MSIAC Munitions Safety Information Analysis Center
Supporting Member Nations in the Enhancement of their Munitions Life Cycle Safety

Bulletin

In this issue

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PM's Perspective

Progress in 2016

Looking back at 2016 it struck me just how busy a year it was. For much of the first half of 2016 MSIAC staff were involved in the preparation and then the holding of the science of cook-off workshop. The workshop successfully achieved its objectives and was a major deliverable for the year. Work still continues and by the end of February 2017 we expect to have completed a number of documents which will be published as limited reports in due course. Follow on activities looking at slow cook-off testing and application of scaled testing and modelling through a hierarchal approach are planned in 2017.

MSIAC staff worked on a range of other work elements in 2016 and much of the output is now accessible as Limited and Open reports on the secure web environment. Highlights of the work were presented at meetings and symposia during the year. For more information, including full reports, please visit the secure website or request a secure website password if you have not already done so.

Reports released in 2016

L-099	Revised - Review of ignition mechanisms and small-scale tests related to cookoff (Update)
L-192	Integrated Munition Health Management (IMHM) - STO technical report TR-AVT-212
L-193	Munition Health monitoring - Feedback from the use of environmental data loggers
L-194	Science of Cook-off Information Package
L-195	State of the art overview of Cook Off Simulation
L-196	Catalogue of Environmental Testing Facilities
L-197	Gun propellant cook-off discussion white paper
L-198	Polymer Bonded Explosives (PBX) cook-off discussion white paper
L-212	Use of Laboratory Setback Activator Tests to assess Suitability for Gun Launch

O-166	Barricade blockage angle distribution
O-167	Analysis of the IM type V response descriptor
O-168	Projection criteria for Insensitive Munitions and Hazard Classification
O-169	Benefits of IM on Storage and Operations
O-170	Reflection on 25Y Supporting the Munitions Safety Community

O-171	Changes to IM Policy and Full Scale Testing Documents
O-172	Turning Up The Heat SoCo Workshop Findings
O-173	MTM-Mitigation Techniques for Munitions Easy Access Online
O-174	Experimental and theoretical basis of current NATO standards for safe storage of ammunition and explosives
O-175	Consolidated Guide to Material Parameters for IM Modeling and simulation efforts Progress Update
O-176	Temper Status and Recommendations

*All **PUBLICATIONS** on can be found in the Technical Reports section on our Secure Web-environment via this **hyperlink** .*

We also delivered a number of new tools or web applications during 2016. The web-based Mitigation Techniques for Munitions (MTM) database was launched. The MADx "MSIAC Accident Database Exchange (MADX)'' was also deployed on the MSIAC portal. This database is accessible to contributing nations (Australia, Canada, France, UK, and US) to encourage sharing of information. We also produced a new version of the MSIAC Toolbox of Engineering Models for the Prediction of Explosive Reactions (TEMPER) which is described further in this newsletter.

MSIAC continued to provide support to AC/326, the group responsible for ammunition safety policy at NATO, and 2016 was another active year. To provide more visibility of the on going work of this group and its subgroups, MSIAC will provide an overview of activities in this and future newsletters in conjunction with the group chairs.

25th Anniversary

In the last newsletter of 2016, I provided an outline of the history and evolution of MSIAC over 25 years. To celebrate this anniversary a brief ceremony was held at NATO HQ on the 15th of December during the AC326 main group meeting.
We had a number of distinguished speakers including: the outgoing MSIAC Chair, Lt.Col. Christopher Heron (retd); Patrick Lamy, chair of AC326; and Ernest J. Herold, NATO Deputy Assistant Secretary General for Defence Investment.

Patrick Lamy

Ernest J. Herold

NATO Deputy Secretary General Rose Gottemoeller (left) also attended our ceremony

After I had provided an overview of MSIAC, Ernest J. Herold said that sharing and expanding munitions safety technology within each participating nation of MSIAC, as well as making that technology available throughout the 13 participating nations are at the core of what NATO stands for and what MSIAC does.
At the ceremony, the presenters also pointed out how a project like MSIAC impacts the NATO community, participating in the process of policy and standards development, and facilitating shared knowledge across the Alliance. This in turn supports Alliance military operations through encouraging and coordinating common approaches among nations. This also extends to non-NATO nations such as Australia, Finland and Sweden.

Lt Col Tony Heron explained that "nations benefit from input from the combined resources of all participants, as well as the support of the MSIAC technical staff who are all leading experts in their fields. The collaborative and communal imperatives behind the establishment of the project continue to hold true today and drive the program of work and the products to which we have access. These products are derived from some of the best and leading edge work being carried out throughout the international munitions community."

Patrick Lamy, Conference of National Armaments Directors (CNAD) Ammunition Safety Group, AC/326, chair cited the importance of MSIAC products and services in assisting nations' efforts in the advancement of munition safety policies. He explained how MSIAC's products and services help to: "take into account existing or still under development technologies and methods", ensure relevance against operational needs, and assist nations to implement standards. Mr Lamy said that "MSIAC's competence and expertise are vital to ensure these policies and standards are relevant, realistic, applicable and implemented" and he concluded that he was "confident about the future support that MSIAC will

provide to continue to foster CASG activities by taking into account the new technologies developed by industry or by tackling future challenges such as in-service surveillance and the maintenance of the safety level over time".

I had the privilege to close the speeches by thanking the speakers. This was followed by the opportunity for those attending to discuss with the MSIAC Technical Specialist Officers.

There is a short video clip of the event which can be viewed on line at https://www.youtube.com/watch?v=S68FkBBCNY8&feature=youtu.be!

Lastly, I want to bring your attention to the 2017 programme of work. Many of the existing work elements continue but there are also new work elements for 2017:

AC/326 Main Group Representatives

Science of Cook-off (POC Dr Matt Andrews) - This work element follows on from the successful science of cook-off workshop in April 2016. At the workshop it was agreed that nations would assess a hierarchy based methodology to predict cook off response using current tools and a shared data set. MSIAC staff propose to facilitate this effort in 2017.

Improved Understanding of Setback Ignition (POC Dr Ernie Baker) - Problems experienced introducing new explosives into gun launched projectiles have highlighted the need to develop improved understanding on the suitability of energetic materials to survive setback forces. Output of this work will be a review of tools and their use as part of an improved safety assessment methodology.

Probabilistic Aspects of the Initiation (POC Martijn van der Voort) - This work element seeks to address the need for data to support quantitative risk assessment. Given that we are often required to make decisions based on data from few experiments, this programme of work seeks to identify how we can optimise experiments and analysis in the most efficient and informative way.

Reaction mechanisms of rocket motor to impact / shock (POC new Propulsion TSO) - There have been a number of recent efforts by MSIAC nations to improve understanding of rocket motor response mechanisms, particularly in bore XDT. The programme of work will generate a limited report capturing our current knowledge in this area.

Catalogue of Energetic Material Producers (POC Dr Matt Andrews) - To assist those working with energetic materials, MSIAC will update MSIAC report O82 on this topic.

Issues / Advantages Regarding 3-D Printed Materials (POC Wade Babcock) - This effort will review the types of materials currently being used in 3-D printing technology, the resultant material properties achieved, and the main issues facing the munitions community in utilising 3-D printed materials

Munitions Health Management (POC Wade Babcock) - MSIAC staff will work to deliver two reports to assist nations' efforts in this area:

1. Review of previous S&T activities on the topics of munitions sensing, logging, age modelling, and condition assessment, as viewed through the lens of munitions safety policy. (An Open Report)
2. A review of implementation strategies and related standards for integrated munition health management which could enhance service life at lower cost to national defense agencies.

Quantity-Distance (QD) standards (POC Martijn van der Voort) - Following on from the study in 2016 on the "Experimental and theoretical basis of current QD standards", this work element will develop further some of the conclusions and will seek to address the recommendations through AC/326 SGC.

Technical support to NATO Committees (POC Martin Pope) - A new work element to capture Task Requests from AC/326 and its sub committees for various analysis and recommendations is proposed.

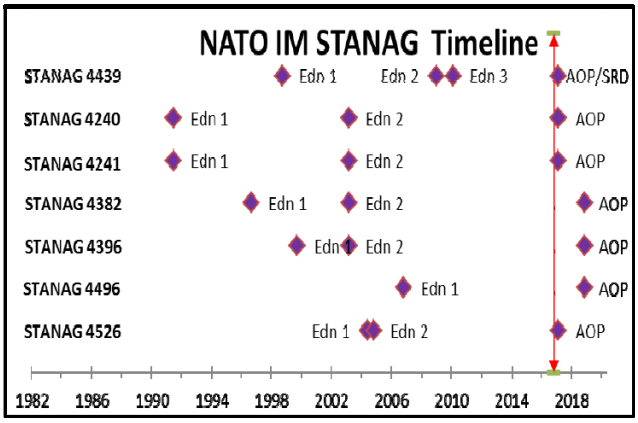
As always, I would like to encourage you to get involved in our programme of work during 2017. Please feel free to send us an e-mail requesting more information or to be kept informed or involved on any of our work elements. More information can also be found on the web site under the *Areas of Expertise* section https://www.msiac.nato.int/areas-of-expertise

Dr Michael Sharp
MSIAC Project Manager

Changes to NATO IM Policy and Full Scale Testing Documents

This Newsletter article follows a paper presented at the most recent IMEMTS Symposium by Florian Pechoux as the Custodian of STANAG 4439.
The complete paper and presentation are available through the Portal on the MISAC website using the Weblink WL application at the following path: MSIAC\MSIAC Member Nations\SYMPOSIA Open to MSIAC Member Nations\IMEMTS_IMTS_Insensitive Munitions & Energetic Materials Technology Symposium.

This article gives an update on work to date on changes to NATO IM Policy and the structure of the supporting documents. Figure 1 shows the timeline for development of NATO IM policy documents. Historically there has been a degree of coordinated development of NATO IM policy and documents but changes to STANAG 4439 have introduced other requirements and guidance to the existing full scale testing requirements.



There was a need to review the policy and testing to reflect changes and development in testing technology and experiences from assessment of test results. As a result a number of strands of work evolved:

- Review of IM Response Descriptors (Annex I to AOP-39)
- Review of Test Conduct and Reporting (Annex H to AOP-39)
- Review of IM Full Scale Tests

The Full Scale Test STANAGs are being reviewed in 2 tranches, the first addressing:

- STANAG 4240 – Fast Heating
- STANAG 4241 – Bullet Impact
- STANAG 4526 – Shaped Charge Jet

Changes to NATO Standardisation policy provided an opportunity to restructure the policy and guidance between the documents to reduce the amount of repetition and enable revisions to documents to be made more quickly. The new NATO Standardisation Policy is:

- Covering Document (STANAG) – the document used for ratification.
- Allied Standard – (e.g. AOP, AAS3P) – the document containing requirements, policy, texts etc. Requires a reduced process for approval.
- Standards Related Document – contains guidance or reference information e.g. implementation guide, catalogue. Can be updated without the requirement for approval.

The key changes are discussed below.

Response Descriptors

There will be no wholesale change to the Response Descriptors; the current Annex I and its structure will be retained. There will be changes to some of the descriptions of the evidence used to assign the Response Type for better clarity but this is more for commonality of interpretation than anything significant.

There was some concern that too much reference was made to the Table in Annex I by others when assessing the Response Type. This table is a summary of the actual criteria detailed in the Annex and, whilst a useful guide, is not accurate or to be treated as authoritative, this distinction will be emphasised in the revised text. There is a UK proposal for a decision tree based approach for Response Type assignment which is being developed and if accepted will be included in the new STANAG 4439 (AOP-39).

Response Type IV can be assigned on the basis of fragmentation and or propulsion. This distinction in Response Type will be highlighted by a suffix to show the determining criteria (f) for fragmentation, (p) for propulsion and (fp) for both. This will give a more appropriate indication of the nature of the hazard when assessing safety.
There was a significant amount of discussion on fragmentation and a number of reviews were available to assist. This led to a number of proposals on changes to how fragmentation will be assessed.

- The current graph is based on projection energy and will be changed to impact energy.
- The current graph is based on steel, additional graphs for fragments of different densities will be added.

Additional guidance on how Primary and Secondary evidence will be treated in determining the Response Type will also be included.

Full Scale Testing

Separate Working Groups have reviewed 3 of the Full Scale Test specifications. They will now be structured with a covering STANAG implementing an AOP. The AOP will contain the Test specifications and requirements and both documents will retain the previous STANAG number.
The External Fire Test (AOP-4240) has improved thermal characteristics and specifications for the following tests, Large Pool Fire Test, Mini Pool Fire Test and Fuel Burner Fire Test. The Bullet Impact Test (AOP

-4241) has improved specifications for aim point and contains test specifications for the Triple and Single Bullet tests. The Shaped Charge Jet Test (AOP-4526) has improved characterisation criteria for the charges and specifications for 2 differing shaped charges as a donor.
Working Groups have been established to review the remaining 3 full scale tests.

Policy and Test Documentation

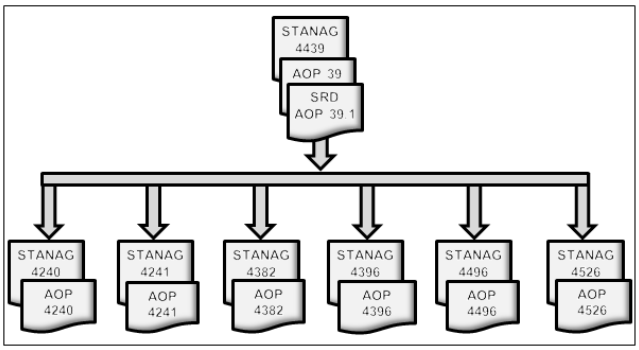
Changes in NATO standardisation policy has allowed a restructuring of the supporting documentation for IM policy and testing. A new type of document, a Standards Related Document (SRD), has been introduced. These are supporting documents to Standards covering information sources such as manuals or other information, but cannot contain policy or requirements.

The current AOP-39 Annex H, Conduct and Reporting of Full Scale Hazard Tests, was reviewed together with the content of all versions of the Full Scale Test documents. This addressed a number of questions; the correct balance and implications of generic vs. specific text between AOP-39 and the other documents; inconsistencies or variations developed between AOP-39 and the other documents and the implications for any change in the balance of generic vs. specific text between AOP-39 and the other documents.

A SRD, (titled SRD AOP 39.1), has been drafted with guidance on generic aspects of IM test conduct, responsibilities and reporting. The SRD contents are as follows:

- Test framework, organisation and responsibilities
- Test programme
- Test planning and guidance
- Test specific considerations
- Documenting
- Test conduct
- Reporting
- Annex A - Test Framework and Organisation
- Annex B - General Full-Scale Test Guidance
- Test Item Configuration - Test Conditions - Baseline Tests - Instrumentation and Recording - Observations and Records
- Annex C - Information to be Included in the Test Directive
- Annex D - Test Report Template

The new AOPs will refer to the SRD for guidance on all generic aspects of Full Scale Testing. The document hierarchy is shown in the diagram below.



The benefits of these changes will be:

- All tests will have been reviewed and updated.
- Requirements currently in Annex H of AOP-39 will be integrated into the new AOPs.
- AOP-39 and the new AOPs will be reduced in size.
- The Test AOPs will have a common structure and format.
- Guidance will be common for all Tests.
- The process in future updates of the documents will be reduced.

There will be some transitional arrangements: for example Tests not yet reviewed will remain extant until cancelled.

A significant amount of work has been undertaken to get to this stage. All those involved are to be thanked for the invaluable contribution they have made.

Florian PECHOUX *(FRA)* & Martin POPE
MSIAC Munition Systems Specialist

Laboratory Setback Activator Testing Report

Limited distribution report L-212: Use of Laboratory Setback Activator Tests to assess Suitability for Gun Launch is now available on the MSIAC limited access WebLink. The report is available to NATO MSIAC member nations and summarizes a six month study on current and historical laboratory setback activator testing.

One of the major safety concerns for energetic materials present in gun launched munitions is the exposure to severe set-back forces which develop as the shell is accelerated. Under these conditions energetic materials, dependent on munition design, have been observed to react prematurely, resulting in potentially catastrophic consequences for exposed personnel and defence materiel. The term in-bore premature is used to categorize events where severe response results in detonation or explosion of the munition whilst it is still travelling down the barrel. Catastrophic responses can also be experienced as the shell exits the barrel or on its flight down range.

There is currently no agreed standard methodology for assessing the suitability of explosives for gun launch or for the determination of acceptance criteria for explosive fill defects. Laboratory setback activator testing has been used to investigate the suitability of explosives for gun launch. Unfortunately, laboratory setback activator testing is not standardized and large variations exist in activator design, function and results between different laboratories. However, it is the only, currently available tool for assessing an explosives safety and suitability to launch-induced setback forces.

Report L-212 starts with a brief description of the current NATO munition qualification process and places specific emphasis on the relevance to weapon handling and gun launch safety. A gap analysis identifies the areas where improvements could be considered. In the second part of the paper, laboratory setback actuator technology is reviewed and the observed ignition mechanisms are discussed.

The link between laboratory setback activator ignition and the prediction of actual gun launch premature ignitions will be further researched during 2017. Associated laboratory setback activator technology development to this end needs to be further developed, validated and standardized. As a result, it was agreed for the AC326 SG/A to stand up a Custodial Working Group (CWG) for "Gun Launch Setback Ignition" to be led by the USA. It is currently planned that Dr. Ernie Baker will be providing MSIAC technical support to the CWG.

Resulting Gun Barrels from Catastrophic In-Bore Prematures

Dr Ernest Baker
MSIAC Warhead Specialist

Fragment Impact Custodial Working Group Meeting

The STANAG 4496 Fragment Impact Custodial Working Group (FI CWG) Meeting was held on 24-25 January 2017 at the DGA Missile Test Centre, Bordeaux, France. France is the custodian, with Nicolas Kmiec overseeing the process. This was the first meeting of the group held in order to review STANAG 4496, make recommendations and provide a draft STANAG update for review by the NATO AC326 CNAD Ammunition Safety Group. The meeting was attended by 18 subject matter experts representing France, USA, UK, Norway, Sweden, and Turkey. Emmanuel Schultz has been providing technical support to the group, and he provided a presentation of results from the recent MSIAC Fragment Impact Survey (Report O-159 edition 2). The survey identified a number of testing issues for review including projectile material, sabot design, impact velocity, impact projectile orientation, impact accuracy, blast characterization and heavy protection items. National positions were presented by the French, USA and UK representatives. Lively technical discussions resulted in significant consensus, as well as a requirement for gathering of further information especially on the orientation at impact. Of particular note was a historical review of the requirements development presented by Kathryn Hunt from the USA Office of Secretary of Defense (OSD). The currently agreed fragment was selected to be equivalent to a 16 gram cubic fragment impacting with a 10° yaw. A velocity was selected to represent typical high velocity bomb fragments, while the lower velocity is more representative of an artillery fragment. Some of the historical data are summarized in the MSIAC L-86 report.

The next STANAG FI CWG Meeting will be held 12-13 April 2017 at the Kromhout Kazerne in Utrecht, the Netherlands. Ernie Baker will be taking over the MSIAC technical support for FI CWG at that meeting.

Emmanuel Schultz & Dr Ernie Baker
MSIAC Propulsion & Warheads Technology Specialists

MSIAC Career Achievement Award

In our previous newsletter, we reported on the winners of the MSIAC awards, including the Career Achievement Awards, handed out to M. Steven Struck and M. Bruno Nouguez.

Unfortunately, **M. Bruno Nouguez** EURENCO France, was unable to attend the IMEMTS meeting thus was unable to accept the award in person.

As hoped, MSIAC managed to track down Mr Nouguez and congratulate him personally on receiving the award at the EURENCO RD day last December 2016.

Bruno Nouguez *(EURENCO) and* ***Emmanuel Schultz*** *(MSIAC TSO),*

Science - Technology - Procurement

Science, Technology and Procurement news items have been grouped into the following sections:

- **Industry**
- **Manufacturing**
- **Policy and Standards**
- **Systems**
- **New Technology**
- **Contracts**

All information has been gathered from open source websites and links to the original information is included with each item.

Martin Pope
MSIAC Munitions Systems Specialist

You can access the latest on ***Science, Technology & Procurement*** *via this hyperlink .*

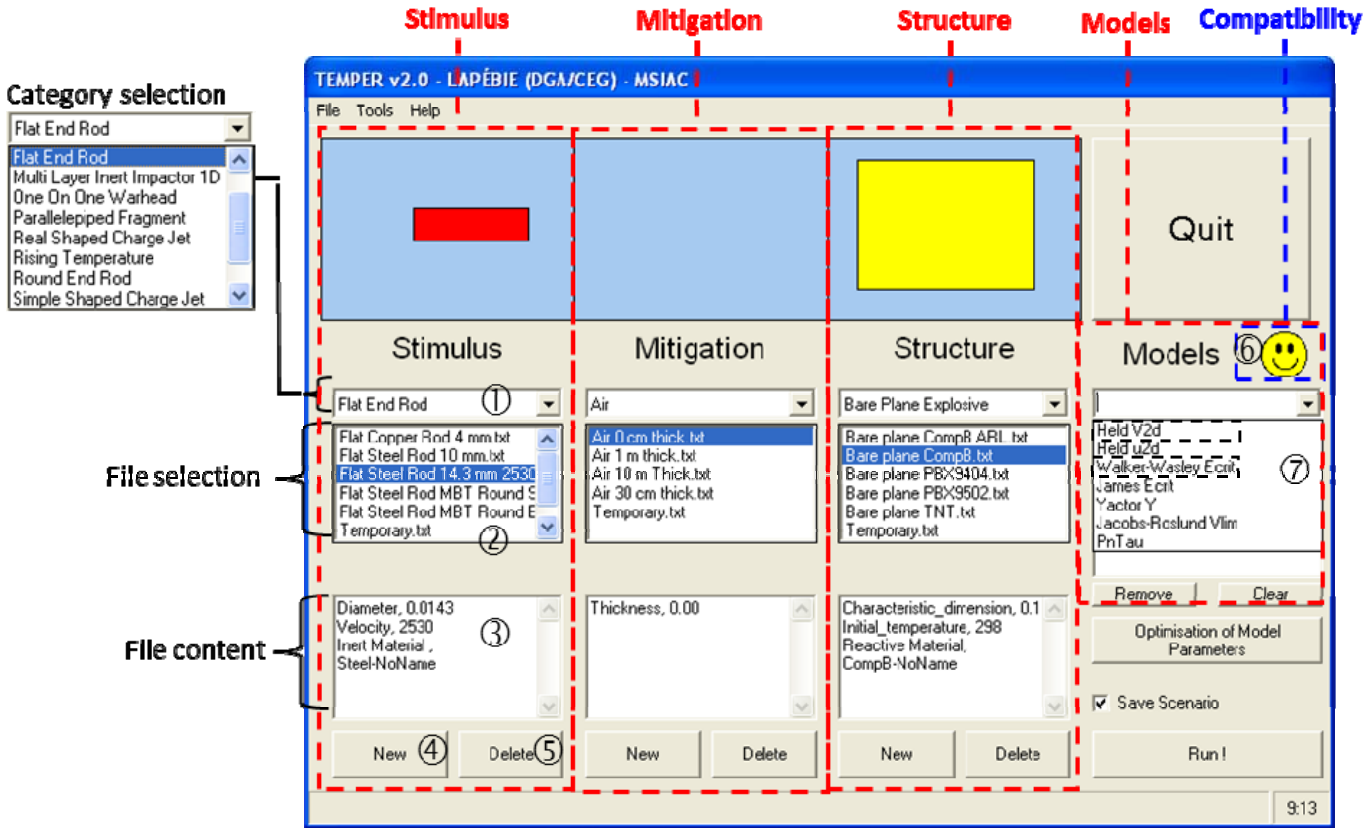
HOLD YOUR TEMPER

The latest version of Toolbox of Engineering Models to Predict Explosive Reactions, TEMPER v2.3 has been successfully compiled and uploaded to the MSIAC secure website and is ready for use. It is essentially identical to TEMPER v2.2.1, except that it will now run on recent versions of Windows and is compatible with recent versions of Excel. It may be accessed by filling out the online request form (https://www.msiac.nato.int/contact-access/access-request-form-for-members-of-msiac-nations) for WebLink access and receiving subsequent approval by the associated National Focal Point Officer (NFPO). After downloading through the WebLink (MSIAC > MSIAC Member Nations > MSIAC Software Tools > TEMPER - Toolbox of Engineering Models for the Prediction of Explosives Reaction), TEMPER v2.3 may be unzipped, installed and run locally on modern Windows based computers that include a modern version of Excel. An installation program is included that requires local administrative computer rights.

TEMPER is a library of models developed by the Gramat Research Centre (Centre d'études de Gramat, or CEG) and the NATO Munitions Safety Information Analysis Centre (MSIAC). MSIAC is responsible for making TEMPER available via it's secure website, some product support and development, and user group management.

TEMPER is a unique and powerful software package that utilizes a library of empirical or semi-empirical models dedicated to insensitive munitions (IM) assessment. It is an "open source", Object-Oriented Programming project programmed in Microsoft Visual Basic 6.0 (VB6). It was developed with the intention of allowing full flexibility to add custom models or to enhance existing ones. Munitions, insensitive munitions (IM) and energetics subject matter experts (SME) can use it as an aid to predict the response of a munition or laboratory experiment to a mechanical or a thermal threat. The intent was to allow SMEs the possibility to implement their own models with limited programming skills. The easiest way to do this was to use an object-oriented programming language, much more modular than classical ones (such as Fortran). VB6 was chosen for its many easy programming advantages and especially because it is an easy-access, widely used environment with a friendly Graphical User Interface (GUI).

Unfortunately, the final release of VB6 was in 1998. On April 8, 2008 Microsoft stopped supporting VB6. The last supported version was TEMPER v2.2.1. which runs on Windows XP, but does not run under more modern versions of Windows. As a result, TEMPER was recently ported through VB6 to run under Windows 2012R2, Windows 7, Windows 10 and to be compatible with Excel 2010, 2013, 2016. The resulting version has been named TEMPER v2.3 and contains all of the capability and shortcomings (bugs) of the previous version. In 2017 TEMPER will be ported into a more modern and supported computer language and address existing shortcomings. Augmentation and updating of the TEMPER capabilities will start thereafter. MSIAC Report O-176, TEMPER Status and Recommendations provides an overview of the TEMPER modeling capability and plans.



TEMPER Main Window

Dr Ernest Baker
MSIAC Warhead Specialist

What's going on in AC/326 and its Sub-groups

SG/A(IST) – Initiation Systems

This is a brief summary of the main elements from current programme of work undertaken by SG/A(IST) and presented at the December AC/326 Main Group meeting. Twelve nations were represented at the September programme of working groups and Sub-Group meeting. The more significant STANAGs currently being reviewed are:

- STANAG 4187/ AOP 4187 –Fuzing Systems, Safety Design Requirements (France/Canada –Interim Custodians for UK). A number of drafts have been circulated with the most recent prepared by the interim Custodians and presented to the Working Group. There is still some outstanding drafting of a few parts of the Standard to be completed before the next meeting with work now reaching a conclusion. This will then lead to a programme of reviews of other linked Standards.
- STANAG 4326 / AOP 8 –NATO Fuze Characteristics Data (Germany –Custodian). The current drafts of the STANAG and AOP were discussed and the draft version of the proposed SRD presented.
- STANAG 2818 / AOP-31 / AOP-32 –Demolition Systems (Turkey –Custodian with MSIAC support). An analysis was given of Demolition Systems and the differences with other types of initiation systems. Further work is in hand to produce a new draft STANAG 2818; any testing requirements more appropriate for SG/B to manage will be transferred to that Sub-Group.

The Group has commenced work on developing a new NATO Standard to address the requirements for Remotely Controlled SAF Systems (USA –Custodian). A Remotely Controlled SAF System is any weapon system that is controlled via a secure network and can be recoverable/reusable or a one-time use munition. Work is at an initial stage on a draft from the Custodian.

A significant amount of effort has been put into reviewing terms used within the Sub Group documents in support of a NATO initiative. Many with an obvious meaning have been removed but a number will need to be retained where it is necessary to maintain a clear and unambiguous understanding of terminology. Progress has been thorough and methodical driven by the Canadian Terminology Officer.

There was also a session with the Interservice Ammunition Working Group on software tools they have developed in support of NATO Interoperability. Data from SG/A(IST) is used in the databases and the opportunity to look at and review the functionality of the tools was appreciated.

New or revised NATO Standards in the approval process or promulgated are:

- STANAG 4157 - Fuzing Systems: Test Requirements for the Assessment of Safety and Suitability for Service Edition 3, in the ratification process.
- STANAG 4363 - Initiation Systems: Testing for the Assessment of Detonating Explosive Components - AOP-21 Edition 3, now promulgated on 24 November 2016.
- STANAG 4369 Design Requirements for Inductive Setting of Large Calibre Projectile Fuzes - AOP-4369 Edition 2, sent to NSO for release into ratification process as of 10 January 2017.
- STANAG 4497, Hand Emplaced Munitions, Principles for Safe Design, Edition 2, now promulgated on 16 November 2016.
- STANAG 4560, Electro-Explosive Devices, Assessment and Test Methods for Characterization – AOP-43, Edition 3, now promulgated on 21 November 2016.

SG/A - Energetic Materials

The SG/A EM team is currently responsible for maintaining over 40 STANAGs and AOPs relating to energetic material ingredients, qualification and safety. To maintain these documents the nations agree a program of work based on national and NATO priorities. This has also included implementing changes to the NATO document structure; with the STANAG providing only ratification information, test procedures reside within the AOP and all associated information moved to the Standards Related Document (SRD).

Recent efforts have focused on the amalgamation of all mechanical testing STANAGs to form AOP/STANAG 4717, due for ratification in 2017. EU legislation (REACh) has generated research into new propellant stabilisers, which in turn has an impact on the stability test procedures and requirements STANAG (4620 and AOP-48). This has provided the impetus to review the STANAG and to provide recommendation for the future of the document.

MSIAC is also providing support to SG/A through reviews of compatibility testing and areas of interest such as gun launch simulators.

SG/B – Munition Systems

This is a brief summary of the main elements from current programme of work undertaken by SG/B and presented at the December AC/326 Main Group meeting. From a busy programme of work the more noteworthy items are:

- Full Scale Test Standards. Formation of working groups to review the Slow Heating, Sympathetic Reaction and Fragment Impact STANAGs and create new STANAGS/AOPS.
- STANAG 4110 – Definition of Pressure Terms and their Interrelationship for use in the Design and Proof of Cannons or Mortars and Ammunition – STANAG to be transferred from AC/225 to this sub group as Sponsor.
- STANAG 4675 – In-service Surveillance and Monitoring (AOP 62, AOP 63 and AOP 64) now in ratification.
- STANAG 4518 – Safe Disposal of Munitions, Design Principles and Requirements, and Safety Assessment – reviewed and current draft circulated for comment.

The AAS3P Working Group continues to develop with the AAS3P Allied Standards, current status of Standards are:

- AAS3P-1 Guidance, Edition B, Version 1 - finalized and to be delivered to SG/B December 2016.
- AAS3P-10 Shoulder Launched Munitions, Edition B, Version 1 – deliver to SG/B for silence procedure December 2016.
- AAS3P-11 Surface and Underwater Launched Munitions, - covering STANAG 4758 issued for ratification.
- AAS3P-12 Air Launched Munitions – covering STANAG 4759 issued for ratification.
- AAS3P-20 Large Caliber Munitions – covering STANAG 4761 issued for ratification.
- AAS3P-21 Medium Caliber Munitions – expect delivery to SG/B for silence procedure by Fall 2017.
- AAS3P-22 Small Caliber Munitions – plan to **deliver** to SG/B for silence procedure Spring 2017
- AAS3P-23 Land Forces Munitions (i.e. mortars) - expect delivery to SG/B for silence procedure by Fall 2017.
- AAS3P-30 Aircraft Ancillary Devices Containing Energetic Materials – expect delivery for silence [procedure by Fall 2017

The NATO Smart Defence Initiative on Integrated Munition Health Management will hold its first working meeting in the Netherlands 3-5 April 2017, chaired by UK. Further details and registration are available through the MSIAC website.

A cross cutting review of NATO policy on Insensitive Munitions (SG/B) and Hazard Classification (SG/C) looking at areas for harmonisation has recently commenced. This is looking at the current UN Test Series 6 and UN Test Series 7 to see where there are opportunities for harmonisation of efforts, better use of expertise and knowledge and more appropriate classification. This will be a significant programme of work with the initial step the production of a draft Standard. This is co-led by the USA and UK and will need to include technical groups to review and address key areas identified such as scope and classification protocols amongst other key area.

SG/C – In–service and operational safety management

The AC/326 SGC is responsible for developing and maintaining standards in the field of In-Service & Operational Safety Management. These are published in AASTP-1 and AASTP-5 for safe storage in the home nation (AASTP-1 should be applied overseas whenever possible) and on deployed missions respectively. AASTP -3 deals with hazard classification (HC) of ammunition, and AASTP-4 provides a detailed description of explosives safety risk analysis and related engineering models for explosion effects, damage and injury.

There are a number of active technical working groups that aim to further develop the aforementioned standards, and keep the technical content up to date with the latest experimental results and insights. With respect to AASTP-1 there is a focus on improvements of Quantity Distance (QD) criteria (Part I) and updated criteria for airfields (Part IV). An important development has been the QDs for storage of Small Quantities (<500 kg NEQ HD1.1), referred to as SQQD. The impact of that work on QDs for other hazard divisions that can exhibit (partial) detonation reactions is currently a topic of research. Another task is to review the 400 m minimum Inhabited Building Distance (IBD) for HD1.1. Recent debris data generated in full scale tests has suggested that a significantly larger distance may be required. This has led to a review of the test data and experimental procedures. The AASTP-5 WG will review recommendations from the last Exercise Capable Logistician and update AASTP-5 accordingly. Within the AASTP-4 Custodian Working Group a lot of work has been conducted in preparation of the most recent version of this document. It now contains a wealth of new and updated explosive effect and consequence models, e.g. lung injury, injury due to debris impact, and structural damage. The initiatives of the US in relation to Insensitive Munitions and HC are followed with interest as they may have an impact on the content of AASTP-3.
The standards are also continuously updated based on feedback from the AASTP-1 and AASTP-5 lecture series, where Explosives Safety Officers (ESO) learn how to apply the standards. This course has been developed by MSIAC. Other relevant topics in which MSIAC plays a role are the maintenance of databases related to hazard classification, accidents and nationally approved structures.

Accident Reporting & MADx

The MSIAC Accident Database (MADx) allows easy searching in over 11,000 accident reports from US, UK, France, Australia and Canada. After a year of development and testing, MADx has recently been released to all governmental users from those nations. MADx is available through the portal: https://portal.msiac.nato.int/madx/

We invite other nations to contribute to MADx and gain access to the database.
MSIAC also regularly updates a series of open accident reports based on information in the media. In conjunction with this newsletter a new update has been added to the website, covering the period between August and December 2016.
https://www.msiac.nato.int/news/accident-reportings

You can access all reported ACCIDENTS via this hyperlink .

AASTP-1 and AASTP-5 Lecture Series in 2017

The AASTP-1 and AASTP-5 Lecture Series is being presented five times in 2017. This means another busy year for instructors Johnny de Roos and Tom Taylor. The dates and locations are as follows:

- 6-11 February: Vilseck, Germany (US Europe)
- 27 February-3 March: Mc Alester, US
- 6-11 March: Mc Alester, US
- 24-28 April: Paris, France

- 2-6 October: Kineton, UK

The first three events have been organized in cooperation with Ms. Theresa Smith from the U.S. Army Technical Center for Explosives Safety at the McAlester Army Ammunition Plant.
A few seats are still available on these five events, so please let us know if there's an interest from other nations. The MSIAC steering committee has decided to also allow students from non-MSIAC member NATO nations to attend the lecture series at a cost of 400 euro per person.

AASTP-1 and 5 Lecture Series in Vilseck, Germany, 6 to 10 February 2017

Another interesting development is that the lecture series has recently been registered in the Education and Training Opportunities Catalogue (ETOC) from the Allied Command Transformation (ACT). This makes the AASTP-1 and AASTP-5 Lecture Series an official NATO course.: https://e-itep.act.nato.int/Guest/ETOCindex.aspx

Martijn van der Voort
MSIAC Safety of Storage and Transport Specialist

DO NOT FORGET...

INTITUTE OF EXPLOSIVE ENGINEERS (IEXPE)

ANNUAL GENERAL MEETING
This years AGM, Conference and Dinner will be held on **Monday and Tuesday 3 and 4 April 2017** at QHotels, Norton Park, Sutton Scotney, Winchester, S021 3NB. Any member interested in attending should contact the Institute's Secretariat.

IEXPE 2017 AWARDS
The Institute have also called for nominations for the Harold Swinnerton Award. The worthy recipient must be nominated by a member of the Institute for services to the industry. Recipients are not restricted to IExpE members. Nominations are to be received by 1 March 2017 via email to ***Charlene.firkins@iexpe.org***.

10TH HEATFLOW CALORIMETRY SYMPOSIUM— ENERGETIC MATERIALS (HFCS-EM)

!! CHANGE OF DATE !!

This years' symposium will now be held from **25 to 28 September 2017** in Crane, IN, USA.

35TH ISSC THE PREMIERE INTERNATIONAL CONFERENCE ON SYSTEM SAFETY

This year's conference, with a much greater focus on explosive safety than previous years, will take place from **21 to 25 August 2017** in Allbuquerque, New Mexico, USA.
The theme for the 35th ISSC **"Pushing the Boundaries of System Safety"** is intended not only to redefine how system safety is applied in many different domains, but also to reach into our history of lessons learned, go beyond our present thinking, and push the boundaries of the *System* of Safety as well as how we think about the safety of systems. The goal of this training conference and workshop is to bring interdisciplinary practitioners and the foremost thinkers within the system safety and related disciplines together to exchange ideas, knowledge, experiences and best practices. For more info, visit: http://issc2017.system-safety.org/

ALSO GOOD TO KNOW...

NATO STANDARDS APP

(Source https://nso.nato.int/protected/WEBUpdate/20161209/news.html)

Free download available at the App Store, Google Play and Windows Store. On 29 November 2016 the Committee for Standardization approved the release of the NSO Mobile App as a new standardization information tool. With this app you will be able to browse, download and read NATO standards directly on your mobile device. The App will also let you store NATO standards in your mobile device for an offline reading mode.

NATO TERMINOLOGY

(Location https://nso.nato.int/natoterm/content/nato/pages/home.html?lg=en)

NATO is moving to a single database for all terms used in its NATO Standards and publications. A central online dictionary has been created called NATO*Term*, accessible through the NATO Standardisation Office website. Access to this is managed under the following caveats:

- Access to NSO's protected website is limited to NATO nations and NATO Partners that have been certified by the NOS.
- Only official email addresses are supported. Usage of email from WEB Mail providers (Google, Yahoo, Hotmail etc.) will require further authorization.
- This site is not open to industry.
- Release of STANAGs to industry is a national responsibility.

Munitions safety terminology is being actively reviewed and the NATO*Term* database is being populated. Many existing terms are being removed where the dictionary definition is acceptable but some terms will be retained.