Project Plan for the CEN Workshop on “Complement to test and evaluation of mechanical equipment used in demining operations”

(WS HUMANITARIAN MINE ACTION)

1 Status of the Business Plan
Business Plan approved by WS 80 “Humanitarian Mine Action” members on 2015-10-16

2 Background to the Workshop

2.1 Context and market environment

2.1.1 The global context
The presence of landmines and other Explosive Remnants of War (ERW)\(^1\) represents a serious safety hazard and a major obstacle to reconstruction and development in former disputed areas around the world. Current estimates record several dozens of countries in the world contaminated with millions of mines and unexploded ordnance (UXO) items. Recent conflicts have added a new generation of UXO and improvised Explosive Devices threats which those engaged in Humanitarian Mine Action (HMA) have to deal with alongside more familiar mines and booby traps.

All currently recognised methods of ground clearance involve people (men and women) being inside the threat area at some time. Globally, the most common approach to ground clearance is still the use of manual deminers covering the ground with the aid of a variety of tools and assets that may include Explosive Detecting Animals and mechanical equipment. When animals are used, human assets control the animals and check their indications. When mechanical equipment is used, it can assist the process and may sometimes be effective in reducing the area that must be cleared, but human assets are still used to check their effectiveness and deal with discovered devices. Protective equipment issued to these individuals varies widely, and its proven effectiveness against HMA threats is often uncertain.

2.1.2 Personal Protective Equipment (PPE)
Some accidental initiation of devices is recognised as being inevitable during demining.\(^2\) In many cases, effective PPE can prevent seriously disabling injury. Humanitarian principles and the legal aspects of an employer’s “duty of care” or “legal responsibility” make it essential to limit the injuries that result by the provision of ineffective PPE. To achieve this reliably, it is necessary to provide appropriate guidance about the effectiveness of the various PPE products that are on the market, and to reach an agreed means of comparing product effectiveness one against another.

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\(^1\) An overview of the abbreviations used is in Annex F

\(^2\) Database of Demining Accidents: more than 21% of recorded accidents are classed as “unavoidable”
Standardisation will support the development of new protective equipment and will facilitate the comparison of performance and effectiveness of existing PPE products in a manner appropriate for the HMA end-use. This will significantly increase the use of effective PPE and so reduce the incidence of severely disabling injury and personnel loss. The benefit of agreed specifications and verifiable performance indicators is widely acknowledged. The focus will be on testing eye, face and body protection against blast and/or fragments that PPE can provide.

The markets that will be affected by the outcome of this CEN Workshop are the manufacturers of PPE and the purchasers of PPE for HMA. The PPE market is both mature and growing, with PPE products used in civilian and military contexts and designed to protect against a range of threat from fire to chemical and biological agents. Most manufacturers supplying PPE for HMA also make PPE for civilian and military markets.

The PPE originally used in humanitarian demining was designed for combat purposes. Since 1995, some physical/mechanical design elements have been altered to meet the needs of Humanitarian Demining, but the materials used have remained substantially unchanged. The methods of determining the level of protection provided is defined in the International Mine Action Standards (IMAS) in terms of blast and fragmentation effects.

### 2.1.3 Mechanical equipment

The Humanitarian Demining market for mechanical equipment is small but is not limited to the type of mechanical equipment for which a T&E Protocol currently exists (on mechanical equipment whose stated purpose is the detonation, destruction or removal of landmines). These mechanical equipment are tested, according to the existing T&E Protocol 15044:2009 (formerly known as CWA 15044:2009), in artificial test lanes in “laboratory” conditions in specialised test sites in Europe.

The proposed CWA differs from T&E Protocol 15044:2009 by applying to other types of mechanical equipment. T&E Protocol 15044:2009 states: "For the purposes of this document, demining machines are defined as those machines whose stated purpose is the detonation, destruction or removal of landmines." But other mechanical equipment can still be useful in mine action. The proposed CWA would extend T&E Protocol 15044:2009 mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines, such as equipment designed to reduce or remove obstacles to clearance such as tripwires, vegetation or metal contamination and to prepare difficult soils to make subsequent clearance operations more efficient. The document will not cover flying equipment.

### 2.2 Existing standards and legal environment

#### 2.2.1 Mechanical equipment

IMAS 09.50 clearly states that each demining mechanical equipment shall be Tested and Evaluated (T&E) to determine its suitability for the task(s) it is expected to carry out in the conditions in which it will work and that T&E for demining mechanical equipment should be designed to: identify the operational limitations and the optimal operating conditions of the mechanical equipment, identify the effectiveness in disrupting, destroying, detonating or
otherwise removing different types of landmines or ERW from hazardous areas in different operating environments, identify the residual risk remaining from each potential hazard to be targeted in the operating environments in which the mechanical equipment will work, identify any limitations in the employment of a mechanical equipment,… and identify any potential environmental damage caused through the use of demining mechanical equipment e.g. soil erosion.

So far there are no guidelines for the T&E of mechanical equipment in realistic conditions in mine affected countries, so helping national mine action authorities (NMAAs) to highlight scenarios where specific mechanical equipment performs appropriately and to both know their limitations and how best to follow-up their work with other assets. The choice of adopting one mechanical equipment or another in a specific environment should be based on realistic, quantitative data, possibly also including cost as a significant variable, so allowing an informed evaluation that allows a better management of resources.

This will in particular be very important as the mine action community moves to a greater focus on technical survey.

This Workshop will not deal with aspects of safety of machinery in the sense of the Machinery Directive.

2.2.2 Personal protective equipment
The TIRAMISU project which will be contributing to this Workshop is also producing results related to PPE.

The mechanism to contribute to standardization (either through contribution to the relevant TCs or through a project for a new CWA under Guide 29) is still under discussion.

2.3 Motivation for the creation of this Workshop

Acceptance Test and Evaluation Specifications and Methodology for all types of mechanical equipment not covered by T&E Protocol 15044:2009 need to be developed for the following reasons:

1. The topic to consider is a new CWA on complement to the Test and Evaluation of Demining mechanical equipment used in demining operations for all types of demining equipment other than equipment whose stated purpose is the detonation, destruction or removal of landmines, in realistic conditions. The CWA would allow national mine action authorities (NMAAs) and demining organisations to compare different mechanical equipment on the basis of their performance in similar environments, allowing choices on which equipment to employ and where to employ it on the basis of quantitative, realistic data. The CWA, once adopted as a baseline for evaluating mechanical equipment performance whose stated purpose is not the detonation, destruction or removal of landmines in mine affected countries, could serve as reference for local mechanical equipment producers to aim at the right target while designing their products, promoting local innovation and development.
2. The system suggested in the new CWA would allow NMAAs to allocate better the money at their disposal, choosing the right tool for the right task.

It is expected that a considerable amount of money will be saved and that both operational efficiency and safety will be improved by facilitating the informed use of the right tool in the right place.

3. Introducing guidelines on how to test and evaluate demining mechanical equipment whose stated purpose *not* is the detonation, destruction or removal of landmines during the acceptance trials would allow NMAAs to introduce a statistically valuable system to ensure the proper T&E of demining equipment prior to their deployment on demining operations (IMAS 09.50). Moreover it would help a system for demining organizations to maintain detailed records of their mechanical equipment and follow-up operations to establish a statistical database of information that can be used for operational decision making (IMAS 09.50).

At the end, by supporting operational decision making toward a better use of resources, the system would allow mine affected communities to have their land released in a shorter time. It might even open up the road for an honest competition between locally built machinery and expensive machines sold on the international mine action market, therefore, potentially fostering local development.

4. Existing IMAS on the topic, such as IMAS 03.40 on Test and Evaluation of Mine Action Equipment and IMAS 09.50 on Mechanical Demining, address the problem of T&E demining machines against their intended use in conditions in which they will work, but only in broad general terms. Therefore a new CWA, giving details about how to use the new system proposed for T&E of demining mechanical equipment whose stated purpose is *not* the detonation, destruction or removal of landmines during acceptance trials in realistic conditions in mine affected countries is deemed an appropriate tool. Moreover, since the system could benefit from a pre-defined method of data recording in a spreadsheet, the CWA could also specify in details how to deal with data entry to the spreadsheet.

3 Workshop proposers and Workshop participants

3.1 Proposers

The proposers of this CEN Workshop are as follows:

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<thead>
<tr>
<th>Company of Institution</th>
<th>Contact person</th>
<th>Telephone</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Military Academy</td>
<td>Yann Yvinec</td>
<td>+32 2 441 40 42</td>
<td><a href="mailto:yvinec@elec.rma.ac.be">yvinec@elec.rma.ac.be</a></td>
</tr>
</tbody>
</table>

Royal Military Academy, Brussels, volunteers to take the responsibility for the Chair of this WS. AENOR will provide the professional standardisation expertise and a formal link to the CEN System.

The market players that will benefit from the outcome of this CEN Workshop are:
• Donors;
• Manufacturers of equipment for mine action;
• Commercial and non commercial humanitarian demining organisations;
• Members of the public who benefit from the work of humanitarian demining organisations;
• Mine Action Centres; and
• Test and evaluation agencies.

3.2 Participants for WS on Mechanical equipment

Considering the market described above, the following groups of people in particular shall be invited to contribute to this CEN Workshop:

• Users of Demining Machines and mechanical equipment;
• Manufacturers of Demining mechanical equipment;
• Institutions/agencies who perform tests on Demining Machines and mechanical equipment;
• Mine Action Centres;
• Experts in standardisation of measurement equipment; and
• Donors.

4 Workshop scope and objectives

The proposed CWA will cover at least the following points;

• evaluation of mechanical demining equipment whose stated purpose is not the detonation, destruction or removal of landmines in standardised test lanes
• Acceptance test of mechanical demining equipment whose stated purpose is not the detonation, destruction or removal of landmines

The purpose of this CEN Workshop is to agree well defined specifications for:

• critical criteria to be tested;
• appropriate acceptance testing methodologies; and
• appropriate acceptance evaluating methodologies.

The agreement will be formalized by one CEN Workshop agreement (CWA).

The objectives for standardization on demining mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines (later mentioned only as ‘mechanical equipment’) will be reached by:
agreeing on specifications for baseline data, to be able to compare mechanical equipment with the same aim on the basis of their characteristics and their efficiency

- defining a method for evaluating cost-efficiency of different mechanical equipment with reference to the baseline efficiency of manual demining; see Annex A;
- agreeing on specifications for performance testing in realistic and defined conditions; see Annex B;
- agreeing on specifications for survivability testing for the mechanical equipment as constrained by manufacturer’s claims; see Annex C;
- agreeing on specifications for integrated test to provide necessary figures for a comparable estimation of cost-efficiency; see Annex D;
- agreeing on mine and ERW targets that may be used to determine target exposure; see Annex E;
- agreeing on specifications for the assessment of ground and vegetation conditions before and after the test; and
- agreeing on specifications for recording results of tests in a uniform manner.

The beneficiaries of this process will be field operators, manufacturers, researchers and developers within the global HMA community. The results of this work should ensure that, for the first time, there is a baseline standard against which to judge the performance of demining mechanical equipment in realistic in-field conditions.

This will improve the effectiveness of the demining process, reduce risk and ensure a continuous high level of land release quality. Users of mechanical systems will be able to make informed decisions over the further actions required after the mechanical system has operated.

The main objective therefore is to develop widely accepted and applied specifications for the testing and evaluation in realistic in-field scenarios of demining mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines as part of Humanitarian Mine Action activities. The document will not cover flying equipment or equipment mounted with sensors to detect landmines or other ERW.

The CEN Workshop process is open to participation from non-CEN member states. This is clearly an advantage in this case where the aim is to produce a document that can be accepted internationally. It has been decided therefore, to start with a CEN Workshop Agreement (CWA). This could then form the basis for a Technical Note for Mine Action (TNMA), IMAS, EN Standards or possibly ISO Standards.

The deliverable is a CEN Workshop Agreement (CWA) defining specifications for complement to test and evaluation of mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines as part of Humanitarian Mine Action activities. It is intended
that the CWA, resulting from the WS, will conform to the IMAS on equipment test and evaluation.

5 Workshop programme

5.1 Work plan for mechanical equipment

This CEN Workshop will agree on appropriate Specifications and Methodology for the Acceptance Testing and Evaluation (T&E) of demining mechanical equipment for Humanitarian Mine Action (HMA) whose stated purpose is not the detonation, destruction or removal of landmines. In preparation for this WS contacts have already been initiated with efforts made to ensure that the CEN Workshop meetings are well attended by those identified under Section 3. Following the kick-off meeting, there will be other meetings as determined by the group (but not exceeding three Workshop meetings in all). Reflecting the global relevance of the output and the requirement for members from outside the EU to contribute, the venue for these meetings will be determined by agreement between participants. A suggested structure for a draft agreement will be presented for consideration at the first meeting, with revisions circulated as frequently as appropriate to advance consensus between meetings.

The CWA will likely to be published as one CWA with the following sections:

- Baseline data and efficiency appraisal of mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines
- Field - performance tests for mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines
- Survivability test for mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines
- Integrated test on performance and survivability of mechanical equipment whose stated purpose is not the detonation, destruction or removal of landmines
- Simulated mine targets

5.2 Milestones

- Kick-off meeting combined with First Technical Workshop meeting (30 June 2015)
- First Technical Workshop meeting (25 September 2015)
- Second Technical Workshop meeting (October or November 2015)
- Third Technical Workshop meeting (if required)
- CEN Workshop Agreement finalised by the end of 2015.

This CEN Workshop will formally start with a Kick-Off Meeting to be held at the Royal Military Academy in Brussels. The meeting will decide on this Business Plan and appoint a Chairperson and a Secretariat. It will also introduce the range of discussion topics.

The first Technical WS meeting is planned to take place on 25 September 2015 where progress towards agreement will be presented and areas requiring further work discussed.

The Second WS meeting is planned to take place in November 2015. The Chairperson will seek agreement in each meeting.
Following each of the WS meetings, the minutes will be distributed for comment by the participants. The minutes with comments, if any, from the participants will be the basis for the draft CWA to be prepared by the Chairperson/the secretariat.

A fourth WS meeting will be arranged, if needed, to discuss and adopt the final CWA. The objective is to have a draft CEN Workshop Agreement for adoption in December 2015. When the CWA have been agreed and adopted it will be circulated to CEN members to make them available at national level.

On completion of the work programme as described in the WS BP and adoption of the CWA, the CEN/CENELEC Management Centre (CCMC) will, in co-operation with the Chairperson and Secretariat, consider the Business Plan to be fulfilled. On approval of the CWA it will be sent by CCMC to the Geneva International Centre for Humanitarian Demining (GICHD) for presentation to the IMAS Review Board and consideration for inclusion in the IMAS as a substantive reference.

Following publication of the CWA, contacts will be made with the CEN-CENELEC Joint Commercial Advisory Group (JCAG) to agree on the conditions through which the published CWA could be made publicly accessible from the CEN website. In the event that the CWA would be withdrawn from the CEN collection, a process will be initiated in the CEN/BT for handing over the CWA to IMAS for further use and maintenance.

6 Workshop structure
The promoters will support this WS on Complement to test and evaluation of mechanical equipment used in demining operations with a Secretariat with a local organisation team.

Chair: Royal Military Academy, Brussels, has volunteered to take responsibility for the Chair and local organisation of the WS.

Secretariat to the WS: AENOR.

The CEN Workshop working language will be English.

7 Resource requirements
All costs related to the participation of interested parties in the Workshop’s activities have to be borne by themselves.

The operation of the Workshop Secretariat (AENOR) will be funded through the TIRAMISU FP7-project

8 Related activities, liaisons, etc.
CEN Workshop Agreements have the advantage of being very flexible and are therefore the preferred initial option. Later they may be upgraded into an EN or ISO Standard. Close liaisons will be maintained with the TIRAMISU project, GICHD, the United Nations Mine Action Service (UNMAS), and the EC’s Research Executive Agency (REA).
9 Contact points
After kickoff meeting, participants in WS- 80 agreed to appointment the Chairperson and Secretary as following.

9.1 Chairperson

The Royal Military Academy
Mr. Yann Yvinec
30 Av. de la Renaissance, B-1000 Brussels, Belgium
Yann.Yvinec@elec.rma.ac.be

9.2 Secretariat
CEN/CENELEC Member: AENOR
Francisco Arribas (confirmed at the kick-off meeting)
Standardization Division AENOR
Génova, 6. 28004 Madrid
(e-mail): farribas@aenor.es
(web): www.aenor.es

CEN-CENELEC Management Centre
Joanna Frankowska
Programme Manager
CCMC
Avenue Marnix 17 - 1000 Brussels, Belgium
Tel: +32 2 550 0964 - Fax: +32 2 550 0819
jfrankowska@cencenelec.eu
www.cencenelec.eu
10 Annex A: Mechanical equipment—Baseline data and efficiency appraisal

The aim is to develop specifications for minimum data to be provided by mechanical equipment manufacturers that will allow the classification of equipment according to the output they produce and an informed estimation of their performance- and cost-efficiency. The aim is also to agree on a way to compare the efficiency of each type of equipment in terms of the advantages they can predictably grant to manual demining operations in a defined context.

The agreement of specifications defining the minimum data to be provided by mechanical equipment manufacturers shall include the following topics (as a minimum):

- classification of mechanical equipment according to the output expected and information gained or lost, anticipated follow-up requirements, type of detonation the mechanical equipment can withstand, means of controlling the machine;
- technical data relative to physical dimensions, including detailed geometry and mass properties required for predicting soil trafficability;
- technical data relative to engine, including fuel consumption during varied activities;
- technical data relative to any hydraulic system(s), including lifting systems;
- technical data relative to armouring;
- technical data relative to controlling the range of activities which the mechanical equipment can conduct;
- technical data relative to specific features, including max and min operating temperatures and data measured by manufacturer in its own facilities, including maximum drawbar pull;
- estimated data relative to the lifetime of the mechanical equipment;
- data relative to purchasing cost of the machine and any optional attachments or transportation needs;
- data relative to shipping and transportation costs (including the cost of bringing the mechanical equipment to the test site);
- data relative to minimum training time and cost;
- data relative to insurance cost;
- data relative to minimum personnel needed to run the mechanical equipment; and
- data relative to working hours between service intervals and between major overhauls.

The specifications for how to compare the efficiency of a single type of mechanical equipment with unassisted manual demining operations in a defined context shall be derived from existing time and motion studies and shall include the following topics (as a minimum):

- division of work done by manual deminers into discrete parts/actions; and
data relative to time taken by manual deminers to perform each discrete action as a percentage of working time.

11 Annex B: Mechanical equipment — Field performance test

The aim is to develop specifications for realistic and repeatable performance tests that will produce meaningful and comparable results. Tests should be conducted in realistic ground, in a cleared area near by a Suspected Hazardous Area (SHA).

The specifications for how to conduct these performance tests shall include the following topics (as a minimum):

- specification of test facilities;
- execution of tests;
- documentation of tests; and
- presentation/evaluation of test results.

When discussing the specifications of test facilities, the following criteria will be considered for inclusion in the agreement (as a minimum):

- specifications for the assessment of ground and vegetation conditions before and after the test (i.e. soil compaction and moisture content, vegetation size and density);
- dimensions of test lanes; and
- deployment of simulated mine and ERW targets (i.e. pattern, depth and number).

When discussing the specifications of execution of tests, the following criteria will be considered for inclusion in the agreement (as a minimum):

- mechanical equipment mobility, including minimum turning radius, maximum driving speed, hill climbing ability, ground pressure, ground print size and wheel (or track) slip;
- effects of implements on soil (i.e. size of soil particles, depth of work);
- effects of implements on vegetation (i.e. size of vegetation pieces);
- effects of the entire mechanical equipment (platform plus implements) on mines/hazards (i.e., level of damage, translocation from original position, ability to expose them and provide information on their type, condition, location);
- removal of obstacles (i.e. vegetation, metal fragments, rubble, roots);
- fuel consumption during varied activities;
- speed of operation during varied activities; and
- agreement over when and where to use live mines, explosive or non explosive targets during T&E.
During performance testing of any capability claimed regarding live mines or ERW, it should be decided whether it is preferable to use live mines or ERW whenever possible.

12 Annex C: Mechanical equipment —Survivability test

The aim is to develop specifications for realistic and repeatable survivability tests for the mechanical equipment. The test should produce meaningful and comparable results. Tests should be conducted in realistic ground, in a cleared area near to a Suspected Hazardous Area (SHA) with live mines or mine targets located in appropriate position, when required.

The specifications for how to conduct these survivability tests shall include the following topics (as a minimum):

- type and size of charges;
- position of charge with respect to the mechanical equipment;
- execution of test; and
- evaluation of impact on mechanical equipment; and
- predictable cost in terms of downtime and repair.

When discussing the specifications of evaluation of the impact of an explosive event on mechanical equipment, the following criteria will be considered for inclusion in the agreement (as a minimum):

- the ability of the mechanical equipment to withstand the range of explosive detonations claimed by the manufacturer;
- the ability of the mechanical equipment to continue working after a detonation without reduction in efficiency; and
- the ability of the mechanical equipment to withdraw from the hazardous area under its own power after a detonation.

13 Annex D: Mechanical equipment —Integrated test

The aim is to develop specifications that will lead to the determination of realistic results on performance and survivability of mechanical equipment in realistic ground with realistic mine/ERW conditions. Accordingly, the Test should be conducted in a Suspected Hazardous Area (SHA).
The specifications for how to conduct these acceptance tests shall include the following topics (as a minimum):

- list of documents to be submitted prior to the testing by the party ordering the test and evaluation (i.e. Standard Operating Procedures (SOPs), instruction manual); and
- parameters to measure (i.e. fuel consumption, productivity of the mechanical equipment and productivity of the follow-up).

14 Annex E: Mechanical equipment —Mine targets

The aim is to develop specifications for mine and ERW targets that may be used to determine target exposure by a mechanical process. The following topics shall be considered (as a minimum):

- use of available live mines or explosive charges;
- key characteristics of surrogate non explosive targets; and
- specifications for surrogate targets that meet minimum replicability requirements.

15 Annex F: Abbreviations

ERW - Explosive Remnants of War
GICHD - Geneva International Centre for Humanitarian Demining
HMA - Humanitarian Mine Action
IMAS - International Mine Action Standards
JCAG – the CEN-CENELEC Joint Commercial Advisory Group
NMAAs - national mine action authorities
PPE - Personal Protective Equipment
T&E - Tested and Evaluated
UXO - unexploded ordnance