

Develop and Demonstrate Full Aircraft Laser Coating Removal in a Production Environment (Task N.0793)

Statement of Need

Complete aircraft depainting is performed as part of the normal programmed depot maintenance (PDM) process. The aircraft are routed to the depot depaint bays where they are stripped with abrasive blast media or chemical paint removers. The abrasive dry media blasting process generates solid waste that is difficult and time consuming to collect and manage. The chemical paint removal process utilizes chemicals containing volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) and requires large amounts of fresh water for rinsing. Both processes are costly and time consuming and result in large amounts of hazardous waste air emissions. Additionally, because these technologies are largely non-selective, the entire coating system, including the chromate containing primer, is routinely removed whether or not the coating system needs to be stripped down to the substrate.

An example of the extent of this problem is the depainting of the F-16 aircraft. The current process for the depainting of the F-16 involves three main steps: prep, depaint, and de-prep. The preparation step includes washing of the aircraft, towing and positioning of the aircraft in the paint hanger, masking and sealing delicate areas, jacking of the aircraft and retracting the landing gear, and then final masking and sealing operations. This preparation step requires an average of 167 man-hours of work. The depaint step involves either automated or manual plastic media blasting (PMB), then touch up operations using manual PMB hoses requiring 92 man-hours of labor if performed manually. The final step in the process is the de-prep work which involves removal of all masking and sealing materials, touch up of residual paint and sealant using hand sanding, and a final wash down of the aircraft. This final step requires an additional 70 man-hours of work bringing the total labor burden required for depainting the F-16 to 329 man-hours.

Conservatively, for a single F-16, an estimated 2,000 square feet of surface area must be stripped using PMB. This requires approximately 20,000 pounds of media, 2,000 pounds of which end up as hazardous waste. Based on an average annual production of 80 aircraft, and factoring in maintenance, waste stream, materials, and other costs, the total cost to depaint fighter size aircraft at one depot comes to approximately \$4.2 million and generates 160,000 pounds of solid hazardous waste annually. The cost and environmental impact of depainting operations is equal or greater when other aircraft operations are evaluated.

Technical Approach

Laser coating removal is an alternative technology to the currently utilized coating removal methods. It has been demonstrated in recent years that a laser-assisted coating removal system has the potential to offer significant environmental improvements and cost reduction in depot operations. NDCEE Task N. 793 will develop, validate, and demonstrate, in an operational environment, the use of laser coatings removal technology for the full aircraft processes performed at Air Logistics Centers (ALC).

This task will leverage on-going and previously completed work by the United States Air Force Research Laboratory (AFRL) that combines laser coating removal technology with robotic manipulation systems as an environmentally acceptable replacement for traditional coatings removal processes. This task is comprised of two related efforts to demonstrate and provide the capability for automated coatings removal of fighter and cargo aircraft processed at Ogden ALC (OO-ALC).

Results and Benefits

The implementation of an automated laser coating removal system at OO-ALC for coating removal of the F-16 aircraft is projected to result in a labor savings of approximately \$1,870,000, an annual materials cost savings of approximately \$323,000, an annual maintenance cost avoidance of approximately \$106,000, and a waste management cost avoidance of approximately \$3,600. The total annual operating cost savings equals approximately \$2,300,000. In addition to cost savings, implementation of an ARLCRS for the F-16 aircraft depainting will eliminate worker exposure to strenuous depainting processes such as media blasting.

The implementation of ARLCRS at OO-ALC for coating removal of C-130 aircraft is projected to result in a labor savings of approximately \$2,100,000, an annual materials cost savings of approximately \$240,000, and a waste management cost avoidance of approximately \$79,000; however, there would be an annual maintenance/utility cost increase of approximately \$92,000. The total annual operating cost savings equals approximately \$2,300,000.

Technology Transfer and Outreach

This task will result in the implementation at OO-ALC of a fully automated system for coatings removal operations on fighter size aircraft as well as the implementation of a separate system at OO-ALC for cargo size aircraft.

Government POC
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Status
Ongoing

