IMEMG MURAT
EUROPEAN MANUFACTURERS GROUP

The 3rd European IM Day
Amsterdam, 18-19th May 2017

Session chair
Serge Bordachar

SESSION 2

REGULATION & LEGAL FRAMEWORK

IM Policies & Implementations

Overarching Framework

Dr. Mike Sharp
Project Manager MSIAC

Martijn van der Voort
TSO MSIAC

MSIAC

Munitions Safety Information Analysis Center

Supporting Member Nations in the Enhancement of their Munitions Life Cycle Safety

Improved Explosives and Munitions Risk Management

IMEMG IM Day - 18-19 May 2017
Amsterdam

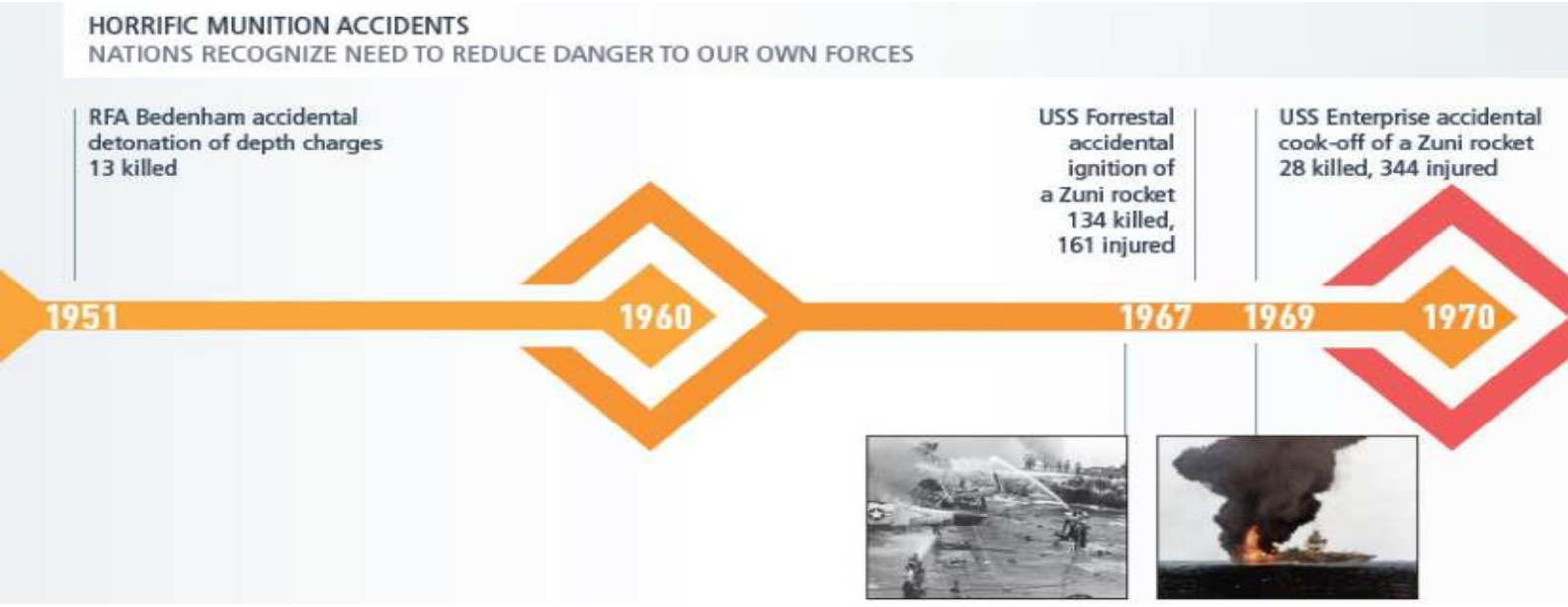
Martijn van der Voort
TSO - Munitions Transport and Storage Safety
+32 2 707 5426
m.vandervoort@msiac.nato.int

Dr Michael Sharp
MSIAC PM
+32 2 707 54 95
m.sharp@msiac.nato.int

History of NIMIC/MSIAC is linked to history of IM

- Need arose from horrific accidents of 1960s and 1970s

Time Line


HORRIFIC MUNITION ACCIDENTS
NATIONS RECOGNIZE NEED TO REDUCE DANGER TO OUR OWN FORCES
RFA Bedenham accidental detonation of depth charges 13 killed
USS Forrestal accidental ignition of a Zuni rocket 134 killed, 161 injured
USS Enterprise accidental cook-off of a Zuni rocket 28 killed, 344 injured
1951
1960
1967
1969
1970

MSIAC

Technical Information & Analysis Center Focusing on Munitions Safety

- NATO Project Office
- Independently Funded by its Member Nations

MSIAC Strategic Goal:

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

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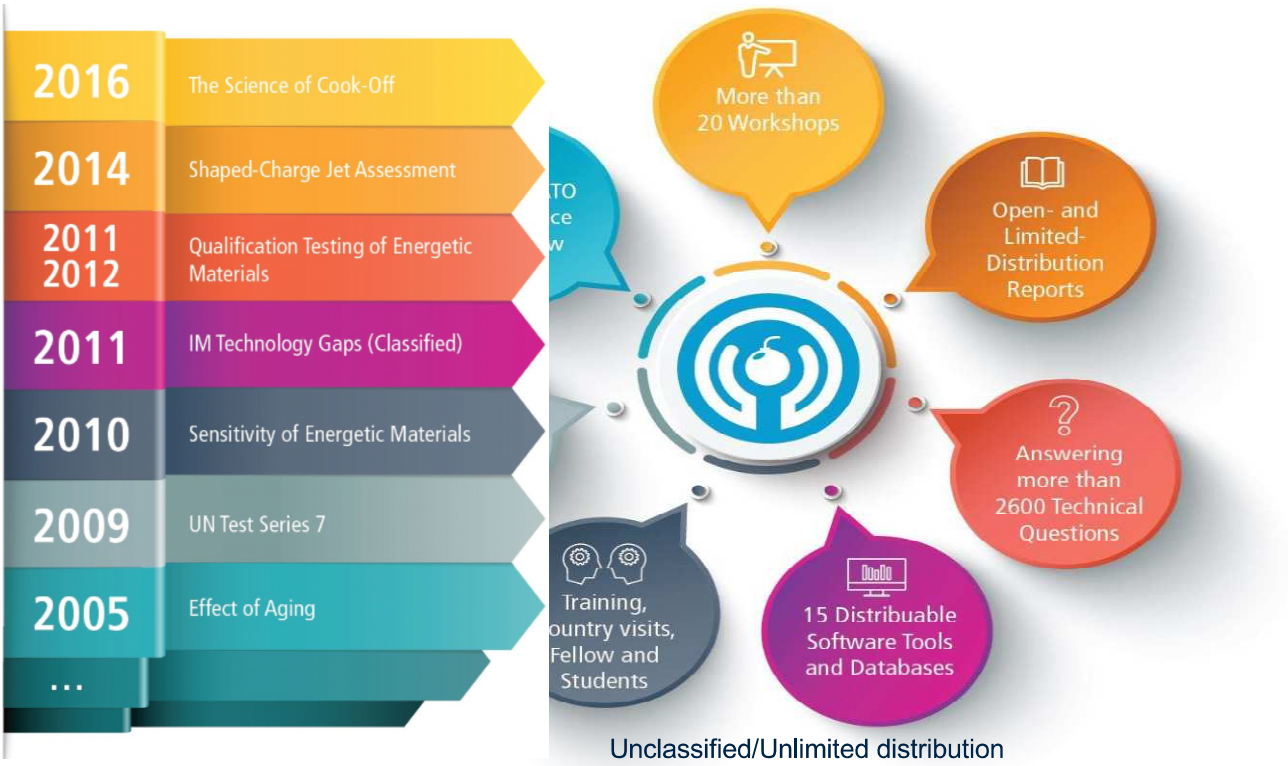


Proposed Workshops

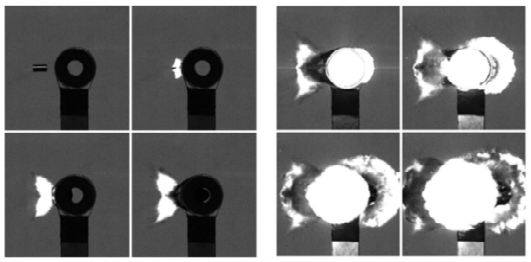
- **<u>Improved Explosives and Munitions Risk Management (2018)</u>**
  More information in this presentation

Proposals for years 2019-2023 (in no particular order):

- Methodologies to Determine Acceptability of Defects and Design Tolerance on Safety

- Introduction of New Processing Technology and its Impact on Safety

- IM – Understanding Mechanical Damage and Violence of Response



IMEMTS 2016 *DE&S, UK Ministry of Defence* THALES
Small Scale Fragment Attack Testing on the LMM Missile Boost Motor and the Influence of the Conduit Form on XDT Threshold
Authors: Stephen Holden, *et al.*

Planned Proposed Technical Meetings

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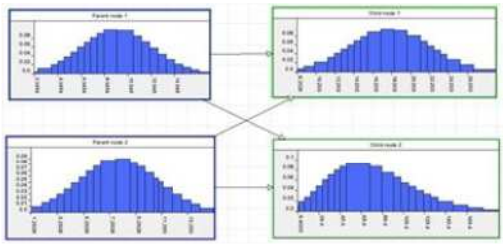
- IMHM Support of Smart Defence Initiative (**2017-2019**)
- IM/HC Harmonisation (**2017-2018**)

- Continuation of Science of Cook-off work: hierarchy exercise (**2017-2019**)

- Probabilistic Aspects of Accidental Initiation and Ignition of Energetic Materials (EM) and Munitions (**2018-2019**)



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Proposed Technical Meetings

Proposals for year 2019-2023 (in no particular order):

- Impact of Reactive Materials (RM) on Performance/Safety Trade Space
- Autonomous Systems (Legislation, Safety, Testing)
- Optimising the introduction of new EM into service
- Energetic Material Binders (polymer developments, new technology)
- Compatibility Testing (review current methods, new technology, life prediction)
- AC/326 Stocktake (priorities, challenges, direction, process & responsibilities, SG coherency and structure, gaps, overlaps, realignment)

Workshop and Technical Meeting Planning

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In moving forwards, MSIAC requires feedback from the community on:

- Relevance of the topics for the community
- Priorities and timescales
- Other needs – are there other MS and IM topics that we should be addressing
- Specific feedback on the proposed 2018 workshop - “Improved Explosives and Munitions Risk Management”

A questionnaire will be made available through the MSIAC website, see newsletter for more details

www.msiac.nato.int

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Proposed Workshop for 2018

Improved Explosives and Munitions Risk Management

This workshop seeks to exploit our improved understanding of munition vulnerability and consequences to deliver improvements in munitions risk management

Date and **Venue** to be determined (Offers to host welcome)

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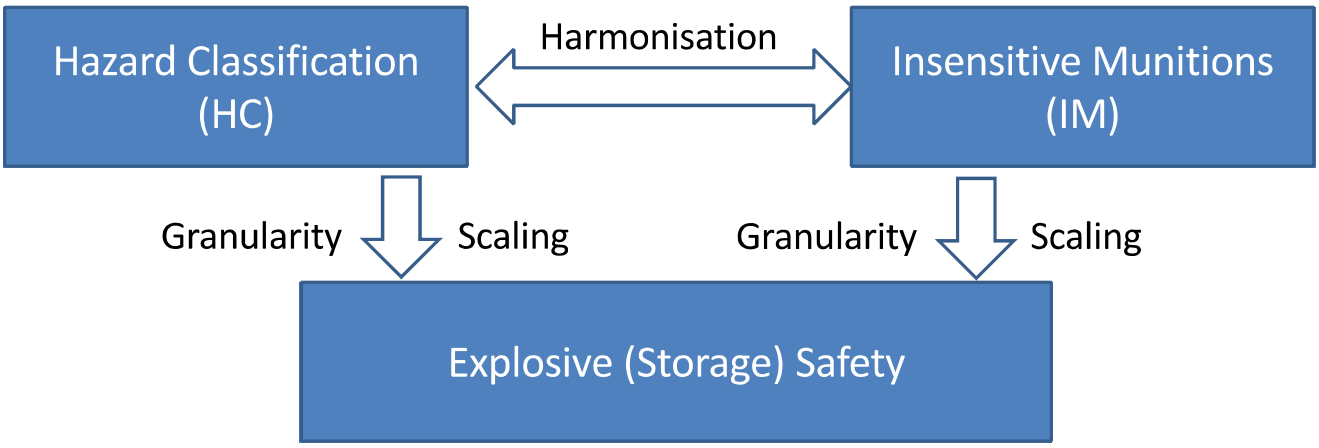
Proposed Workshop for 2018

Brings together stakeholders from three communities to develop a coordinated and optimised approach to managing explosives and munitions risk



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Goals

- Support the IM and HC harmonization initiative
- Exploit scaled testing and modelling to facilitate quantitative assessment methodologies
- Develop improved methodologies to allow risk to be managed with sufficient granularity
  - Benefits from IM can be realised whilst munitions presenting greatest hazard can be more efficiently managed
- Review and make recommendations with respect to updating standards used to manage explosive and munitions risk
  - Ensuring they reflect the changing nature of the munitions stockpile
  - Balancing ease of user application vs. complexity of the problem

Improved HC and IM assessment: Exploitation of all available evidence

- Scaling and confinement issues
- Use of wider body of evidence to assign HC

IM / HC

Scaling
Confinement

Storage

Improved HC and IM assessment: Revised Criteria for HD assignment

- Current system to assign HD for explosives and munitions loosely defines explosive effects
- Differences in assignment of HD between nations possible
- Will be addressed as part of the effort to harmonize HC and IM
- Revised protocols using response descriptors (AOP-39 & UN TS7) to assign HD to military explosive articles

Improved HC and IM assessment: Revised Hazard (sub) divisions

- The current HC system with its Hazard (sub) Divisions may not be ideally representing the risk posed by the changing nature of the munitions stockpile

- Possible revision of Hazard (sub) Divisions, compatibility groups and aggregation rules

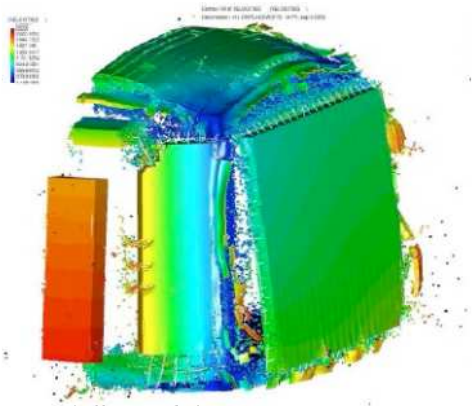
Improved Quantification of Consequences and Risk

- Standards for QD and risk analysis (AASTP-1, 4, 5)
- Limitation to (mass) detonations and thermal effects
- Mismatch with the finer granularity offered by response descriptors
- Problems with the recognition of the benefits of IM

	Munitions Response	Models available
I	Detonation	**Yes**
II	Partial Detonation	**Yes/No**
III	Explosion	**No**
IV	Deflagration	**No**
V	Burn	**Yes**
VI	No Reaction	NA

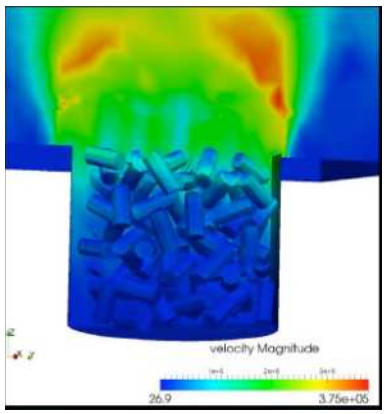
Improved Quantification of Consequences and Risk

- What experimental data and models are necessary to quantify the consequences and risks based on the response descriptors?
- Discuss effects of scaling, confinement and venting



Modelling of detonation in ammunition magazine

US research effort 2017:
Applied Simulations, Inc (ASI).
Presented by R. Conway and Dr. J. Covino
AASTP-4 Working Group meeting,
Kolsas, Norway, 25-27 April 2017



Modelling of propellant combustion

Improved Explosives and Munitions Risk Management

Appraisal on how we should be managing the risk during storage, transport and operations

- Introduction of computer-based tools to enable more detailed risk management
- Change guidance and assumptions that prohibit progress (e.g. aggregation rules in AASTP-5)
- Possibility to address risk at the munitions level
- Holistic approach: cost and benefits of using more quantitative assessment methods vs. simplistic conservative assessment methods

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Summary

The envisaged results of the workshop are:

- Revised approach to munitions hazards and risks in light of development and introduction of IM
- Improved Quantitative Risk Assessment
- Improved understanding of the true nature of hazards and risks and how this can improve ownership and associated costs

Finally, please provide your input by sending us your feedback on proposed the workshops and technical meetings.

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