

Leading Edge Coating Depaint Testing

Background:

Due to coating system failures on the leading edge or windward edges of aircraft surfaces, where flight-induced erosion or peeling of coatings is a common problem, USAF Field Units and Air Logistics Centers (ALC) have applied specialty coatings to leading edges in an attempt to solve the problem. These coatings must be removed to return the aircraft to its original flight configuration for periodic maintenance operations at the ALCs. CTIO has been asked to determine the removal rates of three selected specialty coatings using approved coating removal methods per USAF T.O. 1-1-8.

Project Sponsor/Customer: Air Force wide

Period of Performance: 1997

Objective:

The objective of this test program was to determine coating removal rates of three selected specialty coatings, Ceram-Kote 54, Courtaulds PR 475, and Courtaulds Teflon Anti-Chafe, using approved coating removal (depaint) methods per USAF T.O. 1-1-8. These coating systems are candidates to be used on the leading or windward edges of aircraft surfaces where flight induced erosion or peeling of coatings is a common problem. These coatings must be removed to return the airframe to its original flight configuration and for depot level maintenance operations. The testing was done per the guidelines of the draft USAF Engineering Qualification Plan for Coatings/Paint Removal Techniques (EQP).

Status:

The coating systems tested were applied to aluminum substrates only. No testing was done on composite materials. The removal processes tested were (1) plastic media blasting (PMB), (2) medium-pressure water (MPW), and (3) methylene chloride based chemical paint stripper. For the mechanical removal processes (PMB and MPW) a removal rate was determined for representative process parameters. A single residual stress measurement was then made as a preliminary screening to determine if there was potential for substrate damage. The process parameters for stripping were selected to be representative of standard practice at the USAF ALCs and MAJCOM Field Units. No attempt was made to optimize the process parameters or removal rate. No

additional testing, other than determination of the removal rate, was done for the methylene chloride paint stripper.

All of the candidate coating systems were successfully removed by each of the three processes. The mechanical processes (PMB, MPW) were much slower in removal than with standard coatings. The degree of difficulty in removing the coating was greatest with Ceram-kote 54 and PR-475. The Teflon Anti-Chafe was difficult to remove, but easier than the other two coatings. Removal rates of 0.05 to .1 square feet per minute were typical in comparison to 1.0 to 1.5 square feet per minute on standard coating systems. The residual stresses were higher (0.0049 mils to 0.0082 mils) as compared to standard coating systems (0.001 mils to 0.003 mils)

Although not tested in this program, this initial assessment would indicate that these coatings could possibly provide substantially more resistance to erosion. Conversely, if the coatings are removed by a mechanical blasting process, there might be a greater potential for damage to the substrate due to the longer dwell times required to remove the coatings. This should be considered when applying these coatings to thin skin aluminum or composite substrates. A specific concern would be resin based composites where the surface resins might be eroded faster than the specialty coatings when they are blasted.

The depaint process using chemical strippers was also successful. All of the coating systems tested were successfully removed by a single application of methylene chloride based chemical stripper within a two-hour period. This is an acceptable removal method for metallic substrates, however chemical strippers cannot be used on resin surface composites because the stripper will attack the resin. These coatings can be used if the amount of chemical stripper is kept under the annual NESHAP limit and if the metallic substrate is qualified for use with the stripper.

Final Report: "Leading Edge Coatings Removal Testing"

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