Collaborating on corrosion

Corrosion of military aircraft parts is a multi-billion dollar problem. Through the Queensland Centre for Advanced Materials Processing and Manufacturing (AMPAM), scientists and engineers at the top of their fields have joined forces to reduce these corrosion impacts by developing unique prognostic tools.

The new collaboration brings together a multidisciplinary team from the Defence Materials Technology Centre (DMTC), the CRC for Polymers (Prof. Peter Halley), UQ (Assoc Prof. Martin Veidt, Prof. Graeme George), RMIT University (Prof. Graham Clark), DSTO (Tony Trueman and Grant McAdam) and BAE Systems Australia (James Waldie and Nelson Evans).

At the centre of this new collaboration is PhD student Bing Kathy Han ("Kathy"), the first recipient of an AMPAM scholarship with additional financial support from the DMTC, CRC for Polymers and UQ.

Kathy is a Finite Element Analysis Engineer with seven years of industry experience. Finite Element Analysis uses numerical discretisation to calculate the mechanical stresses and deformations in complex materials and structures.

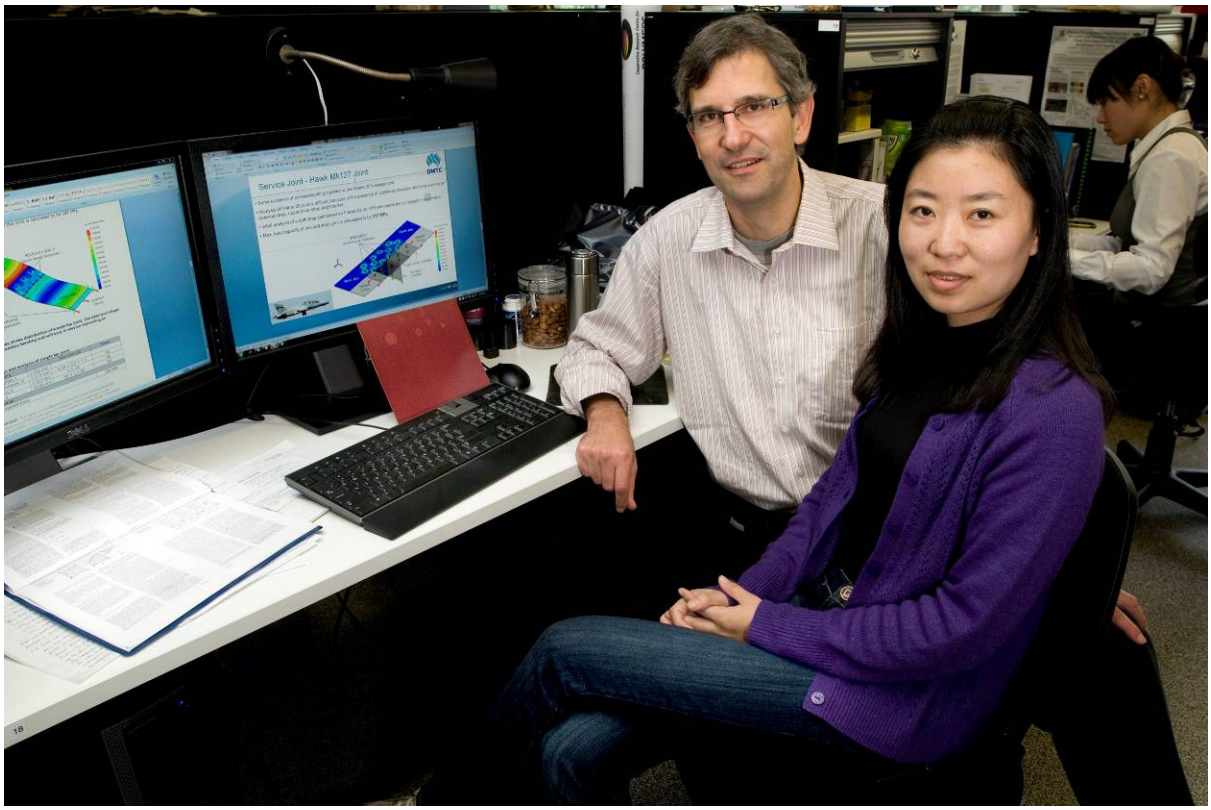
Corrosion of metal parts and moisture ingress in composites on aircrafts often begins with cracking of the protective coating. Kathy is developing a finite element simulation tool to predict micro-crack evolution in aircraft polymer top coats under external mechanical and temperature loadings.

With Associate Professor Martin Veidt, Kathy will specifically investigate the influence of age-related changes in coating properties on crack formation, propagation and final failure. Her research will encompass the effect of stress concentrations around discontinuities on the surface of an aircraft such as exposed edges and fastener holes in different joint configurations.

Kathy's research will feed into a DMTC Project which aims to develop tools to predict the likelihood of corrosion on military aircraft so that smart preventative practices can be utilised. The DMTC project is focused on developing and delivering a validated and certified Corrosion Prognostic Health Management capability in the form of a prognostics tool box, which will include a combination of sensors, models, monitors and management tools.

Polymer experts Professors Graeme George and Peter Halley will determine the material properties of the coatings as a function of degradation level. These properties are essential input parameters for Kathy's simulation work. Meanwhile, Professor Graham Clark will provide the loading that the coatings will experience during service and identify the critical locations where paint degradation will most likely occur.

The synergies and efficiencies that will flow from this critical mass of diverse expertise are made possible by AMPAM's co-location of scientists and engineers from various organisations at The University of Queensland's St Lucia campus.



Bing Kathy Han and Associate Professor Martin Veidt developing a finite element simulation

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ACRONYMS

AMPAM: Queensland Centre for Advanced Materials Processing and Manufacturing. AMPAM is supported by the Queensland Government's Smart State Innovation Building Fund.

CRC: Collaborative Research Centre

DMTC: Defence Materials Technology Centre

DSTO: Defence Science & Technology Organisation

QUT: Queensland University of Technology

RMIT: Royal Melbourne Institute of Technology

UQ: The University of Queensland