



## 2010 Insensitive Munitions & Energetic Materials Technology Symposium



### *"International Progress in Insensitive Munitions and Energetic Materials"*

### Programme



11 – 14 October, 2010  
München Marriott Hotel  
Munich, Germany

# General Information

## REGISTRATION:

Payment should be made at time of application. All payments should be made in Euro (€) to ALL ABOUT LIVECOM (AALC) by order and on account of IMEMG.

For any questions, please contact the support agency AALC at [imemts2010@aalc.eu](mailto:imemts2010@aalc.eu)

For Conference Registration as well as for Hotel Registration please visit <http://www.imemts2010.eu>

## REGISTRATION FEES INCLUDE:

- Admission to all Symposium sessions and exhibits
- One set of Symposium Proceedings (CD ROM)
- Welcome Reception on Monday, 11 October
- Gala Dinner on Tuesday, 12 October
- Three sit down Lunches during the Symposium
- Coffee, tea and soft drink refreshments as well as pastries during the coffee breaks
- Name badges and participants list
- Participation in one of the Leisure Programme events on Wednesday, 13 October, afternoon

## ACCOMPANYING PERSON FEE INCLUDE:

- Welcome Reception on Monday 11 October
- Gala Dinner on Tuesday 12 October
- Participation in one of the Leisure Programme events on Wednesday, 13 October, afternoon
- Three sit down Lunches during the Symposium

## DRESS CODE:

Business casual except for the Gala Dinner, where lounge suits and cocktail dresses are appropriate.

## IDENTIFICATION BADGES:

At the time of registration check-in each participant will be issued an identification badge. Please be prepared to show a government issued photo I.D. Badges must be worn at all Symposium functions.

## PROCEEDINGS:

A CD-ROM of Symposium papers and presentations will be given to participants upon check-in at the Symposium Registration Desk.

## ENQUIRIES:

For further Symposium information please email: [imemg@imemg.org](mailto:imemg@imemg.org) or visit <http://www.imemts2010.eu>

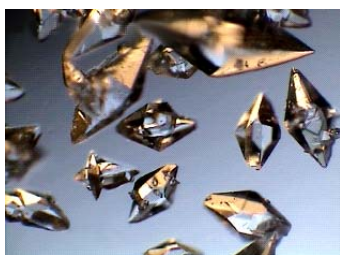
## SYMPOSIUM HOTLINE:

In case you have any questions or queries at the Symposium please call the HOTLINE: +49 (0) 160 745 200 3.

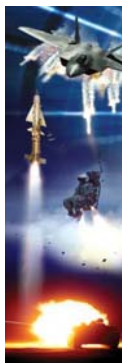
## PARTICIPANTS LIST:

A Participants List will be distributed at the Symposium. Your Conference Registration must be received by 09 October 2010 to be included in the list. An updated list will NOT be printed after the Symposium.

## THANK YOU TO OUR BREAK SPONSORS:



With over 40 years of experience, EURENCO designs, develops and manufactures a comprehensive range of explosive and propellant solutions for Insensitive Munitions: High explosive molecules, Cast PBX charges for warheads and ammunition, demolition explosives for special forces and military engineers, advanced combustible items, and LOVA propellants for all types of gun-launched munitions.



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MBDA Deutschland works mainly within the framework of international collaborative ventures to develop and manufacture guided missile systems for surface-to-air and air defense tasks, stand-off missiles for aircraft armament, missiles for battlefield engagement, and missile systems that can be deployed against sea targets. The guided missile systems consist of fire units/launchers, missiles and peripheral equipment for mission planning, maintenance, training and other tasks. In addition, MBDA Deutschland designs, develops and manufactures subsystems and key components for guided missile systems, in particular warheads and propulsion units. MBDA Deutschland also provides complete logistic support for the systems.



# 2010 Insensitive Munitions & Energetic Materials Technology Symposium

## *"International Progress in Insensitive Munitions and Energetic Materials"*

11 – 14 October, 2010  
München Marriott Hotel  
Munich, Germany

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Monday, October 11, 2010

16:00 **On-site Registration**

18:00 Welcome Reception sponsored by MBDA Group and TDW 

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Tuesday, October 12, 2010

07:00 **On-site Registration**

*Session 1: Plenary Session*

08:00 **Introduction/Administrative Remarks**

Dr. Helmut Muthig, IMEMG VP Germany, IMEMTS 2010 Organization Committee

08:10 **IMEMG Keynote Address**

Dr. Paul Wanninger, President IMEMG

08:25 **The IMEMG Journey and its Future**

Ian McIntosh, IMEMG VP United Kingdom

08:40 **MSIAC Recent Military Accident History Review and Energetic Material Trends**

Roger L. Swanson, MSIAC, NATO

09:00 **IM in the Field – Experience of Reduced Sensitivity Mortar Cartridges to Actual  
Combat Threat Stimuli**

Jeffrey Smith, US Army, ARDEC

09:20 **MSIAC Award**

Roger L. Swanson, MSIAC, NATO

09:35 *Break sponsored by Aerojet* 

10:15 *(Plenary room is split into two single meeting rooms,  
please take all your belongings with you. Thank you!)*

## Tuesday, October 12, 2010 (cont'd)

### Session 1A – Explosive Formulations #1

Chair: Bruno Noguez

- 10:15 **Development and Manufacture of an Insensitive Composition B Replacement Explosive IMX-104 for Mortar applications**  
Virgil Fung, BAE Systems, USA
- 10:35 **Additional Properties Studies of DNAN Based Melt-pour Explosive Formulations**  
Pierre Pelletier, GD-OTS, Canada
- 10:55 **GUNTONAL- an Insensitive Melt Cast for Underwater Warheads**  
Dr. Per Sjöberg, Eurenco, Sweden
- 11:15 **A Step further for the XF® Explosive Family dedicated to Insensitive Munitions (IM)**  
Régis Aumasson, NEXTER, France
- 11:35 **IM Melt cast Compositions based on NTO**  
Dr. Christian Spyckerelle, EURENCO, France

### Session 1B – Testing #1

Chair: Dr. Jamie Neidert

- RIGHTTRAC Technology Demonstration Program: Preliminary IM Tests**  
Patrick Brousseau, DRDC Valcartier, Canada
- Characterization of Aging, Screening Hazards and IM Testing of Solid Rocket Propellants and Warhead Explosives**  
Dr. Jamie Neidert, US Army, AMRDEC, USA
- Slow Cook-off Testing of a Thermally Activated Venting System**  
Michael Fisher, Cornerstone Research, USA
- Measuring the Blast Output of Aluminised Explosive Charges in a Semi-confined Environment**  
Dr. Frederik Mostert, CSIR, South Africa

*last minute withdrawal*

11:55  
-  
13:15

Sit down Lunch sponsored by Rheinmetall  
and Poster Session



### Session 2A – Processing

Chair: Steven Nicolich

- 13:15 **Development of a Production Scale Process for the Manufacture of New IM Pressable PAX-46 Explosive**  
Mike Ervin, BAE Systems, USA
- 13:35 **Processing of Energetic Composite Particles by Fluidized Bed Technology**  
Thomas Heintz, ICT, Germany
- 13:55 **Nondestructive Inspection of Energetic Materials during Manufacture**  
Dr. Wesley Cobb, Applied Sonics, USA
- 14:15 **Processing and Characteristics of Foamed Propellants**  
Dr. Jutta Böhnlein-Mauß, ICT, Germany

### Session 2B – Standardization

Chair: Patrick Lamy

- Changes to United Nations Test Series 7 for Hazard Division 1.6 Explosive Articles**  
Dr. Michael Sharp, MSIAC, NATO
- STANAG 4178 Ed. 2 – A New, Internationally Accepted Standard For Testing of Nitrocellulose**  
Dr. Beat Vogelsanger, Nitrochemie, Switzerland
- Are there Different Test Methods for IM based on STANAG 4439?**  
Dr. Gerhard Hubricht, IMEMG, Europe
- Rationalization of IM Test Requirements: The 6°F SCO Test**  
Dr. Kerry Clark, US Navy, NSWC, USA

14:35  
-  
14:55

Break

## Tuesday, October 12, 2010 (cont'd)

### Session 3A – IM Systems

Chair: Dr. Manfred Bohn

- 14:55 **IMX-104 Qualification**  
Wendy Balas Hummers, US Army, ARDEC, USA
- 15:15 **Achieving STANAG 4439 IM Shaped Charge Requirements on 155mm Shells: An Update**  
Bruno Nouguez, Eurenco, France
- 15:35 **New French Insensitive 500 lb Bombs**  
Laurent Delrieu, DGA, France
- 15:55 **Development of an IM Improved Performance Bangalore Torpedo**  
Colin Young, Chemring, UK

16:15  
-  
16:35

Break sponsored by EURENCO



### session 4A – IM Technol. & Issues #1

Chair: Patrick Brousseau

- 16:35 **IMX-104 HE Loading of 81MM & 120MM Projectiles**  
Charlie Patel, US Army, ARDEC, USA
- 16:55 **XP® : A Cost effective Approach for Medium Calibre Insensitive Munitions (IM)**  
Christophe Coulouarn, NEXTER, France
- 17:15 **How to get Insensitive Munitions Benefits according to Hazard Classification**  
Yves Guengant, IMEMG, Europe
- 17:35 **Quick Response Application of IM System Solutions: An Example of Applying Lessons Learned to a Successful Quick Low Cost IM Improvement**  
Manfred Becker, US Navy, NAVAIR, USA

17 :55

Sessions Adjourn

18 :55

Buses leave for Gala Dinner

19:30

Bavarian Dinner at the Löwenbräukeller

incl. Best Poster Award

-

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23:00



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# Wednesday, October 13, 2010

## Session 5A – Mitigation #1

Chair: Kenneth Graham

- 08:00 **Container Modifications for 120MM HE Mortar Ammunition to Improve Fast Cook Off Reactions**  
Luis Rodriguez, US Navy, NSWC, USA
- 08:20 **Development of a Venting Selection Methodology for Slow Cook-off Mitigation**  
Arthur Daniels, US Army, ARDEC, USA
- 08:40 **Mitigation Techniques for Reduced Rocket Motor Vulnerab. against Ext. Thermal Stimuli**  
Benjamin Smit, Rheinmetall-Denel, South Africa
- 09:00 **Venting Techniques for Penetrator Warheads**  
Stephen Kelley, USAF, Eglin, USA
- 09:20 **General Purpose Bomb Fast Cook-Off Mitigation Technique using Vented Base Plugs**  
Tony Walls, US Navy, NAWC, USA

09:40  
-  
10:00

Break sponsored by ROXEL



## Session 6A – Explosive Formulations #2

Chair: Stephen Struck

- 10:00 **Characterization and Comparison of a High Performance CL-20 Explosive**  
Dr. Robert Hatch, ATK, USA
- 10:20 **Transferable Explosive Formulations**  
Dr. Peter Bolton, AWE, UK
- 10:40 **IM Explosive Replacement for Cratering Charge**  
Anthony Di Stasio, US Army, ARDEC, USA
- 11:00 **IM Tests of a New IMI Less Sensitive Demolition Charge**  
Eli Shachar, IMI, Israel
- 11:20 **PAX-11, A High Performance Booster For IM Applications**  
Dr. Melissa Mileham, ATK, USA

11:40  
-  
13:00

Sit down Lunch sponsored by NTS  
and Poster Session



## Session 5B – IM Artillery Session

Chair: Andrew Wilson

- Common Low-cost Insensitive Munitions Explosive Program to Replace TNT and Comp B**  
Charlie Patel, US Army, ARDEC, USA
- 155mm HE Projectile Qualification Program**  
Charlie Patel, US Army, ARDEC, USA
- Initiation Trials of the IMX-101 Explosive in the M795 Projectile**  
Anthony Di Stasio, US Army, ARDEC, USA
- The Insensitive TNT Replacement Explosive IMX-101**  
Wendy Balas Hummers, US Army, ARDEC, USA
- IMX-101 HE Loading of 155MM Projectiles**  
Anthony Di Stasio, US Army, ARDEC, USA

## Session 6B – Testing #2

Chair: Arthur Daniels

- Shaped Charge Initiation Test Configuration for IM Threat Testing**  
Dr. Ernest Baker, US Army, ARDEC, USA
- Shaped Charge Jet Initiation of High Explosives Equipped with an Explosive Train**  
Dr. Werner Arnold, MBDA-TDW, Germany
- Update on the Sub-scale External Fire Test**  
Kevin Ford, US Navy, NAWC, USA
- Fast Cook-Off using Liquefied Propane Gas – The Development of an Alternative Test Method**  
Jon Toreheim, SAAB Bofors, Sweden
- The Army Burn-to-Violent Reaction (ABVR) Test: A Sub-Scale IM Screening Test**  
Jamie Neidert, US Army, ARMDEC, USA

Wednesday, October 13, 2010 (cont'd)

## Leisure Programme and Tours

13:00  
-  
17:00

- Nymphenburg Castle
- Deutsches Museum
- BMW Welt (Factory Tour or Special Tour)
- Munich City Tour
- Brewery Guided Tour

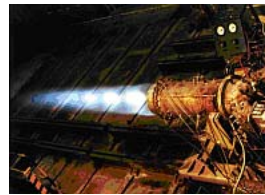
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# Thursday, October 14, 2010

## Session 7A – Synthesis

Chair: Dr. Andrew Sanderson

- 08:00 **Synthesis of DNMT: A New Energetic, Insensitive Melt-pour Ingredient**  
Dr. David Price, BAE Systems, USA
- 08:20 **ADNQ – A Low Sensitive Replacement for RDX**  
Prof. Thomas Klapötke, LMU Munich, Germany
- 08:40 **Synthesis, Scale-Up, and Recrystallization Studies of 2,6-Diamino-3,5-Dinitropyrazine-1-Oxide (LLM-105)**  
Andrew Pearsall, US Navy, NSWC, USA
- 09:00 **Synthesis, Characterization and Combustion of Triazolium Based Salts**  
Uwe Schaller, ICT, Germany
- 09:20 **1,2,6,8-Tetranitrocarbazole (TNC): Synthesis, Optimization and Manufacture**  
Dr. David Price, BAE Systems, USA

09:40  
-  
10:00

Break sponsored by SEI



## Session 8A – Ingredients #1

Chair: Matthew Beyard

- 10:00 **NC Quality Characterization Improvements and its Impact on Single Base Propellant Manufacturing and Performance**  
Zachary Higginbotham, ATK, USA
- 10:20 **3,3-Diaminoazoxyfurazan (DAAF) Survey of Performance Testing and Characterization**  
Elizabeth Francois, Los Alamos NL, USA
- 10:40 **Detonation Characteristics of Dichlorate(VII) m-tri(4-amino-1,2,4-triazole)Copper(II)**  
Dr. Stanislaw Cudzilo, MUT, Poland
- 11:00 **Measurement of CMC-PbN6 Micro-charge Detonation Growth**  
Ai-jun He, Beijing Institute of Technology, China
- 11:20 **FOX-12 (GuDN): An IM Ingredient Candidate – Where Are We Today?**  
Henric OEstmark, PhD, FOI, Sweden

11:40  
-  
13:00

Sit down Lunch sponsored by TDA  
and Poster Session



## Session 7B – Rocket Propellants

Chair: Didier Zanelli

- Evaluation of Less Shock Sensitive Minimum Smoke Propellants in High Performance Composite Cases**  
John Esslinger, US Army, AMRDEC, USA
- High Performance Aluminized GAP-Based Propellants – IM Results**  
Caroline Nguyen, SNPE, France
- Solid Propellant Rocket Motor Insensitive Munitions, Testing and Simulation**  
Dr. Alexander Weigand, MBDA-Bayern-Chemie, Germany
- The Research of Ballistic Properties of Ejection Seats Rocket Motors**  
Dr. Bogdan Zygmunt, MUT, Poland
- Replacement of a Doublebase Sustainer by a Smokeless IM Propellant for Shoulder launched Projectiles**  
Dr. Klaus Menke, ICT, Germany


## Session 8B – Testing #3

Chair: Dr. Werner Arnold

- Simple Measurements to support an early Assessment of the Performance and Shock Sensitivity of new IM Ingredients**  
Mike Willcox, AWE, UK
- Insensitive Enhanced Blast Formulations**  
Peter Gerber, ICT, Germany
- The Development of Tube Testing for IM Assessment of Booster Explosives**  
Helmut Zoellner, DynITec, Germany
- Initiation Trials of IMX-104 in 81mm Mortars**  
Anthony Di Stasio, US Army, ARDEC, USA
- MSIAC Audit Procedure of IM Testing Organizations' Capabilities**  
Pierre Archambault, MSIAC, NATO

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## Thursday, October 14, 2010 (cont'd)

### Session 9A – IM Technol. & Issues #2

Chair: Dr. Wim de Klerk

- 13:00 **Synchronization of IM and HC testing: The Navy Perspective**  
Dr. Kerry Clark, US Navy, NSWC, USA
- 13:20 **ASM – Insensitive Munition Program**  
  
Tal Eliash, Rafael, Israel
- 13:40 **Investigation of Aging Effects on Material Properties, Subscale Hazards and Impact Tests for PBXN-109 and PAX-3**  
Dr. Jamie Neidert, US Army, AMRDEC, USA
- 14:00 **Ageing Behaviour of Composite Rocket Propellant Formulations investigated by DMA, SGA and GPC**  
Dr. Manfred Bohn, ICT, Germany
- 14:20 **Mechanical Properties Characterization and Accelerated Aging of Comp C-4 Explosive**  
Dr. Ryan Olsen, US Navy, NSWC, USA

14:40  
-  
15:00

Break sponsored by Chemring



### Session 10A – Ingredients #2

Chair: Mike Ervin

- 15:00 **Development of a Single Pot DEMN Formulation**  
Dr. Sarah Headrick, ATK, USA
- 15:20 **Further Development and Optimization of IM Melt-Pour Ingredients at Holston Army Ammunition Plant**  
Virgil Fung, BAE Systems, USA
- 15:40 **RDX-based Nanocomposite Granules for Significantly Reduced Shock Sensitivity**  
  
Dr. Hongwei Qiu, Stevens Instit. of Tech., USA
- 16:00 **Exploring the Insensitive PBXs Allowing the Higher Performance of Inertial Confinement: EDA's R&T Project "RSEM-HPIC"**  
Igor Plaksin, University of Coimbra, Portugal
- 16:20 **AG:GTFA – A Promising Ionic Liquid-based Melt-Pour Explosive Binder**  
Michael Adams, ATK, USA

16:40

Sessions Adjourn  
Closing Address by IMEMG

### Session 9B – Gun Propellants

Chair: Dr. Paul Braithwaite

- Insensitive Propellant for 105mm Artillery for Improved IM**  
Dr. Christine Michienzi, US Navy, NSWC, USA
- Propellant Instability Leads International Industry Partners to Qualify New Propellant for the US Army**  
Kelly Moran, ATK, USA
- TEGDN, Sensitivity Reducing Ingredient for Nitrocellulose Based Propellants**  
  
Jaana Suuronen, Eurenco, Finland
- Less Sensitive and "Green" Propellant**  
Charles Wiehahn, Rheinmetall-Denel, South Africa

*last minute withdrawal*

### Session 10B – Mitigation #2

Chair: Dr. Michael Sharp

- Venting of Anti-Armor Warheads to Mitigate Cook-Off Threats**  
Dr. Ernest Baker, US Army, ARDEC, USA
- Fast Cook-off Mitigation in Large Rocket Motors**  
  
Kenneth Graham, Aerojet, USA
- The Demonstration of a Predictive Modelling Approach to the Design of Mass Efficient Fragment Mitigation Systems**  
William Huntington-Thresher, QinetiQ, UK
- Venting Technology for Large Caliber Gun Propulsion Systems – Metal Cartridge Case and Packaging Container Venting**  
Anthony Di Stasio, US Army, ARDEC, USA
- Evaluation of Thermal Protection Systems for Insensitive Munitions**  
Christopher Mealy, Hughes Assoc., Inc., USA

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NTS and NAMMO have teamed up to offer Mil-STD-2105 Insensitive Munitions (IM) Testing Fragment Impact as part of the complete series for IM qualification of systems/components in Europe.



#### Contacts:

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## Poster Session

<b>1</b>	<b>Combustion Instability of the Energetic Materials: From Microstructures of Physical Fields to Macroscale Properties</b> Dr. Alexander Lukin, Western Caucasus Research Center, Russia
<b>2</b>	<b>Origin of Test Requirements and Passing Criteria for the Qualification and Final (Type) Qualification of Explosives</b> Ken Tomasello, US Navy, NSWC, USA, presented by Dr. Michael Sharp, MSIAC, NATO
<b>3</b>	<b>MSIAC's Safety Assessment Software (SASO)</b> Dr. Michael Sharp, MSIAC, NATO
<b>4</b>	<b>Development of Waxes-based Fuel for Hybrid Rockets</b> Abraham Shalom & Hadassa Aped, IMI, Israel
<b>5</b>	<b>Mortars Insensitive Munitions Program</b> Jeffrey Smith, US Army, ARDEC, USA
<b>6</b>	<b>Study on Preparation of a Novel Fire Signal Composition Based on Obsolete HTPB Propellant</b> Dayong Jiang, XRI, China
<b>7</b>	<b>Kinetic Modelling for the Thermal Decomposition of Solid Propellant</b> Christophe Boulnois, Nexter, France
<b>8</b>	<b>Modelling of Intumescent Coatings Growth: Simulations from Lab-scale to the Large one</b> Dr. Fabian Chassagne, DGA, France
<b>9</b>	<b>The Nonlinear Viscoelastic Properties of PBXs</b> Jung-Seob Shim, ADD, South Korea
<b>10</b>	<b>Shock Sensitivity of Novel IHE Main Charge Formulations</b> Helen Flower, AWE, UK
<b>11</b>	<b>Insensitive Munitions Training in the South African Defence Force</b> Johan Niemand, Armscor, South Africa
<b>12</b>	<b>Twin Screw Extrusion Manufacturing Process for the Thermobaric Explosive PAX-3</b> Brian Alexander, BAE Systems, USA
<b>13</b>	<b>Explosives Coating via Advanced Cluster Energetics (ACE) Fluid Energy Mill (FEM) Technology</b> Brian Alexander, BAE Systems, USA
<b>14</b>	<b>Reduced Sensitivity RDX Evaluations and Comparisons for Less-sensitive Minimum Signature (MS) Propellants</b> Al DeFusco, US ARMY, AMRDEC, USA
<b>15</b>	<b>Slow Cook-Off Testing Methodologies and Explosive Response Characterization</b> Arthur Daniels, US Army, ARDEC, USA
<b>16</b>	<b>Development of a Scaling Hierarchy for Cook-off Hazards</b> Alice Atwood, US Navy, NAWC, USA
<b>17</b>	<b>1,2,4-Butanetriol (BT): Synthesis and Manufacture at Holston Army Ammunition Plant</b> Dr. William Tilford, BAE Systems, USA
<b>18</b>	<b>Verified Aluminum Reaction in Anaerobic Detonation of Combined Effects Explosives</b> Steven Nicolich, US Army, ARDEC, USA

### NOTE:

This list is naming the presenters mainly and not the authors.  
Authors of the Posters can be found in the Poster Headlines.

## Poster Session (cont'd)

<b>19</b>	<b>New Synthesis Routes for Preparation of 1-Methyl-2,4,5-Trinitroimidazole (MTNI)</b> Wendy Balas Hummers, US Army, ARDEC, USA
<b>20</b>	<b>Toxicological Testing of ADN, GUDN and FOX 7</b> Helen Stenmark, Eurenco, Sweden
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