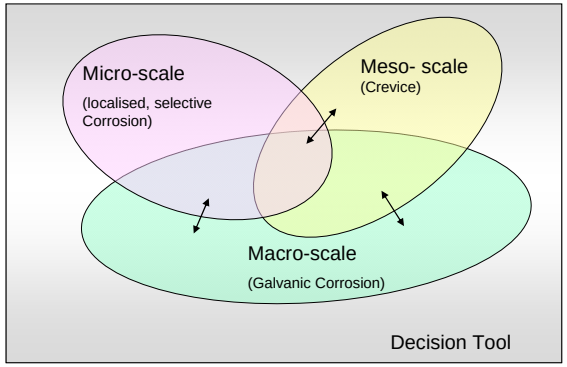
SICOM Overview

Simulation based Corrosion Management – SICOM – is a Specific Targeted Research Project in the Sixth Framework Programme, PRIORITY 4 Aeronautics and Space. The project has been prioritised by the European Aeronautic Science Network EASN.

The aim is to develop numerical models for the simulation of corrosion of Al-alloys with regard to microstructure and the micro-electrochemical conditions. The influence of surface treatment on modelling results will be included with regard to inhibitor release from protection systems.



EADS Innovation Works (F, D)

Airbus Deutschland

Computational Mechanics International Ltd.

Swiss Federal Laboratories for Materials Testing & Research

Universite de Bourgogne

University of Erlangen

Vrije Universiteit Brussel

Sheffield Hallam University

University of Patras

Warsaw University of Technology

Simulation based Corrosion Management

http://www.easn.net/supported-projects/sicom/

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SICOM Benefits

Corrosion modelling tools for prediction of corrosion occurrence and corrosion propagation will be a driver for new technical advances in the fields of corrosion maintenance, development of new materials, structural designs and surface protection systems.

SICOM will provide models that can become an essential part of future predictive maintenance concepts to avoid unanticipated and unscheduled maintenance with high costs. Data from monitoring systems and non-destructive inspection can be used as model input. Model outputs will be utilised for the repair decision process or can supply structural integrity concepts and hereby fill the gap between monitoring or inspection and calculation of the structural impact of corrosion. Aircraft development costs will be reduced through saving on testing time and quantity. The prediction models can be combined with expert systems and databases for a more efficient and reliable development and selection of materials.

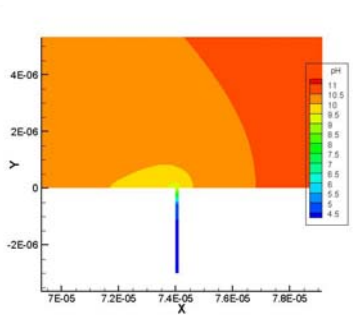
Fuselage showing damage to protective coating

SICOM Objectives

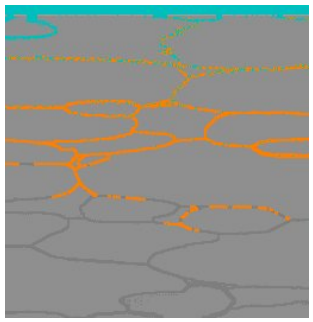
- ***Definition of representative modelling parameters.***
- ***Micro-scale modelling of localised corrosion of Al-alloys considering micro-structure and the micro-electrochemistry.***
- ***Determine the corrosion rate of Al-alloys in the meso-scale of occluded cells by numerical calculation.***
- ***Numerical model for prediction of galvanic corrosion and upscaling for application to structural elements.***
- ***The analysis and integration of the impact of surface treatment of modelling results.***
- ***Development of a decision support tool to link model of different scales and finally model validation***

SICOM Models

I) Microscale modelling



Mass Transport Model

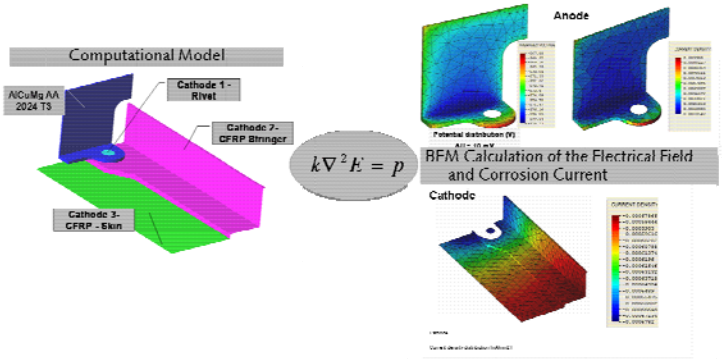


Cellular Automaton Model

II) Engineer based modeling – occluded cell

Top view pH map inside occluded cell

III) Engineer based modeling – galvanic corrosion



IV) Decision Support tool