



Review of IM policies across the nations

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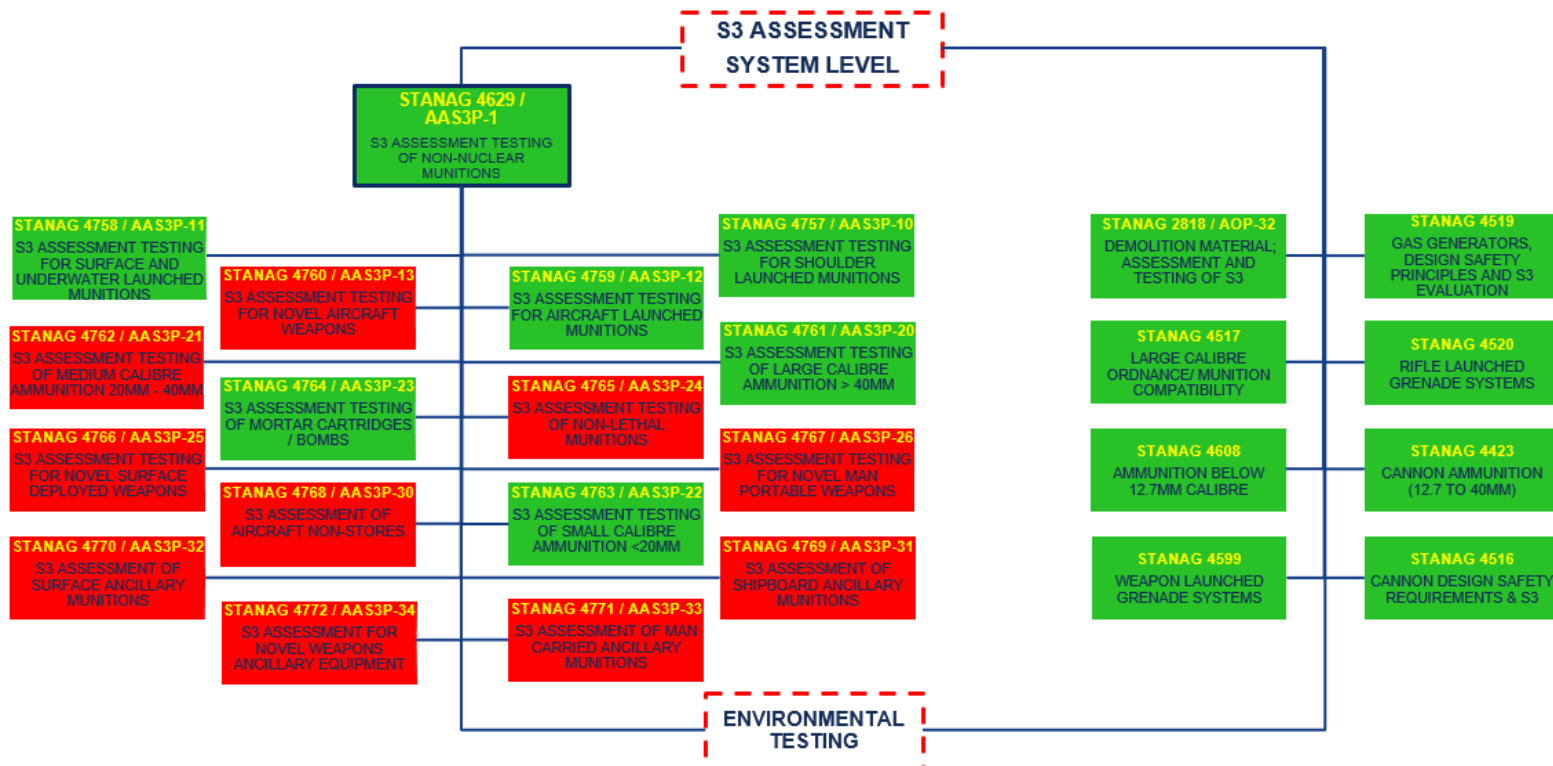
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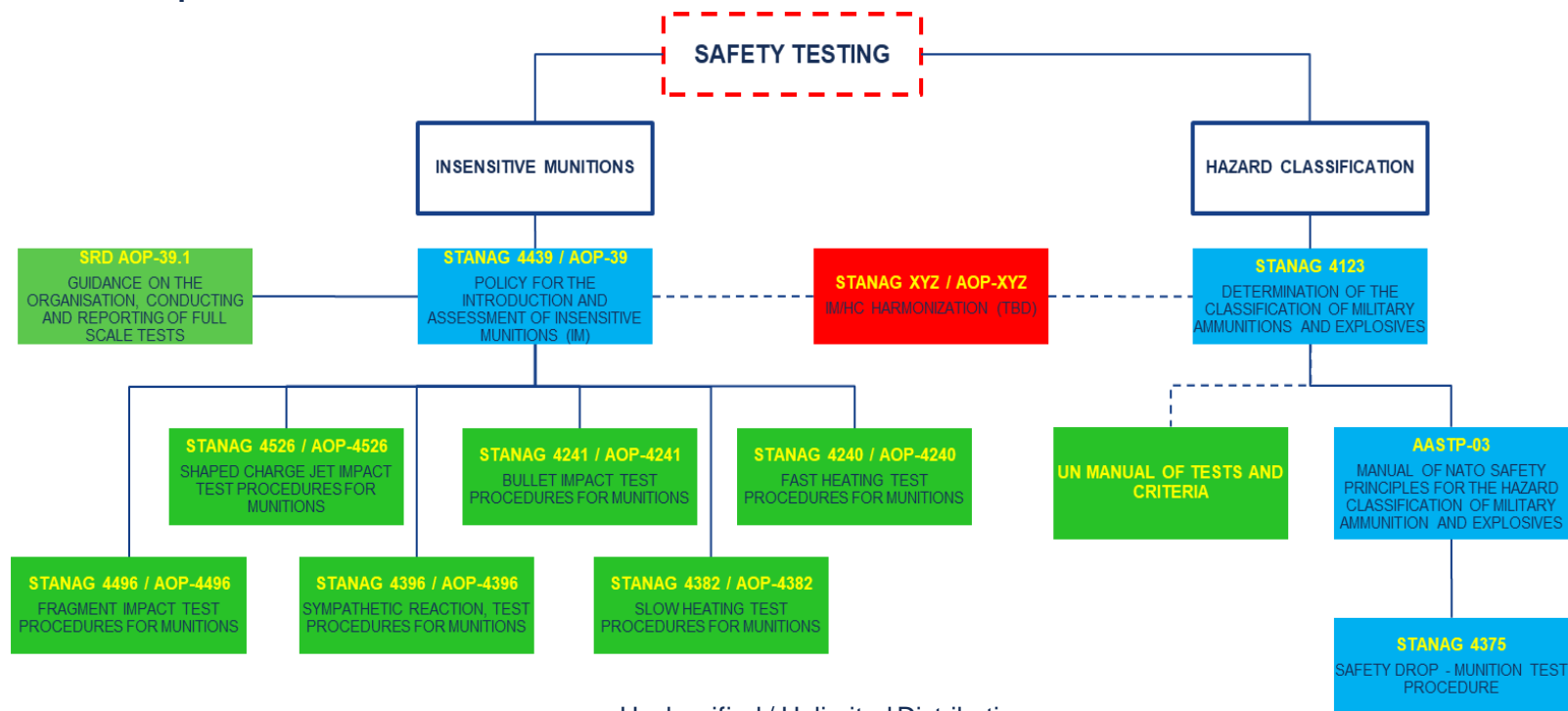
Introduction

- The last time MSIAC had analysed the international and national IM policies was in the early 2000s.
- Since then, no such review has been conducted → it is thus appropriate to review the IM policies of the nations.
- To do so, MSIAC searched its database of documents and surveyed its member nations in order to analyse the most recent versions of international and national IM policies.
- A limited report gathers the full output of this activity: L-290 (limited to MSIAC member nations – under internal review).

- These standards help ensure that sufficient and appropriate evidence is collected to allow prediction of the amount of environmental stress a munition should be able to withstand without degrading to an unsafe condition.



- Safety testing considers extreme but credible threats to munitions from accidents or enemy action, and seeks to quantify their response to these threats.
- Unlike S3 assessment testing, a reaction of the munition to these tests is, in most cases, expected.



- Documents Examined

- DEFLOGMAN Part 2 Volume 9 Chapter 4 “Insensitive Munitions”, version 2012
- DEOP 102 - Part 2 Chapter 6 “Hazard and Threat Identification”, version 2021



- Specifics

- Australia is currently in the process of cancelling their existing IM Policy in preference for the recently published content of DEOP 102 as the existing policy is not consistent with AUS legislation
- IM assessment is a mandatory requirement and is part of S3 assessment
- Use of the So Far As is Reasonably Practicable (SFARP) principle

- Documents Examined

- DAOD 3002-2, “Insensitive Munitions”, versions 2008 and 2017
- DAOD 3002-1, “Certification of Ammunition and Explosives”, version 2017



- Specifics

- The 2017 version of DAOD 3002-2 includes explicit mention of risk management in case of non IM-compliance
- It also refers to DAOD 3002-1 which is the top-level document governing S3

- Exemptions from IM assessment

- Ammunition or explosives in use prior to 2004 and scheduled for replacement prior to 2020
- Ammunition and explosives in HD 1.4



- Documents Examined

- PEHOS PAK, 10:01 – Insensitive Munition Policy (2005)



- Specificities

- *“The Finnish Defence Forces is committed to introduce into service munitions which are as insensitive as reasonably practicable and fulfill the requirements for performance. The course of action is in line with the principles in STANAG 4439”*
- IM assessment is interlinked with S3 qualification programs

- Exemptions from IM assessment

- Legacy munitions already procured
- Ammunition and explosives substances assigned to HD 1.4



- Documents Examined

- MoD IPE Instructions #211893 (2011), #1184, #1187 and #1190



- Specifics

- The overarching French IM policy is detailed in the IPE instruction #211893
- France uses the term “MURAT” (“MUnition à Risques ATténués”) for IM
- The detailed procedure for assigning a MURAT label is available in the IPE Instruction #1184
- France uses 3 levels of MURAT: MURAT 1*, 2*, 3*
- Heavy Fragment Impact (HFI) is part of the required tests for IM assessment
- France is now considering to take into account the benefits of MURAT in HD for storage

- Exemptions from IM assessment

- Munitions containing small quantities of active materials and not representing serious hazards in the logistic phase (typically munitions that are assigned HD 1.4)



- Documents Examined

- A-2070/3 “Munitionstechnische Sicherheit der Bundeswehr und Schießsicherheit der Bundeswehr”
- A-425/1 “Standardisierung”



- Specifics

- The German IM policy is globally aligned on STANAG 4439 / AOP-39
- Deviations only possible when experience suggests or the needs of a project dictate it

- Exemptions from IM Assessment

- SAAs with a caliber of less than 12.7 mm are usually not tested



- Documents Examined

- Guidelines for the development, assessment and checking of Insensitive Munitions (IM); Linee Guida Nazionali per lo Sviluppo, la valutazione e la verifica delle munizioni a rischio attenuato MURAT, 2000



- Specifics

- HFI is part of the required tests for IM assessment
- Like France, Italy defined three levels of “IMness” (NB: with different passing criteria as France): IM^{Φ} , $IM^{\Phi\Phi}$, and $IM^{\Phi\Phi\Phi}$
- The IM levels are associated with expected benefits in storage
- IM and S3 programs are interconnected with the use of IM test results to provide direct inputs to S3 programs

- Documents Examined

- Netherlands IM Overview by van Gool and Bouma, 1999



- Specifics

- So far, there is no national IM policy in place in the Netherlands
- The conduct of specific IM tests for each munition type are part of the S3 evaluation which is prescribed in nine national Generic S3 Programs
- The aim of the future Dutch IM policy is to prescribe relevant IM treats that will be standard for certain article groups but may be adjusted by a threat hazard approach

- Documents Examined

- “Insensitive Munition Policy – Norway” by Lt Col Morten Kjellvang, 2017



- Specifics

- *“All procurement of ammunition must include a statement of compliance with the IM-requirements goals specified in STANAG 4439 and AOP-39”*
- IM assessment is considered to be part of the qualification process

- Exemptions from IM assessment

- Articles in HD 1.1 when operational requirements make use of IM inappropriate, or no IM solutions exists.
- Articles in HD 1.2, 1.3 and 1.4 where initiation of more than one ammunition article represents a very low probability, and where each single ammunition article does not represent hazard consequences to personnel or materiel



- Documents Examined
 - DSA-03.OME (formerly JSP 520) Part 1 Chapter 11 on “Insensitive Munitions”, 2021
- Specifics
 - The key principle in the UK IM policy is that the sensitivity of the munition must be “As Low As Reasonable Practicable” or ALARP
 - The UK IM policy applies on all new munition acquisitions. For already in-service munitions, they are *“kept under review to identify insertion opportunities (...) to achieve full or improved levels of IM compliance.”*
 - A target IM signature is requested prior to any munition contracting
 - The munitions are subjected to IM tests in accordance with a THA
- Exemptions from IM assessment
 - Where the stimuli significantly overmatches the credible worst case response of the system under test (e.g. shaped charge jet would be assessed as overmatching a pyrotechnic smoke store)



- Documents Examined

- US Code, Title 10, Chapter 141, Section 2389 December 2001
- DoD Directive 5000.01, The Defense Acquisition System, 2020
- MIL-STD-2105E, 2022



- Specifics

- A THA is systematically conducted to establish which standard IM stimuli are appropriate or applicable. This results in an IM test plan which can be standard or tailored
- Wherever possible, a combined IM/HC test plan should be developed and conducted
- Acceptance of alternative ways to replace full-scale assessment tests (e.g. M&S, relevant small scale tests conducted in the frame of EMQ)

- Exemptions from IM assessment

- SAAs that are currently in the inventory, and all future similar technology SAAs, with no incendiary or high explosive projectiles as per OUSD Memo dated 3 Jul 2001
- CAD/PAD as per OUSD Memo dated 10 Oct 2003



- The well-known “IMEMG card” provides a table of the IM passing criteria in use in NATO and in a selection of nations

REPRESENTATION OF THE IM REQUIREMENTS													2021
THREAT	TEST PROCEDURES		NATO	UK	GERMANY	ITALY			FRANCE			USA	
	Stimull	STANAG	STANAG 4439										
			IM requirements	AASTP-1 S&D 1.2.3	JSP 520	FÜ S IV 3	DG-AT IM Guidelines 2000			INSTRUCTION N° 211893 July 21 st , 2011			MIL-STD-2105D
						Φ	ΦΦ	ΦΦΦ	★	★★	★★★ ⁴		
Magazine / store fire or aircraft / vehicle fuel fire	FH	4240	V	V	V	V	V	V	V	IV ²	V ³	V ³	V
Fire in adjacent magazine, store or vehicle	SH	4382	V	V	V	V	V	V	III	V	V	V	
Small arms attack	BI	4241	V	V	V	V	V	V	III	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	III	
Fragmenting munitions attack	FI	4496	V		V	V		I ¹	V		V	V	V
	FI Heavy Fragment	4496						I ¹	V		III	III	
Shaped charge weapon attack	SCJI	4526	III		III	III		I ¹	III		III	III	III

¹ Type I or more, as per THA ² Without propulsion ³ Only after five minutes ⁴ All EM compliant with UN Orange Book Test Series 7
 STANAG 4439 "Policy for introduction and assessment of Insensitive Munitions" • AOP 39 "Guidance on the Assessment and Development of Insensitive Munitions"
 Any variation in the threats shall be justified through an approved munition Threat Hazard Analysis (THA) cf. STANAG 4439 para.10.
 The IM Signature is assessed for any particular configuration of a munition during its life cycle.

- Three main approaches have been identified
 - Target full IM compliance as per STANAG 4439 / AOP-39 criteria, and authorize waivers in case of non IM-compliance. Such IM waivers may have a limited time validity.
 - Use of a progressive approach, with the identification of different IM levels and without systematically conducting a THA process. Only France and Italy follow this approach.
 - Use of a tailored approach where the requirement for IM testing / assessment and the level that must be achieved is bespoke to each individual munition and proportionate to the risk, as per the THA.
 - The USA follows this approach where the IM test plan is exclusively based on the approved THA, with a limited use of IM waivers.
 - Australia and the UK also follow this approach by applying the “SFARP” or “ALARP” risk principle, upon appropriate justification but with no use of IM waivers.

- Relationship between IM and S3 assessment:
 - S3 assessment testing include tests reproducing the LCEP experienced by a munition (e.g. environmental testing) → Those tests should not lead to the reaction of the energetic material contained in the munition.
 - IM tests evaluate the behavior of the munition under extreme but credible accidental or enemy action threats (e.g. thermal hazards, mechanical impacts) → These aggressions result in most cases in the reaction of the energetic material contained in the tested item.
 - Thus not possible to read across the results between IM and S3 testing
 - Some nations take into account the results from characterizations that were performed prior to IM testing on a munition and its energetic filling (e.g. EMQ, M&S). These are useful indication on the credibility of the definitive IM signature.

- Munitions that have benefited so far from IM assessment
 - Not a publicly disclosed information
 - In France, only 10% of the stockpile (in number) have been assigned an IM signature. The remaining 90% are mostly SAA (exempt from IM assessment as per the French IM policy).
- Munitions that are exempt of IM assessment
 - The NATO standards and the national IM policies claim to apply to all munitions, although exemptions often exist
 - Most nations exempt SAA from IM testing, and more generally items classified HD 1.4 S (such as pyrotechnic systems and other articles containing small quantities of primary explosives/pyrotechnics)
 - The items exempted from IM assessment are generally those for which the stimulus in the IM test overmatches the credible worst case scenario → but this requires proper justification

Conclusions

- Most MSIAC nations have implemented a national IM policy. They are based on STANAG 4439 / AOP-39
- Three main approaches have been identified: a full-compliancy approach possibly associated to the use of IM waivers, a progressive approach with the use of IM levels, and the SFARP/ALARP approach
- Differences exist in the relationship between IM and S3 assessment
- Exemptions from IM assessment are generally applied to SAA and, to a lesser extent, to pyrotechnic systems and other articles containing small quantities of primary explosives/pyrotechnics

Any Questions?

