# Mine Action TECHNOLOGY NEWSLETTER

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# Mine Action Technology

## Where is it? What is it? How do you find out more?

**The Mine Action Technology Newsletter lets you know where to find more information and who to contact, where to go and what is going on in support of your work. Please forward your comments to the Editors.**

This is the second Issue of the Mine Action Technology Newsletter, produced by UNMAS and GICHD, and is dedicated to the promotion and development of related technology.

The first issue was distributed in November 2004 and received a number of constructive comments from readers. It is still our intention to produce a Newsletter on a quarterly basis and we continue to depend on the reaction and needs of the readers. We will try to provide information as to where further details can be found. The Newsletter will not deliberately duplicate work being done by other organizations, or media, but will attempt to assist by advertising these facilities and sites.

Readers are once again invited to provide their own comment and to make constructive suggestions to the Editors, Noel Mulliner, Technology Coordinator at UNMAS, or Al Carruthers, Technology Officer in GICHD, (contact details are provided at the left side of Page 1). Feedback from the field, NGOs, manufacturers, donors or headquarter organizations will help make the Newsletter more effective. It will be available on the UN Mine Action Service website, **E-Mine** (www.mineaction.org) at the Technology, Research and Development page and on the GICHD site at www.gichd.ch/oa_research/technology_newsletter.htm.

This issue includes three feature articles, one on the Rake Excavation and Detection System (REDS), one on “Problem Soils” and Metal Detector Performance and one on ITEP activities. It is hoped that these articles will stimulate thought and further enquiries, perhaps even leading to the adoption of new techniques in some programmes.

We welcome new ideas and would happily share them with others if sent for inclusion in the Newsletter. While the Spring season is here (at least in many parts of the world) the Honey Bees will be waking up and it is thought we have not heard the last of them as a possible technique for surveys of suspected areas!

Following the article on dual sensor detectors in the first issue of the Newsletter, HSTAMIDS, the US military dual sensor detector continues its world tour and some readers will hopefully have seen it being demonstrated in their area. The UK/German dual sensor detector, now known as MineHound, will begin a field trial in 2005 and the Japanese models will continue to be developed and tested in Afghanistan. The day when dual sensor detectors can be used on a day-to-day basis for operations may not be that far away and the consequences of their introduction should be being considered now.

# Conferences and Training Courses

## Conferences, Symposiums and other Events

**Editor's Note:** Surprisingly little information on future technology-related conferences have been found for 2005. If readers have details of interesting conferences, please submit the information to one of the editors. Mine Action Programmers should note that UNMAS has some funds to sponsor attendance at relevant technology conferences. Anyone from the field mine action programmes interested in attending relevant technology meetings should contact Noel Mulliner of UNMAS (contact information on the left side of Page 1) as soon as possible.

### Croatian Mine Action Center hosts Second Expert Symposium "Humanitarian Demining 2005"

The Croatian Mine Action Center (CROMAC) and CROMAC Center for Testing, Development and Training (CROMAC-CTDT) will host the Second International Symposium "Humanitarian Demining 2005" at Sibenik, Republic of Croatia from 25 ~ 28 April 2005.

The symposium will cover a wide range of topics related to demining equipment, such as the position and role of demining machines in humanitarian demining, testing and awarding compatibility grade of such machines, development of demining machines and combinations with other methods, etc. In addition there will be exhibits from machine manufacturers and demonstrations.

For more information on the symposium:
http://www.hcr.hr/index.php?link=simpozij&lang=en
or contact Nicola Pavkovic:
+385-44-544-109
nikola.pavkovic@hcr.hr
http://www.hcr.hr

### Countering IEDs Europe

Exploring and Exploiting Our Advantages

This Conference will take place in Amsterdam, 7-9 June 2005. The conference is being organized by Marcus Evans and is intended for professionals from militaries, law enforcement and industry to discuss technology, tactics and trend analysis. (There is a conference fee to attend and this conference does not qualify for the UNMAS assistance mentioned in the Editor's note above.)

For more information:
www.marcusevansbb.com/ied-europe
or contact Joseph Chan, Global Defense Division
(416) 955 0375 Ext 259

### International Advanced Robotics Program hosts HUDEM2005 at Tokyo

The International Advanced Robotics Program will host the Sixth International Workshop on Robotics and Mechanical Assistance in Humanitarian Demining (HUDEM2005) at Tokyo, Japan from 21 ~ 23 June 2005.

The objective of HUDEM2005 is to encourage development of systems which dispense humans from demining operations in harsh and demanding or dangerous environments, to meet strong operational needs of robotic and other advanced technologies for more reliable, more efficient and safer demining operations.

The Workshop will discuss available and potential technologies, and their limitations including recent development of new systems from national projects in Japan. Other topics will include Sensors and sensor fusion systems for mine detection, test and evaluation of demining systems, tele-operation systems, etc.
This Workshop is **Invitation Only**.
For more information:
http://www.itep.ws/pdf/CFP_HUDEM2005.pdf

### Japan Science and Technology Agency Demonstration of GPR-MD System

The Japan Science and technology Agency (JST) conducted a field demonstration of the GPR-MD System on 16 March 2005. The demonstration was held at the Bannosu Industrial Park, Sakaide City, Kagawa Prefecture, Japan.

For more information contact Jun Ishikawa:
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ishikawa@mine.jst.go.jp

# Course Information

**Editor's Note:** This section highlights details of some courses that have been brought to the attention of the editors and are therefore shared with readers. If anyone has details of other courses suitable for technology/operational staff from mine action field programs, NGOs, or commercial companies, please submit details to the Editors. Program Managers may consider Quality Assurance / Control Monitors attending "Lead Auditor's Courses", which are run by many civilian Quality Management / Auditing Companies and have some good general guidance.

## United Nations Institute for Training and Research Programme of Correspondence Instruction

UNITAR POCI offers a self-paced correspondence course entitled *"Mine Action: Humanitarian Impact, Technical Aspects, and Global Initiatives."* All course materials are mailed directly to the student and usually arrive within two weeks. The course has 12 lessons students complete on their own through self-study. Each lesson has a quiz with answers available. When students finish all 12 lessons they complete an End-of-Course Examination and submit it by mail, fax, or e-mail. If they pass with 75% they are awarded a Certificate-of-Completion from UNITAR POCI. The enrollment fee is US$95 and covers all costs except the postage to submit the Exam.

For more information:
http://www.unitarpoci.org
United Nations Institute for Training and Research
Programme Of Correspondence Instruction
Box 20475
Dag Hammarskjold Centre
New York, NY 10017-20475

## International School for Search and Explosives Engineers

The International School for Search and Explosive Engineers (ISSEE) has released their 2005 curriculum for Search, security, Explosives and Counter-Terrorism Training. David Hitchins, Sales and Marketing Director of ISSEE, explains that all training can be delivered from a single, purposed-built site and has the added benefit of enabling the internationally recognized City and Guilds of London academic qualification.

The Standard UK courses are suitable for all ranks of military and police students. In addition, ISSEE offers quick development and delivery of bespoke courses in order to meet more specific technical requirements.

Courses can be delivered through an interpreter for students who do not have English as their first language.

For more information:
http://www.issee.co.uk
+44 (0) 1980 847484.

## Swedish EOD and Demining Center

The Swedish EOD School is offering quality certified training. Each year approximately 35 courses are performed, which means totally 10 000 student hours. All the school instructors are benefiting from a wide spectre of knowledge and experience within EOD and mine clearance. Several of them have been out on various international missions.

For more information
http://www.swedec.mil.se/article.php?dontaddcount=1&id=5639

*Deminers on joint training exersices (Photo: UNMAS)*

**Feature Article 1**

# Rakes and Rake Excavation and Detection System (REDS)

**Andy Smith**
*Demining Consultant*

At the start of the new millennium, demining was being conducted in Sri Lanka by both government security forces and the LTTE. With limited funds and extensive human resources, both used a low-cost, labour intensive "raking" technique. The Tamil's Humanitarian Demining Unit (HDU) used short-handled rakes but they were not marking the areas, and not imposing safety distances or wearing PPE. The Government security forces did wear PPE, but also paid little attention to the concept of safety distances and area marking. Clearance on both sides was "successful", but there were disabling casualties and the relatively random method raised concerns over how thoroughly the ground had actually been processed.

When NPA were invited to advise the HDU in 2002, it would have been easy for them to dismiss the rakes and impose metal-detector drills. The cost of importing hundreds of metal-detectors would have been high, but many saw no alternative. To their credit, the NPA advisors saw that the raking was potentially as thorough as sieving the ground and so would be very attractive if it could be controlled within a marking and safety package that would be effective in preventing missed mines and accidents. They looked at ways to refine the tools and to control rake-use within site marking and supervision regimes that would create an entire system that would be accepted within mainstream demining.

The resulting Rake Excavation and Detection System (REDS) uses two simple raking tools to excavate and sift the ground to the required depth. One is a Brush-rake, the other has two curved tines to loosen the ground like a Harrow. Conventional demining site markings are used, and side of lane depth trenches allow effective internal QA. A "Base-trench" across the front of the lane marks the extent of the processed area. Loose soil is brushed from the uncleared area into the Base-trench, and then packed to the rear of the trench. When the use of the Brush-rake becomes ineffective, the Harrow-rake is used to scarify the ground, allowing the Brush-rake to be used again. The Base-trench rolls forward as work progresses, which can be surprisingly fast in ideal ground conditions.

The Brush-rake has flexible tines that exert little pressure in any one place on the ground. Many thousands of mines have been exposed using it, and none have detonated. The Harrow-rake is heavier and is used to both scarify the ground and to lift shallow mines to the surface. If used incautiously, mines can be initiated by hitting the Harrow-rake-head on the ground. This has happened several times, but no severe injuries have occurred. The long handle on the refined rakes keeps the deminer at a distance from the blast, and the PPE that is now part of the REDS system completes the protection against the anti-personnel blast mines they are clearing very effectively.

*The picture above show the Brush-rake and Harrow-rake in use on HDU sites.*

The early design of the Harrow-rake head was very cheap and worked adequately in loose, sandy soils. It is currently being revised for use in harder soils by SARVATRA - a demining NGO from India who are working with NPA in government controlled areas of Sri Lanka. Their revision of the Harrow-rake uses a material with a proven record of maintaining integrity in AP mine blasts (low-grade Stainless Steel). The tools dig into and cut the ground without the need to apply any downward pressure and can be refurbished periodically to have a very long life. Locally made, they cost rather more

than the original rake-design, but do not cost as much as three sets of Duracell batteries for a well known metal-detector.

*SARVATRA Harrow-rake heads*

The HDU/NPA are field-trialling these rakes with a view to their widespread adoption. SARVATRA are refining the design further, to make the REDS applicable on even harder ground and to make refurbishment of rake-heads a simple field exercise. The curvature of the tines and their spacing are important to achieve efficiency.

SAVATRA and NPA are also currently trialling mechanical "Ripper/rakes" to be used ahead of the deminers in overgrown or hard-ground areas. Using small back-hoes as the carrier, these "Arjun" machines are very low-cost and unusually versatile (under $25k complete).

**When Rakes are not REDS**

Because the REDS system sieves the ground, it can give complete confidence of clearance to the required depth. Metal-detectors and other area-excavation techniques cannot always achieve this. This is true however, only when the entire REDS system is applied. Using rakes without understanding the principles behind REDS can lead to ill-conceived methods, a bad safety record and poor quality clearance.


*Ripper rakes on the Arjun*

NPA in Sri Lanka has provided assistance to the Tamil demining groups and authorities, helping them to refine their own systems and so meet the requirements of Sri Lanka National Mine Action Standards. Uniquely, they have achieved this without losing the low-cost features that are essential to any locally sustainable method. Recently NPA has begun to support a similar process in government controlled areas, working with both the army (in co-operation with RONCO) and civil demining groups. Their civil partners are the Milinda Morigoda Institute for People's Empowerment, HORIZON and SARVATRA. The first is a local Sri-Lankan NGO moving into Humanitarian Demining and the other two are demining branches of NGOs based in India. All three are using REDS as their main clearance drill.

REDS may have application in many other areas and is already being considered in other programmes. The importance of using the entire system cannot be stressed too much, however.

For more information on REDS drills, contact Andy Smith at avs@nolandmines.com, Luke Atkinson (NPA, Sri Lanka) at luke_sj@hotmail.com, or Judy Grayson (UNDP) at judy.grayson@undp.org.

**Feature Article 2**

# "Problem Soils" and Metal Detector Performance

**Al Carruthers**
*Technology Officer*
*Geneva Center for Humanitarian Demining*

The metal detector is a real workhorse in the mine action community and there are few operations that do not rely on its performance for an efficient and successful outcome. Therefore, when its effectiveness is reduced or negated, there is a big reduction in production, and often safety, for a demining activity. Most field practitioners are well aware of the problems that are caused by difficult or lateritic soils and this article explains why these problems occur, how significant or serious the problem can be, and what can be done about it.

## Why are Metal Detectors Affected by Soil Conditions?

Metal detectors are instruments which detect changes or differences in magnetic characteristics in the soil. A typical detector creates a magnetic field, called the primary magnetic field, which will in turn generate a secondary magnetic field in metallic objects that are on the surface or in the soil.

When the detector detects a variation caused by the presence of this induced secondary magnetic field, the operator is alerted by an audio signal. Unfortunately secondary magnetic fields can also be generated by magnetic materials in the soil or in soils with a high saline content. Sometimes an anomaly is created from a neutral stone in a homogeneous difficult soil and a false signal is generated.

Readers are encouraged to read the two documents listed as References 1 and 2. These documents are available on the websites listed below.

## What Soil Conditions Affect Detector Performance?

Strongly magnetic soils will cause modern metal detectors to react as if a metallic item were present. The soil properties that can cause false alarms in metal detectors are the *magnetic susceptibility* which is the extent to which the soil is magnetised by the detector's primary field, and the *magnetic viscosity* (or frequency dependent magnetic susceptibility), which is the extent to which this magnetisation tracks high frequency changes in the detector's field. Magnetic viscosity is a relatively new parameter which has been shown to affect detector performance. It is measured by taking a small sample of soil and measuring the magnetic susceptibility at two different frequencies. The greater the difference between the magnetic susceptibilities, the greater the effect the soil will have on detector performance. *Soil conductivity* can also affect detector performance but to a much lesser degree than high magnetic susceptibility or magnetic viscosity. Soil conditions where you find high magnetic susceptibility/viscosity include:

- Soils which have a high iron, iron sulphide, or iron oxide content. Examples of minerals in soil that have high magnetic

susceptibility include hematite, ilmenite, pyrite, and magnetite.

- Some soils of volcanic origin,

- Red-coloured tropical soils which typically have high levels of iron oxide.

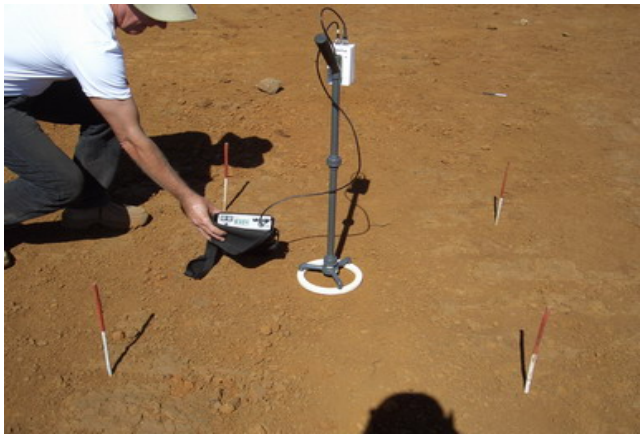
Since 1997, scientists and technologists interested in the soil problem have been collecting magnetic susceptibility and conductivity data on soils in many mine affected areas throughout the world. Several general observations have been made. First of all, regions with high magnetic susceptibility and conductivity that can affect detector performance are much more prevalent than originally thought. Secondly, the ability of detectors to compensate for problem soil conditions varies widely and covers the whole spectrum from very little capability to an excellent capacity to compensate for ground conditions. The third observation is that in poor soil conditions, the sensitivity of detectors will be reduced, even for those detectors that show good ground compensation capability.

**How Can Deminers Test for Difficult Soil Conditions?**

Many demining operations already use a procedure which can be easily applied in most situations. The most common name given to this procedure is "calibration pit test".

There are some slight variations in individual country Standard Operating Procedures (SOPs) but they generally follow the procedure described in Section 2.3.1, "Daily routines" of the Metal Detector Handbook for Humanitarian Demining (Reference 1).

There are some actions that can be taken by National Mine Action Authorities to more accurately assess the difficult soil problem and mitigate its effect. The first step is to identify just how much of a problem difficult soil is in the area. If a soil problem is identified, then a specific requirement of the Technical Survey should be to define the nature and extent of the problem. There are instruments that can quickly measure magnetic susceptibility and magnetic viscosity. One of them is the Bartington MS2 Magnetic Susceptibility Meter which is the most commonly available on the market (Reference 3). Demining organizations are unlikely to have such an instrument but they are commercially available, simple to use, and inexpensive to operate. Such an instrument will provide accurate data on the magnetic susceptibility and magnetic viscosity of soil in a region. Once the range of magnetic susceptibility of the soil in a region is known then it can be determined if detectors possessing ground compensation capability or an ability to reduce sensitivity would need to be used in specific regions. Scientists are now actively compiling magnetic susceptibility data for mine affected countries and testing metal detectors to determine what models can effectively work under conditions of high magnetic susceptibility. Another option would be to use the procedure described in Section 3.7 of the Metal Detector Handbook for Humanitarian Demining (Reference 1) called Ground Reference Height measurement. Although the procedure was developed for use with the Schiebel 19/2 Mode 7, it can be used with other detectors found in the mine action community. The detector must be a "static" type of detector, i.e., it will alarm continuously when held stationary above a metal object. Examples of this type of detector are the Foerster Minex 2FD 4.500, the CEIA D1, and the MineLab F3. The ground reference height procedure does not provide a direct reading of magnetic susceptibility but it does give a relative indicator on how difficult a soil may be for detector operation. The greater the ground reference height measured, the more difficult the soil will be for detector operation.



*Using the Bartington MS2 meter to measure soil magnetic susceptibility*

**What Can Be Done About Difficult Soil?**

Unfortunately there are few options for handling difficult soil by the individual deminer. There are a few procedures that can be used such as:

a. Localize the extent of the difficult soil. Often the magnetic susceptibility in an area of problem soil can be highly variable. In some cases moving a few metres or tens of metres will mean the difference between being able to use a detector or not use a detector. Operators should therefore test the area frequently with their detectors to see if they are still getting a signal from the soil. They must ensure that they can still detect threat mines with the detector to the required depth.

b. Reduce detector sensitivity. Some mine detectors are able to work through some difficult soil conditions and still detect threat mines to the required or desired depth of clearance. This is done by reducing the sensitivity of the detector to a level where the signal generated by the soil is rejected by the detector electronics. It is particularly important when using this procedure that the operator should verify that the detector will still detect the threat mines to the required depth.

c. Use of detectors with ground compensation capability. Some modern detectors have built in a ground compensation capability and some of these may be available within the demining organization. Supervisors should ensure that these detectors are distributed in the areas where they will be most effectively used. Supervisors should ensure that these detectors are distributed in the areas where they will be most effectively used.

d. Revert to other means of detection such as dogs.

e. Use other manual techniques such as manual excavation and prodding. Although this is the least attractive means of dealing with difficult soil, it may be the only means available to combat the problem.

If a significant soil problem was identified during the general assessment process or technical survey phases of a mine action operation, then consideration should be given by program management toward the purchase of metal detectors with a good ground compensation capability. A thorough test and evaluation must be done on any detectors to be used in difficult soils to ensure that they are able to operate effectively in the region.

In summary, soil magnetic characteristics can have a significant impact on detector performance. That in turn can severely affect productivity and safety in demining operations. It is a factor which cannot be ignored. There have been numerous advances in detector procedures and in metal detector design which can compensate for many difficult soil conditions. However, the decision on what detector to use would have to be determined through test and evaluation of the detector(s) performance under soil conditions that will be encountered in the mine affected country.

## References


1. Metal Detector Handbook for Humanitarian Demining, Authors: Dieter Guelle, Andy Smith, Adam Lewis, Thomas Bloodworth, http://www.itep.ws/pdf/metal_detector_handbook.pdf

2. Metal Detector Description by James Trevelyan http://www.mech.uwa.edu.au/jpt/demining/tech/detect/md-intro/text.html

3. MS2 Magnetic Susceptibility System, Application Note AN0008 http://www.bartington.com/notes/an0008.htm

4. CEN Workshop Agreement, Humanitarian Mine Action – Test and Evaluation- Metal Detectors, June 2003 http://humanitarian-security.jrc.it/demining/cw07/pdf/CWA14747.pdf

**Feature Article 3**

# ITEP Collaborative Test and Evaluation of Humanitarian Demining Equipment 2005

The annual review meeting of the ITEP Work Plan took place in January 2005. During the latter meeting representatives of all ITEP Participants presented their plan for the upcoming year related to test and evaluation (T&E) of humanitarian demining equipment. The review then allowed for identification of possible duplication and initial planning of collaborative efforts. The ITEP Work Plan 2005 is available on the ITEP website and has been endorsed by the ITEP Executive Committee in March 2005.

The Work Plan clearly shows that during 2005 two major collaboration efforts will take place under the ITEP umbrella, focusing on dual-sensor mine detectors and mechanical demining equipment. Furthermore, the systematic test and evaluation of metal detectors (STEMD), initiated in 2004, will continue in the course of 2005. This overview article, however, does not cover the STEMD trials.

## Test and evaluation of dual sensor mine detectors

To our knowledge, there are currently only two dual sensor mine detectors available that are nearly ready for field deployment in humanitarian demining operations: the Cyterra Handheld Stand-Off Mine Detection System (HSTAMIDS/AN-PSS14) and the ERA Technology MineHound (former Minetect). Both detectors are being deployed to mine-affected regions in 2005 for operational field trials.

The Handheld Stand-Off Mine Detection System (HSTAMIDS) Operational Field Trails and Demonstrations Project (ITEP Project Nr. 2.4.2.6), headed by the U.S. Department of Defense (DoD) Humanitarian Demining Research and Development Program (HDP) started last year with a first trial in Thailand. The second field trial is at this moment being carried out in Namibia (March 2005). The last field trial of this collaborative project will be held in the second half of 2005, most probably in Afghanistan.

ITEP representatives from Sweden, Canada, UK and the Netherlands are actively involved in the trials which have the following main objectives:

- evaluate the performance and suitability of the HSTAMIDS in multiple humanitarian demining environments,
- train local deminers in the proper use and operation of the HSTAMIDS,
- assess the performance of metal detectors operators after limited experience and training with the HSTAMIDS and evaluate the training methods, the human factor characteristics and the overall performance, and
- demonstrate the HSTAMIDS to regional demining organizations

The Assessment of the next generation of the ERA dual-sensor mine detector (ITEP Project 2.4.2.4), headed by the UK, started in December 2004 with in-depth field trials on UK test sites in order to assess the latest model of the dual-sensor detector (MineHound), incorporating a Vallon metal detector, instead of a Guartel metal detector in the previous model (Minetect). Two long-term trials of the MineHound detector, running partially in parallel, are planned to be carried out in Cambodia and Angola, starting in summer 2005. The main aim of these trials is the assessment of the MineHound detector operated alongside the metal detector used during the daily demining activities of the Mines Advisory Group (MAG). In this context the dual-sensor detector will be used fundamentally as a confirmation sensor and the data collected will, amongst other things, provide a realistic idea on the potential of the tested detector for false alarm reduction. Several ITEP Participants are currently preparing to take part in the trials, mainly in the role of trial oversight and quality assessment.

## Test and evaluation of mechanical demining equipment

The ITEP Participants that are involved in T&E of demining equipment during 2005 are mainly Canada, Sweden, UK and US. Other ITEP Participants are invited and might still contribute on a case by case basis. Each of the above mentioned

countries have their own T&E program that they co-ordinate amongst each other, i.e. they contribute test engineers and test facilities to each others programs as and when required, and they have accepted the test protocol CEN Workshop Agreement, Test and Evaluation of Demining Machines (CWA 15044).

Some examples of ITEP collaborative T&E that will be carried out during 2005 are given below. Regular news on upcoming trials, as well as the corresponding evaluation reports will be available on the ITEP website.

- The UK, with support from Canada and the US, and in collaboration with the Mines Advisory Group (MAG) has just carried out (February 2005) an evaluation of the Tempest Ground Penetrating Flail in Cambodia (ITEP Project 3.2.24). A full set of trials was conducted, applying the CWA 15044 as closely as possible within the time and logistical constraints. The trial details and evaluation outcome will be published in the near future.

- Canada will lead a multi-activity T&E project, in cooperation with the Thailand Mine Action Centre (TMAC) and expects to engage ITEP partners from UK, US and Sweden. The corresponding trials are scheduled for May 2005 and involve the testing of several tools from the mechanical demining kit.

- An in-country performance test of the Bozena-4 mini flail will be carried out as follow-up of the 2004 performance testing in Sweden (ITEP Project 3.2.22). This is being considered as a means to examine how well the CWA 15044 performance test can be transplanted out from the "controlled" test facilities of ITEP countries into mine affected countries. Furthermore, the Bozena-4 will also undergo the in-country acceptance test prescribed by the CWA 15044. This will make the Bozena-4 the first demining machine to run completely through the whole CWA 15044 procedure from pre-trial assessment at the factory to acceptance testing in the mine-affected country.

- Evaluation of a bunching saw attachment to a hydraulic excavator (ITEP Project 3.2.26). The bunching saw is a piece of equipment, used during forest thinning operations and perfectly suited for small to medium sized carriers. A similar attachment is envisaged to have two potential benefits: 1) the vegetation is cut and removed from the minefield in one step rather than being shredded onto the ground and requiring a second operation to remove the slash and 2) the intact vegetation may be salvageable, especially larger trees and bamboo, either for use or to generate additional funds for demining projects. Whether either benefit can be realized in a cost effective manner is unknown. Furthermore, a performance comparison will be carried out between the single-operation bunching saw and a two-operation shredder/remover, using the on-site ProMac BDM48 or other available vegetation grinders/cutters with secondary raking mechanisms. During the second half of 2005, a pre-trial assessment (PTA) of the Armtrac-75 may be performed by the UK, while Sweden may test the Mineworm. On condition these machines will pass the PTA, a full trial according to the CWA 15044 will be carried out, possibly with support of other ITEP Participants.

## Contacts

- ITEP Secretariat
- Handheld Stand-Off Mine Detection System (HSTAMIDS) Operational Field Trails and Demonstrations, Lee Offen
- Assessment of the next generation of the ERA dual-sensor mine detector, Ian Dibsdall
- Evaluation of the Tempest Ground Penetrating Flail in Cambodia, Pre-Trial Assessment of the Armtrac 75, Chris Leach
- T&E of the Bozena-4 mini flail, Evaluation of the bunching saw, Geoff Coley
- Pre-Trial Assessment of the Mineworm, Goran Danielsson

# Mine Action Technology Information Resources

**The following are useful websites containing information on the latest technical mine action activities and organizations, as well as calendars showing forthcoming technology conferences.**

### E-Mine

The Official Website of the United Nations Mine Action Service (UNMAS) designed to support both the planning and coordination of global mine action efforts

http://www.mineaction.org

### Geneva International Centre for Humanitarian Demining

The Official Website of GICHD that provides regular updates on GICHD activities, studies and projects, including the Equipment Catalogues.

http://www.gichd.ch

### International Campaign to Ban Landmines

Provides information on the Ottawa Treaty, as well as general information on landmines, campaigns and calendar information on mine action activities.

http://www.icbl.org

### International Test and Evaluation Programme

Provides information, updates, current test and evaluation reports of demining machines and technologies.

http://www.itep.ws

### UXOInfo.com

Website devoted to information on Unexploded Ordinance (UXO). Latest news on UXO, photo galleries and technology information available.

http://www.uxoinfo.com

### Mine Action Information Center at James Madison University

Contains a good global mine action registry, the Journal of Mine Action, Lessons Learned database, and a Spatial Information Clearing House.

http://www.maic.jmu.edu

### Canadian Forces National Defence Mine/Countermine Information Center

The NDMIC provides mine and countermine information for Canadian Forces in international operations.

http://ndmic-cidnm.forces.gc.ca


### United States Department of Defense Humanitarian Demining R&D Program

The Humanitarian Demining R&D Program was established by the US Department of Defense to develop, demonstrate, and validate equipment for immediate use in various international humanitarian demining missions and environments.

http://www.humanitariandemining.org

### ORDATA Online

ORDATA Online supports the U.S. Department of Defense by providing information to facilitate international UXO training, awareness and clearance operations.

http://www.maic.jmu.edu/ordata

*The following sites have not been updated since 2003:*

### Demining Technology Information Forum

http://www.maic.jmu.edu/dtif

### Society for Countermine Technologies

Good for technical publications and news of SCOT/MINWARA conferences.

http://www.demine.org