1. Aluminum and Aluminum Alloy — Corrosion Removal

A. General

Aluminum and its alloys are the most widely used materials in the construction of commercial airplanes. The metal is nontoxic, nonmagnetic and because of its high energy absorption properties, will not spark when struck against other metals. Although aluminum appears relatively high in the electrochemical series, the formation of a tightly adhering oxide film on the surface offers increased resistance to mildly corrosive conditions. The obvious sign of corrosion is a whitish deposit of corrosion products. General etching, pitting or roughness of the surface gives an indication of early stages of corrosion damage. Procedures for corrosion removal by either the mechanical or chemical methods are provided in the following paragraphs.

B. Procedure

WARNING: PERSONNEL USING THESE PROCEDURES SHALL OBSERVE ALL SAFETY PRECAUTIONS AND PROCEDURES RELATING TO COMPLETION OF THESE PROCEDURES.

(1) Corrosion Removal - Mechanical

(a) Positively identify the metal as aluminum. See Original Finishes, 51-20-00, General, the appropriate ATA chapter of this manual or contact Gulfstream Technical Operations if clarification is required.

(b) Protect adjacent areas to prevent additional corrosion damage from corrosion products removed during mechanical corrosion removal.

(c) If grease or soil is present, clean area. See Corrosion Rework Preparations, 51-13-10, General.

(d) Strip paint (if applicable). See Corrosion Rework Preparations, 51-13-10, General.

(e) Determine extent of damage. See Corrosion Levels and Rework Limits, 51-13-10, General.

(f) Remove corrosion by one of the following methods:

CAUTION: DO NOT USE CARBON STEEL BRUSH OR STEEL WOOL ON ALUMINUM SURFACES. TINY DISSIMILAR METAL PARTICLES MAY BECOME IMBEDDED IN THE ALUMINUM CAUSING FURTHER CORROSION AND SUBSEQUENT DAMAGE TO THE COMPONENT PART. SIMILARLY, STEEL FASTENERS SHOULD BE REMOVED PRIOR TO CORROSION CLEANUP TO ENSURE THAT THE CORROSION IS COMPLETELY REMOVED AND THE ALUMINUM SKINS DO NOT BECOME CONTAMINATED WITH STEEL PARTICLES. THIS CAN OCCUR WHEN FASTENER HEADS ARE GROUND DOWN WHILE REMOVING ADJACENT SKIN CORROSION.

1 Light surface corrosion shall be removed by light hand sanding using the abrasive materials listed in Table 201. See Corrosion Removal, 51-13-20, Repair.

2 Light surface corrosion and stains may also be removed with pumice paste. Prepare pumice paste by mixing pumice powder with water to form a slurry paste. Apply to stain using a clean, soft cloth and rub gently. When paste has dried to a white powder, wipe off with a clean, dry, soft cloth. If corrosion products still exist, use 600 grit, wet or dry abrasive paper and water to remove the remaining corrosion.
Remove moderate corrosion products by hand scraping with any of the following items:

a. Carbide tipped scraper.
b. Fine fluted rotary file.
c. 400 grit aluminum oxide (alumina) abrasive paper.
d. Stainless steel brush (bristles of the brush not to exceed 0.010 inch in diameter). After use of the stainless steel brush or file, surface shall be polished with 400 grit alumina abrasive paper then with 600 grit alumina abrasive paper.

**CAUTION:** VIGOROUS, HEAVY, CONTINUOUS RUBBING (SUCH AS WITH POWER DRIVEN WIRE BRUSHES) CAN GENERATE ENOUGH HEAT TO CAUSE METALLURGICAL CHANGE.

Mechanically remove moderate or severe corrosion by stainless steel wire brushing, grinding or abrasive blasting. See Corrosion Removal, 51-13-20, Repair. Select appropriate abrasives. See Table 201. Bristles of stainless steel wire brush are not to exceed 0.010 inch in diameter.

**CAUTION:** ON NONCLAD SURFACES WHICH HAVE BEEN ANODIZED, CARE MUST BE EXERCISED TO AVOID DAMAGE TO THE ANODIZED SURFACE ADJACENT TO THE CORROSION AREA.

Dry abrasive blasting with glass beads is an approved method for corrosion removal from aluminum and aluminum alloys. See Corrosion Removal, 51-13-20, Repair. Air pressures of 40 - 80 psi shall be used. The higher pressure removes corrosion more rapidly, but is not to be exceeded to prevent damage to the surfaces and excessive material removal.

(g) After removing all corrosion visible through a 10X power magnifying glass, remove an additional 0.001 inch of material (if available) to ensure complete removal of corrosion products.

(h) Fair depression resulting from rework. See Corrosion Removal, 51-13-20, Repair and Figure 201. Surface finish with 400 or 600 grit abrasive paper. Select appropriate abrasives from Table 201.

(i) Clean reworked area.

(j) Determine depth of faired depression to ensure that rework depth limits have not been exceeded. See Corrosion Removal, 51-13-20, Repair.

(k) In cases involving repair of clad aluminum components, test for cladding. See Corrosion Removal, 51-13-20, Repair.

(l) Treat reworked area. See Aluminum and Aluminum Alloys - Surface Treatment, 51-21-21, Repair.

**CAUTION:** AVOID CHEMICAL REMOVAL AT TEMPERATURES ABOVE 100°F OR BELOW 40°F.

(2) Corrosion Removal - Chemical

(a) Mask adjacent area to prevent brighteners from contacting magnesium, anodized aluminum, glass, plexiglass, fabric surfaces and steel.
WARNING: WEAR ACID RESISTANT GLOVES, PROTECTIVE MASK AND PROTECTIVE CLOTHING WHEN WORKING WITH ACID COMPOUNDS. IF THE ACID ACCIDENTALLY CONTACTS THE SKIN OR EYES, FLUSH OFF IMMEDIATELY WITH A CONSIDERABLE AMOUNT OF CLEAR WATER. CONSULT A PHYSICIAN IF EYES ARE AFFECTED OR IF SKIN IS BURNED.

CAUTION: DO NOT ADD WATER TO ACID. ALWAYS SLOWLY ADD ACID TO WATER. DO NOT USE ALKALINE-TYPE CORROSION REMOVERS TO REMOVE CORROSION FROM ALUMINUM ALLOYS.

WHEN APPLYING CORROSION REMOVAL SOLUTION, PARTICULAR CARE SHOULD BE TAKEN TO KEEP CHEMICALS OUT OF FAYING SURFACES, BUTT JOINTS, SEAMS, CREVICES, ETC.

(b) Dilute phosphoric acid base corrosion removing compound according to manufacturer’s instructions. Mix compound in wood, plastic or plastic lined containers.

(c) Apply diluted solution to corroded areas by spraying or with a sponge or brush. Apply with a circular motion, starting from lower surfaces and working upward to minimize runs and streaks.

(d) Leave the solution on from 5 - 30 minutes, depending on temperature and the amount of corrosion present. Agitate occasionally with a short fibered, acid resistant brush. Do not allow solution to dry on surface, as streaking will result.

(e) Rinse with a stream of water or wipe off with clean moist cloth, frequently rinsing cloth in clear water.

(f) Dry area with clean dry cloth and inspect area for corrosion.

(g) Repeat Steps 1.B.(2)(c) thru 1.B.(2)(f), if any corrosion remains.

(h) Fair depressions resulting from rework. See Corrosion Removal, 51-13-20, Repair. Select proper abrasive and surface finish with 400 or 600 grit abrasive paper. See Table 201.

(i) Clean reworked area.

(j) Determine depth of faired depression to ensure that rework depth limits have not been exceeded. See Corrosion Removal, 51-13-20, Repair.

(k) Treat reworked surface. See Aluminum and Aluminum Alloys - Surface Treatment, 51-21-21, Repair.
**Table 201: Abrasives for Surface Blending and Mechanical Removal of Corrosion and Paint**

<table>
<thead>
<tr>
<th>MATERIAL TO PROCESS</th>
<th>RESTRICTION</th>
<th>OPERATION</th>
<th>ABRASIVE CLOTH OR PAPER</th>
<th>ABRASIVE FABRIC OR PAD</th>
<th>WOOL</th>
<th>PUMICE</th>
<th>LAPPING COMPOUND</th>
<th>ABRASIVE WHEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel alloys</td>
<td>Does not apply to heat treats of 220 ksi and above</td>
<td>Corrosion and paint removal</td>
<td>150 grit or finer</td>
<td>150 grit or finer</td>
<td>Fine to ultra fine</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finishing</td>
<td>400 grit or finer</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Nickel chromium</td>
<td>Corrosion and paint removal</td>
<td>150 grit or finer</td>
<td>150 grit or finer</td>
<td>Fine to ultra fine</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Finishing</td>
<td>400 grit or finer</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Aluminum alloys</td>
<td>Do not use silicon carbide abrasives</td>
<td>Corrosion and paint removal</td>
<td>150 grit or finer</td>
<td>7/0 grit or finer</td>
<td>Fine to ultra fine</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td></td>
<td>Finishing</td>
<td>400 grit or finer</td>
<td></td>
<td></td>
<td>x</td>
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</tr>
</tbody>
</table>

**Notes:**
- Stainless steel alloys do not apply to heat treats of 220 ksi and above.
- Nickel chromium does not allow use of silicon carbide abrasives.
GULFSTREAM IV
STRUCTURAL REPAIR MANUAL

DAMAGE REMOVED AND SURFACE SMOOTHED WITH SHALLOW ELLIPTICAL DISH-OUT
INTERVENING MATERIAL BETWEEN CLOSELY SPACED MULTIPLE DEPRESSIONS
REMOVED TO FORM SINGLE, SMOOTH SURFACE DEPRESSION

DETAIL A

NOTES:
1. SEE SPECIFIC REPAIR FOR MAXIMUM ALLOWABLE DEPTH
2. SINCE MAXIMUM DEPTH VARIES AT DIFFERENT LOCATIONS, MAXIMUM SIZE OF DEPRESSION WILL ALSO VARY
3. THE BLENDING RATIO SHALL BE MAINTAINED AT ALL TIMES UNLESS OTHERWISE SPECIFIED IN A SPECIFIC REPAIR

Blend Out Ratio
Figure 201

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