Mobile Anodizing and Plating Plants for In-Place Coating and Corrosion Repair

Electroplates and anodize coatings protect aircraft, vehicles, and other equipment from corrosion and wear damage. But when the coating is damaged your only options are to let it corrode or send it out for a few months for repair. Corrdesa has developed a better alternative – a plating and anodizing shop on wheels. Our family of robust, mobile electrochemical treatment systems and patented tools are used worldwide as Ground Support Equipment (GSE) to perform on-aircraft repairs with minimum set up time and no drips and spills to clean up. They are so convenient they are also used in production, where damaged parts can be touched up in place immediately to avoid interrupting production. Even coating damage from grinding and welding can be quickly remediated. Treatments use less hazardous, qualified materials, replacing Cd/Cr^{6+} with ZnNi/Cr^{3+}, and CAA with SAA. There is even an electrolytic corrosion and cadmium removal process, which avoids releasing toxic dusts.

Plating Repair

In 2021 the Corrdesa non-drip plating system was qualified as approved ground support equipment for the F-35 (Figure 1), and to date more than 100 of these systems have been shipped worldwide for on-aircraft repair on flight lines and aircraft carriers. They include vibration isolators, non-spill chemical holders, anti-static wheels, brakes, and Cr^6-free anodize, primer and paint system. Corrdesa also provides worldwide on-site training and certification.

Figure 1. F-35 Mobile Plating Repair System.

Anodizing and Anodize Repair

Non-drip brush anodizing is particularly suited to large-scale repair for corrosion protection. Large aluminum storage cylinders and giant space-launch rockets are manufactured in sections that are joined by stripping the protective anodize along the weld and friction stir welding. Since the assembled tank can no longer fit in a commercial anodizing tank it is usually Chem-Filmed, which is practically worthless compared to a proper anodize repair, see Figure 2. The more robust solution is to re-anodize with one of Corrdesa's large-scale non-drip brush anodizing tools

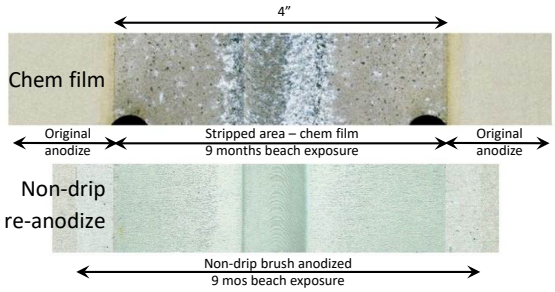

Figure 2. Superior performance of re-anodized first stage rocket alloy over Chem Film after 9 months salt spray.

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to re- establish the corrosion resistance of the original anodize coating.

Figure 3. Re-anodizing C-5 cargo floor.

The aluminum cargo floor of the C-5 Galaxy, the largest cargo aircraft in the US Air Force, has a similar problem. The floor is often damaged by heavy cargo and patching requires stripping the surrounding anodize. But until now there had been no way to re-anodize around the patch. Figure 3 shows a technician re-anodizing a C-5 floor using a Corrdesa GSE unit with a large-area anodizing tool. Because the tool leaks neither acid nor fumes, the surrounding area needs no protection, no acid leaks through bolt holes in the floor, and the technician only needs safety glasses, vinyl gloves and lab coat.

Figure 4. P-8 Poseidon raked wing tip.

The Navy's new P-8 Poseidon has an extended wing tip with a bare aluminum shield, which corrodes rapidly. Disassembling it for anodizing is a massive job, and the treatment area is 22 sq ft/aircraft. So NAVAIR contracted Corrdesa to create 3 on-wing anodizing systems to overhaul the fleet.

Plating Repair & Corrosion Remediation

Once the Cd plate on Outer Mold Line (OML) fasteners is damaged or lost you are stuck with the problem of fastener head corrosion, poor paint adhesion, unsightly rivet rash, and ultimately corrosion damage to the surrounding aluminum skin. Until now the only answer was to replace the fasteners – an expensive and risky proposition. Now we can electrochemically strip and re-plate the fastener heads and re-anodize the surrounding aluminum in-place on the aircraft, without having to remove the fasteners (Fig. 5), and without dripping acids into the aircraft. The automated GSE that carries out all these processes is shown in Figure 6.

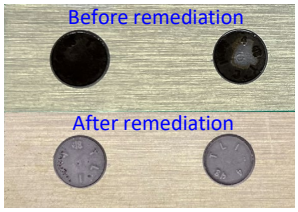

Figure 5. OML remediation.

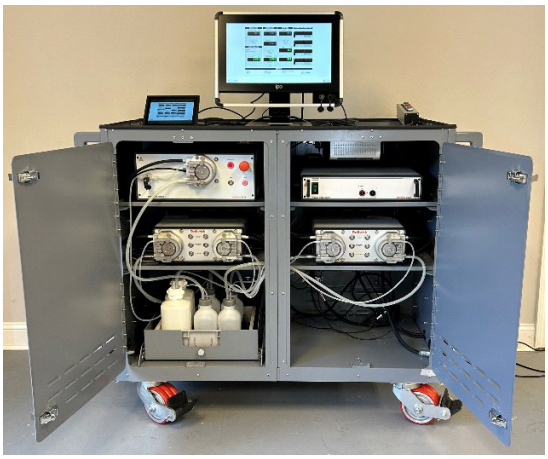

Figure 6. GSE for multi-process corrosion remediation.

The Right Tool & Process for the Job

When dealing with such a variety of problems one size does not fit all. Each problem is unique and often requires different tools and modified processes. Corrdesa combines deep electrochemical knowledge with specialized computational methods to develop the right tools and processes for each application.

We design all our systems using computational fluid dynamic and electrodynamic simulation. We model, not just the tool, but the entire problem – tool, fluid delivery and return system, and the electrochemistry of the process as it operates on the aircraft. Most important of all, however, is that we use the new engineering discipline of **Computational Corrosion Engineering** to determine what coating should be used and how the repaired system will perform in service.