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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PREVENTIVE TECHNICAL MEASURES IN MUNITIONS MANAGEMENT

Submitted by the Argentine Republic

I. INTRODUCTION

1. At the previous meeting of the Group of Governmental Experts, held in March, in the paper entitled "Perspectives 2005", the Chairperson of the Meeting of Military and Technical Experts on Explosive Remnants of War (ERW) offered an opportunity to organize work on preventive technical measures which are both relevant and feasible for reaching the goal of improving the reliability of munitions. Preventive measures have relevance throughout the life cycle of munitions, from initial design to proper stockpile management.

2. Consequently, the Argentine Republic considers it appropriate to outline national practice as a contribution to the discussions on this topic in the Group of Governmental Experts.

II. TECHNICAL MEASURES

3. Argentina implements preventive technical measures in munitions management, principally in order to ensure the safety of personnel, both during handling in facilities where the munitions are stored and during operational use. This paper refers in particular to a contribution to preventive measures, more specifically to the studies focused on evaluation and extension of the useful life of the munitions, highlighting a methodology which has a positive impact on the reliability and safety of the munitions, and demonstrating how technical measures applied to the munitions will lead to a reduction in the number of cases of unexploded munitions.

4. The technical status of each munition is monitored and managed continuously throughout its life cycle, but particularly towards the end of its useful life as indicated by the manufacturer or specified in the appropriate technical regulations. In that regard, Argentina is making a contribution to technical measures for enhancing reliability and safety in the form of the methodology described below, which we will refer to as Evaluation and Studies of the Remaining Useful Life of Outdated Munitions.

(a) Legal framework

5. Act No. 24.948 lays down that the armed forces must analyse equipment options in the following order: rehabilitation of equipment which is out of commission, when possible; updating of available equipment; and acquisition of new equipment.

6. Within the reform programme under way in the armed forces, research and development objectives are selected in keeping with the following priorities:

(i) Projects and programmes under which weapons systems, including existing munitions, can be rehabilitated or kept operational;

(ii) Projects and programmes designed to update weapons systems, including the corresponding munitions.

(b) Contributing technical measures

7. In the area under the responsibility of the Ministry of Defence, the methodology for Evaluation and Studies of the Remaining Useful Life of Outdated Munitions forms part of the Argentine armed forces' joint plan for the rehabilitation and decommissioning of outdated munitions. This methodology has been implemented in recent years in particular, and is scheduled to be used on a larger scale in the future.

8. The joint chiefs of staff of the Argentine armed forces carry out surveys of the situation regarding munitions in the three armed forces, so as to optimize their use and assess alternative options for future use. These surveys point to the need to carry out studies aimed at evaluating the remaining useful life of munitions, recommending their retention in service, or the rehabilitation or conversion of outdated munitions, and determining the most appropriate methodologies for those which require decommissioning.

9. Argentina's Armed Forces Scientific and Technical Research Institute (CITEFA) is the only institution in Latin America which has the capability to carry out studies that will allow the useful life of munitions to be extended. Maintaining this capability and increasing the availability of scientific and technological services in general makes it possible to enhance cooperation with other countries in the defence sphere through specific agreements for assistance, cooperation and research and development.

10. Related points to be given special emphasis are the procedures relating to storage, handling, inspection, testing and supervision. Munitions stored for long periods and often in harsh environmental conditions suffer deterioration in quality, which can affect their safe use and handling and their reliability. For this reason the manufacturers set a date beyond which they are classed as unsuitable for use because of the major risks involved. However, in many cases the munitions have not deteriorated, because of good storage conditions, stable components or very high manufacturing quality, so that their maintenance in service can be authorized for a specific period, subject to examination of their condition, which must be repeated at the end of this period.

(c) Guiding criteria underpinning the methodology for evaluation and studies of the remaining useful life of outdated munitions

11. Checks of technical condition are based on duly identified batches to which a traceability system has been applied, duly recording their previous history in terms of places of storage, whether they have been removed from their original packaging, and the environmental conditions to which they have been subjected.

12. Under the methodology, statistically representative samples are taken of the batches of munitions for evaluation, so that the remaining useful life of the munitions and their components can be estimated, in order to determine the scope for retaining them in commission, reconditioning them or updating them, or, as a last resort, the need to decommission them as potentially dangerous, presenting hazards in terms of both personnel safety and potential adverse environmental impacts.

13. In some cases, it is appropriate to recondition the munition for other applications or to improve its functioning, which requires a prior analysis of its condition and the modifications required, so as to gauge the economic benefit of the investment involved.

14. In cases where a decision is taken to undertake decommissioning, it is also necessary to ascertain the condition of the munition. This will make it possible to establish the safety conditions required for the various operations involved, and also to assess the desirability of recovery and recycling of the various components which retain high economic value.

15. Owing to the wide variety of munitions in use in the armed forces, and the different characteristics of their constituent elements, specific studies must be carried out for each type of munition in particular. The scale of these studies depends on the type of munition, so that there is a great difference in the resources and technological capabilities needed to evaluate the condition of missiles or ammunition for light weapons or minor components of weapons systems.

16. The methodology used in evaluation and studies of the remaining useful life of outdated munitions is described in the annex.

III. CONCLUSIONS

17. Extending the useful life of munitions, which may be accomplished on the basis of these studies, leads to substantial savings of resources for the armed forces. The scale of such savings varies depending on the characteristics of the munition, the size of the stored batches and the weapons system of which they are a part. Other non-quantifiable benefits arise such as an increase in the operational capability of the armed forces, greater logistical capability, an increase in scientific and technological capability with improved safety in storage areas, use in safe and reliable conditions and the reduction of possible adverse environmental impacts.

18. The activities being carried out by Argentina in the scientific and technological area show that it possesses technical and human capabilities for the application of methodologies such as those described contributing to sustainable management of munition stocks which ensures their sound use.

19. Evaluation of the remaining useful life of outdated munitions and those kept in stockpiles is a technical measure which makes it possible to rehabilitate them and extend their period of use in safe and reliable conditions.

20. In the area of defence and the armed forces the Argentine Republic has a plan for evaluation, rehabilitation and decommissioning of munitions which complies with best practice in this area as a preventive measure and also extends to the entire life cycle as a means of enhancing their reliability.

21. Some of the advantages of the use of this methodology are set out below.

(a) Direct benefits

(i) A technical measure which increases reliability and safety throughout the life cycle of the munition, and especially at the end of its useful life. It should be regarded as a contribution by Argentina in the context of technical annex No. 3 to CCW Protocol V.

(ii) Increased capabilities of the technological sector, in quantitative and qualitative terms, for the provision of greater scientific and technological services in the defence field.

(iii) Maintenance of the stockpile of munitions available to the armed forces.

(iv) Use can be made of the armed forces' complex weapons systems which are out of commission owing to minor problems, with assurances of reliability.

(v) Major economic savings through recovery of equipment that was otherwise destined for final disposal.

(b) Indirect benefits

(i) Contribution to the implementation of defence policies and best practices in munitions management.

(ii) Enhancing scientific and technological capabilities, in quantitative and qualitative terms, for purposes of assistance and cooperation with the States parties.

(iii) Greater safety in arsenals and in handling munitions.

(iv) Greater technological capabilities of R & D sectors to provide support to the armed forces and contribute to defence objectives.

(v) Reduction in the quantity of wastes generated by the decommissioning of munitions, thus contributing to preservation of the environment.

Annex

METHODOLOGY USED IN EVALUATION AND STUDIES OF THE REMAINING USEFUL LIFE OF OUTDATED MUNITIONS

Tests to determine and, as appropriate, extend the remaining useful life of outdated munitions involve the following main stages:

I. INITIAL STAGE

1. The most important steps include:

(i) Search of internal and external databases for information on the munition in question, in view of the fact that the manufacturer normally provides little or no technical information;

(ii) Visual inspection of samples by specialists in munitions, explosives and armaments, some of whom have over 30 years' experience;

These inspections are carried out on statistical samples of each of the batches to be evaluated, which are taken from those which have been subjected to the harshest storage conditions;

(iii) Design and scheduling of tasks which involve operating with hazardous components, especially when they have not originally been designed for dismantling and experience must compensate for such circumstances.

II. IMPLEMENTATION STAGE

2. The studies conducted with a view to possible extension of the useful life of outdated munitions may be classified as:

(i) Non-destructive tests;

(ii) Static and dynamic laboratory tests;

(iii) Operating tests.

Non-destructive testing

3. Visual inspection by specialists makes it possible to evaluate the general condition of the munition and identify the safety conditions which must be met in order to carry out the subsequent tests. This is complemented by specific studies of components, which may include:

(i) Radiographic inspection (X-rays or gamma rays);

(ii) Determination of dimensions;

(iii) Conventional microscopy and scanning electron microscopy;

(iv) Non-destructive testing to identify cracks, etc.

Static and dynamic laboratory tests

4. The purpose of laboratory testing of the munition and its components is as follows:

(i) To determine their capacity to function reliably;

(ii) To establish to what extent their critical physico-chemical, mechanical, electric, chronographic and other characteristics have been modified, and why;

(iii) To establish whether they may safely be stored and used in combat.

5. These tests may include:

(i) Stability tests on secondary and primary explosives;

(ii) Compatibility tests;

(iii) Corrosion studies;

(iv) Drop tests and impact tests;

(v) Measurement of explosive train response times;

(vi) Metallographic tests;

(vii) Measurement of ignition retardation times.

6. Various analytical techniques are used to determine the quantity of residual stabilizer in the propellant and its reaction products, which must be above a level established as a safe concentration. High-sensitivity calorimetric techniques are used to determine the rate of degradation of high explosives, propellants and pyrotechnic mixtures, and this makes it possible to characterize their degree of ageing, predict the risk of self-ignition and determine how temperature influences their degradation. The influence of other environmental factors, such as humidity, on the storage stability of explosive and other components of the munition is analysed.

7. Compatibility studies are also carried out to determine the influence of the materials making up the munition on the stability of the explosives, as well as mechanical tests to evaluate the behaviour of different components in the various situations to which the munition is exposed. All this information is used to devise accelerated ageing tests to classify the munition for storage purposes.

8. The metallographic, corrosion and drop and impact studies provide data on the state of the equipment so that its normal functioning can be predicted and it does not display any faults.

9. All the information is processed using purpose-built data acquisition systems.

Operating tests

10. These may include:

(i) Fuse and primer tests;

(ii) Component vibration tests;

(iii) Tests of operation at extreme temperatures;

(iv) Operation of fuse safety features;

(v) Test launch to check trajectory safety;

(vi) Launch tests to check operation.

11. Tests of the components, sub-assemblies and assemblies are planned, designed and carried out. They are followed by launch tests, involving dynamic assessment of compliance with safety conditions and correct operation in real conditions, and measurement of velocities, pressures, effect on the target and any other parameter which may prove critical in keeping with the characteristics of the munition. In the case of rockets and missiles, motors are tested on a test bed, and in some cases they are complemented by tests in flight which may also include telemetry.

III. FINAL STAGE

12. The results of the tests are evaluated in order to prepare a recommendation on action to be taken with regard to the evaluated batch of outdated munitions, bearing in mind their reliability, their probability of operation, and their safety. The evaluation specifies whether the munitions are in a state to continue being stored and used operationally and whether, and for how long, they should undergo reconditioning, recharging or destruction.

13. The various tests also furnish reference data for future evaluations of munitions, drawing up a record of their history for cases where the period of storage and use of munitions has been extended because they remain serviceable, enabling them to be retained for a period to be determined in accordance with their condition.
