1. Corrosion Removal and Preventive Procedures

   A. Introduction

   The contents of this section will provide sufficient general information for maintenance personnel to detect corrosion on ferrous and nonferrous metal structures. Background information regarding the original design philosophy is outlined to give a general overview of corrosion resisting systems presently in use in the GIV aircraft. Information is also provided to prevent further damage and where feasible, to repair damage and restore the as manufactured protection to its original capability. Most methods of corrosion prevention are temporary in nature and must be renewed to remain effective. Detailed procedures are provided for the application of corrosion inhibiting compounds.

   This section also describes various known types of corrosion and their causes to aid in identification of corrosion in the field and the selection of proper repair practices. It is vital that corrosion be properly identified so that the underlying cause may be determined. This will allow the correct procedure to be implemented, thus eliminating the factors required for corrosion propagation.

   The nature of corrosion is to consume material meant to absorb or transfer structural loads. When corrosion progresses beyond the point of acceptable structural material section reduction, the only way to fully restore part functionality is to replace the corroded part or repair it by adding material. Corrosion rework limits establish the point of acceptable material section reduction. Corrosion rework limits are manufacturing design tolerances or the manufacturer’s prescribed material removal (blend-out) limits, which can be obtained by referring to the appropriate ATA chapter of this manual or by consulting with Gulfstream Technical Operations. Corrosion that is within these limits must be removed and protective surface treatments restored to prevent further occurrence. Corrosion prevention is the ideal and early corrosion detection is necessary to allow corrosion removal within limits. See Corrosion Removal Techniques - Safety Precautions, 51-13-10, General and Standard Surface Treatment Methods, 51-13-10, General of this section for a definition of corrosion levels, corrosion removal techniques and surface treatment methods. For repair of corrosion damage in excess of corrosion rework limits, see the appropriate ATA chapter of this manual or contact Gulfstream Technical Operations for assistance.

   B. General

   The Gulfstream IV model aircraft was first placed into service in 1987. The design utilizes the latest technology in corrosion prevention. The aluminum constituting the majority of the structural fabrication employs Alclad coating where possible. A chromate conversion coat process (Alodine) was applied to the Alclad aluminum, followed by a primer coat and a top coat of epoxy paint. The wing structural skin planks are machined one piece 7075-T7351 aluminum alloy for the upper plank and a three piece 2024-T351 lower plank assembly, all of which are chromic acid anodized. The steel parts of the structure were cadmium plated as a minimum and followed by a primer coat as well as top coat of epoxy paint where practical. Where aluminum and steel parts interface, both parts are coated with at least one coat of primer plus a surface coat of a white urethane sealer to prevent galvanic corrosion. Phased in during production, the aluminum / steel interface parts are also given a double coat of white paint after being primed. This corrosion protective system has proven to be very efficient in preventing corrosion of the airframe.

   The design requirements of the airframe were to use corrosion resistant aluminum alloys where possible. The pressure vessel consists of predominantly 2024-T3 skins, with 7075-T6 longerons. The cold bonding process used by some airframe manufacturers is not used in the GIV design. All joints are riveted with the rivet material matching the parent metal where possible. The mixture of aluminum and steel parts requires the fastening with cadmium plated Monel or titanium fasteners. This procedure was instituted to prevent corrosion from dissimilar metals both at the interface and in the holes.

   51-13-10
   Page 1
   February 29/04
The paint utilized is an epoxy based primer which is resistant to Skydrol attack. It has proven to be especially strong in adhesion and provides excellent corrosion resistance. A second coat of white epoxy topcoat is used in areas where Skydrol is routinely present. This makes inspection easier. The application of the white topcoat has been expanded from wheel well areas to the wing rear beam and the aft equipment bay.

The aft fuselage and empennage of the GIV is designed to withstand the effects of sonic fatigue from the fuselage mounted engines. The skin sections in these areas are increased at the attachment points, while retaining the thin sections necessary for a weight efficient design elsewhere. This is done with the process of chemical milling.

To avoid stress corrosion, the design loading was kept as low as possible. The use of steel was limited to predictable alloys such as 4340 with heat treatment common in the 160 - 180 ksi range. Only in rare instances heat treat levels in excess of 180 ksi are used. Corrosion resistant steels were used in many applications where the part was exposed to the outside environment. These design requirements will be instrumental in the delayed initiation of corrosion.

Through service experience, it has become apparent that even this corrosion protective system has limitations. Gulfstream has seen corrosion in early, intermediate and advanced stages through the years on various airplanes. Aviation industry aging aircraft awareness has been heightened by airframe structural failures previously thought of as a thing of the past. The 1950’s saw the advent of fail safe designs and fatigue testing philosophies which greatly reduced structural failures of all aircraft. In the 1980’s, the design philosophies shifted from fail safe / safe life to damage tolerance criteria based on fracture properties and crack / flaw growth. The GIV is a combination of these two types of design philosophies. Corrosion can compromise safe life design philosophies by attacking both elements of the fail safe structure.

It is important to state that there have not been any structural failures in the GIV fleet as a result of corrosion. It is also important to state that the introduction of the corrosion inspection philosophy is to insure prevention of failure by proper detection.

### 2. Types of Corrosion

During the visual inspection, corrosion appears in many different outward signs on the corroded metal. Corrosion is catalogued and typed in many ways. For descriptive purposes, the types we will discuss fall under these commonly accepted titles:

- Uniform Etch
- Pitting
- Intergranular
- Exfoliation
- Galvanic
- Stress
- Concentrated Cell

#### A. Uniform Etch

Surface corrosion of metals by uniform chemical attack is the simplest form of corrosion and occurs in the atmosphere and in liquids. See Figure 1. It occurs frequently under normal conditions of exposure and is relatively uniform over the metal surface. The surface effect produced by most chemical attacks (as by an acid) is a uniform etching of the metal. On a polished surface, this type of corrosion is first seen as a dulling of the surface and if allowed to continue, the surface becomes rough and possibly frosted in appearance.

Micro anode and cathode areas are involved; consequently, uniform etch corrosion is localized corrosion occurring consistently and uniformly over the surface of a metal. The rusting of iron, the tarnishing of silver, the fogging of nickel and the high temperature oxidation of iron or stainless steels
are typical versions of uniform etch. The discoloration or general dulling of metals created by exposure to elevated temperatures are not considered as uniform etch corrosion.

B. Pitting

Pitting corrosion is the most common and severe form of localized corrosive attack on aluminum and magnesium alloys. See Figure 2. Thin metal sheets or plates are especially vulnerable to failure by this form of attack since penetration of the metal pit sites can result in perforation of the metal and possible unserviceability.

Pitting usually occurs in grain boundaries and other highly anodic points on the metal surface. It is primarily the result of localized cell action. Pitting on aluminum alloys is first noticeable as a white or gray powdery deposit, similar to dust, which blotches the surface. When the deposit is cleaned away, tiny pits or holes are seen in the metal surface. Pitting corrosion also appears in other types of metal alloys.

C. Intergranular

Intergranular corrosion occurs along boundaries between grains or crystals in metals. See Figure 3. The boundary areas are usually anodic to the grains. In certain corrosive electrolytes, if sufficiently wide potential differences exist between the anodic grain boundaries and the cathodic grains, rapid, concentrated intergranular or intercrystalline corrosion occurs.

Many metals are susceptible to some extent to intergranular corrosion, in many cases, this type of attack is of little significance. However, where the corrosion attack at grain boundaries is severe, the strength and other physical properties of the metal may be reduced out of proportion to the amount of metal consumed. Structural alloys, such as the so-called nonstabilized 300 series stainless steels are singularly vulnerable to intergranular corrosion. When these alloys are heated 900°F - 1500°F, the carbon contained in the alloy will combine with chromium in the alloy to produce an iron chromium carbide, which precipitates in the grain boundaries. This results in lowering of chromium content in the areas adjacent to the carbides. The chromium deprived portions of the alloy are susceptible to intergranular corrosive attack.

This increased susceptibility to intergranular corrosion through heating is frequently referred to as sensitization to intergranular corrosion. If not followed by proper solution annealing treatment, welded nonstabilized stainless steels may be sensitized to grain boundary corrosion attack in the heat affected zones on either side of the weld.

D. Exfoliation

Exfoliation corrosion is a form of intergranular corrosion. See Figure 4. It shows itself by lifting up the surface grains of a metal by the force of expanding corrosion occurring at the grain boundaries just below the surface. This is visible evidence of intergranular corrosion and is most often seen on extruded sections where grain thicknesses are usually less than in rolled forms of metal alloys.

E. Galvanic

Galvanic corrosion occurs when dissimilar metals are in contact and an external circuit is provided by the presence of moisture. See Figure 5. It is usually recognizable by the presence of a buildup of corrosion at the joint between the metals. For example, aluminum and magnesium skins riveted together in an aircraft wing form a galvanic couple if moisture or contamination are present. When aluminum is attached with steel fasteners, galvanic corrosion can occur.

When two dissimilar metals are in contact in the presence of an electrolyte, a potential difference has been found to exist between them. The electron flow is from the anode through the metal path to the cathode as previously described. In galvanic corrosion, the anode turns out to be the least noble.
metal of the two. Table 1 gives a list of commonly used metals starting with the least noble metals and running progressively down the list in the noble direction. There will be relatively little galvanic corrosion between two metals next to each other on the list. As the metals become further apart on the list, the rate of corrosion increases considerably.

F. Stress

Stress corrosion results from the combined effects of tensile stress and corrosion. Cold working or straining, quenching (in heat treatment), grinding or welding may produce internal stresses, while applied stresses may be local and uniform, static or cyclic. The most destructive type of stress is that which is local and nonuniform. Under such conditions, the stressed zones are subject to accelerated corrosion.

It is known that areas of metals which are subjected to applied stresses will develop a more anodic nature at such areas under corrosive conditions. Adjoining unstressed areas or less stressed areas will be less anodic or more cathodic.

Stresses induced when a piece is deformed, those induced by press and shrink fits and those in rivets and bolts are internal stresses. Unanticipated residual stress is more important than design stress, because stress corrosion is difficult to recognize before it has overcome the design safety factor.

The magnitude of the stress varies from point to point within the metal. Stresses approaching the yield strength are generally necessary to promote stress corrosion cracking.

G. Concentration Cell

Concentration cell corrosion is a localized accelerated corrosive attack caused by nonuniformity of the electrolyte or the environment. The attack, which is electrochemical in nature, ensues because of differences in the concentration of ions or of dissolved gases (oxygen, for example), resulting in differences in potential on the surface of the same metal or surfaces of electrodes consisting of the same metal. Differences in environment may result because of cracks or crevices on the metal surface which, because of reactions in confined spaces, deplete electrolyte constituents, such as oxygen deficient cells at faying surfaces.
Table 1: Potential Tendency of Metals for Galvanic Corrosion

<table>
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<tr>
<th>GROUP NO.</th>
<th>METAL OR ALLOY</th>
<th>CORRODED END (ANODIC OR LEAST NOBLE)</th>
<th>PROTECTED END (CATHODIC OR MOST NOBLE)</th>
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<td></td>
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<tr>
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<td></td>
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<tr>
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<td>12 Copper</td>
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<tr>
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</tr>
<tr>
<td>14 Graphite</td>
<td>0 0 0 0 1 1 1 1 1</td>
<td></td>
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</tr>
</tbody>
</table>

**NOTE:** The larger the number, the greater the tendency for galvanic corrosion.
Surface Corrosion of Metals

Figure 1

Pitting

Figure 2
Intergranular Corrosion
Figure 3 (Sheet 3 of 3)

Exfoliation
Figure 4 (Sheet 1 of 2)
3. Corrosion Inhibitors

Refer to GIV Aircraft Maintenance Manual Chapter 51 for Corrosion Inhibiting Compounds.

Before beginning corrosion removal, determining specific corrosion rework limits by contacting Gulfstream Technical Operations or referring to the appropriate ATA chapter of this manual may have significant benefit. Comparison of the degree of corrosion with the rework limits may make it obvious that the corrosion cannot be removed within the rework limits. This could allow a repair / replacement to be made before expending any corrosion removal effort. Complete removal of corrosion products and affected base material is of primary importance. Failure to achieve complete removal in a timely manner may result in continuance of corrosion even after the affected areas are refinished. There are two methods of corrosion removal; mechanical and chemical. The type of metal and degree (level) of corrosion will determine which of these techniques to select.

The removal techniques for each metal and level of corrosion are outlined. See the following:

- Aluminum and Aluminum Alloy - Corrosion Removal, 51-13-21, Repair
- Magnesium Alloy - Corrosion Removal, 51-13-22, Repair
- Alloy Steel - Corrosion Removal, 51-13-23, Repair
- Stainless Steel and Nickel Chromium Alloy - Corrosion Removal, 51-13-24, Repair
- Titanium Alloy - Corrosion Removal, 51-13-25, Repair
- Plated or Phosphated Surfaces - Corrosion Removal, 51-13-26, Repair
- Tungsten Ballast Weights - Corrosion Removal, 51-13-27, Repair

The removal techniques for each metal and level of corrosion are outlined. See the following:

In cases where chemical techniques are used, control and removal of chemical residues are as important as removing corrosion.

Gulfstream recommends that first consideration be given to mechanical techniques over chemical techniques. Chemical techniques should be employed with extreme care and only by qualified personnel knowledgeable in their use.

Some operators have used dye penetrant inspection in cases where suspected corrosion residues may still be present.

This technique does not ensure that the cleanup area is free of corrosion contaminants. It is the operator’s responsibility to thoroughly inspect the area after cleanup to ensure that no visible corrosion residue is present.

A. Safety Procedures

The following safety procedures should be adhered to when handling hazardous materials:

NOTE: Many of the materials specified in this manual may have significant safety, health or environmental requirements related to their use. Material Safety Data Sheets (MSDS) must be consulted to determine the manufacturer’s recommendations concerning exposure precautions and manufacturer’s instructions shall be followed when using any of the specified materials. It is the sole responsibility of the user to ensure protection of their employees from injury or exposure, safe application of material, proper disposal and compliance with any federal, state or local regulations regarding the use of any materials specified in this manual.

Rules for handling materials with hazardous properties used in corrosion removal work are contained in General Safety Precautions.

The immediate treatment of personnel who inadvertently come into contact with one of the hazardous materials is contained in Emergency Safety Procedures.

General Safety Precautions
NOTE: The following safety precautions shall be observed when using or handling solvents, special cleaning compounds, paint strippers (strong alkalis and acids), etchants (corrosion removers containing acids) or solutions that produce chemical conversion coatings (on aluminum for example):

- Avoid prolonged breathing of solvent or acid vapors. Solvents and acids must not be used in confined spaces without adequate ventilation or approved respiratory protection.
- Never add water to acid. Always, slowly add acid to water.
- Do not mix chemicals except as prescribed by procedure.
- Clean water for emergency use shall be available in the immediate work area before starting work.
- Avoid prolonged or repeated contact of solvents, cleaners, etchants (acids) or conversion coating materials with the skin.
- Rubber or plastic gloves and goggles shall be worn when using solvents, cleaners, paint strippers, etchants or conversion coating materials.
- Goggles or plastic face shields and rubber raincoats and rain hats shall be worn when cleaning, stripping, etching or conversion coating overhead surfaces.
- When mixing alkalis or acids with water or other substances, use only containers that are made to withstand the chemicals themselves and the heat generated by the process.
- Wash body skin or clothing immediately after contact with any paint stripper, etchant or conversion coating material.
- Materials splashed in the eyes shall be promptly flushed out with water and the injured person taken to a medical facility for further treatment.
- Do not eat or keep food in areas where it may absorb poisons. Always wash hands before eating or smoking.
- All equipment should be cleaned after work has been completed.

Emergency Safety Procedures

NOTE: Personnel must be thoroughly familiar with the following emergency safety procedures before using any materials which are referenced to an emergency safety procedure paragraph.

Immediate attention is most important in skin, eye and inhalation treatment.

- If exposed to physical contact with any of the following materials, treat as shown below:
  - Methyl Alcohol (Methanol)
  - Xylene
  - Methyl Ethyl Ketone (MEK)
  - Methyl Propyl Ketone (MPK)
  - Petroleum Naphtha
  - Methyl Isobutyl Ketone (MIBK)
  - Chromates
  - Toluene
  - Dichromate
  - Acetates
  - Epoxy Resin
  - Cyclohexanone
  - Methylene Chloride
  - Cellosolve
  - Chemical conversion coating solutions (e.g. Alodine)
  - Carbon Tetrachloride
  - Acetone
  - Isopropyl Alcohol
Treatment For Exposure

- If splashed into eyes, do not rub. Flush eyes immediately with water for at least 15 minutes. Lift upper and lower lids frequently to ensure complete washing.
- If splashed on clothing or onto large areas of the body, immediately remove contaminated clothing and wash body with plenty of soap and water. Wash clothing before wearing again.
- If splashed onto an easily accessible part of the body, immediately wash with soap and water.
- If suffering headache or other obvious symptom resulting from overexposure, move to fresh air immediately.
- If vapors are inhaled and breathing has slowed down or stopped, remove person from exposure and start artificial respiration at once. Call ambulance and continue this treatment until ambulance arrives.
- If exposed to physical contact with any of the following materials, treat as shown below:
  - Acetic acid
  - Hydrofluoric acid
  - Phenol
  - Nitric acid
  - Formic acid
  - Cresols
  - Phosphoric acid
  - Tricresyl Phosphate
  - Hydrochloric (Muriatic) acid

Treatment For Exposure

NOTE: It cannot be overemphasized that immediate attention is most important in skin, eye and inhalation treatment.

- **Eyes**
  - If splashed into eyes, do not rub
  - Flush eyes immediately with water for at least 15 minutes
  - Lift upper and lower lids frequently to ensure complete washing
  - Get immediate medical attention

- **Clothing**
  - If splashed on clothing or onto areas of the body, remove contaminated clothing and wash body under shower for at least 15 minutes. Wash clothing before reusing
  - Report to medical facility

- **Inhalation:**
  - If vapors are inhaled, remove worker to fresh air and apply artificial respiration if necessary. Tricresyl phosphate is not considered an inhalation hazard.
  - Call medical facility

- **Internally** (proceed as follows):
  - **Worker unconscious:**
    - Do not give unconscious person any liquid
    - Begin artificial respiration
    - Have someone call medical facility immediately

  - **Worker conscious**
    - Phenols and Cresols
• Do not attempt to induce vomiting
• Encourage him to wash out his mouth with large quantities of water
• Call medical immediately

• Phosphoric Acid
  • Do not induce vomiting
  • Call medical immediately

• Hydrofluoric Acid
  • Drink water to dilute acid, then cause vomiting by placing finger in the back of throat
  • Repeat
  • Wash out mouth repeatedly
  • Call medical immediately

• Nitric Acid
  • Do not induce vomiting
  • Drink large quantities of water, if possible
  • Call medical immediately

• Tricresyl Phosphate
  • Cause vomiting by placing finger in the back of the worker’s throat
  • If necessary, have him drink water, then use finger to induce vomiting
  • Call medical immediately

5. Corrosion Levels and Rework Limits

A. Corrosion Levels

The three levels of corrosion are as follows:

Level 1

Corrosion that is controllable at scheduled inspection intervals within the manufacturer’s prescribed material removal (blend out) limits. This level includes the following categories:

Light Surface Corrosion
  – Consists of light rust (steel) or whitish powdery discoloration (aluminum) with no exfoliation, galvanic action, erosion, or pitting; is local in nature; does not involve high strength (180 ksi +) steel and can typically be removed by the operator with light hand sanding or pumice slurry techniques.
  – Following material removal, the affected area must be within design thickness tolerances.

Moderate Surface Corrosion
  – Similar to light surface corrosion except that exfoliation, galvanic action, erosion or pitting may be present and either of the following:
    – Corrosion is more widespread and may require extensive hand / mechanical sanding.
    – Corrosion removal may cause design material thickness tolerances to be exceeded.
    – Use of the appropriate ATA chapter of this manual or consultation with Gulfstream Technical Operations will be required if design material thickness tolerances are exceeded.

Level 2
Corrosion that occurs between inspections, producing damage exceeding the manufacturer’s prescribed material removal (blend out) limits and requires repair, replacement or other assistance. Pitting, erosion, exfoliation, widespread attack from a spill / rupture and any unusual exposure are examples of Level 2 corrosion.

Use of the appropriate ATA chapter of this manual or consultation with Gulfstream Technical Operations is required.

Level 3

Level 2 corrosion suspected of having or known to have an urgent airworthiness concern requiring corrective action before further flight.

B. Degree of Corrosion Damage

A preliminary assessment of corrosion damage is always advisable before cleanup to determine whether there is any chance of reclaiming the part. Where damage (i.e. Level 2 and Level 3 corrosion) is obviously in excess of manufacturer’s prescribed material removal (blend out) limits, repair or replacement actions can be initiated without expending any corrosion removal efforts. Consult the appropriate ATA chapter of this manual or Gulfstream Technical Operations.

C. Previously Reworked Areas

Allowed material removal data is based on a loss of material thickness which shall include any loss of thickness due to previous rework. Previous rework may be ignored if the actual thickness remaining after corrosion cleanup is within manufacturer’s prescribed material removal (blend out) limits.

Suitable NDT equipment, such as eddy current or ultrasonic instruments, is recommended both for crack detection and material thickness measurement.

D. Depth Measurement Using Straight Edge

Depth measurement is often possible using a straight edge and a 10X power magnifying glass. The straight edge should be placed at various angles to ensure that incorrect measurements are not recorded due to local surface irregularities. See Figure 6.

E. Measuring Material Removal with a Dial Depth Gage

The method for taking measurements with a dial depth gage is outlined as follows:

- Remove corroded material and blend out the damage by careful grinding
- Position the depth gage and determine the measurement reading. See Figure 7
- Take several additional depth readings
- Select the deepest reading as the depth of the corrosion damage

NOTE: The base of the depth gage shall be flat against the undamaged surface on each side of the corrosion. When taking measurements on concave or convex surfaces, place the base perpendicular to the radius of curvature of the surface as shown in Figure 7.

F. Measuring Material Removal with Impression Materials

In the event the corrosion area is inaccessible for use of a dial depth gage, the use of impression materials is recommended.

G. Clay

Modeling clay or similar materials may be used for making impressions of the corrosion damage. Accurate measurements of the depth of corrosion damage can be made by an optical comparator or other accurate measurement means.
H. Silicone Flexible Mold Compound Rubber RTV 630A and RTV 630B

A General Electric Co. silicone flexible mold compound or an equivalent material may be used to make impressions of corrosion damage and will be more permanent than the clay impressions. Measurements can be made by comparator or other accurate measurement means.

I. Rework Limits

The maximum rework limitations should be determined from the criteria referenced in the appropriate ATA chapter of this manual. If no criteria are available, consult Gulfstream Technical Operations. To ensure that allowable limits are not exceeded, an accurate measurement of the material removed or material remaining in the reworked area after fairing should be made. If corrosion damage is in a previously worked area, material removal must include the thickness removed during previous rework.
Determining Depth of Corrosion - Straight Edge Method

Figure 6

SEE DETAIL A

CORROSION SITE BEING EXAMINED

STRAIGHT EDGE

CORRODED PART

DETAIL A

CORROSION AREA

51-13-10
Page 16
February 29/04
Corrosion Damage and Rework Measurement Using Depth Dial Gage
Figure 7

DIAL INDICATOR MARKED IN INCREMENTS OF 0.0005 IN
ADJUSTABLE DIAL FACE LOCK
POINT A
POINT B
CONICAL POINT
CORROSION PIT
POINT C
DIAL INDICATOR 0.00 - 0.500 INCH RANGE
SEE DETAIL A
TAKE READINGS AT VARIOUS POINTS
DETAIL A
6. Corrosion Rework Preparations

Prior to starting any corrosion rework, the airplane and the affected corrosion area must be prepared as outlined in the following procedures. Personnel performing these procedures shall observe all safety precautions for handling the materials used.

Position airplane in wash rack or provide apparatus which will permit rapid rinsing of all affected surfaces. Refer to the Maintenance Manual for washing guidelines.

Statically ground the airplane. Refer to the Maintenance Manual.

Remove or disconnect airplane batteries as required. Refer to the Maintenance Manual.

NOTE: Aircraft batteries should be disconnected when working in the vicinity of battery operated electrical equipment, especially when flammable materials are being used.

Some preventive maintenance procedures such as paint removal or chemical conversion coating, require large quantities of water to be used. In these cases, disconnecting the batteries is prudent.

Protect the pitot static openings, louvers, air scoops, engine openings, landing gear, wheels, tires, magnesium skin panels and airplane interior from moisture and acidic or solvent type chemicals.

Protect surfaces, joints and seams adjacent to rework areas from chemical paint strippers, corrosion removers and surface treatments.

A. General Cleaning

Prior to paint stripping and corrosion removal, the area shall be cleaned if the corroded area or component is soiled by grease, dirt or other foreign material. For general cleaning procedures refer to Maintenance Manual. Safety precautions necessary when working with cleaning chemicals are provided in Corrosion Removal Techniques - Safety Precautions, 51-13-10, General.

B. Paint Stripping

Abrasive Blasting

NOTE: To prevent peening of corrosion products into aluminum alloys, contamination of abrasive compound should be kept below 2%. Abrasives that have been used on steel must never be used on aluminum.

Avoid excessive localized blasting which may result in warpage or distortion of thin material; the removal of some clad surface is also likely.

– Abrasive removal of paint and other coatings shall use dry nonmetallic abrasives only. See Table 2 for approved abrasive cleaning materials.
– Abrasive cleaning shall be performed per Preparation of Surfaces by Abrasive Methods, 51-28-10, Repair or per MIL-S-5002. Abrasive blast removal of paint and other coatings shall use dry nonmetallic abrasives only. See Table 2 for approved abrasive blast compounds.
– During blasting, use the minimum air pressure required. Do not exceed maximum air pressure limits defined in Table 2.
– The abrasive material should never be silicon carbide. Particle size of the abrasive should not be over 180 mesh (0.08 mm) for coarse, rapid removal of the coating. For better control of coating removal, material in the 400 - 600 mesh (0.038 - 0.025 mm) range is advised.
– The blast nozzle should be held at a 45° angle at a distance sufficient so that it removes the coating in an approximately 1 inch diameter path. Use of the equipment requires a moderate amount of skill that may be gained by practicing on a test panel of equivalent thickness.

Abrasive Sanding
Hand sanding techniques using abrasive cloths with abrasive materials similar to those listed in Table 3 are acceptable and practical, especially for small areas or small component parts.

Chemical Stripper - Chemical removal of paint shall employ a suitable epoxy paint remover per MIL-R-81294, MIL-R-81903, MIL-R-25134, AMS 1375, AMS 1376, AMS 1377 or TT-R-2918.

- Mask adjacent areas containing nonaluminum components, including steel fasteners and sealants. To prevent contact with chemical stripper, mask off adjacent bare metal and polished areas.
- Apply a thick, continuous coating of paint stripper compound to cover the surface to be stripped.
- Allow paint stripper to remain on the surface for the length of time required to wrinkle and completely lift the paint.
- Reapply paint stripper as required to those areas where the paint remains firmly adhered or where the material has dried.
- Remove loosened paint and residual paint stripper by washing and scrubbing the surface with fresh water and a stiff nylon bristle brush or an abrasive pad in those areas where paint remains adhered.
- After a thorough rinsing, remove masking materials, thoroughly clean the surface with a clean cloth dampened with a solution of cleaning compound per MIL-C-43616, MIL-C-85570 or MIL-C-87937 and rinse.

**Table 2: 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</td>
<td>X X X X X X</td>
<td>70 - 63</td>
<td>80</td>
<td>30 - 50</td>
</tr>
<tr>
<td>Nickel Chromium Alloys</td>
<td>——</td>
<td>Corrosion and paint removal</td>
<td>X X X X X X</td>
<td>70 - 63</td>
<td>80</td>
<td>30 - 50</td>
</tr>
<tr>
<td>Aluminum Alloys</td>
<td>Do not use silicon carbide abrasives</td>
<td>Corrosion and paint removal</td>
<td>X X X X X X</td>
<td>70 - 63</td>
<td>80</td>
<td>10 - 40</td>
</tr>
</tbody>
</table>
### Table 3: 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>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>
</tr>
<tr>
<td></td>
<td></td>
<td>Finishing</td>
<td>400 grit or finer</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### 7. Standard Surface Treatment Methods

#### A. General

In order to prevent the return of corrosion after corrosion removal or corrosion damage repair, the exposed surfaces of most metals must be immediately treated (e.g., restoring the original finish or applying a supplementary coating) after rework. These treatments include chemical conversion coating, painting, plating, anodizing, and the application of a thin protective film (i.e., oil or primer) over the base metal. The conversion coatings and primer application in addition to improving corrosion resistance also enhance the surface adhesion qualities for painting. Some metals, such as stainless steel and titanium, which are basically corrosion resistant, do not normally require surface protection except for painting to match the surrounding structure, or in dissimilar metal applications, plating, painting or sealing may be necessary.
Corrosion Prevention

After the surface finish has been restored by the treatment methods in this section, to minimize the recurrence of corrosion, service experience indicates a benefit in applying a corrosion inhibiting compound over the surface finish in the more corrosion susceptible areas.

Refer to GIV Aircraft Maintenance Manual Chapter 51 for Corrosion Inhibiting Compounds.