



SCIENCE AND TECHNOLOGY ORGANIZATION
APPLIED VEHICLE TECHNOLOGY PANEL



NATO Science & Technology Organization (STO)
Collaboration Support Office (CSO)
Applied Vehicle Technology Panel (AVT)

Preliminary Meeting Announcement and

Call for Papers

AVT-384-RSM Specialists' Meeting

on

Novel Materials and Manufacturing in Military Vehicle Design

organized by the Members of the
Applied Vehicle Technology Panel
AVT-384 Programme Committee
to be held in Koblenz, Germany

16-18 October 2024

Contributions and participation are invited from NATO Nations
plus Enhanced Opportunity Partners (EOP) Australia, Japan, and Sweden

Note: Final date for submission of abstracts is 1st March 2024



AVT-384 RSM on Novel Materials and Manufacturing in Military Vehicle Design

Framework of the Meeting

The Applied Vehicle Technology Panel of the NATO Science and Technology Organization is organizing under its Mechanical Systems, Structures, and Materials Focus a Research Specialists' Meeting on the subject of "Novel Materials and Manufacturing in Military Vehicle Design."

The meeting is open to NATO Nations plus the Enhanced Opportunity Partner (EOP) nations Australia and Sweden and is classified as "NATO UNCLASSIFIED OPEN TO AUSTRALIA, JAPAN, and SWEDEN". The Meeting is to be held in Koblenz, Germany 16-18 October 2024 in parallel with the 54th AVT Panel Business Meeting.

A Research Specialists' Meeting is a medium-sized three-day event with up to 100 participants aiming to promote exchange of state-of-the-art knowledge among an audience of experts and specialists on an important scientific or applied topic. The meeting will focus on the intersection and integration of materials, manufacturing, and design; and include three keynote speakers and 15 technical presentations. Each day will end with a spirited focused discussion. The Programme Committee is responsible for selecting and inviting the speakers. Observers, who present no paper, are encouraged to participate. Research Specialists' Meetings result in a STO Report (Meeting Proceedings).

The Programme Committee will select a best paper based on technical content and impact to the field. A certificate detailing the award will be presented to the author on the last day of the meeting. High quality papers may be published in a NATO STO technical journal.

Presentations are 30 minutes. Please plan for 20 minutes of briefing followed by 10 minutes of questions and discussion.

Keynote presentations will be given by:

Mr Alexander L Carrere, Senior MDAO Engineer at Boeing Research & Technology, USA

Alexander Carrere is a Senior Multidisciplinary Design Analysis and Optimization (MDAO) engineer in Boeing Research and Technology (BR&T) focused on developing, tailoring,



and applying a wide variety of MDAO models to design advanced platforms across Boeing. He is a Boeing Designated Expert in MDAO and has worked as the MDAO study lead on a variety of derivative and clean sheet vehicle design projects that include F-18, T-7a, MQ-25a, X-65, Blended Wing Body, and small missiles. He is a member of the AIAA Multidisciplinary Design Optimization (MDO) Technical Committee.

Dr Richard M. Kearsey (Rick), Director R&D, Aerospace Research Centre, National Research Council of Canada (NRC)

Over the past 8 years, as Director R&D for both the Structures and Materials Performance Lab and the Aerospace Manufacturing Research Centre of NRC, Dr. Kearsey has been leading a team of more than 100 scientists and technicians in the design, development, and certification of materials and structures for aerospace applications. With over 30 years experience in the field, he has gained practical & professional experience by supporting research at the national & international levels, including cutting edge research with Defence partners, large OEM clients, numerous SME's and MRO's, and an extensive list of colleagues within academia and International Research Organization cadre. Fundamental research activities involve the design and fabrication of high temperature materials systems, risk assessment and residual life assessment of critical airframe and engine components, and the development of digital twin and physics-based deformation modelling methods.

Dr Jonathan D. Miller, Technical Director for Manufacturing and Industrial Technologies, Air Force Research Laboratory, USA

Dr. Jon Miller is the Technical Director for the Manufacturing & Industrial Technologies Division at AFRL's Materials & Manufacturing Directorate. He is responsible for the technical investment strategy and execution quality of the Division's program. Dr. Miller received a materials science and engineering doctorate from the University of Michigan in 2011 and bachelor's and master's degrees in chemical engineering from the University of Dayton. He has served 18 years as a civil servant. Other assignments include serving as the Technical Advisor for Manufacturing of Structural Systems and Manufacturing Enterprises, the AFRL/RX lead for Additive Manufacturing, the Metallic Materials and Processes Research Leader, a 2-yr overseas assignment with Defence Science & Technology of the Australian Government, and other roles within the High Temperature Metals Branch for AFRL/RX.

General Scope and Meeting Objectives

The AVT-384 Technical Team is investigating the current state-of-the-art of novel materials and manufacturing techniques in military vehicle design and its ability to greatly

reduce the time required to implement new materials and processes. By incorporating materials and manufacturing into modern design practices NATO's ability to maintain a technological advantage over adversaries during long conflicts will be preserved with the ability to complete swift design updates responding to changing battlespace needs or the introduction of new materials or processes. The AVT-384 Team seeks to engage in spirited discussion of current capabilities, identify technology gaps, and propose innovative solutions.

For example, contributions could discuss the physical, thermal, and mechanical characterization of high temperature materials, experimental techniques used to assess those materials in a representative environment, and the ensuing predictive multidisciplinary model suitable for inclusion in a MDAO framework. Contributions could include the development of a one-step design framework incorporating multimaterial hierarchical metamaterial design via surrogate modelling into a system level design process, a system level design sensitivity study, and multidisciplinary experimental validation.

The Technical Team will summarise the content and discussions from this RSM, together with external information and data to provide a final summary report detailing the current state-of-the-art. This will include recommendations for modifications to current procedures or new approaches discussed at the RSM.

Research Specialists' Meeting Topics

Papers are invited in the areas of:

- Integration of Novel Materials into design frameworks and agile manufacturing, including:
 - Characterization;
 - Experimental techniques;
 - High temperature materials;
 - Metamaterials;
 - Multiscale materials;
 - Smart materials;
 - Architected/hierarchical materials;
- Integration of Novel Manufacturing capabilities, including:
 - Agile manufacturing;
 - Reconfigurable processes;
 - Additive manufacturing;
 - Implications on initial operating capability timelines;
- Developments in Novel Design methods, including:
 - Multidisciplinary design and optimization (such as gradient-based techniques);



- Integration of material design and manufacturing constraints;
- AI/ML based generative design methods.

Motivating applications may span ground, sea, air, and space domains. The focus of discussions will be on the integration of novel materials and manufacturing modelling into design processes and the effect their interconnectedness has on initial operating capabilities, technology transition, and timelines.

Background and Justification - Relevance to NATO

In recent years the confluence of the advances in gradient-based optimization techniques (density-based methods, L-system techniques, level set approaches, and their derivatives), novel materials (to include multiscale materials, metamaterials, smart materials, architected materials, and hierarchical materials), and novel manufacturing methods (including agile and reconfigurable manufacturing processes, additive manufacturing, multimaterial printing, production rate flexibility, and non-polymer 3D printing) have provided designers with materials capable of both complex geometries and idyllic smooth gradations across a domain as well as the ability to fabricate them quickly.

The design community now finds itself in the unique position of being behind in the development of tools and models to take advantage of these opportunities. To that end, efforts across the community are underway to bridge this gap, enabling new opportunities to take advantage of the unique qualities of these new materials and manufacturing techniques.

The seamless integration of novel materials and manufacturing into design processes is expected to yield several benefits. Historically three key factors have decided near peer conflicts: technological advantages, logistics, and intelligence. At the onset of a conflict it is unlikely fielded systems will be perfectly optimized for the evolving battlespace. Implementation of just-in-time design practices necessitate the incorporation of novel material design and manufacturing strategies into the design process as early as possible. NATO will maintain a technological advantage throughout future conflicts with the ability to quickly include new materials and manufacturing requirements and timelines into designs.



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Deadlines and Preliminary Schedule

- Nov 2023** **Distribution of Call for Papers**
To solicit abstracts from NATO and EOP nations
After: authors to send their abstracts to the Programme Committee
- 1 March 2024** **Abstract Submission Deadline**
After: Programme Committee to select abstracts and to create the Meeting Programme from selected abstracts
- 1 April 2024** **Authors Informed of Selection Decision**
Programme Committee to inform selected as well as rejected authors
AVT to dispatch authors' information package to selected authors
After: selected authors to prepare their papers, presentation and clearances
- 8 April 2024** **Final Agenda Approved by the Programme Committee**
Programme Committee to finalize the Programme
After: AVT to prepare and publish the official Meeting Announcement
- 19 Aug 2024** **Submission of Advance Copy of US Papers to US National Coordinator**
Deadline for US authors to submit a copy of their advance paper to the US National Coordinator (special instructions to be issued with authors' information package)
- 2 Sept 2024** **Electronic Advance Copy of Paper due at AVT**
Deadline for all other authors to send an advance copy of their full scientific Paper to AVT
After: Technical Evaluator to review all submitted papers
- 9 Sept 2024** **Submission of Final Version of all Papers to AVT**
Deadline for all authors to send final cleared papers to AVT
After: AVT to pre-release all papers on the STO website making them accessible to all registered participants of the Research Specialists' Meeting
- 16-18 Oct 2024** **Specialists' Meeting to be held in Koblenz, Germany**
- 11 Nov 2024** **Submission of Corrected Manuscripts**
Deadline for all papers to be included in the Meeting Proceedings
After: AVT to edit, prepare, produce Meeting Proceedings, which will be made accessible through the STO website



Procedures

Invitation and Abstract Submission

The initial abstract should describe in 1000-1500 words the aim, results and conclusions of the work. Inclusion of 1 to 2 figures and/or photographs to support the abstract is recommended. Authors' names, complete email addresses and other pertinent information must be included with the abstracts. For this purpose, please use the Abstract

Submittal Form (Annex 1) and keep the size of files less than 2 MB.

The full scientific paper (recommended limit of 12 pages) will be requested once the Programme Committee has selected the authors and developed the final agenda for the Meeting.

Please submit your abstract along with the Abstract Submittal Form by no later than 1st March 2024 via email to the Programme Committee Co-Chairs:

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Security Level, Clearance and Paper Preparation

This Research Specialists' Meeting is classified as "NATO UNCLASSIFIED OPEN TO AUSTRALIA, JAPAN, and SWEDEN". For details please consult the attached section on NATO and Partner Nations Overview (Annex 2). It is the responsibility of each contributor to fulfil the publication release and clearance requirements of his/her organization/company/affiliation and country to obtain clearance of abstracts and papers as needed. **An official clearance is mandatory in the US (see Annex 3)** and there may also be a requirement in other countries. If in doubt, authors should contact a Programme Committee Member.

Authors of papers selected for presentation and publication will be notified by the Programme Committee by no later than 1 April 2024. The AVT Executive Office will then



send an Authors' Information Package containing templates, detailed instructions concerning the preparation of manuscripts, as well as information about the clearance process to each lead author.

Travel and Logistics

Authors of contributions selected for presentation will not be financially supported by NATO. Authors are responsible for their own hotel and travel reservations based on suggestions given in the General Information Package which will be provided typically 4 months ahead of time. Expenses for travel and per diem costs are the responsibility of each author's organisation and nation.

Contact Information

Any questions about the technical aspects of the scientific programme or the contents of papers should be addressed to the Programme Committee Co-Chairs listed above.

Questions on the administrative aspects of this Research Specialists' Meeting or requests for further information about STO activities should be addressed to:

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***Thank you for your contributions
which are very much appreciated by the NATO community.***



The NATO Science & Technology Organization

The NATO Science & Technology Organization promotes and conducts co-operative scientific research and exchange of technical information amongst NATO nations and NATO partners. Being the largest such collaborative body in the world, the STO encompasses over 5000 scientists and engineers addressing the complete scope of defence technologies and operational domains. This effort is supported by the Collaboration Support Office, which facilitates the collaboration by organising a wide range of studies, workshops, symposia, and other fora in which researchers can meet and exchange knowledge.

For further information, please consult the STO web site: www.sto.nato.int

The STO website provides a wide variety of information and on-line services ranging from overview information on the organization's mission to news regarding upcoming events. You will find on-line access to more than 1800 scientific publications, as well as, information about current activities.

Applied Vehicle Technology

The Applied Vehicle Technology 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.

The members of the AVT community exploit and focus their joint expertise in the following fields:

- Mechanical Systems, Structures, and Materials
- Performance, Stability and Control, Fluid Physics
- Propulsion and Power Systems

For further information please consult the [AVT web site](#).



3. Author Title

Name

Affiliation:

Full Mailing Address:

Telephone / Email address:

3. Author Title

Name

Nationality

Affiliation:

Full Mailing Address:

Telephone / Email address:

Please copy as required – recommended not more than 5 authors.

Note bene:

Authors should be listed in the order they will appear on the programme and in the final manuscript. Unless specified otherwise, the first listed author is presumed to be the lead author having the major responsibility regarding content of the paper.

Annex 2

**NATO and Partner Nations Overview
with Geographical Abbreviations**

NATO NATIONS			
ALBANIA	ALB	LITHUANIA	LTU
BELGIUM	BEL	LUXEMBOURG	LUX
BULGARIA	BGR	MONTENEGRO	MNE
CANADA	CAN	NORTH MACEDONIA	MKD
CROATIA	HRV	NORWAY	NOR
CZECH REPUBLIC	CZE	POLAND	POL
DENMARK	DNK	PORTUGAL	PRT
ESTONIA	EST	ROMANIA	ROU
FRANCE	FRA	SLOVAKIA	SVK
GERMANY	DEU	SLOVENIA	SVN
GREECE	GRC	SPAIN	ESP
HUNGARY	HUN	THE NETHERLANDS	NLD
ICELAND	ISL	TURKEY	TUR
ITALY	ITA	UNITED KINGDOM	GBR
LATVIA	LVA	UNITED STATES	USA

EAPC/PARTNERSHIP for PEACE NATION (PfP)			
ARMENIA	ARM	KYRGYZSTAN	KGZ
AUSTRIA	AUT	MALTA	MLT
AZERBAIJAN	AZE	MOLDOVA	MDA
BELARUS	BLR	SERBIA	SRB
BOSNIA & HERZEGOVINA	BIH	SWEDEN*	SWE
FINLAND*	FIN	SWITZERLAND	CHE
MACEDONIA	MKD	TAJIKISTAN	TJK
GEORGIA	GEO	TURKMENISTAN	TKM
IRELAND	IRL	UKRAINE	UKR
KAZAKHSTAN	KAZ	UZBEKISTAN	UZB

MEDITERRANEAN DIALOGUE NATION (MD)			
ALGERIA	DZA	MAURITANIA	MRT
EGYPT	EGY	MOROCCO	MAR
ISRAEL	ISR	TUNISIA	TUN
JORDAN	JOR		

ISTANBUL COOPERATION INITIATIVE (ICI) NATION LIST			
BAHRAIN	BHR	SAUDI ARABIA	SAU
KUWAIT	KWT	UNITED ARAB EMIRATES	ARE
QATAR	QAT		

GLOBAL PARTNERS (GP)			
AFGHANISTAN	AFG	KOREA (Republic Of)	KOR
AUSTRALIA*	AUS	NEW ZEALAND	NZL
IRAQ	IRQ	PAKISTAN	PAK
JAPAN	JPN		

OTHER NATIONS (including CONTACT COUNTRIES)			
ARGENTINA	ARG	CHINA	CHN
BRAZIL	BRA	INDIA	IND
CHILE	CHL	SINGAPORE	SGP

* Australia, Finland and Sweden are usually referred to as “Enhanced Opportunity Partner” (EOP).



Annex 3

**Special Notice for U.S. Authors
and non U.S. Authors Affiliated with U.S. Organizations**

**Abstracts of Papers from the U.S. must be sent to the following P.O.C.
4 weeks prior to the regular abstract submission deadline:**

NATO S&T Organization U.S. National Coordinator
OUSD(R&E)/IO&P,
3030 Defense Pentagon, Room 5A1082
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20301-3030
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Email: osd.pentagon.ousd-atl.mbx.usnatcor@mail.mil

In addition to their abstract, all U.S. Authors must provide:

1. Certification (can be signed by the author) that there are no proprietary or copyright limitations;
2. Internal documentation from their local public affairs or foreign disclosure office (or equivalent) that clearly shows:
 - Title of the paper or presentation
 - Level of clearance (i.e., Approved for Public Release)
 - Name, title, and organization of the approval authority
3. Full details of authors

Note that only complete packages (abstracts + items listed above) will be accepted by the U.S. PoC.

After review and approval, the U.S. PoC will forward all U.S. abstracts to the AVT Panel Office, who will send them to the Programme Committee.

U.S. authors are encouraged to address questions and concerns to the PoC as early as possible to the US Member of the Programme Committee. Delays in meeting deadlines will impact the timely submission of your abstract.