

NORTH ATLANTIC TREATY ORGANIZATION	
	SCIENCE AND TECHNOLOGY ORGANIZATION
	
LECTURE SERIES AVT-220	
on “Structural Health Monitoring of Military Vehicles”	
sur “Suivi de l'état des structures des véhicules militaires”	
organized by the	
Applied Vehicle Technology Panel	
to be held in	
Berlin (DEU) on 11-12 February 2014	
This Lecture Series is open to citizens from NATO, Partnership-for-Peace (PfP) and Mediterranean Dialogue (MD) Nations	
Latest Enrolment Date	
NATO Nations	07 February 2014
PfP & MD Nations	21 January 2014
Enrol on-line at http://www.cso.nato.int/Meetings.aspx	
All presentations and discussions will be held in English.	
	GERMAN SOCIETY FOR NON DESTRUCTING TESTING

Background

The mission of STO is to conduct and promote co-operative research and information exchange. STO consists of a three level organization: the Science and Technology Board (STB), the Panels and the Technical Teams. The Applied Vehicle Technology (AVT) Panel is one of the seven Panels under the STB.

The Applied Vehicle Technology Panel strives to improve the performance, affordability, and safety of vehicles through advancement of appropriate technologies. The Panel addresses vehicle platforms, propulsion and power systems operating in all environments (land, sea, air, and space), for both new and ageing systems.

To accomplish this mission, the members of the AVT community exploit their joint expertise in the fields of:

- Mechanical systems, structures and materials ;
- Propulsion and power systems ;
- Performance, stability and control, fluid physics

Theme

Structural Health Monitoring (SHM) is an emerging technology, dealing with the development and implementation of techniques and systems where monitoring, inspection and damage detection become an integral part of structures and thus a matter of automation. It does further even merge with a variety of techniques being related to diagnostics and prognostics as such.

SHM emerged from the field of smart structures and laterally encompasses disciplines such as structural dynamics, materials and structures, fatigue and fracture, non-destructive testing and evaluation, sensors and actuators, microelectronics, signal processing and possibly much more. A multidisciplinary approach among these disciplines is therefore required to holistically manage the operation of an engineering structure through its life cycle in the future and to generate breakthroughs in structural engineering.

The objective of this lecture series is to get the experts prepared for the European and other industries to be able to design and manage structural health of engineering structures in the future. A matching network of experts from European universities and research institutions selected by their technical competence and teaching experience has prepared a lecture series, covering all theory and techniques relevant to the understanding and handling of SHM.

Topics to be covered:

Elastic waves application for SHM - Mathematical algorithms and data processing - Fibre Bragg Gratings for Structural Health Monitoring - Methods for damage detection and localization in composite and metallic structures - Piezo networks, phased arrays and vibration based SHM - Composites NDE. Damage mechanics.

Thème

Le suivi de l'état des structures (SHM, *Structural Health Monitoring*) est une technologie émergente, qui s'attache au développement et à l'application de techniques et de systèmes dans lesquels le suivi, l'inspection et la détection des dommages font partie intégrante des structures et sont donc une question d'automatisation. Il fusionne même à ce titre avec toute une série de techniques relatives au diagnostic et au pronostic.

Le SHM est une émanation du domaine des structures intelligentes et englobe des disciplines telles que la dynamique des structures, les matériaux et structures, la fatigue et les fractures, les essais non destructifs et l'évaluation, les capteurs et actionneurs, la microélectronique, le traitement des signaux et potentiellement bien d'autres. Une approche pluridisciplinaire est par conséquent nécessaire pour gérer à l'avenir de manière holistique le fonctionnement d'un ouvrage d'art tout au long de son cycle de vie et permettre des percées dans les techniques de construction.

L'objectif de cette série de conférences est de préparer les experts pour que les industries européennes et autres puissent concevoir et gérer l'état structural des ouvrages d'art à l'avenir. Un réseau correspondant de spécialistes des universités et établissements de recherche européens, sélectionnés pour leur compétence technique et leur expérience de l'enseignement, a préparé une série de conférences couvrant toute la théorie et les techniques utiles à la compréhension et à la gestion du SHM.

Sujets traités :

Application des ondes élastiques au SHM - Algorithmes mathématiques et transformation des données - Réseaux de Bragg à fibres pour le suivi de l'état des structures - Méthodes de détection et localisation des dommages dans les structures composites et métalliques - Réseaux piézo, antennes réseau à commande de phase et SHM fondé sur les vibrations - Evaluation Non Destructive (END) des matériaux composites - Mécanique de l'endommagement.

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LECTURE SERIES PROGRAMME

DAY ONE

- 8:00 Registration
- 9:00 Opening Ceremony & STO Overview
National Authorities
- 9:15 Introduction & Overview (**C. Boller**)
- 9:30 Why SHM? A Motivation (**C. Boller**)
- 10:30 Implementation Strategies for SHM in Civil and Military Applications (**C. Boller**)
- 11:20 Morning Break
- 11:40 Fibre Optic Strain Sensors FBG (**A. Güemes**)
- 12:30 Lunch Break
- 13:30 Fibre Optic Distributed Sensing (**A. Güemes**)
- 14:30 Vibration-based Methods for SHM (**C.-P. Fritzen**)
- 15:20 Afternoon Break
- 15:40 Load Identification for Structural Health Prognosis (**C.-P. Fritzen**)
- 16:40 Methods based on the phenomenon of elastic wave propagation (guided waves).
Interaction with damage (**W. Ostachowicz**)
- 17:30 End of Day 1

DAY TWO:

- 8:30 Algorithms for damage localization and characterization – estimation of optimal sensors placement. Novel signal processing methods (**W. Ostachowicz**)
- 9:30 Lamb Wave Based Piezoelectric Networks and Phased Array Solutions (**A. Suleman**)
- 10:20 Morning Break
- 10:40 Management of Manufacturing Quality, Curing and Life Prognosis of Composite Aircraft Structures (**A. Suleman**)
- 11:40 Principles of Time Series Methods for SHM (**S. Fassois**)
- 12:30 Lunch Break
- 13:30 Demonstration Examples with Time Series Methods (**S. Fassois**)
- 14:30 Some examples of military SHM projects, and reconsidering the Hunt Class MCMV mid-life update (**M. McGugan**)
- 15:20 Afternoon Break
- 15:40 Offshore Wind – an enabling application for SHM? (**M. McGugan**)
- 17:30 End of Day 2

APPLICATION TO ENROL LECTURE SERIES AVT-220

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Enrolment must be made via internet only at
<http://www.cso.nato.int/Meetings.aspx>

Note: if you enrolled for other RTO-STO activities in the past, please use the same e-mail address as previously. If your e-mail address has changed, please inform the STO-CSO contact before enrolling.

Once your enrolment has been validated, you will receive a General Information Package with the latest information on travel, accommodation and local arrangements. Please note that participants are to make their own travel arrangements and hotel bookings.

If you are unable to enrol via the internet, please contact the CSO enrolment coordinator:

Anne Reboul - anne.reboul@cso.nato.int

Please respect the following dates for enrolment:

Latest Enrolment Dates

NATO Nations **07 February 2014**

PfP & MD Nations **21 January 2014**

Contact/Enrolment Coordinator

NATO Collaboration Support Office (CSO)

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