

- AC/326 Main Group (MG) approved the creation of a Working Group (WG) to review NATO policy and guidance on Insensitive Munitions (IM), Hazard Classification (HC) to assess opportunities for harmonisation and assess introduction of Hazard Frequency Analysis (HFA) approach
- Brent Knoblett (USA) and Phil Cheese (UK) were appointed to lead the WG, with support provided by MSIAC
- A number of meetings have been held to define scope, develop proposals, documentation and test our thinking
- Workshops and briefings at a number of NATO and other meetings

- Nations sometimes classify/assess munitions differently (HC/IM)
- Resource is wasted through duplication of effort
- Adequacy of IM signature and HC for risk assessment?
- UN manual of tests and criteria development on UN TS 6 are driven by civil side and could be seen as not fully representative of the military environment
- IM & HC are not the same!

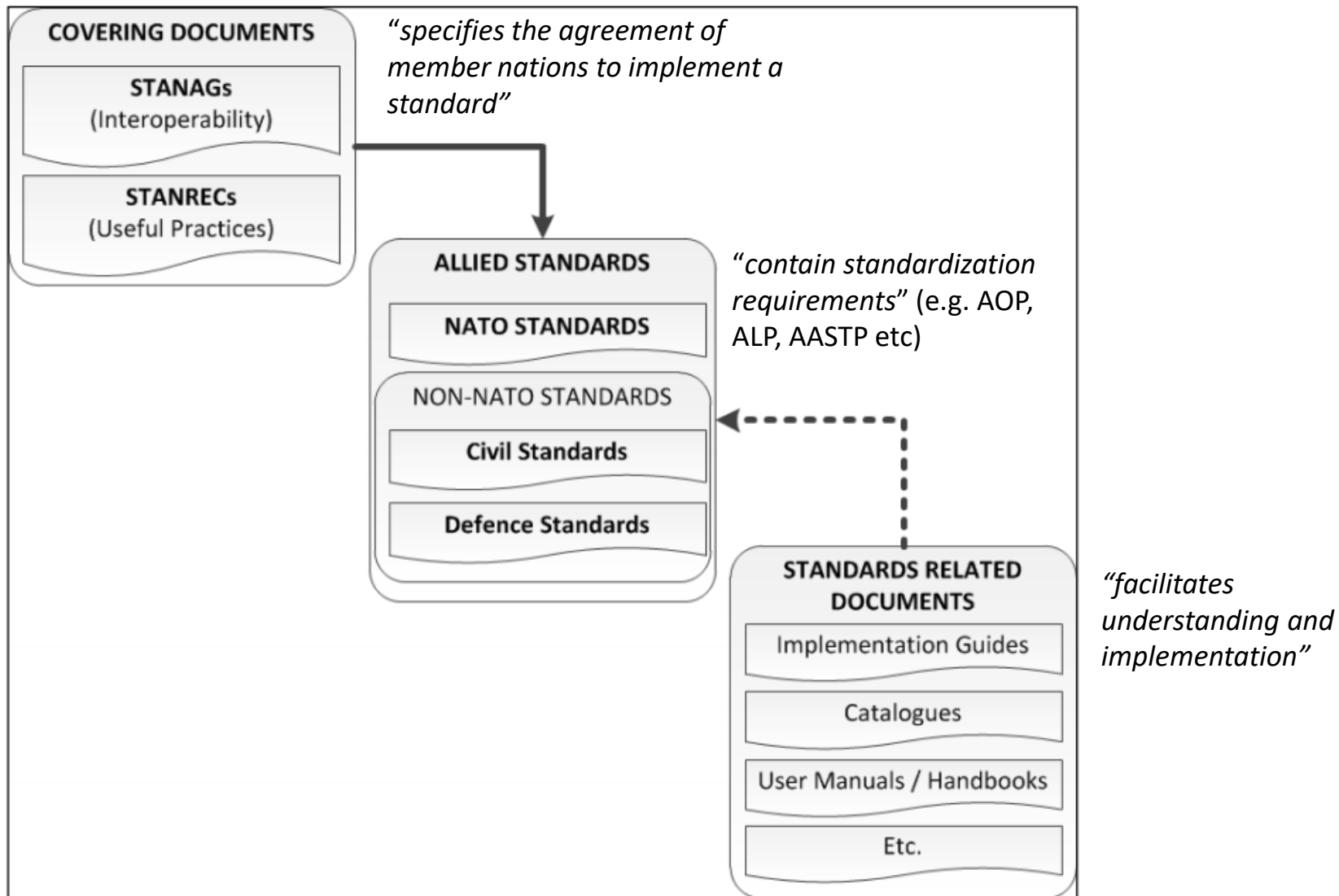
- Clarify the relationship between IM, HC, and risk
- Assess the IM ‘Whole Body of Evidence’ approach Improve consistency, coherency and interoperability
 - Take the opportunity to address other issues affecting a standardized approach to hazard classification and IM assessment
- Improve approach to risk assessment
 - Provide granularity in data to inform designers and users
- Minimize bureaucracy by limiting scope to munitions that will benefit from IM policy and/or enhanced HC assessment process
- Migrate NATO’s policy for “military-unique munitions” into United Nations (UN) as a revision for UN TS 7
 - Proposals for UN TS 7 Substance Tests

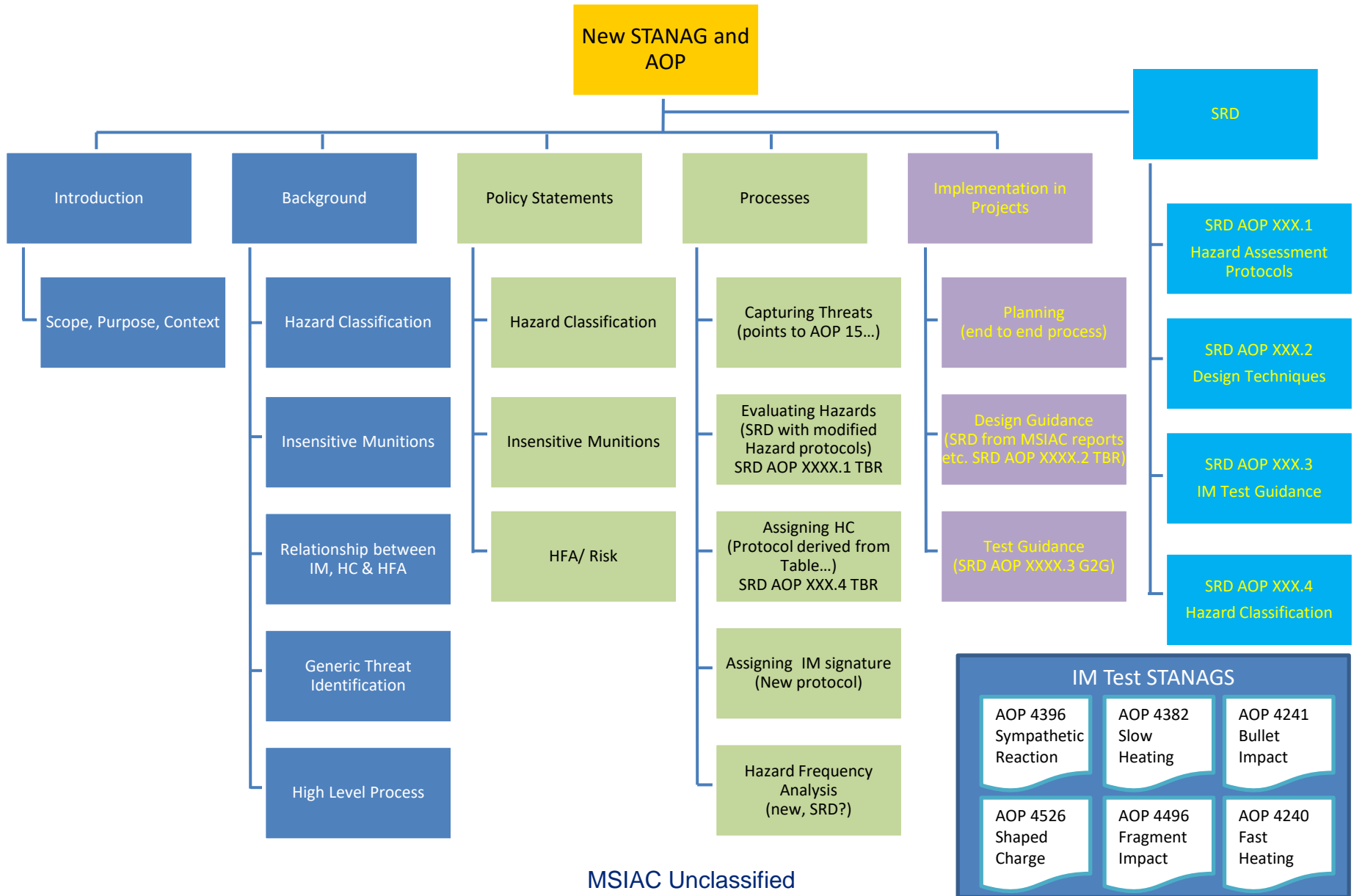
- To standardize, harmonize and streamline IM and HC policy on requirements and assessment and enshrine this in UN international policy (legislated):
 - Reaffirming and clarifying the purposes of the IM and HC policy
 - Building on IM and HC methodology to improve munition risk assessment for unplanned stimuli
 - Developing processes and documents to deliver these:
- Draft title
 - Safety of munitions exposed to extreme but credible accident environments or enemy action*

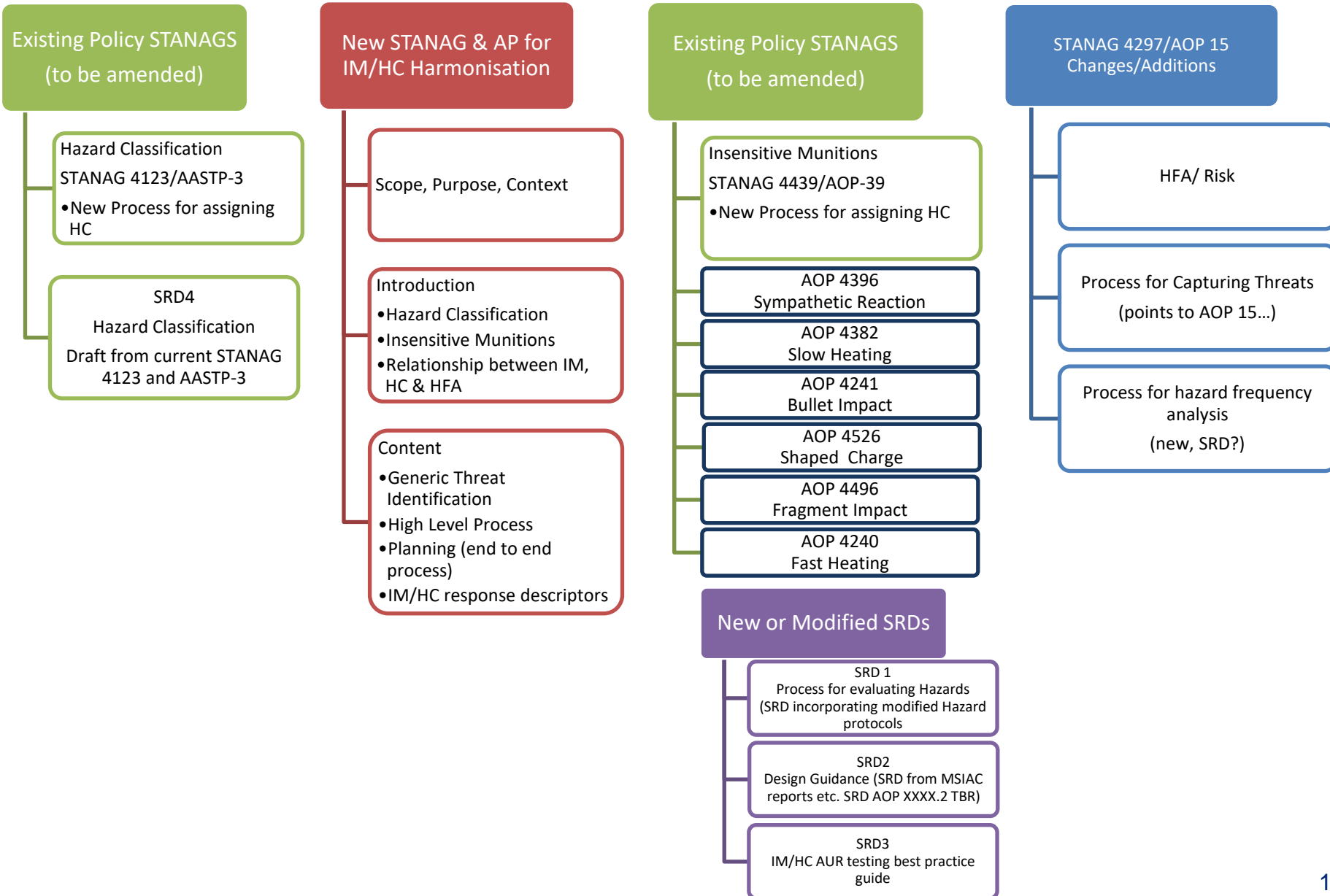
- UK proposal
- HC and IM Assessment give a snapshot in time
- Difficult to translate these outputs to calculate risk
 - Both processes subject the test item to a threat could cover a number of scenarios
 - Neither encompasses all the lifecycle threats
- To assess the possible reaction of a munition throughout the lifecycle the following is required:
 - The nature, magnitude and frequency of the threats the munition may be exposed to;
 - The variations in response as the magnitude of the stimuli varies;
 - Any inherent variability of response at each stimulus level and;
 - The consequences of any possible event.

- Questionnaire posted on MSIAC website in Spring 2018
- Currently 15 answers from 8 countries
- 9 Questions (see supplemental slides)
 1. Use of a UN classification to support storage?
 2. Should HC and IM testing become further harmonised?
 3. Do you agree that this is an appropriate way to harmonise?
 4. Use of additional evidence?
 6. Do you use additional or alternative evidence to determine IM signatures?
 7. Do you support a review of the substance tests in UN Test Series 7?
 8. Use of HC/IM tests to support QRA and HC assignment.
 9. Are HDs sufficient to optimise lifecycle risk management.
- Survey still open
<https://www.msiac.nato.int/surveys/imhc-survey>

- Answers of interest - Qs 5, 7, 8 and 9 - all strongly in favour
 - Question 5 - Do you agree that the introduction of additional evidence to support HC assessment would increase confidence in assignments of Hazard Divisions (HD)?
 - Question 7 - Do you support a review of the substance tests in UN Test Series 7 used for assignments of HD 1.6?
 - Question 8 - Do you agree that it would be beneficial to use HC/IM tests to generate information to support situation-specific quantitative risk assessment and/or hazard classification assignment (i.e. HD 1.1 thru 1.4 & 1.6) when siting/licensing/ESMRM?
 - Question 9 - Do you believe that the current Hazard Divisions provide sufficient granularity to optimise the management of risk throughout the lifecycle?
- Question 5(a) use of additional evidence as a goal to support HC , opinions divided.
- Unanimous agreement
 - Question 3 - Do you agree that Hazard Classification (HC) and Insensitive Munitions (IM) testing should become further harmonised wherever possible?
 - Question 5(c) - Do you agree that using the response descriptors (RD) should help in assignments of hazard classification? (i.e. using the existing AOP-39 RD).







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Existing Policy STANAGS (to be amended)

- Hazard Classification STANAG 4123/AASTP-3
 - New Process for assigning HC
- SRD4 Hazard Classification Draft from current STANAG 4123 and AASTP-3

New STANAG & AP for IM/HC Harmonisation

- Scope, Purpose, Context
- Introduction
 - Hazard Classification
 - Insensitive Munitions
 - Relationship between IM, HC & HFA
- Content
 - Generic Threat Identification
 - High Level Process
 - Planning (end to end process)
 - IM/HC response descriptors

Existing Policy STANAGS (to be amended)

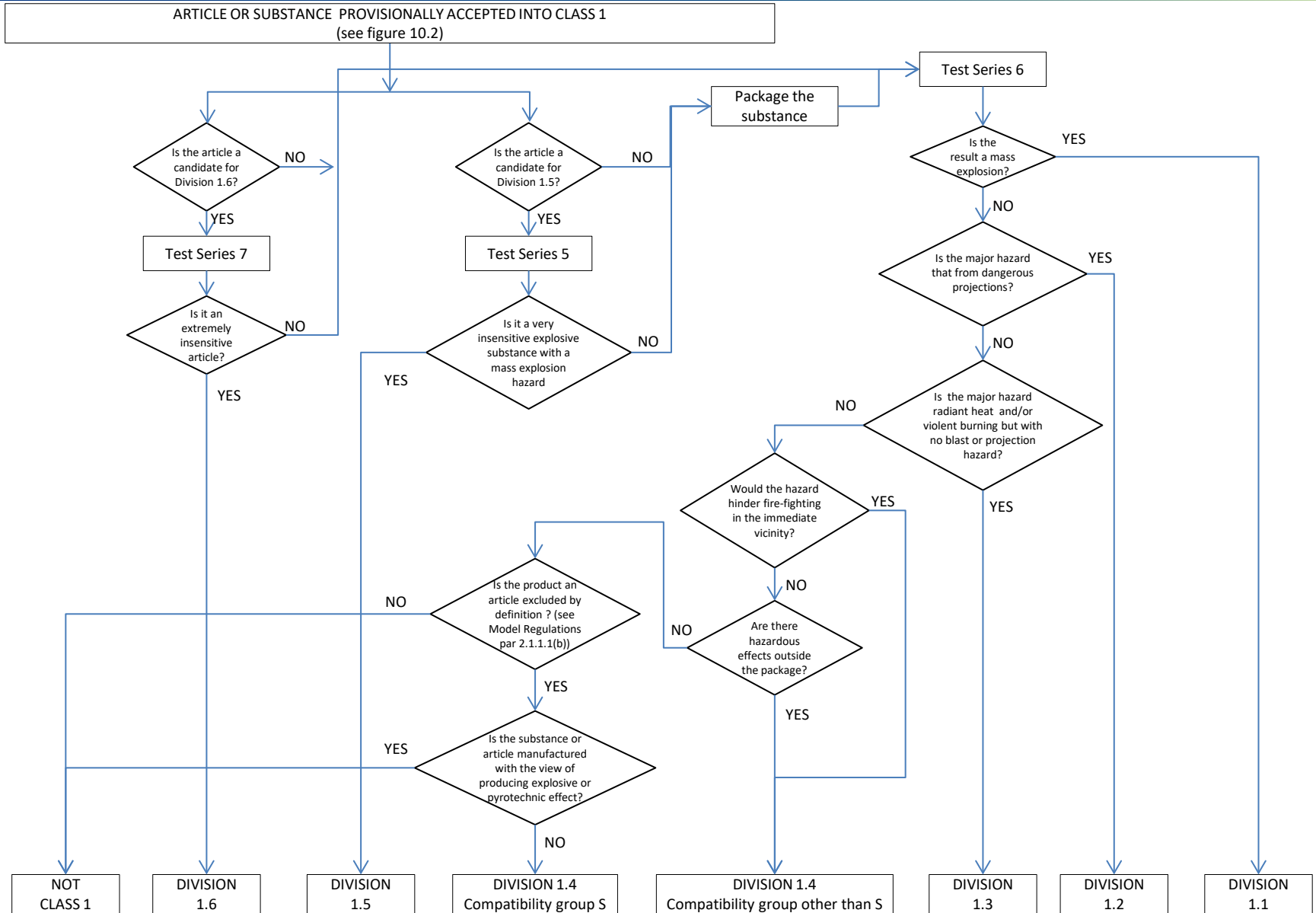
- Insensitive Munitions STANAG 4439/AOP-39
 - New Process for assigning HC
- AOP 4396 Sympathetic Reaction
- AOP 4382 Slow Heating
- AOP 4241 Bullet Impact
- AOP 4526 Shaped Charge
- AOP 4496 Fragment Impact
- AOP 4240 Fast Heating

New STANAG for Risk Assessment of munitions exposed to extreme but credible accident environments or enemy actions

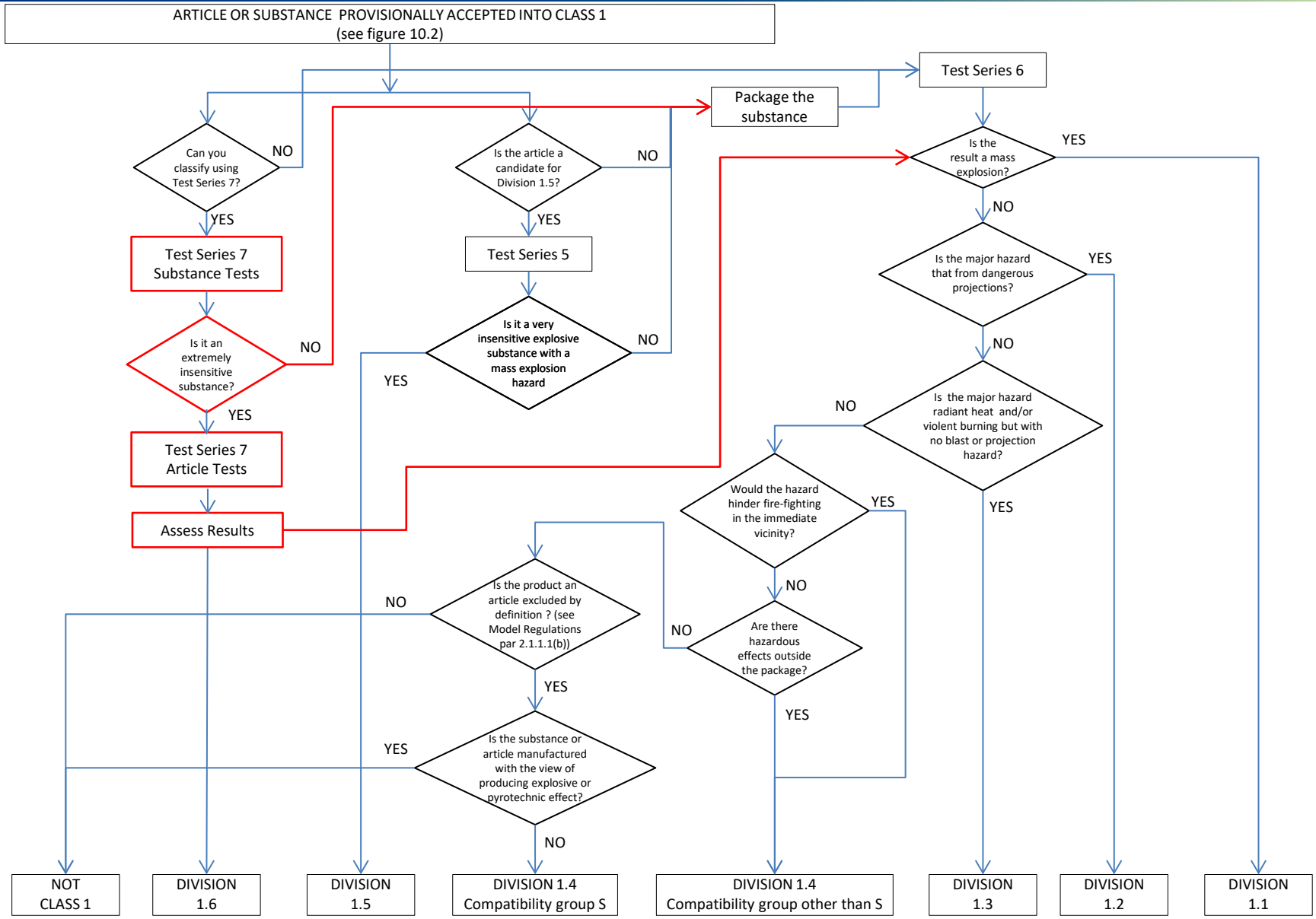
- Hazard Frequency Analysis and Risk Assessment
- Process for Capturing Threats (points to AOP 15...)
- Process for hazard frequency analysis (new, SRD?)
- Risk Assessment Process

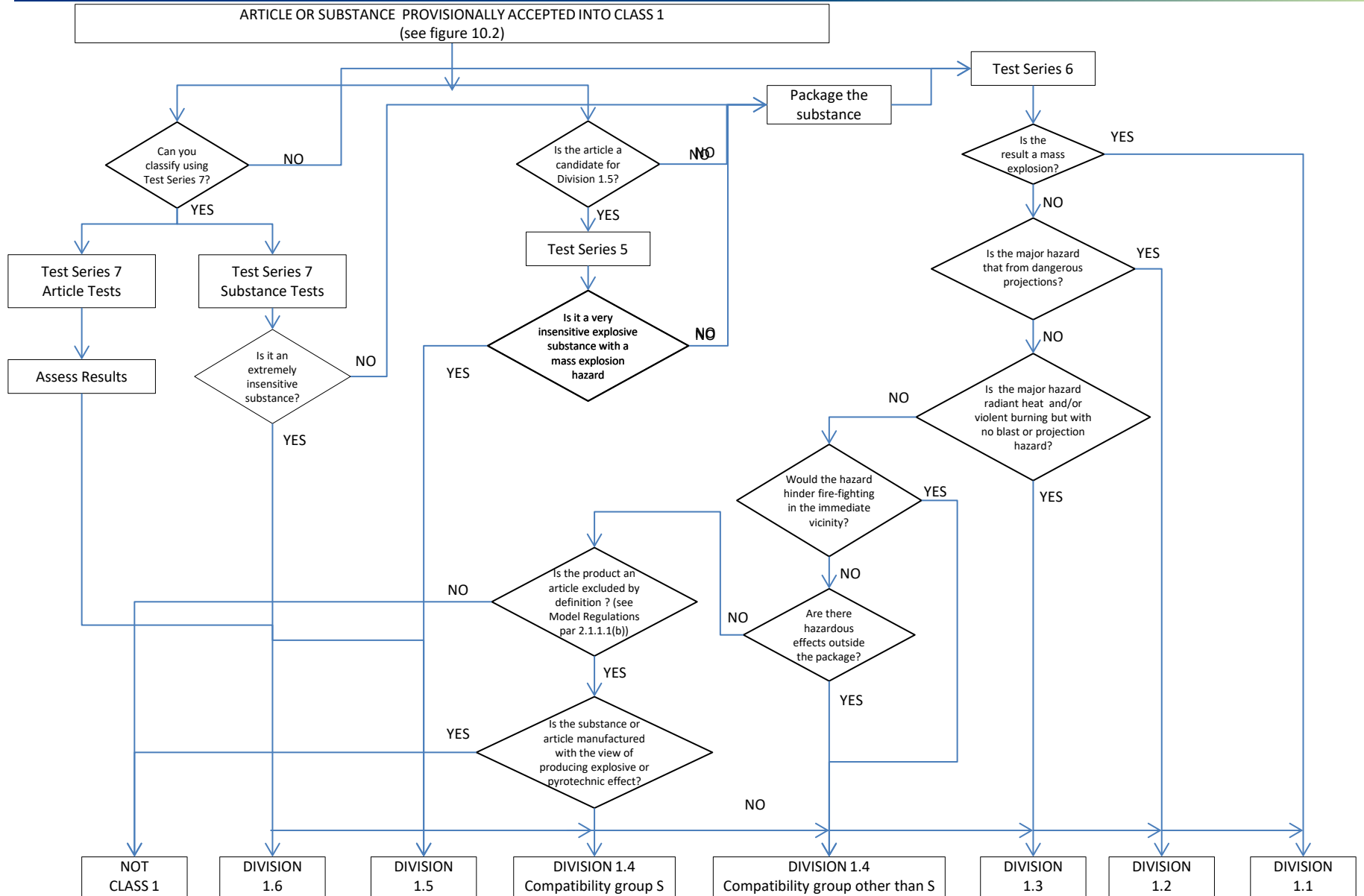
New or Modified SRDs

- SRD 1 Process for evaluating Hazards (SRD incorporating modified Hazard protocols)
- SRD2 Design Guidance (SRD from MSIAC reports etc. SRD AOP XXXX.2 TBR)
- SRD3 IM/HC AUR testing best practice guide



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- A number of options considered, none yet accepted

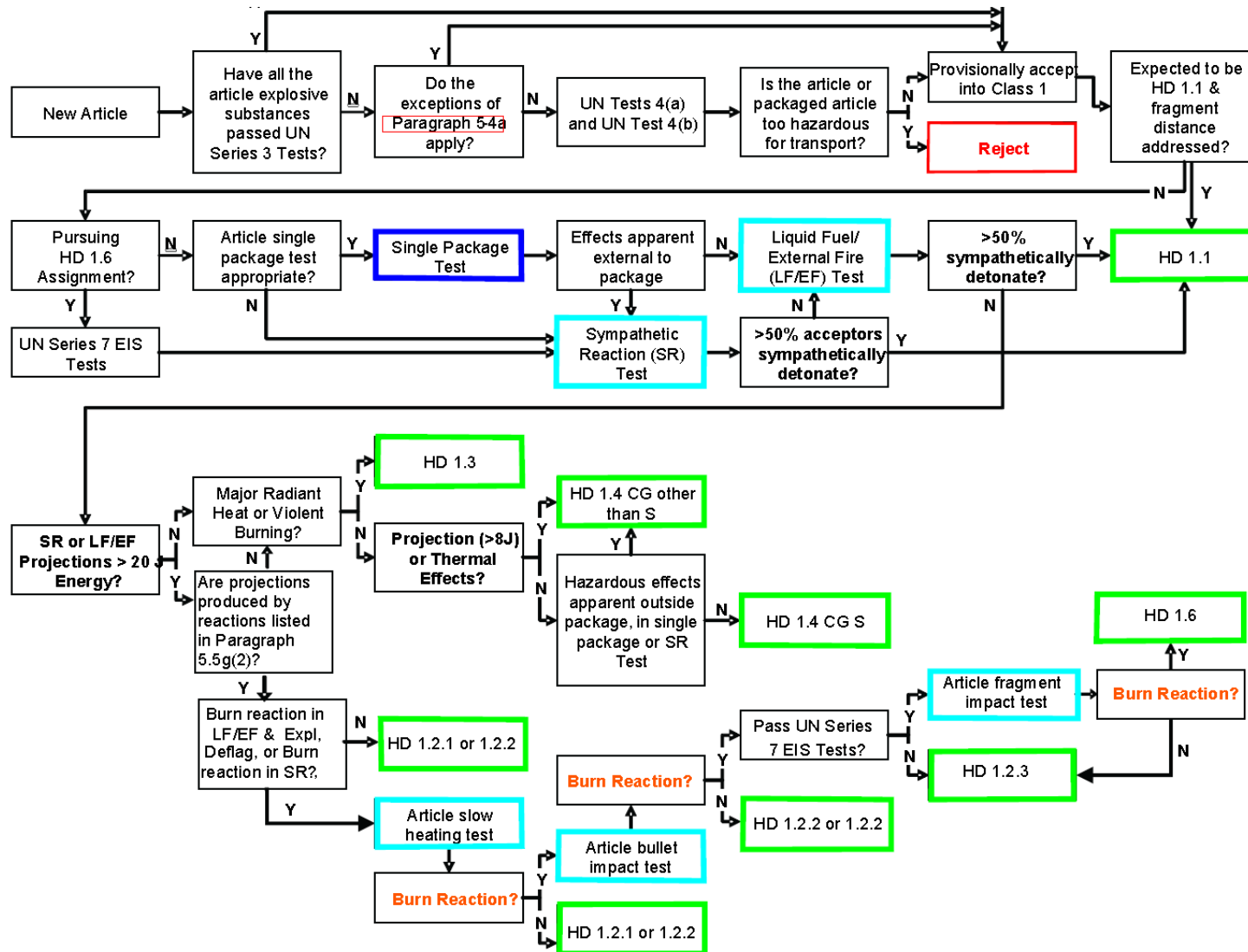
Example 1

Hazard Division	1.1	1.2	1.3	1.4	1.6
Additional description	A mass explosion is one which affects almost the entire load virtually instantaneously		Substances and articles which: (a) Give rise to considerable radiant heat; or (b) Which burn one after another, producing minor blast or projection effects or both	Substances or articles that present only a small hazard in the event of ignition or initiation. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected	Articles that are insensitive and which demonstrate a negligible probability of accidental initiation or propagation
Threshold Criteria	(a) Mass explosion is possible	(a) Perforation of any of the witness screens	(a) Fireball or jet of flame extends beyond any witness screens (4m)	(a) Fireball or jet of flame extends more than 1m	(a) No mass explosion is possible
		(b) A metallic projection with KE exceeding 20 J	(b) A fiery projection thrown more than 15 m	(b) Fiery projection thrown more than 5 m	(b) Articles are insensitive
			(c) Burning time less than 35 s, for 100 kg net explosive mass (duration is heat of combustion dependent)	(c) Witness screen indentation > 4 mm	
				(d) Metallic projection with KE exceeding 8 J	
Rationale	• Mass detonation is possible	• Mass detonation is not possible	• Mass detonation is not possible	• Mass detonation is NOT possible	• Mass detonation is NOT possible
	AND	AND	AND	AND	AND
	• Initiation of a donor in worst case mode is credible	• Lower fragmentation/blast thresholds for 1.2 are exceeded	• Thermal hazard thresholds for 1.2 are not exceeded	• Thermal hazard thresholds for 1.2 are not exceeded	• Initiation of a donor in worst case mode is incredible
			AND	AND	
			• Lower fragmentation thresholds for 1.2 are not exceeded	• Upper fragmentation thresholds for 1.4 are not exceeded	

Example 2

1.1				1.2		1.3		1.4		1.6		
Q1	Is Mass Explosion Possible?			Is there a Projection Hazard?		Is there a fire hazard?		Is there no significant hazard?		Is there a negligible probability of initiation?		
										AND Is there a negligible possibility of mass explosion?		
OR	1(a)	Bonfire Test	YES	1.1	Stack Test	YES	Stack Test*	YES	Stack Test	YES	Stack Test	YES
			NO			or			or			or
	1(b)	SR Test	YES	Q2	Bonfire	YES	Bonfire	YES	Bonfire	YES		
			NO	Not 1.1								
AND				OR		OR		OR		AND		
Q2	Is Mass Explosion Credible?											
			Detonation?									
	Fire		YES	Fire	YES	Fire	YES	Fire	YES	Fire	YES	
			or		or		or		or		and	
	Bullet		YES	Bullet	YES	Bullet	YES	Bullet	YES	Bullet	YES	
			or		or		or		or		and	
	Fragment		YES	Fragment	YES	Fragment	YES	Fragment	YES	Fragment	YES	
			or		or		or		or		and	
	SCO		YES	SCO	YES	SCO	YES	SCO	YES	SCO	YES	
			or		or		or		or		and	
	SCJ		YES	SCJ	YES	SCJ	YES	SCJ	YES	SCJ	YES	
						* - Initiate to worst possible response.						

TB 700-2 Assessment Protocol as a current example



- No reason to stop working on the proposal
- Need to ensure we are accurately assessing the hazard from munitions
 - Need to look at interactions between different munitions
 - New protocols required to enable more effective munitions storage
- Further work to refine assessment protocols necessary
 - Assess against real classifications and IM assessments
- US TB 700-2 already using IM tests
- Need wider engagement
 - Survey still open – please register your views and concerns
 - Direct contact
- Further work at IEMRM Workshop
 - Follow up meetings and briefings
- Civil Competent Authorities



- Questions

1. Does this response represent your own personal views?
2. Do you consider that the current use of a UN classification intended to support classification for transport is appropriate to support storage classification?
3. Do you agree that Hazard Classification (HC) and Insensitive Munitions (IM) testing should become further harmonised wherever possible?
4. Do you agree that this is an appropriate way to further progress harmonisation (i.e., to blend the two independently-existing HC and IM policies into one integrated Allied Publication series)?
5. Do you agree that the introduction of additional evidence to support HC assessment would increase confidence in assignments of Hazard Divisions (HD)?
 - a. Do you agree that using additional evidence should be a goal?
 - b. Do you currently use modeling to support HC assignment?
 - c. Related: Do you agree that using the response descriptors (RD) should help in assignments of hazard classification? (i.e. using the existing AOP-39 RD)

- Questions

6. In addition to, or in lieu of, the full scale IM tests (i.e. BI, FI, SR, SCO, FH, SCJ), do you use additional or alternative evidence to determine IM signatures?
 - a. Do you support development of an agreed set of substance tests (smaller-scale) for routine/mandatory use to increase confidence in IM assessment?
 - b. Do you currently use modelling to support IM assessment?
7. Do you support a review of the substance tests in UN Test Series 7 used for assignments of HD 1.6?
 - a. Do you support the wider use of such substance testing to improve confidence in all HC assignments (i.e. HD 1.1 thru 1.4)?
 - b. Do you support the use of modelling to support improved confidence in HC assignments?
8. Do you agree that it would be beneficial to use HC/IM tests to generate information to support situation-specific quantitative risk assessment and/or hazard classification assignment (i.e. HD 1.1 thru 1.4 & 1.6) when siting/licensing/ESMRM?

- Questions

9. Do you believe that the current Hazard Divisions provide sufficient granularity to optimise the management of risk throughout the lifecycle?
 - a. Do you believe that additional or revised Hazard Divisions, or wider use of the hazard sub divisions such as those that exist for storage, could be used to better manage risks posed by munitions that are, or close to, IM-compliant?
 - b. Given that national stockpiles now contain a significant mix of IM and non-IM, do you believe that the increasing the complexity the Hazard Classification would (as at 8.a. above), on balance, be beneficial?

