Fourth Conference of the High Contracting Parties to Protocol V on Explosive Remnants of War to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects

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Report on generic preventive measures

Addendum

Submitted by the Coordinator[1] on generic preventive measures, pursuant to Article 9 and the Technical Annex of the Protocol

Guide for the implementation of Part 3 of the Technical Annex

Introduction

1. This is a check list of questions to be used as a tool at the discretion of the High Contracting Parties to facilitate implementation of Article 9 as well as Part 3 of the Technical Annex.

2. This guide has no legal status. It is aimed at assisting HCPs to clarify various issues, establish best practises and also monitor and improve National Generic Preventive Measures aimed at minimizing ERW.

3. This guide may be adapted nationally.

4. This guide may also be kept under review nationally and improved as per the specific requirements of HCPs.

5. HCPs are encouraged to share their experiences in utilizing the guide.

6. HCPs are encouraged to inform all the relevant organisations and personnel at a national level about the existence of this guide.

Methodology

1. The following guidelines are suggested:

[1] In accordance with the relevant decision of the Third Conference of the High Contracting Parties to Protocol V on Explosive Remnants of War as contained in paragraph 54 (f) of its final document (CCW/P.V/CONF/2009/9), the discussion on generic preventive measures, pursuant to Article 9 and the Technical Annex of the Protocol was coordinated by Mr. Eric Steinmyller (France).

(a) Unless stated, the preventive measures apply by default to all types of munitions.

(b) The preventive measures never impose a technical solution or procedure, they guide the deliberations. The implementation of the subsequent actions is the responsibility of each State party.

(c) The preventive measures do not make any reference to methods of analysis or to unrecognised procedures. They explicitly describe the objectives to be realised or the procedures to implement.

2 The questions and the specific preventive measures are formulated according to different stages of the life cycle of munitions.

3 Given that different understandings could exist on the notion of life cycle, for the purpose of the guide the term life cycle means a time-based description of the events and environments from manufacture to final use or disposal.

Questionnaire

1. **Specification**

(a) Has each stage (storage, transport, handling, training, use, …) of the life cycle of munitions been defined, in terms of:

(i) Normal conditions, abnormal conditions and accidental conditions of use,

(ii) Type of environmental conditions and the level to which munitions may be exposed (direct or indirect exposure i.e when integrated in weapon system),

(iii) Duration and frequency of exposure to different environmental conditions,

(iv) Configuration/ state of munitions during periods of exposure to different environmental conditions,

(v) Maximum allowable degradation during its operational lifecycle i.e. during storage, transport, handling, use with particular weapons systems …?

(b) Is there a requirement for a specified life time?

(c) Are quantitative reliability and safety requirements included in the specification for the entire life cycle?

(d) Is there a maximum allowable UXO rate?

(e) Have the types of targets to be engaged and scenarios of use by munitions been considered and characterized?

(f) Are the impact conditions of the munitions considered i.e. angle of impact of munitions/ type of impact surface?

(g) Has fuse sensitivity been defined in specification?

(h) Are any materials, which are forbidden by international standards or regulations, used?

(i) Which design standards shall be applied during development and production? Are they internationally recognized? If not, is there a comparison matrix between standards?

2. **Concept**

(a) Does the design process include a proactive systems safety program (SSP)?

(b) Have the safety aspects and potential hazards of munitions on becoming an UXO been considered?

(c) Does the fusing system incorporate design features that allow armed status assessment to facilitate render safe procedures?

(d) Does the design of fusing systems (or munitions) allow replacement or incorporation of advanced solutions to decrease the failure rate (e.g.: self destruction mechanism, self neutralization mechanism, self-deactivating features, multiple initiating mechanisms, hardware or software upgrades …)?

(e) Are environmental (mechanical, temperature, relative humidity …) automatic data recorders (as HUMS) included in munitions? In packaging? In storage and transportation means? In weapon systems?

3 **Development**

(a) Does the design work include features and parameters to enable munitions products to meet the specified requirements for reliability, safety, storage, transport and handling, throughout the whole life cycle of munitions (e.g. : including operational usage and disposal)?

(b) Are munitions designed to maintain the required level of reliability in all specified environmental and foreseeable operational conditions throughout all life cycle stages?

(c) Is the quality of the chosen components (materials, mechanical parts, explosive materials, compatibility and time degradation of pyrotechnic materials, electronic parts, battery…) optimised against the performance and the specified UXO rate?

(d) Where appropriate and technically feasible, does the design permit the testing of critical functions, which may lead to UXO prior to use (by user or BIT)?

(e) Does the fusing system incorporate design features, which definitively limit the foreseen active time of munitions: self-destruction mechanism, self-deactivating feature (e.g. Electrical Firing Energy Dissipation), self-neutralisation mechanism (e.g. disarming, sterilisation), and self-disruption?

(f) Are all features or functions related to safety tested?

(g) Does the design of the fusing system include features that facilitate, as applicable, effective automated and/or manual quality assurance methods, tests and inspections?

(h) Are munitions designed to achieve the specified lifetime without unacceptable degradation of reliability and safety?

(i) Does the design of munitions include features for health monitoring that facilitate, as applicable, a prognostics and diagnostics capability, thereby assuring the effectiveness and reliability of munitions throughout the lifecycle?

(j) Are the lot numbers marked on munitions?

(k) Has a reliability and safety analysis been performed e.g. are potential malfunctions of munitions analysed and is the design improved and verified by analysis and specific reliability and safety tests?

(l) Are critical functions and characteristics, with respect to UXO, defined?

(m) Are quantitative reliability and safety requirements assessed by analysis and tests?

(n) If, in munitions, there are software or programmable components, do you refer to international standards? Do you define, plan and perform specific activities to assure reliability and safety?

(o) Has process analysis been realised to assure the greatest reliability of munitions? (e.g. FMECA process).

3.1 Reducing UXO sensitivity

(a) Does the fusing system design include features to prevent initiation of the explosive train (e.g. through depletion of electrical energy) after the operating time of the fusing system has expired? How long does it take for the fusing system of the UXO to become inoperable e.g. for the firing electric energy to be depleted to a level below the minimum current required to initiate the detonator (i.e. non fire current level)?

(b) Does the fusing system incorporate fail-safe design (safe state of the fusing system in case of failure) or sterilisation (e.g. : initiate the primary explosive element in its safe position or deplete energy of the ignition capacitor in order to prevent detonation of the main charge, avoid inadvertent charging of ignition capacitor)?

(c) Have the least sensitive/ most stable explosive components been used in the explosive train (fusing system, main charge…)?

3.2 Reducing potential civilian casualties from ERW

(a) Is the colour, marking and/or shape chosen for munitions the result of a compromise between ease of disposal and reducing the attractiveness/ allure for civilians especially children?

(b) Has an explosive hazard or appropriate warning symbol been marked on munitions?

3.3 Qualification work

(a) Does the qualification program (testing and simulation) cover all military and technical requirements and have the data been recorded and been used to assess the UXO rate and to manage them during the conflict?

(b) Does the qualification program (testing and simulation) have sufficient statistical validity to allow a reliable evaluation of the reliability and safety of munitions in all operational environments?

(c) Is there a safety assessment report which covers all safety aspects (UXO included) for the entire lifecycle?

(d) Is there any independent office or organization to check and approve safety of munitions (e.g. fuse review board, national safety authority …)?

(e) Are the quality testing procedures for different components laid down and followed?

(f) Is the packaging of munitions supervised by trained personnel during production?

4. **Production**

(a) Has the production process been qualified?

(b) Are critical characteristics for safety and UXO rate, defined in safety assessment studies, checked during production?

(c) Have the production process quality assurance methods been validated?

(d) Is there assembly line/configuration management in place during production to record batches of munitions and parts? (e.g.: to permit investigation of defaults found during tests, training and use)?

(e) When some parts of munitions are stored during the manufacturing process, are conditions and limited durations of storage known and applied? Are the parts checked before using?

(f) Is the acceptance test procedure defined in accordance with national or international standards?

5. **Utilisation**

(a) Storage

(i) Do the actual storage conditions meet the specified military requirements?

(ii) Are munitions stored in compliance with a recognised storage regulation and/or best practices to maintain munitions reliability and safety? E.g. "A Guide to Ammunition Storage" by the Geneva International Center for Humanitarian demining (GICHD) or equivalent.

(iii) Where munitions temporarily cannot be stored in accordance with regulations e.g. in temporary tactical deployments is there a risk reduction procedure such as "As Low As is Reasonably Practicable" that can be followed (e.g. : temperature and humidity surveillance, …).

(iv) Are storage sites inspected to ensure that risk reduction procedures such as "As Low As is Reasonably Practicable" are being followed?

(v) Is there a procedure to manage stockpiles of munitions?

(vi) Is there a quality assurance program to ensure that training, service, maintenance, inspections and stockpile management are accomplished within standard?

(b) Transportation and handling

(i) Are there provisions to task manufacturers and users to attach written safety procedures for handling (and transportation) of munitions they produce and transport?

(ii) Do the means of transportation (and handling) meet the specified military requirements?

(iii) Are they in accordance with international hazardous materials transportation guidelines and/or UN recommendations on the transport of dangerous goods?

c) Training

(i) Is the user trained to perform visual checks of munitions before use or firing?

(ii) Is the user trained to test the weapon system and/or munitions before use or firing?

(iii) Is the user trained to use munitions? Does he know the limits of use defined in user manual?

(iv) Are negatively influencing factors on munitions, such as mechanical, thermal, electrical, climatic, biological, polluting, radiating or poisoning hazards, known to the users?

(v) Is the user trained to identify ERW and to apply procedure of treatment (e.g. mark, isolate, report and inform…)?

(vi) Are there training programmes adapted to different profile of users (operational, headquarters, maintenance…) and level of knowledge to have?

(vii) Do training programmes involve all personnel in the entire chain involved with the life cycle of munitions?

(viii) Are there specific training programme for specific munitions?

(ix) Is the training of users documented? (i.e. diploma, certificate…)

d) Using

(i) Does the user apply the correct procedure of use?

(ii) If not, for operational reasons, does he report these cases?

(iii) Are these cases analysed and taken into account for other project specifications?

(iv) Is there a system in place to record the batches/lots of munitions as they are distributed?

(v) Is there a procedure for munitions incidents, defects and accidents to be reported, recorded, analysed and for action to be taken during development, production and in service (especially during training)?

(vi) Is there a system of "lessons learnt" and their dissemination in the entire armed forces? (e.g.: measures taken in case in accident).

6. **Support**

(a) Maintenance of weapon system, munitions and packaging

(i) Is the user trained, if necessary, to adequately maintain the weapon system and/or munitions and the package?

(ii) Are the weapons systems and/or munitions and the package regularly checked by qualified personnel?

b) In service surveillance

(i) Is there an 'In Service Surveillance' procedure and organisation to assess reliability and safety during the lifecycle of munitions? For pyrotechnic parts? For electronic parts? For other parts?

(ii) Is there a system in place to check that all the explosive and pyrotechnic parts within the munition remain safe and reliable?

(iii) Is there a system in place to check that all the explosive and pyrotechnic parts within the fusing chain are capable of initiating the next stage as required?

(iv) Is the integrity of the pyrotechnic and explosive train checked (e.g. gap between components, integrity of components …)?

(v) Is there a procedure to identify and remove degraded munitions from operational service (i.e.: regular inspection of munitions)?

(vi) Is there a procedure to increase/reduce the operational lifetime of munitions?

(vii) In case of an increase in the operational life time of munitions do the tests and analysis maintain confidence in the previously required level of reliability and safety?

(viii) Is there an 'In Service Surveillance' procedure and organization to record the environmental conditions that the munitions have been exposed to/ tested in?

c) Documentation

(i) Is there a user manual for each type of munition?

(ii) Is information on munitions and their correct handling available, articulated in suitable terms for the respective level? Is the user of this information trained?

(iii) Do the OEMs provide to the users all technical details regarding munitions during the entire life cycle than can reduce or eliminate the probability of UXO?

(iv) Is the user manual adapted to different profiles of users (operational, headquarters, maintenance…)?

(v) Are the limits of use defined in the user manual?

(vi) Is there safety area defined (for troops, civilians and urban installations)?

(vii) In the user manual, are there recommendations about factors that can negatively influence munitions, such as mechanical, thermal, electrical, climatic, biological, polluting, radiating or poisoning hazards?

(viii) Are the technical manuals and their translations sufficiently detailed to achieve the objective of reduction of UXO?

7. **Disposal**

a) Identification

(i) Is the marking of munitions defined by a standard?

(ii) Is this standard known by other countries? By EOD team?

(iii) Is there an identification part (e.g.: bar code, RFID…) which allows automatic recognition?

b) Procedure

(i) Identify hazards associated with the Item, such as Anti-Tamper devices, Time Out Firing Trains, Battery Bleed Down Times, etc. to the Render Safe and Disposal Procedures.

(ii) Have render safe and disposal procedures for ERW (UXO and AXO) been developed, verified, recorded in data base, available and known by users or EOD team?

(iii) Is there a procedure in case of decision to abandon some munitions (AXO)?

(iv) Who is responsible for the disposal?

(v) What are the measures for destroying degraded munitions and keeping account of such destruction?

c) Information of other parties

Is there a process in place to inform other parties after an armed conflict of the types and potential locations of ERW in accordance with article 4 of CCW Protocol V?

8. **COTS and MOTS**

(a) Is the initial specification and qualification report or matrix known to the new customer and is it compliant with his own requirements?

(b) Are there some initial deviations from the initial specification?

(c) Are there some user's documentations which define recommendation for storage, transport, handling, use, training, monitoring…?

(d) Are these recommendations applied?

(e) In case of modification of design or process, is there an analysis with justifications to determine which analysis and trials are necessary for munitions to perform again?

(f) If munitions are already in military storage for a few years, are there some guarantees, justifications (by analysis or trials) about reliability, life time and safety?

9. **Others questions for storage related to safety**

(a) Is the risk of explosion in stockpiles minimized by the use of appropriate stockpile arrangements?

(b) Where munitions temporarily cannot be stored in accordance with regulations e.g. in temporary tactical deployments is there a risk reduction procedure such as "As low as reasonably practicable" that can be followed (e.g.: minimum safety distances to reduce risk of sympathetic explosion, construction of blast walls)?

(c) Is access to the storage site restricted (e.g.: perimeter fenced, guard forces…)?

(d) Is the storage site located a safe distance from personnel at all times?

(e) Are adequate emergency fire-fighting procedures in place?

List of abbreviations

ALARP:	As low as is reasonably practicable [aussi bas qu'il est raisonnablement practicable]
AXO:	Abandoned explosive ordnance [munition abandonée]
BIT:	Built in test [test integré]
COTS:	Commercial off the shelf [produit sur catalogue]
EOD:	Explosive ordnance disposal [service de destruction d'explosif]
ERW:	Explosive remnants of war (see definition in convention on CCW] [reste de guerre (REG) voir la définition dans la convention sur certaines armes classiques)]
FMECA:	Failure modes, effects and criticality analysis [analyse des modes de défaillance, de leurs effets et de leur criticité]
HCP:	High Contracting Party [Hautes Parties contractantes]
HUMS:	Health and usage monitoring system [système de surveillance d'utilisation et d'état]
MOTS:	Modified off the shelf [modifié sur catalogue]
OEMs:	Original equipment manufacturers [maître d'œuvre]
RFID:	Radio frequency identification device [système de radio-identification]
UXO:	Unexploded ordnance [see definition in Convention on CCW] [munition non explosée (voir la définition dans la Convention sur certaines armes classiques)]