



A new member company:

**EXPAL SYSTEMS joins IMEMG**

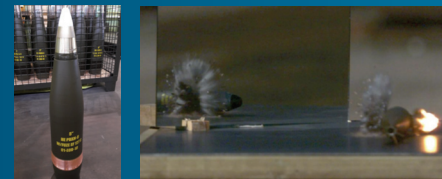


EXPAL is the leader in the ammunition and explosives sector in Spain, as well as one of the main providers of demilitarization and EOD services. Among its range of products, which are highly integrated and high performance, EXPAL produces IM ammunition with different technologies, such as Aviation munitions, Torpedo warheads Land and Naval artillery projectiles, Mortar grenades and Engineering Materials for the Armies, Navies and Air Forces.

EXPAL has successfully delivered in the last dates a first batch of 5" HE IM projectiles equipped with IM Proximity Fuzes and coupling two PBXN loading technologies, this successful case enlarges our classic Naval IM capacities, based on Torpedo and Air-to-Ground Warheads, and Underwater Warfare.

Completing our Naval IM proposal, EXPAL is currently qualifying IM payloads for Mortar Grenades destined, initially, to Ma-

rine forces, where the on-board safety requirements are stricter, and where EXPAL's know-how presents clear advantages to our customers.



# 2018 IM card

**IMEMG IM card**

Easy to handle to compare the different national regulations and the test requirements for IM.

REPRESENTATION OF THE IM REQUIREMENTS											
THREAT	TEST PROCEDURES	STANAG	NATO		UK	GERMANY	ITALY		FRANCE		USA
			STANAG	STANAG	STANAG	STANAG	STANAG	STANAG	STANAG	STANAG	
Magazine / store fire or aircraft / vehicle fuel fire	FH	4240	V	V	V	V	V	V	V	V	V
Fire in adjacent magazine, store or vehicle	SH	4382	V	V	V	V	V	V	V	V	V
Small arms attack	BI	4241	V	V	V	V	V	V	V	V	V
Most severe reaction of some munition in magazine, store, aircraft or vehicle	SR	4396	III	III	III	III	III	III	III	III	III
Fragmenting munitions attack	FI	4496	V	V	V	V	V	V	V	V	V
FI Heavy Fragment	FI	4496	V	V	V	V	V	V	V	V	V
Shaped charge weapon attack	SCJI	4526	III	III	III	III	III	III	III	III	III

Type of Response (defined in AOP39)				
	English	Français	Deutsch	Italiano
VI	No Reaction	Absence de réaction	Keine Reaktion	Nessuna Reazione
V	Burn	Combustion	Abbrand	Combustione
IV	Deflagration	Eclatement	Deflagration	Deflagrazione
III	Explosion	Explosion violente	Explosion	Esplosione
II	Partial detonation	Détonation partielle	Teilweise Detonation	Detonazione parziale
I	Detonation	Détonation	Vollständige Detonation	Detonazione

Munition Test Procedures					
stimuli	English	Français	Deutsch	Italiano	
FH	4240	External Fire	Incendie externe	Schnelle Aufheizung	Incendio rapido
SH	4382	Slow Heating	Echauffement lent	Langsame Aufheizung	Incendio lento
BI	4241	Bullet Impact	Impact de balles	Projektilbeschuss	Impatto con proiettili di piccolo calibro
SR	4396	Sympathetic Reaction	Réaction par influence	Sympathetische Reaktion	Reazione per influenza
FI	4496	Fragment Impact	Impact d'éclat	Splitterbeschuss	Impatto con scheggia
SCJI	4526	Shaped Charge Jet Impact	Impact de jet de charge creuse	Hohlladungsbeschuss	Impatto con dardo di carico cavo

**IMEMG Expert Working Groups**

These groups mainly focus on capturing the knowledge from munition design specialists and vulnerability test teams.

Hazard Assessment & Classification group proposes regular improvements for Vulnerability Test STANAGs and AOPs; its views are considered by NATO MSIAC and AC326 experts. Cost & Benefit Analysis group designed ASSIM software (Assistant to Specify a Signature for an IM) dedicated to look for the best compromise between performance and costs for the IM

signatures set by procurement agencies and stakeholders for new munitions.

The group on Fast Cook-off is dedicated to allow the introduction of cook-off tests using gaseous fuels (see page 1).

The Computer modelling group assesses the various tools that are used or that could be used to predict the response to IM threats; exchanges are based on feedback from numerical modelling experts.

The group on the Effects of ageing works on the possible influence of explosives

ageing on IMness of munitions; a major topic for the IM community and the Forces; Energetic Materials broad knowledge of industry experts is key and will help bring pertinent technical answers to this question.

IMEMG's positions are supported by an expert community from IM industry.

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## EDITORIAL



Dr. Ron E. Hollands  
President

Our Group is present one more time in 2018 at EUROSATORY .

All stakeholders such as EDA, NATO Procurement Agencies, MSIAC, Industry and other organisations from many nations are combining their efforts and collaborating to create effective IM solutions for the defence market. These collaborative efforts on In insensitive Munitions are in line with the Smart Defense Policy expressed by the NATO Secretary General as a vehicle to promote more intelligent defence spending by member Nations.

IMEMG priorities are to support stakeholders during the IM product's lifecycle for safer storage, logistics and operations. IMEMG brings its expertise and knowledge and aims to forge a harmonized understanding into the IM community.

Technically qualified representatives comprising scientists, engineers and technologists from IMEMG member companies are collectively working with globally recognized experts on number of pertinent IM-related issues such as munitions hazards and UN Classification, and prediction of IM response to threat stimuli.

In 2017 IMEMG organized another IM Day event acknowledged by participants as a great success.

Government bodies, the armed services and other stakeholders presented updates on their respective domestic procurement situations. The increasing need for munitions users to have better information on IM in order to reduce front line risk was expressed with the continuing objective of better defining the IM signature required for operations. The aim/objective is to define the IM signature they will need in operational conditions, as soon as possible.

Find in this NEWSLETTER a summary of the main positions expressed during the IM Day event in Amsterdam.

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### Expert Working Groups, a way to facilitate a cohesive IM approach?

> Marie DeBats, EWG chairman

In order to classify munitions as insensitive, positive results to the NATO standard Fast Heating (FH) test must be accomplished. The FH test as described in STANAG 4240 requires the test munitions to be engulfed in a jet fuel fire. Due to the environmental impact of burning jet fuel and the high cost of performing such a standard test, attempts have been made to replace jet fuel with an alternative method of heating the munitions, in representative conditions.

The opening to alternative fire tests for FH assessment including IM qualification will significantly shatter usual IM design



Liquid Fuel Fire  
(Courtesy of SBTC, Sweden)



LPG Fire  
(Courtesy of WTD91, Germany)

processes. In order to mitigate the risks, the IMEMG has established a dedicated Expert Working Group gathering key FH actors within IMEMG companies: trial engineers, chemical experts, thermal experts, project leaders in charge of IM design, etc.

By pooling their knowledge and experience and focusing on harmonization needs, while respecting programs confidentiality, they have issued a deepened review of recent experimental and numerical studies on standard and alternative FH trials, lay the foundation of an harmonized approach of FH trials within IMEMG companies and bring significant progress in fire heat flux measurements.

Such collaborative action is facilitating a cohesive approach to IM design and strengthen the leadership of IMEMG companies regarding IM design.

## In sensitive Munitions procurement in NATO Nations: Current situation and future developments

2017 IM Day was the opportunity to gather several NATO Nations and Bodies representatives for a successful event to present the different methodologies, decision processes and current evolutions. Here we present a summary of the positions expressed.



## Spain to host the next IMEMTS

The fifth In sensitive Munitions and Energetics Materials Technology Symposium (IMEMTS) to be held in Europe will take place on 21-24 October 2019 in Sevilla, Spain. This international gathering of chemists, systems designers and engineers provides a venue for exchange and dissemination of the latest research namely in synthesis, formulations and system design, as well as a review of IM policies and testing standards to enhance harmonisation of safer munitions being produced by the industry. It all aims at improving munitions safety as well as effectiveness.

### 🇺🇸 NATO keynote address

"All stakeholders have an interest in the safety and security of our soldiers, sailors, airmen and marines and in the use of IM. They are combining efforts and collaborating to place the right solutions on the market as quickly as possible. Those collaborative efforts for In sensitive Munitions fit into the Smart Defence Policy expressed by NATO Secretary General in order to let us spend money smartly".

### 🇬🇧 UK

IM compliance is a full system approach which includes energetic materials, munition design and external mitigation techniques.

However, variability of test results and absence of mechanisms comprehension make authorities decision difficult and place great emphasis on trusting AOP protocols.

The idea is not to design safer munitions just to pass the tests, but manufacturers have to give confidence in IM design solutions.

UK adopted a new procurement process to replace IM waiver proposals. IM signature is to be agreed by all parties from manufacturers to final authorities when reviewed through the life cycle.

Such policy requires all parties to work closely in order to meet the IM requirements as far as current technologies allow, whilst taking into account users expectations.

### 🇩🇪 German

The German Explosives Law does not apply to Forces, but the rules are issued by German MOD. Forces do have to implement NATO Standards such as STANAG 4439 for IM procurement. Forces establish requirements but waivers require MOD approval.

No particular IM policy document exist but statements for ammunition safety and IMness are part of the regular procurement process. Tests are performed in compliance with AOP39 (except FCO which is performed with LPG instead of fuel)

New procured munitions have to fulfill IM requirements and Project managers have to provide evaluations of IM performances as they sign and manage contracts with Industry.

A central office for Technical Ammunitions Safety was created to coordinate ammunition safety evaluations. This office can provide advice to project managers as an independent body.

### 🇫🇷 France

Considering that Stanag 4439 is not applicable, France has adopted, as many other nations, its domestic approach to IM. France decided that IM specifications are mandatory for any new acquisition program. They do have to be the highest level reasonably achievable and tests for IM signature must be performed.

France has a unique authority for approval of IM signature but also for Hazard Classification assignment according to the UN Orange Book. Nevertheless any waiver must also be approved by Armed Forces staff.

IM signature is based on hazards acceptance and munition reaction effects according to equipment's classes. The safety analysis takes into account the different life cycle phases and possible configuration from storage to use.

### 🇳🇴 Norway

Norway adopted an IM Policy to give guidance during the procurement and information on waiver process (based on THA for weapon platform and IM cost).

For in-service munitions there is a requirement to identify IM status and fix priorities for IM implementation.

One main IM goal is a cost-effective design for safe transport, storage and handling. When in accidental conditions, IM are mixed with a substantial quantity of HD 1.1 classified munitions, IM might also contribute to dangerous effects. This induces difficulties to assess logistic benefits. Norway wants also to work on a specific marking on IM munition to make a difference.



MSIAC provides a large number of products and tools developed over the last 25 years on design, procurement, safety assessment and IM test results.

The database includes 1300 formulations with performance comparisons and provides guidelines for energetics choice (performance vs insensitivity). MSIAC provides a database on gap test results and tools to predict explosive reaction type under shock, taking into account mitigation technologies such as barriers created by packaging or low-density liners.

A web-based application of mitigation techniques is accessible via the MSIAC portal. This database is focused on technologies already tested and applicable to warheads, cartridges and rocket motors.

MSIAC remains a focal point and encourages all parties involved into IM field to identify themselves.



EDA is in favour of reducing energetic materials sensitivity and to focus on the certification process and certification for ammunition safety.

EDA brought the countries together to work on characterising the priorities. A partnership is established with the industry to provide products that the Forces need, together with examining/evaluating possible solutions to cope with certain requirements.

All Nations representatives express their strong views for munition user and Forces staff to be more and more involved in IM procurement decision processes.

WHAT'S  
ON

### A few challenges still ahead

NATO Nations have released IM policies for quite a time, yet these remain not binding. Waivers processes have been implemented for several years.

To begin with, the perception of the need was heterogeneous. Some nations came across real serious accidents; some others did not experience any accident for decades.

In addition, decision at domestic level, may depend on various authorities.

The mix between IM and non-IM is still a tough situation to handle; indeed, all different safety plans as well as risk/hazards analysis, only consider the most dangerous one. This helps disseminate the idea that there are no gains with IM.

There is no devoted marking on IM munition to highlight the difference and facilitate storage management in operational conditions.

Most often domestic regulations do not apply during external operations. Even if every depot is subject to a safety study, there are no clear drivers to deal with safer munitions. Even NATO publications such as AASTP1 and 5 do have to be taken into account. Munitions concerned are those assigned to HD 1.1/1.2/1.3.

According to UN rules for transport, the Hazard Division assigned does not sufficiently reflect the safety enhancement facing all unplanned stimuli. IM and HD are not the same issue and both do not fully inform about the real risk of dangerous effects. On logistic constraints aspects, NATO Storage sub-division (DR 1.2 Unit risk/SsD 1.2.3) should also be implemented. Safer storage conditions in operational conditions and deployments remain difficult to handle.

A working group has been settled at NATO level to refresh NATO Policy and guidance on IM. The objective is to combine the IM process with Hazard Classification for HD and the risk assessment methods. The UK MoD is leader on this issue, with the support of MSIAC.

The aim is to prepare draft proposals for the UN experts to improve the Tests and Criteria UN Manual. The idea is to assess IM signature and Hazard Classification with homogeneous criteria, response descriptors and tests procedures..

Thanks to the various collaborative programs and methodologies enhancements involving users, these difficulties are about to be over.