STANDARD OVERHAUL PRACTICES MANUAL

PREPARATION OF ALUMINUM ALLOYS FOR ELECTROPLATING

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STANDARD OVERHAUL PRACTICES MANUAL

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To: All holders of PREPARATION OF ALUMINUM ALLOYS FOR ELECTROPLATING 20-42-04.

Attached is the current revision to this STANDARD OVERHAUL PRACTICES MANUAL

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20-42-04 REVISION RECORD					
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Revision		Filed		Revision		Filed	
Number	Date	Date	Initials	Number	Date	Date	Initials

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INTRODUCTION

1. General

A. The instructions in this manual tell how to do standard shop procedures during maintenance functions from simple checks and replacement to complete shop-type repair.

B. This manual is divided into separate sections:

(1) Title Page

(2) Transmittal Letter

(3) Highlights

(4) Effective Pages

(5) Contents

(6) Revision Record

(7) Record of Temporary Revisions

(8) Introduction

(9) Procedures

C. Refer to SOPM 20-00-00 for a definition of standard industry practices, vendor names and addresses, and an explanation of the True Position Dimensioning symbols used.

D. The data is general. It is not about all situations or specific installations. Use it as a guide to help you write minimum standards.

E. If the component overhaul instructions are different from the data in this subject, use the component overhaul instructions.

PREPARATION OF ALUMINUM ALLOYS FOR ELECTROPLATING

1. INTRODUCTION

A. The data in this subject comes from Boeing Process Specification BAC5714. The airline has a copy of the Boeing Process Specification Manual.

B. The data is general. It is not about all situations or specific installations. Use this data to help you write minimum standards.

C. This subject gives procedures to clean, activate, and do basic striking before you apply plating on aluminum alloys. Use the data in this subject with other Boeing electroplating processes when the overhaul instructions apply an electroplate on aluminum and aluminum alloys.

D. Refer to SOPM 20-00-00 for a list of all the vendor names and addresses.

2. MATERIALS

A. Sodium Hydroxide, Flake or Granulated – O-S-598

B. Nitric Acid, 40 to 42 degree Be – O-N-350

C. Hydrofluoric Acid, 70 percent, Technical – O-H-795

D. Zinc Oxide, USP Grade

E. Cuprous Cyanide, 70 percent Copper Minimum, Plating Grade

F. Sodium Carbonate, 58 percent, Technical, Plating Grade

G. Sodium Cyanide, 96 to 98 percent, Egg, Plating Grade

H. Sodium Potassium Tartrate (Rochelle Salt), Technical

I. Ferric Chloride, Technical

J. Sodium Nitrate, Purified Grade

K. Zincate Compound – ZN-77, V71410

L. Alumon D powder or liquid, V02258

M. Sulfuric Acid, 66° Be – O-S-809

N. Actane 70, V02258

3. SOLUTION PREPARATION

A. Standard Zinc Immersion Bath

(1) Clean tank thoroughly and add 1/2 total amount water.

(2) Add 15.5 ounces sodium hydroxide for each gallon of final solution. Stir until dissolved.

(3) Add 2.5 ounces zinc oxide for each gallon of final solution. Stir until dissolved.

(4) Cool solution to room temperature.

(5) Make a mixture of 0.13 ounces sodium nitrate, 0.27 ounces ferric chloride, and 6.7 ounces sodium potassium tartrate for each gallon of final solution. Dissolve these chemicals in water.

(6) Add the mixture, in small quantities, to the solution. Stir thoroughly after each addition.

(7) Fill tank with water to operating level.

(8) Maintain solution at 70-75°F.

(9) Control solution at 15.0-16.0 oz/gal sodium hydroxide and 2.2-2.7 oz/gal zinc oxide.

(10) Discard solution when additions of sodium hydroxide and zinc oxide do not produce an acceptable zinc plate.

B. Alumon D Zincate Bath

(1) Clean tank thoroughly and add 1/5 total amount water.

(2) Add 16.0 ounces Alumon D powder or 0.25 gallon Alumon D liquid for each gallon of final solution. Add chemical slowly with agitation to prevent excess heating.

(3) Fill tank with water to operating level.

(4) Maintain solution at 70-115°F.

(5) Control solution at 0.9-1.7 oz/gal as metallic zinc.

(6) When you adjust the concentration, do not add Alumon D powder directly to the tank. Make a mixture of 5.0 pounds Alumon D powder to 1 gallon water or use Alumon D liquid.

(7) Discard solution when additions of Alumon D do not produce an acceptable zinc plate.

C. Diversey Zincate Immersion Bath

(1) Clean tank thoroughly and add 1/2 total amount water.

(2) Add 48.0 ounces zincate compound for each gallon final solution. Stir until dissolved.

(3) Fill tank with water to operating level.

(4) Cool solution to 70-90°F.

(5) Maintain solution at 70-90°F.

(6) Control solution at 40.0-56.0 oz/gal zincate compound. (The equivalent specific gravity is 1.26-1.34 at 70°F, and 1.255-1.338 at 90°F.)

(7) Discard solution when additions of zincate compound do not produce an acceptable zinc plate.

D. Caustic Etch Solution

(1) Clean tank thoroughly and add 1/2 total amount water.

(2) Add 5.0 ounces sodium hydroxide for each gallon of final solution. Stir until dissolved.

(3) Fill tank with water to operating level.

(4) Maintain solution at 130-150°F.

(5) Control solution at 4.0-5.0 oz/gal sodium hydroxide.

E. Copper Strike Solution

(1) Clean tank thoroughly and add 1/2 total amount water.

(2) Add 5.5 ounces cuprous cyanide for each gallon of final solution. Stir until dissolved.

(3) Add 6.5 ounces sodium cyanide for each gallon of final solution. Stir until dissolved.

(4) Add 4.0 ounces sodium carbonate for each gallon of final solution. Stir until dissolved.

(5) Add 6.0 ounces sodium potassium tartrate for each gallon of final solution. Stir until dissolved.

(6) Fill tank with water to operating level.

(7) Maintain solution at 100-130°F.

(8) Control solution at 5.0-5.5 oz/gal cuprous cyanide, 4.0-8.0 oz/gal sodium carbonate, 4.0-8.0 oz/gal sodium potassium tartrate, 0.2-2.0 oz/gal free sodium cyanide, and a pH of 10.2-11.5.

F. Actane 70-Nitric Acid Solution

(1) Clean the tank.

(2) Fill tank to 3/4 of operating level with nitric acid.

(3) Fill tank to operating level with water and mix thoroughly.

(4) Add 16 ounces of Actane 70 for each gallon of final solution.

(5) Control solution at 70-80 oz/gal nitric acid and 12-16 oz/gal Actane 70 at room temperature.

G. Actane 70-Nitric-Sulfuric Acid Solution

(1) Clean the tank.

(2) Fill tank to 1/4 operating level with water.

(3) Fill tank to 3/4 operating level with nitric acid. Let the solution cool to 100°F.

(4) Add sulfuric acid to the operating level.

(5) Slowly add 16 ounces of Actane 70 for each gallon of final solution.

(6) Operate this solution at 60-90°F.

(7) Control solution with nitric and sulfuric acids added in a 2 to 1 ratio.

H. Nitric-Hydrofluoric Acid Solution

(1) Clean the tank.

(2) Fill tank 3/4 of operating level with nitric acid.

(3) Add hydrofluoric acid to fill tank to operating level. Mix thoroughly.

(4) Maintain solution at room temperature.

(5) Control solution at 60.0-87.0 oz/gal nitric acid and 18.0-29.0 oz/gal hydrofluoric acid.

(6) Discard solution when time required to remove smut is more than 20 seconds or if you see copper deposits on parts.

I. Nitric Acid Dip

(1) Clean tank thoroughly.

(2) Fill tank to operating level with nitric acid.

(3) Maintain solution at room temperature.

(4) Control solution at a minimum of 100.0 oz/gal nitric acid.

(5) Discard the solution when time required to strip zinc plate exceeds 10 seconds.

4. PREPARATION FOR PLATING PROCESSES

A. General Notes

(1) The Diversey zincate immersion bath and the Alumon D zincate bath are alternates to the standard zinc immersion bath.

(2) Surfaces must be water break-free after immersion in any processing solution or rinse, other than vapor degrease, solvent cleaning, or emulsion cleaning. A water break-free surface is a surface which keeps a continuous water layer for a minimum of 30 seconds after a spray or immersion rinse in clean water at a temperature below 100°F. Clean surfaces again which are not water break-free.

(3) When selective finishes are specified, anodize the parts and seal all pores before you send the parts through the procedures of this subject. Conversion coatings such as Alodine can be applied after plating.

(4) Adjust the overflow rate on immersion rinse tanks to keep the solids no more than 750 ppm above the contamination level of the incoming water. Final rinse tank contamination must not be more than 150 ppm above the contamination level of the incoming water.

(5) For the plating thickness, refer to the overhaul instructions, or the applicable standard practice, about the final electroplating.

B. Precleaning

(1) If parts are oily or greasy, vapor degrease or emulsion clean them per SOPM 20-30-03.

(2) Rack and mask parts. Use only aluminum or aluminum alloy racks which are completely masked except for contact points.

(3) Alkaline clean per SOPM 20-30-03 using soak cleaners only.

(4) Rinse for 10 minutes minimum. Examine the parts for water-break-free surface. Clean the parts again, if necessary.

C. Oxide and Scale Removal

(1) If necessary, remove oxides and heat-treat scale per BAC5765 or use the procedure of Paragraph 4.C.(2).

(2) Alternate Method

CAUTION: PARTS MUST BE AT OR BELOW ROOM TEMPERATURE, OR OVER-ETCHING CAN RESULT.

(a) Use one of these solutions:

1) Actane 70-Nitric Acid (Paragraph 3.F.)

2) Actane 70-Nitric-Sulfuric Acid (Paragraph 3.G.)

3) Nitric-Hydrofluoric Acid (Paragraph 3.H.)

(b) Etch the parts in the solution for the following times:

CAUTION: DO NOT ETCH LONGER THAN THE MAXIMUM TIME SHOWN.

1) Aluminum alloys with less than 0.5 percent silicon: 2-5 minutes.

2) Aluminum alloys with more than 0.5 percent silicon: 5-15 minutes.

(c) Rinse the parts. Examine them for water breaks. If necessary, alkaline clean them again. Then examine them for water breaks.

D. Pre-plate Etch

(1) Immerse in caustic etch solution (Paragraph 3.D.). Let the part give out gas over all of its surface for 5 to 15 seconds.

(2) Rinse in warm water (100-130°F).

(3) Rinse in room temperature water.

CAUTION: PARTS MUST BE AT OR BELOW ROOM TEMPERATURE OR OVER-ETCHING CAN RESULT.

(4) Immerse in Actane 70-nitric acid (Paragraph 3.F.), nitric-sulfuric (Paragraph 3.G.), nitric-hydrofluoric acid, (Paragraph 3.H.) or nitric acid solution (Paragraph 3.I.) until smut is removed.

(5) Rinse twice with separate rinse tanks, 10-20 seconds in each rinse.

E. Zincate Application

(1) Put the parts in standard zinc plating immersion bath solution with moderate agitation. Let the parts stay for 90-120 seconds for alloys with over 0.5% silicon, or 30-60 seconds for alloys with under 0.5% silicon. Or put all parts in Diversey zincate immersion bath for 30-60 seconds. Or put all parts in Alumon D zincate bath solution for 15-20 seconds.

(2) Rinse for 10-20 seconds.

(3) For parts with over 0.5% silicon, proceed as follows:

(a) Dip in nitric acid-hydrofluoric acid, nitric acid-water, or nitric acid-sulphuric acid solution until the gas stops.

(b) Rinse twice with separate rinse tanks, 10-20 seconds in each rinse.

(c) Put the parts in standard zinc immersion bath for 90-120 seconds, Diversey zincate immersion bath for 30-60 seconds, or Alumon D zincate bath for 15-120 seconds. Provide moderate agitation of parts.

(d) Rinse in water which is not more acid than the incoming tap water. Rinse must not be same as that following acid dip.

(4) Examine all parts for a smooth, continuous gray coating. Dark, heavy or non-uniform coatings will not let the plating bond well. If you find bad coating, put the parts in one of these solutions to remove the coating. Rinse well. Then apply the zincate coating again.

(a) Nitric acid solution for 30-300 seconds.

(b) Actane 70-nitric acid, Actane 70-nitric-sulfuric acid, or nitric-hydrofluoric acid for 120 seconds maximum.

(5) Do not let the surfaces dry. Continue immediately with copper strike.

F. Copper Strike

CAUTION: MAKE ELECTRICAL CONNECTIONS AND PUT THE PARTS INTO THE SOLUTION QUICKLY, BEFORE THE SURFACES DRY.

(1) Make electrical connections to part outside the plating tank. Apply a voltage so that current will flow upon immersion of part. Put the parts into the copper strike bath. Immediately adjust current for a density of 24 amps per square foot (asf). After 2 minutes, decrease current to a density of 12 asf and keep at this value for 3-5 minutes.

(2) For parts to be copper plated per SOPM 20-42-07, move them to the copper plate solution and continue per SOPM 20-42-07.

(3) For all other parts, rinse in cold water thoroughly. Continue with applicable plating procedures.

G. Rework

(1) If you rejected parts because of bad plating, strip them per SOPM 20-30-02. Then do all of the preparation-for-plating process again.

5. QUALITY CONTROL

A. Quality

(1) The plating must be smooth and well-bonded, with no nodules, blisters, or burned areas.

(2) Edge-lines around masked areas must be free of excessive build-up or nodules.

(3) Rack-marks must not be on any surface where plating is necessary for the function of the part.

B. Thickness – Refer to the overhaul instructions, or the applicable standard practice about the plating.