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Test and evaluation of mine action equipment

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Foreword

International standards for humanitarian mine clearance programmes were first proposed by working groups at an international technical conference in Denmark, in July 1996. Criteria were prescribed for all aspects of mine clearance, standards were recommended and a new universal definition of 'clearance' was agreed. In late 1996, the principles proposed in Denmark were developed by a UN-led working group and the *International Standards for Humanitarian Mine Clearance Operations* were developed. A first edition was issued by the UN Mine Action Service (UNMAS) in March 1997.

The scope of these original standards has since been expanded to include the other components of mine action and to reflect changes to operational procedures, practices and norms. The standards were re-developed and renamed as *International Mine Action Standards* (IMAS).

The United Nations has a general responsibility for enabling and encouraging the effective management of mine action programmes, including the development and maintenance of standards. UNMAS, therefore, is the office within the United Nations responsible for the development and maintenance of IMAS. IMAS are produced with the assistance of the Geneva International Centre for Humanitarian Demining.

The work of preparing, reviewing and revising IMAS is conducted by technical committees, with the support of international, governmental and non-governmental organisations. The latest version of each standard, together with information on the work of the technical committees, can be found at <http://www.mineactionstandards.org/>. Individual IMAS are reviewed at least every three years to reflect developing mine action norms and practices and to incorporate changes to international regulations and requirements.

Introduction

The purpose of Testing and Evaluation (T&E) is to provide an independent assessment of the suitability and effectiveness of mine action equipment. The results of such assessments may be used by planning staff in UN headquarters and National Mine Action Authorities (NMAA), and by designers and donors to establish programme options, inform procurement decisions and establish Quality Assurance (QA) requirements. T&E can assess the potential of new technologies or confirm the performance and characteristics of Commercial off the Shelf (COTS) equipment.

The need for T&E standards is evident. The results of T&E are most useful if the testing conforms to accepted protocols and the results are presented in a uniform manner.

This IMAS is aimed mainly at T&E 'stakeholders' at the international level (ITEP) and the national level (manufacturers). It establishes principles, definitions and the methodology for an 'ideal' T&E programme as part of the procurement process. The 'user' at the field level will clearly find it impractical to conduct the extensive T&E programme contained within this IMAS, however they should follow the principles that are established, albeit on a smaller scale.

Test and evaluation of mine action equipment

1. Scope

This standard provides guidelines, principles and procedures for a common approach to the Test and Evaluation (T&E) of mine action technology and equipment.

2. References

A list of normative references is given in Annex A. Normative references are important documents to which reference is made in this standard and which form part of the provisions of this standard.

3. Terms, definitions and abbreviations

A list of terms, definitions and abbreviations used in this standard is given in Annex B. A complete glossary of all the terms, definitions and abbreviations used in the IMAS series of standards is given in IMAS 04.10. In particular, the following definitions are necessary for a full understanding of this standard:

3.1. Evaluation

The analysis of a result or a series of results to establish the quantitative and qualitative effectiveness and worth of software, a component, equipment or system, within the environment in which it will operate.

3.2. Test

The determination of one or more characteristics according to a procedure. [ISO 9000:2000]

3.3. Trial

A series of tests organised in a systematic manner, the individual results of which lead to an overall evaluation of a component, equipment or system.

3.4. IMAS language

In the IMAS series of standards, the words 'shall', 'should' and 'may' are used to indicate the intended degree of compliance. This use is consistent with the language used in ISO standards and guidelines:

- a) 'shall' is used to indicate requirements, methods or specifications that are to be applied in order to conform to the standard;
- b) 'should' is used to indicate the preferred requirements, methods or specifications; and
- c) 'may' is used to indicate a possible method or course of action.

4. Purpose of trials

The principal purpose of a trial is to provide quantitative data. Whenever practicable, the quantity of data provided should be sufficient in statistical terms to ensure that the results have not arisen from chance. The data can thus be used with confidence to support valid conclusions and recommendations.

The T&E of mine action equipment may be conducted for one of the following reasons:

- a) to develop and/or prove and/or confirm system performance;
- b) to obtain data on new operational concepts under field conditions;
- c) to provide reliable data as an aid to decision making and as a basis for future work;
- d) to develop and/or prove component or sub-system performance before incorporation in a new or modified equipment;
- e) to enable comparison between equipments or methods as part of a procurement or selection process; and/or
- f) to measure reliability to enable in-service reliability and maintainability to be determined.

Because trials are invariably costly in time, resources and manpower, very careful thought and planning is required in their design. The aim of a trial shall be precisely defined and there shall be a clear statement of all the information required and exactly how it is to be obtained, recorded and processed. Allowances shall be made for dealing with unexpected results and equipment failure.

Trials are not an end in themselves, but a vital contribution to the development and procurement of safe, effective and appropriate equipment for mine action programmes. They are a way of finding out early enough what is wrong, not merely to confirm that everything is right. The failure of components and sub-assemblies can be addressed as part of the development process, without jeopardising the findings of the trial.

4.1. Control of T&E

Trials, and the subsequent evaluation of trials data, require an effective control organization. The form and scope of this organisation may vary, although three appointments should be common to most trials programmes.

4.1.1. Sponsor

The Sponsor is the authority requiring the trial to be carried out. This is most likely to be a national MAC, a donor, members of the International Test and Evaluation Program for Humanitarian Demining (ITEP), or UN Headquarters, but it could also be a manufacturer or developer.

4.1.2. Organiser

The Organiser is the person or organisation charged with setting up the trial to meet the Sponsor's requirements. He/she shall be responsible for the design and planning of the trial.

4.1.3. Supervisor

The Supervisor is the person responsible for carrying out the trial. In practice he/she may be known either as:

- a) Trials Director;
- b) Trials Officer; or
- c) Officer in Charge.

Note: The Sponsor and Organiser may be the same, for example a national MAC carrying out an evaluation of hand-held mine detectors for use in national programmes. On the other hand the Sponsor may be a donor wishing to provide in-kind support, the Organiser may be a national MAC and the Supervisor/Monitor may be a consultant hired by UNOPS to ensure that the trials are perceived as independent and impartial. For major trials the Supervisor may have deputies and a supporting staff.

4.2. Finance

The full cost of resources including the use of test facilities, consumable stores, instrumentation, maintenance, salaries and travel shall be assessed at the earliest opportunity. For the introduction of COTS equipment to UN programmes, the cost of trials, evaluation and monitoring should normally be attributed to that programme unless additional funding is provided by a donor. For development trials the costs should normally be attributed to the equipment development programme.

4.3. Trial location

Trials should when possible and appropriate be conducted at T&E facilities that are accredited to the appropriate national standards for the maintenance of technical standards in laboratories and T&E establishments.

Examples of such accreditation schemes are the Netherlands Normalisatie-Instituut (NNI) (<http://www.nen.nl/>), UK Accreditation Service (<http://www.ukas.com/>) or the US National Institute of Standards and Technology (NIST) (<http://www.nist.gov/>). The use of such accredited laboratories and test and evaluation establishments has the advantage of ensuring:

- a) T&E standards are in accordance with ISO 25 and 54;
- b) quality of trials conduct;
- c) accuracy of trial equipment calibration levels; and
- d) repeatability and replicability of trials.

Such accreditation schemes recognise the trial results and findings from other national accreditation schemes under the auspices of agreements such as the European Cooperation on Accreditation (EA) (<http://www.european-accreditation.org/>), the International Laboratory Accreditation Conference (ILAC) (<http://www.ilac.org/>) and the International Accreditation Forum (IAF) (<http://www.iaf.nu/>).

Should a trial be conducted at an establishment that is not a member of such accreditation schemes, then the development and maintenance of results to an acceptable 'international' standard will be more difficult, and may involve additional resources.

5. Categories of trials and evaluation

5.1. Concept and technology demonstrator trials

Concept and technology demonstrator trials are designed to gather data on the potential use of equipment in the field, for example to assess the most effective and efficient mix of equipment and procedures for conducting a technical survey. They shall take the form of carefully controlled 'scenarios', often using pre-production equipment. Such trials may also involve current equipment and existing procedures to provide a 'benchmark' against which the research equipment and new procedures can be measured.

The purpose shall be to record data from which general principles can be established on the relative value of different equipment, techniques and methods of employment. Considerable effort may be required to ensure that the research technologies are representative of the likely performance of production equipment under field conditions. Great care shall be taken in setting out a trial plan to ensure that the results are statistically valid and suitable for analysis.

5.2. Development trials

Development trials should normally be conducted by the prime contractor that is developing the equipment. The aim is to establish that the design is technically satisfactory and meets the parameters of the agreed Statement of Requirement (SOR). Trials of components and sub-systems to be incorporated in a complete equipment are included in this category. For example, a new type of engine or flail unit could be fitted to a proven vehicle so that the engine or flail is on trial, not the whole new vehicle.

It may be appropriate for such trials to be conducted in the prime contractor's own test facilities or in one of the 'approved' test sites being proposed by the ITEP. For trials that aim to evaluate the effectiveness of equipment or sub-systems in field conditions, it shall be necessary to deploy the system to a test site that faithfully reproduces the anticipated field conditions. (It is also possible that such trials may take place in real hazardous areas).

One particular category of development trials enable prime contractors to establish, and then improve, the reliability of equipment under controlled conditions. So-called Reliability Growth Trials may be required for expensive and sophisticated new equipment in order to reduce the risk of fielding unreliable production systems. Reliability Growth Trials make use of mathematical techniques to reinforce sound engineering judgement.

5.3. Acceptance trials

The purpose of an Acceptance Trial is to provide the Sponsor with sufficient information so that a decision can be taken on the acceptability of an equipment for its intended use. In particular, an Acceptance Trial should:

- a) establish that the performance of the equipment in the hands of the User (NGO, contractor or national staff) meets the characteristics specified in the SOR in field conditions;
- b) give the User early experience of the equipment to develop operational procedures, drills and training programmes; and
- c) confirm the logistic implications and ensure that there will be sufficient spares and an appropriate maintenance organisation in place prior to the arrival of the production equipment.

Acceptance Trials shall be conducted on equipment which are as near as possible representative, at least in all functional aspects, of the production equipment.

5.3.1. Monitoring

Sometimes it may be necessary for trials to be conducted after a mine action programme has already commenced. In such circumstances, the implications of the equipment failing to meet the Acceptance Criteria should normally be addressed in the contract documentation.

5.4. Consumer reports

Trials may be conducted with the aim of producing a 'consumer report' of a range of COTS mine action equipment. These trials may involve a review of previous trials, tests in laboratory conditions, and some new field trials to enable a useful summary of current systems. The format of the results may vary to meet the needs of the target audience, but in all circumstances they shall be based on a rigorous (and defensible) evaluation methodology. The conclusions of the reports may be subject to much commercial interest, and this may involve the Sponsor, Organiser and Trial Supervisor being required to justify the methodology and evaluation criteria adopted for the trial.

6. Conduct of trials

Trials may vary widely in their aim and scope. However, there are a number of common activities in setting up and carrying out all trials. If a trial is routine in its form, many of the activities will be covered by established arrangements and the Organiser need only give close attention to variations from the normal. In other cases a lengthy period of planning and preparation may be necessary. There are four common stages of managing a trial: planning, preparation, execution, and reporting.

6.1. Planning

Planning involves a clarification of the aim of the trial, review of the factors that may impact on the aim, selection of an appropriate way to proceed, and subsequent formulation of the detailed method by which the trial will be conducted. This shall include the type of measurements to be made, data to be collected and proposed method(s) of analysis, special handling and release procedures for proprietary data, and the requirements for public release of the test results. The planning stage should result in the preparation of a Trial Instruction.

6.1.1. Trial instruction

The Sponsor shall normally be responsible for preparing and publishing the Trial Instruction; an outline format is given at Annex C. This indicates the information which should be included, the detail being varied as necessary to suit the particular circumstances. The success or failure of a trial could depend on the Trial Instruction, which shall be comprehensive and clear but at the same time not impose unnecessary limitations on the Supervisor's freedom of action.

6.1.2. Aim

The aim of a trial may seem obvious, and in routine trials this may be so. However, in complex trials considerable care is needed to ensure that the aim represents precisely the purpose of the trial. Preliminary study and consultation will normally be needed to decide the precise aim that will govern the design of the trial.

6.1.3. Constraints

There could be practical limitations that constrain the conduct of the trial such as time and resources, and the possible effects of external factors such as weather. In some cases the effect of the constraints can be moderated by sound design and planning, but in other cases the aim of the trial may have to be modified. In this case additional trials may be necessary to meet the Sponsor's needs, or he/she in turn may be able to modify his/her requirements or conform to what is feasible.

6.1.4. Trial design

The design of a trial shall reflect the priorities set by the Sponsor and where practical should include the deliberate determination of the limitations of the equipment or process which is under trial. Certain information shall be considered essential; other information may only be desirable; the gathering of desirable information should assume a lower priority and not expose the equipment to an unacceptable risk early in the trial.

Generally, components should be proved before assemblies, and assemblies before the whole system. For example, trials to establish equipment manoeuvrability should precede demining with live landmines.

Trials are by their very nature experimental. Thus there may be occasions when an unexpected result is more significant than the routine data obtained from the main run of the trial. The trial design shall allow for unexpected results to be recognised as such, taken account of in later stages of the trial, and subsequently fed into the development or production equipment.

6.1.5. Specialist support

If the trial involves a number of variables, particularly when a reliable estimate of significance is required, advice should be sought from a statistician who has practical experience in supporting equipment trials. Similarly, if the trial includes questionnaires or tests designed to evaluate subjective issues such as user response, these should always be set up with specialist advice.

6.2. Preparation

Preparation involves all those activities and acts of enablement which develop the capacity to carry out a trial. This should include setting up the trials organization, acquiring specialist equipment and stores, carrying out necessary training, and deploying to the test site.

Trials can be ruined by bad administration. Appropriate provision shall be made for the security of stores, conducting routine maintenance and repairs, calibrating instrumentation, and the availability of administrative support and telecommunications. Major trials will attract considerable interest and specialist arrangements may be required for visitors.

Considerable costs are incurred as soon as all the resources are assembled. Any delay not only wastes the resources but could mean that the results are restricted, as it is seldom possible to keep all the resources available indefinitely. Pilot trials may be required to prove instrumentation methods and prepare the operators prior to the main trial.

For trials which will be conducted in, or close to, mined areas it shall always be a pre-condition that full medical arrangements be established before the main trial is allowed to start.

6.3. Execution

If the planning and preparation stages are conducted thoroughly, the execution of the trial should present no problem. However, the unexpected is bound to arise and the main concern shall be to ensure that the momentum of the trial is not lost due to equipment failures or bad weather. Problems with the execution of the trial plan shall be discussed with the Organiser, and with the Sponsor and manufacturer/ developer to ensure that any modifications to the plan will not adversely affect the objectives or results of the trial. If practicable and affordable the trial should continue so long as useful data can be obtained.

Generally, the trial should be conducted in a series of distinct tests each covering a main objective. At the end of each test a report shall be required as a record of progress and as a guide to any alterations which may be needed in a later phase. The Execution Phase as a whole shall be covered by a comprehensive written instruction supported by a verbal briefing of the key participants.

6.4. Reporting and control

The end product is the final trial report. This shall not only contain the information that the trial is intended to determine but shall also reach the Sponsor promptly. Arrangements shall be made for the communication of reports by telephone, fax or e-mail. Arrangements shall also be made for the Supervisor/Monitor at working level to be able to consult the Organiser and Sponsor as rapidly as possible, particularly on issues of safety.

Trials reports should be based on the general format given at Annex D modified as agreed with the Sponsor.

7. International Test and Evaluation Programme (ITEP) for Humanitarian Demining

7.1. Background

ITEP is an international programme for cooperation and collaboration on T&E efforts in support of worldwide humanitarian demining. The programme resulted from a joint initiative between the United States and the European Commission, supported by the United Nations. The programme was formally launched with the signing of the MoU on 17 July 2000. The current participants are Belgium, Canada, Germany, The Netherlands, Sweden, United Kingdom, United States, and The European Commission.

7.2. ITEP mission

To strengthen world-wide demining efforts by providing the efficient generation, collection and distribution of objective, independent, scientifically based T&E data and information on humanitarian demining equipment, systems and methods.

7.3. Purpose of ITEP

ITEP was formed to create, support and increase the cooperative T&E efforts of the international research and development community to support solutions to the procurement of better, safer and more cost-effective demining equipment. ITEP establishes a network of T&E capabilities for measuring performance, and evaluating effectiveness and suitability, of all forms of humanitarian demining equipment, systems and methods.

7.4. ITEP objectives

- a) Conduct T&E of existing equipment, systems under development, and of promising technologies, processes, and algorithms;
- b) Develop and use universally accepted and respected T&E protocols and evaluation methodologies;
- c) Collect, generate, assess, evaluate and distribute robust, scientifically objective data and information products on technology, material, processes and systems for humanitarian demining; and
- d) Establish and employ standards, protocols and methodologies for co-operative T&E.

8. CEN Workshop Agreements (CWA)

8.1. Background

The European Union (EU), in its desire to participate in the standardisation initiatives within the Mine Action Sector, directed the *European Committee for Standardisation* (CEN) to collaborate with the Geneva International Centre for Humanitarian Demining (GICHD) and the United Nations in the enhancement of existing standardisation initiatives. CEN subsequently created *Technical Board Working Group 126* (WG126) to perform this work using the CEN Workshop process. The products of this process are *CEN Workshop Agreements* (CWA), which are endorsed and adopted by interested parties on a voluntary basis. (These differ from full CEN Standards which are binding for participating partners and used as a basis for national standards).

Within WG126 four Ad Hoc Groups (AHG) were formed to examine specific task areas in the field of Mine Action:

- a) AHG 1 – T&E of Equipment.
- b) AHG 2 – Technical Training Assessment and Certification.
- c) AHG 3 – Existing Standards, Terminology and Definitions.
- d) AHG 4 – Risk and Quality Management and Performance Indicators.

AHG 1 was further split into two technical workshops dealing with Metal Detectors and Demining Machines. The Workshop involved with the T&E standards for Metal Detectors was conducted under the title of CEN Workshop 7, 'Humanitarian Mine Action – Test and Evaluation – Metal Detectors' (CW 7). The CWA was completed in June 2003 with the reference title CWA 14747:2003 under the leadership of the EC Joint Research Centre at Ispra, as part of an ITEP supported project. The workshop dealing with the T & E standards for Demining Machines was conducted under the title of CEN workshop 12. The CWA was completed in April 2004 with the reference title CWA 15044:2004 under the leadership of the Swedish EOD and Demining Centre (SWEDEC)

8.2. CWA 14747:2003

Metal detectors are an essential part of the toolkit for demining and provide one of the few 'non-contact' methods available to search for mines. Despite the fact that metal detectors have been used for finding mines since the Second World War, there is no universal specification for any performance standards.

Many trials of the capabilities of metal detectors have been performed in recent years, however the lack of an agreed standard for comparing the performance of these instruments limited the value of this work to end-users. Without a testing standard, it is difficult to make cross-comparison between instruments to determine which is best-suited to any particular needs.

CWA 14747:2003 provides a standard test method. Different parts of the CWA are intended to be used by R&D laboratories, manufacturers, operators of T&E facilities, organisations needing to procure metal detectors, MACs and metal detector operators in the field.

Assistance and training in conducting tests in accordance with CWA 14747:2003 can be provided. Further information can be found through CEN, and ITEP websites, <http://www.itep.ws>

8.3. CWA 15044:2004

Test standardisation for demining machines will support the development of new demining tools and methods and makes it easier to compare different existing tools and products. The CWA is the product of a collaborative effort conducted between developers and end users. The CWA covers:

- a) Performance testing.
- b) Survivability testing.
- c) Acceptance testing.
- d) Test targets.

Further information can be found through CEN, and ITEP websites, <http://www.itep.ws>.

9. Responsibilities

9.1. United Nations

The United Nations shall be responsible, within available resources, for:

- a) the development of a strategic policy for T&E needs and priorities;
- b) co-ordination with ITEP and sponsors necessary to support the T&E process; and
- c) the staffing and conduct of technical feasibility studies.

9.2. National Mine Action Authority (NMAA)

The NMAA shall be responsible for establishing and maintaining national standards, regulations and procedures for the T&E of mine action equipment. These procedures should be consistent with IMAS, and other relevant national and international standards, regulations and requirements.

9.3. International Test and Evaluation Programme (ITEP)

The ITEP shall:

- a) Conduct T&E of existing equipment, systems under development, and of promising technologies, processes, and algorithms in support of the international demining community;
- b) Collect, generate, assess, evaluate and distribute robust, scientifically objective data and information on the performance and effectiveness of demining equipment, processes, and methods under a variety of environmental, physical, technical, and operational conditions;
- c) Develop, establish and use standards, protocols and methodologies for co-operative T&E;
- d) Support the development of technical standards in collaboration with UNMAS, GICHD, ISO, CEN, and other standards generating organisations; and
- e) As appropriate, provide T&E protocols and methodologies for distribution through the IMAS Review Board process or as Technical Notes for Mine Action (TNMA).

9.4. Mine action organizations/the Users

Mine action organisations (the Users) should:

- a) establish SOPs which enable T&E projects to be conducted effectively and efficiently; and
- b) cooperate with other Users to ensure that relevant information on the planning and conduct of T&E is available to all stakeholders.

9.5. Donors

Donors should:

- a) ensure that T&E activities in mine action technology that they support is in accordance with the principles and priorities established by the United Nations and have clear 'end user' application;

- b) ensure that full and formal risk assessments are developed prior to T&E activities; and
- c) ensure that the minimum duplication of effort exists between competing T&E programmes.

9.6. Research and development organisations and industry

The mine action technology research and development organisations and related industry should:

- a) liaise with T&E programmes in similar technology areas, (within the bounds of commercial confidentiality);
- b) aim to establish complementary and focused, rather than competing, areas of T&E; and
- c) ensure that operational and end user applications are clearly identified.

Annex A (Normative) References

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid ISO or EN:

- a) IMAS 03.10. Guide to the procurement of mine action equipment;
- b) IMAS 03.20. The procurement process; and
- c) IMAS 03.30. Guide to research of mine action technology.
- d) CEN Workshop Agreement CWA 14747:2003, Humanitarian Mine Action – Test and Evaluation – Metal Detectors.
- e) CEN Workshop Agreement CWA 15044:2004, Test and evaluation of demining machines.

The latest version/edition of these references should be used. GICHD hold copies of all references used in this standard. A register of the latest version/edition of the IMAS standards, guides and references is maintained by GICHD, and can be read on the IMAS website (www.mineactionstandards.org). NMAA, employers and other interested bodies and organisations should obtain copies before commencing mine action programmes.

Annex B (Informative) Terms, definitions and abbreviations

B.1.

Commercial off the Shelf (COTS)

in the context of mine action equipment procurement, the term refers to an equipment that is available direct from the manufacturer and requires no further development prior to introduction into service apart from minor modifications.

B.2.

development

the stage of the project (and its associated costs) prior to production concerned with developing a design sufficiently for production to begin.

B.3.

donor

all sources of funding, including the government of victim states.

B.4.

equipment

a physical, mechanical, electrical and/or electronic system which is used to enhance human activities, procedures and practices.

B.5.

evaluation

the analysis of a result or a series of results to establish the quantitative and qualitative effectiveness and worth of software, a component, equipment or system, within the environment in which it will operate.

B.6.

failure

an event in which any system, equipment, components or sub-components does not perform as previously specified.

Note: Failures may be classified as to cause, degree, relevance, dependence and responsibility.

B.7.

International Organization for Standardization (ISO)

Note: A worldwide federation of national bodies from over 130 countries. Its work results in international agreements which are published as ISO standards and guides. ISO is a NGO and the standards it develops are voluntary, although some (mainly those concerned with health, safety and environmental aspects) have been adopted by many countries as part of their regulatory framework. ISO deals with the full spectrum of human activities and many of the tasks and processes which contribute to mine action have a relevant standard. A list of ISO standards and guides is given in the ISO Catalogue [www.iso.ch/infoe/catinfo/html].

Note: The revised mine action standards have been developed to be compatible with ISO standards and guides. Adopting the ISO format and language provides some significant advantages including consistency of layout, use of internationally recognised terminology, and a greater acceptance by international, national and regional organizations who are accustomed to the ISO series of standards and guides.

B.8.

National Mine Action Authority (NMAA)

the government department(s), organization(s) or institution(s) in each mine-affected country charged with the regulation, management and coordination of mine action.

Note: In most cases the national MAC or its equivalent will act as, or on behalf of, the NMAA.

Note: In certain situations and at certain times it may be necessary and appropriate for the UN, or some other recognised international body, to assume some or all of the responsibilities, and fulfil some or all the functions, of a NMAA.

**B.9.
prototype**

an equipment, component or sub-component built as nearly as possible to the final design and build standard.

Note: Prototypes are used to aid development of the final production standard and/or to demonstrate performance or specification compliance.

**B.10.
sponsor**

the sponsor of an equipment trial is the authority requiring the trial to be carried out.

Note: This is most likely to be an international organisation, national MAC, donor or demining organisation.

**B.11.
Standard Operating Procedures (SOPs)
Standing Operating Procedures**

instructions which define the preferred or currently established method of conducting an operational task or activity.

Note: Their purpose is to promote recognisable and measurable degrees of discipline, uniformity, consistency and commonality within an organization, with the aim of improving operational effectiveness and safety. SOPs should reflect local requirements and circumstances.

**B.12.
test**

determination of one or more characteristics according to a procedure. [ISO 9000:2000]

**B.13.
Test and Evaluation (T&E)**

activities associated with the testing of hardware and software.

Note: Activities include the formation and use of procedures and standards, the reduction and processing of data and the assessment and evaluation of test results and processed data against criteria such as defined standards and specifications.

**B.14.
trial**

a series of tests organised in a systematic manner, the individual results of which lead to an overall evaluation of a component, equipment or system.

**B.15.
United Nations Mine Action Service (UNMAS)**

the focal point within the UN system for all mine-related activities.

Note: UNMAS is the office within the UN Secretariat responsible to the international community for the development and maintenance of IMAS.

Note: UNICEF is the focal point for MRE, within the guidelines of UNMAS overall coordination.

**B.16.
user**

the individual or organisation that will operate the equipment.

Note: For the purpose of mine action, the user could also be defined as 'a composite body of informed and authoritative opinions on the needs of national commercial and NGO users, today and in the future'.

B.17.

validation

the act of ratification that takes place after a process of verification.

B.18.

verification

confirmation, through the provision of objective evidence that specified requirements have been fulfilled. [ISO 9000:2000]

Annex C (Informative) Layout and format of trial instruction

	Address block of Sponsor
	Date
Trial instruction [Description of equipment under trial] [Reference number]	
References:	
A.	SOR.
B.	As required.
1.	Background
1.1.	Problem or need leading to need for equipment under trial
1.2.	History of development
1.3.	Other related trials
2.	Aim and scope
2.1.	Aim of trial
2.2.	Scope of trial
2.3.	Constraints and limitations
3.	Trial format
3.1.	Key objectives of trial and priorities
3.2.	Trial scenarios
3.3.	Structure and format of trial to achieve objectives
4.	Criteria
4.1.	Evaluation criteria
4.2.	Acceptance criteria
4.3.	Methodology to be used to evaluate results of trial
5.	Execution
5.1.	Trial organization, key appointments and support staff
5.2.	Location of trial
5.3.	Trial equipment

5.4. Special facilities and instrumentation

5.5. Trial programme

5.6. Safety

5.7. Training

6. Support and administration

6.1. Security

Security of information

Security of equipment

Security of trial location

Security of personnel

6.2. Medical support and post-accident procedures

6.3. Issue and disposal of trial equipment

6.4. Consumables and spares

6.5. Servicing, maintenance and repair

6.6. Technical documentation

To include technical handbooks and support literature.

6.7. Administrative support

Including: vehicles, accommodation, clerical support, local finance and procurement

7. Reporting and control

7.1. Schedule for, and format of, reporting

7.2. Provision of communications

Signature block
of Sponsor

Annexes:
As required

Distribution:
As required

Annex D (Informative) Layout and format of trial report

	Address block of Trial Supervisor
	Date
Trial report [Description of equipment under trial] [Reference number]	
References:	
A. SOR.	
B. Trial Instruction.	
C. As required.	
1. Introduction	
1.1. Background	
From the Trial Instruction.	
1.2. Aim and scope	
From the Trial Instruction.	
1.3. Authority	
Quote the authority for the trial; include any Trial Instruction or Directive as an Annex.	
1.4. Duration	
2. Equipment under test	
Include a brief description. If further specification and details are necessary include them as an Annex. Whenever possible include scaled drawings and photographs as an Annex.	
2.1. Associated equipment	
If the equipment has to be compatible with other equipment, give details including drawings and photographs.	
3. Trial equipment and stores	
3.1. Test instrumentation	
Describe any instruments or equipment used. If the trial involves a comparison with existing equipment describe the characteristics and limitations of the existing system.	
3.2. Stores	
Describe any explosive and non-explosive stores used for the conduct of the trial. Full details shall be given to assist future replicability of the trial.	
3.3. General equipment	

Describe any general equipment used for the conduct of the trial. Full details shall be given to assist future replicability of the trial.

4. Trial procedure

- 4.1. Trial location(s)
- 4.2. Trial programme
- 4.3. Climatic conditions encountered
- 4.4. Description of tests

Specify the conditions and procedures followed during each test. The first and last tests should normally be inspections to ascertain the state and completeness of the equipment. If tests are complex their description should be included as an Annex.

- 4.5. Operator or special training

State any special training undertaken to facilitate the trial.

5. Trial results

Give the results of each test carried out. Detailed information, e.g. schedules of results and calculations (if relevant) should be in an Annex. Photographs may avoid a mass of complicated detail.

The Trials Instruction should have specified the information to be recorded and how it is to be presented and evaluated. In other cases, the Trial Supervisor may devise his own methods of recording and presenting the information required, which should generally include the following:

- a) the ability of the equipment to fulfil its function in the required operating environment;
- b) ease of operation and operator training;
- c) ease of mobility and transportation;
- d) ease of servicing and maintenance;
- e) total hours run/operated and frequency of servicing and maintenance. Any analysis should be shown as an Annex;
- f) details of all engineering defects and replacement of parts should form an Annex. Wherever possible use photographs;
- g) details of design defects;
- h) special tools required;
- i) spares availability and cost; and
- j) compatibility with existing mine action equipment.

6. Arisings

Indicate any explosive or toxic arisings as a result of the trial and how they were disposed of.

7. Visitors

Include a full record of all visitors to the trial.

8. Operational and organisational considerations

Include any operational and organizational implications which would be required if the equipment under trial were to be adopted; for example:

- a) new or refined operational procedures;
- b) management training;
- c) operator skills training;
- d) special servicing and maintenance facilities; and
- e) specialist calibration facilities.

9. Conclusions

An explicit statement on the suitability (perhaps with caveats) of the equipment under test, and whether major modifications or development is necessary. Provide a summary of further action required (e.g. technical, organizational and training.)

Include any lessons learned on the conduct of the trial that may be of use in planning future trials.

10. Recommendations

Recommendations for the adoption, modification, scaling, training or any future action.

Signature block
of Trial Supervisor

Annexes:

- A. Diary of events
- B. Photographs
- C. Instrumentation results
- D. Tabulation of results
- E. Graphs of results
- F. As required

Distribution:

Sponsor
Organiser
Donor(s)
Technology Coordinator, UNMAS
Mine Action Team, UNDP
Mine Action Unit, UNOPS
Head of Technology Section, GICHD
ITEP

Amendment record

Management of IMAS amendments

The IMAS series of standards are subject to formal review on a three-yearly basis, however this does not preclude amendments being made within these three-year periods for reasons of operational safety and efficiency or for editorial purposes.

As amendments are made to this IMAS they will be given a number, and the date and general details of the amendment shown in the table below. The amendment will also be shown on the cover page of the IMAS by the inclusion under the edition date of the phrase *'incorporating amendment number(s) 1 etc.'*

As the formal reviews of each IMAS are completed new editions may be issued. Amendments up to the date of the new edition will be incorporated into the new edition and the amendment record table cleared. Recording of amendments will then start again until a further review is carried out.

The most recently amended IMAS will be the versions that are posted on the IMAS website at www.mineactionstandards.org.

Number	Date	Amendment Details
1	1 Dec 2004	1. Formatting changes. 2. Minor text editing changes. 3. Changes to terms, definitions and abbreviations where necessary to ensure that this IMAS is consistent with IMAS 04.10. 4. Substantive changes: a) Clause 7.1, updating the membership of ITEP. b) Clauses 8.1 and 8.2, new section added on CEN workshop agreements.
2	23 Jul 2005	1. Clause 4, second paragraph. Inclusion of a new sub clause d). Amendment to sub clause e) (formerly sub clause d)). 2. Clause 4.3, first paragraph, inclusion of phrase 'when possible and appropriate'. 3. Clause 6, change of a 'shall' to a 'may'. 4. Clause 6.1.4, first paragraph, changes to the first sentence. 5. Clause 7, entire clause (including 7.1 to 7.4) reworded. 6. Clause 8.1, third paragraph, inclusion of two sentences covering CEN workshop 12 on demining machines. 7. Clause 8.3, a new clause covering CWA 15044:2004 has been added. 8. Clause 9.3, entire clause reworded. 9. Clause 9.5, sub clause a), wording expanded. 10. Clause 9.6, inclusion of new sub clause c). 11. Annex A, first paragraph, inclusion of a new sub clause e) referring to CWA 15044:2004. 12. Annex B, removal of the term 'organiser'.