

Supporting the Munitions Safety Community

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This presentation will provide an overview of:

- The MSIAC project
- Some recent advancements in Munition Safety (MS) and Insensitive Munitions (IM) efforts on behalf of its member nations
- Tools and services available to the community

- **Technical Information & Analysis Center Focusing on Munitions Safety**
 - NATO Project Office
 - Independently Funded by its Member Nations
- **MSIAC Strategies, Policies, & Work Efforts Defined by a Steering Committee (SC)**
 - 1 SC Representative per Member Nation, 1 Vote per Member Nation
 - 1 Elected Chairman (non-voting) from a Member Nation
- **MSIAC Strategic Goal:**

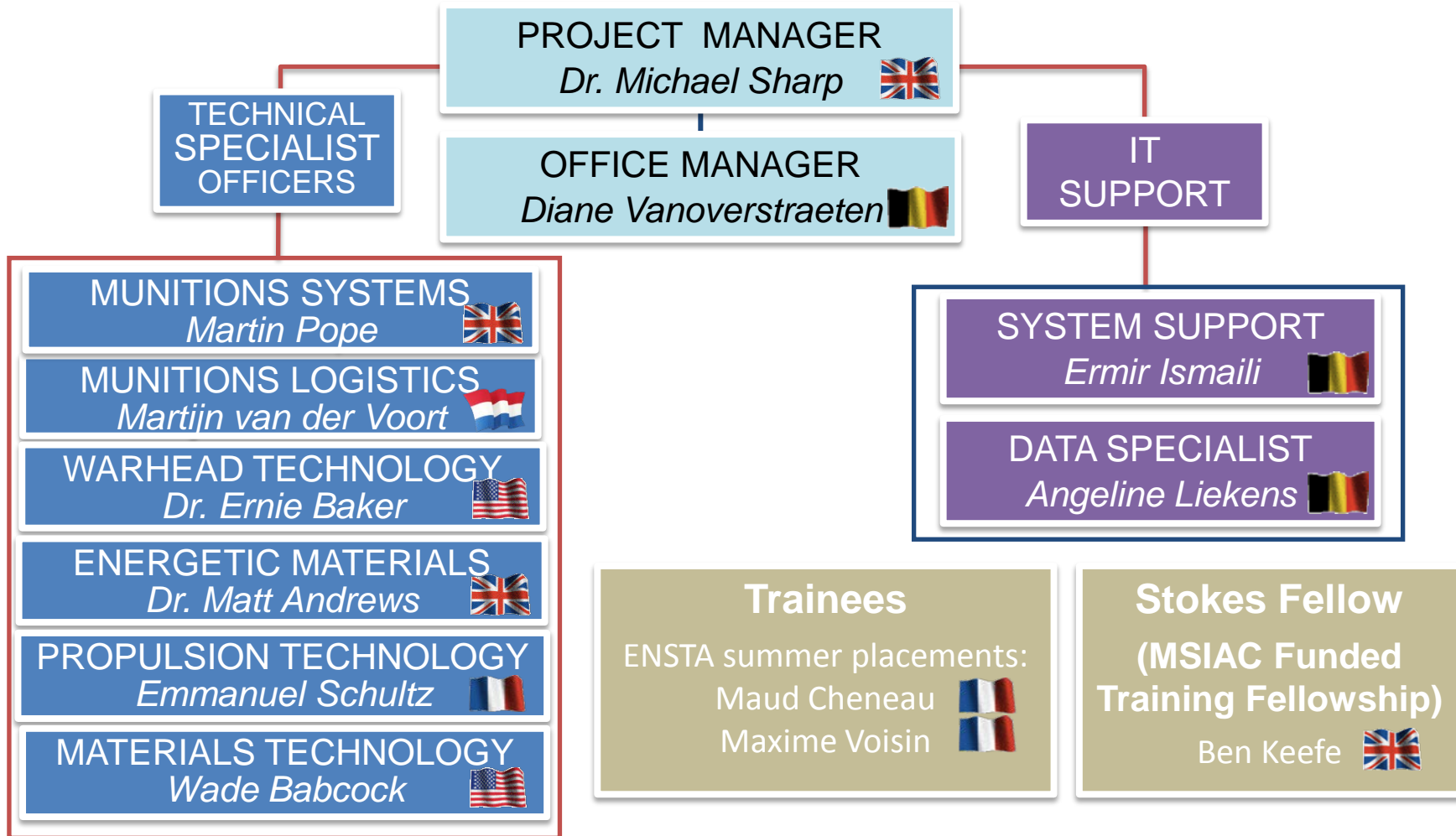
Eliminate Hazardous Consequences due to Unintended Reactions of Munitions and Energetic Materials Throughout their Lifecycle

- **13 Members**



- **Poland is anticipated to be a member near the end of 2017**
- **South Korea is anticipated to be a member in 2018**





Knowledge & Access to Community of Technical Experts Across our Member Nations



Short Courses, Country visits,
Fellows and Trainees...



Websites (Both Open & Secure)
with more than 600 users



15 Distributable
Software Tools
and Databases



Policy Advice and Review,
Support to NATO



More than 150 Open- and
180 Limited-Distribution
Reports



More than 2600
Technical Questions Answered



More than 20 Workshops



Develop, Synthesize, and Maintain **Knowledge** and understanding to enhance Munitions Safety

Define, harmonize, improve and promote **Policies** for Munitions Safety (support AC/326)

Capture and Analyse Munitions Safety **Requirements**

Maintain technical Expertise and Resources to **Deliver** Information and Promote Munitions Safety

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- Develop, Synthesize, and Maintain **Knowledge** and understanding to enhance Munitions Safety
 - Develop Understanding of Reaction and Response Mechanisms
 - Analysis of the ammunition accident in Cyprus 2011 (Parts 1 and 2)
 - Posters developed
 - Updated report published to cover preventative measures (O-151 Rev 2)



- Host & Facilitate Technical Workshops
 - Driven by Member Nations' Needs
 - Variety of Technical Topics; Potential Interactions with Policy and STANAG reviews
 - Classification & Security Needs



- **Develop Understanding of New Energetic Materials**
 - Energetic Ionic Liquids report is being finalised
 - Resonant Acoustic Mixing (RAM) - questionnaire developed.
 - Presentation on new energetic materials available
- **Environmental Impact Methodology**
 - Research the environmental tests taking place to evaluate the effect of munitions through manufacture, in-service and disposal.
 - Two case studies: PBXN-109 and Comp B
 - Deliverables: MSIAC limited report, paper and presentation at IMEMTS 2015



Manufacture



Test & Evaluation



In-service Use

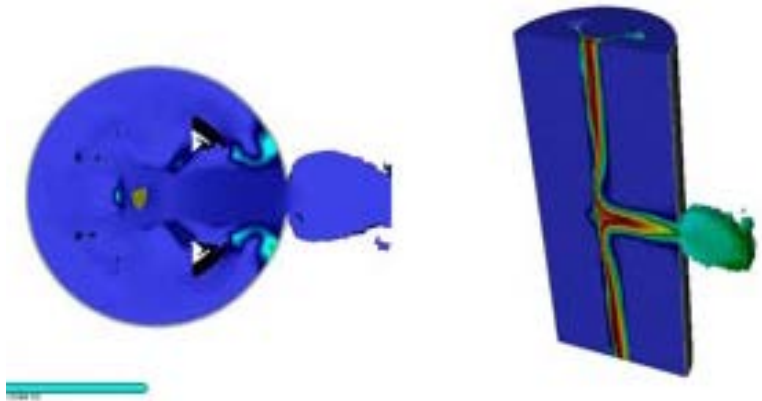


Storage



Disposal / Demil

- Effect of Ageing on Materials and Munitions Safety
 - Provide MSIAC nations the state of the art on the effect of ageing on munition response to IM threats.
- Projectile Launch Setback Ignition
 - Physics based review of laboratory and actual gun launch setback ignition and defect acceptance criteria
- Definition of Material Properties and Data for Modelling
 - Generation of report containing important material properties and the methods to determine them required to support modelling efforts



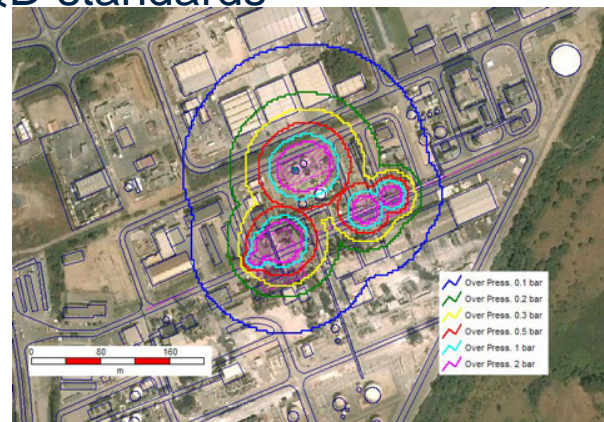
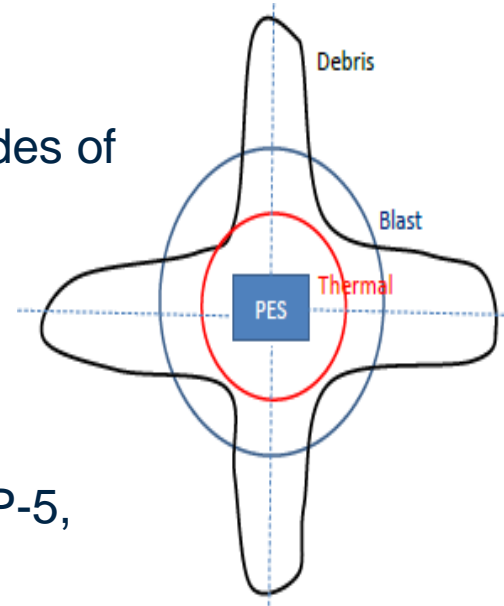
Experimental and Theoretical basis of current QD standards

- **Background**

- QD standards are based on many tests and decades of development
- Steep learning curve for new people in the field
- Transparency could be improved

- **Tasks:**

- Collect all references with experimental work and analysis that are relevant for AASTP-1 and AASTP-5, including the latest WPs
- Compile a comprehensive report that gives the experimental and theoretical basis of current QD standards
- Identify knowledge gaps and advice on areas for further development



Develop, Synthesize, and Maintain **Knowledge** and understanding to enhance Munitions Safety

- Answering Technical and non-Technical Questions
 - Its available free of charge to member nations
- Questions can easily be submitted using an online form

<https://www.msiac.nato.int/products-services/msiac-technical-question-form>



- Questions are now categorised by MSIAC under the following headings:

- Energetic Materials
- Modeling & Simulation (M&S)
- Tests & Test Standards
- Hazard Classification
- Ageing & Health
- Electromagnetic Interference
- Safety

Science

Test and Evaluation

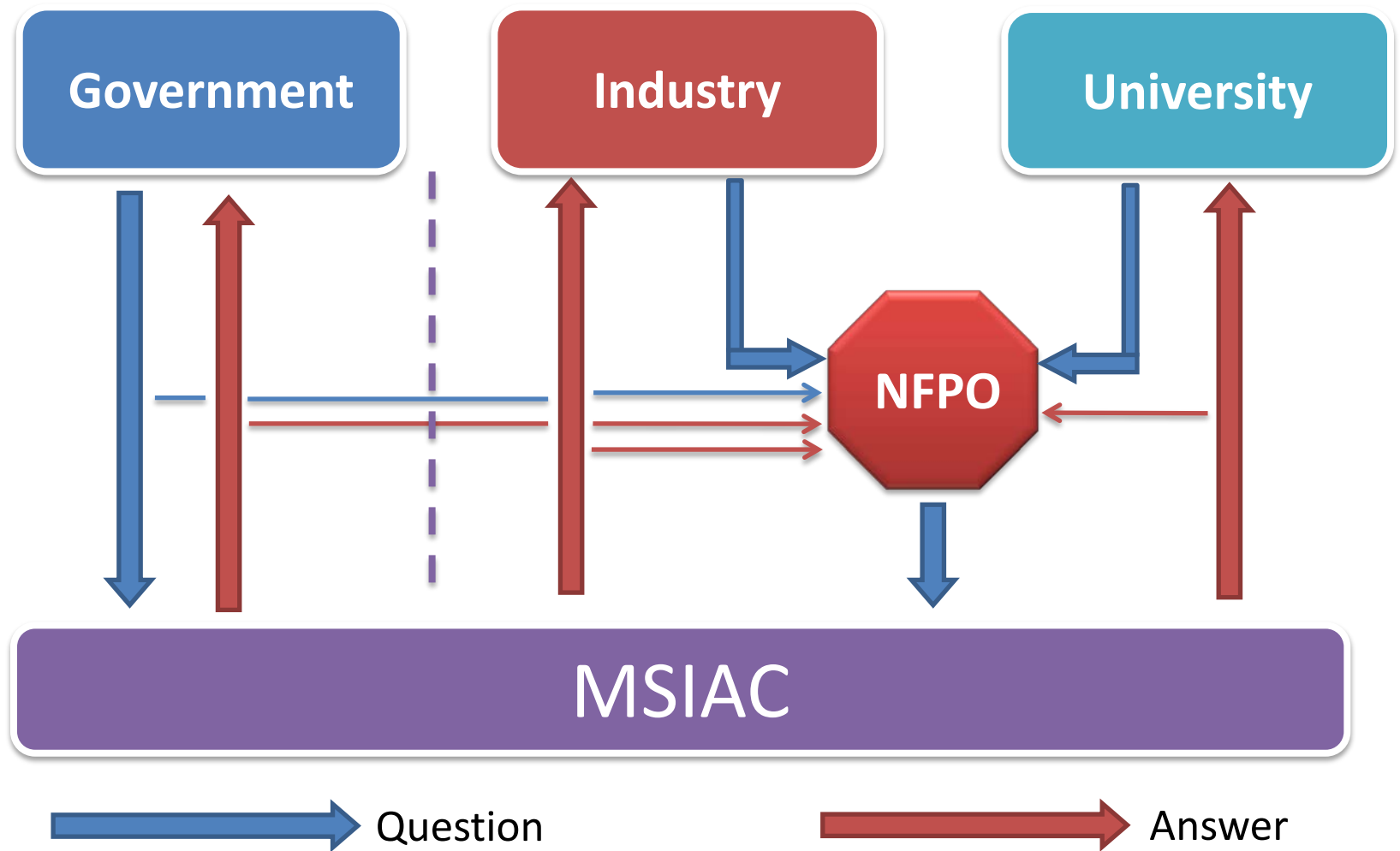
Policy

Lessons Learnt

Munition Specific Information

Question specifics (requestor and the topic) are not communicated to other member nations

- Operational & In-Service Support
- Munitions Characteristics
- Munitions IM Characteristics
- Market Survey



Enabling Activities

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IM Test Technical Procedures - Support to AC/326 SG-B

- Sympathetic Reaction In 2017
- Slow Cook-off In 2016
 - MSIAC finalised an international review of the test and a brief were provided to AC/326 SG/B
 - Following MSIAC recommendations, SG/B decided to create a Custodian Working Group (CWG) to update the SCO STANAG.
- Fragment Impact In 2015
 - MSIAC finalised an international review of the test (paper O-159) and a brief were provided to AC/326 SG/B
 - Following MSIAC recommendations, SG/B decided to create a Custodian Working Group (CWG) to update the FI STANAG.
- Shaped Charge Jet CWG: Draft documents have been reviewed by MSIAC MSIAC presented a joint paper with the US on progress at IMEMTS (O-160)
- Fuel Fire CWG: Draft documents have been reviewed by MSIAC

IM Test Technical Procedures - Support to AC/326 SG-B

- A second Response Descriptors working group meeting was hosted by MSIAC at NATO HQ in September 2015
 - A key issue being considered is the fragment criteria (79J vs. 20J) MSIAC support completed during 2016
- Structure of AOP-39 and the test STANAGs
 - CWGs were hosted by MSIAC at NATO HQ in April and September 2015
 - MSIAC has provided drafts to support the development of a Standards Related Document (SRD)

Recent Development: discussion at AC326 on further harmonising hazard classification (HC) and IM testing and assignment procedures

Mr. Brent Knoblett, US DDESB, is ‘socialising’ some ideas:

- Develop combined guidance on STANAG 4439 AOP39 and STANAG 4123 AASTP-3, as well as the associated test STANAGs
 - A single standard reference document is proposed
- Harmonise IM and HC testing beyond NATO
 - Use UN test series 7 for hazard division 1.6 (rarely used)
 - Could provide the means to hazard classify, mainly but not exclusively, military munitions to assign hazard divisions 1.1, 1.2, 1.3, 1.4, and 1.6
 - Benefits include:
 - Address some issues related to applying UN TS6 to large military munitions
 - Reduce differences between competent authorities in interpreting test results
 - Treats IM and HC testing as a single body of testing
 - Improves confidence; encourages a ‘whole body of evidence’ approach requiring EIS substance testing



- **MSIAC S3 Study**
 - Provide a comparison of national safety management systems (SMS) over the munitions lifecycle to demonstrate and assure safety and suitability for service
- **ISS Guidelines**
 - Developing examples of typical ISS for 3 generic munition types (mortar, small arms, and guided missile)
 - Agreed with custodian potential to add as annex to AOP-63
- **MSIAC National Exchange of Information Databases**
 - Both the Hazard Classification and Accident databases continue to be updated
 - **New** Develop a common accident database: MADx



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Helping to Enhance Technical Expertise in Member Nations

- MSIAC Tools on request
 - Particularly relevant for Temper and SASO
- Training on AASTP-1 & 5
 - Course continues to receive very good feedback from participants
 - Requested 5 times in 2015
- Trainees
 - Stokes Fellow
 - Students: 2 in 2014 & 2 in 2015 – and 2 for 2016.
 - Work covered: HD 1.3 materials, catalogue of environmental testing facilities, TEMPER, IM and ageing, and cook off



- A goal of MSIAC is to encourage and facilitate the sharing of MS and IM related information **We encourage you to contribute!**
 - Release of documents and information must comply with MSIAC Security Instructions

Responsibilities of the releasing authority:

- Must be marked appropriately (equivalent NATO classification and release restrictions)
- Up to Confidential

Responsibilities of MSIAC:

- Classified Documents stored on a stand alone system accessible by staff only from the MSIAC offices
- Unclassified documents
 - Some documents accessible to external authorised users (SC or NFPO approved)
- All documents are security tagged to ensure that access (internally and externally) complies with release restrictions

MSIAC DMS **Laserfiche**[®]

8,000 Docs (160k pages)

*Directly Accessible via Secure
Web Environment*

<https://www.msiac.nato.int/Weblink/>



*120,000 Docs (2.9M pages)
Accessible by MSIAC staff
on your behalf*

Limited

- L-186 Final Report on the 2014 SCJ Workshop
- L-188 Detonics and Response Mechanisms - SCJ Workshop Appendix
- L-189 Small Scale Testing - SCJ Workshop Appendix
- L-190 Modelling - SCJ Workshop Appendix
- L-191 Test set-up session - SCJ Workshop Appendix
- **L 193 IMHM**

Open

- O-159 An International Review of the Fragment Impact Test
- O-160 MSIAC Shaped Charge Jet Workshop: Report for IMEMTS, Rome 2015
- O-161 Case Study: Transport and Storage of Insensitive Munitions (IM)
- O-162 Integrated Munition Health Management - A cooperative demonstration of technology
- O-163 Environmental Impact of Munitions Life Cycle - A case study using Comp B
- O-164 MSIAC Supporting the Munitions Safety Community
- O-165 Mitigation Techniques for Munitions Technical Specifications
- 20 Joule report

Large number of products and tools available to MSIAC nations developed over 20 years

- Advanced IM Search (AIMS);
- Safety Assessment Software (SASO);
- Munition Safety and Standardisation Database (MSAS)
- Energetic Materials Compendium (EMC);
- NIMIC Excel Worksheet Gap tests (NEWGATES);
- Insensitive Munitions State-of-the-Art (IMSoA);
- Mitigation Technologies for Munitions (MTM);
- Cost Benefit Analysis Model (CBAM);
- Toolbox of Engineering Models for the Prediction of Explosive Reactions (TEMPER)
- Munitions Accident Database (MADx)

- MSIAC provides technical support on Insensitive Munitions and Munitions Safety
- Policy remains an active area for MSIAC with support to AC 326 facilitating review of standards
- Workshops continue to be an important means to help advance munitions safety efforts
- MSIAC expertise expanded in 2015 with the addition of a Munition Materials Technology Specialist
- Training courses and opportunities exist and can be exploited by members

