APPLICATIONS

AVIATION APPLICATIONS

The SIFCO Process of selective plating is a versatile tool that is used for many different, demanding OEM and repair applications on aircraft components. This localized plating process works well in the manufacturing environment. It is easily and quickly integrated into the production line. It also stands out as a great repair tool that can be used anywhere, in the shop or in the field.

Selective plating is an out-of-tank process that lets you put deposits and coatings where you need them with minimal-to-no masking requirements. And it lets you hold very tight thickness tolerances. Selective plating falls under the auspices of AMS2451 and MIL-STD-865. Its deposits and coatings also meet the performance requirements of its tank counterparts.

This portable process offers deposits such as Cadmium LHE® (No Bake), Zn-NI LHE® (No Bake), AeroNikl® (sulfamate nickels that come in three hardness ranges) and coatings for all types of anodizing. SIFCO Selective Plating can provide you with the combination of field experience, expertise in chemistry, engineering, metallurgy, and electroplating to help you with your most difficult metal finishing applications!

SIFCO PROCESS

AP2021

AVIATION APPLICATIONS

Perform On-Site, Cost Effective, Permanent Repairs

- **Repair Components in Place**
- **Reduce Equipment Downtime**
- **Eliminate Expensive Disassembly and Shipping Costs**
- **Expand In-House Maintenance and Repair Capabilities**
- **Provide a Permanent Cost Effective Repair**
- **Minimize Waste Stream**

Electroplated Deposits
AeroNikl®
Cadmium LHE®
Copper
Nickel
Silver
Tin
Zinc-Nickel®

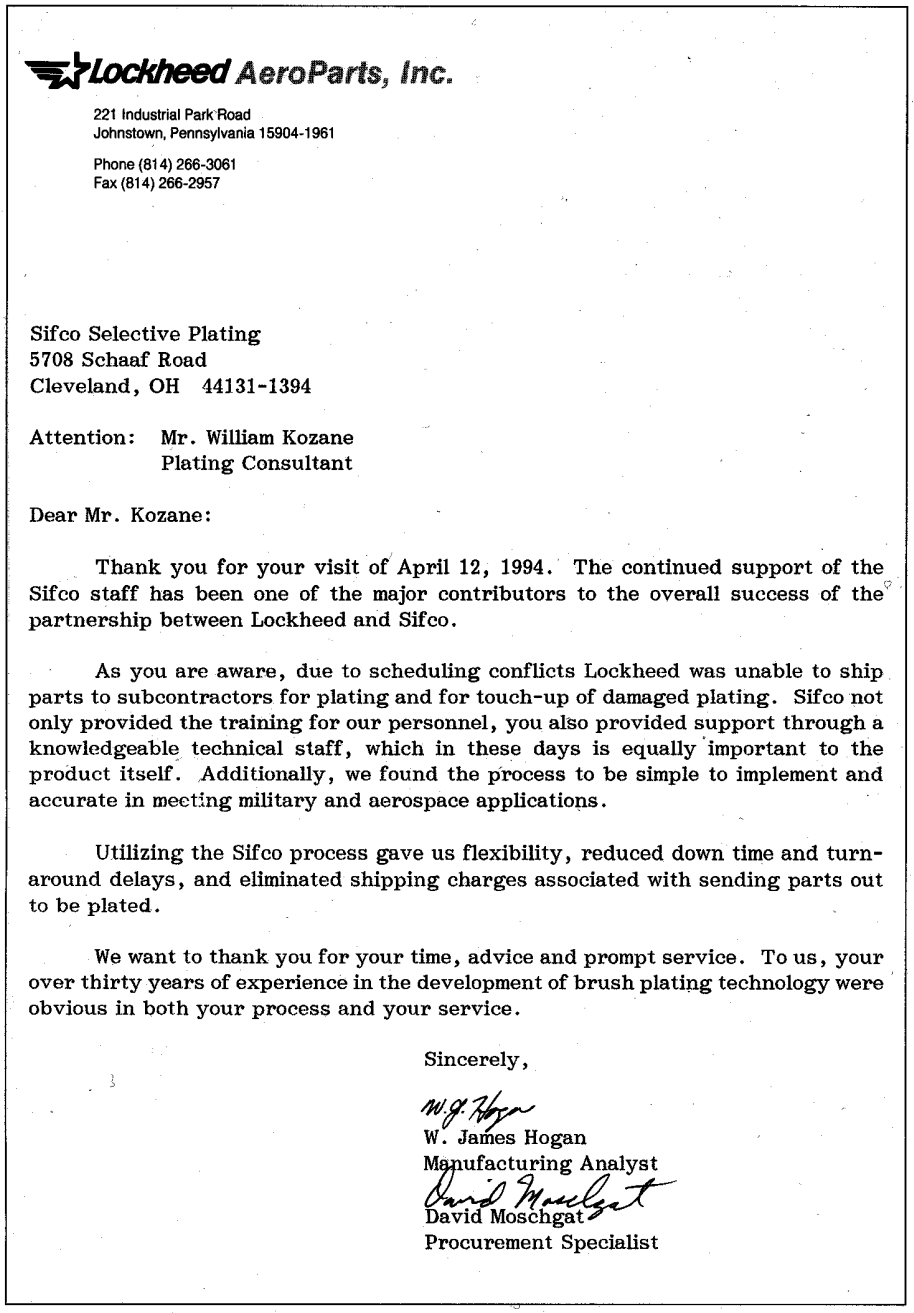
Anodized Coatings
Chromic (Type I)
Sulfuric (Type II)
Hard Coat (Type III)
Phosphoric
Boric-Sulfuric

APPLICATIONS

- Resize worn or mismachined components
- Apply deposits for surface enhancement or prebraze
- Protect surfaces from corrosion or wear
- Touch-up nicks, dings, and scratches
- Tail Rotor Pitch Change Tube Assembly: Salvage of outside diameter with nickel for dimensional restoration and to provide a hard, wear resistant deposit.
- Axle Journals: OEM application of AeroNikl to increase hardness of journal.
- Main Input Bevel of Main Transmission: Salvage of pinion, bearing area.
- Liner Bore Grip and Washer Bottom Grip Flange Faces: OEM and Salvage using AeroNikl for wear resistance and prevention of pitting and galling.
- Main Gearbox Support Fitting, Forward Sponson Mount, Tail Cone Fuselage Support Fitting: Salvage of mounting faces and bores using Sulfuric (Type II Anodized Coating).
- Turbine components: Prebraze for OEM and Repair using AeroNikl.
- Retention Plates: OEM application of AeroNikl to increase hardness.
- Tail Rotor Shaft: OEM application of Hardcoat (Type III Anodized Coating) to Flange faces for wear resistance.

AVIATION APPLICATIONS

SIFCO Selective Plating is recognized as the world's leading manufacturer of selective electroplating equipment and provider of job shop brush plating services. But our commitment to quality goes beyond manufacturing equipment and providing contract services. We believe that our success depends on how we keep our customers – not on how we get our customers. In-depth training, knowledgeable problem solving, competent technical support, and prompt customer service are the cornerstones of our service philosophy.



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5708 Schaaf Road
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Attention: Mr. William Kozane
Plating Consultant

Dear Mr. Kozane:

Thank you for your visit of April 12, 1994. The continued support of the Sifco staff has been one of the major contributors to the overall success of the partnership between Lockheed and Sifco.

As you are aware, due to scheduling conflicts Lockheed was unable to ship parts to subcontractors for plating and for touch-up of damaged plating. Sifco not only provided the training for our personnel, you also provided support through a knowledgeable technical staff, which in these days is equally important to the product itself. Additionally, we found the process to be simple to implement and accurate in meeting military and aerospace applications.

Utilizing the Sifco process gave us flexibility, reduced down time and turn-around delays, and eliminated shipping charges associated with sending parts out to be plated.

We want to thank you for your time, advice and prompt service. To us, your over thirty years of experience in the development of brush plating technology were obvious in both your process and your service.

Sincerely,

W. James Hogan
Manufacturing Analyst

David Moschgat
Procurement Specialist

AVIATION APPLICATIONS

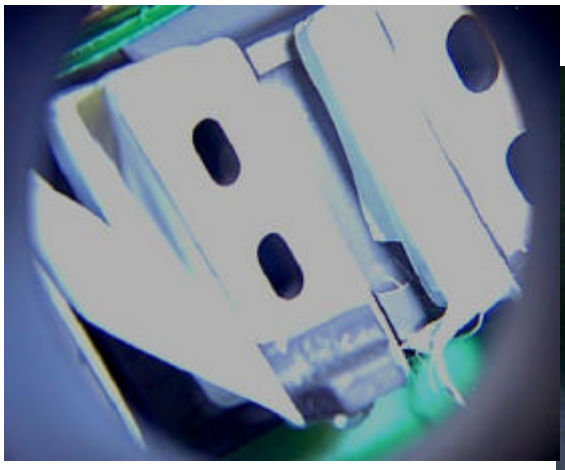
Prebraze

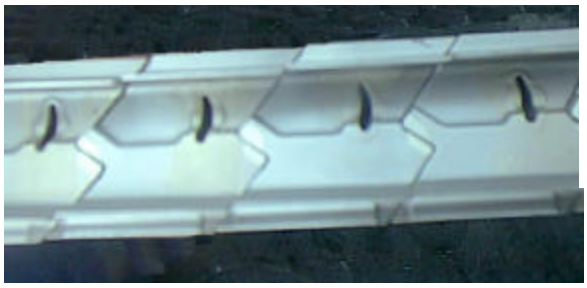
TURBINE STATOR: Inner and outer stator and seal diameters are plated with 5μm to 20 μm (0.0002 in. to 0.0008 in.) thickness of AeroNikl 250 Code 7280 for prebraze at the repair facility. The ability to selectively apply the prebraze deposit in house, without the need for immersion tanks saves time and money as well as minimizes any potential environmental issues associated with large tank plating operations.

TURBINE FRAMES: These components are plated with 5μm to 15μm (0.0002 in. to 0.0006 in.) thickness of AeroNikl 250 Code 7280 for prebraze and a contract basis by SIFCO Selective Plating for over 5 years, providing a quick turn around time for the customer.

These parts were originally tank plated and required an extensive and time consuming masking operation. The use of selective plating on these parts has eliminated the need for complicated masking and significantly reduced turn around time for each part.

TURBINE BLADES: Over the last 5 years, SIFCO Selective Plating's Contract Service Department has processed well over 11,000 OEM second stage blades, which previously were tank plated. The switch to selective plating for this prebraze application provided considerable savings to the customer and a much faster turn around time.





AVIATION APPLICATIONS

Selective Anodizing

Selective anodizing techniques are similar to those used in selective plating. The coatings are formed using either solutions or gels, depending upon the specific application. SIFCO Selective Plating offers the following anodizing coatings:

- **First Stage Stator:**
  SIFCO Hard Coat 5025 was used to repair the leading edges of 15 heavily corroded vanes. The eroded areas were first ground to a smooth finish and were then hard coat anodized with a coating thickness of 100μm (0.004 in.) to provide maximum corrosion and wear resistance.
- **Tail Cone Fuselage Support Fitting, Forward Sponson Mount, and Main Gearbox Support Fitting:**
  Mating surfaces of these various helicopter components, inspected on a regular basis, often are corroded. Repairs are made, in place, with a 12.5μm (0.0005 in.) thick Type II Sulfuric Brush Anodized coating.
- **Wing Droop Leading Edge:**
  The chromic acid anodized coating on this component is often damaged from in-service use or during maintenance operations. Rather than disassembling this component for stripping and reanodizing, it was repaired in place using SIFCO Process Chromic Acid Anodizing. The damaged areas were isolated, stripped and reanodized at one tenth the cost of complete disassembly and reanodizing.

CHROMIC (Type I): Can be applied as in as little as 15 minutes as a base for organic coatings and finishes and one hour to provide coatings for corrosion protection. The use of Chromic Gel is beneficial for on-site applications, such as underside of a part, where pumping solution could present a problem. SIFCO's Chromic coatings meet the requirements of AMS 2470 and MIL A-8625.

SULFURIC (Type II): Coatings are used to provide corrosion protection, wear resistance, and dimensional restoration of worn or mismachined parts. Coatings thicknesses of up to 50μm (0.002 in.) can be obtained. Selective sulfuric anodizing can also be used to repair damaged anodized coatings. SIFCO's Sulfuric coatings meet the requirements of AMS 2471, AMS 2472, and MIL-A-8625.

HARD COAT (Type III): Selective hard coat deposits are applied for wear resistance, corrosion protection, and dimensional restoration of worn or mismachined parts. The coatings meet the requirements of AMS 2468, AMS 2469, and MIL-A-8625. Thicknesses of up to 113μm (0.0045 in.) can be achieved using SIFCO's Hard Coat Solution.

PHOSPHORIC: Coatings are used to prepare aluminum surfaces for adhesive bonding and occasionally as a preparatory procedure for a subsequent plating operation. Both solution and gel are available for the phosphoric coatings, which can be applied in 10 minutes.

BORIC-SULFURIC: This alternative to chromic acid anodizing produces protective films that provide corrosion resistance equal to or greater than chromic acid anodized coatings in approximately 20 minutes.

AVIATION APPLICATIONS

Salvage & Repair

- **Compressor and Torque Cone Flanges:** Repair of worn bolt holes with a nickel Code 2088 buildup of 125µm (0.005 in.). This material was selected because it approximates the hardness of the substrate material.
- **Landing Gear:** Touch-up with Cadmium LHE for corrosion protection allows repairs to be made on-site, saving disassembly cost.
- **Main Landing Gear Outer Cylinder:** CVGP (Controlled Velocity Gap Plating) has allowed orifice tube boss ID's to be repaired with thicknesses ranging from 250µm to 750µm (0.010 to 0.030 in.), with a tolarance range of 50µm (0.002 in.). Deposits of 750µm (0.030 in.) can be applied in approximately 2 hours.

Tank plating, for the same repair, requires the part to be immersed for extended periods (24 to 72 hours is common) for the required deposit thickness. Machining is then required because of the excessive edge buildup. This immersion requires very time consuming, and careful masking. CVGP speeds up the processing time and requires less masking. Further, the limited edge buildup using CVGP reduces or eliminates machining operations.

AeroNikl®

Since 1982, SIFCO Selective Plating has provided the Aircraft/Aerospace Industry with AeroNikl sulfamate nickel deposits for both salvage and OEM applications. The AeroNikl solutions provide fast plating rates, minimize masking, minimize the need for post-plating machining and lessen the environmental concerns by using small solution volumes. The solutions provide defect-free, adherent, high quality nickel deposits in three hardness levels (250, 400, and 575 HV).

Cadmium (No Bake) and Cadmium LHE®

Provides excellent corrosion protection on high strength steels susceptible to hydrogen embrittlement

No post-plating bake

Little to no masking required for touch-up applications

Components plated in place with little or no disassembly

Zinc-Nickel (No Bake) and Zinc-Nickel LHE®

A less toxic replacement for cadmium

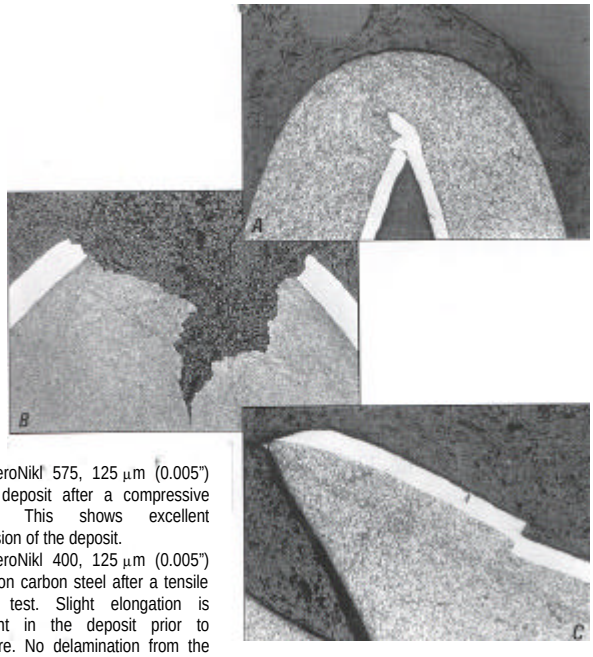
Used in applications requiring a high degree of corrosion protection

Excellent for applying anti-corrosion coating on high strength steels prone to hydrogen embrittlement

Post-plating bake not required

AVIATION APPLICATIONS

Adhesion of SIFCO Deposits



A. AeroNikl 575, 125 µm (0.005") thick deposit after a compressive bend. This shows excellent adhesion of the deposit.
B. AeroNikl 400, 125 µm (0.005") thick on carbon steel after a tensile bend test. Slight elongation is evident in the deposit prior to fracture. No delamination from the base. Excellent adhesion
C. AeroNikl 575, 125 µm (0.005") thick on carbon steel after being subjected to a chisel test. The deposit cracked and shifted under load. No delamination. Excellent adhesion.

By using ASTM C633-79, entitled "Standard Test Method for Adhesion or Cohesive Strength of Flame Sprayed Coatings" SIFCO Selective Plating established values for the adhesion of SIFCO Process deposits, which show that the cohesive strength of the deposit exceed that of the cement. For example, the minimum tensile strength value established (at the point of cement failure during testing) for Nickel (High Speed) is 22,803 kPa (11,200 psi) on a SAE 4130 carbon steel base material.

In additional qualitative tests, as described in QQ-N-290, the plated areas were subjected to high stresses and strains. These tests consisted of compressive and tensile bend tests as well as chisel test into the deposit. The result showed excellent adhesion to the base material per ASTM B517 test methods.

Ask for Technical Service Bulletins 81006, 82005, and 88004.

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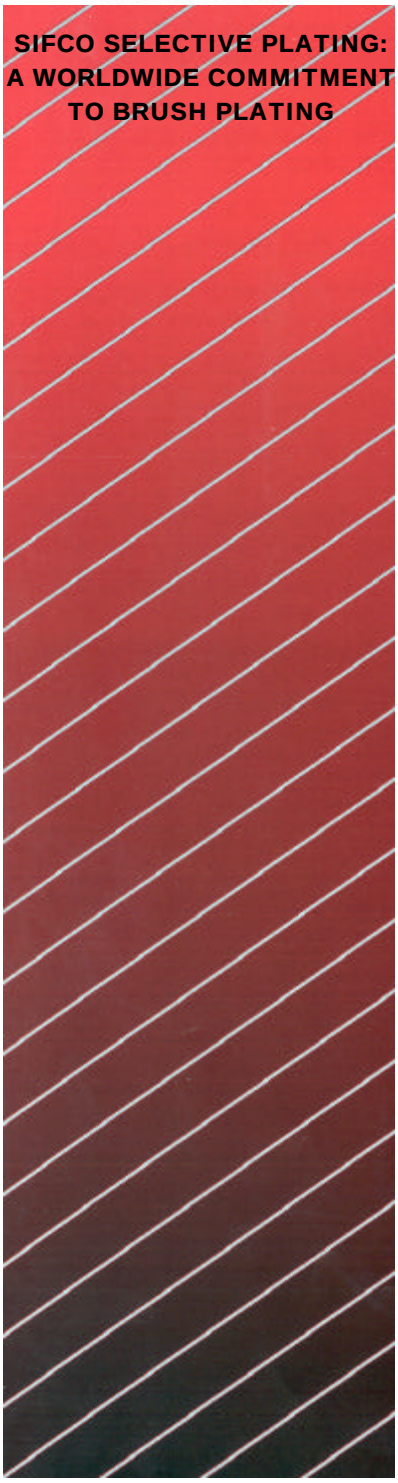

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