

MSIAC TOOLS



[HTTPS://WWW.MSIAC.NATO.INT](https://www.msiac.nato.int)

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Foreword

Over the last 25 years, MSIAC has developed a suite of tools to support member nation's efforts to design, develop, procure, and use safer munitions. During this time the numbers of tools and their format have changed considerably, but the goal remains essentially the same: to add value to shared knowledge and understanding for the purposes of promoting and improving munitions safety. These are freely available to individuals in MSIAC member nations, upon approval, so I would encourage you to make full use of the tools and to inform colleagues who may also benefit. Please consider whether you can contribute to the continuous process of improvement and update of tools by providing information or by offering feedback

M W Sharp
MSIAC Project Manager

Introduction

MSIAC has developed a secure suite of applications to aid its members in their day-to-day business. Access to these tools is fast, secure and developed to be intuitive. The tools will be beneficial to any MSIAC member working in the fields of Munition Safety and/or Insensitive Munitions.

Secure access to the tools is via the MSIAC website under the 'Secure Website' tab. The tools are located in either the **Portal** or **Weblink**. This guide will provide you with the location for each tool.

Permission is granted to users by their National Focal Point Officer (NFPO) after completion of the on-line access form: www.msiac.nato.int/access

Please browse each tool for further details on their functions, features and location then go online and take advantage of these free tools.

Advanced IM Search is a quick, easy and fully searchable database of IM test results. It is intended to support munitions designers, test centres, IM boards, program managers and munitions suppliers.

- TSO> Warhead Technology
Propulsion Technology
- 📄 O-156 AIMS Advanced Insensitive Munitions Search
- 🌐 <https://www.msiac.nato.int/aims>
- ✓ All approved MSIAC members

aims provides access to IM test results for munitions and generic test units for each threat defined by the NATO IM policy: fast heating, slow cook-off, bullet impact, fragment impact, sympathetic reaction and shaped charge jet.

Every test result is fully referenced, searchable and in certain cases access is granted directly to the source material. The information is displayed in a table that provides the munitions name, its main characteristics (energetic material, caliber, case material, packaging), mitigation, test set-up and test results. For each test result, a detailed view provides additional information on the munitions and the test itself, and when available, a picture of the test is included.

The platform also enables users to search through all the databases at once by using a unique and simple interface. The results are displayed per IM threat in separate tabs that reproduces the interfaces of each database. Tests performed with the standardized IM threats can also be sorted in a synthesized table that easily allows comparison of the munitions IM signatures.

Users can also access the related NATO test standards, the list of references used to populate the database as well as a description of commonly used generic test units and shaped charges.



Fragment Impact: Test ID 4299 - 81 mm M89A2 HE Mortar

Material	Quantity	Unit	Location	Batch	Lot
81 mm M89A2 HE Mortar	100	kg

Reaction Summary

Reaction ID	Reaction Type	Reaction Date	Reaction Status	Reaction Notes
4299	Fragment Impact	2023-10-26	Completed	...

Reaction Details

Reaction ID	Reaction Type	Reaction Date	Reaction Status	Reaction Notes
4299	Fragment Impact	2023-10-26	Completed	...

Reaction Conditions

Reaction ID	Reaction Type	Reaction Date	Reaction Status	Reaction Notes
4299	Fragment Impact	2023-10-26	Completed	...

Reaction Results

Reaction ID	Reaction Type	Reaction Date	Reaction Status	Reaction Notes
4299	Fragment Impact	2023-10-26	Completed	...

Reaction Images

News

ID	Munition	Tested Item	Energetic Material	Database	Reaction Type	Updated
4299	81 mm M89A2 HE Mortar	Warhead	80K-104	Fragment Impact	I	2 months, 2 weeks ago
4090	81 mm M89A2 HE Mortar	Warhead	80K-104	Fragment Impact	V	2 months, 2 weeks ago
4101	81 mm M89A2 HE Mortar	Gun Propellant	1A-38	Fragment Impact	IV	2 months, 2 weeks ago
4097	81 mm M89A2 HE Mortar	Warhead	80K-104	Fragment Impact	IV	2 months, 2 weeks ago
4099	81 mm M89A2 HE Mortar	Gun Propellant	1A-38	Fragment Impact	V	2 months, 2 weeks ago
4104	81 mm M89A2 HE Mortar	Warhead	80K-104	Synthetic Reaction	Pass	2 months, 2 weeks ago
4105	81 mm M89A2 HE Mortar	Warhead	80K-104	Synthetic Reaction	Pass	2 months, 2 weeks ago
4103	81 mm M89A1 HE Mortar	Warhead	80K-104	Fragment Impact	V	2 months, 2 weeks ago
4102	81 mm M89A1 HE Mortar	Warhead	80K-104	Fragment Impact	V	2 months, 2 weeks ago
4100	81 mm M89A2 HE Mortar	Warhead	80K-104	Fragment Impact	I	2 months, 2 weeks ago
				Slow Cook-Off	V	2 months, 2 weeks ago
				Slow Cook-Off	V	2 months, 2 weeks ago
				Fast Cook-Off	V	2 months, 2 weeks ago

Fast Cook-Off (211)

Reaction ID	Reaction Type	Reaction Date	Reaction Status	Reaction Notes
211	Fast Cook-Off	2023-10-26	Completed	...



The Energetic Materials Compendium (EMC) is a quick, easy and fully searchable database to access explosive property data on energetic materials. It is intended to support formulation scientists, energetic chemists and warhead designers.

TSD> Energetic Materials

 0-157 The development and future of EMC

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

✓ All approved MSIAC members

emc provides one location to access test data for high explosives, gun propellants, rocket propellants and pyrotechnic formulations. The database is a collation of openly published energetic material technical data and has been organised by two connected databases: formulations and components.

The powerful search feature within the formulation database allows users to find data from multiple fields such as performance (detonation velocity), sensitivity (impact), physical properties (thermal conductivity), composition details (component percentage), manufacturer and application.

Within the components database users are able to search both energetic and non-energetic ingredients via name, Chemical Abstract Service (CAS) number, and chemical formula. Data will also be fully searchable across chemical (enthalpy of formation), physical (density), explosive (detonation velocity) and hazard (LD50, STEL, REACH) properties.

A side-by-side comparison tool for both the formulations and components databases allows users to compare up to four materials.

Every formulation and component is fully referenced, searchable and in certain cases access is granted directly to the source material.



Formulation Comp B

Blank 1.700 g/g Edit Print

Type: High Explosive
Application: Blanket process explosive (Typical of large period)
Status: Low 5, 2017

References: Details | Name | Comp | Blank | Reference

Components

Component	Percent	Blank	Chemical Formula	CS#
1001	99.99	Colloidal Phosphor, Colloidal Phosphor, 1.5 Micron Colloidal Phosphor	CaH ₂ P ₂ O ₇	121
1002	0.01	Acetic Acid	CH ₃ COOH	124
1003	0.01	2,2,2-Trifluoroethyl 2,2,2-Trifluoroacetate	CF ₃ CO ₂ CF ₃	196
1004	0.01	Perfluorobenzene	C ₆ F ₆	205

Formulation Search

Use the page to search for a formulation by name, formula, or CS# or a subunit name by entering a search string.

Name: Search

Formulations (1305)

Name	Blank	Type	Application	Density	References
1001-01-a		Self-Propagating	Self-Propagating, heterogeneous mixture, Blank	1.700 g/cm ³	12
1001-01-b		Self-Propagating	Self-Propagating, heterogeneous mixture	1.700 g/cm ³	12
1001-01-c		Self-Propagating	Self-Propagating, heterogeneous mixture	1.677 g/cm ³	12
1001-01-d		Self-Propagating	Self-Propagating, heterogeneous mixture	1.667 g/cm ³	12
1001-01-e		Self-Propagating	Self-Propagating, heterogeneous mixture	1.700 g/cm ³	12
1001-01-f		Self-Propagating	Self-Propagating, heterogeneous mixture	1.700 g/cm ³	12
1001-01-g		Self-Propagating	Self-Propagating, heterogeneous mixture	1.700 g/cm ³	12
1001-01-h		Self-Propagating	Self-Propagating, heterogeneous mixture	1.700 g/cm ³	12
1001-01-i		Self-Propagating	Self-Propagating, heterogeneous mixture	1.700 g/cm ³	12
1001-01-j		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-k		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-l		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-m		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-n		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-o		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-p		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-q		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-r		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-s		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-t		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-u		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-v		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-w		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-x		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-y		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12
1001-01-z		Self-Propagating	Self-Propagating, heterogeneous mixture	1.690 g/cm ³	12

Component TNT

Blank 1.700 g/g Edit Print

Blank 1.700 g/g Edit Print

O=C1C=CC(=O)C=C1[N+](=O)[O-]

Name: 2,4,6-Trinitrotoluene, 3-nitro-1,3,5-trinitrobenzene
CAS: 132-62-1
GHS:

Formula: C₇H₅N₃O₆
State: Solid

Chemical Properties | Physical Properties | Explosive Properties | Hazard Properties | Reference | Formulations



MADx allows easy searching in over 11,000 accident reports associated with munitions. Information is provided by Australia, Canada, France, Germany, the United Kingdom and the United States.

TSO> Safety of Storage and Transport

📄 Not available

🌐 <https://www.msiac.nato.int/madx>

✓ Selected governmental MSIAC members
AUS, CAN, DEU, FRA, GBR, USA

mad^x provides access to multinational accident information in a common format allowing fast and easy searching across countries. The database contains information about the accident date, location, weapon type, cause, lifecycle phase, damage category, and both the number of fatalities and injured.

A powerful search engine allows information to be retrieved using the aforementioned criteria. Search results are displayed in a summary table including a brief description of the accident, date and location. Results are also displayed as histograms that show the number of accidents per year, probably cause, category and country. The application also offers the possibility to select a list of accidents and then print or export to an Excel format for further analysis.

MADx can be used in safety assessments of particular weapon types and to support ammunition accident investigations.

We invite other nations to contribute to MADx and in turn gain access to the database.

Terminology

A number of terms are described in more detail on this page.

Category (Severity of the accident)

The severity of an accident should be assigned a category in accordance with the guidance below. The severity of an accident is categorised based on the property damage or loss of life and/or injuries incurred.

- **Critical (Cat A):** An occurrence involving personnel and equipment which causes one or more of the following:
 - Fatality or serious injuries resulting in long-term illness or disability to military personnel or members of the public.
 - Extensive loss, damage to, or contamination of military or civilian equipment in property of multiple facilities, or to the environment.
- **Major (Cat B):** An occurrence involving an ammunition which causes one or more of the following:
 - Serious injuries resulting in hospital treatment in military personnel or members of the public.
 - Loss, damage to, or contamination of the munition or explosive, or to military or civilian equipment or property of a single facility.
- **Severe (Cat C):** An occurrence involving ammunition which causes one or more of the following:
 - Injury requiring medical treatment and time off work but which does not require hospital treatment.
 - Minor loss, damage to the munition or explosive or minor contamination of military or civilian equipment, property, or the environment.
- **Minor (Cat D):** An occurrence involving ammunition which causes one or more of the following:
 - An injury or threat to military personnel or members of the public.
 - Casualty damage to ammunition not affecting performance or safety.

MA2x Accidents Help Multiple Accidents

Reporting Country:
Reporting Country ID:
MA2x ID:
Life cycle phase:
Begin date:
End date:
Damage cost:
Injuries:
Free text:
Description:
Search

Accident 22609 Print Export

ID	22609	OID	11176
Reporting Country	France	Date	04/11/2017
National type	T01	Life cycle phase	T01
Description	Reporting form used to report an incident. See number and government threat to report form used as 10-000		
Location	NUT00002	Administrative	NUP
Bank number	NUP	Weapon type	NUP
Damage code	N	Category	C
Reference	N	Injuries	F
Probable cause	NUP	Primary reason	NUP
Contributing factors			
Connective address	NUP		
Licensee license	NUP		

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Mitigation Techniques for Munitions

MTM is a searchable database containing state of the art mitigation technologies with regards to less sensitive storage configurations and insensitive munitions design methods.

It is intended to support munitions designers, IM boards, program managers and the military by offering a source of potential options or solutions to satisfy today's munitions IM Requirements.

TSO> Propulsion Technology

- 📄 0-165 MTM – Technical specifications
- 📄 0-173 MTM – Easy access online
- 🌐 <https://www.msiac.nato.int/mtm>
- ✓ All approved MSIAC members

MTM provides access to technologies to mitigate the reaction of munitions against IM threats as defined by the NATO IM policy: fast heating, slow cook-off, bullet impact, fragment impact, sympathetic reaction and shaped charge jet. Munitions manufacturers may use it to design less sensitive munitions and containers (e.g. venting, thermal protection). The military will find storage solutions specifically to avoid sympathetic reaction (e.g. barrier, storage arrangement).

A powerful search engine and table provides a short description of the technologies and its related attributes. The numerous criteria allow searching by text, threat, component, category of munitions, mitigation family, configuration, design change and reference. In the detailed view, each technology is fully described and illustrated with picture(s) when available. The user can easily navigate from one technology to another by using the arrows on a keyboard or by swiping on a touch screen.

The application offers the possibility to select a list of mitigations and then print or create a PDF document.

The active behaviour of the application makes it convenient for use with smartphone and tablets.

Every technology is fully referenced, searchable and in certain cases access is granted directly to the source material.



Example 9

Using a thermal imaging camera to inspect for overheating electrical conductors that could be a fire hazard in a control room. The control room is located in a building that is used for the control of the power plant. The control room is used for the control of the power plant. The control room is used for the control of the power plant. The control room is used for the control of the power plant.



Technique	Thermal protection	Component	Field Data
Category	Heat, Hot, Warm	Heat	FCC
Configuration	See Location	See Location	FCC
Field Data	See Location	See Location	FCC

Thumbnail Data: 1/18

Examples (108)

ID	Description	Phase	Component	Category	Technique	Configuration	Permanent modification	Ref
1	Nondestructive testing including Power Cable and for P&ID Form 404.6	FCC	Resistor Motor (Wahhead)	Electric, Motor, Electrical, Resistor	Thermal protection	See Location	Yes	2, 3, 4, 11
2	Nondestructive testing to reduce the NCR2 Resolution Di-30-82	FCC	Resistor Motor (Wahhead)	Electric, Motor	Thermal protection	See	Yes	5
3	A fire resistant was applied to the exterior surface of...	FCC	Propelling Charge	Artillery	Thermal protection	Packed	Yes	6
4	Steel thermal insulating material Thermal side of a heat...	FCC	Resistor Motor (Wahhead)	Electric, Motor	Thermal protection	See Storage	Yes	7
5	Assessment of several types of materials applied to containers and boxes to storage	FCC	Propelling Charge (Wahhead)	Artillery, Direct Fire, Warter	Thermal protection	Packed	Yes	8
6	Assessment of several types of alloys on containers	FCC	Propelling Charge	Artillery, Direct Fire, Warter	Pressure sensing device	Packed	Yes	9
7	Typical Symbols for: 008 (see 174 30) (1) Possible Heat Protection	FCC, NCC	Resistor Motor (Wahhead)	Electric, Resistor	Thermal protection	Packed	No	10
8	Thermal insulating material AQ 250	FCC	Resistor Motor (Wahhead)	Electric, Motor	Thermal protection	See Storage	Yes	11
9	A Series Heat Energy/Heat situation used to identify product...	FCC	Resistor Motor (Wahhead)	Electric, Motor, Resistor	Thermal protection	See Location	Yes	12
				Electric	Thermal protection	See	Yes	13

Example 10

The use of an array of thermal imaging cameras designed for targets. This method can identify and assess heating equipment, during a long time. It would have to be adapted to make it suitable for a production from another plant.



Technique	Thermal protection	Component	Field Data
Category	Heat	Heat	FCC
Configuration	See	See	FCC
Field Data	See	See	FCC

Thumbnail Data: 1/18



SASO is an online tool that enables identification and selection of the appropriate policy, design requirements, environmental and other testing requirements from international and national Standards considered appropriate to support the S3 process.

TSO> Munition Systems

📄 0-155 MSIAC Safety Assessment Software
L-180 SASO v1.2.10 User Guide

🌐 <https://www.msiac.nato.int/saso>

✓ All approved MSIAC members

SASO provides a step-by-step tool to provide fast access to relevant standards and is an enabler for anyone involved or interested in munitions safety. This tool supports anyone working in any capacity, from designers through to final risk and safety assessment.

From the user input the tool selects requirements based on the munition type, features incorporated (e.g. EEDs), applicable international and national standards, environmental lifecycle profile and identified threats.

Standards are selected by providing details of the Lifecycle Environmental Profile (LCEP). These are down-selected by identifying and adjusting phases (storage, carriage) during the life and the potential threat source(s) during each phase.

The output includes relevant tests, standards, policy and design requirements specific to the munition and its lifecycle. All documentation is directly accessible from an up-to-date repository.

Document List (764)

Reference	Title	Nation	File
MILSTD3814C3401a	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment - Methods CE101, CE102, CE104, CE105, CE106, CE109, CE114, CE116 and CE118	United States (US)	
STANAG3999Part49a	Environmental Handbook For Defence Materiel - Part 5: Induced Mechanical Environments - Mechanical Aspects of Handling	United Kingdom (UK)	
STANAG3941434a	Safety Management Requirements for Defence Systems - Part 1 - Requirements	United Kingdom (UK)	
MILSTD3814C3401a	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment - Methods CE101, CE102 and CE106	United States (US)	
FIRPGAT209P12	Doctrine nationale française en matière de munitions à risques abnormaux	France (FR)	
CARADOC000140111	Certification des munitions et explosifs	Canada (CA)	
FIRPGAMEG13M9111	Etatex généraux des matériels - Guide des Choix de la DAT	France (FR)	
ALMCOG1718422a	Inertive Munition - Policy Directive	Australia (AU)	



MSIAC
Mission Safety Information Analysis and Control

Safety Assessment Software Online¹⁴²

Home > Assessments > New Assessment

New Assessment

- Initial Delivery
- Transport Threats
- Depot Storage
- Depot Threats
- Transport to Ammunition Store
- Storage in Ammunition Facility
- Storage Risks
- Transport to forward position
- Transport threats
- Loaded in Self propelled launcher
- Loaded into
- Transport to Depot
- Transport threats
- Storage for Disposal
- No Threats
- Transport to Clipboard

Assessment - New Assessment by Matthew Andrews for None Assigned

General | **Munition** | Environment | Design Documents

Munition

Munition: Land Artillery Ammunition (e.g., 325 and 165 mm) (TC)

Munition name: None Assigned

Munition expected life: 10

Munition description:

This button to save your changes on the server

Threat - Transport threats

Properties | Munition Details | Specific Information | **Select Threat** | Summary

Select Threat

Natural Environment: All; Accidents
 All; Combined Climate Environments (FTE)
 Diurnal Temperature Cycling

Logistic Environment: Acceleration
 Acoustic Noise
 All; Combined Climate Environment

Carriage Environment: Acceleration
 Acoustic Noise
 Ammunition Heating
 All

Human Interactions: Air Operations
 All
 Ballistic Shock
 Combined Environment

Accidents: Small Accident (take off or landing)
 All
 Arrested Landing Pull Off
 Jetburn

Inertive Munition: All
 Ball Impact
 Ball/Case Off
 Fragment Impact



Cost Benefit Analysis Model (CBAM) is available to help member Nations calculate the benefits of introducing Insensitive Munitions (IM) into their munitions inventory. It is intended to assist the decision-making process by informing on the costs and benefits of introducing Insensitive Munitions over the munition lifecycle.

TSO> Munition Systems

- 📄 O-80 Cost Benefit Analysis Studies of the Introduction of IM
L-104 The NIMIC CBAM: User Guide and Input Data Compilation
- 🔗 <https://www.msiac.nato.int/cbam>
- ✓ All approved MSIAC members

CBam is used to compare costs associated with introducing IM versus non-IM versions of the same munition. The tool analyses direct costs, such as development and procurement related costs, as well as potential ones, those associated with accidents or unplanned events. The model employs a Monte Carlo simulation to help assess data uncertainty and results are displayed as graphical representations of the most likely outcome.

Other potential uses for CBAM include:

- Determining life cycle costs of weapon systems (and the life cycle cost comparison between different technologies)
- Risk analysis
- Threat hazard assessment (using the life cycle tree capabilities)



Available as:



IM State of the Art provides a snapshot of system improvements and IM technology trends that provide benefit to the warfighter.

TSD> Warhead Technology

📄 L-101 The State of the Art of IM Design Technology

🌐 <https://www.msiac.nato.int/imsoa>

✓ All approved MSIAC members

imsoa contains information on over 50 systems that are at high level of maturity.

The topics are divided between Land, Sea and Air Launched Systems. The information normally provided includes the performance relative to a non-IM variant for comparison, customers, indication of which nations have the round in service, indication of program status, IM technology, details of energetic fill, mitigation devices, design options, packaging, IM Benefits, Cost comparison IM vs. non-IM, IM Signature, and the IM signature of round compared to non-IM when available.

155/52 Artillery shell: 155-mm LU 211-IM

Performance Comparison		IM Technology
	Control	AP-1000
Penetration	400/2000 (mm)	400/2000 (mm)
Density	1.41	0.70
WEI	1500	7.700

- IM Intra Explosive: AP-1000
- AP-1000: 70% (10% min. 70%)
- Embedded booster (E-200)
- Storage gained 20-round configuration (30% of its cyclic) fast fused -Plugged

IM Benefits (cost analysis)

- Heaval / AP-1000 (AFIC cost sensitive)
- Increased Lethal Cost shell = 5 %

IM Signature

Heaval	LU211-IM	AP-1000	AP-1000	AP-1000	AP-1000
0.00	0.00	0.00	0.00	0.00	0.00

Customers
 French Army = 5,000 rounds in 2004 plus 20,000 in 2006.

*Heavy Fragment Impact 250 g = 2000m/s
 Type III MPAAT - (latest results suggest **)

Available as:



MHCD^x contains Hazard Classification data on items and munitions systems from selected member nations that can be accessed by governmental users from those nations.

- TSO> Safety of Storage and Transport
-  L-215 An International Review of Hazard Classification
-  <https://www.msiac.nato.int/madx>
- ✓ Selected governmental MSIAC members
AUS, BEL, CAN, CZE, DEU, FIN, GBR, LAT, NLD,
NOR, POL, SLO, UKR, USA

MHCD^x typically contains, as a minimum, information on the Hazard (sub) Division, National Stock Number (NSN), and the Net Explosive Quantity (NEQ). Most nations provide regular updates to their national HC data. MHCDx can be used to exchange HC information, which is helpful during the national HC process and in preparation for multinational missions and exercises.

MHCDx is currently available in the original file formats provided by the nations, but there are plans to develop a common database application.

We invite other nations to contribute to MHCDx and in turn gain access to the database.

Available as:



MSAS is a library of munitions and safety related International and national standards considered relevant for the munition safety community and which are not classified.

TSO> Munition Systems

- 📄 L-143 MSAS Database
- 📄 L-144 MSAS User Manual
- 🔗 <https://www.msiac.nato.int/msas>
- ✓ All approved MSIAC members

msas is a library of munitions and safety-related international and national standards considered relevant for the munition safety community and which are not classified. The contents are based on accumulated knowledge and understanding of documents that may be appropriate for as wide an audience as possible within MSIAC nations.

NATO standards are more readily accessible than from the NATO repository and national documents are updated regularly.

MSAS can be used by nations as a readily accessible repository for their own Standards and documents.

MSAS is structured in two different ways:
by nation, type and number
by topic

The structure can be expanded or modified as required.

NEWGATES is a database of common gap test setups and test results. It has been designed to provide scientists and engineers with a comparison tool.

TSD> Warhead Technology

📄 O-89 The NIMIC Excel Worksheets on Gap Tests
L-148 Ed3 NEWGATES Version 1.10 User Guide

🌐 <https://www.msiac.nato.int/newgates>

✓ All approved MSIAC members

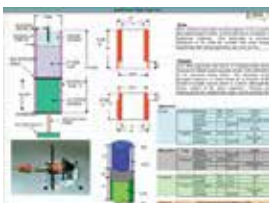
newGATES has been designed to provide:

- Scientists and engineers with a tool, which is easy to use and up to date. It can be used to compare gap tests results and/or calculate critical initiation pressure and critical initiation time
- Modellers with a flexible research tool containing referenced data required to validate models

It also provides the IM community with 6 databases:

- Information about 10 gap tests (description and diagrams, complete with dimensions, scope, principles)
- Pressure calibration curves
- Time calibration curves
- Shock curvature calibration curves
- 1568 gap test results
- 250+ Hugoniot

A module has also been added to calculate analytically the Hugoniot parameters of an energetic mixture from its ingredients. This module can be used to estimate the initiation pressure threshold for the energetic composition itself.



Available as:



TEMPER | Toolbox of Engineering Models for the Prediction of Explosive Reactions

TEMPER is a tool for the prediction of explosive reactions to insensitive munitions (IM) threats. It utilizes a library of empirical or semi-empirical models dedicated to insensitive munitions (IM) assessment.

TSD> Warhead Technology

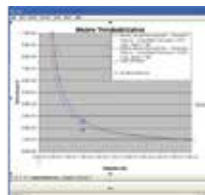
- 📄 0-176 Temper status and recommendations
L-139 TEMPER v2.0 – User's Manual
- 🌐 <https://www.msiac.nato.int/temper>
- ✓ All approved MSIAC members & nations

TEMPER provides a:

- Library of threats, models and parameters to run the models
- Direct selection of threat / mitigation / structure / model from the Graphic User Interface with automatic compatibility management
- Ability to perform parametric or stochastic simulations by varying one or two parameters of the problem
- Ability to draw curves and save results using an embedded Excel workbook

It also includes models for fragment impact, shaped charge, sympathetic reaction and thermal threats such as:

- an MSIAC modified Jacobs-Roslund model that is based on an analysis of many experimental test results and that requires only one parameter
- the implementation of conical fragment that enables simulation of the NATO fragment defined in STANAG 4496 for IM testing
- the modelling of a residual fragment after perforation of a mitigation for conical-ended and parallelepiped fragment. This model will be very useful to simulate the impact of a NATO fragment on bare or packed munitions
- a sympathetic reaction model, SANDI, that is based on a different approach than that of the One on One Warhead model



Available as:





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

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