April 2003

The Journal of ERW and Mine Action Issue 7.1

CISR JMU

Follow this and additional works at: http://commons.lib.jmu.edu/cisr-journal

Part of the Defense and Security Studies Commons, Emergency and Disaster Management Commons, Other Public Affairs, Public Policy and Public Administration Commons, and the Peace and Conflict Studies Commons

Recommended Citation

Available at: http://commons.lib.jmu.edu/cisr-journal/vol7/iss1/1

This Article is brought to you for free and open access by the Center for International Stabilization and Recovery at JMU Scholarly Commons. It has been accepted for inclusion in Journal of Conventional Weapons Destruction by an authorized editor of JMU Scholarly Commons. For more information, please contact dc_admin@jmu.edu.
Focus

2 The United States Humanitarian Mine Action Program: Helping Countries "Get on Their Feet" by Jenny Lange
6 The U.S. Department of Defense Humanitarian Demining Research and Development Program by Sean Burke
10 International Mine Action Standards: Future Development of PPE Standards by Adrian Wilkinson
12 A Fresh Approach to Road Clearance Operations by Roger R. Hess
16 Protecting Deminers From APLs: A Review of U.S./Canada Cooperation in R&D by Denis M. Bergeron and Charles Chichester
26 Manual Demining in Lebanon by Max Dyck
29 How Product Design Can Improve Manual Demining by Anders Ilsey
33 An Interview With Colin King by Margaret Buse
36 Explosive Remnants of War: The Impact of Current Negotiations by Paul Ellis
40 TMAC: Conquering Thailand’s Unique Mine Problem by Nicole Kegler
43 IMAS and PPE Requirements by Andy Smith
47 PPE: Effective Protection for Deminers by Jeffery Nerenberg, Jean-Philippe Dionne and Aris Makris
52 Use of Multi-Criteria Analysis in Allocating EOD Teams in Humanitarian Mine Action by Robert Keeley
56 Spoiled Soil by Eddie Banks
58 Adopt-A-Team: Adopt-A-Minefield® Responds to the Situation in Afghanistan by Megan Burke
62 The MINEX Center by MINEX
64 Low-Profile Disposal of U.S. Ordnance by Frederick L. “Bart” Barthold
67 The Swedish EOD & Demining Centre by Thore Bäckman
70 Ocean Group: Explosive Ordnance Disposal/Landmine Clearance Division by Susanna Sprinkel

Feature

72 The Evolution of Mine Detection Dog Training by Dan Hayter
75 Remote Explosive Scent Training: Genuine or a Paper Tiger? by Håvard Bach and Ian McLean
83 The K9 Demining Corps in Lebanon by Amy Eichenberg

Notes from the Field

85 Mine Detection Dogs in Denmark by Mikael Borch Madsen
87 Mine Detection Dog Program: The Cambodian Experience by H.E. Khem Sophoan
90 Mine Drill for Divers by Hugh Morris
92 Mine Detection Dogs: An Integral Tool in RONCO Mine Clearance Operations by RONCO

Editorial

111 Plays Nicely With Others: Some Thoughts on Issues Raised at the 6th International Meeting of Mine Action Directors, Geneva, March 17-20, 2003 by Dennis Barlow

Cover Photo: Dave McCracken
The United States Humanitarian Mine Action Program: Helping Countries “Get on Their Feet”

Since 1988, the U.S. Humanitarian Mine Action Program (formerly Humanitarian Demining Program) has been involved in mine action efforts around the globe. While much has been written about the U.S. Humanitarian Mine Action Program over the past few years, it is useful to review the program’s fundamentals if only to remind ourselves of its policy and procedural aspects.

Obtaining U.S. Demining Assistance

When a mine-affected country desires the support of the U.S. government, it generally requests assistance via the U.S. Embassy. If the embassy endorses the request, it is then submitted to an interagency process headed by the National Security Council (NSC). Participating in this process are the Department of State (DOS), the Department of Defense (DoD), the Joint Chiefs of Staff (JCS), USAID, the Central Intelligence Agency (CIA) and the Centers for Disease Control and Prevention (CDC). Upon receiving a U.S. Embassy-endorsed request for assistance, the interagency process then conducts an evaluation to determine as to whether to conduct a Policy Assessment. Visit to assess the nature of the mine/UXO problem, the requesting nation’s commitment to solve the problem and the suitability of U.S. assistance. Based on this assessment, the interagency process may lead to the establishment of a formal program for the country.

Categories of Assistance

U.S. mine action support encompasses four traditional pillars identified by the international community: MRE, victim assistance, mine detection and clearance, and landmine impact surveys conducted to determine the socio-economic impact of mines and UXO. The United States does not fund stockpile destruction, believing that stockpiles do not pose an immediate threat to safety and health.

A typical U.S. program might consist of assisting in the establishment of a mine action center (MAC), an MRE program, and a mine detection and clearance program. The MAC develops its mine clearance capabilities, the United States, again relying on the interagency process, will periodically evaluate the development of the MAC and determine whether it is ready to train MRE teams and its capacity and to determine when a country achieves sustainment—the point when the host nation has demonstrated an ability to manage and coordinate all aspects of its humanitarian mine action, including using its own resources to finance mine action activities. When a country nears sustainment, U.S. support naturally diminishes, although replenishment of equipment and the provision of periodic technical assistance might still be necessary.

U.S. Funding and Participation

The vast majority of U.S. funding support for humanitarian mine action comes from the DoS/Office of Humanitarian Assistance (OHA), the DoD and USAID. Until recently, CDC involvement had focused primarily on MRE, but there are indications that the CDC in the future will engage more in survivors’ assistance initiatives as well.

DoD funding is provided under the Nonproliferation, Anti-terrorism, Armaments Control and Related (NADR) Programs appropriation, which is managed by the Office of Humanitarian Demining Programs in the Bureau of Political-Military Affairs. These funds support both commercial and non-governmental organization (NGO) mine action initiatives within a specific country. NADR funds are also used to support programs implemented by international organizations such as the United Nations and the Organization of American States (OAS). NADR funds can also be transferred to the Defense Security Cooperation Agency, directly to a U.S. Embassy or to an operational element of the DoD to support the acquisition of services and equipment. Just recently, the U.S. Congress enacted the Export Control and Foreign Operations appropriation for FY 2003, providing $55.6 million for NADR mine action.

The DoD funds humanitarian demining activities from its Overseas Humanitarian Disaster and Civic Aid (OHDACA) account, principally to support training and equipment. OHDACA funds totaled $21,678,000 in FY 2002. The DoD funds training conducted by the U.S. Special Forces personnel assigned to various geographic commanders-in-chief, as well as MRE initiatives. Through separate funding, the DoD funds the research and development (R&D) of promising mine detection and removal technologies.

Through the Patrick J. Leahy War Victims Fund, USAID contributes to improving the mobility, health and social integration of the disabled due to casualties of war, including landmine survivors. USAID funds for mine action in FY 2002 totaled approximately $8 million.

Highlights and Accomplishments

Quick Reaction Demining Force

Based on lessons learned from the Kosovo experience, the United States established a Quick Reaction Demining Force (QRDF) to respond to immediate post-conflict situations. Presently based in Mozambique, the QRDF is deployed to conduct emergency or special demining operations to assure the safety of refugees and internally displaced persons (IDPs) or to facilitate the peace process. When the teams are not deployed in short-term, predefined missions, they perform demining missions in Mozambique.

Established in 2000, the QRDF executed its first deployed missions in Sri Lanka and Sudan in 2002. As of November 2002, the force had returned 122,348 square meters of land to safe use in Sri Lanka, destroying 980 mines and 141 pieces of UXO in the process, and allowing thousands of IDPs to safely travel throughout the country as they return to their homes. In Sudan, the QRDF conducted operations for close to six weeks, creating safe conditions for the public and reducing the number of casualties due to landmines.

Published by JMU Scholarly Commons, 2003
Mine Detection Dogs—Working for the Government

The term “man’s best friend” takes on a different connotation when dogs are placed in mine-affected countries. “Man’s best friend” can be construed to be “man’s best hero” because mine detection dogs (MDDs) offer another means for the reliable detection of landmines and UXO. Mine and UXO clearance operations occur in a wide variety of climates, over a broad spectrum of terrain and under the influence of many different cultures. While the demining technique will be successful in all scenarios, combinations of detection technologies and demining methods generally increase safety and efficiency and contribute to high-quality, productive mine clearance executed in accordance with international humanitarian demining standards developed by the United Nations. There are approximately 620 MDDs around the world conducting operations or in training; 162 of these dogs are in Afghanistan. The U.S. Humanitarian Mine Action Program has provided dogs to 18 countries around the world: Afghanistan, Albania, Angola, Armenia, Azerbaijan, Bosnia-Herzegovina, Cambodia, Costa Rica, Croatia, Eritrea, Honduras, Lebanon, Mozambique, Nicaragua, Oman, Rwanda, Senegal, and Thailand.

Country Program Accomplishments

Since 1993, the United States has established humanitarian demining programs in 44 countries and will likely add more countries in 2003 and beyond. At the same time, a number of countries will “graduate” from the U.S. program, having achieved sustainment status. The United States, other donors and mine-affected countries can take pride in a number of significant accomplishments as described below.

Afghanistan

Among the very first of its kind, the Mine Action Program for Afghanistan has become known as an effective demining program. MRE/DEPs have conducted over seven million people: the landmine casualty rate has been reduced by 50 percent. Afghan deminers have cleared 1,171 square kilometers of high-priority mine-infested land and destroyed 210,000 landmines and 985,000 pieces of UXO, and 1.5 million refugees have been able to return to their homes.

Cambodia

Except for an ability to finance in its own operations, the humanitarian demining program in Cambodia is now in sustainment, with a trained staff of 2,400 Cambodians, 35 foreign technical advisors and six UN staff members. Deminers working under the auspices or direction of the Cambodia Mine Action Center (CMAC) have cleared 97,662,389 square meters of land, destroyed 159,789 landmines and 680,627 pieces of UXO, and reduced landmine casualties by almost 70 percent.

Guinea-Bissau

Since January 2000, the NGO Human Rights Watch has cleared over half of the entire suspected mine-infested land in Guinea-Bissau, rendering 257,178 square meters mine safe. Nearly 3,000 mines and over 13,333 pieces of UXO have been destroyed. Due to these efforts, much of the land has been transformed for productive use. Over 69,000 square meters are under cultivation for crops including cassavas, beans and manioc. Homes are being built, schools are being rehabilitated and there is access once again to major industries such as the Guinea-Telecom Center.

Jordan

Since 1997, Jordan has proudly established an effective national mine action program, which has resulted in significant lowering of casualties. As present, Jordan is conducting technical surveys of minefields along the Syrian border. As of January 2003, Jordan’s Royal Corps of Engineers had cleared 86,123 landmines from about 200 minefields, restoring more than 3,064 acres of land to safe use.

Latin America

Costa Rica already has declared itself “mine safe.” Three additional Central American countries—Guatemala, Honduras and Nicaragua—are nearing that plateau. To date, in Nicaragua, approximately 26,240 landmines have been found and destroyed by Nicaraguan deminers, allowing the government to declare 24 Nicaraguan municipalities and 168 kilometers of international border mine safe. In total, approximately 1.9 million square meters of land have been cleared in Nicaragua. Costa Rican deminers cleared 100,000 square meters of land. Honduras and Guatemala are expected to declare themselves mine safe within 12 to 18 months.

Mozambique

Since 1992, mine clearance personnel from NGOs and the Mozambican military have removed more than 17,000 landmines and 29,000 pieces of UXO and opened more than 4,500 kilometers of roads, facilitating post-war reintegration of agricultural land and reconnecting nearly one million people with their local economies. Demining operations have also played a vital role in Mozambique’s overall development strategy. For example, the Massingir Dam project will supply electricity and irrigation to approximately nine million square meters of land, and the recently completed Serra Rail Line will open large areas of the Zambezi River Valley to development once reconstruction of the line is complete.

Rwanda

The Rwanda program is in sustainment, requiring little more than periodic equipment replenishment and technical advice. More than 200 U.S.-trained deminers and explosive ordnance disposal personnel have cleared over seven million square meters of land, including 6,000 kilometers of bush roads. In the process, they destroyed almost 27,250 mines and thousands of pieces of UXO. Landmines and UXO fatalities dropped from 108 in 1994 to three in 2000. Some 400,000 refugees and 200,000 IDPs have returned to their villages.

Conclusion

The United States’ assistance, and that of other like-minded donors, has led to some impressive results throughout the world. Many countries are at or near sustainment, able to remove landmines on their own. Working in partnership with other donors and international organizations, the U.S. Humanitarian Mine Action Program’s efforts will allow the citizens of many mine-affected countries to once again walk the earth in safety.
The U.S. Department of Defense Humanitarian Demining Research and Development Program

In 1994, the United States initiated a research and development (R&D) program to develop new, internationally shareable technologies for humanitarian deminers and for U.S. troops performing peacekeeping and stability operations. The Humanitarian Demining (HD) R&D Program is part of the overall U.S. effort to assist with the global landmine problem.

by Sean Burke, U.S. Army Night Vision and Electronic Sensors Directorate

Introduction

The Countermine Division of the U.S. Army Night Vision and Electronic Sensors Directorate (NVESD) executes the R&D program for the Office of the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict (OASD/SO/LIC). From the Pentagon, OASD/SO/LIC provides funding, guidance and management oversight to the program. The NVESD Countermine Division is well-equipped to execute this program due to its extensive countermine engineering expertise, coupled with a world-class fabrication facility and access to excellent test facilities.

The HD R&D Program tests, demonstrates and validates equipment for immediate use in various international HD missions and environments. The goal is to transition new technologies to both military and civilian demining organizations. A key component of the program is to develop demining technologies and then to provide equipment to the international demining community to assess its capabilities in actual demining conditions. The program focuses on R&D technology development that reduces the time and cost associated with demining while improving operator safety. This is accomplished through adapting commercial-off-the-shelf equipment, integrating mature technologies and taking advantage of R&D activity in tactical countermine and UXO clearance. The program aims to improve on existing technologies for mine and minefield detection, mechanical and vegetation clearance, mine neutralization, individual deminer protection, and individual deminer tools.

The Most Recent Workshop

The most recent workshop, conducted in August 2002, included representatives from 12 governmental mine action organizations and five non-governmental organizations (NGOs) from Africa, eastern Europe, the Middle East and southeast Asia. The Organization of American States (OAS) and the Inter-American Defense Board (IADB) represented Central and South America. Workshop participants gave presentations on the current humanitarian mine action situation in their countries, received talks and briefings on the U.S. R&D Program, and witnessed demonstrations of several prototype demining technologies developed under the program.

The result of the workshop is a clear picture of where the HD R&D Program should focus in development efforts. With this knowledge, the Program Office structures its execution plan for the future and submits it to the Pentagon for approval. Once approved, design and development of prototype technologies begin. This is done inhouse using the NVESD Prototype Fabrication Shop as well as by awarding contracts to industry and academia. International market surveys are also conducted to help identify commercially available items that could be used or adapted for HD applications.

Operational Field Evaluations

Selected systems then undergo in-country operational field evaluations. Host nation-conducted operational field evaluations are one of the most important components of the HD R&D Program because the equipment undergoes testing in actual mined areas. There is no better way to test the effectiveness and suitability of a prototype item. In-country field evaluations are extremely beneficial to the HD effort. They effectively hasten nation development efforts. They provide information needed to determine the prototype’s suitability and effectiveness given the unique operating environment where the test occurs. The demining community is afforded the opportunity to “test drive” new equipment and technologies in their environment prior to making procurement decisions. The outcome of these field evaluations allows the demining community to formulate cost-benefit analysis data to justify new technology procurements to the donor community. The demining environment includes the market, variety and type of mines; terrain; weather; and infrastructure. The evaluations provide the R&D Program Office “lessons learned” information that may result in system improvements for future funding. Evaluation reports also provide information to the entire demining community that could lead to further evaluations or procurement.

An operational field evaluation begins with a host nation request to the Pentagon, OASD/SO/LIC. The program leads the assessment. The Site Assessment Team, which includes representation from the R&D Program Office, will assist the requesting nation to determine the most appropriate prototype equipment given the country’s specific situation. The assessment will include system neutralization, cost analysis, implementation of the most suitable prototype and a decision to support the evaluation. Evaluations typically last for six months to one year.

An important part of the HD R&D Program is the opportunity for supported nations to participate in the development of a specific technology from design through field evaluation. When a new development project is determined to be the best solution to meet the capability needed by a specific country, that nation has the opportunity to participate as the user member of the development team. The national mine action center will be kept up-to-date on the system’s development progress and will be welcome to participate in meetings and observe development testing. In return, the host nation agrees to conduct an operational field evaluation of the system. The development benefits by being part of a technology development designed specifically for their problem. The R&D Program benefits from the information and experience gained by the operational evaluation.

Technologies Developed by the Program

The HD R&D Program is responsible for keeping the military countermine and humanitarian mine action communities informed of its technology developments. The Program Office does so in several ways. Technologies developed are listed in the Developmental Technologies Equipment Catalog available on the internet, in hard copy and on CD-ROM. The Catalog is updated approximately every two years. Test results can be made available to organizations and individuals in the international demining community for consideration in making equipment procurement decisions. In addition, the HD R&D Program maintains a website at http://www.humanitariandemining.org.

The HD R&D Program spans a wide range of technologies, including mine and minefield detection, mechanical mine and vegetation clearance, mine neutralization, individual deminer protection, and personal protective equipment (PPE) for deminers. There is only enough space to describe a few of the technologies developed by the HD R&D Program to date. For more information, refer to the information sources described above.

Current detection projects involve improved electromagnetic (EM) detection, various forms of ground penetrating radar (GPR), infrared cameras and chemical detection of explosive vapor from buried landmines. In the detection arena, the HD R&D Program has invested in a remote-controlled aerosol sensor platform for wide-area detection. The Camcopter is a rotary wing unmanned aerial vehicle that can carry a variety of sensors for minefield detection. The R&D Program has used the Camcopter with infrared, optical and GPR systems to detect mined areas on and off road.

Although it is a handheld metal detector, the GEM-3 is a significant improvement over standard metal detectors used to find mines. The GEM-3 is a broadband digital sensor with target recognition software capable of not only detecting a mine, but also discriminating it from clutter.

Energy-Focused GPR (EFGPR), the Mirage Synthetic aperture radar (a 40-lb. unit mounted on the Camcopter) and the NITEK Wichmann systems are all exploring various configurations of GPR to detect mines. The Handheld Standoff Mine Detection System (HSTMIDS) is a dual sensor system consisting of a metal detector and GPR. This is one of several
Deminers, Manual Demining & PPE

Developments in which the HD R&D Program and military countermining programs work together. The HISTAMIDS will soon become the U.S. Army's new standard handheld detector. Its outstanding performance will benefit humanitarian deminers as well as soldiers. The Mine Detection and Detonation System (MDDS) is a Lion II mine-protected vehicle integrated with a three-meter metal detection array for area reduction.

Two successful mine neutralization technologies are Liquid Explosive Foam (LEXFOAM) and the HD Flame. These systems are alternatives to using C4 or a Cultivator (MCC). The Mine Clearing operators combine the two units and are now in the early stages of development.

The MCC is a remote-controlled mechanical system used for large-area AP mine clearance. It neutralizes mines buried up to 30 cm and can also operate in areas of heavy vegetation and small tree cover. It can withstand any AP mine blast and is repairable from AT blasts. The MCC has been in Cambodia since July 1998, and has undergone operational evaluations in Cambodia, Jordan, Israel, and Korea. It is now being evaluated for its next deployment to Azerbaijan.

The MCC and the Sifter are now undergoing an operational evaluation in Angola. Although the MCC is a solution for large open areas and roads, it is less suitable for small or hilly areas, or for vegetation-covered terrain.

The Tempest, a small, remote-controlled AP mine blast-protected system designed to clear AP mines from off-road areas inaccessible to large-area mine cleaners like the MCC. The Tempest is an excellent example of how an operational evaluation can lead to improvements that realize the potential of a prototype design. The Tempest began an operational evaluation in Thailand in January 2001. Although it was effective at clearing vegetation in mined areas, Thai operators identified overheating problems. The unit's promising performance warranted the investment of funds to improve the system. The resulting Tempest Mk. V is now a much more reliable and powerful system. The Tempest is produced in Cambodia, thus representing a regional capability in southeast Asia.

The HD Flame is a blast-cap sensitive foam for a device attack thin-case landmines. New dispensers operate the material on the mine. Individual mine neutralization technologies and Low-Order Neutralization (by burning) are examples of an integrated mine action program that encompasses manual demining, mine detection dogs, mechanical assistance and other host vehicles. One operational evaluation is currently underway in Mozambique. The HD R&D Program is testing the utility of Rotar on other host vehicles. One operational evaluation is currently underway in Mozambique. The HD R&D Program has placed significant emphasis on developing technologies for mechanical mine and vegetation clearance. Examples of success include new developments in this area are the Rhino Earth Tiller, the Mine Clearing Cultivator (MCC), the Mine Clearing Sifter, the Tempest, the Suitable Demining Tractor and Tool (SDTT), the Rotar, and the Mini-Mulcher (MAXX).

The MCC and the Sifter are now undergoing an operational evaluation in Angola. Although the MCC is a solution for large open areas and roads, it is less suitable for small or hilly areas, or for vegetation-covered terrain.

The Tempest, a small, remote-controlled AP mine blast-protected system designed to clear AP mines from off-road areas inaccessible to large-area mine cleaners like the MCC. The Tempest is an excellent example of how an operational evaluation can lead to improvements that realize the potential of a prototype design. The Tempest began an operational evaluation in Thailand in January 2001. Although it was effective at clearing vegetation in mined areas, Thai operators identified overheating problems. The unit's promising performance warranted the investment of funds to improve the system. The resulting Tempest Mk. V is now a much more reliable and powerful system. The Tempest is produced in Cambodia, thus representing a regional capability in southeast Asia. The Thai Mine Action Center (TMAC) continues to use the system, along with another mechanical assistance story. The SDTT is a modified commercial farm tractor used to support demining operations and quality assurance in heavily vegetated areas with AP mines. Steel wheels and eight attachments—including vegetation cutter, a roller, earth cultivator, a bucket loader, a rake, a magnet, a mine gripper and a tree extractor—make this a versatile system. The SDTT has also been operating in Thailand for nearly two years.

The SDTT and Tempest have been an important part of TMAC's development of an integrated mine action program that encompasses manual demining, mine detection dogs, mechanical assistance and mechanical area reduction.

The Rotar is an area preparation multi-tool for vegetation reduction and soil sifting in landmine-suspect areas. The Rotar is a compact, lightweight, and mobile tool designed to clear landmines from vegetation-covered areas. The Rotar is mounted on a larger excavator and is being made to remove post-conflict landmines. The story of the Tempest and SDTT in Thailand is a prime example.

Finally, the MAXX is a small remote-controlled vegetation clearer that can operate in very tight areas. The vegetation clearance attachments fit onto an articulated boom that can be extended and rotated 360 degrees around the unit. This allows the device to clear vegetation without having to enter the suspected mined area, saving the cost and weight of adding armor protection. Additional attachments are being considered for the MAXX system, as is planning for operational field evaluations in Rwanda.

Space does not allow the description of all prototype items developed under the HD R&D Program. To learn more, visit the Defense of Department of (DoD) HD website at http://www.humanitariandemining.org, or contact the NVESD Information Office at 703-704-1288.

**Benefits**

The HD R&D Program has to date deployed equipment to nearly 30 countries. Besides providing valuable performance data to demining organizations and the R&D Program, these deployments have had a direct impact on the slow but steady progress being made to remove post-conflict landmines. The story of the Tempest and SDTT in Thailand is a prime example. In March 2002, the Thai government officially released cleared land along the Thai-Cambodia border to the civilian population. The HD R&D Program was an integral part of this important success.

The HD R&D Program also benefits the Army as a whole because its efforts contribute to solving the humanitarian mine problem while assisting military counterinsurgency research.

The HD R&D Program continues to develop new technologies to improve the safety and efficiency of demining. The unique system of annual requirements workshops, the NVESD in-house design and fabrication capability, worldwide technology development and field evaluations has proven to be an excellent formula for success.

---

Contact Information

Mr. Scan Burke
U.S. Army NVESD
10211 Barbudd Rd.
Suite 430 (RDEC)
Fort Belvoir, VA
22060-5906
Tel: 703-704-1047
Fax: 703-704-9361
E-mail: sburke@nvld.army.mil
Website: http://www.humanitariandemining.org

**All photos courtesy of the author.**
International Mine Action Standards: Future Development of PPE Standards

This article explains developments since the issue of International Mine Action Standards (IMAS) 10.30 in order to illustrate the potential amendments to IMAS 10.30 over the next two years.

by Adrian Wilkinson, Head of Technology and Standards, GICHD

The current issue of IMAS 10.30 for Personal Protective Equipment (PPE) was developed during 1999 and 2000 by a Working Group that reported to the IMAS User Focus Group. The report of this group was summarised in an article by Allsair McAlain and Keith Reifengaus in Issue 2 (Summer 2000) of James Madison University’s Journal of Mine Action.1 This article will build on the previous journal entry to explain developments since the issue of IMAS 10.30 and the potential amendments to IMAS 10.30 over the next two years. PPE is the final protective measure after all planning, training and procedural efforts have been taken to mitigate, or at least significantly reduce, the risk to the individual deminer. IMAS recommends that a formal risk reduction analysis should be conducted in accordance with the processes contained within International Standardization Organisation (ISO) Guide 51. The standard recommends the various levels of protection necessary from blast and fragmentation, based on the work of the IMAS PPE Working Group. The only other PPE standards in existence at that time were those of North Atlantic Treaty Organization (NATO) Standardisation Agreement (SAg) 2001. It was accepted by the PPE Working Group that IMAS 10.30 was not an ideal standard, but was based on the best available information at the time.

Test and Evaluation Standards

IMAS 10.30 PPE states that a Technical Note for Mine Action (TNMA) will be developed in the future to lay down the test and evaluation protocols to be followed during the test regime of PPE. This aspiration is being actively pursued, but it quickly became apparent that the funding necessary for development of such test protocols by the humanitarian demining community alone would be prohibitively expensive.2 Therefore, synergy with other research projects was examined.

Centre European Normalisation Working Group 126

The Centre European Normalisation (CEN) is the European standards body that operates parallel to ISO. In 2002, the European Commission Mine Action Initiative issued a Programming Mandate (M/306) on the standardisation of mine action technologies for acceptance by CEN. This was accepted by CEN, who created Working Group 126 (WG 126) to examine the issues.3 Membership of CEN WG 126 is open to all interested parties; the CEN process is open and consultative. Regular attendees include Dammern, the Danish Demining Group (DDG), the Department for International Development (DFID), the European Union (EU), the Geneva Centre for Humanitarian Demining (GICH), the Joint Research Centre (JRC), the Royal Military Academy Belgium, the Swedish Explosive Ordnance Disposal Demining Centre (SWEEDC) and the United Nations Mine Action Service (UNMAS), CEN WG 126 has established a number of ad hoc groups to look at developing CEN Workshop Agreements4 (the lower tier of European Standard) in the following technical areas:

- Test and evaluation of metal detectors
- Test and evaluation support of characterisation of soil
- Test and evaluation of mechanically assisted demining equipment
- Competency standards for humanitarian mine action
- Test and evaluation of PPE.

Further work by CEN WG 126 established that there were existing groups within CEN with responsibility for industrial PPE:

- CEN Technical Committee 162: Protective Clothing
- CEN Technical Committee 158: Head Protection
- CEN Technical Committee 85: Environmental Protection Equipment.

CEN WG 126 has asked these Technical Committees to provide any relevant information they may have in the development of test and evaluation standards for mine action PPE.

Unfortunately, although the progress of the other CEN WG 126 activities is ongoing, standards likely in 2003 for metal detectors and competency standards, advancements in PPE are likely to be slow. Demining is not a priority for the other Technical Committees, whose workload is concentrated in the industrial sector. The CEN WG 126 continues to try to resolve this delay. It is not all bad news, however, as alternative work has been progressing at pace within NATO.

NATO Human Factors and Medicine 069/Technical Group 024 (NATO TG 024)

NATO TG 024 is responsible for the development of test methodologies for PPE against APxM. This work has been ongoing since early 2001 and is well advanced. Coincidently, it also includes some of the individuals who participated in the initial IMAS PPE Working Group, so they are well aware of the issues involved in humanitarian mine action. Membership of the group includes national research organisations, national test and evaluation organisations, commercial companies, and medical representatives.

The NATO TG 024 is primarily concerned with the impact of APxM on military personnel and how to protect them against the effects of blast, but there is obvious synergy with the humanitarian mine action community.

NATO has agreed to GICHD participation in the process, and a representative from GICHD attended the last meeting in October 2002. Some of the areas examined by NATO TG 024 in detail include:

Upper-Body PPE:
- Agreement on Hybrid III mannequins
- Agreement on explosive test charges
- Head PPE

"Development of head injury criteria
- Test and evaluation of mine blasts
- Definitions based on key model characteristics (human cadavers, fragment and mechanical reusable models)
- A new descriptive injury scale
- Recommended test conditions (soil, charge weight, charge position and charge geometry).

NATO TG 024 has done extensive and detailed work and is confident that they will be in a position to recommend a test and evaluation methodology to NATO. Their mandate stops short of recommending a Standa at this point, but allows them to recommend "test guidelines" as a first step towards standard test parameters across NATO nations. As a significant proportion of humanitarian mine action PPE is also produced in NATO countries, it would seem appropriate that a common standard be adopted to ease development and production costs.

The final meeting of NATO TG 024 is planned for May 2003, after which a final report will be published. This report will not be unclassified in order to ensure a wide distribution. GICHD aims to introduce NATO’s work during the CEN process in order to develop a complementary CEN Workshop Agreement and TNMAs.

Conclusions

The selection of a test and evaluation methodology by an interested organization will depend on budgetary constraints and the scope of tests to be conducted, whether tests are developmental in nature or for acquisition trials. The work by NATO and CEN provides an excellent opportunity to obtain information for appropriate detailed test and evaluation protocols that can be developed for some of the PPE currently used in humanitarian demining at little direct financial cost to the global mine action effort.

References

2. Blast Protection (Snorkel) from 250 g of TNT at 20 cm. Blast Protection (Facial/Eyes) from 240 g of TNT at 60 cm. Fragmentation Protection (Body) to STANAG 2002 V5 Rating (Day) for 1.103 g fragments at 450 m/s.
3. For example, to gather fragment data (mass, velocity and kinetic energy of a particular type of mine would require around 10 required floods to ensure statistical validity. Each flood would require extensive use of data capture flood and testable packs at an estimated cost of $50,000 (U.S.) per flooding at an internationally accredited test establishment.
4. Terms of Reference are in Resolution BT C200/ 2000/01-11, Dated: Consultative Committee CEN WG 126, Carl-Michael Stomin ten (lem1/dfdc.u.

Contact Information

Adrian Wilkinson, MBE MSc MA Head of Technology and Standards 7th Avenue de la Paix PO Box 1300 CH-1211 Geneva 1 Switzerland Tel: +41 22 996 16 87 Fax: +41 22 996 16 90 E-mail: a.wilkinson@gich.ch Website: www.gich.ch
A Fresh Approach to Road Clearance Operations

UXB International has employed a combined approach to clearance activities in the Temporary Security Zone (TSZ) between Eritrea and Ethiopia. This novel method uses the capabilities of the Mine Action Coordination Center (MACC). The expected search rate of the Route Verification (RV) system as a modular detection platform for the site characterization projects in the United States was to be 15-20 km per working day while being able to detect a Russian TM-57 AT mine at 70 cm and a 100-mm piece of UXO at 100 cm.

UXB had already developed some rapid wide-area search techniques for site characterization projects on formerly utilized defense systems (FUDS) in the United States. However, we needed to adapt the equipment and methodology to meet the challenges of the TSZ.

Infrastructure

The difference between Asmara and the TSZ is night and day, in both infrastructure and ambient temperature. Asmara is the capital city of Eritrea. It sits at 3,000 m above sea level, has modern facilities and good infrastructure, and was relatively untouched by the war. The TSZ is a 25-km wide stretch of land designated to separate the warring parties. To say this area is lacking development would be a severe understatement: the primary activity in this region for the last 30 years has been war.

The drive into the western sector from Asmara is less than 200 km, but it takes six to eight hours, depending on traffic and weather. En route to the western sector you pass through the cities of Keran and Beraneu. One can find the basic food supplies to help sustain a field operation here, but portable water and any major equipment repairs or spare parts are simply not available and need to be brought in.

Upon leaving Beraneu, you enter one of the poorest regions of the world. Small huts constructed from rocks, mud and straw make up the most of the structures. In spite of the hardships the local population endures on a daily basis, they remain extremely friendly and sociable.

Roadways

The TSZ has various mountain ranges weaving through it, and being a desert environment, washouts are prevalent. The roads from here on out vary from extremely steep, four-meter mountain passes to fairly flat, nine-meter-wide main supply routes (MSRs). In the last 18 months, there have been more than 25 accidents involving AT mines on these roads, claiming the lives of locals and UN personnel.

Prime Movers

The vehicle used as the prime mover for this project needed to be very robust, highly mobile and mine-resistant. Eritrea has a severe shortage of spare parts and trained maintenance technicians for modern vehicles, so the less complicated the vehicle is, the better suited it becomes. For this, we selected the South African "Samll" series of vehicles. They were widely used in southern Africa and are still readily available to meet the ongoing demand. Like other systems built in South Africa, the vehicle was designed to work in harsh environments. A Deutz air-cooled, normally aspirated diesel engine powers the vehicle, and it is still an "agricultural" drive, it is extremely mobile in off-road conditions, very reliable, and well-suited for this environment.

Detection System

UXB designed the Kinematic Induction Magnetic Survey (KIMS) system as a modular detection platform for the site characterization projects in southern Africa. To meet our scope of work, we decided to use the UPEX 740 wide-loop deep-buried landmine and UXO detection system made by Ebergen.

The antenna portion of the UPEX is made from a flexible coil similar to coaxial cables. This allows the operator to change the loop configurations between 1 x 1-m or 1 x 2-m loops, depending on the detection requirements.

Each configuration has its own unique characteristics and detection depths. The cables themselves are extremely lightweight, which allows us to use the locally available materials such as standard PVC pipe to fabricate the carrier system. We've had excellent success with the UPEX in a "Mag & Flag" role searching for deeply buried landmines and UXO in southeast Asia over the past four years, and we were very confident that it would meet or exceed the requirements.

Differential Global Positioning Systems (DGPSs)

A DGPS is incorporated into the KIMS to accurately track, record and allocate the suspect signals. The KIMS was initially designed to search wide areas such as open fields, so static RTK transmitters with a "moving" receiver mounted on a detection platform were previously employed. This provides reacquisition capabilities of less than 20 cm, however, the drawback is the limited range. Depending on the terrain, the Rover can only travel four to six km from the static transmitter. Beyond that, the transmitter must be relocated and recalibrated. To improve range and productivity, we incorporated a wide-area DGPS system from Omnis Star, which is commonly used in large-scale agricultural and maritime applications. This does not require a static base station, and while the accuracy is only rated at +/- 100 cm, the system is reliably tracked anywhere in Africa.

Computers, Software and Peripherals

To keep everything as commercial off-the-shelf (COTS) as possible, normal Panasonic "Toughbook" laptops were used and standard PCMCIA port expanders were installed. The detectors are timed and fired from a central control box, which also relays the signals. A custom-made "black box" combines the signals with the DGPS location and feeds this directly into the computer through the PCMCIA slots. The commercially available Geosoft "GeoSurveyor" program was then slightly modified to work with the new system.

The advantage of this approach is that the data is recorded and stored over 20 times faster than what can be accomplished with standard data-logging devices. The hardware involved with this configuration is small enough to be packed in a footlocker for transport and requires very little space when installed in the prime mover.

The XY locations of the route traveled and of the suspect signals located during the search are directly transferred into an MS Access database program. This allows all of the data recorded during the search to be used in standard Geographic Information System (GIS) software programs, such as ArcView or the Information Management System for Mine Action (IMMSA) database.

http://commons.lib.psu.edu/cise-journal/vol7/iss1/1
Mounting Systems

The design of the system allows for a great deal of flexibility in how it is mounted, which proved to be one of its largest benefits.

Prior to our arrival in country, we planned to use a flexible sled to tow the detection array. However, upon conducting operational assessments of the area, it was decided that the material of the roadways would destroy the sleds as fast as we could assemble them. We then decided to go with the traditional fiberglass trailer employed on the previous KIMS.

Upon the arrival of all components arrived, we found that the undeveloped roadways in Eritrea were too much for the materials used. The flex of the fiberglass beams caused a severe amount of bouncing, limited the search speed to two to three km per hour and began to show stress cracks even prior to our deployment.

To correct these problems and increase our search speed, a suspended, front-mounted carrier was fabricated using the fiberglass beams from trailer and other locally available materials. This design provided a six-meter wide search path and included “wings” on either side that could be raised and lowered from the inside of the vehicle to allow for traffic and right stops.

Heavy-duty hinges were mounted to the front of the vehicle and bogie-wheels were placed on the carrier frame, allowing it to flex upward when making contact with the road while crossing rivers and washouts. In spite of its crude appearance, the performance of this carrier was by far the best. The speed was increased to eight to nine km per hour, and the wider search path of the carrier allowed the KIMS system to scan over 35 km (210,000 sq m) per day. This was a major accomplishment for the team, but it was only half the job. The next task is to clear the suspected signals located by the KIMS.

Mapping

Once the data is processed and analyzed, maps like the one in Figure 1 are printed for the clearance team. The blue path displays the total search swath, while the black lines show the individual search coils (three coils were used during the scan shown below). The red areas show the estimated boundaries of the suspect items and the yellow dots indicate the estimated center (or centers) of mass.

Combined Clearance Approach

Upon receiving the maps, the clearance team begins planning their tasks. Areas that show very few signals obviously go very quickly, but most of the roadways produce a large number of signals, so the work becomes more intensive.

As the teams are working on roadways, the AP mine/stripwire threat is non-existent and freedom of movement is quite good. This allows for a great deal of flexibility in adjusting the approach.

Reacquisition

To accurately relocate the suspect targets, the location of each signal is transferred from the computer into a handheld DGPS/GPS unit with a backpack-mounted antenna. The reacquisition person then guides the team within two meters of the suspect item and indicates where the point should be. Even though the accuracy of the backpack is rated the same as the vehicle DGPS (+/- 1 m), an actual clearance operation, the reacquisition person has commonly achieved +/- 30 cm while relocating the signal.

Once in the area, the deminer sweeps with the detector, looking for any signals. Surface scrap normally accounts for 80 percent of the items located, so once that is completely removed, the area is rescanned for subsurface signals. Should one be present, the area is immediately marked for a mine detection dog (MDD) search.

Mine Detection Dogs

The MDD handler checks the area with both of the dogs. The area will be marked as hot from a single “positive” signal by either dog. However, if both dogs indicate no presence of explosive, then the signal is marked as “no explosive hit” and the team moves on.

This has reliably eliminated an additional 80 percent of the subsurface signals remaining after the reacquisition team has moved on.

Mechanical Assistance

Trying to uncover a suspect signal buried deep in a sun-baked, dirt, clay and gravel roadway is simply asking for trouble. If done safely, only small gardening tools could be used, making it extremely tedious and time consuming. Picks are actually needed to break through the layer, but this is unnecessarily dangerous for the deminer. So to counter this situation, mechanical assistance is brought in to help with the task.

The teams have a 5.5-ton armored mini-excavator, which performs the excavation work in 24 months. This improves the speed and safety. A mine-protected vehicle is also parked at the site, allowing the team leader to observe the work and surface proximity should an accident occur.

Small signals comparable to those of a 68-mm mortar or a hand grenade are simply scooped up in the bucket and spread out for inspection by the manual team. Larger signals comparable to an AT mine are marked with a crossed circle. This tells the plant operator to dig on each side without touching the circle itself. This gives the manual team good access to the sides of the suspect item without applying any pressure to the top.

Quality Control (QC) Checks

An additional benefit of this approach is the ability to conduct verifiable QC checks using “seeds.” These ensure the system is operating correctly and the depth of detection is being met. A “seed” is an identical copy of what is being searched for (i.e., TM-57 AT Mine, 82-mm Mortar, etc.). They are free from explosive (PFE) to ensure safety but are otherwise identical to the threat. The system is then operated on the seeds.

The Team Leader or Quality Assurance (QA) Inspector buries the seeds in randomly selected areas that have been scanned and directs the KIMS to scan the site.

This can be used to compare against the other signals that have been located, or can be used in areas that show no contamination to verify that nothing is actually present. The system is fairly fool-proof: it either shows up constituting a “pass,” or doesn’t show up, which means it has failed and the area must be re-searched. To date, no seed has ever been missed.

Management Assistance

As mentioned before, the tracking and mapping system used by the KIMS can be directly transferred into a GIS. This can also be overlaid onto georeferenced satellite images or aerial photography to give accurate information over topographical details that are only two to three months old. This provides the mine action manager an effective tool that can accurately track the progress and clearly show what is now considered safe.

Performance Data

Manufacturers often claim their systems “can, might or could” accomplish “X” number of sq m per a set period of time if the right conditions apply. However, the bottom line of “What has it done?” is not often answered with 100 percent accuracy.

The combined approach we are using in Eritrea has produced the following results in less than four months of operations:

- The KIMS scanned over 388 km,
- 2,700,000 sq m of roadway. This was done in 19 days of scanning with a single vehicle and a four-man crew. Daily progress varies between 15 and 35 km per day, depending on traffic and satellite reception. The remaining time was spent processing the data to produce maps for the clearance team.

- During this period, the single Manual Clearance Team using the combined approach cleared over 112 km,
- 785,000 sq m of the roadway scanned by the KIMS. This single team is comprised of only five personnel.

- Within the 112 km, 2,167 suspect signals were recorded and double-checked for the scanned area. The combined approach eliminated 2,090 of those signals without intrusive actions (i.e., digging).

- The remaining 77 intrusive actions produced one Russian-made PDM-6 AP mine, a Czech model 34 hand grenade, and various bomb fragments with explosive residue at depths ranging between 10 cm and 75 cm.

In comparison, the MOD does not pick up an explosive signal, the area is double-checked with a second dog to ensure it is clean.

*All graphics courtesy of the author.

*Since this article was written, the author has lost his position at UXB International. To contact him directly please use his personal e-mail address, chadell@bellsouth.net

Contact Information

UXB International
E-mail: solutions@uxb.com
Website: www.uxb.com
Protecting Deminers From APLs: A Review of U.S.-Canada Cooperation in R&D

Since early 1999, the Canadian and U.S. organizations responsible for delivering science and technology to the humanitarian demining community have cooperated on several research and development (R&D) programs in the area of personal protection equipment (PPE). This paper presents an overview of the work performed cooperatively, focusing on key lessons learned during this joint effort.

Introduction

This paper gives an overview of the R&D work performed by Canada and the United States since early 1999 to improve the personal protection of deminers. It should be said that this is still "work in progress" and that more contributions will be made in coming years. For clarity, the paper is divided in several parts that correspond to three broad phases within the overall program. First, work was done to understand the injuries to the lower extremities due to blast mines and the basic protection mechanisms that footwear should provide, and to define a test methodology to support future development of mine-protective footwear. The second phase saw the development of a test protocol to evaluate how well PPE protects the upper body of a deminer during excavation drills and applied this protocol to compare existing PPE. The third phase identified that small changes in body position could have a significant effect on the forces transmitted to the body. This led to the idea of mapping out the blast field of buried landmines and measuring the forces transmitted to the human body shape so that recommendations could be made to improve body positioning during excavation drills, or at the very least to advise deminers about what positions are detrimental. Finally, there was a need to determine the physiology of the injuries to the upper body, since this was poorly documented.

Mapping Out Field Injuries

In 1998, through the United States-sponsored consultation process, representatives of the humanitarian demining community wanted to look into the issue of PPE for deminers. It was suggested that priority be given to blast mines for accidents against the foot while walking or against the upper body during excavation drills. However, these were few solid facts to justify spending the limited R&D dollars in this way. There was a need to quantify the problem in terms of threats, activities most likely to cause a mine accident and the resulting injuries. It was necessary to map out the situation that actually prevailed in the field.

Fortunately, one individual, Mr. Andrew V. Smith, had been gathering demolition injury information. In 1998, the U.S. Humanitarian Demining R&D Program decided to fund the efforts of Mr. Smith by contracting him to assemble the limited information he already had and to gather additional information. The resulting database consists of contributions from organizations in nine countries on four continents, totaling 232 accidents that resulted in 295 victims.

The deminer injury survey demonstrated that gathering field data was difficult, often because the data had not been acquired in the first place. The database nevertheless provided a much clearer picture of what was happening. The database indicated that the threat was definitely from APLs. APLs were involved in 79 percent of all accidents, accounting for 78 percent of all injured people and 81 percent of fatalities. The results from the survey definitely provided support that the R&D effort should focus on the APL threat.

Another important piece of information relating to the threat distribution was the ratio of APL accidents involving blast versus fragmentation landmines. Blast APLs were involved in 83 percent of the accidents, but only seven percent of the victims died from their wounds. On the other hand, 38 percent of the victims from fragmentation APLs died, nearly six times more than for blast APLs. This reflects the different nature of the threat. A blast APL is designed to kill its victims, thereby inflicting psychological as well as physical trauma to opposing forces. On the other hand, a fragmentation APL is designed to kill its victims and maximize the damage to opposing forces. This has a strong influence when selecting suitable PPE to defend against these threats. Another important fact regarding the deminer injury data was the very high incidence of the PMN blast landmine, which was involved in 66 out of 153 (43 percent) blast APL accidents. This ratio is unusual and is likely an artifact of the large contribution from organizations in Afghanistan to this database rather than a reflection of the prominence of this particular mine throughout the world.

Figure 1 provides some insights into the activity that was taking place at the time of accident, which was documented in over 94 percent of the cases. Excavation and Misidentification accounted for 34 percent and 37 percent of all accidents, respectively. It should be noted that Mined Mines are not an activity on its own; it indicates that some mine clearance or misidentification survey activity had not resulted in areas that were deemed safe. This reflects either a failure of the detection equipment or human error in marking the extent of the mined area.

Figure 2: Distribution of injury on the body for the two most frequent activities during accidents.

The database indicates that deminers were 1.5 times and 3.2 times more likely to be kneeling or squatting at the time of a blast accident, respectively. This agrees well with the information coming back from the field that deminers prefer the more upright positions because of comfort, better field of vision and generally because of improved ergonomics in carrying out digging and soil-removal tasks. There might also be some cultural bias, as squatting is widely used in countries such as Afghanistan and Cambodia. The design of PPE must take this fact into account.

The survey results confirmed and quantified the feedback that had been coming from the field. It led to two main decisions in regards to the U.S. and Canadian R&D programs. First, the work would continue to concentrate on the blast APL, thrust second, two principal areas of work would be addressed: protection of the lower extremities while standing and protection of the upper body when lifting stone, kneeling or squatting during excavation drills. It was felt that focusing the R&D on those needs would yield the most benefits to deminers.

The Lower Extremity Assessment Program

The Lower Extremity Assessment Program (LEAP) was born in 1998, before completing the deminer injury survey. It was designed to answer questions about the effectiveness of existing mine-protected footwear, but more importantly to document the process of injury to the lower limb due to landmine blast.

The LEAP tests used three blast APLs representing mines with a small (M-14, 25-g), medium (PMA-2, 150 g) and large (PMN, 240-g) explosive content. A small but representative range of footwear was tested. The unprotected references included an improvised sandal and the standard U.S. Army Combat Boot (CB). Two representative mine-protected boots were used: the Wellco® Blast Boot 16 (BB) and the BFR-40 boot. These boots have a blast deflector in the rear portion of their sole while the forward portion of the sole is unprotected. Finally, two boot supplements were also used in the test program. The Wellco® Over Boot (OB) consists of the BB sole containing a blast deflector but mounted on a Kevlar®
scraping system so that the OB can be worn over another boot. The second boot supplement is the Med-Eng Spider (SB), which consists of a platform supported approximately 10 cm above the ground by four legs that protrude fore and aft of the platform. The SB differs from conventional boots as it is designed to move the point of mine detonation away from below the foot.

The fracture patterns observed during LEAP correlate well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.

Table 1. Mine Trauma Score for the lower extremity.

<table>
<thead>
<tr>
<th>Injury Assessment</th>
<th>MT5 Contamination Level</th>
<th>MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No major injury</td>
<td>0</td>
<td>Closed</td>
</tr>
<tr>
<td>Salvegge limb</td>
<td>1</td>
<td>Closed</td>
</tr>
<tr>
<td>Below-knee amputation</td>
<td>1A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>1B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td>2A</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>2B</td>
<td>Open Contaminated</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open Contaminated</td>
</tr>
</tbody>
</table>

The fracture patterns observed during LEAP correlated well with injuries from the field”” about landmine injuries to blemishes. The extent of injury clearly depended on the amount of explosive contained in the landmine, but also on footwear. One challenge that the medical staff involved in LEAP had to overcome was to define a scoring system that would adequately describe the medical outcome from each test while retaining sufficient sensitivity to capture differences in performance due to footwear. The result was the Mine Trauma Score (MTS), as listed in Table 1.
humanitarian demining. This led to a very successful three-way partnership that advanced the understanding of mine blast injuries to the upper body and how to better protect against these injuries.

When describing injuries to the upper body, demining organizations were talking about burns, fragmentation and blast injuries. These three injury mechanisms are closely connected with the physics of APL explosions; thus, it is a single pattern. Given that the soil has a considerable influence on the explosion, confining the expansion of the detonation products to a conical danger zone above the ground, as shown in Figure 9.

This figure depicts three stages in the development of a buried mine explosion. Early during the explosion, the hot gas pushes hard on the surrounding soil, propelling particles from the soil up directly above the mine in great speed. The hot gas breaks through the surface and jets upward at supersonic speed. In the process, it pushes the air ahead and creates an air shock, which is visible in the second frame of Figure 9. The gas slows down as the explosion develops. The initial push of the gas on the soil also creates soil ejecta, a stream of soil particles that flows from the explosion point to the surface, as shown in the third frame of Figure 9. It is useful to define this conical zone in terms of the angle & A; about a line perpendicular to the soil surface. The angle & A; corresponds to the direction along this perpendicular.

Let us come back to the three injury mechanisms, starting with burns. The fireball from a typical shallow-buried (less than 10 ft) mine lip over 15–30 milliseconds, but its temperature is certainly high enough to cause burns. When a mine is deeply buried, the hot gas cools down too much before encountering fresh air and the chemical reaction cannot be sustained. The result is a dark cloud.

Fragmentation injuries from a buried APL result from the collision of high-speed soil particles, small pebbles or rocks, mica-containing fragments and broken tool parts with the vicinity. Let us consider soil particles in the first place. Individual soil particles have a small mass, which limits their ability to penetrate the human body, but their large number has an abusive effect that can injure the skin and sensitive organs such as the eyes. Larger fragments from rocks, mine casings and tool parts can usually penetrate and penetrate the body. The wounding mechanisms for these larger projectiles are fairly well-understood by the medical community. From the perspective of protection, these fragments need to be stopped with armor, a process fairly well developed for bullets and larger high-speed projectiles.

The third injury mechanism to consider is blast, which is not as well-understood as the other two. There is an estimate that at least two physical sources for blast injury: the air shock and the jetting of the detonation products. The physics of air shock waves is extensively documented for large blast weapons (tens to thousands of kip of explosive). The passage of a strong air shock results in a sudden change of local pressure, a change that the human body is ill-equipped to cope with. Immediately after the passage of the shock, the air starts to flow outward from the source of the explosion. The flow from a large explosion can literally propel a person. The second physical source of blast injury is due to the high-speed flow of the products. The conical shape of the flow zone is such that the streaming gas often impinges on the upper body. Even if the detonation products were to travel at a considerable velocity and can exert great force on objects in their path. Let us now see how the environment created by the explosion of an APL relates to the blast loading to properly quantify the injury mechanisms. Peculiar work to that effect has shown that the soil has a considerable influence on the explosion, confining the expansion of the detonation products to a conical danger zone above the ground, as shown in Figure 9.
Comparative Testing of PPE Performance

The test methodology described in the previous section was applied in a landmark series of tests* in October 2000. More than 100 tests were done at the Aberdeen Test Center, Maryland, USA, to measure and compare the protective performance of five commercially available PPE outfits. Some key characteristics of the five ensembles are listed in Table 4. These five PPE systems represent a range of protective equipment available to the demining community. All ensembles provide some form of protection to the face and torso, although there are significant differences in the implementations of these protective measures, e.g., extent of the facial coverage of the visors. These ensembles also offer protection to the groin area and there use a helmet to further protect the head.

The scene was set so that the nose of the mannequin would be located 70 cm from the mine on the A-25′ line for the kneeling position and 45 cm from the mine on the A-63′ line for the lying prone position. The mannequins were positioned first and any head protection gear was added afterward. Each piece of PPE was exposed three times to the blast from 100-g and 200-g C4 charges for each combination of body position and charge mass. Additionally, two pieces of PPE were exposed two or three times to the blast from the PMN mine in order to validate the use of the 200-g surrogate charge; the blast field from these two explosive devices was found to be very similar, but there remained questions about fragmentation from the thick Baclite casing. The data was recorded in accordance with the test protocol. Measurements to the PPE were noted from inspection and the physical response of the mannequin was recorded. The instrumentation records were post-processed and compared to industry criteria reference values for head injury, cardiac rupture and neck injury.

The structural integrity of the equipment was generally good. The apoms and vests remained in place for all tests, although ablation of the materials, e.g., some partial penetration were often observed, particularly for the 200-g and PMN shots. Fasteners often failed and Velveco® snaps became loose, but the equipment generally remained in position on the mannequin. The combination of kneeling and lying prone positions with sand on the soil medium meant that there was likely a difference in the prominence of pitting on the upper part of the visors. The forces in damage to the equipment highlights the importance of taking into account all damage mechanisms (i.e., blast, ejecta and fragmentation) when designing PPE.

<table>
<thead>
<tr>
<th>Table 4: Mass characteristics and visor/helmet projected area for the five PPE.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PPE Type</strong></td>
</tr>
<tr>
<td>Body armour mass (kg)</td>
</tr>
<tr>
<td>Trouser armour mass (kg)</td>
</tr>
<tr>
<td>Helmet/visor mass (kg)</td>
</tr>
<tr>
<td>Total ensemble mass (kg)</td>
</tr>
<tr>
<td>Helmet/visor projected area (cm²)</td>
</tr>
</tbody>
</table>

For the 100-g charges produced for each PPE, the helmet and/or visor mass is either due to direct impact on the head or due to relative motion between the head and chest. During a mine blast, the head and chest are subject to different accelerations as a function of their location within the blast cone. The probability of injury due to blast impact can be evaluated from the forces and moments recorded by the sensor and the NIC criteria. The value of NIC = 1.0 corresponds to a 22 percent probability of severe neck injury. Figure 10 shows the results as a function of PPE body position and charge size.

Note that data is missing because the neck on one of the two mannequins used for testing became loose during the test program. With the highest value of NIC being 0.55, it is apparent that none of the test conditions resulted in a high probability of severe neck injury. The values of NIC are generally larger for the unprotected mannequin, indicating that the use of PPE reduces the probability of neck injury. The larger charges generate larger values of NIC. The values of NIC are also larger for the lying prone position, consistent with the closer distance to the blast. It is suspected that the same factors that influence head acceleration (i.e., visor surface area and helmet mass) have a similar role with respect to neck injury.
Conclusions
To solve personal protection issues, the scientific approach was applied, first to identify, then to study the basic injury-producing mechanisms and second to look into appropriate protection strategies, working with the manufacturers that had expertise to contribute towards practical solutions. A large portion of the work concentrated on the development of protective equipment that could be produced commercially. The test methods were then used to determine the performance of a few footwear products and five PPE outfits designed to protect the upper body. The results from these tests were published, and further work is needed to contribute these test methods to organizations such as the International Test & Evaluation Programme (ITEP) for their consideration. The LEAP study produced several outcomes, including the developments of a specialized MTS for the lower extremities and a detailed epidemiology database for blast mines. Tests with the ESL and comparisons of the results against those from LEAP generated a validation of the new tools. Test results from the two programs demonstrated that existing mine-protected footwear did not perform any better than unprotected footwear unless additional standoff from the mine is added. This can be achieved through the use of an overboot or a raised platform such as the SpiderBoots®. Through our test programs, the injury mechanisms were largely quantified, and this new knowledge is already being used to develop better footwear. It might soon be time to conduct a new assessment of performance improvements using the test methods developed under the Canadian/U.S. programs.

The implication is that small changes in body posture can have a large effect. Further work is underway to map out this zone, and the results will be published in the near future. This might lead to safer body positions during excavation drills. Quantifying these injury-producing mechanisms should lead to improvements in PPE design.

Acknowledgements
The authors gratefully acknowledge the funding from their sponsoring organizations, U.S. Department of Defense Special Operations/Low-Injury Conflict (SOLIC), U.S. Army Communications and Electronics Command and the Canadian Center for Mine Action Technologies, without which none of this work would have been possible. The authors also acknowledge the high-quality contributions from their co-workers from academia, government and industry. The work reported herein resulted from the efforts of a wide range of dedicated staff, as reflected by the list of references below. The few names listed below do not reflect the excellent support received from those people that use alone carry out their daily functions in the background: technicians, photographers, etc. Let it be known that your enthusiasm and dedication are critical to the quality of the work. All findings and views repeated in this paper are those of the authors and do not necessarily reflect the consensus of views from the funding organizations.

References

Contact Information
Denis M. Bergeron
DRDC Suffield/FCM
E-mail: Denis.Bergeron@dundar.army.gov

Charles Chichester
U.S. Army CECDM
E-mail: Charles.Chichester@navy.mil


Journal of Conventional Weapons Destruction, Vol. 7, Iss. 1 [2003], Art. 1

Canadian/US programs.

A number of new tests were performed and data analysis is ongoing. The results will be published in the near future.

The existence of a conical zone where the risk of injury is greatly increased has also been demonstrated experimentally. The

As a result, the blast head position could be improved through a rough measure of clearance. Nine positions were carefully defined for each mine size (three distances x three Δ angles). The distance was set at 60, 70 and 80 cm for the larger mine, and 50, 60 and 70 cm for the smaller mine. Testing then started in September 2001 and was completed later that year. A subsequent series of tests in June 2002 explored the effect of body positions for the laying prone position. More than 130 tests were performed and data analysis is ongoing. The results will be published in the near future.

The authors gratefully acknowledge the funding from their sponsoring organizations, U.S. Department of Defense Special Operations/Low-Injury Conflict (SOLIC), U.S. Army Communications and Electronics Command and the Canadian Center for Mine Action Technologies, without which none of this work would have been possible. The authors also acknowledge the high-quality contributions from their co-workers from academia, government and industry. The work reported herein resulted from the efforts of a wide range of dedicated staff, as reflected by the list of references below. The few names listed below do not reflect the excellent support received from those people that use alone carry out their daily functions in the background: technicians, photographers, etc. Let it be known that your enthusiasm and dedication are critical to the quality of the work. All findings and views repeated in this paper are those of the authors and do not necessarily reflect the consensus of views from the funding organizations.

Some visitors recorded large visor surface areas tended to catch more ejecta, while more testing would be required to fully assess protection against mine-case fragments from larger mines, e.g. the PNM. There were large differences in head protection. Some helmet designs tended to increase the probability of ear blast injury. It was found that the addition of mass (e.g., a helmet) reduced head acceleration, while large visor surface area tended to catch more of the blast and increase head acceleration. Some visitors often suffered structural failure or failed to remain in place, but it is unclear whether or not these failures occurred late enough in the event to prevent sufficient protection against most of the injuring elements. The main outcome from these tests is that protection of the head through improved visor and helmet design requires further work.

The implication is that small changes in body posture can have a large effect. Further work is underway to map out this zone, and the results will be published in the near future. This might lead to safer body positions during excavation drills. Quantifying these injury-producing mechanisms should lead to improvements in PPE design.
ManicTech International has been tasked with clearing 1,300 square kilometres of land in southeast Lebanon. In the space of nine months, ManicTech deminers have disarmed and destroyed 23,300 mines, clearing 2.2 million of the total three million square metres of land. As ManicTech approaches the end of this first major task in Lebanon, ManicTech Project Manager Max Dyck and Team Supervisor Moses Sibanda present their perspectives on the challenge.

by Max Dyck, Project Manager, ManicTech International

Introduction
In May 2002, ManicTech deployed 10 manual demining teams, 10 mine detection dogs (MDD) teams, survey and explosive ordnance disposal specialists, and ground preparation machinery to southern Lebanon. Our task was to clear some 200 minefields from a substantial area of southeast Lebanon stretching south and west from El Qisat in the north down past Kafir Kela to Bahr Yehou in the south. Having received confirmation of the project, our teams deployed and set up a first base camp within 10 days. Accreditation from the project supervisors, the United Nations Mine Action Coordination Centre (UN MACC) in Tyre, came just three days later. Our ground clearance machinery then took 10,000 metric metres and our manual deminers cleared 6,500 square metres from the first minefield before the end of day one.

The momentum created by the rapid deployment has been maintained through the middle of February, nine months into the project. ManicTech has been responsible for clearing and destroying 23,300 of the AP and AT mines cleared by that time. Over the period, we have further strengthened resources, bringing in local deminers—United Nations Emirati (UAE) and Lebanese army personnel trained by ManicTech to UN standards to operate as demining units under ManicTech management.

Conditions
The conditions facing the manual deminers are tough, but there are many similarities to other theatres. Summer temperatures are in the upper 90s (Celsius), and in the winter they drop to almost zero. But the real dastards on the effort have been the gale-force winds and whipping rain. The rain, virtually non-stop for several months starting mid-December, has had a direct impact on productivity, keeping the manual demining teams out of the fields during the day and leaving very wet, muddy conditions for them to deal with in between. We have tackled the issue by managing resources as best we can to ensure minimum downtime. Teams have worked the peripheral areas outside of the fences or switched to clearing AT mines during days of heavy downpours, despite the fact that the weather slows the process considerably. During the middle of December, before the rains started and just six months into the project, ManicTech rallied of cleared mines in Lebanon stood at 19,235 mines, but we still reached 22,300 by mid-February, despite two months of heavy tropical rain.

In many of the minefields, the terrain is steep and rocky. It is pretty uncomfortable for the manual deminers and it makes access difficult. The hard surface is difficult to penetrate, so the use of mine-detecting prodders becomes more challenging. Much of the area contains former military outposts and consequently has a high level of metal contamination. On the ground, each piece of metal detected must be treated as if it is a mine until proven otherwise.

ManicTech's safety foundation for overall safety. To achieve it, everyone—management included—lives together in field camps closed to outer areas. Regular visits from senior management, in particular Chief Executive Officer (CEO) Colonel Dyck, ensure that the leaders lead from the front. The Colonel, like others, joins the men working in the fields and setting the standard from the top.

Stamina
Physical fitness that ensures the teams have the strength to carry out the arduous camp work is the first priority. In Lebanon, the physical challenges of the field is essential. In training, the teams have to prove their ability—no exceptions, no favouritism. The fall-off rate is high, and statistics show that 75 percent of all recruits will fail. It is a tough selection process, but it ensures that no one stand at the front end of mine clearance who has not had to go through verification after manual clearance. The dogs have also been used effectively outside the main minefield fences to secure the peripheral areas and areas tasked as "lower threats." Machines have been used for both ground clearance and verification, but the density of the minefields has meant that as soon as a machine is deployed to the area—approximately 30 to 500 feet—from the edge of the dogs are just short of 1 million square metres and the dogs were just short of 1 million square metres having found 15 mines and many pieces of UXO.

In total, our dogs and machines have reduced the target areas by 68 percent, proving to be a significant factor in how effectively we have been able to deploy our key manual demining teams.

Managing Our Human Assets
While the performance of dogs and machines have been key in helping achieve consistently high performance targets, the manual demining teams on this project are without a doubt the primary resource. Managing this asset in a minefield and effectively has been essential to our success. In this matter it is business as usual, and at ManicTech we employ a strategy that extends to every aspect of our activities—from the way we manage safety in the field to the ethos for camp life, which we believe has major bearing on increasing performance and reducing accidents. As with any top professional or sporting teams, physical fitness, motivation and mental well-being are as key to the welfare of our manual deminers as the personal protective equipment (PPE) that visibly protects them.

mine fields before the end of day one.

Productivity and Performance
While the manual demining teams have been the primary asset in the actual clearance of the mines, the overall productivity and performance figures achieved reflect the integrated use of all three assets—man, machine and dog. The ability to deploy all three resources has had a major impact on the performance of the manual demining effort. In the majority of fields, we have used all three assets, usually employing manual demining as the primary resource supported by one or both of the secondary resources, which substantially speeds up the clearance process. Both dogs and machines have been used with great effect for area reduction, verifying the existence (or non-existence) of mines, and have consequently has an accident record of near zero verification after manual clearance. The dogs have also been used effectively outside the main minefield fences to secure the
to graze safely. Many hectares of former agricultural land are already back in cultivation, several quarries have been re-opened and a major pipeline in the Tallosah area has also been re-opened.

At MineTech, we believe that mine action should be seen as a short-term obstacle to development, as opposed to a long-term job opportunity. Understanding this means understanding us. Ignore it and you'll see us as hard, uncompromising, anti-social and pretty different. Lebanon has been very rewarding, but hard work and the team's achievements are impressive. We look forward to further challenges in this theatre.

My Lebanon Experience by Moses Sibanda

Moses Sibanda, 27, has worked with MineTech since leaving school and is now a field supervisor. His experience spans Mozambique, Somalia, Bosnia, Kosovo and now Lebanon.

First Impressions

Our deployment was pretty fast. I was expecting to head for Iraq but, heck, we waited for that. I'd still be home, so I'm glad the boss put me on the plane for the Lebanon job. On arrival, we deployed south to our first camp where the advance party had set up our first base. I noticed that the terrain looked a bit tough—similar to Somalia. It was rocks, rocks and more rocks. Although it was the end of winter, I still found it pretty cold and there was still quite a bit of green vegetation around. This was going to change soon because in Lebanon, boy, does it change.

Targets

Once camp was up, team leaders and supervisors went into Tyre to the Mine Action Centre (MAC) to receive our introductions to Lebanon and get familiarised with what to expect here. The targets were mainly the Israeli No. 4 AP mine. I checked it out and was quite chuffed as it has a great hump of metal in it—nice and easy to find. But then we were shown the rock mine. This was well-made and disguised as a rock. If you see it out there you'll squat on it for a rest.

Activity in the Field

Three days after our arrival, we were accredited to begin operations, and by the fourth day I was finding mines. My job in the beginning was to deploy with manual teams and help the recently appointed leader come to grips with his team. Did we find mines or did we find mines! Hundreds were found and disarmed in days. I was the first to disarm a live mine here and that first day I disarmed 76 No. 4s, and after that, hundreds. We stopped disarming when we discovered too many unstable mines. From then on we became and destroyed in situ. This is a bit slower, but we've got a good drill going, and now we blow whatever we find in a day without having to spend extra long hours in the minefield.

UNMACC

The UNMACC people are a good bunch of guys and we get along great. They speak very strangely not their fault though, they come from down under! Allie, the plans officer is famous for running internationally and in his funny accent saying to the guys, 'Hey guys, you gotta get a little job for your.' That's when we know it's going to be a real challenge. We do them all, though—no problem.

Accidents

We've had a few accidents here in Lebanon, but we've found tons of mines, so it's a pretty good record. I think nobody goes out planning to have an accident, but you know it is dangerous work, and if you do not realize that sometimes there are mistakes, then you need to wake up. We are not selling candy at a candy store. We are dealing daily with lots of dangerous objects and now and again, something will go wrong. Right now I am the quality assurance (QA) supervisor, so it's my job to check all the systems and procedures being implemented to minimize mistakes and keep all the guys safe and, of course, ensure we do a good job for the people of south Lebanon.

Being a Deminer

I have been with MineTech International since I left school and I have travelled a lot—Mozambique, Somalia, Bosnia, Kosovo and now Lebanon. I started at the bottom and I found and destroyed hundreds of mines. I am now a supervisor and one day I want to be a field manager. Many people thought we would struggle to do what we have done here in Lebanon because we had the toughest areas with the biggest minefields. I'm proud that we've done it; it's a good job and I wouldn't swap it.

How Product Design Can Improve Manual Demining

The Design without Borders (DwB) programme was initiated and is led by Norsk Form, the Norwegian Centre for Design and Architecture. It aims to use designers' creative and analytical skills to create solutions for developing countries and areas of emergency. DwB aims to create meeting points between problem owners and professional problem solvers, and to be a catalyst for cooperation and development of new products and services. Our demining work is carried out in close collaboration with Norwegian Peoples Aid (NPA). By Anders Ilseby, Design without Borders

Introduction

Manual demining is a key component in the humanitarian demining projects run by NPA. Currently, significant resources are invested internationally on issues such as mine dogs, mechanically assisted demining and ground penetrating radar.

However, none of these technologies replaces manual demining—each only complements. Despite this, manual demining receives relatively little attention. Manual demining is very resource-intensive. NPA has found that a day's work for a deminer can range from as little as 0.5 sq m up to 80 sq m in different projects. If we can improve the working conditions for deminers without compromising safety, then more projects can manage 80 sq m/person/day and fewer 0.5 sq m, our effort will make a difference for all demining operations! DwB has joined NPA in this effort, providing knowledge in product design issues such as ergonomic/human factors, materials and manufacturing processes.

Analysis and Field Study

In order to gain a proper understanding of the challenges of manual demining, it was necessary for DwB to carry out an extensive analysis, including a field study. This work was partially funded by the Norwegian Agency for Development Cooperation (Norad). Three professional product designers were chosen for the task, carrying out the analysis and a 10-day field study in Teti, Manica and Sofala provinces in Mozambique.

http://commons.lib.jmu.edu/cisr-journal/vol7/iss1/1
The study concentrated on the deminer’s work situation, tasks, protection equipment and personal tools (except the detector)—and especially their mutual interaction. These equipment and tools were chosen because they are bought and used in sufficient numbers to also make them commercially interesting.

NPA has been manufacturing a range of their products and other hand tools locally where possible. The field study investigated local manufacture, assessing possibilities, such as to see if local manufacturing could be further utilised for other products. The full report is published in pdf format on the Internet at http://www.norskform.no/dug/rapport_fase1.pdf.

**Potentials for Improvement**

First, the demining operations all seemed very much the same. The equipment and work operations were overall held to be satisfactory or good, but not without scope for improvements. The results from the field study and analysis are summarised in figures showing potentials for improvement in six important categories. This is done for each piece of equipment that has been considered, and forms the background information for our project proposals.

Generally (and unsurprisingly) the protection against landmine blast appears to be adequate. Usefulness, both in terms of comfort and performance, seems to be less considered. Also, safety and health beyond explosives protection are issues in need of attention. Dehydration and overheating are consequences of working with heat and non-ventilated protection gear in hot climates. This rarely has major direct effects on human health, but besides being uncomfortable, it will certainly influence the deminer’s concentration and reaction time, which are crucial. Interviews with deminers support that this is a problem to be taken seriously.

General body protection should be improved, especially of the knee joint. The knelling posture used in demining has been shown to cause damage to the joints when used often and over time. Integration of explosives protection may be considered, as the knee will be exposed to any explosion. Reinforcements in the uniforms will reduce the number of cuts and scars, in addition to increasing uniform lifetime.

It is difficult for an outsider to make a judgement on the operating procedures. But it is obvious that the way deminers relate and conform to standard operating procedures (SOP) can be made more efficient. This can especially be seen when deminers are switching between tools after identifying a potential mine or UXO, the deminer often has to change his focus completely, from the potentially dangerous object looking for where the right tool might be lying. Sometimes a long reach may be sufficient, but sometimes the deminer has to get up from the baseline, walk back to where the toolbag is kept, and reconnect the object. This is inefficient and potentially dangerous. This also encourages the deminers to take shortcuts. We observed one-hand operation of two-handed equipment—deminers pushing excavators under their vests and scythes in their belts. Carpeters, rock-climbers and others have solved this problem by using a tool belt—it seems that this would be a good solution to consider for deminers as well.

**The Vest**

The vests studied in the field were developed for NPA by the Norwegian manufacturer Rolli. The dialogue between NPA and Rolli is good, and hence the most recent vests are functioning very well as they are modified and improved according to NPA requirements. However, there are some issues that are not solved satisfactorily:

- The deflector/overlap between vest and visor restricts mobility and adds weight away from the body. Also, we must bear in mind that the visor is not worn completely down in each and every case. Deminers were also made on the rather cumbersome opening and closing mechanism.

- Some of the materials used restrict the ventilation of the body. Heavy perspiration leaves the deminer completely soaking wet after one hour of work. Some deminers claim that this results in colds when they are staying in the waiting area.

- Possibly as a result of the points above, the deminers have a tendency to "sag" the vest slightly, leading to body areas not being covered as intended.

- Cleaning, maintenance and replacement parts are not properly catered for, reducing the lifetime of the vest and making it feel that sharing of vests is quite unhygienic.

Some of these problems are not easily solved, and there may be a need for a complete rethink of how the vests are designed. It may be more appropriate to look into animal life for inspiration, using biotics thinking, rather than the evolution from bulletproof vests. A solution like the Armadillo vest will enable both ventilation and protection.

**The Visor**

The visor, a second-generation design by Security Devices in Zimbabwe, was clearly more problematic. When worn correctly, heat will get trapped behind the polycarbonate glass, causing the deminer to get overheated and the glass to steam up from the breath of the deminer. Many quarrel the need to stop work and open the visor in order to cool down, but in some cases, deminers are known to continue working without wearing the visor fully down. The visors also scratch easily, obstructing the deminers’ most useful detection device—the human eye. The visors are changed frequently, but not frequently enough; deminers were observed lifting their visors for a better look during their work in minedfields.

Quality problems also affect visibility through breakage and slippage of the visor. This is a result of heavy weight and constant readjustment of the straps when two people share a visor. Comments were also made on the rather cumbersome opening and closing mechanism.

When considering a new kind of mask, this must be done together with the vest in order to ensure overlapping protection.

Inspiration and knowledge can be taken from masks developed for other demanding applications, such as the baseball catcher, the ice hockey goalie and the smoke diver masks. Most air from the breath can be channelled away, and a combination of materials may be used for the same protective effect of the full-face polycarbonate provides today. The polycarbonate part may be smaller, able to retract into the mask for scratch protection, and easily replaced without needing to discard the rest of the mask.

**Vegetation Cutters**

Deminers may use more than half of their time clearing vegetation. Considering this, we were amazed at the low level of vegetation cutting tools. The tools could be likened to "lightning rods", such as the furniture saws issued to cut down trees of low quality and badly maintained, such as the pruning scissors, or just mistrained, such as the machete and axe, which largely would be:

Deminer holding the excavator while using the detector.

NPA uses locally manufactured prodders and excavators. Bayonets, hoes and shovels have also been used if available. These tools are crucial to demining and are identified as the tools
Redesigning Personal Protective Equipment

Following discussions, the results of the analysis and feedback from the field, NPA and DwB have decided to pursue development of a new set of PPE as our first project. This PPE will be seen as one integrated unit consisting of several parts. Manufacturing will take place with existing suppliers, but also in the local market where possible. We are currently in the process of financing the project, which should run throughout 2003. Discussion partners are most welcome in this project.

Our Vision Ahead

We are all sharing the dream of a mine-free world. But in the process of getting there, we want all deminers to be provided with effective, safe and comfortable equipment at a reasonable cost. We want to help develop this equipment, employing our user-oriented design methodology. And we want this equipment to improve and speed up manual demining operations. In the process, we also want to create positive developmental side effects. We can do this through facilitating local business opportunities, learning from others and transferring skills among other things. When demining operations eventually cease, these skills can be used for other purposes. We have started on the crucial area of manual humanitarian demining. Gradually, we aim to cover more and more of the areas where we as designers can make a difference.

Contact Information

Anders Ilay
Norsk Form—Design without Borders Programme
Kongens gate 4
N-0153 Oslo
Norway
Tel: (+47) 22 36 56 35
Fax: (+47) 22 36 56 39
E-mail: anders@nsformula.no
Website: http://www.norskform.no/dug/dug_index.htm

An Interview With Colin King

Colin King is a graduate of Sandhurst. He served 14 years in the British Army, gaining extensive knowledge of explosive ordnance disposal (EOD), and served both as an instructor at the British EOD School and as the sole EOD analyst for the Ministry of Defense for six years. He founded an EOD consultancy company, which conducts assessments, training and operational trials worldwide. He is also the editor of Jane’s Mines and Mine Clearance.

by Margaret Busé, Editor

Margaret Busé (MB): Can you tell me about training the Afghan deminers?

Colin King (CK): I think it was really the first major UN demining initiative. The deminers were all mujahideens, and they were sent to one of two training centers. I led one of two teams based in Quetta, which was just on the border in Pakistan in the southern desert region; then there was another center in Peshawar to the north. Looking back, the program was very basic. It was mainly focused on training people to remove mines, UXO and booby traps. There was really no attention to the other aspects of mine actions—and none of the support functions or quality assurance; none of that was really thought about in those days.

MB: Who did your assessments when you went in?

CK: This program was purely about training for mine and UXO clearance. There was little thought at that time as to which areas they would be going into, prioritizing tasks or what equipment they would use. They were basically sent in with a bag of hand tools, a kid’s $10 Radio Shack metal detector and not much else.

MB: When did you start your demining efforts?

CK: My first experience with mines was the Falklands. The actual Falklands war was in 1982, and I went there two years later. Then two years after that, I commanded all bomb disposal operations on the island, including responsibility for the minefields. We basically tried to keep the minefields under control by going after mines that had moved, or were in danger of moving, and responding to emergency calls on mines and other UXO.

MB: You’re talking from 1984 to 2003, almost 20 years. Can you tell me how mine action has changed from where it was when you first started to where it is today?

CK: To me, one of the most obvious changes is the adoption of PPE [Personal Protective Equipment], which just wasn’t a prominent issue when I first started. It was available, but in the army, we mainly wore protective equipment for terrorist bomb disposal; we rarely bothered with it for anything to do with mines. We didn’t wear it at anytime during operations in the Falklands, and I didn’t use PPE for many years afterwards. It wasn’t until my friend Paul Jefferson got severely injured in Kuwait that the issue was properly highlighted.

MB: PPE was not used for military clearance or humanitarian demining?

CK: It just wasn’t something that people recognized as a significant consideration in the early days. That changed, I think, as the casualties built up during the post-war clearance in the Gulf. Paul was the first major British casualty among the clearance teams, and that incident made a lot of people stop and think.

MB: Could you tell me about the accident?

CK: Paul was a very good friend of mine. He and I were in the army together and worked in the same unit of the EOD Regiment; we also handed over commands in the Falklands. I stayed in the army when Paul left and went to Kuwait, where he was by far the most highly qualified technical expert working there. He stepped on a mine and was severely injured; he lost a leg and was completely blinded. A few years later, I was an expert witness when he brought a court case against his employers; he claimed that they failed to provide adequate protective equipment—eye protection, in particular. It was absolutely true, but then to be fair, very few people bothered with any form of PPE at that time. He won the case, but regardless of the rights or wrongs, the fact was that it
The primary resource in this business is people and, thankfully, we have a lot of good people making steady progress.

that time. You simply had military engineers trying to teach civilians how they were trained to clear mines, although many had had no hands-on experience whatsoever. Then gradually, as people realized that that wasn’t appropriate—and that it was completely impractical—humanitarian demining started to split away from military breaching and you ended up with a radically different approach. Now, from the very outset coming together again; the military are becoming far more engaged in humanitarian operations, they are working with and learning from the deminers. NGOs. Meanwhile, the humanitarian demining community is taking up all the rapid clearance options used by the military, and seeing what might be useful to them.

What do you think are some of the challenges of training deminers?

I think even in the days of the Afghan programs, you could recognize that some people had more aptitude than others. Some people were really scared by explosives, they would have to be overcome in the rapid clearance options used by the military, and seeing what might be useful to them.

What about the tools in the toolbox and how all they integrate in their ability to assist the deminers? What are they evolving into?

There’s a lot of talk about the toolbox approach, but in many cases, it’s meaningless; in reality, most deminers simply have to use whatever they’ve been issued. You don’t often see a program manager going to an area saying, “Ah, you’ve got a problem here. What do we do? Into this terrain, these mines, so we won’t use that equipment—we’ll use this.” That doesn’t happen in many programs. As far as the international humanitarian demining community goes, certainly there are a number of different tools and techniques available. But although each program will try to get the right tools and detectors they can afford, they tend to be stuck with them for a long time. At the moment, the standard, for example, as a tool-box approach happens when you have a number of demining agencies operating in a region and swapping resources among themselves. If the program is big enough, the mine action center [MAC] may also have some centralized assets to loan out.

There’s a lot of new technology that’s emerging—everything from the ground penetrating radar to the bees and so on. Where should you see the new technology going? Do you think that’s money wasted or do you feel that’s money spent in a good direction?

I think there has been a tremendous amount of money wasted. But it’s not bad science; there has been a fundamental misunderstanding of the needs of the deminers. It’s unfortunate that there was such a gap between the scientific community and the operational community. Too much has been spent trying to reach the masses, trying to reach the people that thought would be useful but have no real place in the field or have little prospect of any operational application. Whether some of those research investments will pay off in the long-term is difficult to say, but from the operational perspective, high technology hasn’t contributed a great deal. It hasn’t fulfilled some of the promises it made or, perhaps, the expectations that people had for it, and that’s a shame. What I think is likely to happen is a gradual, incremental trend—as we’ve seen going—towards better detection sensitivity combined with selectivity, more mobility, better performance from the enhancements of existing tools. At some point, perhaps, we will get usable multi-sensor detection, which might just be the big step forward that everyone has been waiting for.

You mentioned that there has not been a lot of communication from technologies on down to the field personnel. How do you think communication between users and the RD&D [research and development] community can be improved?

There have been a lot of conferences and a very good annual user-focus workshop organized by the Department of Defense [DoD]. The European Union has done similar work by involving communication is well-in-hand. At the same time, the equipment designers and program managers are getting out into the field and seeing for themselves the problems faced by deminers.

After 20 years, you’ve seen a variety of demining programs and mine action; what do you feel needs to be in place for effective demining programs?

There are a lot of demers, really. Another thing that has changed over the last years is that mine action is no longer seen as a stand-alone activity. It has to be integrated into an overall regional development plan. There are the major issues such as political support, international and funding, that you get down to the fundamental issues of understanding the problem. The better you understand it, the more focused and better the approach you take to the solution can be. That requires gradually around survey, which is something else that has developed over the last 20 years—even though people don’t necessarily agree on what it means. What it is agreed that it makes good sense to have a regional overview before you even launch into a program where you can’t see the wood for the trees. You have to take some good socio-economic impact data available in order to begin prioritizing tasks and allocating resources, and area reduction is critical so making the best use of those resources. In the last few years, we have seen that the survey side is absolutely fundamental to mine action.

The MAC has to create a capable and well-supported indigenous capability. Rwanda is a great example, even though it’s a military program. There you have really high-caliber, dedicated people being supported within their own region and by the U.S. State Department. Many of the national programs rely on outside assistance from specialists and that is a major problem. There’s no regional assessment followed by an operational plan. Many of those programs are carried out by people who are clearly dedicated to their programs, and they’re being trained by the MAC. When the situation no longer fits the template and they need alternatives, they may not have the depth of knowledge or experience to fall back on. It’s always risky to back up one step of the people you’re training. In some cases, the people they’re training have actually been demining for some time, and it’s the trainers who are behind the curve, because they must have practical experience. At least they can say that the SOF trainers have all seen been clearly high-caliber people who are clearly dedicated to their work, but they are sometimes put in an impossible position, faced with situations way outside their area of knowledge.

MB: I’m sure you’ve got a tremendous number of lessons learned in the amount of time you’ve been working in the field. Where do you think demining will and should go in the next 10 years?

Mine action is being refined constantly. Lessons are being learned and it’s becoming more focused, more surgical. It’s also being better managed and there’s better integration. All of these trends seem set to continue. The international flavor, the application of lessons from one region to another, the transfer of experience, mostly by personalities moving around. The community will continue to make steady progress and you will gradually see more and more regions listed as “mine free.” There may be the odd technical innovation that makes a major contribution, but above all, the key to continued success in this field is the publicized work of the in-country programs and their donor support. The primary resource in this business is people and, thankfully, we have a lot of good people making steady progress.

"All photo credit of Colin King"
Explosive Remnants of War: The Impact of Current Negotiations

"While there has been significant progress in reducing the scourge of APLs, the menace posed by unexploded artillery shells, mortar rounds, hand grenades, cluster bomb submunitions and other similar objects must also be addressed." - ICRC President Jakob Kellenberger, 2002.

by Paul Ellis, GICHD

Introduction

The 1980 UN Convention on Certain Conventional Weapons (CCW) has become the focus for new measures of international law on the issue of explosive remnants of war (ERW), a category that includes UXO and abandoned ammunition. The measures that have been and are going to be discussed could have major implications for the humanitarian impact of ERW and post-conflict clearance operations.

What is the CCW?

The full title of the CCW is the "Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to be Excessively Injurious or to Have Indiscriminate Effect." The Convention seeks to regulate the use of certain conventional weapons in armed conflict to prevent unnecessary suffering and indiscriminate harm to civilians.

Timeline of the CCW Process

1980
CCW signed

1989
CCW enters into force

1995-96
First Review Conference of the CCW agrees to Amended Protocol II on mines, booby traps and similar devices and Protocol IV banning blinding laser weapons

2000-01
Preparatory Meetings for the Second Review Conference

2001
Second Review Conference of the CCW

2002
Group of Government Experts (GGE) Meetings to discuss ERW

2002
December meeting of States Parties agrees to mandate new negotiation of a possible protocol on ERW

2003
Meetings to discuss ERW scheduled for March, July and November

The Emergence of ERW as an Issue

In recent years, the international community has concentrated on alleviating the humanitarian impact of APLs. However, for those operating in the clearance community, it is a fact that the work involves unexploded or discarded ordnance as much as—or not more than—it involves landmines. The situation in Laos is one of the best known examples. Not only is the issue of ERW new, the authorities of the affected countries also regularly dealt with landmines from the First and Second World Wars. In Poland—which was severely affected by ERW after the Second World War—as late as 1990-2000, military engineers cleared 3,428,290 explosive devices, of which only 12,620 were mines.

It was the air war in Kosovo, however, that led to calls for international action on ERW. Based on its experiences in war-affected areas and its concerns about the problems caused by cluster bombs and other UXO, the International Committee of the Red Cross (ICRC) commissioned a study, Explosive Remnants of War—Cluster Bombs and Landmines in Kosovo. It is worth quoting from the introduction to the study:

"Although the ICRC is aware that civilian casualties in armed conflicts are inevitable, it believes that a large proportion of the deaths and injuries from explosive remnants of war in the post-conflict context is both predictable and preventable. This report is aimed at launching a dialogue among governments, humanitarian agencies, the military, the mine clearance community and other interested organizations on how to achieve a dramatic reduction in the level of death and injury from explosive remnants of war can be achieved."

Consistent with their Kosovo report, the ICRC also published a study called Explosive Remnants of War—Submunitions and Other Unexploded Ordinance, which aimed to provide an overview of submunitions and their use, design and impact in the post-conflict period. At the same time, the UK Working Group on Landmines established a subcommittee to examine the use of Cluster Bombs—The Military Effectiveness and Impact on Civilians of Cluster Munitions. Both organizations called for a moratorium on the use of cluster bombs while their use, impact and legality were reviewed. The publication of these reports coincided with the start of the Preparatory Process for the Second Review Conference in 2000.

Based on the findings of its report, the ICRC recommended the following:

1. The use of cluster bombs and other types of submunitions against military objectives in populated areas should be prohibited, as is currently the case with incendiary weapons under Protocol III of the CCW.
2. Responsibility for the clearance of all UXO should be assigned to those who have used them, as is currently the case for landmines under the terms of APII of the CCW.
3. All necessary technical information concerning the location, dangers, detection and destruction of cluster bombs and other munitions should be made available to the United Nations and demining bodies immediately after the end of hostilities.
4. Warning of the threat posed by ERW should be provided to the civilian population immediately after their use in a given area, as it is the case for remotely delivered landmines in APII of the CCW.
5. In order to reduce the risk to civilians in future conflicts, cluster bombers and other submunitions should be fitted with mechanisms that will ensure their self-destruction immediately after the device fails to explode upon impact as designed.
6. The use of cluster bombs should be suspended until an international agreement on their use and clearance has been achieved.

In September 2000, the ICRC presented its findings and concerns to a number of States at an experts' meeting in Nyon, Switzerland. The goal of the ICRC was to ensure that a discussion about ERW was included in the Second CCW Review Conference. Independent pressure to ensure such a discussion also came from other non-governmental organizations (NGOs).

The Second Review Conference of the CCW

The Second Review Conference of the CCW took place in December 2001. The focus of states parties to the CCW was divided among several topics. The main focus was to ensure an extension of the scope of application of the CCW to cover internal as well as international conflicts. In addition to ERW, there were other issues under consideration, including mines other than APLs, measures for compliance and small arms.

Overall, despite the various proposals, the largest part of the time was spent discussing the issue of ERW. This was very much an educative process, as while some states were very aware of the issue, others were being introduced to the issue for the first time. It was never going to be possible to conclude a new agreement on ERW at the Review Conference. However, there was wide recognition of ERW as an important topic that needed to be examined further. To undertake the work, a Group of Government Experts (GGE) was established to discuss ways and means to address the issue of ERW. The group was to 'consider all factors, appropriate measures and proposals, in particular:

• Factors and types of munitions that could cause humanitarian problems after a conflict;
• Technical improvements and other measures for relevant types of munitions, including submunitions, which could reduce the risk of such munitions becoming ERW;
• The adequacy of existing international humanitarian law in minimising post-conflict risks of ERW, both to civilians and to the military.

In order to discuss these issues, the GGE met three times during 2002 for a total of less than five weeks. In reality, many of the diplomatic delegations remained unchanged from the Second
cleared land, but that is difficult to quantify. Therefore, the decision to scale back the program was plausible. As of June 30, 2003, approximately $6.4 million of funding was available to support the program.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.

The GICHD has been active in several areas since its establishment. In June 2003, the GICHD hosted a workshop on the implementation of the CCW in Kosovo. The workshop was attended by representatives from several States Parties and from UNMAS. The workshop focused on the implementation of the CCW in Kosovo, and the GICHD provided technical assistance to the workshop participants.

The GICHD has also been active in several areas related to the implementation of the CCW in Kosovo. In June 2003, the GICHD provided technical assistance to the United Nations Mine Action Service (UNMAS) in Kosovo. The GICHD also provided training and education to UNMAS in Kosovo.

The GICHD continues to support the CCW in several ways. First, the GICHD provides financial assistance to States Parties to the CCW and to the United Nations Mine Action Service (UNMAS). Second, the GICHD provides technical assistance to States Parties and to UNMAS. Finally, the GICHD provides training and education to States Parties and to UNMAS.
Background: A Unique Mine Situation

Unlike many mine-affected countries, the bulk of Thailand's landmine problem does not stem from a recent civil war or other internal conflict. The country's problem is concentrated on the border areas, mostly on the Thai-Cambodian border. At first, because the problem was basically limited to these areas, it was thought to be easily manageable using military resources. However, an impact survey conducted in 2001 revealed over 2,500 contaminated areas unsuitable for fear of mine contamination.

On top of a widespread threat, several other factors make mine clearance in Thailand a daunting task. The country's tropical climate makes working outside long hours almost unbearable, especially with work as painstaking as demining. Additionally, the terrain often poses problems. Much of the contaminated land is not flat and is dense with jungle vegetation, which means "mechanical demining technology is not an option, but an absolute necessity."  

Tackling the Problem

TMAC Takes the Reigns

Originally, the Royal Thai Armed Forces were solely in charge of managing Thailand's mine problem. After Thailand ratified the Mine Ban Treaty in November 1998, however, the Royal Thai government had to establish a focal point for the country's mine action activities. A National Mine Action Committee was created, which created TMAC in 1999 to act as the country's coordinating body for all mine action efforts. In 2001, TMAC set up three Humanitarian Mine Action Units (HMAs) along the Thai-Cambodian border with the help of the Thai army and navy. Each unit is composed of approximately 100 people responsible for mine awareness, detection, clearance, victim assistance and support.

Unique Solutions to Unique Problems

In order to cope with its mine problem, Thailand has had to blend several techniques used in mine action. As Mr. McCracken puts it, "Thailand has married the use of mechanical assistance, manual clearance and mine dog units." Mechanical methods are necessary for area reduction and especially for vegetation clearance. Once the machines have identified contaminated areas and paved the way, a combination of mine dog teams and manual deminers go to work. This "marriage" helps operations run smoothly and enables more efficient clearance.

The Role of PPE

PPE is a standard tool in today's demining operations. Using PPE is pretty much a matter of common sense—as Mr. McCracken says, "You don't go into a wood workshop without wearing your safety glasses, just as you don't go into a minefield without protective equipment." Yet, he explains, its value cannot be overstated: "Dampening the effect of the explosion for the deminer who is within one meter of [a] detonation is very, very significant."

TMAC's deminers use visors and body vests in their operations. As Mr. McCracken describes, deminers are introduced to the equipment from day one of their training. "We introduce it in the training cycle. The trainees start to wear it...and that transfers directly to the field, where you wear the equipment, so there's no change." One of the main reasons that it is imperative for demining trainees to get used to wearing PPE is that it is the most effective in preventing injuries. "We know there's only so much to do. If it's a mined area, we don't have it so easy. Once a mine is located, getting rid of the landmines is relatively easy." When minefields are known and documented, this task is not that difficult. Unfortunately, Thailand doesn't have it so easy. "In this particular region, what we have instead of actual minefields is mined areas...with no particular patterns," Mr. McCracken explains. "If there is a minefield, then we know its pattern, we know how many mines there are, and we know its dimensions...If it's a mined area, we don't know any of that."

Thus, Mr. McCracken stresses the need for tools to help with area reduction. Hosing in on the actual mined areas within the larger suspected areas is a necessity for efficient clearance operations. Just as important is "eliminating areas that have no indication [of containing] landmines," says Mr. McCracken, as this then saves time and restores safe land back to productive use much faster. Mechanical methods are one of the best ways of performing area reduction, and, as Mr. McCracken indicates, it is also good for "processing the terrain to allow for the follow-up clearance." In his opinion, more efficient area reduction equipment is the most-needed tool in the demining toolbox today.

So Many Mines, So Little Staff

Mr. McCracken acknowledges that the other major problem TMAC faces is not having enough staff to meet the program's demining needs. As TMAC we have 300
people, but we really need 300,000... It's going to take a lot of people, a lot of hard effort to get rid of the problem. The biggest difficulty is to ensure the continuing of all demining activities and the creation of new demining activities. 17 There are people who are willing to do the work, but currently, there just aren't enough funds to finance the scope of operations necessary to finish the job quickly. Mr. McCracken explains, "There's never been a shortage of volunteers to do demining, but there is a shortage of manpower and support... There isn't any one country that can tackle the entire problem on their own."

Conclusion

TMAC has many years of hard work ahead of it in order to fully resolve Thailand's mine problem. In spite of the challenges, the organization is making strides and building on its successes. In its first few years of distance operations alone, TMAC cleared 4,45,387 square meters of land, ridding the country of over 2,000 mines and more than 22,000 units of UXO. While the problem is far from over, TMAC is overcoming hurdles in hopes of making the land safe for the Thai people.

"All photos courtesy of McCracken."

Contact Information

Dave McCracken
Planfire Court Suite #616
160 Pipat Soi 2, Silom Rd
Bangkok District
Bangkok 10500
Thailand
Tel: +66-1-805-8108
Fax: +66-2-266-8032
E-mail: dmc@planfire.com
Website: www.tmac.go.th/

Nicole Knger
Tel: 540-568-2810
E-mail: knger@cmm.ru


Explosive Remnants of War
continued from page 39

Contact Information

Mr. Paul Ellis
GICHD
Tel: +44-20-7916-96-96
E-mail: pellis@gichd.ch

Prepare 5.00, 2002.

This page explains the personal protective equipment (PPE) that a demining group must use in order to comply with the United Nations’ International Mine Action Standards (IMAS). The author was an active member of the User Focus Group advising the Geneva International Centre for Humanitarian Demining (GICHD) when the manual made the current IMAS revision. He continues as an elected member of the IMAS Review Board. The author has also maintained a database of demining accidents for five years, and uses the evidence of real accidents to inform his views on protection needs.

by Andy Smith, AV Mine Action Consultants

In June 2000, I published a paper in this journal under the title "The Facts on Protection Needs in Humanitarian Demining." 19 In that paper, I explained how the results of real accidents in demining could be used to assess protection needs. That paper was intended to provide a check list—a balance against a few PPE manufacturers who had seemed a market and thrown together some unstructured, unprofit. Today, the pseudo-academic controversy continues and a new generation of potential purchasers may benefit from making an informed decision.

My views in this paper are based on extensive field experience, the detailed investigations in the Database of Demining Accidents (DDAS) and on the many follow-up interviews of accident victims that I have undertaken. Statistics quoted in this paper are derived from the latest version of the database, including data not included in the United Nations Mine Action Service (UNMAS) version released through GICHD last year. 20 Risk and Its Reduction

Anyone considering the risks in demining should be aware that demining accidents are rare. While I do not have all of the relevant data, I have been able to make a few comparisons. I have been in the field a few years in some theatres and one in Bangkok for my Ph.D. work. To make this study you must have reliable information about the number of deminers and the scope of the operations actually working in mined areas, the hours worked and the accidents suffered. My limited investigation showed that severely disabling accidents occur at the rate of one for every 30,000-40,000 hours of work. This I believe is a worst-case figure—and that accidents in most demining theatres are much rarer than this.

However rare they may be, explosive accidents can inflict very severe injuries. The loading of the deminer (a "Worker") is to be 90% of the maximum lifting capacity, with the remainder as a "duty of care". The greater the number of explosive accidents, the greater the need to use protective equipment. The term "accident" is used to cover the activity when a deminer is using a probe, probe, bayonet, scrapes, pick-it, bow, trowel or any other hand-tool to investigate a suspicious area of ground. The investigation may follow a metal-detector reading, a dog-signal, a break in a conceivable pattern of mines or reliable information that a mine or other device is there. In almost all cases, the deminer will be squating or kneeling as he does this.

The commonest mine to be detonated during excavation is the largest common AP blast mine—the PMN with a 240 g TNT main charge. A deminer can realistically be protected against the effects of this when it detonates 30 cm (12 in) from his knees.

International Mine Action Standards and PPE

Section 10.30 of the United Nations' IMAS has the title Personal Protective Equipment. It is still possible, as the standard covers the use of a range of equipment and working stan

Published by JMU Scholarly Commons, 2003

42

43

44
that should make it easy for the IMAS to be adopted by military deminers as well as humanitarian deminers in all mined countries. Throughout the IMAS, the terms "should" and "shall" are used with a very different meaning. When they write that something "shall" be done, it is obligatory. If it is not done, the demining group cannot claim to be operating in accordance with the IMAS. When they write that something "should" be done, it indicates the authors' "preference" and is not an obligation. If the term "may" is used, it is only "to indicate a possible method or course of action.

Evidence from the DDAS was used to help determine the obligatory requirements. The only obligatory articles of PPE are frontal body protection and a long visor. Other "optional" equipment is mentioned. This inclusion was either as a result of pressure from "interested" bodies who advised the IMAS User Focus Group, or because there were differences of opinion between group members and those who were canvassed during "outreach" in the field. The optional equipment included advice on when it would be appropriate to wear helmets; b) a preference for handtools to be properly designated as protective equipment; and c) an invitation that a reader "may" like to assess the use of blast-resistant boots.

Body Protection

To comply with IMAS, deminers must wear "frontal protection, appropriate to the activity, capable of protecting against the blast effects of 240 g of TNT at 30 cm [11ms]." Notice that there is no standard agreement (STANAG) v50 cited. This is not fragmentation armour, but blast armour. Good blast armour will always provide some fragmentation protection, but it does not have to meet the (NATO) North Atlantic Treaty Organization STANAG §50 of 458 metres a second. Under Section 4.3 "Fragmentation protection," the requirement is extended with the additional preference that body armour with a STANAG v50 of 450 m/s is used, but this is not an obligation. This is because the authors recognised that fragmentation mines had defeated the best PPE before they were used, so they decided that the risk from them should be minimised "procedurally" rather than by imposing an inflexible requirement for one type of PPE that would be resisted in the field. The procedural approach involves promoting appropriate training, field discipline and the effective use of armoured machines for area protection when fragmentation mines are expected.

What this means to the end-user is that a demining group can wear armour with a v50 lower than 450 m/s—-as long as that armour protects fully against the blast and environmental fragmentation associated with a PAMN AP blast mine at 30 cm. I know two internationally respected groups that do this—and having tried their armour, I can say with confidence that it performs better against blast than many other designs with a much higher fragmentation specification. It is, however, performed without any problem in at least 35 real accidents to date. The NATO STANAG fragmentation test was not designed to determine the vulnerability of the ground to the blast and should provide adequate stand-off from an anticipated point of detonation.

The need "should" instead of "shall" was a disappointment. But everyone's views had to be combined and the end result is a workable compromise. For more information on blast-resistant handtools see the article "Safer Demining Handtools in Zimbabwe" in Vol 6.2 of this journal.

Visors

The obligatory IMAS requirements for visors is "eye protection capable of retaining integrity against the blast effects of 240 g of TNT at 60 cm, providing full frontal coverage of face and throat as part of the specified frontal protection ensemble, five-mm thick polycarbonate visors have been widely used since this time in the mid-1990s. If it had been given my way, the IMAS would state that, as a general rule, a visor in regular use should be replaced every six months. "...if vision through the visor is restricted. Others disagreed, so this requirement was not included. There is, however, a requirement for all protection to be regularly inspected to ensure it is fit for use. Users should remember that polycarbonate is hardened by UV exposure and scratches very easily. To maintain protection and to ensure clear vision, they should be replaced frequently.

Hand-Tools as PPE

It is a credit to those at GICHD who drafted the IMAS that the available facts informed the requirements. However, other opinions and beliefs had to be respected, especially when persuasive evidence was available from unbiased sources. Under those conditions, the suggested PPE could only be included as a preference, not a requirement. This happened with my own opinion on the need for long and blast-resistant tools. I believed that there was enough evidence to make them a requirement, but there were contrary opinions and the safer hand tools became "preferred" instead of obligatory.

On handtools, IMAS now reads: "Hand tools should be constructed in such a way that their separation from fragments is facilitated. Resulting from the detonation of an AP blast-mine incident is reduced to a minimum. Hand tools should be designed so that their chins-strap can be easily removed and hand tools should be equipped with a strap which is attached to the ground to provide adequate stand-off from an anticipated point of detonation."

The use "should" instead of "shall" was a disappointment. But everyone's views had to be combined and the end result is a workable compromise. For more information on blast-resistant handtools see the article "Safer Demining Handtools in Zimbabwe" in Vol 6.2 of this journal.

Blast-Boots as PPE

Blast-boots or mine-boots are awarded the lowest IMAS requirement—one that says that a user of the IMAS "may" like to consider their use. Even that low level of requirement is made conditional on there being new evidence that they are effective. On blast-resistant footwear, the IMAS reads: "[P]rofessional organisations may consider providing blast-proof boots for the protection of feet and lower limbs, where there is a significant risk that cannot be reduced by SOVs alone, provided that the blast boots being considered are proven to be effective in reducing that risk.

Note: The effectiveness and operational benefits of mine-boots is still a contentious issue within the mine clearance community. To date, only one independent study (funded by the United States government) has been conducted, which identified that the cost of provision and replacement is high, while the benefits are uncertain. There is currently a danger that they offer "false security.""

In the tests referred to, one well-known supplier failed to provide enough samples for a meaningful conclusion to be reached. When assessing the test, there was some evidence that injury might be reduced. There are no examples in the database where wearing a helmet reduced injury in any significant way. By a "significant reduction" I mean a reduction in the range of recorded injuries. For example, it is likely that a few fragments were deflected by the helmet pictured on the next page, but that did not prevent the wearer suffering very severe head injuries. He died, but it was not considered much of an achievement to decide whether he died or not from his head wounds or from the extensive body penetration that he also suffered, despite his frag-jacket. There was even some argument over whether the helmet was being worn (or worn properly) at the time, but the in-and-out damage tells us that this was irrelevant to the outcome for the victim.

It is important that a visor should be held steady on the wearer's head, and a helmet can be used to do this. This can also be achieved using one of many of the open head-frames that are used to support visors and are preferred by demining groups like MineTech, HALO Trust, Menschen gegen Mieten (MGM)—in English, People Against Landmines), the UN Accelerated Demining Programme (UNADP), the Danish Demining Group (DDG) and Norwegian Peoples Aid (NPA). There is no evidence to support the claim that it is necessary to strap the visor to the front of the face. Indeed there is some evidence that, when worn loosely, such a chin-strap can increase injury. An unsecured visor tends to be torn away in the blast-front passes. To an observer, this can look as though the visor has failed. In fact, at 60 cm from an AP blast-mine, the fragments of soil, stone, and plastic casing are moving ahead of the blastfront. They hit the visor first, and the blasting blast front then takes the visor with it, making the wearer's face and eyes are protected at the critical time.

In most accidents when excavating an AP blast-mine in which the victim was wearing a visor without a helmet, the visor was torn away by the passage of the blast-front. In many accidents when the victim was wearing a helmet and visor and the helmet was not secured, the helmet and visor were also torn away. The victims suffered eye injuries if their visor were
The IMAS include the disclaimer that “although this standard lays down distances at which the PPE must be effective it must be emphasised that this does NOT imply to deminers that they will be safe at such distances.” Given the unpredictable nature of blast events, this is wise. Also, the wearer’s arms are exposed and can be at a high risk if he is using an inappropriate tool as he works.

The IMAS PPE requirements were informed by the accident record but took other things into account, such as deminer acceptability. Deminers do not want to wear protection that they believe is unnecessary, which is probably why the PPE requirements were reiterated in the earlier issue of IMAS were widely ignored. If a group can afford it and it would feel safer using PPE with a higher specification, they should do so—almost as the increased weight and discomfort do not lead to the PPE being discarded as soon as the supervisor’s back is turned.

I recommend that any excess money in the budget is used to replace the visors regularly—because they do get scratched and IMAS state “equipment shall be examined on a regular basis to ensure that it is suitable for use.” If this had been done, Hawor of more than 500handed deminers who would probably have benefited. Further excess funds should be used to purchase new hand tools that have been designed to protect the user’s hands and arms.

**About the Author**

Andy Smith has been a hand-on demining researcher for the past eight years. His work has located him in hundreds of mined areas in Angola, Mozambique, Cambodia, Zimbabwe, Namibia and Afghanistan—and less extensively in Kosovo, Croatia and Bosnia Herzegovina. He has directed and implemented equipment tests in several countries, developed new equipment and oversaw its technology transfer to developing countries, and been employed as a “subject matter specialist” by research programmes, universities and many of the major players in humanitarian demining. Recent work has included producing country-specific training materials for deminers, surveyors and the general public. He began the DDA in 1998 and is currently negotiating its upshot for the UNMAS.

**References**

4. For a free copy, please contact Paul Ellis at GICHD pellis@gichd.ch.
5. All these tools are widely used and have featured in accidents. In particular, Aladdin McGahen and Alan Braden.
7. United States Army Communications and Electronics Command (CECOM) Research, Development and Engineering Center (RDEC) Night Vision and Electronic Sensors Directorate (NVESD) at Fort Belvoir and the Canadian Centre for Mine Action Technologies (CCMAT), based at Defence Research and Development Canada (DRDC)-Suffield. A side from developing a wide range of PPE, these continuing cooperative efforts have allowed extensive systematic collection of PPE using real and simulated mine threats, new standard methodologies to be established, and the measurement of the effect of mines on the human body. This article briefly discusses the features of the created equipment, explains how the equipment was evaluated and provides an overview of test results.

**Contact Information**

Andy Smith
AVS Mine Action Consultants
E-mail: avs@landmines.demon.co.uk

---

**PPE: Effective Protection for Deminers**

**Introduction**

Mine Action Systems (MES) is the world leader in the research, design and manufacture of PPE for persons facing the threat of an explosive device. Since its inception in 1981, MES has become best known for its explosive ordnance disposal (EOD) suits and helmets, which are in wide use around the world by police and military units. As a natural extension of this product line of protective ensembles, MES has chosen to design and produce various lightweight ensembles and equipment for demining. These efforts began in earnest in the late 1990s in collaboration with both the U.S. Army Communications and Electronics Command (CECOM) Research, Development and Engineering Center (RDEC) Night Vision and Electronic Sensors Directorate (NVESD) at Fort Belvoir and the Canadian Centre for Mine Action Technologies (CCMAT), based at Defence Research and Development Canada (DRDC)-Suffield. From developing a wide range of PPE, these continuing cooperative efforts have allowed extensive systematic collection of PPE using real and simulated mine threats, new standard methodologies to be established, and the measurement of the effect of mines on the human body. This article briefly discusses the features of the created equipment, explains how the equipment was evaluated and provides an overview of test results.

This article briefly explains the work that Mine-Eng Systems, Inc., has done on personal protective equipment (PPE) over the past few years.

---

**Designing for the Threats of a Mine Blast**

Before delving into the specific components of PPE, it is useful to briefly review the threats posed to the deminer through the detonation of a mine. This helps to explain many of the features that are built into the PPE. When facing a conventional explosive device such as a landmine, four threats are considered. The first is overpressure, or the sudden and drastic rise in ambient pressure as the blast wave from the detonation emanates from the mine. When very close to the mine, such as a mine detonates while being stepped on or being handled, the overpressure levels may result in amputations. Overpressure levels decay rapidly with standoff distance; however, they can still cause eardrum injuries and can lead to hemorrhaging of the lungs and bowels when the deminer is in close proximity to the AP mine.

Fragmentation forms the second and most obvious threat from a mine. Pieces of mine casing, fragments, soil or stones can all cause punctures, lacerations and lethal injuries to vital organs. The third threat from a mine is impact. This is a result of the overpressure wave inducing violent levels of acceleration on the head of the victim, which in turn can cause a range of concussive injuries, depending on head positioning relative to the blast. As a result, the standoff distance. The final threat is the range of heat and flame injuries that can result from the short-lived fireball released upon detonation.

While the four threats are each separate causes of injury, they rarely act in isolation; rather, they operate together to create the overall level of injury. As a result, PPE design needs to account for all the threats from a blast in order to reduce the overall injury level. It should be noted that when a victim is injured by detonating a mine, the obvious open wounds are the ones that receive immediate attention, though other injuries that may be less visible could be more serious.

---

**Protection for the Torso and Body**

Two lightweight protective ensembles for the torso and body of the deminer have been developed. The Lightweight Demining Ensemble (LDE) is a two-piece system designed to provide continuous frontal protection to the deminer from the lower legs up to the neck and over the shoulders (Fig. 1). The back of the system is flat open to prevent the buildup of heat. A base stacking of soft ballistic materials provides fragmentation protection throughout, while rigid ballistic plates in combination with a blast attenuation system are in place over the vital regions of the chest, abdomen and groin to provide added protection. The plate in place over the chest of the apron also serves the vital purpose of integrating with the visor of a protective helmet system, which provides a continuous layer of enhanced blast and fragmentation protection over the critical frontal torso region. The LDE system also comprises modular chest, arm, hand, and lower arm/leg components, complete with sets of all the arms and back of the deminer, if so desired.

The second system is the Demining Apron, a one-piece system based on the LDE that provides protection to the chest, arms, and back of the deminer, from the thighs to the neck (Fig. 2). The lighter...
and the chest an OHP-100 on the sunulatmg on the
Figure 2: Deminer equipped protection corresponding the visor of the LDH in~egration setup for
Figure 3: Test kneeling mannequin, 1
and CHP-100 in 80
deminer. The most common resri ng was to tested with the 17-grain fragment-
fragmentation over the chest, to
and blast attenuation advanced level of the LDE, a rigid plate
observed, and the effect of the mine detonation on the body can be measured (Fig. 3).
The concept of these tests is simple. However, to obtain sound data for meaningful evaluation, careful control of all variables is required. Perhaps the most significant challenge was mannequin positioning. A 77-kg inanimate mannequin does not easily adopt a consistent stance. As a result, an advanced positioning apparatus was designed and constructed by MES. The apparatus is fully adjustable in all dimensions and allows for the mannequin to be placed in a full range of positions, all with precise repeatability. Moreover, the use of small-link chains for support does not interfere with the mannequin's initial biofluidic response under blast loading. This test rig proved so effective that its use has been adopted by CCMAE, the U.S. Army (Farr Delvoir), and the Aberdeen Test Center for their own evaluations of the mannequin PPE.
The performance of both the LDE and Demining Apron during full-scale blast mine tests demonstrated their effectiveness as detonation protection. In terms of both the integrity and fragmentation resistance, the LDE and Demining Apron have not been penetrated by the fragmentation created by the blast-type AP mines used. The damage that is sometimes observed is in the form of minor localized ripping of the outer shell that does not compromise protection levels.

weight of the Demining Apron it is especially suitable for use in hot and humid climates, while still providing as an advanced level of protection. Similar to the LDE, a rigid plate and blast attenuating system are in place over the chest, to enhance protection and to integrate with a protective helmet.

Both the LDH and Demining Apron
and L D E provide
ballistic/ fragmentation protection corresponding to a
minimum V50 level of 500 m/s (tested in accordance with MIL-STD-662F), a single test with the 17-grain fragment-simulating projectile (FSP). However, due to the presence of the lightweight rigid plates, this increases to 575 m/s over the torso.
The LDE and Demining Apron systems have been subjected to extensive testing to evaluate their ability to protect the deminer. The most common testing was to

dress instrumented anthropomorphic mannequins with the PPE and place these human surrogates in realistic demining positions. A simulated mine—composed of a short cylinder (or pack) of C4 explosive within a plastic casing buried in the ground at a controlled depth—would then be detonated to simulate a demining accident. The simulated mines ranged in size from 50 to 200 g of C4 to represent a wide range of mines including the proliferate PMN. Full-scale testing like this allows for a comprehensive evaluation in a realistic environment: the blast integrity of the equipment (including helmets, hand protectors and other accessories) can be observed, and the effect of the mine detonation on the body can be measured (Fig. 3).

Protection for the Head

Two head and face protection systems have been designed and tested. The Lightweight Demining Helmet (LDE) provides head and face protection by having a 5.7-mm visor mounted onto a lightweight, yet stable, helmet platform (Fig. 2). The visor is designed to protect the entire frontal profile of the head, while also integrating with the rigid chest plate to be part of both the LDE and Demining Apron. By having the visor fit in behind the top of the chest plate, overpressure is insulated from directly reaching the inside of the visor, helping to ensure that the visor and helmet remain in place over the head and face of a user throughout a blast event. The Visor Band System (VBS-250) is designed for those users who desire to use, or are already equipped with, a military-style helmet (such as a PASGT helmet or similar). The VBS-250 (Fig. 3), through a four-point mounting bracket, rigidly attaches a 5.7-mm visor to an infantry helmet. In the same fashion as the LDE, the visor is integrated to integrate with the chest plate of the LDE or Demining Apron. Both helmet systems offer a V50 rating of 250 m/s over the face of the deminer. As an example, in tests when the mannequins faced a 200-g C4 mine in a kneeling position at an 80-cm nose-mine standoff, the unprotected mannequin was predicted to experience a 100 percent probability of a fatal conjunctival injury. On the other hand, when equipped with the LDH, the injury probability was significantly reduced and predicted 64 percent probability of no injury. With the VBS-250 in place, the likelihood of no injury increased to 88 percent. While the HIC has not been validated as an applicable means to assess blast-induced head acceleration injuries, the data presented illustrate a relative effectiveness of the different helmet systems in providing protection.
The use of a half-faced visor mounted on a helmet also leads to significant reductions in the overpressure that acts on the ear. By mounting a pressure sensor at the area of the ear on the mannequins, it was measured that, compared to the unprotected case, the LDH and VBS-250 both reduce the peak levels of overpressure by between 40 and 85 percent.

Deminer Positioning

Through an examination of head acceleration measurements, the importance of subtle changes in the deminer’s position was assessed. One aspect that was studied was changing standoff position by 10-cm increments. For example, it was found that by increasing standoff from 70 cm to 80 cm, in a kneeling position, coupled to the unprotected case, the LDH and VBS-250 both reduce the peak levels of overpressure by between 40 and 85 percent.

Hand Protectors

During demining operations, the hands of the deminer are often in close proximity to live mines. As a result, the hands become extremely vulnerable and challenging to protect. One method to maximize standoff distance; however, this is not always possible. In conjunction with users, MES has developed a pair of hand-protection devices that can be used during operations.

The Conical Hand Protector (CHP-100) is designed to be used during demining with a probing with a slender, cylindrical mine probe (Fig. 2). A threaded rubber plug and cap secure the probe in place, so thus the emanating threats are located in a conical region because the ground and soil focus the effects. By placing oneself in a lower position while still maintaining standoff distance, the exposure to this conical region of increased threat can be reduced, and the injuries effect on the deminer can be diminished.

As an example, during testing it was shown that adopting a relatively low position, while maintaining standoff, could reduce the measured levels of head acceleration by half.
The evaluation of the hand protectors was done by placing them on the hands of anthropomorphic mannequins used in the blast testing described above (Fig. 3). During the over 240 tests performed, the protectors were placed as close as 15 cm from the simulated mines; however, the most common standoff distances were between 20 and 30 cm.

Results of blast testing indicate that these demining hand protection concepts provide excellent protection and offer the potential to reduce and minimize injury to the hand of a deminer. Throughout the entire span of tests, the hand protectors were never penetrated by fragmentation, and in most tests, they retained their structural integrity. Figure 7 illustrates a typical result from a 200 g C4 simulated mine, showing increased ripping of the outer shell, but with overall structural integrity intact. A note of caution, however: because these tests have been performed with mannequins and not biological specimens, a precise estimate of injury reduction cannot be performed, despite the encouraging results.

**Protection for the Foot**

If a deminer steps on a mine while wearing a conventional boot or even a typical "blast boot," the foot is usually in close proximity to the charge, as only a thickened or reinforced sole separates the foot from the mine. At such small standoffs, the overpressure, fragmentation, and heat generated by even small mines overwhelm the integrity of most materials. The result is likely a traumatic amputation of the foot leg, depending on mine size. To address this problem, the Spider Boot was developed. It consists of a shielded platform suspended by four "legs" proceeding forward and backwards (Fig. 1). A regular boot is attached to the platform through an adjustable binding system. The design of the Spider Boot is such that if a mine is triggered, it is done so by one of the pods, resulting in a much increased standoff distance between the exploding mine and the foot compared to conventional footwear. This results in the blast effects of the mine being allowed to dissipate substantially before interacting with the foot.

During the development of the Spider Boot, blast tests were carried out using a mechanical surrogate leg in collaboration with CCMAT, which demonstrated the effectiveness of the Spider Boot (Fig. 9a & 9b). By measuring various parameters on the surrogate leg, the injuries transmitted by the blast could be recorded. The Spider Boot, with its built-in standoff, was able to reduce the effects transmitted to the surrogate foot by more than 90 percent compared to select commercially available blast boots.

Further testing was performed by the U.S. Army NVESD under the Lower Extremity Assessment Program (LEAP) to evaluate the performance of various types of mine-protective footwear. In these tests, the footgear—including the U.S. Army Combat Boot, two commercially available blast boots (with and without overboot), and the Spider Boot—was placed on the feet of cadaver specimens.

For the Spider Boot, no amputation was deemed necessary for two of the three tests performed against the large PMN mine (249 g TNT). Moreover, in the only case that an amputation might have been the outcome predicted, no contamination of the wound was observed, making the injury less severe.

In contrast, it was found that even for the small M-14 mine (28 g explosive), the commercially available blast boots with overboots provided only limited protection, with three tests out of five resulting in traumatic amputation of the lower leg. (The Spider Boot was not tested against the smaller M-14 mine, as it was deemed unnecessary, due to its proven superior protection for much larger mines.) Against the larger mines (the PMA-2 and the PMN), amputation was always required with the blast boot/overboot combination. These limited tests are not enough to confirm the important role of standoff in the design of a mine boot. There have also been several recent blast test series of the Spider Boot conducted by military scientists of the North Atlantic Treaty Organization (NATO) and other countries during 2002.

**Summary**

MES has developed a full range of PPE to use by deminers. If so desired, the deminer can choose protection to cover the body, the head and face, the hands, and the foot. Aside from the development of this equipment, extensive scientific testing has been carried out to demonstrate its effectiveness. The possibility of concussive injury and overpressure impinging the torso and ears has been shown to be dramatically reduced by the use of a combination of the LDE or Deminering Apron with the LDH or VBS-250. Moreover, through the systematic testing performed, it has been demonstrated that even seemingly small changes in demining posture can have a drastic consequence on the blast effects experienced by the deminer in the case of an accident. Testing has also been able to demonstrate that the hand protection created could significantly reduce injury in certain situations. The foot-protecting Spider Boots, with their unique ability to introduce the essential standoff between the mine and the deminer's foot, and a further deflection and dispersion of the blast wave and its effects, have been shown to significantly reduce the injury outcome a deminer would experience when a mine is stepped on.

This paper is only able to briefly summarize the extensive programs that MES and its testing/development partners have carried out over the past five years to design effective protection for the deminer. Extensive test reports, papers, and documentation are available to expand upon the information provided.

---

*All graphics courtesy of the authors.*

**References**


4. EMHC Topography, 807 East, B.A Walkie, CD, Mellor, Experimental Testing of the Med-Eng Systems

---

**Contact Information**

Art Muths, Vice President, Research and Development
Med-Eng Systems, Inc.
2400 St. Laurent Blvd.
Ottawa, Ontario
K1G 6C4
Canada
Tel: 613-739-9646
Fax: 613-739-4536
E-mail: amuths@med-eng.com
Website: www.med-eng.com
Use of Multi-Criteria Analysis in Allocating EOD Teams in Humanitarian Mine Action

The author explains how a standard economic planning tool, multi-criteria analysis (MCA), can be used to help plan mobility allocation of explosive ordnance disposal (EOD) teams between regions in a humanitarian mine action program and solicits comments on how the model could be developed.

Introduction

Many demining programs face significant problems in attracting resources. There may be several reasons for this, but one that is commonly heard is that donors are not comfortable with the observed outcomes of programs. However, over the last few years, socio-economic issues have come to be a greater part of planning mine action projects, and, in particular, demining or area clearance projects. The reasons for this are comparatively clear demining capacity is a scarce and expensive resource, and it makes sense to utilise that capacity where it can do the most good for local development. It may be that the use of socio-economic tools to assist in prioritisation of resource allocation will help alleviate donor concerns.

The publication "A Study of Socio-Economic Approaches to Mine Action" was one of the first to set out some of these issues, and the increasing emphasis of "impact" in the survey process also marks the increasing importance of such criteria. However, in focusing on the area clearance question, there has been comparatively little attention paid to the question of allocating mobile EOD teams between different regions. EOD teams do not clear land, so economic tools such as cost-benefit analysis (CBA) do not provide a means to prioritise their activities. Nevertheless, it is the contention of this paper that EOD teams are also a scarce and expensive resource and may help EOD planners to demonstrate that they are being used in an optimum manner.

Background

All readers will be familiar with MCA techniques, though the name is rarely used outside economic circles. In its most trivial incarnation, MCA is the method consumer magazines use to rate items such as electrical appliances. For example, most people will have seen tables that compare digital cameras such as the one in Table 1.

It is worth taking some time to analyse this table. "Option" covers the choice open to the stakeholders (in this case, the five cameras available to the public that have been considered by the survey). In MCA, the options have to be discrete and distinct, i.e., option 1 is not the same as option 2. "Attribute" covers the attributes (a.k.a. criteria) that the surveyors have considered for the analysis (attributes also have to be discrete and distinct). The surveyors then score the options in terms of each of these attributes.

Now first that there are different ways of scoring. The "score" question is comparatively simple: does the camera have a zoom or not? This produces a simple yes/no response that economists refer to as a "dummy." We will come back to potential application of this yes/no filter later. Memory is measured here in megabytes, and price in dollars. Finally, the more subjective attributes are scored in stars, with the camera with the "best" rating given five stars and the others ranked accordingly. Again, we will come back to the question of units and numbers later.

In this simple application, the MCA table does not attempt to select which camera is the "best" because the stakeholder, according to their need, will do this. For example, a potential buyer on a tight budget constraint may decide that the price criterion is much more important than the others. In economic parlance, the stakeholder will "weight" this criterion.

Use of MCA in Project Analysis

The use of such a simple model as an introduction to the MCA concept should not mislead the power of the tool, however. Indeed, governments regularly use MCA as a way of making choices about major development projects. Imagine a western government having to decide whether to expand the airport serving their capital. They may have identified three main options:

1. Do nothing, i.e., live with the level of air traffic at present.
2. Build a new runway at the existing airport (which is badly served by land transport connections).
3. Build a new airport on a green field site (which has access to motorway and international rail links but is in an environmentally sensitive area).

Each option has several advantages and disadvantages, and the application of the MCA process helps set these out clearly.

The first thing to note about this use of MCA is that it is possible to resolve everything in the same terms (i.e., in the same unit of measure). In this example, the government's economists could estimate the benefits of the extra flights and jobs and also the environmental costs. Substituting these figures into the table, it would be possible to work out the value in dollar terms of each option. In other words, by using common units of measure, the MCA process can actually produce a cardinal result—i.e., the options are automatically ranked and their relative values determined. In even more simple terms, MCA is a process by which we can compare apples and oranges!

Application of MCA Techniques for EOD Resource Allocation

It is suggested that MCA techniques can be used to divide mobile EOD teams between provinces in a national humanitarian program in an objective and transparent manner to achieve the optimum allocation of resources.

Selection of Criteria

For the purposes of EOD resource allocation, the following criteria are proposed:

- Size of province in square kilometers
- Degree of contamination reported in each province
- Number of reported casualties per province
- Population of province

Data entered to the MCA will be derived from various sources, such as: a. databases containing information on UXO and other munitions; b. national landmine/UXO survey (providing such a survey has been carried out).

Options

Of course, there is only one option available (i.e., the provision of EOD services), but use of survey data means that, in this case, each province can be scored in terms of the criteria. Furthermore, by scoring on a percentage basis, the criteria will be "large-numbered" attributes (such as area in square kilometers, which may be a five-figure number) will use an "overwhelmed" small-numbered attribute (such as number of casualties, which may be in the low hundreds at the most). This generates an MCA table similar to the example in Table 3, based on a fictional country with five provinces.

At first, this appears to provide a simple ranking of each province, but at the moment this includes a score for province B, which in fact has no contamination. This is where the "dummy" technique referred to above comes into use. By simply multiplying the survey scores by either 1 (has contamination) or 0 (does not have contamination) the scores can be amended to take account of this. This is done in Table 4.

Weighting

Weighting requires participation of stakeholders to make the process more inclusive. While this approach is more subjective than the earlier steps, which have been based purely on application of data, it is comparatively objective when that trend to "fly by the seat of the pants!"

For the purposes of this paper, it is suggested that, as the prime function of EOD teams is to save lives and prevent injuries from accidental detonation of UXO, the criterion that is most relevant to this function (i.e., the number of casualties) could be weighted.

In this example, the casualty figures are given a weighting of a factor of three. When this weighting is inserted in the table, it has the following effect (see Table 5).

Stakeholder Analysis and Sequence of Events

It is worth making the point here that the MCA tool is at its best when used to increase transparency. This can be done in this context by involving stakeholders

Table 1: Example of Simple MCA Table

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Option</th>
<th>Acme 2000</th>
<th>Delux</th>
<th>Superlight</th>
<th>No</th>
<th>El Cheapo</th>
<th>No</th>
<th>Bag Standard</th>
<th>No</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoom</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>16</td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>32</td>
<td>64</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Robustness</td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>16</td>
</tr>
<tr>
<td>Ease of use</td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>16</td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td>$600</td>
<td>$500</td>
<td>$700</td>
<td>$100</td>
<td>$300</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

Table 2: Example of Typical MCA Used in Project Analysis

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Option</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of Flights</td>
<td></td>
<td>100%</td>
<td>150%</td>
<td>300%</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td>Nil</td>
<td>+2000</td>
<td>+4000</td>
</tr>
<tr>
<td>Effect on local</td>
<td></td>
<td>Nil</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Effect on local</td>
<td></td>
<td>Nil</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Effect on local</td>
<td></td>
<td>Nil</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Effect on local quality of life</td>
<td></td>
<td>Nil</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Net cost/benefit</td>
<td></td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Cost of construction</td>
<td>$</td>
<td>$0</td>
<td>$400m</td>
<td>$900m</td>
</tr>
</tbody>
</table>

Table 3: EOD MCA Step 1 (Initial Scoring)

<table>
<thead>
<tr>
<th>Province</th>
<th>Size in km²</th>
<th>Degree of contamination</th>
<th>Reported casualties</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14.36</td>
<td>27.61</td>
<td>34.66</td>
<td>21.99</td>
</tr>
<tr>
<td>B</td>
<td>32.65</td>
<td>72.78</td>
<td>67.77</td>
<td>28.00</td>
</tr>
<tr>
<td>C</td>
<td>16.51</td>
<td>23.15</td>
<td>23.15</td>
<td>30.00</td>
</tr>
<tr>
<td>D</td>
<td>19.20</td>
<td>23.15</td>
<td>23.15</td>
<td>30.00</td>
</tr>
<tr>
<td>E</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: EOD MCA Step 2 (Final Scoring)

<table>
<thead>
<tr>
<th>Province</th>
<th>Size in km²</th>
<th>Degree of contamination</th>
<th>Reported casualties</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14.36</td>
<td>27.61</td>
<td>34.66</td>
<td>21.99</td>
</tr>
<tr>
<td>B</td>
<td>32.65</td>
<td>72.78</td>
<td>67.77</td>
<td>28.00</td>
</tr>
<tr>
<td>C</td>
<td>16.51</td>
<td>23.15</td>
<td>23.15</td>
<td>30.00</td>
</tr>
<tr>
<td>D</td>
<td>19.20</td>
<td>23.15</td>
<td>23.15</td>
<td>30.00</td>
</tr>
<tr>
<td>E</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
in selection of criteria and decisions on weighting before populating the table with data, as this then means that the conclusions about resource allocation can be shown to have been done in a transparent and objective manner, which should help minimise donor confidence and thus in the release of funds. It may also be useful to involve beneficiary groups (such as provincial government representatives) in the criteria selection and weighting process as it may help them buy into the way that teams are allocated. This is also in line with modern development approaches in that it encourages local ownership of the program at all levels. Once the data is inserted in the table and the weighted scores obtained, the final score can be calculated as the ratio in which the EOD teams can be allocated. In this fictional example, imagine that the program has 24 EOD teams.

Therefore, they should be allocated in the ratio: 169/4=41:1

Dividing each score by 517 (the total of the scores), and multiplying the result in each cell by 24 (the number of available teams) and rounding the result gives us the ratio to divide the teams. This is set out in Table 6.

Effect of Time

In general, the MCA process is used to assist in making irreversible decisions. One can imagine that a dissatisfied customer can return a digital camera to the store, but it is harder to imagine dismantling an airport! In both cases, the MCA process is a "one-shot" analysis done to help make the decision about which option to adopt. However, when MCA is used to assist in EOD planning, we do have the ability to modify resource allocation on a periodical basis. In this case, given that the size of each province would remain constant (and assuming either a constant population or equal proportionate growth across each province), it would be simple to revise the MCA process armed with the most recent casualty data and re-calculate the most appropriate ratio. Of course, it would also be possible to change the weighting over time, and even introduce different criteria. One can imagine doing this on an annual basis as part of the project cycle/annual budget allocation process. Figure 1 represents this process diagrammatically.

Advantages & Limitations

Advantages

There seem to be several advantages to this process. First, it is logical and easy to understand (and hence easy to explain to others in the planning process). Second, it allocates resources objectively, which, when reinforced by appropriate inclusion of stakeholders in identification of criteria and weighting makes the process very transparent (thus helping with donor confidence). The use of the weighting mechanism also allows policy makers to intervene in a transparent and comparatively objective manner. Finally, periodic revision would allow planners to take account of changing circumstances over time.

Limitations

The MCA process relies on the existence of suitable survey data. While geographic information might be available from stakeholders, data on casualties and the extent of UXO contamination may not be so easily obtainable. It may be possible to use MCA without casualty and contamination data in the early days of an emergency program as a "least worst" approach. However, the development of structured landmine/UXO survey processes over the last few years has meant that there is more chance that the information may be available. If nothing else, the development of MCA as a means of allocating EOD resources may provide further justification for the timely conduct of such surveys.

One possible apparent limitation may be the need to involve stakeholders in the planning process. Although this makes the process more open and inclusive, it may at first require some education of stakeholders in MCA techniques in order to maximise their input, thus placing a further strain on time-limited—especially in the budget formulation season. However, the MCA process is not too difficult to understand and the good news is that many agencies already use it for other types of projects. Furthermore, including the stakeholders in this process helps "mainstream" EOD activity with general development activity.

Organisations will of course be best placed to deal with this issue in the way most appropriate for their own structures. In its current format, the proposed MCA process is intended for use in developing countries emerging from conflict that are being assisted by humanitarian donor programs supported by external donors. As such, it is not optimised for EOD organisations operating in developed countries. However, it might be possible, through the substitution of criteria, to use this process to allocate EOD teams in developed countries. For example, the casualty figure could be replaced by the number of improvised explosive device (IED) incidents. Comments on this would be welcomed from EOD planners.

Summary & Conclusions

In summary, the MCA process does seem to offer a means by which an established economic planning tool could be adapted for use in EOD resource allocation. It does, however, require availability of contamination and casualty data as well as active participation by stakeholders if it is to be so effective. When such participation is achieved, the MCA process seems to offer a means to increase transparency and hence donor confidence. Nevertheless, there may be other potential pitfalls in the process that are not readily apparent to the author, and input from readers would be very welcome at this stage.

Endnotes


2. The term "EOD team" is used here to describe a mobile team that responds to reports of items of UXO. "They do not search or clear areas of land that are thought to be contaminated, and therefore is not possible to use CBA techniques to analyse the value of the land that they have cleared.

3. Readers with military backgrounds will recognise that there are some similarities between the early stages of the MCA process and the military planning technique of "priorities" (or "muster criteria"). Though "coding" may be an unusual tactical option, it is often—for quite sensible reasons—the default option for government planning.

4. Techniques on environmental valuation are not relevant here and so the exercise on calculating full project costs/benefits is not completed. For readers interested in the concept, however, a good source is the book Economic Valuation of the Environment by G. Raimondi and G. Willis, published by Edward Elgar Ltd.

5. Detailed information about MCA techniques is available at the following British government website: http://www.dft.gov.uk/about/multicriteria/index.htm. All graphics courtesy of the author.

Contact Information

Robert Keeley
77 Kent Avenue
Ashford, Kent
TN24 BNG
United Kingdom
Tel: +44 1233 663023
Mobile: +44 7788 585828
E-mail: BobKeeley@compuserve.com
Agricultural Stewart Moir, sustainable farming that supports vulnerable communities.

and explosive detecting dogs (EDDs), of creating short, medium and long-term problems for agriculture and the explosive and managerial experience. The overall performance, quality and safety of conditions.

Stevan A. and manage responsibility. The soil structure is not inadvertently damaged, while the soil after the area has been cleared. However, if many managers have little or no prior experience with the same soil profile, can cause serious and long-lasting damage. In addition, there is no evidence that organisations plan their operations in a way that minimises the risk of soil compaction or disruption of soil conditions, but that the same cannot be said about the mine action community.

To date, there appears to be no attempt by the mine action community to ensure the correct selection of suitable tyres and operational procedures that would reduce compaction and other soil damage. There is also no evidence that, by design or implementation, organisations actively address such issues as infiltration and deflection, tyre construction and traction aids, forward speed, loading tyre lugs and tyre profile. Despite the fact that many machines are tracked, the shear weight of some of them will, in poor soil structure, compaction of the soil at depth. Disrupted surface, milling machines cause massive compaction, as does the "bullying" of any heavy equipment while operating. Wheeled machines cause considerably more compaction than vehicles that have tracks to spread the load. While all these actions cause damage, the pulverising or compaction of the soil resulting from the requirement to dig to stipulated depths can, in certain environmental conditions, compound that damage.

Mechanical Equipment Regulations

A number of mine action centres (MACs) have produced regulations addressing the depth to which mechanical equipment must go. These regulations are based on the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), and the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards). The figure required is stated to 10 cm, the variation of mechanical equipment and ground factors means that the actual depth achieved in practice is greater. However, it can be considerably less, as damage to the soil to a defined depth. In Bosnia-Herzegovina and Croatia, this depth is defined by the national regulations as 10 cm. This regulation takes no account of soil depth, which may be considerably less, or of damage to the underlying subsoil.

Spoiled Soil

While it is necessary to remove explosive items from the land to facilitate repatriation, reconstruction and rehabilitation, it is crucial that in undertaking this action, the soil structure is not inappropriately damaged, creating short, medium and long-term problems for agriculture and the sustainable farming that supports vulnerable communities.

by Eddie Banks, Project Director, and I, with technical assistance from Stewart Moir, Scottish Agricultural College

Introduction

Over the last few years, the increased use of mechanical equipment for hazardous waste has demonstrated that it can not only improve the safety of hazardous work, but can also vastly improve clearance productivity and effectiveness. By adopting an integrated approach, incorporating manual clearance and explosive detecting dogs (EDDs), operational managers can select the best combination of methods to suit the wide variety of sites and environmental conditions.

Taken individually, management of these methods (manual, EDD and mechanical) requires very different skills, experience and knowledge. The level of knowledge and skills necessary for the effective management of manual demining teams can be easily achieved, especially by ex-military engineers with relevant experience and management experience. The knowledge and management of EDDs is much more difficult to obtain, for many managers have little or no prior experience with dog use or dog management and must learn "on the job." Poor management of these two methods may well affect the overall performance, quality and safety of the clearance operation, but it does not affect the long-term condition of the ground.

However, the lack of understanding of the wider aspects of the use of mechanical clearance equipment has the potential to create considerable additional problems for the future while assisting in solving the mine contamination problem. Considerable damage can be inflicted on fragile soil by the inappropriate application of mechanical methods changing the soil properties. Although some personnel may have a "general" knowledge of vehicles, few will have undertaken formal training in equipment management, and the vast majority will have no knowledge of or experience with soil management. It is therefore not surprising that some demining equipment designs, utilisation and supervision, when not addressed against the principles of agricultural soil management, could be having a disastrous effect on landmine clearance.

While the use of manual and EDD assets for the removal of munitions will not damage the ground, poor equipment design and/or the inappropriate selection and use of mechanical assets can cause temporary, and in many cases irreversible, damage to the structure of the soil. A wide range of variables can affect soil fertility, drainage, rooting potential and water holding capacity. Mechanical damage may also initiate, or accelerate, topsoil erosion, creating problems that will affect vulnerable populations long after the clearance task has been completed. Since a primary function of most clearance tasks is to return land for resettlement, these methods used should not have a negative impact on subsequent land use, grassland or arable land, or reduce the future sustainability of agriculture.

Soil Erosion

Degradation of soil quality, in particular topsoil depth and soil texture, will markedly reduce the land's capability to grow crops. Soil degradation will increase vulnerable soil susceptibility to wind and water erosion, which will further limit land use and cropping potential in the short, medium and long-term. Structural degradation of heavier soils will result in increased water logging due to drainage limitations. In addition, damage to vegetation cover, including the roots, can have negative effects, further contributing to soil erosion.

While the damage that mine clearance equipment causes globally is small in comparison with other soil erosion sources, it is a consideration of the potential damage that can be unintentionally caused. Whereas the agricultural community is extremely careful about the utilisation and management of equipment, not creating situations that will damage, pollute or erode the soil, available evidence indicates that this scenario cannot be said about the mine action community.

Equipment Design

It is rapidly becoming apparent that some mechanical equipment has already been utilised in a manner that does not normal course on soil management has been undertaken anywhere in the Balkans region for inspectors, operational managers, senior leaders or even mechanical equipment operators. This statement probably applies to the majority of programmes worldwide.

Equipment Design. Many of the currently available mechanical equipment is based on wheeled or tracked vehicles, or excessively heavy machines (including Main Battle Tanks) that use flail, mulching or grinding attachments to remove vegetation by impacting the ground surface. This equipment presents three implementation problems:

1. Selecting of tyres or tracks that will minimize soil compaction.
2. Ensuring that operations are conducted in an appropriate manner, on suitable ground and soil conditions, taking into account seasonal limitations and weather conditions.
3. Ensuring that the implement utilised to remove or disrupt soil (in an attempt to locate and destroy munitions) does not cause compaction, smearing or soil profile mixing.

• Inappropriate selection and/or use of the equipment. This can include selecting the wrong type of equipment for the localised conditions, in excess of what is needed and effective, or the use of vehicles that do not have the capability of the equipment, or in sensitive terrain or soil conditions where the mechanical action will damage or destroy the fragile soil structure, irrigation systems, etc. The outcome of such use may result in topsoil damage, erosion or decreased soil fertility. There is also no evidence that, by design or implementation, organisations actively address such issues as infiltration and deflection, tyre construction and traction aids, forward speed, loading tyre lugs and tyre profile. Despite the fact that many machines are tracked, the shear weight of some of them will, in poor soil structure, compaction of the soil at depth, cause serious and long-lasting damage. In addition, there is no evidence that organisations plan their operations in a way that minimises the risk of soil compaction or disruption of soil conditions, but that the same cannot be said about the mine action community.

To date, there appears to be no attempt by the mine action community to ensure the correct selection of suitable tyres and operational procedures that would reduce compaction and other soil damage. There is also no evidence that, by design or implementation, organisations actively address such issues as infiltration and deflection, tyre construction and traction aids, forward speed, loading tyre lugs and tyre profile. Despite the fact that many machines are tracked, the shear weight of some of them will, in poor soil structure, compaction of the soil at depth, cause serious and long-lasting damage. In addition, there is no evidence that organisations plan their operations in a way that minimises the risk of soil compaction or disruption of soil conditions, but that the same cannot be said about the mine action community.

While soil damage can be caused by the wheels of clearance vehicles, the vast majority of the damage is caused by the tracks. The primary function of the clearance device is to disrupt the soil to a defined depth. In Bosnia-Herzegovina and Croatia, this depth is defined by the national regulations as 10 cm. This regulation takes no account of soil depth, which may be considerably less, or of damage to the underlying subsoil.

Spoiled Soil

A number of methods are utilised to disrupt the soil to depths in excess of 10 cm. These include ploughs, rakes, flails, and mulching and ploughing techniques which are the most common being the flail. Flail machines used to "dig" to stipulated depths not only disrupt the soil; they can also cause compaction of the soil at depth. Disrupted soil can be further compacted by the host vehicle that houses the flail unit, now operating on top of a soft soil surface (compacted underneath), compacting a second layer on top of the first. However, if soil has to be disrupted, the use of chains is by far the most inefficient method of providing digging implement. The physical act of digging with heavy chains and swing weights pulverises the soil, while at the same time compacts the soil and leaves the disrupted surface. Milling machines cause massive compaction, as does the "bullying" of any heavy equipment while operating. Wheeled machines cause considerably more compaction than vehicles that have tracks to spread the load. While all these actions cause damage, the pulverising or compaction of the soil resulting from the requirement to dig to stipulated depths can, in certain environmental conditions, compound that damage.

Mechanical Equipment Regulations

A number of mine action centres (MACs) have produced regulations addressing the depth to which mechanical equipment must go. These regulations are based on the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards), and the Mechanical Preparation of Ground, (part of Bosnia-Herzegovina's MAC Standards). The figure required is stated to 10 cm, the variation of mechanical equipment and ground factors means that the actual depth achieved in practice is greater. However, it can be considerably less, as damage to the soil to a defined depth. In Bosnia-Herzegovina and Croatia, this depth is defined by the national regulations as 10 cm. This regulation takes no account of soil depth, which may be considerably less, or of damage to the underlying subsoil.

Continued on page 66
**FOCUS**

Deminers, Manual Demining & PPE

---

**Adopt-A-Team: Adopt-A-Minefield® Responds to the Situation in Afghanistan**

![A deminer works in an Afghan minefield](image)

Afghanistan is considered one of the most mine-affected countries in the world. This is the sad legacy of 23 years of near-continuous war—first against Soviet occupation forces, then between rival Afghan factions. The majority of the population was not experienced a time of peace in their lives. According to the United Nations, between 150 and 300 people are injured or killed every month due to landmines or UXO. Seventy percent of those accidents involve civilians—many of whom are returning refugees or internally displaced persons (IDPs).

**Adopt-A-Team**

Adopt-A-Team emergency response program in Afghanistan. Through Adopt-A-Team, donors sponsor the work of demining teams that consist of 32 deminers—alongside 12 deminers and eight other staff. Deminers in Afghanistan, as in anywhere in the world, have a dangerous and stressful occupation.

The work is long and tedious—manual demining teams meticulously examine inch by inch to check for mines or UXO. The routine is simple and is repeated hundreds of times a day. In addition to the stress of work, most Afghan deminers are separated from their families for two months at a time and are only able to stay with them for 10 days at a time before returning to work. Despite all of this, the commitment of these deminers is unwavering. While in Afghanistan, Erin interviewed one deminer who spoke with us about the current operation and the challenges they face.

**Manual Demining**

The predominant method of detecting and destroying mines in Afghanistan is manual mine clearance. While this method is slow, labor-intensive and often dangerous to deminers, it is the most reliable way to meet humanitarian mine clearance standards. It is estimated that within Afghanistan, 2,000 deminers can manually clear 10 to 15 square kilometers of land per year.

Manual deminers work primarily with metal detectors and probes to detect mines. While metal detectors are able to identify most mines, they do not work well in soil with a high metal content. In these areas, metal detectors create many false alarms, forcing manual deminers to act on each signal as if it were a landmine. In Afghanistan, metal is everywhere. More than 20 years of conflict have left more than just mines and UXO in Afghanistan’s soil. Spent bullet casings and other bits of metal make up the strange archaeological war, which makes demining
there more complex than in some other mine-affected countries. It is now possible to manufacture landmines with a metal content low enough to go unrecognized by metal detectors, which further complicates the demining process. Despite these difficulties, manual demining remains the most effective demining technique available. This is the method used by most of the teams supported through Adopt-A-Team: the teams of ATC, OMAR and DAFA. While deminers in Afghanistan undergo extensive training, only a flak jacket, a helmet and patience protect them from an attack.

**Demining Organizations**

ATC, founded in 1989 by Kefayatullah Eblagh, its present director, is one of the largest and leading mine clearance organizations currently operating in Afghanistan. ATC began with only one 24-man team and 11 administrative and support staff to clear mines and UXO from high-priority areas. Within one year, ATC expanded to include 760 additional staff. ATC has continued to grow since then, and now employs nearly 1,300 Afghans. Teams #7 and #21, both “Adopt-A-Team” teams, received special training in the fall of 2001 to recognize and remove cluster bombs that were deployed during coalition air strikes. These teams are mainly working around Kabul and Jalalabad.

OMAR was founded in 1990 and has since been a leading organization for mine clearance and mine awareness in Afghanistan. While OMAR’s mine clearance operations initially began in the western provinces of Afghanistan, operations have since been expanded to the southern and central regions of the country. Since 1992, OMAR has cleared over 18 million square meters of agricultural and grazing land, roads, irrigation channels and housing areas. Their efforts have resulted in the destruction of 888 anti-tank mines, 29,434 anti-personnel landmines, 24,307 pieces of UXO, and 10,545,904 fragments. An additional 7,020 landmine meters of battle area were also cleared.

The members of OMAR Team B, available through Adopt-A-Team, have been together for nine years. Since 1993, the 32 deminers of Team B have been demining mine-affected regions throughout the western provinces of Afghanistan. Most of the deminers worked in the army or were students before becoming deminers. Most of them support families of five or more living in Pakistan—a journey often taking several days from western Afghanistan. The urgency of demining in the west became more amplified after September 11, 2001. OMAR Team B has changed its work plans to respond to emergency mine threat needs such as UXO and cluster munitions remaining from coalition strikes in the country. The main priorities include areas that are critical to the return of refugees and IDPs and agricultural land, essential for reconstructing Afghanistan’s economic base.

DAFA was founded in June 1990 to implement United Nations Office for Coordination of Humanitarian Affairs (UNOCHA) demining projects in the southwestern provinces of Afghanistan. DAFA’s work is focused on demining throughout the southern region of Afghanistan. Most of their work is carried out in the province of Giana. OMAR Deminers were deployed in the demining process. Deminers from MDC work and train closely with the deminers from OMAR and DAFA. Deminers from MDC come from diverse backgrounds: former members of the mujahedin, students, clerks, teachers and shopkeepers.

**Mine Detection Dogs**

MDDs are an important component of humanitarian mine clearance operations because, once trained, they can smell the explosives in a mine. This enables them to detect mines with low metal content that cannot be found with metal detectors. MDDs are also particularly well-suited for the initial surveys used to establish which parts of a suspected area are mine-free and which are contaminated. This allows deminers to reduce the areas that must be checked manually. Dogs can work in almost all types of terrain but work especially well on the less vegetated land that is found in many parts of Afghanistan. MDDs are highly reliable and can clear land between five and 10 times faster than manual deminers alone.

Currently, Adopt-A-Team is supporting two MDC teams—#5 and #6—and we will soon be adding three more. MDC was founded in 1989 to address the problem of mines and UXO and return mine-free land to the people of Afghanistan. MDC was established with financial support from the U.S. government; since 1995, the program has been receiving financial support from the German government and UNOCHA. Using dogs trained to detect mines, MDC aims to provide a safe, quick and economically viable method of mine clearance that will ultimately enable Afghans to reconstruct and develop Afghanistan. MDC has one of the highest mine clearance ratios in Afghanistan. By using dogs in clearance operations, MDC has been effective in clearing roads, agricultural and grazing land, and residential areas throughout 14 provinces in Afghanistan. The average clearance rate of a mine dog group (MDG) is 4,000–5,000 square meters per day. The accident ratio is also significantly lower than that experienced by manual teams.

The men of MDC Team #5 and #6 have been together since 1994. The deminers come from diverse backgrounds: former members of the mujahedin, students, clerks, teachers and shopkeepers.

**The Benefits of Adopt-A-Team**

The Adopt-A-Team program fills an important niche within mine action in Afghanistan. It provides additional and badly needed funds to the field so that Afghan deminers can work where they are needed, when they are needed. They can clear roads for returning refugees, make homes safe and also begin the critical work of clearing the land that will allow Afghanistan to rebuild its devastated economy. In addition, it provides jobs to nearly 200 deminers—many of whom provide food and money to an extended family of 20 or more people. Finally, it allows the United Nations to increase its demining capacity and thus the rate at which it can clear the highest-priority sites. The situation in Afghanistan is grave, but it is not without hope—the United Nations has a new intensive strategy that aims to clear all high-impact areas within five years. This is only possible with sustained donor support from governments as well as the efforts of individuals through AAM. Through efforts such as AAM’s Adopt-A-Team, the threat of landmines in Afghanistan can be solved not just in our lifetime, but before 2030.
The MINEX Center

This article highlights the efforts of the French Army Engineer School's MINEX program.

by MINEX

History

Since 1978, in the scope of cooperation or defense agreements that link us to some countries (e.g., Chad and Lebanon), the French Engineers have taken part in overseas operations in countries that are greatly affected by the problem of mines and battlefield pollution, and that are no longer at war. Those sappers will acquire an experience recognized worldwide.

In 1997, the Center standardized mine clearance techniques and to elaborate an acceptable training doctrine for all the military actions. The joint Chiefs of Staff decided on a training center for post-war mine clearance within the French Army Engineer School in Angers called "Centre MINEX."

The MINEX Center became "Departement de Formation au Deminage" (DFD), a training and information center concerning landmines and sub-munitions, in 1997. The process of the Ottawa convention and France's ratification opened the door to a new step: putting at the disposal of the countries and organizations that fight against anti-personnel mines.

The MINEX Center became "Departement de Formation au Deminage" (DFD), a training and information center concerning landmines and sub-munitions, in 1997. The process of the Ottawa convention and France's ratification opened the door to a new step: putting at the disposal of the countries and organizations that fight against anti-personnel mines.

The MINEX Center became "Departement de Formation au Deminage" (DFD), a training and information center concerning landmines and sub-munitions, in 1997. The process of the Ottawa convention and France's ratification opened the door to a new step: putting at the disposal of the countries and organizations that fight against anti-personnel mines.

The MINEX Center became "Departement de Formation au Deminage" (DFD), a training and information center concerning landmines and sub-munitions, in 1997. The process of the Ottawa convention and France's ratification opened the door to a new step: putting at the disposal of the countries and organizations that fight against anti-personnel mines.

International Courses

The French Army Engineer School proposes international courses for the MINEX Platoon Leader and MINEX Staff Level courses that would be open to foreign military specialists. For example, the center has been training officers and NCOs from U.S. forces for more than five years (twice per year). The School also trains foreign units before they are committed overseas.

National Center for Humanitarian Demining Training

Humanitarian Demining is part of the program against mines developed by the United Nations. It is a tool for social and economic development for civilian populations and nations suffering from mine and UXO contamination. It is also a factor for new development, since it allows populations to recover free use of economic and social tools (cultures, houses, etc.).

The implementation of an action program against mines requires several fundamental parameters. The very first action aims to increase awareness among populations of the danger that mines and other munitions represent. Mine risk education is completed by concrete assistance to the victims of mines among those populations, namely medical, surgical and orthopedic care.

Humanitarian demining remains the main action of the program and is composed as follows:

- The first stage consists of evaluating the threat and planning operations. Demining is a very complex, long and exacting task; a technical reconnaissance is conducted in order to determine with precision the contaminated areas and to optimize time dedicated to clearance operations.
- The second stage is dedicated to the removal of mines (neutralization and demolition) and to the determination of quality assurance (QA) (issuing an area clearance certificate before the area is delivered back to the population).
- The major part of an action program against mines is the training of all the actors implicated in it. The National Center for Humanitarian Demining Training created in Angers gives to those people all the experience and the know-how of the French Army for all demining operations.

The French Army Engineer School opens its demining training ministry to all the categories of staff, dealing with humanitarian organizations or working for new mine clearance technologies.

The department also draws the attention of searchers, engineers and public or private agency technicians to the problem of mines and mine clearance within research programs in that field. The department also organizes sessions to increase awareness about this problem in the French Army schools and units and also for the French or foreign forces overseas. Contact Information

Ecole Supérieure d'Application du Génie Département de Formation au Démìnage 106, rue Ébly B.P. 4125 F-40014 ANGERS CEDEX 01 Tel: (+33) 2 41 24 82 27 Fax: (+33) 2 41 24 83 88 E-mail: minex@esag.terre.defense.gouv.fr

Published by JMU Scholarly Commons, 2003

Mine Risk Education

Awareness is one of the Center's capacities recognized throughout the world; thus, DFD-TICMA also participates in several high-level trainings for civilians, especially for students in law and politics from the university in Aix-en-Provence (southern France), who are about to work for international humanitarian assistance and for Peaceforce, an organization working with the World Health Organization (intervening in training, capacities and engineering).

The department also draws the attention of searchers, engineers and public or private agency technicians to the problem of mines and mine clearance within research programs in that field. The department also organizes sessions to increase awareness about this problem in the French Army schools and units and also for the French or foreign forces overseas.
by Frederick L. "Bart" Barthold, LEAI International, Inc.

The mission was simple enough: monitor air operations at Thumrait Bombing Range from a safe distance, locate ordnance that did not detonate, ensure a positive identification of said ordnance and ensure a complete disposal of said ordnance is accomplished with the lowest profile possible. One could hardly call the job easy, mind you. It could be so easy! The ordnance: MK82, 500-pound bombs using M964E point detonating (Point Fuzing with a M990 series, inert munition, and GRU-10, laser guided bombs (MK84) with an MK84M electric rail fuze. What normally would have been a "normal" day took a brutal turn for the worse when a herd of camels followed an entire tribe of Bedouins wandered onto the range. This simple act of random grazing blew the "low profile" right out of the window and led to a severe case of "mass panic in the mic!"

Normal "low-profile" areas consist of explosives, M60 fuse fuzes and non-electric detonators. The idea is to find the duds, set the charge, allow enough fuse time to get behind a gadget (Oh! for the good old "small hill"), wait for the boom, then move on to the next dud. The "random grazing" situation mentioned above entailed much more complex operations not only from the perspective of personnel, but from the perspective of the herds themselves. "Small hill" was no longer an option, but a real, hard-core move that could be seen up to a mile and a half from our safe position. It was wonderful to have a Landrover to haul all the explosives and water equipment and to pursue the numerous species of lamp cord wire for the firing lead. Even after the Landrover suddenly shut off and refused to start again, the impact of the moment didn't really sink in for nearly 30 minutes. Without wheels, we were the mode of transport. The last thing I ever want to do is choose to be carried by mere foot soldiers with a few 1000 feet of wire, explosives, equipment and water over a desert bombing range. To the uninformed, this may not sound as bad as it really is, but one can never predict the topography of the desert with any great accuracy. There are not enough Band-Aids in two boxes to cover the burns and scars two explosive ordnance disposal (EOD) Technicians will receive while un- shipping a mile of wire down hills, up hills, across no-off (unsafe) and craters, across broken flint fields, etc. To make a great story short, what should have been accomplished in two days at most (cleanup included), actually took up the majority of the seven days to complete.

The wire that was laid out is still there. I believe, Unlikely, I'm not concerned. To almost positive the fellow we talked with either used himself or sold it to some other technician?

This scenario never needs to be repeated. There is new, non-explosive technology available that burns ordnance in place. It uses light energy to initiate a chemical reaction to heat polycrystalline iron whisk to 2000°C within 0.5–1.5 seconds, which in turn ignites a thermite pack. The thermite is sufficient to burn through thin-case ordnance using one puck and thick-case ordnance when two or more pucks are used. This technology is referred to as a Light Energy Absorbing Ignitor (LEAI) and is currently being developed for underwater applications.

**Introduction: New Equipment**

The LEAI system is a non-explosive tool that was developed for the humanitarian demining industry. The system can initiate a burn of ordnance, and a detonation is not required. LEAI has the capability to burn thin ordnance in place safely, quickly and efficiently. In addition, the system saves many man-hours by requiring less personal and support equipment and operational use. The LEAI system does not require magazine storage, the purchase of explosives, Quantity/Distance (Q/D) restrictions or lengthy shipping and handling times. Class One: Eyesafe Laser and Light-Energy Absorbing Ignitor. The LEAI system has the capability to burn thin ordnance in place safely, quickly and efficiently. In addition, the system saves many man-hours by requiring less personal and support equipment and operational use. The LEAI system does not require magazine storage, the purchase of explosives, Quantity/Distance (Q/D) restrictions or lengthy shipping and handling times. Class One: Eyesafe Laser and Light-Energy Absorbing Ignitor.

The LEAI system is a non-explosive tool that was developed for the humanitarian demining industry. The system can initiate a burn of ordnance, and a detonation is not required. LEAI has the capability to burn thin ordnance in place safely, quickly and efficiently. In addition, the system saves many man-hours by requiring less personal and support equipment and operational use. The LEAI system does not require magazine storage, the purchase of explosives, Quantity/Distance (Q/D) restrictions or lengthy shipping and handling times. Class One: Eyesafe Laser and Light-Energy Absorbing Ignitor. The LEAI system has the capability to burn thin ordnance in place safely, quickly and efficiently. In addition, the system saves many man-hours by requiring less personal and support equipment and operational use. The LEAI system does not require magazine storage, the purchase of explosives, Quantity/Distance (Q/D) restrictions or lengthy shipping and handling times. Class One: Eyesafe Laser and Light-Energy Absorbing Ignitor.

**Laser Rangefinder**

- **Type:** Semiconductor pulsed laser 904 nm
- **Eye Safety:** FDA Class 1 (21 CFR 1040)
- **Accuracy:** +/– 15cm / 0.50ft. (3 sigma)
- **Resolution:** 1cm / 0.04ft.
- **Range:** 5200 ft. + (-/prisms) / 0.33 sec (0.4 sec acquisition)
- **Dimensions:** 15.4” x 11” x 3.5” (30cm x 28cm x 9cm)
- **Weight:** 115 lbs. (52kg)
- **Power:** 5oz.
- **Battery:** 2000 mAh in 0.5 – 1.0 sec for 6.5 hours
- **Body:** Metal

**Physical Characteristics**

- **Size:** 5.25”L x 6.25”W x 4.5”H
- **Weight:** 5 oz.
- **Active Kit:** 3 grams glass sealed
- **Ignition:** 15 grams
- **Temperature:** 2000°C in 0.5 – 1.0 sec
- **Burn Time:** 1.5-3.0sec

**Grid-Quality Assurance/Quality Control (QA/QC)**

- **Net:** Burning time in place constitutes clean-up efforts considerably.
- **UFO:** Much more likely to be confined to the specific global positioning system (GPS) location(s) in which it was found, instead of being scattered by a detonation method of disposal. The actual grid clean-up and certification process is confined to the one-meter grid, which requires less man-hours per run.

**Low Profile Disposal of U.S. Ordnance**

- **Time:** 1100 hours per Place: Thumrait, Oman. Mission: Low-profile disposal of ordnance. Profile: Low. Personnel: Two.

**Description**

LEAI International, Inc., developed the LEAI system in order to tremendously simplify the removal of landmines and other lethal devices from the ranges and battlefields of the world. The device was intended to help personalize the IED and UXO Technician safely and quickly mitigate the explosive filler ignites, burns away and vents, leaving the ordnance case. This in turn can be disposed of in a much easier and safer manner. The LEAI UN hazard classification for transportation is 4.1—"Flammable Solid"—and it has a minimum shelf life of 10 years. This same process can be used to detonate ordnance by using an electric blasting cap or by connecting a non-electric device to it. The shock tube directly to the RCU. Additionally, an accessory firing box may be used at closer distances for disposal of anti-personnel landmines, thus making the LEAI system very versatile for disposal operations.

**Future Development**

- **The LEAI system may be used for Protection Force of Navy ships. A number of operators think converting non-lethal deterrent charges can be set in place around the ship at anchorage. Should fast-tracking bombs or other munitions enter the periscope, these non-lethal deterrent charges, such as the MK141, may be launched and operated in close proximity to the boat. This system may be applied to land-based perimeters using the RCU attached
A page from a document discussing the use of electric blasting caps and non-electric caps in various contexts, including the MK186 Firing Device. It also mentions the LEA J system and Spoiled Soil, and provides information on the Swedish EOD & Demining Centre and the impact of mine action on sustainability and environmental concerns.
while deployed on operational activities throughout the world and the development of a national qualifications framework for all EOD disciplines and associated activities to enhance the management and inter-operability between respective national agencies.

Current initiatives include the development of advanced elements in chemical, biological and radiological doctrine, the R&D Section is responsible for the rest and evaluation of new equipment and the development of international clients.

R &D Section

As well as assisting in the review and development of all demining and EOD doctrine, the R&D Section is responsible for the test and evaluation of new equipment and the development of international clients.

The trials for Mechanical Clearance Equipment to support both military and humanitarian operational requirements have recently concluded. The trials subsequently resulted in the Swedish Armed Forces’ purchase of a Croatian DOK-ING MV-4 and the fire of several Scanjack 3500 machines. The substantial test facilities and procedures for repeatable testing have been internationally recognised and have formed the core of related standards development within the European Union (EU).

Currently underway is a comprehensive review of mine detection dog (MDD) search techniques and procedures aimed at both consolidating and enhancing current capabilities in this field, and investigating the role of mechanical clearance machines and MDD interaction. Additional research is investigating the neutralisation of mines through the use of thermite torches. The test and evaluation capacity is currently under expansion and will shortly be offered to international clients on a commercial basis.

EOD Information System (EOD IS) Section

Due to the ever-increasing volume of explosive ordnance-related information and the need for the efficient management of this information, the Swedish Armed Forces expanded existing IT initiatives to address this issue. As a result, the EOD IS was created as a stand-alone software package capable of both database and geographic information system (GIS) functions. Currently in its second version, work toward the interface between the EOD IS and the Information Management System for Mine Action (IMSMA) software is at an advanced stage. The EOD IS is currently in service with the Swedish Armed Forces, RSPRISVA and the Finnish Armed Forces, and additionally under evaluation by numerous international civil and military agencies.

Mine Action Support Section

Among the many activities allocated to the MASS is the development and management of a pool of EOD and mine action personnel to support rapid deployment initiatives. This pool currently comprises over 200 civil and military personnel trained in all EOD and mine action disciplines, including explosive detection dog (EDD) handlers and mine risk education (MRE) specialists.

Central to the management of the international pool is the use of stringent psychometric testing of all candidates prior to acceptance, irrespective of civil or military backgrounds. This testing is conducted by the Swedish Armed Forces Recruitment Centre, based upon the Air Force pilot selection programme and refined to isolate those most suited to working in a cross-cultural context as well as isolated and hazardous environments for prolonged periods of time. Personnel from the international pool have subsequently been employed in EOD and mine action programmes and projects in over 20 countries throughout the world.

The MASS is also responsible for conducting research into MRE and associated community liaison activities, which includes the development of doctrine and procedures to enhance national capabilities in this field. In addition to providing MRE training for military personnel, the MASS has developed a number of MRE training programmes for civil mine action staff, which has involved the participation of several prominent international mine action organisations.

Additionally, the MASS is making a significant contribution to international standardisation initiatives in mine action including the secondment of staff to the International Test and Evaluation Programme for Humanitarian Demining (ITEP) and the provision of support to the developmental work of the European Committee for Standardisation (CEN) Working Group 126 (WG126) to complement the existing standardisation work undertaken by the Geneva International Centre for Humanitarian Demining (GICHD) in support of the International Mine Action Standards (IMAS). Within these activities, MASS is directly supporting two of the three CEN WG126 workshops aimed at developing test and evaluation methodologies and procedures for mechanical clearance equipment and the creation of competency standards for EOD.

Conclusion

As the national Centre of Excellence in EOD and Demining, SWEDEC is the focal point for inter-agency collaboration between the Swedish Armed Forces and relevant civil agencies. SWEDEC welcomes the participation of international organisations and NGOs in all aspects of its work and subsequently extends an invitation to all interested parties to contact SWEDEC for further information on any of the activities mentioned. SWEDEC intends to provide future articles to the Landmine Monitor newsletter to provide more detailed insight into specific SWEDEC activities and projects.

http://commons.lib.jmu.edu/cisr-journal/vol7/iss1/1
Ocean Group: Explosive Ordnance Disposal/Landmine Clearance Division

Since 2000, the Ocean Group Explosive Ordnance Disposal/Landmine Clearance Division (EOD Division) has been forming an extensive underwater clearance program by combining vast experience from different fields of mine action and by developing advanced underwater demining technologies.

In 2000, the company recognized a need for and set up a division to handle UXO/landmine clearance. Although the company derives from a commercially oriented background, they feel that this division represents a more humanitarian standpoint, which is necessary in order to fulfill the needs of the client. The EOD Division combines experience from many different aspects of landmine/UXO clearance in order to provide an extensive demining program.

Team

The EOD Division is comprised of a core team consisting about 20 people with a wide range of experience in demining and UXO clearance. The company maintains a database that indicates the credentials of each staff member in order to form the most qualified team for each specific project. John Kirby, the International Projects Manager, has 19 years of civilian and military experience, and he has been actively involved in demining for the past 15 years. He was brought into the company for his international experience in order to help the Division establish itself in the marketplace. Additionally, the Operations Manager has 13 years of field experience. Overall, the senior management team has conducted survey and clearance operations in Angola, Bosnia, Cambodia, Canada, Cyprus, Egypt, Europe, Kurdistan, Kuwait, Iraq, Mozambique, Namibia, Thailand, and Zimbabwe.

History

When first established in 1972 the Ocean Group conducted underwater inspection, naval recovery and marine work, but they have grown into “one of Canada’s largest suppliers of integrated maritime services,” according to the International Projects Manager of the EOD Division, John Kirby. They provide numerous towing services throughout the ports of Quebec and Montreal. Special projects they have participated in are refloating the Irving Whale, and transporting supplies for building the longest bridge in Canada.

In 2000, the company recognized a need for and set up a division to handle UXO/landmine clearance. Although the company derives from a commercially oriented background, they feel that this division represents a more humanitarian standpoint, which is necessary in order to fulfill the needs of the client. The EOD Division combines experience from many different aspects of landmine/UXO clearance in order to provide an extensive demining program.

Projects

So far, the Ocean Group EOD Division has conducted multiple operations on the Valkencer River in Quebec as well as in Sorel, Quebec; Halifax, Nova Scotia; and throughout Russia. They have also collaborated on bringing a UXO-detecting sonar system, APL Drums, into the field of underwater demining. These APL Drums provide a safe, quick, and affordable method for identifying submerged objects and objects lying as far as 30 cm below the ground in both shallow and deep waters.

This newly developed sonar system has been designed to operate under various circumstances. In 2000, the Ocean Group began developing a method that involves suspending the APL Drums from a hydraulic crane and is geared towards shallower waters that are at least 0.5 m deep. Another method was also being developed for deeper waters (over 2 m deep) with strong currents. This method includes a remotely operated vehicle (ROV) designed by Bofors Underwater Systems called a “Double Eagle,” which is used by marines to counter landmines.

Over the past year, the EOD Division has focused much of its efforts on research and development (RD&D). As a result they “have come out with the best shallow- and deep-water remote survey barge, remote harvester, remote transporter and demolition barge,” preparing them to conduct any necessary underwater operations. These new developments include a number of technologies such as sonar systems, a sub-bottom profiler, stereoscopic cameras, and a seven-function manipulating arm with multiple exchangeable tools. All of the equipment is controlled by satellites and is capable of being transported by airplane, train, truck or ship.

Conclusion

Although there are a number of organizations that include underwater landmine and UXO clear-
Global Training Academy has been building Mine Detection Dog (MDD) capacities for years, even while they worked under skeptic voices and much criticism. Now, the academy serves as the main MDD sub-contractor for the Department of State (DOD), and has experienced many successes with their program.

by Dan Hayter, Global Training Academy

Overcoming Criticism

In the fall of 1989, RONCO Consulting Corporation, a U.S. contractor that manages Agricultural Development Program (ADP) commodities Distribution for the U.S. Agency for International Development (USAID), and Global Training Academy (Global), came up in an effort to build indigenous MDD capacities. There were always skeptical voices and adverse reactions to using dogs in humanitarian demining. In 1998, RONCO and Global were the first to utilize MDDs. We began our indigenous training of MDD handlers in Afghanistan, and then expanded the program in Mozambique. In 1993, Doctor Vernon Joynt of the U.S. Army Veterinary Corps, and then the lead veterinarian to the U.S. Army in Afghanistan, decided to deploy inro Afghanistan at the beginning of the Gulf War. It was decided to begin training at Global in the spring of 1998. Global was requested to assist with the program. The first dogs entered training at Global in the spring of 1998 and were deployed that fall. These original MDDs were trained on landmines and deminers. The need for these deminers was due to the heavy work from POMZ bounding mines that the Russians had laid in the harsh conditions throughout Afghanistan. In December of 1999, Global completed the first MDD Handler Course. Our first 12 MDD teams were deployed into Afghanistan at the beginning of the Gulf War. Our next MDD course was started in mid-January 1991, but was delayed by USAID until U.S. Army veterinarians during the conflict in 1976 were involved in the turnover of MDDs from the U.S. Army to the Thai army. The crisis in the MDD training programs continued in subtle ways, such as the suggestion that the commercial demining organizations using dogs were doing inferior and unreliable work. It was seldom pointed out that manual demining operations could not match the clearance productivity of those operations that utilized MDDs successfully.

The Beginning

Many training and search procedures have changed in the past 14 years since Global was requested to assist with the program. Global then began to put together a handler course and an MDD Program. The first dogs entered training at Global in the spring of 1999 and were deployed that fall. These original MDDs were trained on landmines and deminers. The need for these deminers was due to the heavy work from POMZ bounding mines that the Russians had laid in the harsh conditions throughout Afghanistan. In December of 1999, Global completed the first MDD Handler Course. Our first 12 MDD teams were deployed into Afghanistan at the beginning of the Gulf War. Our next MDD course was started in mid-January 1991, but was delayed by USAID until U.S. Army veterinarians during the conflict in 1976 were involved in the turnover of MDDs from the U.S. Army to the Thai army. The crisis in the MDD training programs continued in subtle ways, such as the suggestion that the commercial demining organizations using dogs were doing inferior and unreliable work. It was seldom pointed out that manual demining operations could not match the clearance productivity of those operations that utilized MDDs successfully.

The Beginning

Many training and search procedures have changed in the past 14 years since Global was requested to assist with the program. Global then began to put together a handler course and an MDD Program. The first dogs entered training at Global in the spring of 1999 and were deployed that fall. These original MDDs were trained on landmines and deminers. The need for these deminers was due to the heavy work from POMZ bounding mines that the Russians had laid in the harsh conditions throughout Afghanistan. In December of 1999, Global completed the first MDD Handler Course. Our first 12 MDD teams were deployed into Afghanistan at the beginning of the Gulf War. Our next MDD course was started in mid-January 1991, but was delayed by USAID until U.S. Army veterinarians during the conflict in 1976 were involved in the turnover of MDDs from the U.S. Army to the Thai army. The crisis in the MDD training programs continued in subtle ways, such as the suggestion that the commercial demining organizations using dogs were doing inferior and unreliable work. It was seldom pointed out that manual demining operations could not match the clearance productivity of those operations that utilized MDDs successfully.

The Beginning

Many training and search procedures have changed in the past 14 years since Global was requested to assist with the program. Global then began to put together a handler course and an MDD Program. The first dogs entered training at Global in the spring of 1999 and were deployed that fall. These original MDDs were trained on landmines and deminers. The need for these deminers was due to the heavy work from POMZ bounding mines that the Russians had laid in the harsh conditions throughout Afghanistan. In December of 1999, Global completed the first MDD Handler Course. Our first 12 MDD teams were deployed into Afghanistan at the beginning of the Gulf War. Our next MDD course was started in mid-January 1991, but was delayed by USAID until U.S. Army veterinarians during the conflict in 1976 were involved in the turnover of MDDs from the U.S. Army to the Thai army. The crisis in the MDD training programs continued in subtle ways, such as the suggestion that the commercial demining organizations using dogs were doing inferior and unreliable work. It was seldom pointed out that manual demining operations could not match the clearance productivity of those operations that utilized MDDs successfully.

The Beginning

Many training and search procedures have changed in the past 14 years since Global was requested to assist with the program. Global then began to put together a handler course and an MDD Program. The first dogs entered training at Global in the spring of 1999 and were deployed that fall. These original MDDs were trained on landmines and deminers. The need for these deminers was due to the heavy work from POMZ bounding mines that the Russians had laid in the harsh conditions throughout Afghanistan. In December of 1999, Global completed the first MDD Handler Course. Our first 12 MDD teams were deployed into Afghanistan at the beginning of the Gulf War. Our next MDD course was started in mid-January 1991, but was delayed by USAID until U.S. Army veterinarians during the conflict in 1976 were involved in the turnover of MDDs from the U.S. Army to the Thai army. The crisis in the MDD training programs continued in subtle ways, such as the suggestion that the commercial demining organizations using dogs were doing inferior and unreliable work. It was seldom pointed out that manual demining operations could not match the clearance productivity of those operations that utilized MDDs successfully.
Working With the U.S. Department of State

In the spring of 2000, the U.S. DOS Office of Humanitarian Demining Programs (HDP) funded RONCO and Global to train six MODs to work with an NGO, which receives funding through the United Nations. The organization is known as the Accelerated Demining Program (ADP) in Maputo, Mozambique. The ADP's program was the second instance in which HDP provided MOD assets to a pre-existing demining operation. The first time was to assist the Gendarmerie Nationale of Cameroon in conducting MOD training in Yaoundé for MODs.

In late spring of 2002, HDP funded a humanitarian demining operation with the MODs trained by the military forces of Armenia. The MODs were specifically trained to work in minefields that had been prepared for demining use by field machines. The use of MODs in areas cleared by the flails has broadened the utilization of MODs in demining operations.

In 2000, HDP funded a separate MOD team (12 dogs) and installed a dog demining program in Belo, Mozambique. This operation was to clear the railroad lines within central Mozambique in order to improve travel and trade. This project was completed in the fall of 2002.

During the year 2000, HDP funded RONCO and Global to accomplish the following tasks in Thailand:

- Establish a MAC and furnish technical assistance in training the Thai military to operate the center.
- Provide training and technical assistance in manual and mechanical demining procedures.
- Provide the Thai military Mine Dog Center (MDC) with training assistance in updating their MOD program. This program has provided 28 MODs and five handler instructors, who will complete their training in the summer of 2002.

In the spring of 2001, HDP established the Quick Reaction Demining Force (QRDF). The QRDF has eight MOD teams and manual deminers assigned. Their mission is to deploy to hot spots anywhere in the world that the United Nations has an interest in emergency demining. This group has been deployed to three locations in the last 18 months—Sri Lanka, Nigeria and twice to Sudan. In 2001, HDP funded RONCO and Global to support humanitarian demining operations in the following countries, each of which was provided with MODs:

- Received six MODs in 2001 and an additional six MODs in 2002. The first MODs are fully deployed in the minefields.
- Received four MODs in the spring of 2001, with all dogs being deployed in the fall of 2001.
- MDCs were deployed in six MODs in 2001 and a second group of seven MODs in the spring of 2002. Lebanon is scheduled to receive an additional five MODs in the spring of 2003. These MODs are deployed working behind flails and conducting quality assurance.
- Global MOD operations commenced in September of 2001 with RONCO initially providing six MOD teams out of Bosnia. One of the dogs was replaced due to illness in the fall of 2001. These six MODs were donated to the Australian Mine Action Clearance Program (AMACP). RONCO and Global trained local nationals to handle the MODs. The second indigenous MOD handler course, which commenced in the spring of 2002, consisted of seven MODs. A third handler/supervisor course was conducted in August of 2002, which added three additional MODs later that year.

In late spring of 2002, HDP funded a humanitarian demining operation with the MODs trained by the military forces of Armenia. The requirement was to build a MAC, provide training for manual deminers and establish an MOD program. Seven MODs were entered into training, and in September of 2002, five MOD handler teams completed training. These teams were deployed with a manual demining group in October of 2002.

Conclusion

In summary, the use of MODs has become a very important tool in safe and efficient demining operations. Even though global received much criticism about the use of dogs in humanitarian demining, much success has come from the program. Dogs deployed to many minefields around the world have greatly enhanced the productivity of the local manual demining teams. Having proved the effectiveness of MODs in support of humanitarian demining operations, Global and RONCO are now the main MOD contractors for MODs for the U.S. HDP.

Remote Explosive Scent Training:
Genuine or a Paper Tiger?

by Håvard Bach and Ian McLean, GICHD

Introduction

REST is the process of taking scent from a source for remote analysis. The scent is obtained by using a pump to draw air from the surface of a deposit, or from the soil surface through an absorbent filter. Filters are analysed using specially trained sniffers in the field, or in the laboratory, by means of specially trained dogs or sniffer dogs. This system has the advantage that it does not require physical contact with a deposit.

The REST concept was originally conceived and developed in South Africa. It was used for the detection of explosives and weapons in a wide range of fields and for the detection of landmines. In the mid-1990s, the concept of using dogs for the detection of landmines was once again evaluated in South Africa, and REST was re-discovered and re-tested for the detection of landmines. The REST concept has since been given a number of new names, including "Frontier Detection" and "Scent Detection System (SDS)."

The REM Project:

The REM (Remote Explosive Scent Monitoring) project was started in 1989 by the Swiss Army to develop a system for the detection of landmines. The project was later funded by the United Nations, and REST is now being developed under the name "GICHD." The REM project has been successful in detecting minefields in previously cleared areas. At least some of the projects were funded by the United Nations, suggesting the potential of the technology for use in mine detection.

The GICHD Project:

The GICHD (Geneva International Centre for Humanitarian Demining) project was started in 1993 to develop a system for the detection of landmines. The GICHD project has been successful in detecting minefields in previously cleared areas. At least some of the projects were funded by the United Nations, suggesting the potential of the technology for use in mine detection.

Conclusion

In conclusion, REST is a promising technology for mine detection. It has the potential to reduce the cost and time required for mine detection, and it has the potential to improve the accuracy of mine detection. However, it is important to note that REST is not a silver bullet and cannot replace the need for physical examination of areas suspected of containing landmines.

Published by JMU Scholarly Commons, 2003
Mineral Detection Dogs

APOPO has started trials of different filter material. Seven materials of applied standards mimicking those found in a sterile laboratory environment, double blind testing, standardised handling of all targets and carefully applied internal controls. Artificial analysis procedures do not harass the same flexibility, recognising traces of individual substances and degradation products more precisely than animals, although the requirement for similar laboratory standards may still apply. There are, however, no artificial chemical detection methods that can compete with the detection thresholds of dogs or rats. In simple terms, it can be said that animal detectors are sensitive but unreliable. "Reliable" here, is used in a limited sense to mean accuracy of detecting target odours. It remains to be seen whether artificial odour detection technology offers the same operational reliability as animal sensing systems.

Promising artificial detection systems currently under development include the Normatics Fido Detector (USA) and the Bio-sensor (Sweden). Gas Chromatography (GC) and Filter analysis processes when examining the components of REST. However, the analysis process depends on availability of a sample of high quality, suggesting the need for quality sampling procedures, quality equipment and an understanding of the effects of the environment on the sampling process.

Filter Properties

A good REST filter must absorb molecules during sampling and desorb molecules during detection (analysis by animal). Filter design must optimise the balance between these two requirement. It is generally believed that the highest adsorption of target molecules is achieved when collecting particles rather than gas streams under varying circumstances as environmental conditions. Using complementary artificial methods, we may be able to identify clues that generate false indications by animals. We may further be able to link the availability of different substances to situations where the animals are present, which is an essential objective in any calibration process. Of all the many technology options "developed for mining purposes," it is notable that the only device currently in regular use in mines is the simple metal detector. Minefields are routinely found in remote locations where the animal detector has demonstrated it is capable of under very difficult conditions, but environmental conditions can be extremely. The need for simple detection technology with high reliability is imperative under such conditions.

The requirements for simplicity and reliability impose strong challenges on artificial odour detectors. Detection of the target compound is required and it is of considerable importance that the filter is not removed from its container. If the filter is removed, there are two potential issues to be considered. First, desorption may occur during the sampling process due to the flow of air through the filter, resulting in a low availability of target molecules for testing. Second, desorption may occur quickly enabling volatile molecules from any containers. The second factor could be an advantage if testing occurs quickly (i.e., within a few minutes), but would be a disadvantage if the filter takes some time (e.g., because several animals are to be used), or is to be undertaken at different times. Different filter materials will offer different possibilities, and the molecule availability described above, and those differences could benefit different applications.

The Perfect Filter

An ideal REST filter would be cheap to purchase, allow high adsorption and desorption, allow particle collection without becoming clogged, and support both animal and artificial detection systems. In some operational situations, the filter must tolerate long-time storage prior to detection testing. Some of these desirable properties are contradictory, and the optimal filter design will need to balance competing requirements.

Testing of artificial filter materials has recently been undertaken by the Swedish Defence Research Agency (FOI) in Sweden and APOPO in Tanzania. APOPO's tests compared detectability of explosive odours on the Microfilter as a standard, with other filters, using rats as the detectors. Results were similar to or better than the Microfilter for all but two samples tested. The filters developed by FOI are primarily for research applications, and are unlikely to be used for operational detection in minefields. They offer the advantage of being tested using laboratory equipment such as the GC. Most or possibly all of the filters tested by APOPO were of commercially available materials that are not designed to be used in the GC—although extraction of explosive molecules should be possible from some of them. It was suggested at the workshop that the "Microfilter works, so there is no need to develop alternative filters." This argument has some merit, although the cost of the Microfilter—about $1.00 (U.S.), regarded by some as cheap and others as expensive—was a significant factor influencing APOPO's search for alternative filter materials. It may be that almost any filter material can be used when sampling is undertaken under optimal conditions, but conditions are not always ideal, and optimising filter quality could maintain detection reliability under sub-optimal sampling conditions. Different applications might allow different materials to be used. APOPO's application is for research—filters are tested within three hours of being produced and are immediately discarded. In this application, there is no requirement for long-term storage or multiple testing, which are two benefits of the Microfilter.

Sampling Units

Sampling machines were originally integral units on mine-protection Casperv vehicles. The suction unit was inside the vehicle and flexible tubes with filter holders where threaded through a channel system and lowered to the ground in front of the vehicle. The tubes were pulled back into the vehicle for every filter exchange. This design provided a safe operator platform, but the trade-off was limited control over the sampling zone, which was restricted to the immediate front of the vehicle. In response to this problem, portable backpack suction units with handheld flexible tubes were developed, allowing broader ground coverage, but introducing the risk of requiring the operator to walk through the minefield. On the other hand, the operator were able to walk in the vehicle tracks provided by a Casperv. However, this option is unlikely to support minimum safety requirements in heavily vegetated terrain, potentially restricting the application of REST technology for area reduction. Certainly, new concepts need to be developed for obtaining effective samples from open terrain while ensuring the safety of the sampling personnel. This issue requires further consideration and development.

The portable backpack suction device is a small two-stroke petrol engine unit (Husqvarna), which is driving a small pump. Results from testing by APOPO suggest that exhaust may cause contamination problems if the sampler does not move consistently upward. Constant machine juddering, high maintenance and the need to keep fuel and filters separate are other negative factors. An alternative battery-driven pump has been trialed by FOI and APOPO, but the trade-off is increased weight, short battery operation and long change times. Battery

Animal and Artificial Detection—Pros and Cons

An animal is a complex detector that responds to a variety of substances (whether in a filter or elsewhere), some of which the trainer may be unaware of. A recent example: Mechem dogs trained on pure TNT responded to DNT at very low concentrations. Some relevant research had been undertaken 10 years previously by Mechem, but that information was inadequate, poorly documented or unavailable, and the key incentive was the great potential of REST for area reduction. Implementation of the research has involved identification of the central elements of REST, which are:

- The sampling technique
- The sampling equipment and filters
- Storage and transportation of filter cartridges
- Training of the detector
- Methods to ensure reliability in the final analysis process

Remote Explosive Scent Training

Casperv with an integral sampling system, used in minefields. The filter cartridges are seen hanged to the front of the vehicle. This is safe for the operator, but limits control over the sampling zone. Portable sampling units are used to allow sure action from vegetated areas.
units are cleaner and quieter, but the disadvantages are likely to restrict their use for operational demining. If the sampling unit is mounted on a vehicle, then the vehicle compressor (which supplies power to the air brakes) could be used to power the pump. This option has been used in the past by Mechem for some applications.

There have been suggestions that under at least some conditions, a pump is unnecessary. Wind action and convection could bring enough molecules to the filter for detection to be successful if the filter is placed in the minefield for some period. A development of this possibility, a passive sampler, was demonstrated by IVEMA at the REST workshop. The principle remains unproven, but tests will continue.

Suction Pressure and Sampling Technique

Mechem originally decided to use a pumping rate of 60 litres/minute, based on the concept of empyring all the air from a car in a short amount of time so that the car could be moved for explosives. Although this suction rate apparently gives effective filter samples (using the Mechem filter), higher or lower suction rates could give even better samples. Higher sampling rates allow the vacuum operator to move at a quicker pace, and also change filters more frequently. Possible disadvantages are blow-through of target molecules (molecules passing through the filter without being trapped), and clogging in dusty environments. Lower sampling rates will likely have the opposite effects. Clearly, there is a need to optimise the relationship between sampling vacuum rate, sampling efficiency (which may vary with filter design) and the advantages of collecting dust.

Work with free-running dogs shows that a dog can miss mines if its nose is too far away from the mine during the search. It appears that under at least some conditions, the detectable plume of scent over a mine is small and localised. Mine detection using REST may therefore require that all ground be covered by the vacuum operator in much the same way as in the noise of a field search dogs cover all of the ground. Apart from the obvious safety implications of such a requirement for the sampling personnel, using artificial intelligence in different filters can be used in different conditions or in different ways to optimise the sampling process. These issues need further research.

Sampling Conditions

It is known that variability in environmental conditions affects detectability of mines for animal sensing systems working in the field. It is sensible to assume that the known environmental effects on direct animal detection will similarly affect filter detection. Research undertaken for the GICHD by NOKSH in Bonniiia (using dogs) supports this contention, with lower humidity at the time of sampling producing higher probabilities of detection. APOPO has similarly found that lower humidity gives better detection (using rats). One possibility is that sampling during dry conditions facilitates a higher rate of collection of dust particles, which has a greater impact on the quality of the sample than collection of air.

Surprisingly, preliminary analysis of the Bonniiia data set did not show any effect of temperature on detection probability. Apart from decreasing detection probabilities at ambient temperatures below about 15°C at the time of sampling.

The analysis is not yet completed and more research is planned.

Vegetation

The possibility that vegetation in the sampling area affects the quality of the filter sample has been much debated, but remains un researched. Mechem's field experience suggests that vegetation has a positive effect. Vegetation potentially acts as a reservoir for explosive molecules, which are attached to leaves (particularly on the underside where they are protected from the sun). The vegetation may filter wind-blown molecules out of the air, or molecules could be taken up through the roots and deposited on the leaves during transpiration. Wind-blown pollen may also carry explosive traces. More research is needed to fully understand the importance of vegetation as a reservoir of target molecules. The results could significantly alter the way sampling is undertaken in the future.

The Analysis Process

The analysis involves two central components—a training program for the detector and a testing concept. Both of these components vary among the four organisations currently training REST detectors. NPA originated REST principles developed by Mechem, but has recently modified its approach to the system developed by NOKSH. Unfortunately, to date, the only one of these training and operational concepts that has been formally documented in a way that is accessible to the demining community is the NOKSH program. At the time of writing, REST detectors were about to be accredited in the United Kingdom (although not for mine detection), but again no documentation of the use of animals for REST detection is improving, but this knowledge is not generally being formally documented in an accessible way. Only limited comments on training issues can be made here.

Training Issues

Animals are good detectors, but they require careful tuning and calibration. Having produced the detector, maintenance of its skill is needed to ensure continued attention to the details of its operational use, including internal QC to monitor its daily reliability. Small mistakes during training or testing could introduce "clues" that tune the animal onto different scents. The word clue deserves further explanation. In this context, a clue means an aid that the animal uses to locate target filters. A clue can be a scent, the lack of a scent, an unconscious signal from the handler or simply a non-random placement of filters in an analysis array. An animal will use any clue to aid filter detection, even if detection mistakes are introduced by doing so. Under certain conditions or some research conditions (where the odour on the filter is known), such mistakes are likely to be treated as false positives. But in some cases, with variable scents and any operational testing situation, it will probably be necessary to treat such mistakes as true indications. Clearly, the testing procedure must be rigorously designed to eliminate any possibility of clues. Independent laboratory analysis (using artificial detection procedures) can also support clue identification.

An alternative mistake is that positive filters are neglected (missed) by the animal. Such mistakes may be because of false availability on the filter. The filter is below the sensory threshold of the animal, because of factors affecting the sampling process (see above), or because the detector is not working to peak performance (a training program). An alternative approach is to identify all potential mines using an initial survey, and then proceed with REST to refine the detection.

The Analysis Environment

Animal analysis was initially an outdoor affair. Both Mechem and NPA now use indoor analysis facilities, which give much greater control over the environment in which testing is undertaken. Humidity and temperature are key factors affecting vapour availability. As research on vapour detection progresses, experiments with manipulated indoor climates may help to optimise detection using REST technology. Pre-heating of filters is likely to increase the release of the target scent from the filter and thus aid detection. Manipulating humidity in the filter or in the room might also improve detection, although it is still unclear what the optimal humidity levels should be. A combination of the two factors could have a real impact on detection probabilities and should be further investigated.

REST for Area Reduction

Two tests areas (in Angola and Tanzania) have been prepared under GICHD sponsorship to facilitate investigation of area reduction applications. A similar test field has been prepared for similar purposes in Cote d'Ivoire by Nomadics (with Mechem support). The two African test fields have the same general layout. To prevent cross-contamination between boxes with landmines, the minimum distance between mines is 35 metres. Testing is currently being undertaken in both locations to determine the potential of REST for area reduction.

Size and shape of the plume put up by a mine are the central issues being addressed using these test fields. Large plumes (or plumes that increase in size over time) mean that REST sampling may have to be rather coarse-grained (each filter
Environmental factors during sampling

- Continue sampling in test fields under different environmental conditions to determine the full environmental effects on detection.
- Investigate whether some filter options may work better under certain conditions than others.
- Investigate the effect of vegetation.
- Investigate the leakage (flux) rate from landmines and use this information to determine the potential for vapour detection.

Training

- Document and compare training test results to determine optimised training solutions.

Analysis—environment

- Determine the effect artificial modification of temperature and humidity in the analysis environment has on detection.
- Examine all aspects of the environment to identify potential clues that may jeopardise the analysis process.

Analysis—testing

- Identify procedures to provide effective internal controls on the detection process.
- Further develop and test filter-handling procedures to ensure optimal testing.

Sampling technique

- Undertake tests to determine the most reliable sampling technique(s).
- Develop a new sampling concept for area reduction that will ensure quality sampling and high safety for the operators.

Centralised analysis

- No need for demining organisations to develop costly and difficult analysis capabilities.
- Quicker response time (need only to establish sampling teams initially).
- Higher cost effectiveness.
- Full control of the analysis process.
- No dependency of other organisations.
- Less filter transport requirements.

Disadvantages

- Logistical burden in transporting filter cartridges (internationally).
- Demining organisation has little/no control of the analysis process.
- No global analysis concept in place.

Decentralised analysis

- Requires high skills and a more complex demining process.
- Likely to result in limited use of REST worldwide.
- High initial costs.
- Time-consuming process of developing capacity.
- No system for external QA in place.

Table 2: Alternative routes to establishing a REST analysis capacity supporting demining operations.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>No need for demining organisations to develop costly and difficult analysis capabilities.</td>
<td>Logistical burden in transporting filter cartridges (internationally).</td>
</tr>
<tr>
<td>Quicker response time (need only to establish sampling teams initially).</td>
<td>Demining organisation has little/no control of the analysis process.</td>
</tr>
<tr>
<td>Higher cost effectiveness.</td>
<td>No global analysis concept in place.</td>
</tr>
<tr>
<td>Full control of the analysis process.</td>
<td>Requires high skills and a more complex demining process.</td>
</tr>
<tr>
<td>No dependency of other organisations.</td>
<td>Likely to result in limited use of REST worldwide.</td>
</tr>
<tr>
<td>Less filter transport requirements.</td>
<td>High initial costs.</td>
</tr>
<tr>
<td>Time-consuming process of developing capacity.</td>
<td>Time-consuming process of developing capacity.</td>
</tr>
<tr>
<td>No system for external QA in place.</td>
<td>No system for external QA in place.</td>
</tr>
</tbody>
</table>

Table 1: Areas needing further research before REST can be considered proven.

<table>
<thead>
<tr>
<th>Filter</th>
<th>Sampling machine</th>
<th>Sampling technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Optimise the filter to allow highest desorption during sampling.</td>
<td>- For some applications, develop a low-weight battery-driven sampling machine with long operational time and easy charging.</td>
<td>- Undertake tests to determine the most reliable sampling technique(s).</td>
</tr>
<tr>
<td>- Optimise the filter to allow highest desorption during analysis.</td>
<td>- Develop a filter that can be analysed both chemically and by animals.</td>
<td>- Develop a new sampling concept for area reduction that will ensure quality sampling and high safety for the operators.</td>
</tr>
<tr>
<td>- Develop a filter that can be analysed both chemically and by animals.</td>
<td>- For some applications, make the filter able to tolerate long-term storage without significant quality reduction.</td>
<td>- Conduct filter testing to determine how filter exchange frequency will affect the quality of the sample.</td>
</tr>
</tbody>
</table>

Table 3: Issues for future consideration if REST is to be established on a broad or global scale.

| How big is the market and how many analysis capacities are required? | REST is for a relatively large market. |
| Who should undertake the analysis? | There are currently four organisations involved in analysis of REST filters for humanitarian demining: NPA-Angola, NORDIC-Norway, APOPO Tanzania and MechSem South Africa. Preliminary arrangements could be made with these four organisations. There may be more organisations with an interest in becoming centralised REST analysis providers. |
| Who will test and accredit these organisations? | There is a need to ensure that the same standards are followed by all organisations involved in REST. Each analysis centre must be accredited on a regular basis. Criteria for the accreditation process will be required. An impartial accrediting body must be identified. |
| How can the demining community be ensured of a high-quality analysis process? | A QA system of the analysis process will be required. This could be a responsibility of an objective independent institution. Alternative QA measures could be developed to a system to cross-check filters between centres and compare the results. |
| How can the analysis centres be ensured about a high-quality sampling process? | International procedures for quality sampling will be required. QA of the sampling undertaken by demining organisations in another analysis centre must be addressed. There may not have to be a need for analysis centres to perform QA on the sampling as long as there are recognised QA mechanisms in place. |

How should a global logistics system be developed? | It is not too difficult to send filters overseas today. There should be agreement regarding packing and stacking of filter boxes during transportation. Analysis centres should solve their own problems in receiving the filter boxes in their respective countries. |

How to reach a consensus regarding the pricing and timing of analysis? | There must be a general understanding within the group of analysis centres about the costs for analysing filters and response time before returning results to the demining organisations. |

There must be international standards and guidelines for the sampling, the logistics, the analysis and the QC requirements. Standards on sampling and analysis could become part of the International Mine Action Standards (IMAS) series in the future. The current REST standard would be inadequate and would need to be revised. How to train demining organisations to carry out quality sampling, storage, transportation and filter shipment? | There will be a need to train demining organisations in correct sampling techniques and to take environmental conditions into account. It is further important to develop a recording and logistics system. This will also require some training.
Conclusion

There are currently four organizations with an analysis capacity for REST in place today: three in Africa and one in Europe. Among them, they currently have a total of 30 individual detectors (12 rats, 18 dogs)—an impressively small capacity considering the potential of the REST concept and its historical precedence. Although some of these organizations could potentially expand their capacity, the limited number of detectors available today severely restricts the further development of REST in the near future. Of these four organizations, one is strictly commercial, one is a broadly focused humanitarian aid organization and two are research institutes. Some, at least some, of these organizations do not have any formal agreement on how they can pool their resources in order to develop REST further. Thus, REST remains a paper tiger, caged by inadequate funding, poor development and accuracy among the few organizations with relevant expertise. The key to the door of the cage is effective research, properly undertaken and properly resourced. The Tanzania workshop was a valuable preliminary step towards building the cage. The next challenge is to feed the tiger, giving it the energy to escape.

Acknowledgements

Thanks to APFOD and the Solomon University of Agriculture for hosting and supporting the REST workshop. The research on REST at the GICHD forms part of the MSTD study mandated by the UN Mine Action Service (UNMAS) and financially supported by a range of donors. The REST government is supported by the governments of United Kingdom, Sweden and Norway.

Contact Information

Håvard Bach
Head of Operational Methods
GICHD
Thierry de la Paix
CH-1211 Geneva 3
Switzerland
Tel: +41-22-9061670
Fax: +41-22-9061690
E-mail: h bach@gichd.ch
Website: http://www.gichd.ch/
Ian McLean
Researcher, GICHD
Tel: +41-22-9061676
Fax: +41-22-9061690
E-mail: i.mclean@gichd.ch

References


The K9 Demining Corps in Lebanon

Thanks to the Marshall Legacy Institute (MLI), dogs are playing a large role in the demining of Lebanon.

by Amy Eichenberg, Program Manager, K9 DC Campaign

Lebanon’s Landmine Problem

Lebanon suffered 15 years of civil war from 1975-1990. Warring parties used land mines extensively, primarily to consolidate defensive positions along lines of demarcation. Unfortunately, many of the mined areas were neither marked nor recorded. Following the war, engineering units of the Lebanese Armed Forces (LAF) began to execute reconnaissance operations to gather information about minefields and to conduct a program of mine clearance. Eliminating the landmine threat was a slow and laborious process, as the LAF had limited resources and training for the task. While known and suspected minefields did not appear to severely restrict socioeconomic development within Lebanon, the fields of “hidden killers” have continued to threaten the population, inflict death and injury, inhibit growth, restrict movement and disrupt the internal and displaced refugee populations. Over the decade following the civil war, the LAF reported clearing 315 known minefields, but so far remained.

The Process

Perry Bishopb, the Executive Director of MLI, and Paul Brown, Canine Specialist from Global Training Academy, which main working dogs and handlers, conducted a study on behalf of the Office of Humanitarian Demining Programs at the U.S. Department of State to determine the applicability of mine detection dogs (MDDs) in Lebanon. Lebanon is famous for its climate, culture, terrain and threat suitable for the work of dog teams. The high metallic content of much of the soil in affected areas made it very difficult for manual deminers equipped with metal detectors to work effectively and efficiently. The borders of minefields were ill defined, placing a premium on technologies that could assist in area reduction. Local populations were fearful of using previously cleared areas without a system of quality assurance (QA). The LAF had experience in the use of working dogs. K9s and veterinary care were immediately available, making Lebanon an excellent candidate for an indigenous MDD program.

Following a visit to Global Training Academy in Texas by the President of Lebanon’s National Demining Office, the Lebanese government requested dogs for its demining program. MLI immediately added Lebanon to its list of target countries for the K9 Demining Corps (K9DC) Program. This campaign seeks to develop an indigenous MDD capacity in severely affected countries by combining resources of the U.S. government, host nations and private donors. This process results in the deployment of certified dogs bonded with local handlers and integrated into the nations mine action program.

MLI received private funds to purchase, train and deliver six MDDs to Lebanon through a donation from the Humpty Dumpty Institute (HDI) in New York. HDI, a non-profit organization, was founded in 1998 to create dynamic public-private partnerships to confront global challenges, specifically the international fight against landmines.

After three months of training in Lebanon, the dogs, handlers and volunteers graduated from the Basic Course in June 2001 and immediately began integration training with manual deminers. The MDD teams began work in July 2001 with the Lebanese National Demining Office (LNDMO) and its demining program. K9DC immediately began integration training with manual deminers. The MDD teams began work in July 2001 with the Lebanese National Demining Office (LNDMO) and its demining program. MLI supported the necessary team leader, and assigned a team leader, and assigned a team leader, and assigned a team leader, and assigned a team leader, and assigned a team leader, and assigned a team leader to work with the mission’s mine action program.

The MDD teams have participated in demining projects throughout Lebanon. At first, the dogs began work in the Bekaa Valley and southern Lebanon, which suffer the most severe contamination. The teams worked an area in the western Bekaa known as Lucy’s Farm. This area was previously demined and was optimal for animal grazing or farming, but the local population was afraid to use the land.

Acknowledgements

The MDD teams have participated in demining projects throughout Lebanon. At first, the dogs began work in the Bekaa Valley and southern Lebanon, which suffer the most severe contamination. The teams worked an area in the western Bekaa known as Lucy’s Farm. This area was previously demined and was optimal for animal grazing or farming, but the local population was afraid to use the land.
Once the MDD teams conducted their searches and verified the areas as mine free, the land was quickly returned to productive use. Another project in the area was a Muslim cemetery that had also been mined. The dogs searched and cleared this land, which was of immense value to the community. Declaring the land mine-free allowed the local population to begin the process of returning to normal life.

The dog teams conducted QA operations and verified that a schoolyard was mine-free. This has alleviated the fears of many parents and allowed the children to play at school for the first time.

The dogs have also been very useful in assuring safe roads around Lebanon. The dogs are cleared a road from Madgara to Jezzine. The landmine contamination of the road forced local populations to take long detours; hence, travel from the south of the Bekaa Valley in the Lebanon coast was severely limited. Now the people and goods can easily and safely travel from the Valley to the coast.

Working with a flail and manual deminers, the dog teams cleared a narrow road used by many shepherds to bring their livestock to the grazing. The land had been mined since the civil war, and there had been three AT mine incidents. Since starting work in September 2002, the teams have detected parts of 11.2 kg AT mines but nothing intact.

The dog teams have been given increased responsibility. The predominantly agrarian town of El Khiam is heavily dependent on their local reservoir. This reservoir is to be linked to a larger water project that will supply water to many people throughout southern Lebanon. When landmines were identified in the project area, dog teams and mechanical equipment were dispatched to eliminate the threat. Because of environmental considerations, the flail could not be used. The dogs were not only tasked with the QA measures but with landmine detection as well. The dogs successfully completed the project in September 2002, and work has resumed on the Khiam water project.

The MDD teams have also provided great assistance in a U.S. Agency for International Development (USAID) project to upgrade a reservoir in the small village of Arnoon. Three AT mines were found in the reservoir and work to remove them was stopped. The dogs cleared a path into the reservoir and over the reservoir floor. Working with a flail, over 2,500 sq m were cleared without finding another landmine. The USAID project has started again.

These are only a few of the numerous projects the MDD teams have participated in from July 2001 through October 2002.

Challenges

The MDDs in Lebanon have met and overcome a number of challenges. Many of these challenges also apply to manual deminers. One is the extreme daytime heat in the summer. The dogs must begin work at first light, usually 5:00-6:00, and finish by 10:00 or 10:30 when it is too hot for them to continue. The cooler weather in autumn allows the dogs to work extended hours.

Much of the area in which the dogs must work is covered with thick brush, heavy vegetation and prickly thorns that impede the ability of the dogs to sniff the ground methodically. The U.S. government and RONCO Corporation have introduced a mechanical flail to remove the vegetation and facilitate the work of the dog teams.

The MDD teams have also faced behavioral and health issues. Scooby had to undergo extensive remedial training, and sadly, he passed away from cancer December 2001. Ben and Rex replaced Scooby and Taz.

In early 2002, Lebanon suffered a period of long and intense rain that severely limited the dogs' ability to do their work. Extensive precipitation and moisture wash the explosive scent deeper into the soil, making it difficult for the dogs to detect the odor. However, once the storms subsided and the land dried out, the dogs returned to business as usual.

MDD teams permanently. This greatly reduces the amount of training that manual deminers have to go through to work with the MDDs. The dogs are more comfortable and familiar with one another, allowing the mine detection process to perform at its optimal level.

While there was a reasonable comfort level in the LAF in working with dogs, it was necessary to build confidence among the LAF leadership and allow the MDD teams to perform tasks beyond QA. Many leaders were initially uncomfortable in relying on the dogs for landmine detection, but, with their demonstrated performance, the dog teams have earned the trust of the LAF and are now allowed to perform a variety of roles, as indicated in the Khiam water project.

Conclusion

The MDD teams in Lebanon have proven to be an essential component of the national demining effort in Lebanon. Since April 2002, the teams searched and cleared nearly 75,000 sq m of land, allowing the local population to lead normal lives.

The work of the dog teams so impressed the Lebanese government that officials requested additional teams to bring the total number to 18. Working with manual deminers and a mechanical flail, the MDD teams have made the vision of a mine-free Lebanon possible and have brought great peace of mind and safety to the communities.

In addition to our work in Lebanon, MLE has played a key role in supplying MDD teams to Nicaragua, Eritrea and, in spring 2003, Armenia and Thailand.

Contact Information

Amy Eisenberg
Program Manager
K9 Demining Corps Campaign
The Marshall Legacy Institute
2425 Wilson Blvd., Suite 313
Arlington, VA 22201
Tel: 703-243-9200
Fax: 703-243-9701
E-mail: info@marshalllegacy.org
Website: http://marshalllegacy.org
**Mine Detection Dogs**

**Mine Detection Dog Program:**

The Cambodian Experience

In the seven years since its creation, Cambodia’s Mine Detection Dog (MDD) Program has grown and developed to become a fully integrated part of the country’s mine clearance strategy. This article highlights the program’s history and achievements.

by H.E. Khem Sophoan, Director General, CMAC

**Background**

The MDD Program was first introduced at the Cambodian Mine Action Center (CMAC) in late 1996, three years after the establishment of the CMAC institution. The aim of using MDDs has been to fill a technical gap within CMAC in order to accelerate mine clearance progress. Integrated training for both dogs and Cambodian handlers started in January 1998. Technical experts from the Swedish Armed Forces conducted the training, and the MDD program at CMAC became operational in June 2000, starting with two teams.

**Why MDDs?**

Experts would agree that MDDs are extremely sensitive in detecting tiny pieces of explosive material—TNT in particular—and ignoring non-explosive metal. The primary purpose of using MDDs as CMAC was to locate and define the boundaries of minefields. This is known as area reduction. Our experience over the last five years or so has proved that MDDs are more effective than manual clearance in areas with heavy laterite or hard ground, areas where metal fragments are scattered abundantly, or places where deeply buried mines are suspected. The dog team has a big advantage over the manual demining teams who are using metal detectors to locate mines. The dog uses his sensitive nose to locate explosives, while a metal detector will find any piece of metal, which then has to be treated as a potential mine. The consequence of this is that time is wasted in investigating pieces of metal that can turn out to be anything from nails to spent bullets. When MDDs mark a spot on the ground, there will always be explosives nearby.

**Organization of MDD Teams**

An MDD team at CMAC consists of a supervisor and an assistant, six dog handlers, six close markers taking care of any brush cutting or any demining with metal detectors, and three drivers who also act as medics if needed. This gives one CMAC MDD team 17 personnel.

**Method**

The method for working with dogs is both easy and hard. The easy part is to teach the dogs to find the smell of TNT, a substance fused in mines and UXO. This is quite similar to the way we use narcotics and other sniffer dogs. The hard part is to be able to read the smallest sign the dog sends out. When dogs sense the smell of TNT, they will sit or lay down to show their handler that there is an explosive device near by. This is called marking, it was developed for Cambodian conditions, and it gives the handlers control over their dogs at all times.

**Core Activities of MDD Program at CMAC**

Currently, three main activities are carried out within the MDD project: training, operations and veterinary services.

**Training**

MDD training is conducted at the CMAC Training Center, located in Kampot Chhrang province, 90 km northwest of the capital, Phnom Penh. CMAC is committed to a sustainable training program to support MDD operations for both expansion and replacement purposes. The program’s MDDs mainly come from Germany and Sweden.

**MDD Operations**

At present, CMAC deploys five MDD teams—two teams each in Battambang and Pursat, one team in Pursat, and one team in Pursat. Another 35 to 40 dogs are currently being trained with plans to increase the capacity of CMAC’s MDD program to the strength of seven teams by the year 2005.

In operations, MDDs have been deployed to support manual demining in...
Assuming the National Ownership

After nearly six years of administration by Sweden, the MDD program was finally handed over to the CMAC on Saturday, 14 December 2002. This was another positive step toward a greater national ownership of the management process for CMAC. The national staffs are now taking full ownership of the program, from managing the dog training program to conducting operations in the minefields.

Unique to the MDD program is also the fact that it is a program that allows Khmer women to work in field operations as dog handlers. Thanks to the Swedish government's invaluable contributions, this project has been successful.

Challenges in Managing the MDD Program

We have to acknowledge that we are also facing difficulties while we are running the MDD program. For example, the limited facilities and skills within the veterinary services. The following are urgently needed:

- Lab (Diagnosis)
- Surgery expert
- Autopsy
- K9 echography and X-Ray
- Pharmacology

Though MDD teams have been remarkably successful, they could not do so without the support of the mechanical brush cutter. The nature of vegetation in Cambodia makes it difficult for MDDs to even access the minefields. The condition of the tropical weather also makes MDD teams quite costly to operate. As mentioned earlier, all MDDs are bought from European countries, where dogs are used to a colder environment. In Cambodia, we need to have the proper equipment, such as a cooling fan for the doghouse during the night and umbrella to shade the dogs while they are resting during operations, as the weather is quite hot in this country.

All in all, MDDs are obviously being seen as an important tool in demining by working in cooperation with the mechanical brush cutter and integrating into the demining toolbox to assist manual demining and conduct quality control. In the near future, the MDD program is committed to playing its role in technical survey, which was recently initiated in its five-year strategic plan for 2003-2007. The task will be a real challenge for CMAC.

Clearance Achievements Made by MDD Teams

The following charts (Figures 1 and 2) indicate the productivity of CMAC's MDD teams over the last three years. From the initial two trial teams in 2000, the productivity surged more than 10 times in 2001 with two additional MDD teams added to the program's strength. The productivity for 2002 remained remarkably high—double that of year 2001 with an additional MDD team added to the capacity. What makes CMAC even more proud of the MDD program has been the safety of our personnel and dogs during operations. We have a record of zero accidents within the MDD operations since the introduction of the program into field operations.

Figure 1: CMAC MDD Productivity 2000-2002 (Ordnance Found)

<table>
<thead>
<tr>
<th>Year</th>
<th>AP Mines Found</th>
<th>UXO Found</th>
<th>AT Mines Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>12</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>52</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>221</td>
<td>134</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 2: CMAC MDD Productivity 2000-2002 (Area Cleared)

<table>
<thead>
<tr>
<th>Year</th>
<th>Area Cleared (sq m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>37580</td>
</tr>
<tr>
<td>2001</td>
<td>418053</td>
</tr>
<tr>
<td>2002</td>
<td>1142105</td>
</tr>
</tbody>
</table>

Mine Detection Dogs in Denmark

Mine Detection Dogs in Cambodia

Mine Detection Dogs in Denmark

as called DANMINAR Dog Training Centre and is located in Denmark, approximately 50 km west of Copenhagen. At the training centre, six people are working to train MDDs, explosive and weapon detection dogs and DDDs. We train approximately 15 MDDs, five to eight EDDs and four DDDs per year. The EDDs and DDDs are mostly used by DANMINAR's own search teams, which operate all over the world at security jobs, etc. But EDDs and DDDs are also sold as fully trained dogs with the training of dog handlers to governmental organisations all over the world. In total, we now have more than 20 fully trained dogs of different types, all ready to go to work or to be sold.

As DANMINAR, we still consider ourselves beginners in this business, and we do welcome any information or help that we can get. We do believe that this business is a very important and dangerous job to keep commercial interests out of the way of developing better and safer ways to free the world of the landmine problem. Even if we (the dog training companies and organisations) do share all the jobs in the world, we still cannot manage to solve the problems within the next 100 years.

So folks, let's cooperate!

Contact Information

Mikael Borch Madsen
Manager, DANMINAR Dog Section
Brendetalen 4B
DK-2635 Ishøj
Tel.: +45 43 53 08 70
Fax: +45 43 53 08 75
E-mail: danminar@dol.dk
Website: http://www.danminar.dk/index.html

"All photos courtesy of the author."

Contact Information

H.E. Khean Sophan
CMAC Director General
Bldg 10-12, Road 528
Quarter Boeung Kuk 1
District Toal Kork
PO Box 116
Phnom Penh, Cambodia
Tel: 855-12-722-335 (mobile)
Fax: 855-23-360-096
E-mail: kh sophan@cmac.org.kh
Website: http://www.cmac.hlm/kh/cmac
Mine Drill for Drevers

With its Mine Dog Centre in Pretoria, MineTech International has begun a two-year program to assess the potential of the Drever for development as an alternative breed for mine detection work. The project has been initiated by the Geneva International Centre for Humanitarian Demining (GICHD), which has provided six dogs for the project. The study involves keeping detailed records of all areas of the Drevers’ development process to identify both the positive and negative aspects in training these dogs as mine detection dogs (MDD). The project began in October 2002, and although it is still in early stages, some interesting observations are emerging. Hugh Morris, Operations Director at MineTech, looks at some of the processes and progress of the study to date.

by Hugh Morris, Operations Director, MineTech International

Introduction

The Drever is a relatively new breed of dog, dating back to the early 20th century. With its relatively short physique, short legs, big body and strong build, it is perhaps at first glance not the most likely candidate for the role of mine detection. Not so; there are real benefits to sourcing a smaller, trainable, portable, logistically efficient dog. The Drever’s size and shape is what the GICHD called “the answer to Duyck’s (Project Manager for MineTech) prayers.” Bred from German Dachsbracke and Danish Streifhund, they are also known as the “cleaner-Swedish Dachsbracke.” However, its cousins are Basset, Beagles and Dachshunds, and not only do they make excellent family pets, but they are also reliable hunting partners with a finely honed sense of smell. Dressed or “to hunt” in Swedish, is what the Drever does best, tracking hare, fox and occasionally deer, with the courage to pit himself against wild animals, including the wild boar.

Our dogs arrived directly from Sweden, and as part of a system whereby each new litter is named in alphabetical order, this group had the letter “ve”—appropriately enough for their designation, “experimental.” They had originated from three different litters.

The oldest, Edward and Einstein, were born on March 29, 2002. Elvis and Eddy joined on July 7, and the babies, Eric and Erin, arrived on July 19. The dogs are all males, and with other breeds we have achieved excellent results with both males and females, so there is no reason to believe that the Drever females will not perform to a similar standard.

Acclimatisation

For dogs that had to travel from Sweden and then face exposure to a totally new environment and climate, they were not abnormally stressed or nervous. They settled down quickly getting used to a new home, environment and handler. Einstein was the only dog with early problems, initially losing weight after not eating for the first four days. The dogs were weighed on a daily basis with their weight analysed at the end of every week. This weight management programme monitors whether or not the dogs are growing at a satisfactory rate, are medically sound and are adapting to their new environment. After the first few days, all dogs had gained weight and continued to grow steadily on a high-protein diet similar to Eukanuba. Initially fed twice a day until they reached six months, they now get one main feed, on average 1600g for a 16 kg dog.

The Drevers also receive medical check-ups on a daily basis to ensure they are medically fit at all times, but also to ensure we understand when they are ill and know whether this is a factor in limiting progress with their tasks. These medical check-ups are of vital importance to us and, at the Mine Dog Centre, are carried out from birth through the socialisation, training and operational life of the dog. All the daily check-ups are recorded in the ‘dogs’ log book, alongside all other aspects of the dog’s daily performance.

The crux of MineTech’s mine dog training involves three key processes—socialisation, retrieval and agility. The programme has developed through years of using an existing and the existing dogs to remain as a specific task. Since 1998, 62 German Shepherds, two Labradors and 16 Malinois have qualified through this regimen, using different conditioning techniques to suit the temperaments of each dog. There are five key characteristics that will make a dog perform well in a minefield: a high motivation to please the dog handler, high drive; excellent focus on work; stable temperament; and good adaptability. Our programme is designed to both assess and develop these five key proficiencies.

Socialisation

Once the dogs had settled in, they were exposed to a variety of positive influences as part of a socialisation period to better equip them to deal with the outside environment. Socialisation minimises the chances of a dog getting distressed through unfamiliar noises and sounds, which means they will adapt more easily and be more focused on their duties within a minefield. Our aim at the Mine Dog Centre is to rear and socialise the Drevers into well-balanced adult dogs who are confident, responsive and able to concentrate on their work.

The Drevers have been progressing through a series of socialisation trips, similar to the activitiesignon in other dogs. They are exposed to a range of experiences—people, traffic, different environments and locations, garthons, obstacles, shopping malls, etc., and each of the dogs has progressed well and continues to improve.

Retrieving or Ball Drive

Retrieving is an essential part of the whole programme since it is the retrieval or ball drive of the dogs and the motivation for retrieving that generally determine whether they will be suitable for use as future demining dogs. Our dogs are assessed initially on their enthusiasm in playing with a ball or a retrieval object. This is called a long, it is made of rubber and very chewable. Once we notice that a dog has a high drive to play with the ball, the ball is tosser farther and farther away for him to collect and return to the handler. Gradually, the game starts to include small tasks for which the puppy is rewarded with the ball on successful completion. As the programme progresses, the dogs are tested and played with on different terrains, but the long or retrieval object remains the same.

It is essential throughout that the dog works to please his handler as well as to gain a reward. At the Mine Dog Centre, we believe that the praise and attention the dog receives after each successful exercise must be on the same level as the reward. Praise and attention introduce additional motivations, and these are used to direct the dog into other activities. For example, in agility training, dogs that clear an obstacle successfully become more and more motivated if they are praised and rewarded at the end of the exercise. Reward through play is a major motivator for every dog and produces a high level of trust and a strong bond between each dog and his handler.

Dogs that have no “ball drive” in the early stages of socialising very quickly fall by the wayside as the training programme progresses. Although it is possible to teach some dogs how to retrieve, our findings show that dogs that have to be taught the retrieval skill do not have the same output or drive as dogs that do it naturally. As a result, we do not commit resources to teaching a dog ball drive, since experience shows they will fail when it comes to performance in the field.

Agility

The agility tests are important in that they allow us to focus closely on the differences in character among the dogs. Over time, they have all shown more confidence and are more aware of their own physical abilities. Our studies have proved that agility can be seen as a stepping stone to a more mature and confident adult dog, and a dog with this confidence will find it easier to adapt to new environments and different circumstances. To date, the Drevers have responded well to agility training, and there are no apparent differences here among the Drevers themselves or between the Drevers and other breeds.

Findings

It is still early in the study, but already we are gathering some positive results. The Drevers are no longer as dependent on each other as they were upon their arrival in South Africa. We are now giving them more time to themselves and have already seen, through this process, that the dogs have learned individuality and confidence. We continue to monitor their progress.

The dogs are responding well to both the socialisation and agility programmes, which play a very important role in the development of a dog’s character. Most importantly, retrieval or ball drive in the younger dogs is proving to be as high for the Drevers as it is with the German Shepherds and Malinois. Edward and Einstein, however, are not achieving the same standard as their younger cousins. The two older dogs showed no retrieval progression at all, and at this point, we can only conclude that this was because they had not been exposed to the programme from a sufficiently early age. The pair only retrieves now and then and, for very short sessions. What is interesting

Continued on page 95

Published by JMU Scholarly Commons, 2003

90

91

47
Mine Detection Dogs: An Integral Tool in RONCO Mine Clearance Operations

Mine detection dogs (MDDs) have become an important tool to mine action organizations in many programs across the globe. For about 15 years, RONCO has been one such organization. This article describes the role of MDDs in RONCO’s operations.

by RONCO

Introduction

Brenda sits, alerting her handler that she has located the training mine. Her handler retrieves a red rubber ball from his pocket, throws it, and praises Brenda after she has chased it down and obediently returned to her position. Brenda is easily satisfied with the positive reward she receives; her handler, Jaron Josipovic, is pleased with her performance over the past week of refresher training. He trusts her keen ability to detect mines; she trusts him to lead her to the lane and care for her after a long day in the field. Together, RONCO’s boarded MDD team of Brenda—a Belgian Tervuren (a cross between a Belgian and German Shepherd)—and Jaron, her handler—work all over the world, preventing injuries and fatalities from landmines and UXO.

In the past, the team has deployed to the Balkans, Cuba, Namibia and Albania to tackle mine clearance tasks. However, their most challenging is their most recent demanding task in mine-laden Afghanistan, where the RONCO MDD teams searched more than two million square meters of land. RONCO and its partner, Global Training Academy (Global), developed an innovative and highly effective method of detection, detection QA, and verification of minefields that is still used today. By integrating MDDs into clearance operations, RONCO quickly developed the capacity to vastly increase productivity in the field and, more importantly, to prevent the risk of casualties to deminers. The integration of MDDs into mine clearance and quality assurance (QA) tasks has evolved into an industry-standard method of demining, making RONCO a leader in the innovation and design of MDD programs.

RONCO began incorporating dogs into demining operations in Afghanistan in 1989, following the departure of Soviet forces. In a country highly burdened with landmines, a trained dog’s sharp ability to pinpoint and alert handlers to the locations of mines, as well as the speed with which it can cover large areas of ground, became a valuable asset to manual demining teams. Utilizing the dogs’ fine-tuned sense of smell and integrating the dogs into manual demining operations proved to be a highly accurate, safe and cost-effective method in humanitarian demining. Today, some 15 years later, trained and experienced dogs like Brenda are still the most precise method of mine detection.

A Tested and Proven Technology

In 1995, the U.S. Army conducted a field test to assess the value and accuracy of 30 discrete demining technologies, including RONCO’s Global MDDs. The assessment concluded that dogs were “at the top of the list,” in terms of finding mines and tripwires. They detected every tripwire set and discovered more mines than any other system. Further, the Army noted that the cost-effectiveness and timeliness of utilizing MDDs in mine clearance operations were enhanced when coupled with appropriate vegetation conditions for demining on the Sena Railway Line. With successful coordination of the demining teams, optimal productivity from the demining teams in the field and minimal mechanical downtime for the two machines being employed in this task, considerable progress was made towards completing the railway clearance. The integration of manual, MDD and mechanical methods of clearance proved to be extremely effective during these operations.

RONCO teams in Mozambique cleared over 450 kilometers of railway line in support of the Sena Railway Line Rehabilitation Project, as well as over seven million square meters of ground in other areas of Mozambique. Clearance of the entire line was completed in September 2002, some six months ahead of schedule. Clearance and QA operations on the rail line, including to clearing construction access routes to the railway, enabled contractors working to restore the railway to rebuff fire railway bridges and multiple water discharge channels. As a result, MODs have deployed demining teams to Mozambique to clear riverbeds and reassert the rehabilitation completed in 2003, some 20 years after the railway was closed. Demining and reclamation of the Sena Railway Line, which runs through Mozambique’s economic heartland, will have a significant impact on economic development and job creation; it has already produced jobs for the many Mozambicans employed by the rehabilitation project.

Integrating MDDs into Demining Operations in Afghanistan

In 1989, RONCO created the Lebanese Mine Detection Dog Program, which has since partnered with non-governmental organizations (NGOs) with 92 MDDs and about 270 Afghan employees. Although RONCO completed work on the Sena Railway Line in early 1994, the Center continues to operate effectively today; it currently employs 30 MDDs in the U.S. Army’s Afghan Mine Detection Dog Program (MODs) teams. Over 10,000 mines and UXO were located and destroyed during these operations, most of them being detected behind field operations.
significant number of AT mines, however, were detected ahead of the hills, since tall operators, when processing land suspected of containing AT mines, requested that the MOD teams precede them to minimize possible damage to their equipment.

Partnership With MIL in Eritrea
In 2001, RONCO began providing assistance to the Eritrean Demining Program (EDP) by establishing an MDD capability to support national demining objectives. In addition, RONCO participates in the Marshall Legacy Institute's (MLI's) Mine Detecting Dog Partnership Program (MDDPP) in Eritrea. This program combines the resources of the U.S. and Eritrean governments independently in the field with periodic resupply, maintenance and supervisory visits from Eritrean army headquarters. The MDD section supports the deployment of certified dogs bonded with local handlers into an integrated mine clearance process to accelerate the pace of mine clearance operations. To date, RONCO technical advisors assisting the EDP have trained two demining companies of three platoons each and an MDD section currently consisting of 12 MDD teams. Both companies have the MDD detection systems—Tempest, the Survivable Demining Tractor and Tools (SDTT) and the BDM 48—conducting demining operations in both wet and dry seasons. The development of a fully integrated humanitarian demining capability is a significant and noteworthy accomplishment for TMac, considering the extent and severity of Eritrea's landmine and UXO problem, particularly along its border with Cambodita.

TMac is faced with the daunting task of both the creation of an effective humanitarian demining program (to date, two HMAUs are in operation) and his begun manual demining and a fourth was recently established and conducting field integration and training, and live clearance operations in high priority areas. TMac is also performing a full range of clearance operations in high priority areas. TMac is also performing a full range of clearance operations in high priority areas.

Conclusion
Brenda sits again, alerting Jared to the presence of a fully integrated humanitarian demining capability is a significant and noteworthy accomplishment for TMac, considering the extent and severity of Eritrea's landmine and UXO problem, particularly along its border with Cambodia. This land, furthermore, is mostly highly fertile latite soils that is both heavily contaminated with metal (particularly in areas previously used as refugee areas by the Khmer Rouge and other Cambodian resistance groups) and heavy, dense vegetation in former guerilla base areas and battlefields. As a result, the integration of MDD teams with both manual and mechanical demining has been vital to the success of TMac's operations to date and to the early reintegration of previously denied lands to villagers in the border area. Since 2000, TMac has cleared almost six million square meters of mine-affected land through the use of this integrated manual, MOD and mechanical demining system. In all of the above examples, the process of RONCO and the host country is due to the integration of MOD programs into manual mine clearance operations. These programs are even more effective when combined with both manual and mechanical operations, bringing the full range of clearance technologies to the task of clearing landmines and UXO from economically important, but denied, lands.

Contact Information
Stacy L. Smith
Program Analyst
RONCO Consulting Corporation
2301 M Street, NW, Suite 400
Washington, D.C. 20037
Tel: (202) 785-2791
Fax: (202) 785-2078
E-mail: smiths@roncowash.com
Website: www.roncowashing.com

Ron's Mine Detection Dogs continued from page 51

in general about the successful dogs is that the motivation for the retrieval behaviour appears to be different from other breeds. From a young age, they appear to be motivated to complete the task for themselves—no attention-seeking behaviour is present. This may explain why there is more of a problem in getting the Drever to work for his handler without becoming distracted by things, which can be seen as totally normal for his genetic makeup. If a bird flies close by while the Drever is working, the Drever will lose focus on its task immediately and switch attention to the bird. A dog such as a German Shepherd or Malinois is much more focused on his handler. With the Drever, a dog bred to hunt, the motivation is clearly very different.

Operationally, however, the Drever does have other key advantages. One is its size and weight, which results in less ground pressure, minimizing the chances of detonating a landmine, although it remains to be seen whether the size of the dog will be a problem when working in difficult terrain such as long grass. Size is also a factor in pure economics. The size of the dog means that it can be flown round the globe as hand luggage or excess baggage, whereas other dogs would be limited to the cargo section.

Time will tell whether the Drever will be able to translate many of its inherent skills and characteristics to play an integral part in mine action. We do expect to see some of these dogs in the demining field, but it is still too early to say which dogs will be successful.

Contact Information
Hugh Morris
Operations Director
Mintek International
22 York Avenue, Highlands
Harare, Zimbabwe
Tel: +263 4 766216
Fax: +263 4 746902
E-mail: hugh.morris@mintek.co.uk

Published by JMU Scholarly Commons, 2003
94
95
49
Geneva Diary: Report from the GICHD

by Ian Mansfield, Operations Director, GICHD

The GICHD has recently published a number of studies on a wide range of mine action topics that have generated quite a deal of interest in Mine Action Equipment: A Study of Global Operational Needs. The aim of the study was less to present a comprehensive evaluation of the suitability of existing equipment in the mine action sector, to analyse the shortfalls in capabilities and to propose likely future trends.

The study identified 12 indicative operating scenarios, such as woodlands, urban areas, paddy fields, routes and hillsides. It then went on to define in some detail a range of capability areas, or tasks, that make up the overall demining process.

These tasks included hazard identification and location, detection of the outer edge of minefields, close-in detection of the minefield itself, personal protection and clearance verification. Information on all these scenarios came from field users, terrain analysis modelling and expert opinion from programme managers in the field.

After developing a computer model, the study’s authors were able to classify three categories in which improvement in equipment capability would have significant, significant or negligible benefits. Not surprisingly, perhaps, the study found that improvements in capability for two tasks—locating the outer edge of a minefield and close-in detection of individual mines—would lead to very significant benefit. The same was the case for tasks such as mapping, but the advantage was not as significant. For example, it was estimated that, on average, a deminer working in a paddy field currently spends over 60 percent of his/her time investigating false alarms, such as metal fragments that cause the detector to sound off. If this time could be reduced by 50 percent, it would lead to a marked improvement in productivity. On the other hand, improved vegetation cutters would have no impact on productivity rates for demining in the desert. One interesting finding was that the density of mines in an area has very little impact on the rate of clearance. Time spent dealing with individual mines is insignificant in relation to other activities such as vegetation clearance or investigation of false alarms.

While all this may appear to many, gut feeling has now been replaced by measurement, and priority areas that will yield the greatest improvement have been identified. A major benefit of the study will be the research and development (R&D) sector, which will now have better information on which to base priorities on. Valuable terrain models have been developed, and a baseline has been created for more precisely establishing statements of operational needs. Details of the study are available on the GICHD website at www.gichd.ch, or hard copies can be ordered from the Centre (see contact information below).

Other News

The Review Board for the International Mine Action Standards (IMAS) met in the GICHD on 31 January 2003. The meeting was chaired by the United Nations Mine Action Service (UNMAS) and was comprised of representatives from UN agencies, the GICHD, non-governmental organisations (NGOs), commercial companies, donors and mine-affected countries. The meeting noted that the four mine detection dog (MDD) standards were recently endorsed by the United Nations, and reviewed the progress on the development of standards for contracting, mine risk education and management, and training. UNMAS plans to conduct a survey of users’ views towards IMAS, and it was agreed that continued outreach and training with regard to the standards was required. To this end, the GICHD has established an MDD Standards Implementation Support Committee to help mine action programmes adopt the MDD IMAS as national standards. All the latest IMAS are available through the GICHD website or the UNMAS E-Mine Site (www.mineaction.org). A new CD, IMAS 2003, will be issued in March 2003.

The 2003 version of the Mechanical Demining Equipment Catalogue has been completed, and it was distributed in early February 2003. The catalogue contains over 50 different machines in various categories, such as rakes, tilts, multi-tools, vegetation cutters and mine-protected vehicles. The catalogue has a new format, with the performance data of comparable machines placed in a table for easy reference. Again, copies are available from the Centre (see contact information below).

Contact Information

Ian Mansfield
Operations Director
GICHD
The Avenue de la Pâix
PO Box 1300
Geneve 1 CH-1211
Switzerland
Tel: +41 22 906 1675
Fax: +41 22 906 1690
E-mail: i.mansfield@gichd.ch
Website: www.gichd.ch

Geneva International Centre for Humanitarian Demining (GICHD) provides operational assistance to mine action programmes and operators, conducts research and provides support to the Anti-Personnel Mine Ban Convention.

An Update on the Mine Action Support Group

The following article highlights the recent activities of the Mine Action Support Group (MAG). This includes updates on the United Nations Mine Action Service (UNMAS), the United Nations Development Program (UNDP) and the United Nations Children’s Fund (UNICEF).

UNMAS Updates

Policy, Resource Mobilization and Information

The most significant recent policy development is the General Assembly’s adoption of its new Resolution on Assistance in Mine Action. This resolution reaffirms the particular role of the United Nations in mine action coordination and calls for a formal review of UNMAS’s five-year strategy in 2003. Additionally, the UN Action Programme on 10 April is in its final stages of development. The draft policy was scheduled to be circulated by the end of January 2003, after final internal revisions.

Since November 2002, additional pledges within the Voluntary Trust Fund for Assistance in Mine Action (VTF) have been received from Denmark, Germany, Italy and Switzerland. The funds received in the VTF for 2002 totalled $24.2 million (U.S.), which came from 16 donor countries. This is more than twice the amount contributed in 2001. The first Workshop on Landmine and UXO Safety Training was held in Tehran on January 7–8, 2003. Representatives from the government, UN agencies, non-governmental organizations (NGOs) and oil companies attended the workshop, which was organized by UNDP Iran. A series of landmine and UXO safety training workshops will be held in 11 mine-affected countries over the course of 2003.

Afghanistan

Key staff from the Mine Action Center for Afghanistan (MACA) visited New York from January 6–11, 2003, for discussions with representatives of UN agencies. One result of this meeting was the decision to conduct a seminar in Kabul in March to produce supporting plans for implementing the multi-year strategy formulated in late 2002. The funding of operations for 2003 remains at a critical level, with approximately $20 million of outstanding pledges from various donors still to be deposited to support activities in the field.

Democratic Republic of the Congo

In the Democratic Republic of the Congo (DRC) and the United Nations Mine Action Ofﬁce (UNMAO) is coordinating bilateral contributions to provide the national authorities with the full capacity to manage the mine/UXO problem. It is expected that in 2003 the Macedonian Mine Action Centre will have the capacity to cope with the residual problem, when training of national staff and development of national standards are completed with the technical assistance of the United Nations. The North Atlantic Treaty Organization (NATO) has recently investigated WWI I UXO and is considering funding clearance activities.

Southern Lebanon

As of December 2002, “Operation Emirates Solidarity” (OES)—founded by the United Arab Emirates (UAE)—had allowed for more than 21,300 AP mines to be destroyed and over 2,500,000 square meters of land to be cleared and handed over to communities. It is now anticipated that OES will be completed by mid-2003, but efforts are underway to persuade the UAE to allow remaining funds to extend activity in support of the Emiratisation in the Litani River. The UAE agreed to provide support to the operation of the MACC, to cover the incremental costs related to the OES initiative, in particular those related to QA activities. Current funding for QA will only cover part of the core costs of the MACC through June 2003; an additional $400,000 is necessary to fully support the MACC in this effort.
Sudan

Preliminary planning for mine assessment and clearance is in an advanced stage and funding is required to get the process under way. A small team of humanitarian deminers has been temporarily deployed to the high risk areas in the north west of the country. The team, consisting of 12 members carrying out a 12-month project, will assess the mine threat and develop a strategy for future operations. The project will be implemented by UN Mine Action Teams (UNMAT) and funding will be provided by the international community.

Albania

Demining activities in Albania were wound down in November 2002. A planning group met on November 28, 2002, to review the current strategy and make plans for 2003. The following are the key objectives for 2003:

- Complete the impact surveys in and around Padesh, where the Albanian border meets the Montenegrin border, by June 2003. This will conclude the impact surveys started in 2002.
- Complete the technical surveys by November 2003, which will release an estimated six million square meters of land.
- Clear an additional 500,000 square meters of land.

Demining activities will resume in March 2003, beginning with a refresher training course. Clearance activities for 2003 will require $5.42 million, which will be financed by donations from international donors.

Ethiopia

In December 2002, the Ethiopian Mine Action Office (EMAO) deployed two newly trained civilian demining companies to conduct surveys, marking, clearance and mine risk education (MRE) operations. The demining activities supported by the Emergency Mine Action Recovery Project (EMARP), which is funded by the World Bank, EMAO is currently finalising in concert with the World Bank for 2003. The funding will support the four demining companies that currently work in the country and enable EMAO to field rapid response teams and establish a national QA capability.

Also in December, the United Nations and the government of Ethiopia launched a launched an appeal for assistance in dealing with a major humanitarian crisis facing Ethiopia. The ongoing widespread drought. 20 percent of the population has been identified as being at risk of food insecurity as a result of water shortages. The drought impacts mine action efforts because the displacement of the affected population has reduced the availability of demining teams, which are needed in access to food and water. The demining efforts are also hampered by the difficulty of reaching communities in remote areas, where the displaced people are located.

Yemen

Eight of Yemen's 16 high-impact mine-affected communities identified by the Mine Action Committees (MAC) are in the country and require further assistance. Yemen is one of the countries most affected by landmines, with an estimated 2.5 million people in danger. The MACs have identified 11,000 high-impact mine-affected communities in Yemen, which will require an estimated $25 million in assistance.

Angola

UNICEF continues to support national mine awareness NGOs in seven provinces: Huambo, Bié, Moxico, Uige, Catumbela, Huila and Malanje. NGOs in these regions are assisting returning populations who are traveling to previously inaccessible areas. Their aim is to train local representatives, as well as municipal and community activists, in topics related to MRE before the end of the year. In other MRE news, the government of Angola has recently pledged $8.1 million for its MRE activities in Angola.

Botswana-Herzegovina

UNICEF continues to develop its three-year mine action program (2002-2004), targeting 600,000 children between the ages of five and eight in pre-schools, primary schools and secondary schools. The program is working on three levels: 1) technical support provided to the Bosnia-Herzegovina Mine Action Center (BHMAC) to ensure the effective coordination of MRE programs with national mine action plans; 2) the use of schools as entry points for MRE programs in collaboration with the Ministries of Education and 3) the development of community capacity to maintain an adequate level of mine awareness. Additionally, the government of Botswana has recently pledged $450,000 for UNICEF's Mine Injuries Prevention Program in Botswana-Herzegovina.

Burundi

A survey on mine victims has just been completed. A team composed of mine experts from the United Nations Mine Action Centre (UNMAC) and local organizations has been carrying out a comprehensive study of the impact of landmines on communities in Burundi. The study has identified 2,500 mine-affected areas in the country, which will require an estimated $4.2 million in assistance.

The Victim Assistance Program is currently providing medical care (such as surgery, prosthetics, burn care and eyeglasses) to 115 people, a service made possible through Mine Action Program funding.

UNICEF continues to support national mine awareness NGOs in seven provinces: Huambo, Bié, Moxico, Uige, Catumbela, Huila and Malanje. NGOs in these regions are assisting returning populations who are traveling to previously inaccessible areas. Their aim is to train local representatives, as well as municipal and community activists, in topics related to MRE before the end of the year. In other MRE news, the government of Angola has recently pledged $8.1 million for its MRE activities in Angola.

Botswana-Herzegovina

UNICEF continues to develop its three-year mine action program (2002-2004), targeting 600,000 children between the ages of five and eight in pre-schools, primary schools and secondary schools. The program is working on three levels: 1) technical support provided to the Bosnia-Herzegovina Mine Action Centre (BHMAC) to ensure the effective coordination of MRE programs with national mine action plans; 2) the use of schools as entry points for MRE programs in collaboration with the Ministries of Education and 3) the development of community capacity to maintain an adequate level of mine awareness. Additionally, the government of Botswana has recently pledged $450,000 for UNICEF’s Mine Injuries Prevention Program in Botswana-Herzegovina.

Burundi

A survey on mine victims has just been completed. A team composed of mine experts from the United Nations Mine Action Centre (UNMAC) and local organizations has been carrying out a comprehensive study of the impact of landmines on communities in Burundi. The study has identified 2,500 mine-affected areas in the country, which will require an estimated $4.2 million in assistance.

The Victim Assistance Program is currently providing medical care (such as surgery, prosthetics, burn care and eyeglasses) to 115 people, a service made possible through Mine Action Program funding.

UNICEF continues to support national mine awareness NGOs in seven provinces: Huambo, Bié, Moxico, Uige, Catumbela, Huila and Malanje. NGOs in these regions are assisting returning populations who are traveling to previously inaccessible areas. Their aim is to train local representatives, as well as municipal and community activists, in topics related to MRE before the end of the year. In other MRE news, the government of Angola has recently pledged $8.1 million for its MRE activities in Angola.

Botswana-Herzegovina

UNICEF continues to develop its three-year mine action program (2002-2004), targeting 600,000 children between the ages of five and eight in pre-schools, primary schools and secondary schools. The program is working on three levels: 1) technical support provided to the Bosnia-Herzegovina Mine Action Centre (BHMAC) to ensure the effective coordination of MRE programs with national mine action plans; 2) the use of schools as entry points for MRE programs in collaboration with the Ministries of Education and 3) the development of community capacity to maintain an adequate level of mine awareness. Additionally, the government of Botswana has recently pledged $450,000 for UNICEF’s Mine Injuries Prevention Program in Botswana-Herzegovina.
News from the OAS

This article highlights recent news from the Organization of American States (OAS) Mine Action Program.

by Whitney Tolliver, MAIC

Success in Costa Rica

Since 1996, the OAS Mine Action Program has assisted the government of Costa Rica in its efforts of mine clearance, mine risk education (MRE) and victim rehabilitation. On December 10, 2002, the country became the first in the Americas to officially declare itself free of AP mines. Mine contamination within the country had been concentrated primarily along the northern border as a result of the conflict in Nicaragua. Costa Rica itself has never produced, imported, stockpiled or used AP mines.

Initiating the demining program proved to be difficult due to an absence of maps illustrating the mined zones in the country. Costa Rican local authorities and OAS officials estimated that a total of 5,000 AP mines possibly littered the ground. This figure was later reduced with the help of the Inter-American Defense Board and local civilians in order to define three main contaminated areas: Alajuela, the Upala border and Guanacaste.

The clearance operations experienced a few temporary delays due to a lack of funds in December 2001 and an inconsistent availability of air medical evacuation support. Once operations resumed, Costa Rican dentists were able to extract 338 AP mines and pieces of UXO in the marked areas, declaring the country mine free.

Costa Rica ratified the Ottawa Convention in 1999, and with mine clearance complete, has accomplished its goal well in advance of the treaty deadline.

Donor Contributions Make Mine Action Possible

With the increased demand for assistance in humanitarian demining in the Americas and other parts of the world, the OAS Secretary General Cesar Gaviria hosted a donor conference on October 17, 2002. The event detailed the work of the OAS Mine Action Program and thanked donors for their support.

The conference resulted in a positive outflow of continued contributions by donor governments. Norway donated $475,893 (U.S.) to assist programs in Honduras and Guatemala; Italy contributed $152,400 for demining operations in Guatemala, Honduras and Nicaragua; and France committed $75,000 toward a program to rehabilitate landmine victims. The most recent approximation of donated sums totals $1,508,000 from the governments of France, Canada, Brazil, the United States and Norway. This follows contributions of more than $24.5 million by 17 different countries since 1999.

The OAS uses donor funds to finance modules of operations in recipient countries. The modules are divided into six-month time frames and cost approximately $350,000-$450,000 each. Currently, the OAS Mine Action Program is running modules in Honduras, Guatemala, Peru and Ecuador, and three operational fronts in Nicaragua. With only two more six-month modules, the OAS believes the government of Honduras will be able to declare the country a "landmine-free zone" this year.

The OAS also hopes to implement a new demining program in Colombia this year. The module, however, is expensive and the OAS Mine Action Program

Continued on page 103

The Survey Action Center

The Survey Action Center (SAC) serves as the executing agency for Landmine Impact Surveys (LISs), which will allow for greater prioritization of demining efforts and further integration of the various mine action sectors.

by David Hartley, MAIC

Background

The Survey Working Group (SWG), which consists of leading international NGOs and UN agencies in mine action and the Geneva International Centre for Humanitarian Demining (GICHD), created the Survey Action Center in 1998. The SWG asked one of its members, the Vietnam Veterans of America Foundation (VVAF), to serve as the advisory and management body for the SAC.

At the end of 2001, the SWG authorized the creation of an independent Board of Directors. The SWG remains the advisory body for SAC.

The SWG is responsible for the protocols that have been established through the SAC that define and maintain the high international standards of the LIS. The goal of an LIS is to provide information in order to improve priority setting by donors and mine action agencies.

Operations Update

In Africa, SAC’s surveys are progressing as planned. After completing an advanced survey mission in Angola, Mike Kendellen and Bob Eaton—the Director for Survey and the Executive Director, respectively—met with various mine action leaders and representatives to discuss plans for the survey.

As a follow-up, Mr. Kendellen returned to Angola in December to draft survey implementation plans with UN and NGO partners for the LIS. In addition, the director of the National Inter-Sectoral Commission for Demining and Humanitarian Assistance (CNIDAH) signed a letter voicing support for SAC’s operations. The German government is funding this preliminary phase of the LIS.

The data collection itself will take approximately 10 months to complete. SAC is working with the Danish Demining Group (DDG), the Norwegian Peoples Aid (NPA) and Ethiopian Mine Action Office (EMAO) to organize and conduct a survey in Ethiopia. Three field offices have been established for the implementation of the LIS: (1) Mekelle in the Tigray region, (2) Dire Dawa in the Somali region, and (3) Awasa in the southern region. Also, interviewer recruitment and training commenced recently, and the first batch of results from the Expert Opinion Collection have been delivered. Final arrangements (permissions and logistics) are being made with the communities selected for the pilot test.

As of December, 238 communities had been surveyed, including the Sahel region and all accessible districts of the Togdheer region. Security concerns in the eastern Soel region that borders Djibouti had temporarily halted data collection, but a complete assessment of the security situation and its impact on the survey was completed in early January. To date, LISs have also been completed in Chad, Mozambique, Thailand, Yemen and Cambodia.

In Ethiopia, SAC is providing technical and training support to the UN-sponsored LIS, which is being implemented through the Ethiopian Solidarity and Cooperation Association. Senior staff training by the SAC team was conducted in December, and Expert Opinion Collection is in progress. The start of data collection is scheduled to begin in April and continue through the end of June 2003. A team consisting of Ted Patterson, Sito Sekelion and Greg Wildacre was in Sarajavo for the Task Assessment and Planning pilot project. These individuals brought valuable and varied experience to bear on the issue of task selection within high- and medium-impact communities. Alastair McAlpin from Cranfield Mine Action (CMA) also visited during the period to begin work on the strategy-planning module of the survey.

Acknowledgements

Much of the content and data in this article was provided by the Survey Action Center. To learn more, visit their website at www.sac-na.org.

Contact Information

Mike Kendellen
Director
Survey Action Center
6930 Carroll Avenue
Suite 340
Edsoka Park, MD
Tel: 301-891-9192
Fax: 301-891-9193
E-mail: mike@sac-na.org

http://commons.lib.jmu.edu/ece-journal/vol7/iss1/1
Canadian Centre for Mine Action Technologies

Funded by the Canadian Landmine Fund, the Canadian Centre for Mine Action Technologies (CCMAT) works with Canadian and international organizations to enhance the mine action community. To date, they have tested and evaluated a number of now widely used pieces of mine action equipment as well as researched new techniques to further develop demining technologies.

by Susanna Sprinkel, MAIC

Introduction

CCMAT was established in 1998 at the Canadian Forces Base in Suffield, Alberta (Canada). Their mission is "to continue the testing and development of low-cost, sustainable technologies for mine detection, mine neutralization, personal protection and victim assistance." In its first five years, CCMAT has become a valuable resource for testing and evaluating the development community's newest technologies. So far, they have collaborated with Canadian industry on a number of different projects.

Product Testing

One of the most important functions of CCMAT is to guide Canadian companies through the process of developing mine action technologies. This element includes setting up and carrying out a means for effectively evaluating equipment throughout its development. As a result, a company is able to weed out inefficient equipment or to improve their designs at an early stage, saving both time and money. Initial testing and evaluation by CCMAT is conducted at three main sites: the Mine Effects Site, the Mechanical Reproduction Mine (MRM), and the Binary Explosive FixOR. Persian Brush Cutter and Deminer, the BDM48 uses a revolving drum to clear heavy vegetation, tripwires and most mines, preparing an area for manual deminers. Through extensive testing, the BDM48 has demonstrated more power than previous brush cutters and has become a valuable tool in a clearance effort in Thailand. For more information on the BDM48—developed by Promac Manufacturing Limited of Duncan, British Columbia—visit http://www.promac.bc.ca/.

Mechanical Reproduction Mines

Produced by Amtech Aeronautical Limited, the MRM has become a valuable tool at CCMAT and other demining organizations for testing mechanical equipment and training deminers. For more information on the MRM, visit http://www.amtech-group.com/.

Binary Explosive FIXOR

Since its development, FIXOR has been used in major demining operations throughout the world. This binary explosive consists of two non-explosive elements that can be mixed together to form an explosive immediately before being placed near landmines/UXO. Because FIXOR includes two separate non-explosive elements, it can be carried on commercial aircraft, making it more readily available than alternative solutions. For more information on FIXOR—produced by MREI Specialty Explosive Products Limited—visit http://www.fixors.com/.

Nicaragua Foot

Developed by Niagara Prosthetics and Orthotics Limited (NPO), the Nicaragua Foot is an injection-molded prosthetic foot that is less vulnerable to failure from fatigue than other prosthetic feet. This product has been tested by mine victims in Thailand, where results gathered by survey have reported that the Nicaragua Foot is not only easy to use but also requires little muscular exertion, thus enhancing mobility in the opposite leg. For more information on the Nicaragua Foot, visit http://www.cmcat.gc.ca/CCMATProgram/Victim/Aids/index_english.html.

Research & Development

Aside from testing and evaluating mine action technologies, CCMAT also has an extensive research and development (R&D) program that has had a number of noteworthy successes. For example, during 2015, a number of R&D projects have been funded under the Technical Replication Program (TRP). These projects have already been developed and are currently being tested at CCMAT facilities. Full reports of these projects can be found under the Technical Reports section of the CCMAT website (http://www.cmcat.gc.ca/).

Hyperspectral Imaging

Hyperspectral Imaging can help identify potential mine-affected areas during the initial reconnaissance survey process. The Compact Airborne Spectrographic Imager (CASI), developed by Iners Research of Calgary and Defense Research and Development Canada (DRDC-Suffield), was able to detect surface-laid mines obscured by vegetation but has been less effective in identifying buried landmines. Consequently, CCMAT is researching the use of short-wave and thermal infrared wavebands for detecting buried targets.

Ground Penetrating Radar

In the past, GPR has only been effective in detecting large AT mines. As a result, CCMAT has been researching the necessary factors for identifying AP mines through GPR. These factors, including sensor height, polarization, soil type, surface roughness and variation in soil water content, are being investigated by Sensor and Software, Inc., of Toronto in an attempt to enhance current GPR technology. If this technology proves effective, CCMAT will use the results of these studies to develop a handheld or small robotic vehicle-mounted GPR sensor.

Sonar Detection

Currently, a parametric sonar detection device is being developed by Giugneco International Limited in order to detect landmines/UXO in flooded minefields and economically important canals and waterways. Initial trials indicated that this technology could detect munitions buried in up to 30 cm of sediment and 75 cm of water.

Protective Footwear

In order to better protect deminers from mine blasts, CCMAT and collaborating organizations have been researching enhanced protective footwear. To test this footwear, they are developing a surrogate leg and a numerical model that mimics the response of a human leg to a mine blast. The aim is to develop protective footwear that prevents catastrophic injury from the most common AP mines.

Conclusion

Since 1998, CCMAT has worked with a number of Canadian and international organizations to enhance mine action technologies. They have also helped establish the International Testing and Evaluation Program (ITEP) in order to designate a standard for testing and evaluating mine action equipment before it is used in the field. CCMAT welcomes the opportunity to assist the mine action community through testing and evaluation as well as R&D.

News from the OAS continued from page 100

continues to search for more funds to fulfill the needs of the affected communities. To sum, an estimated $8 million is needed to sustain the program this year.

Nicaragua Completes a Mine Awareness Campaign

On October 31, 2002, the Nicaraguan government, in collaboration with the OAS Mine Action Program and the United Nations International Children's Emergency Fund (UNICEF), completed a major mine awareness and MRE campaign in the department of Nueva Segovia. Much of the effort was led by two Nicaraguan landmine survivors who actively promoted the program.

The campaign emphasized the solicitation of information from local inhabitants about the location of mines near their homes. As a result, more than 400 mines and pieces of UXO were able to be located and destroyed.

"All information has been adopted with permission from the OAS. A publication of the OAS Mine Action Program and the United Nations International Children's Emergency Fund (UNICEF)," the publication can be downloaded online at http://www.unicef.org/publications/landing.html, or at http://www.unicef.org/publications/landing.html.spa.html for the publication in Spanish.

"All photos courtesy of the OAS Mine Action Program.

References

1. Article 7 Report, points 2, 4, 5, and 8.

Contact Information

Jaime Perez
Organization of American States
Unit for the Promotion of Democracy
1809 F Street
Washington, DC 20006
(202) 458-3708
E-mail: jperlez@oas.org

Published by JMU Scholarly Commons, 2010
The Demining Technology Information Forum

The Demining Technology Information Forum (DTIF) organizes conferences and publishes proceedings and relevant papers in an effort to increase communication between users and developers of demining technology.

by DTIF

The primary aim of the DTIF is to create an opportunity for the research and development (R&D) community to exchange information and ideas on technology for humanitarian demining. However, the DTIF also gives the user community a chance to have their voices heard by the developers of demining technology and vice versa. These aims are accomplished through workshops with the proceedings published on the DTIF website (www.maic.jmu.edu/dtif).

The three DTIF workshops held to date have been:
- Research on Demining Technologies—Joint Workshop, Ispra, Italy, July 12–14, 2000;
- A Workshop for the Users and Developers of Mine Action Technology, Vancouver, Canada, June 4–5, 2001;

The DTIF website has also re-published selected papers from the 4th and 5th Monterey Symposium on Technology and the Mine Problem and from the 2nd Joint Australian/American Conference on Technologies of Mine Countermeasures, held in Sydney, Australia, 2001. These papers were re-published with the permission of the organizing committee; the objective being to expand the audience for the work among the demining R&D community.

DTIF has had considerable success with its workshops—three completed and two more in the planning stages (one on detection of explosives and another, jointly with James Madison University, on mapping of mine affected areas). When the DTIF online journal (DTIF) was introduced, the editors intended it as a vehicle for the publication of selected and unsolicited papers on the development of technology for mine action and experience with the use of technology in the field (lessons learned). To attract more high-quality papers on these and other related subjects, the editors are considering a hard copy version, possibly as part of the Journal of Mine Action.

The website will be retained as the most appropriate vehicle for the publication of the proceedings of DTIF workshops and other mine action conferences.

Contact Information

Francesco Liutmann
Tel: +39 0332 78 62 30
E-mail: francesco.liutmann@irc.it
Website: http://www.mail.jmu.edu/dtif

Use of Mechanical Equipment in Mine Clearance

In recent years, mechanical equipment has become more and more prominent in demining programs around the world. This article provides an overview of mechanical demining equipment and highlights the involvement of the Geneva International Centre for Humanitarian Demining (GICHD) in promoting such equipment.

by Johannes Dirschert, GICHD

The Mechanical Demining Equipment Catalogue

In 2002, the GICHD published the first issue of the Mechanical Demining Equipment Catalogue. The purpose of this document was to provide the international demining community with an overview of commercially available equipment. The listed information was based on documentation provided by manufacturers, test reports provided by independent sources and subject lessons learned in the field. A section on each machine attempted to broadly state an opinion on the capacities and restrictions of each piece of equipment.

In February 2003, the second issue of the catalogue was published. Several new pieces of equipment were added, and almost every manufacturer reported the latest versions of their machines. The catalogue is available in hard copy, on CD or on the GICHD website (see contact information below).

Contact Information

MASG
Chairman: Amb. Dr. Harald Braun
Secretary: Mr. Joachim von Marschall
Tel: 212-940-0429
Fax: 212-940-0402 / 0403
E-mail: MASG@germany-un.org

The Necessity of Mechanical Equipment

Mine clearance programmes are based mainly on manual demining—a slow, dangerous and work-intensive method. The use of mechanical clearance equipment is increasingly becoming acceptable to the demining community. The main roles for mechanical devices include area reduction and ground preparation. The cost-effectiveness model developed by the GICHD allows programme managers to utilize mechanical assets to their fullest operational and, therefore, cost-effective potential.

In July 2002, the GICHD published the study "Mine Action Equipment Standards of Global Operational Needs." The purpose of this study was to examine the effects of technical equipment improvements on the productivity of demining programmes. One of the major conclusions is that the effective determination of the outer edge of mined areas is of predominant importance for increasing productivity. It is generally acknowledged that sustained acceleration of this process is possible only if dogs or mechanical clearance equipment is used.

Limits of the Currently Available Mechanical Equipment

The productivity of a piece of equipment is closely related to its size. The larger a piece of equipment, the greater its potential productivity. Yet the size of a piece of equipment goes together with critical logistical and, therefore, financial implications, which may negatively impact cost-effectiveness.

FLail Systems

FLail systems are commercially available in various sizes. They are the most common demining vehicles in the world. Their usefulness for ground preparation and vegetation clearance is beyond doubt. Yet their capability of clearing mines reliably is—yet another reason—the subject of intensive dispute within the demining community. Agreement as to standardized and internationally accepted test procedures has not been reached. This struggle of philosophies may continue for some time. Regardless of disputed clearance performance, some systems can throw mines or parts of mines out into previously cleared areas, increasing the time required for the post-clearance confirmation process. The dust arising from the felling process may considerably impair the maneuverability of the vehicle and may even cause serious technical problems (e.g., overheating) under specific operational conditions.

Tiller Systems

Tiller systems have evolved from forestry equipment. Depending on their configuration, they may even be used for soil with a high rock ratio. The clearance performance tends to be similar to feller systems. In order to withstand the detonation pressure from mines, the tiller drum needs to be relatively heavy. For that reason, the platform vehicle tends to be a

Continued on page 107
HUMAID’s Demining Efforts in Guinea-Bissau

Guinea-Bissau may not have one of the largest landmine problems in the world, but the lives of native Guineans continue to be threatened on a daily basis by landmines/UXO that remain from previous conflicts. This article highlights the efforts of the non-governmental organization (NGO) HUMAID, whose main objective is to keep working until Guinea-Bissau is landmine-free.

Guinea-Bissau is one of the most landmine-affected countries in the world. An estimated total of 100,000 landmines and 300,000 unexploded ordnance (UXO) are still present in the country, posing a significant threat to civilians. Since the end of the civil war, HUMAID has been actively involved in demining efforts, working closely with local communities to remove landmines and UXO from residential areas.

The organization has made significant progress in recent years, with the number of landmines cleared increasing steadily. In 2022, HUMAID reported that it had cleared a total of 5,000 landmines and 30,000 UXO from various locations in the country. This has helped to reduce the risk of injury and death to civilians and has allowed for the safe return of displaced populations.

In addition to field operations, HUMAID has also focused on community awareness and education, working with local leaders and schools to raise awareness about the dangers of landmines and UXO. The organization has also partnered with the United Nations Mine Action Service (UNMAS) and other international organizations to coordinate efforts and share best practices.

HUMAID continues to face significant challenges in its work, including funding constraints and the need for continued support from donors. However, the organization remains committed to achieving its goal of making Guinea-Bissau landmine-free and improving the lives of its people.

Use of Mechanical Equipment in Mine Clearance

Continued from page 105

The Future

In the medium term, the GICHD believes that, given suitable topography, soil and mine type, machines capable of becoming "stand-alone" assets will become realised. While this may be so, for the foreseeable future there will be a need for at least some form of backup clearance system in support. The goal is that this backup system will be minimal, fast and highly cost-effective. It will be based on the known residual threat likely to be left by a particular machine. In most current situations, the combined applications of mine detection dogs, manual teams and machines in measures suitable to a specific environment will continue to provide the best results.

Contact Information

Johni Blacken
HUMAID
Caixa Postal 964
Bissau
Guinea-Bissau
Tel: 245-20185
Fax: 245-204430
E-mail: humaid@lsgtelecom.gov
Susanna Sprinkel
MAIC
Tel: (540) 568-2810
E-mail: sprinkal@jmu.edu
The International Test & Evaluation Program

On 17 July 2000, Belgium, Canada, the Netherlands, Sweden, the United Kingdom, the United States and the European Commission (EC) signed a Memorandum of Understanding to form the International Test and Evaluation Program (ITEP); Germany became a participant on 14 June 2002. The following information was extracted from the ITEP website (www.itep.ws).

by ITEP

Mission

Through its members, ITEP constitutes a global network of test and evaluation resources for humanitarian demining. The following are activities within ITEP:

• Developing and using universally accepted standards for test and evaluation methodology.
• Collecting, generating and distributing robust, scientifically objective data on technologies, materials and systems for humanitarian demining.
• Establishing a responsive and cost-effective test and evaluation program.
• Performing test and evaluation of equipment and systems—existing or in development.

Efficiency is achieved through collaboration among ITEP participants with complementary test facilities and technical capabilities. Data generated through ITEP test and evaluation activities is available to the demining community in the form of reports published on the ITEP website.

Organizational Structure

ITEP is managed by an Executive Committee consisting of one representative from each member, that reports to a Board of Directors. Administrative and technical support is provided by a Secretariat, currently hosted by the EC Joint Research Centre in Ispra, Italy. The Secretariat is the main communication channel and point of contact for those seeking information from or contact with ITEP. Points of contact for the participating countries are provided on the website and contact information for the Secretariat may be found at the end of this article.

Activities

A work plan, listing national and collaborative projects, has been prepared and published on the ITEP website. It is divided into six technical areas listed as survey, detection, mechanical assistance, personal protection, manual tools and neutralization. The lead nation and partners are identified for each project, and a timeline for completion is provided.

When ITEP was established in 2000, there were no universally accepted methods for testing and evaluating humanitarian demining equipment and systems. Individual ITEP participants were in the process of developing test methods that generate reliable, reproducible and statistically significant data. Under ITEP workshops are being conducted to review these national methodologies and identify universally acceptable test protocols for metal detectors and mechanical assistance equipment. A similar process is planned for personal protective equipment (PPE).

A systematic inventory has been completed of test and evaluation activities, capabilities, and needs in southeastern Europe. The inventory was carried out through questionnaires, visits to Bosnia-Herzegovina, Croatia and Slovenia, and a regional workshop in Croatia. A report is available on the website.

Contact Information

ITEP Secretariat
Joint Research Centre
Via E.Fermi—JTI P 723
21020 Ispra (VA)—Italy
Tel: +39 0332 78 5546
Fax: +39 0332 78 5772
E-mail: secretariat.itep@jrc.it
Website: http://www.itep.ws

Costa Rica: Free of AP Landmines

On December 10, 2002, Costa Rica declared itself the first country free from anti-personnel landmines in the Western Hemisphere. Placed in hills and brooks, bridges and roads, mines and UXOs were buried for more than 15 years during the conflict in Central America.

by Jaime Perales and Carl Case

Introduction

With the support of the Organization of American States (OAS), Costa Rican deminers detected and destroyed more than 338 mines on the border with Nicaragua, and cleared more than 130,000 square meters of land. As a result, formerly contaminated areas were rehabilitated as potential agricultural areas. There were no mine accidents, or 338 deaths, that we had the opportunity to prevent and this gives us satisfaction and pride," said Luis Alonso Rosales, international supervisor of the OAS.

OAS/Mine Action began its work in 1996 with the government of Costa Rica in the areas of mine clearance, mine risk education (MRE) and mine victim rehabilitation. With the conclusion of operations, the government fulfilled its commitment to the Ottawa Convention, which stipulates the destruction of anti-personnel landmines in approximately a ten-year period. Costa Rica signed the Convention in 1997 and ratified it in 1999.

Multilateral Cooperation Effort

OAS/Mine Action is a program created by the OAS at the request of its member countries. Apart from Costa Rica, OAS/Mine Action has programs in Honduras, Guatemala, Nicaragua, Ecuador and Peru. In collaboration with the Inter-American Defense Board (IADB)—military counterpart of the Inter-American System—the program has the following components: 1) humanitarian demining, 2) MRE, 3) mine victim rehabilitation, 4) stockpile destruction and 5) database and information systems.

The financial support of 19 donor countries has permitted the OAS to clear more than 1,400,000 square feet of land in Central America and more than 22,000 anti-personnel landmines. The total effort of more than $40 million (U.S.), channeled through the OAS for all Central America, has been key to finalizing mine clearance operations in Costa Rica.

The IADB has assisted in the training for demining operations since the creation of the program. To the present, this military entity has trained approximately 260 international supervisors from 11 member countries. International supervision coordinates more than 900 deminers placed in five mine-affected countries.

Mine Clearance in Latin America

The programs supported by OAS/Mine Action have different challenges, depending on the country. In Honduras, some 2,269 mines have been cleared from the border with Nicaragua. In addition, in 2000, Honduras became the first country in Central America to destroy all its stockpiled mines. In 1998, Hurricane Mitch caused flooding and mudslides, which delayed operations. Despite this setback, it is expected that demining will finalize at the end of this year.

Civil war in Guatemala lasted more than 30 years, leaving different types of UXO throughout the country. The UXO found in the affected zones includes homemade mines, booby traps and various types of grenades. There are an estimated 6,000 pieces of UXO in the country that are being located and destroyed systematically by three entities: volunteer firefighters, former members of the Guatemalan National Revolutionary Unit and the National Army. It is expected that operations will be completed by the end of 2004.

In Nicaragua, mines are scattered throughout the country, especially in strategic areas such as bridges and electric towers. Nevertheless, Nicaragua has reliable equipment and personnel (as well as a reliable infrastructure) in these areas, which have permitted a constant clearance effort. According to official sources, more than 63 percent of mines have been cleared and all mine stockpiles have been destroyed. It is expected that Nicaragua will be a landmine-free country by the end of 2005.

As a result of the 1995 conflict between both countries, Ecuador and Peru have more than 130,000 mines on their border. With more landmines than the four Central American countries combined, Peru and Ecuador have emphasized the need for mine clearance operations. The OAS has collaborated in the area of technical training, supervision and stockpile destruction. The large
An OAS Mine Awareness campaign.

Preventive Education, Rehabilitation, Stockpile Destruction & Database

Mine Awareness Education is among the main components of the OAS/Mine Action program. In mine-affected countries, the program develops a campaign in the affected areas and coordinates efforts with the National Army, schools, community leaders and local media. The steps to follow when finding a mine are disseminated to the population through these channels. The OAS has allowed landmine victors to share their experiences with the affected population.

The OAS rehabilitation program has provided more than 450 handicapped people with medical attention and prostheses. Since last year, OAS/Mine Action has included an additional component: job training for victims.

Stockpile destruction is another component of the program that has been developed in collaboration with the governments of the affected countries. Since 2001, Honduras, Nicaragua, Ecuador, Peru, and Panama have completely eliminated their anti-personnel landmine stockpiles by destroying a total of more than a half million mines.

The OAS, in collaboration with the United Nations, has implemented the Information Management System for Mine Action (IMSMART) in Nicaragua, with the goal of maintaining a record of mined areas, supporting victims of anti-personnel landmines, recording mines that have been destroyed and targeted areas that have been supported by mine awareness campaigns. IMSMA in Nicaragua has records of more than 500 victims, and the system has expanded to Guatemala, Peru and Ecuador.

Costa Rica: First Country Completed

Fewer mines than expected were located in Costa Rica. Approximately 5,000 were thought to have been placed along the border with Nicaragua, but these estimates were further reduced once operations were in progress. The lack of minefield registries was a problem shared by other Central American countries.

There were no records of mined zones and, for us, this was as if we were looking for a needle in a haystack,” said Freddy Santamaria, the chief of demining operations of the Ministry of Public Security of Costa Rica.

Apart from the initial supervision by the IADB, mine clearance operations require a helicopter for medical evacuation, a paramedic at the demining site and health insurance for mine clearance personnel. “The lack of at least one of these elements will not allow us to continue mine clearance operations in the area,” stated William McDonough, the coordinator of the OAS/Mine Action Program.

Mine clearance operations and destruction of USAOs were executed according to United Nations international standards. No accidents occurred during mine clearance operations in the country. Nevertheless, demining in Costa Rica was not completely a walk in the park. Operations suffered delays from exogenous variables such as Hurricane Mitch, which caused the loss of mines, and successive infrastructural difficulties in locating them. With the support of the OAS/Mine Action Program, Costa Rican deminers cleared three mine sectors along the border with Nicaragua in the provinces of Guanacaste and Alajuela.

A mine awareness campaign was developed in collaboration with the Ministry of Public Security to target local schools and communities close to the mined zones. The campaign consisted primarily of distributing educational materials, including posters, photographs, pencils and uniforms for students. According to Leda Marin, local coordinator of the OAS Program in Costa Rica, children’s enthusiasm about the campaign was generated not only by “the message carried on the T-shirt, the notebook or the pencil, but also by the receipt of the present itself.”

Although Costa Rica does not have a large number of landmine victims, according to the Ministry of Public Security, at least 10 people suffered injuries from landmines. In the case of the few Costa Rican mine victims who had not previously received assistance, the OAS program provided them with prosthesis and medical treatment in Nicaragua.

The completion of the OAS Mine Action Program in Costa Rica represents a small but significant step in the fulfillment of the mandate provided by OAS General Assembly Resolution 1745 to continuously support member countries that request assistance with mine action in order to make the idea of the Western Hemisphere being an anti-personnel landmine-free zone a reality.

How many times have we been cautioned to bound valuable information; to share it only at the risk of watering down our organization’s—or personal—power? Our altruistic inclination to give and (hopefully) receive information has all too often been beaten back by vague suspicions of those who may want to use our information as a way to marginalize us. Often times, this imperative is reinforced, if at least indirectly, by our own organization.

At the Mine Action Information Center (MAIC), we have tried to drive this point home and to deal in (to paraphrase Woodrow Wilson), “open information, openly arrived at.” We were gratified at the directors’ meeting when someone from elsewhere in the mine action community (Nels Hoek of the UN High Commission for Refugees) suggested that the paradigm has now shifted. “To share information in today’s world, he asserts, it is necessary to increase—not diminish—one’s power. It is through that helpful and re-purposed lens that we would like to review two critical issues facing the mine action community: strategic planning and coordination, which were raised at the recent meetings in Geneva.”

References
1. Argentina, Germany, Austria, Australia, Brazil, Canada, Denmark, France, Finland, Holland, Italy, Germany, the Netherlands, Norway, Panama, South Korea, Spain, Sweden, United Kingdom, and the United States (information since the beginning of the program).
2. Argentina, Bolivia, Brazil, Colombia, Chile, El Salvador, Guatemala, Honduras, Peru, Uruguay and Venezuela (information since the beginning of the program).

Contact Information
Jamie Peralta OAS E-mail: jperal@oas.org
Carl Case OAS E-mail: ccase@oas.org

by Dennis Barlow, Director

How many times have we been cautioned to bound valuable information; to share it only at the risk of watering down our organization’s—or personal—power? Our altruistic inclination to give and (hopefully) receive information has all too often been beaten back by vague suspicions of those who may want to use our information as a way to marginalize us. Often times, this imperative is reinforced, if at least indirectly, by our own organization.

At the Mine Action Information Center (MAIC), we have tried to drive this point home and to deal in (to paraphrase Woodrow Wilson), “open information, openly arrived at.” We were gratified at the directors’ meeting when someone from elsewhere in the mine action community (Nels Hoek of the UN High Commission for Refugees) suggested that the paradigm has now shifted. “To share information in today’s world, he asserts, it is necessary to increase—not diminish—one’s power. It is through that helpful and re-purposed lens that we would like to review two critical issues facing the mine action community: strategic planning and coordination, which were raised at the recent meetings in Geneva.”

Strategic Planning

The recent efforts, notably of Cranfield University and the Geneva International Center for Humanitarian Demining (GICHD), to apply a more structured and goal-oriented approach to mine action planning has resulted in a methodology that requires discrete and logical actions based on goals, levels of analysis and decision-making strategies. Each of these decisions—whether to determine objectives or tasks, analyze various courses of action, implement the plan or evaluate it—requires a different set of informational inputs.

Even more daunting, the information needed for each set of requirements will probably be vastly different. Some required data can be very technical in nature, such as soils taxonomy and landmine specifications. Other types of data will deal with economic factors including land use, that may be considered or discounted when determining the value of goods. Some necessary information will deal with societal considerations such as education, gender roles, and customs, while other phases of strategic planning will require information relative to other supporting agencies and organisations involved in work in the region. In other words, the need for accessing and properly using information becomes more critical as the necessity of strategic planning becomes more evident.

Reflecting on the information needs of a mine action strategic plan, it can be concluded that the requirements are much more complex than planning an event to be conducted by a very controlled organization (e.g., military operations) concerned with a short-duration event focused on the completion of a specific task (e.g., capping an oil well). Even worse from the planner’s perspective is that mine action programs need to be diverse, often calling for capabilities residing in organizations that do not usually “play well together.” A mine action campaign, therefore, should utilize the available data to support phases over a considerable period of time, involve a number of unrelated functional specialties, support the well-being of all segments of a threatened region and facilitate the integration, or at least cooperation, of diverse—even perhaps antagonistic—organizations. This last requirement quite naturally leads us to the second major topic of the directors’ meeting.

Coordination

The words communication, cooperation, coordination and collaboration must be entirely too much confusion linked with such a broad concept. They should be defined that we can comminicate well together,” but have been mired in the morass of jargon, that is, the words we use not often stop and ponder carefully the intended and perceived use of these terms. In the end, whatever word we use can hirt at the same time. Institutional, administrative, or another kind of relationship.

Nevertheless, the concept of coordinating plans, and finding and utilizing congruencies both within mine action campaigns (internal coordination) and outside the realm of mine action (external coordination), has become a major discussion point within the humanitarian mine action community. Discussions about how to integrate the various functions of mine action as well as the advisability of “mainstreaming” mine action activities into socio-economic development plans are healthy—and critical—trends.

Mine action coordination requires, just as with planning requirements, need more information and communications support than other more traditional civil works endeavors. Anyone with experience in the mine action realm is aware of the great variety of functions found under one umbrella. Bringing order out of that system of chaos is hard, especially given that in most mine action programs there is no single line of authority. When the activities of UN support, technical advice, training assistance, donor wishes, military aid, bilateral agreements and a host country typically beset with...
many developmental problems, the goal of a unified approach may be more of a hope than a reality.

Furthermore, it becomes increasingly difficult when trying to effect linkage with external authorities. Communications with “outside” agencies usually involve talking with officials who do not understand the landmine issue, who do not comprehend what it could possibly do with them, and who would probably like to avoid at all costs dealing with an issue as volatile—politically as well as technically—as landmines. Officials who are responsible for humanitarian assistance actions, peacekeeping missions and development programs could potentially have a great need for integration with mine action activities, but they are not typically included in demining planning or informational distribution, nor do they, as a matter of course, initiate such coordination.

**The Keys to Effective Information Sharing**

Bringing about the kind of effective strategic planning and coordination that should be at the heart of many mine action initiatives is the problem touched on by Mr. Harild at the Mine Directors’ meeting. Mine action practitioners must do a better job of identifying, processing and above all, sharing information. The following are common-sense guidelines that could take some of the sting out of information sharing and bring in a little daylight.

**Be Proactive**

I once had a boss who said, “When in charge, take charge! When not in charge, take charge!” While overstated, the idea of mine action planners taking the initiative in offering information-sharing techniques is right on the button. Whether a mine action organization is in the lead, in support or situated laterally in the organizational “wire diagram,” the important thing is to cast widely about you to find out who is involved. Even if the Ministry of Health, for instance, should be in charge of landmine casualty data, that fact should not preclude mine action victim assistance staff from visiting that ministry to discuss and decide on the preferred method of sharing information and helping reach an agreement on such a methodology.

**Refine Information Needs**

When “brokering” information, you should be willing to do two things. One is to have clearly in mind what information you need and would find valuable. Do not go on a fishing expedition and make potential information sharers suspicious by rooting around in their information treasure chest hoping to turn up a serendipitous gem. Asking for specific information needs will be the quickest and most professional way to get what you need. Conversely, if you do your homework and find out what information other organizations need, you may be able to create a “win-win” scenario by trading information that you need for information that someone else needs.

**Use Common Platforms**

One of the great success stories in mine action is the advent of the Information Management System for Mine Action (IMSSMA), an information software system that has allowed most of the mine action centers to interface in a practical and reliable way. For this, the mine action community (and the GICHD, in particular) should be lauded. However, this does not mean that the goal has been reached. The greater challenge remains of making mine action-related information interface with information systems utilized by peacekeepers, humanitarian organizations, host governments and commercially accepted electronic vehicles. The more related platforms mine action operators and managers can “talk to,” the more information they will be able to capture, share and process.

**Keep It Simple**

The world may be getting smaller, but it is not getting any simpler. Data measurement, data input, analysis, programming, etc., are skills that are still in great demand and are not accessible or sustainable in many parts of the world, including developed countries. Not only operators but also managers and, yes, even policy makers, are not necessarily capable of processing all the information that they see or are presented. Therefore, every form, every input mechanism and every display needs to meet the “Napoleon’s Corporal” acid test. There is an apocryphal story that Napoleon, before sending a message to his subordinate generals or field marshals would first have it read by a lowly corporal. If he understood the message, it was sent; if he did not, it was re-drafted. So it should be with all information systems. If they are not logical and as simple as they can be, they may be counterproductive.

**Sandboxes are for Sand; Ricebowls are for Rice**

Every organization seems to want to prevent others from encroaching into its area of interest, to maintain (ideally to enlarge!) its sandbox or protect its ricebowl. This zero-sum approach to mine action can be its death knell. Mine action depends on a multitude of varying organizations, functions, players, philosophies, resources and motivations to somehow be applied in a complementary way. We do not suggest a world in which all simply reduce their organizational boundaries to rubble, nor do we believe that an autonomous entity should direct mine action actions. But we do believe that many different capabilities can be applied in a most ingenious and cooperative way in which those skills are maximized when used in the proper mix, at the proper time and with proper support. To this end, we believe that endless discussions concerning precise definitions of subjective terms (e.g., “development”), the precise moment for “mainstreaming” to occur and the precise term to be applied to describe an ideal relationship are inhibitors to real and desperately needed action.

Share your information. Tout your successes. Let others learn from your trials and errors. Maybe it will not work, but it would be such a noble way to fail—certainly better than watching landmine accidents mount because we could not learn to play nicely with others.

**Contact Information**

Dennis Barlow  
Director, MAIC  
E-mail: barlowdc@jmu.edu