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PREDICTIVE CORROSION AND WASH OPTIMIZATION FOR INCREASED A/C AVAILABILITY AND DECREASED COST

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ABSTRACT

Currently, United States Air Force (USAF) corrosion wash intervals are performed on a calendar-based schedule derived from the USAF Environmental Severity Index (ESI) which includes mild (180 day), moderate (90 day), and severe (30 day) ratings for base locations. This calendar-based methodology does not account for variables such as environmental conditions of aircraft locations during operation, nor does the ESI account for environmental effects during altitude changes and flight exposure to contaminants. This can generate unnecessary corrosion maintenance actions (washes), increasing costs, and maintainer exposure to hazardous materials.

This effort seeks to optimize maintenance processes and scheduling efficiency through the use of predictive analytics. Matrices of environmental indicators and cumulative exposure states will be developed and validated to predict the likelihood of corrosion as a function of environmental exposure. A data-driven approach will be utilized to develop an algorithm for predicting corrosion as a function of environmental exposure based upon measurements of key outdoor conditions. The corrosion algorithm will be trained using data gathered through outdoor exposures at nine USAF bases of varying ESI. Environmental data (input) will be collected via corrosion sensors and weather stations, while data for the corresponding corrosion damage (response) will be collected via analysis of witness panels. The predicted exposure state will define the severity of exposure for a given location. A threshold value for cumulative exposure can then be defined for an individual asset based upon its mission profile. The data from the corrosion algorithm and cumulative exposure will be inputs to Condition Based Maintenance Plus (CBM+) algorithms for predictive prognostics and expanded asset health monitoring. This effort will advance environmental exposure characterization and provide decision-makers with the ability to more efficiently plan and execute maintenance.