

Science & Technology Organization
Collaboration Support Office
Applied Vehicle Technology Panel

**AVT-303 Research Workshop on
Corrosion Management
Athens, Greece
10-12 December 2018**

This Workshop is open to NATO Nations, Australia, Sweden and Finland.

Theme and Topics

In 2011, two NATO activities took place relating to corrosion, AVT-140 and AVT-137. The first activity (Corrosion Fatigue and Environmentally Assisted Cracking in Aging Military Vehicles) provided an update to AGARD Corrosion Handbook Vol 1, while the second activity (Corrosion and Maintenance Data Sharing) had a goal to promote sharing of best practices in terms of corrosion prevention and maintenance procedures used on military vehicles. Unfortunately, the second activity did not obtain the desired number of contributors and thus the goal was not achieved.

However, more recently during two workshops that were held in October 2014 (AVT-222, AVT-223) discussions took place with regards to corrosion management across the various NATO nations. It was unclear to the participants as to how corrosion within these fleets was managed and to what level this management is taking place. For instance, is the previous "Find-it, Fix-it" philosophy still being used and if so at what cost. There is a requirement to understand once corrosion is found, 1) what is the process NATO nations use to ensure structural integrity; 2) are there algorithms which are used to predict the future state of the corrosion; 3) are health monitoring techniques being used or being considered to determine the current state of components susceptible to corrosion.

The objectives of the workshop are 1) to share the best practices on how corrosion is managed across the NATO nations, including diagnostic and prognostic tools and non-destructive inspection (NDI) techniques used to assess corrosion damage; and 2) to discuss the possible approaches that will allow NATO nations to improve the corrosion management.

The workshop will cover tri-service experience from air, sea, and land, on both vehicle structure corrosion and engine hot corrosion.

Background

The mission of the Science & Technology Organization is to conduct and promote co-operative research and information exchange. STO consists of a three level organization: the Science and Technology Board, the Panels and the Technical Teams. The Applied Vehicle Technology (AVT) Panel, comprising more than 1000 scientists and engineers, strives to improve the performance, reliability, affordability, and safety of vehicles through advancement of appropriate technologies. The Panel addresses platform technologies for vehicles operating in all domains (land, sea, air, and space), for both new and ageing systems.

AVT Executive Office, Collaboration Support Office (CSO), Paris – Points of Contact:

Dipl.-Ing. Christoph Mueller
AVT Executive Officer
Tel: +33 (0)1 55 61 22 85
christoph.mueller@cso.nato.int

Dr. Veronika Gumpinger
AVT Panel Assistant
Tel: +33 (0)1 55 61 22 87
veronika.gumpinger@cso.nato.int

Programme Committee

CO-CHAIRS

Dr. Min LIAO
National Research Council Canada
Email: Min.Liao@nrc-cnrc.gc.ca

Dr. Ludmila 't HOEN-VELTEROP
Netherlands Aerospace Center
Email: Ludmila.t.hoen@nlr.nl

MEMBERS

AUSTRALIA

Mr. Loris Molent
Defence Science and Technology
Email: Loris.Molent@dst.defence.gov.au

CANADA

Dr. Prakash Patnaik
National Research Council Canada
Email: prakash.patnaik@nrc-cnrc.gc.ca

CROATIA

Dr. Vinko Simunovic
University of Zagreb
Email: vinko.simunovic@fsb.hr

FRANCE

Mr. Thierry Vilain
Dassault Aviation
Email: thierry.vilain@dassault-aviation.com

GERMANY

Dr. Roland Lang
Airbus Defence and Space
Email: roland.lang@airbus.com

NETHERLANDS

Prof. Tiedo Tinga
Netherlands Defence Academy
Email : t.tinga@mindef.nl

UNITED KINGDOM

Mr. Joseph Plummer
Defence Science and Technology Laboratory
Email: jeplummer@dstl.gov.uk

UNITED STATES

Dr. Kimberli Jones
United States Airforce
Email: kimberli.jones.1@us.af.mil

PANEL MENTOR

Mr. Thierry Vilain
Dassault Aviation
Email: thierry.vilain@dassault-aviation.com

TECHNICAL EVALUATOR

Mr. Jerzy Komorowski
Retired from National Research Council Canada
Email: jerzy.komorowski@jpwkaero.com

Programme

Monday, 10 December 2018

Registration

- 10:00 Registration
13:00 Opening Ceremony

Session 1 – Case Studies

- 14:00 KEYNOTE:
Failure of Gas Turbine Engine Components: Hot Corrosion, CMAS and Oxidation Induced Degradation
P. Patnaik, National Research Council, Canada
- 14:30 Stainless Steel Corrosion Case Studies
V. Simunovic, V. Alar, M. Jakopcic, University of Zagreb, Croatia
- 15:00 Lessons Learned from Operating a Composite Helicopter in Maritime Environment
J.J.H.M. v. Es, Royal Netherlands Air Force, L. 't Hoen-Velterop, Netherlands Aerospace Center, The Netherlands
- 15:30 COFFEE BREAK

Session 2 – Case Studies

- 16:00 Corrosion Performance of a Nickel Aluminium Bronze Alloy Refurbished Using Laser Additive Manufacturing
Y. Wang, J. Huang, X. Pang, X. Cao, Department of National Defence, P. Wanjara and J. Gholipour, National Research Council, Canada
- 16:30 Predicting Cumulative Galvanic Corrosion Damage in Aircraft Structures
R. Adey, A. Peratta, J. Baynham, CM BEASY Ltd, United Kingdom, T. Curtin, Computational Mechanics International Inc., United States
- 17:00 Discussion
- 17:30 END OF DAY 1

Tuesday, 11 December 2018

Session 3 – Corrosion Prevention and Control

- 08:30 KEYNOTE:
The Impact of Corrosion on Availability and Cost of the United States Department of Defense Weapon Systems
R. Stroh, E. Herzberg, Logistics Management Institute, United States
- 09:00 Future Surface Protection Treatments for Corrosion Protection of Military Aircraft Structures
H. Baron, Airbus Defence and Space, Germany
- 09:30 Corrosion Protection of Al7075 by Thermally Sprayed WC-Co-Cr Nanostructured and Conventional Coatings
A. Lekatou, D. Sioulas, University of Ioannina, Y. Yannoulis, N. Melanitis, Hellenic Naval Academy, D. Grimalis, Hellenic Aerospace Industry, Greece
- 10:00 Corrosion Damage Atlas for Aircraft Corrosion Management and Structural Integrity Assessment
M. Liao, National Research Council, Canada
- 10:30 COFFEE BREAK

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Session 4 – Corrosion Repair

- 11:00 [The Development of Retrogression and Re-aging to Inhibit Corrosion Damage in Australian Defence Force Aircraft.](#)
B.R. Crawford, A. Shekhter, C. Loader, Defence Science and Technology Group, Australia
- 11:30 [Additive Metal Solutions to Corroded Wing Skins](#)
N. Matthews, RUAG Australia, R. Jones, Monash University, Australia, N. Phan, T. Nguyen, Naval Air Systems Command, United States
- 12:00 [Corrosion Repair of US Naval Aircraft Components by Cold Spray Deposition](#)
F. Lancaster, B. Boyette, Naval Air Systems Command, United States
- 12:30 LUNCH BREAK

Session 5 – Corrosion Monitoring and Prognostic Tools

- 14:00 KEYNOTE:
[The In-service Management of Potential Airframe Fatigue Nucleated from Corrosion Pits](#)
L. Molent, Defence Science and Technology Group, Australia
- 14:30 [Computer Aided Analysis for Corrosion Risk Assessment: From Find-it/Fix-it towards Predict&Manage](#)
A. Franczak, Elsyca N.V. Belgium, Poland, C. Baete, B. van den Bosche, Elsyca N.V., Belgium
- 15:00 [Advanced Experimental and Modelling Approaches to Understand and Predict Better Corrosion of Metals](#)
N. van den Steen, D. de Wilde, D. Pecko, J. Deconinck, H. Terryn, Vrije Universiteit Brussel, Belgium
- 15:30 COFFEE BREAK

Session 6 – Corrosion Monitoring and Prognostic Tools

- 16:00 [In Situ Corrosion Monitoring & Assessment With Diagnostic and Prognostic Capabilities For Condition-Based Maintenance](#)
D. Darr, B. Laskowski, Analatom Incorporated, United States
- 16:30 [Corrosion Prognostic Health Management Principles Applied to Deployment of Environmental Sensors on Australian Defence Force Helicopters](#)
D. Gerrard, C. Loader, D. Gerard, J. Waldie, J. Smithard, A. Butler, A. Schultz, Defence Science and Technology Group, Australia
- 17:00 Discussion
- 17:30 END OF DAY 2

Wednesday, 12 December 2018

Session 7 – Corrosion Management Policy

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| 09:00 | Application of Industrial Corrosion Management Technologies to Military Assets
E. Mielgo, O. Conejero, ITMA Materials Technology, Spain |
| 09:30 | Corrosion Management at Dassault-Aviation - Challenges and Perspectives
P. Vautey, Dassault, France |
| 10:00 | Corrosion Management - AFRL Perspectives and Activities
E. Lindgren, USAF, United States |
| 10:30 | COFFEE BREAK |

Session 8 – Discussion and Evaluation

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| 11:00 | Technical Evaluation Report
J. Komorowski, Canada |
| 11:30 | Discussion |
| 12:30 | END OF MEETING |

Science and Technology Organization in NATO

In NATO, Science & Technology (S&T) is defined as the selective and rigorous generation and application of state-of-the-art, validated knowledge for defence and security purposes. S&T activities embrace scientific research, technology development, transition, application and field-testing, experimentation and a range of related scientific activities that include systems engineering, operational research and analysis, synthesis, integration and validation of knowledge derived through the scientific method.

In NATO, S&T is addressed using different business models:

- The Collaborative business model where NATO provides a forum where NATO Nations and partner Nations elect to use their national resources to define, conduct and promote cooperative research and information exchange.
- The In-House delivery business model where S&T activities are conducted in a NATO dedicated executive body, having its own personnel, capabilities and infrastructure.

The Science and Technology Organization - STO

The mission of the NATO STO is to help position the Nations' and NATO's S&T investments as a strategic enabler of the knowledge and technology advantage for the defence and security posture of NATO Nations and partner Nations, by:

- Conducting and promoting S&T activities that augment and leverage the capabilities and programmes of the Alliance, of the NATO Nations and the partner Nations, in support of NATO's objectives;
- Contributing to NATO's ability to enable and influence security- and defence-related capability development and threat mitigation in NATO Nations and partner Nations, in accordance with NATO policies;
- Supporting decision-making in the NATO Nations and NATO.



AVT-303 Research Workshop

Acknowledgement

The Applied Vehicle Technology Panel expresses its thanks to Greece for the invitation to hold this meeting in Athens and for the facilities and personnel, which make this meeting possible.