GROUP OF GOVERNMENTAL EXPERTS OF THE STATES PARTIES 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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Working Group on Explosive Remnants of War

Meeting of military and technical experts

By the Chairperson of the Meetings of the Military and Technical Experts on Explosive Remnants of War (ERW)

Introduction

1. The present paper is drafted under the personal responsibility of the Chairperson of the Meetings of Military and Technical Experts. It attempts to reflect the progress made in these Meetings in 2004.

2. The main purpose of the paper is to facilitate the future discussion on the issue on possible preventive measures aimed at improving the design of certain specific type of munitions, including submunitions, with a view to minimizing the humanitarian risk of these munitions becoming explosive remnants of war. It also addresses related issues such as exchange of information, assistance and cooperation which were part of the work on ERW during the course of 2004.

The Mandate of the Working Group on ERW

3. The 2003 Meeting of the States Parties to the CCW adopted the following mandate for the Working Group on ERW for the year 2004:

> *"To continue to consider the implementation of existing principles of International Humanitarian Law and to further study, on an open-ended basis, and initially with particular emphasis on meetings of military and technical experts, possible preventive measures aimed at improving the design of certain specific type of munitions, including submunitions, with a view to minimize the humanitarian risk of these munitions becoming explosive remnants of war. Exchange of information, assistance and cooperation would be part of this work."*

4. The mandate tasked the Working Group on ERW to further study possible preventive measures aimed at improving the design of certain specific type of munitions, including submunitions, with a view to minimize the humanitarian risk of these munitions becoming

explosive remnants of war. It was understood that the study is to be conducted on an open-ended basis and with particular emphasis on meetings of military and technical experts.

The Meetings of the Military and Technical Experts in 2004

5. In accordance with the mandate of the Working Group on ERW, the Chair proposed that the Meetings of the Military and Technical Experts discussed the following questions:

a. The designs of which types of munitions, including sub-munitions, need to be considered for improvement as possible preventive measures? In this regard, the Meetings had to identify those munitions, including submunitions, which as unexploded ordnance pose the greatest humanitarian hazard.

b. What are the possible preventive measures aimed at improving the design of specific type of munitions, including submunitions? In this regard, the Meetings had to discuss and identify the different types of preventive measures, to examine whether there was a satisfactory methodological approach, and to determine whether specific preventive measures would be technically and economically feasible.

c. What is the role of the technical cooperation and assistance with respect to the possible preventive measures? In this regard, the Meetings had to discuss the technological and economic feasibility of the possible preventive measures while taking into account the disparity in military, technological and economic capabilities of the States Parties to the CCW. These disparities have important financial and technical implications, particularly for the development, production and stockpiling of new munitions, for the retrofitting of existing munitions as well as the decommissioning or destruction of existing stockpiles. Another important consideration in this respect is access to and transfers of appropriate technology.

6. The Meetings made some progress with respect to the first and the second questions. This progress is reflected in the matrices attached to this paper. With respect to the third question, much remains still to be done. Any future discussion on possible preventive measures shall focus primarily on the issue of technical cooperation and assistance.

Specific Types of Munitions

7. The discussion during the Meetings showed that from an ERW perspective the identification of possible specific types of munitions, including submunitions, is a complex exercise. The main reason is that the assessment of the humanitarian risk cannot only be based on objective criteria. By its nature it is a rather subjective undertaking, which must take into account perceptions of individual countries, past experiences from former conflicts as well as eye witness accounts of the humanitarian implications of explosive remnants of war. In addition, elements such as military doctrine and specific defence needs must also be taken into account as well as the procurement cycles of individual countries.

8. The military and technical experts identified a preliminary list of certain specific types of munitions that might pose greater humanitarian risk. This list, as reflected in both matrices, includes the following munitions: Cannon shells (>14.5 mm), pyrotechnics and propellants, air-launched submunitions (single fuze, multi-fuze), ground-launched submunitions (single

fuze, multi-fuze), hand and projected rifle grenades, mortar rounds, artillery projectiles and aircraft unitary bombs.

9. The list represents a cross-section of specific types of munitions which could become dangerous explosive remnants of war in future armed conflicts, including wars of internal and international character.

10. The list of specific types of munitions is illustrative. It should not be seen or understood as proof or irrefutable evidence that the identified types of munitions might pose an unacceptable humanitarian risk as explosive remnants of war.

11. With respect to submunitions, the list identifies that several types of submunitions have different humanitarian risk associated with them. This conclusion is also reflected in many analysis and assessment of the humanitarian risk associated with submunitions. In particular, multi-fuze submunitions seem to pose a much lower humanitarian risk than submunitions with single fuze or mortar rounds.

Possible Preventive Measures

12. With respect to possible preventive measures, the Meetings discussed the feasibility of a comprehensive approach, taking into account all relevant activities related to the life-cycle of munitions, such as design, production, storage and use. It was noted that there is no single preventive measures, that it sufficient by itself to reduce the likelihood of munitions becoming explosive remnants of war. From a military as well as from a humanitarian point of view, all possible preventive measures should be applied to ensure that the munition functions as intended or designed.

13. During the Meetings views were expressed that the best approach to preventive measures should take into consideration all possible measures to ensure that munitions functions as intended. However, there are some nuances with respect to implementation of the most appropriate preventive measures for munitions, including submunitions. The discussion in 2004 showed the following:

a. There should be a distinction between future production and possible retrofitting of existing munitions.

b. In order to determine whether existing munitions should be retrofitted or disposed of and replaced by more technically advanced munitions, States should study the reliability and safety of existing munitions as well as the technical and economic feasibility of the possible preventive measures.

c. The detonator with which the munitions are equipped is a very important element with respect to the possible preventive measures. In more than 99% of the cases malfunction of munitions is due to detonator failure. In future discussions on possible preventive measures in the context of the CCW the design, the technology and the quality of the detonator should be an important focus.

14. In the discussions during the 2004 Meetings views were expressed that proper stockpile management as well as continued reliability testing of munitions during storage were also considered as important possible preventive measures which should not be overlooked. The

reliability testing of existing and stored munitions should be part of any preventive measure designed to reduce the likelihood of munitions, including submunitions, from becoming ERW.

15. In the discussion during the 2004 Meetings views were also expressed that the cost-effectiveness and cost implications of the possible preventive measures were important considerations. However the discussion also made clear that the terms of reference for possible preventive measures should be the life-cycle cost of munitions, which include among others development and procurement costs as well as the storage and reliability testing costs. With respect to other types of costs, such as removal of unexploded ordnance or the humanitarian costs associated with accidents due to ERW, the discussion showed that there was insufficient data for arriving at meaningful assessments and conclusions.

Future Work

16. The Meetings showed that there was still an impressive amount of substance to be discussed with respect to possible preventive measures. In particular, in view of the CCW Review Conference in 2006, it is advisable to continue the work on ERW within the framework of the CCW on the basis on the present mandate. The mandate is far from being exhausted, especially with respect to technical cooperation an assistance, costs as well as design questions related to the technology and the nature of detonators and fuzes.

17. The Meetings profited considerably from presentations and well researched studies and analysis from interested participating States and organisations. Without their contributions it would not have been possible to make such a progress in 2004. Participating States and organisations should be encouraged to plan and prepare presentations for 2005.

18. The work of the Meetings also profited from the help and support from the Coordinator. Without his encouragement and active involvement in the work of the Meetings it would not have been possible to make much progress.

19. In 2004 the international workshop on Preventive Technical Measures for Munitions in Thun, Switzerland, which was jointly organised by Switzerland and Germany, as well as other expert meetings outside the institutional framework of the CCW, contributed substantially to the work of the Meetings of the Military and Technical Experts. Participating States and organisations should be encouraged to plan and organize similar events in 2005.

Annex I

Possible Types of Munitions (Any possible assessment of their associated Humanitarian Risk in the Annex)	Operational use	Retrofitting/ Capability Risk Reduction	**Possible Preventive Measures (Retrofit and future production)**						Itemized costs for possible preventive measures	Information Exchange Assistance/ cooperation
			Design		**Production**		**Storage**			
			Reliability	Efficiency Testing	Production Quality Assurance	Acceptance Test (Production Lot testing)	Stockpile Munitions Management	Testing during storage		
Small Arms Ammunition (<14.5mm)	soft and medium hard targets	Not possible	Improve bullet properties							
Cannon shells (>14.5 mm)	medium and hard targets	Replacement of cartridge case and propellant	Improve fuze, fragmentation, penetration							
Pyrotechnics	illumination smoke, flares	Not possible	Environment. Safe, components							
Air delivered sub-munitions (single fuze)	Dual use, soft and hard targets	Not possible	Back up system							
Air delivered sub-munitions (multi fuze)	Dual use, soft and hard targets	Replacement of fuze	Better target acquisition							
Artillery delivered sub-munitions (single fuze)	Dual use, soft and hard targets	Not possible	Back up system, better target acquisition							

Artillery delivered sub-munitions (multi fuze)	Dual use, soft and hard targets	Replacement of fuze	Better target acquisition							
Hand & projected (rifle) grenades	Soft targets	Replacement of fuze	Reliability of fuze							
Mortar rounds (excl carrier round)	Soft targets	Replacement of fuze (backup fuze for single fuze system)	Back up system (for single fuze system)							
Artillery & tank projectiles	Hard targets	Replacement of cartridge case and propellant	Penetration propriety							
Guided missiles	Hard targets	Replacement of rocket mortor	Penetration and precision							
Free Flight Rockets (gnd to gnd and air to gnd)	Soft and medium targets	Replacement of rocket motor	Ballistic properties/ performance							
Aircraft unitary bombs	Soft and hard targets	Replacement of fuze and tail unit	Reliability of fuze							
Abandoned Stockpiles	n.a.									
Abandoned Weapons	n.a.									

Annex II

HUMANITARIAN RISK THREAT MATRIX SHOWING RELATIVE HAZARD

Category	Quantity Used in Conflict Zone	Likelihood of remaining post conflict	Sensitivity of remaining items	Attractiveness to civilians	Impact of detonation (blast, shrapnel)	Overall Humanitarian Impact
Cannon shells (>14.5mm)						
Pyrotechnics – including smoke, flares.						
Air launched sub-munitions (single fuze)						
Air launched sub-munitions (multi fuze)						
Ground launched sub-munitions (single fuze)						
Ground launched sub-munitions (multi fuze)						
Hand & projected (rifle) grenades						
Mortar rounds (excl carrier rounds)						
Artillery projectiles						
Aircraft unitary bombs						

Key :

High / Poor	Medium	Low / Good

Annex III

Methodological approach to evaluation in the context of improvement of the design of certain specific types of munitions[1]

<table>
<tr><td>1</td><td colspan="3">Type</td><td rowspan="2">Munitions</td></tr>
<tr><td>2</td><td colspan="3">Quantity used in conflict</td></tr>
<tr><td>3</td><td colspan="4">Human risks</td></tr>
<tr><td>4</td><td colspan="4">Operational use</td></tr>
<tr><td>5</td><td colspan="4">Capability risks reduction</td></tr>
<tr><td>6</td><td colspan="3">Stocks management</td><td rowspan="20">Prevention capability</td></tr>
<tr><td>7</td><td>Reliability</td><td></td><td rowspan="7">Future productions</td></tr>
<tr><td>8</td><td>Detectability</td><td rowspan="2">Design</td></tr>
<tr><td>9</td><td>AMDEC product</td></tr>
<tr><td>10</td><td>AMDEC process</td><td rowspan="3">Production</td></tr>
<tr><td>11</td><td>Production quality assurance</td></tr>
<tr><td>12</td><td>Acceptance tests</td></tr>
<tr><td>13</td><td>Cost evaluation</td><td>Cost</td></tr>
<tr><td>14</td><td>Reliability</td><td rowspan="3">Design</td><td rowspan="7">Retrofit</td></tr>
<tr><td>15</td><td>Detectability</td></tr>
<tr><td>16</td><td>AMDEC product</td></tr>
<tr><td>17</td><td>AMDEC process</td><td rowspan="3">Production</td></tr>
<tr><td>18</td><td>Production quality assurance</td></tr>
<tr><td>19</td><td>Acceptance tests</td></tr>
<tr><td>20</td><td>Cost evaluation</td><td>Cost</td></tr>
<tr><td>21</td><td colspan="4">Information/exchange</td></tr>
<tr><td>22</td><td colspan="4">Assistance/cooperation</td></tr>
</table>

AMDEC - analyse de mode de défaillances et de la criticité =
FMECA - failure mode, effects and criticality analysis

[1] The present Annex is part of document CCW/GGE/VIII/WG.1/WP.1

How to fill in the matrix

Column 1	Specify the model of munition, or more precisely the model of the detonator with which the munition is equipped. Different munitions may be grouped together if they are equipped with the same detonator and stored in the same conditions, i.e. logistical packaging (wooden crate, for example).
Column 2	Evaluation of the quantity of munitions used in conflict - three levels of use proposed.
Column 3	Evaluation of the humanitarian risk posed by this type of munition. Criteria such as the size of the munition, its ability to be neutralized simply, its anti-personnel effectiveness in the event of untimely operation, and ease of locating it during the demining phase will be crucial in evaluating this risk in terms of five levels.
Column 4	Type of object targeted by this type of munition, AP, AV, area saturation or specific target.
Column 5	Reply yes or no depending on the technology and the age of the design. If the reply is no, replacement of the detonator on this munition with a more up-to-date device should be envisaged and the reader should refer to columns 21 and 22. If the reply is yes, please continue completing columns 6 to 22.
Column 6	Does this munition undergo regular ageing checks? Have certain batches undergone technical checks following operational faults, or been banned from use because of reliability or safety problems? Might improvement of the stockpile management policy for this munition be sufficient to improve operational reliability in the field?
Columns 7 to 13	For future production of this munition to supplement existing stockpiles, and to improve the reliability of the product with a view to reducing the unexploded remnants generated, is it necessary to:
Columns 7 to 9	Review the specification of the product?
Column 7	Review the design of the weapons system in which the cause of the malfunctioning has been clearly identified?
Column 8	Focus on the detectability of the munition by applying international colour coding?
Column 9	Before taking any decisions regarding modification, carry out a study of the reliability and safety of the specification of the munition by performing a failure mode, effects and criticality analysis (FMECA), which does not exist for this product?
Columns 10 to 12	Review the manufacture of the product?

Column 10	Before taking any decision regarding a resumption of production, carry out a study of the reliability and safety of the process of production of the munition by performing a failure mode, effects and criticality analysis (FMECA) on the production process, which does not exist for this product?
Column 11	Before taking any decision regarding a resumption of production, reformulate the terms for monitoring the quality of production for this product, with the aim of improving its reliability in operation?
Column 12	Before taking any decision regarding a resumption of production, reformulate the terms of acceptance for this product with the aim of improving its reliability in operation by stiffening the criteria for testing and/or acceptance?
Column 13	Estimate the costs of improvement measures which may be envisaged for this type of munition or detonator in the event of a resumption of production?
Columns 14 to 20	In the event that a retrofit of this munition may be envisaged for the reconstitution of existing stockpiles, and with the aim of improving the reliability of the product so as to reduce the unexploded remnants generated, is it necessary to:
Columns 14 to 16	Review the specification of the product?
Column 14	Review the design of the weapons system in which the cause of the malfunctioning has been clearly identified?
Column 15	Focus on the detectability of the munition by applying international colour coding?
Column 16	Before taking any decisions regarding modification, carry out a study of the reliability and safety of the specification of the munition by performing a failure mode, effects and criticality analysis (FMECA) on the specification, which does not exist for this product?
Columns 17 to 19	Review the manufacture of the product for the introduction of the retrofit?
Column 17	Before taking any decision regarding retrofit, carry out a study of the reliability and safety of the process of production of the munition by performing a failure mode, effects and criticality analysis on the production process (FMECA), which does not exist for this product?
Column 18	Before taking any decision regarding retrofit, reformulate the terms for monitoring the quality of production for this product with the aim of improving its reliability in operation?
Column 19	Before taking any decision regarding retrofit, reformulate the terms of acceptance for this product with the aim of improving its reliability in operation by stiffening the criteria for testing and/or acceptance?

Column 20	Estimate the costs of retrofit actions for the improvement of this type of munition or type of detonator for all or part of the existing stockpile. Compare this cost with the solution involving a resumption of production of new munitions which have been subjected to the measures identified in columns 7 to 13.
Column 21	Indication of the need of the country possessing this munition to obtain from a third party information whereby the operation of the munition could be improved.
Column 22	Offer of or request for assistance or cooperation in improving the operation of the munition described in the table.