

(This Service Bulletin Supersedes Service Bulletin M20-170)

SUBJECT:

INSTRUCTIONS TO PREVENT VIOLATIONS
OF STANDARD AIRCRAFT PRACTICES FOR
MAINTAINING WOOD STRUCTURES

MODELS AFFECTED:

M20 and M20A, all serial numbers

TIME OF**COMPLIANCE:**

Immediate compliance is required. Installation of a metal empennage is mandatory within one year. Compliance with instructions in Service Bulletin M20-170A are mandatory before further flight with the wood empennage unless already accomplished.

Service Bulletin M20-170A must be accomplished by individuals who are skilled in the inspection, maintenance and repair of wood structures. You may consult the FAA or the Mooney Customer Service Department for guidance as necessary.

INTRODUCTION:

The recent issuance of Mooney Service Bulletin M20-170 (dated 12-9-68) and the subsequent Airworthiness Directive 68-25-6 (Amendment 39-695) forcing compliance with M20-170 have exposed an alarming number of wood repair malpractices, inadequate inspections and unauthorized maintenance by apparently novice repairmen. As a result of these findings, which continue to be reported, it must be assumed that a sufficient number of cracked, deteriorated or improperly repaired wood components are still in service to justify mandatory grounding of these aircraft until at least the following Inspection Instructions of this bulletin are verified for the owner.

Figure 7 is an example of a fin that had flown two weeks before Airworthiness Directive 68-25-6 was released. This fin had passed a visual inspection by an authorized mechanic but failed the detailed inspection of previous Service Bulletin M20-170 Part II D 1, 2. The cracked spar was visible only after removing apparently good fabric and some deteriorated skin. More detailed Inspection Instructions are in-

cluded in this Service Bulletin to prevent oversight during inspection of this area.

The continuous inspections do not relieve the owner or operator from adequately protecting the aircraft to help prevent wood deterioration. (Reference FAR Part 91 which states that "the owner or operator of an aircraft is primarily responsible for maintaining that aircraft in an airworthy condition. . . . In addition, he shall ensure that maintenance personnel make appropriate entries in the aircraft and engine records indicating the aircraft has been released for service."

This Service Bulletin supersedes Mooney Service Bulletin M20-70 dated May 26, 1960 and M20-170 dated December 9, 1968.

INSTRUCTIONS: PART I:

REWORK OF WOOD EMPENNAGE BEFORE NEXT FLIGHT.

Rework the wood empennage before further flight, unless all of the requirements of this revised Service Bulletin have been individually and collectively accomplished in complying with Mooney Service Bulletin M20-170 and Airworthiness Directive 68-25-6 or unless metal empennage is installed.

- A. Remove all the fabric from the horizontal and the vertical stabilizers and carefully inspect all the wood skin for condition, and the wood skin attach areas for separation of glue joints (reference Figures 2 and 3). Gently flexing adjacent parts and tapping joints with a small plastic mallet or hammer while listening for variations or changes in the sounds emitted are recognized aids during visual inspection. Flex and closely inspect the glue joints between the wood skin and main spar at bottom fin rib. **IF THE WOOD SKIN IS CRACKED, DISCOLORED, DETERIORATED, OR NOT ATTACHED TO THE FIN MAIN SPAR AT THE BOTTOM RIB, REMOVE THE SKIN IN THIS AREA AND CAREFULLY INSPECT THE SPAR FOR CRACKS AND DETERIORATION. THE WOOD SKIN SHOULD BE REMOVED IN THIS AREA REGARDLESS OF CONDITION UNLESS THE INSPECTOR CAN ASSURE HIMSELF THAT THE SPAR IS NOT DAMAGED. THE FIN MAIN SPAR SHOULD ALSO BE CAREFULLY INSPECTED BELOW THE BOT-**

TOM RIB (reference Figure 3 and 7). The fin main spar below the bottom rib should not be covered with fabric or dope. This will cause a water trap and cause deterioration of wood.

Closely inspect those areas which have had fabric patch and tape repairs. Repairing cracked and damaged fabric areas without inspecting the wood skin first may have left trapped moisture which has resulted in concealed deterioration growth.

- B. Add inspection access holes per instructions noted on Figures 1 and 2.
- C. Install two straps on bottom aft area of the fin per instructions noted on Figure 1 (Detail A).

INSTRUCTIONS: PART II:

INSPECTION OF THE WOOD EMPENNAGE

- A. Mandatory at the initial inspection and at each 90 day interval thereafter.
 - 1. Inspect and clean all drain holes. Note: If drain holes are found obstructed, inspection is required at a more frequent interval than 90 days.
 - 2. Remove the fairings from both sides of the tail-cone at the empennage attach points and inspect the front spar faces of the fin and horizontal stabilizer. (Figures 2 and 3.)
 - 3. Inspect the cluster hinge bracket and adjacent wood structure at the aft fin attach point.
 - 4. Inspect all exterior empennage surfaces for loose, cracked, or broken fabric. Remove the fabric from all suspicious areas and inspect the wood structures underneath.
 - 5. Remove the water-proof tape on the right and left side of the horizontal stabilizer and inspect the wood structure. Reinstall tape as shown in Figure 4.
 - 6. Remove the inspection access hole coverings on the fin and horizontal stabilizer and inspect the interior structure.

7. Accomplish the full initial inspection requirements whenever wood deterioration is detected.
- B. Mandatory at the initial inspection and at the 180 day inspection.**
1. Accomplish all inspection requirements noted in above Item II-A.
 2. Disconnect the rudder and elevator control rods at the control horns.
 3. Remove the empennage trim link bolt.
 4. Remove the tail stinger attaching bolts at the four attach points and remove the stinger assembly.
 5. Remove the upper empennage attach bolts.
 6. Remove the empennage assembly.
 7. Remove the vertical fin.
 8. Remove the tail truss assembly. Inspect the bolts and bushings for rust, corrosion, and elongated bolt holes. Inspect the wood for evidence of discoloration and deterioration.
 9. Inspect the empennage attach fittings and bolts for wear and elongated bolt holes.
- C. Mandatory at the initial inspection.**
1. Accomplish all inspection requirements noted in above Item II-B.
 2. Remove the rudder and elevator control surfaces.
 3. Inspect the rudder and elevator hinge fittings.
 4. Inspect the bolts and bushings for evidence of rust or corrosion. Inspect the wood for discoloration and deterioration. (Refer to Figures 2 and 3.)
 5. Check the ADF Antenna on aircraft equipped with and ADF for the following:
 - a. 8 lbs. maximum tension on the antenna with one inch extension of the antenna spring with aircraft trimmed full nose up.
 - b. 30 lbs. maximum tension on the antenna with aircraft trimmed full nose down.

6. Comply with Service Bulletin No. 20-62.

D. GENERAL INSPECTION REQUIREMENTS AND REWORK RECOMMENDATIONS

Applicable on the 90, 180, and initial inspection.

1. Carefully inspect all the skin attach areas (reference Figures 2 and 3) for separation of glue joints by gently flexing adjacent parts or by tapping the joints with a small plastic mallet or hammer while listening for variations or changes in the sounds emitted. Rework all separated glue joints before further flight.
2. Remove the fabric from all suspect areas and inspect the wood for discoloration and deterioration.
3. Discoloration penetrating into the wood grain is considered evidence of wood deterioration. Sand all discolored areas to determine the depth of penetration into the wood grain. Repair all stained and/or deteriorated wood before further flight.
4. Finish all the repaired or replaced wood with at least two coats of sealer or spar varnish on the interior surfaces. Do not allow sealer to contact the joint surfaces which are to be glued, as the glue will not adhere to the sealer. Exterior surfaces where fabric will contact should be coated with dope-proof spar varnish or sealer. Coat the exposed end-grain in drain and vent holes with spar varnish or sealer and apply a final coat of aluminized spar varnish.
5. Apply fabric patches to all the areas where fabric has been removed for inspection of the wood. Allow the patch to overlap existing fabric at least two inches. Apply fabric patches over all the exposed wood surfaces including areas under fittings, etc. Do not cover the vertical fin spar stub-end which attaches to the horizontal stabilizer.
6. Refinish patched areas to match the existing finish.
7. Add a piece of water-proof tape on the right and left side of the horizontal stabilizer as shown in figure 4.

8. Accomplish any repairs required in the wood empennage in accordance with FAA AC 43.13-1 as required by FAR Part 43.

INSTRUCTIONS: PART III:

INSPECTION OF WOOD WINGS

Mandatory at the initial inspection unless already accomplished and at each annual inspection thereafter if conditions and environment do not warrant a more frequent inspection as noted:

1. Remove the wing to fuselage fairing and fillets.
2. Remove all the wing and center section access doors and panels. (Refer to Figure 5.)
3. Remove the sealing tape at the wing-fuselage joint and inspect the areas around the fittings for evidence of deterioration or joint separation.
4. Remove the rear seat and auxiliary fuel tank for access to the wing center section.
5. Remove the wing flaps and ailerons. Inspect the bolts, bearings and bushings for evidence of rust, corrosion and wear.
6. Check condition of the wing flap and aileron hinge fitting attach bolts and bushings. (Refer to Figure 6.)
7. Inspect the wood end-grain surrounding bolt holes for evidence of rust, discoloration, deterioration and evidence of moisture accumulation at the trailing edges of the wings.
8. Comply with Service Bulletins No. 20-29 and 20-67.
9. Inspect and clean all the drain holes in the lower wing skins. (Minimum 90 day inspection recommended.)
10. Inspect the fuel scupper areas for sealant condition between the scupper boxes and wing structure.

General inspection requirements and rework recommendations.

- a. Carefully inspect all the skin attach areas for separation of glue joints by gently flexing the adjacent parts or by tapping the joints with a small plastic

- mallet or hammer while listening for variations or changes in the sounds emitted. Rework all separated glue joints before further flight (reference Figure 6).
- b. Remove the fabric from all suspect areas and inspect the wood for discoloration and deterioration.
 - c. Discoloration penetrating into the wood grain is considered evidence of wood deterioration. Sand all the discolored areas to determine the depth of penetration into the wood grain. Repair all the stained and/or deteriorated wood before further flight.
 - d. Finish all the repaired or replaced wood with at least two coats of sealer or spar varnish. The exterior surfaces of wood should be coated with dope-proof sealer or spar varnish. Coat the exposed end-grain in vent and drain holes with sealer or spar varnish and apply a final coat of aluminized spar varnish.
 - e. Apply fabric patches to all areas where fabric has been removed for inspection of the wood. Allow patches to overlap the existing fabric at least two inches. Apply the fabric patches under the wing flap and aileron hinge fittings where the wood is exposed by cutouts in the existing fabric.
 - f. Apply a coat of aluminized sealer or spar varnish to the wheel well area and wing center section as required, in accordance with Service Bulletin M20-67.
 - g. Any repairs required in the wood wing must be accomplished in accordance with FAA AC 43.13-1 as required by FAR Part 43.

INSTRUCTIONS

PART IV:

REPLACEMENT OF THE WOOD EMPENNAGE WITH AN ALL-METAL EMPENNAGE

Replacement of the wood empennage with an all-metal empennage relieves the owner or operator from the rework and inspection requirements applicable to the wood empennage. Instructions and a kit enabling the replacement of the wood empennage assembly with an all-metal empennage assembly is supplied with Service Bulletin Kit 20-170-1.

INQUIRIES CONCERNING THIS MODIFICATION OF M20 AND M20A AIRCRAFT SHOULD BE ADDRESSED TO MOONEY CORPORATION, CUSTOMER SERVICE DEPARTMENT, BOX 72, KERRVILLE, TEXAS 78028

**COMPLIANCE
NOTIFICATION:**

To comply fully with this bulletin, complete and mail a Service Bulletin Compliance Card upon completion of inspection requirement, or installation of Service Bulletin M20-170-1 metal empennage kit.

**SERVICE BULLETIN
KITS:**

A limited number of wood wing aircraft spare parts are available at Mooney Corporation, Spare Parts Department. No wood wing or empennage parts will be built by Mooney Corporation in the future. Service Bulletin M20-67 Kits are no longer available. Guidance as to materials acceptable for local manufacture of wood parts in accordance with FAA AC 43.13-1 is contained in Service Bulletin M20-67.

**SERVICE BULLETIN
M20-170-1 KIT:**

METAL EMPENNAGE KIT

This kit is available to each M20/20A owner at \$860.00 plus tax F.O.B. Kerrville, Texas. These kits will be shipped only on instructions from registered M20/20A owners after "N" number, S/N verification.

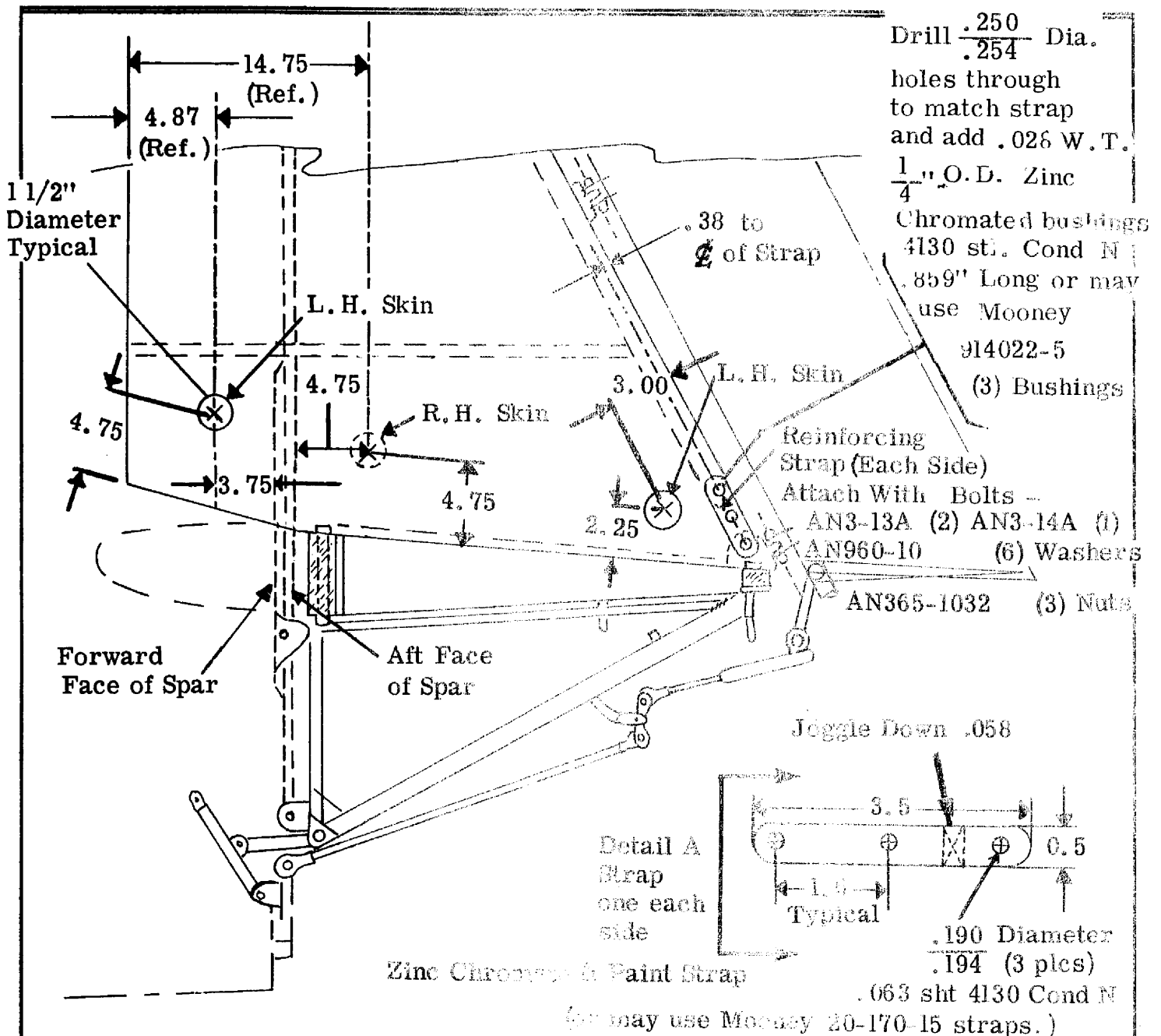
This is a special quantity production kit price established as non profit support for affected Mooney owners. Price is subject to change or withdrawal without prior notice and in no case will exceed one year from date of this bulletin. This offer is not intended to alter company policy or set a precedent for future claims.

Service Bulletin M20-170-1 metal empennage kit may be ordered directly from the factory (Phone 512-257-4043).

**SERVICE BULLETIN
M20-170-2 KIT:**

Repair Parts - This kit may be purchased through your local Mooney dealer or distributor

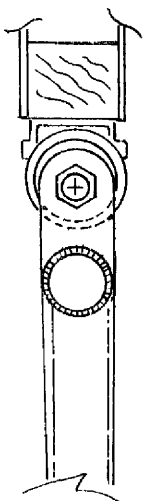
| | |
|------------|--------------|
| M20-170-15 | (2) Straps |
| 914022-5 | (3) Bushings |
| AN3-13A | (2) Bolts |
| AN3-14A | (1) Bolt |
| AN365-1032 | (3) Nuts |
| AN960-10 | (6) Washers |



Note: Glue joints are found wherever the wood contacts the internal structure e.g.: spar, rib, stringer, etc.

FIG.1 EMPENNAGE INSTALLATION

Add access holes 1.5 inches diameter (smooth all edges) close holes using 5.5 inch diameter doped patches. Install reinforcing straps (P/N 20-170-15) or its equivalent picking up top cluster fitting attach bolt. (See Detail A use bolt sizes noted above) Install the bushings (P/N 914022-5) by first saturating the holes with spar varnish.



Elevator Hinge Detail

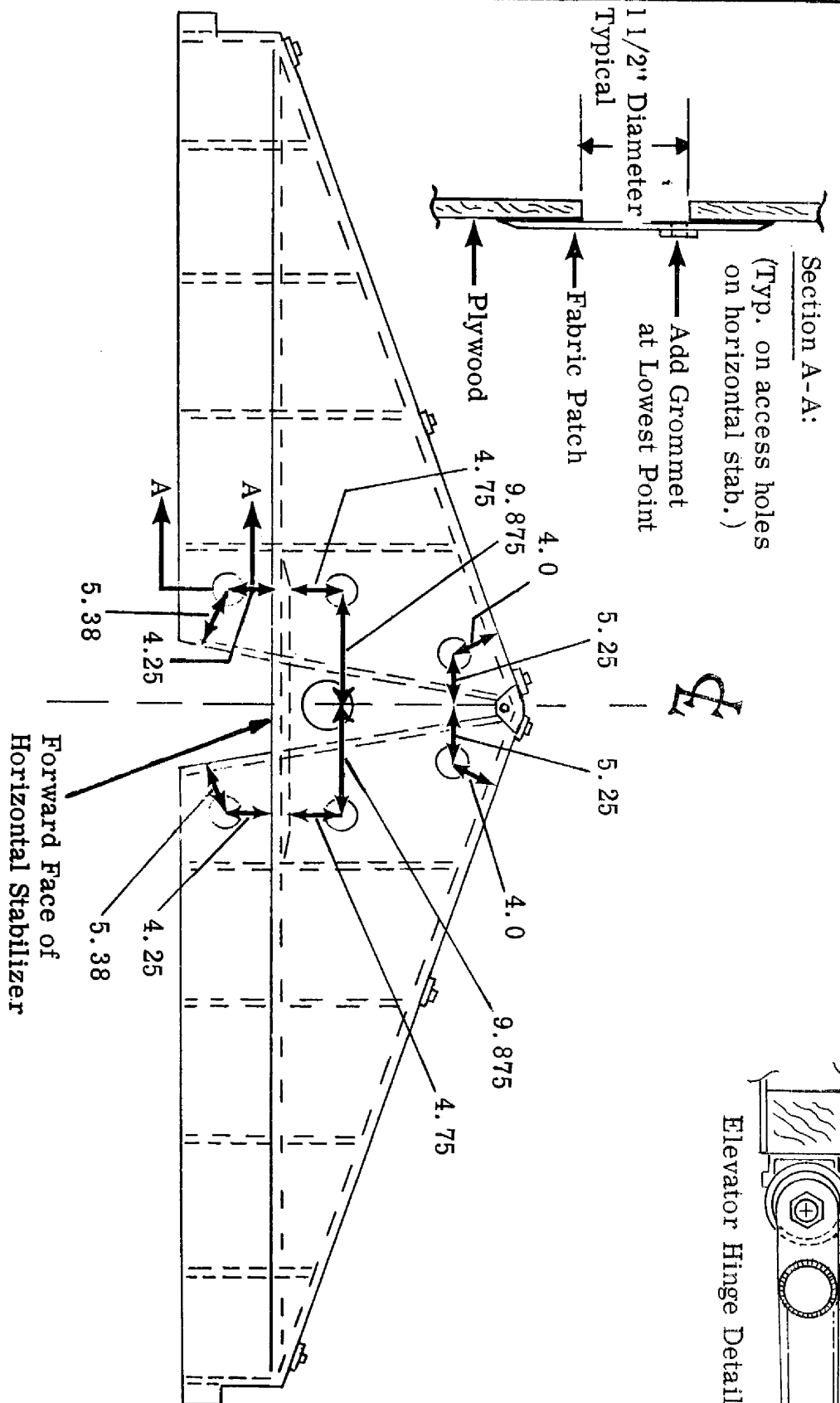
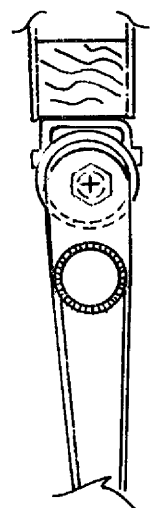


FIG. 2 STABILIZER BOTTOM VIEW

Add access holes 1.5 inches diameter in bottom skins as shown. (smooth all edges.) Close holes using 5.5 inch Dia. doped patches. Also add grommets to fabric patches approximately as shown.

Note: Glue joints are found wherever the wood contacts the internal structure e.g.: spar, rib, stringer, etc.



Rudder Hinge Detail

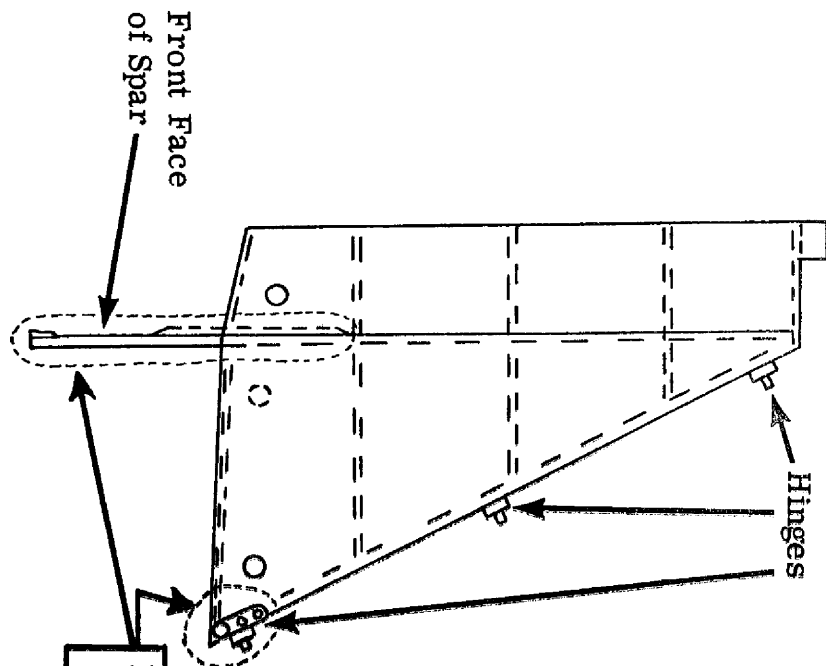


FIG. 3 FIN ASSEMBLY

Note: Glue joints are found wherever the wood skin contacts the internal structure e.g.: spar, rib, stringer, etc.

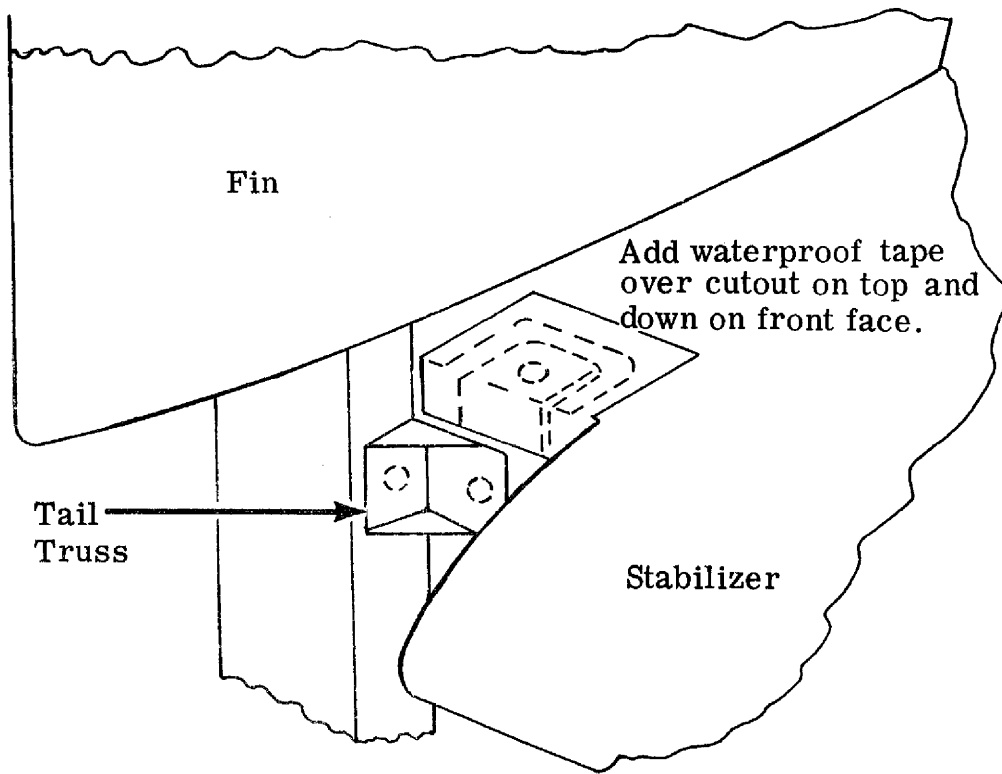


FIG. 4

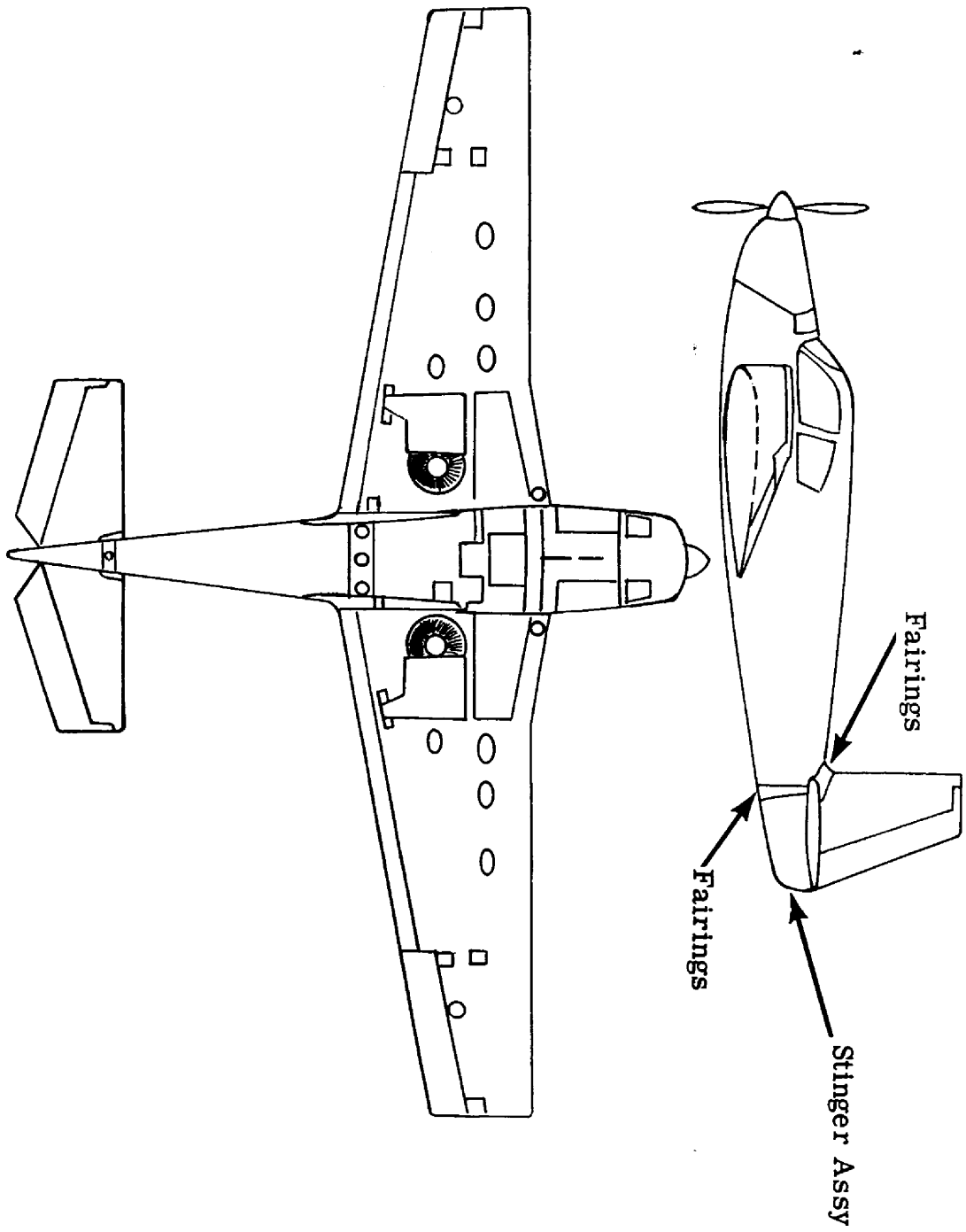


FIG.5 ACCESS DOORS & PANELS

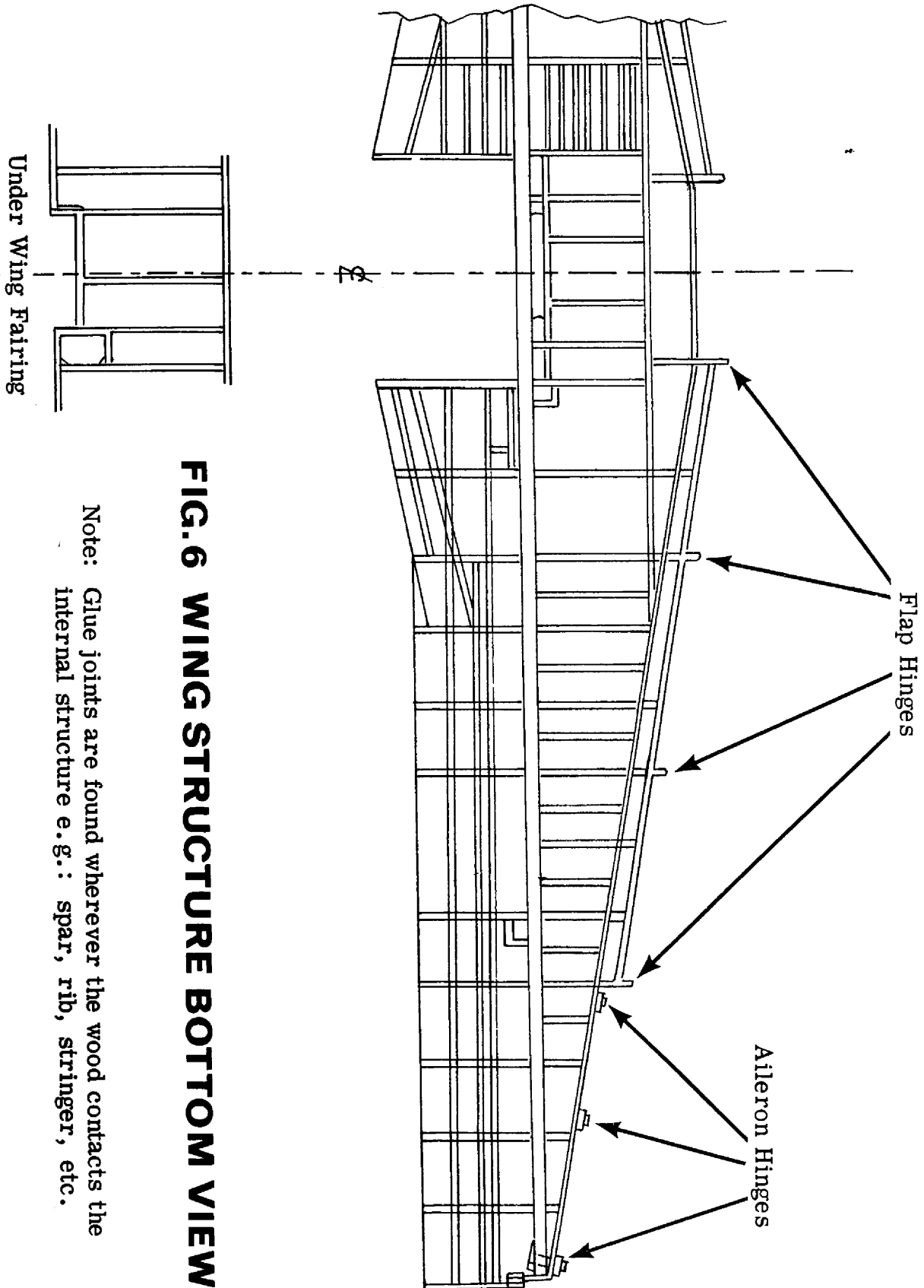
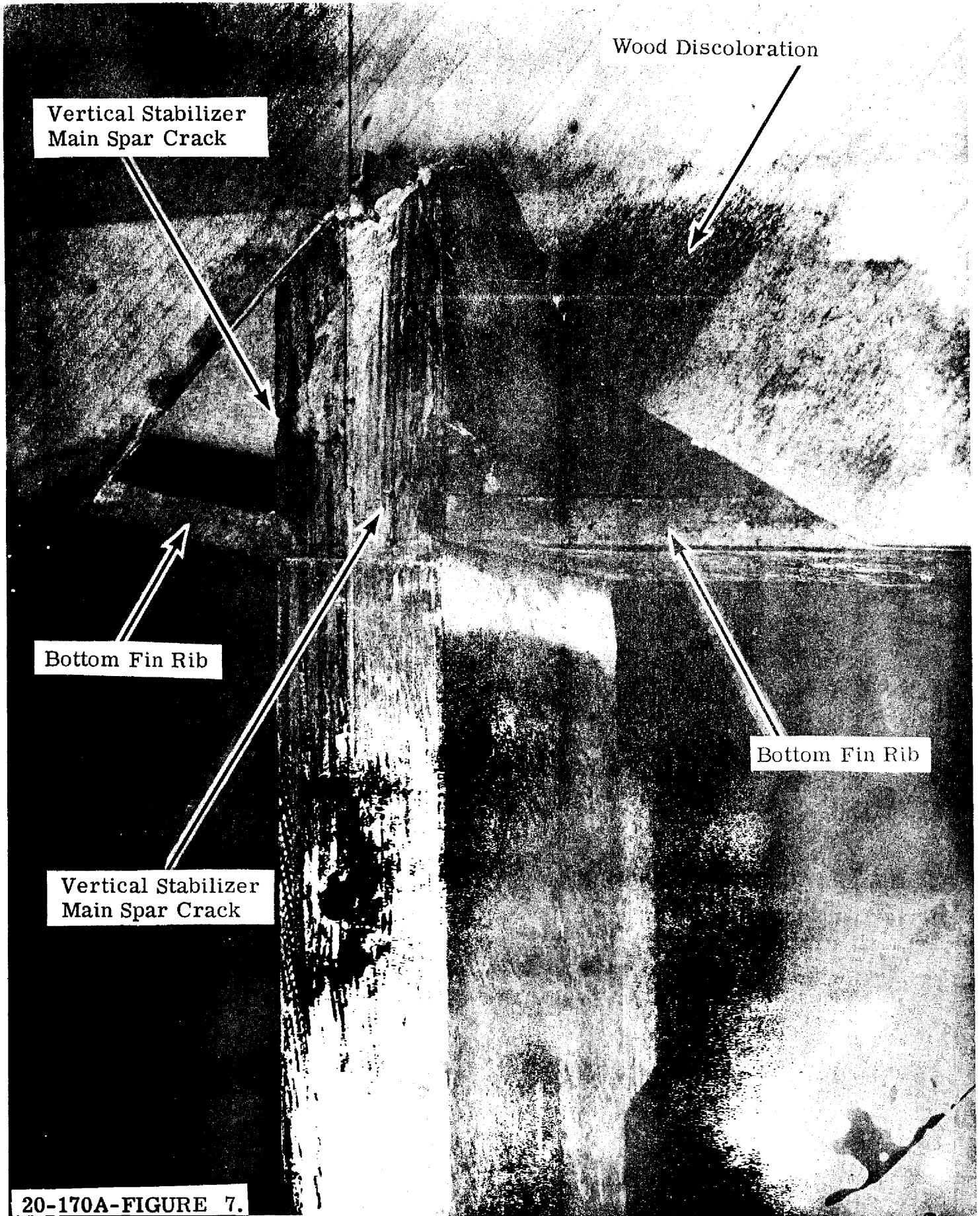


FIG. 6 WING STRUCTURE BOTTOM VIEW

Note: Glue joints are found wherever the wood contacts the internal structure e.g.: spar, rib, stringer, etc.



20-170A-FIGURE 7.