DISCUSSION PAPER 5

Presented by Colonel Jean-Christophe Le Roux of France,
Coordinator on Generic preventive measures, pursuant to Article 9 and the Technical Annex of the Protocol

A CHECK-LIST ON GENERIC PREVENTIVE MEASURES

A - METHODOLOGY

The following rules are suggested:

- unless stated in the text on the preventive measure, the preventive measures apply by default to all types of munitions.

- 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

- 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.

The questions and the specific preventive measures are formulated according to different stages of the life cycle of a munition

B- CHECK LIST

1) Specification

- Is the life cycle of the munition defined completely, e.g.:
  - all direct environmental conditions or induced by means,
  - duration and configuration in each conditions,
  - for all life cycle stage,
  - take into account all operational means (storage, transport, handling, weapons…),
  - for normal, abnormal and accidental conditions?
- Do the munitions have a specified shelf life requirement?
- Are quantitative reliability and safety requirements included in specification for all life cycle?
- Is there a quantitative requirement for UXO in specification?
- Are targets characterized and use cases defined in specification?
- Do limits of angle impact (munition/surface of impact) defined in specification?
- Do limits of sensibility fuze defined in specification?
- In case of missing the target, is there requirement to minimize UXO rate?
- Are there forbidden materials (or components) requirements? (by knowledge, standards or international regulation or agreement)
- Which standards shall be applied during development and production? Are they international recognized? If not, is there a comparison matrix between standards?

2) Concept

- Does the design process include a proactive systems safety program (SSP)?
- Have the safety aspects and potential hazards of the munition on becoming an UXO been considered?
- Does the fusing system incorporate design features that allow assessment to facilitate render safe procedures?
- Does the design of the fusing system (or the ammunition) allow replacement or incorporation of advanced solutions to decrease the failure rate (e.g. : have self destruct, self neutralization features been considered, redundant train or components)?

3) Development

- Does the design work include features and parameters to enable the munition 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)?
- Are the munitions designed to maintain the required level of reliability in all specified environmental and foreseeable operational conditions throughout all life cycle stage?
- 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?
- 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)?
- Does the fusing system incorporate design features which definitely terminate the foreseen active time (e.g : self-functioned, de armed, sterilised, self-disrupted, Electrical Firing Energy Dissipation...)?

- Does the design of the fusing system include features that facilitate, as applicable, effective automated and/or manual quality assurance methods, tests and inspections?
- Are the munitions designed to achieve the specified shelf life without unacceptable degradation of reliability and safety?
- Does the design of the 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 ammunition lifecycle?
- Does the batches of munitions marked on the munitions?
- Has a reliability and safety analysis been performed e.g. are potential malfunctions of the munition analysed and is the design modified and verified by analysis and specific reliability and safety tests?
- Are critical functions and characteristics, with respect to UXO, defined?
- Are quantitative reliability and safety requirements assessed by analysis and tests?
- If, in the munition, there are software or programmable components, do you refer to international standards? Do you define and plan specific activities to assure reliability and safety?

Reducing ERW sensitivity

- Does the fusing system design include provisions to prevent initiation of the explosive train (e.g. through depletion of electrical energy) after the operating time of the fusing system has been expired? If it does not, has it been considered? Does the time necessary, to be under the non fire current, has been evaluated?
- 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)?
- Have the least sensitive/ most stable explosive components been used in the explosive train (fusing system, main charge…)?

Reducing potential civilian casualties from ERW

- Is the colour, marking and/or shape chosen for the munitions the result of a compromise between ease of disposal and reducing the attractiveness/ allure for civilians especially children?
- Has an explosive hazard or appropriate warning symbol been marked on the ammunition? (perhaps necessary to define this international symbol)

Qualification work

- Does the qualification program (testing and simulation) cover the military requirements and have the data been recorded and been used to assess the UXO rate and to manage them during the conflict?
- Does the qualification program (testing and simulation) have sufficient statistical validity to allow a reliable evaluation of the reliability and safety of the munitions in all operational environments?
- Is there a safety assessment report which covers all safety aspects (ERW included) for all lifecycle?
- Is there safety area defined (for troops, civilians and urban installations)?

4) Production

- Does the production process been qualified?

- Are critical characteristics for safety and UXO rate, defined in safety assessment studies, been followed during production?
- Have the production process quality assurance methods been validated in practice?
- Is there a configuration management in place during production to plot batches of munitions and parts? (e.g. : to permit investigation of defaults found during tests, training and use)?
- When some parts of munitions are stored during manufacturing process, are conditions and durations of storage known, respected, and checked before using of these parts?
- Does process analysis been realised to assure the greatest reliability of munitions?
- Does acceptance test procedure defined in accordance with international standards?

5) Utilisation

5.1) Storage

- Do the storage conditions meet the specified military requirements?
- Are the munitions stored in compliance with a recognised storage regulation to maintain munitions reliability and safety? For example GICHD A Guide to Ammunition Storage or equivalent
- Where the 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, …)
- Are storage sites inspected to ensure that risk reduction procedures such as "As Low As is Reasonably Practicable" are being followed?

5.2) Transportation and handling

- Are there provisions to task manufacturers to attach written safety procedures for handling (and transportation) of the munitions they produce and transfer?
- Do the means of transportation (and handling) meet the military requirements?
- Are they in accordance with international hazardous materials transportation guidelines and/or UN recommendations on the transport of dangerous goods?

5.3) Training

- Is the user trained to perform visual checks of the munitions before use or firing?
- Is the user trained to test the weapon system and/or the munition before use or firing?
- Is the user trained to use the munition? Does he know the limits of use defined in user manual?
- Is the user trained to identify ERW and apply procedure of treatment?

5.4) Using

- Does the user apply the procedure of use?
- If not, for operational causes, does he report these cases?
- Are these cases analysed and taking into account for other project specifications?

6) Support

6.1) maintenance of weapon system, munitions and packaging

- Is the user trained to adequately maintain the weapon system and/or the munition and the package?
- Are the weapons systems and/or the munition and the package regularly checked by qualified personnel?

6.2) In service surveillance

- Is there an In Service Surveillance procedure and organisation to assess the reliability and safety during the life of a munition? For pyrotechnic parts? For electronic part? For others parts?
- Is the capability of pyrotechnic parts to be initiated checked?
- Is the capability of pyrotechnic parts to initiate checked?
- Is the integrity of the pyrotechnic train checked (gap between components, integrity of components, …)?
- Is there a procedure to identify and remove degraded munitions from operational service (i.e. : regular inspection of munitions)?
- Is there a procedure to amend the life of a munition?
- In case of an increase in the operational shelf life of the munitions do the tests and analysis maintain confidence in the level of reliability and safety?
- Is there an In service Surveillance procedure and organisation to record what environmental conditions it has been supported by the munitions

6.3) failure report and data record

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

7) Retirement

Identification

- Does the marking of ammunition defined by a standard?
- Does this standard known by other countries? By EOD team?
- Is there an identification parts (e.g.: bar code, RFID,…) which allow automatic recognition?

Procedure

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

Information others parties

- Is there a process in place to inform other Parties after an armed conflict of the types and potential locations of ERW according to IHL/ in accordance with CCW Protocol V?

8) COTS and MOTS

- Are the initial specification and qualification report or matrix known by the new customer and been compliant with his own requirements?
- Are there some initial waivers against the initial specification?
- Are there some user's documentations which define recommendation for storage, transport, use, training, surveillance…?
- Is these recommendations respected?
- In case of modification, is there an analysis with justifications to determine which analysis and trials it is necessary to perform again?
- If the munitions are already in military storage for a few years, are there some guarantees, justifications (by analysis or trials) about reliability and safety?

9) Others questions for storage related to safety

- Is the risk of explosion in stockpiles be minimized by the used of appropriate stockpile arrangements?
- Where the 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. : safety distances to reduce risk of sympathetic explosion, construction of blast walls)?
- Is access to the storage site restricted (e.g. : perimeter fenced, guard forces…)?
- Is the storage site located a safe distance from personnel at all times?
- Are adequate emergency fires fighting procedures in place?

Glossary

ALARP : As Low As is Reasonably Practicable
AXO : Abandoned eXplosive Ordnance
BIT : Built In Test
CCW : Certain Conventional Weapons
COTS : Commercial Off The Shelf
EOD : Explosive Ordnance Disposal
ERW : Explosive Remnants of War (see definition in convention on CCW)
IHL : ?
MOTS : Modified Off The Shelf
RFID : Radio Frequency Identification Device
UXO : UneXploded Ordnance (see definition in convention on CCW)

———