

## Corrosion Under Surveillance

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Corrosion has a significant impact on the life cycle costs of air vehicles. These costs could be reduced if successful mathematical modelling and a corrosion prediction tool was developed<sup>1</sup>. The corrosion processes are complex. For example the corrosion of 2024 T3 aluminium alloy has been the subject of intensive study over recent years<sup>2-5</sup>. Localised pitting initiated due to microgalvanic coupling of the matrix with 2<sup>nd</sup> phase particles has been shown to result in corrosion damage that will effect fatigue life. Any model of this situation requires high quality, time resolved data for validation.

This work has put corrosion under surveillance. Methods to map and monitor localised corrosion in 3.5% NaCl have been considered. Previous work used SEM/EDX to evaluate the corrosion process. However optical microscopy showed that SEM caused corrosion inhibition (Fig 1).

An optical scanning system has been constructed that allows high resolution micrographs to be recorded, tiled and montaged. The development of the corroding surface has been followed as a function of time and the fate of individual 2<sup>nd</sup> phase particles could be tracked along with the germination, growth and termination of individual pits.

The effect of different environments on pit formation and propagation has been examined including constant immersion, intermittent immersion, neutral salt spray and outdoor exposure<sup>6</sup>.

The optical micrographs were also compared with electrochemical scanning probe techniques (Fig 2). SVET identified the major features and provided an independent assessment of the corrosion damage. The amount of local aluminium dissolution was correlated with observed pit volume.

The system has provided an effective tool for the study of localised corrosion.

### References

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### Acknowledgement

This work was supported by BAE SYSTEMS with additional EPSERC funding for Sue O'Driscoll

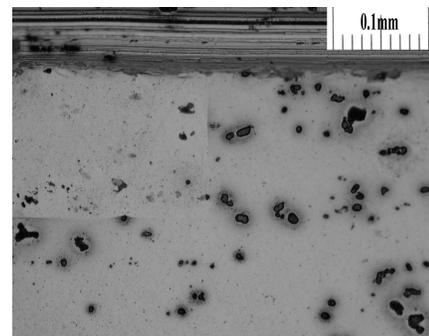


Fig 1 Optical micrograph of corroded 2024 T3 aluminium alloy

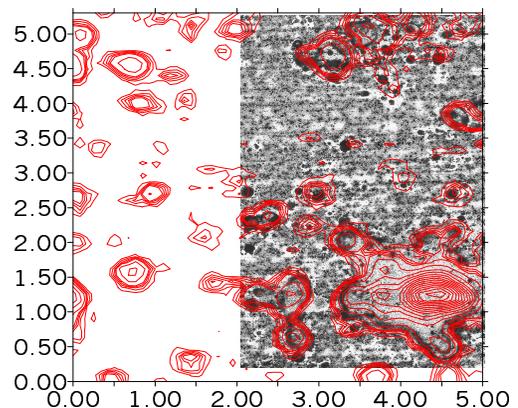


Fig 2 Optical image of corroded 2024T3 aluminium alloy and correlation with SVET contour plot