# BUILDING ENVIRONMENTAL HISTORY FOR NAVAL AIRCRAFT

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Operating environments of Navy aircraft vary to a good degree depending upon the squadron location, flight requirements, and other related field and ground activities. All these conditions promote both mechanical and environmental damage of various types. Uniform stress free corrosion arises from the geographical location ambient weather and the average ground time of the aircraft. Even a small scratch during operation can lead to a corrosion cell arising under a surface moisture film. Use of de-icing salts in cold environments will also accelerate the corrosion process. Crevice corrosion, meanwhile, results from the accumulation of dirt and debris in confined spaces such as access door flanges and wheel wells; as well as capillary action that keeps faying surfaces wetted even in low humidity exterior conditions. Due to the presence of wet condensates and appreciable concentrations of chloride (and other active) ions, many areas of the aircraft are prone for pitting, intergranular attack or exfoliation. The aircraft operations will also have influence on type and morphology of corrosion. Thus, building an environmental history of the aircraft is crucial to correctly identify different corrosion and mechanical damage processes to monitor and track the development of attack in many areas of the aircraft structure.

We outline a method for building the environmental history of Naval aircraft using three available resources: maintenance and materials management (3M) system data, daily weather history data of the squadron location, and field activity data as recorded in logbooks. This includes development of a part-specific microclimate builder which tracks a local climate history specific to a part or component. The climate builder takes the flight information such as flight duration, altitude, geographical location, etc., as well as daily weather history data from the NOAA Database. It will translate the asset service history (such as: stored indoors vs. outdoors) into a series of scenarios and assigns weighting factors to these scenarios based on geographical location. The underlying approach that is currently used in the climate scenario builder is based on both models/simulations and sensor data. Our current suite of models combined with the climate builder will provide an integrated framework within which life prediction for a combinatorial situation of mechanical and environmental history can be performed.