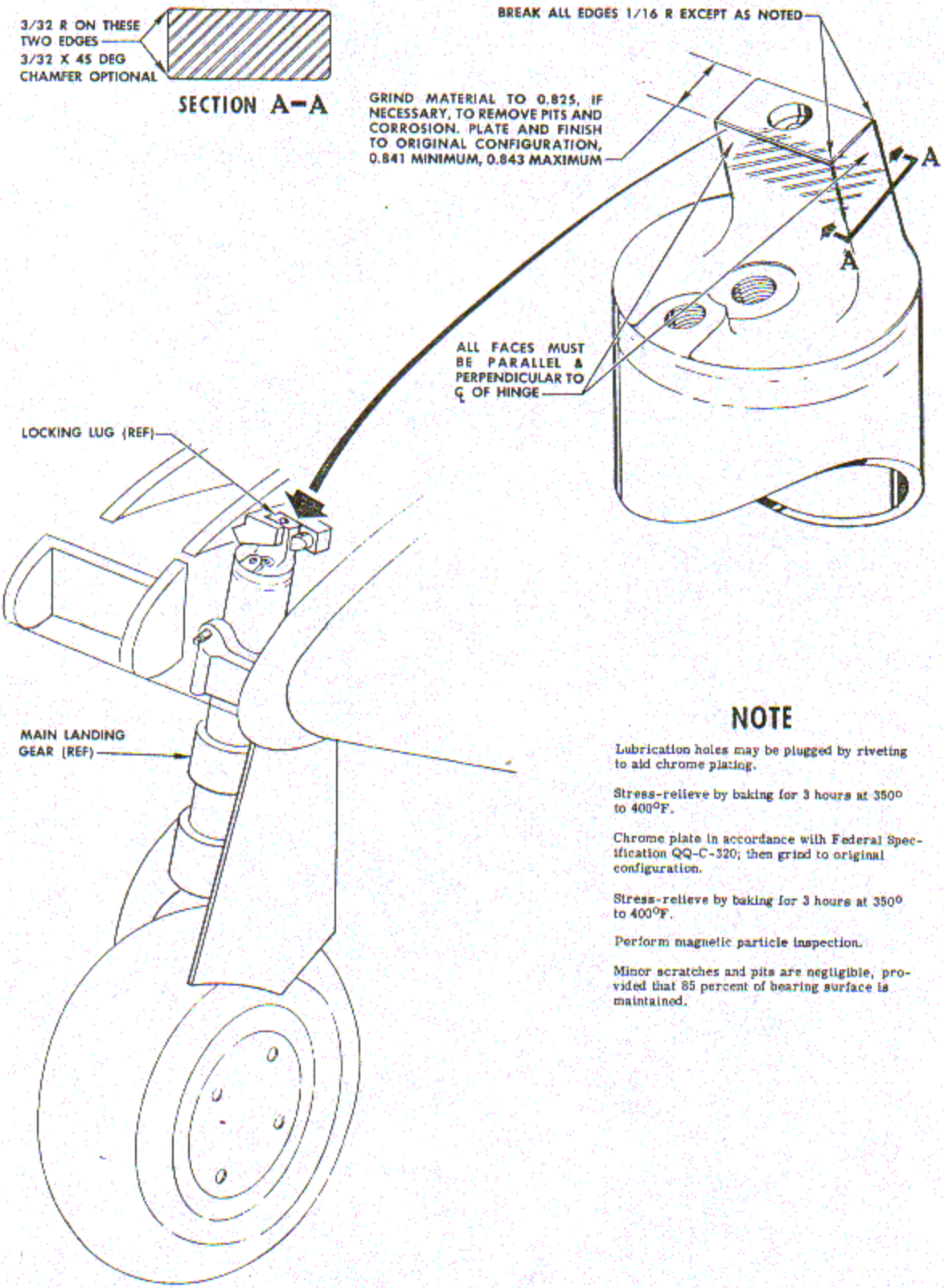


Figure 123 — Locking Lug Grinding Jig



NOTE

Lubrication holes may be plugged by riveting to aid chrome plating.

Stress-relieve by baking for 3 hours at 350° to 400°F.

Chrome plate in accordance with Federal Specification QQ-C-320; then grind to original configuration.

Stress-relieve by baking for 3 hours at 350° to 400°F.

Perform magnetic particle inspection.

Minor scratches and pits are negligible, provided that 85 percent of bearing surface is maintained.

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Figure 123 A—Rework Procedure, Locking Lug

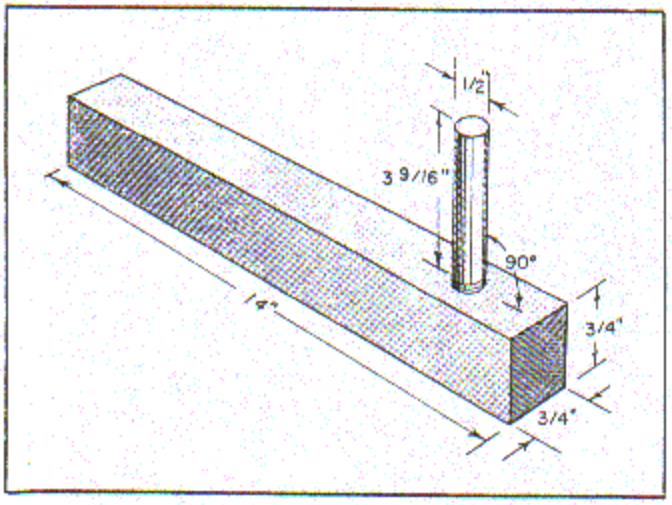


Figure 124—Locking Lug Grinding Gage

post becomes bent at one or more points when subjected to a severe or crash landing. The wheel bearing area on the spindle becomes worn in the course of service.

(1) NEGLIGIBLE DAMAGE. — Knuckles bent less than 1/32 inch may be returned to service without straightening. Burrs and scratches up to 1/32 inch must be removed by smoothing with a fine file or fine emery paper.

(2) DAMAGE REPARABLE BY STRAIGHTENING.—Knuckle posts bent more than 1/32 inch must be normalized at 1600°F, heated with acetylene torch at each side where bent or twisted, and straightened to original position, using a bar or pipe as a lever. Reheat repeatedly if necessary.

CAUTION

Do not strike with a hammer or other object to straighten.

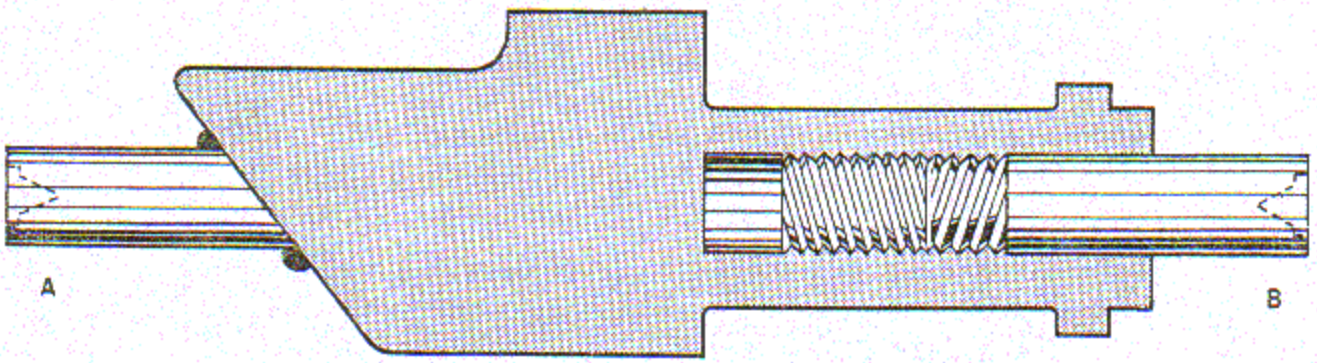
As final inspection, magnaflux before installation.

(3) DAMAGE NECESSITATING REPLACEMENT.—Any crack or flaw in the knuckle post necessitates replacement of the part.

TABLE I

MATERIALS REQUIRED

MATERIAL	NUMBER REQUIRED	REMARKS
SAE 4130 Steel	1	.093 in. x 2-3/16 in. x 4-11/16 in.
SAE 4130 Steel	2	.125 in. x 15/16 in. x 2-3/16 in.
Drill Rod	2	.468 in. dia. x 2 in.
Drill Rod	2	.562 in. dia. x 2 in.
Drill Rod	2	.466 in. dia. x 2 in.
Drill Rod	2	.5605 in. dia. x 2 in..
Bolt	4	AN 173-16
Nut	2	AN 310-3
Washer	2	2W18-10
SAE 4130 Steel	4	2-7/8 in. dia. x 1-1/2 in.
SAE 4130 Steel	4	2-7/8 in. dia. x 1-5/8 in.



Note: Magnaflux before rework
A and B are Grinding Centers

1. Prepare false centers from short length of 3/8 inch steel rod and solder to undercut end of lockpin. Prepare steel stud threaded at one end to fit 3/8-24NF tapped hole in shank of lockpin.

2. Rough grind outside diameter to clean up. Do not exceed .020 inch. Then hard chrome plate. Bake 4 hours at 400°F and finish grind to NAA Dwg 55-33525.

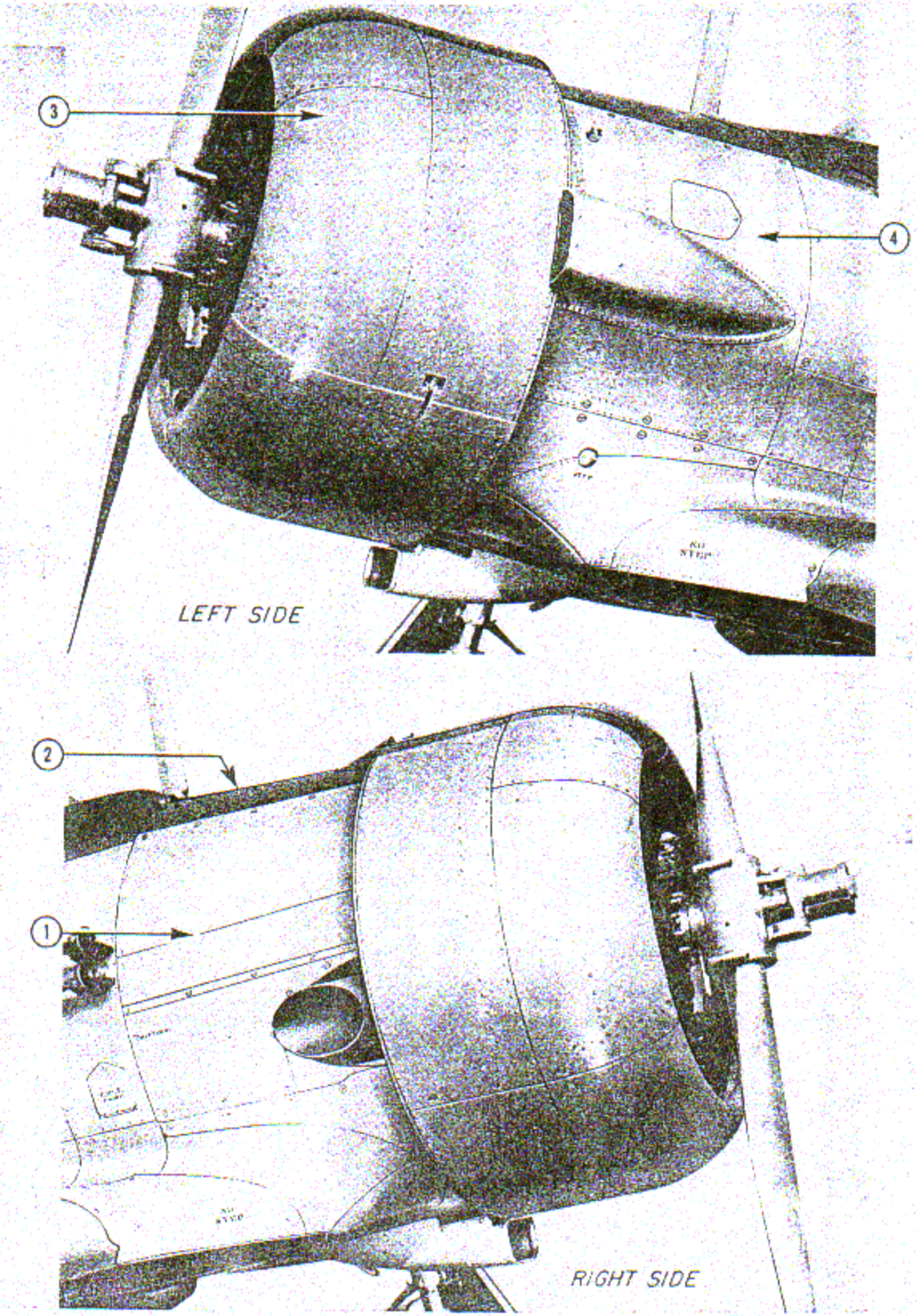
3. Clamp lockpin in common Vee block held by vise mounted on grinder table and grind latching face to clean up. Hard chrome plate. Bake 4 hours at 400°F. Magnaflux and finish grind to NAA print.

Figure 125—Locking Pin and Attached False Centers

TABLE II

BUSHINGS, COMPONENT PARTS

LOCATION OF BUSHING	BUSHING No.	ASSEMBLY No.	No. REQ.	OUTSIDE DIA.	INSIDE DIA.
Landing Gear Support	36-33117	77-33106	2	2.125	1.872 +.0000 −.0005
Landing Gear Retracting Oleo Attaching Fitting	36-33119	66-33118	2	2.1265 +.0010 −.0005	1.875 +.0005 −.0010
Landing Gear Lockpin Mechanism Support	55-33538	55-33513	1	.500	Drill "W" (.386)
Tail Wheel Attachment	19-34011	88-34001	1	.623 +.000 −.001	.375 +.0005 −.0010



1. Cowling, Upper Right Removable
2. Cowling, Removable Top
3. Cowling, Engine Ring
4. Cowling, Upper Left Removable

Figure 126 – Engine Cowling Assembly

SECTION VI

ENGINE SECTION

1. ENGINE MOUNT.

a. DESCRIPTION. *(See figure 127.)*—The engine mount is of welded chrome-molybdenum steel tubing construction with the exception of the rear cross tube which is 2024-T aluminum alloy fastened by four bolts to the welded structure. This tube supports the rear of the oil tank.

b. CLASSIFICATION OF DAMAGE.

(1) NEGLIGIBLE DAMAGE.—If tubes are not bent more than 1/32 inch or if scratches are less than 1/32 inch in width or depth, round out with a fine file or emery cloth and return to service.

(2) DAMAGE REPARABLE BY PATCHING OR INSERTION.—See *figure 86* for the tube sizes and wall thickness. For tube repair procedure refer to Section X of AN 01-1A-1, General Manual for Structural repair.

(3) DAMAGE NECESSITATING REPLACEMENT.—Reject as unserviceable all tubing bent more than 1/16 inch if cracks or flaws are evident.

2. ENGINE COWLING ASSEMBLY.

a. DESCRIPTION. *(See figure 126.)*—A spotwelded and flush-riveted removable cowling assembly encloses and streamlines the engine, the exhaust collector ring, and the engine accessory compartment. All removable parts of cowling are fastened by Dzus fasteners and clamping bolts. Most of the cowling sections are .032- and .040-inch 2024-T3 Alclad. Parts subjected to heat from the exhaust stack or from the fixed fuselage gun blast are made of .025- and .038-inch corrosion-resistant steel.

(1) ENGINE RING COWLING ASSEMBLY. *(See figure 128.)*—Padded support brackets on the engine support the engine ring cowling assembly. On early airplanes this is held in position by an engine ring cowling stop pin. The cowling assembly is secured to the engine by one exterior and two interior clamping bolts. The flush-type Dzus fasteners which attach the engine accessory compartment cowling are secured to four stainless steel channels which extend from the fire wall to the baffle plate ring just aft of the exhaust collector ring.

(2) REMOVABLE BOTTOM COWLING ASSEMBLY.—A cold air scoop for the oil cooler is located in the removable bottom section aft of the ring cowling. It is fabricated of .040-inch 2024-O Alclad sheet, heat-treated after forming, and reinforced internally by two 2024-O Alclad baffle plates, .020- and .040-inch thick, heat-treated after forming. The assembly is bolted to the carburetor air mixing chamber at the forward end and to the fire wall at the aft end.

(3) REMOVABLE CARBURETOR AIR SCOOP COWLING ASSEMBLY. *(See figure 129.)*—The carburetor air scoop on the left side of the engine is formed from .032-inch 2024-O Alclad sheet. Two baffle plates made from .032-inch 2024-O Alclad sheet are spot-welded inside as reinforcements and deflectors. The assembled scoop is then spot-welded to the large cowling panel made from .040-inch 2024-T3 Alclad sheet.

(4) REMOVABLE TOP COWLING ASSEMBLY.—This panel is made in two sections. The top left side, made of .040-inch 2024-T3 Alclad sheet, is riveted to the top right side panel, made from .025-inch corrosion-resistant steel sheet, to form one large main panel. A gun blast trough made of .025-inch corrosion-resistant steel is spot-welded to the center of the top right section of the main panel. Spot-welded to the gun blast trough is a shield made from .042-inch corrosion-resistant steel sheet reinforced with .025- and .062-inch corrosion-resistant steel strips. Where the two panels are riveted together a joint channel reinforcement is turned up at the left side of the steel sheet to strengthen the panel and prevent canning. The entire main panel is held in place by 14 Dzus fasteners.

(5) REMOVABLE UPPER RIGHT COWLING ASSEMBLY.—This panel is made in three sections and is held in place with 16 Dzus fasteners. The upper portion is made from .040-inch 2024-T3 Alclad sheet. The middle section is formed from .025-inch corrosion-resistant steel sheet with one side fabricated to form a reinforcing channel parallel to the riveted joint. A bottom section of .025-inch corrosion-resistant steel sheet is spot-welded to the middle section.

b. CLASSIFICATION OF DAMAGE.—The cowl assembly is subjected to damage from vibration, causing cracks around Dzus fasteners. Interior and exterior clamps, clamping bolts, and aligning pins show rapid wear from constant handling.

(1) NEGLIGIBLE DAMAGE.—Scratches and nicks not more than 1/32 inch in width or depth can result in stress concentrations and subsequent failure of the part during flight. Remove them with fine emery cloth or a fine riffle file and polish with crocus cloth and oil.

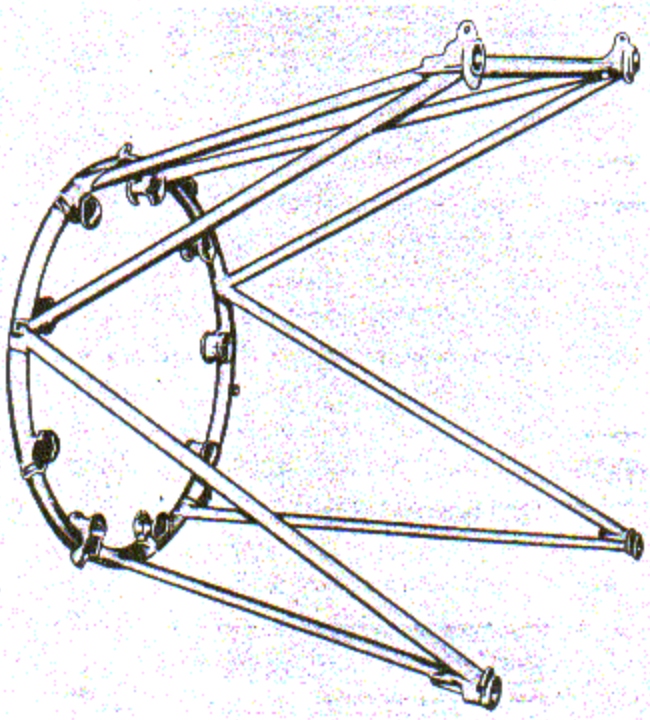


Figure 127 — Engine Mount Truss Assembly

(2) DAMAGE REPARABLE BY PATCHING OR INSERTION. *(See figure 130.)*—When one or more cracks appear around the Dzus fastener area, insert a reinforcement strip. For repair to fasteners see Section VIII, General Manual for Structural Repair, AN 01-1A-1.

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace worn interior and exterior clamps, clamp bolts, and aligning pins. If damage to any one section of cowling exceeds 50 percent, reject as unserviceable. No damage to the air scoop is reparable; it must be replaced when damaged.

3. CARBURETOR COLD AIR DUCT.

a. DESCRIPTION.—This air duct suspended from the engine mount truss assembly connects the carburetor air scoop to the assembled carburetor air mixing chamber. It is fabricated from .040-inch 5052-O aluminum alloy with two .064-inch doublers spot-welded to the front bottom corners. The carburetor air filter frame is fabricated from .035-inch corrosion-resistant steel and is fastened inside the air duct to become part of the assembled air duct.

b. CLASSIFICATION OF DAMAGE.—There is no satisfactory repair. Replacement of the part is necessary in the event of damage.

4. EXHAUST MANIFOLD ASSEMBLY.

a. DESCRIPTION. *(See figure 131.)*—The exhaust manifold assembly, consisting of seven sections, is constructed of .044- and .055-inch thick corrosion-resistant steel. All sections are interconnected by clamp-type joints that provide for expansion and contraction of the engine and manifold.

b. CLASSIFICATION OF DAMAGE.—The extreme temperatures to which the exhaust manifold is subjected cause damage to the materials. Excessive torque on clamping bolts results in damage to attaching brackets, exhaust ports, and joint clamps.

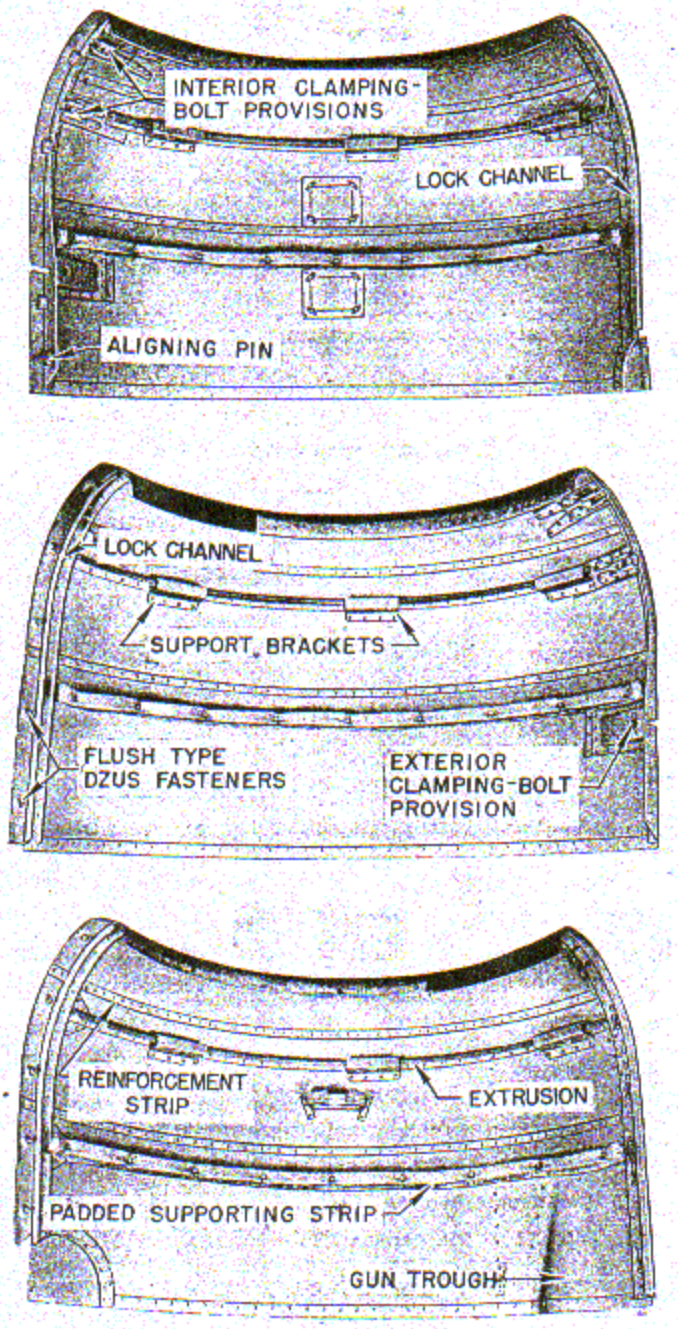


Figure 128 — Engine Ring Cowling Construction

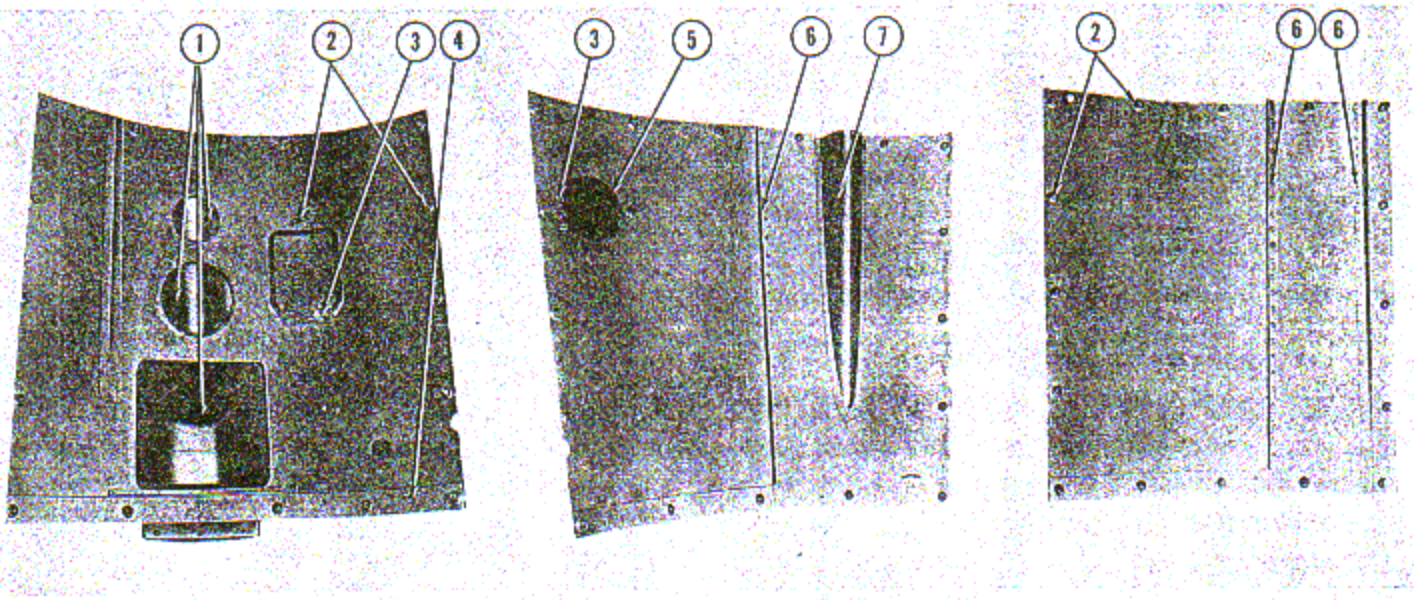


Figure 129 — Engine Accessory Cowling

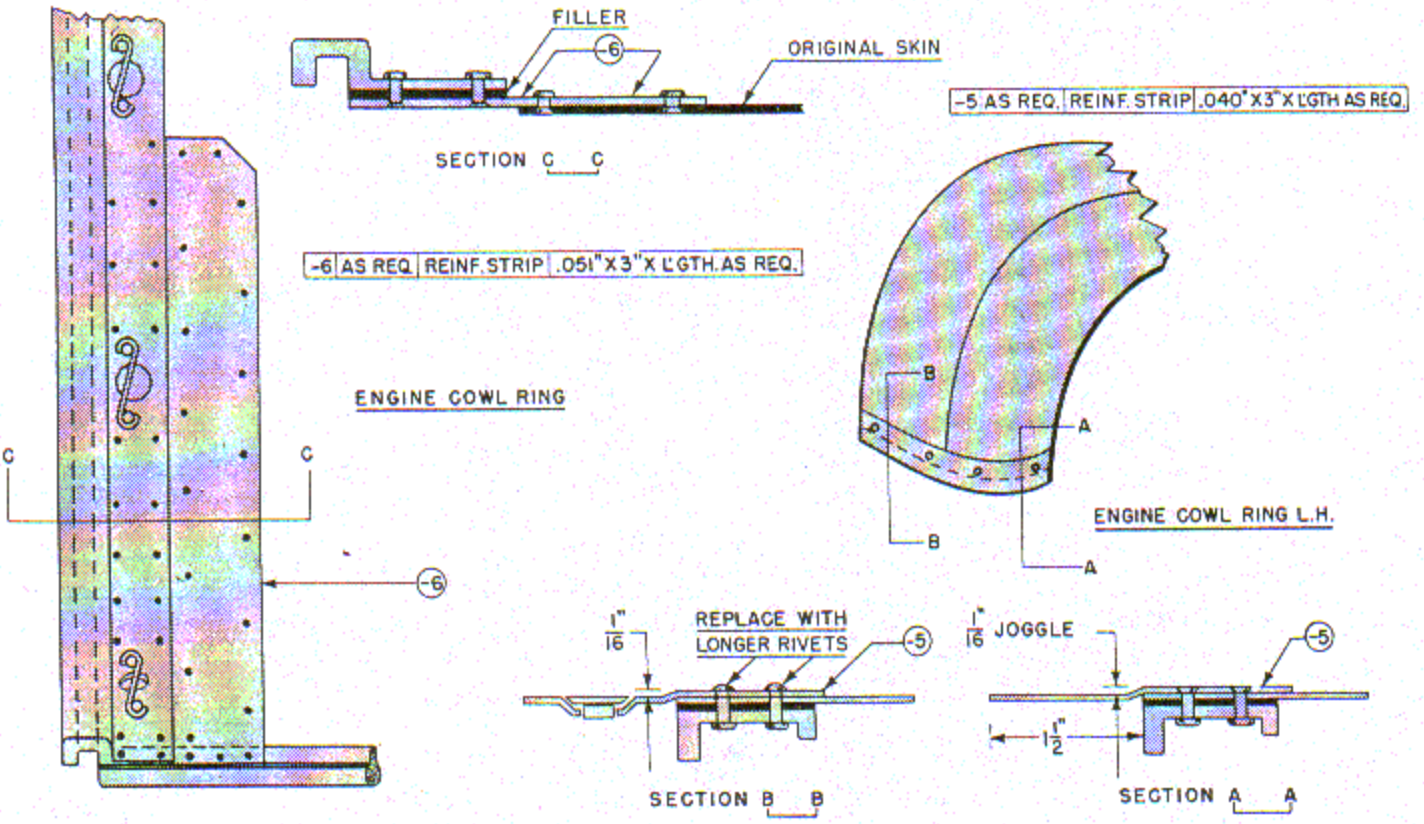


Figure 130 — Dzus Fastener Skin Area Repair

(1) NEGLIGIBLE DAMAGE.—Small nicks, burrs, scratches, and dents may be ignored as they in no way impair operation of the manifold.

(2) DAMAGE REPARABLE BY WELDING.—Repair worn or broken bolting or clamping bosses on joint clamps by grinding off the damaged area and welding a new piece of ⅜-inch diameter by .058-inch wall tubing in place. Then cut a slot for clearance. When clamping or attaching angle brackets are broken, remove the damaged bracket and weld a new bracket in the exact location and in proper alignment. Small surface cracks in welded areas and in the main body of the manifold may be welded.

(3) DAMAGE NECESSITATING REPLACEMENT.—Replace manifold when twisted out of alignment, broken, or when an area in any section is burned out.

5. CARBURETOR AIR MIXING CHAMBER.

This mixing chamber is made in a permanent mold casting or sand casting from 356-T6 aluminum alloy. It is heat-treated and receives some machining. No repairs are permissible; when cracked or broken, the assembly must be rejected as unserviceable.

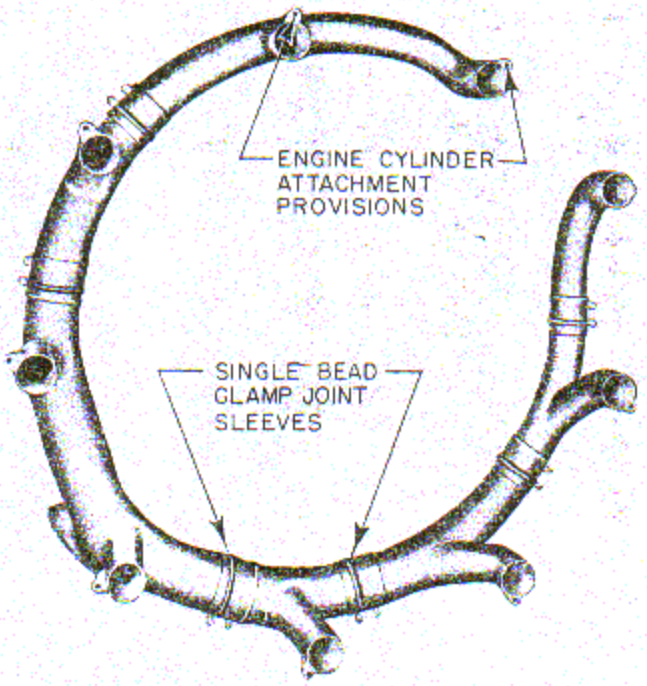


Figure 131. Exhaust Manifold Assembly

TABLE I
STEEL STRUCTURE REPAIR MATERIAL

The following materials are required for the repair of the engine mount and exhaust manifold assembly.

MATERIAL	SPECIFICATION	REMARKS
Sheet, Chrome-Molybdenum Steel (X4130)	MIL-S-6758	
Tube, Chrome Molybdenum Steel (X4130)	MIL-T-6731	See Section IV, figure 86 for tube size and diameter.
Tube, Corrosion-Resistant Steel (¼-inch Diameter)	MIL-T-6737	
Bar, Corrosion-Resistant Steel (¼-inch Diameter)	MIL-S-7720	Condition A Composition FM
Sheet, Corrosion-Resistant Steel	MIL-S-6721	
Rod, Welding (Electric)		Stainweld A5 Lincoln Electric Co.
Rod, Welding (Oxyacetylene)		Cromaloy-mixed with shellac. Linde Air Products
Tube, Aluminum Alloy (2024-T4)	WW-T-785	Condition A or T
Sheet, Aluminum Alloy (2024-T3)	QQ-A-355	Condition F

SECTION VII

FABRIC REPAIR AND ATTACHMENT

1. GENERAL.

Instructions for fabric repair and fabric section replacement are contained in Section XIII of AN 01-1A-1, General Manual for Structural Repair. In the event that damage exceeds areas reparable by these methods, a partial or new envelope may be prepared and attached.

2. PARTIAL ENVELOPE.

a. When damage is near a rib and partial re-covering is practical, remove the fabric from both sides of all sections to be re-covered. *(See figure 132.)* Prepare a partial envelope cover from new fabric large enough to cover the stripped area of the structure and long enough to lap over the undamaged area at least 2 inches. Slip the partial envelope cover over the structure and pull taut. Pin the edges in place and proceed with the hand sewing as set forth in a subsequent paragraph. Attach the reinforcing tape to all ribs under the new fabric, using the screws that were previously removed. Apply all finishing tape and canvas and fabric patches with the second coat of dope. For proper location of tape, screws, and drain washers, refer to the corresponding fabric re-covering diagram. *(See figures 133, 134 and 135.)* Follow routine doping and painting procedure.

b. If damage occurs to fabric between ribs, cut out damaged section, leaving as much fabric as possible on each side. Pull this fabric taut over rib and sew upper and lower pieces together as shown in *figure 136.* In the event the damage occurs near the end of the damaged member, add the partial envelope. If the damage occurs in a center section, add a width of fabric beginning at the trailing edge, going up over the leading edge and back on the opposite side of the trailing edge. Proceed as outlined in foregoing paragraph.

3. NEW ENVELOPE.

a. The preparation of a new fabric envelope covering for the aileron, rudder, or elevator will differ as to shape following the contour of the individual assembly. Make aileron envelope with the smaller end closed, continuing the seam part way along the trailing edge. Envelope for rudders and elevators should be made in two sections. Stitch the curved portions of both sections, leaving trim tab openings free, and slip them on at each end. Pull taut toward center, overlap, fold under, pin, stitch by hand, and dope along the seam. Initial stitching should be done by a double-stitching machine equipped with double-folding equipment. If this is not possible, fold by hand and stitch on a regular sewing machine, being sure that stitching is uniform and goes through all four layers of the fold. Rows of stitches must be at least 1/16 inch from the edge of the fold and 1/4 to 3/8 inch apart.

b. To attach envelope to member, slip over structure and pull taut. The application of powdered pumice to the frame will facilitate pulling the fabric along the leading and trailing edges of the structure where the friction is greatest. A small rough rubber sheet may be used as a further aid in pulling or pushing the fabric covering along the leading and trailing edges of the frame. *(See figure 137.)* Press the sheet firmly upon the leading edge and rub the fabric in the required direction. Keep the pull on the leading and trailing edge fabric as nearly equal as possible and work toward the large end of the structure. Pull the fabric taut around the large end of the structure and pin the fabric together with straight pins spaced not more than 2 inches apart. Pin around the entire unsewed end of the cover and along the trailing edge until the machine stitching is reached. Care must be taken to prevent the fabric from slipping while being pinned and thus causing an uneven pull. The pull or tension on the fabric along the open end and the trailing edge should be uniform. After

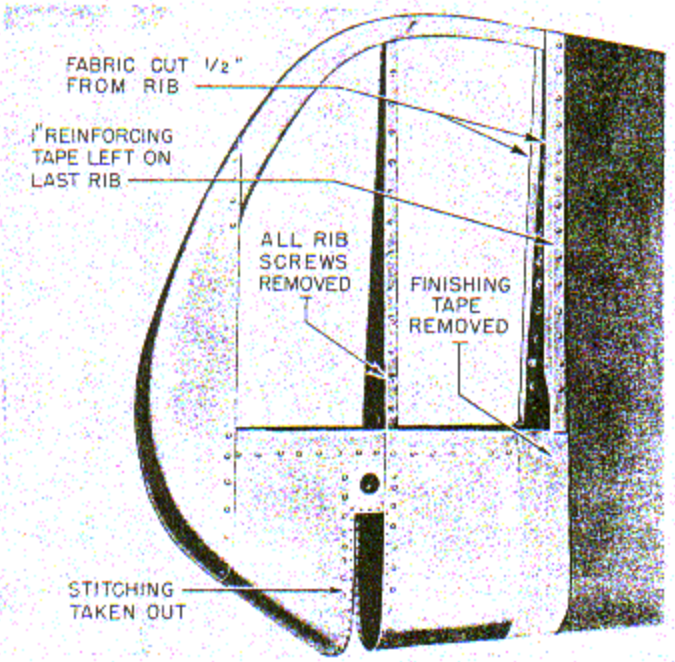


Figure 132—Typical Removal of Fabric From Two or More Sections

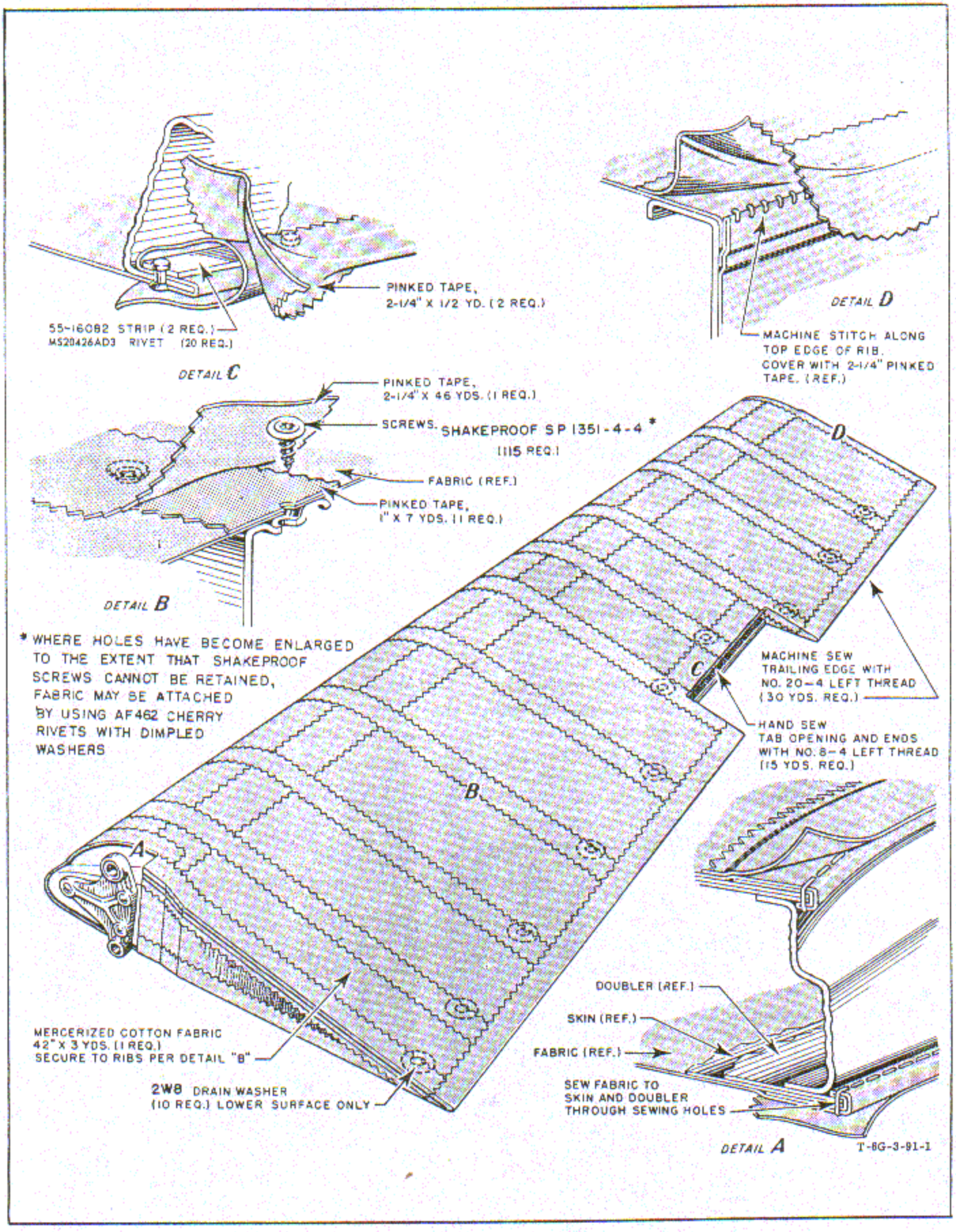


Figure 133 — Aileron Fabric Covering Requirements

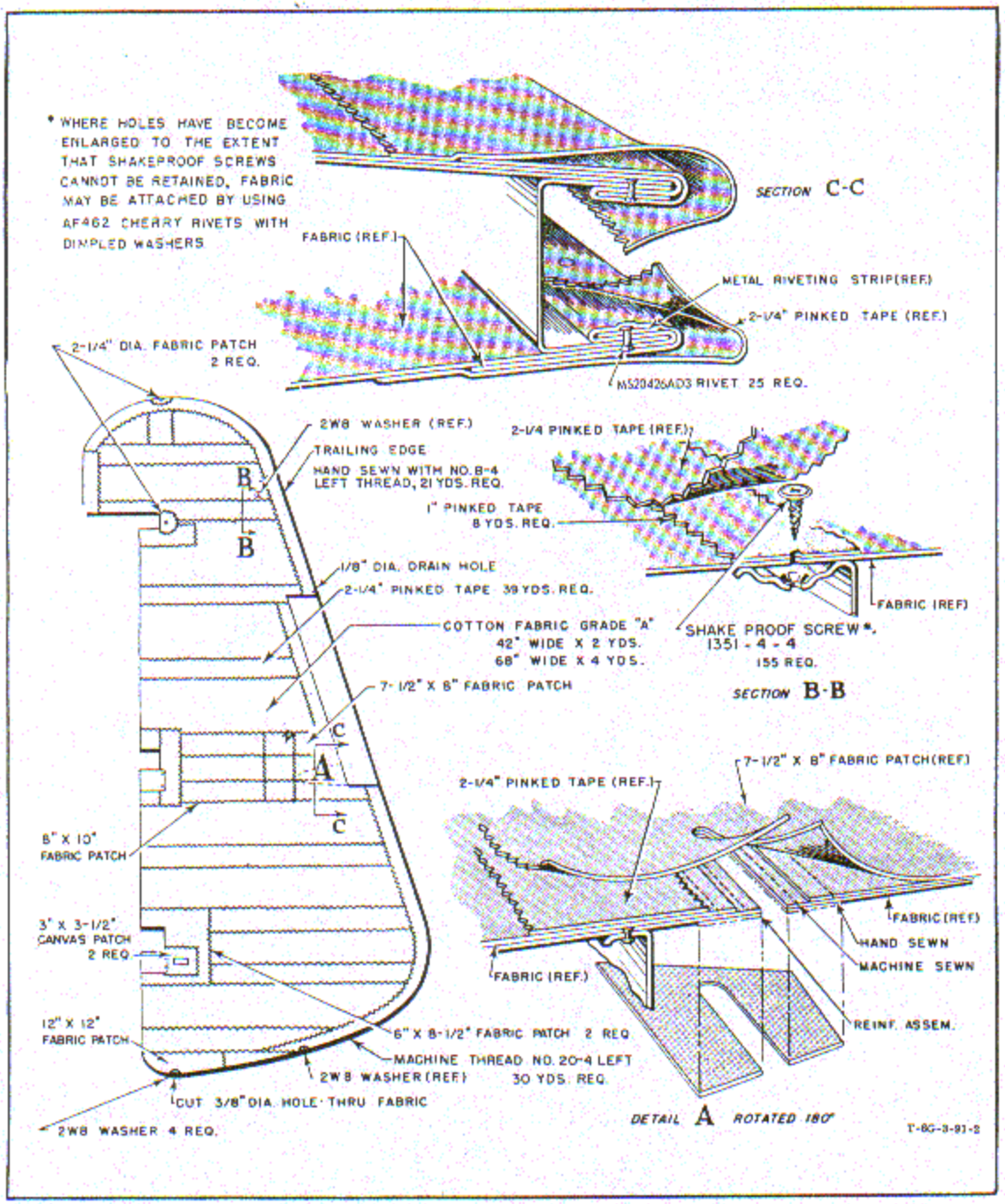


Figure 134 — Rudder Fabric Covering Requirements

the unsewed end of the fabric envelope has been pinned down in this manner, trim the excess fabric with a pair of regular or pinking shears. Cut the fabric on a line 1 inch from and parallel to the pins.

c. Apply a coat of dope around all hinge and access cut-outs and along the trim tab channel. Allow this dope to dry before removing the pins and stitching the unsewed edge. This action retains fabric tautness when the fabric is cut around all such cut-outs.

d. Hand sewing is required along the trailing edge where the machine stitching terminates, at both ends of the trim tab cut-out, and around all hinge and access cut-outs. Use a small curved sack needle and a single strand of No. 8, four-ply cotton hand-sewing thread. Use a baseball stitch with a minimum of four stitches per inch. Fold under material and start at point where machine stitching stops and proceed to leading edge, knotting thread every 6 inches. At both ends of the trim tab cut-out, use an overthrow or roll stitch. *(See figures 133, 134, and 135.)* At the hinge bracket cut-outs and the access cut-outs, small holes in the metal edges are provided for the stitches and the following method of stitching will be utilized.

e. Cut the fabric around the hinge cut-outs to within

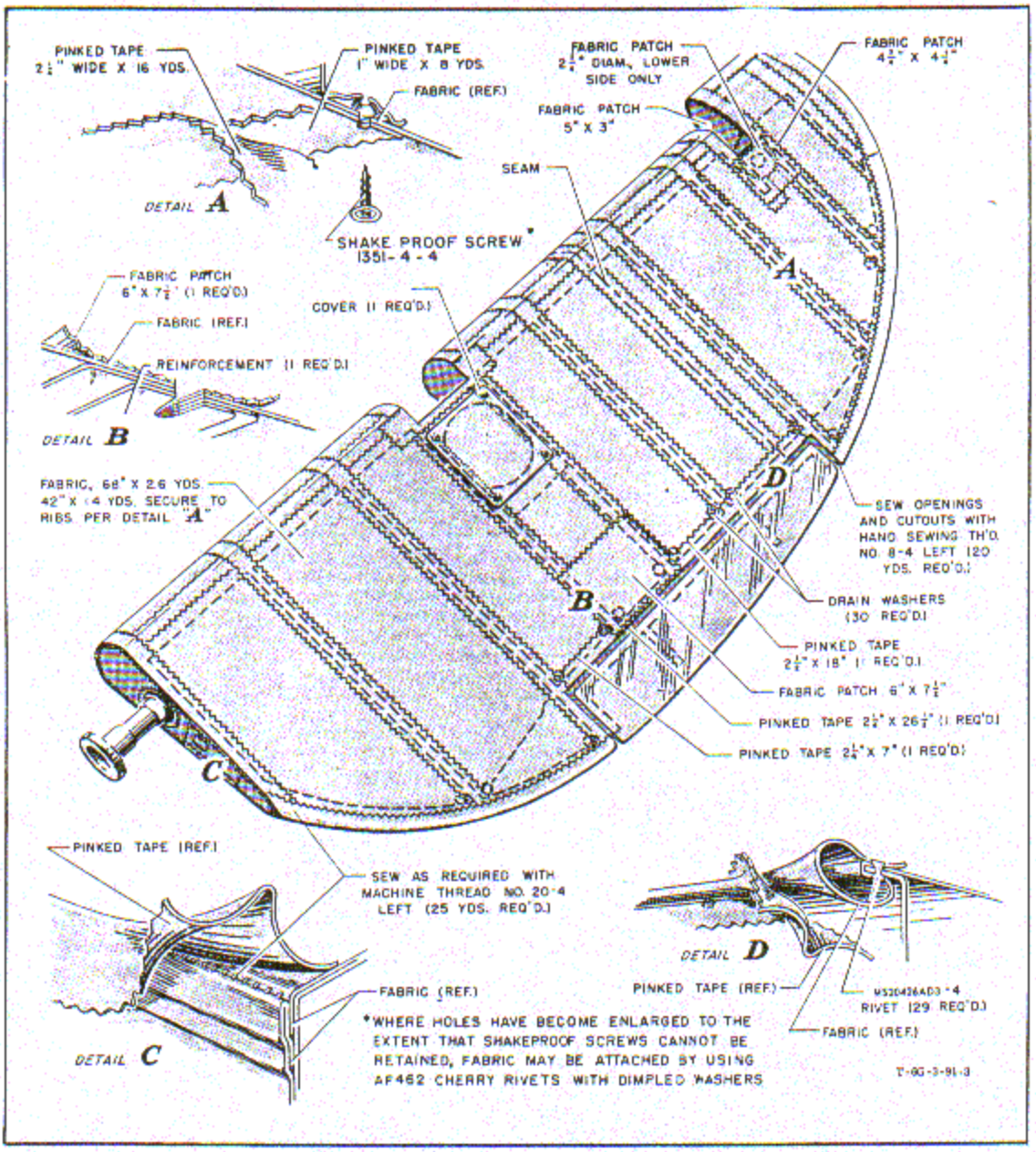


Figure 135—Elevator Fabric Covering Requirements

½ inch of the metal edge. Fold fabric under, providing double thickness around cut-out. Pass the needle through the fabric and the hole in one direction and back through the adjacent hole in the opposite direction for one complete circuit around the edge; reverse the direction and repeat circuit. *(See figures 133, 134 and 135.)*

At the aileron inboard cut-out similar stitching is utilized; however, the folded fabric is doubled over the metal edge, forming four thicknesses of fabric to sew through. *(See A, figure 133.)*

f. Pull the fabric taut around the trim tab opening, and pin the fabric. Cut the fabric diagonally into each corner of the trim tab opening. Fold the fabric under the attaching flange of the trim tab channel spar and place the metal riveting strip in alignment with the rivet holes in the flange. Punch holes through the two layers of fabric at each rivet hole, and insert and drive a MS20426AD3 rivet in each hole. Trim excess fabric to within 1-½ inches of the metal riveting strip; apply one coat of dope to the remaining fabric strip; turn the fabric back over the riveting strip and up on the fabric surface that covers the trim tab channel spar. *(See figures 133, 134 and 135.)*

g. Obtain or cut all reinforcing and finishing tape required from pre-doped fabric. Apply a coat of dope to fabric on each rib, and while this dope is still wet, center and pin a length of 1-inch pre-doped reinforcing tape over each rib of the trailing edge. Attach the

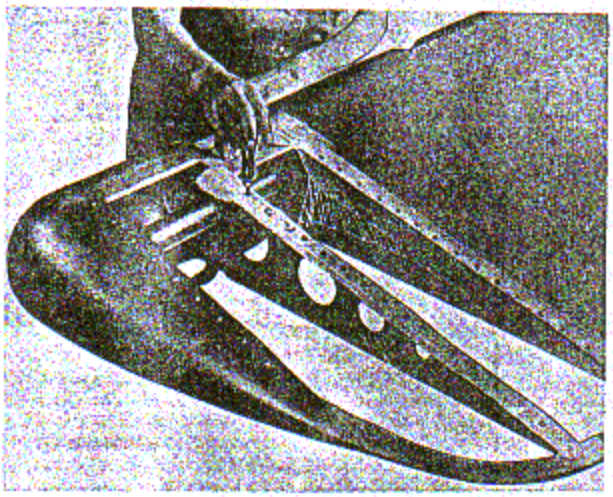


Figure 136 — Fabric Securing Method for "Between Rib" Repair

fabric covering to all ribs by inserting SP1351 Shake-proof screws and washers attached in the recesses provided in each rib cap strip. *(See figure 138.)*

h. Doping procedure is described completely in Section XIII, T. O. AN 01-1A-1, General Manual for Structural Repair.

i. After the first complete coat of dope has been put on fabric, apply all finishing tape along the ribs, trailing edge, all seams, and around all cut-outs. Obtain or cut from pre-doped fabric all reinforcing and finishing tape required. Apply simultaneously with second coat of dope, pattern following corresponding diagram *(figures 133, 134 and 135)* and procedure following *figure 2* Section XIII, in the General Manual for Structural Repair, AN 01-1A-1.

4. REMOVAL OF ENTIRE FABRIC COVERING.

To remove the old fabric covering from the entire structure, first tear the trailing edge tape free. Lift rib finishing tape and remove it. Remove all other finishing tape around cut-outs and over seams. Remove Shake-proof screws with screw driver, being careful to screw out, and not pull out, all rib screws. Pass a sharp knife about the trailing edge to cut all machine and hand stitching. Drill out the MS20426AD3 rivets in the two metal riveting strips at the trim tab cut-out. Carefully peel the covering forward, cutting attaching threads about the circumference of access holes and hinge cut-outs as necessary. After the covering is removed, clean the frame thoroughly with dope thinner and a clean cloth. Inspect the entire structure for damage.

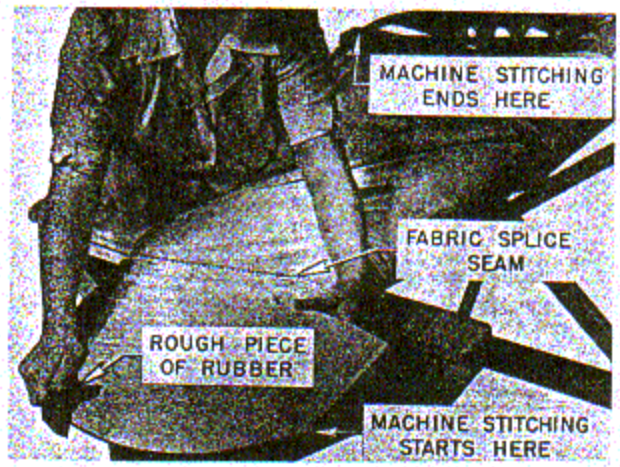


Figure 137 — Pulling New Fabric Cover Over Control Surface Structure

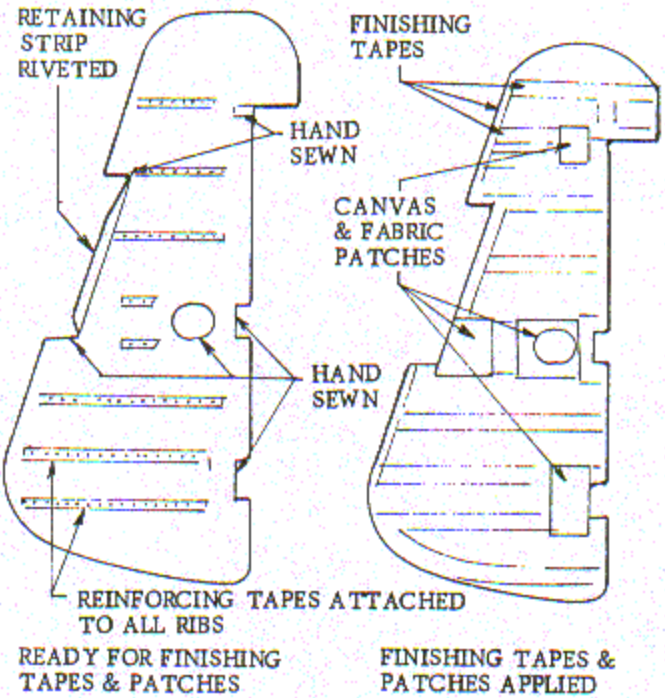


Figure 138 — Fabric Envelope Prior to First and Second Coats of Dope

5. ALTERNATE METHOD OF ATTACHING FABRIC TO CONTROL SURFACES.

When the screw holes in the ribs have become enlarged to the extent that screws or rivets cannot be securely installed, rib stitching may be used. *(See figure 138A.)*

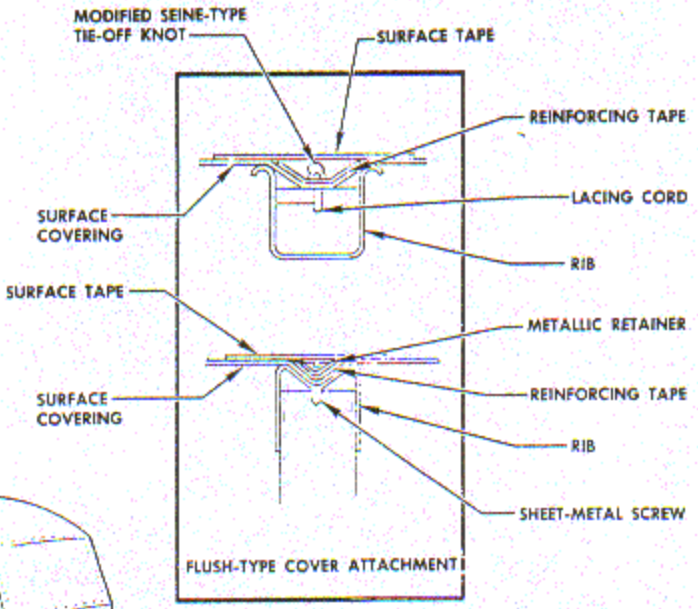
NOTE Rib stitching may be used for attaching the fabric to the control surface frames when the screw holes in the ribs have become enlarged.

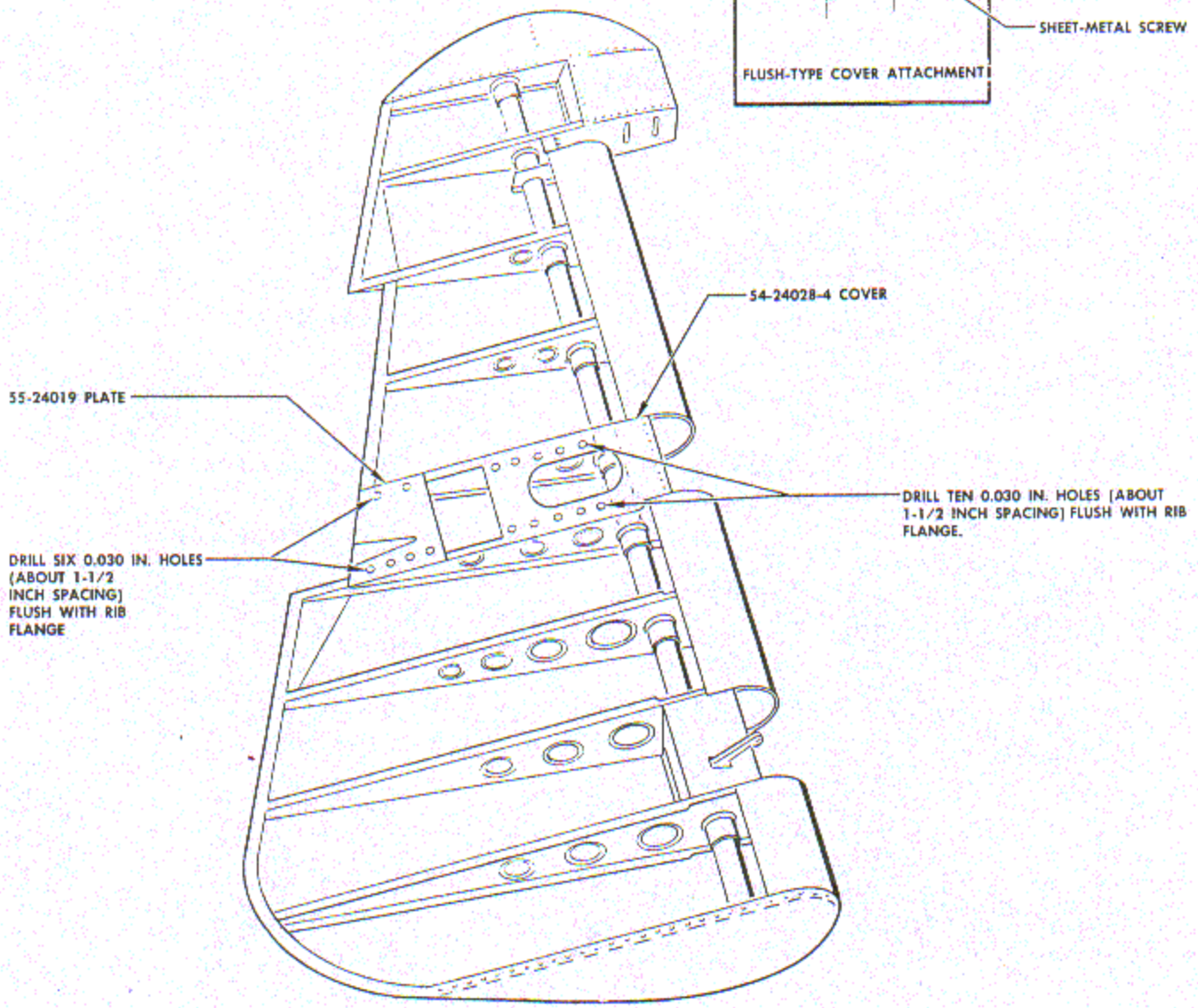
Under all rib stitching, use reinforcing tape (Specification MIL-T-5661). The width of the tape must be equal to the width of the member over which the tape is applied.

Attach fabric to frame using braided cotton cord (Specification MIL-C-5648).

The fabric attachment must be an approved flush type, as shown, or equal.

To ribs of control surface where no holes exist, provide required holes as shown.





T-6G-3-20-1

Figure 138A — Alternate Method of Fabric-covering Control Surfaces

TABLE I
AILERON, RUDDER, AND ELEVATOR COVERING MATERIALS

MATERIAL	USE	SPECIFICATION
Fabric, mercerized cotton	Covering for all airfoils	CCC-C-437
Tape	Reinforcing and finishing	MIL-T-5661
Canvas, 10 oz	Reinforce cut-out on rudder	CCC-C-419, Type III
Cloth, pre-doped	Reinforce trim tab actuating	MIL-C-5643
Thread, machine, No. 20 four-ply, left	All machine sewing	V-T-276, Type 1B1
Thread, hand-sewing, No. 8, four-ply, left	All hand sewing	V-T-276, Types 1B2 and 1B3
Washers, mercerized cotton	Draining	2W8
Screws, Shakeproof	Attaching fabric to metal structure (-6-4 used for repair; -4-4 used originally)	SP1351
Strip, 2024-T3 Alclad	Secures fabric to trim tab channel	QQ-A-362
Rivets	Fastens fabric to strip	MS20426AD3
Paste, aluminum-pigment aircraft	Doping procedure	TT-A-468
Dope, cellulose nitrate, clear	Doping procedure	MIL-D-5553, FSN 8010-168-8812
Thinner	Doping procedure	MIL-T-6095, FSN 8010-162-5289

SECTION VIII

EXTRUSION EQUIVALENT CHART

1. GENERAL.

(See figure 139.)

The various extrusions used in the repair of structural stringers, stiffeners, tees, angles, and spar caps are listed in the subsequent charts by the new NAA standard number, the second figure of which is always "E." To facilitate identification, the old number is also given. Each extrusion has a corresponding Alcoa die number, prefixed by "K" or "L." The suffix "T" indicates heat-treated material. All listed extrusions are formed of 2024-T4 aluminum alloy, AAF Specification QQ-A-267.

2. ROLLED SECTIONS AS EXTRUSION SUBSTITUTES.

In the event that certain extrusions are not available, a substitute rolled section has been listed wherever possible. These are 2024 aluminum alloy, AAF Specification QQ-A-355, heat-treated. Rolled section equivalents may be formed by a power brake, hand brake, or by a soft mallet and blocks of wood held firmly in a vise. While forming the substitute sections, carefully avoid making the radii sharper than specified.

3. ROLLED SECTIONS AS ORIGINAL MEMBERS.

Many of the stringers and certain angles are formed from rolled sections originally. These have been listed with NAA standard numbers and basic dimensions on a separate chart. These rolled sections are 2024 Alclad AAF Specification QQ-A-362.

4. HEAT-TREAT.

All 2024-O material must be heat-treated in accordance with instructions given in Section V, T. O. AN 01-1A-1, General Manual for Structural Repair.

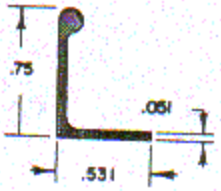
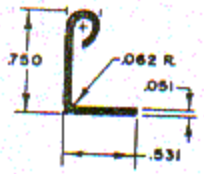
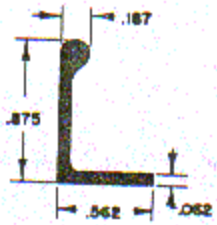
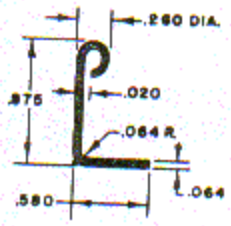
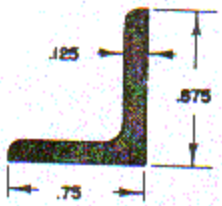
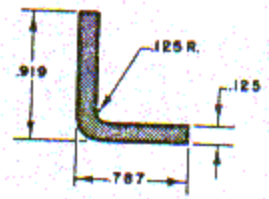
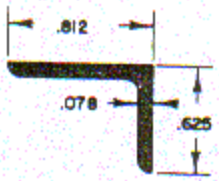
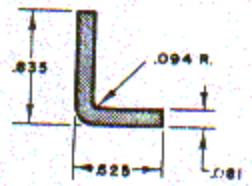
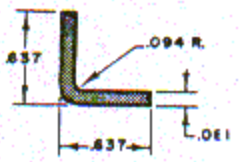
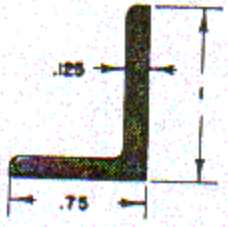
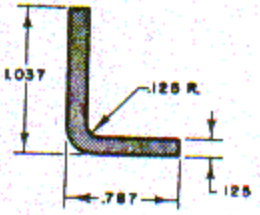
NA STANDARD NO.	ALCOA DIE NO.	BASIC DIMENSIONS	SUBSTITUTE ROLLED SECTION NO.	BASIC DIMENSIONS
1E2T (C180T)	K14280		1S100T (NONE)	
1E4T (C366T)	L24910		1S107T (NONE)	
1E87T (C250T)	K16869		1S71T (C617T)	
1E100T (C204T)	K14654		1S59T (C668T)	
1E101T (C203T)	K14653		1S89T (NONE)	
1E110T (C148T)	K734JJ		1S84T (NONE)	

Figure 139 (Sheet 1 of 2 Sheets)—Extrusion Equivalent Charts

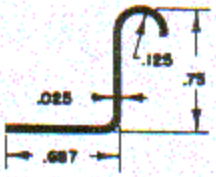
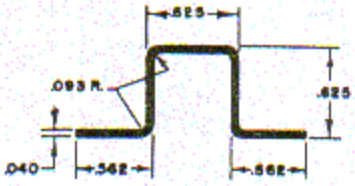
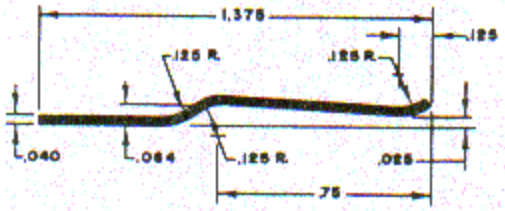
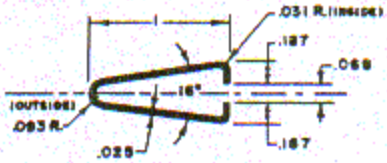
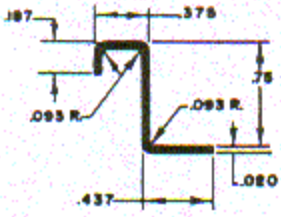
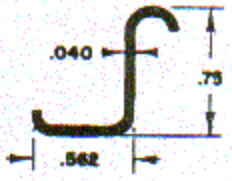
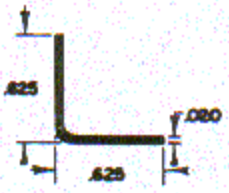
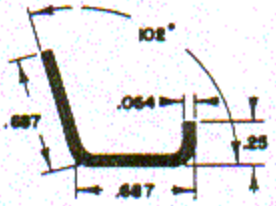
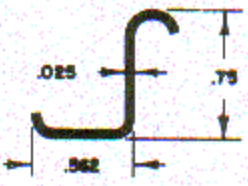
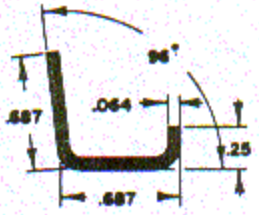
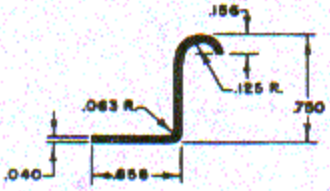
NA STANDARD NO.	BASIC DIMENSIONS	NA STANDARD NO.	BASIC DIMENSIONS
IS3LT (C373LT)		IS27LT (NONE)	
IS12LT (C371LT)		IS32LT (C144LT)	
IS13LT (C364LT)		IS40LT (C123LT)	
IS14LT (C107LT)		IS61LT (C265LT)	
IS23LT (C234LT)		IS62LT (C266LT)	
IS163LT (NONE)			

Figure 139 (Sheet 2 of 2 Sheets)—Extrusion Equivalent Charts

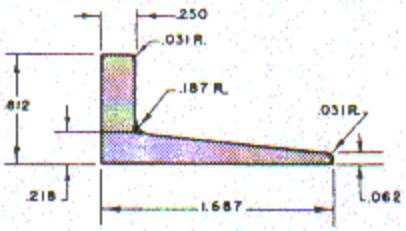
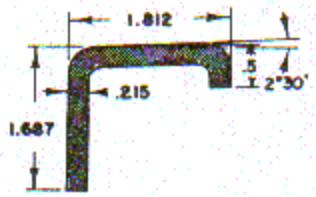
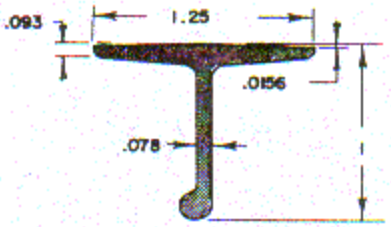
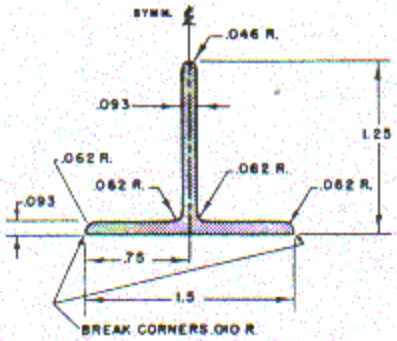
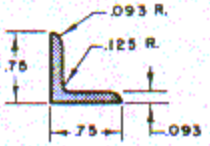
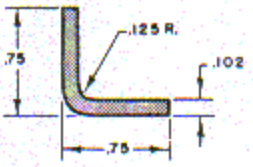
NA STANDARD NO.	ALCOA DIE NO.	BASIC DIMENSIONS	SUBSTITUTE ROLLED SECTION NO.	BASIC DIMENSIONS
1E116T (C108T)	K10293		NONE	
1E117T (C245T)	K16862		NONE	
4E6T (C274T)	L23966		NONE	
4E8T (C280T)	L24010		NONE	
NONE	K77A		NONE	
NONE	K78C		1S60T (C669T)	

Figure 140 — Rolled Sections

Appendix I

UNITED STATES-BRITISH GLOSSARY OF AERONAUTICAL NOMENCLATURE

UNITED STATES	BRITISH EQUIVALENTS
Accumulator	Accumulator or Pressure Reservoir
Air Controls or Cable Controls	Flying Controls
Air Duct	Interconnecting Sleeve or Trousers
Air Filter	Air Cleaner
Airplane	Aeroplane
Airplane Tail, Empennage, or Tail Group	Empennage or Tail Unit
Airport, Airfield, or Airdrome	Aerodrome
Airspeed Head or Pitot Tube	Pressure Head
Anchor Lights	Riding Lights or Mooring Lights
Antenna	Aerial
Artificial Horizon or Gyro Horizon	Artificial Horizon
Automatic Pilot, Gyro Pilot, Mechanical Pilot, or Robot Pilot	Automatic Pilot, Automatic Control, or George
Battery, Storage	Storage Battery or Accumulator
Binding Post	Terminal
Bulletproof Glass	Armour Glass
Cable Controls or Air Controls	Flight Controls
Calibrated Speed	Indicated Air Speed (A.S.I.)
Ceiling	Cloud Height
Center Section or Center Wing Panel	Centre Section or Centre Plane
Check Valve	Check Valve or Non-return Valve
Chord	Chord Line
Clevis	Clevis, Fork Joint, or Knuckle Joint End
Command Set	Pilot Controller Set
Cone, Split	Collet
Cone, Union	Nipple
Control Stick	Control Column
Controls, Air, or Cable Controls	Flying Controls
Converter	Converter or Motor Generator (A.C. to D.C.)
Cotter Pin	Split Pin
Driftmeter or Drift Indicator	Drift Sight
Empennage, Airplane Tail, or Tail Group	Empennage or Tail Unit
Engine Section (complete)	Power Plant
Feathering	Feathering or Differential Pitch-control
Filter, Air	Air Cleaner
Filter, Screen, or Oil Strainer	Filter
Firewall	Fireproof Bulkhead
Flare, Signal	Signal Projectile or Signal Star
Fuel Gage or Fuel Level Gage	Fuel-contents Gauge or Fuel Level Indicator
Fuel, Gasoline, or Gas	Fuel or Petrol
Gasket	Gasket, Joint, or Washer
Gasoline Capacity or Fuel Capacity	Fuel Volume or Petrol Volume
Gasoline, Gas, or Fuel	Fuel or Petrol
Generator	Generator or Dynamo
Glass, Armor, or Bulletproof Glass	Armour Glass
Gyro Horizon or Artificial Horizon	Artificial Horizon
Hardware	Ironmongery
Horizontal Stabilizer or Stabilizer	Tail Plane
Hydraulic Cylinder or Hydraulic Strut	Jack
Indicated Airspeed (IAS)	Air-Speed-Indicator Reading
Inspection Window	Inspection Port

UNITED STATES	BRITISH EQUIVALENTS
Interphone	Intercommunication or Intercom
Inverter	Motor Generator (D.C. to A.C.)
Landing Gear or Undercarriage	Alighting Gear, Undercarriage, or Chassis
Leading Edge Airfoil or Slat	Slat
Left	Port
Liaison Set	General Purpose Set
Life Raft	Dinghy
Lights, Anchor	Riding Lights or Mooring Lights
Lockring or Snap Ring	Circlip
Lock Washer	Spring Washer
Loop Antenna or Radio Loop	Loop Aerial
Manifold Pressure	Boost Pressure or Boost
Manifold Pressure Regulator	Boost Control Unit or Automatic Boost Control Unit
Manometer Pressure or Superpressure	Super-pressure
Meter, Drift, or Drift Indicator	Drift Sight
Meter, Frequency	Wavemeter
Monkey Wrench	Screw-spanner
Mooring Rings or Mooring Lugs	Picketing Rings
Mooring Spindle or Mooring Cone Outrigger	Mooring Spindle
Nut, Spanner	Ring Nut
Oil Cooler or Oil Radiator	Oil Cooler
Oil Strainer or Screen Filter	Filter
Outer Wing Panel or Outboard Panel	Outer Plane or Outer Main Plane
Pad	Accessory Mounting Face
Palnut	Locknut (type of)
Panel, Center Wing, or Center Section	Centre Section or Centre Plane
Panel, Outboard, or Outer Wing Panel	Outer Plane or Outer Main Plane
Pilot, Automatic, Gyro Pilot, Mechanical Pilot, or Robot Pilot	Automatic Pilot, Automatic Control, or George
Pin, Cotter	Split Pin
Pitot Tube or Airspeed Head	Pressure Head
Post, Binding	Terminal
Radio	Wireless
Radio Loop or Loop Antenna	Loop Aerial
Radio Operator	Wireless Operator
Raft, Life	Dinghy
Rib, Former, or False Rib	Nose Rib
Right	Starboard
Ring, Lock, or Snap Ring	Circlip
Rings, Mooring, or Mooring Lugs	Picketing Rings
Screen Filter or Oil Strainer	Filter
Screw, Cap	Set Screw
Screw, Fillister	Cheese-headed Screw
Screw, Flat Head	Countersunk-head Screw
Seal, Valve	Jam Pot Cover
Setscrew or Headless Setscrew	Grub Screw
Shield or Screen (ignition)	Ignition Harness or Screening
Signal Flare	Signal Projectile or Signal Star
Slat or Leading Edge Airfoil	Slat
Snap Ring or Lockring	Circlip
Socket Wrench	Box Spanner
Spanner Nut	Ring Nut
Speed, Calibrated	Indicated Air-speed (A.S.I.)
Speed, Indicated Air (IAS)	Air-Speed-Indicator Reading
Split Cone	Collet
Stabilizer or Horizontal Stabilizer	Tail Plane
Stabilizer, Vertical, or Tail Fin	Fin
Stack	Pipe (single)

UNITED STATES	BRITISH EQUIVALENTS
Static Tube	Static-pressure Tube
Stick, Control	Control Column
Storage Battery	Storage Battery or Accumulator
Strut, Oleo, or Air-Oil Strut	Compression Leg, Shock Absorber Leg, or Oleo Leg
Supercharger, Reciprocating-type	Piston-type Supercharger
Superpressure or Manometer Pressure	Super-pressure
Tachometer	Tachometer, Engine Speed Indicator, Revolution Indicator, or Rev. Counter
Tail Fin or Vertical Stabilizer	Fin
Tail Group, Airplane Tail, or Empennage	Empennage or Tail Unit
Traffic Control Projector	Traffic-control Light
Tube (radio)	Valve
Tube, Static	Static-pressure Tube
Union Cone	Nipple
Valve	Valve or Cock
Valve, Jettison, Dump Valve, or Emergency Fuel-release Valve	Jettison Valve
Valve Seal	Jam Pot Cover
Vent	Vent-pipe
Vertical Stabilizer or Tail Fin	Fin
Washer, Lock	Spring Washer
Weight, Empty, or Dead Load	Tare Weight or Tare
Weight, Fixed Power Plant	Gross Dry-weight
Weight, Gross, or Full Load	Gross Weight or All-up Weight
Window, Inspection	Inspection Port
Windshield	Windscreen
Wing	Main Plane
Wires, Fairing	Circumferential Outer-cover Wires
Wrench, Monkey	Screw-Spanner
Wrench, Socket	Box Spanner

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