INSENSITIVE MUNITIONS EUROPEAN MANUFACTURERS GROUP (IMEMG)

EXPERT WORKING GROUP ON COST & BENEFIT ANALYSIS

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ASSIM: THE HELP-TO-DECISION TOOL TO OPTIMISE IM SIGNATURE SPECIFICATION

ABSTRACT

A Cost Benefit Analysis (CBA) approach can be used to demonstrate the economic arguments to justify the costs associated with the introduction of Insensitive Munitions (IM) – Munitions à Risques Atténués (MURAT). Tools such as CBAM and ACB have been developed by MSIAC and IMEMG to estimate the costs to comply with a required IM level. This analysis involves the comparison of the various ownership costs across the life cycle of the munition to identify savings that could be made with the use of IM.

*A CBA approach has also generated the need for derivative tools not directly linked to cost calculations. The IMEMG Expert Working Group on CBA started developing the help-to-decision tool ASSIM (**A**ssistant to **S**pecify a **S**ignature for an **IM**/Murat – **A**ide à la **S**pécification d'une **SI**gnature IM/**M**urat) as a means for the various stakeholders to discuss and apply ALARP principles to IM specification.*

Though manufacturers aim to meet the requirements of STANAG 4439, only a few of the munitions currently manufactured are fully IM compliant. This raises the question: why reach a full STANAG 4439 compliance if other means can lead to acceptable risks? For a given threat, would it be reasonable to accept a Type III instead of a required Type V to ease the requirement? If the question is considered over the entire life cycle of the ammunition, are there sufficient arguments to support such a decision? The ASSIM tool was developed to tackle these questions. With no calculations, the aim was to provide a structure to facilitate discussion of IM requirements between the manufacturer and other stakeholders during the specification phase.

The first release of ASSIM will be presented to highlight the primary functions of the tool. The feedback received from beta testers will also be reported, and a number of new functions will be proposed to develop and improve the tool.

1 INTRODUCTION

The Insensitive Munitions European Manufacturers Group (IMEMG) is a European Organisation grouping the leading armament companies working with Insensitive Munitions (IM) technologies. A total of 21 major companies from Austria, France, Germany, Italy, Norway, Sweden and United Kingdom are members of this association created eleven years ago. IMEMG is the extrapolation at the European level of the French "Club MURAT" created in 1991.

IMEMG is the voice of the industry expertise in the field of IM technologies, regulations and policies. This organisation is also acting as a focal point of contact for members' domestic authorities, the European Defence Agency (EDA) and the Munitions Safety Information Analysis Centre (MSIAC). Aiming for increased operational benefits for the Armed Forces, IMEMG:

- supports the harmonisation of international IM policies & regulations with an emphasis on domestic implementation methods;
- facilitates the enforcement of international standards for the manufacture, storage, transport and testing of IM products during their entire life cycle;
- promotes IM policy, regulation and sharing of IM technological progress worldwide.

The organisation is governed by a board of Directors. The Annual General Assembly defines the programme of work for the year to come, creating Expert Working Groups (EWGs) whenever necessary. In 2011, five EWGs were created with the following topics assigned:

- Fast Cook-Off (FCO) test procedures
- Computer models for IM Performance
- Hazard Assessment and Classification
- Effects of Ageing
- Cost and Benefit Analysis

This paper is the result of the work prepared by the Cost and Benefit Analysis EWG.

2 COST AND BENEFIT ANALYSIS BACKGROUND

The increased safety and survivability offered by IM – Munitions à Risques Atténués (MURAT) have clear benefits from an operational point of view. IM bring increased safety for soldiers and survivability for combat platforms, enhancing battle winning capability and reducing consequences of peacetime accidents. In addition, there are opportunities to realise logistical benefits with the reduction of regulatory constraints associated with the reduced risk of accidental detonation.

With a confirmed interest in IM, there has been a need for industry and users to improve the analysis supporting the introduction of IM. A Cost Benefit Analysis (CBA) approach is often used by the community (National Defence Organisations, Operational Forces and Services, Industry) to consider the pros and cons of IM.

As military budgets tend to decrease, it becomes vital to be able to justify the cost and the content of any new project. The methodology defined and provided by CBA can be applied to a particular system in order to define its performance and allow comparison with the competition. Any actor on the defence market is interested in monitoring the CBA rules and the outputs that can be expected.

Benefits achieved by the development of specific regulations for IM may be illustrated by applying CBA methods over the entire life cycle *from cradle to grave* (i.e. across the complete Manufacture to Target / Disposal Sequence (MTDS)). Tools dedicated to this aspect may be used to assist in quantifying potential cost savings provided by IM at various stages of the MTDS [1; 2]. IM provides enhanced safety during peacetime phases of the MTDS (production, storage, transport etc.) as well as during military logistics operations. A better understanding of these improvements when preparing future regulations will benefit all stakeholders.

In this context, tools dealing with CBA were developed at the beginning of 2000s. These tools were based on the use of a defined life cycle of the munition to account for the global cost of ownership through the MTDS. Despite a demonstrated interest, these tools were only used occasionally to consider generic cases: it is often difficult to discuss the costs of a specific system due to the quantitative data embedded in the analysis. There is an aspiration to use additional tools excluding quantitative aspects to permit a greater flexibility in exchange and to push forward IM implementation.

In accordance with North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) 4439, participating nations are obliged to assess the performance of munitions against the required IM signature. These requirements are ambitious and few munitions currently in development or in mass production are fully compliant. Waivers are needed to the munitions currently in service and the need for an "As Low As Reasonably Practicable" (ALARP) IM specification is becoming more and more urgent.

Based on that observation, EWG on CBA members have proposed to put in place a methodology to compare:

- A specified signature (by default baseline is STANAG 4439)
- The best possible signature that can be achieved with available technologies

and to use this comparison in order to identify a compromise that would be acceptable based on the analysed risks.

The method consists of defining the munition's life cycle and specifying acceptable reaction levels for each stage or elementary situation with respect to each of the threats identified in STANAG 4439. The analysis ends by establishing a raw signature for the munition, which is determined using the lowest reaction level (i.e. the most insensitive one) for each threat. The comparison can then be made between the requirements of STANAG 4439 and the best possible signature that can be achieved with available technologies. Showing the number of situations leading to this raw signature, it is then possible to structure an argument, analysing the gaps and the hazards associated with an ALARP signature.

The aim of this paper is to present the tool developed using this new approach, the ideas promoted by the tool, the feedback received on the potential interest of such a tool, and the possible routes for future development.

3 SUMMARY OF CBA TOOLS

Estimates of the benefits that could be expected with IM insertion are of interest to many in the defence community. Methodologies have been proposed and developed into software to enable CBA studies, the aim being always the same: to determine the key cost drivers when comparing a non-IM product with an envisaged IM solution.

At the beginning of the 2000s, a two-part workshop was organised by the NATO IM Information Center (NIMIC) (former name of MSIAC) regarding risk assessment and CBA [3]. It was agreed that the assessment of risks across the whole life cycle required consideration of the sequence of events leading to and resulting from a hazardous event (i.e. threat leading to a stimulus, probability of the stimulus, leading response, probability of an event, effect of the event upon the surroundings, etc.). Despite difficulties in defining appropriate CBA methodologies, it was noted that several models and programs had been developed; these are briefly discussed below.

<u>CBAM: a tool developed by MSIAC</u>

Unlike the Cost Benefit Analysis (COBEAN) tool developed by the Chief Inspector of Naval Ordnance (CINO) (role now part of the UK Ministry of Defence (MoD) Defence Ordnance Safety Group (DOSG)), the Cost Benefit Analysis Model (CBAM) developed by NIMIC/MSIAC incorporates more generic life cycles that can be applied to a range of munitions and service environments. Though the tools require a significant amount of data as an input, once this is provided, they allow a complete CBA to be conducted.

The CBAM tool is able to calculate the cost benefits associated with the introducing IM into service [4]. The analysis is based on a user-created life cycle tree for the studied munition: direct costs associated with purchase and use of the munition (procurement, transport, storage, etc.) and data on the risks and consequences of initiation of the munition are entered into CBAM. These inputs are used by the model to generate the complete ownership cost over the entire life cycle of the munition. This calculation can be used to make a direct comparison of costs associated with IM and non-IM versions of the same munition.

ACB: a tool developed by IMEMG

In addition to these tools, the Analyse Coût/Bénéfice (ACB) from IMEMG was also identified as being of interest because it featured the most of the parameters agreed by the IM community for CBA: for example at first stage of analysis:

- Pilot NIMIC methodology (F. Möller) is used as a basis,
- CBA simulation considers the entire life cycle of the munition,
- The model must have the capability to simulate munitions with different levels of insensitivity.

With ACB, the analysis is comprised of three main phases:

1. Construct the life cycle of the munition,
2. Collect and enter the data describing required technical and economical parameters,
3. Analyse the results and to validate data input.

In the ACB software, the life cycle of the munition is described with a life cycle tree showing the various phases of the munition life and the relevant threats or incidents that may occur during each phase. This tree structure is subdivided into four levels:

1 - **The studied case**:	The baseline munition and its corresponding IM version in a given life cycle are considered. It is possible to deal with several cases in parallel: for example, comparison of several similar munitions with different IM profile levels relative to the baseline munition, or incorporating different assumptions into the life cycle.
2 - **The sequence**:	The munition life cycle is divided into separate operational phases which can be preceded or followed by storage periods on the national territory. Every sequence is characterised by a geographic zone of deployment and a military status (peace, crisis or combat).
3 - **The elementary situation**:	Every sequence is defined by a succession of storage, transportation and mission steps on identical or different platforms. Each individual storage, transportation or mission step is referred to as an elementary situation because it is not possible to subdivide it further.
4 - **The event**:	Every elementary situation can be the subject of one or several accidental or deliberate threats that generate a specified response.

Within the ACB software, every element of the tree structure, including every studied case, every sequence, every elementary situation and every undesirable event, is also referred to as a node. Data is required at each node to perform the analysis.

The Möller formula is the core of the ACB software and is the basis of the CBA calculations applied to the specified munition and life cycle. It determines benefits which are dependent on earnings and cost differences, between referenced and planned munitions.

4 ASSIM OVERVIEW

ASSIM functions

ASSIM is a tool to aid the specification of an IM signature for a new munition or an existing munition to be upgraded. The specification process consists of the following steps:

1. Identify elementary situations of the life cycle that can lead to a potential event,
2. Choose the threats that could cause the munition to react in these situations,
3. Assign a reaction level for each threat and situation,
4. Perform analysis to converge towards an IM signature (referred to as the unique or raw signature),
5. Provide illustrations to support discussion between stakeholders and specification of the required IM/signature.

The aim of the ASSIM software is to follow a structured approach to identify an achievable IM signature requirement, and to record the rationale to justify this choice. The tool should be able to be used in parallel with a CBA tool, such as ACB, to provide the economic considerations necessary to support the decision making process. To ease this interface between the two tools, the ASSIM tool will be developed such that it shares common functions with the ACB tool wherever possible. The intended interaction between the two tools is illustrated in the following diagram:

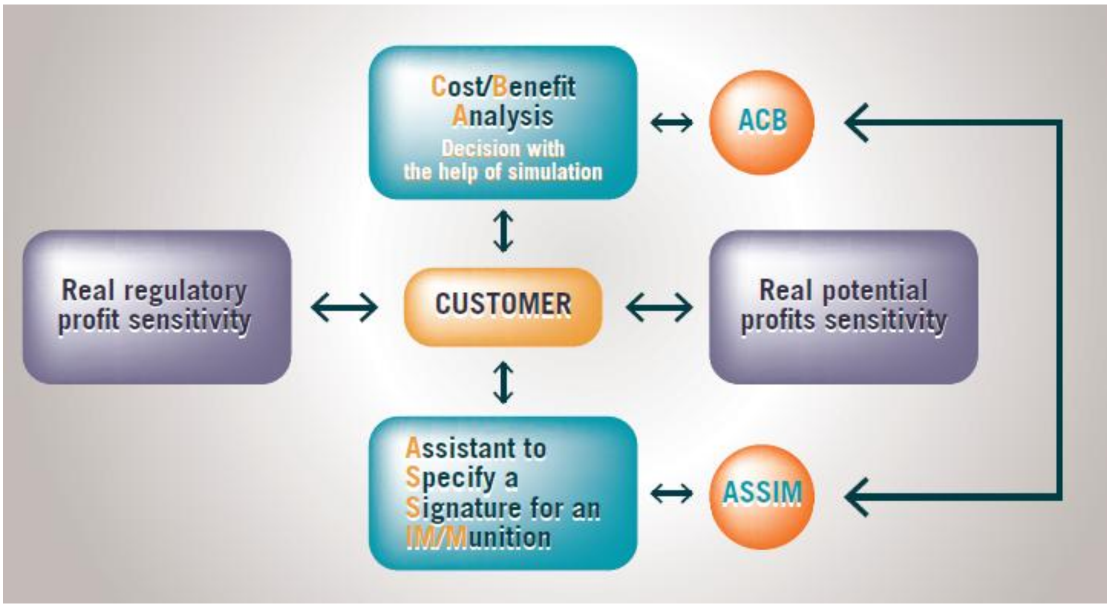

Figure 1 : ASSIM tool position with respect to ACB tool

With the aim of ensuring commonality between the tools, the four levels of analysis described previously for CBA with ACB are reused as the basis for defining the life cycle of a munition in ASSIM:

1 - **The studied case**	1. Case n°1
2 - **The sequence**	1.1. Sequence n°1
3 - **The elementary situation**	1.1.1. Storage n°1
4 - **The event (threat)**	1.1.1.1. Fast Heating **or** 1.1.1.3. Bullet Impact **or …**

For each elementary situation, all potential hazardous events are listed. A reaction level is assigned to each STANAG 4439 threat (or “aggression”) to describe the required response of the munition in each elementary situation. The reaction level runs from Type I for a detonation to Type VI for no reaction. There may be different reaction levels assigned for a given threat when considering the various elementary situations.

Once the definition of all potential hazardous events is complete, ASSIM is able to perform the analysis. This consists of selecting the least violent response (i.e. the most difficult to achieve) for each threat, and using these results to generate the required IM signature (raw / unique signature) for the munition. It is then possible to compare the signature requirement with the IM performance and signature of available products and technologies. Identifying and analysing the gaps between the requirement and possible solutions will aid the decision and selection process.

ASSIM prototype

The first stage of analysis with ASSIM consists of constructing a tree to describe the life cycle of the munition. This process is illustrated in the following images taken directly from the software:

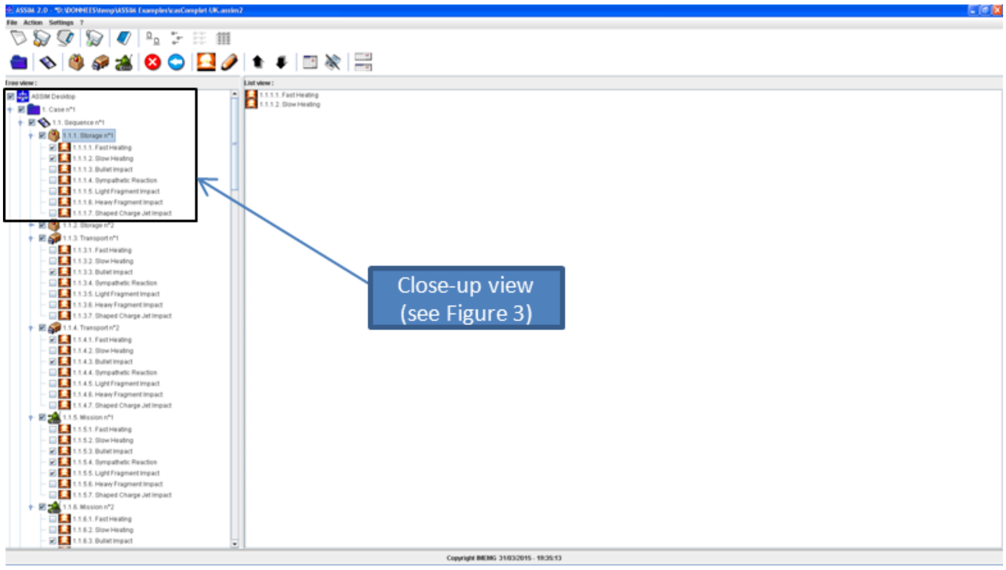

Figure 2 : ASSIM main window - example of a life cycle tree

The four levels used in the analysis (case, sequence, elementary situation and threat) are developed, as shown below:

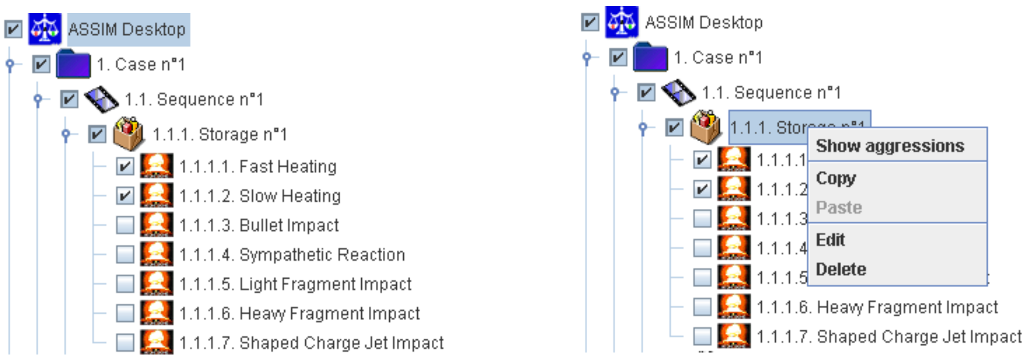

Figure 3 : Close-up view of Figure 2 (left) and right-click menu on an elementary situation (right)

All possible threats are listed for each of the elementary situation ("Storage n°1" in the example above); the six threats identified in STANAG 4439 are included, along with the additional Heavy Fragment Impact (HFI) threat considered in the French Direction Générale de l'Armement (DGA) requirement for MURAT** and MURAT*** specifications.

At this stage, the aim is to identify the possible threats associated with the given elementary situation, and to assign the required reaction level for each of these threats. If Fast Heating (FH) and Slow Heating (SH) are chosen, as shown on Figure 3 (left), the following windows are shown when "Show aggressions" is selected using the right-click menu (see Figure 3 right):

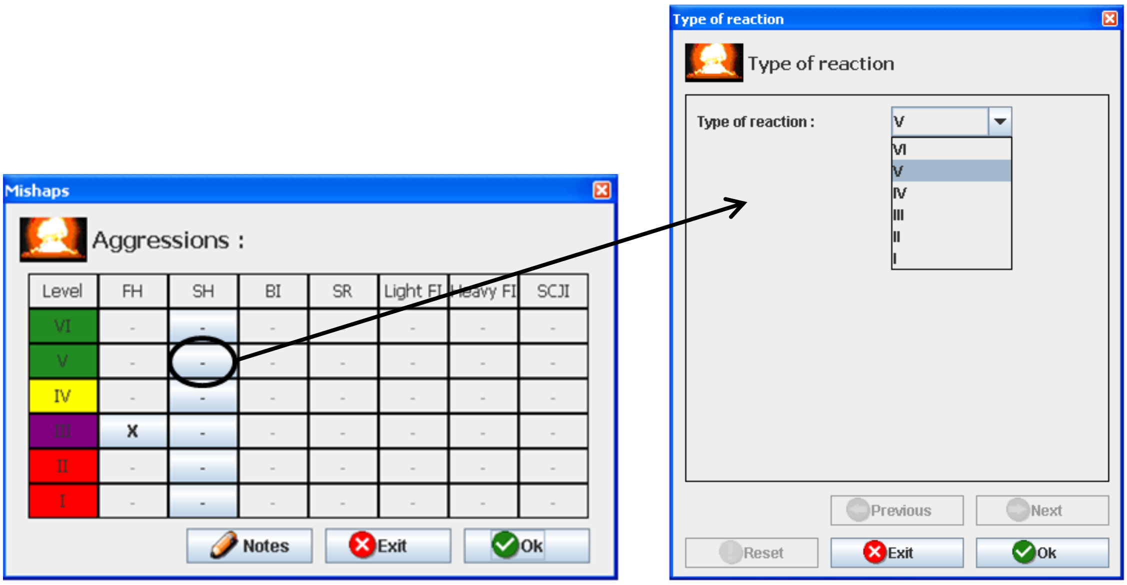

Figure 4 : Type III reaction level selected for FH (left) – a Type V will be chosen for SH (right)

Note: to be consistent with STANAG designation, Light Fragment Impact should be called Fragment Impact.

The example in Figure 4 (left) shows that a Type III reaction level has already been selected for the FH threat. To assign a Type V reaction level for the SH threat, the user clicks the appropriate cell in the matrix, as highlighted in Figure 4 (left), which opens the selection menu shown in Figure 4 (right).

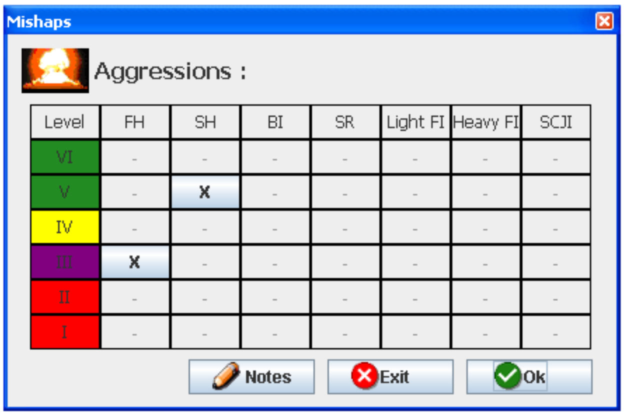

Figure 5 : Reaction levels assigned to the FH and SH threats when selected in Figure 3 (left)

Using the 

button will open a window in which comments could be written. For example, from one sequence to another, the configuration of the munition studied can be different and can influence reaction level assignment. It can be noted in this comment window for information.

Once every threat selected for the given elementary situation (see Figure 3 left) has been assigned a required response, the same process is carried out for the next elementary situation in the munition's life cycle. In this example, a second storage elementary situation ("Storage n°2") has been identified (see Figure 6), which is then followed by a transport elementary situation:

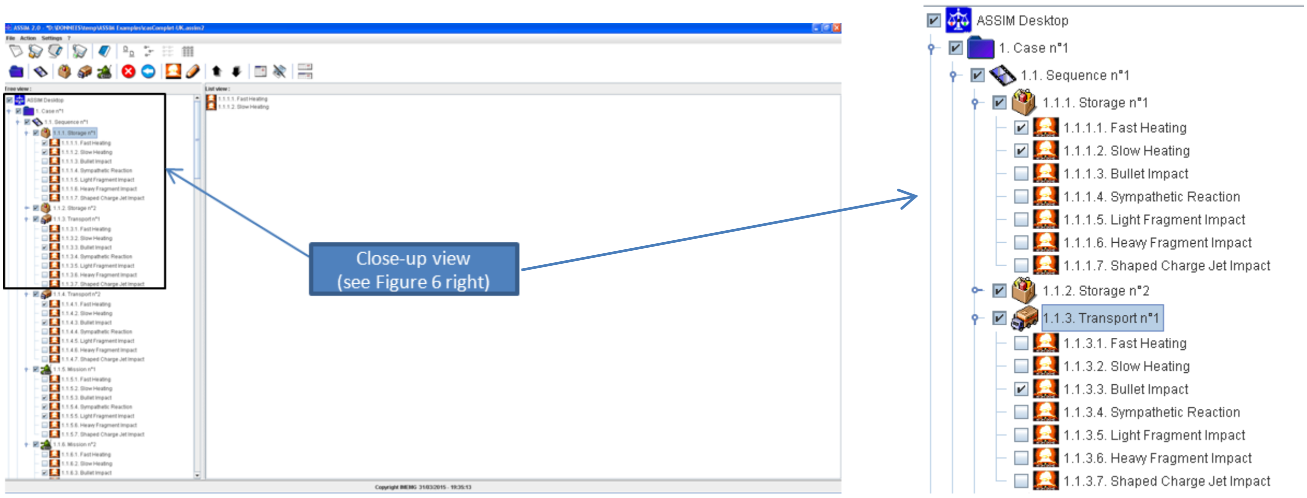

Figure 6 : Progress in defining the life cycle: a transport elementary situation

Figure 6 shows a "Transport n°1" elementary situation with a Bullet Impact (BI) threat identified.

It is possible to copy an elementary situation, a sequence or even the whole case in order to save time when constructing the complete life cycle for the munition. The copying procedure duplicates all nodes in the structure under the selected element and it has to be made at the parent level. An example is shown below, where a copy of the selected case is pasted at the ASSIM Desktop level (i.e. the “parent” of the case):

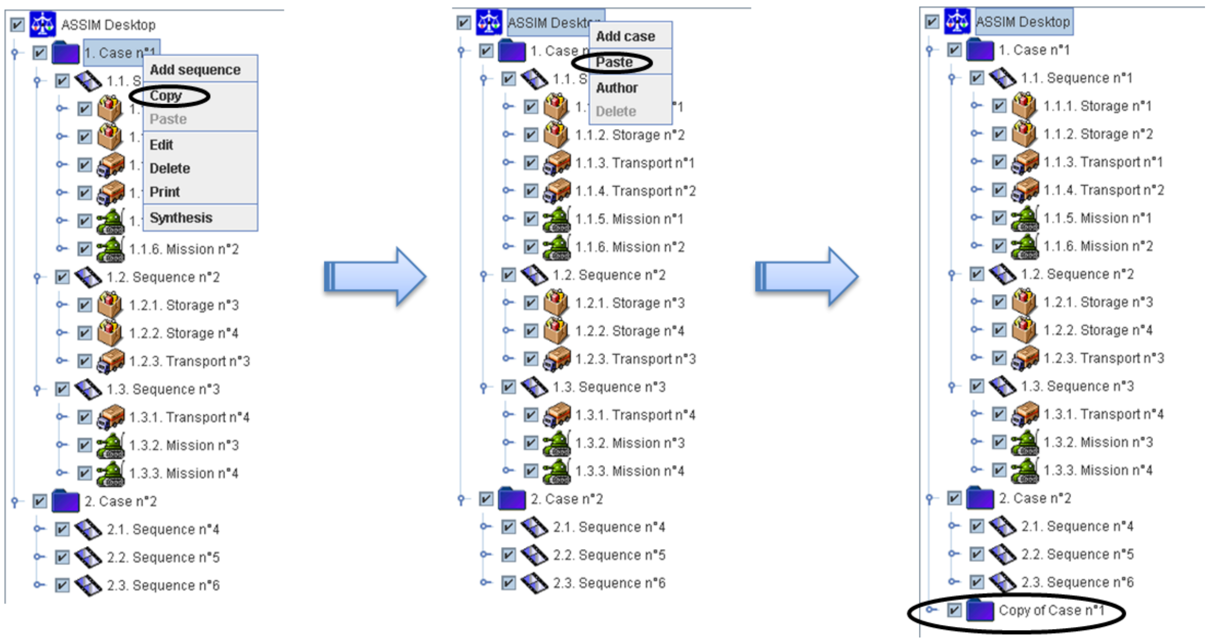

Figure 7 : Example of a copying with a case at the ASSIM Desktop level

This copying process provides a simple method to reproduce and assess similar scenarios with only a small number of changes to the life cycle of the studied munition. The addition of comments directly at different levels of the tree allows any differences to be clearly identified and traced, as illustrated below:

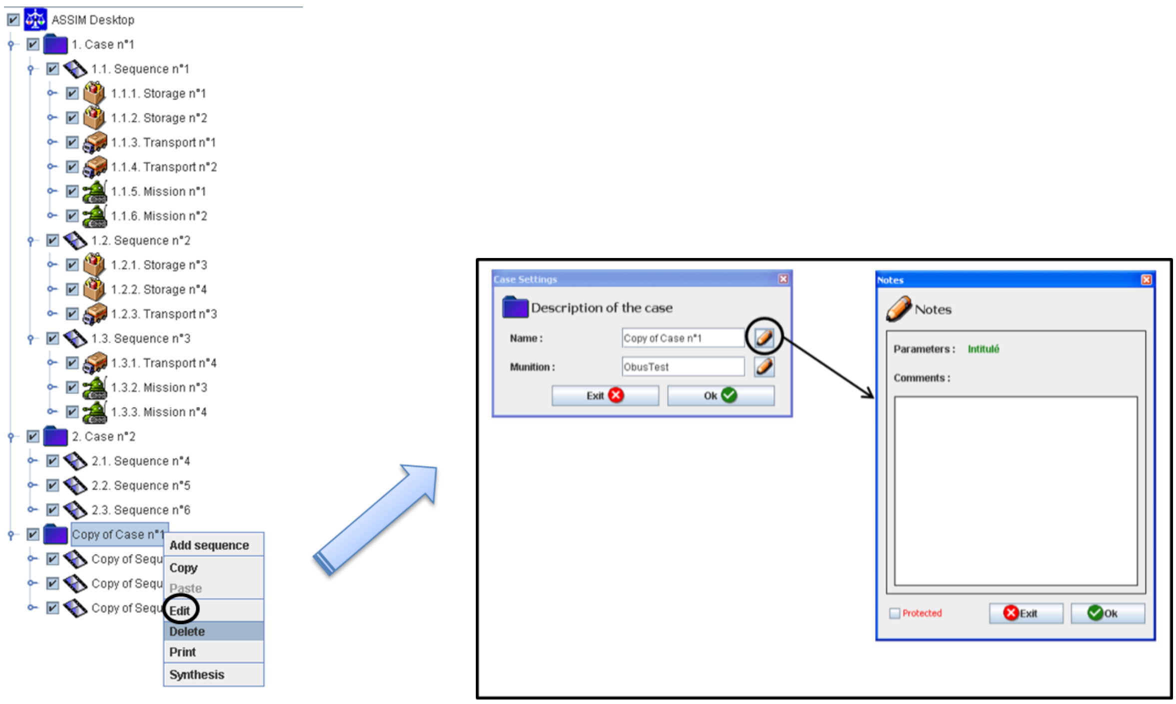

Figure 8 : Example for a comment added to a "case" node

The tool has been developed with both English and French interfaces to allow greater flexibility and use by a wider community.

5 ASSIM RESULTS AND DISCUSSION

ASSIM results

ASSIM software is still under development, with the current prototype including only the key functions in order to promote the approach used by this "help-to-decision" tool. The main results generated by the prototype tool are:

- a synthesis table summarising the different reaction levels for each threat for the case studied,
- a unique signature considering requirements for all the elementary situations considered,
- a comparison between signatures for two different cases.

These three outputs can be produced using icons on the ASSIM toolbar, as illustrated below:

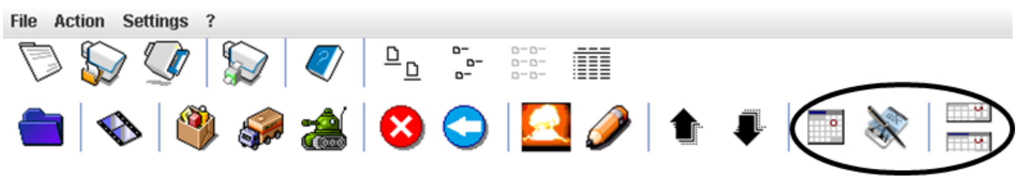

Figure 9 : Icons giving access to ASSIM results

Figure 10 : Details of icon functions

For the example considered in this paper, all the elementary situations were assessed, with the appropriate threats and reaction levels assigned. Using the icon "Launch a case synthesis" on the ASSIM toolbar (see Figure 10 left), the following summary table can be generated:

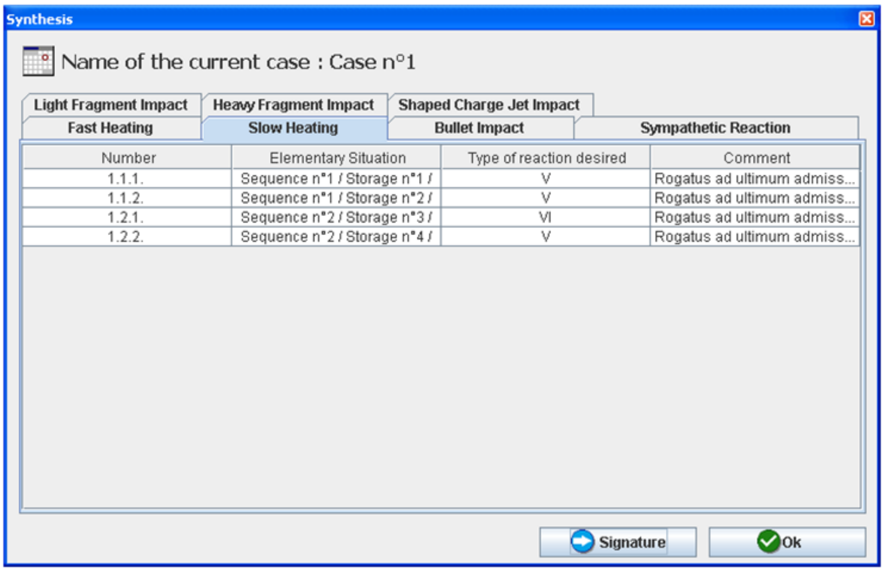

Figure 11 : Synthesis table: detailed results for SH

The summary table provides detailed results for each of the seven threats considered in the analysis, including:

- the number of the node considered in the life cycle tree structure with the corresponding elementary situation,
- the reaction level required for each elementary situation,
- any comments added to the node (note, the ASSIM prototype currently populates this column with generic placeholder text).

Figure 11 above shows the summary table for the SH threat. Figure 12 below shows a similar table for the BI threat, where, in this instance, the nodes have been ranked by response type (by double clicking on the header for the reaction column:

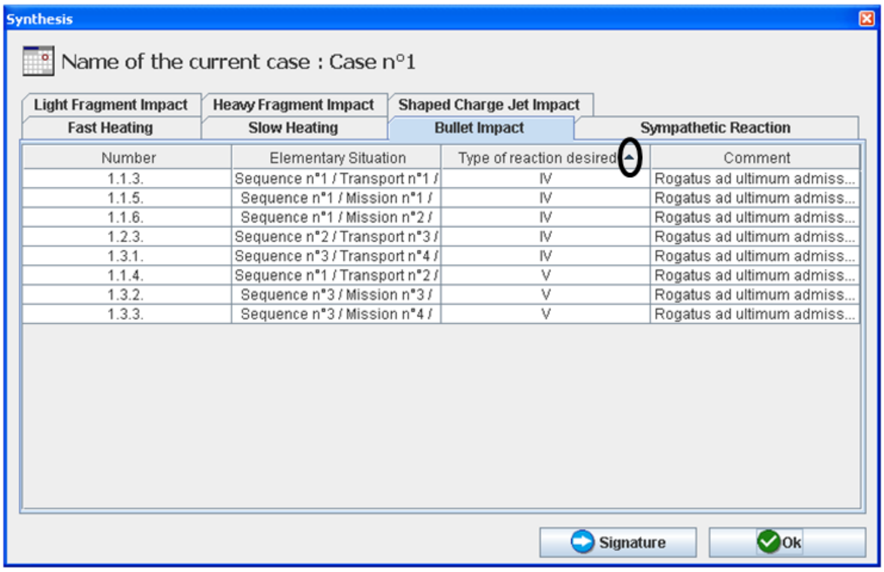

Figure 12 : Detailed results for BI with ranking

Once this table has been reviewed, the unique signature can be generated by clicking on the 

button in the case synthesis window (see Figure 11 and Figure 12), or from the toolbar icon shown in Figure 10 (centre). The signature for the munition assessed in this example is shown in Figure 13 below:

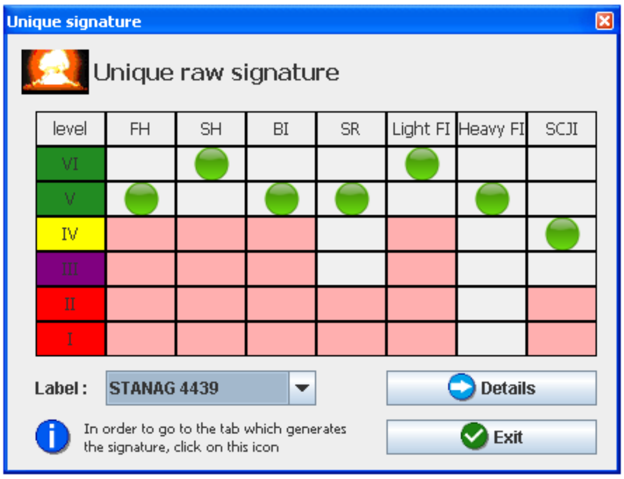

Figure 13 : Signature result given for the fictitious example

As discussed previously, this unique signature represents the compilation of the least violent response (i.e. the most difficult to achieve) required for each of the threats identified across the various stages of the life cycle for the munition. This resulting signature can be directly compared to the IM requirements defined in STANAG 4439 (Figure 13) or the different MURAT signatures specified by the French DGA using the "Label" menu shown in the signature window. An example is given in Figure 14, which shows the MURAT*** requirement with a Type III response for HFI:

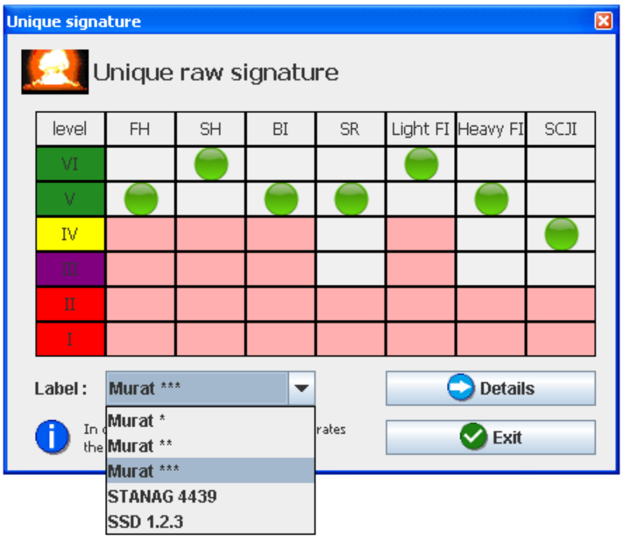

Figure 14 : “Label” menu with list of defined IM signatures (such as MURAT***) available for comparison with the unique signature generated for the munition

The number of situations associated with the different threats and reaction levels (collected in the synthesis table) can be displayed in the signature window to illustrate the distribution for each of the threats and demonstrate that the least violent response is included in the overall signature for the munition. These detailed results can be viewed by clicking on the  button in the signature window:

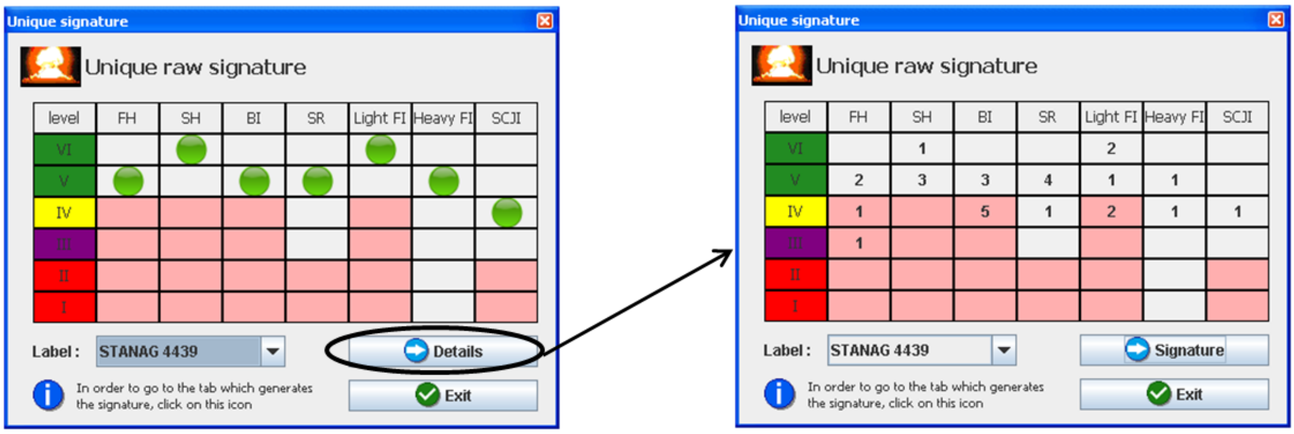

Figure 15 : Detailed results leading to the unique signature

Once the baseline case describing the IM requirements has been defined, the process of assigning reaction levels to identified threats over stages of the life cycle can be repeated (using the copying method described previously) with an IM solution offered by a manufacturer. This "IM solution" can then be directly compared with the unique signature that defines the IM requirements for the munition. The comparative results can also be generated by clicking on the ASSIM toolbar button presented in the right of Figure 10. Two differences are highlighted in the example given in Figure 16; the "IM solution" (Case n°2) has a less violent response to the Bullet Impact (BI) and Shaped Charge Jet Impact (SCJI) than is required (Case n°1):

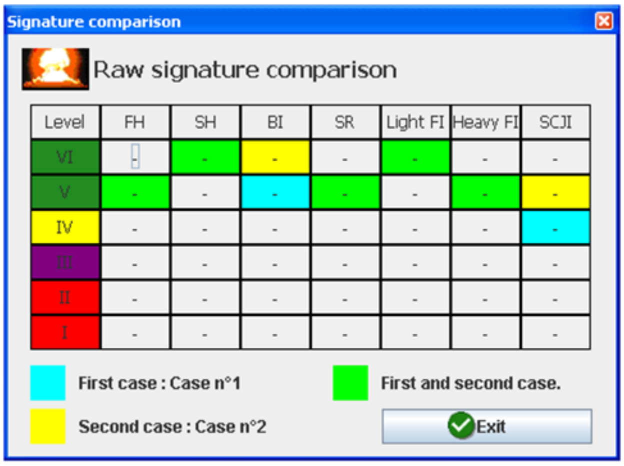

Figure 16 : Comparison of signatures for two different cases

Discussion of ASSIM results

Any gaps identified in the comparison of the "IM solution" signature with the specified IM requirements can be analysed by considering the number of situations associated with the given threat and reaction levels. For example, the system described in Figure 17 has only one elementary situation leading to the required Type V response for SH threat:

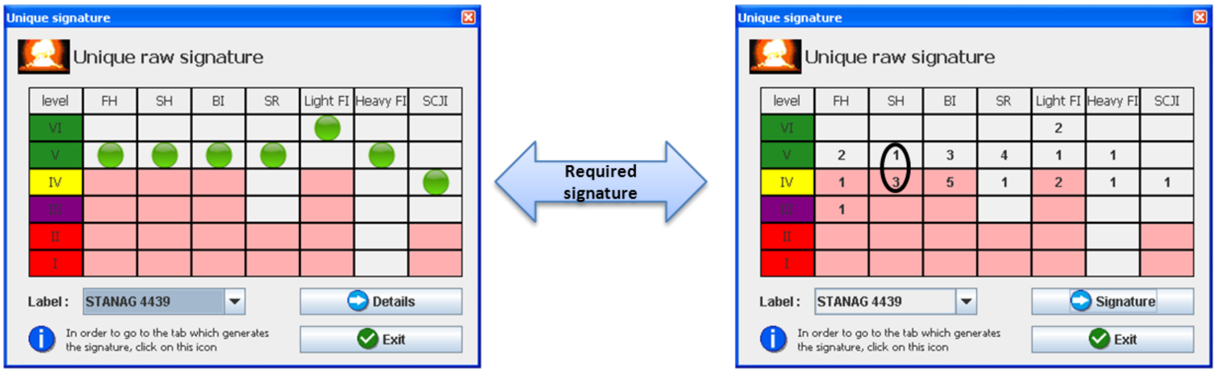

Figure 17 : Example with unique signature and detailed results

This information can form the basis for the various stakeholders to engage in discussion of the suitability of the specified response for this particular situation. For instance, the SH threat requires a confined space (e.g. iso-container or battleship magazine) to allow the temperature to increase, which also has the effect of preventing projection of fragments that discriminate between Type IV and Type V responses. In this context, consideration of the response to a SH threat could support the argument to reduce the requirement from a Type V to a Type IV response. In general, the ability to review and reduce the IM performance requirements for the munition can result in lower development and production costs for the manufacturer and, ultimately, lower procurement costs for the customer.

The requirement on the elementary situation can be modified to get produced an agreed ALARP signature specification:

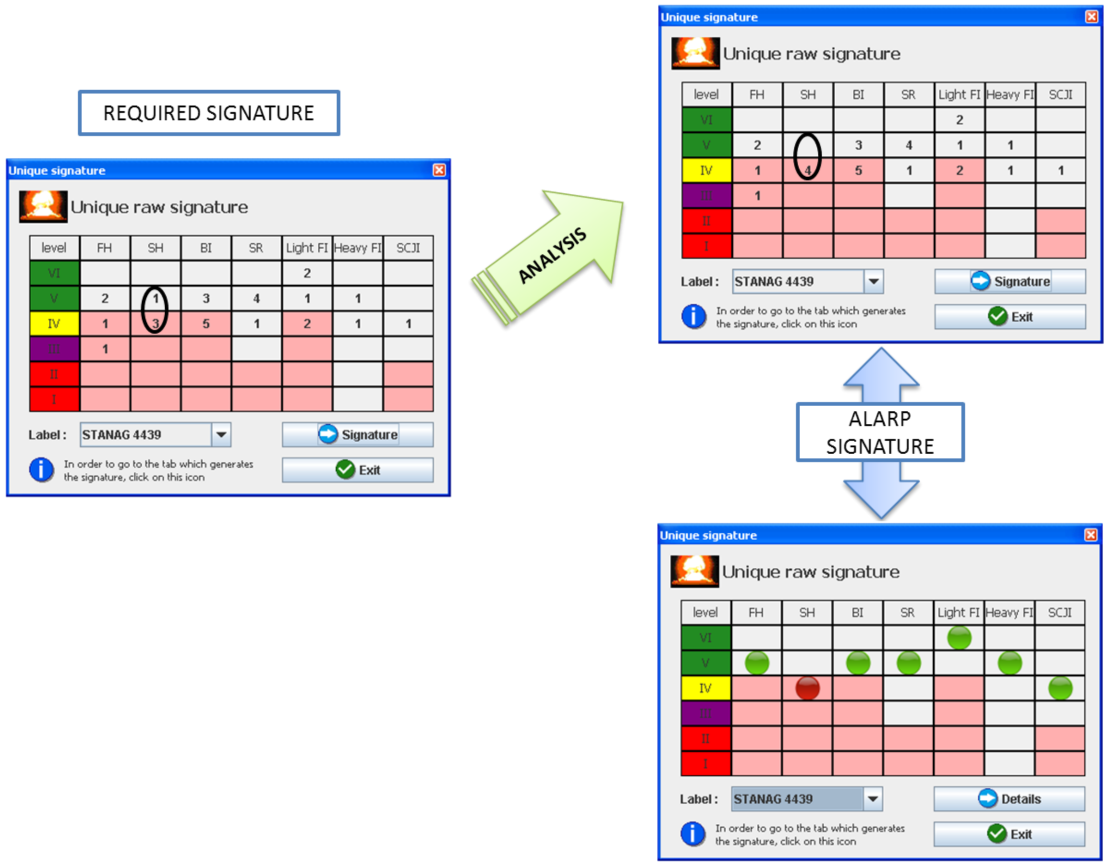

Figure 18 : ALARP signature using ASSIM results

In contrast, the reduction of the requirement is not possible if the Sympathetic Reaction (SR) threat is considered: four elementary situations are shown to require a Type V response, increasing the importance of this specified reaction level.

In this example, the application of an ALARP signature raises several questions: is it reasonable to accept the Type IV response for the SH threat in the given situation? Are residual risks fully understood?

6 CONCLUSIONS AND PERSPECTIVES

Ideas promoted by ASSIM

The simplest way to specify an IM signature for a munition is to stipulate compliance with STANAG 4439. However, the costs associated with meeting any non-essential requirements could outweigh the potential benefits released. Without any cost entry, ASSIM is a useful tool promoting discussion between manufacturers, customers and end users in order to reach an agreement on the best compromise in terms of IM requirements. This methodology allows the assessment and comparison of different technological solutions.

Few of the munitions currently manufactured are fully IM compliant. The fictitious example given in this paper raises the question: is it necessary to achieve full STANAG 4439 compliance if the residual risks are understood and can be accepted? An analysis performed using ASSIM methodology can lead to an ALARP signature, where a level of risk is accepted, but it does not avoid the requirement to accurately describe the life cycle for the munition. The following step is a true economic analysis which can then be valued through a "conventional" CBA tool (see Figure 1) and is facilitated using the same life cycle.

This approach can raise other questions: are we able to claim that a munition has a unique signature? If an ALARP signature is based on an acceptable level of risk, then other signatures could be defined with higher or lower levels of risk. As the risk associated with a hazardous event is dependent on the probability of occurrence as well as its severity, these two parameters could be used to define alternative signatures.

Initial feedback on ASSIM

The initial ideas about the way to specify a signature and to put them into a tool began inside IMEMG at the end of 2000s. In the meantime, the French Ministry of Defence (MoD) issued a new MoD Instruction (n°211893) establishing the policy on MURAT (IM) and its implementation. Several of the reaction levels describing MURAT signatures were changed. A number of procedures for MURAT implementation were also outlined, involving the definition of MURAT requirements for procurement of any new munitions and the assessment of MURAT signature and its validation. The procedures are covered by several technical instructions; one of these describes the determination and validation of two kinds of signatures (called "Stabilized" before a Request For Information (RFI) and "Reference" [5]) that will have to be justified. When presented with the key functions of ASSIM, the French DGA expressed an interest and indicated that the tool could help progress this approach. Specifically, the tool and the data generated offer several clear advantages that align with the requirements for MURAT assessment:

- A life cycle description is illustrated with a tree diagram
- The level of reaction is defined by each sequence of the life cycle and by threat
- The consistency of the data can be checked with the help of the synthesis table
- In addition to the use of a typical response chart to represent the IM signature, it is possible to show the number of required reaction levels for any given threat
- The Stabilized signature can be determined before the RFI

This initial feedback confirmed that ASSIM tool is able to provide a means to answer ALARP operational requirement for IM at the European level.

ASSIM: the way ahead

The response highlighted the opportunities for analysis to contribute to discussions between all stakeholders involved in the IM signature specification. In addition, several recommendations to improve functionality of the tool were provided:

- The ability to study the influence of hazard severity and the probability of occurrence on reaction level would be also of interest
- An IM state of the art signature has to be considered
- The logistic benefits provided by dedicated signatures should be taken into account
- A signature depending on the munition configuration (logistic, tactical, etc.) would be also of interest

These suggestions could constitute the way ahead for ASSIM development.

The IMEMTS 2015 Symposium provides an opportunity for review and feedback from a wider audience: do not hesitate to come and discuss development of the ASSIM tool with IMEMG Members.

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9 GLOSSARY

ACB: **A**nalyse **C**oût **B**énéfice (IMEMG tool on CBA)

ALARP: **A**s **L**ow **A**s **R**easonably **P**racticable

ASSIM: **A**ssistant to **S**pecify a **S**ignature for an **IM**/MURAT – **A**ide à la **S**pécification d'une **SI**gnature IM/**M**URAT (IMEMG tool on CBA)

BI: **B**ullet **I**mpact

CBA: **C**ost **B**enefit **A**nalysis

CBAM: **C**ost **B**enefit **A**nalysis **M**odel (NIMIC / MSIAC tool on CBA)

CINO: **C**hief **I**nspector of **N**aval **O**rdnance (CINO) (role now part of DOSG)

COBEAN: **CO**st **BE**nefit **AN**alysis (CINO/DOSG tool on CBA)

DGA: **D**irection **G**énérale de l'**A**rmement

DOSG: **D**efence **O**rdnance **S**afety **G**roup (part of the UK MoD)

EDA: **E**uropean **D**efence **A**gency

EWG: **E**xpert **W**orking **G**roup

FH: **F**ast **H**eating

HFI: **H**eavy **F**ragment **I**mpact

IM: **I**nsensitive **M**unition

IMEMG: **IM E**uropean **M**anufacturers **G**roup (formerly Club MURAT)

LFI: **L**ight **F**ragment **I**mpact (**FI** to be consistent with STANAG designation)

MoD: **M**inistry **o**f **D**efence

MSIAC: **M**unition **S**afety **I**nformation **A**nalysis **C**enter (formerly NIMIC)

MTDS: **M**anufacture to **T**arget / **D**isposal **S**equence

MURAT: **MU**nitions à **R**isques **AT**ténués

NATO: **N**orth **A**tlantic **T**reaty **O**rganization

NIMIC: **N**ATO **IM I**nformation **C**enter

RFI: **R**equest **F**or **I**nformation

SCJI: **S**haped **C**harge **J**et **I**mpact

SH: **S**low **H**eating

SR: **S**ympathetic **R**eaction

STANAG: **STAN**dardization **AG**reement