Quality of Anodic Coatings

The advantages of this type of coating are numerous:
excellent wear resistance, corrosion resistance, and adherent. Anodic coatings can be dyed with a variety of colors and since the anodic film is nonconductive, it can be used for electrical insulation purposes.

SUMMARY OF ANODIZE TYPES
Type I, chromic acid anodizing, possesses good chemical resistance but poor abrasion resistance. Type II anodize should be used instead of Type I when improved corrosion - and/or abrasion resistance is required.

Type II is the preferred general-purpose anodic coating and is formed in a sulfuric acid bath. The thickness range is 0.07 to 1.0 mil and the coating can be dyed (non-dyed = Class 1; dyed = Class 2). Sealing controls the corrosion resistance of the coating and is performed after dyeing by immersion in an appropriate bath--often a hot aqueous solution of nickel or cobalt acetate or boiling deionized water.

Type III anodize (hard coat) provides excellent wear resistance when used non-dyed and unsealed. It is applied in a 0.5 to 4.5-mil thickness range and is often lapped or honed to size to remove a thin relatively soft surface layer.

QUALITY TESTS FOR ANODIC COATINGS
Process Control Tests:
Minimum coating weight for Types I and II
Coating weight or thickness for Type III
Salt spray corrosion resistance test for Types I and II
Light fastness resistance for dyed Type I and II coatings
Abrasion resistance for Type III

Quality Conformance Tests:
Visual for coating quality
Part dimensional compliance per drawing
While these tests will ensure high quality anodic coatings if they are performed properly, there are several tests that can be used upon receipt as a verification inspection for flightanodized parts:

Appearance--The most common quality control test is visual inspection. The coating should be smooth and uniform in appearance, free from smudged or powdery areas, adherent and bright depending on the base metal finish.

Adherence --Tape lift tests can be performed on anodic coatings to determine the size and frequency of particles that are removed. A good anodic coating should not release particles when tested with Scotch 810 Magic Tape. The coating can also be repeatedly rubbed with swabs dampened with acetone, alcohol, hexane, or deionized water. Dye coloration or particles should not be observed.

Sealing Effectiveness--Optimized corrosion resistance occurs when sufficient sealing time is employed. Well-sealed coatings will show less than a 30-mg/square decimeter weight loss in

the phosphoric/chromic acid test per ISO 3210. Approximately 2.8-inch square witness samples are required.
Coating Thickness--An eddy current thickness meter rapidly and accurately indicates if the coating is within the proper thickness range at numerous locations on the part.

Metallographic--Metallographic examination of the surface of parts at 400X magnification will rapidly and nondestructively reveal the tightest surface cracks.

Destructive evaluation indicates porosity, entrapped phases, thickness, and cracking.Tests that are required by MIL-A-8625 on a monthly basis--such as salt spray or abrasion resistance--can be performed on a specific lot of flight hardware parts if desired.

CLEANING
Cleaning of anodic coatings is somewhat controversial. The best approach is to use high purity acetone, heptane or hexane. Ethanol, isopropyl alcohol and neutral pH detergents have been used for short periods of time with good results. Avoid alkaline (Sparkleen, etc.) or acidic cleaners.

OTHER
--Use adequate edge radii as specified in MIL-A-8625 to avoid weak coatings at edges.
--If anodic coating is specified on 100% of a part's surface, there will be bare spots where the part is clamped. Be aware of touchup materials that may have been applied.
--Anodic coatings are high moisture outgassers.