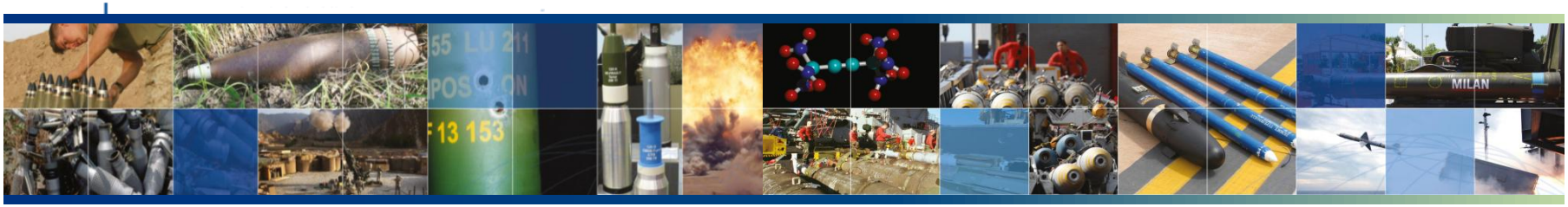
MSIAC

Munitions Safety Information Analysis Center

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



AIMS Advanced Insensitive Munitions Search

IMEMTS 2013 – San Diego, CA, USA

Emmanuel Schultz
TSO Propulsion Technology
+32.(0)2.707.54.47
e.schultz@msiac.nato.int

MSIAC Office
+32.(0)2.707.54.16
info@msiac.nato.int
http://www.msiac.nato.int

The past

- Over the years, MSIAC has developed 6 databases of IM test results:
  - One base per IM threat
  - Easy to populate and use
  - Inclusion of comments and pictures
- Updated every 2 years
- Use of open literature only

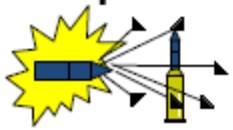
Slow cook-off

Fast cook-off

Bullet impact

Sympathetic reaction

Fragment impact

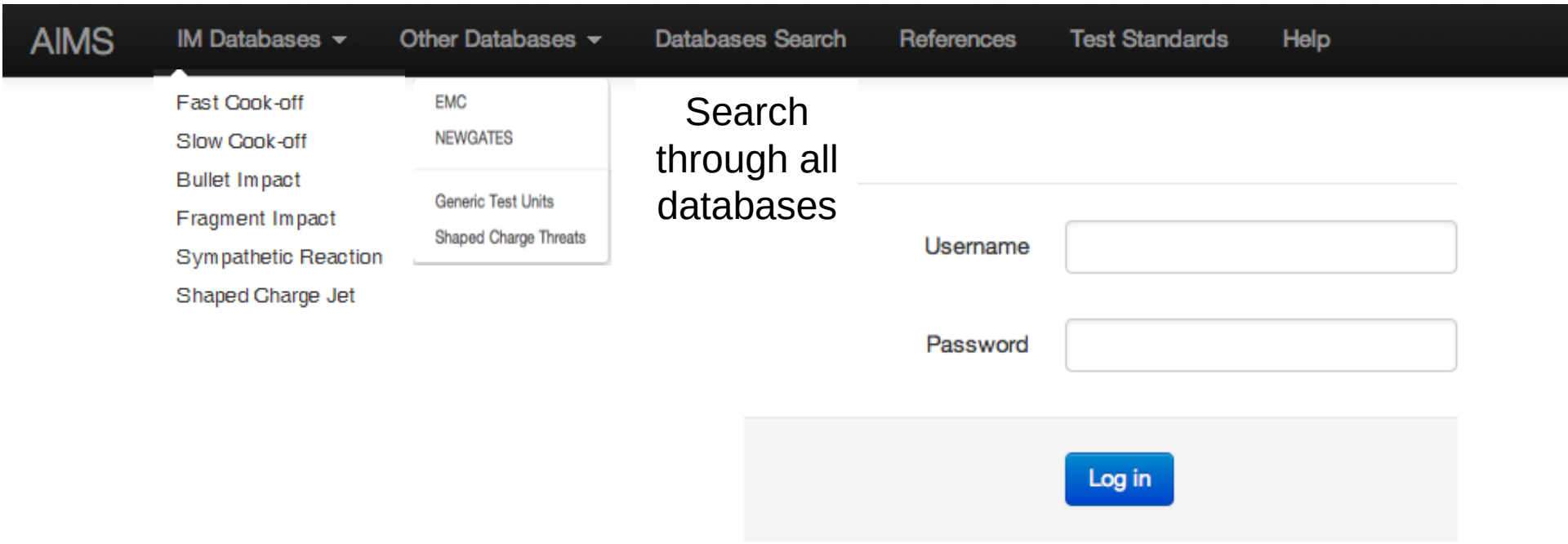


Shaped charge jet impact

Migration

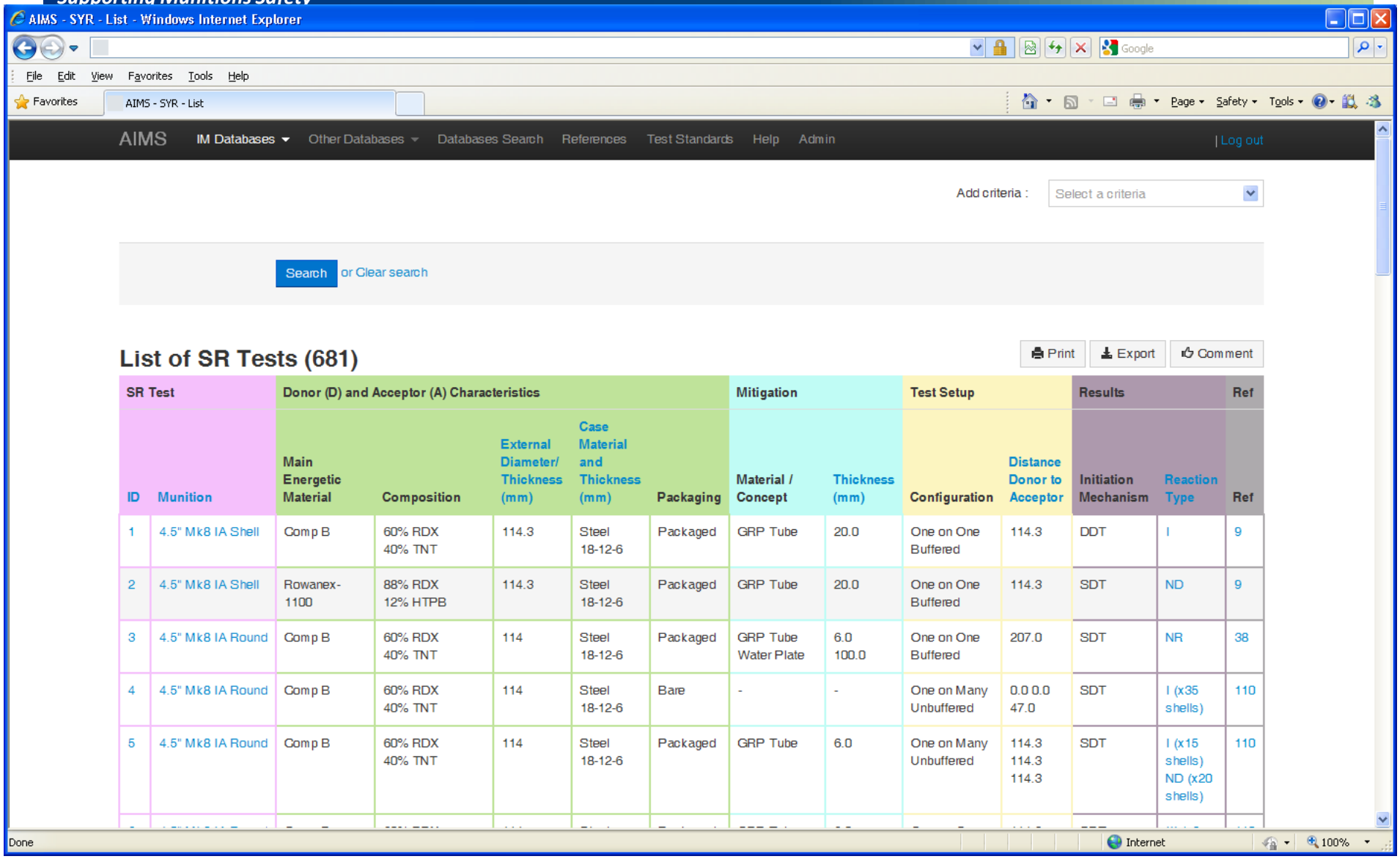
- Excel format well adapted for these data but …
  - The large quantity of data makes it time consuming to find results
  - Need to look through six databases
- Database migration to a web-based environment:
  - Available from anywhere and always up-to-date
  - Unique and powerful search engine to look in all databases with only a few clicks
  - More intuitive search interface compared to excel
  - More information provided
- Contract signed with a company specialized in web application (EMC – SASO):
  - Work started in February 2012 with SYR
  - Final deployment on MSIAC server in January 2013
  - Upgrade contract already granted for the next 3 years

Web Based Platform



Access to a Database

Supporting Munitions Safety



SR Test		Donor (D) and Acceptor (A) Characteristics					Mitigation		Test Setup		Results		Ref
ID	Munition	Main Energetic Material	Composition	External Diameter/ Thickness (mm)	Case Material and Thickness (mm)	Packaging	Material / Concept	Thickness (mm)	Configuration	Distance Donor to Acceptor	Initiation Mechanism	Reaction Type	Ref
1	4.5" Mk8 IA Shell	Comp B	60% RDX 40% TNT	114.3	Steel 18-12-6	Packaged	GRP Tube	20.0	One on One Buffered	114.3	DDT	I	9
2	4.5" Mk8 IA Shell	Rowanex-1100	88% RDX 12% HTPB	114.3	Steel 18-12-6	Packaged	GRP Tube	20.0	One on One Buffered	114.3	SDT	ND	9
3	4.5" Mk8 IA Round	Comp B	60% RDX 40% TNT	114	Steel 18-12-6	Packaged	GRP Tube Water Plate	6.0 100.0	One on One Buffered	207.0	SDT	NR	38
4	4.5" Mk8 IA Round	Comp B	60% RDX 40% TNT	114	Steel 18-12-6	Bare	-	-	One on Many Unbuffered	0.0 0.0 47.0	SDT	I (x35 shells)	110
5	4.5" Mk8 IA Round	Comp B	60% RDX 40% TNT	114	Steel 18-12-6	Packaged	GRP Tube	6.0	One on Many Unbuffered	114.3 114.3 114.3	SDT	I (x15 shells) ND (x20 shells)	110

Browse a Database

Supporting Munitions Safety

AIMS - SYR - List - Windows Internet Explorer

File Edit View Favorites Tools Help

Favorites | AIMS - SYR - List

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Sympathetic Reaction | Test ID 1137 - 4.5" Mk8 IA Shell

Print | Export | Comment | Edit

Munitions

Name	Category	Fire Capability	Submunitions	Purpose	Effects
4.5" Mk8 IA Shell	Artillery	Sea to air/ground/sea	No	General Purpose	Blast Fragmentation

Donor (D) and Acceptor (A) Tested Item Characteristics

Tested Item	Main Energetic Material	Type	Composition	Initiation/Ignition Energetic Material	Type	Composition	External Diameter (mm)	Case Thickness (mm)	Case Material	Packaging
Warhead	Comp B (Cast)	Melt-cast	60% RDX 40% TNT	Debrix-18AS		95.3% RDX 2.5% Wax 2.2% HDK	114	18-12-6	Steel	None

Mitigation					Test Setup Distance				Results		
Concept	Material	Thickness (mm)	Width (mm)	ρ (g/cm³)	Arrangement	Donor to Acceptor (mm)	Donor to Mitigation (mm)	Acceptor to Mitigation (mm)	Initiation Mechanism	Reaction Type	IM Test
Container Plate	GRP Water	3 x2 100		1.0	One on One Buffered	207.0			SDT	NR	Yes

Comment	References
4.5" Improved Ammunition Test performed in all-up-round configuration with MNLF gun propellant 3 packed donors in a stack and 1 packed acceptor separated by a water barrier Simultaneous detonation of the 3 donors Dimensions measured on a test set up picture	38

Sympathetic Reaction Test with 4.5" Mk 8 IA Shells in their Container
Shells Filled with Composition B and Mitigated with Water

Internet

Search a Database

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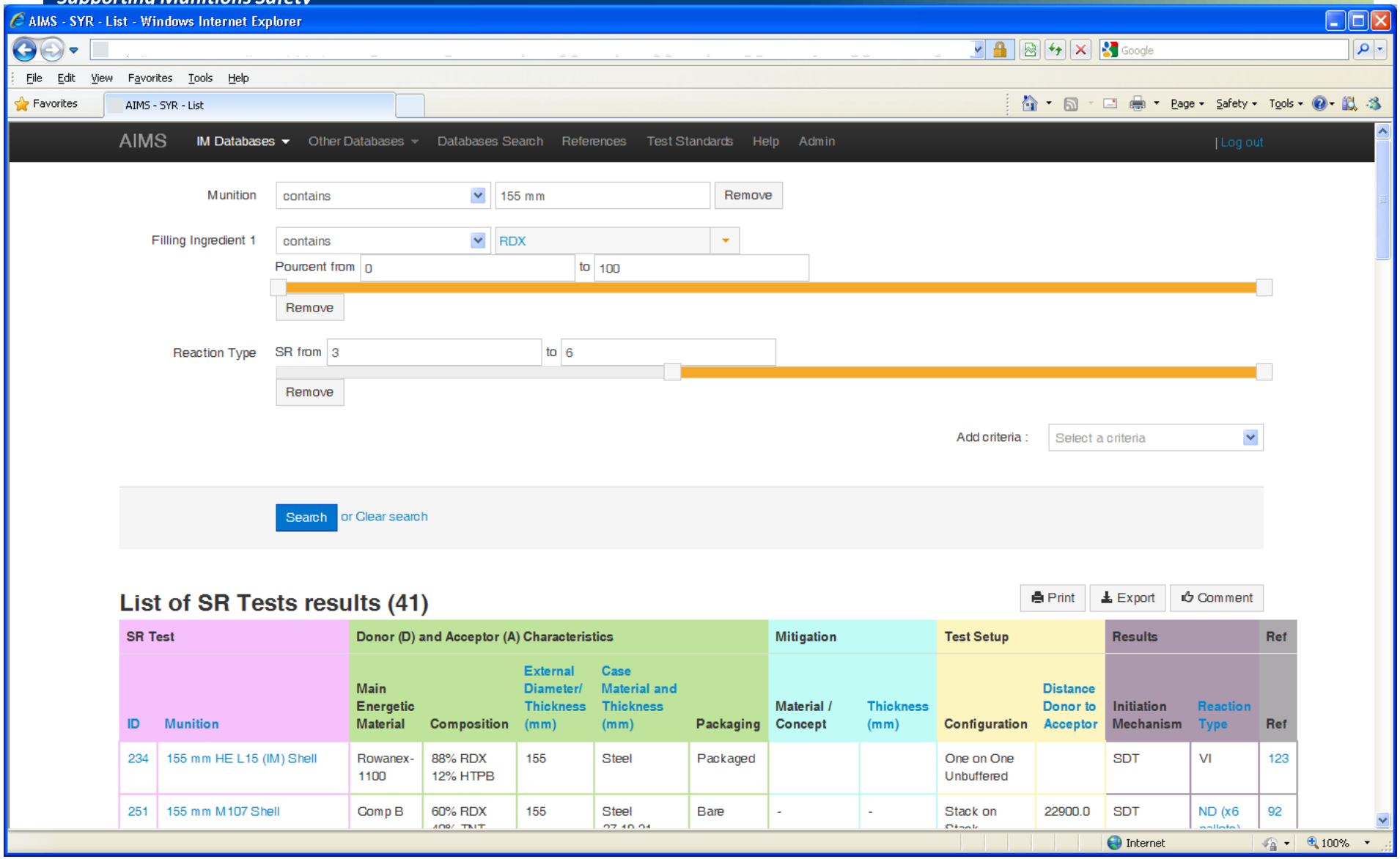
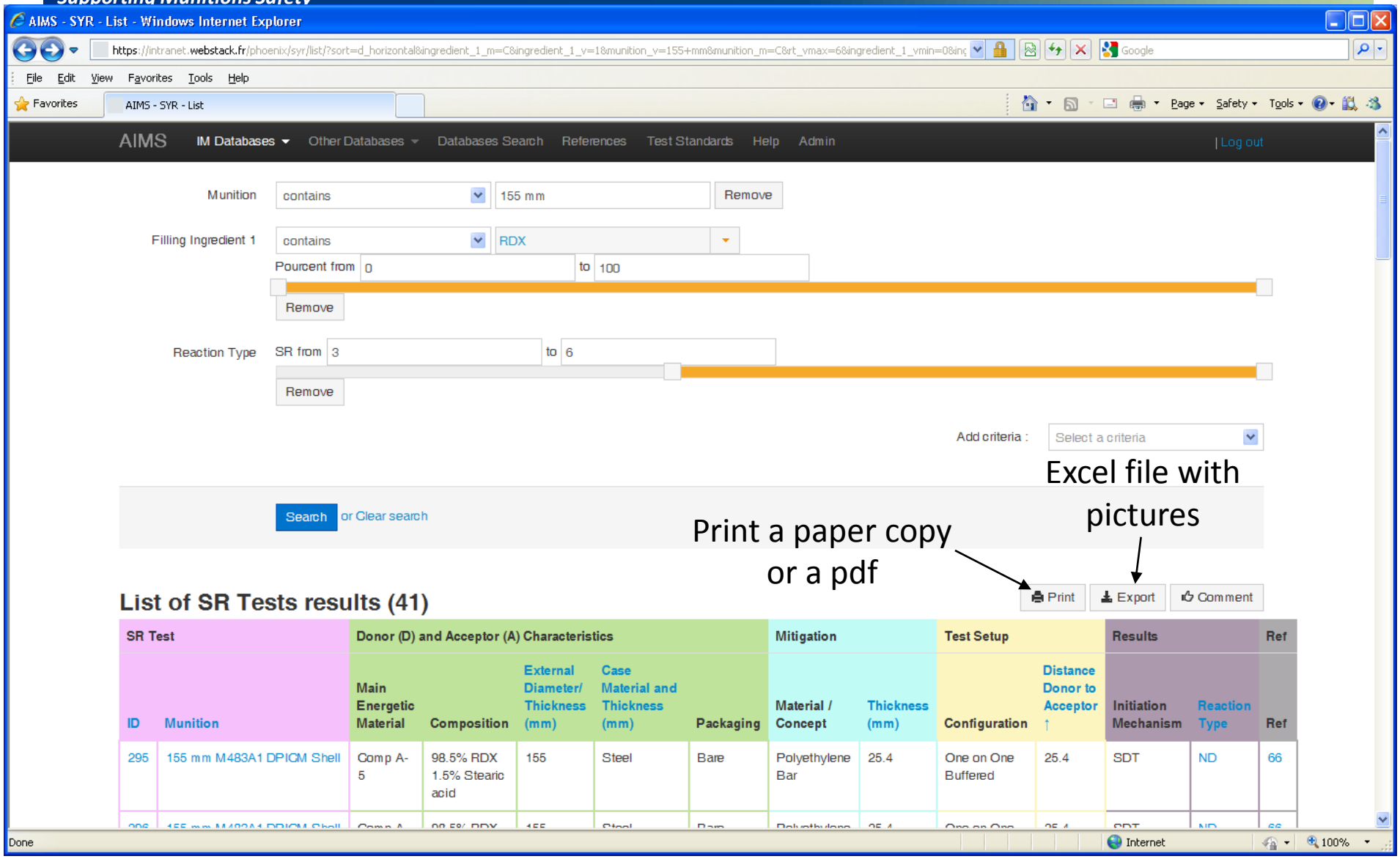


Save Results

Supporting Munitions Safety



SR Test		Donor (D) and Acceptor (A) Characteristics					Mitigation		Test Setup		Results		Ref
ID	Munition	Main Energetic Material	Composition	External Diameter/ Thickness (mm)	Case Material and Thickness (mm)	Packaging	Material / Concept	Thickness (mm)	Configuration	Distance Donor to Acceptor ↑	Initiation Mechanism	Reaction Type	Ref
295	155 mm M483A1 DPICM Shell	Comp A-5	98.5% RDX 1.5% Stearic acid	155	Steel	Bare	Polyethylene Bar	25.4	One on One Buffered	25.4	SDT	ND	66

Bullet Impact Database

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Bullet Impact | Test ID 683 - Tomahawk Missile - WDU-25B Warhead

Print | Export | Comment | Edit

Munitions

Name	Category	Fire Capability	Submunitions	Purpose	Effects
Tomahawk Missile - WDU-25B Warhead	Cruise Missile	Sea to sea	No	Anti-ship	Blast Fragmentation

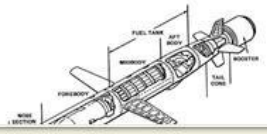
Tested Item Characteristics

Tested Item	Main Energetic Material	Type	Composition	Initiation/Ignition Energetic Material	Type	Composition	External Diameter (mm)	Case Thickness (mm)	Case Material	Packaging
Warhead	Picratol H-6 (Dual)	Melt-cast/ Melt-cast	**Picratol** 48% TNT 52% Ammonium Picrate **H-6**	Not Documented			419		Steel	Bare

Mitigation				Test Setup								Results		
Concept	Material	Thickness (mm)	ρ (g/cm³)	Bullet Type	Initial Velocity (m/s)	Firing Distance (m)	Impact Velocity (m/s)	Burst or Single	Burst Timing (m/s)	Aim Point	Test Standard	Number of Tests	Reaction Type	IM Test
None				12.7 AP			850 ± 60	Burst	50 ± 10	Center	MIL-STD-2105A	4	I (x3) NR (x1)	Yes

Comment	References
Warhead called Bullpup, Mk40 mod 0 or WDU-25 Explosive filling composed of two compositions Picratol and H-6 Picratol put at the warhead front	130 255

TOMAHAWK (BGM-109 B/C-2) Sympathetic Detonation Testing and Hazard Arc Determination



Done | Internet

Slow Cook-Off Database

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Search or Clear search

- ✓ Select a criteria
- Munition
- Fire Capability
- Category
- Purpose
- Effect
- Item
- Energetic Material
- Filling Ingredient 1
- Filling Ingredient 2
- Filling Ingredient 3
- Energetic Material Type
- Initiation/Ignition Energetic Material
- External Size
- Case Thickness
- Case Material
- Packaging
- IM Tests Only
- IM Standard Reactions
- Reference
- Mitigation Concept
- Mitigation Material
- Mitigation Thickness
- Heating Rate
- Reaction T°
- Reaction Type (overall)

Slow Cook-Off (175)

SCO Test		Tested Item Characteristics					Mitigation	Test Setup					
ID	Munition (Tested Item)	Energetic Material	Composition	External Diameter/ Thickness (mm)	Case Material and Thickness (mm)	Pack.	Family / Name / Material	Heating rate (°C/Hr)	Preheating T° (°C)				
3846	105 mm M915 DPICM Shell (Warhead)	PAX-2A	85% HMX 9% BDNPA/F 6% CAB	105	Steel	Packaged	Container / PA117 / Steel	27.8	65				
3847	105 mm M915 DPICM Shell (Warhead)	Comp A-5	98.5% RDX 1.5% Stearic Acid	105	Steel	Packaged	Container / PA117 / Steel	27.8	59				
3849	105 mm Modular Charge - Denel (Gun Propellant)	SSE-075	NC DNT	105	Combustible	Bare	None / /			Horizontal	V	127	435

Databases Search

- Common search interface to look through all the databases at the same time

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Search or Clear search

0 Fast Cook-off | 0 Slow Cook-off | 10 BI Tests | 6 FI Tests | 8 SR Tests | 0 Shaped Charge Jet

SR Test		Donor (D) and Acceptor (A) Characteristics					Mitigation	Test Setup		Results		Ref
ID	Munition (Tested Item)	Main Energetic Material	Composition	External Diameter/ Thickness (mm)	Case Material and Thickness (mm)	Packaging	Material / Concept / Thickness (mm)	Configuration	Distance Donor to Acceptor	Initiation Mechanism	Reaction Type	Ref
1366	120 mm M934A1 Mortar (Warhead)	Comp B (Cast)	60% RDX 40% TNT	120	High Fragmentation Steel ~13.5		Container	One on Many Buffered		SDT SDT DSDT USDT	I	25 27 89
1365	120 mm XM1101 EFSS Mortar (Warhead)	PBXW-128	77% HMX 23% Binder	120	Steel 8 (estimated)		Container	One on Many Buffered		SDT SDT DSDT	ND	83
1371	120 mm MECAR Mortar (Warhead)	Comp B (Cast)	60% RDX 40% TNT	120	Steel		GRP Container	One on Many Buffered		SDT	I	75
1370	120 mm Smoke EFSS Mortar (Warhead)	White Phosphorous	White Phosphorous	120	Steel		Container	One on Many Buffered		SDT SDT DSDT	ND	83
1367	120 mm M934A1E1	HBU-88 B	12% HTPB	120	High		GRP	One on Many		SDT	ND	25

https://intranet.webstack.fr/phoenix/core/search/?munition_m=C&munition_v=mortar&external_dt_m=D&external_dt_vl=120&external_dt

Internet

Display by IM Signature

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External Size: Diameter from 81 to 81 mm Remove

Based on the item shape: diameter for a cylinder and thickness for a parallepiped.

IM Tests Only ☑ Remove

If ticked, only tests carried out in accordance with IM STANAGs are displayed.

Select a criteria

Search or Clear search

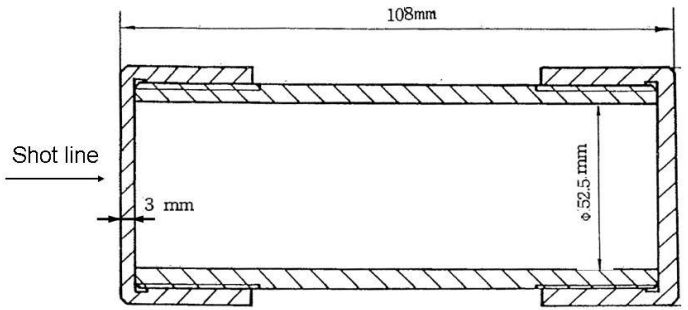
4 FCO Tests | 6 SCO Tests | 4 BI Tests | 3 FI Tests | 15 SR Tests | 3 SCJ Tests | 13 IM Signatures | Export

Munition	Item	Main Energetic Material	Packaging	IM Test Results						Comments
				FCO	SCO	BI	FI	SR	SCJ	
81 mm HE Mortar	Warhead	Comp B	Bare			IV		I (x2)		BI - 850 m/s SR H-V-D (mm) = 203.2 - N/A - N/A
81 mm HE Mortar	Warhead	TBI-60	Bare		V					SCO - N/A °C/Hr
81 mm HE Mortar	Warhead	TBI-60	Packaged	V		NR (x3)	NR (x3)	NR		FCO - Fuel Fire BI - 850 m/s FI - 2400 (m/s) SR H-V-D (mm) = N/A - N/A - N/A
81 mm M816 Infrared Illuminating Mortar	Gun Propellant	M-38	Bare		V (x2)					SCO - 3.3 °C/Hr
81 mm M816 Infrared Illuminating Mortar	Gun Propellant	M-38	Packaged	IV						FCO - Bonfire

Generic Test Units (GTU)

- Provides a list of commonly used Generic Test Units

Chinese Pipe Nipple Bomb (PNB-C)



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List of Generic Test Units

ID ↑	Designation	Acronym	Country	Shot Line					Overall Length (mm)	Reference
1	3.2" Generic Shaped Charge Test Unit	3.2" GSCTU	USA	Radia					193.0	40
2	6.9" Generic Shaped Charge Test Unit	6.9" GSCTU	USA	Radia						40
3	Chinese Generic Test Unit	CGTU	China	Axial					127.0	132
4	Chinese Pipe Nipple Bomb	PNB-C	China	Radial	Steel	3.0	52.5	58.5	102.0	138
5	EMTAP Pipe Nipple Bomb	PNB-E	UK	Radial	Steel	9.5	57.0	76.0	120.0	332
6	GEMO 3 Liters Thick Wall Test Unit	GEMO 3L	France	Radial	Steel	10.0	123.0	143.0	260.0	15
7	GEMO 90 Gun Propellant Combustible Cartridge	GEMO Poudre C	France	Radial	Combustible Case	3.3	87.5	94.1	360.0	258

Shaped Charge Threats

- Provide a description of commonly used Shaped Charges

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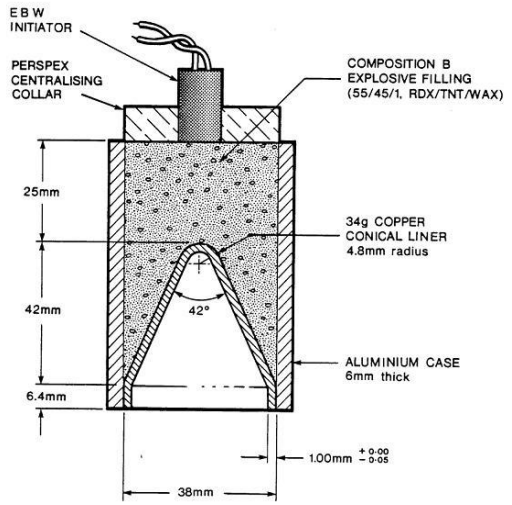
List of Shaped Charge Threats

ID	Designation	Munition Type	Country	Charge Diameter (mm)	Charge Caliber (mm)	Charge Weight (g)	Explosive Name	Expl Mas							erences
1	Rockeye	Bomblet	USA	53.6	50	600	Comp B	174							
2	MRL 38	Laboratory	Australia	50	38		Comp B								
3	SC 25	Laboratory	Germany	26	21		RDX based	18							
4	M9A1	Laboratory	USA	55.6	41					44	1	101.6	8		393
5	DM1348	Bomblet	Germany	42.3	33	292	Comp A5	43.5	Copper			0			
6	DM1383	Bomblet	Germany	42.2	36	293	Comp A5	43.5	Copper			15			
7	GE-PG7 Mock-up	Rocket	Germany		75				Copper			150	7.2	3,2	407

MRL 38 Shaped Charge



Reference View

List of References (437)

Ref.

Development and Assessment of Low Sensitive Melt-cast and Pressed Explosives

Authors: Mesnil R. and Aumasson R.
Symposium, Report Number: IMEMTS
Year: 2004

This reference is used for the following Bullet Impact Test Results:

Test ID	Munition Name (Tested Item)	Main Energetic Filling	Material / Concept / Thickness (mm)	Bullets Characteristics (Velocity)	Reaction Type
1035	155 mm LU211-M Shell (Warhead)	XF-13333		12.7 AP (850 m/s)	V (x1) NR (x6)

This reference is used for the following Fragment Impact Test Results:

Test ID	Munition Name (Tested Item)	Main Energetic Filling	Material / Concept / Thickness (mm)	Fragment Characteristics (Velocity)	Reaction Type
1557	155 mm LU211-M Shell - GEMO 3L GTU (Warhead)	XF-13333		Φ 31.6 mm Steel Cube Flat Shape (2000 m/s)	III (x1)

Test Standards

- Access to NATO standard related to IM

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Test Standards

Title	Standard	Edition	PDF in English	PDF in French
POLICY FOR INTRODUCTION AND ASSESSMENT OF INSENSITIVE MUNITIONS	STANAG4439	3	PDF	PDF
GUIDANCE ON THE ASSESSMENT AND DEVELOPMENT OF INSENSITIVE MUNITIONS	AOP-39	3	PDF	
LIQUID FUEL / EXTERNAL FIRE, MUNITION TEST PROCEDURES	STANAG4240	2	PDF	PDF
SLOW HEATING, MUNITIONS TEST PROCEDURES	STANAG4382	2	PDF	PDF
BULLET IMPACT, MUNITION TEST PROCEDURES	STANAG4241	2	PDF	PDF
FRAGMENT IMPACT, MUNITIONS TEST PROCEDURES	STANAG4496	1	PDF	PDF
SYMPATHETIC REACTION, MUNITION TEST PROCEDURES	STANAG4396	2	PDF	PDF
SHAPED CHARGE JET, MUNITIONS TEST PROCEDURES	STANAG4526	2	PDF	PDF

Merci pour votre attention