1. Magnesium Alloy — Corrosion Removal
   
   A. General
   
   In some instances, magnesium alloys are used in airplane construction. Magnesium is lightweight, but is the most chemically active usable metal. Therefore, it is highly susceptible to corrosion when failure of protective coating has occurred. In order to preclude serious structural damage, early detection and prompt corrective action should be taken. The beginning of corrosion attack causes lifting of paint film and white spots which rapidly develop into snow like mounds or whiskers. Procedures for corrosion removal by either mechanical or chemical method are outlined in the following paragraphs.

   B. Corrosion Removal - Mechanical

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

   SMALL PARTICLES AND FINE SHAVINGS OF MAGNESIUM IGNITE EASILY AND PRESENT AN EXTREME FIRE HAZARD. MAGNESIUM DUST IS HIGHLY FLAMMABLE AND IN THE PROPER CONCENTRATION CAN CAUSE AN EXPLOSION. WATER IN CONTACT WITH MOLTEN MAGNESIUM PRESENTS A STEAM EXPLOSION HAZARD. EXTINGUISH FIRES OF MAGNESIUM WITH ABSOLUTELY DRY TALC, CALCIUM CARBONATE, SAND OR GRAPHITE BY APPLYING THE POWDER TO A DEPTH OF 1/2 INCH OR MORE OVER THE BURNING METAL. DO NOT USE FOAM, WATER, CARBON TETRACHLORIDE OR CARBON DIOXIDE ON MAGNESIUM FIRES.

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

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

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


   (6) Remove loose corrosion products using aluminum wool.

   CAUTION: DO NOT USE CARBON STEEL BRUSH OR STEEL WOOL ON MAGNESIUM SURFACES. TINY DISSIMILAR METAL PARTICLES MAY BECOME IMBEDDED IN THE MAGNESIUM CAUSING FURTHER CORROSION AND SUBSEQUENT DAMAGE TO COMPONENT PART.

   DO NOT USE SILICON CARBIDE ABRASIVES ON MAGNESIUM SURFACES.

   (7) Remove corrosion by one of the following:

   (a) Light surface corrosion shall be removed by hand sanding using the abrasive materials listed in Table 201. See Corrosion Removal, 51-13-20, Repair.
(b) Light 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 remaining corrosion. See Table 201 for list of abrasive paper.

(c) Remove moderate corrosion products by hand scraping using any of the following items:

1. Carbide tipped scraper.
2. Fine fluted rotary file.
3. With 400 grit alumina abrasive paper. See Table 201.
   **NOTE:** After use of stainless steel brush or file, surface shall be polished with 400 grit alumina abrasive paper then with 600 grit alumina abrasive paper.
4. Stainless steel brush (bristles of brush not to exceed 0.010 inch in diameter).

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

(d) Mechanically remove moderate or severe corrosion by stainless steel wire brushing, grinding or abrasive blasting. See Corrosion Removal, 51-13-20, Repair for procedures. Select appropriate abrasives from Tables 201 and 202.

**NOTE:** Bristles of stainless steel wire brush not to exceed 0.010 inch in diameter.

(e) Dry abrasive blasting is an approved method for corrosion removal from magnesium alloys. See Corrosion Removal, 51-13-20, Repair for procedures. Air pressures of 10 - 35 psi shall be used on magnesium alloy surfaces.

(8) After removing all corrosion visible through a 10X power magnifying glass, apply corrosion treating solution prepared in Step 1.C.(4) and wash thoroughly with fresh water.

(9) Fair depressions resulting from rework. See Corrosion Rework Preparations, 51-13-10, General. Surface finish with 400 or 600 grit abrasive paper. See Table 201.

(10) Clean reworked area.

(11) Determine depth of faired depression to ensure that rework depth limits have not been exceeded. See Corrosion Rework Preparations, 51-13-10, General.

(12) Treat reworked area as described. See Magnesium Alloys - Surface Treatment, 51-21-22, Repair.

C. Corrosion Removal - Chemical

**CAUTION:** THE FOLLOWING PROCEDURES ARE NOT APPLICABLE TO ADHESIVE-BONDED PARTS OR ASSEMBLIES, AREAS WHERE THE CHEMICAL AGENTS MIGHT BECOME LODGED AND LOCAL AREAS BARED SPECIFICALLY FOR GROUNDING OR ELECTRICAL BONDING OF COMPONENTS.

(1) Positively identify metal as magnesium. See Original Finishes, 51-20-00, General, the appropriate ATA chapter of this manual or contact Gulfstream Technical Operations if clarification is required.
NOTE: Chromic acid treating solution may be used to remove surface oxidation and light corrosion products from magnesium surfaces. This method is not adequate where deep pitting or heavy corrosion has occurred. These situations require mechanical methods of removal. If properly used, chemical corrosion removal methods cause less reduction in section thickness. Components containing copper based inserts shall not be treated with this method unless properly masked off. Excessive amounts of other acid anions, such as fluorides, sulfates or chlorides should not be allowed to build up in treating (pickle) solution as these anions tend to coat and pit metal rather than clean the surface. Frequent changing of solution will help to prevent this problem from occurring.

(2) Remove loose corrosion products using aluminum wool.

(3) Mask off other materials and parts, especially rubber parts, bearings, cast or pressed inserts, cracks and plated steel to prevent contact with treating solution or its fumes.

(4) Prepare corrosion treating solution. Two chemical preparations are available. To prepare the solutions, proceed as follows:

WARNING: ADD CHROMIUM TRIOXIDE TO WATER; DO NOT ADD WATER TO THE CHROMIUM TRIOXIDE. KEEP CHROMIUM TRIOXIDE POWDER AWAY FROM ALL ORGANIC SOLVENTS (ALCOHOL, MEK, TRICH, MIBK, ETC.) OR EXPLOSIONS OR FIRE MAY OCCUR.

WEAR ACID RESISTANT GLOVES, PROTECTIVE MASK AND PROTECTIVE CLOTHING WHEN WORKING WITH ACID COMPOUNDS. IF ACID ACCIDENTALLY CONTACTS SKIN OR EYES, FLUSH OFF IMMEDIATELY WITH A CONSIDERABLE AMOUNT OF CLEAN WATER. CONSULT A PHYSICIAN IF EYES ARE AFFECTED OR IF SKIN IS BURNED.

(a) Chromium Trioxide Preparation:

1. To make one U.S. gallon of solution, add 24 ounces of chromium trioxide to water in a one gallon mixing container of lead lined steel, stainless steel or 1100 alloy (commercially pure) aluminum. Dissolving time is 1 - 15 minutes when heated to 190°F - 202°F. Longer dissolving time is required when mixed at room temperature.

(b) Sodium Dichromate / Nitric Acid Preparation:

1. Prepare solution in the following proportions:

   - 1 1/2 pounds of sodium dichromate and 1/2 U.S. pints of concentrated nitric acid per U.S. gallon of water

Mix as follows:

NOTE: The solution shall be prepared and stored in clean polyethylene or glass containers.

a. Fill a suitable container with a volume of water equal to approximately 1/4 of total desired quantity of solution.

b. Add total quantity of sodium dichromate in proportions indicated above and agitate until chemical is dissolved.

c. Add another volume of water until quantity of solution is equal to 2/3 of total desired quantity.

d. Slowly add total volume of nitric acid to solution and mix thoroughly.
Add water until total desired quantity of solution is obtained and stir until entire solution is thoroughly mixed.

Remove corrosion by carefully applying chromic acid solution to corroded area with an acid resistant brush.

Allow solution to remain on surface for approximately 15 minutes; agitate surface with brush and wipe dry.

Rinse thoroughly with water while scrubbing with brush and wipe dry.

Repeat Steps 1.C.(4)(b)1 f thru 1.C.(4)(b)1 h, as necessary until all corrosion products have been removed and a bright metallic color of the metal appears.

Fair depressions resulting from the rework. See Corrosion Removal, 51-13-20, Repair.

Clean reworked area.

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

Treat reworked surfaces after corrosion removal. See Magnesium Alloys - Surface Treatment, 51-21-22, 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></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Nickel chromium</td>
<td></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></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td>Finishing</td>
<td>400 grit or finer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **ALUMINUM OXIDE**
- **SILICON CARBIDE**
- **GARNET**
- **AUSTENITIC STAINLESS STEEL**
- **350 MESH OR FINER**
- **ALUMINUM OXIDE**
- **SILICON CARBIDE**
### Table 202: Abrasives for Abrasive Blast Removal of Corrosion and Paint

<table>
<thead>
<tr>
<th>MATERIAL TO PROCESS</th>
<th>RESTRICTION</th>
<th>OPERATION</th>
<th>ABRASIVE PER MIL-A-21380</th>
<th>MICRO INCHES RMS</th>
<th>GRIT SIZE</th>
<th>AIR PRESSURE PSI</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 X X X X X X</td>
<td>70 - 63 80</td>
<td>50 - 32 120</td>
<td>30 - 20 220</td>
<td></td>
</tr>
<tr>
<td>Nickel Chromium Alloys</td>
<td>———</td>
<td>Corrosion and paint removal X X X X X X</td>
<td>70 - 63 80</td>
<td>50 - 32 120</td>
<td>30 - 20 220</td>
<td></td>
</tr>
<tr>
<td>Aluminum Alloys</td>
<td>Do not use silicon carbide abrasives</td>
<td>Corrosion and paint removal X X X X X</td>
<td>70 - 63 80</td>
<td>50 - 32 120</td>
<td>30 - 20 220</td>
<td></td>
</tr>
</tbody>
</table>