

Case Study - Flight line Anodizing Repair

Client

NAVAIR is the US Naval aviation organization that runs the Fleet Readiness Centers (FRCs), whose job is to keep Navy aircraft in good repair. Naval Air Station Jacksonville (commonly known as NAS JAX) recently took delivery of a squadron of brand new P-8 Poseidon aircraft to replace their old prop-driven P-3s. These aircraft are sub-hunters whose job is to patrol the coast, to find and track submarines.

NAVAIR is always looking for better processes and materials because Naval



Figure 1 P-8 launches a sonobuoy over the Atlantic Test Range

aircraft operate in some of the worst possible conditions for corrosion, and corrosion is the most common initiator of cracks that cause structural failure.

Corrdesa has been working with NAVAIR to further develop and qualify non-drip selective plating and anodizing equipment and processes for repairing coatings on Naval aircraft. The basis of the equipment is the Commercial off the Shelf (COTS) Dalistick system invented by Dalic in France and sold in the US by Corrdesa.

The Problem

The P-8 is a military version of the Boeing 737, one of the most widely used passenger aircraft in the world, whose job is to take off from airports and ferry passengers across land and ocean at 35,000 feet, which is a very different operating environment compared to sub-hunting in very salty, humid atmospheres. Consequently, the unprotected aluminium parts on the P-8 are rapidly corroding after only a year or two of operation. Corrosion is showing up everywhere on the aircraft exterior where the aluminum is not painted – static ports, leading-edge slats, engine intakes.

The standard approach for this sort of problem is to grind out the corrosion and treat the area with a chromate conversion coating to retard corrosion. This is not a very effective approach and NAVAIR needed a more robust and more environmentally friendly coating given the severity of problem on their P-8s. The best approach would be to anodize the aluminium, but that is usually a tank process that can only be done on the struts and panels before they are assembled into an aircraft. Once the aircraft is made it is too late to anodize since you cannot put the entire aircraft into a tank.

The solution

Corrdesa's solution was to bring selective, non-drip anodizing directly to the flight line. This provides the same level of protection as tank anodizing. The usual problem with selective plating and anodizing is that the sulfuric acid solution drips down and attacks areas below the repair, or penetrates into the aircraft and damages internal components.

Corrdesa optimized a non-drip process for minimum mess and maximum electrochemical impedance. NAVAIR ran beach exposure testing to ensure equivalence to tank anodizing. Corrdesa developed the

necessary application procedure to deposit the coating uniformly across the surface. Since all the P-8s are needed on patrol, the work had to be done between missions. The aircraft returned from patrol in the morning, was pulled into the hangar for anodizing and went back on patrol in the evening. Since this demonstration was done with a standard 1 sq. in tool, and the static port is 8" diameter (50 sq. in), the process took half an hour, about the maximum time Vivien could work overhead. It was a hot job with the hangar temperature rising to 86°F.

The picture shows the static port before and after selective anodize repair. The aircraft will



Figure 2 Selective non-drip anodizing applied directly on plane

continue to fly and be checked periodically for any signs of corrosion, comparing the anodized port on the right side of the aircraft with the standard repaired port on the left.

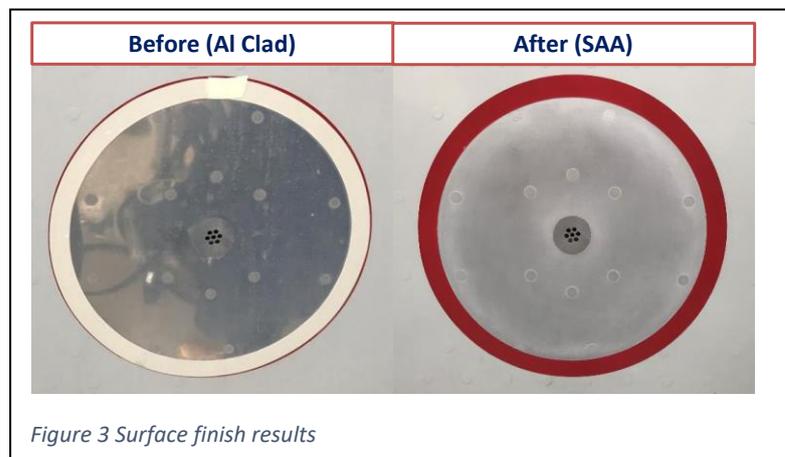


Figure 3 Surface finish results

Rolling out this process to other aircraft and components will improve corrosion performance, reduce repair cost, and

minimize the risk of corrosion-related structural failure. As NAVAIR's Clifford Davis said "The process will get the plane flying sooner and safer and save the ground crews a lot of work."

Impact

Having successfully demonstrated the technology, the next step is to make it more efficient. Leveraging computational simulation capabilities, Corrdesa will design a new, larger tool to do this job in a quarter of the time. The US Air Force is interested in using the process for floor repairs in the C-5 Galaxy, the largest plane in the US fleet. The same anodizing approach can also be applied to friction stir welds that are often used to weld large aluminum tanks, an application that will clearly require much larger, specialized robotic tools.