PASSENGER CABIN WINDOWS - INSPECTION/CHECK

1. General

A. This procedure has this task

(1) The inspection of the passenger cabin windows.

TASK 56-21-00-200-801

2. Passenger Cabin Window Inspection

(Figure 601, Figure 602)

A. General

CAUTION: APPLICATION OF PAINT OR OTHER UNAPPROVED OR NON-TRANSPARENT MATERIAL TO THE ACRYLIC PASSENGER WINDOW PANES IS PROHIBITED. SOLVENT IN PAINT WILL CAUSE STRUCTURAL DAMAGE TO THE ACRYLIC AND THE PAINT WILL PREVENT DAMAGE DETECTION.

(1) The types of damage to acrylic windows are as follows:

(a) Crazing:

1) Crazing is many very fine fissures with no visible width at the surface of a ply.

2) In a bright light shown from an angle to the surface, crazing looks frosted and appears to light up.

3) In dim light and light normal to the surface, crazing is difficult to see.

4) Crazing can develop into cracks.

(b) Cracks:

1) A crack is a fissure that has a visible width and depth.

2) Cracks can start from a scratch or a crazing mark Figure 601.

3) Cracks can be single or dual Figure 601.

4) Cracks in stretched acrylic plastic that occur in the direction of the applied force can become in-plane cracks.

(c) Scratches:

1) A scratch is the removal of material from the surface of the window.

2) Scratches usually occur in a straight line or slight curve.

3) The depth of a scratch is not usually greater than the width of the scratch.

(d) Chips:

1) Chips are pieces or layers of acrylic broken from the surface.

2) Spall (shell-type) chips:

a) Spall chips are circular with many fine ridges.

b) The ridges in the chip follow the outer edge and get smaller and deeper near the center and give it the clamshell appearance.

3) Vee-shaped chips:

a) These chips have a sharp "V" shape bottom that continues to the surface of the ply.

(e) In-plane Cracking:

1) In-plane cracking is sometimes referred to as delamination.

2) In-plane cracking is a crack that grows parallel to the surface of the ply from an edge or crack.

3) In-plane cracking looks shiny in reflected light.

(f) If the window is damaged as specified in this procedure, remove the window and replace or repair the damaged components (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

(2) Other conditions that may be seen on acrylic windows are as follows:

(a) Fogging:

1) Fogging is visible moisture that has condensed on the window surfaces.

NOTE: During aircraft flight, or cold weather ground operations, the moisture may freeze on the window panes and appear as frost or ice crystals.

2) Fogging can be caused by a seal that leaks or excessive humidity due to changes in climate and location.

3) Fogging is categorized as minor or severe:

a) Minor fogging:

<1> Appears as a very light mist, or fog, on the window surfaces.

<2> Has few or no visible water droplets in the main viewing area of the window

NOTE: It is normal for some visible water droplets to be found in the area directly around the window vent hole.

<3> May dry during normal aircraft operation or continue to worsen and become severe fogging

b) Severe fogging:

<1> Appears as a dense mist, or fog, on the window surfaces that prevents clear vision through large areas of the window typically 1/3 or more.

<2> Has many easily visible water droplets in the main viewing areas of the window.

<3> Continues to worsen during normal aircraft operations and can result in water pooling at the bottom of the window.

(b) Warping (deformation)

1) Warping is defined as visible deformation of a window pane from its original shape.

NOTE: The 'original' or normal shape of the window panes should match the shape (curvature) of the aircraft structure. Panes on a normal window will not have warping and will have a uniform air gap between the panes.

2) Warping can be caused by long-term exposure of the panes to moisture from severe fogging or exposure to temperatures greater than 200°F (93°C).

3) Minor warping may occur at the edge of the window panes where the attachment clips contact the window panes.

B. References

Reference	Title
56-21-00 P/B 401	PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION
56-21-00-000-801	Removal of a Passenger Cabin Window (P/B 401)
56-21-00-300-801	Repair the Passenger Windows (Orbital Sander Method) (P/B 801)
56-21-00-400-801	Passenger Cabin Window Installation (P/B 401)

C. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
COM-2039	Micrometer, Optical (Min Depth .02 inch and Accuracy +/-.0005 Inch) (Part #: 8400K, Supplier: 65956, A/P Effectivity: 737-600, -700, -700C, -700ER, -700QC, -800, -900, -900ER) (Part #: MODEL 966A1, Supplier: 0ZYB5, A/P Effectivity: 737-600, -700, -700C, -700ER, -700QC, -800, -900, -900ER) (Opt Part #: 8400PCK, Supplier: 65956, A/P Effectivity: 737-600, -700, -700C, -700ER, -700QC, -800, -900, -900ER)
COM-4786	Processor/Printer - Optical Micrometer (used with 8400K only) (Part #: DP-1VR, Supplier: 65956, A/P Effectivity: 737-600, -700, -700C, -700ER, -700QC, -800, -900, -900ER)

D. Location Zones

Zone	Area
220	Subzone - Passenger Compartment - Body Station 259.50 to 360.00
230	Subzone - Passenger Compartment - Body Station 360.00 to 663.75
240	Subzone - Passenger Compartment - Body Station 663.75 to Body Station 1016.00

E. Procedure

SUBTASK 56-21-00-200-001

(1) Use an optical micrometer, COM-2039 to measure damaged areas in the window. It is necessary to use the optical micrometer processor/printer, COM-4786 with the micrometer, COM-2039.

NOTE: You can use other accurate methods to find the crack depth.

(a) Multiply the acrylic plastic index of refraction (1.49) by the micrometer value, to calculate the depth of the damage.

SUBTASK 56-21-00-200-002

(2) Examine the middle pane for damage.

WARNING: YOU MUST IMMEDIATELY REPLACE THE MIDDLE PANE IF IT HAS DAMAGE. A CRACK MAY PREVENT MIDDLE PANE FROM CARRYING PRESSURE IF OUTER PANE FAILS DURING FLIGHT AND IS CRITICAL FOR THE SAFETY OF THE PASSENGERS.

(a) Replace the middle pane if it has any damage (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

NOTE: Middle pane cracks that start from the vent hole and are 0.062 in. (1.575 mm) or less in length do not need to be replaced.

(b) Replace the middle pane if the thickness is less than 0.157 in. (3.988 mm) (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

SUBTASK 56-21-00-200-003

(3) Examine the outer pane for cracks.

(a) Replace the outer pane if the depth of the crack is more than 0.050 in. (1.270 mm) (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

(b) Replace the outer pane if the window, after the repair, is less than 0.265 in. (6.731 mm) thick (Figure 602) (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

SUBTASK 56-21-00-200-004

(4) Examine the outer pane for crazing.

(a) Replace the outer pane if the depth of the crazing on the edge is more than 0.030 in. (0.762 mm) as shown in (Figure 602).

SUBTASK 56-21-00-200-005

(5) Examine the edges of the outer pane for in-plane cracking.

(a) Replace the outer pane if it has this damage (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401) :

1) With the window installed, you can see in-plane cracking at the edges.

2) With the window removed, the in-plane cracking is more than 0.55 in. (13.97 mm) from the edge.

3) There is less than 0.14 in. (3.56 mm) between damaged areas, 0.10 in. (2.54 mm) from the edge of the window as shown in (Figure 602).

SUBTASK 56-21-00-200-006

(6) Examine the outer pane at the areas other than the edges for chips and cracking.

(a) Replace the outer pane if it has this damage (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401):

1) The depth of a chip is more than 0.05 in. (1.27 mm).

2) The maximum diameter of an area of in-plane cracking is more than 0.40 in. (10.16 mm).

3) The distance between damaged areas must be more than two times the diameter of the damaged area.

SUBTASK 56-21-00-200-007

(7) Examine the windows for scratches.

(a) If you find scratches, do this task: Repair the Passenger Windows (Orbital Sander Method), TASK 56-21-00-300-801.

SUBTASK 56-21-00-200-009

(8) Examine the windows for deterioration.

(a) If you find deterioration, do this task: Repair the Passenger Windows (Orbital Sander Method), TASK 56-21-00-300-801.

SUBTASK 56-21-00-200-011

(9) Examine the window for warping (deformation).

(a) Make sure that the middle pane vent hole is open.

NOTE: A window that is warped or deformend with no visible damage beyond allowable limits is structurally satisfactory even if the middle and outer panes touch when the airplane is not pressurized. Window panes that have warping can be replaced during usual maintenance to prevent possible leakage.

(b) If you find warping (deformation), do this task: Repair the Passenger Windows (Orbital Sander Method), TASK 56-21-00-300-801.

SUBTASK 56-21-00-200-012

(10) If you find a window that is bent, repair it (Repair the Passenger Windows (Orbital Sander Method), TASK 56-21-00-300-801).

NOTE: It is possible to repair the window to its initial shape or very near.

(a) Remove the bent window with moisture in it.

(b) To dry the window, put it in a low moisture space at room temperature for an extended period of time.

SUBTASK 56-21-00-200-013

(11) Examine the windows for visual distortion.

(a) Replace windows that have bad visual distortion, or window thickness that is not constant (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

NOTE: High temperatures can cause this damage.

SUBTASK 56-21-00-210-002

(12) Examine the window for fogging between the middle and outer panes.

NOTE: Windows that have fogging with no other visible damage beyond allowable limits are considered structurally satisfactory and may remain in service. Windows with severe fogging can be replaced as desired by the operator during a future scheduled maintenance check.

(a) If severe fogging causes water to pool at the bottom of the window or block the vent hole, the window and/or seal must be replaced (PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION, PAGEBLOCK 56-21-00/401).

(b) Windows with severe fogging should be examined for signs of leaks.

SUBTASK 56-21-00-200-015

(13) Examine the windows for leaks between the middle and the outer panes.

(a) Replace the seals if these signs of leaks show on the window: (do this task: (Removal of a Passenger Cabin Window, TASK 56-21-00-000-801 and do this task: Passenger Cabin Window Installation, TASK 56-21-00-400-801)

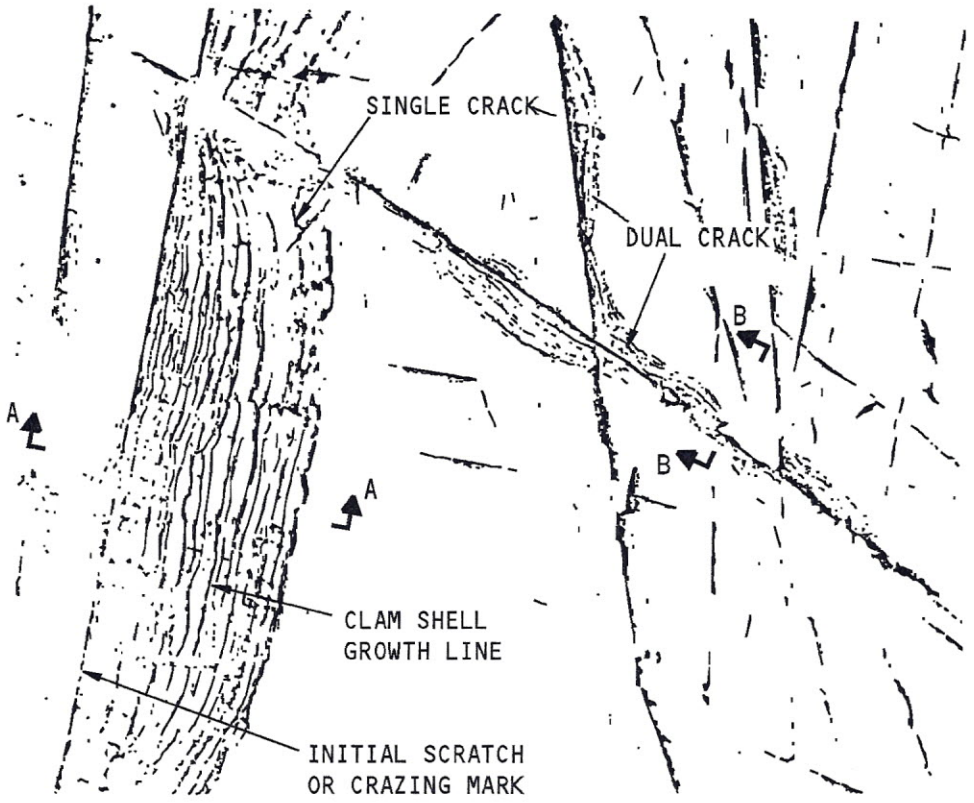
1) If water has pooled at the bottom of the window or blocks the vent hole, the window or seal must be repaired or replaced.

2) Brown stains show near the seal or in the vent hole in the middle pane.

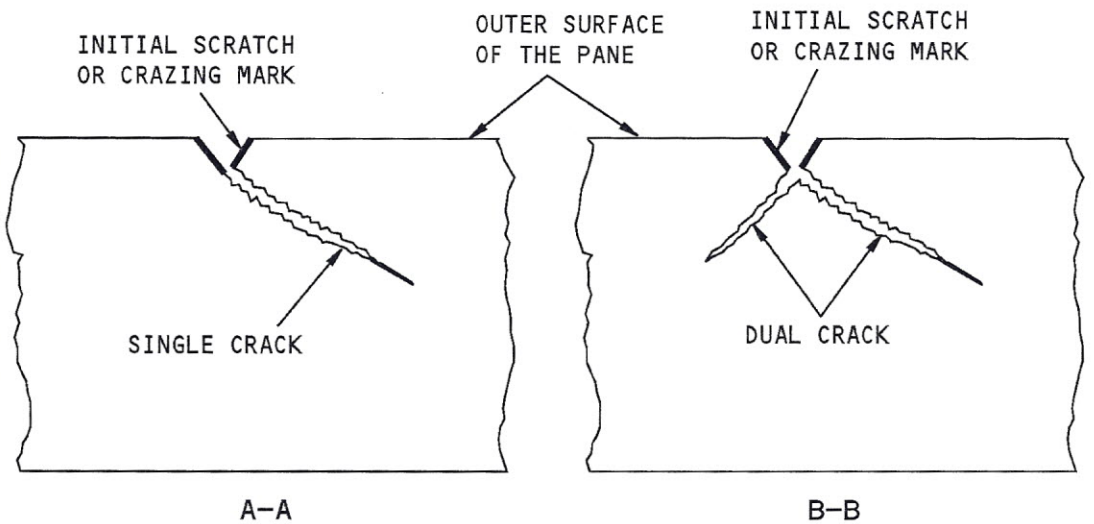
3) A seal that is observed to be out of place, rolled back, or damaged.

NOTE: Provided no other damage beyond allowable limits is visible, a seal that is out of place, rolled back, or damaged, may remain in service. The seal may be repaired or replaced as desired by the operator during a future scheduled maintenance check.

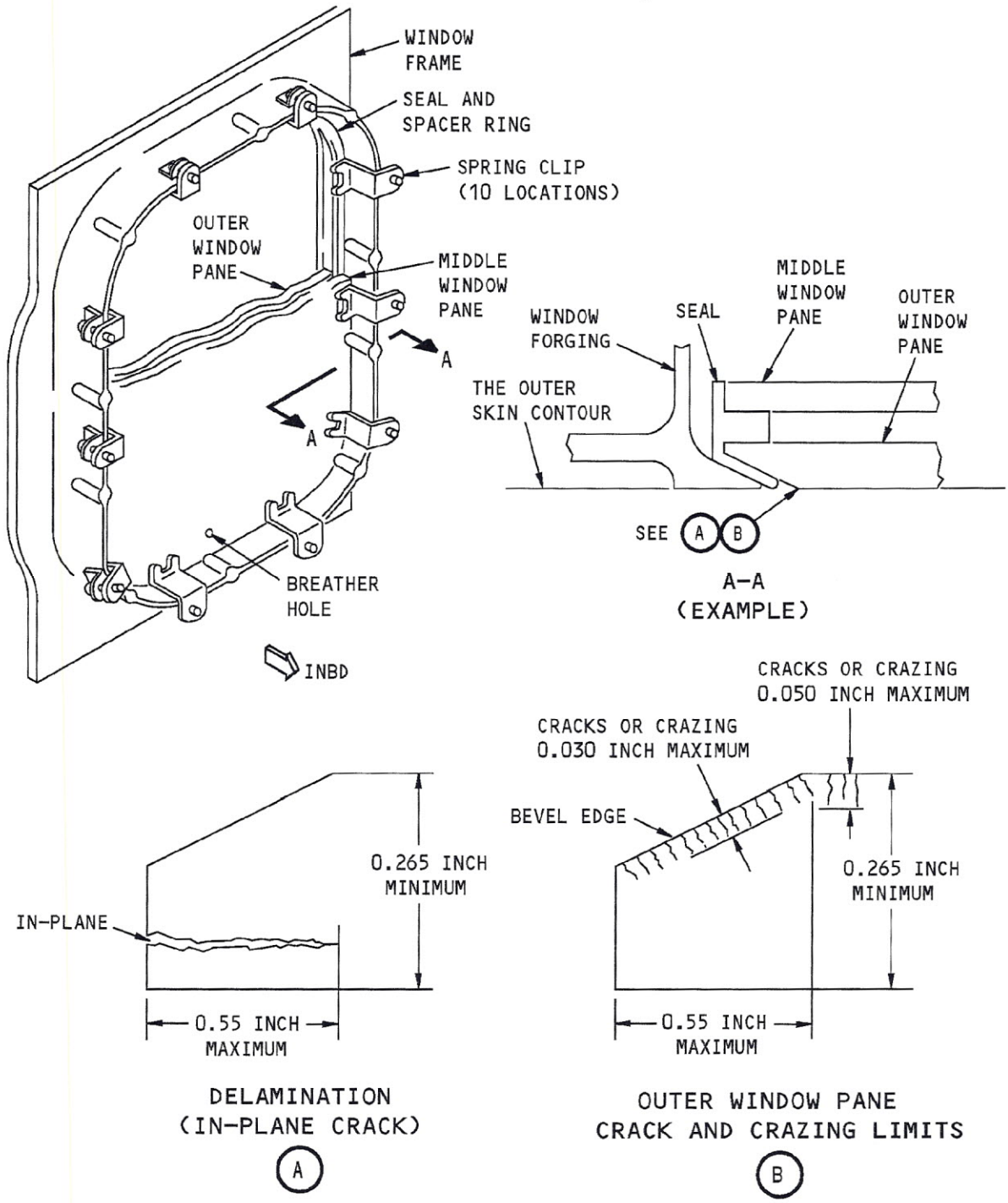
END OF TASK



WINDOW SURFACE
(EXAMPLE)



Example of Window Surface Cracks that Develop (Outer Pane Stretched Acrylic)
Figure 601/56-21-00-990-802



Passenger Compartment Window Inspection
Figure 602/56-21-00-990-803

PASSENGER CABIN WINDOWS - REPAIRS

1. General

A. This procedure has two tasks. These tasks repair the external surface of the outer passenger windows.

B. This procedure contains repairs that you can do with the windows installed in the airplane.

C. You can do this task with the windows installed on the airplane.

D. The damage limits for the windows are given in Passenger Cabin Windows - Inspection/Check (AMM 56–21–00/601).

E. Use clean cotton gloves when you touch the windowpanes to prevent more damage.

F. Do not cause damage to the window surface with finger rings or other sharp objects.

TASK 56-21-00-300-801

2. Repair the Passenger Windows (Orbital Sander Method)

A. References

Reference	Title
56-21-00 P/B 401	PASSENGER CABIN WINDOWS - REMOVAL/INSTALLATION
56-21-00-200-801	Passenger Cabin Window Inspection (P/B 601)

B. Tools/Equipment

Reference	Description
STD-1207	Sander/Polisher - Orbital, Air Driven

C. Consumable Materials

Reference	Description	Specification
G00139	Tape - Protective - Gizzard Protex-20V	
G01111	Tape - Aluminum Foil, Pressure Sensitive, Heat Reflective, Adhesive	A-A-59258
G50978	Kit - Micro-Surfaces Finishes Light Damage Removal Kit	

D. Location Zones

Zone	Area
200	Upper Half of Fuselage

E. Procedure

SUBTASK 56-21-00-160-004

(1) Do the steps that follow to clean the window:

(a) Examine the condition of the seal. Replace the window seal if there are signs of condensation or seal damage (PAGEBLOCK 56-21-00/401).

(b) Apply Gizzard Protex-20V tape, G00139 or tape, G01111 to the window frame.

(c) Apply Gizzard Protex-20V tape, G00139 or tape, G01111 to the seal.

(d) Use a water spray to clean the window.

(e) Remove loose dirt with your bare hand.

SUBTASK 56-21-00-350-003

(2) Do the steps that follow to remove the window damage (Orbital Sander Method):

NOTE: This task is intended to supplement the manufacturers' repair kit instructions for final polishing of the window, and is not intended to replace them.

(a) Select the grade of sandpaper found in the repair kit listed below:

1) Light Damage Removal Kit, G50978.

(b) Wrap the sandpaper around the sander/polisher, STD-1207.

(c) Use sufficient water to keep the window surface cool and to flush away the grit and acrylic material removed.

(d) Sand the window with the orbital sander horizontal direction.

(e) Sand the whole window surface.

(f) Keep water on the surface being sanded.

NOTE: Water will serve as a lubricant and coolant on the window.

(g) Sand the window with the abrasive paper in a vertical direction.

(h) Sand the whole window surface.

(i) Use each grade of sandpaper in the kit to remove the previous pattern made by the previous sandpaper.

(j) Do the procedure until all the surface damage is removed and the window has a constant thickness.

(k) Measure the window thickness dimensions (Passenger Cabin Window Inspection, TASK 56-21-00-200-801).

(l) Remove the water spray.

(m) Attach the polishing pad (included in the kit) to a right angle polisher.

(n) Wet the surface with water.

(o) Apply approximately 1 tablespoon (15 mL) of Micro-Gloss (included in the kit) and polish for 2-4 minutes.

(p) Attach the white foam sponge pad (included in the kit) to the right angle polisher and repeat the previous three steps.

(q) Rinse the surface off with water.

(r) Wipe clean with the dry flannel cloth.

NOTE: All fine scratches should be gone.

(s) Apply Anti-Static compound (included in the kit) to the surface with a clean dry flannel cloth.

(t) Polish the surface by hand to remove the static charge that has built up during the process.

(u) Measure the window thickness dimensions (Passenger Cabin Window Inspection, TASK 56-21-00-200-801).

(v) Make sure the window pane thickness is greater than the limits permitted (Passenger Cabin Window Inspection, TASK 56-21-00-200-801).

END OF TASK

TASK 56-21-00-300-802

3. Repair The Passenger Windows (Hand Method)

A. References

Reference	Title
56-21-00-200-801	Passenger Cabin Window Inspection (P/B 601)

B. Tools/Equipment

Reference	Description
STD-9478	Sanding Block

C. Consumable Materials

Reference	Description	Specification
G00139	Tape - Protective - Gizzard Protex-20V	
G01111	Tape - Aluminum Foil, Pressure Sensitive, Heat Reflective, Adhesive	A-A-59258
G50972	Abrasive - 3M Wetordry Tri-M-ite 400A abrasive paper (400 Grit)	
G50973	Abrasive - 3M Wetordry Tri-M-ite 600A abrasive paper (600 Grit)	
G50974	Kit - Micro-Surfaces Finishes KR-70 Acrylic/Plastic Restoral Kit	
G50975	Kit - Micro-Surfaces Finishes HP-100 Acrylic Restoral Kit	
G50976	Kit - Micro-Surfaces Finishes NC-78-1 Acrylic Restoral Kit	
G50977	Kit - Micro-Surfaces Finishes MA-1 Acrylic Restoral Kit	

D. Procedure

SUBTASK 56-21-00-160-005

(1) Do the steps that follow to clean the window:

(a) Examine the condition of the seal. Replace the window seal if there are signs of condensation or seal damage (TASK 56-21-00-200-801).

(b) Apply Gizzard Protex-20V tape, G00139 or tape, G01111 to the window frame.

(c) Apply Gizzard Protex-20V tape, G00139 or tape, G01111 to the seal.

(d) Use a water spray to clean the window.

(e) Remove loose dirt with your bare hand.

SUBTASK 56-21-00-350-004

(2) Do the steps that follow to remove the window damage (Hand Method):

(a) Select the grade of sandpaper from the items that follow:

1) Use 3M Wetordry Tri-M-ite 400A abrasive paper, G50972 for deep scratches and bad crazing.

2) Use 3M Wetordry Tri-M-ite 600A abrasive paper, G50973 for minor scratches and crazing.

(b) Use sufficient water to keep the window surface cool and to flush away the grit and acrylic material removed.

(c) Wrap the sandpaper around a sanding block, STD-9478.

(d) Sand the window with the abrasive paper in a horizontal direction.

(e) Sand the whole window surface.

(f) Keep water on the surface being sanded.

NOTE: Water will serve as a lubricant and coolant on the window.

(g) Sand the window with the abrasive paper in a vertical direction.

(h) Sand the whole window surface.

(i) Do this procedure until all the surface damage is removed and the window has a constant thickness.

SUBTASK 56-21-00-350-005

(3) Do the steps that follow to polish the window after repairs have been done:

NOTE: This task is intended to supplement the manufacturers' repair kit instructions for final polishing of the window, and is not intended to replace them.

(a) Select the grade of sandpaper found in the repair kits listed below:

1) KR-70 Acrylic/Plastic Restoral Kit, G50974.

2) HP-100 Acrylic Restoral Kit, G50975.

3) NC-78-1 Acrylic Restoral Kit, G50976.

4) MA-1 Acrylic Restoral Kit, G50977.

(b) Wrap the sandpaper sheets around a foam sanding block (included in the kit).

(c) Use sufficient water to keep the window surface cool and to flush away the grit and acrylic material removed.

(d) Sand the window with the abrasive paper in a horizontal direction.

(e) Sand the whole window surface.

(f) Keep water on the surface being sanded.

NOTE: Water will serve as a lubricant and coolant on the window.

(g) Sand the window with the abrasive paper in a vertical direction.

(h) Use each grade of sandpaper in the kit to remove the previous pattern made by the previous sandpaper.

(i) Do this procedure until all the surface damage is removed and the window has a constant thickness.

(j) Measure the window thickness dimensions (TASK 56-21-00-200-801).

(k) Do a check of the window visually for optical quality. If the window is damaged, do the repair process again.

(l) Make sure the window pane thickness is greater than the limits permitted (TASK 56-21-00-200-801).

END OF TASK