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The Mine Action Technology Newsletter aims to let you know what is going on in support of your work and who to contact to find more information.

Introduction

This is the fifth issue of the Mine Action Technology Newsletter, produced by the United Nations Mine Action Service (UNMAS) and the Geneva International Centre for Humanitarian Demining (GICHD), dedicated to the promotion and development of related mine action technology.

We welcome new ideas and will share them with others if sent for inclusion in the Newsletter. Feedback from the field, NGOs, manufacturers, donors or headquarter organizations helps to make the Newsletter more effective.

This issue includes four feature articles: the Explosive Harvesting Project in Cambodia; a comprehensive up-date on International Test and Evaluation Program (ITEP) activities; a preliminary report on the magnetic clutter reduction project; and an important procedure for measuring the anticipated adverse effect of the soil on metal detectors. Also included is one page with snippets of general information and news.

This newsletter is sent out via e-mail to persons and organizations who have expressed an interest in mine action technology. Those wishing to receive a copy as soon as it is available can contact one of the editors at the e-mail addresses listed at the side of this page. The newsletter is also available on the UNMAS website, **E-Mine** (www.mineaction.org) and on the GICHD website at www.gichd.org .

Readers are once again invited to provide their own comment and to make constructive suggestions to the Editors, Noel Mulliner, Technology Coordinator at UNMAS, and Erik Tollefsen at the GICHD.

WHAT'S GOING ON IN TECHNOLOGY ?

Conferences, Training and other Events

Editor's Note: Please submit details of any forthcoming conferences, symposiums or training events to one of the editors.

19-22 March 2007. Mine Action National Directors and UN Advisors Meeting. (by invitation only)

The Mine Action National Directors and UN Advisors Meeting is an annual meeting held by UNMAS and hosted by GICHD in Geneva. The aim of the meeting is to gather the Mine Action National Directors of UN supported programmes, UN Advisors and donors to discuss relevant issues in mine action in the framework of the UN Mine Action Strategy 2006-2010.

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24-27 April 2007. Fourth Symposium on "Humanitarian Demining" - Sibenik, Croatia

The Croatian Mine Action Centre (CROMAC) and the Centre for Testing, Development and Training (CTDT) will host the Fourth International Symposium "Humanitarian Demining 2007" at Sibenik, Republic of Croatia from 24 to 27 April 2007. The Symposium will cover a large number of topics related primarily to mechanical demining issues and the employment and management of mechanical equipment in mine action. There will be special emphasis on the topics of area reduction, cost-effectiveness, and risk management. In addition, there will be demonstrations of equipment by machine manufacturers and displays of other mine action equipment such as detectors and personal protective equipment. Further details can be obtained from the CROMAC website: http://www.hcr.hr/index.php?link=pmdh&lang=en or by contacting Nikola Pavkovic at +385 (1) 650 0023, e-mail nikola.pavkovic@ctro.hr or Sanja Vakula at +385 (1) 650 0020, e-mail sanja.vakula@ctro.hr . Fax +385 652 0301.

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27-30 August 2007. UXO/Countermine/Range Forum 2007

The UXO/Countermine/Range Forum assembles the best researchers, developers, policy makers and programme planners from industry, government and contractors to showcase cutting-edge technologies, ideas, programmes and partnerships. Learn and network with fellow professionals and researchers while exploring this year's theme "Countering Explosive Threats: Integrating Technologies and Forming Partnerships. For more details of this meeting which will be held in Orlando, Florida, visit the website at http://www.theforum2007.com/.

Research and Development Information Update
Explosive Harvesting Project (EHP): Cambodia

Golden West Humanitarian Foundation has developed a novel way of recycling explosive from excess ordnance. The Explosive Harvesting Project (EHP) is working with funding and assistance from the US Department of Defence Humanitarian R&D Program and the Secretary of State to develop and refine the equipment and processes.

The team has established that recovering explosives from excess ordnance and constructing disposal charges **can be** safely accomplished in a field environment.

The team is now focusing their efforts on assessing **if** this equipment **is** the most cost effective and supportable means to safely accomplish this task.

Cost is obviously a key issue as there is no sense building a system that cannot be afforded by most end-users. Of all equipment purchased for this project; the hydro-abrasive cutting system was the most expensive.

Hydro-abrasive methods are recognized as the safest means to cut explosive ordnance *(A TNT loaded USSR 122 mm projectile cut with our system is shown below*). World-wide; over 500,000 pieces of ordnance have been cut using this method, including highly sensitive primary explosives such as lead azide and mercury fulminate.

A very extensive market survey was done and the BHR/DiaJet © Osprey was the best price available.

However, an equal part in developing this system is to ensure it can be supported ***in field conditions***. This includes working in remote locations where re-supply is difficult, local manpower has minimal skills, and only the bare essentials such as fuel and water are available.

While looking at alternatives; we were informed that an African ammunition manufacturer had been using modified metal cutting saws with great success.

Further investigation revealed that other test centers have also used metal cutting saws on explosive ordnance. Over 3,000 pieces had been cut using this process that we could track. Only one accident had occurred when a power hacksaw ran out of cutting fluid and was not shut down.

We went forward from there.

The team procured an inexpensive metal cutting band saw through local sources and tested the system on empty shell casings to assess the cutting speed and temperature.

Some adjustments were made and more tests conducted, then the team felt confident in testing the saw against explosive ordnance in our hardened site. The barricading of this site is sufficient to protect the team from blasts of

up to a 155 mm HE projectile, so safety is maintained at all times.

The results were above our expectations.

Neither the case nor the explosives exceeded ambient temperature, and there was no measurable loss of explosives. The ordnance can be cut **four to five times *faster*** than with the Hydro-abrasive system.

It must be noted that the band saw **cannot** perform the full range of the tasks that can be done with the Hydro-abrasive systems. *For instance the band saw should never be used to cut fired, fuzed ordnance.*

Results: Some more modifications and testing are planned for the band saw technique, however for processing stock pile ordnance and converting it into disposal charges, the initial results show a ***75% decrease*** in capital equipment costs with a ***150% increase*** in production capability.

The sustainability in remote locations is greatly improved and training requirements for local staff are minimal. This approach also eliminates the over-spray concerns of the hydro-abrasive system and the hazardous waste stream of the production line is all but eliminated.

Explosive Recovery: Along with reducing the time required to cut open a projectile; our Cutting, Melting, and Casting (CMC) manager improved the steaming adapter used to extract the explosives from the ordnance casing. These improvements reduced the time for extraction by over 25%.

The exact time varies with the projectile sizes and fillers; however a broad average for TNT and Composition B loaded large caliber projectiles is now only 3.00 minutes.

The explosives drop free from the projectile casing as a solid piece. Once it has been allowed to dry and cool; it is weighed and inventoried.

Casting Operations: As cast TNT is **not** sensitive to standard blasting caps; the team has analyzed mixtures of TNT and other commonly available main charge explosives to cast small, individual charges and to make the recovered stockage go as far as possible.

For larger charges; boosters with detonating cord knots are first cast then TNT is cast over the booster which ensures full contribution of the TNT. Maximum use is being made of locally available, low cost containers which still allow the permanent marking system to be employed for accountability and reliability tracing.

Pressed TNT Filled Projectiles: Our team noticed a very substantial difference between the texture and density of Russian and US TNT. Working on a hunch, our EOD Supervisor created a detonator well in a small piece of Russian TNT for a standard blasting cap and tested it against a 20 mm steel witness plate.**It detonated with full contribution.**

Research revealed that the Russian manufacturers used a process called "Screw Loading" for filling large caliber projectiles with TNT. This in fact makes what the Western technicians would call **Pressed TNT**.

This fact was not referenced in any of our manuals, however when this specific type of ordnance is available, the harvesting process becomes far simpler. The recovered explosive can be quickly converted into half-moon or wedge charges without complete recasting;

producing disposal charges that are extremely well suited for EOD and demining operations. HALO Trust has reported a **100% success** rate with these charges.

Stock Pile Reduction: The working relationship with Royal Cambodian Armed Forces (RCAF) is excellent and they are fully cooperating with the EHP; turning over large stocks of their excess ammunition for processing.

This not only identifies a good ***internal*** source of disposal explosives to support the long term clearance effort in Cambodia, it also lessens the ammunition storage risks for the general public and reduces environmental damage caused by bulk demolition of ordnance.

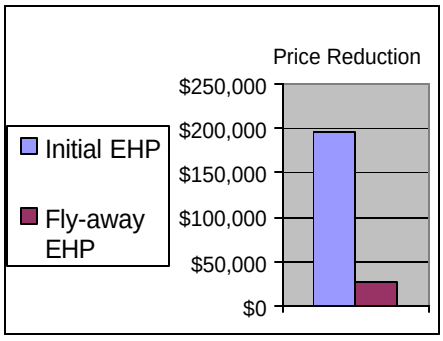
FFE Metal: Nearly 1.5 metric tons of "Free From Explosive" metal has been returned to the RCAF. The empty shells are heat treated for four hours, exposing the metal to temperatures exceeding 1,000c. This ensures all explosive residues are destroyed and that metal is completely safe to recycle.

Immediate Future: There are still some development issues required prior to the EHP becoming a functional, cost effective package. The team has already made exceptional progress on the development of a "Flyaway" version of the EHP. The intent is to develop a smaller, less expensive package to support and supply small teams. This system is designed to fit into a single 8x10 ISO shipping container for sea/air transport, or sent by individual component boxes that can load into a single 3 to 5 ton cargo truck.

The modified band saw already reduced our size, weight and cost requirements; however, the steam generator was the other major item that required attention. The current unit is 1.8meters tall, weighs 480 kilograms and requires a 110 KVA electrical power generator for operation. Other commercial units were not suitable so our Cutting Melting and Casting (CMC) Supervisor built a system specific to the EHP needs. The new steam generator is less than one third the size and weight of the original unit and requires only 10 KVA of electrical generator capacity for operation. The smaller steam generator and electrical power generator significantly reduce the overall capital costs, shipping costs and fuel consumption for the entire system.

Overall Cost Reductions: With the recent developments; the capital expense and logistical support required to assemble and support a "Fly-away" version has substantially decreased.

These price reductions have brought this specific version down to a level which *is cost effective* for an NGO to procure the required equipment and train their personnel in its use.



Long-term future: Working with the US DoD-NVESD, the US DoS Weapons Removal and Abatement (DoS/WRA) office has recently committed funds to expand the EOD capacity of the program in 2006 and to support the basic operation at Kampong Chnnang in 2007.

Between the support of NVESD and WRA; the Golden West EHP team can continue training our CMAC counter-parts in these specialized skills while providing support and assistance to the demining, EOD and stock pile reduction efforts in Cambodia.
With this the potential exists to construct a second EHP site in Kampong Cham *specifically designed for processing large capacity air-dropped bombs* and to field mobile "Fly-away" kits *in key locations.*

Editor's Note: This article was originally written in July 2006. Roger Hess/Golden West recently provided an update on the Explosive Harvesting Project.
-They have recently received about 100 AT Mines (TM-62M and TM-57 mines) and the main charge is cap sensitive. This means that the charges can be processed quicker and they are able to obtain 70 charges from one mine.
-CMAC, HALO Trust and MAG have used over 5000 Explosive Harvesting Project charges with excellent success.
-Over six metric tones of "Free From Explosive" have been turned over to Cambodian authorities for recycling.

Feature Article 2

ITEP Test and Evaluation of Humanitarian Demining Equipment - Update on activities

During summer and autumn 2006, a series of test and evaluation activities were carried out by ITEP. A summary update is given below. More detailed information can be obtained by going to the applicable ITEP Work Plan Project or by contacting the ITEP Secretariat at secretariat@itep.ws .

Systematic Test and Evaluation of Metal Detectors (STEMD, ITEP project, 2.1.2.3)
The third and last regional trial was carried out in Croatia during October 2006 by Germany with assistance from Belgium, the Netherlands and the Croatian Centre for Testing Development and Training (CROMAC-CTRO). As far as possible, all latest metal detectors models were included, as well as two metal detectors of Russian origin which were unknown in humanitarian demining. Factors assessed were the probability of detection, maximum detection depth for a typical local target, and the pinpointing accuracy. The trial report of this last STEMD trial is expected to be published early in 2007. Reports of the previous two trials in Laos and Mozambique have been published in 2004 and 2005 respectively, and are available from the ITEP website. A report on the laboratory trials which were carried out in the course of the STEMD project is also available.

Evaluation of metal detector arrays for humanitarian demining (ITEP project, 2.1.2.5 and 2.1.2.6)
In-laboratory testing of the detector arrays is carried out by Canada, with input from the Netherlands, Germany and the United States. Two metal detector arrays (Schiebel, Vallon) have already been tested. Negotiations are underway to transfer the US Humanitarian Demining Research and Development Program (US HDP) Ebinger array to Canada for testing before March 2007. The Minelab array is, at this momen, not available for testing. However, it is hoped to still obtain this array in time, prior to the end of the project (March 2007). The in-soil and in-country performance evaluation is awaiting the results of the in-laboratory testing and has been postponed until mid-2007.

Integrate and test and evaluate the "Mine Stalker" NIITEK Ground Penetrating Radar system (ITEP project, 2.2.2.3)
The Mine Stalker system consists of a GPR array on a remote controlled platform with GPS tracking. This project continues to develop the system as a ruggedized field ready system based on the lessons learned during an Angola operational field evaluation in November 2005. Confidence levels of the radar are being defined for discrimination of mines from clutter and further work is being done on the detection and discrimination algorithms to improve performance over a wide range of environments and targets. The system will deploy to Africa in 2007 for a second operational field evaluation.

Handheld Stand-Off Mine Detection System (HSTAMIDS) Long Term Operational Evaluations (ITEP Project, 2.4.2.11)
This project is carried out by the United States, and is a follow-up to the Handheld STAnd-off Mine Detection System (HSTAMIDS) Operational Field Trials and Demonstration project (ITEP Project, 2.4.2.6), in which the system was deployed to Thailand, Namibia and Afghanistan for field trials and demonstrations (in test lanes). The current project consists of using the HSTAMIDS system as a primary and sole detector in live minefields for an extended period (up to a year) by local deminers. Data are being collected on system and operator performance. Up to date, long term operational evaluations have started in Cambodia, Afghanistan, and Thailand with possible future evaluations in Angola.

Note that the United States are also working on a humanitarian version of the HSTAMIDS (ITEP Project, 2.4.2.1). The HD-HSTAMIDS project is looking into modifications of the current HSTAMIDS hardware for a tailored, low cost demining version and improvements/additions of region specific algorithms and algorithms to search for deep buried mines and UXOs in order to increase the detection rate in the humanitarian demining environment.

Test and evaluation of available dual sensors to be used in humanitarian demining (ITEP Project, 2.4.1.3)
This activity is executed by Germany and will receive support from other ITEP Participants in the course of 2007. The final objective of the project is to compile a "state of the art" report of the available dual-sensor technology. Currently, the project is in its initial stage. An optimal reliability test design for dual sensor detectors is being prepared, based on the experiences gained during the STEMD trial (*ITEP project, 2.1.2.3*) and the MINEHOUND ™ dual-sensor trials (*ITEP project, 2.4.2.4*) last year.

Evaluation of the clutter reduction effectivity of demining tools with magnets (ITEP Project, 2.5.2.6)
The aim of this project, executed by the Netherlands, is to quantify the effectivity enhancement, and hence productivity increase in manual demining when handheld magnets and rakes equipped with magnets are used. The Cambodian Mine Action Center (CMAC) took part in the first data-acquisition phase.
This project is also evaluating a prototype handheld magnet, developed by the US HDP. (See feature article for more details)

Test and evaluation of mechanical demining equipment in Croatia (ITEP Project, 3.2.33, 3.2.34, 3.2.3, 3.2.36)
Trials with the Bozena-5 flail, MineWolf tiller and MV-10 flail and tiller were carried out during May-June and September 2006 by Canada in collaboration with the Croatian Centre for Testing Development and Training (CROMAC-CTRO). All performance tests were executed using the guidelines described in the CEN Workshop Agreement for Test and Evaluation of Demining Machines (CWA 15044) and the newly designed anti-personnel mine simulator target system WORM (Wirelessly Operated Reproduction Mine). Performance tests were then followed by a one-day HCR-CTRO designed acceptance test, which effectively doubled as a CWA 15044 survivability test.
It was originally planned to also trial the MV-20. However, this trial had to be suspended because of test layout logistics, but might be carried out in the future by the CROMAC-CTRO. Trial reports are currently under development.

In-country demonstration trial of the MV-4 and Bozena-4 mini-flails (ITEP Project, 3.2.41)
During the first half of October 2006, an in-country demonstration trial took place of two Commercial-Off-The-Shelf flail machines, the DOK-ING MV-4 and the WAY INDUSTRY Bozena 4. Participants from Canada, Sweden, the United Kingdom and Belgium carried out the trial at the premises of the International Mine Action Training Centre (IMATC) in Nairobi, Kenya, which also provided all logistical support.
The main trial objectives were to provide information on the possible use of the flails in environmental conditions similar to those in Southern Sudan, and to evaluate the effect of hammer wear on the flail performance. Furthermore, the trial was intended to provide an answer to whether the performance testing guidelines of the CEN Workshop Agreement on Test and Evaluation of Demining Machines (CWA 15044) could be used for testing in-country, outside specialised purpose-built test facilities.

This trial provided a unique opportunity to test the comparative performance of two machines in relatively wide use in humanitarian demining. The results were based on a relatively short trial period and the conditions must be described as difficult and a real challenge for mini-flails. Valuable insight was gained into the measurement of performance parameters that would be important to anyone faced with the conduct of an in-country trial and accreditation of a demining machine. For more information, interested persons should read amore complete description of the trial on the ITEP website at http://www.itep.ws/pdf/NairobiTrialArticle.pdf

The US HDP is currently also executing a series of mechanical equipment operational field evaluations, amongst others of the MANTIS Mine Clearing Survivable Vehicle in Nicaragua (*ITEP Project, 3.2.3*), the Rhino in Azerbaijan ((*ITEP Project, 3.2.12*), the Tempest Mk5 (*ITEP Project,3.2.6*), the MAXX+ Vegetation Clearance System (*ITEP Project*,) and the Excavator Based Mine Clearance Tool (*ITEP Project*,) in Cambodia.

Detection trials with conditioned bees (ITEP Project, 2.3.2.6)
Trials of the bee explosive detection system, currently under development and funded by the US Department of Defense, were scheduled for August 2006 at the CCMAT Mine Pen enclosure. Regrettably, the trials were suspended. However, it is still hoped that the trials can be carried out in early spring 2007.

CEN Workshop (CW 26) on a Test Methodology for Personal Protective Equipment (PPE) for use in Humanitarian Mine Action (ITEP Project, 5.1.2)
The CW 26 kicked-off in June 2006 and is co-chaired by Sweden (The Swedish Standards Institute, SIS) and the Geneva International Centre for Humanitarian Demining (GICHD).
The first technical meeting, hosted by the GICHD, took place in September 2006. The meeting was attended by approximately 25 participants, representing PPE manufacturers, end-users and test establishments coming from different countries. There were also participants from the ITEP Nations Belgium, Germany, the Netherlands and Sweden. It was agreed that the CEN Workshop Agreement (CWA) on Test and Evaluation of PPE would deal with the threat of AP blast mines for the frontline deminer. Results and lessons learned from extensive tests that were already carried out by Canada and the United States will be used as a basis for the CWA. A first draft of the CWA is currently being developed, which was distributed for discussion during the Workshop meeting from the 4th to the 6th of December 2006.

CEN Workshop on Soil Characterization for Electromagnetic Sensors used in Humanitarian Demining (ITEP Project, 2.4.1.2)
The Workshop kick-off meeting was held on the 15th of November 2006. The main objectives are to agree on, and summarize the newly gained knowledge on soil characterization for metal detectors since the publication of the CEN Workshop Agreement on Test and Evaluation of Metal Detectors (CWA 14747) in 2003. It is further intended to expand the soil characterization work to also include GPR-based detectors.

CEN Workshops 28 and 29 on Follow on Processes after the use of Mechanical Demining Machines and Methods for Quality Control (QC) after Mechanical Demining Operations and Consequent Recommendations.
Both Workshops had their Kick-Off meeting in Brussels in November 2006 and will again meet in Sibenik, Croatia, prior to the CROMAC Symposium. These Workshops aim to provide standard agreed procedures for the two situations described in their title.
For further information contact Alan MacDonald at GICHD – a.macdonald@gichd.ch

Published test reports
The following reports on test and evaluation activities listed in the ITEP Work Plan have been published since June 2006:

- Publication of the MINEHOUND ™ 2005 - 2006 trial summary report.
- Publication of the German project HuMin/MD midterm project summary.
- Publication of the report on the 2006 Japanese GPR-EMI Dual Sensor System trials.

Feature Article 3

ITEP Magnetic Clutter Reduction Project – First Results from Cambodia

by Arnold Schoolderman and Yolanda Barrell, TNO Defence, Security and Safety, The Netherlands

In June 2002 the GICHD published a study called "Mine Action Equipment: Study of Global Operational Needs". This study concluded that improvements in the 'close-in' detection phase of humanitarian demining could yield 'very significant benefits'. For example a 50% decrease in the number of false alarms of metal detectors would produce efficiency improvements of between 21% and 47% in demining operations in 10 of the 12 scenarios defined in this study.

Furthermore, in its recent study on manual mine clearance, the GICHD found that demining organizations are experimenting with simple tools as additions to the standard tool set. One of the additional tools was a small hand-held permanent magnet. This magnet was being used in a demining operation in Cambodia to remove metallic clutter on the surface of the ground. The added value of this tool will, of course, depend highly on the demining scenario but, the use of magnets as an addition to the standard demining tool set is one of the recommendations of the study. In addition, in the Mine Action Technology Newsletter issue of October 2005 demining organizations were asked to buy and test magnets.

During the study on manual mine clearance the GICHD noted that demining organizations are conducting tests with new tools, however the results and conclusions of these tests "tend to be poorly reported". The conduct of tests and the publication of the results is a role for the International Test and Evaluation Program for Humanitarian Demining (ITEP), and so the Netherlands, one of the countries participating in ITEP, started a project to investigate the productivity increase that can be obtained by using hand-held permanent magnets or hand-held tools provided with magnets in manual demining. The project is being executed by TNO, the Netherlands Organization for Applied Scientific Research. The work is funded by the Netherlands Ministry of Defence and supported by UNMAS and the GICHD.

The Cambodian Mine Action Centre (CMAC) participated in the first test phase of this project. Six pairs of deminers, working according to the 2-men-1-lane principle, used three different types of magnet-tools in their demining operation at Koh Ker, Preah Vihear province. The test covered a period of five weeks. The tools used were; a strong, ring-shaped rare earth magnet with a diameter of 10 cm, the Hand-Held Sweep Magnet (a prototype developed by Colin King, UK) and a rare earth magnet hand rake (developed by Mike O'Malley of Canica Design), all shown in Figure 1. Two other demining pairs used only the standard CMAC toolkit, which contains a small and weak magnet, and served as a reference group (see Figure 2). During the clearance the deminers recorded each metal object that was found, the way it was found (visually, by scanning with the magnet-tool or, during excavation) and the area cleared per day. After five weeks of working with the magnet-tools, the results were evaluated by interviewing the deminers, and the data recording sheets were analyzed.

Figure 1 Three types of magnet-tools in the test: ring-magnet, Hand-Held Sweep Magnet and magnet-rake (from left to right).

Figure 2 The CMAC manual demining toolkit. The ring-magnet in use by CMAC is attached on the excavation tool on the left. The Minelab F1A4 metal detector is not shown.

All participating deminers reported that they were convinced that the use of magnets speeds up their work, providing the magnets have sufficient strength. The deminers used the magnet-tools for scanning the soil surface for metal parts and checking the soil removed during excavation (see Figure 3). The magnet-tools, including the gardening rake equipped with magnets, were not used for the manipulation of the top layer of the soil. Apart from the size and strength of the magnet-tools, the deminers mentioned robustness and low weight as important requirements for these tools.

Figure 3 A CMAC deminer scanning the soil surface with the ring-magnet.

The data recorded by the deminers show that the deminers that worked with the strong ring-magnets picked up a considerable number of metal fragments by scanning the soil surface with this tool: 12.5 times more than with the small CMAC magnet (corrected for area cleared). For the Hand-held Sweep Magnet and the magnet-rake the results are 3 times and 9 times more, respectively. However, the deminers working with the CMAC magnets, and those working with the Hand-held Sweep Magnet, cleared up to 45% more hazardous area than those working with the ring-magnet and the magnet-rake (see Figure 4). This can be explained by the smaller total number of metal parts that they encountered during their operations: 301 (CMAC magnet) and 464 (Hand-held Sweep Magnet) versus 621 (ring-magnet) and 625 (magnet-rake). The number of excavations was not reduced by using the strong ring-magnets. Both findings support the idea that deminers using the ring-magnets and magnet-rakes coincidently encountered more metal parts on the surface than those working with the CMAC magnet. Overall the strong magnets (both the ring-magnets and the magnet-rakes) were effective for removing metal parts from the surface but the speed of

the operation was highly influenced by the scenario in which the deminers worked.

The overall conclusion of this first test is that strong hand-held magnets can help to reduce the number of false alarms of metal detectors significantly and thus will increase the speed of manual demining operations.
A second test phase will be executed in the first half of 2007 in a different scenario, in Angola. In this phase held-hand 'magnet-rakes' with flexible tines suitable for light, careful manipulation of the top soil will be considered, along with the strong ring-magnets used in the first test phase.

For further information, contact arnold.schoolderman@tno.nl

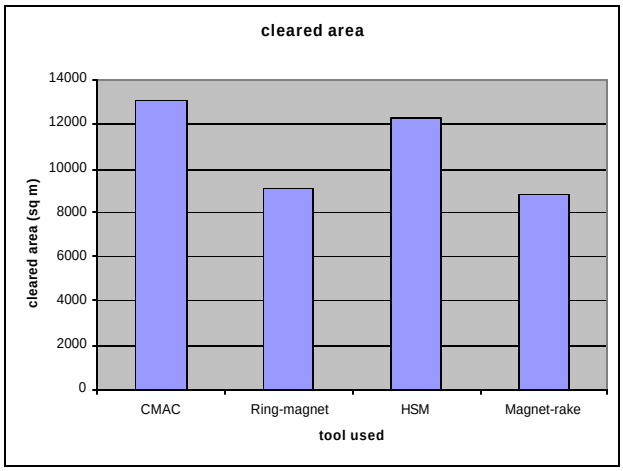


Figure 4 Total cleared area for each of the tools used.

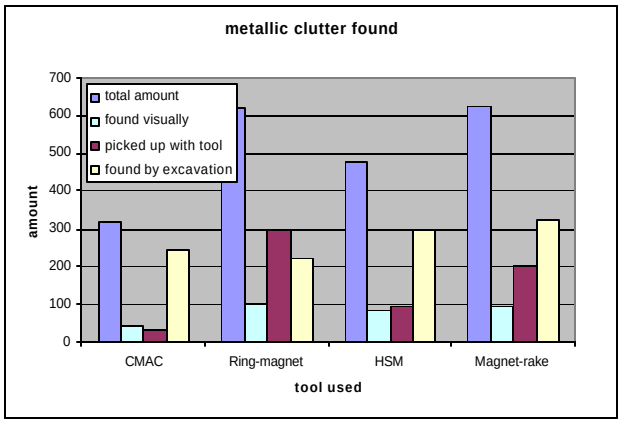


Figure 5 Amount of metallic clutter found for each tool, broken up for the way in which it was found: visually, pick up by the tool during scanning or found by excavation.

The Effect Of Soils On Metal Detectors

by Dieter Guelle and Noel Mulliner

Does Ground Reference Height (GRH) mean anything to you? If not, read on.

If you have ever glanced at the very informative Metal Detector Handbook for Humanitarian Demining, you will have noticed that there is much more to just turning on a metal detector and hoping it is giving you 100% reliability and effectiveness.

We have learnt a great deal about metal detectors and can now say that they do not reliably detect small pieces of metal deeper than 8- 10 cm, in normal circumstances, and that both the soil and the operator can adversely affect the performance.

Before setting off on a new task in a new area it is highly recommended that an estimation of the adverse effect of the soil on the metal detector is made to confirm that the type of metal detector about to be used on the task is the most suitable. A very simple way of measuring the "un-cooperativeness" of the soil is to measure the Ground Reference Height, or GRH.

The GRH can be measured by simply taking a metal detector and, on maximum sensitivity setting, bringing it vertically down to the surface of the ground from a height if about 1-2 m. The height at which the detector produces a signal is the GRH for that soil/area. Make sure that you do not measure directly above a piece of metal in the ground! -take a few readings to eliminate this possibility. If no signal is heard then the soil is cooperative and metal detectors should have no problem working there. A high GRH indicates that the soil has a greater adverse effect on metal detectors than a low GRH. Static detectors should be used in preference to dynamic detectors as it is easier to measure the height between detector and ground. Also, bear in mind that there may be hot spots which will be randomly distributed. In a hot spot, the sensitivity of the detector could be reduced by 60% depending on the detector. See the interim report of a trial in Mozambique, where 12 detectors in seven soil types were tested against 12 targets (STEMD Interim Report Mozambique, www.itep.ws).

To be able to make comparative decisions from one area to another and even from one country to another, it is necessary to use the same type of detector to measure the GRH. Because there are lots of Schiebel AN 19/2 M7s around this detector has been designated as a standard one to use. Ideally, therefore, every mine action programme should obtain some Schiebel AN 19/2 M7s and begin to collect GRH for all new tasks, and potential task areas, so that the planning team can make sensible decisions with regard to which metal detector should be used.. If there are no Schiebel AN19/2 M7s available a single type of detector in the programme area should be identified and used whenever planning or survey personnel are visiting areas prior to operations. By building up the information of GRHs associated with particular areas across the programme area a picture can be built up and the best tool for the job selected. The opposite situation i.e. if GRHs are NOT collected whenever and wherever they can be, there is a very high chance that the wrong metal detector will be used on a task and the possibility of missed mines rises dramatically.

To determine which Metal Detector you should be using read the Handbook or contact one of the authors, quoting the GRH, and seek advice!

So, measure GRH whenever you can and plan ahead to increase safety.

For further details refer to the Metal Detector Handbook for Humanitarian Demining.

Mine Action Technology Information Resources

The following websites contain 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.org

International Test and Evaluation Programme

Provides information, updates, current test and evaluation reports of demining machines and technologies.
http://www.itep.ws

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

The International Mine Action Training Centre (IMATC)

The International Mine Action Training Centre (IMATC) is a joint British and Kenyan venture aimed at alleviating the suffering caused by landmines and Explosive Remnants of War by providing high quality Mine Action Training.

http://www.army.mod.uk/aroundtheworld/ken/imatc/

UXOInfo.com

Website devoted to information on Unexploded Ordinance (UXO). Latest news on UXO, photo galleries and technology information available.
http://www.uxoinfo.com

Canadian Forces National Defense Mine/Countermine Information Center

The NDMIC provides mine and countermine information for Canadian Forces in international operations.
http://ndmic-cidnm.forces.gc.ca

US Humanitarian Demining R & D Programme

This site provides an overview of the optional products and technologies that are available for use in global humanitarian demining and developed, or being developed, tested, and evaluated under the U.S. Department of Defense (DoD) Humanitarian Demining Research and Development Program.

http://www.humanitarian-demining.org/demining/default.asp

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

Mine Information and Training Centre (MITC)

Sponsored by the Battlefield Engineering Wing at Minley in Surrey, UK, MITC provides a gateway that facilitates the flow of information between military and civilian organisations.

http://www.army.mod.uk/royalengineers/org/mitc/index.htm

Nordic Demining Research Forum (NDRF)

Aims to stimulate research and development activities to support improvement in demining efficiency and safety through promotion of co-operation between the operator, research and development, and industrial environments; stimulation of information exchange; and initiation of cross border and cross sector research and development activities between companies and institutions in the Nordic countries.
http://www.ndrf.dk/

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

SOUND BITES

The following section contains items of general interest. They are collected from different communications in the course of the working day. They are offered for what they are worth but the accuracy of the information cannot be guaranteed. If you, too, have short interesting bits of information just send them to the Editors and we will pass them on, submit to the lessons learnt database or discard as appropriate!

Guidebook on Detection Technologies and Systems for Humanitarian Demining. The Guidebook on Detection Technologies and Systems for Humanitarian Demining is a new GICHD publication and is a compilation of known technologies that could be applied to the detection of mines and minefields. It covers a wide spectrum of technologies from the common metal detector through to airborne detection systems. The Guidebook is written in such a way that it will provide information of a technical nature to a wide readership. An electronic version of the Guidebook are available at http://www.gichd.org/898.0.html and printed copies are also available by ordering from the same web site.

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Nordic Demining Research Forum (NDRF)- Proceedings of NDRF Summer Conference 2006

The editors would like to bring the readers attention to the Nordic Demining Research Forum (NDRF) and the proceedings of their annual conference which took place 23-25 August 2006. The purpose of the NDRF is to stimulate research and development through qualified exchange of information. This year the summer conference focussed on four major topics:

- Situation and Environment
- Operations
- Detection and Systems
- Risk and Reliability

Many of the presentations given during the conference will be of interest to readers of the Technical Newsletter and are available on the following web address.

http://www.ndrf.dk/documents/groupp/SS06-Programme.pdf

For those wishing more information on NDRF activities and future conferences, the home page for the NDRF at http://www.ndrf.dk/index_frame.html.

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Publication – "Applications of Technology to Demining" An Anthology of Scientific Papers 1995-2005 by Albert M. Bottoms and Dr. Clyde Scandrett

The objective in bringing this material together in one place is to ease the task of the research investigator who wishes to follow the development and application of streams of technology to what may be broadly termed the Counter Ordnance Problem. The entire set of three books and an accompanying DVD is a compendium of about 600 papers that were presented over the span of ten years of Mine Warfare Association (Minwara) /Society for Counter Ordnance Technology (SCOT) conferences. More than 1100 pages are devoted to landmine countermeasures and mine action.

Unfortunately this publication is expensive, 232 USD for the publication set, handling and shipping. Those wishing more information and ordering details can go to the Demine Web Site at http://www.demine.org/

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Integrated Disarmament, Demobilisation and Reintegration Standards (IDDRS) were launched on 18 December 2006. These Standards are the result of two years work on DDR issues and represent an agreed set of standards among 15 different agencies. Standards are very comprehensive and bear a vague similarity to

the layout of IMAS. At the same time there is a very informative Resources Centre at www.unddr.org which will be able to assist you you in many ways and direct you to people involved if required

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Japanese detectors and machines are undergoing tests in Cambodia.

The results of several years of R&D support in Japan are being tested in Cambodia field conditions and results will hopefully be available on the ITEP Website. On the detector side, Japan has, like HSTAMIDS and MINEHOUND, combined metal detection with Ground Penetrating Radar (GPR) but, instead of an audio alarm, they have concentrated on the analysis of computer images in the same way as a doctor would analyse the X-Ray images of your chest. Field tests of three systems have been conducted. At the same time Japanese machines have also been tested in Cambodian field conditions and these include two flails and two tillers, one wheeled and one tracked. Further details can be obtained from CMAC but as they are heavily involved in the tests and results information may not be that quickly forthcoming. Watch out on the ITEP website.

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New mine protected vehicle tested.

The Council for Scientific and Industrial Research (CSIR) in South Africa have conducted explosive blast tests on their new Oryx test platform Type 2, which has been developed by Armour Technology Systems (pty) Ltd for use by forces deployed in Iraq and Afghanistan, on 28 November 2006. Lessons were learnt and most of them already incorporated or implemented. Further details can be obtained from Armour Technology Systems (pty) Ltd. The Oryx is one of the main contenders for the US Army and Marines, MRAP (Mine Resistant Ambush Protected) vehicle programme that closed on 08 December and the award should be announced during March 2007. There is a potential requirement for some 4200 vehicles!

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Improved Visors!

There has been much discussion about the lack of comfort and problems associated with the current style of full face protection offered by industry to deminers. The current mask is too heavy, too hot, mists up and gets scratched very easily. As a result, some people claim that they are not used properly and subsequent accidents are more severe. The solution could be to enforce correct wearing through much tighter supervision and penalties for incorrect use OR, a completely new design of mask which eliminates the existing problems and makes the wearing of facial protection more acceptable. Up till now this has not been possible but this may soon change.

Following intense studies of body movement and alternative materials as well as a bit of lateral thinking a new design of face mask has been conceived. NPA have been closely involved with the development and it is likely that production may start in early 2007. At a slightly higher cost than the present mask it is hoped that the new mask will be lighter, less liable to scratching and mist free. If you are considering replacing your face masks in 2007 do make enquiries as to the progress of this new design and development.