

Preparing advanced energetic materials & insensitive munitions for high intensity warfare

# EMTWG'24

Energetic Materials Technology  
Working Group

[Formerly IMEMTS]

13-16 May 2024 - Oslo, Norway

IMEMG



MSIAC

## TENTATIVE AGENDA

### MONDAY 13<sup>th</sup> May 2024

- 16h00 On-site Registration **Mingle area**
- 18h00 Welcome Reception **Roof Top Calmeyers Hage -13th floor (2h00)**

### TUESDAY 14<sup>th</sup> May 2024

- 07h00 Continental Breakfast **Restaurant**
- Late On-Site Registration **Mingle area**

#### PLENARY SESSION 1 - Hyde Park ABC

08h00 **Chair: Loïc Minguet, IMEMG President, France**

Welcome Address & Intro - **Mr Vegard Sande**, President of NAMMO Raufoss AS / EVP Large Caliber Systems

Keynote Address #1/ **Mr Anthony Di Stasio**, Director of the Manufacturing, Capability Expansion, and Investment Prioritization Directorate (McEip), OUSD A&S -  
*The New Industrial Base Policy Office and McEip Investment Strategy*

Keynote Address #2/ **ICA (Col.) Serge Bordachar**, Delegated Chief Inspector for Propellants and Explosives, DGA, FRA/ MoD -  
*What level of safety for our munitions in a wartime economy context ?*

MSIAC - **Ms Christelle Collet**, Technical Special Officer / Propulsion Technology -  
*MSIAC Highlights and Future Priorities*

- 10h00 *Networking Coffee Break Mingle area (0h30mn)*

#### Sessions A - Hyde Park AB

##### 10h30 **2A - IM Policy & Requirements**

**Jesus O. Mares Jr**, US AirForce, AFMC AFRL/RWTEC  
**Hervé Bénard**, DGA/IPE, France

24010- *Status on implementation of IM-policy in the Norwegian defence sector*  
Mr Hans Øiom, FMA, Norway

24069- *NATO IM Portfolio Update w/ Focus on IM-HC Harmonization*  
Mr Daniel J. Pudlak, U.S. ARMY, DEVCOM AC, Armaments Center, USA

24113- *IM Industry Contribution: How to benefit from IM munitions during manufacturing and storage phases.*  
Ms Carole Fournier, IMEMG

24035- *Cost and Benefit Analysis: a necessary approach to support massive ammunition resupply in current geopolitical context*  
Mr Rémi Boulanger, IMEMG

#### Sessions B - Central Park AB

##### 10h30 **2B - Propellants: Formulations & Performance**

**Paul Braithwaite**, Northrop Grumman, USA  
**Eirik André Løkke**, Nammo Raufoss, Norway

24024- *Improved performance of LOVA-propellants with maintained production safety*  
Mr Erik Tunestål, Eurenco Bofors

24025- *Partial Burn Testing of New High Energy Extruded Double Base Rocket Propellants and Associated Self-Extinguishment Properties*  
Mr Joseph O. Bellotte, BAE Systems, Ordnance Systems Inc. USA

24031- *Ageing Characteristics of Solid Composite Propellants*  
Mr Eirik Østbye Pedersen, NAMMO Raufoss AS, Norway

24032- *Solid Fuel Ramjet Technology at Nammo Raufoss AS*  
Ms Camilla Alm, Nammo Raufoss AS, Norway

- 12h10 *Sit-down Lunch Restaurant (1h20mn)*

##### 13h30 **3A - IM Test Methodology I**

**Tom Swierk**, Hart Technologies, USA  
**Jon Toreheim**, Bofors Test Center, Sweden

24039- *AOP-4240 FCO test: Feedback from Euro industry*  
Mr Alessandro Liberatore, Gruppo Esea, Italy

24076- *Heat flux measurements with CALIFLUX in Fast Heating tests*  
Ms Marie De Bats, IMEMG

24079- *Guidance on Temperature and Heat Flux Measurement Techniques Used in IM and HC Testing*  
Ms Christelle Collet, MSIAC

24056- *Slow heating: First lessons learnt from heating rate standard test change on composite RM response.*  
Mr Laurent Bonhomme, ROXEL France

##### 13h30 **3B - EM Processing**

**Tomislav Kosta**, US Air Force, RWTEC, USA  
**Dr Almuth Kessler**, Rheinmetall WM GmbH, Germany

24064- *Qualification of Energetic Materials with Advanced Manufacturing Methods.*  
Mr Matt Paesch, Energetics Technology Center, Indian Head, USA

24003- *Advancements in ResonantAcoustic® Continuous Flow Technology for Surrogate Energetic Material Synthesis and Crystallization*  
Mr Joseph Mayne, Resodyn Corporation, USA

24118- *Assessment of RAM technology applied to TDW cast cured formulations*  
Mr Quirin Axthammer, TDW, Germany

24112- *CL-20 in the Beginning: Perspectives from Eyewitnesses to the Early Days*  
Mr Bob Wardle, ETC & Wardle Enterprises, Energetics, Services & Technology, USA

14h50 *Networking Coffee Break Mingle area (0h30mn)*

15h20 **4A - IM Test Methodology II**  
**Ken Graham**, Judson Consulting Service, USA  
**Gianluca Bersano**, Leonardo, Italy

24098- *Novel Rocket Motor Impact Threat Protection*  
Mr Dan Turner, Roxel UK Ltd, UK

24110- *IM Industry Contribution: Review of Recent Modifications and Type V Criterion required for both Slow Cook-Off and Fragment Impact Tests*  
Ms Carole Fournier, IMEMG

24068- *Successful Transition of Insensitive Munitions Technologies to LAW FFE*  
Mr Daniel J. Pudlak, US ARMY DEVCOM Armaments Center, USA

24062- *A Review of the Likelihood of Bullets Impacts on Munitions During Domestic Transport*  
Dr Brian E. Fuchs, US ARMY, DEVCOM Armaments Center, USA

**4B - EM Formulations & Synthesis I**  
**Phil Samuels**, US ARMY, DEVCOM AC, USA  
**Phil Gill**, ROXEL UK

24007- *Continuous crystallization of energetic materials using continuous oscillatory baffled crystalliser*  
Mr Ruairaidh Wells, NiTech Solutions Ltd, UK

24015- *Use of soluble desensitizer to pilot terminal performance and IM response for a TNT based melt-cast composition*  
Mr Teddy Gilloux, THALES LAS, France

24023- *A rocky road toward a suitable TNT replacement*  
Mr Arthur Delage, Eurenco, France

24049- *Optimized Lab and Pilot Scale Synthesis of 2,4-Dinitroanisole (DNAN) from Anisole*  
Mr Tomasz Modzelewski, BAE Systems, USA

16h40 *Sessions Adjourn*

19h00 *Event Reception dinner Jernbanetorget A (2h30)*

## WEDNESDAY 15<sup>th</sup> May 2024

### PLENARY SESSION 2 - Hyde Park ABC

08h00 **Chair: Christelle Collet, MSIAC**

Keynote Address #3/ **Ms Holly Pennington**, Weapons Technical Service Team Leader /DE&S, UK - *Preparing for High Intensity Warfare through Collaboration and Standardisation*

Keynote Address #4/ **Dr Chris Michienzi**, MMR Defense Solutions, LLC, USA - *EM in DOD Systems: Transition, Production & Availability*

Discussion point/ **Mr Christopher Zember**, Office of the Assistant Secretary of Defense for Industrial Base Policy, U.S. DOD *Expanding Industrial Base Capacity for Munitions Manufacturing -24104*

**MSIAC** – Munitions Safety Awards

10h00 *Networking Coffee Break Mingle area (0h30mn)*

### Sessions A - Hyde Park AB

10h30 **5A - IM Properties & Characteristics II**  
**Cynthia C. Manns**, US NAVY, IMAD - NOSSA, USA  
**Carole Fournier**, Eurenco, France

24041- *How to assess thermo-chemical aging of high explosives in adequate way. Peculiarities in application of test protocols*  
Dr Manfred A. Bohn, Fraunhofer Institute for Chemical Technology, ICT Germany

24084- *Terminal Effects of Blast Wave Propagation from Metal Enhanced Home-Made Explosive Composition*  
Ms Pholisa Ngcebesha, Council for Scientific and Industrial Research, South Africa

24028- *Enhanced Blast Explosives with Improved Survivability*  
Mr James White, NSWG - Indian Head, USA

### Sessions B - Central Park AB

**5B - IM Properties & Characteristics I**  
**Dr Jacob Morris**, Air Force Research Laboratory, USA  
**Andrew Carr**, BAE Systems, UK

24004- *Inherent Material Property Effects on Dimensional Stability of PBXN-9*  
Mr Francis J. Milbower III, L3Harris Fuzing and Ordnance Systems, USA

24013- *Self Heating of High Explosives in Safe Scale Up for Manufacturing*  
Mr Philip Samuels, US ARMY -DEVCOM Armaments Center, USA

24033- *Identification and assessment of potential thermostable and powerful explosives*  
Dr Eric Pasquinet, CEA/DAM/Le Ripault - France

24096- *Explosive acceleration of fluoropolymer-based reactive material fragments*  
Ms Hayleigh J Lloyd, TNO, The Netherlands

### POSTERS SESSION

#### Poster session A - Frognerparken room

12h15 **PA: Insensitive Munitions**  
**Jon Toreheim**, Bofors Test Center, Sweden  
**Christelle Collet**, TSO, NATO MSIAC

24055- *Mitigation system for dual pulse rocket motor to aim for a French MURAT\* label*  
Mr Laurent Bonhomme, ROXEL France

24097- *Drop test: Model of rocket Motor ignition probability*  
Mr Johan Herault, ROXEL France

24037- *Improved testing capabilities for characterization of carbon composite materials*  
Mr Vincent Vilamosa, NAMMO Raufoss AS, Norway

#### Poster session B - Ueno Area

**PB: Energetic Materials**  
**Wendy Hummers**, Hanwha Defense USA, Inc.  
**Kathleen Bubniak**, US ARMY, DEVCOM AC, USA

24022- *Best Practice for the Development and Manufacture of Energetic Materials*  
Mr Lawrence C Farrar, Resodyn Acoustic® Mixers, USA

24102- *Combustion and mechanical properties of co(glycidyl nitrate-glycidyl azide) polymer energetic binders*  
Mr Charles Dubois, Polytechnique Montréal, Canada

24054- *Energetic Materials for cutting-edge nanotechnology*  
Mr Yash, Beacon Industries Inc. USA

24047- *Representation of RDX Thermal Response for Use in Digital IM Engineering Tools*  
Mr Keith Clutter, Science & Risk (SciRisk).USA

24106- *Employing New Technologies & Methods for IM-Testing at the WTD 91*  
Mr Philipp Hamhuis, Technical Center WTD 91, Bundeswehr, Germany

24122- *A numerical and experimental study of output of M55 and M100 igniters*  
Mr John Moxnes, Norwegian Defence Research Establishment, Norway

24123- *Successful Insensitive Munitions Technology Development, Demonstration, Integration & Transition*  
Mr Daniel J. Pudlak, US ARMY DEVCOM Armaments Center, USA

24077- *Design of energetic molecular hybrids of 2-(dinitromethylene)-1,3-diazacyclopentane (DNDZ) and calculation of their detonation performance parameters*  
Mr Lamla Thungatha, Council for Scientific and Industrial Research, South Africa

24115- *Characterization of HVRB Model of ERA Explosive by Gap Tests and Correlation with 20mm FSP Tests*  
Mr Tuğçe Tekin Başer, Roketsan, Türkiye

24030- *Qualification of Australian Munitions Composition B*  
Mr Philip Samuels, US ARMY, DEVCOM Armaments Center, USA

24125- *Inherently Safer continuous Nitration's at large scale*  
Mr Marc Winter, CORNING Inc. France

13h30 *Sessions adjourn*

13h30 *Sit-down Lunch Restaurant (1h30)*

Free time  
**Visits**

## THURSDAY 16<sup>th</sup> May 2024

### Sessions A - Hyde Park AB

#### 08h00 **7A - IM Modelling**

**Nausheen Al-Shehab**, US ARMY, DEVCOM AC, USA  
**Yves Guengant**, ArianeGroup, IMEMG VP, France

24021- *Simulating the Nammo 155 mm Artillery Projectile Sympathetic Reaction with IMPETUS Solver*  
Mr Lars Olovsson, IMPETUS Afea, Norway

24027- *A model to determine the response of munitions for lower order reactions*  
Mr Gert Scholtes, TNO, The Netherlands

24059- *Modeling and simulation of Cook-Off scenarios of DEM-based three-dimensional propellant beds in cased munitions*  
Mr Daniel Tomaschewski, Fraunhofer Institute for Chemical Technology, ICT Germany

24074- *Demonstrating munitions insensitivity through simulation: the IMEMG compendium dedicated to cook-off scenarios*  
Mr Didier Picart, IMEMG

09h20 *Networking Coffee Break Mingle area (0h30mn)*

#### 09h50 **8A - IM Mitigation & Testing**

**Dr David Hubble**, NSWC Dahlgren Division, USA  
**Gareth Flegg**, AWE Plc, IMEMG VP, UK

24017- *Insensitive Munitions (IM) Response of Resonant Acoustic® Mixing (RAM)-Loaded Mix-in-Case (MIC) Munition Items*  
Mr Andrew Nelson, NAWC Weapons Division, USA

24026- *IM Tests on Vulcano Guided ammunitions*  
Mr. Gianluca Bersano, Leonardo, Italy

24082- *Mitigation of sympathetic detonation of navy munitions*  
Mr Stefan De Koster, TNO, The Netherlands

24101- *Higher Lethality Medium Caliber Munition Classification and Criticality*  
Ms Nausheen Al-Shehab, US ARMY, DEVCOM Armaments Center, USA

11h30 *Sit-down lunch Restaurant (1h30mn)*

### Sessions B - Central Park AB

#### 08h00 **7B - EM Qualification & Technology**

**Steven Struck**, US Air Force, AFMC AFRL, USA  
**Stefan de Koster**, TNO, Netherlands

24053- *Large Scale Production and Material Qualification of a Less Sensitive PBXN-9 Variant*  
Mr Virgil Fung, BAE Systems, USA

24006- *Status of NATO Energetic Material Qualification Requirements*  
Mr Philip Samuels, US Army, DEVCOM Armaments Center, USA

24094- *A Method to Extend the Qualification of a PBXN-109 loaded Aircraft Bomb using an Inert Surrogate Material*  
Ms Carole Fournier, Eurenco, France

24051- *Pilot Scale Evaluation of Modified 3,4-Dinitropyrazole (DNP) Synthesis Process*  
Mr Tomasz Modzelewski, BAE Systems, USA

#### 09h50 **8B - EM Formulations & Synthesis II**

**Dr Paritosh Dave**, Leidos, USA  
**Erik Tunestål**, Eurenco, Sweden

24016- *New low cost melt-cast composition for IM mortar ammunition - Theoretical approach to experimental aspect*  
Mr Teddy Gilloux, THALES LAS, France

24117- *Characterization and evaluation of alternative plasticizers to mitigate exudation from pressed PBX*  
Mr Quirin Axthammer, TDW, Germany & MSIAC

24072- *SHS Synthesis of Micrometer-sized boron particles with increased surface area and higher reactivity for energetic applications*  
Dr.-Ing. Sebastian Wurster, Fraunhofer Institute for Chemical Technology, ICT Germany

13h00 **9A - IM System Technology**  
**Joe LiVolsi**, NOSSA, USA  
**Quirin Axthammer**, TDW, Germany

24040- *Advantages of Modular Development for Electronic Initiation Systems*  
 Mr Lars Christian Lund, NAMMO Raufoss AS, Norway

24060- *Shock initiation of explosives using a plane wave booster driven flyer plate*  
 Ms Anne Haslam, NSWC, Indian Head, USA

24065- *Slow Cook-Off Soak Temperature Effect on Munition Response*  
 Ms Nausheen Al-Shehab, US ARMY, DEVCOM Armaments Center, USA

24100- *AFRL Advanced Munitions Technology Complex*  
 Dr Jacob Morris, US Air Force Research Laboratory, USA

**9B - EM Lab-scale Testing**  
**Melissa Mileham**, Northrop Grumman, USA  
**Marie De Bats**, MBDA France, IMEMG Group Chair

24071- *Energetic Defect Characterization (EDC) - A Multi-Disciplined, Multi-Faceted, US Joint-Service Approach for Identifying & Determining Defect Criticality for specific Munitions and their Respective Energetics*  
 Mr Daniel J. Pudlak, US ARMY, DEVCOM Armaments Center, USA

24038- *Feature Extraction using Machine Learning for Defect Characterization*  
 Mr Benjamin L.Ung, US ARMY, DEVCOM Armaments Center, USA

24099- *Characterization of the Impact-Induced Reaction of Multiple Explosives Using the AFRL High Explosive Survivability Test (HEST)*  
 Dr Jesus Mares Jr., US Air Force Research Laboratory, USA

24066- *Utilization of the Focus Beam Reflectance Measurement (FBRM) Probe in Explosive Processing*  
 Mr Kyle J. Ramos, Los Alamos National Laboratory, USA

14h40 *Networking Coffee Break **Mingle area** (0h30mn)*

15h10 **10A - IM Modelling & Materials**  
**Mike Ervin**, BAE Systems Inc. USA  
**Didier Picart**, CEA France, IMEMG Group chair

24105- *An innovative methodology to predict reaction of complex warhead to fragment impacts*  
 Mr Karol Woirin, MBDA France

24114- *Void collapse-initiated deflagration: Progress towards predictive modeling for risk evaluation PT. 2*  
 Mr Brandon L. Johnson, Applied Research Associates, Inc., USA

24078- *Small Scale Impact Sensitivity Testing of Energetic Materials under Temperature and Relative Humidity*  
 Ms Christelle Collet, MSIAC

**10B - EM Subscale Testing**  
**Kathryn Brown**, NSWC, Indian Head, USA  
**Philipp Hamhuis**, WTD 91, Germany

24002- *Subscale testing of nanocomposite-modified solid fuels & propellants*  
 Mr Michael Fisher, Helicon Chemical Company, USA

24057- *Sensitivity Testing of Propellants in a Small-scale Experiment*  
 Mr Claudius Zimmermann, Fraunhofer Institute for Chemical Technology, ICT Germany

24080- *Thermal Radiation in Interior Ballistics and Closed Bomb Testing*  
 Dr Jon Yagla, Consultant

16h30 *Sessions adjourn*

16h40 *Best Poster Award and Farewell address by Charlie Zisette, NAC Executive Director*

18h30 **Conference adjourns**