



APPLICATIONS FOR A HAND-HELD, SUB-COATING IMAGING SYSTEM

INTRODUCTION

Laser and Plasma Technologies (LPT) has developed a sub-coating detection system, the LPT-S2. This handheld system is able to “see” through painted surfaces to detect incipient corrosion, image composite structures, and discover sub-surface defects.

Examination of aircraft and other military assets for corrosion and structural defects is still heavily dependent upon visual inspection methods, either with the unaided eye or with a flashlight. These techniques have traditionally been unreliable, with detection of problem areas occurring only after defects have extended to larger areas where high cost repairs are required.



Figure 1. LPT-S2 in use at NAVAIR Jacksonville.

The LPT-S2 contains word data storage so images can be viewed later. The S-2 greatly increases the accuracy, reliability, and speed of inspection by providing real-time, high-resolution imaging of metal and composite surfaces underneath the paint.

METHODOLOGY

The metal and composite structures of military assets are principally coated with primer + topcoat paint systems. An engineering goal of these paint systems is to prevent surface corrosion and limit the material’s exposure to the environment. However, these coatings also act to “hide” the metal or composite surface underneath. Corrosion and other surface defects can therefore only be detected visually once the coating system has been compromised by delamination, blistering, or staining. Once this has occurred, significant repairs are often required that may also introduce unexpected asset downtime. Identifying these defects in their earliest stages provides the opportunity for less costly repairs and a lowered structural risk to the asset in operation

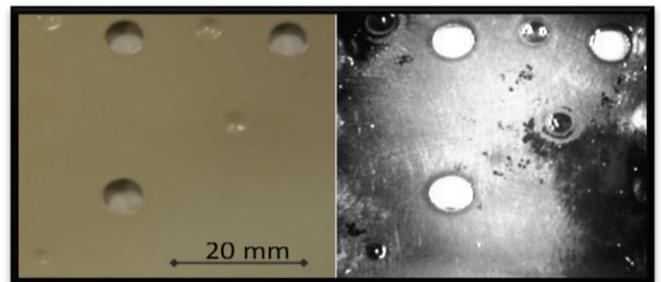


Figure 2. LPT-S2 imaging through coatings. *LEFT*: sample with P8 Poseidon primer + topcoat, no corrosion apparent. *RIGHT*: Sample as-imaged through LPT-S2, with dark areas indicating prevalent surface corrosion.



Figure 3. Avionics specialists with the 12th Aircraft Maintenance Unit prepare a Global Hawk for a runway taxi test at Beale Air Force Base, California.



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The LPT-S2 can be described as a handheld video imaging instrument *engineered to penetrate coating systems*. In order to resolve an image of the sub-coating surface, photons have to travel through the paint layers and reach the surface of the metal or composite. These photons must then return back through the paint to transmit surface information to a detector. The LPT-S2 is designed to generate and detect photons at wavelength bands transparent to many MIL-SPEC paint systems. Figure 2 shows one such example, with the instrument imaging through the standard paint scheme of a P8 Poseidon aircraft.

INSTRUMENT

Defects and corrosion tend to be more prevalent in constrained areas where moisture can collect, and at joining regions such as adhesive lips and rivets. With this in mind, a key criteria for LPT-S2 has been to design towards a miniaturized form factor with rugged construction. Battery power operation is essential to inspect assets without a tethered power supply cord.



Figure 4. LPT-S2 system in use, with main instrument housing and tablet PC display shown.

Instrument imaging (vs unaided eye inspection) also affords the ability to track trouble areas over time. LPT-S2 is driven by a powerful PC-based software program that provides image enhancement, data-basing, and customized metadata options.

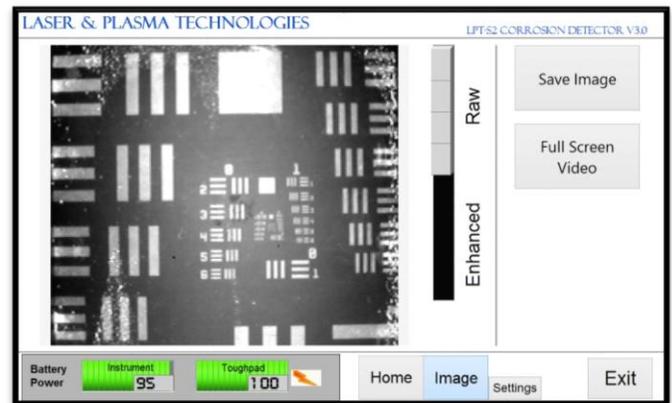


Figure 5. LPT-S2's custom software interface, showing an Air Force 1951 target resolved through a primer + topcoat paint system.



Figure 6. Airmen perform maintenance checks on a CV-22, tilt-rotor aircraft Osprey on the flight line at Cannon Air Force Base.



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Our instrument design is driven by NAVAIR's specifications for corrosion monitoring of the P3 Orion and P8 Poseidon aircraft fleet, LPT-S2 is a proven depot-level tool for both military and commercial applications.

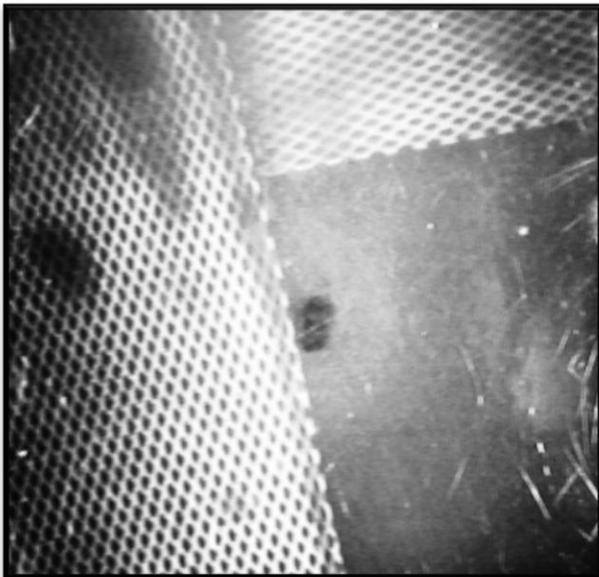


Figure 7. Conductive lightning arrestor mesh imaged through primer + topcoat coating system.



Figure 8. Sailors perform maintenance on the propeller of an MH-60S Sea Hawk helicopter assigned to the Eightballers of Helicopter Sea Combat Squadron (HSC) 8 on the flight deck of the aircraft carrier USS Nimitz (CVN 68)

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ABOUT US:

LPT delivers high value products and expertise in laser and infrared imaging technologies. The LPT-S instrument platform provides best-in-class resolution and inspection speed for NDI of painted and coated surfaces.