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## Guide to the research of mine action technology

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## Foreword

International standards for humanitarian demining programmes were first proposed by working groups at an international technical conference in Denmark, in July 1996. Criteria were prescribed for all aspects of demining, 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) with the first edition produced in October 2001.

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**

Research is an integral part of the procurement process. Indeed, it is difficult to imagine any equipment in use in mine action programmes today, from mine detectors and GPS to protective visors and prodders, which have not been the result of some research activities. Without on-going research it will not be possible to improve on the current generation of mine action equipment.

This standard explains the principles and processes of research.

## Guide to the research of mine action technology

### 1. Scope

This standard establishes principles and provides background and introductory guidance on the research requirements for equipment for mine and Explosive Remnants of War (ERW), including unexploded sub-munitions clearance tasks and processes.

### 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 complete glossary of all the terms, definitions and abbreviations used in the IMAS series of standards is given in IMAS 04.10.

In the IMAS series of standards, the words 'shall', 'should' and 'may' are used to indicate the intended degree of compliance.

- 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.

#### National Mine Action Authority

##### NMAA

(2009)

government entity, often an inter-ministerial committee, in an EO-affected country charged with the responsibility for broad strategic, policy and regulatory decisions related to mine action.

Note: In the absence of an NMAA, it may be necessary and appropriate for the UN, or some other body, to assume some or all of the responsibilities of an NMAA.

### 4. Research categories

#### 4.1. Pure research

The term 'pure research'<sup>1</sup> normally refers to research activities that are not linked to any specific application. The outcome of pure research may eventually lead to a product, but its immediate aim is to establish generic principles.

#### 4.2. Applied research

Applied research is focused at clearly defined problems and market opportunities. Its principal purpose is to establish the *feasibility* of applying technology to solve a clearly defined problem, within defined parameters such as cost, time and risk.

### 5. Research activity groups

Research involves four distinct groups of activities:

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1. Also occasionally referred to as 'basic' or 'strategic' research.

## **5.1. Analysis of the problem**

The first research activity is an analysis of the problem. For mine action this should involve the collection, collation and analysis of all relevant factors, which will enable the problem to be accurately defined and scoped. For mine action technology, this primarily involves an analysis of the Statement of Operational Need (SON). This important activity is often overlooked or conducted with insufficient effort.

## **5.2. Analysis of constraining factors**

The second research activity involves an analysis of the factors that constrain the technology solution. Such limiting factors should include the operational imperative, the environmental conditions, the mine and ERW hazards, manufacturing constraints and in-country support, (including maintenance and repair, operator skills and the availability of funding).

## **5.3. Analysis of potential technologies**

The third research activity involves an analysis of potential technologies to determine their suitability, availability and affordability. This should include an assessment of the risk of using new components, materials, manufacturing processes and unproven software.

## **5.4. Communication of research results**

The fourth activity involves communicating the results of the research to those who need to make decisions. In this process it is important to include a broad range of actors to ensure as wide a variety of interest as possible. Pure research may involve peer review to establish the necessary validity and authority. Peer review is normally exercised via academic and/or professional journals and conferences.

Applied research is normally presented to the project sponsor in a formal report, reinforced where necessary with technology demonstrations. Technology demonstrations create a visible product, which helps to establish credibility and confidence in the findings of the research work. They are particularly relevant when the User needs convincing of the potential value of innovative or revolutionary technology.

# **6. Research facilities**

## **6.1. Academia**

Traditionally, most research has been conducted in universities and technical institutes of higher learning. Funding for such work has come from a number of sources, with an increasing reliance on external sources.

## **6.2. Industry**

In recent years, as industries have become larger and more global, and as the market has required technology to evolve at an ever-increasing pace, there has been a shift in applied research from academia to industry. In-house applied research (and product development) is common in industries such as pharmaceuticals, computer and aerospace, where product development is particularly dynamic. Applied research conducted in such circumstances may involve substantial investment, and is unlikely to be made readily available to potential competitors, even for humanitarian causes such as mine action.

## **6.3. National facilities**

Governments have developed national research facilities for strategic capabilities such as defence, nuclear power and public health. There is growing pressure to transfer more information into the public domain. This includes the results of government-sponsored research into mine action technologies, although the procedures for such sharing have yet to be fully developed.

#### **6.4. International facilities**

International research facilities are normally the result of two or more countries sharing facilities for mutual benefit. Such benefit may reduce the overall costs, or the objectives may have a political imperative.

In the case of the European Union (EU), the concept of common international facilities has evolved to cover a comprehensive range of issues of common interest to the member states and to maintain throughout the whole procurement cycle independent technical expertise. Research into mine action technology is supported by the European Commission's Joint Research Centre (JRC), Ispra in Italy. These facilities were the core of the participation of the European Commission to the ten-year International Test and Evaluation Programme for Humanitarian Demining (ITEP), which closed on 17 July 2010. Details of the role of JRC Ispra and a summary of on-going research, evaluation and coordination activities are available at <http://www.jrc.ec.europa.eu>.

### **7. Operational Analysis (OA)**

OA is a field of research that applies scientifically-based quantitative and qualitative analysis to assist management decisions. OA is helpful in making informed and auditable decisions on future requirements. In such circumstances a series of plausible scenarios should be generated based on a logical progression of trends, events and consequences.

A structured approach is necessary to establish a shared vocabulary and set of common references. Effective OA is predicated on reliable, objective and consistent data, clear and justifiable assumptions, appropriate judgement, and valid mechanisms and decision support tools. Clearly, the results of OA depend critically on the data and initial assumptions and it is therefore crucial that they are based on recent mine action experience.

### **8. Research and development standards**

The ITEP initiative was the first example of movement towards the development of international mine action R&D standards. It was supported by the European standards body, CEN, and the work of its Working Group (WG) 126, which ceased in 2009. These technical standards will not be restricted to advanced detection equipment, but will have wider application within mine action R&D, and will be incorporated into IMAS at a later date.

### **9. Funding**

Many promising technologies have not been exploited due to the lack of available funding. Although funds may exist, there is currently no formal mechanism to link donors to technology opportunities, and *vice versa*. Donors should expect new technologies to demonstrate measurable improvements over existing methods.

The funding of ambitious technology research projects poses a particular problem. Such research, particularly if it involves major demonstrations, may involve significant financial commitment and exposure to risk. Furthermore, investment in research requires a long term commitment, and existing methods of mobilising resources through UNHQ do not provide such a commitment from donors. There is thus a need to identify novel arrangements that satisfy the requirements of industry, research organizations, the user community and the donors.



## **10. Direction and control**

### **10.1. National**

At national level, decisions on the use of national resources and research facilities for the benefit of mine action are driven by government policy and perceived national interests. Although many governments have committed themselves to assisting victim states by providing the information and facilities needed to improve technology, they have yet to develop the national procedures for making the information and facilities readily available. National security, IPR (intellectual property rights) and funding limit the quantity and quality of information that can be made available.

### **10.2. International**

At the international level there are a number of fora for developing international policies that provide direction (directly and indirectly) and cooperation on research. These mainly exist within existing regional, defence or trade groupings such as the EU, OAS, NATO, WEU and PfP.

At the Washington Conference on Humanitarian Demining in May 1998, the EC and US agreed to work together (with other partners) on a wide range of technological initiatives, including the development of common R&D standards (see clause 8) and a joint programme of international technology demonstration projects. This initiative was a good example of a formal arrangement to improve international cooperation in the research necessary for mine action technologies. ITEP was one of the concrete outcomes of this cooperation. Another one was the Demining Technologies – Information Forum (DTIF), which was launched by Canada together with the European Commission and the USA. It was then joined by UNMAS, GICHD and other nations. This Forum provided a systematic, multi-disciplinary opportunity for the identification of demining technology gaps, for the synergistic exchange of ideas, for collaborative international programme co-ordination and planning and for the review of progress in the mine action technology area. Besides an electronic journal and facilitating technology-focused workshops, DTIF also provided a service as a technology information clearing house. Regrettably, the DTIF is no longer functioning as at November 2009.

The UN has an obligation and the mandate to provide direction and general guidance on research principles and priorities and, in the future will give specific guidance on applied research activities.

## **11. Responsibilities**

### **11.1. United Nations**

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

- a) the development of strategic policy for the development of mine action technology;
- b) the coordination between donors, users, sponsors and developers; and
- c) the development of priorities and principles for investment in mine action technology.

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

- d) the coordination of generic research activities.

### **11.2. National Mine Action Authority (NMAA)**

The NMAA shall be responsible for:

- a) establishing and maintaining national standards, regulations and procedures for research into mine action technology. These procedures should be consistent with IMAS, and other relevant national and international standards, regulations and requirements; and
- b) the selection and accreditation of the appropriate mine action technology specific to their national conditions and requirements, based on research results.

#### **11.3. Mine action organizations / the Users**

Mine action organisations (the Users) should:

- a) cooperate with other Users to ensure that relevant information on the use of particular technology is available to all stakeholders.

#### **11.4. Donors**

Donors should:

- a) ensure that research and development activities in mine action technology that they support is in accordance with the principles and priorities established by the United Nations;
- b) ensure that full and formal risk assessments are developed prior to investment in research and development activities; and
- c) ensure that the minimum duplication of effort exists between competing research and development programmes.

#### **11.5. Research and development organisations and industry**

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

- a) liaise with research and development programmes in similar technology areas, (within the bounds of commercial confidentiality); and
- b) aim to establish complementary and focused, rather than competing, areas of research.

## **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 04.10 Glossary of mine action terms and definitions;
- b) IMAS 03.10 Guide to the procurement of mine action equipment;
- c) IMAS 03.20 The procurement process; and
- d) IMAS 03.40 Test and evaluation of mine action equipment.

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 (<http://www.mineactionstandards.org/>). NMAA, employers and other interested bodies and organisations should obtain copies before commencing mine action programmes.

## 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](http://www.mineactionstandards.org).

Number	Date	Amendment Details
1	01 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.
2	01 Aug 2006	1. Minor changes/additions to the first and second paragraph of the foreword. 2. Clause 5.2, removal of the term 'threat'. 3. Inclusion of the term 'mines <b>and ERW</b> '.
3	01 Mar 2010	1. Updating definition of NMAA. 2. Updating UNMAS address. 3. Inclusion of a reference to IMAS 04.10 in Annex A. 4. Minor changes throughout to ensure gender and cluster munitions issues. 5. Removal of Annex B from the IMAS series.
4	01 Aug 2012	1. Updated text in regard to ITEP in Clause 6.4 and CEN WG 126 in Clause 8. 2. Reviewed for impact of IATG development. 3. Minor typographical amendments.
5	01 Jun 2013	1. Reviewed for the impact of new land release IMAS. 2. Amendment No included in the title and header.