



Durable Aircraft

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DURABLE AIRCRAFT CONCEPT

Vision

- Develop galvanic management technologies and engineered systems that eliminate fleet maintenance and reduce life-cycle corrosion costs of aircraft.

Major Focus Areas

- Integrated Structural and Corrosion Design Tool
- Tests for Prototyping Corrosion
- Engineered Interfaces and Materials



Requires a Radical Shift in Design Philosophy

INTEGRATED STRUCTURAL AND CORROSION DESIGN TOOL

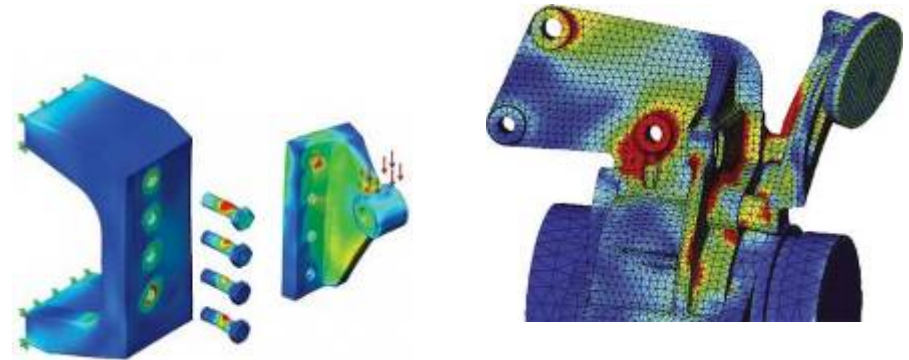
Innovative technologies that enable the modeling, simulation and validation of galvanic stress

Investment Technologies (TRL 2):

- Surface Corrosion Science
- Aircraft model of galvanic stress
- Engineering-design tool development

Vision of Galvanic Modeling Tool:
Mapping Galvanic Stress Areas

- Electric Potential Drives Corrosion
- Factors
 - EM Environment
 - Weather / Op Environment
 - Dissimilar Materials
 - Stress
 - Design
 - Coatings
 - Material Degradation



$$\Delta V = \Delta V^{\circ} - \frac{RT}{nF} \ln \frac{[M_1^{n+}]}{[M_2^{n+}]}$$

Technology solutions will focus on F/A-18, H-60, E-2, H-53 a/c and future platforms - N-UCAS, F/A-XX.

- Highest cost drivers by platform and need
- Build upon initial work done by NRL for ships



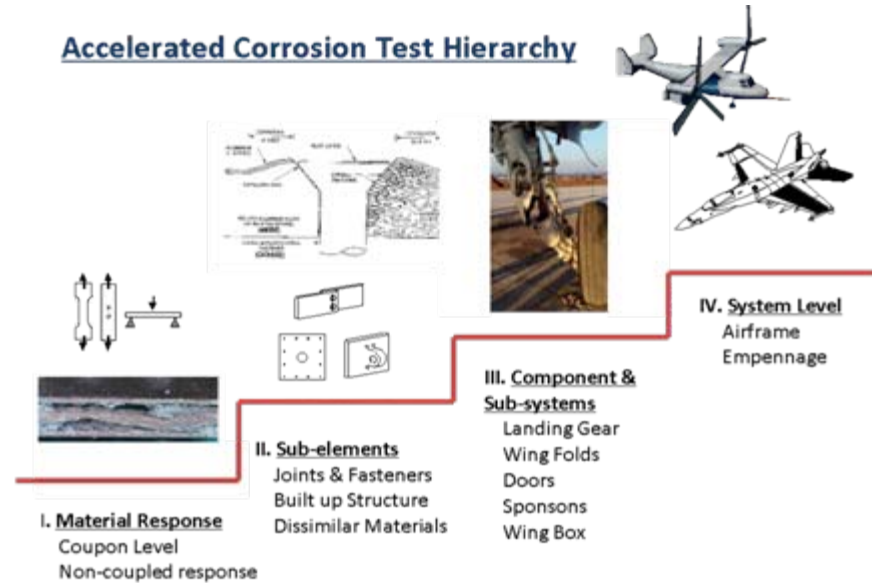
TESTS FOR PROTOTYPING CORROSION

Innovative test technologies enabling prototyping
and risk reduction for airframe corrosion performance at sea

Investment Technologies (TRL 2):

- Test and validation process
- Prototyping standard
- Advanced trade study method

- Government- Industry Accepted
- Validate Corrosion Response
- Realistic and Reliable
- Enables credible design AoA
- Enforceable Contract Language
- Design validation via DT
- Provides Answers
 - How much will it cost/save?
 - How long will it last?
 - What is the ROI?



Technology solutions will focus on F/A-18, H-60, E-2, H-53 a/c and future platforms - N-UCAS, F/A-XX.

- Highest cost drivers by platform and need
- Build upon work underway funded by SERDP



ENGINEERED INTERFACES AND MATERIALS

Develop new technologies that reduce galvanic potential between materials used on airframe

Investment Technologies (TRL 2):

- Carbon fiber composites with reduced cathode area and less noble open circuit potential
- Multi-compatible fasteners and conductive coatings/sealants
- Galvanically tuned protective coatings



Technology solutions will focus on F/A-18, H-60, E-2, H-53 a/c and future platforms - N-UCAS, F/A-XX.

- Highest cost drivers by platform and need
- Multiple possible solutions

Summary

- Corrosion is responsible for reduced safety, reduced mission capable assets, increased FRC workload, and increased logistics trail
- \$3B per year is spent on Navy-Marine Corp aircraft corrosion maintenance, i.e., 7.5% of NAVAIR's Budget
 - Airframe corrosion is approximately 86% of total
 - Galvanic damage at holes and other interfaces is bulk of structural damage
- Goals for each thrust
 - Design tool: improved materials selection and structural life prediction
 - Prototyping: validation of new materials and designs before they are fielded on full aircraft
 - Interfaces: new materials and processes which reduce galvanic corrosion and loss of structural life due to environmental effects

