

USAAMRDL-TR- 75-25B



**BONDED FIELD-REPLACEABLE ROTOR BLADE POCKET
FOR THE CH-54B**

Volume II - Instruction Manual

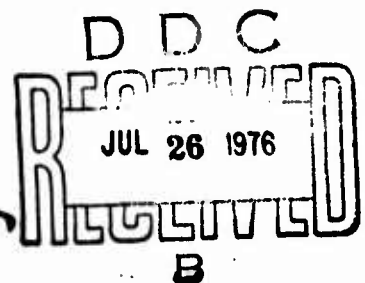
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**Sikorsky Aircraft Division
United Technologies Corporation
Stratford, Conn. 06497**

June 1976

Final Report for Period 5 June 1973 - 5 May 1974

Approved for public release;
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Prepared for

**EUSTIS DIRECTORATE
U. S. ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LABORATORY
Fort Eustis, Va. 23604**

EUSTIS DIRECTORATE POSITION STATEMENT

This report is presented in two volumes. Volume I provides a discussion of the purpose and objective of the study together with a description of the design and fabrication efforts and the results of a 6-month field service evaluation. Volume II is the instruction manual for the bonded field-replaceable rotor blade pocket.

This effort is one of several related activities conducted by this Directorate leading to the definition of improved field repairability of helicopter rotor blades. USAAMRDL Technical Report 72-69, dated February 1973, describes the field-replaceable pocket concept that was evaluated under this contract.

This report has been reviewed by the Eustis Directorate and is considered to be technically sound. Specifically, the metal-to-metal bonding technique described in the report is believed to represent a significant technical achievement and indicates that metal blade field repairs can be much more extensive than presently allowed by Army maintenance practices. This Directorate is currently planning a program to examine nonpocket metal blade field repairability limits and preferred repair techniques; initiation is scheduled for late FY76.

The technical monitor for this contract was Mr. Thomas E. Condon of the Military Operations Technology Division.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Volume II presents the instructions for installing field-replaceable pockets on CH-54B main rotor blades. It is the end result of experience gained from in-house activity and army personnel installing pockets at Sikorsky's Stratford, Conn. plant and in the field at Fort Wainwright, Alaska, and Fort Eustis, Va. The instruction manual is part of a self-contained kit which has all the necessary components to make a field repair. Volume I contains the results of pocket and adhesive development and evaluation; the final pocket design and adhesive were successfully proof load, fatigue, whirl and flight tested.		

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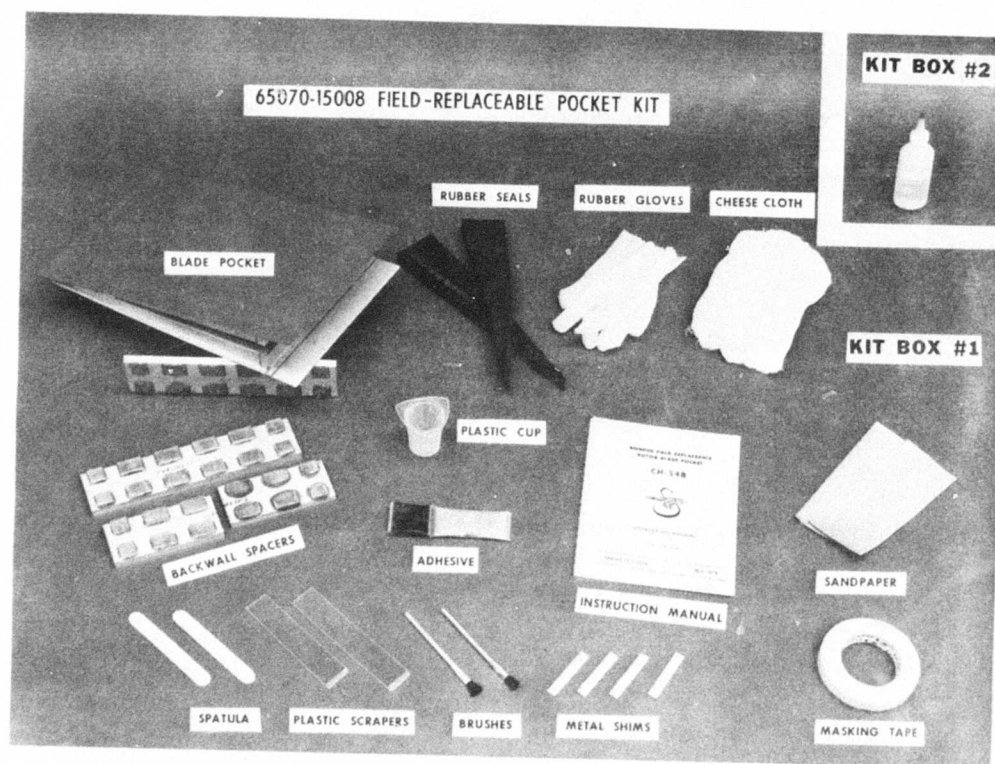
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CH-54B BONDED FIELD-REPLACEABLE ROTOR BLADE POCKET

INSTRUCTION MANUAL

For installing EWR 38633 Bonded Field Replaceable Pockets on CH-54B main rotor blades.

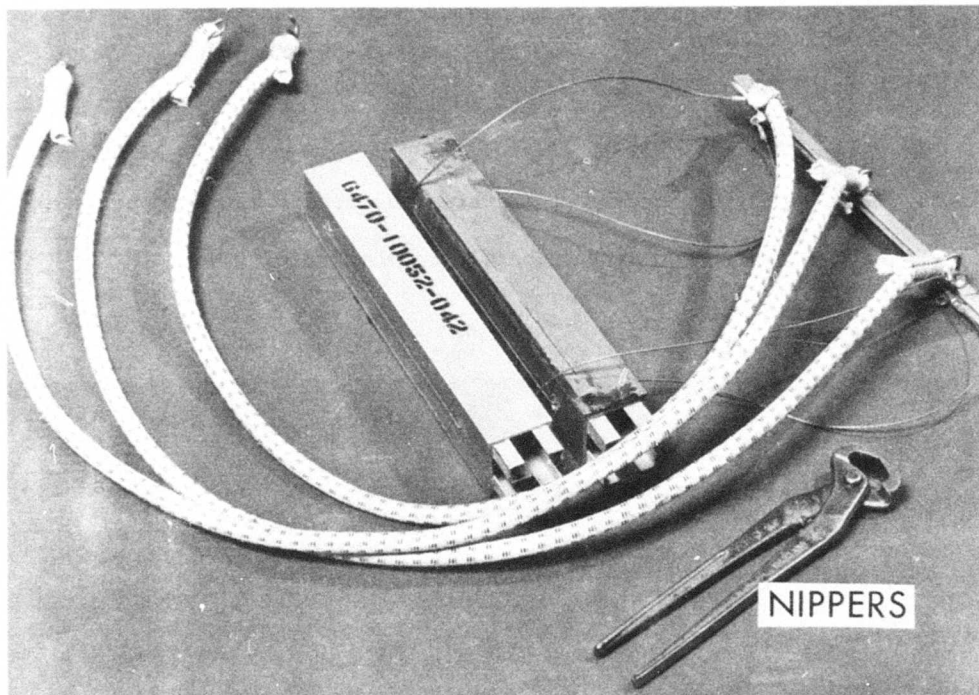
1. Procure a 64070-15008 replaceable pocket kit. This consists of two boxes; box number 1 contains the repair kit components and box number 2 contains a bottle of commercial grade ethyl alcohol solvent..



POCKET KITS

Also, procure a 64070-15009 Field Bonding Kit which contains an EWR

6470-10052 Bonding Fixture and a Sears Roebuck Cutting Nipper #9HT-45241



FIELD BONDING KIT

2. Obtain the cutting nippers from the field bonding kit and remove the damaged pocket from the blade by following the instructions and Figures 1 through 16.

NOTE: Follow closely the exact sequence of operations to prevent damage to adjacent pockets or spar.

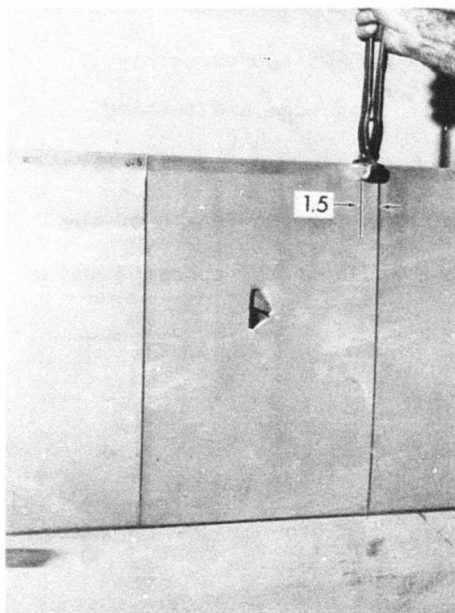


FIGURE 1

- (a) Cut through the trailing edge of the pocket to be removed with the cutting nippers, with a back and forth motion; see Figures 1, 2, and 3.

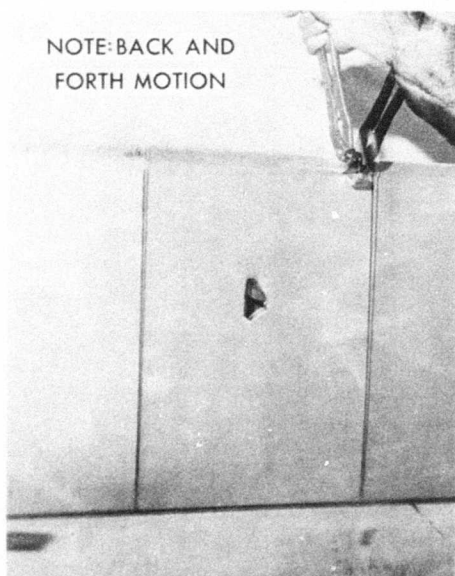


FIGURE 2

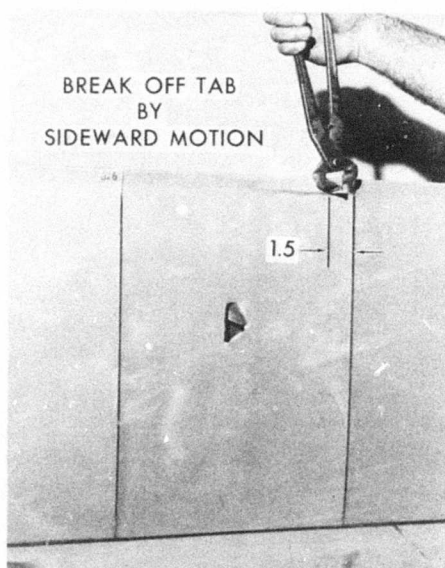


FIGURE 3

- (b) Tear the pocket skin from the pocket end rib, approximately 1 inch from the end, starting at the trailing edge and tearing downward toward the center of the pocket. Pulling in this direction will remove a 1-inch strip of skin for the length of the pocket. See Figure 4. Repeat steps a and b on the opposite end of the pocket, Figure 5.

WARNING: Use caution during above operation to prevent damage to adjacent pockets.

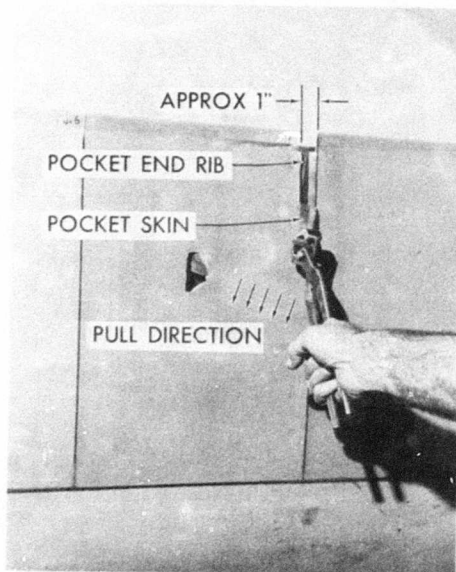


FIGURE 4

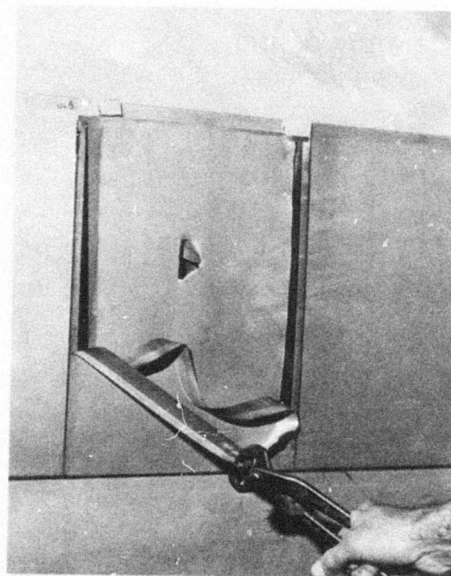


FIGURE 5

- (c) Peel the remaining pocket skin from the spar, Figure 6, by peeling upward toward the back of the pocket. Start from one corner and work to the other corner peeling in the direction shown on Figure 6, using an upward rolling motion of the nippers.

CAUTION:

Do not damage spar. Nicks and scratches would have to be removed.

- (d) Repeat steps a, b and c on opposite side of the pocket.
- (e) Using the palm of the hand, break the center portion of the pocket from the spar backwall channel with a back and forth motion.

See Figure 7.

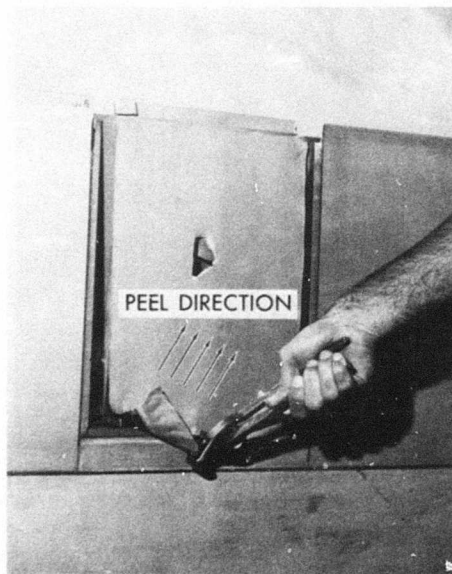


FIGURE 6

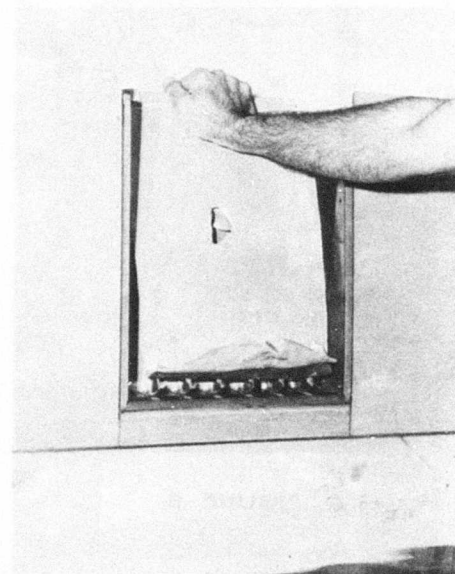


FIGURE 7

NOTE: A plastic scraper, shim or other nonmetallic object may be used as a wedge to lift the pocket from the spar on the back stroke; see Figures 8 and 9.

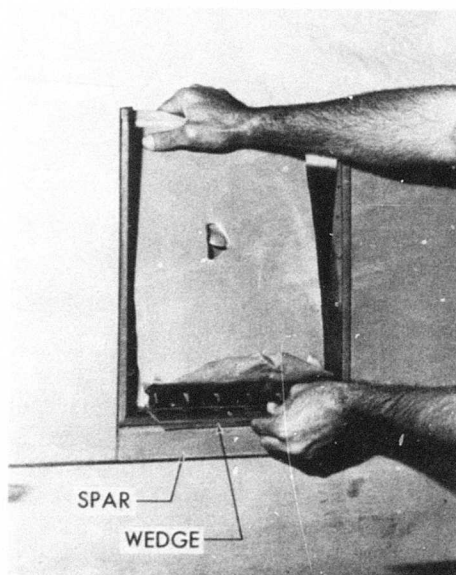


FIGURE 8

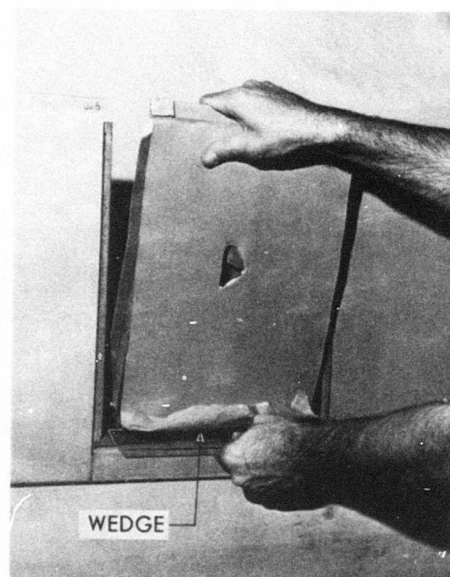


FIGURE 9

(f) Peel and break the remaining channel from the spar backwall; see Figures 10, and 11. Use the plastic scraper from the kit to obtain leverage for the nippers and to prevent damage to the spar, Figure 11.

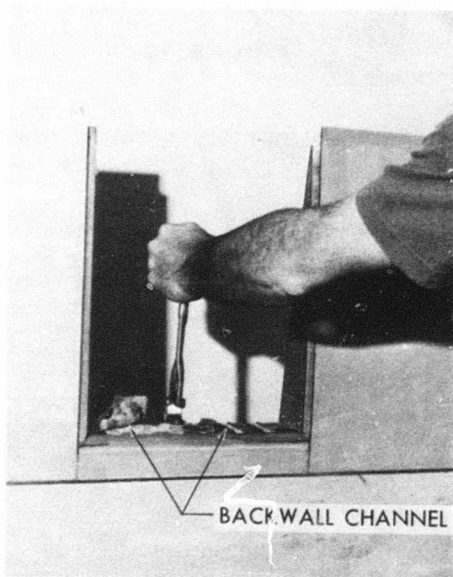


FIGURE 10

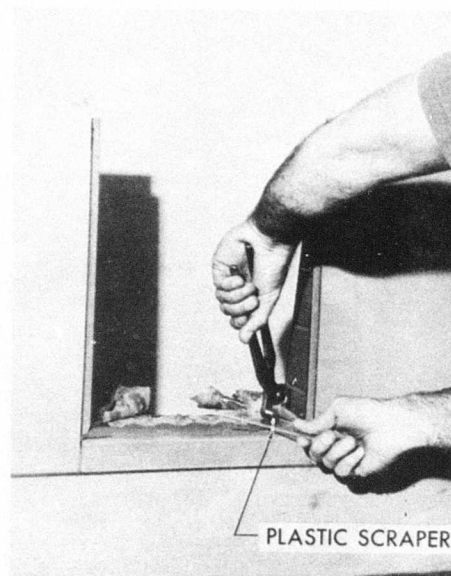


FIGURE 11

(g) Grasp the trailing edge of the pocket end rib with the nippers and pull it away from the adjacent pocket; see Figures 12 and 13. Repeat with the opposite end rib, Figure 14.

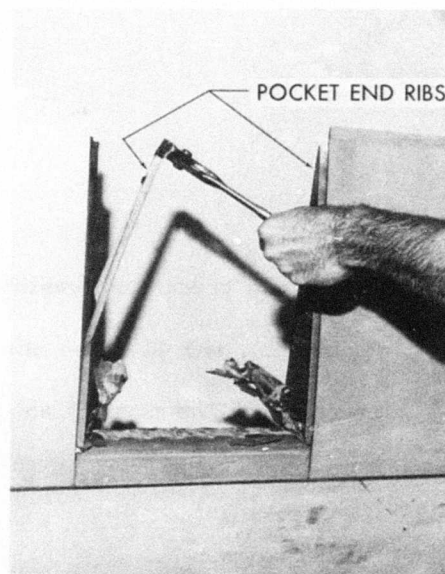


FIGURE 12

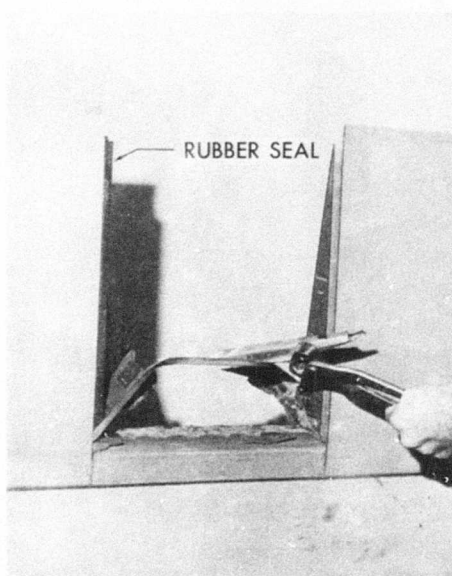


FIGURE 13

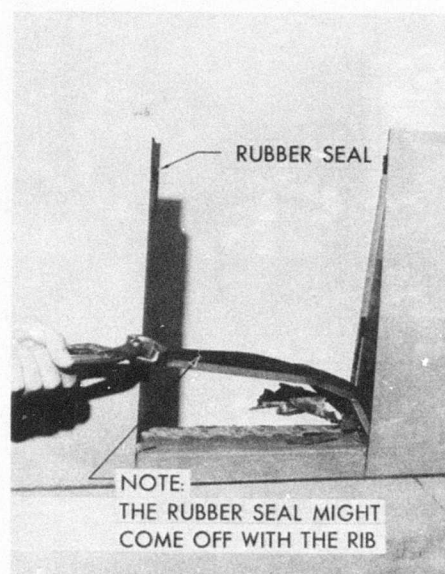


FIGURE 14

- (h) Remove the remaining portions of the rubber seal, Figure 15, by hand and with the plastic scraper.

See Figure 16.

3. Remove masking tape, sandpaper, solvent, cheesecloth, etc., from the 64070- 15008 Pocket Kit and place on a clean surface.

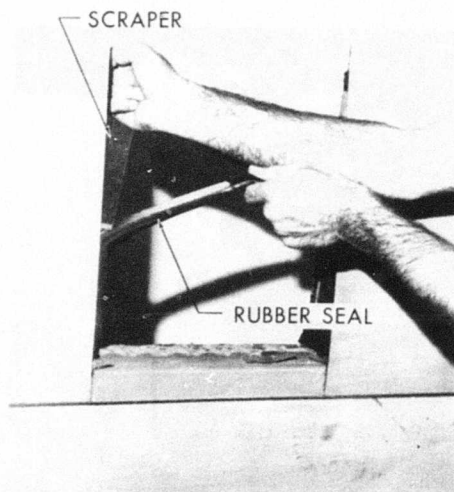


FIGURE 15



FIGURE 16

4. Apply one layer of masking tape to the spar and pockets adjacent to the bond area, Figure 17, to prevent sanding damage to adjacent areas and to eliminate excess adhesive cleanup after new pocket has been installed. The masking tape must be in line with the sides and leading edge of the adjacent pockets.
5. Chip off the raised portions and loose adhesive on the spar with the plastic scraper and a mallet if necessary. See Figure 18.

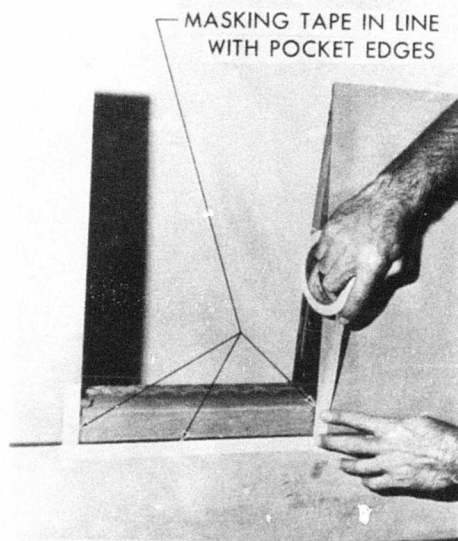


FIGURE 17

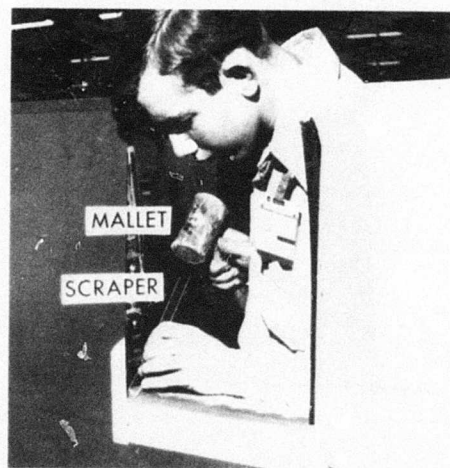


FIGURE 18

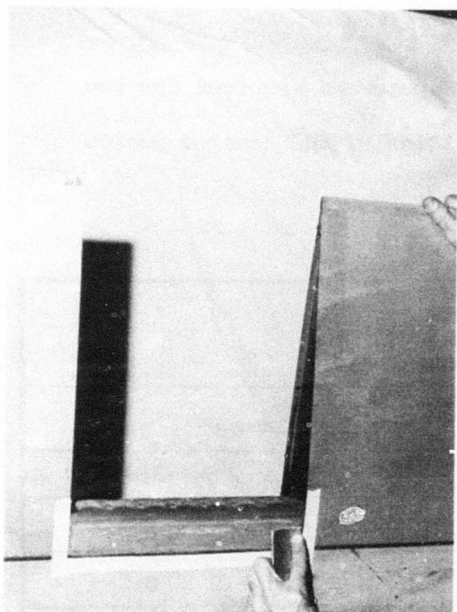


FIGURE 19

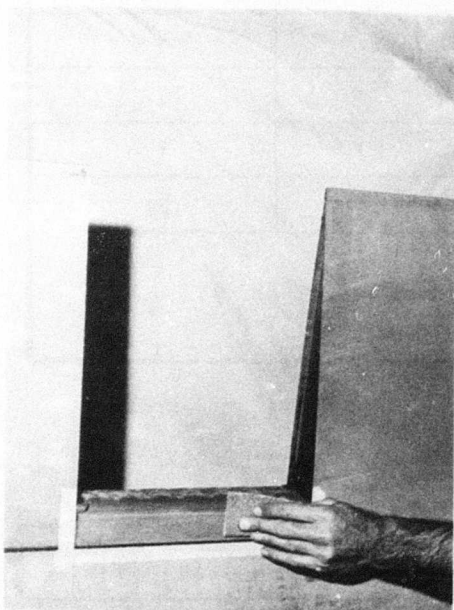


FIGURE 20

CAUTION:

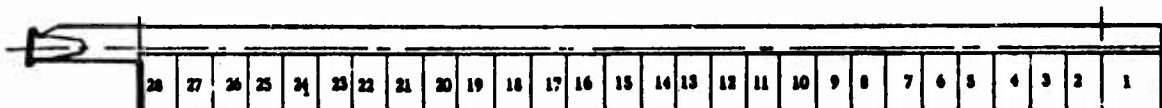
Do not scrape to the spar. Sand the old adhesive on the spar with #80 grit paper from the kit to smooth the surface; see Figures 19, 20 and 21. Do not sand with the intent of removing all the adhesive. Do not sand the spar.



FIGURE 21

6. From Table 1 determine if a backwall spacer is required for the replaceable pocket at the pocket position of the damaged pocket.

TABLE 1		
BACKWALL SPACER REQUIREMENT		
Blade Pocket Position No.	Spacer Requirement	
	EWR-38673-1	EWR-38673-2
2	1	0
3	1	0
4	1	0
5	1/2	1/2
6	0	1
7	0	1
8	0	1
9	0	1/2
NOTE: Spacer not required inboard of pocket No. 9.		



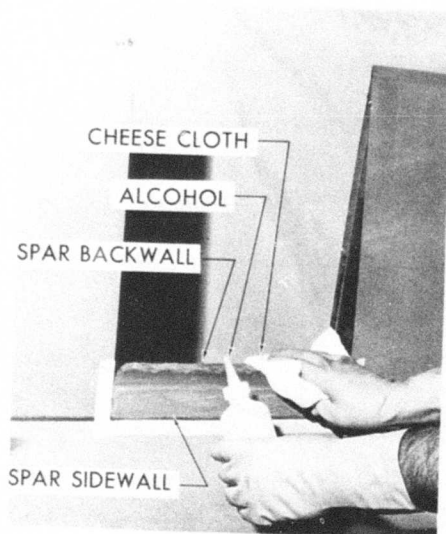


FIGURE 22

CAUTION: Do not saturate cheesecloth; use only for cleaning repair area; discard when dirty and use clean cheesecloth.

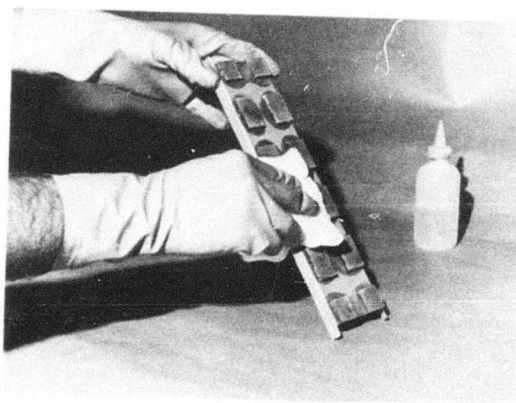


FIGURE 24

7. Put on rubber gloves prior to the cleaning operation to prevent contamination to spar and pocket and to protect hands from solvent and adhesive.
8. Wipe the two sides and backwall of the spar clean with cheesecloth dampened with the commercial grade alcohol solvent, Figure 22.

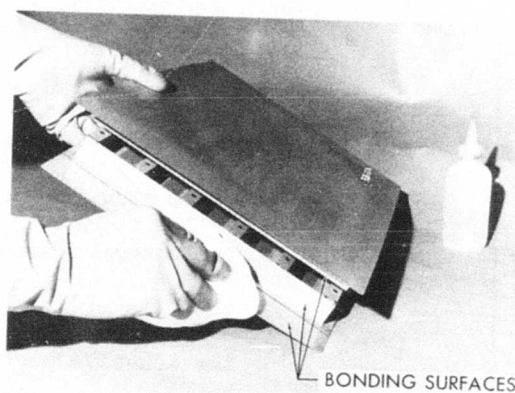


FIGURE 23

9. Clean the area of the new replacement pocket that is to be bonded to the spar with clean cheesecloth dampened with the alcohol solvent, Figure 23. Clean any required spacers in the same manner, Figure 24.

CAUTION: Once the parts are cleaned, they are not to be handled or contaminated with bare hands, oil, dust, etc. If accidentally dropped, soiled, etc., repeat Step 9.

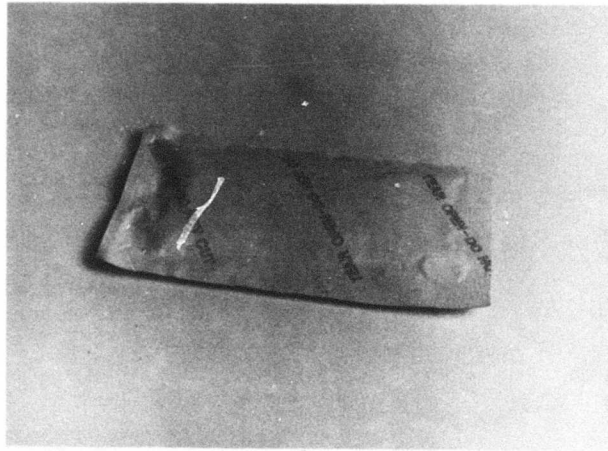


FIGURE 25

10. Remove the packaged adhesive from its container, Figures 25 and 26, and mix per the following instructions:

CAUTION: The adhesive has only a 20-minute work life from the time it is removed from the package. Therefore, the adhesive must be mixed, all components coated with adhesive and assembled on the blade, with the bonding fixture installed, within 20-minutes.



FIGURE 26

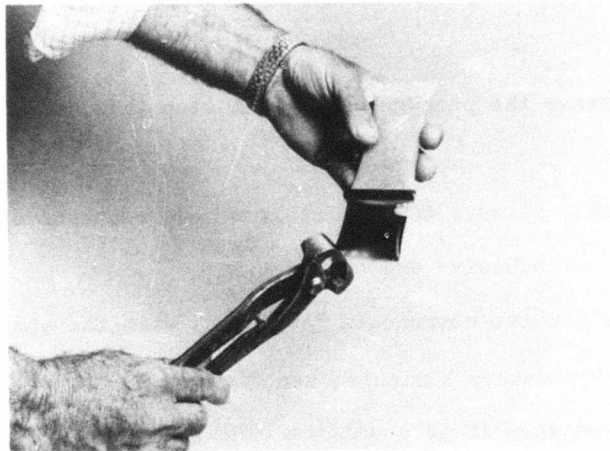


FIGURE 27

- (a) Obtain the plastic cup and a spatula provided with the kit.
- (b) Clip off one corner of the adhesive package using the nippers, scissors, or knife as shown in Figure 27 and squeeze the adhesive into the cup as shown in Figure 28.

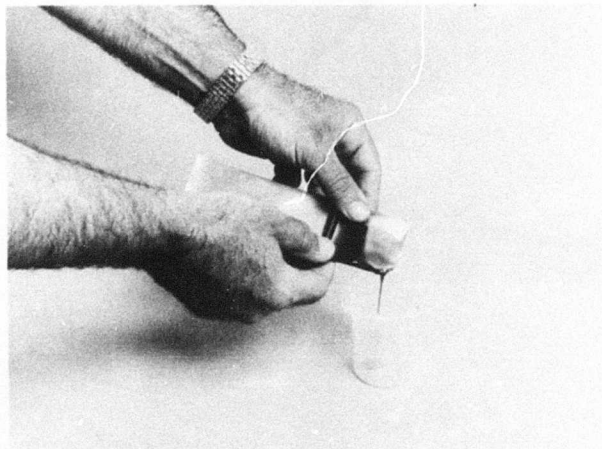


FIGURE 28

- (c) Reverse the package and repeat step (b).

NOTE: Be sure to completely remove contents of both
adhesive and catalyst.

- (d) Mix the two components thoroughly with the spatula for
approximately 1 minute; see Figure 29. The adhesive is
mixed when it is a uniform blue color.

- (e) Adhesive is now ready to be brushed on the surface.



FIGURE 29

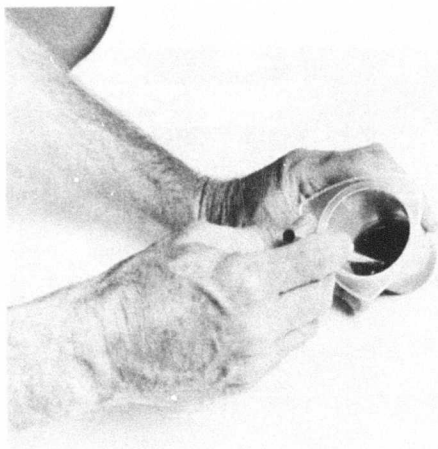


FIGURE 30

11. Using the brush from the kit and dipping it into the mixed adhesive, Figure 30, rapidly brush a thin coat of adhesive on the spar bond area, both sides and backwall.

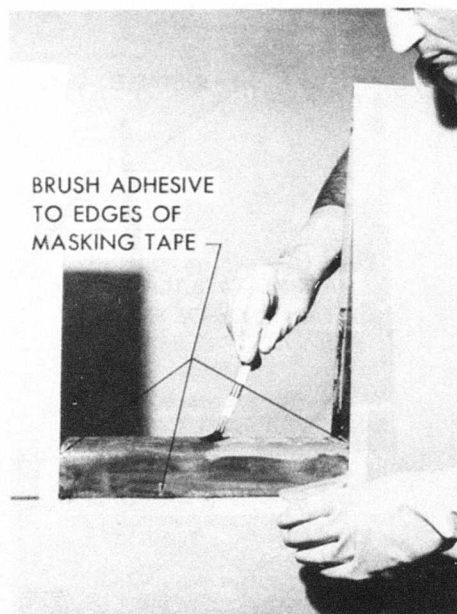


FIGURE 32

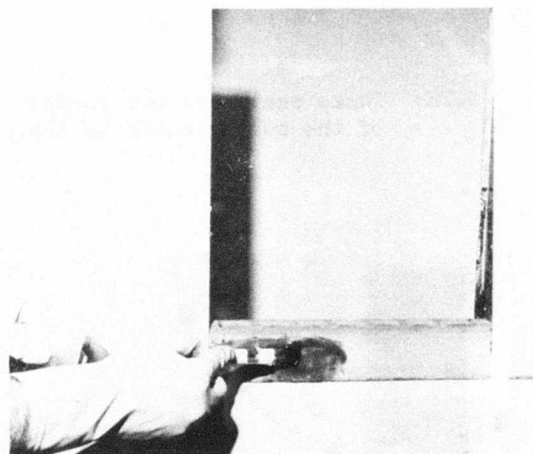


FIGURE 31

See Figures 31 and 32. Be sure to brush adhesive to cover the exposed spar area. Brush adhesive to the edge of the masking tape.

12. Coat any required spacers with adhesive, Figure 33, and install on backwall of spar; see Figure 34. Coat only areas of the spacer which will be in contact with the field-replaceable pocket and the spar.

NOTE: Only use spacer if required. Check Table 1.

13. Install one rubber seal in each of the open end ribs of the exposed pockets on the blade. See Figure 35.

NOTE: These seals are not bonded. Merely tape the trailing edge of the rubber seals to the pockets. See Figure 35.

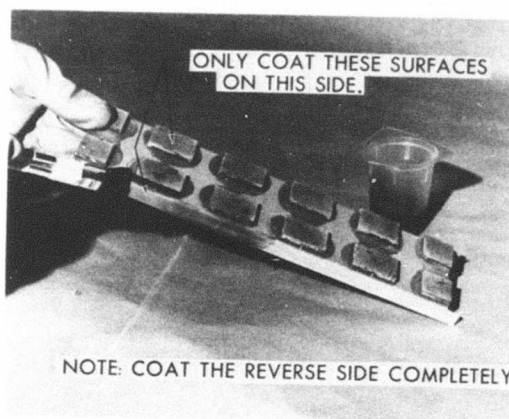


FIGURE 33

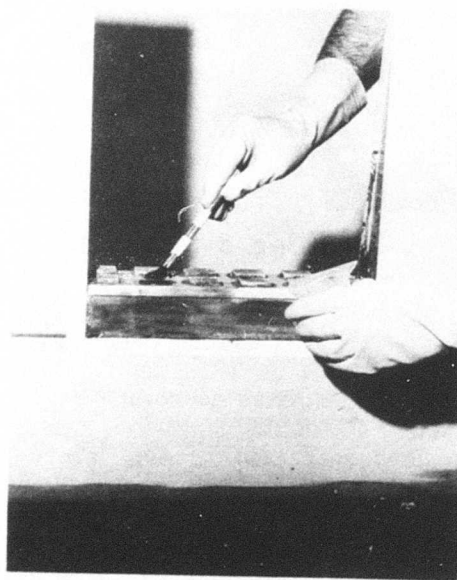


FIGURE 34



FIGURE 35

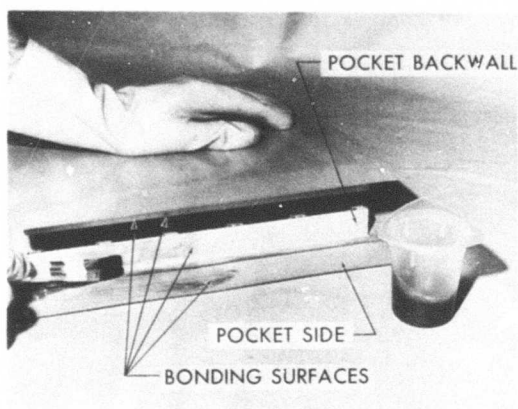


FIGURE 36

14. Coat the bond area of the replacement pocket, both sides and backwall, with adhesive, Figure 36, and install the replacement pocket on the spar, by sliding the pocket down over the seals. See Figure 37. Wipe off excess adhesive squeezed out from the pocket with cheesecloth dampened with alcohol solvent.

15. Drape the 6470-10052 bungee tool fixture over the pocket and spar, see Figure 38.

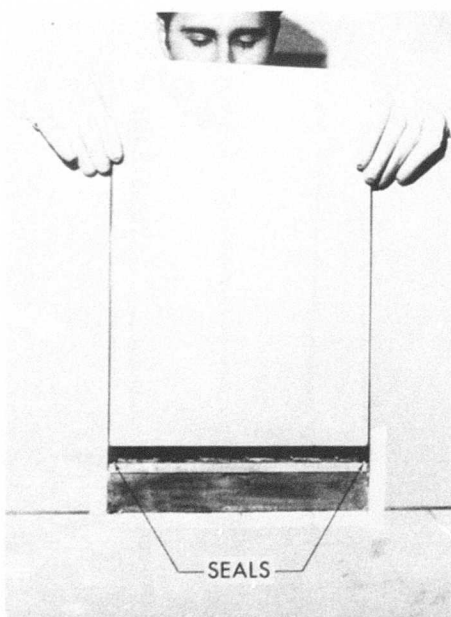


FIGURE 37

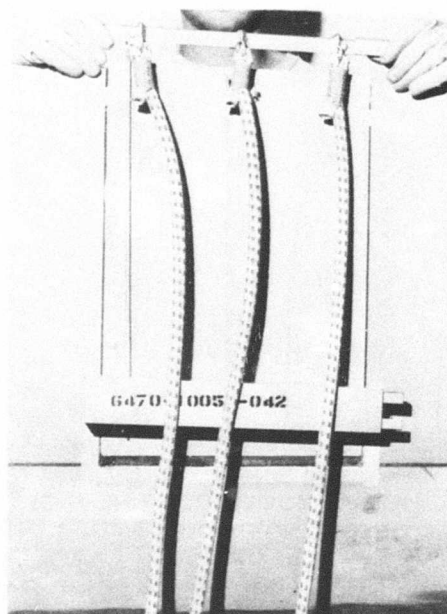


FIGURE 38

16. Install metal shims from kit in pocket gaps to center replacement pocket between original pockets. Retain the shims by taping them to the pocket skins as shown in Figure 39.
17. Pull the loose end of the center bungee cord tight around the spar leading edge and connect it to the trailing edge of the fixture, Figure 40. Repeat with the two other bungee cords, Figure 41.

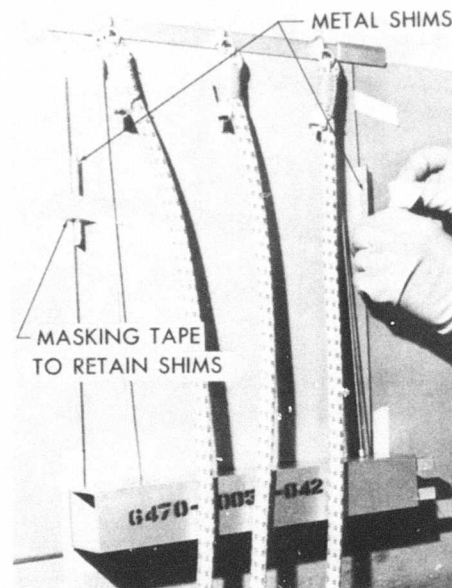


FIGURE 39

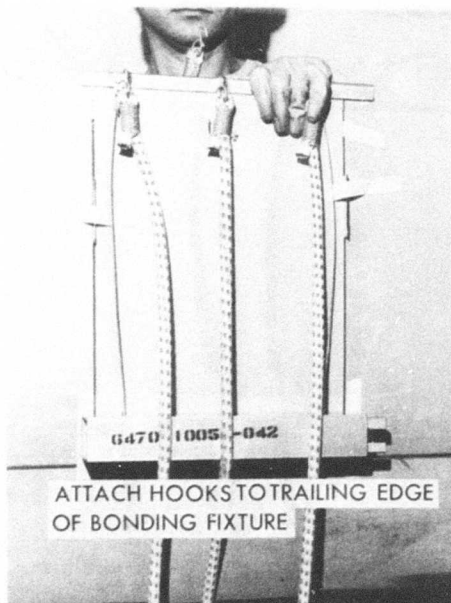


FIGURE 40

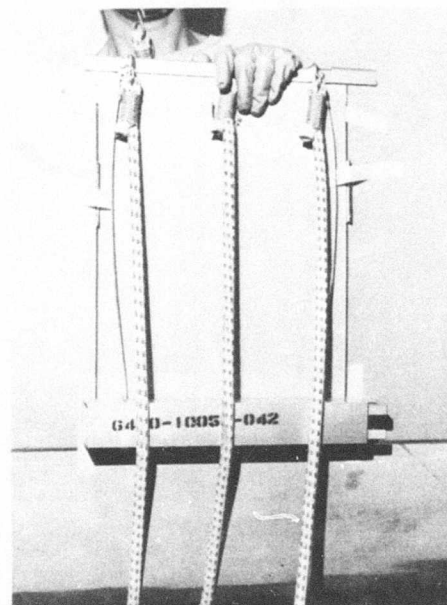


FIGURE 41

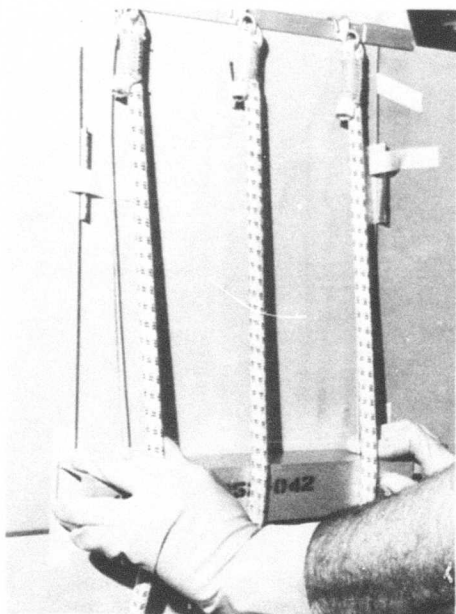


FIGURE 42

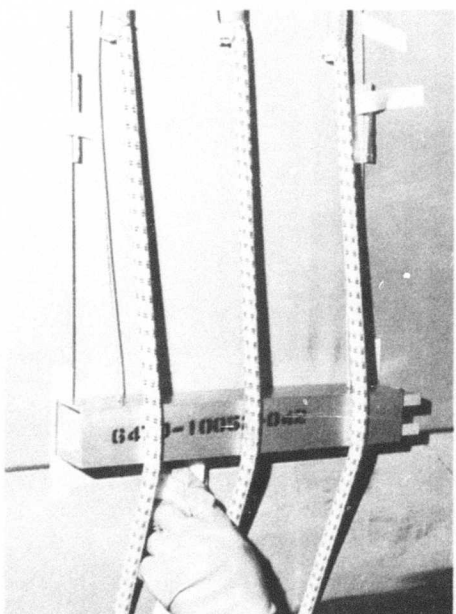


FIGURE 43

NOTE: Pull each bungee cord away from each rubber faced tube to ensure equalizing pressure.

18. Check the fixture to ensure that all rubber faced tubes are flat against the blade and in position; see Figure 42.
19. Wipe off excess adhesive with cheesecloth dampened with methyl-ethyl-ketone; see Figure 43.
20. Allow the fixture to remain in position, Figure 44, a minimum of the following hours and temperatures:
 - 3 hours at 100°F
 - or
 - 6 hours at 75°F
 - or
 - 48 hours at 40°F
21. Remove metal spacers and masking tape.

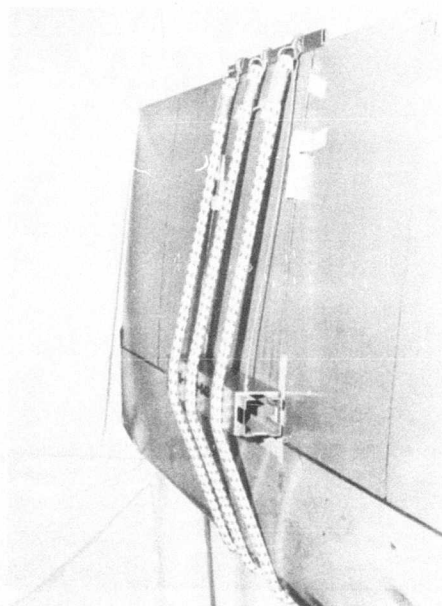


FIGURE 44

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