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

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Knowledge & Access to Community of Technical Experts Across our Member Nations
Steering Committee and NFPOs

Steering Committee Members

- Lt Col Arthur Tsamis
- Lt Col Piet Verlinden
- Maj Kim Brooks
- Mr Kari Makinen
- M. Patrick Lamy
- Mr Peter Ubbenjans
- TV Fabio Calamari
- Mr Erik van Arkel
- Mr Gunnar Ove Nevstad
- Lt Col Emilio Larriba de la Rubia
- Mr Svante Wahlin
- Mr Ian Carr
- Ms Mary Ellen Caro
- LCDR Grant Wing
- Maj Gunnar Povie
- Ms Mira Pellerin
- Ms Maija Hihkio
- TR Dir Dietmar Hey

National Focal Point Officers (NFPO)

- Dr. Brian Fuchs
- Ms Mira Pellerin
- Mr. Ephraim Washburn
- Mr. Christer Daun
- Mr Chris Wong
- Mr Stephen Struck
- Dr Brian Fuchs
- Dr Josephine Covino
- Mr. Chris Wong
- Mr. Ephraim Washburn
- Dr Ephraim Washburn

Service Representatives

Navy
- LCDR Grant Wing
- Ms Mira Pellerin
- Ms Maija Hihkio
- TR Dir Dietmar Hey

Air Force
- Dr Brian Fuchs

Army
- Dr Josephine Covino

DoD
- Dr Ephraim Washburn

MSSIC Unclassified
More than 2600 Technical Questions Answered

15 Distributable Software Tools and Databases

More than 150 Open- and 180 Limited-Distribution Reports

More than 20 Workshops

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

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

Policy Advice and Review, Support to NATO
Enabling Activities

- 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
Enabling Activities

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Knowledge Related Efforts

• 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)
Workshops

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

- 2005: Effect of Aging
- 2009: UN Test Series 7
- 2010: Sensitivity of Energetic Materials
- 2011: IM Technology Gaps (Classified)
- 2011: Qualification Testing of Energetic Ingredients
- 2012: Qualification Testing of Energetic Materials: Part II
- 2014: SCJ Assessment
- 2016: The Science of Cook-Off

MSIAC Unclassified
• 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
Knowledge Related Efforts

• **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
Supporting Munitions Safety

Knowledge Related Efforts

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

Typical Examples of Questions

- Questions are now categorised by MSIAC under the following headings:
  - Energetic Materials
  - Modeling & Simulation (M&S)
  - Tests & Test Standards
  - Hazard Classification
  - Ageing & Health Monitoring of Munitions
  - Electromagnetic Environmental Effects (E3)
  - Safety & Suitability for Service Use (S3)
  - Safety practices
  - Policies & STANAGs/APs
  - Interchangeability
  - Accidents & Causes
  - Production & In-Service Support
  - Munitions Specific Characteristics
  - Munitions IM Characteristics
  - Market Survey

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How Questions are Handled

Government

Industry

University

NFPO

MSIAC

Question

Answer
**Enabling Activities**

1. Develop, Synthesize, and Maintain Knowledge and understanding to enhance Munitions Safety
2. Define, harmonize, improve and promote **Policies** for Munitions Safety (support AC/326)
3. Capture and Analyse Munitions Safety Requirements
4. Maintain technical Expertise and Resources to Deliver Information and Promote Munitions Safety
Policy Activities

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 DDES, 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
Policy Activities

- 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
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
Training

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
    - 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

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-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
MSIAC Tools

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)
Summary

• 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