

# URGENT

TM 1-1500-204-23-10  
C3

CHANGE }  
NO. 3 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 20 August 2004

**TECHNICAL MANUAL**  
**AVIATION UNIT MAINTENANCE (AVUM)**  
**AND AVIATION INTERMEDIATE**  
**MAINTENANCE (AVIM) MANUAL**  
**FOR**  
**GENERAL AIRCRAFT MAINTENANCE**  
**(SHEET METAL SHOP PRACTICES)**  
**VOLUME 10**

**DISTRIBUTION STATEMENT A:** Approved for public release; distribution is unlimited.

TM 1-1500-204-23-10, dated 31 July 1992, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages  
A and B  
10-19 and 10-20  
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Insert pages  
A and B  
10-19 and 10-20  
10-20.1 through 10-20.3/(10-20.4 blank)

2. Retain this sheet in front of manual for reference purposes.

## LIST OF EFFECTIVE PAGES

Insert latest changed pages: dispose of superseded pages in accordance with regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original	31 July 1992	Change 2	13 January 2003
Change 1	1 February 2000	Change 3	30 August 2004

Page No.	*Change No.	Page No.	*Change No.
Cover.....	0	7-2.....	2
Blank.....	0	7-2.1 and 7-2.2 added.....	2
a through c.....	0	7-3 through 7-5.....	0
d blank.....	0	7-6.....	2
A and B.....	3	7-7 and 7-8.....	0
i.....	2	7-9.....	2
ii.....	0	7-10 and 7-11.....	0
1-1.....	0	7-12.....	2
1-2 blank.....	0	7-13.....	0
2-1 and 2-2.....	1	7-14.....	1
3-1 through 3-7.....	0	7-15 through 7-17.....	2
3-8.....	1	7-18 through 7-21.....	0
3-9 through 3-12.....	0	7-22.....	1
3-13.....	1	7-23 through 7-28.....	0
3-14.....	0	7-29.....	1
3-15.....	1	7-30.....	0
3-16.....	0	7-31.....	1
3-17.....	1	7-32 through 7-35.....	0
3-18.....	0	7-36.....	2
4-1 through 4-12.....	0	7-37 through 7-41.....	0
5-1 through 5-14.....	0	7-42.....	1
5-15.....	1	7-43 through 7-46.....	0
5-16 through 5-21.....	0	7-47.....	1
5-22.....	1	7-48 and 7-49.....	0
5-23 and 5-24.....	0	7-50.....	2
5-25 and 5-26.....	1	7-51 through 7-71.....	0
5-27 through 5-36.....	0	7-72.....	1
5-37.....	1	7-73 through 7-84.....	0
5-38 through 5-46.....	0	7-85.....	1
5-47.....	1	7-86.....	0
5-48 through 5-53.....	0	7-87.....	1
5-54 blank.....	0	7-88.....	0
6-1 through 6-5.....	0	7-89 and 7-90.....	1
6-6 through 6-8.....	1	7-91 through 7-96.....	0
6-9 through 6-16.....	0	7-97 and 7-98.....	2
6-17.....	1	7-99.....	0
6-18 through 6-21.....	0	7-100.....	2
6-22 blank.....	0	7-101 through 7-105.....	0
7-1.....	0	7-106.....	1

\*Zero in this column indicates an original page.

(c) Clean transparent acrylic plastic using polish and cleaner and soft, clean cloth.

b. Polishing. If the acrylic plastic has scratches on it after removing dirt and grease, the scratches may be removed as described in paragraph 10-12.

c. Waxing. If not many scratches are visible after removing dirt and grease, the acrylic plastic should be waxed with an approved wax that will fill in minor scratches and help prevent further scratching. It should be applied in a thin, even coat and rubbed in with a soft dry cloth to achieve a high luster.

d. Hot Climate Precautions. When the transparent acrylic plastic enclosures of a packed aircraft are exposed to the direct rays of hot sunlight, they may absorb sufficient heat to soften and distort the plastic enclosure. This is known as thermal distortion. When exposed to the sun, these enclosures may receive heat directly from three sources.

- The sun's rays produce heat that is absorbed by transparent acrylic plastic; thus, the plastic can become considerably hotter than the surrounding air inside or outside the aircraft.
- The air inside an unshaded and unventilated aircraft will transmit the heat radiated by the metal members in the aircraft to the plastic by convection.
- In some cases, fabric covers are used over transparent acrylic plastic enclosures. These covers tend to absorb heat, causing the enclosure to heat up to a temperature higher than what it would be without the cover because the air does not circulate. Transparent plastic enclosures must not be covered except for protection against windblown sand and grit or when ground temperature is above 120° F (49° C).

The following paragraphs describe precautions that should be taken to prevent thermal distortion.

(1) Temperature below 100° F (38° C). When the surrounding air temperature is below 100° F (38° C), no special precautions are necessary except to make sure that when covers are used no part of the cover will come in contact with the transparent acrylic plastic.

(2) Temperature between 100 and 120° F (38 to 49° C). When the surrounding air temperature is between 100 and 120° F (38 to 49° C), enclosures should be open enough to permit air to circulate freely through the aircraft and under the enclosure. If a canopy cover is needed to protect the transparent enclosure from windblown sand or grit, the cover should not come in contact with the transparent plastic surfaces.

(3) Temperature above 120° F (49° C). When the surrounding air temperature is above 120° F (49° C), the enclosure must be opened and protected from the sun by a suitable cover that does not come in contact with the transparent acrylic plastic. If possible, the aircraft should be parked in the shade.

**NOTE**

When removing enclosure covers, lift them off because sliding them can cause abrasion of the acrylic plastic surface.

e. Cold Climate Precautions. During extremely cold weather, transparent plastic enclosures will be more brittle than at normal temperatures. Exercise care when near them that they are not inadvertently struck. When preheating an aircraft prior to flight, do not apply heat directly to plastic surfaces because crazing, cracking and discoloration may develop. Before removing the aircraft from a heated hangar, open all windows to prevent cracking.

**10-15.1. EZClear Polishing System for Repair of Acrylic Plastic.**

a. Application. The current application is for all aircraft acrylic transparencies that have hazing, scratches, damage from airborne abrasives, or surface imperfections. The EZClear method is a polishing system that can be used in the field with the transparencies in place on the aircraft.

b. Equipment. EZClear equipment and materials are not currently available in the supply system, but can be purchased directly from Plastek, LLC., 525 East Bayshore Road, Redwood City, CA, 94063. Tel: (650) 367-7075; Fax: (650) 365-8201; Website: [www.plastekllc.com](http://www.plastekllc.com). Item descriptions and Part Numbers are shown below.

EZCLEAR PRODUCT LIST

ITEM	CONTENTS	P/N
EZClear kit Complete	12 oz. bottle (Principle Polish) 12 oz. bottle (Finishing Polish) 16 oz. trigger spray bottle (Prep Polish) 8 oz. spray bottle (Master Clear) 2 yellow Buffer Pads (1 lg, 1 sm) 2 Red Buffer Pads (1 lg, 1 sm) 2 Backing Plates (1 lg, 1 sm) 1 Pack Wipes (25 towels) Instruction Manual	EZ1000
EZClear Spares Kit	4 Yellow Buffer Pads (2 lg, 2 sm) 4 Red Buffer Pads (2 lg, 1 sm) 1 pack wipes (25 towels)	EZ1100
EZClear Prep Polish	4 (1 gallon jugs) per case	EZ1200
EZClear Master Clear	4 (1 gallon jugs) per case	EZ1300

c. Process. The procedure consists of three major steps. (1) Cleaning and assessment. (2) Principle polish. (3) Finishing polish.

(1) Cleaning and Assessment.

(a) Cleaning Procedure.

**NOTE**

Remove rings, watches or other hard objects from hand before washing the transparency. Never use a rough or coarse cloth for cleaning.

**1** Flush the surface with plenty of water, using the bare hand to gently feel and dislodge any debris.

**2** Wash with a mild detergent and water. Be sure that the water is free of dirt or abrasive particles. A soft cloth may be used, but only as a

means of carrying soapy water to transparency. Use only the bare hand to go over surface to detect and remove dirt before it scratches transparency.

**3** Dry with clean towel, taking care not to rub until the transparency is dry. Rubbing too much may cause scratches and will build up an electrostatic charge that attracts dust particles to the surface.

(b) Assessment Procedure. Use the assessment procedures to determine with which step you should begin window refurbishment. Some window conditions may only require you begin the EZ-Clear process at STEP 2 – FINISHING POLISH.

**1** Proceed to PRINCIPLE POLISH – STEP 1 – If you assess any of the following conditions: Deep scratches – easily felt with fingertips.

Minor scratches – readily detected with fingernail.

Any blemishes.

Heavily scratched areas which have become non transparent.

**2** Proceed to FINISHING POLISH – STEP 2 – If you assess any of the following conditions:

Fine or hairline scratches

Light scuffs

Hazing

Light swirl marks

(c) Refurbishment Techniques. Begin refurbishment process on most affected/scratched area first.

**NOTE**

Shake each polish bottle well before beginning refurbishment. In addition, shake polish bottles well prior to every polish application to buffer pad and transparency.

**1** Use a left to right and a top to bottom polishing method. However, you may use a different method so long as you work your way evenly from the affected area toward the transparency's outside edge. Use a variable speed polisher with EZCLEAR backing plates and buffer pads. Do not allow variable speed polisher to exceed 2500 R.P.M. Activate polisher only after contact is made with surface.

**2** Spray prep polish directly on transparency and buffer pad prior to beginning refurbishment.

**NOTE**

Use prep polish to lubricate surface/buffer pad and keep temperature low throughout procedure.

**3** Using minimal pressure, maintain constant contact at a slight angle between buffer pad and surface, polish using a consistent/even motion. Open angle should face in direction buffer is moving. Never allow buffer pad to stop in one area as the heat created may damage the transparency.

**4** Assess the surface temperature every 15 seconds to ensure it is not too hot. Hot surface temperature may occur from excessively applying pressure to the surface and/or not using enough polish. To assess surface temperature place your palm directly on main polishing area.

**(2) Principle Polish – STEP 1.**

**NOTE**

Put on proper eye protection and wear throughout refurbishment procedures. Shake prep polish and principle polish well before first use and additionally before every application throughout the procedure.

(a) Upon determining transparency is clean (see Cleaning and Assessment) spray prep polish directly on transparency's surface and gently wipe with towel to ensure towel wipes clean.

(b) Attach appropriate size backing plate variable speed polisher. Use large backing plate when polishing large surface areas and small backing plate for small, confined area.

(c) Attach appropriate size yellow buffer pad to appropriate backing area.

**NOTE**

Carefully center backing plate on buffer pad. Confirm buffer pad is centered by slowly activating polisher; if buffer pad spins unevenly, re-center until spins in perfect circle.

(d) Place a generous amount of principle polish on front of buffer pad. Using a generous amount of polish will reduce surface temperature and remove scratches more effectively. Re-apply principle polish

throughout procedure to keep surface lubricated. Use prep polish for additional surface lubrication if necessary during refurbishment.

(e) Gently compress buffer pad against transparency before activating variable speed polisher. This will allow buffer pad to absorb polish and minimize overspray.

(f) Reassess progress every couple of minutes. First, work most polish off surface with buffer pad and polisher. Then spray and wipe surface with prep polish and towel.

**NOTE**

Reassessing your progress will save time and help prevent unnecessary surface removal.

(g) Upon determining that heavy scratches/blemishes have been removed and you are satisfied with the results, remove principle polish and towel.

(h) Upon completing STEP 1 – PRINCIPLE POLISH, proceed to STEP 2 – FINISHING POLISH.

**(3) Finishing Polish – STEP 2.**

**NOTE**

Put on proper eye protection and wear throughout refurbishment procedures. Shake prep polish and finishing polish well before use and additionally before every application throughout the procedure.

(a) Spray prep polish directly on transparency surface and gently wipe with towel to ensure that the towel wipes clean. Always use a fresh towel after each prep polish application.

(b) Attach appropriate size backing plate to variable speed polisher. Use large backing plate when polishing large surface areas and small backing plate for small, confined areas.

(c) Attach appropriate size red buffer pad to appropriate size backing plate. Carefully center backing plate on buffer pad. Confirm buffer pad is centered by slowly activating polisher; if buffer pad spins unevenly, re-center until spins in perfect circle.

(d) Place a generous amount of finishing polish on front of buffer pad only at first application.

**NOTE**

For additional finishing polish applications, use minimal amounts of polish, taking care not to over-saturate the buffer pad. Spray prep polish on buffer pad and on surface throughout finishing polish procedure. This will help draw polish from buffer pad to surface, keep surface lubricated, and reduce friction/surface temperature.

(e) Gently compress buffer pad against transparency before activating variable speed polisher. This will allow buffer pad to absorb polish and minimize over spray.

(f) Reassess progress after each finishing polish application as not a lot of finishing polish may be required. First, work most polish off surface with buffer pad and polisher. Then, spray and wipe surface with prep polish and towel. Always use a fresh towel.

(g) Upon determining transparency is clear, carefully remove excess finishing polish from outer areas and then inner areas by lubricating well with prep polish and gently wiping with towel.

(h) After wiping surface with last prep polish application, allow to dry. Buff excess residue away gently by hand using a dry towel. Always use a fresh towel.

(i) As a final step, spray minimal amount of finishing cleaner or transparency's surface and wipe with towel. After residue dries, buff excess away by hand with towel.

(j) Dispose of all EZClear components upon completing refurbishment.

**10-16. Recommended Installation Procedures for Transparent Plastics.** There are several methods of installing transparent acrylic plastic panels in aircraft. The method used by the manufacture will depend on the position of the panel on the aircraft, the stresses it will be subjected to, and many other factors. When installing a replacement panel, the airframe repairman should use, when ever possible, the same mounting method that was used by the manufacture of the aircraft.

a. Installation Considerations. Several different factors must be considered when acrylic plastic panels are being installed.

(1) Hardware. When it is difficult to install replacement panels using rivets, bolts may be substituted for them provided that the original strength requirements of the manufacturer are met and the bolts do not interfere with adjoining equipment.

(2) Panel fit. In some cases, replacement panels will not fit the installation exactly. When a replacement panel requires adjustment, the original design drawing, if available, should be consulted to determine the proper clearances.