Aircraft aboard ships at sea are exposed to a highly corrosive environment. The science and engineering literature is full of experimental investigations showing the reduction in crack initiation and crack growth life as a result of prior or concomitant corrosion. Unfortunately, current engineering approaches to manage corrosion fatigue (CF) in aerospace weapon systems made of strong-tough steel and aluminum alloys are less than robust in terms of material data and prediction algorithms for engineered components and their operational environments. Poor component life prediction results in improper structural integrity assessments or increased inspection and maintenance burden, technical surprises in the field or at depot input, and premature component retirement. The public good will be served by not only transitioning the new technology to the US Navy (and DoD) research and development, acquisition, and sustainment activities, but also to weapon system Original Equipment Manufacturers (OEMs).

Corrosion damage has a strong deleterious effect on the fatigue life of airframe components. A standardized specimen and testing protocol to evaluate the relative influence of material, environment, inhibitors, and loading spectrum on the pit-to-crack transition is beginning to evolve. The development of a fatigue crack from a corrosion pit is complex process. Furthermore, the crack shape and internal topography of the corrosion pit affects the cycles to initiation from a corrosion flaw to a fully formed (periphery) fatigue crack. The crack shape development is also of high importance and an understanding of how the crack develops from the pit is critical to understanding when the pit has transitioned to a crack. To look at the pit to crack transition in different environments sensitive measurements of the fatigue crack growth is required. The best method to measure crack growth in these situations is direct current potential drop (dcPD). However, this method can be highly influenced by crack shape development and requires and understanding of the stress intensity factor (K) solution as well. To develop a test protocol which accurately determines the effect of coating systems and corrosion inhibitors on the pit to crack transition, all of these issues must be investigated and understood.