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Air Methods Process Specification

AMPS 020-0135

Corrosion Protection for Aluminum and Aluminum Alloy Components

Revision: AC

Revision History

The latest revision of this document is indicated by the highest revision letter as listed below in the Revision History. All pages are revised when any page is changed so that all pages maintain the same revision level. A "List of Effective Pages" is therefore not included. Changes to the current revision will be indicated within the document by change bars in the right margin.

Revision	Date	Prepared By	Checked By	Approved By	ODA Project Number
IR	4/27/1996	K. Pharris	KM Hoganson	KM Hoganson	N/A
Description of Changes:		Initial Release			
A	10/3/1996	P. Harris	KM Hoganson	KM Hoganson	N/A
Description of Changes:		Reformatted, Added Classes of Protection			
B	7/17/1998	P. Harris	KM Hoganson	KM Hoganson	N/A
Description of Changes:		Reformatted, Added Instructions and Procedures; Removed Mil Specs.			
C	6/14/1999	C. Sanchez	D. Boette	J. Marsh	N/A
Description of Changes:		Incorporation of ECOR 1853 to correct document number callouts.			
D	8/9/1999	J. Marsh	J. Marsh	D. Boette	N/A
Description of Changes:		Addition of Class I, Type 2 (Sulfuric Anodize).			
E	1/20/2000	C. Sanchez	No Signature on File	No Signature on File	N/A
Description of Changes:		Addition of note in section 1-4			
F	1/23/2004	L. Green	E. Weiskamp	M. Knap	N/A
Description of Changes:		Corrected anodizing callouts, thread treatment; Deleted chromic anodize			
G	1/7/2005	J. Musco	L. Green	M. Knap	N/A
Description of Changes:		Corrected Table of Contents for Class VI: Hard Anodize. Was: IAW MIL-A-8325, Type III, Class II, Sealed. Added MIL-A-63576, MIL-A-26074 and AMS-C-5541.			
H	10/23/2006	K. Blecha	L. Green	J. Musco	N/A
Description of Changes:		Added information on page 4, step 4.2.1 to include Type 1 Class C2 Primer. Added information on page 3: step 3.7.1 thru 3.7.3, for hard anodize seal options.			
I	11/7/2006	N/A	N/A	N/A	N/A
Description of Changes:		Revision "I" is not used			
J	11/7/2006	L. Vardakova	L. Green	J. Musco	N/A
Description of Changes:		Added information on page 3, general note, for anodized finishes of parts with holes and threaded features..			
K	2/2/2009	J. Henson	E. Weiskamp	J. Musco	N/A
Description of Changes:		Clarify masking, Deleted Chromic Anodize from Class I, Corrected Mil-Spec class numbers to Arabic numerals, Added Mil-Spec Alt for Alodine Class V, Revised Para 3.9 (was "Type I" is now "Type II."), Added finishes in paragraphs 3.11 thru 3.14.			
L	6/1/2009	J. Henson	T. Muir	E. Weiskamp	N/A
Description of Changes:		Addition Section 6 to clarify top coats and color shades on AMC drawings.			
M	3/20/2014	T. Muir	No Signature on File	B. Salus	N/A
Description of Changes:		Revisions to Section 3, masking requirements. Revisions to Section 4 Class V Alodine procedures.			
N	6/12/2017	S, Johansson	J. Whorton	KM Hoganson	N/A
Description of Changes:		Added alternate conversion coatings to Alodine 1201. Removed Alodine 1201 as a generic term for conversion coating. Added masking details Reformatted and renumbered Anodize term "Clear" replaced with "Undyed". Updated standard paints and powder coat P/Ns.			
O	5/29/2018	N/A	N/A	N/A	N/A
Description of Changes:		Revision "O" is not used			
P	5/29/2018	M. Morin	J. Whorton	T. Muir	
Description of Changes:		§2.2 Added MIL-PRF-85582; §3.8 Added verbiage to complete the title of AMPS 020-0135; §3.15 Added AMPS 020-0135 Class XIV; §4.2 Added verbiage "Chemical and Solvent Resistant"; §4.3 Added Class XIV Epoxy Polyamide Prime (Waterborne); Adjusted formatting.			
Q	7/25/2019	N/A	N/A	N/A	N/A
Description of Changes:		Revision "Q" is not used			
R	7/25/2019	M. Morin	J. Whorton	T. Muir	N/A
Description of Changes:		Updated MIL Spec in §6.1; edited verbiage in §3.7. Updated formatting.			
S	10/23/2019	N/A	N/A	N/A	N/A
Description of Changes:		Revision "S" is not used			
T	10/23/2019	M. Morin	T. Muir	J. Moyer	N/A
Description of Changes:		Added verbiage regarding Conversion Coating, §3 and §4.			

Revision	Date	Prepared By	Checked By	Approved By	ODA Project Number
U	3/11/2020	M. Knight	J. Whorton	T. Muir	N/A
Description of Changes:		Reformatted entire process, revised section 4.1 for clarity			
V	9/1/2020	M. Morin	C. Chapel	J. Moyer	N/A
Description of Changes:		§6.1 updated Polar White to Imron AF700 L2418 White or Delfleet FDGH-2418 White			
W	7/20/2021	M. Morin	J. Whorton	T. Biegler	N/A
Description of Changes:		Reference specification updates; §4.2.1. Materials – Class Type correction			
X	8/21/2023	N/A	N/A	N/A	N/A
Description of Changes:		Revision "X" is not used			
Y	8/21/2023	C. Chapel	M. Knight	B. McCormick	N/A
Description of Changes:		Removed Class CI or Type I Class C2 Primer From §4.2, replaced with Class N primer. Removed Class C2 Primer from §4.3, replaced with Class N primer.			
AA	11/29/2023	C. Chapel	M. KNIGHT	L. RIBICH	N/A
Description of Changes:		Added section 6.2, 6.3 and 6.4.			
AB	6/6/2024	C. Chapel	M. KNIGHT	C. Chapel	N/A
Description of Changes:		Revised sections 6.4.4, 4.4.6, 6.4.7, and 6.4.9.			
AC	1/14/2025	C. Chapel		4/29/2025	N/A
Description of Changes:		Complete document reformatted. Changes Highlighted in yellow.			

Table of Contents

1 Scope

1.1 This document details corrosion protection methods and procedures to be performed by Air Methods Corporation and its subcontractors.

1.2 The protection methods and procedures applied herein shall be applicable to all parts, details, assemblies, components and hardware delivered by Air Methods as a product or service.

1.3 The intent of this document is to comply with the requirements of Federal Aviation Regulations, Part 21, 23, 25, 27, and 29.

1.4 In the event of a conflict between this specification and the drawing face, the drawing shall prevail.

2 Applicable Documents

2.1 Corporate Standards

100-QMS-Quality Manual

2.2 Military Standards

MIL-PRF-8625	Anodic coatings for Aluminum and Aluminum Alloys
MIL-A-63576	Aluminum Oxide Coatings, Lubricative, For Aluminum and Aluminum Alloys
MIL-DTL-5541	Chemical Conversion Coatings on Aluminum Alloys
MIL-DTL-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
AMS-C-26074	Coatings, Electroless Nickel (E.N.)
MIL-DTL-32119	Detail Specification:Coatings, Electroless Nickel, Requirements For
MIL-PRF-23377	Primer Coatings: Epoxy, Chemical and Solvent Resistant
MIL-PRF-85582	Primer Coatings, Epoxy, Waterborne
AMS-STD- 595	Colors

3 Methods

3.1 One or more of the following corrosion protection finish classes shall be specified for all aluminum alloy components produced by Air Methods or its subcontractors.

3.2 When anodize or other deposited finishes are specified, plug or mask all threaded features and threaded holes unless otherwise specified on the face of the drawing. Ensure threaded holes and threaded features are coated per class V prior to masking.

3.3 When primer and/or top coated finishes are specified, all threaded features shall be plugged or masked prior to primer and/or top coating being applied. Ensure threaded holes and threaded features are coated per class V prior to masking.

3.4 Masking of holes is not to include counter bores or countersinks unless otherwise specified. These areas are to be protected by the specified plating and/or finish.

3.5 It is permissible to mask threaded holes using “masking dots” or equivalent. Ref Appendix A, Figure A-1 .125” dots (as a standard size) are acceptable for masking #6, #8, & #10 threaded holes prior to the application of primer, paint, powder coat, anodize or plating. Areas under masking dots are to be protected by conversion coating.

3.6 Tolerances on masking and silkscreen are to be ± 1/8”. This note is to supersede the block tolerance on the drawing with respect to these features.

3.7 With respect to finishes in threaded holes – it is acceptable to have primer, paint, powder coat, anodize or plating in the 1st 2 threads of a threaded hole, as may happen with a masking or plugging failure or leak as long as the mating screw can thread into the hole without issue. With the exception of nutplates it is permissible to chase threads and touch up conversion coating if thread gauge fails. This will not be cause for rejection.

3.8 Minor cosmetic blemishes (such as rack marks) less than approximately ¼” in diameter on finish coats are not to be cause for rejection. However, nicks, dings, or gouges which expose the substrate material are not acceptable. See Appendix B for examples of defects in finishes.

3.9 When anodizing, contact marks shall be at a minimum consistent with good practice. (see MIL-A-8625 section 6.14) If a specific location for marks is desired, the location shall be specified.

AMPS 020-0135 Class I: Non-Dyed Anodize IAW MIL-PRF-8625, Type II, Class 1.

AMPS 020-0135 Class II: Color Anodize IAW MIL-PRF-8625, Type II, Class 2.

AMPS 020-0135 Class III: Non-Dyed Hard Anodize IAW MIL-PRF-8625, Type III, Class 1. Note: This finish is not optimum for AL 2024 or AL 7075 alloys and other finish methods should be considered such as Type II.

AMPS 020-0135 Class IV: Color Hard Anodize IAW MIL-PRF-8625, Type III, Class 2. Note: This finish is not optimum for AL 2024 or AL 7075 alloys and other finish methods should be considered such as Type II.

AMPS 020-0135 Class V: Non Hexavalent Chromium Conversion Coat IAW MIL-DTL-5541, Type II, Class 1A.

AMPS 020-0135 Class VI: Hard Anodize IAW MIL-A-8625, Type III, Class 1 sealed by immersion in a medium, such as hot deionized water, or a hot aqueous solution containing nickel acetate. Note: Hard anodize is not optimum for AL 2024 or AL 7075 alloys and other finish methods should be considered, such as Type II.

AMPS 020-0135 Class VII: Epoxy Polyamide Prime (MIL-PRF-23377, Chemical and Solvent Resistant) IAW Section 4.2.

AMPS 020-0135 Class VIII: Teflon Anodize IAW MIL-A-63576, Type II, unsealed surface with PTFE applied (by dipping, spraying, or brushing).

AMPS 020-0135 Class IX: Electroless Nickel IAW MIL-DTL-26074, Class 4, Grade C (.0015" thick min).

AMPS 020-0135 Class X: Electroless Nickel IAW MIL-DTL-26074, Class 4, Grade B (.0005" thick min).

AMPS 020-0135 Class XI: All drawings referring to this class shall be finished in accordance with Class VIII.

AMPS 020-0135 Class XII: Non Hexavalent Chromium Conversion Coat IAW MIL-DTL-5541, Type II, Class 1A.

AMPS 020-0135 Class XIII: Non Hexavalent Chromium Conversion Coat with Low Electrical Resistance IAW MIL-DTL-5541, Type II, Class 3.

AMPS 020-0135 Class XIV: Epoxy Polyamide Prime (MIL-PRF-85582, Waterborne) IAW Section 4.3.

4 Procedures

4.1 Class VII Epoxy Polyamide Prime (Chemical and Solvent Resistant)

4.1.1 Materials:

- Soap and water
- Mil-PRF-23377, Type I Class N Primer.

4.1.2 Process Steps:

4.1.2.1 Wash part with soap and water.

4.1.2.2 Verify that part will support an unbroken film of water. (No oil or grease left on surface.)

4.1.2.3 Dry part completely

4.1.2.4 Spray on primer using cross-coat coverage.

4.1.2.5 Dry part for 24 hours in a dust-free area.

4.1.2.6 Inspect part for complete coverage and no excessive buildup of primer.

4.2 Class XIV Epoxy Polyamide Prime (Waterborne)

4.2.1 Materials:

- Soap and water
- Mil-PRF-85582, Type I Class N Primer.

4.2.2 Process Steps:

4.2.2.1 Wash part with soap and water.

4.2.2.2 Verify that part will support an unbroken film of water. (No oil or grease left on surface.)

4.2.2.3 Dry part completely.

4.2.2.4 Spray on primer using a cross-coat coverage.

4.2.2.5 Dry part for 24 hours in a dust-free area.

4.2.2.6 Inspect part for complete coverage and no excessive buildup of primer.

5. Drawing Annotation

A standard note shall be placed on the face of the drawing for all aluminum alloy components. The note shall be worded as follows:

Conversion Coat: "Finish Per AMPS 020-0135, Class V",-or- other applicable specification.

Anodize: "Finish Per AMPS 020-0135, Class ___, Color___" -or- applicable specification.

Primer and Top Coat: "Finish Per AMPS 020-0135, Class VII, Top Coat ___" -or- applicable specification.

6. Top Coats and Color Shades

The following clarifies color shades and top coat products titles for Air Methods face of drawing finish notes. Where noted the following callouts supersedes drawing finish notes for the applicable finish type only.

All top coats shall be applied per the manufacturer's instructions unless otherwise specified on the face of drawing.

6.1 Standard Air Methods Paint Top Coats:

- "Imron Gray": Imron Elite 72092EA Gray or Delfleet FDGH-32663 Gray
- "Polar White": Imron AF700 L2418 White or Delfleet FDGH-2418 White
- "Interior Teal": Sherwin-Williams Genesis LV3-56218-377354-A Teal or Delfleet FDGH-56218 Teal
- "Polane Black": Polane F63 B 12 Black or Delfleet FDGH-9700 Black
- "Flat Gray": MIL-DTL-53039, Interior Aircraft Gray 36231
- "GDLS White": MIL-C-22750, White 17925
- "429 Beige": Sherwin Williams F93XXA36424-4358 Beige or Imron 6000 equivalent shade
- "Almond" or "Tan": Delfleet FDGH-T009-B601 Almond or Imron 6000 equivalent shade
- "Flat Black" or "Camouflage Black": PPG 03BK074

Standard Air Methods Powder Coats:

- Instrument Panels use “Cardinal T002-BK08” (#27038, Black 20% Gloss)
- Floor Pallets use “Cardinal GDR00366” (Texture Gray)
- Med Panels gray use “Cardinal T009-GR230” (RAL 7035. Gray 90% Gloss)
- Med Panels beige use ”Tiger 38/10002” (RAL 9002 Gloss)
- Med Panels almond use “Cardinal T009-BG01” (Almond 90% Gloss)

Silk Screen (Note: Use Arial Font (or similar)):

- “Black: Pantone 433C”
- “Blue: Pantone 289C”
- “Brown: Pantone 464C”
- “Green: Pantone 347C”
- “Red: Pantone 200C”
- “Yellow: Pantone Yellow C”
- “White: Pantone 11-0601 TCX”

Anodize Color Dye:

- “Black”: AMS-STD-595 27038 – Black anodic dye coating shall meet the light fastness resistance requirements per MIL-PRF-8625 § 3.7.1.3. Commercial substitutions must have a blue wool rating of 7 or higher in order to be acceptable.
- “Blue / Gray”: AMS-STD-595 25053
- “Green”: AMS-STD-595 24187
- “Red”: AMS-STD-595 21120
- All Other Shades: Use similar AMS-STD-595 shade to Pantone silk screen callouts in Section 6.3

6.2 Inspection Instructions for Paint

It is preferred that the inspection be conducted in either daylight or ambient light between 100-200 Foot Candles (FC). All installed interior lighting shall be operated and all hatches shall be open during interior inspections. Inspection should be conducted with the inspected material at arm’s length (~30 inches) or the natural distance when in use (i.e. when seated a component may be less than arm’s length from the operator). It is preferable that the inspection be conducted in the daylight or ambient lighting condition described above but if not possible additional lighting such as flashlights may be used. The flashlight should be maintained at 90° to the surface being inspected, and should not be closer than 24” to the object being inspected. Hand tools such as mirrors may be used to visually inspect areas that are difficult to access. Magnification tools such as magnifying glasses are not to be used with the exception of prescription glasses intended to restore sight to 20/20 vision.

The inspection should be conducted by scanning the product in a continuous manner, viewing for approximately 2-3 seconds per square foot. Conditions that are immediately identified shall be evaluated against the intent of the cosmetic criteria.

6.3 Defect Definitions

- **Paint –** Top coat and Primer
- **Blister -** a raised area on a surface (such as a painted wall) that is filled with air
- **Brush Mark –** painted surface with uneven surface texture which may have slight gloss or color variation.
- **Fisheye –**Small, crater-like opening in the paint finish after it has been applied.
- **Gouge –** break in topcoat and primer occurring from damage from contact with other objects exposing bare metal or primer surface
- **Marring – "**scuff" mark or surface lightening due to handling in the topcoat of a painted surface.
- **Orange Peel -** Uneven surface formation (similar in appearance to that of the skin of an orange) which results from poor coalescence of atomized paint droplets. Paint droplets dry before they can flow out and level smoothly together.
- **Paint Run -** Heavy application of sprayed material that fails to adhere uniformly to the surface.
- **Pinholes –** small holes in dried paint film or sealant.
- **Scratches on Painted Surfaces –** scratches are thin marks in the painted surface (topcoat) but not in the primer.

6.4 Acceptance Levels for Paint

6.4.1 Bare metal

Areas are unacceptable unless specified in the applicable technical data package.

6.4.2 Blisters

Maximum diameter of 0.01 inch with no more than 3 blisters in a 20 inch X 20 inch area.

6.4.3 Boiling, Pinholes, and Popping

Maximum diameter of 0.01 inch with no more than 3 blisters in a 20 inch X 20 inch area.

6.4.4 Bullseyes, Fisheyes, and Craters

Maximum diameter of 0.01 inch with no more than 3 fisheyes in a 20 inch X 20 inch area.

6.4.5 Drips, Runs, and Sags

Defect size not to exceed .20 inch width and 2 inch in length and no more than 5 runs, drips, or sags in a 12 inch X 12 inch area.

6.4.6 Brush Marks

Brush marks that have a uniform finish and are blended to the surrounding surface finish are acceptable.

6.4.7 Over and Under Spray

Over Spray - If overspray is bonded to the paint surface and does not become loose by light rubbing, and it is of the same color, it is acceptable.

Under Spary – Under spray on visible surfaces should be looked at by engineering, see section 6.4.9. Under spray on non visible surfaces are acceptable if material is protected from corrosion, i.e. Primer covers the metal, or it has chem film or anodize.

6.4.8 Scratches

Scratches no larger than .05 inch wide by 2.0 inch long with no more than 5 scratches within a 12 inch X 12 inch area are acceptable. Scratches past the topcoat (into the primer) are unacceptable.

6.4.9 Scuffs and Marring

Surfaces with scuff/marring that has not broken the topcoat down to the primer is acceptable.

6.4.10 Visible surfaces

All concerns of defects on visible surfaces should be documented on a Squawk for internal, and Supplier Concern Resolution Request (SCRR) for suppliers.

APPENDIX A - MASKING

Figure A-1

Examples of Masking Dots and Tapes

Figure A-2

Examples of plugs used during plating and painting applications

APPENDIX B - FINISH DEFECTS

Figure B-1

Unacceptable: Exposed Substrate Material, Powder Coat

Figure B-2

Unacceptable: Exposed Substrate Material, Powder Coat

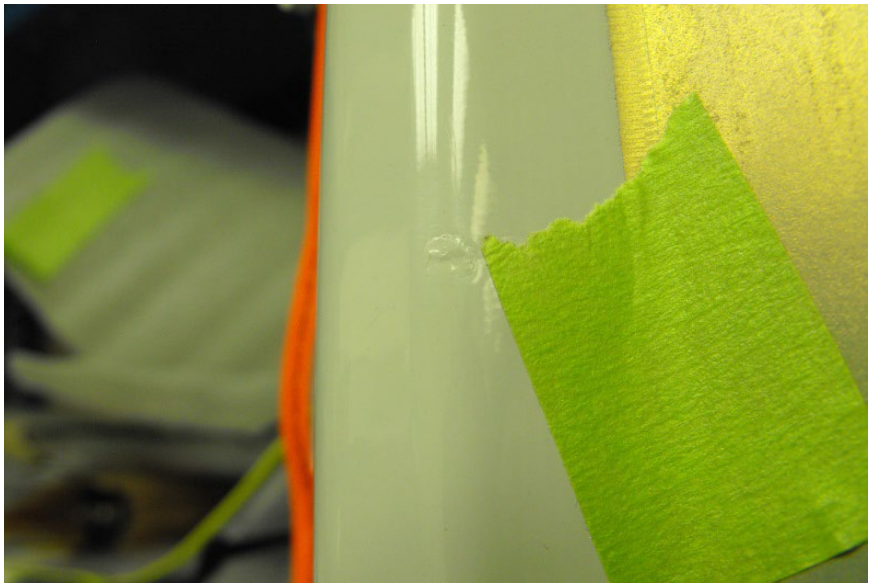

Figure B-3

Acceptable Blemish: Part Is Fully Protected, Liquid Paint (touched up)

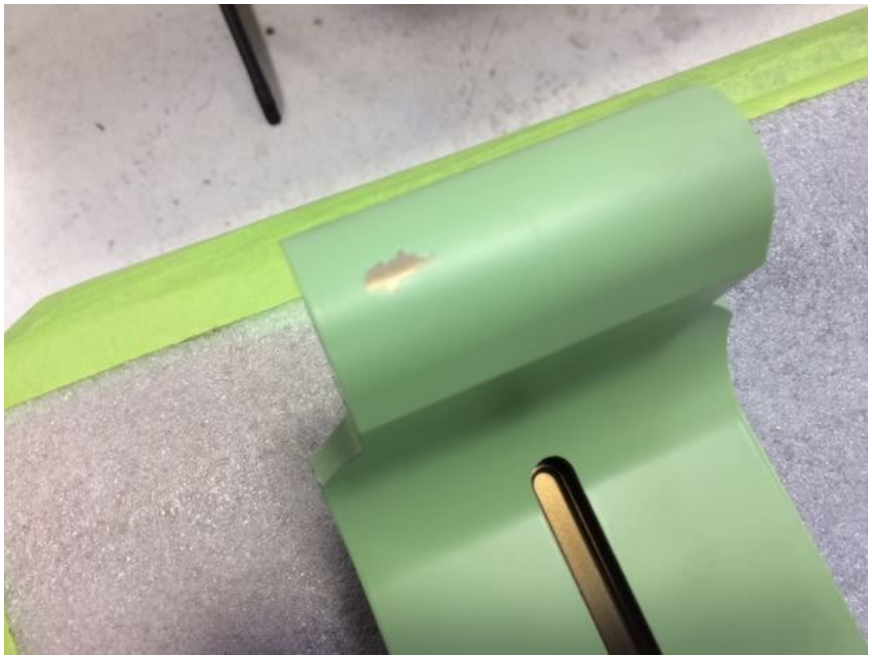

Figure B-4

Unacceptable: Exposed Substrate Material, CARC Paint

Figure B-5

Unacceptable: Exposed Substrate Material, Anodize

Figure B-6

(Unacceptable: Exposed Substrate Material, Dyed Anodize, Defect Exceeds ¼”” Dia and Failed Conductivity)

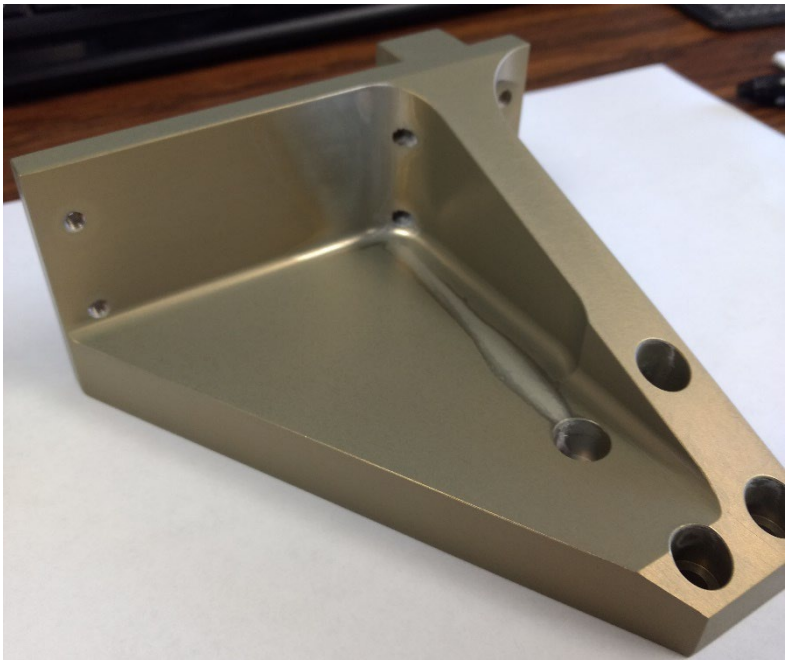

Figure B-7

Bleed out of solutions during anodize process.
Cosmetic only and allowable by spec but seek PM input for acceptance

Figure B-8

Rack Marks during anodize process –
Cosmetic only and Allowable by spec but seek PM input for acceptance